Activity of Fuel Batches Processed Through Hanford Separations Plants, 1944 Through 1989

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Abstract: Updated inventories of radionuclides in spent fuel processed through Hanford separations plants from 1944 through 1989 were generated for input to the Hanford Defined Waste Model. Revised inventories were based on updated half-lives, fission product yields, initial fuel and cladding compositions, single-pass reactor cross sections, splitting factors between cladding waste & separations waste, historical product separations factors, and separations plant processing.

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CONTENTS

1.0 INTRODUCTION 1

2.0 METHODS AND MODEL IMPROVEMENTS 2

2.1 FUEL AND CLADDING COMPOSITIONS 2
2.1.1 Fuel Compositions 3
2.1.2 Cladding Compositions 5
2.1.3 Thoria Fuel 7
2.2 DECAY LIBRARY 7
2.3 FISSION PRODUCT YIELDS 10
2.4 CROSS SECTIONS 14
2.4.1 N Reactor Cross Sections 14
2.4.2 Updated Single Pass Reactor Cross Sections 15
2.4.3 Updated Thorium Cross Sections 18
2.5 BURNUP INTERPOLATION 18
2.6 PRODUCT RECOVERY AND SEPARATION OF CORE AND CLADDING WASTE STREAMS 19
2.6.1 ORIGEN2 Changes 24
2.6.2 Unified Separations Production File Waste Loss Fractions 24

3.0 RESULTS 26

3.1 EFFECTS OF METHODS IMPROVEMENTS ON TOTAL INVENTORY 26
3.2 OUTPUT SUMMARY 29

4.0 RECOMMENDATIONS FOR FUTURE WORK 33

5.0 REFERENCES 34

APPENDICES

A INDEPENDENT REVIEW COMMENTS AND CHECKLIST A-1

B INPUT FILES B-1

C DECAY LIBRARY CHANGES C-1

D FISSION PRODUCT YIELD UPDATE PROGRAM D-1

E SINGLE PASS REACTOR CROSS SECTION GENERATION E-1

F DKPRO VERSION 3.1 VERIFICATION AND VALIDATION F-1

G DKPRO VERSION 3.0 USER'S GUIDE G-1

H SUMMARY NUCLIDE INVENTORY TABLES H-1

LIST OF FIGURES

Figure 2-1. ^{235}U Fission Product Chain Yield Update. 13

Figure 2-2. ^{238}U Fission Product Chain Yield Update. 13

Figure 2-3. ^{239}Pu Fission Product Chain Yield Update. 14

Figure 2-4. Preparation of Separate Core and Clad ORIGEN2 Files for Input to DKPRO 20

Figure 2-5. DKPRO Processing to Create Separate Cladding Waste and Separations Waste Inventories. 21

LIST OF TABLES

Table 2-1. Definition of Fuel Types and Fuel Codes for Radionuclide Inventory Modeling. 2

Table 2-2. Uranium Fuel Impurities. 3

Table 2-3. Uranium Fuel Initial Isotopic Compositions. 4

Table 2-4. Time Dependant Fuel Impurities 4

Table 2-5. Fuel Cladding Fraction. 5

Table 2-6. Single Pass Reactor Aluminum Cladding Composition Including Impurities 5

Table 2-7. N Reactor Zirconium Cladding Composition Including Impurities 6

Table 2-8. Aluminum Cladding Composition With Impurities For Thoria Fuel 7

Table 2-9. Isotopes Corrected for Beta Decay Branching to Metastable States That Did Not Exist in the ORIGEN-S Decay Library 8

Table 2-10. Updated ORIGEN2 Half Lives (seconds) for Key Radionuclides 8

Table 2-11. ORIGEN2 Chain Yields ENDF/B-6 vs. ORIGEN2 Library 10

Table 2-12. Fuel Amounts and Average Exposures 15

Table 2-13. Updated Natural Single Pass Reactor Cross Sections for Actinides 16

Table 2-14. Updated Enriched Single Pass Reactor Cross Sections for Actinides 17

Table 2-15. Updated Natural Single Pass Reactor Cross Sections for Activation Products 17

Table 2-16. Updated Enriched Single Pass Reactor Cross Sections for Activation Products.... 18

Table 2-17. Adjusted ^{232}Th Cross Sections for Thorium Fuel 18

Table 2-18. ORIGEN2 Generated Burnup Interpolation Files for DKPRO..... 18

Table 2-19. Fuel Core Separations Waste Splitting Factors (1-F_{core})..... 22

Table 2-20. Cladding Waste Splitting Factors (F_{clad}) 23

Table 2-21. Measured Cladding Recovery Waste (CRW) loss factors (Fcrw) 25

Table 2-22. Default Minimum Loss Factor (S)..... 25

Table 3-1. Cases Tracking Changes from Previous (1996) HDW Input Case For Total Production With No Reprocessing, Core Plus Cladding 27

Table 3-2. Current Versus Previous (1996) Total Production With No Reprocessing for Reference Decay Date of 2001..... 29

Table 3-3. Summary of Total Radionuclide Inventory Before and After Processing 30

Table 3-4. Summary of Total Radionuclide Inventory Before and After Processing (curies)... 31

LIST OF TERMS

CRW	Cladding Recovery Waste
g	grams
HDW	Hanford Defined Waste Model
g/MTU	grams per metric ton of uranium
I&E	Internal and External
kg/MTU	kilograms per metric ton of uranium
lbs	pounds
MWD	Mega Watt days
MWD/MTU	Mega Watt days per metric tons of uranium
MT	metric tons
MTU	metric tons of uranium
ppm	parts per million
PUREX	Plutonium-Uranium Extraction (facility or plant)
REDOX	reduction-oxidation/Reduction and Oxidation Facility

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1.0 INTRODUCTION

Best-Basis tank waste inventories consist of 25 chemicals and 46 radionuclides on a global and tank-specific basis, representing greater than 99.9 percent of the chemical mass and radionuclide activity. The best-basis inventory was developed by considering actual sampling data, computer model predictions generated by the Hanford Defined Waste Model (HDW), and engineering analyses of historical records such as process flowsheets and material purchase invoices. The HDW model is relied upon heavily to generate the best-basis inventory for the radionuclides that were not determined from analytical sampling information

The primary radionuclide input to the HDW model consists of a file of "pre-decayed" isotopic inventories (Fuel Activity Records) generated using the ORIGEN2 (Croff et al. 1979; Roblyer 1994) and DKPRO (Appendix F) codes. The DKPRO code solves the general problem of modeling complex nuclear waste streams using ORIGEN2 radionuclide production files. The ORIGEN2 code is used to calculate initial radionuclide inventories as a function of fuel type, fuel burnup, and reactor type, with subsequent decay and processing computed by the DKPRO code. Input to the DKPRO code includes an archive file of separations processing records by fuel batch, a file of processing directives, a file of summary directives, and a set of ORIGEN2 inventory files representing unprocessed radionuclide inventories. The processing directives input to DKPRO are used to control the removal or splitting of waste streams. Each fuel batch record contains data on fuel type, fuel tonnage, exposure, separations, date, cooling time, and product recovery factors. For each separations processing record, DKPRO calculates the radionuclide activities in that batch of fuel by interpolating on the ORIGEN2 generated inventory files as a function of fuel type and fuel exposure (MWD/MTU), and then performs decay calculations and whatever processing instructions are provided in the process directives file or the fuel records file. Output from the DKPRO code are two files (one for cladding waste and one for separations waste) of approximately 1300 Fuel Activity Records of pre-decayed radionuclide values, each record representing the inventory associated with a batch of fuel processed by month (or shorter period) through individual separations plants, decayed to the reference decay date of January 1, 2001.

Previous input for the HDW model was generated with ORIGEN2 and DKPRO assuming no processing of the fuel, no removal of product constituents, and no splitting between fuel separations waste and cladding waste (Wootan and Schmittroth 1997). The DKPRO code primarily performed the functions of interpolation and decay on the ORIGEN2 inventory files. The splitting between fuel separations and cladding waste streams and product recovery was performed in the HDW model. Uncertainties are inherent in the process of generating the radionuclide input to the HDW model, arising from both basic nuclear data uncertainties and modeling assumptions. Subsequent studies indicated several areas for potential improvement in the ORIGEN2 and DKPRO process. These included updating the half-lives in the decay library, updating fission product yields, updating single pass reactor cross sections, updating fuel and cladding impurities, and improving the interpolation on burnup. In addition, the interface between the DKPRO and HDW model was changed so that the DKPRO processing provided the splitting between fuel separations and cladding waste streams and recovery of products.

Section 2.0 describes the method improvements. Section 3.0 presents the inventory results. Code documentation, input files, and additional details are provided in the appendices. Appendix A provides peer review comments, Appendix B provides listings of input files, Appendix C provides details of the ORIGEN2 decay library update, Appendix D provides details of the ORIGEN2 fission product yield update. Appendix E provides details of the single pass reactor cross section update, Appendix F and G provide the DKPRO code documentation, and Appendix H provides summary activity tables for all the processed fuel and for the processed fuel that went into tanks 241-AZ-101 and 241-AZ-102.

2.0 METHODS AND MODEL IMPROVEMENTS

2.1 FUEL AND CLADDING COMPOSITIONS

For the purpose of this radionuclide modeling task, Hanford Site fuels have been classified in six fuel types, as defined in Table 2-1. Each fuel type has been further classified into subtypes according to fuel and cladding impurity levels which varied with time. Historical records of single pass and N Reactor fuel and cladding compositions and upper limit impurity specifications were used to develop initial compositions for fuel and cladding for each fuel type in the ORIGEN2 calculations of compositions as a function of burnup. The primary improvements to the compositions over those used previously included the use of time dependent concentrations for nuclides that varied over different time periods, distinguishing between intermetallic contributions from lead-dip and triple-dip single pass fuels, the inclusion of the beryllium braze material on N Reactor fuel, and corrections to the treatment of thorium fuel and cladding. The main nuclides that exhibited time dependence included the nitrogen and ^{236}U content in the fuel, and the nickel content in aluminum cladding. The following sections describe the compositions used in the current analyses and also provide comparisons with those used previously.

Table 2-1. Definition of Fuel Types and Fuel Codes for Radionuclide Inventory Modeling.

Code	Fuel Definition
Al-0.71U	Aluminum clad, natural enrichment uranium (0.71 percent ^{235}U) - either solid core or I&E (Internal and External), Single-pass reactor fuel.
Al-0.94U	Aluminum clad, "Enriched" uranium (0.94 percent ^{235}U) Single-pass reactor fuel.
Zr-0.94U	Zircalloy clad, "Enriched" uranium (0.94 percent ^{235}U) N Reactor fuel.
Zr-1.1U	Zircalloy clad, "Spike" uranium (0.94 percent ^{235}U inner fuel tube and 1.25 percent ^{235}U outer fuel tube, together averaging 1.1 percent ^{235}U) N Reactor fuel.
Zr-2.1U	Zircalloy clad, "Co-Product" driver uranium (2.1 percent ^{235}U) N Reactor fuel.
Al-0.0Th	Aluminum clad, Thorium oxide target elements. Single-pass reactors.

2.1.1 Fuel Compositions

Table 2-2 lists the impurities included in the single pass reactor and N Reactor fuel compositions for the ORIGEN2 calculations of nuclide inventories. In addition to the time dependent impurities, nominal amounts (1 ppm) of chlorine and cobalt were added to all the fuel compositions in the ORIGEN2 calculations to allow tracking and scaling of the activation products ^{36}Cl and ^{60}Co if better information on actual impurity levels for these elements in the fuel are developed. Technetium impurities in recycled uranium are not included.

Table 2-2. Uranium Fuel Impurities.

Element	Fuel Impurities (g/MTU)				
	Single Pass Reactor		N Reactor		
	<1959	>1959	<1971	1972-1980	>1980
H			2.	2.	2.
Be			10.	10.	10.
B			0.25	0.25	0.25
C			550.	550.	550.
N [a]	65.	17.5	17.5	8.0	9.3
Mg	25.	25.	25.	25.	25.
Al			800.	800.	800.
Si	75.	75.	124.	124.	124.
Cl	1.	1.	1.	1.	1.
Cr	65.	65.	65.	65.	65.
Mn	25.	25.	25.	25.	25.
Fe	150.	150.	350.	350.	350.
Co	1.	1.	1.	1.	1.
Ni	100.	100.	100.	100.	100.
Cu			75.	75.	75.
Zr			65.	65.	65.
Cd			0.25	0.25	0.25

Note: [a]N content in fuel varied with reactor discharge date and fuel type.

Table 2-3 lists the initial uranium isotopic compositions for each of the fuel types for the ORIGEN2 calculations of nuclide inventories.

The MK-IV fuel contains two fuel elements, an inner tube and an outer tube. These elements start with the same 0.94 percent ^{235}U enrichment, but burn at different rates because of different neutron flux levels and different neutron spectra. The ORIGEN2 model created separate inventories for the inner tubes and outer tubes as a function of burnup, and then combines the inner and outer values together to create an assembly inventory.

The MK-1A fuel actually contains two enrichments, 0.94 percent ^{235}U inner fuel tube and 1.25 percent ^{235}U outer fuel tube. The ORIGEN2 model created separate inventories for the inner tubes and outer tubes as a function of burnup, and then combined the values together to create a composite that was labeled as 1.1 percent ^{235}U.

Table 2-3. Uranium Fuel Initial Isotopic Compositions.

Fuel Type			^{234}U (g)	^{235}U (g)	^{236}U (g)[a]	^{238}U (g)
Single Pass Natural	AL-0.71U	all years	53.1	7,110	0	992,837
Single Pass Enriched	AL-0.94U	all years	80	9,470	60	990,390
N Reactor MKIV	ZR-0.94U	<1971	80	9,470	100	990,350
		1972-1980	80	9,470	300	990,150
		>1980	80	9,470	500	989,950
N Reactor MK1A ZR-1.1U[b]	ZR-0.94U	<1971	80	9,470	100	990,350
		1972-1980	80	9,470	300	990,150
		>1980	80	9,470	500	989,950
	ZR-1.25U	<1971	80	12,500	200	987,220
		1972-1980	80	12,500	400	987,020
		>1980	80	12,500	650	986,770
N Reactor Coproduct	ZR-2.1U	all years	80	21,000	170	978,750

Notes:

[a] ^{236}U content varied with reactor discharge date and fuel type.

[b] ZR-1.1U is a mixture of 0.94 percent ^{235}U inner fuel tube and 1.25 percent ^{235}U outer fuel tube, together averaging 1.1 percent ^{235}U.

As shown above, the concentration of nitrogen and ^{236}U impurities in fuel varied significantly from the 1940s to the 1980s. This time variation was approximated by making ORIGEN2 inventory files for each fuel subtype identified for each unique initial material composition. Each fuel subtype was defined as shown in Table 2-4.

Table 2-4. Time Dependant Fuel Impurities

Fuel Type	Reactor Discharge Year	N (ppm)	^{236}U (ppm)
AL-0.71UA[a]	1944-1954	65	0
AL-0.71UB[a]	1955-1958	65	0
AL-0.71UC	1959-1989	17.5	0
AL-0.94U	1944-1989	17.5	60
ZR-0.94UA	1944-1971	17.5	100
ZR-0.94UB	1972-1980	8.0	300
ZR-0.94UC	1981-1989	9.3	500
ZR-1.1UA[b]	1944-1971	17.5	200
ZR-1.1UB[b]	1972-1980	8.0	400
ZR-1.1UC[b]	1981-1989	9.3	650
ZR-2.1U	1944-1989	17.5	170

Notes:

[a] The AL-0.71UA and AL-0.71UB correspond respectively to the Triple Dip and Lead Dip process, and not to the fuel impurities.

[b] ORIGEN2 creates 1.1 fuel as a combination of 0.94 and 1.25. The listed impurities are for the 1.25 portion. The 0.94 portion uses the 0.94 impurities.

2.1.2 Cladding Compositions

The total aluminum cladding in Single Pass Reactor fuel includes significant aluminum and minor elements in the aluminum-silicon layer. There is a big variation (factor of 100 difference) in the nickel content of two aluminum alloys used for cladding. Average nickel concentrations of 100 ppm or 11000 ppm were used. The lower nickel content was used in the early years and the higher value was used when the nickel content was increased in the 1950s.

Table 2-5 lists the ratio of cladding to fuel for the single pass reactor and N Reactor fuel compositions for the ORIGEN2 calculations of nuclide inventories. These values include the intermetallic and braze contributions.

Table 2-5. Fuel Cladding Fraction.

Fuel Type	Cladding Fraction (kg/MTU)
Single Pass Reactor Triple Dip <1955	41.26
Single Pass Reactor Lead Dip 1955-1958	41.93
Single Pass Reactor Lead Dip >1958	42.23
Single Pass Reactor Thoria	70.78
MK-IV	70.42
MK-1A	85.72
MK-II	87.06

Table 2-6 lists the impurities for the single pass reactor cladding compositions for the ORIGEN2 calculations of nuclide inventories. These values include the intermetallic and braze contributions. The previous compositions are also shown for reference.

Table 2-6. Single Pass Reactor Aluminum Cladding Composition Including Impurities. (2 sheets)

Element	Triple Dip Low Ni 1944-1954 (ppm)[a]	Lead Dip Low Ni 1955-1958 (ppm)[a]	Lead Dip High Ni 1959-1972 (ppm)[a]	Previous Model <1959 (ppm)	Previous Model >1959 (ppm)
Li	70[b]	70[b]	70[b]		
B	10	10	10	10	10
N	30	30	30	50	50
Mg	90	90	90	100	100
Al	911500	896900	890400	982600	982600
Si	31900	31400	31100	35300	35300
Ti	400	400	400	500	500
Cr	300	300	300	300	300
Mn	300	300	300	300	300
Fe	6600	6500	6500	5000	5000
Co	10	10	10	10	10
Ni	150	150	7300	100	11000
Cu	16100	1200	1200	2900	2900
Zn	300	300	300	300	300
Cd	30	30	30	30	30
Sn	31500	70	70	4100	4100

Table 2-6. Single Pass Reactor Aluminum Cladding Composition Including Impurities. (2 sheets)

Element	Triple Dip Low Ni 1944-1954 (ppm)[a]	Lead Dip Low Ni 1955-1958 (ppm)[a]	Lead Dip High Ni 1959-1972 (ppm)[a]	Previous Model <1959 (ppm)	Previous Model >1959 (ppm)
Pb	600	62200	61800	60100	60100
Bi	90	90	90	100	100

Notes:

[a] The ppm values are based on the combined aluminum cladding and intermetallic dip mass.

[b] The value of 70-ppm lithium in cladding plus intermetallic dip is derived from a maximum specification value of 80 ppm in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

Zircalloy-2 alloy was used as cladding material for N Reactor fuel. Impurity estimates were based on the midrange or maximum impurity specification as available. The end caps of the N Reactor fuel are brazed to the rest of the fuel element with a 95 percent zirconium, 5 percent beryllium braze. Table 2-7 lists the current N Reactor cladding compositions for the ORIGEN2 calculations of nuclide inventories. The previous cladding compositions are also shown for reference. The only difference from the previous composition was that beryllium in the braze filler was included in these impurities.

Table 2-7. N Reactor Zirconium Cladding Composition Including Impurities.

Element	Current Model (ppm)	Previous Model (ppm)
H	25	25
Be	974	
B	0.5	0.5
C	275	275
N	80	80
Na	20	20
Mg	20	20
Al	75	75
Si	100	100
Ti	50	50
V	50	50
Cr	1000	1000
Mn	50	50
Fe	1350	1350
Co	10	10
Ni	550	550
Cu	50	50
Zr	981400	981400
Mo	50	50
Cd	0.5	0.5
Sn	14500	14500
Hf	200	200
W	50	50
Pb	100	100
U	2.5	2.5

2.1.3 Thoria Fuel

Thoria (thorium oxide) fuel assemblies were irradiated in the single pass reactors to breed ^{232}Th into ^{233}U. The thoria fuel consisted of thorium oxide powder or wafers inside aluminum cans. Two campaigns to process and recover the Th and ^{233}U were done in the Plutonium-Uranium Extraction (PUREX) facility, the first in 1966 and the second in 1970. For this analysis, the thoria was treated as natural ThO2 with no impurities, because no data on impurities was located. The impurities in the aluminum cladding composition are shown in Table 2-8. The aluminum cans were represented as the same aluminum alloy used in the single pass reactor uranium fuel during this time period, except that the lead dip and intermetallic contributions were not included. Therefore, the ppm levels are slightly higher than those in Table 2.6 are. The ratio of clad to fuel was taken from data in ARH-2127, *PUREX Process Operation and Performance 1970 Thoria Campaign* (Jackson and Walser 1977) showing 400 lbs Al per 5660 lbs Th. The masses in the MTU column in the Unified6 fuel record file were modified from metric tons of thoria to metric tons of thorium. These records correspond to a total mass of thorium processed in both campaigns of 548.5 MT.

Table 2-8. Aluminum Cladding Composition With Impurities For Thoria Fuel.

Element	Concentration (ppm)
Li	80
B	10
N	50
Mg	100
Al	978300
Si	1660
Ti	500
Cr	300
Mn	300
Fe	5600
Co	10
Ni	11000
Cu	1470
Zn	300
Cd	30
Sn	100
Pb	100
Bi	100

2.2 DECAY LIBRARY

The ORIGEN2 decay library contains the half lives and decay branching ratios used by both ORIGEN2 and DKPRO to calculate the changes in inventory by decay processes during the irradiation of the fuel, cladding and impurities and the subsequent out-of-reactor decay. The ORIGEN2 decay library in common use has not been updated since before 1980. More recent

values of half-lives and branching ratios can be found in the ENDF/B-6 evaluation files and other published references such as the *Nuclides and Isotopes, Fifteenth Edition Chart of the Nuclides* (Parrington et al. 1996).

The approach taken to update the ORIGEN2 half lives and branching ratios was to substitute the ORIGEN-S decay library (Ryman and Hermann 1998; Toffer 2002), which is supported by Oak Ridge National Laboratory (ORNL) and had been updated with ENDF/B-6 values, for the ORIGEN2 library, and then update the half lives of the 46 key radionuclides updated to the *Nuclides and Isotopes, Fifteenth Edition Chart of the Nuclides* (Parrington et al. 1996). The steps involved included removing extra lines from the ORIGEN-S library and correcting a few branching ratios that were discovered to be in error. These errors involved the isotopes identified in Table 2-9, where the ORIGEN-S decay library included Beta decay branching to metastable daughter isotopes that were not in the decay library. These were fixed by changing the branching ratio so that all of the Beta decay goes to the ground state daughter nuclide. These are short-lived fission products, but it is important to correctly track the direct fission yields and subsequent decay in order to get the correct cumulative mass chain yield of the resultant longer lived fission products. Having a decay to a non-existent isotope would under-calculate the inventory of the long-lived daughter products.

Table 2-9. Isotopes Corrected for Beta Decay Branching to Metastable States That Did Not Exist in the ORIGEN-S Decay Library

Isotope	Isotope ID in Library
Zn-74	300740
Ga-79	310790
Ga-81	310810
Sr-93	380930
Sr-97	380970
Cd-126	481260
In-130	491300
In-131	491310

Table 2-10 shows the current and previous half-lives, and the ratio of the current to the previous, for the 46 key radionuclides. Appendix C lists the same information for all of the radionuclides in the updated ORIGEN2 decay library.

Table 2-10. Updated ORIGEN2 Half Lives (seconds) for Key Radionuclides. (2 sheets)

Nuclide	ORIGEN2 Library Identification	Current (Parrington et al. 1996)	Previous (ORIGEN2 Decay Library)	Current/ Previous
H3	10030	3.89E+08	3.90E+08	0.997
C14	60140	1.80E+11	1.81E+11	0.997
Ni59	280590	2.40E+12	2.52E+12	0.949
Co60	270600	1.66E+08	1.66E+08	0.999
Ni63	280630	3.15E+09	2.90E+09	1.086

Table 2-10. Updated ORIGEN2 Half Lives (seconds) for Key Radionuclides. (2 sheets)

Nuclide	ORIGEN2 Library Identification	Current (Parrington et al. 1996)	Previous (ORIGEN2 Decay Library)	Current/ Previous
Se79	340790	2.05E+13	2.05E+12	10.000
Sr90	380900	9.08E+08	9.19E+08	0.988
Y90	390900	2.31E+05	2.30E+05	1.001
Zr93	400930	4.73E+13	4.83E+13	0.980
Nb93m	410931	5.08E+08	4.29E+08	1.183
Tc99	430990	6.72E+12	6.72E+12	0.999
Ru106	441060	3.22E+07	3.18E+07	1.011
Cd113m	481131	4.45E+08	4.60E+08	0.966
Sb125	511250	8.70E+07	8.74E+07	0.995
Sn126	501260	7.88E+12	3.16E+12	2.498
I129	531290	4.95E+14	4.95E+14	0.999
Cs134	551340	6.51E+07	6.51E+07	1.001
Cs137	551370	9.48E+08	9.47E+08	1.002
Ba137m	561371	1.53E+02	1.53E+02	1.000
Sm151	621510	2.84E+09	2.84E+09	0.999
Eu152	631520	4.27E+08	4.29E+08	0.995
Eu154	631540	2.71E+08	2.71E+08	0.999
Eu155	631550	1.50E+08	1.57E+08	0.957
Ra226	882260	5.04E+10	5.05E+10	0.999
Ac227	892270	6.87E+08	6.87E+08	0.999
Ra228	882280	1.82E+08	2.11E+08	0.859
Th229	902290	2.30E+11	2.32E+11	0.994
Pa231	912310	1.03E+12	1.03E+12	1.000
Th232	902320	4.42E+17	4.43E+17	0.996
U232	922320	2.20E+09	2.27E+09	0.969
U233	922330	5.02E+12	5.00E+12	1.004
U234	922340	7.76E+12	7.72E+12	1.005
U235	922350	2.22E+16	2.22E+16	1.000
U236	922360	7.39E+14	7.39E+14	1.000
Np237	932370	6.75E+13	6.75E+13	0.999
Pu238	942380	2.77E+09	2.77E+09	0.999
U238	922380	1.41E+17	1.41E+17	1.000
Pu239	942390	7.60E+11	7.59E+11	1.001
Pu240	942400	2.07E+11	2.06E+11	1.003
Am241	952410	1.37E+10	1.36E+10	1.001
Pu241	942410	4.54E+08	4.54E+08	0.999
Pu242	942420	1.18E+13	1.22E+13	0.969
Cm242	962420	1.41E+07	1.41E+07	0.998
Am243	952430	2.32E+11	2.33E+11	0.998
Cm243	962430	9.18E+08	8.99E+08	1.020
Cm244	962440	5.71E+08	5.72E+08	0.999

2.3 FISSION PRODUCT YIELDS

The ORIGEN2 cross section library includes fission product yields for eight fissioning isotopes (^{232}Th, ^{233}U, ^{235}U, ^{238}U, ^{239}Pu, ^{241}Pu, ^{245}Cm, and ^{249}Cf). The ORIGEN2 fission product yields in common use have not been updated since before 1980 (Croff 1980). More recent values of fission product yields can be found in the ENDF/B-6 evaluation files (England and Rider 1994). The ORIGEN2 fission product yields for all fission products in the ORIGEN2 cross section library were replaced with the ENDF/B-6 independent fission product yields corresponding to the eight-fissioning nuclides. Low mass fission products such as H, Li, Be, and C are produced by ternary fission, where three fission products are emitted in the fission process instead of two. Because the ENDF/B-6 fission product yields did not include ternary fission, the fission product yields for these light nuclides were not changed in the ORIGEN2 library. ORIGEN2 uses independent fission yields for each nuclide. The cumulative mass chain yield is more relevant for comparison, because they are more accurately known than the individual yields. Table 2-11 and Figures 2-1, 2-2, and 2-3 show the sum of the updated individual mass chain yields compared to the sum of the values from the previous ORIGEN2 library. Significant differences in yields are primarily limited to masses of 105 to 130 between the double peaks, with up to factor of ten lower yields for ^{238}U from ENDF/B-6. Additional details of the fission product yield updating process are provided in Appendix D.

Table 2-11. ORIGEN2 Chain Yields ENDF/B-6 vs. ORIGEN2 Library. (3 sheets)

Mass Chain	^{235}U			^{238}U			^{239}Pu		
	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous
3	1.10E-02	1.10E-02	1.0000	2.30E-02	2.30E-02	1.0000	1.75E-02	1.75E-02	1.0000
6	5.00E-05	5.00E-05	1.0000	5.00E-05	5.00E-05	1.0000	5.00E-05	5.00E-05	1.0000
7	1.00E-06	1.00E-06	1.0000	1.00E-06	1.00E-06	1.0000	1.00E-06	1.00E-06	1.0000
9	1.50E-06	1.50E-06	1.0000	1.50E-06	1.50E-06	1.0000	1.50E-06	1.50E-06	1.0000
10	9.00E-06	9.00E-06	1.0000	9.00E-06	9.00E-06	1.0000	9.00E-06	9.00E-06	1.0000
14	1.30E-06	1.30E-06	1.0000	1.30E-06	1.30E-06	1.0000	1.30E-06	1.30E-06	1.0000
66	1.43E-11	5.43E-10	0.0263	1.96E-10	4.40E-10	0.4455	1.38E-09	1.03E-10	13.4320
67	0.00E+00	2.36E-11	0.0000	8.05E-12	4.91E-12	1.6395	9.94E-11	4.69E-12	21.1940
68	4.74E-11	0.00E+00	#	2.74E-10	0.00E+00	#	3.65E-09	0.00E+00	#
69	0.00E+00	0.00E+00	#	1.06E-12	0.00E+00	#	1.79E-10	0.00E+00	#
70	3.03E-08	0.00E+00	#	7.53E-08	0.00E+00	#	1.50E-06	0.00E+00	#
71	9.39E-10	5.71E-09	0.1644	1.03E-09	5.50E-09	0.1873	1.36E-07	1.66E-08	8.1928
72	2.65E-05	6.98E-05	0.3797	6.05E-05	1.59E-03	0.0382	1.21E-04	1.69E-04	0.7175
73	1.02E-04	2.49E-04	0.4095	2.06E-04	2.76E-03	0.0745	2.62E-04	3.10E-04	0.8441
74	3.39E-04	6.39E-04	0.5295	2.77E-04	4.22E-03	0.0657	6.36E-04	6.96E-04	0.9133
75	1.07E-03	1.55E-03	0.6871	4.62E-04	7.48E-03	0.0618	1.37E-03	1.48E-03	0.9286
76	3.10E-03	4.59E-03	0.6760	8.01E-04	1.18E-02	0.0679	2.94E-03	3.22E-03	0.9113
77	7.95E-03	1.02E-02	0.7770	3.31E-03	1.78E-02	0.1855	7.23E-03	7.92E-03	0.9131
78	2.09E-02	2.07E-02	1.0110	1.12E-02	2.72E-02	0.4105	1.88E-02	2.20E-02	0.8529
79	4.46E-02	5.29E-02	0.8436	3.26E-02	8.19E-02	0.3978	4.37E-02	4.68E-02	0.9323
80	1.28E-01	1.26E-01	1.0160	4.11E-02	1.10E-01	0.3748	9.37E-02	1.09E-01	0.8587
81	2.03E-01	2.14E-01	0.9507	8.56E-02	2.30E-01	0.3728	1.84E-01	1.65E-01	1.1147
82	3.26E-01	3.33E-01	0.9782	2.14E-01	3.45E-01	0.6196	2.30E-01	2.06E-01	1.1143
83	5.35E-01	5.36E-01	0.9976	3.94E-01	5.10E-01	0.7717	2.96E-01	3.03E-01	0.9774

Table 2-11. ORIGEN2 Chain Yields ENDF/B-6 vs. ORIGEN2 Library. (3 sheets)

Mass Chain	^{235}U			^{238}U			^{239}Pu		
	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous
84	8.94E-01	9.92E-01	0.9005	6.25E-01	8.29E-01	0.7541	4.73E-01	4.87E-01	0.9705
85	1.29E+00	1.31E+00	0.9797	9.27E-01	8.98E-01	1.0324	5.81E-01	5.76E-01	1.0075
86	2.03E+00	1.95E+00	1.0438	1.25E+00	1.24E+00	1.0099	7.48E-01	7.70E-01	0.9705
87	2.52E+00	2.53E+00	0.9944	1.59E+00	1.57E+00	1.0116	9.90E-01	9.70E-01	1.0209
88	3.53E+00	3.62E+00	0.9764	1.83E+00	2.22E+00	0.8250	1.31E+00	1.37E+00	0.9583
89	4.75E+00	4.81E+00	0.9887	2.69E+00	2.87E+00	0.9365	1.72E+00	1.72E+00	1.0003
90	5.89E+00	5.86E+00	1.0039	3.47E+00	3.23E+00	1.0727	2.16E+00	2.12E+00	1.0161
91	5.85E+00	5.87E+00	0.9967	4.08E+00	3.75E+00	1.0892	2.49E+00	2.49E+00	0.9981
92	5.98E+00	5.94E+00	1.0070	4.31E+00	4.05E+00	1.0636	2.99E+00	3.01E+00	0.9910
93	6.24E+00	6.33E+00	0.9850	4.65E+00	4.61E+00	1.0095	3.75E+00	3.88E+00	0.9643
94	6.58E+00	6.38E+00	1.0304	4.83E+00	4.26E+00	1.1328	4.35E+00	4.41E+00	0.9867
95	6.55E+00	6.45E+00	1.0146	5.13E+00	5.27E+00	0.9740	4.85E+00	4.90E+00	0.9886
96	6.35E+00	6.23E+00	1.0191	6.16E+00	5.14E+00	1.1988	4.90E+00	5.07E+00	0.9667
97	6.00E+00	5.95E+00	1.0079	5.57E+00	5.40E+00	1.0319	5.41E+00	5.56E+00	0.9747
98	5.75E+00	5.80E+00	0.9916	5.87E+00	5.39E+00	1.0902	5.80E+00	5.82E+00	0.9960
99	6.14E+00	6.07E+00	1.0114	6.24E+00	5.97E+00	1.0448	6.23E+00	6.11E+00	1.0198
100	6.30E+00	6.30E+00	1.0005	6.73E+00	5.81E+00	1.1580	6.77E+00	6.92E+00	0.9783
101	5.18E+00	5.08E+00	1.0186	6.21E+00	6.12E+00	1.0145	6.02E+00	5.99E+00	1.0062
102	4.30E+00	4.24E+00	1.0136	6.45E+00	6.19E+00	1.0416	6.13E+00	6.09E+00	1.0071
103	3.03E+00	3.15E+00	0.9624	6.27E+00	5.39E+00	1.1635	6.99E+00	6.95E+00	1.0054
104	1.88E+00	1.89E+00	0.9926	4.99E+00	4.94E+00	1.0097	6.08E+00	6.02E+00	1.0097
105	9.72E-01	1.04E+00	0.9352	4.09E+00	3.85E+00	1.0616	5.65E+00	5.37E+00	1.0516
106	4.02E-01	4.17E-01	0.9617	2.50E+00	2.58E+00	0.9689	4.36E+00	4.31E+00	1.0110
107	1.46E-01	1.93E-01	0.7549	1.44E+00	1.52E+00	0.9472	3.33E+00	3.22E+00	1.0352
108	5.41E-02	9.15E-02	0.5911	6.01E-01	9.96E-01	0.6032	2.16E+00	2.23E+00	0.9673
109	3.11E-02	4.46E-02	0.6971	2.51E-01	7.70E-01	0.3265	1.48E+00	1.44E+00	1.0267
110	2.55E-02	3.26E-02	0.7828	1.42E-01	6.12E-01	0.2314	6.45E-01	6.27E-01	1.0286
111	1.74E-02	2.63E-02	0.6609	7.12E-02	5.68E-01	0.1255	2.96E-01	2.85E-01	1.0370
112	1.30E-02	1.91E-02	0.6820	5.58E-02	5.23E-01	0.1069	1.29E-01	1.18E-01	1.0894
113	1.42E-02	1.85E-02	0.7682	4.61E-02	4.88E-01	0.0944	8.17E-02	8.44E-02	0.9679
114	1.18E-02	1.73E-02	0.6865	3.92E-02	3.93E-01	0.0998	6.03E-02	5.26E-02	1.1460
115	1.26E-02	1.60E-02	0.7853	3.75E-02	4.78E-01	0.0784	4.26E-02	4.20E-02	1.0151
116	1.32E-02	1.68E-02	0.7866	3.93E-02	3.69E-01	0.1065	5.07E-02	3.75E-02	1.3509
117	1.28E-02	1.64E-02	0.7759	3.78E-02	3.80E-01	0.0993	4.45E-02	3.75E-02	1.1855
118	1.13E-02	1.81E-02	0.6256	4.32E-02	3.63E-01	0.1191	3.25E-02	3.73E-02	0.8715
119	1.29E-02	1.72E-02	0.7474	3.98E-02	3.60E-01	0.1105	3.23E-02	3.81E-02	0.8471
120	1.24E-02	1.79E-02	0.6936	3.87E-02	3.63E-01	0.1067	2.95E-02	3.80E-02	0.7765
121	1.30E-02	1.88E-02	0.6934	3.69E-02	3.72E-01	0.0992	3.78E-02	3.99E-02	0.9463
122	1.46E-02	1.97E-02	0.7406	3.98E-02	3.92E-01	0.1014	3.73E-02	4.17E-02	0.8955
123	1.57E-02	2.35E-02	0.6676	4.45E-02	4.25E-01	0.1048	4.41E-02	4.89E-02	0.9017
124	2.68E-02	3.05E-02	0.8773	4.64E-02	4.70E-01	0.0987	7.86E-02	6.16E-02	1.2757
125	3.41E-02	3.97E-02	0.8576	4.85E-02	5.62E-01	0.0862	1.12E-01	1.33E-01	0.8371
126	5.74E-02	7.36E-02	0.7800	5.39E-02	6.24E-01	0.0864	2.01E-01	2.09E-01	0.9597
127	1.57E-01	1.59E-01	0.9881	1.36E-01	8.90E-01	0.1533	5.07E-01	4.98E-01	1.0182
128	3.48E-01	3.98E-01	0.8736	2.85E-01	1.29E+00	0.2202	7.34E-01	8.44E-01	0.8695
129	5.43E-01	7.14E-01	0.7609	1.01E+00	1.65E+00	0.6141	1.37E+00	1.49E+00	0.9188
130	1.80E+00	1.51E+00	1.1930	1.89E+00	2.59E+00	0.7315	2.35E+00	2.48E+00	0.9474

Table 2-11. ORIGEN2 Chain Yields ENDF/B-6 vs. ORIGEN2 Library. (3 sheets)

Mass Chain	^{235}U			^{238}U			^{239}Pu		
	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous	Current	Previous	Current/ Previous
131	2.89E+00	2.89E+00	1.0011	3.29E+00	3.68E+00	0.8938	3.86E+00	3.77E+00	1.0247
132	4.31E+00	4.30E+00	1.0015	5.15E+00	4.99E+00	1.0306	5.41E+00	5.27E+00	1.0258
133	6.71E+00	6.75E+00	0.9939	6.73E+00	6.31E+00	1.0661	7.02E+00	6.95E+00	1.0097
134	7.85E+00	7.67E+00	1.0243	7.45E+00	6.86E+00	1.0860	7.67E+00	7.38E+00	1.0395
135	6.55E+00	6.56E+00	0.9994	7.04E+00	6.10E+00	1.1533	7.63E+00	7.45E+00	1.0239
136	6.10E+00	6.27E+00	0.9728	6.69E+00	5.81E+00	1.1510	6.98E+00	6.76E+00	1.0323
137	6.34E+00	6.26E+00	1.0126	6.23E+00	5.62E+00	1.1094	6.71E+00	6.66E+00	1.0084
138	6.77E+00	6.77E+00	0.9989	5.77E+00	5.38E+00	1.0733	6.17E+00	5.79E+00	1.0646
139	6.48E+00	6.46E+00	1.0021	5.81E+00	5.52E+00	1.0524	5.66E+00	5.65E+00	1.0004
140	6.23E+00	6.28E+00	0.9914	5.84E+00	5.22E+00	1.1184	5.37E+00	5.55E+00	0.9673
141	5.86E+00	5.90E+00	0.9930	5.37E+00	4.76E+00	1.1289	5.25E+00	5.39E+00	0.9753
142	5.83E+00	5.87E+00	0.9921	4.55E+00	4.66E+00	0.9762	4.93E+00	4.99E+00	0.9876
143	5.96E+00	5.93E+00	1.0053	4.61E+00	4.30E+00	1.0723	4.42E+00	4.54E+00	0.9739
144	5.50E+00	5.42E+00	1.0146	4.54E+00	4.06E+00	1.1163	3.75E+00	3.82E+00	0.9811
145	3.94E+00	3.91E+00	1.0073	3.87E+00	3.56E+00	1.0884	2.99E+00	3.07E+00	0.9733
146	3.00E+00	2.98E+00	1.0069	3.46E+00	3.15E+00	1.0970	2.46E+00	2.53E+00	0.9717
147	2.25E+00	2.28E+00	0.9849	2.59E+00	2.38E+00	1.0874	2.01E+00	2.07E+00	0.9705
148	1.68E+00	1.69E+00	0.9915	2.10E+00	2.04E+00	1.0317	1.64E+00	1.70E+00	0.9665
149	1.08E+00	1.09E+00	0.9949	1.63E+00	1.57E+00	1.0413	1.22E+00	1.27E+00	0.9585
150	6.53E-01	6.51E-01	1.0033	1.27E+00	1.23E+00	1.0354	9.67E-01	9.98E-01	0.9690
151	4.19E-01	4.22E-01	0.9944	7.99E-01	8.50E-01	0.9391	7.38E-01	7.83E-01	0.9430
152	2.66E-01	2.74E-01	0.9722	5.30E-01	5.59E-01	0.9484	5.64E-01	6.05E-01	0.9335
153	1.58E-01	1.67E-01	0.9506	4.14E-01	4.05E-01	1.0218	3.61E-01	3.78E-01	0.9545
154	7.44E-02	7.65E-02	0.9727	2.17E-01	2.36E-01	0.9205	2.60E-01	2.82E-01	0.9208
155	3.21E-02	3.62E-02	0.8867	1.41E-01	1.43E-01	0.9866	1.66E-01	1.76E-01	0.9400
156	1.48E-02	1.52E-02	0.9765	7.60E-02	9.14E-02	0.8318	1.24E-01	1.23E-01	1.0081
157	6.15E-03	7.73E-03	0.7954	4.14E-02	6.10E-02	0.6781	7.42E-02	8.00E-02	0.9266
158	3.29E-03	3.95E-03	0.8326	1.85E-02	2.92E-02	0.6346	4.14E-02	4.42E-02	0.9369
159	1.01E-03	1.32E-03	0.7623	8.62E-03	1.73E-02	0.4996	2.06E-02	2.34E-02	0.8809
160	3.19E-04	5.26E-04	0.6064	3.55E-03	8.74E-03	0.4059	9.68E-03	1.16E-02	0.8366
161	8.53E-05	1.44E-04	0.5908	1.22E-03	5.17E-03	0.2350	4.84E-03	5.71E-03	0.8472
162	1.59E-05	6.90E-05	0.2305	3.41E-04	3.44E-03	0.0989	2.23E-03	2.88E-03	0.7732
163	6.10E-06	2.16E-05	0.2832	2.03E-04	1.88E-03	0.1083	9.17E-04	1.18E-03	0.7741
164	1.88E-06	8.74E-06	0.2153	1.25E-04	1.09E-03	0.1146	3.30E-04	5.29E-04	0.6228
165	9.52E-07	4.16E-06	0.2286	7.67E-05	5.93E-04	0.1294	1.34E-04	2.36E-04	0.5702
166	3.99E-08	2.12E-06	0.0189	2.61E-07	3.37E-04	0.0008	1.50E-05	1.38E-04	0.1090
167	1.10E-12	1.25E-06	0.0000	0.00E+00	1.97E-04	0.0000	1.21E-09	5.14E-05	0.0000
168	6.79E-12	0.00E+00	#	1.76E-11	0.00E+00	#	4.32E-09	0.00E+00	#
169	0.00E+00	0.00E+00	#	0.00E+00	0.00E+00	#	1.52E-11	0.00E+00	#
170	6.42E-11	0.00E+00	#	2.37E-09	0.00E+00	#	1.35E-08	0.00E+00	#
171	1.58E-10	0.00E+00	#	1.26E-08	0.00E+00	#	2.30E-08	0.00E+00	#
172	0.00E+00	0.00E+00	#	0.00E+00	0.00E+00	#	1.94E-12	0.00E+00	#

Figure 2-1. ^{235}U Fission Product Chain Yield Update.

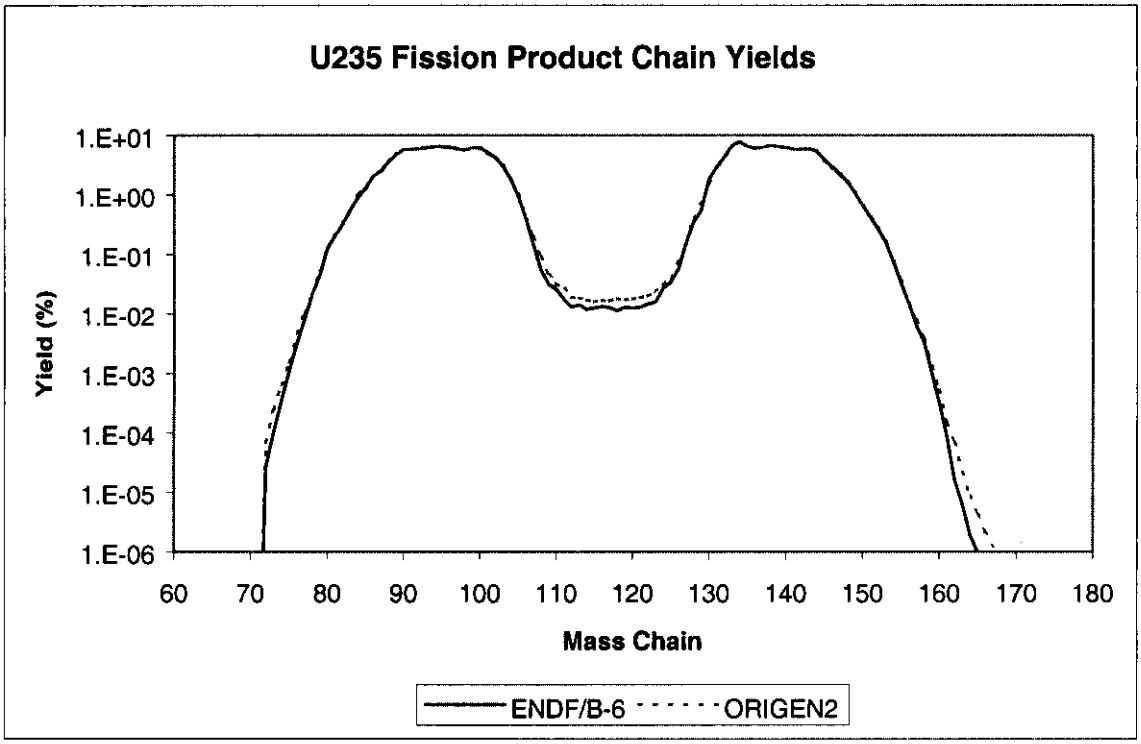


Figure 2-2. ^{238}U Fission Product Chain Yield Update.

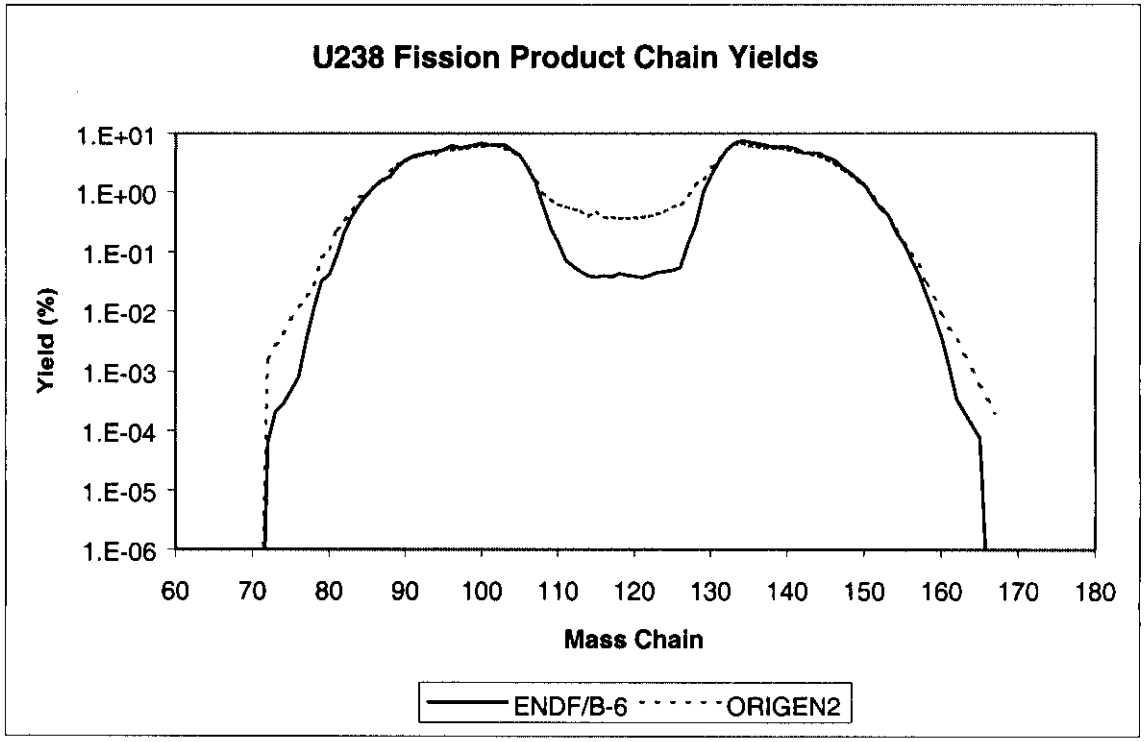
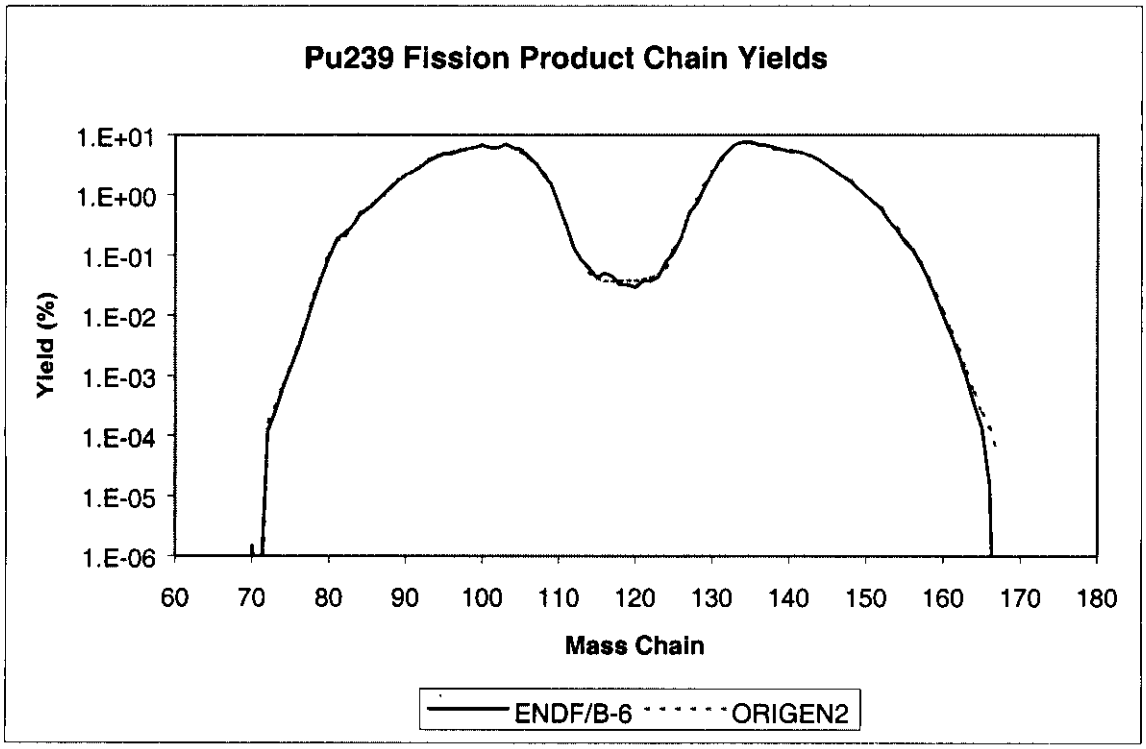


Figure 2-3. ^{239}Pu Fission Product Chain Yield Update.



2.4 CROSS SECTIONS

2.4.1 N Reactor Cross Sections

The ORIGEN2 cross sections for N Reactor fuel that were used in generating the 1996 DKPRO analysis included errors in the treatment of capture to ground and excited states of the daughter nuclides. This primarily affected ^{243}Am capture to produce ^{244}Cm. This was corrected in the 1996 ORIGEN2 analysis by changing the ^{243}Am cross section in the library. These errors were corrected with the release in 1997 of a revised ORIGEN2 cross section library for N Reactor fuel. This cross section set is the current library in the certified version of ORIGEN2 Version S.2 (Roblyer 2001), and was used for the current analysis. These cross sections are based on detailed neutronic analysis with the WIMS-E code, and are incorporated into Fortran DATA statements internal to the ORIGEN2 code that contain burnup-dependant cross section information. One deficiency noted in these cross sections is that the (n, 2n) cross section is not directly calculated by WIMS-E, so that the (n, 2n) cross sections in the ORIGEN2 N Reactor library are too high. As in the 1996 analysis, the ^{238}U (n, 2n) ^{237}U cross section was adjusted to correct the production of ^{237}Np.

2.4.2 Updated Single Pass Reactor Cross Sections

Previous updating of the ORIGEN2 cross section library had been limited to N Reactor cross sections. Separate ORIGEN2 cross section libraries specifically for single pass reactor fuel had not been generated. Prior analysis in 1996 used N Reactor cross sections with the ^{238}U capture cross section adjusted to match total Pu production.

Table 2-12 lists the metric tons of fuel and average exposures for single pass reactor and N Reactor fuel based on the Unified6 fuel record file (Watrous and Wootan 1997). The single pass reactor fuel comprised approximately 92 percent of the total mass of fuel and 82 percent of the total exposure. However, the average burnup of the single pass reactor fuel was much lower than for the N Reactor fuel.

Table 2-12. Fuel Amounts and Average Exposures.

Fuel Type	MTU	MWD	Average MWD/MTU
AL-0.71U	7.81E+04	5.19E+07	6.65E+02
AL-0.94U	1.50E+04	1.38E+07	9.23E+02
ZR-0.94U	5.80E+03	9.84E+06	1.70E+03
ZR-1.1U	1.59E+03	3.51E+06	2.20E+03
ZR-2.1U	3.55E+02	7.61E+05	2.14E+03
Total single pass reactor	9.31E+04	6.58E+07	7.06E+02
Total N Reactor	7.75E+03	1.41E+07	1.82E+03
Grand Total	1.01E+05	7.99E+07	

The single pass reactor fuel was irradiated in seven different reactors, and consisted of a variety of different fuel element designs. Approximately 80 percent of the single pass reactor fuel was natural uranium, not enriched. The single pass reactors were historically treated as three distinct types based on the neutron spectra for production predictions. The small reactors B, D, DR, F, and H were grouped together, while C reactor was treated separately, and KE and KW were grouped together. The largest production was in the KE and KW reactors. The single pass fuel designs for early production was a solid slug design, while the majority of the fuel was a cored or annular slug with a central water channel (also called Internal and External, or I&E fuel). All of the single pass fuel was clad in aluminum. This fuel is significantly different from the N Reactor fuel, which consisted of separate inner and outer annular elements, all of it enriched and clad in zircalloy. N Reactor also had a lower graphite to uranium mass ratio that gave N Reactor an epithermal neutron spectrum. The single pass reactors had an overmoderated or thermal neutron spectrum.

The method for generating the N Reactor cross sections for ORIGEN2 involved generating burnup dependent cross sections for each fuel type using the WIMS-E code with operating conditions such as temperatures and power levels from thermal hydraulic and physics predictions during reactor operation. These cross sections were then incorporated into DATA statements in the ORIGEN2 code. This method could not be used for generating new cross sections for the

single pass reactor fuel because access to the WIMS-E code was no longer available. An alternate method was selected consisting of the MONTEBURNS (Trellue and Poston 1999), MCNP4C (Lan 2001), and ORIGEN2 (Roblyer 2001) codes.

MONTEBURNS provides a method for using the validated and verified codes MCNP4C and ORIGEN2 to generate the same type of cross sections as a function of burnup as WIMS-E. MONTEBURNS, described in Appendix E, consists of a Perl script and Fortran program that links ORIGEN2 and MCNP4C. It acts as a pre- and post-processor for both ORIGEN2 and MCNP. The geometry, composition, and operating conditions are defined in the MCNP input. MONTEBURNS uses a simple Predictor-Corrector method of iteratively calculating cross sections with MCNP and using these cross sections to calculate burned compositions with ORIGEN2.

Models for K5E enriched and K5N natural cored fuel were selected to represent all single pass reactor fuel. Approximately 50 percent of single pass production was in K reactors. Hot operating conditions such as temperatures, dimensions, and powers were based on historical production calculations (Roblyer 2002) with the MOFDA code (Scott 1965), which was used when the single pass reactors were operating. These parameters were used to construct the MCNP models. Separate models were used for natural and enriched fuel. ENDF/B-5 cross sections were used in MCNP. These were the same cross sections used in the MCNP validation report (Lan 2001).

The MONTEBURNS analysis provided cross sections as a function of burnup. However, modification of the ORIGEN2 code would be required to use these burnup dependent cross sections. Because most of the fuel was irradiated to produce weapons grade plutonium (^{240}Pu percentage in Pu of ≤ 6 percent), a single set of cross sections was selected for use in ORIGEN2 that would correspond to this goal exposure. Tables 2-13 and 2-14 list the ORIGEN2 cross sections for actinides used for the natural and enriched single pass fuel. Tables 2-15 and 2-16 list the ORIGEN2 cross sections for activation products used for the natural and enriched single pass fuel. These fixed cross sections were used to modify the ORIGEN2 N Reactor cross section library.

Additional description of the single pass reactor cross section generation and comparison with historical production table values (Perl 1967) can be found in Appendix E.

Table 2-13. Updated Natural Single Pass Reactor Cross Sections for Actinides. (2 sheets)

Library	Nuclide	n,gamma	n,2n	n,3n	n,fission	n,gamma*	n,2n*
442	922350	2.04E+01	1.62E-03	1.54E-06	1.05E+02	0.00E+00	0.00E+00
442	922360	7.71E+00	1.58E-03	2.30E-05	2.32E-01	0.00E+00	0.00E+00
442	922380	8.55E-01	3.07E-03	1.99E-05	6.58E-02	0.00E+00	0.00E+00
442	932370	6.01E+01	2.77E-04	3.21E-06	3.61E-01	0.00E+00	7.88E-04
442	942380	8.42E+01	8.60E-04	2.04E-05	3.56E+00	0.00E+00	0.00E+00
442	942390	1.48E+02	6.75E-04	1.19E-06	2.66E+02	0.00E+00	0.00E+00
442	942400	2.62E+02	2.86E-04	3.24E-06	4.27E-01	0.00E+00	0.00E+00

Table 2-13. Updated Natural Single Pass Reactor Cross Sections for Actinides. (2 sheets)

Library	Nuclide	n,gamma	n,2n	n,3n	n,fission	n,gamma*	n,2n*
442	942410	1.05E+02	4.51E-03	5.92E-06	2.84E+02	0.00E+00	0.00E+00
442	942420	3.78E+01	1.25E-03	1.17E-05	2.98E-01	0.00E+00	0.00E+00
442	952410	2.00E+02	2.32E-04	3.23E-06	1.57E+00	2.49E+01	0.00E+00
442	952421	3.49E+02	2.44E-03	1.32E-05	1.71E+03	0.00E+00	0.00E+00
442	952430	3.07E+00	1.56E-04	2.03E-06	2.91E-01	5.83E+01	0.00E+00
442	962420	6.76E+00	3.53E-05	8.88E-08	7.71E-01	0.00E+00	0.00E+00
442	962430	6.48E+01	4.19E-03	1.41E-05	1.46E+02	0.00E+00	0.00E+00
442	962440	1.36E+01	7.33E-04	1.55E-05	7.51E-01	0.00E+00	0.00E+00

Note: * reaction leading to daughter nuclide in excited state.

Table 2-14. Updated Enriched Single Pass Reactor Cross sections for Actinides.

Library	Nuclide	n,gamma	n,2n	n,3n	n,fission	n,gamma*	n,2n*
442	922350	1.96E+01	1.62E-03	5.16E-07	1.00E+02	0.00E+00	0.00E+00
442	922360	7.95E+00	1.54E-03	9.31E-06	2.41E-01	0.00E+00	0.00E+00
442	922380	8.47E-01	3.04E-03	7.73E-06	6.89E-02	0.00E+00	0.00E+00
442	932370	5.81E+01	2.71E-04	1.10E-06	3.75E-01	0.00E+00	7.88E-04
442	942380	8.05E+01	8.46E-04	7.28E-06	3.48E+00	0.00E+00	0.00E+00
442	942390	1.41E+02	6.75E-04	3.64E-07	2.53E+02	0.00E+00	0.00E+00
442	942400	2.74E+02	2.81E-04	1.16E-06	4.45E-01	0.00E+00	0.00E+00
442	942410	1.00E+02	4.49E-03	2.60E-06	2.70E+02	0.00E+00	0.00E+00
442	942420	3.78E+01	1.24E-03	4.29E-06	3.11E-01	0.00E+00	0.00E+00
442	952410	1.93E+02	2.28E-04	1.13E-06	1.54E+00	2.40E+01	0.00E+00
442	952421	3.31E+02	2.44E-03	5.08E-06	1.62E+03	0.00E+00	0.00E+00
442	952430	3.23E+00	1.55E-04	8.48E-07	3.05E-01	6.13E+01	0.00E+00
442	962420	6.96E+00	3.47E-05	3.13E-08	7.55E-01	0.00E+00	0.00E+00
442	962430	6.19E+01	4.17E-03	5.23E-06	1.40E+02	0.00E+00	0.00E+00
442	962440	1.55E+01	7.25E-04	5.71E-06	7.93E-01	0.00E+00	0.00E+00

Note: * reaction leading to daughter nuclide in excited state.

Table 2-15. Updated Natural Single Pass Reactor Cross Sections for Activation Products.

Library	Nuclide	n,gamma	n,2n	n,alpha	n,proton	n,gamma*	n,2n*
441	70140	1.46E-02	0.00E+00	2.63E-02	3.64E-01	0.00E+0	0.00E+00
441	270590	4.04E+00	4.34E-05	3.01E-05	3.10E-04	4.75E+00	0.00E+00
441	280580	9.04E-01	1.02E-06	1.93E-03	2.14E-02	0.00E+00	0.00E+00
441	280620	2.79E+00	4.43E-05	1.03E-05	6.95E-06	0.00E+00	0.00E+00
441	400930	1.180E 00	0	1.53E-05	0	0	0

Note: * reaction leading to daughter nuclide in excited state

Table 2-16. Updated Enriched Single Pass Reactor Cross sections for Activation Products.

Library	Nuclide	n,gamma	n,2n	n,alpha	n,proton	n,gamma*	n,2n*
441	70140	1.39E-02	1.19E-07	1.84E-02	3.48E-01	0.00E+00	0.00E+00
441	270590	3.88E+00	2.58E-05	2.95E-05	3.13E-04	4.57E+00	0.00E+00
441	280580	8.63E-01	3.38E-07	1.95E-03	2.21E-02	0.00E+00	0.00E+00
441	280620	2.66E+00	2.62E-05	9.92E-06	6.26E-06	0.00E+00	0.00E+00
441	400930	1.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: * reaction leading to daughter nuclide in excited state.

2.4.3 Updated Thorium Cross Sections

For the thorium calculations, the specific power level or burnup could not be treated the same as the uranium fuel. Therefore, the ^{232}Th capture and (n,2n) reaction cross sections were adjusted to match the known ^{233}U production and ^{232}U impurity level using an average flux level from the driver fuel. These adjusted cross sections are listed in Table 2-17.

Table 2-17. Adjusted ^{232}Th Cross Sections for Thorium Fuel

Library	Nuclide	n,gamma	n,2n	n,3n	n,fission
442	902320	1.09E+00	1.89E-04	2.66E-05	2.22E-02

2.5 BURNUP INTERPOLATION

For the previous DKPRO analysis in 1996, ORIGEN2 output files at two or three burnup levels (MWD/MTU) were used for each fuel type to determine the composition by interpolating on the burnup for each fuel batch. Some isotopic compositions change rapidly with burnup at both low and high burnup levels. Therefore, to reduce the error associated with burnup interpolation, the number of ORIGEN2 files for each fuel type and subtype was increased to 20 burnup steps, ranging from less than 20 to greater than 3000 MWD/MTU. Table 2-18 lists the burnup levels for each fuel subtype for the ORIGEN2 runs. Corresponding sets of ORIGEN2 files were created for the "core" and "clad" ORIGEN2 runs. The filenames associated with each burnup step for each fuel subtype can be found in the ORIGDICT files listed in Appendix B.

Table 2-18. ORIGEN2 Generated Burnup Interpolation Files for DKPRO. (2 sheets)

Burnup Levels for Interpolation (MWD/MTU)				
'ZR-1.1U'	'ZR-0.94U'	'ZR-2.1U'	'AL-0.71U'	'AL-0.94U'
19.8	16.5	19.8	15.0	15.0
26.4	22.0	26.4	20.0	20.0
39.6	33.0	39.6	30.0	30.0
66.0	55.0	66.0	50.0	50.0
92.4	77.0	92.4	70.0	70.0
132.0	110.0	132.0	100.0	100.0

Table 2-18. ORIGEN2 Generated Burnup Interpolation Files for DKPRO. (2 sheets)

Burnup Levels for Interpolation (MWD/MTU)				
'ZR-1.1U'	'ZR-0.94U'	'ZR-2.1U'	'AL-0.71U'	'AL-0.94U'
198.0	165.0	198.0	150.0	150.0
264.0	220.0	264.0	200.0	200.0
330.0	275.0	330.0	250.0	250.0
396.0	330.0	396.0	300.0	300.0
528.0	440.0	528.0	400.0	400.0
660.0	550.0	660.0	500.0	500.0
924.0	770.0	924.0	700.0	700.0
1320.0	1100.0	1320.0	1000.0	1000.0
1518.0	1265.0	1518.0	1250.0	1250.0
1716.0	1430.0	1716.0	1500.0	1500.0
2640.0	2200.0	1980.0	2000.0	2000.0
3036.0	2750.0	2244.0	2500.0	2500.0
3604.0	3300.0	2640.0	3000.0	3000.0
3960.0	3960.0	2904.0	3200.0	3200.0

2.6 PRODUCT RECOVERY AND SEPARATION OF CORE AND CLADDING WASTE STREAMS

Previous input for the HDW model was generated with ORIGEN2 and DKPRO assuming no processing of the fuel, no removal of product constituents, and no splitting between fuel separations waste and cladding waste (Wootan and Schmittroth 1997). The DKPRO code primarily performed the functions of interpolation and decay on the ORIGEN2 inventory files. The splitting between fuel separations and cladding waste streams and product recovery was performed in the HDW model. The interface between the DKPRO and HDW model was changed for the current analyses so that the DKPRO processing now provides the splitting between fuel separations and cladding waste streams and the loss from the waste streams from the recovery of products (U, Pu, Np, and Th).

This change in scope of the HDW input generation process required changes to the way both ORIGEN2 and DKPRO were applied. Additional ORIGEN2 calculations were required to provide separate fuel and cladding burnup files for input to DKPRO. DKPRO needed to be run once for the fuel and a second time for the cladding, with separate input split factors for each waste stream. Auxiliary pre and post processor programs were required to separate the ORIGEN2 output burnup files into fuel and cladding, and to combine the DKPRO output files. The waste loss fractions in the fuel record file (UNIFIED6) also had to be modified to correctly account for the batch-wise losses from the waste streams, primarily for product recovery.

Figure 2-4 shows schematically the updated ORIGEN2 processing and Figure 2-5 shows the updated DKPRO processing.

Figure 2-4. Preparation of Separate Core and Clad ORIGEN2 Files for Input to DKPRO

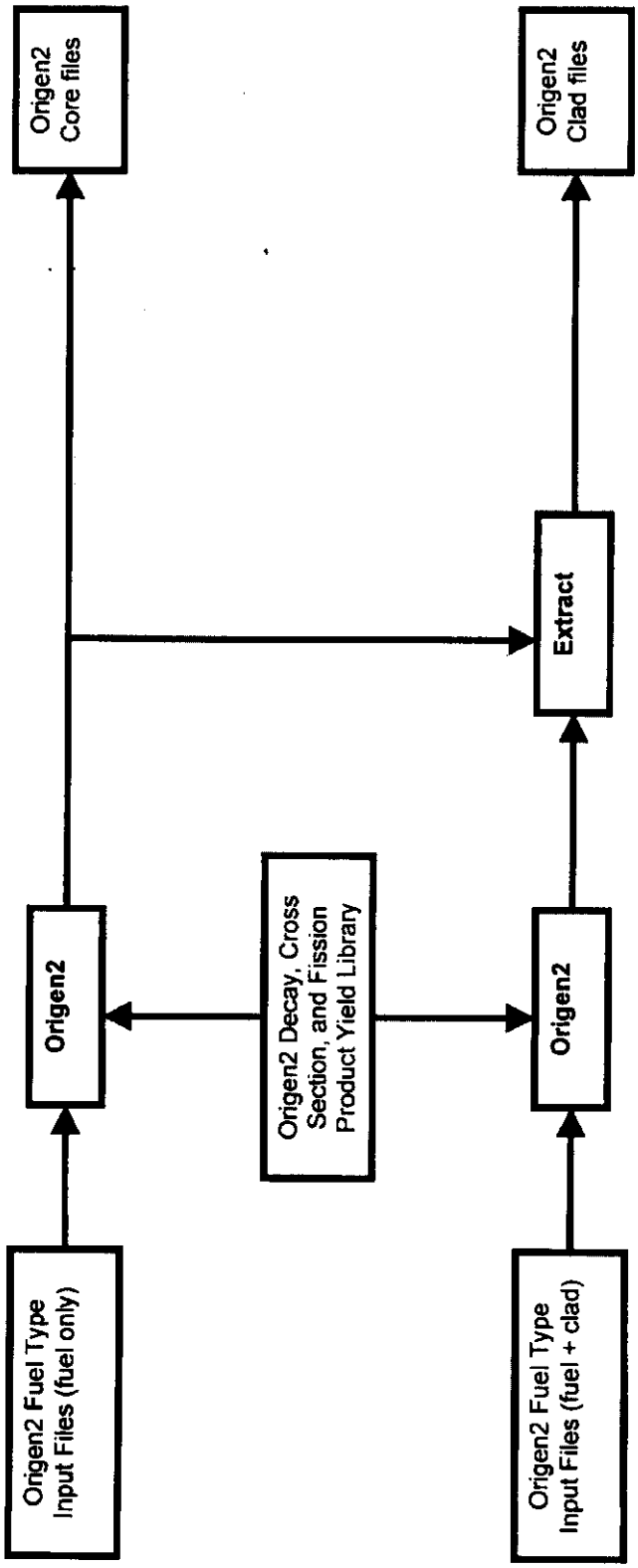
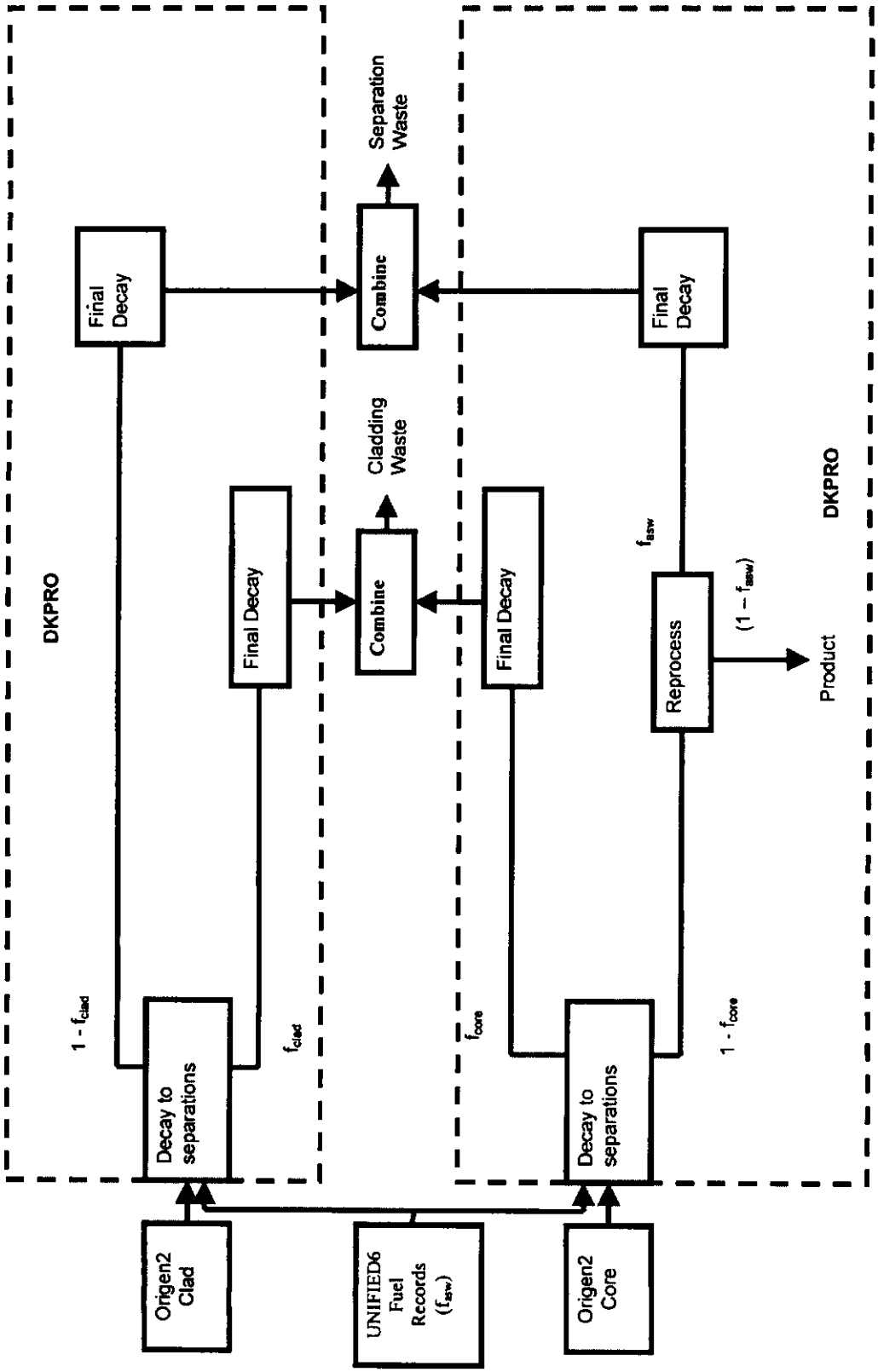


Figure 2-5. DKPRO Processing to Create Separate Cladding Waste and Separations Waste Inventories.



The actual process resulting in fuel separations waste streams and cladding removal waste streams is complicated, because they are not completely separate due to some of the fuel core dissolved into the cladding solution, and some of the cladding wastes were routed to the high level wastes. The approach taken was to start with five quantified split factors:

F1= fraction of fuel core dissolved into decladding solution,
F2= fraction of metal cladding entrained as metal fines and routed to high level waste,
F3= fraction of Cladding Recovery Waste (CRW) solution routed to high level waste,
F4= fraction of dissolved fuel core solution heel routed to CRW, and
F5= fraction of CRW components (e.g. actinides dissolved from core) not recovered.

These five factors were combined into two composite splitting factors, F_{core} and F_{clad}. The F_{core} and F_{clad} splitting factors were used to separate the nuclide activities in fuel core and cladding waste streams for each fuel batch into primary and secondary waste streams. The overall waste loss fraction due to the recovery of Pu, U, Np, and Th was then applied, and the appropriate cladding and separations waste streams were combined.

The fuel batch activity contribution to the cladding waste stream was calculated as

$$A_{crw} = A_{clad} * F_{clad} + A_{core} * F_{core}$$

Similarly, the fuel batch activity contribution to the fuel separations waste stream was calculated as

$$A_{sw} = (A_{clad} * (1-F_{clad}) + A_{core} * (1-F_{core})) * F_{asw}$$

where F_{asw} = waste loss factor (fraction left in waste after reprocessing) defined later in Section 2.6.2, Unified Separations Production File Waste Loss Fractions.

For the DKPRO processing of the Fuel (also called Core) waste stream, split factors were input describing the fractional amount remaining with the fuel (primary), with the remainder being split to the cladding waste stream (secondary) to create the primary and secondary waste streams. Table 2-19 lists the splitting factors between the primary and secondary waste streams for the fuel separations waste as they were input to DKPRO. These factors represent the fraction remaining in the primary waste stream when processing the Fuel Core input.

Table 2-19. Fuel Core Separations Waste Splitting Factors ($1-F_{core}$). (2 sheets)

Plant	Fuel	U	Th	Np, Pu, Am	Soluble Elements	Other Elements
T	AL-0.71U	0.999190	0.999190	0.998980	0.999000	0.999000
T	AL-0.94U	0.999190	0.999190	0.998980	0.999000	0.999000
T	ZR-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
T	ZR-1.1U	0.999000	0.999000	0.999000	0.999000	0.999000
T	ZR-2.1U	0.999000	0.999000	0.999000	0.999000	0.999000
B	AL-0.71U	0.999190	0.999190	0.998980	0.999000	0.999000

Table 2-19. Fuel Core Separations Waste Splitting Factors ($1-F_{core}$). (2 sheets)

Plant	Fuel	U	Th	Np, Pu, Am	Soluble Elements	Other Elements
B	AL-0.94U	0.999190	0.999190	0.998980	0.999000	0.999000
B	ZR-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
B	ZR-1.1U	0.999000	0.999000	0.999000	0.999000	0.999000
B	ZR-2.1U	0.999000	0.999000	0.999000	0.999000	0.999000
REDOX	AL-0.71U	0.999190	0.999190	0.998980	0.999000	0.999000
REDOX	AL-0.94U	0.999190	0.999190	0.998980	0.999000	0.999000
REDOX	ZR-0.94U	0.992800	0.992800	0.994800	0.949050	0.949050
REDOX	ZR-1.1U	0.992800	0.992800	0.994800	0.949050	0.949050
REDOX	ZR-2.1U	0.992800	0.992800	0.994800	0.949050	0.949050
PUREX	AL-0.71U	0.999190	0.999190	0.998980	0.999000	0.999000
PUREX	AL-0.94U	0.999190	0.999190	0.998980	0.999000	0.999000
PUREX	ZR-0.94U	0.993400	0.993400	0.996000	0.949050	0.995975
PUREX	ZR-1.1U	0.993400	0.993400	0.996000	0.949050	0.995975
PUREX	ZR-2.1U	0.993400	0.993400	0.996000	0.949050	0.995975
PUREX	AL-0.0TH	0.988500	0.975700	0.979020	0.979020	0.979020

Note: REDOX = Reduction and Oxidation Facility

Table 2-20 lists the splitting factors between the primary and secondary waste streams for the cladding waste, as they were input to DKPRO. These factors represent the fraction remaining in the primary waste stream when processing the Cladding Waste input.

Table 2-20. Cladding Waste Splitting Factors (F_{clad}). (2 sheets)

Plant	Fuel	U	Th	Np, Pu, Am	Soluble Elements	Other Elements
T	AL-0.71U	0.999000	0.999000	0.999000	0.999000	0.999000
T	AL-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
T	ZR-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
T	ZR-1.1U	0.999000	0.999000	0.999000	0.999000	0.999000
T	ZR-2.1U	0.999000	0.999000	0.999000	0.999000	0.999000
B	AL-0.71U	0.999000	0.999000	0.999000	0.999000	0.999000
B	AL-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
B	ZR-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
B	ZR-1.1U	0.999000	0.999000	0.999000	0.999000	0.999000
B	ZR-2.1U	0.999000	0.999000	0.999000	0.999000	0.999000
REDOX	AL-0.71U	0.999000	0.999000	0.999000	0.999000	0.999000
REDOX	AL-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000
REDOX	ZR-0.94U	0.998000	0.998000	0.998000	0.998000	0.998000
REDOX	ZR-1.1U	0.998000	0.998000	0.998000	0.998000	0.998000
REDOX	ZR-2.1U	0.998000	0.998000	0.998000	0.998000	0.998000
PUREX	AL-0.71U	0.999000	0.999000	0.999000	0.999000	0.999000
PUREX	AL-0.94U	0.999000	0.999000	0.999000	0.999000	0.999000

Table 2-20. Cladding Waste Splitting Factors (F_{clad}). (2 sheets)

Plant	Fuel	U	Th	Np, Pu, Am	Soluble Elements	Other Elements
PUREX	ZR-0.94U	0.124800	0.124800	0.075840	0.960000	0.07584
PUREX	ZR-1.1U	0.124800	0.124800	0.075840	0.960000	0.07584
PUREX	ZR-2.1U	0.124800	0.124800	0.075840	0.960000	0.07584
PUREX	AL-0.0TH	0.999000	0.999000	0.999000	0.999000	0.999000

2.6.1 ORIGEN2 Changes

As described in Section 2.1, Fuel and Cladding Compositions, the fuel is categorized into specific types and subtypes based on initial compositions, enrichments, and dimensions. The initial compositions are burned in ORIGEN2 to provide lookup files of nuclide compositions as a function of burnup for each fuel type and subtype at the time of reactor discharge. DKPRO interpolates between these composition files to determine the end of irradiation compositions for each fuel batch. DKPRO then decays to the time of separations processing, splits the composition into primary and secondary waste streams, removes the products recovered during processing, and then decays to the final reference date. The methodology for using ORIGEN2 to provide input files of compositions as a function of burnup to DKPRO was changed to allow separate treatment of fuel separations waste and cladding waste streams. This was accomplished by making separate ORIGEN2 calculations for each fuel subtype, one with the fuel composition only, and another with the fuel and cladding combined. An Extract program was then used to subtract the fuel only values from the fuel plus cladding values in the output files for each burnup step to create cladding only values. This provided two sets of composition files for input to DKPRO, fuel only and cladding only. This process is shown in Figure 2-1.

2.6.2 Unified Separations Production File Waste Loss Fractions

The Unified Separations Production File (UNIFIED6.PRN) contains 1276 records of fuel batches processed by month (or shorter period) through individual separations plants (T, B, REDOX, PUREX), and also unprocessed fuel remaining in the K-Basins (BASIN). The information for each fuel batch consists of Key date, Fuel Type, MTU, Percent ^{240}Pu, Fuel Exposure (MWD/MTU), Separations Plant, Separations Date, Separations Key, Cooling Days, and Total Waste Loss Fractions for Th, U, Np, and Pu. This information is based on fuel processing records (Watrous and Wootan 1997). The Waste Loss Fractions represent historical losses, primarily product recovery, from the total waste stream for each fuel batch.

The Waste Loss Fractions on the fuel record file were modified using the following equations,

If $((L-F_{crw})/(1-F_{crw}) > S)$, then $F_{asw} = (L-F_{crw})/(1-F_{crw})$.

If $((L-F_{crw})/(1-F_{crw}) < S)$, then $F_{asw} = S$.

where:

L = Historically measured combined waste loss fraction (to the Cladding Recovery Waste and Separations Waste) fuel batch loss factor on original Fuel Record File (unified6.prn);

S = Default minimum separations loss factor;

F_{crw} = Historically measured Cladding Recovery Waste loss factor; and

F_{asw} = Waste loss factor (fraction left in waste after reprocessing).

Table 2-21 lists the cladding recovery waste (CRW) loss factors for each fuel type and processing plant.

Table 2-21. Measured Cladding Recovery Waste (CRW) loss factors (Fcrw).

Plant	Fuel Type	U	Th	Pu, Np, Am
B or T	AL	0.00081	0.00081	0.00102
REDOX	AL	0.00081	0.00081	0.00102
REDOX	ZR	0.00720	0.00720	0.00520
PUREX	AL	0.00081	0.00081	0.00102
PUREX	ZR	0.00660	0.00660	0.00400
PUREX	AL-TH	0.01150	0.02430	

Default minimum waste loss factors (S) were needed for instances where the cladding recovery waste loss factor (Fcrw) was larger than the historical fuel batch waste loss factor (L). Table 2-22 lists the default minimum loss factors for Th, U, Np, and Pu.

Table 2-22. Default Minimum Loss Factor (S)

Th, U	Np, Pu
0.0005	0.0013

3.0 RESULTS

The DKPRO output files containing the primary and secondary waste streams for the separate core and clad analyses were combined using the combine program (an auxiliary program for processing DKPRO output files described in Appendix G) to produce the final separations waste stream and cladding waste stream. These files were called *core2.combine* and *clad2.combine*. These files contain the inventories in curies for the 46 radionuclides for each fuel batch after all of the splitting and product removal has been applied. The values are decayed to the reference date of January 1, 2001.

For comparison purposes, the splitting and reprocessing were turned off to provide total inventories produced. This case was called combo3a. Various other cases with no processing were also run in order to provide diagnostics and track changes from the previous analysis.

3.1 EFFECTS OF METHODS IMPROVEMENTS ON TOTAL INVENTORY

In order to track and separate the impacts of the various method improvements applied in the ORIGEN2 and DKPRO processing, it is useful to look at total radionuclide production without any splitting or product recovery. Table 3-1 shows the step-by-step integral impacts on the total production of key radionuclides from changing the half lives, fission product yields, single pass reactor cross sections, fuel and cladding compositions, and the burnup interpolation scheme. Table 3.2 shows the net ratio of the current unprocessed inventory to the previous (1996) unprocessed inventory adjusted to a reference decay date of 2001.

Significant changes can be seen for several radionuclides. The total tritium increased by more than a factor of six due to the inclusion of lithium impurity in the aluminum cladding, where there was none in the previous analysis. The true lithium content in the aluminum cladding has not been established. It is likely that the actual lithium content was well within the maximum 80-ppm procurement specification, which would result in a lower tritium inventory. As described in Section 2.1.2 Cladding Impurities, these levels of tritium should be interpreted as an upper level bound because they are based on a maximum specification concentration for impurity lithium. Previous predictions of tritium production can be attributed predominantly to that produced as a ternary fission product. It is planned that tritium levels in cladding waste will be corrected in "downstream calculations" (the HDW code) to account for actual lithium impurity concentrations when such data is available. The ^{14}C activity decreased by a factor of 0.5 with the new impurity compositions, but then increased by a factor of 1.5 with the change in cross sections, for a net decrease of a factor of 0.8. The ^{79}Se and ^{126}Sn activities decreased by factors of approximately 0.08 and 0.21, respectively, due to changes in their half-lives. The ^{129}I activity decreased by a factor of 0.77 and the ^{125}Sb activity decreased by a factor of 0.50 due to the change in fission product yields. The ^{233}U activity decreased by a factor of 0.72 primarily due to the change in ^{232}Th cross sections and thorium mass. The Cm activities decreased by approximately a factor of 0.7 due to the change in single pass reactor cross sections.

Table 3-1. Cases Tracking Changes from Previous (1996) HDW Input Case For Total Production With No Reprocessing, Core Plus Cladding. (2 sheets)

Case	combo3a	combo3	combo4	combo5	combo6	combo7	combo8	combo9	combo10	u6outno[b]
Reference decay date	2001	2001	1994	1994	1994	1994	1994	1994	1994	1994
Decay library half-lifes	current	current	current	previous	previous	previous	previous	previous	previous	previous
fission product yields	current	current	current	current	previous	previous	previous	previous	previous	previous
Single-pass cross sections	current	current	current	current	current	previous[a]	previous[a]	previous[a]	previous	previous
Fuel-clad composition	current	current	current	current	current	current	previous	previous	previous	previous
burnup interpolate	current	current	current	current	current	current	current	previous	previous	previous
split/reprocess	none	none	none	none	none	none	none	none	none	none
Th cross sections, Th mass	current	previous	previous	previous	previous	previous	previous	previous	previous	previous
Isotope	Total Curies									
H03[c]	1.10E+06	1.08E+06	1.60E+06	1.60E+06	1.60E+06	1.50E+06	2.38E+05	2.37E+05	2.38E+05	2.38E+05
C14	3.94E+03	3.94E+03	3.94E+03	3.93E+03	3.93E+03	2.53E+03	4.93E+03	4.94E+03	4.90E+03	4.90E+03
NI59	1.33E+03	1.30E+03	1.30E+03	1.24E+03	1.24E+03	9.41E+02	1.19E+03	1.19E+03	1.18E+03	1.18E+03
CO60	1.61E+04	1.60E+04	4.02E+04	4.02E+04	4.02E+04	3.57E+04	1.35E+04	1.34E+04	1.33E+04	1.33E+04
NI63	1.27E+05	1.25E+05	1.31E+05	1.40E+05	1.40E+05	9.39E+04	1.18E+05	1.18E+05	1.17E+05	1.17E+05
SE79	7.90E+01	7.91E+01	7.91E+01	7.91E+02	9.88E+02	1.00E+03	1.00E+03	1.00E+03	1.00E+03	1.00E+03
SR90	8.79E+07	8.79E+07	1.04E+08	1.05E+08	1.03E+08	1.04E+08	1.04E+08	1.04E+08	1.04E+08	1.04E+08
Y90	8.79E+07	8.79E+07	1.04E+08	1.05E+08	1.03E+08	1.04E+08	1.04E+08	1.04E+08	1.04E+08	1.04E+08
ZR93	4.72E+03	4.72E+03	4.72E+03	4.62E+03	4.70E+03	4.74E+03	4.74E+03	4.74E+03	4.74E+03	4.74E+03
NB93m	3.73E+03	3.73E+03	3.38E+03	3.39E+03	3.44E+03	3.48E+03	3.48E+03	3.48E+03	3.48E+03	3.48E+03
TC99	3.43E+04	3.43E+04	3.43E+04	3.39E+04	3.34E+04	3.34E+04	3.34E+04	3.35E+04	3.32E+04	3.32E+04
RU106	1.06E+03	1.06E+03	1.23E+05	1.17E+05	1.19E+05	1.19E+05	1.19E+05	1.17E+05	1.14E+05	1.14E+05
CD113m	5.79E+03	5.79E+03	8.17E+03	7.80E+03	2.12E+04	2.26E+04	2.27E+04	2.27E+04	2.24E+04	2.24E+04
SB125	1.90E+04	1.90E+04	1.10E+05	1.12E+05	2.29E+05	2.30E+05	2.31E+05	2.29E+05	2.19E+05	2.19E+05
SN126	3.29E+02	3.29E+02	3.29E+02	8.21E+02	1.48E+03	1.53E+03	1.53E+03	1.53E+03	1.53E+03	1.53E+03
I129	4.94E+01	4.94E+01	4.94E+01	4.94E+01	6.43E+01	6.37E+01	6.37E+01	6.38E+01	6.41E+01	6.41E+01
CS134	8.56E+03	8.56E+03	8.99E+04	8.97E+04	8.96E+04	8.96E+04	8.97E+04	8.95E+04	8.89E+04	8.89E+04
CS137	1.04E+08	1.04E+08	1.22E+08	1.23E+08	1.20E+08	1.20E+08	1.20E+08	1.20E+08	1.20E+08	1.20E+08
BA137m	9.83E+07	9.83E+07	1.15E+08	1.16E+08	1.14E+08	1.14E+08	1.13E+08	1.14E+08	1.14E+08	1.14E+08

Table 3-1. Cases Tracking Changes from Previous (1996) HDW Input Case For Total Production With No Reprocessing, Core Plus Cladding. (2 sheets)

Case	combo3a	combo3	combo4	combo5	combo6	combo7	combo8	combo9	combo10	u6outno[b]
SM151	3.30E+06	3.30E+06	3.48E+06	3.48E+06	3.56E+06	3.54E+06	3.53E+06	3.52E+06	3.54E+06	3.54E+06
EU152	1.07E+03	1.07E+03	1.54E+03	1.54E+03	1.78E+03	1.92E+03	1.93E+03	1.87E+03	1.89E+03	1.89E+03
EU154	9.19E+04	9.19E+04	1.62E+05	1.62E+05	1.68E+05	1.72E+05	1.73E+05	1.73E+05	1.74E+05	1.74E+05
EU155	5.14E+04	5.14E+04	1.43E+05	1.55E+05	1.67E+05	1.62E+05	1.62E+05	1.60E+05	1.60E+05	1.60E+05
RA226	1.14E-01	1.14E-01	7.86E-02	7.72E-02	7.72E-02	7.70E-02	7.70E-02	7.72E-02	7.72E-02	7.72E-02
AC227	5.11E+00	1.25E+02	1.08E+02	1.08E+02	1.08E+02	1.08E+02	1.08E+02	1.08E+02	1.08E+02	1.08E+02
RA228	5.97E+01	6.79E+01	6.63E+01	6.44E+01	6.44E+01	6.44E+01	6.44E+01	6.44E+01	6.44E+01	6.44E+01
TH229	2.66E+01	3.69E+01	2.92E+01	2.91E+01	2.91E+01	2.91E+01	2.91E+01	2.92E+01	2.92E+01	2.92E+01
PA231	8.21E+00	1.91E+02	1.91E+02	1.91E+02	1.91E+02	1.91E+02	1.91E+02	1.91E+02	1.91E+02	1.91E+02
TH232	6.08E+01	6.91E+01	6.91E+01	6.88E+01	6.88E+01	6.88E+01	6.88E+01	6.88E+01	6.88E+01	6.89E+01
U232	1.43E+02	2.88E+03	3.08E+03	3.02E+03	3.02E+03	3.02E+03	3.02E+03	3.02E+03	3.02E+03	3.02E+03
U233	8.41E+03	1.17E+04	1.17E+04	1.17E+04	1.17E+04	1.17E+04	1.17E+04	1.17E+04	1.17E+04	1.17E+04
U234	3.55E+04	3.55E+04	3.55E+04	3.57E+04	3.57E+04	3.56E+04	3.56E+04	3.56E+04	3.56E+04	3.56E+04
U235	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03	1.47E+03
U236	1.02E+03	1.02E+03	1.02E+03	1.02E+03	1.02E+03	8.50E+02	1.17E+03	1.17E+03	1.17E+03	1.17E+03
NP237	2.44E+02	2.44E+02	2.42E+02	2.42E+02	2.42E+02	2.28E+02	2.53E+02	2.54E+02	2.76E+02	2.76E+02
PU238	1.13E+05	1.13E+05	1.20E+05	1.20E+05	1.20E+05	1.05E+05	1.18E+05	1.16E+05	1.30E+05	1.30E+05
U238	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04	3.29E+04
PU239	3.84E+06	3.84E+06	3.84E+06	3.84E+06	3.84E+06	3.81E+06	3.82E+06	3.83E+06	3.72E+06	3.72E+06
PU240	8.77E+05	8.77E+05	8.78E+05	8.80E+05	8.80E+05	6.02E+05	6.08E+05	6.21E+05	6.79E+05	6.79E+05
AM241	9.98E+05	9.98E+05	9.04E+05	9.04E+05	9.04E+05	7.36E+05	7.54E+05	7.26E+05	8.00E+05	8.00E+05
PU241	7.84E+06	7.84E+06	1.10E+07	1.10E+07	1.10E+07	9.45E+06	9.66E+06	9.32E+06	9.98E+06	9.98E+06
PU242	5.25E+01	5.25E+01	5.25E+01	5.08E+01	5.08E+01	3.38E+01	3.53E+01	3.19E+01	4.25E+01	4.25E+01
CM242	7.33E+01	7.33E+01	7.59E+01	7.09E+01	7.09E+01	6.56E+01	6.83E+01	5.75E+01	1.10E+02	1.10E+02
AM243	4.22E+01	4.22E+01	4.23E+01	4.22E+01	4.22E+01	3.52E+01	3.69E+01	3.36E+01	4.19E+01	4.19E+01
CM243	7.74E+00	7.74E+00	9.15E+00	9.23E+00	9.23E+00	9.27E+00	9.62E+00	9.44E+00	1.37E+01	1.37E+01
CM244	1.92E+02	1.92E+02	2.50E+02	2.50E+02	2.50E+02	2.37E+02	2.46E+02	2.47E+02	3.14E+02	3.14E+02

Notes:

[a] N reactor cross sections after 1997 update (Schwarz 1997)

[b] previous HDW input case provided in 1996 (Watrous and Wootan 1997)

[c] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding. The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

Table 3-2. Current Versus Previous (1996) Total Production With No Reprocessing for Reference Decay Date of 2001

Nuclide	Current/ Previous	Nuclide	Current/ Previous	Nuclide	Current/ Previous
H03[a]	6.847	I129	0.771	U233	0.719
C14	0.804	CS134	1.011	U234	0.997
NI59	1.127	CS137	1.017	U235	1.000
CO60	3.041	BA137m	1.009	U236	0.872
NI63	1.138	SM151	0.983	NP237	0.877
SE79	0.079	EU152	0.815	PU238	0.923
SR90	1.000	EU154	0.931	U238	1.000
Y90	1.000	EU155	0.894	PU239	1.032
ZR93	0.996	RA226	1.018	PU240	1.293
NB93m	0.971	AC227	0.041	AM241	1.130
TC99	1.033	RA228	0.905	PU241	1.102
RU106	1.079	TH229	0.721	PU242	1.235
CD113m	0.365	PA231	0.043	CM242	0.690
SB125	0.502	TH232	0.882	AM243	1.010
SN126	0.215	U232	0.051	CM243	0.668
				CM244	0.796

Note: [a] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding. The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

3.2 OUTPUT SUMMARY

Table 3-3 summarizes the total radionuclide inventory (in grams) remaining unprocessed in the basins, the total in the tanks if no processing was done, the total after applying the processing for product removals, the split of this processed inventory between separations waste (core) and cladding waste (clad). Also included is the ratio of the reprocessed total to the unprocessed total, to illustrate the total product losses. Table 3-4 provides the same information in curies. Additional summary tables for all nuclides are provided in Appendix H. Separate inventory tables for all nuclides for only the fuel batches corresponding to the fill of tank 241-AZ-101 (November 1983 through February 1986) and tank 241-AZ-102 (March 1986 through December 1988) are also included in Appendix H.

Table 3-3. Summary of Total Radionuclide Inventory Before and After Processing (grams). (2 sheets)

Radionuclide	Basin (combo3a)	Total in Process (combo3a)	Total After Reprocess, Core+Clad (core2,clad2)	Core (core2)	Clad (clad2)	After Reprocess/ No Reprocess
H03[a]	2.94E+00	1.14E+02	1.14E+02	1.64E+01	9.74E+01	1.0000
C14	2.39E+01	8.81E+02	8.81E+02	8.30E+02	5.18E+01	1.0000
NI59	4.44E+02	1.67E+04	1.67E+04	5.37E+03	1.13E+04	1.0000
CO60	4.11E+00	1.42E+01	1.42E+01	1.19E+01	2.31E+00	1.0000
NI63	5.92E+01	2.24E+03	2.24E+03	7.12E+02	1.52E+03	1.0000
SE79	8.09E+02	1.13E+04	1.13E+04	1.13E+04	1.89E+01	1.0000
SR90	5.87E+04	6.36E+05	6.36E+05	6.35E+05	1.12E+03	1.0000
Y90	1.49E+01	1.62E+02	1.62E+02	1.61E+02	2.85E-01	1.0000
ZR93	1.30E+05	1.84E+06	1.84E+06	1.84E+06	3.85E+03	1.0000
NB93m	8.77E-01	1.56E+01	1.56E+01	1.56E+01	3.08E-02	1.0000
TC99	1.43E+05	2.02E+06	2.02E+06	2.01E+06	1.37E+04	1.0000
RU106	9.25E-02	3.19E-01	3.19E-01	3.18E-01	1.28E-03	1.0000
CD113m	4.55E+00	2.58E+01	2.58E+01	2.46E+01	1.21E+00	0.9999
SB125	7.03E+00	1.83E+01	1.83E+01	1.81E+01	1.67E-01	1.0000
SN126	2.51E+03	2.90E+04	2.90E+04	2.89E+04	5.03E+01	1.0000
I129	2.27E+04	2.79E+05	2.79E+05	2.77E+05	2.01E+03	1.0000
CS134	3.60E+00	6.62E+00	6.62E+00	6.29E+00	3.33E-01	1.0001
CS137	1.19E+05	1.20E+06	1.20E+06	1.19E+06	1.06E+04	1.0000
BA137m	1.81E-02	1.83E-01	1.83E-01	1.81E-01	1.62E-03	1.0000
SM151	5.89E+03	1.25E+05	1.25E+05	1.25E+05	1.89E+02	1.0000
EU152	3.01E+00	6.17E+00	6.17E+00	6.15E+00	1.96E-02	1.0000
EU154	2.01E+02	3.40E+02	3.40E+02	3.39E+02	1.09E+00	1.0000
EU155	2.40E+01	1.06E+02	1.06E+02	1.05E+02	2.92E-01	1.0000
RA226	1.04E-03	1.15E-01	1.77E-02	1.75E-02	2.63E-04	0.1537
AC227	7.25E-05	7.06E-02	6.44E-02	6.31E-02	1.34E-03	0.9132
RA228	3.40E-10	2.19E-01	1.12E-02	5.84E-03	5.32E-03	0.0509
TH229	4.85E-05	1.24E+02	6.60E+00	5.09E+00	1.51E+00	0.0531
PA231	3.68E-01	1.74E+02	1.51E+02	1.48E+02	3.14E+00	0.8712
TH232	1.26E+00	5.52E+08	2.54E+07	1.20E+07	1.34E+07	0.0461
U232	3.17E-02	6.46E+00	3.39E-01	2.65E-01	7.34E-02	0.0524
U233	6.23E-01	8.72E+05	4.66E+04	3.66E+04	1.00E+04	0.0534
U234	1.57E+05	5.71E+06	4.33E+05	4.26E+05	7.28E+03	0.0758
U235	1.63E+07	6.81E+08	5.53E+07	5.44E+07	8.50E+05	0.0812
U236	1.89E+06	1.57E+07	5.46E+05	5.12E+05	3.43E+04	0.0348
NP237	4.94E+04	3.47E+05	1.88E+05	1.87E+05	5.51E+02	0.5416
PU238	3.03E+03	6.61E+03	1.16E+02	1.02E+02	1.41E+01	0.0175
U238	2.06E+09	9.79E+10	8.09E+09	7.98E+09	1.12E+08	0.0826
PU239	3.57E+06	6.18E+07	5.43E+05	4.60E+05	8.30E+04	0.0088
PU240	4.69E+05	3.86E+06	3.57E+04	3.00E+04	5.70E+03	0.0092
AM241	7.68E+04	2.91E+05	2.41E+04	2.36E+04	5.30E+02	0.0829
PU241	3.79E+04	7.60E+04	1.24E+03	1.06E+03	1.76E+02	0.0162
PU242	7.81E+03	1.33E+04	2.01E+02	1.72E+02	2.96E+01	0.0151
CM242	2.53E-02	2.21E-02	2.21E-02	2.20E-02	6.74E-05	1.0000

Table 3-3. Summary of Total Radionuclide Inventory Before and After Processing (grams). (2 sheets)

Radionuclide	Basin (combo3a)	Total in Process (combo3a)	Total After Reprocess, Core+Clad (core2,clad2)	Core (core2)	Clad (clad2)	After Reprocess/ No Reprocess
AM243	2.67E+02	2.11E+02	2.11E+02	2.11E+02	6.27E-01	1.0000
CM243	3.53E-01	1.53E-01	1.53E-01	1.52E-01	9.15E-04	1.0000
CM244	5.86E+00	2.36E+00	2.36E+00	2.35E+00	1.30E-02	1.0000

Note: [a] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding. The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

Table 3-4. Summary of Total Radionuclide Inventory Before and After Processing (curies). (2 sheets)

Radionuclide	Basin (combo3a)	Total in Process (combo3a)	Total After Reprocess, Core+Clad (core2,clad2)	Core (core2)	Clad (clad2)	After Reprocess/ No Reprocess
H03[a]	2.85E+04	1.10E+06	1.10E+06	1.59E+05	9.43E+05	1.0000
C14	1.07E+02	3.94E+03	3.94E+03	3.71E+03	2.32E+02	1.0000
NI59	3.54E+01	1.33E+03	1.33E+03	4.29E+02	9.00E+02	1.0000
CO60	4.64E+03	1.61E+04	1.61E+04	1.34E+04	2.61E+03	1.0000
NI63	3.36E+03	1.27E+05	1.27E+05	4.04E+04	8.65E+04	1.0000
SE79	5.64E+00	7.90E+01	7.90E+01	7.89E+01	1.32E-01	1.0000
SR90	8.11E+06	8.79E+07	8.79E+07	8.77E+07	1.55E+05	1.0000
Y90	8.11E+06	8.79E+07	8.79E+07	8.77E+07	1.55E+05	1.0000
ZR93	3.33E+02	4.72E+03	4.72E+03	4.71E+03	9.88E+00	1.0000
NB93m	2.09E+02	3.73E+03	3.73E+03	3.72E+03	7.35E+00	1.0000
TC99	2.42E+03	3.43E+04	3.43E+04	3.40E+04	2.33E+02	1.0000
RU106	3.06E+02	1.06E+03	1.06E+03	1.05E+03	4.25E+00	1.0000
CD113m	1.02E+03	5.79E+03	5.79E+03	5.52E+03	2.71E+02	0.9999
SB125	7.30E+03	1.90E+04	1.90E+04	1.88E+04	1.73E+02	1.0000
SN126	2.85E+01	3.29E+02	3.29E+02	3.28E+02	5.72E-01	1.0000
I129	4.00E+00	4.94E+01	4.94E+01	4.90E+01	3.55E-01	1.0000
CS134	4.65E+03	8.56E+03	8.56E+03	8.13E+03	4.30E+02	1.0001
CS137	1.03E+07	1.04E+08	1.04E+08	1.03E+08	9.24E+05	1.0000
BA137m	9.75E+06	9.83E+07	9.83E+07	9.74E+07	8.73E+05	1.0000
SM151	1.55E+05	3.30E+06	3.30E+06	3.29E+06	4.98E+03	1.0000
EU152	5.22E+02	1.07E+03	1.07E+03	1.07E+03	3.40E+00	1.0000
EU154	5.44E+04	9.19E+04	9.19E+04	9.16E+04	2.94E+02	1.0000
EU155	1.17E+04	5.14E+04	5.14E+04	5.12E+04	1.42E+02	1.0000
RA226	1.03E-03	1.14E-01	1.76E-02	1.73E-02	2.60E-04	0.1537
AC227	5.25E-03	5.11E+00	4.66E+00	4.57E+00	9.67E-02	0.9132
RA228	9.26E-08	5.97E+01	3.04E+00	1.59E+00	1.45E+00	0.0509
TH229	1.04E-05	2.66E+01	1.41E+00	1.09E+00	3.24E-01	0.0531
PA231	1.74E-02	8.21E+00	7.15E+00	7.00E+00	1.48E-01	0.8712
TH232	1.39E-07	6.08E+01	2.80E+00	1.32E+00	1.48E+00	0.0461
U232	7.00E-01	1.43E+02	7.48E+00	5.85E+00	1.62E+00	0.0524
U233	6.01E-03	8.41E+03	4.49E+02	3.53E+02	9.68E+01	0.0534

Table 3-4. Summary of Total Radionuclide Inventory Before and After Processing (curies). (2 sheets)

Radionuclide	Basin (combo3a)	Total in Process (combo3a)	Total After Reprocess, Core+Clad (core2,clad2)	Core (core2)	Clad (clad2)	After Reprocess/ No Reprocess
U234	9.77E+02	3.55E+04	2.69E+03	2.65E+03	4.52E+01	0.0758
U235	3.52E+01	1.47E+03	1.20E+02	1.18E+02	1.84E+00	0.0812
U236	1.22E+02	1.02E+03	3.53E+01	3.31E+01	2.22E+00	0.0348
NP237	3.48E+01	2.44E+02	1.32E+02	1.32E+02	3.89E-01	0.5416
PU238	5.19E+04	1.13E+05	1.98E+03	1.74E+03	2.42E+02	0.0175
U238	6.93E+02	3.29E+04	2.72E+03	2.68E+03	3.76E+01	0.0826
PU239	2.22E+05	3.84E+06	3.37E+04	2.86E+04	5.16E+03	0.0088
PU240	1.07E+05	8.77E+05	8.11E+03	6.81E+03	1.30E+03	0.0092
AM241	2.63E+05	9.98E+05	8.27E+04	8.09E+04	1.82E+03	0.0829
PU241	3.91E+06	7.84E+06	1.27E+05	1.09E+05	1.81E+04	0.0162
PU242	3.08E+01	5.25E+01	7.94E-01	6.77E-01	1.17E-01	0.0151
CM242	8.39E+01	7.33E+01	7.33E+01	7.31E+01	2.23E-01	1.0000
AM243	5.33E+01	4.22E+01	4.22E+01	4.21E+01	1.25E-01	1.0000
CM243	1.78E+01	7.74E+00	7.74E+00	7.69E+00	4.63E-02	1.0000
CM244	4.75E+02	1.92E+02	1.92E+02	1.90E+02	1.05E+00	1.0000

Note: [a] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding. The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

4.0 RECOMMENDATIONS FOR FUTURE WORK

Several areas were identified where improvements to the inventory modeling could be made. These improvements included:

- Complete Verification and Validation studies and documentation for the MONTEBURNS code.
- Compare MONTEBURNS and ORIGEN2 calculated compositions with historical isotopic measurements for single pass reactor fuel.
- Modify the ORIGEN2 code to incorporate burnup dependent cross sections for single pass reactor fuel.
- Improve the way ORIGEN2 handles burnup dependent cross sections. Burnup dependent cross sections are incorporated in ORIGEN2 through DATA statements of cross section versus burnup, and does not interpolate between values. The current code produces step function changes in the concentration of some nuclides over the burnup ranges of interest.
- Improve the DKPRO interpolation routine. This could be tested with a 3rd order versus a 5th order Lagrangian Interpolating Polynomial or a 3rd order least squares fit using the closest 5 or 7 exposure steps.
- Revisit the single pass reactor cross section generation to incorporate differences in the small reactors versus KE and KW, and differences in fuel types. This would improve the agreement with total plutonium production and isotopics for the single pass reactor fuel.
- Increase the number of actinide, activation, and fission product cross sections adjusted to the single pass reactor neutronic environment. Only the cross sections for 20 nuclides were adjusted in the current study. Previous generation of N Reactor specific cross sections involved the adjustment of the cross sections for 110 nuclides. This could improve the accuracy of some activation and fission products, such as tritium from lithium activation.
- Investigate further the true lithium impurity in aluminum cladding, and the question of whether any recycled uranium with higher ^{236}U content or ^{99}Tc impurity was used in the natural enrichment single pass reactor fuel.

5.0 REFERENCES

Croff, A. G., 1980, *ORIGEN2 – A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code*, ORNL-5621, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Croff, A. C., R. L. Haese, and N. B. Gove, 1979, *Updated Decay and Photon Libraries for the ORIGEN Code*, ORNL/TM-6055, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

England, T. R., and B. F. Rider, 1994, *Evaluation and Compilation of Fission Product Yields: 1993*, LA-UR-94-3106 (ENDF-349), Los Alamos National Laboratory, Los Alamos, New Mexico.

Jackson, R. R., and R. L. Walser, 1977, *PUREX Process Operation and Performance 1970 Thoria Campaign*, ARH-2127, Atlantic Richfield Hanford Company, Richland, Washington.

Lan, J. S., 2001, *MCNP Version 4C Approval For Use Documentation and Authorized User List*, FFS-LEJ-02-002, July 26, Fluor Federal Services, Inc., Richland, Washington.

Parrington, J. R., H. D. Knox, S. L. Breneman, E. M. Baunm, and F. Feiner, 1996, *Nuclides and Isotopes, Fifteenth Edition Chart of the Nuclides*, GE Nuclear Energy, San Jose, California.

Perl, E. R., 1967, *Reactor Processing Isotope Production and Fuel Conversion Tables*, DUN-2625, Douglas United Nuclear, Inc., Richland, Washington.

Roblyer, S. P., 1994, *Plutonium and Tritium Produced in the Hanford Site Production Reactors*, WHC-SD-CP-RPT-014, Westinghouse Hanford Company, Richland, Washington.

Roblyer, S. P., 2001, *Software Certification Report for ORIGEN2 Version S.2*, HNF-8696, Rev. 0, Fluor Hanford, Richland, Washington.

Roblyer, S. P., 2002, Private Communication of printed output from historical MOFDA single pass reactor calculations.

Ryman, J. C., and O. W. Hermann, 1998, *ORIGEN-S Data Libraries*, OORNL/NUREG/CSD-2/V3/R6, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Schwarz, R. A., 1997, *Modification to ORIGEN2 for Generating N Reactor Source Terms*, PNNL-11555, UC-610, Pacific Northwest National Laboratory, Richland, Washington.

Scott, J. H., 1965, *MOFDA A Reactor Design-Analysis Code*, RL-NRD-497, General Electric Hanford Atomic Products Operation, Richland, Washington.

Toffer, H., 2002, *Authorization to Use an Authorized User List for Engineering Software SCALE 4.4/KENO V.a*, FH-NCS-02-013, Fluor Hanford, Richland, Washington (attachment CCVR 02-001, *SCALE/KENO V.a Plutonium Validation*, D. G. Erickson, March 2002).

Trellue, H. R., and D. I. Poston, 1999, *User's Manual, Version 2.0 For MONTEBURNS, Version 5B*, LA-UR-99-4999, Los Alamos National Laboratory, Los Alamos, New Mexico.

Watrous, R. A., and D. W. Wootan, 1997, *Activity of Fuel Batches Processed Through Hanford Separations Plants, 1944 Through 1989*, HNF-SD-WM-TI-794, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

Wootan, D., and F. Schmittroth, 1997, *DKPRO: A Radionuclide Decay and Reprocessing Code*, HNF-SD-WM-CSWD-082, Fluor Daniel Northwest, Inc., Richland, Washington.

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APPENDIX A

INDEPENDENT REVIEW COMMENTS AND CHECKLIST

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ACKNOWLEDGEMENTS

While David Wootan and Scott Finfrock are listed as primary authors,the work documented in this report involved large amounts of data manipulation requiring the combined efforts over many nonths of several other key individuals. The work of each individual was reviewed and checked by at least one other person. Steve Kessler helped in getting the MONTEBURNS code working and provided the comparison with N Reactor Fuel measurements. Steve Gedeon and Scott Finfrock provided much of the work on the fission product update program. Steve Roblyer provided input on historical fuel and cladding impurities, provided information on the MOFDA code, and assisted in the updating of half-lives. Denise Rumsey also assisted in the updating and checking of half-lives. Kevin Schwinkendorf provided information on single pass reactor and N Reactor fuel models and WIMS cross section processing. Warren Wittekind provided historical information, reevaluated the N Reactor fuel measurements, and provided independent peer review for the overall process. Scott Finfrock made the changes to the DKPRO code and auxiliary programs, generated the DKPRO documentation, and made the final ORIGEN2 and DKPRO runs. David Wootan provided overall technical direction, reviewed and checked the ORIGEN2 and DKPRO input and output files, half-life updates, and fission product yield updates, and generated the cross section adjustments. Bob Watrous provided the cladding and separation waste splitting factors and reprocessing factors.

Desk Instruction 2.0, Rev. 1

CHECKLIST FOR TECHNICAL PEER REVIEW

Document Reviewed - HNF-12613, Revision 0

Title: Activity of Fuel Batches Processed Through Hanford Separations Plants 1944 Through 1989

Authors: D. W. Wootan and S. F. Finfrock

Date: September 2002

Scope of Review: Calculation

Yes	No*	NA		
[X]	[ ]	[ ]		Referenced analyses appropriate.
[X]	[ ]	[ ]		Problem completely defined and all potential configurations considered.
[ ]	[ ]	[X]		Accident scenarios developed in a clear and logical manner.
[X]	[ ]	[ ]		Necessary assumptions explicitly stated and supported.
[X]	[ ]	[ ]		Computer codes and data files documented.
[X]	[ ]	[ ]		Data used in calculations explicitly stated in document.
[ ]	[X]	[ ]		Data checked for consistency with original source information as applicable.
[ ]	[ ]	[X]		Mathematical derivations checked including dimensional consistency of results
[X]	[ ]	[ ]		Models appropriate and used within range of validity, or use outside range of established validity justified.
[ ]	[ ]	[X]		Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
[X]	[ ]	[ ]		Software input correct and consistent with document reviewed.
[X]	[ ]	[ ]		Software output consistent with input and with results reported in document reviewed.
[ ]	[ ]	[X]		Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references.
[X]	[ ]	[ ]		Safety margins consistent with good engineering practices.
[X]	[ ]	[ ]		Conclusions consistent with analytical results and applicable limits.
[X]	[ ]	[ ]		Results and conclusions address all points required in the problem statement.
[X]	[ ]	[ ]		Format consistent with applicable guides or other standards.
[ ]	[X]	[ ]	**	Review calculations, comments, and/or notes are attached.
[X]	[ ]	[ ]		Document approved (for example, the reviewer affirms the technical accuracy of the document).

W. D. Wittekind Warren D. Wittekind 30 Sept. 2002
Technical Peer Reviewer (printed name and signature) Date

* All "no" responses must be explained below or on an additional sheet.
Original data were too massive to review, but values for input could be justified.

** Any calculations, comments, or notes generated as part of this review should be signed, dated and attached to this checklist. The material should be labeled and recorded in such a manner as to be understandable to a technically qualified third party.

PEER REVIEW COMMENT BY WARREN D. WITTEKIND

This calculation for the total Hanford Site waste streams from all reactors, through all reprocessing plants is a massive work that involved a number of analysts and was accomplished over a number of months. Many significant improvements have been made since the previous calculation. Much checking of separate input data was accomplished during the generation of the overall calculation model.

Editorial suggestions were incorporated into the text as the document was being written.

Areas of improvement could be categorized as:

- DKPRO,
- ORIGEN2,
- ORIGEN2 Libraries,
- Modeling categories, and
- Chemical measurement modeling.

The greatest variability in DKPRO results is due to the interpolation routine. This could be tested with a 3rd order versus a 5th order Lagrangian Interpolating Polynomial. Because of the ORIGEN2 mathematical calculations, it is also reasonable to test a 3rd order least squares fit using the closest 5 or 7 exposure steps. Inclusion of zero (0.0) exposure burnup data would reduce uncertainty in the low exposure interpolation.

ORIGEN2 did not have burnup dependant cross-sections for single pass reactor fuel. These cross sections would have to be generated as the N Reactor cross sections were generated.

Most of the ORIGEN2 cross section libraries came from PWR-U library which is an enriched pressurized water reactor core that was modeled at higher exposure than N Reactor operated. The N Reactor cross sections changed only WIMS available cross sections, but did not try to adjust most of the cross sections. The single pass reactor cross section adjustment is another step toward a more thermal spectrum and lower exposure.

Comparison of ORIGEN2 Isotope Cross Section Changes			
	Activation Products	**Actinides and Daughters**	**Fission Products**
ORIGEN2 Total Isotopes	394	78	824
N Reactor changes	56	11	43
Single Pass Reactor additional changes	5	15	0

The modeling categories for single pass reactor exposure could be improved by separating the KE and KW reactors from the smaller single pass reactors, since their production tables were considered separately.

There are more chemical analyses available for N Reactor, and for single pass reactor batches. The single pass reactor analytical chemistry measurements could be included to support the single pass reactor exposure calculation results.

APPENDIX B

INPUT FILES

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ORIGEN2 Input Files

runcombo.bat

```
del /f fort.9 fort.10 fort.12 fort.15 fort.16 fort.20 fort.50 decaylib
copy u:\data\dkpro\testdata\ft27f001rev2 decaylib
type decaylib mkiai mkiao mkivi mkivo > fort.9
copy p:\origen2\S.2\libraries\orig61 fort.10

rem mk1a cases
del fort.3
copy fort.3.mk1a fort.3

call runcase combo mk1aa1
call runcase combo mk1aa2
call runcase combo mk1aa3
call runcase combo mk1ab1
call runcase combo mk1ab2
call runcase combo mk1ab3
call runcase combo mk1ac1
call runcase combo mk1ac2
call runcase combo mk1ac3

rem mkii cases (use mk1a fort.3)
del fort.3
copy fort.3.mk1a fort.3

call runcase combo mkii1
call runcase combo mkii2
call runcase combo mkii3


rem mkiv cases
del fort.3
copy fort.3.mkiv fort.3

call runcase combo mkiva1
call runcase combo mkiva2
call runcase combo mkiva3
call runcase combo mkivb1
call runcase combo mkivb2
call runcase combo mkivb3
call runcase combo mkivc1
call runcase combo mkivc2
call runcase combo mkivc3

rem single pass natural (spn) cases
del fort.3
copy fort.3.spn fort.3

call runcase combo spna1
call runcase combo spna2
call runcase combo spna3
call runcase combo spnb1
call runcase combo spnb2
call runcase combo spnb3
call runcase combo spnc1
call runcase combo spnc2
call runcase combo spnc3

rem single pass enriched (spe) cases
del fort.3
```

```
copy fort.3.spe fort.3

call runcase combo spe1
call runcase combo spe2
call runcase combo spe3

rem thorium
del fort.3
copy fort.3.th fort.3

call runcase combo th1
```

runcore.bat

```
del /f fort.9 fort.10 fort.12 fort.15 fort.16 fort.20 fort.50 decaylib
copy u:\data\dkpro\testdata\ft27f001rev2 decaylib
type decaylib mkiai mkiao mkivi mkivo > fort.9
copy p:\origen2\S.2\libraries\orig61 fort.10

rem mk1a cases
del fort.3
copy fort.3.mk1a fort.3

call runcase core mk1aa1
call runcase core mk1aa2
call runcase core mk1aa3
call runcase core mk1ab1
call runcase core mk1ab2
call runcase core mk1ab3
call runcase core mk1ac1
call runcase core mk1ac2
call runcase core mk1ac3

rem mkii cases (use mk1a fort.3)
del fort.3
copy fort.3.mk1a fort.3

call runcase core mkii1
call runcase core mkii2
call runcase core mkii3


rem mkiv cases
del fort.3
copy fort.3.mkiv fort.3

call runcase core mkiva1
call runcase core mkiva2
call runcase core mkiva3
call runcase core mkivb1
call runcase core mkivb2
call runcase core mkivb3
call runcase core mkivc1
call runcase core mkivc2
call runcase core mkivc3

rem single pass natural (spn) cases
del fort.3
copy fort.3.spn fort.3

call runcase core spna1
call runcase core spna2
call runcase core spna3
```

```
call runcase core spnb1
call runcase core spnb2
call runcase core spnb3
call runcase core spnc1
call runcase core spnc2
call runcase core spnc3

rem single pass enriched (spe) cases
del fort.3
copy fort.3.spe fort.3

call runcase core spe1
call runcase core spe2
call runcase core spe3


rem thorium
del fort.3
copy fort.3.th fort.3

call runcase core th1
```

fort.3.mk1a

```
432  922380 7.148E-01 2.500E-03 4.597E-05 7.287E-02 0.000E+00 0.000E+00   -1.0
442  922380 8.155E-01 2.500E-03 4.597E-05 6.923E-02 0.000E+00 0.000E+00   -1.0
```

fort.3.mkiv

```
412  922380 6.890e-01 2.500E-03 4.597e-05 7.307e-02 0.000e+00 0.000e+00   -1.00
422  922380 7.919e-01 2.500e-03 4.597e-05 6.639e-02 0.000e+00 0.000e+00   -1.00
```

fort.3.spe

```
441   70140 1.392E-02 1.186E-07 1.843E-02 3.483E-01 0.000E+00 0.000E+00   -1.0
441  270590 3.880E+00 2.579E-05 2.947E-05 3.126E-04 4.570E+00 0.000E+00   -1.0
441  280580 8.633E-01 3.380E-07 1.953E-03 2.208E-02 0.000E+00 0.000E+00   -1.0
441  280620 2.662E+00 2.619E-05 9.924E-06 6.261E-06 0.000E+00 0.000E+00   -1.0
441  400930 1.164E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00   -1.0
442  922350 1.960E+01 1.617E-03 5.162E-07 1.003E+02 0.000E+00 0.000E+00   -1.0
442  922360 7.945E+00 1.543E-03 9.311E-06 2.414E-01 0.000E+00 0.000E+00   -1.0
442  922380 8.465E-01 3.037E-03 7.729E-06 6.892E-02 0.000E+00 0.000E+00   -1.0
442  932370 5.814E+01 2.710E-04 1.096E-06 3.754E-01 0.000E+00 7.877E-04   -1.0
442  942380 8.053E+01 8.462E-04 7.281E-06 3.483E+00 0.000E+00 0.000E+00   -1.0
442  942390 1.407E+02 6.749E-04 3.639E-07 2.525E+02 0.000E+00 0.000E+00   -1.0
442  942400 2.741E+02 2.806E-04 1.160E-06 4.452E-01 0.000E+00 0.000E+00   -1.0
442  942410 1.000E+02 4.488E-03 2.603E-06 2.697E+02 0.000E+00 0.000E+00   -1.0
442  942420 3.782E+01 1.236E-03 4.290E-06 3.111E-01 0.000E+00 0.000E+00   -1.0
442  952410 1.930E+02 2.279E-04 1.128E-06 1.538E+00 2.400E+01 0.000E+00   -1.0
442  952421 3.308E+02 2.436E-03 5.081E-06 1.622E+03 0.000E+00 0.000E+00   -1.0
442  952430 3.230E+00 1.547E-04 8.481E-07 3.046E-01 6.130E+01 0.000E+00   -1.0
442  962420 6.959E+00 3.473E-05 3.128E-08 7.550E-01 0.000E+00 0.000E+00   -1.0
442  962430 6.188E+01 4.174E-03 5.233E-06 1.399E+02 0.000E+00 0.000E+00   -1.0
442  962440 1.553E+01 7.250E-04 5.714E-06 7.932E-01 0.000E+00 0.000E+00   -1.0
```

fort.3.spn

```
441   70140 1.460E-02  .000     2.628E-02 3.640E-01  .000      .000       -1.0
441  270590 4.039E+00 4.343E-05 3.013E-05 3.097E-04 4.751E+00 0.000E+00   -1.0
441  280580 9.043E-01 1.016E-06 1.926E-03 2.144E-02 0.000E+00 0.000E+00   -1.0
441  280620 2.790E+00 4.430E-05 1.029E-05 6.951E-06 0.000E+00 0.000E+00   -1.0
```

```
441  400930 1.180E 00 0.0       1.532E-05 0.0       0.0       0.0         -1.0
442  922350 2.044E+01 1.624E-03 1.535E-06 1.050E+02 0.000E+00 0.000E+00   -1.0
442  922360 7.712E+00 1.582E-03 2.295E-05 2.318E-01 0.000E+00 0.000E+00   -1.0
442  922380 8.550E-01 3.073E-03 1.990E-05 6.584E-02 0.000E+00 0.000E+00   -1.0
442  932370 6.005E+01 2.772E-04 3.206E-06 3.605E-01 0.000E+00 7.877E-04   -1.0
442  942380 8.424E+01 8.595E-04 2.039E-05 3.561E+00 0.000E+00 0.000E+00   -1.0
442  942390 1.482E+02 6.752E-04 1.194E-06 2.658E+02 0.000E+00 0.000E+00   -1.0
442  942400 2.622E+02 2.859E-04 3.235E-06 4.274E-01 0.000E+00 0.000E+00   -1.0
442  942410 1.053E+02 4.505E-03 5.915E-06 2.839E+02 0.000E+00 0.000E+00   -1.0
442  942420 3.778E+01 1.254E-03 1.166E-05 2.983E-01 0.000E+00 0.000E+00   -1.0
442  952410 2.002E+02 2.323E-04 3.233E-06 1.569E+00 2.485E+01 0.000E+00   -1.0
442  952421 3.487E+02 2.443E-03 1.324E-05 1.709E+03 0.000E+00 0.000E+00   -1.0
442  952430 3.067E+00 1.558E-04 2.029E-06 2.914E-01 5.827E+01 0.000E+00   -1.0
442  962420 6.758E+00 3.531E-05 8.878E-08 7.707E-01 0.000E+00 0.000E+00   -1.0
442  962430 6.484E+01 4.190E-03 1.410E-05 1.458E+02 0.000E+00 0.000E+00   -1.0
442  962440 1.357E+01 7.330E-04 1.548E-05 7.510E-01 0.000E+00 0.000E+00   -1.0
```

fort.3.th

```
442  902320 1.090E+00 1.890E-04 2.660E-05 2.217E-02 0.000E+00 0.000E+00   -1.00
```

combo.th1.inp

```
-1
-1
-1
TIT     Hanford Thorium/U233 Radionuclide Production orig02tha
LIP     0 0 0
RDA     Use adjusted MK1A outer cross sections
RDA        Set Th232 capture cross section to 1.09 barns
RDA        Set Th232 n,2n cross section to 1.89e-4 barns
RDA        Use Revised XS library
LPU     902320    -1
LIB     0 1 2 3 441 -442 443 9 3 0 3  0
RDA
RDA     1 Metric ton thorium
INP     -1  1  -1  -1  1  1
RDA     1 metric ton aluminum
INP     -2  1  -1  -1  1 1
RDA
RDA         << SINGLE PASS U233 PRODUCTION >>
RDA     Create a vector with 1 metric ton of natural thorium
BAS     One metric ton of natural thorium
MOV     -1  1  0  1.0        THORIUM VECTOR
RDA     Add 70.78 kg/MT Th aluminum cladding
ADD     -2  1  0  0.07078
RDA
RDA     Assume burnup of 100 days at average flux of 1.73e14 n/cm2-s
RDA     obtained from single-pass irradiation.
BUP
IRF     100.0    1.73E+14   1 2 4 2
BUP
RDA     Decay for 1 day
DEC     1.0           2 3 4 1
RDA
RDA     Save values on Unit 7
PCH     3 3 3
RDA
RDA    --------------- output --------------
CUT       5  1.0E-10   7  1.0E-10   -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
```

```
OUT      3 1 -1  0
STP 4
5 900000  1.0E+6   80160 0.138E+6     0   0.0         Nat. thorium
0
4  130000  0.9783E+06    0  0.0                                  Al clad
4   50000   10.0   70000   50.0  120000  100.0  140000 1660.0      "
4  220000  500.0  240000  300.0  250000  300.0  260000 5600.0      "
4  270000   10.0  280000 11000.  290000 1470.0  300000  300.0      "
4  480000   30.0  500000  100.0  820000  100.0  830000  100.0      "
4   30000   80.0       0    0.0                                     "
0
END
```

combo.mk1aa1.inp

```
-1
-1
-1
RDA  ---------------------------------------------------------------
TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
LIP     0 0 0
RDA     Set library for Mk-1a inner
RDA       Use revised decay library
RDA       Set U238 n2n cross section to 0.0025
LPU     922380  -1
LIB     0 1 2 3  431 -432 433 9 3 0  1  43
RDA
RDA     1 Metric ton Natural uranium
INP     -1  1  -1  -1  1  1
RDA     1 Metric ton 0.947 % enriched uranium
INP     -2  1  -1  -1  1  1
RDA     1 Metric ton 1.25 % enriched uranium
INP     -3  1  -1  -1  1  1
RDA     Trace impurities for 1 metric ton on uranium
INP     -4  1  -1  -1  1  1
RDA     1 metric ton zircaloy
INP     -5  1  -1  -1  1  1
RDA
RDA        << Inner calculation >>
BAS     One metric ton of 0.947% enriched uranium
RDA
RDA     Create a vector with 1 metric ton of 0.947% enriched uranium
MOV     -2  1  0  1.0        URANIUM VECTOR
RDA     Add uranium trace impurities
ADD     -4  1  0  1.0
RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
ADD     -5  1  0  0.08572
RDA
RDA     Inner Irradiation sequence
RDA     Each 100 day interval corresponds to an average burnup
RDA     of 1320 MWd/MTU when averaged with the outer.
BUP
IRP       1.5    9.46   1 2 4 2       1.5 day irrad.
IRP       2.0    9.46   2 3 4 0        .5 day irrad.
IRP       3.0    9.46   3 4 4 0         1 day irrad.
IRP       5.0    9.46   4 5 4 0         2 day irrad.
IRP       7.0    9.46   5 6 4 0         2 day irrad.
IRP      10.0    9.46   6 7 4 0         3 day irrad.
BUP
RDA     Save Inner results
MOV     1  -6  0  0.333
MOV     2  -7  0  0.333
MOV     3  -8  0  0.333
```

```
MOV      4  -9  0  0.333
MOV      5  -10 0  0.333
MOV      6  -11 0  0.333
MOV      7  -12 0  0.333
RDA
RDA     --------------- Actinide output, Inners -------------
CUT        5  1.0E-10       -1
OPTA      8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL      8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF      8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT      9  1 -1  0
STP      2
5  920000  1.0E+6            0  0.0                              Nat. U
0
2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
0
2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
0
4   10000    2.0   40000   10.0   50000    0.25   60000 550.0  Fuel Impur.
4   70000   17.5  120000   25.0  130000  800.0   140000 124.0      "
4  240000   65.0  250000   25.0  260000  350.0   280000 100.0      "
4  290000   75.0  400000   65.0  480000    0.25  270000   1.0
4  170000    1.0       0   0.0
0
4  400000  0.9814E+06    0  0.0                                  Zircaloy
4   10000   25.0   50000    0.5   60000  275.0   70000   80.0      "
4  110000   20.0  120000   20.0  130000   75.0  140000  100.0      "
4  220000   50.0  230000   50.0  240000 1000.0  250000   50.0      "
4  260000 1350.0  270000   10.0  280000  550.0  290000   50.0      "
4  420000   50.0  480000    0.5  500000 14500.0 720000  200.0      "
4  740000   50.0  820000  100.0  920000    2.5       0    0.0      "
4   40000  800.0       0    0.0                                    "
0
RDA      Set library for Mk-1a outer
RDA        Use revised decay library
RDA        Set U238 n2n cross section to 0.0025
LPU      922380  -1
LIB      0 1 2 3  441 -442 443 9 3 0  1  44
RDA
RDA         << Outer calculation >>
BAS      One metric ton of 1.25% enriched uranium
RDA
RDA      Create a vector with 1 metric ton of 1.25% enriched uranium
MOV      -3  1  0  1.0        URANIUM VECTOR
RDA      Add uranium trace impurities
ADD      -4  1  0  1.0
RDA      Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
ADD      -5  1  0  0.08572
RDA
RDA      Outer Irradiation sequence
BUP
IRP        1.5   15.07   1 2 4 2       1.5 day irrad.
IRP        2.0   15.07   2 3 4 0        .5 day irrad.
IRP        3.0   15.07   3 4 4 0         1 day irrad.
IRP        5.0   15.07   4 5 4 0         2 day irrad.
IRP        7.0   15.07   5 6 4 0         2 day irrad.
IRP       10.0   15.07   6 7 4 0         3 day irrad.
BUP
RDA     --------------- Actinide output, Outers -------------
CUT        5  1.0E-10       -1
OPTA      8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
```

```
OPTL     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT     9  1 -1  0
RDA
RDA       << Combine results >>
ADD     1  -6  0  0.667
ADD     2  -7  0  0.667
ADD     3  -8  0  0.667
ADD     4  -9  0  0.667
ADD     5  -10 0  0.667
ADD     6  -11 0  0.667
ADD     7  -12 0  0.667
RDA
MOV     -6  1  0  1.0
DEC     1.0      -7  2  4  1
DEC     1.0      -8  3  4  1
DEC     1.0      -9  4  4  1
DEC     1.0      -10 5  4  1
DEC     1.0      -11 6  4  1
DEC     1.0      -12 7  4  1
HED     1  Initial
HED     2  1.5 d
HED     3    2 d
HED     4    3 d
HED     5    5 d
HED     6    7 d
HED     7   10 d
RDA
RDA    --------------- Composite output --------------
CUT       5  1.0E-10    7  1.0E-10     -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT      7  1 -1  0
RDA
PCH      1 1 1
PCH      2 2 2
PCH      3 3 3
PCH      4 4 4
PCH      5 5 5
PCH      6 6 6
PCH      7 7 7
END
```

combo.mkii1.inp

```
-1
-1
-1
RDA  ---------------------------------------------------------------
TIT     Hanford N Reactor Mk-II mkii 2.1U
LIP     0 0 0
RDA     Set library for Mk-1a outer
RDA       Use Revised XS library
RDA       Set U238 n2n cross section to 0.0025
LPU     922380  -1
LIB     0 1 2 3  441 -442 443 9 3 0  1  44
RDA
RDA     1 Metric ton Natural uranium
INP     -1  1  -1  -1  1  1
RDA     1 Metric ton 0.947 % enriched uranium
INP     -2  1  -1  -1  1  1
RDA     1 Metric ton 2.1 % enriched uranium
```

```
INP     -3  1  -1  -1  1  1
RDA     Trace impurities for 1 metric ton on uranium
INP     -4  1  -1  -1  1  1
RDA     1 metric ton zircaloy
INP     -5  1  -1  -1  1  1
RDA
RDA        << Outer calculation >>
BAS     One metric ton of 2.1% enriched uranium
RDA
RDA     Create a vector with 1 metric ton of 2.1% enriched uranium
MOV     -3  1  0  1.0        URANIUM VECTOR
RDA     Add uranium trace impurities
ADD     -4  1  0  1.0
RDA     Add 86.99 Kg Zircaloy / Short Ton uranium + Be braze
ADD     -5  1  0  0.08706
RDA
RDA     Outer Irradiation sequence
BUP
IRP       1.5   13.20   1 2 4 2       1.5 day irrad.
IRP       2.0   13.20   2 3 4 0        .5 day irrad.
IRP       3.0   13.20   3 4 4 0         1 day irrad.
IRP       5.0   13.20   4 5 4 0         2 day irrad.
IRP       7.0   13.20   5 6 4 0         2 day irrad.
IRP      10.0   13.20   6 7 4 0         3 day irrad.
BUP
RDA    --------------- Actinide output, Outers --------------
CUT       5  1.0E-10      -1
OPTA     8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT     6  1 -1  0
RDA
RDA       << Combine results >>
MOV     1  -6  0  1.000
MOV     2  -7  0  1.000
MOV     3  -8  0  1.000
MOV     4  -9  0  1.000
MOV     5  -10 0  1.000
MOV     6  -11 0  1.000
MOV     7  -12 0  1.000
RDA
MOV     -6  1  0  1.0
DEC     1.0     -7  2  4  1
DEC     1.0     -8  3  4  1
DEC     1.0     -9  4  4  1
DEC     1.0     -10 5  4  1
DEC     1.0     -11 6  4  1
DEC     1.0     -12 7  4  1
HED     1  Initial
HED     2  1.5 d
HED     3    2 d
HED     4    3 d
HED     5    5 d
HED     6    7 d
HED     7   10 d
RDA
RDA    --------------- Composite output --------------
CUT       5  1.0E-10    7  1.0E-10     -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT      7  1 -1  0
PCH      1 1 1
```

```
PCH       2 2 2
PCH       3 3 3
PCH       4 4 4
PCH       5 5 5
PCH       6 6 6
PCH       7 7 7
STP 4
5  920000  1.0E+6           0  0.0                            Nat. U
0
2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
0
2  922350  0.02100E+6  922380  0.97875E+6    0 0.0          2.1% enrich.
2  922340  0.00008E+6  922360  0.00017E+6    0 0.0
0
4   10000    2.0   40000   10.0   50000    0.25   60000 550.0  Fuel Impur.
4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
4  240000   65.0  250000   25.0  260000  350.0   280000 100.0     "
4  290000   75.0  400000   65.0  480000    0.25  270000   1.0
4  170000    1.0       0   0.0
0
4  400000  0.9814E+06    0  0.0                                  Zircaloy
4   10000   25.0   50000    0.5   60000  275.0   70000   80.0     "
4  110000   20.0  120000   20.0  130000   75.0  140000  100.0     "
4  220000   50.0  230000   50.0  240000 1000.0  250000   50.0     "
4  260000 1350.0  270000   10.0  280000  550.0  290000   50.0     "
4  420000   50.0  480000    0.5  500000 14500.0 720000  200.0     "
4  740000   50.0  820000  100.0  920000    2.5       0    0.0     "
4   40000  787.0       0    0.0                                   "
0
END
```

combo.mkiva1.inp

```
-1
-1
-1
RDA  ---------------------------------------------------------------
TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
LIP     0 0 0
RDA     Set library for Mk-IV inner
RDA       Use Revised XS library
RDA       Set U238 n2n cross section to 0.0025
LPU     922380  -1
LIB     0 1 2 3  411 -412 413 9 3 0  1  41
RDA
RDA     1 Metric ton Natural uranium
INP     -1  1  -1  -1  1  1
RDA     1 Metric ton 0.947 % enriched uranium
INP     -2  1  -1  -1  1  1
RDA     1 Metric ton 1.25 % enriched uranium
INP     -3  1  -1  -1  1  1
RDA     Trace impurities for 1 metric ton on uranium
INP     -4  1  -1  -1  1  1
RDA     1 metric ton zircaloy
INP     -5  1  -1  -1  1  1
RDA
RDA        << Inner calculation >>
BAS     One metric ton of 0.947% enriched uranium
RDA
RDA     Create a vector with 1 metric ton of 0.947% enriched uranium
MOV     -2  1  0  1.0        URANIUM VECTOR
RDA     Add uranium trace impurities
```

```
ADD      -4  1  0  1.0
RDA      Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
ADD      -5  1  0  0.07042
RDA
RDA      Inner Irradiation sequence
RDA      Each 100 day interval corresponds to an average burnup
RDA      of 1100 MWd/MTU when averaged with the outer.
BUP
IRP        1.5     9.13   1 2 4 2        1.5 day irrad.
IRP        2.0     9.13   2 3 4 0         .5 day irrad.
IRP        3.0     9.13   3 4 4 0          1 day irrad.
IRP        5.0     9.13   4 5 4 0          2 day irrad.
IRP        7.0     9.13   5 6 4 0          2 day irrad.
IRP       10.0     9.13   6 7 4 0          3 day irrad.
BUP
RDA      Save Inner results
MOV      1  -5  0  1.000
MOV      1  -6  0  0.317
MOV      2  -7  0  0.317
MOV      3  -8  0  0.317
MOV      4  -9  0  0.317
MOV      5  -10 0  0.317
MOV      6  -11 0  0.317
MOV      7  -12 0  0.317
RDA
RDA     --------------- Actinide output, Inners --------------
CUT        5  1.0E-10      -1
OPTA      8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL      8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF      8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT      9  1 -1  0
STP      2
5  920000  1.0E+6           0  0.0                              Nat. U
0
2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
0
2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
0
4   10000     2.0   40000   10.0   50000    0.25   60000 550.0  Fuel Impur.
4   70000    17.5  120000   25.0  130000  800.0   140000 124.0      "
4  240000    65.0  250000   25.0  260000  350.0   280000 100.0      "
4  290000    75.0  400000   65.0  480000    0.25  270000   1.0
4  170000     1.0       0   0.0
0
4  400000  0.9814E+06    0  0.0                                  Zircaloy
4   10000    25.0   50000    0.5   60000  275.0   70000   80.0      "
4  110000    20.0  120000   20.0  130000   75.0  140000  100.0      "
4  220000    50.0  230000   50.0  240000 1000.0  250000   50.0      "
4  260000  1350.0  270000   10.0  280000  550.0  290000   50.0      "
4  420000    50.0  480000    0.5  500000 14500.0 720000  200.0      "
4  740000    50.0  820000  100.0  920000    2.5       0    0.0      "
4   40000   974.0       0    0.0                                    "
0
RDA      Set library for Mk-IV outer
RDA        Use revised XS library
RDA        Set U238 n2n cross section to 0.0025
LPU      922380  -1
LIB      0 1 2 3  421 -422 423 9 3 0  1  42
RDA
RDA         << Outer calculation >>
BAS      One metric ton of 0.947% enriched uranium
```

```
RDA
RDA     Recover initial charge
MOV     -5  1  0  1.0
RDA
RDA     Outer Irradiation sequence
BUP
IRP       1.5   11.88   1 2 4 2       1.5 day irrad.
IRP       2.0   11.88   2 3 4 0        .5 day irrad.
IRP       3.0   11.88   3 4 4 0         1 day irrad.
IRP       5.0   11.88   4 5 4 0         2 day irrad.
IRP       7.0   11.88   5 6 4 0         2 day irrad.
IRP      10.0   11.88   6 7 4 0         3 day irrad.
BUP
RDA    --------------- Actinide output, Outers --------------
CUT       5  1.0E-10      -1
OPTA     8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT     9  1 -1  0
RDA
RDA       << Combine results >>
ADD     1  -6  0  0.683
ADD     2  -7  0  0.683
ADD     3  -8  0  0.683
ADD     4  -9  0  0.683
ADD     5  -10 0  0.683
ADD     6  -11 0  0.683
ADD     7  -12 0  0.683
RDA
MOV     -6  1  0  1.0
DEC     1.0     -7  2  4  1
DEC     1.0     -8  3  4  1
DEC     1.0     -9  4  4  1
DEC     1.0     -10 5  4  1
DEC     1.0     -11 6  4  1
DEC     1.0     -12 7  4  1
HED     1  Initial
HED     2  1.5 d
HED     3    2 d
HED     4    3 d
HED     5    5 d
HED     6    7 d
HED     7   10 d
RDA
RDA    --------------- Composite output --------------
CUT       5  1.0E-10    7  1.0E-10     -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT      7  1 -1  0
RDA
PCH      1 1 1
PCH      2 2 2
PCH      3 3 3
PCH      4 4 4
PCH      5 5 5
PCH      6 6 6
PCH      7 7 7
END
```

combo.spe1.inp

```
-1
```

```
-1
-1
TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958
LIP     0 0 0
RDA     Use MK IV Inner cross sections
RDA       Use Revised single pass reactor enriched XS
LPU      70140 270590 280580 280620 400930 -1
LPU     922350 922360 922380 932370 942380 942390 942400
        942410 942421 952410 952420 952430 962420 962430 962440 -1
LIB     0 1 2 3  -441 -442 443 9 3 0 1  0
RDA
RDA     1 Metric ton Natural uranium
INP     -1  1  -1  -1  1  1
RDA     1 Metric ton 0.947 % enriched uranium
INP     -2  1  -1  -1  1 1
RDA     Trace impurities for 1 metric ton uranium
INP     -3  1  -1  -1  1 1
RDA     1 metric ton aluminum
INP     -4  1  -1  -1  1 1
RDA
RDA         << SINGLE PASS PRODUCTION, enriched >>
RDA     Create a vector with 1 metric ton of 0.947% enriched uranium
BAS     One metric ton of 0.947% enriched uranium
MOV     -2  1  0  1.0        URANIUM VECTOR
RDA     Add uranium trace impurities
ADD     -3  1  0  1.0
RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
ADD     -4  1  0  0.04223
RDA
RDA     Assume specific power of 10 MW/MTU.
BUP
IRP       1.5   10.00   1 2 4 2       1.5 day irrad.
IRP       2.0   10.00   2 3 4 0        .5 day irrad.
IRP       3.0   10.00   3 4 4 0         1 day irrad.
IRP       5.0   10.00   4 5 4 0         2 day irrad.
IRP       7.0   10.00   5 6 4 0         2 day irrad.
IRP      10.0   10.00   6 7 4 0         3 day irrad.
BUP
RDA     Decay for 1 day to reduce short-lived nuclides
MOV     2  -2  0  1.0
MOV     3  -3  0  1.0
MOV     4  -4  0  1.0
MOV     5  -5  0  1.0
MOV     6  -6  0  1.0
MOV     7  -7  0  1.0
DEC     1.0    -2 2 4 1
DEC     1.0    -3 3 4 1
DEC     1.0    -4 4 4 1
DEC     1.0    -5 5 4 1
DEC     1.0    -6 6 4 1
DEC     1.0    -7 7 4 1
RDA
HED     1  Initial
HED     2  1.5 d
HED     3    2 d
HED     4    3 d
HED     5    5 d
HED     6    7 d
HED     7   10 d
RDA    --------------- output --------------
CUT       5  1.0E-10    7  1.0E-10     -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
```

```
OPTF     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT     8 1 -1  0
RDA
RDA   Save values on Unit 7
PCH     1 1 1
PCH     2 2 2
PCH     3 3 3
PCH     4 4 4
PCH     5 5 5
PCH     6 6 6
PCH     7 7 7
RDA    ------------------------------------------------------------
STP     4
5  920000  1.0E+6           0  0.0
0
2  922350  0.00947E+6  922380  0.99039E+6    0 0.0          .947% enrich.  0
2  922340  0.00008E+6  922360  0.00006E+6    0 0.0
0
4   70000  17.5  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
4  250000  25.0  260000  150.0  280000  100.0  270000   1.0
4  170000   1.0       0   0.0
"
0
4  130000  0.8904E+06    0  0.0                                  Al clad
4   50000   10.0   70000   30.0  120000   90.0  140000 3.11E+4    "
4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0     "
4  270000   10.0  280000 7300.0  290000 1200.0  300000  300.0     "
4  480000   30.0  500000   70.0  820000 6.18E+4 830000   90.0     "
4   30000   70.0       0    0.0                                   "
0
END
```

combo.spna1.inp

```
-1
-1
-1
TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
LIP     0 0 0
RDA     Use MK IV Inner cross sections
RDA       Use Revised single pass reactor natural XS
LPU      70140 270590 280580 280620 400930 -1
LPU     922350 922360 922380 932370 942380 942390 942400
        942410 942421 952410 952420 952430 962420 962430 962440 -1
LIB     0 1 2 3  -441 -442 443 9 3 0 1  0
RDA
RDA     1 Metric ton Natural uranium
INP     -1  1  -1  -1  1  1
RDA     1 Metric ton 0.947 % enriched uranium
INP     -2  1  -1  -1  1 1
RDA     Trace impurities for 1 metric ton uranium
INP     -3  1  -1  -1  1 1
RDA     1 metric ton aluminum
INP     -4  1  -1  -1  1 1
RDA
RDA         << SINGLE PASS PRODUCTION, natural >>
RDA     Create a vector with 1 metric ton of natural uranium
BAS     One metric ton of natural uranium
MOV     -1  1  0  1.0        URANIUM VECTOR
RDA     Add uranium trace impurities
ADD     -3  1  0  1.0
RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
ADD     -4  1  0  0.04126
```

```
RDA
RDA     Assume specific power of 10 MW/MTU.
BUP
IRP       1.5   10.00   1 2 4 2       1.5 day irrad.
IRP       2.0   10.00   2 3 4 0        .5 day irrad.
IRP       3.0   10.00   3 4 4 0         1 day irrad.
IRP       5.0   10.00   4 5 4 0         2 day irrad.
IRP       7.0   10.00   5 6 4 0         2 day irrad.
IRP      10.0   10.00   6 7 4 0         3 day irrad.
BUP
RDA     Decay for 1 day to reduce short-lived nuclides
MOV     2  -2  0  1.0
MOV     3  -3  0  1.0
MOV     4  -4  0  1.0
MOV     5  -5  0  1.0
MOV     6  -6  0  1.0
MOV     7  -7  0  1.0
DEC     1.0    -2 2 4 1
DEC     1.0    -3 3 4 1
DEC     1.0    -4 4 4 1
DEC     1.0    -5 5 4 1
DEC     1.0    -6 6 4 1
DEC     1.0    -7 7 4 1
RDA
HED     1  Initial
HED     2  1.5 d
HED     3    2 d
HED     4    3 d
HED     5    5 d
HED     6    7 d
HED     7   10 d
RDA    --------------- output --------------
CUT       5  1.0E-10    7  1.0E-10     -1
OPTA     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTL     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OPTF     8 8 8 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
OUT     8 1 -1  0
RDA
RDA   Save values on Unit 7
PCH     1 1 1
PCH     2 2 2
PCH     3 3 3
PCH     4 4 4
PCH     5 5 5
PCH     6 6 6
PCH     7 7 7
RDA    ------------------------------------------------------------
STP     4
5  920000  1.0E+6           0  0.0
0
2  922350  0.00947E+6  922380  0.99039E+6    0 0.0          .947% enrich.  0
2  922340  0.00008E+6  922360  0.00006E+6    0 0.0
0
4   70000  65.0  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
4  250000  25.0  260000  150.0  280000  100.0  270000   1.0
4  170000   1.0       0   0.0
"
0
4  130000  0.9115E+06    0  0.0                                  Al clad
4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4     "
4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0      "
4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0      "
4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0      "
```

```
4   30000   70.0        0    0.0                                        "
0
END
```

diff combo.mk1aa2.inp combo.mk1aa1.inp >dif1

```
38,44c38,43
< IRP      15.0    9.46   1 2 4 2        15 day irrad.
< IRP      20.0    9.46   2 3 4 0         5 day irrad.
< IRP      25.0    9.46   3 4 4 0         5 day irrad.
< IRP      30.0    9.46   4 5 4 0         5 day irrad.
< IRP      40.0    9.46   5 6 4 0        10 day irrad.
< IRP      50.0    9.46   6 7 4 0        10 day irrad.
< IRP      70.0    9.46   7 8 4 0        20 day irrad.
---
> IRP       1.5    9.46   1 2 4 2       1.5 day irrad.
> IRP       2.0    9.46   2 3 4 0        .5 day irrad.
> IRP       3.0    9.46   3 4 4 0         1 day irrad.
> IRP       5.0    9.46   4 5 4 0         2 day irrad.
> IRP       7.0    9.46   5 6 4 0         2 day irrad.
> IRP      10.0    9.46   6 7 4 0         3 day irrad.
47,53c46,52
< MOV     2  -6  0  0.333
< MOV     3  -7  0  0.333
< MOV     4  -8  0  0.333
< MOV     5  -9  0  0.333
< MOV     6  -10 0  0.333
< MOV     7  -11 0  0.333
< MOV     8  -12 0  0.333
---
> MOV     1  -6  0  0.333
> MOV     2  -7  0  0.333
> MOV     3  -8  0  0.333
> MOV     4  -9  0  0.333
> MOV     5  -10 0  0.333
> MOV     6  -11 0  0.333
> MOV     7  -12 0  0.333
103,109c102,107
< IRP      15.0   15.07   1 2 4 2        15 day irrad.
< IRP      20.0   15.07   2 3 4 0         5 day irrad.
< IRP      25.0   15.07   3 4 4 0         5 day irrad.
< IRP      30.0   15.07   4 5 4 0         5 day irrad.
< IRP      40.0   15.07   5 6 4 0        10 day irrad.
< IRP      50.0   15.07   6 7 4 0        10 day irrad.
< IRP      70.0   15.07   7 8 4 0        20 day irrad.
---
> IRP       1.5   15.07   1 2 4 2       1.5 day irrad.
> IRP       2.0   15.07   2 3 4 0        .5 day irrad.
> IRP       3.0   15.07   3 4 4 0         1 day irrad.
> IRP       5.0   15.07   4 5 4 0         2 day irrad.
> IRP       7.0   15.07   5 6 4 0         2 day irrad.
> IRP      10.0   15.07   6 7 4 0         3 day irrad.
119,125c117,123
< ADD     2  -6  0  0.667
< ADD     3  -7  0  0.667
< ADD     4  -8  0  0.667
< ADD     5  -9  0  0.667
< ADD     6  -10 0  0.667
< ADD     7  -11 0  0.667
< ADD     8  -12 0  0.667
---
> ADD     1  -6  0  0.667
```

```
> ADD     2  -7  0  0.667
> ADD     3  -8  0  0.667
> ADD     4  -9  0  0.667
> ADD     5  -10 0  0.667
> ADD     6  -11 0  0.667
> ADD     7  -12 0  0.667
127c125
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
134,140c132,138
< HED     1   15 d
< HED     2   20 d
< HED     3   25 d
< HED     4   30 d
< HED     5   40 d
< HED     6   50 d
< HED     7   70 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mk1aa3.inp combo.mk1aa1.inp >dif2

```
38,46c38,43
< IRP     100.0    9.46   1 2 4 2        100 day irrad.
< DEC     120.0           2 3 4 0         20 day decay
< IRP     135.0    9.46   3 4 4 0         15 day irrad.
< IRP     150.0    9.46   4 5 4 0         15 day irrad.
< IRP     220.0    9.46   5 6 4 0         70 day irrad.
< DEC     240.0           6 7 4 0         20 day decay
< IRP     270.0    9.46   7 8 4 0         30 day irrad.
< IRP     313.0    9.46   8 9 4 0         43 day irrad.
< IRP     340.0    9.46   9 10 4 0        27 day irrad.
---
> IRP       1.5    9.46   1 2 4 2       1.5 day irrad.
> IRP       2.0    9.46   2 3 4 0        .5 day irrad.
> IRP       3.0    9.46   3 4 4 0         1 day irrad.
> IRP       5.0    9.46   4 5 4 0         2 day irrad.
> IRP       7.0    9.46   5 6 4 0         2 day irrad.
> IRP      10.0    9.46   6 7 4 0         3 day irrad.
49,55c46,52
< MOV     2  -6  0  0.333
< MOV     4  -7  0  0.333
< MOV     5  -8  0  0.333
< MOV     6  -9  0  0.333
< MOV     8  -10 0  0.333
< MOV     9  -11 0  0.333
< MOV    10  -12 0  0.333
---
> MOV     1  -6  0  0.333
> MOV     2  -7  0  0.333
> MOV     3  -8  0  0.333
> MOV     4  -9  0  0.333
> MOV     5  -10 0  0.333
> MOV     6  -11 0  0.333
> MOV     7  -12 0  0.333
105,113c102,107
```

```
< IRP     100.0   15.07   1 2 4 2        100 day irrad.
< DEC     120.0           2 3 4 0         20 day decay
< IRP     135.0   15.07   3 4 4 0         15 day irrad.
< IRP     150.0   15.07   4 5 4 0         15 day irrad.
< IRP     220.0   15.07   5 6 4 0         70 day irrad.
< DEC     240.0           6 7 4 0         20 day decay
< IRP     270.0   15.07   7 8 4 0         30 day irrad.
< IRP     313.0   15.07   8 9 4 0         43 day irrad.
< IRP     340.0   15.07   9 10 4 0        27 day irrad.
---
> IRP       1.5   15.07   1 2 4 2       1.5 day irrad.
> IRP       2.0   15.07   2 3 4 0        .5 day irrad.
> IRP       3.0   15.07   3 4 4 0         1 day irrad.
> IRP       5.0   15.07   4 5 4 0         2 day irrad.
> IRP       7.0   15.07   5 6 4 0         2 day irrad.
> IRP      10.0   15.07   6 7 4 0         3 day irrad.
123,129c117,123
< ADD     2  -6  0  0.667
< ADD     4  -7  0  0.667
< ADD     5  -8  0  0.667
< ADD     6  -9  0  0.667
< ADD     8  -10 0  0.667
< ADD     9  -11 0  0.667
< ADD    10  -12 0  0.667
---
> ADD     1  -6  0  0.667
> ADD     2  -7  0  0.667
> ADD     3  -8  0  0.667
> ADD     4  -9  0  0.667
> ADD     5  -10 0  0.667
> ADD     6  -11 0  0.667
> ADD     7  -12 0  0.667
131c125
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
138,144c132,138
< HED     1  100 d
< HED     2  115 d
< HED     3  130 d
< HED     4  200 d
< HED     5  230 d
< HED     6  273 d
< HED     7  300 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mk1ab1.inp combo.mk1aa1.inp >dif3

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
63,64c63,64
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
```

```
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
66,67c66,67
< 2  922350  0.01250E+6  922380  0.98702E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00040E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
70c70
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mk1ab2.inp combo.mk1aa2.inp >dif4

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
64,65c64,65
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
67,68c67,68
< 2  922350  0.01250E+6  922380  0.98702E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00040E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
71c71
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
118d117
< RDA       << Combine results >>
```

diff combo.mk1ab3.inp combo.mk1aa3.inp >dif5

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
66,67c66,67
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
69,70c69,70
< 2  922350  0.01250E+6  922380  0.98702E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00040E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
73c73
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
122d121
< RDA       << Combine results >>
```

diff combo.mk1ac1.inp combo.mk1aa1.inp >dif6

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
63,64c63,64
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
66,67c66,67
< 2  922350  0.01250E+6  922380  0.98677E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00065E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
70c70
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mk1ac2.inp combo.mk1aa2.inp >dif7

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
64,65c64,65
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
67,68c67,68
< 2  922350  0.01250E+6  922380  0.98677E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00065E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
71c71
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mk1ac3.inp combo.mk1aa3.inp >dif8

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
66,67c66,67
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
69,70c69,70
< 2  922350  0.01250E+6  922380  0.98677E+6    0 0.0          1.25% enrich.
< 2  922340  0.00008E+6  922360  0.00065E+6    0 0.0
---
> 2  922350  0.01250E+6  922380  0.98722E+6    0 0.0          1.25% enrich.
```

```
> 2  922340  0.00008E+6  922360  0.00020E+6    0 0.0
73c73
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0      "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0      "
```

diff combo.mkii2.inp combo.mkii1.inp >dif9

```
36,42c36,41
< IRP      15.0   13.20   1 2 4 2        15 day irrad.
< IRP      20.0   13.20   2 3 4 0         5 day irrad.
< IRP      25.0   13.20   3 4 4 0         5 day irrad.
< IRP      30.0   13.20   4 5 4 0         5 day irrad.
< IRP      40.0   13.20   5 6 4 0        10 day irrad.
< IRP      50.0   13.20   6 7 4 0        10 day irrad.
< IRP      70.0   13.20   7 8 4 0        20 day irrad.
---
> IRP       1.5   13.20   1 2 4 2       1.5 day irrad.
> IRP       2.0   13.20   2 3 4 0        .5 day irrad.
> IRP       3.0   13.20   3 4 4 0         1 day irrad.
> IRP       5.0   13.20   4 5 4 0         2 day irrad.
> IRP       7.0   13.20   5 6 4 0         2 day irrad.
> IRP      10.0   13.20   6 7 4 0         3 day irrad.
52,58c51,57
< MOV     2  -6  0  1.000
< MOV     3  -7  0  1.000
< MOV     4  -8  0  1.000
< MOV     5  -9  0  1.000
< MOV     6  -10 0  1.000
< MOV     7  -11 0  1.000
< MOV     8  -12 0  1.000
---
> MOV     1  -6  0  1.000
> MOV     2  -7  0  1.000
> MOV     3  -8  0  1.000
> MOV     4  -9  0  1.000
> MOV     5  -10 0  1.000
> MOV     6  -11 0  1.000
> MOV     7  -12 0  1.000
60c59
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
67,73c66,72
< HED     1   15 d
< HED     2   20 d
< HED     3   25 d
< HED     4   30 d
< HED     5   40 d
< HED     6   50 d
< HED     7   70 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mkii3.inp combo.mkii1.inp >dif10

```
36,44c36,41
```

```
< IRP     100.0   13.20   1 2 4 2        100 day irrad.
< DEC     120.0           2 3 4 0         20 day decay
< IRP     135.0   13.20   3 4 4 0         15 day irrad.
< IRP     150.0   13.20   4 5 4 0         15 day irrad.
< IRP     170.0   13.20   5 6 4 0         20 day irrad.
< IRP     200.0   13.20   6 7 4 0         30 day irrad.
< IRP     220.0   13.20   7 8 4 0         20 day irrad.
< DEC     240.0           8 9 4 0         20 day decay
< IRP     260.0   13.20   9 10 4 0        20 day irrad.
---
> IRP       1.5   13.20   1 2 4 2       1.5 day irrad.
> IRP       2.0   13.20   2 3 4 0        .5 day irrad.
> IRP       3.0   13.20   3 4 4 0         1 day irrad.
> IRP       5.0   13.20   4 5 4 0         2 day irrad.
> IRP       7.0   13.20   5 6 4 0         2 day irrad.
> IRP      10.0   13.20   6 7 4 0         3 day irrad.
53a51,57
> MOV     1  -6  0  1.000
> MOV     2  -7  0  1.000
> MOV     3  -8  0  1.000
> MOV     4  -9  0  1.000
> MOV     5  -10 0  1.000
> MOV     6  -11 0  1.000
> MOV     7  -12 0  1.000
55,63c59
< MOV     2  -6  0  1.000
< MOV     4  -7  0  1.000
< MOV     5  -8  0  1.000
< MOV     6  -9  0  1.000
< MOV     7  -10 0  1.000
< MOV     8  -11 0  1.000
< MOV    10  -12 0  1.000
< RDA
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
70,76c66,72
< HED     1  100 d
< HED     2  115 d
< HED     3  130 d
< HED     4  150 d
< HED     5  170 d
< HED     6  200 d
< HED     7  220 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mkiva2.inp combo.mkiva1.inp >dif11

```
38,44c38,43
< IRP      15.0    9.13   1 2 4 2        15 day irrad.
< IRP      20.0    9.13   2 3 4 0         5 day irrad.
< IRP      25.0    9.13   3 4 4 0         5 day irrad.
< IRP      30.0    9.13   4 5 4 0         5 day irrad.
< IRP      40.0    9.13   5 6 4 0        10 day irrad.
< IRP      50.0    9.13   6 7 4 0        10 day irrad.
< IRP      70.0    9.13   7 8 4 0        20 day irrad.
```

```
---
> IRP       1.5     9.13   1 2 4 2        1.5 day irrad.
> IRP       2.0     9.13   2 3 4 0         .5 day irrad.
> IRP       3.0     9.13   3 4 4 0          1 day irrad.
> IRP       5.0     9.13   4 5 4 0          2 day irrad.
> IRP       7.0     9.13   5 6 4 0          2 day irrad.
> IRP      10.0     9.13   6 7 4 0          3 day irrad.
48,54c47,53
< MOV     2  -6  0  0.317
< MOV     3  -7  0  0.317
< MOV     4  -8  0  0.317
< MOV     5  -9  0  0.317
< MOV     6  -10 0  0.317
< MOV     7  -11 0  0.317
< MOV     8  -12 0  0.317
---
> MOV     1  -6  0  0.317
> MOV     2  -7  0  0.317
> MOV     3  -8  0  0.317
> MOV     4  -9  0  0.317
> MOV     5  -10 0  0.317
> MOV     6  -11 0  0.317
> MOV     7  -12 0  0.317
100,106c99,104
< IRP      15.0   11.88   1 2 4 2        15 day irrad.
< IRP      20.0   11.88   2 3 4 0         5 day irrad.
< IRP      25.0   11.88   3 4 4 0         5 day irrad.
< IRP      30.0   11.88   4 5 4 0         5 day irrad.
< IRP      40.0   11.88   5 6 4 0        10 day irrad.
< IRP      50.0   11.88   6 7 4 0        10 day irrad.
< IRP      70.0   11.88   7 8 4 0        20 day irrad.
---
> IRP       1.5   11.88   1 2 4 2        1.5 day irrad.
> IRP       2.0   11.88   2 3 4 0         .5 day irrad.
> IRP       3.0   11.88   3 4 4 0          1 day irrad.
> IRP       5.0   11.88   4 5 4 0          2 day irrad.
> IRP       7.0   11.88   5 6 4 0          2 day irrad.
> IRP      10.0   11.88   6 7 4 0          3 day irrad.
116,122c114,120
< ADD     2  -6  0  0.683
< ADD     3  -7  0  0.683
< ADD     4  -8  0  0.683
< ADD     5  -9  0  0.683
< ADD     6  -10 0  0.683
< ADD     7  -11 0  0.683
< ADD     8  -12 0  0.683
---
> ADD     1  -6  0  0.683
> ADD     2  -7  0  0.683
> ADD     3  -8  0  0.683
> ADD     4  -9  0  0.683
> ADD     5  -10 0  0.683
> ADD     6  -11 0  0.683
> ADD     7  -12 0  0.683
124c122
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
131,137c129,135
< HED     1   15 d
< HED     2   20 d
< HED     3   25 d
< HED     4   30 d
```

```
< HED     5   40 d
< HED     6   50 d
< HED     7   70 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mkiva3.inp combo.mkiva1.inp >dif12

```
38,46c38,43
< IRP     100.0    9.13   1 2 4 2        100 day irrad.
< DEC     120.0           2 3 4 0         20 day decay
< IRP     135.0    9.13   3 4 4 0         15 day irrad.
< IRP     150.0    9.13   4 5 4 0         15 day irrad.
< IRP     220.0    9.13   5 6 4 0         70 day irrad.
< DEC     240.0           6 7 4 0         20 day decay
< IRP     290.0    9.13   7 8 4 0         50 day irrad.
< IRP     340.0    9.13   8 9 4 0         50 day irrad.
< IRP     400.0    9.13   9 10 4 0        60 day irrad.
---
> IRP       1.5    9.13   1 2 4 2       1.5 day irrad.
> IRP       2.0    9.13   2 3 4 0        .5 day irrad.
> IRP       3.0    9.13   3 4 4 0         1 day irrad.
> IRP       5.0    9.13   4 5 4 0         2 day irrad.
> IRP       7.0    9.13   5 6 4 0         2 day irrad.
> IRP      10.0    9.13   6 7 4 0         3 day irrad.
50,56c47,53
< MOV     2  -6  0  0.317
< MOV     4  -7  0  0.317
< MOV     5  -8  0  0.317
< MOV     6  -9  0  0.317
< MOV     8  -10 0  0.317
< MOV     9  -11 0  0.317
< MOV    10  -12 0  0.317
---
> MOV     1  -6  0  0.317
> MOV     2  -7  0  0.317
> MOV     3  -8  0  0.317
> MOV     4  -9  0  0.317
> MOV     5  -10 0  0.317
> MOV     6  -11 0  0.317
> MOV     7  -12 0  0.317
102,110c99,104
< IRP     100.0   11.88   1 2 4 2        100 day irrad.
< DEC     120.0           2 3 4 0         20 day decay
< IRP     135.0   11.88   3 4 4 0         15 day irrad.
< IRP     150.0   11.88   4 5 4 0         15 day irrad.
< IRP     220.0   11.88   5 6 4 0         70 day irrad.
< DEC     240.0           6 7 4 0         20 day decay
< IRP     290.0   11.88   7 8 4 0         50 day irrad.
< IRP     340.0   11.88   8 9 4 0         50 day irrad.
< IRP     400.0   11.88   9 10 4 0        60 day irrad.
---
> IRP       1.5   11.88   1 2 4 2       1.5 day irrad.
> IRP       2.0   11.88   2 3 4 0        .5 day irrad.
> IRP       3.0   11.88   3 4 4 0         1 day irrad.
> IRP       5.0   11.88   4 5 4 0         2 day irrad.
> IRP       7.0   11.88   5 6 4 0         2 day irrad.
```

```
> IRP      10.0   11.88   6 7 4 0         3 day irrad.
120,126c114,120
< ADD     2  -6  0  0.683
< ADD     4  -7  0  0.683
< ADD     5  -8  0  0.683
< ADD     6  -9  0  0.683
< ADD     8  -10 0  0.683
< ADD     9  -11 0  0.683
< ADD    10  -12 0  0.683
---
> ADD     1  -6  0  0.683
> ADD     2  -7  0  0.683
> ADD     3  -8  0  0.683
> ADD     4  -9  0  0.683
> ADD     5  -10 0  0.683
> ADD     6  -11 0  0.683
> ADD     7  -12 0  0.683
128c122
< DEC     1.0     -6  1  4  1
---
> MOV     -6  1  0  1.0
135,141c129,135
< HED     1  100 d
< HED     2  115 d
< HED     3  130 d
< HED     4  200 d
< HED     5  250 d
< HED     6  300 d
< HED     7  360 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.mkivb1.inp combo.mkiva1.inp >dif13

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
64,65c64,65
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
71c71
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mkivb2.inp combo.mkiva2.inp >dif14

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
65,66c65,66
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
```

```
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
72c72
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mkivb3.inp combo.mkiva3.inp >dif15

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
67,68c67,68
< 2  922350  0.00947E+6  922380  0.99015E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00030E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
74c74
< 4   70000    8.0  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mkivc1.inp combo.mkiva1.inp >dif16

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
64,65c64,65
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
71c71
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mkivc2.inp combo.mkiva2.inp >dif17

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
65,66c65,66
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
72c72
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.mkivc3.inp combo.mkiva3.inp >dif18

```
5c5
```

```
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
67,68c67,68
< 2  922350  0.00947E+6  922380  0.98995E+6    0 0.0          .947% enrich.
< 2  922340  0.00008E+6  922360  0.00050E+6    0 0.0
---
> 2  922350  0.00947E+6  922380  0.99035E+6    0 0.0          .947% enrich.
> 2  922340  0.00008E+6  922360  0.00010E+6    0 0.0
74c74
< 4   70000    9.3  120000   25.0  130000  800.0   140000 124.0     "
---
> 4   70000   17.5  120000   25.0  130000  800.0   140000 124.0     "
```

diff combo.spe2.inp combo.spe1.inp >dif19

```
33,39c33,38
< IRP      15.0   10.00   1 2 4 2        15 day irrad.
< IRP      20.0   10.00   2 3 4 0         5 day irrad.
< IRP      25.0   10.00   3 4 4 0         5 day irrad.
< IRP      30.0   10.00   4 5 4 0         5 day irrad.
< IRP      40.0   10.00   5 6 4 0        10 day irrad.
< IRP      50.0   10.00   6 7 4 0        10 day irrad.
< IRP      70.0   10.00   7 8 4 0        20 day irrad.
---
> IRP       1.5   10.00   1 2 4 2       1.5 day irrad.
> IRP       2.0   10.00   2 3 4 0        .5 day irrad.
> IRP       3.0   10.00   3 4 4 0         1 day irrad.
> IRP       5.0   10.00   4 5 4 0         2 day irrad.
> IRP       7.0   10.00   5 6 4 0         2 day irrad.
> IRP      10.0   10.00   6 7 4 0         3 day irrad.
42,49c41,46
< MOV     2  -1  0  1.0
< MOV     3  -2  0  1.0
< MOV     4  -3  0  1.0
< MOV     5  -4  0  1.0
< MOV     6  -5  0  1.0
< MOV     7  -6  0  1.0
< MOV     8  -7  0  1.0
< DEC     1.0    -1 1 4 1
---
> MOV     2  -2  0  1.0
> MOV     3  -3  0  1.0
> MOV     4  -4  0  1.0
> MOV     5  -5  0  1.0
> MOV     6  -6  0  1.0
> MOV     7  -7  0  1.0
57,63c54,60
< HED     1   15 d
< HED     2   20 d
< HED     3   25 d
< HED     4   30 d
< HED     5   40 d
< HED     6   50 d
< HED     7   70 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.spe3.inp combo.spe1.inp >dif20

```
33,39c33,38
< IRP     100.0   10.00   1 2 4 2        100 day irrad.
< IRP     125.0   10.00   2 3 4 0         25 day irrad.
< IRP     150.0   10.00   3 4 4 0         25 day irrad.
< IRP     200.0   10.00   4 5 4 0         50 day irrad.
< IRP     250.0   10.00   5 6 4 0         50 day irrad.
< IRP     300.0   10.00   6 7 4 0         50 day irrad.
< IRP     320.0   10.00   7 8 4 0         20 day irrad.
---
> IRP       1.5   10.00   1 2 4 2        1.5 day irrad.
> IRP       2.0   10.00   2 3 4 0         .5 day irrad.
> IRP       3.0   10.00   3 4 4 0          1 day irrad.
> IRP       5.0   10.00   4 5 4 0          2 day irrad.
> IRP       7.0   10.00   5 6 4 0          2 day irrad.
> IRP      10.0   10.00   6 7 4 0          3 day irrad.
42,49c41,46
< MOV     2  -1  0  1.0
< MOV     3  -2  0  1.0
< MOV     4  -3  0  1.0
< MOV     5  -4  0  1.0
< MOV     6  -5  0  1.0
< MOV     7  -6  0  1.0
< MOV     8  -7  0  1.0
< DEC     1.0    -1 1 4 1
---
> MOV     2  -2  0  1.0
> MOV     3  -3  0  1.0
> MOV     4  -4  0  1.0
> MOV     5  -5  0  1.0
> MOV     6  -6  0  1.0
> MOV     7  -7  0  1.0
57,63c54,60
< HED     1  100 d
< HED     2  125 d
< HED     3  150 d
< HED     4  200 d
< HED     5  250 d
< HED     6  300 d
< HED     7  320 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.spna2.inp combo.spna1.inp >dif21

```
33,39c33,38
< IRP      15.0   10.00   1 2 4 2        15 day irrad.
< IRP      20.0   10.00   2 3 4 0         5 day irrad.
< IRP      25.0   10.00   3 4 4 0         5 day irrad.
< IRP      30.0   10.00   4 5 4 0         5 day irrad.
< IRP      40.0   10.00   5 6 4 0        10 day irrad.
< IRP      50.0   10.00   6 7 4 0        10 day irrad.
< IRP      70.0   10.00   7 8 4 0        20 day irrad.
---
> IRP       1.5   10.00   1 2 4 2       1.5 day irrad.
```

```
> IRP        2.0    10.00    2 3 4 0          .5 day irrad.
> IRP        3.0    10.00    3 4 4 0           1 day irrad.
> IRP        5.0    10.00    4 5 4 0           2 day irrad.
> IRP        7.0    10.00    5 6 4 0           2 day irrad.
> IRP       10.0    10.00    6 7 4 0           3 day irrad.
42,49c41,46
< MOV      2  -1  0  1.0
< MOV      3  -2  0  1.0
< MOV      4  -3  0  1.0
< MOV      5  -4  0  1.0
< MOV      6  -5  0  1.0
< MOV      7  -6  0  1.0
< MOV      8  -7  0  1.0
< DEC      1.0     -1 1 4 1
---
> MOV      2  -2  0  1.0
> MOV      3  -3  0  1.0
> MOV      4  -4  0  1.0
> MOV      5  -5  0  1.0
> MOV      6  -6  0  1.0
> MOV      7  -7  0  1.0
57,63c54,60
< HED      1   15 d
< HED      2   20 d
< HED      3   25 d
< HED      4   30 d
< HED      5   40 d
< HED      6   50 d
< HED      7   70 d
---
> HED      1  Initial
> HED      2  1.5 d
> HED      3    2 d
> HED      4    3 d
> HED      5    5 d
> HED      6    7 d
> HED      7   10 d
```

diff combo.spna3.inp combo.spna1.inp >dif22

```
33,39c33,38
< IRP      100.0    10.00    1 2 4 2         100 day irrad.
< IRP      125.0    10.00    2 3 4 0          25 day irrad.
< IRP      150.0    10.00    3 4 4 0          25 day irrad.
< IRP      200.0    10.00    4 5 4 0          50 day irrad.
< IRP      250.0    10.00    5 6 4 0          50 day irrad.
< IRP      300.0    10.00    6 7 4 0          50 day irrad.
< IRP      320.0    10.00    7 8 4 0          20 day irrad.
---
> IRP        1.5    10.00    1 2 4 2         1.5 day irrad.
> IRP        2.0    10.00    2 3 4 0          .5 day irrad.
> IRP        3.0    10.00    3 4 4 0           1 day irrad.
> IRP        5.0    10.00    4 5 4 0           2 day irrad.
> IRP        7.0    10.00    5 6 4 0           2 day irrad.
> IRP       10.0    10.00    6 7 4 0           3 day irrad.
42,49c41,46
< MOV      2  -1  0  1.0
< MOV      3  -2  0  1.0
< MOV      4  -3  0  1.0
< MOV      5  -4  0  1.0
< MOV      6  -5  0  1.0
< MOV      7  -6  0  1.0
< MOV      8  -7  0  1.0
```

```
< DEC     1.0    -1 1 4 1
---
> MOV     2  -2  0  1.0
> MOV     3  -3  0  1.0
> MOV     4  -4  0  1.0
> MOV     5  -5  0  1.0
> MOV     6  -6  0  1.0
> MOV     7  -7  0  1.0
57,63c54,60
< HED     1  100 d
< HED     2  125 d
< HED     3  150 d
< HED     4  200 d
< HED     5  250 d
< HED     6  300 d
< HED     7  320 d
---
> HED     1  Initial
> HED     2  1.5 d
> HED     3    2 d
> HED     4    3 d
> HED     5    5 d
> HED     6    7 d
> HED     7   10 d
```

diff combo.spnb1.inp combo.spna1.inp >dif23

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04193
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
87,91c87,91
< 4  130000  0.8969E+06    0  0.0                                  Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.14E+4    "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0     "
< 4  270000   10.0  280000  150.0  290000 1200.0  300000  300.0     "
< 4  480000   30.0  500000   70.0  820000 6.22E+4 830000   90.0     "
---
> 4  130000  0.9115E+06    0  0.0                                  Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4    "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0     "
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0     "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0     "
```

diff combo.spnb2.inp combo.spna2.inp >dif24

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04193
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
90,94c90,94
```

```
< 4  130000  0.8969E+06    0  0.0                                    Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.14E+4     "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0      "
< 4  270000   10.0  280000  150.0  290000 1200.0  300000  300.0      "
< 4  480000   30.0  500000   70.0  820000 6.22E+4 830000   90.0      "
---
> 4  130000  0.9115E+06    0  0.0                                    Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4     "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0      "
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0      "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0      "
```

diff combo.spnb3.inp combo.spna3.inp >dif25

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04193
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
90,94c90,94
< 4  130000  0.8969E+06    0  0.0                                    Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.14E+4     "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0      "
< 4  270000   10.0  280000  150.0  290000 1200.0  300000  300.0      "
< 4  480000   30.0  500000   70.0  820000 6.22E+4 830000   90.0      "
---
> 4  130000  0.9115E+06    0  0.0                                    Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4     "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0      "
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0      "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0      "
```

diff combo.spnc1.inp combo.spna1.inp >dif26

```
4c4
< TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04223
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
83c83
< 4   70000  17.5  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
---
> 4   70000  65.0  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
87,91c87,91
< 4  130000  0.8904E+06    0  0.0                                    Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.11E+4     "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0      "
< 4  270000   10.0  280000 7300.0  290000 1200.0  300000  300.0      "
< 4  480000   30.0  500000   70.0  820000 6.18E+4 830000   90.0      "
---
> 4  130000  0.9115E+06    0  0.0                                    Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4     "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0      "
```

```
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0     "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0     "
```

diff combo.spnc2.inp combo.spna2.inp >dif27

```
4c4
< TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04223
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
86c86
< 4   70000  17.5  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
---
> 4   70000  65.0  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
90,94c90,94
< 4  130000  0.8904E+06    0  0.0                                  Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.11E+4    "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0     "
< 4  270000   10.0  280000 7300.0  290000 1200.0  300000  300.0     "
< 4  480000   30.0  500000   70.0  820000 6.18E+4 830000   90.0     "
---
> 4  130000  0.9115E+06    0  0.0                                  Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4    "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0     "
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0     "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0     "
```

diff combo.spnc3.inp combo.spna3.inp >dif28

```
4c4
< TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
28,29c28,29
< RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
< ADD     -4  1  0  0.04223
---
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
86c86
< 4   70000  17.5  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
---
> 4   70000  65.0  120000   25.0  140000   75.0  240000  65.0  Fuel Impur.
90,94c90,94
< 4  130000  0.8904E+06    0  0.0                                  Al clad
< 4   50000   10.0   70000   30.0  120000   90.0  140000 3.11E+4    "
< 4  220000  400.0  240000  300.0  250000  300.0  260000 6500.0     "
< 4  270000   10.0  280000 7300.0  290000 1200.0  300000  300.0     "
< 4  480000   30.0  500000   70.0  820000 6.18E+4 830000   90.0     "
---
> 4  130000  0.9115E+06    0  0.0                                  Al clad
> 4   50000   10.0   70000   30.0  120000   90.0  140000 3.19E+4    "
> 4  220000  400.0  240000  300.0  250000  300.0  260000 6600.0     "
> 4  270000   10.0  280000  150.0  290000 1.61E+4 300000  300.0     "
> 4  480000   30.0  500000 3.15E+4 820000   600.0 830000   90.0     "
```

diff core.mk1aa1.inp combo.mk1aa1.inp >difcore1

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1aa no cladding 1.1U <1972
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
94a97,98
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
121c125
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mk1aa2.inp combo.mk1aa2.inp >difcore2

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1aa no cladding 1.1U <1972
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
95a98,99
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
```

diff core.mk1aa3.inp combo.mk1aa3.inp >difcore3

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1aa no cladding 1.1U <1972
---
> TIT     Hanford N Reactor Mk-1a  mk1aa 1.1U <1972
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
97a100,101
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
```

diff core.mk1ab1.inp combo.mk1ab1.inp >difcore4

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980 mocl
---
> TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
94a97,98
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
121c125
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mk1ab2.inp combo.mk1ab2.inp >difcore5

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980 mocl
```

```
---
> TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
95a98,99
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
113a118
> RDA       << Combine results >>
```

diff core.mk1ab3.inp combo.mk1ab3.inp >difcore6

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980 mocl
---
> TIT     Hanford N Reactor Mk-1a  mk1ab 1.1U 1972-1980
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
97a100,101
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
117a122
> RDA       << Combine results >>
```

diff core.mk1ac1.inp combo.mk1ac1.inp >difcore7

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980 nocl
---
> TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
94a97,98
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
121c125
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mk1ac2.inp combo.mk1ac2.inp >difcore8

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980 nocl
---
> TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
30a31,32
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
95a98,99
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
```

diff core.mk1ac3.inp combo.mk1ac3.inp >difcore9

```
5c5
< TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980 nocl
---
> TIT     Hanford N Reactor Mk-1a  mk1ac 1.1U >1980
30a31,32
```

```
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
97a100,101
> RDA     Add 171.3 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08572
```

diff core.mkii1.inp combo.mkii1.inp >difcore10

```
5c5
< TIT     Hanford N Reactor Mk-II mkii 2.1U nocl
---
> TIT     Hanford N Reactor Mk-II mkii 2.1U
30a31,32
> RDA     Add 86.99 Kg Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08706
57c59
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mkii2.inp combo.mkii2.inp >difcore11

```
5c5
< TIT     Hanford N Reactor Mk-II mkii 2.1U nocl
---
> TIT     Hanford N Reactor Mk-II mkii 2.1U
30a31,32
> RDA     Add 86.99 Kg Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08706
```

diff core.mkii3.inp combo.mkii3.inp >difcore12

```
5c5
< TIT     Hanford N Reactor Mk-II mkii 2.1U nocl
---
> TIT     Hanford N Reactor Mk-II mkii 2.1U
30a31,32
> RDA     Add 86.99 Kg Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.08706
51a54
> RDA
```

diff core.mkiva1.inp combo.mkiva1.inp >difcore13

```
5c5
< TIT     Hanford N Reactor Mk-IV mkiva .94U<1972 nocl
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
120c122
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mkiva2.inp combo.mkiva2.inp >difcore14

```
5c5
< TIT     Hanford N Reactor Mk-IV mkiva .94U<1972 nocl
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
30a31,32
```

```
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.mkiva3.inp combo.mkiva3.inp >difcore15

```
5c5
< TIT     Hanford N Reactor Mk-IV mkiva .94U<1972 nocl
---
> TIT     Hanford N Reactor Mk-IV mkiva .94U <1972
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.mkivb1.inp combo.mkivb1.inp >difcore16

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
120c122
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mkivb2.inp combo.mkivb2.inp >difcore17

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.mkivb3.inp combo.mkivb3.inp >difcore18

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivb .94U 1972-1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.mkivc1.inp combo.mkivc1.inp >difcore19

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
120c122
< MOV     -6   1   0  1.0
---
> MOV     -6  1  0  1.0
```

diff core.mkivc2.inp combo.mkivc2.inp >difcore20

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.mkivc3.inp combo.mkivc3.inp >difcore21

```
5c5
< TIT     Hanford N Reactor Mk-IV mkivc .94U >1980 nocl
---
> TIT     Hanford N Reactor Mk-IV mkivc .94U >1980
30a31,32
> RDA     Add 140.7 LB Zircaloy / Short Ton uranium + Be braze
> ADD     -5  1  0  0.07042
```

diff core.spe1.inp combo.spe1.inp >difcore22

```
4c4
< TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958 nocl
---
> TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958
27a28,29
> RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04223
```

diff core.spe2.inp combo.spe2.inp >difcore23

```
4c4
< TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958 nocl
---
> TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958
27a28,29
> RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04223
```

diff core.spe3.inp combo.spe3.inp >difcore24

```
4c4
< TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958 nocl
---
> TIT     Hanford Single-Pass enriched spe .94U leaddip highni >1958
27a28,29
> RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04223
```

diff core.spna1.inp combo.spna1.inp >difcore25

```
4c4
< TIT     Hanford Single-Pass natural spna .71U tri-dip low ni<1955 nocl
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
27a28,29
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
```

diff core.spna2.inp combo.spna2.inp >difcore26

```
4c4
< TIT     Hanford Single-Pass natural spna .71U tri-dip low ni<1955 nocl
---
```

```
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
27a28,29
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
```

diff core.spna3.inp combo.spna3.inp >difcore27

```
4c4
< TIT     Hanford Single-Pass natural spna .71U tri-dip low ni<1955 nocl
---
> TIT     Hanford Single-Pass natural spna .71U triple-dip low ni <1955
27a28,29
> RDA     Add 41.26 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04126
```

diff core.spnb1.inp combo.spnb1.inp >difcore28

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58 nocl
---
> TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
27a28,29
> RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04193
```

diff core.spnb2.inp combo.spnb2.inp >difcore29

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58 nocl
---
> TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
27a28,29
> RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04193
```

diff core.spnb3.inp combo.spnb3.inp >difcore30

```
4c4
< TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58 nocl
---
> TIT     Hanford Single-Pass natural spnb .71U leaddip lowni 1955-58
27a28,29
> RDA     Add 41.93 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04193
```

diff core.spnc1.inp combo.spnc1.inp >difcore31

```
4c4
< TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni>1958 nocl
---
> TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
27a28,29
> RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD     -4  1  0  0.04223
```

diff core.spnc2.inp combo.spnc2.inp >difcore32

```
4c4
< TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni>1958 nocl
---
> TIT     Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
27a28,29
> RDA     Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
```

```
> ADD      -4  1  0  0.04223
```

diff core.spnc3.inp combo.spnc3.inp >difcore33

```
4c4
< TIT      Hanford Single-Pass natural spnc .71U lead-dip high ni>1958 nocl
---
> TIT      Hanford Single-Pass natural spnc .71U lead-dip high ni >1958
27a28,29
> RDA      Add 42.23 kg/MTU aluminum cladding+intermetallic+ al-si
> ADD      -4  1  0  0.04223
```

DKPRO Input Files

core2.inp

```
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.core

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

SPLIT

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

clad2.inp

```
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.clad

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

SPLIT

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

core2.process.dir

```
FINAL   1/2001   # Decay to start of 2001 after other steps completed

PROCESS T AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS T ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS T ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS REDOX AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS REDOX AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
```

```
    repro primary given

PROCESS REDOX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
   repro primary given

PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba
0.94905
    repro primary given

PROCESS PUREX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba
0.94905
    repro primary given

PROCESS PUREX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba
0.94905
    repro primary given

PROCESS PUREX AL-0.0TH
    decay given          # Use cooling times from archive file
    split 0.97902  U  0.9885  Th 0.9757  Np 0.97902 Pu 0.97902 Am 0.97902
                   H  0.97902 C 0.97902 Tc 0.97902 I 0.97902 Cs 0.97902 Ba
0.97902
    repro primary given
```

clad2.process.dir

```
FINAL   1/2001   # Decay to start of 2001 after other steps completed

PROCESS T AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999
```

```
    repro secondary given

PROCESS T AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS REDOX ZR-1.1U
```

```
    decay given         # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS REDOX ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS PUREX AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS PUREX AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS PUREX ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given

PROCESS PUREX ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given

PROCESS PUREX ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given

PROCESS PUREX AL-0.0TH
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given
```

core2.summary.dir

```
SUMMARY  T-plant
   PLANT T

SUMMARY  B-plant
   PLANT B

SUMMARY  Redox
   PLANT REDOX

SUMMARY Purex
   PLANT PUREX
```

clad2.summary.dir

```
SUMMARY  T-plant
   PLANT T

SUMMARY  B-plant
   PLANT B
```

```
SUMMARY  Redox
   PLANT REDOX

SUMMARY Purex
   PLANT PUREX
```

subtype.20020724

```
AL-0.71U 1920 1 1 1954 12 31 AL-0.71UA
AL-0.71U 1954 1 1 1958 12 31 AL-0.71UB
AL-0.71U 1959 1 1 3000 12 31 AL-0.71UC
ZR-0.94U 1920 1 1 1971 12 31 ZR-0.94UA
ZR-0.94U 1972 1 1 1980 12 31 ZR-0.94UB
ZR-0.94U 1981 1 1 3000 12 31 ZR-0.94UC
ZR-1.1U  1920 1 1 1971 12 31 ZR-1.1UA
ZR-1.1U  1972 1 1 1980 12 31 ZR-1.1UB
ZR-1.1U  1981 1 1 3000 12 31 ZR-1.1UC
```

origdict.core

```
'ZR-1.1UA'     19.8  'CORE.MK1AA001A.ORG'
'ZR-1.1UA'     26.4  'CORE.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'CORE.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CORE.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CORE.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CORE.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CORE.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CORE.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CORE.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CORE.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CORE.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CORE.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CORE.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'CORE.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'CORE.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CORE.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CORE.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CORE.MK1AA230.ORG'
'ZR-1.1UA'   3604.0  'CORE.MK1AA273.ORG'
'ZR-1.1UA'   3960.0  'CORE.MK1AA300.ORG'
'ZR-1.1UB'     19.8  'CORE.MK1AB001A.ORG'
'ZR-1.1UB'     26.4  'CORE.MK1AB002.ORG'
'ZR-1.1UB'     39.6  'CORE.MK1AB003.ORG'
'ZR-1.1UB'     66.0  'CORE.MK1AB005.ORG'
'ZR-1.1UB'     92.4  'CORE.MK1AB007.ORG'
'ZR-1.1UB'    132.0  'CORE.MK1AB010.ORG'
'ZR-1.1UB'    198.0  'CORE.MK1AB015.ORG'
'ZR-1.1UB'    264.0  'CORE.MK1AB020.ORG'
'ZR-1.1UB'    330.0  'CORE.MK1AB025.ORG'
'ZR-1.1UB'    396.0  'CORE.MK1AB030.ORG'
'ZR-1.1UB'    528.0  'CORE.MK1AB040.ORG'
'ZR-1.1UB'    660.0  'CORE.MK1AB050.ORG'
'ZR-1.1UB'    924.0  'CORE.MK1AB070.ORG'
'ZR-1.1UB'   1320.0  'CORE.MK1AB100.ORG'
'ZR-1.1UB'   1518.0  'CORE.MK1AB115.ORG'
'ZR-1.1UB'   1716.0  'CORE.MK1AB130.ORG'
'ZR-1.1UB'   2640.0  'CORE.MK1AB200.ORG'
'ZR-1.1UB'   3036.0  'CORE.MK1AB230.ORG'
'ZR-1.1UB'   3604.0  'CORE.MK1AB273.ORG'
'ZR-1.1UB'   3960.0  'CORE.MK1AB300.ORG'
'ZR-1.1UC'     19.8  'CORE.MK1AC001A.ORG'
'ZR-1.1UC'     26.4  'CORE.MK1AC002.ORG'
```

'ZR-1.1UC'	39.6	'CORE.MK1AC003.ORG'
'ZR-1.1UC'	66.0	'CORE.MK1AC005.ORG'
'ZR-1.1UC'	92.4	'CORE.MK1AC007.ORG'
'ZR-1.1UC'	132.0	'CORE.MK1AC010.ORG'
'ZR-1.1UC'	198.0	'CORE.MK1AC015.ORG'
'ZR-1.1UC'	264.0	'CORE.MK1AC020.ORG'
'ZR-1.1UC'	330.0	'CORE.MK1AC025.ORG'
'ZR-1.1UC'	396.0	'CORE.MK1AC030.ORG'
'ZR-1.1UC'	528.0	'CORE.MK1AC040.ORG'
'ZR-1.1UC'	660.0	'CORE.MK1AC050.ORG'
'ZR-1.1UC'	924.0	'CORE.MK1AC070.ORG'
'ZR-1.1UC'	1320.0	'CORE.MK1AC100.ORG'
'ZR-1.1UC'	1518.0	'CORE.MK1AC115.ORG'
'ZR-1.1UC'	1716.0	'CORE.MK1AC130.ORG'
'ZR-1.1UC'	2640.0	'CORE.MK1AC200.ORG'
'ZR-1.1UC'	3036.0	'CORE.MK1AC230.ORG'
'ZR-1.1UC'	3604.0	'CORE.MK1AC273.ORG'
'ZR-1.1UC'	3960.0	'CORE.MK1AC300.ORG'
'ZR-2.1U'	19.8	'CORE.MKII001A.ORG'
'ZR-2.1U'	26.4	'CORE.MKII002.ORG'
'ZR-2.1U'	39.6	'CORE.MKII003.ORG'
'ZR-2.1U'	66.0	'CORE.MKII005.ORG'
'ZR-2.1U'	92.4	'CORE.MKII007.ORG'
'ZR-2.1U'	132.0	'CORE.MKII010.ORG'
'ZR-2.1U'	198.0	'CORE.MKII015.ORG'
'ZR-2.1U'	264.0	'CORE.MKII020.ORG'
'ZR-2.1U'	330.0	'CORE.MKII025.ORG'
'ZR-2.1U'	396.0	'CORE.MKII030.ORG'
'ZR-2.1U'	528.0	'CORE.MKII040.ORG'
'ZR-2.1U'	660.0	'CORE.MKII050.ORG'
'ZR-2.1U'	924.0	'CORE.MKII070.ORG'
'ZR-2.1U'	1320.0	'CORE.MKII100.ORG'
'ZR-2.1U'	1518.0	'CORE.MKII115.ORG'
'ZR-2.1U'	1716.0	'CORE.MKII130.ORG'
'ZR-2.1U'	1980.0	'CORE.MKII150.ORG'
'ZR-2.1U'	2244.0	'CORE.MKII180.ORG'
'ZR-2.1U'	2640.0	'CORE.MKII200.ORG'
'ZR-2.1U'	2904.0	'CORE.MKII220.ORG'
'ZR-0.94UA'	16.5	'CORE.MKIVA001A.ORG'
'ZR-0.94UA'	22.0	'CORE.MKIVA002.ORG'
'ZR-0.94UA'	33.0	'CORE.MKIVA003.ORG'
'ZR-0.94UA'	55.0	'CORE.MKIVA005.ORG'
'ZR-0.94UA'	77.0	'CORE.MKIVA007.ORG'
'ZR-0.94UA'	110.0	'CORE.MKIVA010.ORG'
'ZR-0.94UA'	165.0	'CORE.MKIVA015.ORG'
'ZR-0.94UA'	220.0	'CORE.MKIVA020.ORG'
'ZR-0.94UA'	275.0	'CORE.MKIVA025.ORG'
'ZR-0.94UA'	330.0	'CORE.MKIVA030.ORG'
'ZR-0.94UA'	440.0	'CORE.MKIVA040.ORG'
'ZR-0.94UA'	550.0	'CORE.MKIVA050.ORG'
'ZR-0.94UA'	770.0	'CORE.MKIVA070.ORG'
'ZR-0.94UA'	1100.0	'CORE.MKIVA100.ORG'
'ZR-0.94UA'	1265.0	'CORE.MKIVA115.ORG'
'ZR-0.94UA'	1430.0	'CORE.MKIVA130.ORG'
'ZR-0.94UA'	2200.0	'CORE.MKIVA200.ORG'
'ZR-0.94UA'	2750.0	'CORE.MKIVA250.ORG'
'ZR-0.94UA'	3300.0	'CORE.MKIVA300.ORG'
'ZR-0.94UA'	3960.0	'CORE.MKIVA360.ORG'
'ZR-0.94UB'	16.5	'CORE.MKIVB001A.ORG'
'ZR-0.94UB'	22.0	'CORE.MKIVB002.ORG'
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'ZR-0.94UB'	55.0	'CORE.MKIVB005.ORG'
'ZR-0.94UB'	77.0	'CORE.MKIVB007.ORG'

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origdict.clad

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'AL-0.71UC'	20.0	'CLAD.SPNC002.ORG'
'AL-0.71UC'	30.0	'CLAD.SPNC003.ORG'
'AL-0.71UC'	50.0	'CLAD.SPNC005.ORG'
'AL-0.71UC'	70.0	'CLAD.SPNC007.ORG'
'AL-0.71UC'	100.0	'CLAD.SPNC010.ORG'
'AL-0.71UC'	150.0	'CLAD.SPNC015.ORG'
'AL-0.71UC'	200.0	'CLAD.SPNC020.ORG'
'AL-0.71UC'	250.0	'CLAD.SPNC025.ORG'
'AL-0.71UC'	300.0	'CLAD.SPNC030.ORG'
'AL-0.71UC'	400.0	'CLAD.SPNC040.ORG'
'AL-0.71UC'	500.0	'CLAD.SPNC050.ORG'
'AL-0.71UC'	700.0	'CLAD.SPNC070.ORG'
'AL-0.71UC'	1000.0	'CLAD.SPNC100.ORG'
'AL-0.71UC'	1250.0	'CLAD.SPNC125.ORG'
'AL-0.71UC'	1500.0	'CLAD.SPNC150.ORG'

```
'AL-0.71UC'  2000.0  'CLAD.SPNC200.ORG'
'AL-0.71UC'  2500.0  'CLAD.SPNC250.ORG'
'AL-0.71UC'  3000.0  'CLAD.SPNC300.ORG'
'AL-0.71UC'  3200.0  'CLAD.SPNC320.ORG'
'AL-0.94U'     15.0  'CLAD.SPE001A.ORG'
'AL-0.94U'     20.0  'CLAD.SPE002.ORG'
'AL-0.94U'     30.0  'CLAD.SPE003.ORG'
'AL-0.94U'     50.0  'CLAD.SPE005.ORG'
'AL-0.94U'     70.0  'CLAD.SPE007.ORG'
'AL-0.94U'    100.0  'CLAD.SPE010.ORG'
'AL-0.94U'    150.0  'CLAD.SPE015.ORG'
'AL-0.94U'    200.0  'CLAD.SPE020.ORG'
'AL-0.94U'    250.0  'CLAD.SPE025.ORG'
'AL-0.94U'    300.0  'CLAD.SPE030.ORG'
'AL-0.94U'    400.0  'CLAD.SPE040.ORG'
'AL-0.94U'    500.0  'CLAD.SPE050.ORG'
'AL-0.94U'    700.0  'CLAD.SPE070.ORG'
'AL-0.94U'   1000.0  'CLAD.SPE100.ORG'
'AL-0.94U'   1250.0  'CLAD.SPE125.ORG'
'AL-0.94U'   1500.0  'CLAD.SPE150.ORG'
'AL-0.94U'   2000.0  'CLAD.SPE200.ORG'
'AL-0.94U'   2500.0  'CLAD.SPE250.ORG'
'AL-0.94U'   3000.0  'CLAD.SPE300.ORG'
'AL-0.94U'   3200.0  'CLAD.SPE320.ORG'
'AL-0.0TH'      1.0  'CLAD.TH1.ORG'
```

combo3a.inp

```
base case with no split or reprocessing

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.combo

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

OUTPUT
   H3     C14    NI59   CO60   NI63
   SE79   SR90   Y90    ZR93   NB93*  TC99  RU106
   CD113* SB125  SN126  I129   CS134
   CS137  BA137* SM151  EU152  EU154  EU155
   RA226  AC227  RA228  TH229  PA231
   TH232  U232   U233   U234   U235
   U236   NP237  PU238  U238   PU239  PU240
   AM241  PU241  PU242  CM242  AM243
   CM243  CM244
```

combo3a.process.dir

```
#base case with no split or reprocessing

FINAL   1/2001  # Decay to start of 2001 after other steps completed

PROCESS T AL-0.71U
    decay given         # Use cooling times from archive file
```

```
PROCESS T AL-0.94U
    decay given          # Use cooling times from archive file

PROCESS T ZR-0.94U
    decay given          # Use cooling times from archive file

PROCESS T ZR-1.1U
    decay given          # Use cooling times from archive file

PROCESS T ZR-2.1U
    decay given          # Use cooling times from archive file

PROCESS B AL-0.71U
    decay given          # Use cooling times from archive file

PROCESS B AL-0.94U
    decay given          # Use cooling times from archive file

PROCESS B ZR-0.94U
    decay given          # Use cooling times from archive file

PROCESS B ZR-1.1U
    decay given          # Use cooling times from archive file

PROCESS B ZR-2.1U
    decay given          # Use cooling times from archive file

PROCESS REDOX AL-0.71U
    decay given          # Use cooling times from archive file

PROCESS REDOX AL-0.94U
    decay given          # Use cooling times from archive file

PROCESS REDOX ZR-0.94U
    decay given          # Use cooling times from archive file

PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file

PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file

PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file

PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file

PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file

PROCESS PUREX ZR-1.1U
    decay given          # Use cooling times from archive file

PROCESS PUREX ZR-2.1U
    decay given          # Use cooling times from archive file

PROCESS PUREX AL-0.0TH
    decay given          # Use cooling times from archive file

PROCESS BASIN
```

origdict.combo

```
'ZR-1.1UA'     19.8  'COMBO.MK1AA001A.ORG'
'ZR-1.1UA'     26.4  'COMBO.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'COMBO.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'COMBO.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'COMBO.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'COMBO.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'COMBO.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'COMBO.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'COMBO.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'COMBO.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'COMBO.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'COMBO.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'COMBO.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'COMBO.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'COMBO.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'COMBO.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'COMBO.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'COMBO.MK1AA230.ORG'
'ZR-1.1UA'   3604.0  'COMBO.MK1AA273.ORG'
'ZR-1.1UA'   3960.0  'COMBO.MK1AA300.ORG'
'ZR-1.1UB'     19.8  'COMBO.MK1AB001A.ORG'
'ZR-1.1UB'     26.4  'COMBO.MK1AB002.ORG'
'ZR-1.1UB'     39.6  'COMBO.MK1AB003.ORG'
'ZR-1.1UB'     66.0  'COMBO.MK1AB005.ORG'
'ZR-1.1UB'     92.4  'COMBO.MK1AB007.ORG'
'ZR-1.1UB'    132.0  'COMBO.MK1AB010.ORG'
'ZR-1.1UB'    198.0  'COMBO.MK1AB015.ORG'
'ZR-1.1UB'    264.0  'COMBO.MK1AB020.ORG'
'ZR-1.1UB'    330.0  'COMBO.MK1AB025.ORG'
'ZR-1.1UB'    396.0  'COMBO.MK1AB030.ORG'
'ZR-1.1UB'    528.0  'COMBO.MK1AB040.ORG'
'ZR-1.1UB'    660.0  'COMBO.MK1AB050.ORG'
'ZR-1.1UB'    924.0  'COMBO.MK1AB070.ORG'
'ZR-1.1UB'   1320.0  'COMBO.MK1AB100.ORG'
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'ZR-1.1UB'   2640.0  'COMBO.MK1AB200.ORG'
'ZR-1.1UB'   3036.0  'COMBO.MK1AB230.ORG'
'ZR-1.1UB'   3604.0  'COMBO.MK1AB273.ORG'
'ZR-1.1UB'   3960.0  'COMBO.MK1AB300.ORG'
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'ZR-1.1UC'     26.4  'COMBO.MK1AC002.ORG'
'ZR-1.1UC'     39.6  'COMBO.MK1AC003.ORG'
'ZR-1.1UC'     66.0  'COMBO.MK1AC005.ORG'
'ZR-1.1UC'     92.4  'COMBO.MK1AC007.ORG'
'ZR-1.1UC'    132.0  'COMBO.MK1AC010.ORG'
'ZR-1.1UC'    198.0  'COMBO.MK1AC015.ORG'
'ZR-1.1UC'    264.0  'COMBO.MK1AC020.ORG'
'ZR-1.1UC'    330.0  'COMBO.MK1AC025.ORG'
'ZR-1.1UC'    396.0  'COMBO.MK1AC030.ORG'
'ZR-1.1UC'    528.0  'COMBO.MK1AC040.ORG'
'ZR-1.1UC'    660.0  'COMBO.MK1AC050.ORG'
'ZR-1.1UC'    924.0  'COMBO.MK1AC070.ORG'
'ZR-1.1UC'   1320.0  'COMBO.MK1AC100.ORG'
'ZR-1.1UC'   1518.0  'COMBO.MK1AC115.ORG'
'ZR-1.1UC'   1716.0  'COMBO.MK1AC130.ORG'
'ZR-1.1UC'   2640.0  'COMBO.MK1AC200.ORG'
'ZR-1.1UC'   3036.0  'COMBO.MK1AC230.ORG'
'ZR-1.1UC'   3604.0  'COMBO.MK1AC273.ORG'
'ZR-1.1UC'   3960.0  'COMBO.MK1AC300.ORG'
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'ZR-2.1U'	66.0	'COMBO.MKII005.ORG'
'ZR-2.1U'	92.4	'COMBO.MKII007.ORG'
'ZR-2.1U'	132.0	'COMBO.MKII010.ORG'
'ZR-2.1U'	198.0	'COMBO.MKII015.ORG'
'ZR-2.1U'	264.0	'COMBO.MKII020.ORG'
'ZR-2.1U'	330.0	'COMBO.MKII025.ORG'
'ZR-2.1U'	396.0	'COMBO.MKII030.ORG'
'ZR-2.1U'	528.0	'COMBO.MKII040.ORG'
'ZR-2.1U'	660.0	'COMBO.MKII050.ORG'
'ZR-2.1U'	924.0	'COMBO.MKII070.ORG'
'ZR-2.1U'	1320.0	'COMBO.MKII100.ORG'
'ZR-2.1U'	1518.0	'COMBO.MKII115.ORG'
'ZR-2.1U'	1716.0	'COMBO.MKII130.ORG'
'ZR-2.1U'	1980.0	'COMBO.MKII150.ORG'
'ZR-2.1U'	2244.0	'COMBO.MKII180.ORG'
'ZR-2.1U'	2640.0	'COMBO.MKII200.ORG'
'ZR-2.1U'	2904.0	'COMBO.MKII220.ORG'
'ZR-0.94UA'	16.5	'COMBO.MKIVA001A.ORG'
'ZR-0.94UA'	22.0	'COMBO.MKIVA002.ORG'
'ZR-0.94UA'	33.0	'COMBO.MKIVA003.ORG'
'ZR-0.94UA'	55.0	'COMBO.MKIVA005.ORG'
'ZR-0.94UA'	77.0	'COMBO.MKIVA007.ORG'
'ZR-0.94UA'	110.0	'COMBO.MKIVA010.ORG'
'ZR-0.94UA'	165.0	'COMBO.MKIVA015.ORG'
'ZR-0.94UA'	220.0	'COMBO.MKIVA020.ORG'
'ZR-0.94UA'	275.0	'COMBO.MKIVA025.ORG'
'ZR-0.94UA'	330.0	'COMBO.MKIVA030.ORG'
'ZR-0.94UA'	440.0	'COMBO.MKIVA040.ORG'
'ZR-0.94UA'	550.0	'COMBO.MKIVA050.ORG'
'ZR-0.94UA'	770.0	'COMBO.MKIVA070.ORG'
'ZR-0.94UA'	1100.0	'COMBO.MKIVA100.ORG'
'ZR-0.94UA'	1265.0	'COMBO.MKIVA115.ORG'
'ZR-0.94UA'	1430.0	'COMBO.MKIVA130.ORG'
'ZR-0.94UA'	2200.0	'COMBO.MKIVA200.ORG'
'ZR-0.94UA'	2750.0	'COMBO.MKIVA250.ORG'
'ZR-0.94UA'	3300.0	'COMBO.MKIVA300.ORG'
'ZR-0.94UA'	3960.0	'COMBO.MKIVA360.ORG'
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'ZR-0.94UB'	22.0	'COMBO.MKIVB002.ORG'
'ZR-0.94UB'	33.0	'COMBO.MKIVB003.ORG'
'ZR-0.94UB'	55.0	'COMBO.MKIVB005.ORG'
'ZR-0.94UB'	77.0	'COMBO.MKIVB007.ORG'
'ZR-0.94UB'	110.0	'COMBO.MKIVB010.ORG'
'ZR-0.94UB'	165.0	'COMBO.MKIVB015.ORG'
'ZR-0.94UB'	220.0	'COMBO.MKIVB020.ORG'
'ZR-0.94UB'	275.0	'COMBO.MKIVB025.ORG'
'ZR-0.94UB'	330.0	'COMBO.MKIVB030.ORG'
'ZR-0.94UB'	440.0	'COMBO.MKIVB040.ORG'
'ZR-0.94UB'	550.0	'COMBO.MKIVB050.ORG'
'ZR-0.94UB'	770.0	'COMBO.MKIVB070.ORG'
'ZR-0.94UB'	1100.0	'COMBO.MKIVB100.ORG'
'ZR-0.94UB'	1265.0	'COMBO.MKIVB115.ORG'
'ZR-0.94UB'	1430.0	'COMBO.MKIVB130.ORG'
'ZR-0.94UB'	2200.0	'COMBO.MKIVB200.ORG'
'ZR-0.94UB'	2750.0	'COMBO.MKIVB250.ORG'
'ZR-0.94UB'	3300.0	'COMBO.MKIVB300.ORG'
'ZR-0.94UB'	3960.0	'COMBO.MKIVB360.ORG'
'ZR-0.94UC'	16.5	'COMBO.MKIVC001A.ORG'
'ZR-0.94UC'	22.0	'COMBO.MKIVC002.ORG'
'ZR-0.94UC'	33.0	'COMBO.MKIVC003.ORG'

'ZR-0.94UC'	55.0	'COMBO.MKIVC005.ORG'
'ZR-0.94UC'	77.0	'COMBO.MKIVC007.ORG'
'ZR-0.94UC'	110.0	'COMBO.MKIVC010.ORG'
'ZR-0.94UC'	165.0	'COMBO.MKIVC015.ORG'
'ZR-0.94UC'	220.0	'COMBO.MKIVC020.ORG'
'ZR-0.94UC'	275.0	'COMBO.MKIVC025.ORG'
'ZR-0.94UC'	330.0	'COMBO.MKIVC030.ORG'
'ZR-0.94UC'	440.0	'COMBO.MKIVC040.ORG'
'ZR-0.94UC'	550.0	'COMBO.MKIVC050.ORG'
'ZR-0.94UC'	770.0	'COMBO.MKIVC070.ORG'
'ZR-0.94UC'	1100.0	'COMBO.MKIVC100.ORG'
'ZR-0.94UC'	1265.0	'COMBO.MKIVC115.ORG'
'ZR-0.94UC'	1430.0	'COMBO.MKIVC130.ORG'
'ZR-0.94UC'	2200.0	'COMBO.MKIVC200.ORG'
'ZR-0.94UC'	2750.0	'COMBO.MKIVC250.ORG'
'ZR-0.94UC'	3300.0	'COMBO.MKIVC300.ORG'
'ZR-0.94UC'	3960.0	'COMBO.MKIVC360.ORG'
'AL-0.71UA'	15.0	'COMBO.SPNA001A.ORG'
'AL-0.71UA'	20.0	'COMBO.SPNA002.ORG'
'AL-0.71UA'	30.0	'COMBO.SPNA003.ORG'
'AL-0.71UA'	50.0	'COMBO.SPNA005.ORG'
'AL-0.71UA'	70.0	'COMBO.SPNA007.ORG'
'AL-0.71UA'	100.0	'COMBO.SPNA010.ORG'
'AL-0.71UA'	150.0	'COMBO.SPNA015.ORG'
'AL-0.71UA'	200.0	'COMBO.SPNA020.ORG'
'AL-0.71UA'	250.0	'COMBO.SPNA025.ORG'
'AL-0.71UA'	300.0	'COMBO.SPNA030.ORG'
'AL-0.71UA'	400.0	'COMBO.SPNA040.ORG'
'AL-0.71UA'	500.0	'COMBO.SPNA050.ORG'
'AL-0.71UA'	700.0	'COMBO.SPNA070.ORG'
'AL-0.71UA'	1000.0	'COMBO.SPNA100.ORG'
'AL-0.71UA'	1250.0	'COMBO.SPNA125.ORG'
'AL-0.71UA'	1500.0	'COMBO.SPNA150.ORG'
'AL-0.71UA'	2000.0	'COMBO.SPNA200.ORG'
'AL-0.71UA'	2500.0	'COMBO.SPNA250.ORG'
'AL-0.71UA'	3000.0	'COMBO.SPNA300.ORG'
'AL-0.71UA'	3200.0	'COMBO.SPNA320.ORG'
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'AL-0.71UB'	20.0	'COMBO.SPNB002.ORG'
'AL-0.71UB'	30.0	'COMBO.SPNB003.ORG'
'AL-0.71UB'	50.0	'COMBO.SPNB005.ORG'
'AL-0.71UB'	70.0	'COMBO.SPNB007.ORG'
'AL-0.71UB'	100.0	'COMBO.SPNB010.ORG'
'AL-0.71UB'	150.0	'COMBO.SPNB015.ORG'
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'AL-0.71UB'	700.0	'COMBO.SPNB070.ORG'
'AL-0.71UB'	1000.0	'COMBO.SPNB100.ORG'
'AL-0.71UB'	1250.0	'COMBO.SPNB125.ORG'
'AL-0.71UB'	1500.0	'COMBO.SPNB150.ORG'
'AL-0.71UB'	2000.0	'COMBO.SPNB200.ORG'
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'AL-0.71UB'	3200.0	'COMBO.SPNB320.ORG'
'AL-0.71UC'	15.0	'COMBO.SPNC001A.ORG'
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'AL-0.71UC'	50.0	'COMBO.SPNC005.ORG'
'AL-0.71UC'	70.0	'COMBO.SPNC007.ORG'
'AL-0.71UC'	100.0	'COMBO.SPNC010.ORG'

'AL-0.71UC'	150.0	'COMBO.SPNC015.ORG'
'AL-0.71UC'	200.0	'COMBO.SPNC020.ORG'
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'AL-0.71UC'	1250.0	'COMBO.SPNC125.ORG'
'AL-0.71UC'	1500.0	'COMBO.SPNC150.ORG'
'AL-0.71UC'	2000.0	'COMBO.SPNC200.ORG'
'AL-0.71UC'	2500.0	'COMBO.SPNC250.ORG'
'AL-0.71UC'	3000.0	'COMBO.SPNC300.ORG'
'AL-0.71UC'	3200.0	'COMBO.SPNC320.ORG'
'AL-0.94U'	15.0	'COMBO.SPE001A.ORG'
'AL-0.94U'	20.0	'COMBO.SPE002.ORG'
'AL-0.94U'	30.0	'COMBO.SPE003.ORG'
'AL-0.94U'	50.0	'COMBO.SPE005.ORG'
'AL-0.94U'	70.0	'COMBO.SPE007.ORG'
'AL-0.94U'	100.0	'COMBO.SPE010.ORG'
'AL-0.94U'	150.0	'COMBO.SPE015.ORG'
'AL-0.94U'	200.0	'COMBO.SPE020.ORG'
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'AL-0.94U'	300.0	'COMBO.SPE030.ORG'
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'AL-0.94U'	1000.0	'COMBO.SPE100.ORG'
'AL-0.94U'	1250.0	'COMBO.SPE125.ORG'
'AL-0.94U'	1500.0	'COMBO.SPE150.ORG'
'AL-0.94U'	2000.0	'COMBO.SPE200.ORG'
'AL-0.94U'	2500.0	'COMBO.SPE250.ORG'
'AL-0.94U'	3000.0	'COMBO.SPE300.ORG'
'AL-0.94U'	3200.0	'COMBO.SPE320.ORG'
'AL-0.0TH'	1.0	'COMBO.TH1.ORG'

APPENDIX C

DECAY LIBRARY CHANGES

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Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
10030	3.89E+08	3.90E+08	9.97E-01
10040	1.00E-03	1.00E-03	1.00E+00
20060	8.07E-01	8.08E-01	9.98E-01
30080	8.38E-01	8.42E-01	9.95E-01
40080	2.00E-06	2.00E-16	1.00E+10
40100	5.05E+13	5.05E+13	1.00E+00
40110	1.38E+01	1.36E+01	1.02E+00
50120	2.02E-02	2.03E-02	9.95E-01
60140	1.80E+11	1.81E+11	9.97E-01
60140	1.80E+11	1.81E+11	9.97E-01
60150	2.45E+00	2.45E+00	1.00E+00
70130	5.98E+02	5.98E+02	9.99E-01
70160	7.13E+00	7.12E+00	1.00E+00
80190	2.69E+01	2.90E+01	9.28E-01
90200	1.10E+01	1.14E+01	9.65E-01
100230	3.72E+01	3.72E+01	1.00E+00
110220	8.21E+07	8.21E+07	1.00E+00
110240	5.28E+04	5.40E+04	9.77E-01
110241	2.02E-02	1.99E-02	1.01E+00
110250	5.96E+01	5.96E+01	1.00E+00
120270	5.68E+02	5.68E+02	1.00E+00
120280	7.53E+04	7.53E+04	1.00E+00
130280	1.34E+02	1.34E+02	1.00E+00
130290	3.94E+02	3.91E+02	1.01E+00
130300	3.60E+00	3.69E+00	9.77E-01
140310	9.44E+03	9.44E+03	1.00E+00
140320	5.43E+09	2.05E+10	2.65E-01
150320	1.23E+06	1.24E+06	9.97E-01
150330	2.19E+06	2.16E+06	1.01E+00
150340	1.24E+01	1.24E+01	1.00E+00
160350	7.56E+06	7.60E+06	9.94E-01
160370	3.03E+02	3.04E+02	9.98E-01
170360	9.50E+12	9.50E+12	1.00E+00
170380	2.23E+03	2.23E+03	1.00E+00
170381	7.15E-01	7.16E-01	9.99E-01
180370	3.03E+06	3.03E+06	1.00E+00
180390	8.49E+09	8.49E+09	1.00E+00
180410	6.58E+03	6.58E+03	1.00E+00
180420	1.04E+09	1.04E+09	9.97E-01
190400	4.03E+16	4.04E+16	9.98E-01
190420	4.45E+04	4.45E+04	1.00E+00
190430	8.03E+04	8.14E+04	9.87E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
190440	1.33E+03	1.32E+03	1.01E+00
200410	3.25E+12	2.56E+12	1.27E+00
200450	1.42E+07	1.41E+07	1.00E+00
200470	3.92E+05	3.92E+05	1.00E+00
200490	5.23E+02	5.28E+02	9.90E-01
210460	7.24E+06	7.24E+06	1.00E+00
210461	1.88E+01	1.87E+01	1.00E+00
210470	2.89E+05	2.90E+05	9.98E-01
210480	1.57E+05	1.58E+05	9.97E-01
210490	3.43E+03	3.45E+03	9.95E-01
210500	1.03E+02	1.03E+02	1.00E+00
220510	3.46E+02	3.46E+02	1.00E+00
230490	2.92E+07	2.85E+07	1.02E+00
230500	4.40E+24	1.26E+24	3.49E+00
230520	2.25E+02	2.25E+02	1.00E+00
230530	9.66E+01	9.66E+01	1.00E+00
230540	4.98E+01	5.50E+01	9.05E-01
240510	2.39E+06	2.39E+06	1.00E+00
240550	2.10E+02	2.13E+02	9.85E-01
250540	2.70E+07	2.70E+07	9.99E-01
250560	9.28E+03	9.28E+03	1.00E+00
250570	8.72E+01	9.66E+01	9.03E-01
250580	6.53E+01	6.53E+01	1.00E+00
260550	8.62E+07	8.20E+07	1.05E+00
260590	3.85E+06	3.89E+06	9.89E-01
270580	6.13E+06	6.12E+06	1.00E+00
270581	3.29E+04	3.29E+04	9.99E-01
270600	1.66E+08	1.66E+08	9.99E-01
270601	6.28E+02	6.28E+02	1.00E+00
270610	5.94E+03	5.94E+03	1.00E+00
270620	9.00E+01	9.00E+01	1.00E+00
270720	1.24E-01	1.23E-01	1.01E+00
270730	1.29E-01	1.16E-01	1.12E+00
270740	9.20E-02	1.08E-01	8.55E-01
270750	8.17E-02	8.02E-02	1.02E+00
280590	2.40E+12	2.52E+12	9.49E-01
280630	3.15E+09	2.90E+09	1.09E+00
280650	9.07E+03	9.07E+03	1.00E+00
280660	1.97E+05	1.97E+05	1.00E+00
280720	3.83E+00	2.42E+00	1.58E+00
280730	4.91E-01	3.94E-01	1.25E+00
280740	9.00E-01	6.48E-01	1.39E+00
280750	2.31E-01	1.80E-01	1.29E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
280760	3.05E-01	2.68E-01	1.13E+00
280770	1.03E-01	1.03E-01	1.00E+00
280780	1.32E-01	1.38E-01	9.58E-01
290620	5.84E+02	5.84E+02	1.00E+00
290640	4.57E+04	4.57E+04	1.00E+00
290660	3.06E+02	3.06E+02	1.00E+00
290670	2.23E+05	2.23E+05	1.00E+00
290720	6.49E+00	6.00E+00	1.08E+00
290730	5.11E+00	3.95E+00	1.30E+00
290740	6.48E-01	5.73E-01	1.13E+00
290750	9.27E-01	7.67E-01	1.21E+00
290760	2.60E-01	2.21E-01	1.18E+00
290770	3.05E-01	2.95E-01	1.04E+00
290780	1.18E-01	1.21E-01	9.78E-01
290790	1.35E-01	1.47E-01	9.17E-01
290800	8.99E-02	9.11E-02	9.87E-01
290810	7.42E-02	7.45E-02	9.97E-01
300630	2.29E+03	2.31E+03	9.90E-01
300650	2.11E+07	2.11E+07	1.00E+00
300690	3.38E+03	3.42E+03	9.88E-01
300691	4.95E+04	4.95E+04	1.00E+00
300710	1.47E+02	1.44E+02	1.02E+00
300711	1.43E+04	1.41E+04	1.01E+00
300720	1.67E+05	1.67E+05	1.00E+00
300730	2.35E+01	2.35E+01	1.00E+00
300740	9.60E+01	9.50E+01	1.01E+00
300750	1.02E+01	9.00E+00	1.13E+00
300760	5.60E+00	5.40E+00	1.04E+00
300770	2.08E+00	1.40E+00	1.49E+00
300780	1.47E+00	2.43E+00	6.05E-01
300790	1.00E+00	3.82E-01	2.62E+00
300800	5.40E-01	7.11E-01	7.59E-01
300810	1.23E-01	1.29E-01	9.48E-01
300820	1.27E-01	1.35E-01	9.37E-01
300830	8.36E-02	8.39E-02	9.97E-01
310700	1.27E+03	1.27E+03	1.00E+00
310720	5.08E+04	5.08E+04	1.00E+00
310721	3.70E-02	3.97E-02	9.32E-01
310730	1.75E+04	1.76E+04	9.96E-01
310740	4.87E+02	4.86E+02	1.00E+00
310750	1.26E+02	1.14E+02	1.11E+00
310760	3.26E+01	2.71E+01	1.20E+00
310770	1.32E+01	1.30E+01	1.02E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
310780	5.09E+00	4.90E+00	1.04E+00
310790	3.00E+00	2.86E+00	1.05E+00
310800	1.66E+00	1.70E+00	9.76E-01
310810	1.23E+00	7.05E-01	1.74E+00
310820	6.00E-01	1.54E-01	3.90E+00
310830	3.10E-01	1.48E-01	2.10E+00
310840	9.84E-02	9.89E-02	9.95E-01
310850	8.70E-02	9.20E-02	9.46E-01
320710	9.88E+05	1.02E+06	9.69E-01
320711	2.04E-02	2.19E-02	9.32E-01
320731	4.99E-01	5.30E-01	9.42E-01
320750	4.97E+03	4.97E+03	1.00E+00
320751	4.77E+01	4.89E+01	9.75E-01
320770	4.07E+04	4.07E+04	1.00E+00
320771	5.29E+01	5.43E+01	9.74E-01
320780	5.28E+03	5.22E+03	1.01E+00
320790	1.91E+01	4.30E+01	4.44E-01
320800	2.95E+01	2.40E+01	1.23E+00
320810	7.60E+00	1.01E+01	7.52E-01
320820	4.60E+00	4.60E+00	1.00E+00
320830	1.90E+00	1.90E+00	1.00E+00
320840	1.20E+00	1.20E+00	1.00E+00
320850	2.50E-01	2.34E-01	1.07E+00
320860	2.47E-01	2.59E-01	9.53E-01
320870	1.34E-01	1.26E-01	1.07E+00
320880	1.29E-01	1.43E-01	9.04E-01
330760	9.48E+04	9.48E+04	1.00E+00
330770	1.40E+05	1.40E+05	1.00E+00
330780	5.44E+03	5.44E+03	1.00E+00
330790	5.41E+02	5.40E+02	1.00E+00
330800	1.52E+01	1.65E+01	9.21E-01
330810	3.33E+01	3.20E+01	1.04E+00
330820	1.91E+01	2.10E+01	9.10E-01
330821	1.36E+01	1.30E+01	1.05E+00
330830	1.34E+01	1.35E+01	9.93E-01
330840	5.50E+00	5.80E+00	9.48E-01
330850	2.03E+00	2.03E+00	9.99E-01
330860	9.00E-01	9.00E-01	1.00E+00
330870	3.00E-01	3.00E-01	1.00E+00
330880	1.35E-01	1.30E-01	1.04E+00
330890	1.21E-01	1.29E-01	9.37E-01
330900	9.11E-02	9.01E-02	1.01E+00
340750	1.04E+07	1.04E+07	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
340771	1.75E+01	1.75E+01	9.97E-01
340790	2.05E+13	2.05E+12	1.00E+01
340791	2.35E+02	2.33E+02	1.01E+00
340810	1.11E+03	1.11E+03	9.97E-01
340811	3.44E+03	3.44E+03	9.99E-01
340830	1.34E+03	1.35E+03	9.91E-01
340831	7.01E+01	7.00E+01	1.00E+00
340840	1.92E+02	1.98E+02	9.70E-01
340850	3.17E+01	3.90E+01	8.13E-01
340851	1.90E+01	1.90E+01	1.00E+00
340860	1.53E+01	1.66E+01	9.22E-01
340870	5.60E+00	5.60E+00	1.00E+00
340880	1.50E+00	1.50E+00	1.00E+00
340890	4.10E-01	4.10E-01	1.00E+00
340900	4.27E-01	5.55E-01	7.70E-01
340910	2.70E-01	1.85E-01	1.46E+00
340920	1.68E-01	2.48E-01	6.79E-01
340930	9.68E-02	1.07E-01	9.06E-01
350791	4.86E+00	4.86E+00	1.00E+00
350800	1.06E+03	1.04E+03	1.02E+00
350801	1.59E+04	1.59E+04	1.00E+00
350820	1.27E+05	1.27E+05	1.00E+00
350821	3.68E+02	3.68E+02	1.00E+00
350830	8.64E+03	8.60E+03	1.00E+00
350840	1.91E+03	1.91E+03	1.00E+00
350841	3.60E+02	3.60E+02	1.00E+00
350850	1.72E+02	1.72E+02	1.00E+00
350860	5.51E+01	5.50E+01	1.00E+00
350861	4.50E+00	4.50E+00	1.00E+00
350870	5.57E+01	5.58E+01	9.98E-01
350880	1.65E+01	1.63E+01	1.01E+00
350890	4.37E+00	4.50E+00	9.71E-01
350900	1.92E+00	1.60E+00	1.20E+00
350910	6.00E-01	6.00E-01	1.00E+00
350920	3.65E-01	3.00E-01	1.22E+00
350930	1.76E-01	2.01E-01	8.76E-01
350940	1.11E-01	1.11E-01	1.00E+00
350950	1.07E-01	1.17E-01	9.17E-01
350960	8.88E-02	8.38E-02	1.06E+00
360790	1.26E+05	1.26E+05	1.00E+00
360791	5.00E+01	5.50E+01	9.09E-01
360810	6.72E+12	6.62E+12	1.01E+00
360811	1.30E+01	1.33E+01	9.77E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
360831	6.59E+03	6.59E+03	1.00E+00
360850	3.38E+08	3.38E+08	1.00E+00
360851	1.61E+04	1.61E+04	1.00E+00
360870	4.58E+03	4.58E+03	1.00E+00
360880	1.02E+04	1.02E+04	1.00E+00
360890	1.90E+02	1.90E+02	1.00E+00
360900	3.23E+01	3.23E+01	1.00E+00
360910	8.57E+00	8.70E+00	9.85E-01
360920	1.85E+00	1.84E+00	1.01E+00
360930	1.29E+00	1.27E+00	1.02E+00
360940	2.10E-01	2.10E-01	1.00E+00
360950	7.80E-01	5.00E-01	1.56E+00
360960	2.93E-01	4.40E-01	6.66E-01
360970	1.00E-01	1.49E-01	6.73E-01
360980	1.60E-01	2.24E-01	7.14E-01
370860	1.61E+06	1.61E+06	9.99E-01
370861	6.10E+01	6.11E+01	9.99E-01
370870	1.52E+18	1.48E+18	1.02E+00
370880	1.07E+03	1.07E+03	9.99E-01
370890	9.12E+02	9.12E+02	1.00E+00
370900	1.53E+02	1.53E+02	1.00E+00
370901	2.58E+02	2.58E+02	1.00E+00
370910	5.84E+01	5.82E+01	1.00E+00
370920	4.50E+00	4.48E+00	1.00E+00
370930	5.70E+00	5.80E+00	9.83E-01
370940	2.70E+00	2.69E+00	1.00E+00
370950	3.84E-01	3.60E-01	1.07E+00
370960	1.99E-01	2.07E-01	9.61E-01
370970	1.72E-01	1.70E-01	1.01E+00
370980	1.14E-01	1.40E-01	8.14E-01
370990	5.90E-02	7.60E-02	7.76E-01
371000	9.84E-02	1.01E-01	9.79E-01
371010	9.39E-02	1.13E-01	8.28E-01
380850	5.60E+06	5.60E+06	1.00E+00
380851	4.06E+03	4.20E+03	9.67E-01
380871	1.01E+04	1.01E+04	1.00E+00
380890	4.37E+06	4.36E+06	1.00E+00
380900	9.08E+08	9.19E+08	9.88E-01
380910	3.43E+04	3.42E+04	1.00E+00
380920	9.76E+03	9.76E+03	1.00E+00
380930	4.45E+02	4.50E+02	9.90E-01
380940	7.52E+01	7.56E+01	9.95E-01
380950	2.51E+01	2.60E+01	9.65E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
380960	1.06E+00	4.00E+00	2.65E-01
380970	4.20E-01	2.00E-01	2.10E+00
380980	6.50E-01	8.50E-01	7.65E-01
380990	2.71E-01	5.60E-01	4.84E-01
381000	2.02E-01	1.05E+00	1.93E-01
381010	1.94E-01	2.52E-01	7.71E-01
381020	2.87E-01	4.15E-01	6.92E-01
381030	1.20E-01	1.39E-01	8.63E-01
381040	1.63E-01	1.93E-01	8.46E-01
390891	1.61E+01	1.61E+01	1.00E+00
390900	2.31E+05	2.30E+05	1.00E+00
390901	1.15E+04	1.12E+04	1.03E+00
390910	5.06E+06	5.06E+06	1.00E+00
390911	2.98E+03	2.98E+03	1.00E+00
390920	1.27E+04	1.27E+04	1.00E+00
390930	3.64E+04	3.64E+04	1.00E+00
390940	1.12E+03	1.15E+03	9.79E-01
390950	6.30E+02	6.30E+02	1.00E+00
390960	5.90E+00	1.38E+02	4.28E-02
390970	3.50E+00	1.11E+00	3.15E+00
390980	6.40E-01	3.00E-01	2.13E+00
390990	1.47E+00	8.00E-01	1.84E+00
391000	7.35E-01	7.56E-01	9.72E-01
391010	5.00E-01	9.76E-01	5.12E-01
391020	9.00E-01	2.73E-01	3.30E+00
391030	2.60E-01	3.66E-01	7.11E-01
391040	1.28E-01	1.44E-01	8.90E-01
391050	1.47E-01	1.74E-01	8.46E-01
391060	8.94E-02	9.29E-02	9.62E-01
391070	9.23E-02	1.05E-01	8.82E-01
400890	2.82E+05	2.82E+05	1.00E+00
400901	8.09E-01	8.30E-01	9.75E-01
400930	4.73E+13	4.83E+13	9.80E-01
400950	5.53E+06	5.53E+06	1.00E+00
400970	6.08E+04	6.08E+04	1.00E+00
400980	3.07E+01	3.10E+01	9.90E-01
400990	2.10E+00	2.40E+00	8.75E-01
401000	7.10E+00	7.10E+00	1.00E+00
401010	2.00E+00	3.30E+00	6.06E-01
401020	2.90E+00	2.86E+01	1.01E-01
401030	1.30E+00	1.77E+00	7.34E-01
401040	2.57E+00	3.78E+00	6.80E-01
401050	4.93E-01	5.59E-01	8.82E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
401060	9.07E-01	9.80E-01	9.26E-01
401070	2.43E-01	2.49E-01	9.78E-01
401080	3.78E-01	4.08E-01	9.28E-01
401090	1.30E-01	1.39E-01	9.37E-01
410910	2.15E+10	3.16E+11	6.80E-02
410920	1.10E+15	8.78E+05	1.26E+09
410931	5.08E+08	4.29E+08	1.18E+00
410940	6.41E+11	6.41E+11	1.00E+00
410941	3.76E+02	3.76E+02	1.00E+00
410950	3.02E+06	3.04E+06	9.95E-01
410951	3.12E+05	3.12E+05	1.00E+00
410960	8.41E+04	8.41E+04	1.00E+00
410970	4.33E+03	4.33E+03	1.00E+00
410971	6.00E+01	6.00E+01	1.00E+00
410980	2.86E+00	2.80E+00	1.02E+00
410981	3.08E+03	3.09E+03	9.96E-01
410990	1.50E+01	1.43E+01	1.05E+00
410991	1.56E+02	1.56E+02	1.00E+00
411000	1.50E+00	2.40E+00	6.25E-01
411001	2.98E+00	2.41E+00	1.24E+00
411010	7.10E+00	7.00E+00	1.01E+00
411020	1.30E+00	3.00E+00	4.33E-01
411030	1.50E+00	1.57E+01	9.57E-02
411040	4.80E+00	1.00E+00	4.80E+00
411050	2.95E+00	1.80E+00	1.64E+00
411060	1.00E+00	5.35E-01	1.87E+00
411070	7.66E-01	6.69E-01	1.14E+00
411080	2.42E-01	2.22E-01	1.09E+00
411090	3.15E-01	2.86E-01	1.10E+00
411100	1.30E-01	1.26E-01	1.03E+00
411110	1.72E-01	1.56E-01	1.10E+00
411120	8.67E-02	8.51E-02	1.02E+00
420930	1.10E+11	1.10E+11	1.00E+00
420931	2.50E+04	2.47E+04	1.01E+00
420990	2.37E+05	2.38E+05	9.99E-01
421010	8.76E+02	8.77E+02	9.99E-01
421020	6.78E+02	6.66E+02	1.02E+00
421030	6.75E+01	6.00E+01	1.13E+00
421040	6.00E+01	9.60E+01	6.25E-01
421050	3.56E+01	5.40E+01	6.59E-01
421060	8.40E+00	9.00E+00	9.33E-01
421070	3.50E+00	6.39E+00	5.48E-01
421080	1.50E+00	1.50E+00	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
421090	1.41E+00	1.03E+00	1.36E+00
421100	2.77E+00	1.89E+00	1.47E+00
421110	4.66E-01	3.92E-01	1.19E+00
421120	9.75E-01	6.89E-01	1.42E+00
421130	2.29E-01	1.97E-01	1.16E+00
421140	3.77E-01	3.22E-01	1.17E+00
421150	1.26E-01	1.16E-01	1.09E+00
430970	8.21E+13	8.20E+13	1.00E+00
430971	7.82E+06	7.78E+06	1.01E+00
430980	1.33E+14	1.33E+14	1.00E+00
430990	6.72E+12	6.72E+12	9.99E-01
430991	2.16E+04	2.17E+04	9.99E-01
431000	1.58E+01	1.58E+01	1.00E+00
431010	8.52E+02	8.52E+02	1.00E+00
431020	5.28E+00	5.28E+00	1.00E+00
431021	2.61E+02	2.61E+02	1.00E+00
431030	5.42E+01	5.00E+01	1.08E+00
431040	1.10E+03	1.09E+03	1.01E+00
431050	4.56E+02	4.80E+02	9.50E-01
431060	3.60E+01	3.70E+01	9.73E-01
431070	2.12E+01	2.90E+01	7.31E-01
431080	5.17E+00	5.20E+00	9.94E-01
431090	1.40E+00	5.10E+01	2.75E-02
431100	8.30E-01	8.30E-01	1.00E+00
431110	1.98E+00	1.34E+00	1.48E+00
431120	4.31E-01	3.55E-01	1.21E+00
431130	6.52E-01	4.58E-01	1.42E+00
431140	2.02E-01	1.73E-01	1.17E+00
431150	2.70E-01	2.23E-01	1.22E+00
431160	1.16E-01	1.06E-01	1.09E+00
431170	1.52E-01	1.35E-01	1.12E+00
431180	8.16E-02	7.72E-02	1.06E+00
440970	2.51E+05	2.51E+05	1.00E+00
441030	3.39E+06	3.39E+06	9.99E-01
441050	1.60E+04	1.60E+04	1.00E+00
441060	3.22E+07	3.18E+07	1.01E+00
441070	2.25E+02	2.52E+02	8.93E-01
441080	2.73E+02	2.70E+02	1.01E+00
441090	3.50E+01	3.50E+01	1.00E+00
441100	1.50E+01	1.60E+01	9.38E-01
441110	1.60E+00	1.54E+01	1.04E-01
441120	3.60E+00	7.00E-01	5.14E+00
441130	3.00E+00	2.77E+00	1.08E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
441140	8.14E+00	5.05E+00	1.61E+00
441150	8.78E-01	7.29E-01	1.20E+00
441160	1.70E+00	1.41E+00	1.21E+00
441170	3.43E-01	3.09E-01	1.11E+00
441180	6.62E-01	6.16E-01	1.07E+00
441190	1.95E-01	1.77E-01	1.10E+00
441200	3.50E-01	2.93E-01	1.19E+00
451020	9.15E+07	9.15E+07	1.00E+00
451031	3.37E+03	3.37E+03	1.00E+00
451040	4.23E+01	4.23E+01	1.00E+00
451040	4.23E+01	4.23E+01	1.00E+00
451041	2.60E+02	2.60E+02	1.00E+00
451050	1.27E+05	1.27E+05	1.00E+00
451051	4.50E+01	4.50E+01	1.00E+00
451060	2.98E+01	2.99E+01	9.97E-01
451061	7.80E+03	7.92E+03	9.85E-01
451070	1.30E+03	1.30E+03	1.00E+00
451080	1.68E+01	1.68E+01	1.00E+00
451081	3.60E+02	3.54E+02	1.02E+00
451090	8.00E+01	9.00E+01	8.89E-01
451091	5.00E+01	5.00E+01	1.00E+00
451100	3.16E+00	2.90E+01	1.09E-01
451101	2.85E+01	3.00E+00	9.50E+00
451110	1.10E+01	6.30E+01	1.75E-01
451120	1.50E+00	4.70E+00	3.19E-01
451130	9.00E-01	9.00E-01	1.00E+00
451140	1.70E+00	1.70E+00	1.00E+00
451150	8.32E+00	6.02E+00	1.38E+00
451160	9.49E-01	8.33E-01	1.14E+00
451170	1.22E+00	1.08E+00	1.13E+00
451180	3.16E-01	2.95E-01	1.07E+00
451190	4.65E-01	4.48E-01	1.04E+00
451200	1.73E-01	1.62E-01	1.06E+00
451210	2.50E-01	2.21E-01	1.13E+00
451220	1.07E-01	1.05E-01	1.02E+00
451230	1.34E-01	1.34E-01	1.01E+00
461030	1.47E+06	1.47E+06	1.00E+00
461070	2.05E+14	2.05E+14	1.00E+00
461071	2.13E+01	2.13E+01	1.00E+00
461090	4.93E+04	4.85E+04	1.02E+00
461091	2.81E+02	2.81E+02	1.00E+00
461110	1.40E+03	1.32E+03	1.06E+00
461111	1.98E+04	1.98E+04	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
461120	7.58E+04	7.24E+04	1.05E+00
461130	9.30E+01	9.00E+01	1.03E+00
461140	1.47E+02	1.44E+02	1.02E+00
461150	3.80E+01	3.80E+01	1.00E+00
461160	1.27E+01	1.40E+01	9.09E-01
461170	5.00E+00	5.00E+00	1.00E+00
461180	3.10E+00	3.10E+00	1.00E+00
461190	1.76E+00	1.71E+00	1.03E+00
461200	3.91E+00	4.27E+00	9.14E-01
461210	6.44E-01	6.22E-01	1.03E+00
461220	1.41E+00	1.27E+00	1.11E+00
461230	3.00E-01	3.10E-01	9.69E-01
461240	5.14E-01	5.60E-01	9.18E-01
461250	1.66E-01	1.83E-01	9.07E-01
461260	2.52E-01	2.87E-01	8.78E-01
471060	1.44E+03	7.34E+05	1.96E-03
471080	1.42E+02	1.42E+02	1.00E+00
471081	4.01E+09	4.01E+09	1.00E+00
471091	3.96E+01	3.96E+01	1.00E+00
471100	2.46E+01	2.46E+01	1.00E+00
471101	2.16E+07	2.16E+07	1.00E+00
471110	6.44E+05	6.44E+05	1.00E+00
471111	6.48E+01	6.50E+01	9.97E-01
471120	1.13E+04	1.13E+04	1.00E+00
471130	1.93E+04	1.91E+04	1.01E+00
471131	6.87E+01	6.60E+01	1.04E+00
471140	4.60E+00	4.52E+00	1.02E+00
471150	1.20E+03	1.20E+03	1.00E+00
471151	1.80E+01	1.70E+01	1.06E+00
471160	1.61E+02	1.61E+02	1.00E+00
471161	1.04E+01	1.04E+01	1.00E+00
471170	7.28E+01	7.32E+01	9.95E-01
471171	5.34E+00	5.30E+00	1.01E+00
471180	3.76E+00	3.70E+00	1.02E+00
471181	2.00E+00	2.80E+00	7.14E-01
471190	2.10E+00	6.00E+00	3.50E-01
471200	1.17E+00	1.17E+00	1.00E+00
471210	8.00E-01	3.00E+00	2.67E-01
471220	4.80E-01	1.00E-01	4.80E+00
471230	3.90E-01	8.63E-01	4.52E-01
471240	2.50E-01	2.69E-01	9.29E-01
471250	3.34E-01	3.82E-01	8.73E-01
471260	1.40E-01	1.56E-01	8.99E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
471270	1.75E-01	2.05E-01	8.54E-01
471280	9.43E-02	1.02E-01	9.21E-01
481070	2.34E+04	2.34E+04	1.00E+00
481090	4.00E+07	4.01E+07	9.97E-01
481111	2.92E+03	2.92E+03	9.98E-01
481130	2.94E+23	0.00E+00	#DIV/0!
481131	4.45E+08	4.60E+08	9.66E-01
481150	1.93E+05	1.93E+05	1.00E+00
481151	3.85E+06	3.85E+06	1.00E+00
481170	8.96E+03	9.36E+03	9.58E-01
481171	1.21E+04	1.22E+04	9.89E-01
481180	3.02E+03	3.02E+03	1.00E+00
481190	1.61E+02	5.64E+02	2.86E-01
481191	1.32E+02	1.92E+02	6.88E-01
481200	5.08E+01	5.08E+01	1.00E+00
481210	1.35E+01	1.28E+01	1.05E+00
481220	5.24E+00	5.50E+00	9.53E-01
481230	8.91E+00	8.40E+00	1.06E+00
481240	9.00E-01	1.72E+01	5.24E-02
481250	1.55E+00	1.62E+00	9.54E-01
481260	5.06E-01	3.77E+00	1.34E-01
481270	5.72E-01	6.59E-01	8.68E-01
481280	1.05E+00	1.29E+00	8.16E-01
481290	2.99E-01	3.38E-01	8.85E-01
481300	4.77E-01	5.24E-01	9.10E-01
481310	1.06E-01	1.19E-01	8.90E-01
481320	1.36E-01	1.45E-01	9.37E-01
491131	5.97E+03	5.97E+03	1.00E+00
491140	7.19E+01	7.19E+01	1.00E+00
491141	4.28E+06	4.28E+06	1.00E+00
491150	1.39E+22	1.58E+22	8.83E-01
491151	1.62E+04	1.55E+04	1.04E+00
491160	1.41E+01	1.41E+01	1.00E+00
491161	3.25E+03	3.25E+03	1.00E+00
491170	2.63E+03	2.64E+03	9.95E-01
491171	6.99E+03	6.98E+03	1.00E+00
491180	5.00E+00	5.00E+00	1.00E+00
491181	2.67E+02	2.67E+02	1.00E+00
491190	1.44E+02	1.50E+02	9.60E-01
491191	1.08E+03	1.08E+03	1.00E+00
491200	3.08E+00	4.44E+01	6.94E-02
491201	4.62E+01	3.08E+00	1.50E+01
491210	2.31E+01	2.80E+01	8.25E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
491211	2.33E+02	1.98E+02	1.18E+00
491220	1.50E+00	1.00E+01	1.50E-01
491221	1.03E+01	1.50E+00	6.87E+00
491230	5.98E+00	5.97E+00	1.00E+00
491231	4.78E+01	4.80E+01	9.96E-01
491240	3.17E+00	3.20E+00	9.91E-01
491250	2.33E+00	2.33E+00	1.00E+00
491251	1.22E+01	1.20E+01	1.02E+00
491260	1.45E+00	1.53E+00	9.48E-01
491270	1.15E+00	2.00E+00	5.75E-01
491271	3.76E+00	3.64E+00	1.03E+00
491280	9.00E-01	3.70E+00	2.43E-01
491290	5.90E-01	8.00E-01	7.38E-01
491300	3.20E-01	5.30E-01	6.04E-01
491310	2.70E-01	3.00E-01	9.00E-01
491320	1.86E-01	1.20E-01	1.55E+00
491330	1.12E-01	1.14E-01	9.80E-01
491340	8.06E-02	7.75E-02	1.04E+00
501130	9.94E+06	9.95E+06	1.00E+00
501131	1.28E+03	1.20E+03	1.07E+00
501171	1.18E+06	1.21E+06	9.71E-01
501191	2.53E+07	2.12E+07	1.20E+00
501210	9.74E+04	9.65E+04	1.01E+00
501211	1.74E+09	1.58E+09	1.10E+00
501230	1.12E+07	1.12E+07	1.00E+00
501231	2.41E+03	2.41E+03	1.00E+00
501250	8.33E+05	8.33E+05	1.00E+00
501251	5.71E+02	5.71E+02	1.00E+00
501260	7.88E+12	3.16E+12	2.50E+00
501270	7.56E+03	7.56E+03	1.00E+00
501271	2.48E+02	2.48E+02	9.99E-01
501280	3.55E+03	3.54E+03	1.00E+00
501290	1.30E+02	4.50E+02	2.88E-01
501291	4.02E+02	1.50E+02	2.68E+00
501300	2.23E+02	2.23E+02	1.00E+00
501310	3.90E+01	6.30E+01	6.19E-01
501320	4.00E+01	4.00E+01	1.00E+00
501330	1.44E+00	1.47E+00	9.80E-01
501340	1.04E+00	8.45E-01	1.23E+00
501350	4.18E-01	2.91E-01	1.44E+00
501360	7.17E-01	4.13E-01	1.74E+00
511220	2.33E+05	2.33E+05	1.00E+00
511221	2.53E+02	2.52E+02	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
511240	5.20E+06	5.20E+06	1.00E+00
511241	9.30E+01	9.30E+01	1.00E+00
511250	8.70E+07	8.74E+07	9.95E-01
511260	1.07E+06	1.07E+06	1.00E+00
511261	1.14E+03	1.14E+03	1.00E+00
511270	3.33E+05	3.33E+05	1.00E+00
511280	3.24E+04	3.24E+04	1.00E+00
511281	6.24E+02	6.24E+02	1.00E+00
511290	1.58E+04	1.56E+04	1.02E+00
511300	2.37E+03	2.40E+03	9.88E-01
511301	3.78E+02	3.78E+02	1.00E+00
511310	1.38E+03	1.38E+03	1.00E+00
511320	2.52E+02	1.68E+02	1.50E+00
511321	1.68E+02	2.52E+02	6.67E-01
511330	1.50E+02	1.44E+02	1.04E+00
511340	8.50E-01	1.10E+01	7.73E-02
511341	1.04E+01	1.07E+01	9.75E-01
511350	1.71E+00	1.70E+00	1.01E+00
511360	8.20E-01	2.31E-01	3.55E+00
511370	4.78E-01	2.84E-01	1.68E+00
511380	1.73E-01	1.30E-01	1.33E+00
511390	2.18E-01	1.72E-01	1.27E+00
521210	1.45E+06	1.47E+06	9.87E-01
521211	1.33E+07	1.33E+07	1.00E+00
521230	3.91E+20	3.16E+20	1.24E+00
521231	1.03E+07	1.03E+07	1.00E+00
521251	5.01E+06	5.01E+06	1.00E+00
521270	3.37E+04	3.37E+04	1.00E+00
521271	9.42E+06	9.42E+06	1.00E+00
521290	4.18E+03	4.18E+03	1.00E+00
521291	2.90E+06	2.90E+06	1.00E+00
521310	1.50E+03	1.50E+03	1.00E+00
521310	1.50E+03	1.50E+03	1.00E+00
521311	1.08E+05	1.08E+05	1.00E+00
521320	2.82E+05	2.82E+05	1.00E+00
521330	7.50E+02	7.47E+02	1.00E+00
521331	3.32E+03	3.32E+03	1.00E+00
521340	2.51E+03	2.51E+03	1.00E+00
521350	1.90E+01	1.92E+01	9.90E-01
521360	1.75E+01	2.10E+01	8.33E-01
521370	3.50E+00	3.50E+00	1.00E+00
521380	1.40E+00	1.64E+00	8.54E-01
521390	5.80E-01	4.24E-01	1.37E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
521400	8.94E-01	7.52E-01	1.19E+00
521410	2.73E-01	2.36E-01	1.16E+00
521420	5.90E-01	4.91E-01	1.20E+00
531250	5.20E+06	5.16E+06	1.01E+00
531260	1.13E+06	1.13E+06	1.00E+00
531280	1.50E+03	1.50E+03	1.00E+00
531290	4.95E+14	4.95E+14	9.99E-01
531300	4.45E+04	4.45E+04	1.00E+00
531301	5.40E+02	5.40E+02	1.00E+00
531310	6.95E+05	6.95E+05	1.00E+00
531320	8.22E+03	8.28E+03	9.93E-01
531330	7.49E+04	7.49E+04	1.00E+00
531331	9.00E+00	9.00E+00	1.00E+00
531340	3.16E+03	3.16E+03	1.00E+00
531341	2.21E+02	2.22E+02	9.97E-01
531350	2.37E+04	2.38E+04	9.94E-01
531360	8.34E+01	8.30E+01	1.00E+00
531361	4.69E+01	4.60E+01	1.02E+00
531370	2.45E+01	2.46E+01	9.96E-01
531380	6.49E+00	6.40E+00	1.01E+00
531390	2.30E+00	2.40E+00	9.58E-01
531400	8.60E-01	8.60E-01	1.00E+00
531410	4.60E-01	4.00E-01	1.15E+00
531420	2.00E-01	1.96E-01	1.02E+00
531430	4.01E-01	3.28E-01	1.22E+00
531440	1.46E-01	1.33E-01	1.10E+00
531450	1.93E-01	1.87E-01	1.04E+00
541250	6.08E+04	6.12E+04	9.94E-01
541251	5.70E+01	5.70E+01	1.00E+00
541270	3.15E+06	3.15E+06	1.00E+00
541271	6.92E+01	7.00E+01	9.89E-01
541291	7.68E+05	6.91E+05	1.11E+00
541311	1.03E+06	1.03E+06	1.00E+00
541330	4.53E+05	4.53E+05	1.00E+00
541331	1.89E+05	1.89E+05	1.00E+00
541341	2.90E-01	2.90E-01	1.00E+00
541350	3.29E+04	3.27E+04	1.01E+00
541351	9.17E+02	9.17E+02	1.00E+00
541370	2.29E+02	2.30E+02	9.97E-01
541380	8.45E+02	8.50E+02	9.94E-01
541390	3.97E+01	3.95E+01	1.00E+00
541400	1.36E+01	1.36E+01	1.00E+00
541410	1.73E+00	1.72E+00	1.01E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
541420	1.22E+00	1.22E+00	1.00E+00
541430	9.60E-01	3.00E-01	3.20E+00
541440	1.10E+00	1.00E+00	1.10E+00
541450	9.00E-01	9.00E-01	1.00E+00
541460	5.63E-01	9.37E-01	6.00E-01
541470	1.99E-01	2.64E-01	7.55E-01
551310	8.37E+05	8.38E+05	9.99E-01
551320	5.60E+05	5.59E+05	1.00E+00
551340	6.51E+07	6.51E+07	1.00E+00
551341	1.05E+04	1.04E+04	1.00E+00
551350	7.26E+13	7.26E+13	1.00E+00
551351	3.18E+03	3.18E+03	1.00E+00
551360	1.14E+06	1.13E+06	1.00E+00
551370	9.48E+08	9.47E+08	1.00E+00
551380	1.93E+03	1.93E+03	1.00E+00
551381	1.75E+02	1.74E+02	1.00E+00
551390	5.56E+02	5.64E+02	9.86E-01
551400	6.37E+01	6.38E+01	9.98E-01
551410	2.49E+01	2.50E+01	9.98E-01
551420	1.70E+00	1.70E+00	1.00E+00
551430	1.78E+00	1.70E+00	1.05E+00
551440	1.02E+00	1.02E+00	1.00E+00
551450	5.94E-01	5.60E-01	1.06E+00
551460	3.43E-01	1.90E-01	1.81E+00
551470	5.46E-01	5.58E-01	9.78E-01
551480	2.06E-01	2.02E-01	1.02E+00
551490	2.44E-01	2.78E-01	8.78E-01
551500	1.24E-01	1.24E-01	9.95E-01
561310	1.02E+06	1.02E+06	1.00E+00
561311	8.76E+02	9.00E+02	9.73E-01
561330	3.32E+08	3.39E+08	9.80E-01
561331	1.40E+05	1.40E+05	1.00E+00
561351	1.03E+05	1.03E+05	1.00E+00
561361	3.08E-01	3.08E-01	1.00E+00
561371	1.53E+02	1.53E+02	1.00E+00
561390	5.08E+03	4.96E+03	1.02E+00
561400	1.10E+06	1.11E+06	9.97E-01
561410	1.10E+03	1.10E+03	1.00E+00
561420	6.36E+02	6.42E+02	9.91E-01
561430	1.45E+01	1.36E+01	1.07E+00
561440	1.14E+01	1.10E+01	1.04E+00
561450	4.31E+00	6.20E+00	6.95E-01
561460	2.20E+00	2.20E+00	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
561470	7.00E-01	2.23E+00	3.14E-01
561480	6.07E-01	5.90E+00	1.03E-01
561490	6.95E-01	9.18E-01	7.58E-01
561500	9.62E-01	1.80E+00	5.35E-01
561510	3.33E-01	4.37E-01	7.62E-01
561520	4.21E-01	7.55E-01	5.57E-01
571370	1.89E+12	1.89E+12	1.00E+00
571380	3.31E+18	4.26E+18	7.78E-01
571400	1.45E+05	1.45E+05	1.00E+00
571410	1.41E+04	1.42E+04	9.97E-01
571420	5.47E+03	5.56E+03	9.83E-01
571430	8.48E+02	8.40E+02	1.01E+00
571440	4.09E+01	4.00E+01	1.02E+00
571450	2.48E+01	2.90E+01	8.55E-01
571460	6.27E+00	8.30E+00	7.55E-01
571470	4.40E+00	1.00E+01	4.40E-01
571480	1.05E+00	1.30E+00	8.08E-01
571490	2.41E+00	2.86E+00	8.41E-01
571500	6.08E-01	6.49E-01	9.38E-01
571510	7.19E-01	9.54E-01	7.54E-01
571520	2.85E-01	3.09E-01	9.21E-01
571530	3.26E-01	4.37E-01	7.45E-01
571540	1.49E-01	1.75E-01	8.52E-01
571550	1.54E-01	2.22E-01	6.95E-01
581370	3.24E+04	3.24E+04	1.00E+00
581371	1.24E+05	1.24E+05	1.00E+00
581390	1.19E+07	1.19E+07	1.00E+00
581391	5.48E+01	5.62E+01	9.75E-01
581410	2.81E+06	2.81E+06	1.00E+00
581420	3.31E+18	3.31E+18	1.00E+00
581430	1.19E+05	1.19E+05	1.00E+00
581440	2.46E+07	2.46E+07	1.00E+00
581450	1.81E+02	1.80E+02	1.00E+00
581460	8.11E+02	8.52E+02	9.52E-01
581470	5.64E+01	7.00E+01	8.06E-01
581480	5.60E+01	4.30E+01	1.30E+00
581490	5.20E+00	1.00E+00	5.20E+00
581500	4.00E+00	1.00E+00	4.00E+00
581510	1.02E+00	1.00E+00	1.02E+00
581520	7.66E+00	1.40E+01	5.46E-01
581530	1.47E+00	1.73E+00	8.52E-01
581540	2.02E+00	3.59E+00	5.61E-01
581550	5.28E-01	7.13E-01	7.41E-01

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
581560	5.96E-01	1.16E+00	5.13E-01
581570	2.14E-01	3.62E-01	5.93E-01
591390	1.59E+04	1.58E+04	1.00E+00
591400	2.03E+02	2.03E+02	1.00E+00
591420	6.88E+04	6.89E+04	9.99E-01
591421	8.76E+02	8.76E+02	1.00E+00
591430	1.17E+06	1.17E+06	1.00E+00
591440	1.04E+03	1.04E+03	1.00E+00
591441	4.32E+02	4.32E+02	1.00E+00
591450	2.15E+04	2.15E+04	1.00E+00
591460	1.45E+03	1.45E+03	9.98E-01
591470	8.16E+02	7.20E+02	1.13E+00
591480	1.36E+02	1.38E+02	9.87E-01
591490	1.36E+02	1.38E+02	9.83E-01
591500	6.19E+00	1.24E+01	4.99E-01
591510	1.89E+01	4.00E+00	4.73E+00
591520	6.78E+00	8.32E+00	8.15E-01
591530	4.49E+00	7.74E+00	5.80E-01
591540	1.06E+00	1.31E+00	8.12E-01
591550	1.12E+00	1.89E+00	5.93E-01
591560	3.79E-01	5.10E-01	7.43E-01
591570	3.80E-01	6.78E-01	5.61E-01
591580	1.69E-01	2.63E-01	6.41E-01
591590	1.81E-01	3.14E-01	5.75E-01
601410	8.96E+03	9.00E+03	9.96E-01
601440	6.60E+22	6.62E+22	9.97E-01
601470	9.49E+05	9.56E+05	9.93E-01
601490	6.21E+03	6.23E+03	9.97E-01
601510	7.46E+02	7.44E+02	1.00E+00
601520	6.84E+02	6.90E+02	9.91E-01
601530	6.75E+01	6.75E+01	9.99E-01
601540	4.00E+01	4.00E+01	1.00E+00
601550	1.82E+01	2.61E+01	6.99E-01
601560	1.96E+01	5.85E+01	3.35E-01
601570	2.48E+00	4.15E+00	5.98E-01
601580	2.70E+00	7.89E+00	3.42E-01
601590	6.42E-01	1.41E+00	4.56E-01
601600	7.89E-01	2.12E+00	3.72E-01
601610	3.11E-01	5.56E-01	5.60E-01
611450	5.59E+08	5.59E+08	1.00E+00
611460	1.75E+08	1.74E+08	1.01E+00
611470	8.28E+07	8.28E+07	1.00E+00
611470	8.28E+07	8.28E+07	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
611480	4.64E+05	4.64E+05	1.00E+00
611481	3.57E+06	3.57E+06	1.00E+00
611490	1.91E+05	1.91E+05	1.00E+00
611500	9.65E+03	9.65E+03	1.00E+00
611510	1.02E+05	1.02E+05	1.00E+00
611520	2.46E+02	2.46E+02	1.00E+00
611521	4.51E+02	4.50E+02	1.00E+00
611530	3.24E+02	3.24E+02	1.00E+00
611540	1.03E+02	1.68E+02	6.14E-01
611541	1.61E+02	1.08E+02	1.49E+00
611550	4.80E+01	3.66E+01	1.31E+00
611560	1.31E+01	1.31E+01	1.00E+00
611570	6.12E+01	6.80E+01	8.99E-01
611580	3.80E+00	3.80E+00	1.00E+00
611590	3.00E+00	4.23E+00	7.09E-01
611600	7.29E-01	9.96E-01	7.32E-01
611610	7.90E-01	1.19E+00	6.65E-01
611620	3.24E-01	4.00E-01	8.11E-01
621450	2.94E+07	2.94E+07	1.00E+00
621460	3.25E+15	2.21E+15	1.47E+00
621470	3.35E+18	3.38E+18	9.91E-01
621480	2.50E+23	2.53E+23	9.90E-01
621490	3.15E+23	3.15E+23	1.00E+00
621510	2.84E+09	2.84E+09	9.99E-01
621530	1.67E+05	1.68E+05	9.91E-01
621550	1.34E+03	1.33E+03	1.00E+00
621560	3.38E+04	3.38E+04	1.00E+00
621570	4.84E+02	4.80E+02	1.01E+00
621580	3.31E+02	2.64E+03	1.25E-01
621590	1.62E+02	1.62E+02	9.99E-01
621600	7.26E+01	3.49E+02	2.08E-01
621610	4.78E+00	1.29E+01	3.71E-01
621620	5.26E+00	1.96E+01	2.69E-01
621630	1.27E+00	2.56E+00	4.95E-01
621640	1.39E+00	4.25E+00	3.26E-01
621650	4.54E-01	9.27E-01	4.89E-01
631490	8.04E+06	8.04E+06	1.00E+00
631500	1.13E+09	1.14E+09	9.95E-01
631520	4.27E+08	4.29E+08	9.95E-01
631521	3.36E+04	3.36E+04	1.00E+00
631540	2.71E+08	2.71E+08	9.99E-01
631550	1.50E+08	1.57E+08	9.57E-01
631560	1.31E+06	1.31E+06	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
631570	5.47E+04	5.47E+04	9.99E-01
631580	2.75E+03	2.75E+03	1.00E+00
631590	1.09E+03	1.09E+03	1.00E+00
631600	4.40E+01	5.10E+01	8.63E-01
631610	4.21E+01	4.21E+01	1.00E+00
631620	1.62E+02	2.70E+02	6.02E-01
631630	7.60E+00	1.48E+01	5.12E-01
631640	1.53E+00	2.17E+00	7.06E-01
631650	1.36E+00	2.55E+00	5.32E-01
641520	3.41E+21	3.41E+21	1.00E+00
641530	2.09E+07	2.09E+07	9.98E-01
641551	3.10E-02	3.10E-02	1.00E+00
641590	6.68E+04	6.70E+04	9.98E-01
641610	2.20E+02	2.22E+02	9.89E-01
641620	5.04E+02	6.00E+02	8.40E-01
641630	9.28E+01	9.28E+01	1.00E+00
641640	1.30E+03	1.30E+03	1.00E+00
641650	4.23E+01	1.00E+02	4.22E-01
651570	4.73E+09	4.73E+09	1.00E+00
651600	6.25E+06	6.25E+06	1.00E+00
651610	5.96E+05	5.98E+05	9.97E-01
651620	4.66E+02	4.48E+02	1.04E+00
651621	8.03E+03	8.03E+03	1.00E+00
651630	1.17E+03	1.17E+03	1.00E+00
651631	4.20E+02	4.20E+02	1.00E+00
651640	1.80E+02	1.80E+02	1.00E+00
651650	1.27E+02	3.28E+01	3.87E+00
661570	2.93E+04	2.92E+04	1.00E+00
661590	1.25E+07	1.24E+07	1.00E+00
661650	8.40E+03	8.46E+03	9.93E-01
661651	7.55E+01	7.54E+01	1.00E+00
661660	2.94E+05	2.93E+05	1.00E+00
671630	1.44E+11	1.04E+09	1.38E+02
671660	9.65E+04	9.65E+04	1.00E+00
671661	3.79E+10	3.79E+10	1.00E+00
681630	4.50E+03	4.50E+03	1.00E+00
681650	3.73E+04	3.71E+04	1.01E+00
681671	2.28E+00	2.30E+00	9.91E-01
681671	2.28E+00	2.30E+00	9.91E-01
681690	8.12E+05	8.12E+05	1.00E+00
681710	2.71E+04	2.71E+04	1.00E+00
681720	1.78E+05	1.76E+05	1.01E+00
691700	1.11E+07	1.11E+07	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
691701	4.10E-06	4.10E-06	1.00E+00
691710	6.06E+07	6.06E+07	1.00E+00
691720	2.29E+05	2.29E+05	1.00E+00
691730	2.97E+04	2.97E+04	1.00E+00
701690	2.77E+06	2.77E+06	1.00E+00
701750	3.62E+05	3.62E+05	1.00E+00
701751	6.70E-02	6.70E-02	1.00E+00
701770	6.80E+03	6.84E+03	9.94E-01
711760	1.14E+18	9.47E+17	1.20E+00
711761	1.31E+04	1.33E+04	9.85E-01
711770	5.80E+05	5.80E+05	1.00E+00
711771	1.39E+07	1.34E+07	1.04E+00
721750	6.05E+06	6.05E+06	1.00E+00
721781	4.00E+00	4.00E+00	1.00E+00
721791	1.87E+01	1.86E+01	1.00E+00
721801	1.98E+04	1.98E+04	1.00E+00
721810	3.66E+06	3.66E+06	1.00E+00
721820	2.84E+14	2.84E+14	1.00E+00
731800	2.94E+04	5.05E+20	5.81E-17
731820	9.94E+06	9.94E+06	1.00E+00
731821	9.50E+02	9.90E+02	9.60E-01
731830	4.41E+05	4.41E+05	1.00E+00
741810	1.05E+07	1.05E+07	1.00E+00
741831	5.20E+00	5.20E+00	1.00E+00
741850	6.49E+06	6.49E+06	1.00E+00
741851	1.00E+02	1.00E+02	1.00E+00
741870	8.60E+04	8.60E+04	1.00E+00
741880	6.00E+06	6.00E+06	1.00E+00
741890	6.90E+02	6.90E+02	1.00E+00
751860	3.26E+05	3.26E+05	1.00E+00
751870	1.58E+18	1.58E+18	1.00E+00
751880	6.11E+04	6.11E+04	1.00E+00
751881	1.12E+03	1.12E+03	9.95E-01
751890	8.75E+04	8.75E+04	1.00E+00
761850	8.09E+06	8.12E+06	9.96E-01
761901	5.94E+02	5.94E+02	1.00E+00
761910	1.33E+06	1.33E+06	1.00E+00
761911	4.72E+04	4.68E+04	1.01E+00
761930	1.10E+05	1.12E+05	9.84E-01
761940	1.89E+08	1.89E+08	1.00E+00
771920	6.38E+06	6.40E+06	9.97E-01
771921	7.60E+09	7.61E+09	9.99E-01
771940	6.89E+04	6.89E+04	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
771941	1.48E+07	3.20E-02	4.63E+08
781900	1.89E+19	1.89E+19	1.00E+00
781910	2.51E+05	2.59E+05	9.68E-01
781930	1.58E+09	1.58E+10	1.00E-01
781931	3.74E+05	3.72E+05	1.01E+00
781951	3.47E+05	2.71E+05	1.28E+00
781970	6.59E+04	6.48E+04	1.02E+00
781971	5.73E+03	4.80E+03	1.19E+00
781990	1.85E+03	1.80E+03	1.03E+00
781991	1.36E+01	1.41E+01	9.65E-01
791980	2.33E+05	2.33E+05	9.99E-01
791990	2.71E+05	2.71E+05	1.00E+00
792000	2.90E+03	2.90E+03	1.00E+00
801970	2.31E+05	2.34E+05	9.87E-01
801971	8.57E+04	8.64E+04	9.92E-01
801991	2.56E+03	2.58E+03	9.91E-01
802030	4.03E+06	4.03E+06	1.00E+00
802050	3.12E+02	3.30E+02	9.45E-01
812040	1.19E+08	1.20E+08	9.95E-01
812060	2.52E+02	2.51E+02	1.00E+00
812060	2.52E+02	2.51E+02	1.00E+00
812070	2.86E+02	2.86E+02	1.00E+00
812080	1.83E+02	1.84E+02	9.95E-01
812090	1.32E+02	1.32E+02	1.00E+00
822040	0.00E+00	4.42E+24	0.00E+00
822050	4.80E+14	9.47E+14	5.07E-01
822090	1.17E+04	1.19E+04	9.86E-01
822100	7.04E+08	7.04E+08	1.00E+00
822110	2.17E+03	2.17E+03	1.00E+00
822120	3.83E+04	3.83E+04	1.00E+00
822140	1.61E+03	1.61E+03	1.00E+00
832080	1.16E+13	1.16E+13	1.00E+00
832100	4.33E+05	4.33E+05	1.00E+00
832101	9.47E+13	9.47E+13	1.00E+00
832110	1.28E+02	1.28E+02	1.00E+00
832120	3.63E+03	3.63E+03	1.00E+00
832130	2.74E+03	2.74E+03	9.99E-01
832140	1.19E+03	1.19E+03	1.00E+00
842100	1.20E+07	1.20E+07	1.00E+00
842110	5.16E-01	5.60E-01	9.21E-01
842111	2.52E+01	2.50E+01	1.01E+00
842120	2.98E-07	3.00E-07	9.93E-01
842130	4.20E-06	4.20E-06	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
842140	1.64E-04	1.64E-04	1.00E+00
842150	1.78E-03	1.78E-03	1.00E+00
842160	1.45E-01	1.50E-01	9.67E-01
842180	1.86E+02	1.83E+02	1.02E+00
852170	3.23E-02	3.23E-02	1.00E+00
862180	3.50E-02	3.50E-02	1.00E+00
862190	3.96E+00	3.96E+00	1.00E+00
862200	5.56E+01	5.56E+01	1.00E+00
862220	3.30E+05	3.30E+05	1.00E+00
872210	2.94E+02	2.88E+02	1.02E+00
872230	1.31E+03	1.31E+03	1.00E+00
882220	3.80E+01	3.80E+01	1.00E+00
882230	9.88E+05	9.88E+05	1.00E+00
882240	3.16E+05	3.16E+05	1.00E+00
882250	1.28E+06	1.28E+06	1.00E+00
882260	5.04E+10	5.05E+10	9.99E-01
882280	1.82E+08	2.11E+08	8.59E-01
892250	8.64E+05	8.64E+05	1.00E+00
892270	6.87E+08	6.87E+08	9.99E-01
892280	2.21E+04	2.21E+04	1.00E+00
902260	1.85E+03	1.86E+03	9.97E-01
902270	1.62E+06	1.62E+06	1.00E+00
902280	6.04E+07	6.04E+07	1.00E+00
902290	2.30E+11	2.32E+11	9.94E-01
902300	2.38E+12	2.43E+12	9.79E-01
902310	9.19E+04	9.19E+04	1.00E+00
902320	4.42E+17	4.43E+17	9.96E-01
902330	1.34E+03	1.33E+03	1.01E+00
902340	2.08E+06	2.08E+06	1.00E+00
912310	1.03E+12	1.03E+12	1.00E+00
912320	1.13E+05	1.13E+05	1.00E+00
912330	2.33E+06	2.33E+06	1.00E+00
912340	2.41E+04	2.41E+04	1.00E+00
912341	7.02E+01	7.02E+01	1.00E+00
912350	1.45E+03	1.45E+03	1.00E+00
922300	1.80E+06	1.80E+06	1.00E+00
922310	3.63E+05	3.63E+05	1.00E+00
922320	2.20E+09	2.27E+09	9.69E-01
922330	5.02E+12	5.00E+12	1.00E+00
922340	7.76E+12	7.72E+12	1.01E+00
922350	2.22E+16	2.22E+16	1.00E+00
922360	7.39E+14	7.39E+14	1.00E+00
922370	5.83E+05	5.83E+05	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
922380	1.41E+17	1.41E+17	1.00E+00
922390	1.41E+03	1.41E+03	9.97E-01
922400	5.08E+04	5.08E+04	1.00E+00
922410	1.00E+00	1.00E+00	1.00E+00
932350	3.42E+07	3.42E+07	1.00E+00
932360	3.63E+12	3.63E+12	1.00E+00
932361	8.10E+04	8.10E+04	1.00E+00
932370	6.75E+13	6.75E+13	9.99E-01
932380	1.83E+05	1.83E+05	1.00E+00
932390	2.04E+05	2.04E+05	1.00E+00
932400	3.71E+03	3.90E+03	9.52E-01
932401	4.33E+02	4.44E+02	9.76E-01
932410	8.34E+02	9.60E+02	8.69E-01
942360	9.15E+07	9.00E+07	1.02E+00
942370	3.90E+06	3.94E+06	9.91E-01
942380	2.77E+09	2.77E+09	9.99E-01
942390	7.60E+11	7.59E+11	1.00E+00
942400	2.07E+11	2.06E+11	1.00E+00
942410	4.54E+08	4.54E+08	9.99E-01
942420	1.18E+13	1.22E+13	9.69E-01
942430	1.78E+04	1.78E+04	1.00E+00
942440	2.53E+15	2.61E+15	9.69E-01
942450	3.78E+04	3.82E+04	9.91E-01
942460	9.37E+05	9.37E+05	9.99E-01
952390	4.28E+04	4.28E+04	9.99E-01
952400	1.83E+05	1.83E+05	1.00E+00
952410	1.37E+10	1.36E+10	1.00E+00
952420	5.77E+04	5.77E+04	1.00E+00
952421	4.45E+09	4.80E+09	9.28E-01
952430	2.32E+11	2.33E+11	9.98E-01
952440	3.64E+04	3.64E+04	1.00E+00
952441	1.56E+03	1.56E+03	1.00E+00
952450	7.38E+03	7.45E+03	9.90E-01
952460	2.34E+03	1.50E+03	1.56E+00
962410	2.83E+06	3.11E+06	9.11E-01
962420	1.41E+07	1.41E+07	9.98E-01
962430	9.18E+08	8.99E+08	1.02E+00
962440	5.71E+08	5.72E+08	9.99E-01
962450	2.68E+11	2.68E+11	1.00E+00
962460	1.49E+11	1.49E+11	1.00E+00
962470	5.05E+14	4.92E+14	1.03E+00
962480	1.07E+13	1.07E+13	1.00E+00
962490	3.85E+03	3.85E+03	1.00E+00

Table C-1. Updated Half Lives For ORIGEN2 Decay Library. (25 sheets)

Nuclide	Current (15th Edition Chart Of Nuclides or ENDF/B-6)	Previous (ORIGEN2)	Current/Previous
962500	5.49E+11	5.49E+11	1.00E+00
962510	1.01E+03	1.00E+00	1.01E+03
972490	2.77E+07	2.77E+07	1.00E+00
972500	1.16E+04	1.16E+04	9.98E-01
972510	3.42E+03	3.42E+03	1.00E+00
982490	1.11E+10	1.11E+10	1.00E+00
982500	4.13E+08	4.13E+08	1.00E+00
982510	2.83E+10	2.83E+10	1.00E+00
982520	8.35E+07	8.33E+07	1.00E+00
982530	1.54E+06	1.54E+06	1.00E+00
982540	5.23E+06	5.23E+06	1.00E+00
982550	5.40E+03	5.40E+03	1.00E+00
992530	1.77E+06	1.77E+06	1.00E+00
992540	2.38E+07	2.38E+07	1.00E+00
992541	1.41E+05	1.41E+05	1.00E+00
992550	3.37E+06	3.37E+06	1.00E+00

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The following is a full listing of the revised ORIGEN2 decay library.

ft27f001rev2

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1       decay library: activation products (endf/b-vi)
   1    10010  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 9.998E+01 1.000E+00 1.000E+00
   1    10020  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 1.500E-02 1.000E+00 1.000E+00
   1    10030  1      3.885E+08 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 5.690E-03 0.000E+00 2.000E-07 3.000E-03
   1    10040  1      1.000E-03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 0.000E+00 3.000E-08 1.000E+00
   1    20030  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 1.300E-04 1.000E+00 1.000E+00
   1    20040  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
   1    20060  1      8.067E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 1.570E+00 0.000E+00 3.000E-08 1.000E+00
   1    30060  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 7.500E+00 1.000E+00 1.000E+00
   1    30070  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 9.250E+01 1.000E+00 1.000E+00
   1    30080  1      8.380E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 1.027E+01 0.000E+00 3.000E-08 1.000E+00
   1    40080  1      2.000E-06 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 9.500E-02 0.000E+00 2.000E-14 3.000E-08
   1    40090  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
   1    40100  1      5.049E+13 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 2.025E-01 0.000E+00 1.000E-10 3.000E-06
   1    40110  1      1.381E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 6.095E+00 0.000E+00 3.000E-08 1.000E+00
   1    50100  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 2.000E+01 1.000E+00 1.000E+00
   1    50110  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 8.000E+01 1.000E+00 1.000E+00
   1    50120  1      2.020E-02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 6.413E+00 0.000E+00 3.000E-08 1.000E+00
   1    60120  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 9.889E+01 1.000E+00 1.000E+00
   1    60130  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 1.110E+00 1.000E+00 1.000E+00
   1    60140  1      1.802E+11 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 4.947E-02 0.000E+00 1.000E-07 8.000E-04
   1    60150  1      2.449E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 6.483E+00 0.000E+00 3.000E-08 1.000E+00
   1    70130  1      5.979E+02 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 1.511E+00 0.000E+00 3.000E-08 1.000E+00
   1    70140  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 9.963E+01 1.000E+00 1.000E+00
   1    70150  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 3.660E-01 1.000E+00 1.000E+00
   1    70160  1      7.130E+00 0.000E+00 0.000E+00 0.000E+00 1.200E-05 0.000E+00
   1                  0.000E+00 0.000E+00 7.254E+00 0.000E+00 3.000E-08 1.000E+00
   1    80160  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 9.976E+01 1.000E+00 1.000E+00
   1    80170  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 3.800E-02 1.000E+00 1.000E+00
   1    80180  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
   1                  0.000E+00 0.000E+00 0.000E+00 2.040E-01 1.000E+00 1.000E+00
   1    80190  1      2.691E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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1			0.000E+00	0.000E+00	2.681E+00	0.000E+00	3.000E-08	1.000E+00
1	90190	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	90200	1	1.100E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.115E+00	0.000E+00	3.000E-08	1.000E+00
1	100200	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.051E+01	1.000E+00	1.000E+00
1	100210	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.700E-01	1.000E+00	1.000E+00
1	100220	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.220E+00	1.000E+00	1.000E+00
1	100230	1	3.724E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.067E+00	0.000E+00	3.000E-08	1.000E+00
1	110220	1	8.211E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.387E+00	0.000E+00	3.000E-10	3.000E-05
1	110230	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	110240	1	5.277E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.677E+00	0.000E+00	5.000E-09	3.000E-05
1	110241	1	2.018E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.997E-01
1			0.000E+00	0.000E+00	4.730E-01	0.000E+00	3.000E-08	1.000E+00
1	110250	1	5.960E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.946E+00	0.000E+00	3.000E-08	1.000E+00
1	120240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.899E+01	1.000E+00	1.000E+00
1	120250	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+01	1.000E+00	1.000E+00
1	120260	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.101E+01	1.000E+00	1.000E+00
1	120270	1	5.677E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.593E+00	0.000E+00	3.000E-08	1.000E+00
1	120280	1	7.528E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.525E+00	0.000E+00	1.000E-10	3.000E-06
1	130270	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	130280	1	1.344E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.020E+00	0.000E+00	3.000E-08	1.000E+00
1	130290	1	3.940E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.377E+00	0.000E+00	3.000E-08	1.000E+00
1	130300	1	3.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.680E+00	0.000E+00	3.000E-08	1.000E+00
1	140280	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.223E+01	1.000E+00	1.000E+00
1	140290	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.670E+00	1.000E+00	1.000E+00
1	140300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.100E+00	1.000E+00	1.000E+00
1	140310	1	9.439E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.960E-01	0.000E+00	2.000E-08	1.000E-04
1	140320	1	5.430E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.880E-02	0.000E+00	1.000E-10	3.000E-06
1	150310	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	150320	1	1.232E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.949E-01	0.000E+00	2.000E-09	2.000E-05
1	150330	1	2.189E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.640E-02	0.000E+00	1.000E-10	3.000E-06
1	150340	1	1.243E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.640E+00	0.000E+00	3.000E-08	1.000E+00
1	160320	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.502E+01	1.000E+00	1.000E+00
1	160330	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.500E-01	1.000E+00	1.000E+00

1	160340	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.213E+00	1.000E+00	1.000E+00
1	160350	1	7.561E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.863E-02	0.000E+00	9.000E-09	6.000E-05
1	160360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.700E-02	1.000E+00	1.000E+00
1	160370	1	3.030E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.731E+00	0.000E+00	3.000E-08	1.000E+00
1	170350	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.577E+01	1.000E+00	1.000E+00
1	170360	1	9.499E+12	0.000E+00	1.900E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.465E-01	0.000E+00	8.000E-10	6.000E-05
1	170370	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.423E+01	1.000E+00	1.000E+00
1	170380	1	2.234E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.970E+00	0.000E+00	7.000E-08	4.000E-04
1	170381	1	7.150E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	6.710E-01	0.000E+00	3.000E-08	1.000E+00
1	180360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.370E-01	1.000E+00	1.000E+00
1	180370	1	3.028E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.353E-03	0.000E+00	1.000E-04	1.000E+00
1	180380	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.300E-02	1.000E+00	1.000E+00
1	180390	1	8.489E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.188E-01	0.000E+00	1.000E-10	3.000E-06
1	180400	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.960E+01	1.000E+00	1.000E+00
1	180410	1	6.577E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.747E+00	0.000E+00	4.000E-08	1.000E+00
1	180420	1	1.038E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.330E-01	0.000E+00	1.000E-10	3.000E-06
1	190390	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.326E+01	1.000E+00	1.000E+00
1	190400	1	4.030E+16	0.000E+00	1.067E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.336E-01	1.200E-02	1.000E-10	3.000E-06
1	190410	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.730E+00	1.000E+00	1.000E+00
1	190420	1	4.450E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.715E+00	0.000E+00	4.000E-09	2.000E-05
1	190430	1	8.030E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.269E+00	0.000E+00	1.000E-10	3.000E-06
1	190440	1	1.328E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.840E+00	0.000E+00	3.000E-08	1.000E+00
1	200400	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.694E+01	1.000E+00	1.000E+00
1	200410	1	3.250E+12	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.993E-03	0.000E+00	1.000E-10	3.000E-06
1	200420	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.465E-01	1.000E+00	1.000E+00
1	200430	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.300E-01	1.000E+00	1.000E+00
1	200440	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.090E+00	1.000E+00	1.000E+00
1	200450	1	1.415E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.710E-02	0.000E+00	1.000E-09	9.000E-06
1	200460	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.500E-03	1.000E+00	1.000E+00
1	200470	1	3.919E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.401E+00	0.000E+00	6.000E-09	3.000E-05
1	200480	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.900E-01	1.000E+00	1.000E+00
1	200490	1	5.229E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	4.040E+00	0.000E+00	3.000E-08	1.000E+00
1	210450	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	210460	1	7.241E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.122E+00	0.000E+00	8.000E-10	4.000E-05
1	210461	1	1.875E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.427E-01	0.000E+00	3.000E-08	1.000E+00
1	210470	1	2.890E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.708E-01	0.000E+00	2.000E-08	9.000E-05
1	210480	1	1.573E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.576E+00	0.000E+00	5.000E-09	3.000E-05
1	210490	1	3.432E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.190E-01	0.000E+00	3.000E-08	1.000E+00
1	210500	1	1.025E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.838E+00	0.000E+00	3.000E-08	1.000E+00
1	220460	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.250E+00	1.000E+00	1.000E+00
1	220470	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.450E+00	1.000E+00	1.000E+00
1	220480	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.370E+01	1.000E+00	1.000E+00
1	220490	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.400E+00	1.000E+00	1.000E+00
1	220500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.200E+00	1.000E+00	1.000E+00
1	220510	1	3.456E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.238E+00	0.000E+00	3.000E-08	1.000E+00
1	230490	1	2.920E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.426E-03	0.000E+00	1.000E-10	3.000E-06
1	230500	1	4.400E+24	0.000E+00	7.000E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.293E+00	2.500E-01	1.000E-10	3.000E-06
1	230510	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.975E+01	1.000E+00	1.000E+00
1	230520	1	2.250E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.514E+00	0.000E+00	3.000E-08	1.000E+00
1	230530	1	9.660E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.047E+00	0.000E+00	3.000E-08	1.000E+00
1	230540	1	4.980E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.380E+00	0.000E+00	3.000E-08	1.000E+00
1	240500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.350E+00	1.000E+00	1.000E+00
1	240510	1	2.394E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.716E-02	0.000E+00	8.000E-08	2.000E-03
1	240520	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.379E+01	1.000E+00	1.000E+00
1	240530	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.500E+00	1.000E+00	1.000E+00
1	240540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.360E+00	1.000E+00	1.000E+00
1	240550	1	2.098E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.102E+00	0.000E+00	3.000E-08	1.000E+00
1	250540	1	2.697E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.401E-01	0.000E+00	1.000E-09	1.000E-04
1	250550	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	250560	1	9.283E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.523E+00	0.000E+00	2.000E-08	1.000E-04
1	250570	1	8.720E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.203E+00	0.000E+00	3.000E-08	1.000E+00
1	250580	1	6.530E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.100E+00	0.000E+00	3.000E-08	1.000E+00
1	260540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.810E+00	1.000E+00	1.000E+00

1	260550	1	8.615E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.734E-03	0.000E+00	3.000E-08	8.000E-04
1	260560	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.175E+01	1.000E+00	1.000E+00
1	260570	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.150E+00	1.000E+00	1.000E+00
1	260580	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.900E-01	1.000E+00	1.000E+00
1	260590	1	3.845E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.306E+00	0.000E+00	2.000E-09	5.000E-05
1	270581	1	3.290E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.287E-02	0.000E+00	3.000E-07	2.000E-03
1	270580	1	6.127E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.010E+00	0.000E+00	2.000E-09	9.000E-05
1	270590	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	270600	1	1.662E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.601E+00	0.000E+00	3.000E-10	3.000E-05
1	270601	1	6.282E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.976E-01
1			0.000E+00	0.000E+00	6.460E-02	0.000E+00	3.000E-08	1.000E+00
1	270610	1	5.940E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.636E-01	0.000E+00	3.000E-08	1.000E+00
1	270620	1	9.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.240E+00	0.000E+00	3.000E-08	1.000E+00
1	280580	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.827E+01	1.000E+00	1.000E+00
1	280590	1	2.397E+12	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.360E-03	0.000E+00	2.000E-08	2.000E-04
1	280600	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.610E+01	1.000E+00	1.000E+00
1	280610	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.130E+00	1.000E+00	1.000E+00
1	280620	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.590E+00	1.000E+00	1.000E+00
1	280630	1	3.154E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.714E-02	0.000E+00	2.000E-09	3.000E-05
1	280640	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.100E-01	1.000E+00	1.000E+00
1	280650	1	9.072E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.184E+00	0.000E+00	2.000E-08	1.000E-04
1	280660	1	1.966E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.500E-02	0.000E+00	1.000E-10	3.000E-06
1	290620	1	5.844E+02	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.283E+00	0.000E+00	3.000E-08	1.000E+00
1	290630	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.920E+01	1.000E+00	1.000E+00
1	290640	1	4.572E+04	0.000E+00	6.290E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.131E-01	0.000E+00	4.000E-08	2.000E-04
1	290650	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.080E+01	1.000E+00	1.000E+00
1	290660	1	3.060E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.154E+00	0.000E+00	3.000E-08	1.000E+00
1	290670	1	2.226E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.710E-01	0.000E+00	1.000E-10	3.000E-06
1	300630	1	2.286E+03	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.021E+00	0.000E+00	3.000E-08	1.000E+00
1	300640	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.860E+01	1.000E+00	1.000E+00
1	300650	1	2.107E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.899E-01	0.000E+00	2.000E-09	1.000E-04
1	300660	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.790E+01	1.000E+00	1.000E+00
1	300670	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	0.000E+00	4.100E+00	1.000E+00	1.000E+00
1	300680	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.878E+01	1.000E+00	1.000E+00
1	300690	1	3.380E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.214E-01	0.000E+00	2.000E-07	2.000E-03
1	300691	1	4.954E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.997E-01
1			0.000E+00	0.000E+00	4.381E-01	0.000E+00	1.000E-08	6.000E-05
1	300700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.200E-01	1.000E+00	1.000E+00
1	300710	1	1.470E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.363E+00	0.000E+00	3.000E-08	1.000E+00
1	300711	1	1.426E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.097E+00	0.000E+00	1.000E-10	3.000E-06
1	310690	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.010E+01	1.000E+00	1.000E+00
1	310700	1	1.268E+03	0.000E+00	4.100E-03	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.513E-01	0.000E+00	3.000E-08	1.000E+00
1	310710	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.990E+01	1.000E+00	1.000E+00
1	310720	1	5.076E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.206E+00	0.000E+00	6.000E-09	4.000E-05
1	310721	1	3.700E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.192E-01	0.000E+00	3.000E-08	1.000E+00
1	320700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.050E+01	1.000E+00	1.000E+00
1	320710	1	9.880E+05	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.990E-03	0.000E+00	2.000E-07	2.000E-03
1	320711	1	2.040E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.811E-01	0.000E+00	3.000E-08	1.000E+00
1	320720	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.740E+01	1.000E+00	1.000E+00
1	320730	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.800E+00	1.000E+00	1.000E+00
1	320740	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.650E+01	1.000E+00	1.000E+00
1	320750	1	4.967E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.561E-01	0.000E+00	3.000E-08	1.000E+00
1	320751	1	4.770E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.997E-01
1			0.000E+00	0.000E+00	1.359E-01	0.000E+00	3.000E-08	1.000E+00
1	320760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.800E+00	1.000E+00	1.000E+00
1	320770	1	4.068E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.684E+00	0.000E+00	1.000E-10	3.000E-06
1	320771	1	5.290E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
1			0.000E+00	0.000E+00	1.013E+00	0.000E+00	3.000E-08	1.000E+00
1	330750	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	330760	1	9.475E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.483E+00	0.000E+00	3.000E-09	2.000E-05
1	330770	1	1.398E+05	3.200E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.336E-01	0.000E+00	1.000E-10	3.000E-06
1	340740	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.700E-01	1.000E+00	1.000E+00
1	340750	1	1.035E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.065E-01	0.000E+00	4.000E-09	3.000E-04
1	340760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.030E+00	1.000E+00	1.000E+00
1	340770	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.600E+00	1.000E+00	1.000E+00
1	340771	1	1.745E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.592E-01	0.000E+00	3.000E-08	1.000E+00
1	340780	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.350E+01	1.000E+00	1.000E+00

1	340790	1	2.050E+13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.290E-02	0.000E+00	1.000E-10	3.000E-06
1	340791	1	2.346E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	9.370E-02	0.000E+00	3.000E-08	1.000E+00
1	340800	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.980E+01	1.000E+00	1.000E+00
1	340810	1	1.107E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.180E-01	0.000E+00	3.000E-08	1.000E+00
1	340811	1	3.435E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.995E-01
1			0.000E+00	0.000E+00	9.990E-02	0.000E+00	3.000E-08	1.000E+00
1	340820	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.200E+00	1.000E+00	1.000E+00
1	340830	1	1.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.050E+00	0.000E+00	3.000E-08	1.000E+00
1	340831	1	7.010E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.227E+00	0.000E+00	3.000E-08	1.000E+00
1	350790	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.069E+01	1.000E+00	1.000E+00
1	350800	1	1.061E+03	0.000E+00	8.300E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.010E-01	0.000E+00	3.000E-08	1.000E+00
1	350801	1	1.591E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	8.470E-02	0.000E+00	1.000E-10	3.000E-06
1	350810	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.931E+01	1.000E+00	1.000E+00
1	350820	1	1.271E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.783E+00	0.000E+00	6.000E-09	4.000E-05
1	350821	1	3.678E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.760E-01
1			0.000E+00	0.000E+00	7.810E-02	0.000E+00	3.000E-08	1.000E+00
1	350830	1	8.640E+03	9.998E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.325E-01	0.000E+00	1.000E-10	3.000E-06
1	360780	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.500E-01	1.000E+00	1.000E+00
1	360790	1	1.261E+05	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.811E-01	0.000E+00	1.000E-10	3.000E-06
1	360791	1	5.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.259E-01	0.000E+00	3.000E-08	1.000E+00
1	360800	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.250E+00	1.000E+00	1.000E+00
1	360810	1	6.722E+12	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.194E-02	0.000E+00	1.000E-10	3.000E-06
1	360811	1	1.300E+01	0.000E+00	6.400E-05	0.000E+00	0.000E+00	9.999E-01
1			0.000E+00	0.000E+00	1.867E-01	0.000E+00	3.000E-08	1.000E+00
1	360820	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.160E+01	1.000E+00	1.000E+00
1	360830	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.150E+01	1.000E+00	1.000E+00
1	360831	1	6.588E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	3.812E-02	0.000E+00	3.000E-08	1.000E+00
1	360840	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.700E+01	1.000E+00	1.000E+00
1	360850	1	3.383E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.530E-01	0.000E+00	3.000E-07	1.000E+00
1	360851	1	1.613E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
1			0.000E+00	0.000E+00	4.121E-01	0.000E+00	1.000E-07	1.000E+00
1	360860	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.730E+01	1.000E+00	1.000E+00
1	360870	1	4.579E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.123E+00	0.000E+00	2.000E-08	1.000E+00
1	360880	1	1.022E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.322E+00	0.000E+00	2.000E-08	1.000E+00
1	370850	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.217E+01	1.000E+00	1.000E+00
1	370860	1	1.610E+06	0.000E+00	5.200E-05	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	7.613E-01	0.000E+00	2.000E-09	2.000E-05
1	370861	1	6.102E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	5.560E-01	0.000E+00	3.000E-08	1.000E+00
1	370870	1	1.515E+18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.170E-02	2.783E+01	2.000E-09	1.000E-04
1	370880	1	1.067E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.709E+00	0.000E+00	3.000E-08	1.000E+00
1	370890	1	9.120E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.088E+00	0.000E+00	3.000E-08	1.000E+00
1	380840	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.600E-01	1.000E+00	1.000E+00
1	380850	1	5.602E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.271E-01	0.000E+00	4.000E-09	1.000E-04
1	380851	1	4.060E+03	0.000E+00	1.270E-01	0.000E+00	0.000E+00	8.730E-01
1			0.000E+00	0.000E+00	2.286E-01	0.000E+00	1.000E-06	7.000E-03
1	380860	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.840E+00	1.000E+00	1.000E+00
1	380870	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.000E+00	1.000E+00	1.000E+00
1	380871	1	1.012E+04	0.000E+00	3.000E-03	0.000E+00	0.000E+00	9.970E-01
1			0.000E+00	0.000E+00	3.859E-01	0.000E+00	1.000E-10	3.000E-06
1	380880	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.260E+01	1.000E+00	1.000E+00
1	380890	1	4.368E+06	9.300E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.833E-01	0.000E+00	3.000E-10	3.000E-06
1	380900	1	9.076E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.959E-01	0.000E+00	3.000E-11	3.000E-07
1	380910	1	3.427E+04	5.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.347E+00	0.000E+00	9.000E-09	5.000E-05
1	380930	1	4.454E+02	3.460E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.090E+00	0.000E+00	3.000E-08	1.000E+00
1	390890	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	390891	1	1.606E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	9.090E-01	0.000E+00	3.000E-08	1.000E+00
1	390900	1	2.307E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.340E-01	0.000E+00	3.000E-09	2.000E-05
1	390901	1	1.148E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	6.801E-01	0.000E+00	1.000E-10	3.000E-06
1	390910	1	5.055E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.070E-01	0.000E+00	1.000E-09	3.000E-05
1	390920	1	1.274E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.689E+00	0.000E+00	1.000E-08	6.000E-05
1	390930	1	3.636E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.260E+00	0.000E+00	5.000E-09	3.000E-05
1	390940	1	1.122E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.587E+00	0.000E+00	3.000E-08	1.000E+00
1	390960	1	5.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.435E+00	0.000E+00	3.000E-08	1.000E+00
1	400890	1	2.824E+05	0.000E+00	1.300E-03	9.987E-01	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.505E-01	0.000E+00	1.000E-10	3.000E-06
1	400900	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.150E+01	1.000E+00	1.000E+00
1	400910	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.120E+01	1.000E+00	1.000E+00
1	400920	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.710E+01	1.000E+00	1.000E+00
1	400930	1	4.730E+13	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.900E-02	0.000E+00	4.000E-09	8.000E-04
1	400940	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.740E+01	1.000E+00	1.000E+00
1	400950	1	5.531E+06	1.110E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.504E-01	0.000E+00	1.000E-09	6.000E-05

1	400960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.800E+00	1.000E+00	1.000E+00
1	400970	1	6.084E+04	9.480E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.860E-01	0.000E+00	3.000E-09	2.000E-05
1	410910	1	2.146E+10	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.713E-02	0.000E+00	1.000E-10	3.000E-06
1	410920	1	1.104E+15	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.513E+00	0.000E+00	1.000E-10	3.000E-06
1	410930	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	410931	1	5.077E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.898E-02	0.000E+00	4.000E-09	4.000E-04
1	410940	1	6.406E+11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.717E+00	0.000E+00	1.000E-10	3.000E-06
1	410950	1	3.021E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.089E-01	0.000E+00	3.000E-09	1.000E-04
1	410951	1	3.119E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.440E-01
1			0.000E+00	0.000E+00	2.386E-01	0.000E+00	1.000E-10	3.000E-06
1	410960	1	8.406E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.716E+00	0.000E+00	1.000E-10	3.000E-06
1	410970	1	4.326E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.134E+00	0.000E+00	2.000E-07	9.000E-04
1	410971	1	6.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	7.428E-01	0.000E+00	3.000E-08	1.000E+00
1	410980	1	2.860E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.656E+00	0.000E+00	3.000E-08	1.000E+00
1	411000	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.197E+00	0.000E+00	3.000E-08	1.000E+00
1	420920	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.480E+01	1.000E+00	1.000E+00
1	420931	1	2.500E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.426E+00	0.000E+00	1.000E-10	3.000E-06
1	420930	1	1.104E+11	0.000E+00	1.800E-01	8.200E-01	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.600E-02	0.000E+00	1.000E-10	3.000E-06
1	420940	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.300E+00	1.000E+00	1.000E+00
1	420950	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.590E+01	1.000E+00	1.000E+00
1	420960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.670E+01	1.000E+00	1.000E+00
1	420970	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.600E+00	1.000E+00	1.000E+00
1	420980	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.410E+01	1.000E+00	1.000E+00
1	420990	1	2.374E+05	8.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.756E-01	0.000E+00	7.000E-09	4.000E-05
1	421000	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.600E+00	1.000E+00	1.000E+00
1	421010	1	8.760E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.032E+00	0.000E+00	3.000E-08	1.000E+00
1	430970	1	8.205E+13	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.677E-02	0.000E+00	1.000E-08	8.000E-04
1	430971	1	7.819E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	9.230E-02	0.000E+00	5.000E-09	2.000E-04
1	430980	1	1.325E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.517E+00	0.000E+00	1.000E-10	3.000E-06
1	430990	1	6.717E+12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.460E-02	0.000E+00	2.000E-09	2.000E-04
1	431000	1	1.580E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.398E+00	0.000E+00	3.000E-08	1.000E+00
1	431010	1	8.520E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.130E-01	0.000E+00	3.000E-08	1.000E+00
1	440960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	0.000E+00	5.500E+00	1.000E+00	1.000E+00
1	440970	1	2.506E+05	0.000E+00	9.996E-01	3.800E-04	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.527E-01	0.000E+00	6.000E-08	3.000E-04
1	440980	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.900E+00	1.000E+00	1.000E+00
1	440990	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.270E+01	1.000E+00	1.000E+00
1	441000	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.260E+01	1.000E+00	1.000E+00
1	441010	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.700E+01	1.000E+00	1.000E+00
1	441020	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.160E+01	1.000E+00	1.000E+00
1	441030	1	3.392E+06	9.973E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.616E-01	0.000E+00	3.000E-09	8.000E-05
1	441040	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.870E+01	1.000E+00	1.000E+00
1	441050	1	1.598E+04	2.840E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.150E+00	0.000E+00	2.000E-08	1.000E-04
1	441060	1	3.217E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.003E-02	0.000E+00	2.000E-10	1.000E-05
1	441070	1	2.250E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.652E+00	0.000E+00	3.000E-08	1.000E+00
1	451020	1	9.152E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.165E+00	0.000E+00	1.000E-10	3.000E-06
1	451030	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	451040	1	4.230E+01	0.000E+00	4.500E-03	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.990E-01	0.000E+00	3.000E-08	1.000E+00
1	451041	1	2.604E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.987E-01
1			0.000E+00	0.000E+00	1.268E-01	0.000E+00	3.000E-08	1.000E+00
1	451050	1	1.273E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.302E-01	0.000E+00	2.000E-08	1.000E-04
1	451051	1	4.500E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.253E-01	0.000E+00	3.000E-08	1.000E+00
1	451060	1	2.980E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.617E+00	0.000E+00	3.000E-08	1.000E+00
1	451061	1	7.800E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.173E+00	0.000E+00	1.000E-10	3.000E-06
1	451070	1	1.302E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.500E-01	0.000E+00	3.000E-08	1.000E+00
1	461020	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+00	1.000E+00	1.000E+00
1	461030	1	1.468E+06	0.000E+00	2.500E-04	9.998E-01	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.952E-02	0.000E+00	3.000E-08	3.000E-04
1	461040	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.100E+01	1.000E+00	1.000E+00
1	461050	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.220E+01	1.000E+00	1.000E+00
1	461060	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.730E+01	1.000E+00	1.000E+00
1	461070	1	2.051E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.300E-03	0.000E+00	1.000E-10	3.000E-06
1	461071	1	2.130E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.131E-01	0.000E+00	3.000E-08	1.000E+00
1	461080	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.670E+01	1.000E+00	1.000E+00
1	461090	1	4.932E+04	9.995E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.614E-01	0.000E+00	1.000E-08	7.000E-05
1	461091	1	2.814E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.837E-01	0.000E+00	3.000E-08	1.000E+00
1	461100	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.180E+01	1.000E+00	1.000E+00

1	461110	1	1.404E+03	9.926E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.779E-01	0.000E+00	3.000E-08	1.000E+00
1	461111	1	1.980E+04	1.960E-01	0.000E+00	0.000E+00	0.000E+00	7.300E-01
1			0.000E+00	0.000E+00	5.450E-01	0.000E+00	1.000E-10	3.000E-06
1	471060	1	1.440E+03	0.000E+00	9.900E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.946E-01	0.000E+00	1.000E-10	3.000E-06
1	471070	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.183E+01	1.000E+00	1.000E+00
1	471080	1	1.422E+02	0.000E+00	2.850E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.284E-01	0.000E+00	3.000E-08	1.000E+00
1	471081	1	4.008E+09	0.000E+00	9.130E-01	0.000E+00	0.000E+00	8.700E-02
1			0.000E+00	0.000E+00	1.636E+00	0.000E+00	1.000E-10	3.000E-06
1	471090	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.817E+01	1.000E+00	1.000E+00
1	471091	1	3.960E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	8.460E-02	0.000E+00	3.000E-08	1.000E+00
1	471100	1	2.460E+01	0.000E+00	3.000E-03	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.212E+00	0.000E+00	3.000E-08	1.000E+00
1	471101	1	2.158E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.360E-02
1			0.000E+00	0.000E+00	2.813E+00	0.000E+00	3.000E-10	3.000E-05
1	471110	1	6.437E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.810E-01	0.000E+00	8.000E-09	4.000E-05
1	471111	1	6.480E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.930E-01
1			0.000E+00	0.000E+00	6.160E-02	0.000E+00	3.000E-08	1.000E+00
1	471120	1	1.130E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.086E+00	0.000E+00	1.000E-10	3.000E-06
1	481060	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.300E+00	1.000E+00	1.000E+00
1	481070	1	2.340E+04	0.000E+00	6.400E-04	9.994E-01	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.620E-02	0.000E+00	1.000E-10	3.000E-06
1	481080	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.900E-01	1.000E+00	1.000E+00
1	481090	1	3.997E+07	0.000E+00	0.000E+00	1.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.971E-02	0.000E+00	2.000E-09	4.000E-05
1	481100	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.250E+01	1.000E+00	1.000E+00
1	481110	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.280E+01	1.000E+00	1.000E+00
1	481111	1	2.916E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	3.870E-01	0.000E+00	3.000E-08	1.000E+00
1	481120	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.411E+01	1.000E+00	1.000E+00
1	481130	1	2.935E+23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.130E-02	1.220E+01	1.000E+00	1.000E+00
3	481131	1	4.447E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.400E-03
3			0.000E+00	0.000E+00	1.835E-01	0.000E+00	1.000E-10	3.000E-06
1	481140	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.870E+01	1.000E+00	1.000E+00
1	481150	1	1.925E+05	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.101E-01	0.000E+00	6.000E-09	3.000E-05
1	481151	1	3.853E+06	1.100E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.360E-01	0.000E+00	1.000E-09	3.000E-05
1	481160	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.500E+00	1.000E+00	1.000E+00
1	481170	1	8.964E+03	9.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.510E+00	0.000E+00	1.000E-10	3.000E-06
1	481171	1	1.210E+04	1.500E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.235E+00	0.000E+00	1.000E-10	3.000E-06
1	481190	1	1.614E+02	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.472E+00	0.000E+00	3.000E-08	1.000E+00
1	481210	1	1.350E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.179E+00	0.000E+00	3.000E-08	1.000E+00
1	491130	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	0.000E+00	4.300E+00	1.000E+00	1.000E+00
1	491131	1	5.969E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	3.870E-01	0.000E+00	2.000E-07	1.000E-03
1	491140	1	7.190E+01	0.000E+00	5.000E-03	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.753E-01	0.000E+00	3.000E-08	1.000E+00
1	491141	1	4.278E+06	0.000E+00	4.300E-02	0.000E+00	0.000E+00	9.570E-01
1			0.000E+00	0.000E+00	2.360E-01	0.000E+00	7.000E-10	2.000E-05
1	491150	1	1.392E+22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.530E-01	9.570E+01	1.000E-09	9.000E-05
1	491160	1	1.410E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.384E+00	0.000E+00	3.000E-08	1.000E+00
1	491161	1	3.249E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.784E+00	0.000E+00	3.000E-08	1.000E+00
1	491170	1	2.628E+03	3.200E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.542E-01	0.000E+00	3.000E-08	1.000E+00
1	491171	1	6.990E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.710E-01
1			0.000E+00	0.000E+00	5.220E-01	0.000E+00	3.000E-08	1.000E+00
1	491180	1	5.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.848E+00	0.000E+00	3.000E-08	1.000E+00
1	491190	1	1.440E+02	9.300E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.370E+00	0.000E+00	3.000E-08	1.000E+00
1	491191	1	1.080E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.500E-02
1			0.000E+00	0.000E+00	1.107E+00	0.000E+00	3.000E-08	1.000E+00
1	491200	1	3.080E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.759E+00	0.000E+00	3.000E-08	1.000E+00
1	491201	1	4.620E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.922E+00	0.000E+00	3.000E-08	1.000E+00
1	491210	1	2.310E+01	1.130E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.912E+00	0.000E+00	3.000E-08	1.000E+00
1	501120	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+00	1.000E+00	1.000E+00
1	501130	1	9.944E+06	0.000E+00	4.000E-08	1.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.802E-02	0.000E+00	2.000E-09	8.000E-05
1	501131	1	1.284E+03	0.000E+00	8.900E-02	0.000E+00	0.000E+00	9.110E-01
1			0.000E+00	0.000E+00	6.520E-02	0.000E+00	3.000E-08	1.000E+00
1	501140	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.700E-01	1.000E+00	1.000E+00
1	501150	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.800E-01	1.000E+00	1.000E+00
1	501160	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.470E+01	1.000E+00	1.000E+00
1	501170	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.750E+00	1.000E+00	1.000E+00
1	501171	1	1.175E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	3.135E-01	0.000E+00	1.000E-10	3.000E-06
1	501180	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.430E+01	1.000E+00	1.000E+00
1	501190	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.600E+00	1.000E+00	1.000E+00
1	501191	1	2.532E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	8.733E-02	0.000E+00	1.000E-10	3.000E-06
1	501200	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.240E+01	1.000E+00	1.000E+00
1	501210	1	9.742E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.152E-01	0.000E+00	1.000E-10	3.000E-06
1	501211	1	1.736E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.760E-01
1			0.000E+00	0.000E+00	3.900E-02	0.000E+00	1.000E-10	3.000E-06
1	501220	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.600E+00	1.000E+00	1.000E+00
1	501230	1	1.116E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.272E-01	0.000E+00	1.000E-10	3.000E-06
1	501231	1	2.405E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.195E-01	0.000E+00	3.000E-08	1.000E+00

1	501240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.600E+00	1.000E+00	1.000E+00
1	501250	1	8.329E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.123E+00	0.000E+00	3.000E-09	2.000E-05
1	501251	1	5.712E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.162E+00	0.000E+00	3.000E-08	1.000E+00
1	511210	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.730E+01	1.000E+00	1.000E+00
1	511220	1	2.333E+05	0.000E+00	2.400E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.002E+00	0.000E+00	5.000E-09	3.000E-05
1	511221	1	2.526E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.600E-01	0.000E+00	3.000E-08	1.000E+00
1	511230	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.270E+01	1.000E+00	1.000E+00
1	511240	1	5.201E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.236E+00	0.000E+00	7.000E-10	2.000E-05
1	511241	1	9.300E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.500E-01
1			0.000E+00	0.000E+00	5.570E-01	0.000E+00	3.000E-08	1.000E+00
1	511250	1	8.698E+07	2.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.333E-01	0.000E+00	9.000E-10	1.000E-04
1	511260	1	1.071E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.119E+00	0.000E+00	1.000E-10	3.000E-06
1	511261	1	1.140E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.400E-01
1			0.000E+00	0.000E+00	2.186E+00	0.000E+00	3.000E-08	1.000E+00
1	521200	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.100E-02	1.000E+00	1.000E+00
1	521210	1	1.450E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.856E-01	0.000E+00	1.000E-10	3.000E-06
1	521211	1	1.331E+07	0.000E+00	1.140E-01	0.000E+00	0.000E+00	8.860E-01
1			0.000E+00	0.000E+00	2.912E-01	0.000E+00	1.000E-10	3.000E-06
1	521220	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.500E+00	1.000E+00	1.000E+00
1	521230	1	3.913E+20	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.688E-02	8.890E-01	1.000E-10	3.000E-06
1	521231	1	1.034E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.460E-01	0.000E+00	1.000E-10	3.000E-06
1	521240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.620E+00	1.000E+00	1.000E+00
1	521250	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.000E+00	1.000E+00	1.000E+00
1	521251	1	5.011E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.420E-01	0.000E+00	4.000E-09	1.000E-04
1	521260	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.870E+01	1.000E+00	1.000E+00
1	521270	1	3.366E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.292E-01	0.000E+00	3.000E-08	2.000E-04
1	521271	1	9.418E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.760E-01
1			0.000E+00	0.000E+00	9.030E-02	0.000E+00	1.000E-09	5.000E-05
1	521280	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.170E+01	1.000E+00	1.000E+00
1	521290	1	4.176E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.000E-01	0.000E+00	1.000E-07	8.000E-04
1	521291	1	2.903E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.400E-01
1			0.000E+00	0.000E+00	3.070E-01	0.000E+00	1.000E-09	2.000E-05
1	521300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.450E+01	1.000E+00	1.000E+00
1	521310	1	1.500E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.142E+00	0.000E+00	3.000E-08	1.000E+00
1	521311	1	1.080E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.220E-01
1			0.000E+00	0.000E+00	1.612E+00	0.000E+00	6.000E-09	4.000E-05
1	531250	1	5.196E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.880E-02	0.000E+00	8.000E-11	2.000E-07
1	531260	1	1.125E+06	0.000E+00	5.630E-01	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	6.100E-01	0.000E+00	9.000E-11	3.000E-07
1	531270	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	531280	1	1.499E+03	0.000E+00	6.900E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.290E-01	0.000E+00	3.000E-08	1.000E+00
1	531290	1	4.951E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.890E-02	0.000E+00	2.000E-11	6.000E-08
1	531300	1	4.450E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.428E+00	0.000E+00	1.000E-10	3.000E-06
1	531301	1	5.400E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.400E-01
1			0.000E+00	0.000E+00	2.880E-01	0.000E+00	3.000E-08	1.000E+00
1	531310	1	6.947E+05	1.086E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.735E-01	0.000E+00	1.000E-10	3.000E-07
1	531320	1	8.222E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.778E+00	0.000E+00	3.000E-09	8.000E-06
1	541240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E-01	1.000E+00	1.000E+00
1	541250	1	6.084E+04	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.004E-01	0.000E+00	1.000E-10	3.000E-06
1	541251	1	5.700E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.469E-01	0.000E+00	3.000E-08	1.000E+00
1	541260	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.000E-02	1.000E+00	1.000E+00
1	541270	1	3.145E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.106E-01	0.000E+00	1.000E-10	3.000E-06
1	541271	1	6.920E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.930E-01	0.000E+00	3.000E-08	1.000E+00
1	541280	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.910E+00	1.000E+00	1.000E+00
1	541290	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.640E+01	1.000E+00	1.000E+00
1	541291	1	7.681E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.267E-01	0.000E+00	1.000E-10	3.000E-06
1	541300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.100E+00	1.000E+00	1.000E+00
1	541310	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.120E+01	1.000E+00	1.000E+00
1	541311	1	1.028E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.621E-01	0.000E+00	4.000E-07	1.000E+00
1	541320	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.690E+01	1.000E+00	1.000E+00
1	541330	1	4.530E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.835E-01	0.000E+00	3.000E-07	1.000E+00
1	541331	1	1.892E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.253E-01	0.000E+00	3.000E-07	1.000E+00
1	541340	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.040E+01	1.000E+00	1.000E+00
1	541350	1	3.290E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.668E-01	0.000E+00	1.000E-07	1.000E+00
1	541351	1	9.174E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	5.230E-01	0.000E+00	3.000E-08	1.000E+00
1	541360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.900E+00	1.000E+00	1.000E+00
1	541370	1	2.291E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.888E+00	0.000E+00	3.000E-08	1.000E+00
1	551310	1	8.372E+05	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.789E-02	0.000E+00	1.000E-07	9.000E-04
1	551320	1	5.598E+05	0.000E+00	9.813E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.278E-01	0.000E+00	1.000E-10	3.000E-06
1	551330	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	551340	1	6.512E+07	0.000E+00	3.000E-06	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.720E+00	0.000E+00	4.000E-10	9.000E-06

1	551341	1	1.048E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.314E-01	0.000E+00	2.000E-07	1.000E-03
1	551350	1	7.258E+13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.630E-02	0.000E+00	3.000E-09	1.000E-04
1	551360	1	1.137E+06	1.120E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.051E+00	0.000E+00	6.000E-09	6.000E-05
1	551370	1	9.483E+08	9.443E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.875E-01	0.000E+00	5.000E-10	2.000E-05
1	551380	1	1.932E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.604E+00	0.000E+00	3.000E-08	1.000E+00
1	561300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.100E-01	1.000E+00	1.000E+00
1	561310	1	1.020E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.023E-01	0.000E+00	1.000E-08	3.000E-05
1	561311	1	8.760E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.870E-01	0.000E+00	3.000E-08	1.000E+00
1	561320	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E-01	1.000E+00	1.000E+00
1	561330	1	3.320E+08	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.553E-01	0.000E+00	1.000E-10	3.000E-06
1	561331	1	1.400E+05	0.000E+00	9.600E-05	0.000E+00	0.000E+00	9.999E-01
1			0.000E+00	0.000E+00	2.849E-01	0.000E+00	1.000E-10	3.000E-06
1	561340	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.400E+00	1.000E+00	1.000E+00
1	561350	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.590E+00	1.000E+00	1.000E+00
1	561351	1	1.033E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.595E-01	0.000E+00	1.000E-10	3.000E-06
1	561360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.900E+00	1.000E+00	1.000E+00
1	561361	1	3.084E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.030E+00	0.000E+00	3.000E-08	1.000E+00
1	561370	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.120E+01	1.000E+00	1.000E+00
1	561371	1	1.531E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	6.628E-01	0.000E+00	3.000E-08	1.000E+00
1	561380	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.170E+01	1.000E+00	1.000E+00
1	561390	1	5.078E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.425E-01	0.000E+00	3.000E-08	1.000E+00
1	561400	1	1.102E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.930E-01	0.000E+00	1.000E-09	2.000E-05
1	561410	1	1.096E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.730E+00	0.000E+00	3.000E-08	1.000E+00
1	571370	1	1.893E+12	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.048E-02	0.000E+00	1.000E-10	3.000E-06
1	571380	1	3.314E+18	0.000E+00	6.640E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.262E+00	8.900E-02	1.000E-10	3.000E-06
1	571390	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.991E+01	1.000E+00	1.000E+00
1	571400	1	1.450E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.832E+00	0.000E+00	4.000E-09	2.000E-05
1	571410	1	1.411E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.938E-01	0.000E+00	1.000E-10	3.000E-06
1	581360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.900E-01	1.000E+00	1.000E+00
1	581370	1	3.240E+04	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.030E-02	0.000E+00	1.000E-10	3.000E-06
1	581371	1	1.238E+05	0.000E+00	1.000E-02	0.000E+00	0.000E+00	9.900E-01
1			0.000E+00	0.000E+00	2.584E-01	0.000E+00	1.000E-10	3.000E-06
1	581380	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.500E-01	1.000E+00	1.000E+00
1	581390	1	1.189E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	2.480E-01	0.000E+00	1.000E-10	3.000E-06
1	581391	1	5.480E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	7.514E-01	0.000E+00	3.000E-08	1.000E+00
1	581400	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.848E+01	1.000E+00	1.000E+00
1	581410	1	2.808E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.469E-01	0.000E+00	5.000E-09	9.000E-05
1	581420	1	3.311E+18	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.108E+01	2.000E-14	3.000E-08
1	581430	1	1.188E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.090E-01	0.000E+00	7.000E-09	4.000E-05
1	581440	1	2.462E+07	1.400E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.104E-01	0.000E+00	2.000E-10	1.000E-05
1	581450	1	1.806E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.536E+00	0.000E+00	3.000E-08	1.000E+00
1	591410	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	591420	1	6.883E+04	0.000E+00	1.640E-04	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.676E-01	0.000E+00	5.000E-09	3.000E-05
1	591421	1	8.760E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.550E-03	0.000E+00	3.000E-08	1.000E+00
1	591430	1	1.172E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.153E-01	0.000E+00	6.000E-09	5.000E-09
1	591440	1	1.037E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.238E+00	0.000E+00	3.000E-08	1.000E+00
1	591450	1	2.154E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.956E-01	0.000E+00	1.000E-10	3.000E-06
1	601420	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.720E+01	1.000E+00	1.000E+00
1	601430	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.220E+01	1.000E+00	1.000E+00
1	601440	1	6.600E+22	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.910E+00	2.380E+01	3.000E-12	7.000E-05
1	601450	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	8.300E+00	1.000E+00	1.000E+00
1	601460	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.720E+01	1.000E+00	1.000E+00
1	601470	1	9.487E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.083E-01	0.000E+00	8.000E-09	6.000E-05
1	601480	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.700E+00	1.000E+00	1.000E+00
1	601490	1	6.210E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.710E-01	0.000E+00	5.000E-08	3.000E-04
1	601500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.600E+00	1.000E+00	1.000E+00
1	601510	1	7.464E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.481E+00	0.000E+00	3.000E-08	1.000E+00
1	611450	1	5.586E+08	0.000E+00	1.000E+00	0.000E+00	2.800E-09	0.000E+00
1			0.000E+00	0.000E+00	4.400E-02	0.000E+00	1.000E-10	3.000E-06
1	611470	1	8.279E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.193E-02	0.000E+00	2.000E-09	2.000E-04
1	611480	1	4.640E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.303E+00	0.000E+00	1.000E-10	3.000E-06
1	611481	1	3.568E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.600E-02
1			0.000E+00	0.000E+00	2.156E+00	0.000E+00	1.000E-10	3.000E-06
1	611490	1	1.911E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.766E-01	0.000E+00	8.000E-09	4.000E-05
1	611500	1	9.648E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.249E+00	0.000E+00	1.000E-10	3.000E-06
1	611510	1	1.022E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.160E-01	0.000E+00	1.000E-10	3.000E-06
1	611520	1	2.460E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.545E+00	0.000E+00	3.000E-08	1.000E+00

1	621440	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.100E+00	1.000E+00	1.000E+00
1	621450	1	2.938E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.260E-02	0.000E+00	1.000E-10	3.000E-06
1	621460	1	3.250E+15	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.543E+00	0.000E+00	2.000E-14	3.000E-08
1	621470	1	3.345E+18	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.311E+00	1.510E+01	2.000E-12	6.000E-05
1	621480	1	2.500E+23	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.986E+00	1.130E+01	2.000E-14	3.000E-08
1	621490	1	3.154E+23	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.390E+01	2.000E-14	3.000E-08
1	621500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.400E+00	1.000E+00	1.000E+00
1	621510	1	2.838E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.984E-02	0.000E+00	2.000E-09	4.000E-04
1	621520	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.660E+01	1.000E+00	1.000E+00
1	621530	1	1.666E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.348E-01	0.000E+00	1.000E-08	8.000E-05
1	621540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.260E+01	1.000E+00	1.000E+00
1	621550	1	1.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.666E-01	0.000E+00	3.000E-08	1.000E+00
1	631510	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.790E+01	1.000E+00	1.000E+00
1	631520	1	4.270E+08	0.000E+00	7.208E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.288E+00	0.000E+00	4.000E-10	8.000E-05
1	631521	1	3.355E+04	0.000E+00	2.800E-01	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.053E-01	0.000E+00	1.000E-08	6.000E-05
1	631530	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.210E+01	1.000E+00	1.000E+00
1	631540	1	2.710E+08	0.000E+00	2.000E-04	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.532E+00	0.000E+00	1.000E-10	2.000E-05
1	631550	1	1.498E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.311E-01	0.000E+00	3.000E-09	2.000E-04
1	631560	1	1.312E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.695E+00	0.000E+00	1.000E-10	3.000E-06
1	641520	1	3.408E+21	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.206E+00	2.000E-01	2.000E-14	3.000E-08
1	641530	1	2.087E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.483E-01	0.000E+00	3.000E-09	2.000E-04
1	641540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.100E+00	1.000E+00	1.000E+00
1	641551	1	3.100E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.215E-01	0.000E+00	3.000E-08	1.000E+00
1	641550	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.480E+01	1.000E+00	1.000E+00
1	641560	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.060E+01	1.000E+00	1.000E+00
1	641570	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.570E+01	1.000E+00	1.000E+00
1	641580	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.480E+01	1.000E+00	1.000E+00
1	641590	1	6.682E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.620E-01	0.000E+00	1.000E-08	8.000E-05
1	641600	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.180E+01	1.000E+00	1.000E+00
1	641610	1	2.196E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.710E-01	0.000E+00	3.000E-08	1.000E+00
1	641620	1	5.040E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	8.232E-01	0.000E+00	3.000E-08	1.000E+00
1	651570	1	4.734E+09	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00

1			0.000E+00	0.000E+00	1.315E-02	0.000E+00	1.000E-10	3.000E-06
1	651590	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	651600	1	6.247E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.480E+00	0.000E+00	1.000E-09	4.000E-05
1	651610	1	5.962E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.330E-01	0.000E+00	1.000E-10	3.000E-06
1	651620	1	4.656E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.646E+00	0.000E+00	3.000E-08	1.000E+00
1	661560	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.700E-02	1.000E+00	1.000E+00
1	661570	1	2.930E+04	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.167E-01	0.000E+00	1.000E-10	3.000E-06
1	661580	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.030E-01	1.000E+00	1.000E+00
1	661590	1	1.248E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.520E-02	0.000E+00	1.000E-10	3.000E-06
1	661600	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.340E+00	1.000E+00	1.000E+00
1	661610	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.900E+01	1.000E+00	1.000E+00
1	661620	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.550E+01	1.000E+00	1.000E+00
1	661630	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.490E+01	1.000E+00	1.000E+00
1	661640	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.810E+01	1.000E+00	1.000E+00
1	661650	1	8.402E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.740E-01	0.000E+00	7.000E-08	4.000E-04
1	661651	1	7.548E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.776E-01
1			0.000E+00	0.000E+00	1.179E-01	0.000E+00	3.000E-08	1.000E+00
1	661660	1	2.938E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.056E-01	0.000E+00	7.000E-09	4.000E-05
1	671630	1	1.442E+11	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E-10	3.000E-06
1	671650	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	671660	1	9.648E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.255E-01	0.000E+00	6.000E-09	3.000E-05
1	671661	1	3.787E+10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.774E+00	0.000E+00	1.000E-10	3.000E-06
1	681620	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.400E-01	1.000E+00	1.000E+00
1	681630	1	4.500E+03	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.546E-02	0.000E+00	3.000E-08	1.000E+00
1	681640	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.560E+00	1.000E+00	1.000E+00
1	681650	1	3.730E+04	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.297E-02	0.000E+00	1.000E-10	3.000E-06
1	681660	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.340E+01	1.000E+00	1.000E+00
1	681670	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.290E+01	1.000E+00	1.000E+00
1	681671	1	2.280E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.030E-01	0.000E+00	3.000E-08	1.000E+00
1	681680	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.710E+01	1.000E+00	1.000E+00
1	681690	1	8.122E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.030E-01	0.000E+00	1.000E-08	9.000E-05
1	681700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.490E+01	1.000E+00	1.000E+00
1	681710	1	2.706E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.900E-01	0.000E+00	2.000E-08	1.000E-04

1	681720	1	1.775E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.330E-01	0.000E+00	1.000E-10	3.000E-06
1	691690	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	691700	1	1.111E+07	0.000E+00	1.460E-03	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.345E-01	0.000E+00	1.000E-09	5.000E-05
1	691701	1	4.100E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.000E-08	1.000E+00
1	691710	1	6.060E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.601E-02	0.000E+00	4.000E-09	5.000E-04
1	691720	1	2.290E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.005E+00	0.000E+00	1.000E-10	3.000E-06
1	691730	1	2.970E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.960E-01	0.000E+00	1.000E-10	3.000E-06
1	701680	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.400E-01	1.000E+00	1.000E+00
1	701690	1	2.767E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.293E-01	0.000E+00	1.000E-10	3.000E-06
1	701700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.140E+00	1.000E+00	1.000E+00
1	701710	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.440E+01	1.000E+00	1.000E+00
1	701720	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.190E+01	1.000E+00	1.000E+00
1	701730	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.620E+01	1.000E+00	1.000E+00
1	701740	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.160E+01	1.000E+00	1.000E+00
1	701750	1	3.620E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.703E-01	0.000E+00	2.000E-08	1.000E-04
1	701751	1	6.700E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	5.130E-01	0.000E+00	3.000E-08	1.000E+00
1	701760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.260E+01	1.000E+00	1.000E+00
1	701770	1	6.800E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	6.060E-01	0.000E+00	3.000E-08	1.000E+00
1	711750	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	9.740E+01	1.000E+00	1.000E+00
1	711760	1	1.136E+18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.840E-01	2.600E+00	1.000E-10	3.000E-06
1	711761	1	1.309E+04	0.000E+00	9.500E-04	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.479E-01	0.000E+00	1.000E-10	3.000E-06
1	711770	1	5.797E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.820E-01	0.000E+00	2.000E-08	1.000E-04
1	711771	1	1.390E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
1			0.000E+00	0.000E+00	1.249E+00	0.000E+00	1.000E-10	3.000E-06
1	721740	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.600E-01	1.000E+00	1.000E+00
1	721750	1	6.050E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.113E-01	0.000E+00	1.000E-10	3.000E-06
1	721760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	5.200E+00	1.000E+00	1.000E+00
1	721770	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.860E+01	1.000E+00	1.000E+00
1	721780	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.710E+01	1.000E+00	1.000E+00
1	721781	1	4.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.134E+00	0.000E+00	3.000E-08	1.000E+00
1	721790	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.374E+01	1.000E+00	1.000E+00
1	721791	1	1.867E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	3.580E-01	0.000E+00	3.000E-08	1.000E+00
1	721800	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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1                 0.000E+00 0.000E+00 0.000E+00 3.520E+01 1.000E+00 1.000E+00
1  721801  1      1.980E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
1                 0.000E+00 0.000E+00 1.121E+00 0.000E+00 1.000E-10 3.000E-06
1  721810  1      3.662E+06 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 7.320E-01 0.000E+00 1.000E-09 7.000E-05
1  721820  1      2.840E+14 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 3.029E-01 0.000E+00 1.000E-10 3.000E-06
1  731800  1      2.935E+04 0.000E+00 8.600E-01 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 9.960E-02 1.200E-02 1.000E-10 3.000E-06
1  731810  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 9.999E+01 1.000E+00 1.000E+00
1  731820  1      9.936E+06 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 1.508E+00 0.000E+00 7.000E-10 4.000E-05
1  731821  1      9.500E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
1                 0.000E+00 0.000E+00 5.230E-01 0.000E+00 3.000E-08 1.000E+00
1  731830  1      4.410E+05 1.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 6.380E-01 0.000E+00 1.000E-10 3.000E-06
1  741800  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.300E-01 1.000E+00 1.000E+00
1  741810  1      1.047E+07 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 4.770E-02 0.000E+00 4.000E-09 3.000E-04
1  741820  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 2.630E+01 1.000E+00 1.000E+00
1  741831  1      5.200E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
1                 0.000E+00 0.000E+00 2.966E-01 0.000E+00 3.000E-08 1.000E+00
1  741830  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.430E+01 1.000E+00 1.000E+00
1  741840  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 3.067E+01 1.000E+00 1.000E+00
1  741850  1      6.489E+06 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 1.270E-01 0.000E+00 4.000E-09 1.000E-04
1  741851  1      1.002E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
1                 0.000E+00 0.000E+00 1.825E-01 0.000E+00 3.000E-08 1.000E+00
1  741860  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 2.860E+01 1.000E+00 1.000E+00
1  741870  1      8.604E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 7.220E-01 0.000E+00 1.000E-08 6.000E-05
1  741880  1      6.000E+06 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 1.015E-01 0.000E+00 1.000E-10 3.000E-06
1  741890  1      6.900E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 1.230E+00 0.000E+00 3.000E-08 1.000E+00
1  751850  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 3.740E+01 1.000E+00 1.000E+00
1  751860  1      3.263E+05 0.000E+00 6.000E-02 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 3.609E-01 0.000E+00 8.000E-09 5.000E-05
1  751870  1      1.578E+18 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 6.500E-04 6.260E+01 2.000E-08 2.000E-03
1  751880  1      6.113E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 8.359E-01 0.000E+00 6.000E-09 3.000E-05
1  751881  1      1.116E+03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
1                 0.000E+00 0.000E+00 1.610E-01 0.000E+00 3.000E-08 1.000E+00
1  751890  1      8.750E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 3.860E-01 0.000E+00 1.000E-10 3.000E-06
1  761840  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.800E-02 1.000E+00 1.000E+00
1  761850  1      8.090E+06 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 7.273E-01 0.000E+00 2.000E-09 7.000E-05
1  761860  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.582E+00 1.000E+00 1.000E+00
1  761870  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.600E+00 1.000E+00 1.000E+00
1  761880  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
1                 0.000E+00 0.000E+00 0.000E+00 1.330E+01 1.000E+00 1.000E+00
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1	761890	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.610E+01	1.000E+00	1.000E+00
1	761900	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.640E+01	1.000E+00	1.000E+00
1	761901	1	5.940E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.696E+00	0.000E+00	3.000E-08	1.000E+00
1	761910	1	1.331E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.250E-01	0.000E+00	1.000E-08	2.000E-04
1	761911	1	4.716E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	6.990E-02	0.000E+00	3.000E-07	2.000E-03
1	761920	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	4.100E+01	1.000E+00	1.000E+00
1	761930	1	1.098E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	4.451E-01	0.000E+00	9.000E-09	5.000E-05
1	761940	1	1.893E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.420E-02	0.000E+00	1.000E-10	3.000E-06
1	771910	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.730E+01	1.000E+00	1.000E+00
1	771920	1	6.379E+06	0.000E+00	4.760E-02	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	1.035E+00	0.000E+00	9.000E-10	4.000E-05
1	771921	1	7.600E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.508E-01	0.000E+00	1.000E-10	3.000E-06
1	771930	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	6.270E+01	1.000E+00	1.000E+00
1	771940	1	6.894E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	9.010E-01	0.000E+00	5.000E-09	3.000E-05
1	771941	1	1.480E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.413E+00	0.000E+00	3.000E-08	1.000E+00
1	781900	1	1.893E+19	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.243E+00	1.300E-02	2.000E-14	3.000E-08
1	781910	1	2.510E+05	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	3.353E-01	0.000E+00	2.000E-08	1.000E-04
1	781920	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.870E-01	1.000E+00	1.000E+00
1	781930	1	1.578E+09	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	5.379E-03	0.000E+00	1.000E-10	3.000E-06
1	781931	1	3.740E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	1.410E-01	0.000E+00	2.000E-07	1.000E-03
1	781940	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.290E+01	1.000E+00	1.000E+00
1	781950	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	3.380E+01	1.000E+00	1.000E+00
1	781951	1	3.473E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	2.450E-01	0.000E+00	1.000E-10	3.000E-06
1	781960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	2.530E+01	1.000E+00	1.000E+00
1	781970	1	6.590E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.762E-01	0.000E+00	2.000E-08	1.000E-04
1	781971	1	5.725E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.670E-01
1			0.000E+00	0.000E+00	3.993E-01	0.000E+00	2.000E-07	9.000E-04
1	781980	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	7.200E+00	1.000E+00	1.000E+00
1	781990	1	1.848E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.410E-01	0.000E+00	3.000E-08	1.000E+00
1	781991	1	1.360E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
1			0.000E+00	0.000E+00	4.165E-01	0.000E+00	3.000E-08	1.000E+00
1	791970	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
1	791980	1	2.329E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	7.296E-01	0.000E+00	8.000E-09	5.000E-05
1	791990	1	2.712E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
1			0.000E+00	0.000E+00	2.325E-01	0.000E+00	3.000E-08	2.000E-04
1	792000	1	2.904E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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 1                0.000E+00 0.000E+00 1.013E+00 0.000E+00 3.000E-08 1.000E+00
 1  801960  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.500E-01 1.000E+00 1.000E+00
 1  801970  1     2.309E+05 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 1.317E-01 0.000E+00 4.000E-08 3.000E-04
 1  801971  1     8.570E+04 0.000E+00 7.000E-02 0.000E+00 0.000E+00 9.300E-01
 1                0.000E+00 0.000E+00 3.020E-01 0.000E+00 3.000E-08 2.000E-04
 1  801980  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.000E+01 1.000E+00 1.000E+00
 1  801990  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.685E+01 1.000E+00 1.000E+00
 1  801991  1     2.556E+03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
 1                0.000E+00 0.000E+00 5.340E-01 0.000E+00 3.000E-08 1.000E+00
 1  802000  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 2.310E+01 1.000E+00 1.000E+00
 1  802010  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.320E+01 1.000E+00 1.000E+00
 1  802020  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 2.980E+01 1.000E+00 1.000E+00
 1  802030  1     4.027E+06 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 3.362E-01 0.000E+00 2.000E-09 2.000E-05
 1  802040  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 6.900E+00 1.000E+00 1.000E+00
 1  802050  1     3.120E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 5.463E-01 0.000E+00 3.000E-08 1.000E+00
 1  812030  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 2.950E+01 1.000E+00 1.000E+00
 1  812040  1     1.193E+08 0.000E+00 2.570E-02 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 2.393E-01 0.000E+00 9.000E-10 6.000E-05
 1  812050  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 7.050E+01 1.000E+00 1.000E+00
 1  812060  1     2.520E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 5.369E-01 0.000E+00 3.000E-08 1.000E+00
 1  822040  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.400E+00 2.000E-14 3.000E-08
 1  822050  1     4.797E+14 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 5.847E-03 0.000E+00 1.000E-10 3.000E-06
 1  822060  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 2.410E+01 1.000E+00 1.000E+00
 1  822070  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 2.210E+01 1.000E+00 1.000E+00
 1  822080  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 5.240E+01 1.000E+00 1.000E+00
 1  822090  1     1.171E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 1.975E-01 0.000E+00 2.000E-07 3.000E-03
 1  832080  1     1.161E+13 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 2.652E+00 0.000E+00 1.000E-10 3.000E-06
 1  832090  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
 1  832100  1     4.331E+05 0.000E+00 0.000E+00 0.000E+00 1.320E-06 0.000E+00
 1                0.000E+00 0.000E+00 3.890E-01 0.000E+00 2.000E-10 4.000E-05
 1  832101  1     9.467E+13 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 5.309E+00 0.000E+00 2.000E-14 3.000E-08
 1  832110  1     1.284E+02 0.000E+00 0.000E+00 0.000E+00 9.973E-01 0.000E+00
 1                0.000E+00 0.000E+00 6.733E+00 0.000E+00 1.000E-07 7.000E-03
 1  842100  1     1.196E+07 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 5.407E+00 0.000E+00 7.000E-12 7.000E-07
 1  842110  1     5.160E-01 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
 1                0.000E+00 0.000E+00 7.595E+00 0.000E+00 9.000E-05 3.000E+00
 1  842111  1     2.520E+01 0.000E+00 0.000E+00 0.000E+00 9.998E-01 0.000E+00
 1                0.000E+00 0.000E+00 7.515E+00 0.000E+00 2.000E-14 3.000E-08
-1
 2      decay library: actinides and daughters (endf/b-vi)
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2	20040	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
2	812060	1	2.520E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.369E-01	0.000E+00	3.000E-08	1.000E+00
2	812070	1	2.862E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.972E-01	0.000E+00	2.000E-06	8.000E-03
2	812080	1	1.832E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	3.946E+00	0.000E+00	1.000E-06	5.000E-03
2	812090	1	1.320E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	2.811E+00	0.000E+00	2.000E-06	1.000E-02
2	822060	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	0.000E+00	2.410E+01	1.000E+00	1.000E+00
2	822070	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	0.000E+00	2.210E+01	1.000E+00	1.000E+00
2	822080	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	0.000E+00	5.240E+01	1.000E+00	1.000E+00
2	822090	1	1.171E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.975E-01	0.000E+00	2.000E-07	3.000E-03
2	822100	1	7.037E+08	0.000E+00	0.000E+00	0.000E+00	1.900E-08	0.000E+00
2			0.000E+00	0.000E+00	3.954E-02	0.000E+00	4.000E-12	1.000E-07
2	822110	1	2.166E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.209E-01	0.000E+00	1.000E-08	4.000E-04
2	822120	1	3.830E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	3.190E-01	0.000E+00	6.000E-10	2.000E-05
2	822140	1	1.608E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.440E-01	0.000E+00	1.000E-08	5.000E-04
2	832080	1	1.161E+13	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	2.652E+00	0.000E+00	1.000E-10	3.000E-06
2	832090	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
2	832101	1	9.467E+13	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.309E+00	0.000E+00	2.000E-14	3.000E-08
2	832100	1	4.331E+05	0.000E+00	0.000E+00	0.000E+00	1.320E-06	0.000E+00
2			0.000E+00	0.000E+00	3.890E-01	0.000E+00	2.000E-10	4.000E-05
2	832110	1	1.284E+02	0.000E+00	0.000E+00	0.000E+00	9.973E-01	0.000E+00
2			0.000E+00	0.000E+00	6.733E+00	0.000E+00	1.000E-07	7.000E-03
2	832120	1	3.633E+03	0.000E+00	0.000E+00	0.000E+00	3.594E-01	0.000E+00
2			0.000E+00	0.000E+00	2.825E+00	0.000E+00	3.000E-09	4.000E-04
2	832130	1	2.735E+03	0.000E+00	0.000E+00	0.000E+00	2.100E-02	0.000E+00
2			0.000E+00	0.000E+00	7.139E-01	0.000E+00	4.000E-09	5.000E-04
2	832140	1	1.194E+03	0.000E+00	0.000E+00	0.000E+00	2.400E-04	0.000E+00
2			0.000E+00	0.000E+00	2.163E+00	0.000E+00	1.000E-08	6.000E-04
2	842100	1	1.196E+07	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.407E+00	0.000E+00	7.000E-12	7.000E-07
2	842111	1	2.520E+01	0.000E+00	0.000E+00	0.000E+00	9.998E-01	0.000E+00
2			0.000E+00	0.000E+00	7.515E+00	0.000E+00	2.000E-14	3.000E-08
2	842110	1	5.160E-01	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	7.595E+00	0.000E+00	9.000E-05	3.000E+00
2	842120	1	2.980E-07	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	8.953E+00	0.000E+00	1.000E+02	4.000E+06
2	842130	1	4.200E-06	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	8.536E+00	0.000E+00	1.000E+01	3.000E+05
2	842140	1	1.643E-04	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	7.833E+00	0.000E+00	2.000E-01	7.000E+03
2	842150	1	1.780E-03	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	7.526E+00	0.000E+00	1.000E-02	3.000E+02
2	842160	1	1.450E-01	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.906E+00	0.000E+00	2.000E-04	7.000E+00
2	842180	1	1.860E+02	0.000E+00	0.000E+00	0.000E+00	9.998E-01	0.000E+00
2			0.000E+00	0.000E+00	6.113E+00	0.000E+00	1.000E-07	4.000E-03
2	852170	1	3.230E-02	0.000E+00	0.000E+00	0.000E+00	9.999E-01	0.000E+00
2			0.000E+00	0.000E+00	7.199E+00	0.000E+00	9.000E-05	6.000E-01
2	862180	1	3.500E-02	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00

2			0.000E+00	0.000E+00	7.266E+00	0.000E+00	2.000E-14	3.000E-08
2	862190	1	3.960E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	7.000E+00	0.000E+00	2.000E-14	3.000E-08
2	862200	1	5.560E+01	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.405E+00	0.000E+00	1.000E-08	1.000E+00
2	862220	1	3.304E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.590E+00	0.000E+00	3.000E-09	1.000E+00
2	872210	1	2.940E+02	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.512E+00	0.000E+00	1.000E-07	8.000E-04
2	872230	1	1.308E+03	0.000E+00	0.000E+00	0.000E+00	6.000E-05	0.000E+00
2			0.000E+00	0.000E+00	4.127E-01	0.000E+00	4.000E-08	3.000E-04
2	882220	1	3.800E+01	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.670E+00	0.000E+00	2.000E-14	3.000E-08
2	882230	1	9.879E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.999E+00	0.000E+00	8.000E-12	7.000E-07
2	882240	1	3.162E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.790E+00	0.000E+00	2.000E-11	2.000E-06
2	882250	1	1.279E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.224E-01	0.000E+00	5.000E-11	5.000E-07
2	882260	1	5.043E+10	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.872E+00	0.000E+00	2.000E-12	3.000E-08
2	882280	1	1.816E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	9.368E-03	0.000E+00	1.000E-12	3.000E-08
2	892250	1	8.640E+05	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.891E+00	0.000E+00	1.000E-11	5.000E-06
2	892270	1	6.867E+08	0.000E+00	0.000E+00	0.000E+00	1.380E-02	0.000E+00
2			0.000E+00	0.000E+00	8.159E-02	0.000E+00	8.000E-14	2.000E-06
2	892280	1	2.214E+04	0.000E+00	0.000E+00	0.000E+00	5.500E-08	0.000E+00
2			0.000E+00	0.000E+00	1.316E+00	0.000E+00	6.000E-10	9.000E-05
2	902260	1	1.854E+03	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.448E+00	0.000E+00	2.000E-14	3.000E-08
2	902270	1	1.617E+06	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.164E+00	0.000E+00	1.000E-11	2.000E-05
2	902280	1	6.037E+07	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.525E+00	0.000E+00	2.000E-13	7.000E-06
2	902290	1	2.302E+11	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.186E+00	0.000E+00	2.000E-14	4.000E-07
2	902300	1	2.379E+12	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			2.500E-13	0.000E+00	4.763E+00	0.000E+00	8.000E-14	2.000E-06
2	902310	1	9.187E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.840E-01	0.000E+00	4.000E-08	2.000E-04
2	902320	1	4.415E+17	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.086E+00	1.000E+02	1.000E-12	2.000E-06
2	902330	1	1.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.557E-01	0.000E+00	5.000E-07	2.000E-03
2	902340	1	2.082E+06	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.980E-02	0.000E+00	1.000E-09	2.000E-05
2	912310	1	1.034E+12	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			1.500E-12	0.000E+00	5.133E+00	0.000E+00	4.000E-14	9.000E-07
2	912320	1	1.132E+05	0.000E+00	2.000E-03	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.105E+00	0.000E+00	7.000E-09	6.000E-05
2	912330	1	2.333E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.285E-01	0.000E+00	6.000E-09	1.000E-04
2	912341	1	7.020E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.300E-03
2			0.000E+00	0.000E+00	8.271E-01	0.000E+00	4.000E-06	2.000E-02
2	912340	1	2.412E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	2.468E+00	0.000E+00	3.000E-08	1.000E-04
2	912350	1	1.446E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.700E-01	0.000E+00	3.000E-08	1.000E+00
2	922300	1	1.797E+06	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.992E+00	0.000E+00	4.000E-12	5.000E-06
2	922310	1	3.630E+05	0.000E+00	1.000E+00	0.000E+00	5.500E-05	0.000E+00
2			0.000E+00	0.000E+00	8.930E-02	0.000E+00	2.000E-14	3.000E-08

2	922320	1	2.201E+09	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			9.000E-13	0.000E+00	5.412E+00	0.000E+00	9.000E-13	3.000E-05
2	922330	1	5.021E+12	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.915E+00	0.000E+00	4.000E-12	3.000E-05
2	922340	1	7.758E+12	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			1.730E-11	0.000E+00	4.856E+00	5.400E-03	4.000E-12	3.000E-05
2	922350	1	2.220E+16	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			7.200E-11	0.000E+00	4.674E+00	7.200E-01	4.000E-12	3.000E-05
2	922360	1	7.386E+14	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			9.640E-10	0.000E+00	4.568E+00	0.000E+00	4.000E-12	3.000E-05
2	922370	1	5.832E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	3.266E-01	0.000E+00	3.000E-08	1.000E-04
2	922380	1	1.410E+17	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			5.450E-07	0.000E+00	4.270E+00	9.927E+01	3.000E-12	4.000E-05
2	922390	1	1.408E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.578E-01	0.000E+00	5.000E-07	2.000E-03
2	922400	1	5.076E+04	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.508E-01	0.000E+00	6.000E-09	3.000E-05
2	922410	1	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.040E-01	0.000E+00	3.000E-08	1.000E+00
2	932350	1	3.423E+07	0.000E+00	1.000E+00	0.000E+00	1.400E-05	0.000E+00
2			0.000E+00	0.000E+00	9.970E-03	0.000E+00	2.000E-14	3.000E-08
2	932361	1	8.100E+04	0.000E+00	5.200E-01	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.344E-01	0.000E+00	1.000E-10	3.000E-06
2	932360	1	3.629E+12	0.000E+00	9.100E-01	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	3.451E-01	0.000E+00	2.000E-09	5.000E-05
2	932370	1	6.749E+13	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.813E+00	0.000E+00	1.000E-13	3.000E-06
2	932380	1	1.829E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	8.410E-01	0.000E+00	2.000E-09	5.000E-05
2	932390	1	2.035E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.266E-01	0.000E+00	2.000E-08	1.000E-04
2	932401	1	4.332E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.200E-03
2			0.000E+00	0.000E+00	9.450E-01	0.000E+00	8.000E-07	4.000E-03
2	932400	1	3.714E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.621E+00	0.000E+00	5.000E-07	2.000E-03
2	932410	1	8.340E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	4.746E-01	0.000E+00	3.000E-08	1.000E+00
2	942360	1	9.152E+07	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			8.500E-10	0.000E+00	5.865E+00	0.000E+00	6.000E-13	3.000E-05
2	942370	1	3.903E+06	0.000E+00	1.000E+00	0.000E+00	4.200E-05	0.000E+00
2			0.000E+00	0.000E+00	6.523E-02	0.000E+00	2.000E-14	3.000E-08
2	942380	1	2.766E+09	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			1.900E-09	0.000E+00	5.591E+00	0.000E+00	7.000E-14	5.000E-06
2	942390	1	7.600E+11	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			4.400E-12	0.000E+00	5.243E+00	0.000E+00	6.000E-14	5.000E-06
2	942400	1	2.069E+11	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			5.700E-08	0.000E+00	5.253E+00	0.000E+00	6.000E-14	5.000E-06
2	942410	1	4.541E+08	0.000E+00	0.000E+00	0.000E+00	2.390E-05	0.000E+00
2			0.000E+00	0.000E+00	5.361E-03	0.000E+00	3.000E-12	2.000E-04
2	942420	1	1.183E+13	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			5.490E-06	0.000E+00	4.982E+00	0.000E+00	6.000E-14	5.000E-06
2	942430	1	1.784E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.942E-01	0.000E+00	6.000E-08	3.000E-04
2	942440	1	2.525E+15	0.000E+00	0.000E+00	0.000E+00	9.988E-01	0.000E+00
2			1.200E-03	0.000E+00	4.891E+00	0.000E+00	6.000E-14	4.000E-06
2	942450	1	3.780E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	7.340E-01	0.000E+00	1.000E-08	6.000E-05
2	942460	1	9.366E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	2.560E-01	0.000E+00	1.000E-10	3.000E-06
2	952390	1	4.280E+04	0.000E+00	9.999E-01	0.000E+00	1.000E-04	0.000E+00
2			0.000E+00	0.000E+00	3.736E-01	0.000E+00	2.000E-14	3.000E-08
2	952400	1	1.832E+05	0.000E+00	1.000E+00	0.000E+00	1.900E-06	0.000E+00

2			0.000E+00	0.000E+00	1.098E+00	0.000E+00	2.000E-14	3.000E-08
2	952410	1	1.365E+10	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			3.770E-12	0.000E+00	5.629E+00	0.000E+00	2.000E-13	4.000E-06
2	952421	1	4.450E+09	0.000E+00	0.000E+00	0.000E+00	4.500E-03	9.955E-01
2			1.600E-10	0.000E+00	6.820E-02	0.000E+00	2.000E-13	4.000E-06
2	952420	1	5.767E+04	0.000E+00	1.730E-01	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.944E-01	0.000E+00	1.000E-09	1.000E-04
2	952430	1	2.324E+11	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			3.700E-11	0.000E+00	5.431E+00	0.000E+00	2.000E-13	4.000E-06
2	952441	1	1.560E+03	0.000E+00	3.610E-04	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.198E-01	0.000E+00	3.000E-08	1.000E+00
2	952440	1	3.636E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.128E+00	0.000E+00	1.000E-07	5.000E-03
2	952450	1	7.380E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	3.196E-01	0.000E+00	3.000E-07	1.000E-03
2	952460	1	2.340E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.376E+00	0.000E+00	3.000E-08	1.000E+00
2	962410	1	2.834E+06	0.000E+00	9.900E-01	0.000E+00	1.000E-02	0.000E+00
2			0.000E+00	0.000E+00	6.830E-01	0.000E+00	2.000E-14	3.000E-08
2	962420	1	1.407E+07	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			6.330E-08	0.000E+00	6.155E+00	0.000E+00	4.000E-12	2.000E-05
2	962430	1	9.177E+08	0.000E+00	2.400E-03	0.000E+00	9.976E-01	0.000E+00
2			0.000E+00	0.000E+00	6.175E+00	0.000E+00	2.000E-13	5.000E-06
2	962440	1	5.708E+08	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			1.347E-06	0.000E+00	5.900E+00	0.000E+00	3.000E-13	7.000E-06
2	962450	1	2.682E+11	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.615E+00	0.000E+00	2.000E-13	4.000E-06
2	962460	1	1.493E+11	0.000E+00	0.000E+00	0.000E+00	9.997E-01	0.000E+00
2			2.614E-04	0.000E+00	5.525E+00	0.000E+00	2.000E-13	4.000E-06
2	962470	1	5.049E+14	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.354E+00	0.000E+00	2.000E-13	4.000E-06
2	962480	1	1.073E+13	0.000E+00	0.000E+00	0.000E+00	9.174E-01	0.000E+00
2			8.260E-02	0.000E+00	2.126E+01	0.000E+00	2.000E-14	4.000E-07
2	962490	1	3.849E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	2.956E-01	0.000E+00	4.000E-07	2.000E-03
2	962500	7	1.740E+01	0.000E+00	0.000E+00	0.000E+00	2.500E-01	0.000E+00
2			6.100E-01	0.000E+00	1.233E+02	0.000E+00	3.000E-15	6.000E-08
2	962510	1	1.008E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	5.600E-01	0.000E+00	3.000E-08	1.000E+00
2	972490	1	2.765E+07	0.000E+00	0.000E+00	0.000E+00	1.450E-05	0.000E+00
2			4.700E-10	0.000E+00	3.298E-02	0.000E+00	3.000E-11	6.000E-04
2	972500	1	1.158E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.188E+00	0.000E+00	5.000E-09	2.000E-04
2	972510	2	5.700E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.100E+00	0.000E+00	3.000E-08	1.000E+00
2	982490	1	1.106E+10	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			5.200E-09	0.000E+00	6.291E+00	0.000E+00	5.000E-14	4.000E-06
2	982500	1	4.128E+08	0.000E+00	0.000E+00	0.000E+00	9.992E-01	0.000E+00
2			7.700E-04	0.000E+00	6.277E+00	0.000E+00	2.000E-13	1.000E-05
2	982510	1	2.834E+10	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			0.000E+00	0.000E+00	6.041E+00	0.000E+00	6.000E-14	4.000E-06
2	982520	1	8.347E+07	0.000E+00	0.000E+00	0.000E+00	9.691E-01	0.000E+00
2			3.092E-02	0.000E+00	1.222E+01	0.000E+00	7.000E-13	2.000E-05
2	982530	1	1.539E+06	0.000E+00	0.000E+00	0.000E+00	3.100E-03	0.000E+00
2			0.000E+00	0.000E+00	9.620E-02	0.000E+00	3.000E-11	1.000E-04
2	982540	4	6.050E+01	0.000E+00	0.000E+00	0.000E+00	3.100E-03	0.000E+00
2			9.969E-01	0.000E+00	1.994E+02	0.000E+00	2.000E-13	1.000E-07
2	982550	3	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
2			0.000E+00	0.000E+00	1.000E-01	0.000E+00	3.000E-08	1.000E+00
2	992530	1	1.769E+06	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
2			8.700E-08	0.000E+00	6.737E+00	0.000E+00	2.000E-11	2.000E-05
2	992541	3	3.930E+01	0.000E+00	7.800E-04	0.000E+00	9.827E-01	1.547E-02
2			1.030E-03	0.000E+00	8.173E+00	0.000E+00	2.000E-10	2.000E-05

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 2  992540  1     2.382E+07 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
 2                0.000E+00 0.000E+00 6.499E+00 0.000E+00 6.000E-13 1.000E-05
 2  992550  4     3.900E+01 0.000E+00 0.000E+00 0.000E+00 1.000E+00 0.000E+00
 2                4.167E-05 0.000E+00 7.370E+00 0.000E+00 1.000E-11 3.000E-05
 2  162500  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 2                0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00
-1
 3      decay library: fission products (endf/b-vi)
 3   10030  1     3.885E+08 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 5.690E-03 0.000E+00 2.000E-07 3.000E-03
 3   30060  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 7.500E+00 1.000E+00 1.000E+00
 3   30070  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 9.250E+01 1.000E+00 1.000E+00
 3   40090  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
 3   40100  1     5.049E+13 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 2.025E-01 0.000E+00 1.000E-10 3.000E-06
 3   60140  1     1.802E+11 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 4.947E-02 0.000E+00 1.000E-07 8.000E-04
 3  280660  1     1.966E+05 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 6.500E-02 0.000E+00 1.000E-10 3.000E-06
 3  290660  1     3.060E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 1.154E+00 0.000E+00 3.000E-08 1.000E+00
 3  300660  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 2.790E+01 1.000E+00 1.000E+00
 3  290670  1     2.226E+05 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 2.710E-01 0.000E+00 1.000E-10 3.000E-06
 3  300670  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 4.100E+00 1.000E+00 1.000E+00
 3  300680  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 1.878E+01 1.000E+00 1.000E+00
 3  300690  1     3.380E+03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 3.214E-01 0.000E+00 2.000E-07 2.000E-03
 3  300691  1     4.954E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 9.997E-01
 3                0.000E+00 0.000E+00 4.381E-01 0.000E+00 1.000E-08 6.000E-05
 3  310690  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 6.010E+01 1.000E+00 1.000E+00
 3  300700  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 6.200E-01 1.000E+00 1.000E+00
 3  310700  1     1.268E+03 0.000E+00 4.100E-03 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 6.513E-01 0.000E+00 3.000E-08 1.000E+00
 3  320700  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 2.050E+01 1.000E+00 1.000E+00
 3  300710  1     1.470E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 1.363E+00 0.000E+00 3.000E-08 1.000E+00
 3  300711  1     1.426E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 2.097E+00 0.000E+00 1.000E-10 3.000E-06
 3  310710  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 3.990E+01 1.000E+00 1.000E+00
 3  320710  1     9.880E+05 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 8.990E-03 0.000E+00 2.000E-07 2.000E-03
 3  320711  1     2.040E-02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
 3                0.000E+00 0.000E+00 1.811E-01 0.000E+00 3.000E-08 1.000E+00
 3  270720  1     1.235E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 1.153E-01 9.394E+00 0.000E+00 3.000E-08 1.000E+00
 3  280720  1     3.831E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 2.795E+00 0.000E+00 3.000E-08 1.000E+00
 3  290720  1     6.489E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 1.000E-06 5.029E+00 0.000E+00 3.000E-08 1.000E+00
 3  300720  1     1.674E+05 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 2.552E-01 0.000E+00 1.000E-10 3.000E-06
 3  310720  1     5.076E+04 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
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3			0.000E+00	0.000E+00	3.206E+00	0.000E+00	6.000E-09	4.000E-05
3	320720	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.740E+01	1.000E+00	1.000E+00
3	270730	1	1.290E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.512E-01	7.914E+00	0.000E+00	3.000E-08	1.000E+00
3	280730	1	4.906E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.700E-05	4.900E+00	0.000E+00	3.000E-08	1.000E+00
3	290730	1	5.114E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.588E-03	2.759E+00	0.000E+00	3.000E-08	1.000E+00
3	300730	1	2.350E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.715E+00	0.000E+00	3.000E-08	1.000E+00
3	310730	1	1.750E+04	9.870E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.870E-01	0.000E+00	1.000E-10	3.000E-06
3	320730	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.800E+00	1.000E+00	1.000E+00
3	320731	1	4.990E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	6.563E-02	0.000E+00	3.000E-08	1.000E+00
3	270740	1	9.196E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.743E-01	1.074E+01	0.000E+00	3.000E-08	1.000E+00
3	280740	1	9.002E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.560E-03	3.883E+00	0.000E+00	3.000E-08	1.000E+00
3	290740	1	6.482E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.949E-03	5.718E+00	0.000E+00	3.000E-08	1.000E+00
3	300740	1	9.600E+01	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.437E+00	0.000E+00	3.000E-08	1.000E+00
3	310740	1	4.872E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.028E+00	0.000E+00	3.000E-08	1.000E+00
3	320740	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.650E+01	1.000E+00	1.000E+00
3	270750	1	8.166E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.131E-01	9.302E+00	0.000E+00	3.000E-08	1.000E+00
3	280750	1	2.312E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.002E-02	6.047E+00	0.000E+00	3.000E-08	1.000E+00
3	290750	1	9.274E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.470E-02	3.795E+00	0.000E+00	3.000E-08	1.000E+00
3	300750	1	1.020E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.748E+00	0.000E+00	3.000E-08	1.000E+00
3	310750	1	1.260E+02	4.800E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.656E+00	0.000E+00	3.000E-08	1.000E+00
3	320750	1	4.967E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.561E-01	0.000E+00	3.000E-08	1.000E+00
3	320751	1	4.770E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.997E-01
3			0.000E+00	0.000E+00	1.359E-01	0.000E+00	3.000E-08	1.000E+00
3	330750	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	280760	1	3.046E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.511E-02	4.924E+00	0.000E+00	3.000E-08	1.000E+00
3	290760	1	2.602E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.842E-02	6.633E+00	0.000E+00	3.000E-08	1.000E+00
3	300760	1	5.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.152E+00	0.000E+00	3.000E-08	1.000E+00
3	310760	1	3.260E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.704E+00	0.000E+00	3.000E-08	1.000E+00
3	320760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.800E+00	1.000E+00	1.000E+00
3	330760	1	9.475E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.483E+00	0.000E+00	3.000E-09	2.000E-05
3	340760	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.030E+00	1.000E+00	1.000E+00
3	280770	1	1.033E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.712E-02	7.597E+00	0.000E+00	3.000E-08	1.000E+00
3	290770	1	3.052E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.231E-01	4.855E+00	0.000E+00	3.000E-08	1.000E+00

3	300770	1	2.080E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.220E+00	0.000E+00	3.000E-08	1.000E+00
3	310770	1	1.320E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.832E+00	0.000E+00	3.000E-08	1.000E+00
3	320770	1	4.068E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.684E+00	0.000E+00	1.000E-10	3.000E-06
3	320771	1	5.290E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
3			0.000E+00	0.000E+00	1.013E+00	0.000E+00	3.000E-08	1.000E+00
3	330770	1	1.398E+05	3.200E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.336E-01	0.000E+00	1.000E-10	3.000E-06
3	340770	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.600E+00	1.000E+00	1.000E+00
3	340771	1	1.745E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.592E-01	0.000E+00	3.000E-08	1.000E+00
3	280780	1	1.318E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.298E-02	5.866E+00	0.000E+00	3.000E-08	1.000E+00
3	290780	1	1.179E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.909E-02	7.953E+00	0.000E+00	3.000E-08	1.000E+00
3	300780	1	1.470E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.100E-05	3.754E+00	0.000E+00	3.000E-08	1.000E+00
3	310780	1	5.090E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.081E+00	0.000E+00	3.000E-08	1.000E+00
3	320780	1	5.280E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.050E-01	0.000E+00	3.000E-08	1.000E+00
3	330780	1	5.442E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.579E+00	0.000E+00	1.000E-08	8.000E-05
3	340780	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.350E+01	1.000E+00	1.000E+00
3	290790	1	1.351E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.421E-01	5.860E+00	0.000E+00	3.000E-08	1.000E+00
3	300790	1	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.146E-02	5.938E+00	0.000E+00	3.000E-08	1.000E+00
3	310790	1	3.000E+00	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.500E-04	4.216E+00	0.000E+00	3.000E-08	1.000E+00
3	320790	1	1.910E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.052E+00	0.000E+00	3.000E-08	1.000E+00
3	330790	1	5.406E+02	9.894E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.758E-01	0.000E+00	3.000E-08	1.000E+00
3	340790	1	2.050E+13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.290E-02	0.000E+00	1.000E-10	3.000E-06
3	340791	1	2.346E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	9.370E-02	0.000E+00	3.000E-08	1.000E+00
3	350790	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.069E+01	1.000E+00	1.000E+00
3	350791	1	4.860E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.058E-01	0.000E+00	3.000E-08	1.000E+00
3	360790	1	1.261E+05	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.811E-01	0.000E+00	1.000E-10	3.000E-06
3	290800	1	8.988E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.504E-01	9.041E+00	0.000E+00	3.000E-08	1.000E+00
3	300800	1	5.400E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.098E-02	4.005E+00	0.000E+00	3.000E-08	1.000E+00
3	310800	1	1.660E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.200E-03	6.673E+00	0.000E+00	3.000E-08	1.000E+00
3	320800	1	2.950E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.510E+00	0.000E+00	3.000E-08	1.000E+00
3	330800	1	1.520E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.026E+00	0.000E+00	3.000E-08	1.000E+00
3	340800	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.980E+01	1.000E+00	1.000E+00
3	350800	1	1.061E+03	0.000E+00	8.300E-02	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.010E-01	0.000E+00	3.000E-08	1.000E+00
3	350801	1	1.591E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00

3			0.000E+00	0.000E+00	8.470E-02	0.000E+00	1.000E-10	3.000E-06
3	360800	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.250E+00	1.000E+00	1.000E+00
3	290810	1	7.421E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.295E-01	8.810E+00	0.000E+00	3.000E-08	1.000E+00
3	300810	1	1.227E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.737E-02	6.782E+00	0.000E+00	3.000E-08	1.000E+00
3	310810	1	1.230E+00	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.190E-01	4.810E+00	0.000E+00	3.000E-08	1.000E+00
3	320810	1	7.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.283E+00	0.000E+00	3.000E-08	1.000E+00
3	330810	1	3.330E+01	3.000E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.808E+00	0.000E+00	3.000E-08	1.000E+00
3	340810	1	1.107E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.180E-01	0.000E+00	3.000E-08	1.000E+00
3	340811	1	3.435E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.995E-01
3			0.000E+00	0.000E+00	9.990E-02	0.000E+00	3.000E-08	1.000E+00
3	350810	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.931E+01	1.000E+00	1.000E+00
3	360810	1	6.722E+12	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.194E-02	0.000E+00	1.000E-10	3.000E-06
3	360811	1	1.300E+01	0.000E+00	6.400E-05	0.000E+00	0.000E+00	9.999E-01
3			0.000E+00	0.000E+00	1.867E-01	0.000E+00	3.000E-08	1.000E+00
3	300820	1	1.268E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.123E-01	6.577E+00	0.000E+00	3.000E-08	1.000E+00
3	310820	1	6.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.100E-01	8.064E+00	0.000E+00	3.000E-08	1.000E+00
3	320820	1	4.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.214E+00	0.000E+00	3.000E-08	1.000E+00
3	330820	1	1.910E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.002E+00	0.000E+00	3.000E-08	1.000E+00
3	330821	1	1.360E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.617E+00	0.000E+00	3.000E-08	1.000E+00
3	340820	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.200E+00	1.000E+00	1.000E+00
3	350820	1	1.271E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.783E+00	0.000E+00	6.000E-09	4.000E-05
3	350821	1	3.678E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.760E-01
3			0.000E+00	0.000E+00	7.810E-02	0.000E+00	3.000E-08	1.000E+00
3	360820	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.160E+01	1.000E+00	1.000E+00
3	300830	1	8.364E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.287E-01	8.245E+00	0.000E+00	3.000E-08	1.000E+00
3	310830	1	3.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.600E-01	8.072E+00	0.000E+00	3.000E-08	1.000E+00
3	320830	1	1.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.700E-03	5.133E+00	0.000E+00	3.000E-08	1.000E+00
3	330830	1	1.340E+01	7.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.007E+00	0.000E+00	3.000E-08	1.000E+00
3	340830	1	1.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.050E+00	0.000E+00	3.000E-08	1.000E+00
3	340831	1	7.010E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.227E+00	0.000E+00	3.000E-08	1.000E+00
3	350830	1	8.640E+03	9.998E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.325E-01	0.000E+00	1.000E-10	3.000E-06
3	360830	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.150E+01	1.000E+00	1.000E+00
3	360831	1	6.588E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	3.812E-02	0.000E+00	3.000E-08	1.000E+00
3	310840	1	9.838E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.802E-01	9.100E+00	0.000E+00	3.000E-08	1.000E+00
3	320840	1	1.200E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-01	5.063E+00	0.000E+00	3.000E-08	1.000E+00

3	330840	1	5.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.000E-04	5.440E+00	0.000E+00	3.000E-08	1.000E+00
3	340840	1	1.920E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.600E-01	0.000E+00	3.000E-08	1.000E+00
3	350840	1	1.908E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.986E+00	0.000E+00	3.000E-08	1.000E+00
3	350841	1	3.600E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.669E+00	0.000E+00	3.000E-08	1.000E+00
3	360840	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.700E+01	1.000E+00	1.000E+00
3	310850	1	8.697E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.496E-01	9.217E+00	0.000E+00	3.000E-08	1.000E+00
3	320850	1	2.500E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.000E-01	6.351E+00	0.000E+00	3.000E-08	1.000E+00
3	330850	1	2.028E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.100E-01	6.344E+00	0.000E+00	3.000E-08	1.000E+00
3	340850	1	3.170E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.970E+00	0.000E+00	3.000E-08	1.000E+00
3	340851	1	1.900E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.494E+00	0.000E+00	3.000E-08	1.000E+00
3	350850	1	1.722E+02	9.982E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.107E+00	0.000E+00	3.000E-08	1.000E+00
3	360850	1	3.383E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.530E-01	0.000E+00	3.000E-07	1.000E+00
3	360851	1	1.613E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.100E-01
3			0.000E+00	0.000E+00	4.121E-01	0.000E+00	1.000E-07	1.000E+00
3	370850	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.217E+01	1.000E+00	1.000E+00
3	320860	1	2.468E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.200E-01	6.147E+00	0.000E+00	3.000E-08	1.000E+00
3	330860	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.200E-01	7.180E+00	0.000E+00	3.000E-08	1.000E+00
3	340860	1	1.530E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.550E+00	0.000E+00	3.000E-08	1.000E+00
3	350860	1	5.510E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.340E+00	0.000E+00	3.000E-08	1.000E+00
3	350861	1	4.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.752E+00	0.000E+00	3.000E-08	1.000E+00
3	360860	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.730E+01	1.000E+00	1.000E+00
3	370860	1	1.610E+06	0.000E+00	5.200E-05	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.613E-01	0.000E+00	2.000E-09	2.000E-05
3	370861	1	6.102E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	5.560E-01	0.000E+00	3.000E-08	1.000E+00
3	380860	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.840E+00	1.000E+00	1.000E+00
3	320870	1	1.339E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.513E-01	7.229E+00	0.000E+00	3.000E-08	1.000E+00
3	330870	1	3.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.400E-01	7.250E+00	0.000E+00	3.000E-08	1.000E+00
3	340870	1	5.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.900E-03	4.723E+00	0.000E+00	3.000E-08	1.000E+00
3	350870	1	5.569E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.510E-02	4.951E+00	0.000E+00	3.000E-08	1.000E+00
3	360870	1	4.579E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.123E+00	0.000E+00	2.000E-08	1.000E+00
3	370870	1	1.515E+18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.170E-02	2.783E+01	2.000E-09	1.000E-04
3	380870	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.000E+00	1.000E+00	1.000E+00
3	380871	1	1.012E+04	0.000E+00	3.000E-03	0.000E+00	0.000E+00	9.970E-01
3			0.000E+00	0.000E+00	3.859E-01	0.000E+00	1.000E-10	3.000E-06
3	320880	1	1.290E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	2.165E-01	7.172E+00	0.000E+00	3.000E-08	1.000E+00
3	330880	1	1.348E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.991E-01	8.122E+00	0.000E+00	3.000E-08	1.000E+00
3	340880	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.000E-03	4.250E+00	0.000E+00	3.000E-08	1.000E+00
3	350880	1	1.650E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.370E-02	5.881E+00	0.000E+00	3.000E-08	1.000E+00
3	360880	1	1.022E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.322E+00	0.000E+00	2.000E-08	1.000E+00
3	370880	1	1.067E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.709E+00	0.000E+00	3.000E-08	1.000E+00
3	380880	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	8.260E+01	1.000E+00	1.000E+00
3	330890	1	1.212E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.327E-01	8.181E+00	0.000E+00	3.000E-08	1.000E+00
3	340890	1	4.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.000E-02	5.051E+00	0.000E+00	3.000E-08	1.000E+00
3	350890	1	4.370E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.380E-01	5.481E+00	0.000E+00	3.000E-08	1.000E+00
3	360890	1	1.902E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.186E+00	0.000E+00	3.000E-08	1.000E+00
3	370890	1	9.120E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.088E+00	0.000E+00	3.000E-08	1.000E+00
3	380890	1	4.368E+06	9.300E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.833E-01	0.000E+00	3.000E-10	3.000E-06
3	390890	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	390891	1	1.606E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	9.090E-01	0.000E+00	3.000E-08	1.000E+00
3	330900	1	9.112E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.435E-01	9.174E+00	0.000E+00	3.000E-08	1.000E+00
3	340900	1	4.272E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.100E-01	5.607E+00	0.000E+00	3.000E-08	1.000E+00
3	350900	1	1.920E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.320E-01	5.871E+00	0.000E+00	3.000E-08	1.000E+00
3	360900	1	3.232E+01	1.200E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.578E+00	0.000E+00	3.000E-08	1.000E+00
3	370900	1	1.530E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.156E+00	0.000E+00	3.000E-08	1.000E+00
3	370901	1	2.580E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.300E-02
3			0.000E+00	0.000E+00	4.751E+00	0.000E+00	3.000E-08	1.000E+00
3	380900	1	9.076E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.959E-01	0.000E+00	3.000E-11	3.000E-07
3	390900	1	2.307E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.340E-01	0.000E+00	3.000E-09	2.000E-05
3	390901	1	1.148E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	6.801E-01	0.000E+00	1.000E-10	3.000E-06
3	400900	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.150E+01	1.000E+00	1.000E+00
3	400901	1	8.092E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.319E+00	0.000E+00	3.000E-08	1.000E+00
3	340910	1	2.700E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.100E-01	7.062E+00	0.000E+00	3.000E-08	1.000E+00
3	350910	1	6.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.090E-01	5.628E+00	0.000E+00	3.000E-08	1.000E+00
3	360910	1	8.570E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.812E+00	0.000E+00	3.000E-08	1.000E+00
3	370910	1	5.840E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-06	3.901E+00	0.000E+00	3.000E-08	1.000E+00
3	380910	1	3.427E+04	5.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.347E+00	0.000E+00	9.000E-09	5.000E-05
3	390910	1	5.055E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.070E-01	0.000E+00	1.000E-09	3.000E-05

3	390911	1	2.983E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	5.552E-01	0.000E+00	6.000E-07	3.000E-03
3	400910	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.120E+01	1.000E+00	1.000E+00
3	410910	1	2.146E+10	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.713E-02	0.000E+00	1.000E-10	3.000E-06
3	340920	1	1.682E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.323E-01	6.435E+00	0.000E+00	3.000E-08	1.000E+00
3	350920	1	3.650E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.000E-01	7.681E+00	0.000E+00	3.000E-08	1.000E+00
3	360920	1	1.850E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.300E-04	3.559E+00	0.000E+00	3.000E-08	1.000E+00
3	370920	1	4.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.050E-04	4.044E+00	0.000E+00	3.000E-08	1.000E+00
3	380920	1	9.756E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.516E+00	0.000E+00	1.000E-08	6.000E-05
3	390920	1	1.274E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.689E+00	0.000E+00	1.000E-08	6.000E-05
3	400920	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.710E+01	1.000E+00	1.000E+00
3	410920	1	1.104E+15	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.513E+00	0.000E+00	1.000E-10	3.000E-06
3	340930	1	9.677E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.203E-01	8.341E+00	0.000E+00	3.000E-08	1.000E+00
3	350930	1	1.763E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.100E-01	7.533E+00	0.000E+00	3.000E-08	1.000E+00
3	360930	1	1.290E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.950E-02	5.200E+00	0.000E+00	3.000E-08	1.000E+00
3	370930	1	5.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.340E-02	4.071E+00	0.000E+00	3.000E-08	1.000E+00
3	380930	1	4.454E+02	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.090E+00	0.000E+00	3.000E-08	1.000E+00
3	390930	1	3.636E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.260E+00	0.000E+00	5.000E-09	3.000E-05
3	400930	1	4.730E+13	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.900E-02	0.000E+00	4.000E-09	8.000E-04
3	410930	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	410931	1	5.077E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.898E-02	0.000E+00	4.000E-09	4.000E-04
3	350940	1	1.108E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.980E-01	8.908E+00	0.000E+00	3.000E-08	1.000E+00
3	360940	1	2.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.700E-02	4.456E+00	0.000E+00	3.000E-08	1.000E+00
3	370940	1	2.702E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.015E-01	6.925E+00	0.000E+00	3.000E-08	1.000E+00
3	380940	1	7.520E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.267E+00	0.000E+00	3.000E-08	1.000E+00
3	390940	1	1.122E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.587E+00	0.000E+00	3.000E-08	1.000E+00
3	400940	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.740E+01	1.000E+00	1.000E+00
3	410940	1	6.406E+11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.717E+00	0.000E+00	1.000E-10	3.000E-06
3	410941	1	3.756E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.950E-01
3			0.000E+00	0.000E+00	4.670E-02	0.000E+00	3.000E-08	1.000E+00
3	350950	1	1.069E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.708E-01	7.507E+00	0.000E+00	3.000E-08	1.000E+00
3	360950	1	7.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.500E-02	6.463E+00	0.000E+00	3.000E-08	1.000E+00
3	370950	1	3.840E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.520E-02	6.273E+00	0.000E+00	3.000E-08	1.000E+00
3	380950	1	2.510E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	0.000E+00	3.825E+00	0.000E+00	3.000E-08	1.000E+00
3	390950	1	6.300E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.637E+00	0.000E+00	3.000E-08	1.000E+00
3	400950	1	5.531E+06	1.110E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.504E-01	0.000E+00	1.000E-09	6.000E-05
3	410950	1	3.021E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.089E-01	0.000E+00	3.000E-09	1.000E-04
3	410951	1	3.119E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.440E-01
3			0.000E+00	0.000E+00	2.386E-01	0.000E+00	1.000E-10	3.000E-06
3	420950	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.590E+01	1.000E+00	1.000E+00
3	350960	1	8.881E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.192E-01	9.460E+00	0.000E+00	3.000E-08	1.000E+00
3	360960	1	2.931E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.747E-02	4.681E+00	0.000E+00	3.000E-08	1.000E+00
3	370960	1	1.990E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.340E-01	7.849E+00	0.000E+00	3.000E-08	1.000E+00
3	380960	1	1.060E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.100E-05	3.148E+00	0.000E+00	3.000E-08	1.000E+00
3	390960	1	5.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.435E+00	0.000E+00	3.000E-08	1.000E+00
3	400960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.800E+00	1.000E+00	1.000E+00
3	410960	1	8.406E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.716E+00	0.000E+00	1.000E-10	3.000E-06
3	420960	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.670E+01	1.000E+00	1.000E+00
3	360970	1	1.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.393E-02	6.875E+00	0.000E+00	3.000E-08	1.000E+00
3	370970	1	1.718E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.640E-01	8.446E+00	0.000E+00	3.000E-08	1.000E+00
3	380970	1	4.200E-01	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.400E-05	4.660E+00	0.000E+00	3.000E-08	1.000E+00
3	390970	1	3.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.800E-04	3.952E+00	0.000E+00	3.000E-08	1.000E+00
3	400970	1	6.084E+04	9.480E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.860E-01	0.000E+00	3.000E-09	2.000E-05
3	410970	1	4.326E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.134E+00	0.000E+00	2.000E-07	9.000E-04
3	410971	1	6.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	7.428E-01	0.000E+00	3.000E-08	1.000E+00
3	420970	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.600E+00	1.000E+00	1.000E+00
3	360980	1	1.602E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.299E-02	5.391E+00	0.000E+00	3.000E-08	1.000E+00
3	370980	1	1.140E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.600E-01	6.733E+00	0.000E+00	3.000E-08	1.000E+00
3	380980	1	6.500E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.000E-03	3.191E+00	0.000E+00	3.000E-08	1.000E+00
3	390980	1	6.400E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.400E-03	5.151E+00	0.000E+00	3.000E-08	1.000E+00
3	400980	1	3.070E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.001E+00	0.000E+00	3.000E-08	1.000E+00
3	410980	1	2.860E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.656E+00	0.000E+00	3.000E-08	1.000E+00
3	410981	1	3.078E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.462E+00	0.000E+00	3.000E-08	1.000E+00
3	420980	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.410E+01	1.000E+00	1.000E+00
3	430980	1	1.325E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.517E+00	0.000E+00	1.000E-10	3.000E-06
3	370990	1	5.900E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.500E-01	6.422E+00	0.000E+00	3.000E-08	1.000E+00

3	380990	1	2.710E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.700E-04	5.413E+00	0.000E+00	3.000E-08	1.000E+00
3	390990	1	1.470E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.530E-02	3.845E+00	0.000E+00	3.000E-08	1.000E+00
3	400990	1	2.100E+00	3.600E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.593E+00	0.000E+00	3.000E-08	1.000E+00
3	410990	1	1.500E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.020E+00	0.000E+00	3.000E-08	1.000E+00
3	410991	1	1.560E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.630E+00	0.000E+00	3.000E-08	1.000E+00
3	420990	1	2.374E+05	8.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.756E-01	0.000E+00	7.000E-09	4.000E-05
3	430990	1	6.717E+12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.460E-02	0.000E+00	2.000E-09	2.000E-04
3	430991	1	2.164E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.578E-01	0.000E+00	5.000E-07	3.000E-03
3	440990	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.270E+01	1.000E+00	1.000E+00
3	371000	1	9.844E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.950E-02	8.984E+00	0.000E+00	3.000E-08	1.000E+00
3	381000	1	2.020E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.500E-03	3.809E+00	0.000E+00	3.000E-08	1.000E+00
3	391000	1	7.350E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.500E-03	5.804E+00	0.000E+00	3.000E-08	1.000E+00
3	401000	1	7.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.812E+00	0.000E+00	3.000E-08	1.000E+00
3	411000	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.197E+00	0.000E+00	3.000E-08	1.000E+00
3	411001	1	2.980E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.896E+00	0.000E+00	3.000E-08	1.000E+00
3	421000	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.600E+00	1.000E+00	1.000E+00
3	431000	1	1.580E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.398E+00	0.000E+00	3.000E-08	1.000E+00
3	441000	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.260E+01	1.000E+00	1.000E+00
3	371010	1	9.385E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.832E-01	7.370E+00	0.000E+00	3.000E-08	1.000E+00
3	381010	1	1.941E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.470E-02	6.139E+00	0.000E+00	3.000E-08	1.000E+00
3	391010	1	5.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.070E-02	4.224E+00	0.000E+00	3.000E-08	1.000E+00
3	401010	1	2.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.251E+00	0.000E+00	3.000E-08	1.000E+00
3	411010	1	7.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.406E+00	0.000E+00	3.000E-08	1.000E+00
3	421010	1	8.760E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.032E+00	0.000E+00	3.000E-08	1.000E+00
3	431010	1	8.520E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.130E-01	0.000E+00	3.000E-08	1.000E+00
3	441010	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.700E+01	1.000E+00	1.000E+00
3	381020	1	2.871E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.760E-02	4.618E+00	0.000E+00	3.000E-08	1.000E+00
3	391020	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.940E-02	6.947E+00	0.000E+00	3.000E-08	1.000E+00
3	401020	1	2.900E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.987E+00	0.000E+00	3.000E-08	1.000E+00
3	411020	1	1.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.293E+00	0.000E+00	3.000E-08	1.000E+00
3	421020	1	6.780E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.978E-01	0.000E+00	3.000E-08	1.000E+00
3	431020	1	5.280E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

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3                 0.000E+00 0.000E+00 2.613E+00 0.000E+00 3.000E-08 1.000E+00
3  431021  1      2.610E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 2.000E-02
3                 0.000E+00 0.000E+00 3.317E+00 0.000E+00 3.000E-08 1.000E+00
3  441020  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 0.000E+00 3.160E+01 1.000E+00 1.000E+00
3  451020  1      9.152E+07 0.000E+00 1.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 2.165E+00 0.000E+00 1.000E-10 3.000E-06
3  461020  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 0.000E+00 1.000E+00 1.000E+00 1.000E+00
3  381030  1      1.196E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 8.876E-02 6.696E+00 0.000E+00 3.000E-08 1.000E+00
3  391030  1      2.604E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.237E-01 5.081E+00 0.000E+00 3.000E-08 1.000E+00
3  401030  1      1.300E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 2.420E-04 3.924E+00 0.000E+00 3.000E-08 1.000E+00
3  411030  1      1.500E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.370E-04 3.093E+00 0.000E+00 3.000E-08 1.000E+00
3  421030  1      6.750E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 2.278E+00 0.000E+00 3.000E-08 1.000E+00
3  431030  1      5.420E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 1.257E+00 0.000E+00 3.000E-08 1.000E+00
3  441030  1      3.392E+06 9.973E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 5.616E-01 0.000E+00 3.000E-09 8.000E-05
3  451030  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
3  451031  1      3.367E+03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
3                 0.000E+00 0.000E+00 3.798E-02 0.000E+00 2.000E-06 1.000E-02
3  381040  1      1.629E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.347E-01 5.366E+00 0.000E+00 3.000E-08 1.000E+00
3  391040  1      1.283E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 8.777E-02 7.293E+00 0.000E+00 3.000E-08 1.000E+00
3  401040  1      2.573E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.100E-03 2.637E+00 0.000E+00 3.000E-08 1.000E+00
3  411040  1      4.800E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 7.100E-03 5.887E+00 0.000E+00 3.000E-08 1.000E+00
3  421040  1      6.000E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 1.208E+00 0.000E+00 3.000E-08 1.000E+00
3  431040  1      1.098E+03 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 3.695E+00 0.000E+00 3.000E-08 1.000E+00
3  441040  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 0.000E+00 1.870E+01 1.000E+00 1.000E+00
3  451040  1      4.230E+01 0.000E+00 4.500E-03 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 9.990E-01 0.000E+00 3.000E-08 1.000E+00
3  451041  1      2.604E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 9.987E-01
3                 0.000E+00 0.000E+00 1.268E-01 0.000E+00 3.000E-08 1.000E+00
3  461040  6      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 0.000E+00 1.100E+01 1.000E+00 1.000E+00
3  391050  1      1.469E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.975E-01 5.821E+00 0.000E+00 3.000E-08 1.000E+00
3  401050  1      4.926E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 1.400E-02 4.431E+00 0.000E+00 3.000E-08 1.000E+00
3  411050  1      2.950E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 2.232E-02 3.911E+00 0.000E+00 3.000E-08 1.000E+00
3  421050  1      3.560E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 3.177E+00 0.000E+00 3.000E-08 1.000E+00
3  431050  1      4.560E+02 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 1.993E+00 0.000E+00 3.000E-08 1.000E+00
3  441050  1      1.598E+04 2.840E-01 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 1.150E+00 0.000E+00 2.000E-08 1.000E-04
3  451050  1      1.273E+05 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
3                 0.000E+00 0.000E+00 2.302E-01 0.000E+00 2.000E-08 1.000E-04
3  451051  1      4.500E+01 0.000E+00 0.000E+00 0.000E+00 0.000E+00 1.000E+00
3                 0.000E+00 0.000E+00 1.253E-01 0.000E+00 3.000E-08 1.000E+00
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3	461050	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.220E+01	1.000E+00	1.000E+00
3	391060	1	8.943E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.566E-01	8.101E+00	0.000E+00	3.000E-08	1.000E+00
3	401060	1	9.071E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.524E-02	3.235E+00	0.000E+00	3.000E-08	1.000E+00
3	411060	1	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.500E-02	5.882E+00	0.000E+00	3.000E-08	1.000E+00
3	421060	1	8.400E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.978E+00	0.000E+00	3.000E-08	1.000E+00
3	431060	1	3.600E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.630E+00	0.000E+00	3.000E-08	1.000E+00
3	441060	1	3.217E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.003E-02	0.000E+00	2.000E-10	1.000E-05
3	451060	1	2.980E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.617E+00	0.000E+00	3.000E-08	1.000E+00
3	451061	1	7.800E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.173E+00	0.000E+00	1.000E-10	3.000E-06
3	461060	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.730E+01	1.000E+00	1.000E+00
3	471060	1	1.440E+03	0.000E+00	9.900E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.946E-01	0.000E+00	1.000E-10	3.000E-06
3	391070	1	9.226E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.594E-01	6.646E+00	0.000E+00	3.000E-08	1.000E+00
3	401070	1	2.430E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.713E-02	5.200E+00	0.000E+00	3.000E-08	1.000E+00
3	411070	1	7.660E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.781E-02	4.673E+00	0.000E+00	3.000E-08	1.000E+00
3	421070	1	3.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.710E+00	0.000E+00	3.000E-08	1.000E+00
3	431070	1	2.120E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.583E+00	0.000E+00	3.000E-08	1.000E+00
3	441070	1	2.250E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.652E+00	0.000E+00	3.000E-08	1.000E+00
3	451070	1	1.302E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.500E-01	0.000E+00	3.000E-08	1.000E+00
3	461070	1	2.051E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.300E-03	0.000E+00	1.000E-10	3.000E-06
3	461071	1	2.130E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.131E-01	0.000E+00	3.000E-08	1.000E+00
3	471070	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.183E+01	1.000E+00	1.000E+00
3	401080	1	3.781E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.030E-02	3.942E+00	0.000E+00	3.000E-08	1.000E+00
3	411080	1	2.423E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.467E-02	6.727E+00	0.000E+00	3.000E-08	1.000E+00
3	421080	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-06	2.746E+00	0.000E+00	3.000E-08	1.000E+00
3	431080	1	5.170E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.242E+00	0.000E+00	3.000E-08	1.000E+00
3	441080	1	2.730E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.610E-01	0.000E+00	3.000E-08	1.000E+00
3	451080	1	1.680E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.640E+00	0.000E+00	3.000E-08	1.000E+00
3	451081	1	3.600E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.489E+00	0.000E+00	3.000E-08	1.000E+00
3	461080	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.670E+01	1.000E+00	1.000E+00
3	471080	1	1.422E+02	0.000E+00	2.850E-02	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.284E-01	0.000E+00	3.000E-08	1.000E+00
3	471081	1	4.008E+09	0.000E+00	9.130E-01	0.000E+00	0.000E+00	8.700E-02
3			0.000E+00	0.000E+00	1.636E+00	0.000E+00	1.000E-10	3.000E-06
3	481080	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	0.000E+00	0.000E+00	8.900E-01	1.000E+00	1.000E+00
3	401090	1	1.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.394E-02	6.130E+00	0.000E+00	3.000E-08	1.000E+00
3	411090	1	3.154E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.265E-01	5.489E+00	0.000E+00	3.000E-08	1.000E+00
3	421090	1	1.408E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.300E-03	4.552E+00	0.000E+00	3.000E-08	1.000E+00
3	431090	1	1.400E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.700E-02	3.246E+00	0.000E+00	3.000E-08	1.000E+00
3	441090	1	3.500E+01	5.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.300E+00	0.000E+00	3.000E-08	1.000E+00
3	451090	1	8.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.237E+00	0.000E+00	3.000E-08	1.000E+00
3	451091	1	5.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	5.000E-02	0.000E+00	3.000E-08	1.000E+00
3	461090	1	4.932E+04	9.995E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.614E-01	0.000E+00	1.000E-08	7.000E-05
3	461091	1	2.814E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.837E-01	0.000E+00	3.000E-08	1.000E+00
3	471090	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.817E+01	1.000E+00	1.000E+00
3	471091	1	3.960E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	8.460E-02	0.000E+00	3.000E-08	1.000E+00
3	481090	1	3.997E+07	0.000E+00	0.000E+00	1.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.971E-02	0.000E+00	2.000E-09	4.000E-05
3	411100	1	1.298E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.005E-01	7.728E+00	0.000E+00	3.000E-08	1.000E+00
3	421100	1	2.772E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.300E-02	3.355E+00	0.000E+00	3.000E-08	1.000E+00
3	431100	1	8.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.100E-02	5.212E+00	0.000E+00	3.000E-08	1.000E+00
3	441100	1	1.500E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.255E+00	0.000E+00	3.000E-08	1.000E+00
3	451100	1	3.160E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.991E+00	0.000E+00	3.000E-08	1.000E+00
3	451101	1	2.850E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.737E+00	0.000E+00	3.000E-08	1.000E+00
3	461100	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.180E+01	1.000E+00	1.000E+00
3	471100	1	2.460E+01	0.000E+00	3.000E-03	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.212E+00	0.000E+00	3.000E-08	1.000E+00
3	471101	1	2.158E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.360E-02
3			0.000E+00	0.000E+00	2.813E+00	0.000E+00	3.000E-10	3.000E-05
3	481100	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.250E+01	1.000E+00	1.000E+00
3	411110	1	1.718E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.840E-01	6.080E+00	0.000E+00	3.000E-08	1.000E+00
3	421110	1	4.664E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.030E-02	5.515E+00	0.000E+00	3.000E-08	1.000E+00
3	431110	1	1.982E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.695E-02	4.012E+00	0.000E+00	3.000E-08	1.000E+00
3	441110	1	1.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.829E+00	0.000E+00	3.000E-08	1.000E+00
3	451110	1	1.100E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.976E+00	0.000E+00	3.000E-08	1.000E+00
3	461110	1	1.404E+03	9.926E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.779E-01	0.000E+00	3.000E-08	1.000E+00
3	461111	1	1.980E+04	1.960E-01	0.000E+00	0.000E+00	0.000E+00	7.300E-01
3			0.000E+00	0.000E+00	5.450E-01	0.000E+00	1.000E-10	3.000E-06
3	471110	1	6.437E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.810E-01	0.000E+00	8.000E-09	4.000E-05
3	471111	1	6.480E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.930E-01
3			0.000E+00	0.000E+00	6.160E-02	0.000E+00	3.000E-08	1.000E+00

3	481110	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.280E+01	1.000E+00	1.000E+00
3	481111	1	2.916E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	3.870E-01	0.000E+00	3.000E-08	1.000E+00
3	411120	1	8.672E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.364E+00	0.000E+00	3.000E-08	1.000E+00
3	421120	1	9.754E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.079E-02	3.914E+00	0.000E+00	3.000E-08	1.000E+00
3	431120	1	4.314E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.203E-02	6.154E+00	0.000E+00	3.000E-08	1.000E+00
3	441120	1	3.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.839E+00	0.000E+00	3.000E-08	1.000E+00
3	451120	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.633E+00	0.000E+00	3.000E-08	1.000E+00
3	461120	1	7.576E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.590E-02	0.000E+00	1.000E-10	3.000E-06
3	471120	1	1.130E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.086E+00	0.000E+00	1.000E-10	3.000E-06
3	481120	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.411E+01	1.000E+00	1.000E+00
3	421130	1	2.287E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.797E-02	6.250E+00	0.000E+00	3.000E-08	1.000E+00
3	431130	1	6.524E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.186E-02	4.587E+00	0.000E+00	3.000E-08	1.000E+00
3	441130	1	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.000E-06	3.665E+00	0.000E+00	3.000E-08	1.000E+00
3	451130	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.549E+00	0.000E+00	3.000E-08	1.000E+00
3	461130	1	9.300E+01	1.850E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.700E+00	0.000E+00	3.000E-08	1.000E+00
3	471130	1	1.933E+04	1.700E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.339E-01	0.000E+00	1.000E-10	3.000E-06
3	471131	1	6.870E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.000E-01
3			0.000E+00	0.000E+00	2.540E-01	0.000E+00	3.000E-08	1.000E+00
3	481130	1	2.935E+23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.130E-02	1.220E+01	1.000E+00	1.000E+00
3	481131	1	4.447E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.400E-03
3			0.000E+00	0.000E+00	1.835E-01	0.000E+00	1.000E-10	3.000E-06
3	491130	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.300E+00	1.000E+00	1.000E+00
3	491131	1	5.969E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	3.870E-01	0.000E+00	2.000E-07	1.000E-03
3	421140	1	3.766E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.503E+00	0.000E+00	3.000E-08	1.000E+00
3	431140	1	2.023E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.536E-02	6.868E+00	0.000E+00	3.000E-08	1.000E+00
3	441140	1	8.137E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.039E-03	2.317E+00	0.000E+00	3.000E-08	1.000E+00
3	451140	1	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.000E-05	4.495E+00	0.000E+00	3.000E-08	1.000E+00
3	461140	1	1.470E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.674E-01	0.000E+00	3.000E-08	1.000E+00
3	471140	1	4.600E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.254E+00	0.000E+00	3.000E-08	1.000E+00
3	481140	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.870E+01	1.000E+00	1.000E+00
3	491140	1	7.190E+01	0.000E+00	5.000E-03	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.753E-01	0.000E+00	3.000E-08	1.000E+00
3	491141	1	4.278E+06	0.000E+00	4.300E-02	0.000E+00	0.000E+00	9.570E-01
3			0.000E+00	0.000E+00	2.360E-01	0.000E+00	7.000E-10	2.000E-05
3	501140	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	6.700E-01	1.000E+00	1.000E+00
3	421150	1	1.259E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	0.000E+00	6.596E+00	0.000E+00	3.000E-08	1.000E+00
3	431150	1	2.704E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.434E-01	5.237E+00	0.000E+00	3.000E-08	1.000E+00
3	441150	1	8.784E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.276E-03	4.345E+00	0.000E+00	3.000E-08	1.000E+00
3	451150	1	8.315E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.746E-03	3.077E+00	0.000E+00	3.000E-08	1.000E+00
3	461150	1	3.800E+01	2.700E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.597E+00	0.000E+00	3.000E-08	1.000E+00
3	471150	1	1.200E+03	5.700E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.583E+00	0.000E+00	3.000E-08	1.000E+00
3	471151	1	1.800E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.814E+00	0.000E+00	3.000E-08	1.000E+00
3	481150	1	1.925E+05	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.101E-01	0.000E+00	6.000E-09	3.000E-05
3	481151	1	3.853E+06	1.100E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.360E-01	0.000E+00	1.000E-09	3.000E-05
3	491150	1	1.392E+22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.530E-01	9.570E+01	1.000E-09	9.000E-05
3	491151	1	1.615E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.500E-01
3			0.000E+00	0.000E+00	3.314E-01	0.000E+00	6.000E-08	4.000E-04
3	501150	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.800E-01	1.000E+00	1.000E+00
3	431160	1	1.155E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.222E-01	7.260E+00	0.000E+00	3.000E-08	1.000E+00
3	441160	1	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.081E-02	2.833E+00	0.000E+00	3.000E-08	1.000E+00
3	451160	1	9.492E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.379E-03	5.189E+00	0.000E+00	3.000E-08	1.000E+00
3	461160	1	1.272E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.266E+00	0.000E+00	3.000E-08	1.000E+00
3	471160	1	1.608E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.789E+00	0.000E+00	3.000E-08	1.000E+00
3	471161	1	1.040E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.000E-02
3			0.000E+00	0.000E+00	4.061E+00	0.000E+00	3.000E-08	1.000E+00
3	481160	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.500E+00	1.000E+00	1.000E+00
3	491160	1	1.410E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.384E+00	0.000E+00	3.000E-08	1.000E+00
3	491161	1	3.249E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.784E+00	0.000E+00	3.000E-08	1.000E+00
3	501160	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.470E+01	1.000E+00	1.000E+00
3	431170	1	1.518E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.125E-01	5.695E+00	0.000E+00	3.000E-08	1.000E+00
3	441170	1	3.428E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.051E-02	4.731E+00	0.000E+00	3.000E-08	1.000E+00
3	451170	1	1.217E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.820E-02	3.667E+00	0.000E+00	3.000E-08	1.000E+00
3	461170	1	5.000E+00	5.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.002E+00	0.000E+00	3.000E-08	1.000E+00
3	471170	1	7.280E+01	1.400E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.521E+00	0.000E+00	3.000E-08	1.000E+00
3	471171	1	5.340E+00	1.450E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.298E+00	0.000E+00	3.000E-08	1.000E+00
3	481170	1	8.964E+03	9.100E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.510E+00	0.000E+00	1.000E-10	3.000E-06
3	481171	1	1.210E+04	1.500E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.235E+00	0.000E+00	1.000E-10	3.000E-06
3	491170	1	2.628E+03	3.200E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.542E-01	0.000E+00	3.000E-08	1.000E+00
3	491171	1	6.990E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.710E-01
3			0.000E+00	0.000E+00	5.220E-01	0.000E+00	3.000E-08	1.000E+00

3	501170	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.750E+00	1.000E+00	1.000E+00
3	501171	1	1.175E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	3.135E-01	0.000E+00	1.000E-10	3.000E-06
3	431180	1	8.155E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.712E+00	0.000E+00	3.000E-08	1.000E+00
3	441180	1	6.623E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.109E-02	3.230E+00	0.000E+00	3.000E-08	1.000E+00
3	451180	1	3.156E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.917E-02	5.600E+00	0.000E+00	3.000E-08	1.000E+00
3	461180	1	3.100E+00	5.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.759E+00	0.000E+00	3.000E-08	1.000E+00
3	471180	1	3.760E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.088E+00	0.000E+00	3.000E-08	1.000E+00
3	471181	1	2.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.100E-01
3			0.000E+00	0.000E+00	2.751E+00	0.000E+00	3.000E-08	1.000E+00
3	481180	1	3.018E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.644E-01	0.000E+00	3.000E-08	1.000E+00
3	491180	1	5.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.848E+00	0.000E+00	3.000E-08	1.000E+00
3	491181	1	2.670E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.282E+00	0.000E+00	3.000E-08	1.000E+00
3	501180	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.430E+01	1.000E+00	1.000E+00
3	441190	1	1.949E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.358E-02	5.252E+00	0.000E+00	3.000E-08	1.000E+00
3	451190	1	4.654E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.297E-02	4.113E+00	0.000E+00	3.000E-08	1.000E+00
3	461190	1	1.759E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-06	3.448E+00	0.000E+00	3.000E-08	1.000E+00
3	471190	1	2.100E+00	2.200E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-06	3.296E+00	0.000E+00	3.000E-08	1.000E+00
3	481190	1	1.614E+02	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.472E+00	0.000E+00	3.000E-08	1.000E+00
3	481191	1	1.320E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.054E+00	0.000E+00	3.000E-08	1.000E+00
3	491190	1	1.440E+02	9.300E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.370E+00	0.000E+00	3.000E-08	1.000E+00
3	491191	1	1.080E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.500E-02
3			0.000E+00	0.000E+00	1.107E+00	0.000E+00	3.000E-08	1.000E+00
3	501190	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	8.600E+00	1.000E+00	1.000E+00
3	501191	1	2.532E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	8.733E-02	0.000E+00	1.000E-10	3.000E-06
3	441200	1	3.503E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.346E+00	0.000E+00	3.000E-08	1.000E+00
3	451200	1	1.725E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.928E-02	6.127E+00	0.000E+00	3.000E-08	1.000E+00
3	461200	1	3.906E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.800E-05	2.157E+00	0.000E+00	3.000E-08	1.000E+00
3	471200	1	1.170E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.500E-05	5.168E+00	0.000E+00	3.000E-08	1.000E+00
3	481200	1	5.080E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.347E-01	0.000E+00	3.000E-08	1.000E+00
3	491200	1	3.080E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.759E+00	0.000E+00	3.000E-08	1.000E+00
3	491201	1	4.620E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.922E+00	0.000E+00	3.000E-08	1.000E+00
3	501200	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.240E+01	1.000E+00	1.000E+00
3	451210	1	2.496E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.357E-01	4.597E+00	0.000E+00	3.000E-08	1.000E+00
3	461210	1	6.437E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	2.722E-03	3.974E+00	0.000E+00	3.000E-08	1.000E+00
3	471210	1	8.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.600E-04	3.739E+00	0.000E+00	3.000E-08	1.000E+00
3	481210	1	1.350E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.179E+00	0.000E+00	3.000E-08	1.000E+00
3	491210	1	2.310E+01	1.130E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.912E+00	0.000E+00	3.000E-08	1.000E+00
3	491211	1	2.328E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.200E-02
3			0.000E+00	0.000E+00	1.598E+00	0.000E+00	3.000E-08	1.000E+00
3	501210	1	9.742E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.152E-01	0.000E+00	1.000E-10	3.000E-06
3	501211	1	1.736E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.760E-01
3			0.000E+00	0.000E+00	3.900E-02	0.000E+00	1.000E-10	3.000E-06
3	511210	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.730E+01	1.000E+00	1.000E+00
3	451220	1	1.072E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.301E-02	6.486E+00	0.000E+00	3.000E-08	1.000E+00
3	461220	1	1.411E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.377E-03	2.572E+00	0.000E+00	3.000E-08	1.000E+00
3	471220	1	4.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.860E-03	5.559E+00	0.000E+00	3.000E-08	1.000E+00
3	481220	1	5.240E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.252E+00	0.000E+00	3.000E-08	1.000E+00
3	491220	1	1.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.605E+00	0.000E+00	3.000E-08	1.000E+00
3	491221	1	1.030E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.065E+00	0.000E+00	3.000E-08	1.000E+00
3	501220	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.600E+00	1.000E+00	1.000E+00
3	511220	1	2.333E+05	0.000E+00	2.400E-02	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.002E+00	0.000E+00	5.000E-09	3.000E-05
3	511221	1	2.526E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.600E-01	0.000E+00	3.000E-08	1.000E+00
3	521220	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.500E+00	1.000E+00	1.000E+00
3	451230	1	1.343E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.711E-01	5.150E+00	0.000E+00	3.000E-08	1.000E+00
3	461230	1	3.004E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.897E-03	4.356E+00	0.000E+00	3.000E-08	1.000E+00
3	471230	1	3.900E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.600E-02	4.514E+00	0.000E+00	3.000E-08	1.000E+00
3	481230	1	8.905E+00	2.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.965E+00	0.000E+00	3.000E-08	1.000E+00
3	491230	1	5.980E+00	9.680E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.465E+00	0.000E+00	3.000E-08	1.000E+00
3	491231	1	4.780E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.076E+00	0.000E+00	3.000E-08	1.000E+00
3	501230	1	1.116E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.272E-01	0.000E+00	1.000E-10	3.000E-06
3	501231	1	2.405E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.195E-01	0.000E+00	3.000E-08	1.000E+00
3	511230	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.270E+01	1.000E+00	1.000E+00
3	521230	1	3.913E+20	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.688E-02	8.890E-01	1.000E-10	3.000E-06
3	521231	1	1.034E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.460E-01	0.000E+00	1.000E-10	3.000E-06
3	461240	1	5.140E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.699E-02	3.064E+00	0.000E+00	3.000E-08	1.000E+00
3	471240	1	2.495E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.288E-02	5.721E+00	0.000E+00	3.000E-08	1.000E+00
3	481240	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.709E+00	0.000E+00	3.000E-08	1.000E+00

3	491240	1	3.170E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.664E+00	0.000E+00	3.000E-08	1.000E+00
3	501240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.600E+00	1.000E+00	1.000E+00
3	511240	1	5.201E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.236E+00	0.000E+00	7.000E-10	2.000E-05
3	511241	1	9.300E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.500E-01
3			0.000E+00	0.000E+00	5.570E-01	0.000E+00	3.000E-08	1.000E+00
3	521240	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.620E+00	1.000E+00	1.000E+00
3	461250	1	1.660E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.266E-02	4.773E+00	0.000E+00	3.000E-08	1.000E+00
3	471250	1	3.335E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.317E-02	4.434E+00	0.000E+00	3.000E-08	1.000E+00
3	481250	1	1.548E+00	3.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.409E+00	0.000E+00	3.000E-08	1.000E+00
3	491250	1	2.330E+00	8.880E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.090E+00	0.000E+00	3.000E-08	1.000E+00
3	491251	1	1.220E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.769E+00	0.000E+00	3.000E-08	1.000E+00
3	501250	1	8.329E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.123E+00	0.000E+00	3.000E-09	2.000E-05
3	501251	1	5.712E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.162E+00	0.000E+00	3.000E-08	1.000E+00
3	511250	1	8.698E+07	2.300E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.333E-01	0.000E+00	9.000E-10	1.000E-04
3	521250	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.000E+00	1.000E+00	1.000E+00
3	521251	1	5.011E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.420E-01	0.000E+00	4.000E-09	1.000E-04
3	461260	1	2.520E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.031E-02	3.658E+00	0.000E+00	3.000E-08	1.000E+00
3	471260	1	1.398E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.638E-02	6.455E+00	0.000E+00	3.000E-08	1.000E+00
3	481260	1	5.060E-01	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.211E+00	0.000E+00	3.000E-08	1.000E+00
3	491260	1	1.450E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.203E+00	0.000E+00	3.000E-08	1.000E+00
3	501260	1	7.884E+12	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.630E-01	0.000E+00	1.000E-10	3.000E-06
3	511260	1	1.071E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.119E+00	0.000E+00	1.000E-10	3.000E-06
3	511261	1	1.140E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.400E-01
3			0.000E+00	0.000E+00	2.186E+00	0.000E+00	3.000E-08	1.000E+00
3	521260	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.870E+01	1.000E+00	1.000E+00
3	541260	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.000E-02	1.000E+00	1.000E+00
3	471270	1	1.753E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.863E-02	5.117E+00	0.000E+00	3.000E-08	1.000E+00
3	481270	1	5.719E-01	4.999E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.010E-04	4.074E+00	0.000E+00	3.000E-08	1.000E+00
3	491270	1	1.150E+00	8.404E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.600E-03	3.919E+00	0.000E+00	3.000E-08	1.000E+00
3	491271	1	3.760E+00	9.935E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.500E-03	3.919E+00	0.000E+00	3.000E-08	1.000E+00
3	501270	1	7.560E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.413E+00	0.000E+00	1.000E-10	3.000E-06
3	501271	1	2.478E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.777E+00	0.000E+00	3.000E-08	1.000E+00
3	511270	1	3.326E+05	1.750E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.780E-01	0.000E+00	1.000E-10	3.000E-06
3	521270	1	3.366E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	0.000E+00	2.292E-01	0.000E+00	3.000E-08	2.000E-04
3	521271	1	9.418E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.760E-01
3			0.000E+00	0.000E+00	9.030E-02	0.000E+00	1.000E-09	5.000E-05
3	531270	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	541270	1	3.145E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.106E-01	0.000E+00	1.000E-10	3.000E-06
3	471280	1	9.428E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.886E-02	6.932E+00	0.000E+00	3.000E-08	1.000E+00
3	481280	1	1.053E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.100E-03	2.834E+00	0.000E+00	3.000E-08	1.000E+00
3	491280	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.300E-04	5.730E+00	0.000E+00	3.000E-08	1.000E+00
3	501280	1	3.546E+03	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.530E-01	0.000E+00	3.000E-08	1.000E+00
3	511280	1	3.244E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.578E+00	0.000E+00	1.000E-10	3.000E-06
3	511281	1	6.240E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.600E-02
3			0.000E+00	0.000E+00	2.854E+00	0.000E+00	3.000E-08	1.000E+00
3	521280	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.170E+01	1.000E+00	1.000E+00
3	531280	1	1.499E+03	0.000E+00	6.900E-02	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.290E-01	0.000E+00	3.000E-08	1.000E+00
3	541280	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.910E+00	1.000E+00	1.000E+00
3	481290	1	2.987E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.519E-03	4.532E+00	0.000E+00	3.000E-08	1.000E+00
3	491290	1	5.900E-01	1.060E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.600E-03	4.672E+00	0.000E+00	3.000E-08	1.000E+00
3	501290	1	1.296E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.713E+00	0.000E+00	3.000E-08	1.000E+00
3	501291	1	4.020E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.000E-06
3			0.000E+00	0.000E+00	2.899E+00	0.000E+00	3.000E-08	1.000E+00
3	511290	1	1.584E+04	1.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.747E+00	0.000E+00	1.000E-10	3.000E-06
3	521290	1	4.176E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.000E-01	0.000E+00	1.000E-07	8.000E-04
3	521291	1	2.903E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.400E-01
3			0.000E+00	0.000E+00	3.070E-01	0.000E+00	1.000E-09	2.000E-05
3	531290	1	4.951E+14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.890E-02	0.000E+00	2.000E-11	6.000E-08
3	541290	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.640E+01	1.000E+00	1.000E+00
3	541291	1	7.681E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.267E-01	0.000E+00	1.000E-10	3.000E-06
3	481300	1	4.768E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.676E-03	3.486E+00	0.000E+00	3.000E-08	1.000E+00
3	491300	1	3.200E-01	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.100E-03	6.095E+00	0.000E+00	3.000E-08	1.000E+00
3	501300	1	2.232E+02	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.424E+00	0.000E+00	3.000E-08	1.000E+00
3	511300	1	2.370E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.969E+00	0.000E+00	3.000E-08	1.000E+00
3	511301	1	3.780E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.688E+00	0.000E+00	3.000E-08	1.000E+00
3	521300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.450E+01	1.000E+00	1.000E+00
3	531300	1	4.450E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.428E+00	0.000E+00	1.000E-10	3.000E-06
3	531301	1	5.400E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.400E-01
3			0.000E+00	0.000E+00	2.880E-01	0.000E+00	3.000E-08	1.000E+00
3	541300	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.100E+00	1.000E+00	1.000E+00

3	481310	1	1.062E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.873E-02	6.809E+00	0.000E+00	3.000E-08	1.000E+00
3	491310	1	2.700E-01	0.000E-00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.840E-02	4.731E+00	0.000E+00	3.000E-08	1.000E+00
3	501310	1	3.900E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.240E+00	0.000E+00	3.000E-08	1.000E+00
3	511310	1	1.380E+03	6.800E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.332E+00	0.000E+00	3.000E-08	1.000E+00
3	521310	1	1.500E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.142E+00	0.000E+00	3.000E-08	1.000E+00
3	521311	1	1.080E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.220E-01
3			0.000E+00	0.000E+00	1.612E+00	0.000E+00	6.000E-09	4.000E-05
3	531310	1	6.947E+05	1.086E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.735E-01	0.000E+00	1.000E-10	3.000E-07
3	541310	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.120E+01	1.000E+00	1.000E+00
3	541311	1	1.028E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.621E-01	0.000E+00	4.000E-07	1.000E+00
3	481320	1	1.357E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.056E-01	5.433E+00	0.000E+00	3.000E-08	1.000E+00
3	491320	1	1.860E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.000E-02	9.146E+00	0.000E+00	3.000E-08	1.000E+00
3	501320	1	4.000E+01	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.022E+00	0.000E+00	3.000E-08	1.000E+00
3	511320	1	2.520E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.873E+00	0.000E+00	3.000E-08	1.000E+00
3	511321	1	1.680E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.860E+00	0.000E+00	3.000E-08	1.000E+00
3	521320	1	2.815E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.339E-01	0.000E+00	4.000E-09	2.000E-05
3	531320	1	8.222E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.778E+00	0.000E+00	3.000E-09	8.000E-06
3	541320	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.690E+01	1.000E+00	1.000E+00
3	551320	1	5.598E+05	0.000E+00	9.813E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.278E-01	0.000E+00	1.000E-10	3.000E-06
3	561320	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E-01	1.000E+00	1.000E+00
3	491330	1	1.116E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.166E-01	7.391E+00	0.000E+00	3.000E-08	1.000E+00
3	501330	1	1.440E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.549E-03	4.654E+00	0.000E+00	3.000E-08	1.000E+00
3	511330	1	1.500E+02	1.700E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.696E+00	0.000E+00	3.000E-08	1.000E+00
3	521330	1	7.500E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.875E+00	0.000E+00	3.000E-08	1.000E+00
3	521331	1	3.324E+03	1.020E-01	0.000E+00	0.000E+00	0.000E+00	1.750E-01
3			0.000E+00	0.000E+00	2.050E+00	0.000E+00	3.000E-08	1.000E+00
3	531330	1	7.488E+04	2.880E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.021E+00	0.000E+00	4.000E-10	1.000E-06
3	531331	1	9.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.633E+00	0.000E+00	3.000E-08	1.000E+00
3	541330	1	4.530E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.835E-01	0.000E+00	3.000E-07	1.000E+00
3	541331	1	1.892E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.253E-01	0.000E+00	3.000E-07	1.000E+00
3	551330	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	561330	1	3.320E+08	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.553E-01	0.000E+00	1.000E-10	3.000E-06
3	491340	1	8.056E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.376E-01	8.927E+00	0.000E+00	3.000E-08	1.000E+00
3	501340	1	1.040E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	1.700E-01	3.634E+00	0.000E+00	3.000E-08	1.000E+00
3	511340	1	8.500E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.040E-03	5.037E+00	0.000E+00	3.000E-08	1.000E+00
3	511341	1	1.043E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.180E-03	5.142E+00	0.000E+00	3.000E-08	1.000E+00
3	521340	1	2.508E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.095E+00	0.000E+00	3.000E-08	1.000E+00
3	531340	1	3.156E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.227E+00	0.000E+00	6.000E-09	2.000E-05
3	531341	1	2.214E+02	2.300E-02	0.000E+00	0.000E+00	0.000E+00	9.770E-01
3			0.000E+00	0.000E+00	3.250E-01	0.000E+00	3.000E-08	1.000E+00
3	541340	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.040E+01	1.000E+00	1.000E+00
3	541341	1	2.900E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.965E+00	0.000E+00	3.000E-08	1.000E+00
3	551340	1	6.512E+07	0.000E+00	3.000E-06	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.720E+00	0.000E+00	4.000E-10	9.000E-06
3	551341	1	1.048E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.314E-01	0.000E+00	2.000E-07	1.000E-03
3	561340	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.400E+00	1.000E+00	1.000E+00
3	501350	1	4.178E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.600E-02	5.078E+00	0.000E+00	3.000E-08	1.000E+00
3	511350	1	1.710E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.020E-01	4.055E+00	0.000E+00	3.000E-08	1.000E+00
3	521350	1	1.900E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.562E+00	0.000E+00	3.000E-08	1.000E+00
3	531350	1	2.365E+04	1.570E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.951E+00	0.000E+00	1.000E-09	4.000E-06
3	541350	1	3.290E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.668E-01	0.000E+00	1.000E-07	1.000E+00
3	541351	1	9.174E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	5.230E-01	0.000E+00	3.000E-08	1.000E+00
3	551350	1	7.258E+13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.630E-02	0.000E+00	3.000E-09	1.000E-04
3	551351	1	3.180E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.630E+00	0.000E+00	3.000E-08	1.000E+00
3	561350	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	6.590E+00	1.000E+00	1.000E+00
3	561351	1	1.033E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.595E-01	0.000E+00	1.000E-10	3.000E-06
3	501360	1	7.172E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.639E-01	4.124E+00	0.000E+00	3.000E-08	1.000E+00
3	511360	1	8.200E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.300E-01	5.666E+00	0.000E+00	3.000E-08	1.000E+00
3	521360	1	1.750E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.000E-03	3.294E+00	0.000E+00	3.000E-08	1.000E+00
3	531360	1	8.340E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.344E+00	0.000E+00	3.000E-08	1.000E+00
3	531361	1	4.690E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.823E+00	0.000E+00	3.000E-08	1.000E+00
3	541360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	8.900E+00	1.000E+00	1.000E+00
3	551360	1	1.137E+06	1.120E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.051E+00	0.000E+00	6.000E-09	6.000E-05
3	561360	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.900E+00	1.000E+00	1.000E+00
3	561361	1	3.084E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.030E+00	0.000E+00	3.000E-08	1.000E+00
3	511370	1	4.779E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.000E-01	5.062E+00	0.000E+00	3.000E-08	1.000E+00
3	521370	1	3.500E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.200E-02	3.788E+00	0.000E+00	3.000E-08	1.000E+00

3	531370	1	2.450E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.700E-02	3.302E+00	0.000E+00	3.000E-08	1.000E+00
3	541370	1	2.291E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.888E+00	0.000E+00	3.000E-08	1.000E+00
3	551370	1	9.483E+08	9.443E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.875E-01	0.000E+00	5.000E-10	2.000E-05
3	561370	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.120E+01	1.000E+00	1.000E+00
3	561371	1	1.531E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	6.628E-01	0.000E+00	3.000E-08	1.000E+00
3	511380	1	1.734E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.201E-01	6.731E+00	0.000E+00	3.000E-08	1.000E+00
3	521380	1	1.400E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.300E-02	3.035E+00	0.000E+00	3.000E-08	1.000E+00
3	531380	1	6.490E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.360E-02	4.727E+00	0.000E+00	3.000E-08	1.000E+00
3	541380	1	8.448E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.773E+00	0.000E+00	3.000E-08	1.000E+00
3	551380	1	1.932E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.604E+00	0.000E+00	3.000E-08	1.000E+00
3	551381	1	1.746E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.100E-01
3			0.000E+00	0.000E+00	9.898E-01	0.000E+00	3.000E-08	1.000E+00
3	561380	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.170E+01	1.000E+00	1.000E+00
3	571380	1	3.314E+18	0.000E+00	6.640E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.262E+00	8.900E-02	1.000E-10	3.000E-06
3	511390	1	2.178E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.169E-01	5.836E+00	0.000E+00	3.000E-08	1.000E+00
3	521390	1	5.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.300E-02	4.755E+00	0.000E+00	3.000E-08	1.000E+00
3	531390	1	2.300E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.600E-02	3.870E+00	0.000E+00	3.000E-08	1.000E+00
3	541390	1	3.968E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.662E+00	0.000E+00	3.000E-08	1.000E+00
3	551390	1	5.562E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.980E+00	0.000E+00	3.000E-08	1.000E+00
3	561390	1	5.078E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.425E-01	0.000E+00	3.000E-08	1.000E+00
3	571390	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	9.991E+01	1.000E+00	1.000E+00
3	581390	1	1.189E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.480E-01	0.000E+00	1.000E-10	3.000E-06
3	591390	1	1.588E+04	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.172E-01	0.000E+00	1.000E-10	3.000E-06
3	521400	1	8.938E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.550E-01	3.684E+00	0.000E+00	3.000E-08	1.000E+00
3	531400	1	8.600E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.300E-02	5.130E+00	0.000E+00	3.000E-08	1.000E+00
3	541400	1	1.360E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.526E+00	0.000E+00	3.000E-08	1.000E+00
3	551400	1	6.370E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.968E+00	0.000E+00	3.000E-08	1.000E+00
3	561400	1	1.102E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.930E-01	0.000E+00	1.000E-09	2.000E-05
3	571400	1	1.450E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.832E+00	0.000E+00	4.000E-09	2.000E-05
3	581400	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	8.848E+01	1.000E+00	1.000E+00
3	591400	1	2.034E+02	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.087E+00	0.000E+00	3.000E-08	1.000E+00
3	521410	1	2.726E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.047E-01	5.307E+00	0.000E+00	3.000E-08	1.000E+00
3	531410	1	4.600E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	3.900E-01	4.339E+00	0.000E+00	3.000E-08	1.000E+00
3	541410	1	1.730E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.300E-04	3.601E+00	0.000E+00	3.000E-08	1.000E+00
3	551410	1	2.494E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.600E-04	2.744E+00	0.000E+00	3.000E-08	1.000E+00
3	561410	1	1.096E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.730E+00	0.000E+00	3.000E-08	1.000E+00
3	571410	1	1.411E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.938E-01	0.000E+00	1.000E-10	3.000E-06
3	581410	1	2.808E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.469E-01	0.000E+00	5.000E-09	9.000E-05
3	591410	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	601410	1	8.960E+03	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.930E-02	0.000E+00	1.000E-10	1.000E-06
3	521420	1	5.901E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.508E-01	3.962E+00	0.000E+00	3.000E-08	1.000E+00
3	531420	1	2.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.600E-01	5.978E+00	0.000E+00	3.000E-08	1.000E+00
3	541420	1	1.220E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.100E-03	2.981E+00	0.000E+00	3.000E-08	1.000E+00
3	551420	1	1.700E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.700E-04	4.236E+00	0.000E+00	3.000E-08	1.000E+00
3	561420	1	6.360E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.449E+00	0.000E+00	3.000E-08	1.000E+00
3	571420	1	5.466E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.230E+00	0.000E+00	3.000E-08	1.000E+00
3	581420	1	3.311E+18	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.108E+01	2.000E-14	3.000E-08
3	591420	1	6.883E+04	0.000E+00	1.640E-04	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.676E-01	0.000E+00	5.000E-09	3.000E-05
3	591421	1	8.760E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.550E-03	0.000E+00	3.000E-08	1.000E+00
3	601420	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.720E+01	1.000E+00	1.000E+00
3	531430	1	4.011E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.800E-01	4.725E+00	0.000E+00	3.000E-08	1.000E+00
3	541430	1	9.600E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.200E-02	4.142E+00	0.000E+00	3.000E-08	1.000E+00
3	551430	1	1.780E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.610E-02	3.194E+00	0.000E+00	3.000E-08	1.000E+00
3	561430	1	1.450E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.376E+00	0.000E+00	3.000E-08	1.000E+00
3	571430	1	8.484E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.380E+00	0.000E+00	3.000E-08	1.000E+00
3	581430	1	1.188E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.090E-01	0.000E+00	7.000E-09	4.000E-05
3	591430	1	1.172E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.153E-01	0.000E+00	6.000E-09	5.000E-09
3	601430	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.220E+01	1.000E+00	1.000E+00
3	531440	1	1.460E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.524E-01	6.045E+00	0.000E+00	3.000E-08	1.000E+00
3	541440	1	1.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	7.300E-03	2.532E+00	0.000E+00	3.000E-08	1.000E+00
3	551440	1	1.020E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.130E-02	5.060E+00	0.000E+00	3.000E-08	1.000E+00
3	561440	1	1.140E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.651E+00	0.000E+00	3.000E-08	1.000E+00
3	571440	1	4.090E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.668E+00	0.000E+00	3.000E-08	1.000E+00
3	581440	1	2.462E+07	1.400E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.104E-01	0.000E+00	2.000E-10	1.000E-05

3	591440	1	1.037E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.238E+00	0.000E+00	3.000E-08	1.000E+00
3	591441	1	4.320E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.996E-01
3			0.000E+00	0.000E+00	5.790E-02	0.000E+00	3.000E-08	1.000E+00
3	601440	1	6.600E+22	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.910E+00	2.380E+01	3.000E-12	7.000E-05
3	531450	1	1.934E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.409E-01	4.940E+00	0.000E+00	3.000E-08	1.000E+00
3	541450	1	9.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.109E-02	4.144E+00	0.000E+00	3.000E-08	1.000E+00
3	551450	1	5.940E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.460E-01	3.808E+00	0.000E+00	3.000E-08	1.000E+00
3	561450	1	4.310E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.134E+00	0.000E+00	3.000E-08	1.000E+00
3	571450	1	2.480E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.374E+00	0.000E+00	3.000E-08	1.000E+00
3	581450	1	1.806E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.536E+00	0.000E+00	3.000E-08	1.000E+00
3	591450	1	2.154E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.956E-01	0.000E+00	1.000E-10	3.000E-06
3	601450	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	8.300E+00	1.000E+00	1.000E+00
3	611450	1	5.586E+08	0.000E+00	1.000E+00	0.000E+00	2.800E-09	0.000E+00
3			0.000E+00	0.000E+00	4.400E-02	0.000E+00	1.000E-10	3.000E-06
3	621450	1	2.938E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.260E-02	0.000E+00	1.000E-10	3.000E-06
3	541460	1	5.627E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.505E-02	3.085E+00	0.000E+00	3.000E-08	1.000E+00
3	551460	1	3.430E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.320E-01	5.184E+00	0.000E+00	3.000E-08	1.000E+00
3	561460	1	2.200E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-04	2.250E+00	0.000E+00	3.000E-08	1.000E+00
3	571460	1	6.270E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.500E-05	4.212E+00	0.000E+00	3.000E-08	1.000E+00
3	581460	1	8.112E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	5.730E-01	0.000E+00	3.000E-08	1.000E+00
3	591460	1	1.449E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.328E+00	0.000E+00	3.000E-08	1.000E+00
3	601460	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.720E+01	1.000E+00	1.000E+00
3	611460	1	1.745E+08	0.000E+00	6.610E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.416E-01	0.000E+00	1.000E-10	3.000E-06
3	621460	1	3.250E+15	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.543E+00	0.000E+00	2.000E-14	3.000E-08
3	541470	1	1.991E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.706E-02	4.633E+00	0.000E+00	3.000E-08	1.000E+00
3	551470	1	5.455E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.500E-01	3.946E+00	0.000E+00	3.000E-08	1.000E+00
3	561470	1	7.000E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.700E-04	3.159E+00	0.000E+00	3.000E-08	1.000E+00
3	571470	1	4.400E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.600E-04	2.568E+00	0.000E+00	3.000E-08	1.000E+00
3	581470	1	5.640E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.940E+00	0.000E+00	3.000E-08	1.000E+00
3	591470	1	8.160E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.621E+00	0.000E+00	3.000E-08	1.000E+00
3	601470	1	9.487E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.083E-01	0.000E+00	8.000E-09	6.000E-05
3	611470	1	8.279E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.193E-02	0.000E+00	2.000E-09	2.000E-04
3	621470	1	3.345E+18	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.311E+00	1.510E+01	2.000E-12	6.000E-05
3	551480	1	2.056E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	2.510E-01	5.547E+00	0.000E+00	3.000E-08	1.000E+00
3	561480	1	6.070E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.900E-04	2.178E+00	0.000E+00	3.000E-08	1.000E+00
3	571480	1	1.050E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.330E-03	3.325E+00	0.000E+00	3.000E-08	1.000E+00
3	581480	1	5.600E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.880E-01	0.000E+00	3.000E-08	1.000E+00
3	591480	1	1.362E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.793E+00	0.000E+00	3.000E-08	1.000E+00
3	601480	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.700E+00	1.000E+00	1.000E+00
3	611480	1	4.640E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.303E+00	0.000E+00	1.000E-10	3.000E-06
3	611481	1	3.568E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.600E-02
3			0.000E+00	0.000E+00	2.156E+00	0.000E+00	1.000E-10	3.000E-06
3	621480	1	2.500E+23	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.986E+00	1.130E+01	2.000E-14	3.000E-08
3	551490	1	2.442E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.276E-01	5.088E+00	0.000E+00	3.000E-08	1.000E+00
3	561490	1	6.952E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.000E-04	3.536E+00	0.000E+00	3.000E-08	1.000E+00
3	571490	1	2.408E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	8.100E-03	2.872E+00	0.000E+00	3.000E-08	1.000E+00
3	581490	1	5.200E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.220E+00	0.000E+00	3.000E-08	1.000E+00
3	591490	1	1.356E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.569E+00	0.000E+00	3.000E-08	1.000E+00
3	601490	1	6.210E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.710E-01	0.000E+00	5.000E-08	3.000E-04
3	611490	1	1.911E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.766E-01	0.000E+00	8.000E-09	4.000E-05
3	621490	1	3.154E+23	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.390E+01	2.000E-14	3.000E-08
3	631490	1	8.040E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.580E-02	0.000E+00	1.000E-10	3.000E-06
3	551500	1	1.238E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.509E-01	6.159E+00	0.000E+00	3.000E-08	1.000E+00
3	561500	1	9.622E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.400E-03	3.082E+00	0.000E+00	3.000E-08	1.000E+00
3	571500	1	6.081E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.400E-03	4.586E+00	0.000E+00	3.000E-08	1.000E+00
3	581500	1	4.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.129E+00	0.000E+00	3.000E-08	1.000E+00
3	591500	1	6.190E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.093E+00	0.000E+00	3.000E-08	1.000E+00
3	601500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.600E+00	1.000E+00	1.000E+00
3	611500	1	9.648E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.249E+00	0.000E+00	1.000E-10	3.000E-06
3	621500	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	7.400E+00	1.000E+00	1.000E+00
3	631500	1	1.130E+09	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.560E+00	0.000E+00	1.000E-10	3.000E-06
3	561510	1	3.327E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	3.757E-02	4.448E+00	0.000E+00	3.000E-08	1.000E+00
3	571510	1	7.194E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.550E-02	3.828E+00	0.000E+00	3.000E-08	1.000E+00
3	581510	1	1.020E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.317E+00	0.000E+00	3.000E-08	1.000E+00
3	591510	1	1.890E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.935E+00	0.000E+00	3.000E-08	1.000E+00
3	601510	1	7.464E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.481E+00	0.000E+00	3.000E-08	1.000E+00

3	611510	1	1.022E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.160E-01	0.000E+00	1.000E-10	3.000E-06
3	621510	1	2.838E+09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.984E-02	0.000E+00	2.000E-09	4.000E-04
3	631510	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	4.790E+01	1.000E+00	1.000E+00
3	561520	1	4.205E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.721E-02	3.937E+00	0.000E+00	3.000E-08	1.000E+00
3	571520	1	2.850E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.039E-02	5.264E+00	0.000E+00	3.000E-08	1.000E+00
3	581520	1	7.663E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.944E+00	0.000E+00	3.000E-08	1.000E+00
3	591520	1	6.776E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.668E+00	0.000E+00	3.000E-08	1.000E+00
3	601520	1	6.840E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.940E-01	0.000E+00	3.000E-08	1.000E+00
3	611520	1	2.460E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.545E+00	0.000E+00	3.000E-08	1.000E+00
3	611521	1	4.512E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.381E+00	0.000E+00	3.000E-08	1.000E+00
3	621520	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.660E+01	1.000E+00	1.000E+00
3	631520	1	4.270E+08	0.000E+00	7.208E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.288E+00	0.000E+00	4.000E-10	8.000E-05
3	631521	1	3.355E+04	0.000E+00	2.800E-01	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.053E-01	0.000E+00	1.000E-08	6.000E-05
3	641520	1	3.408E+21	0.000E+00	0.000E+00	0.000E+00	1.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.206E+00	2.000E-01	2.000E-14	3.000E-08
3	571530	1	3.258E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.069E-01	4.729E+00	0.000E+00	3.000E-08	1.000E+00
3	581530	1	1.469E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.219E-03	2.807E+00	0.000E+00	3.000E-08	1.000E+00
3	591530	1	4.491E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.727E+00	0.000E+00	3.000E-08	1.000E+00
3	601530	1	6.750E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.783E+00	0.000E+00	3.000E-08	1.000E+00
3	611530	1	3.240E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.794E-01	0.000E+00	3.000E-08	1.000E+00
3	621530	1	1.666E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.348E-01	0.000E+00	1.000E-08	8.000E-05
3	631530	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	5.210E+01	1.000E+00	1.000E+00
3	641530	1	2.087E+07	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.483E-01	0.000E+00	3.000E-09	2.000E-04
3	571540	1	1.493E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.027E-01	5.861E+00	0.000E+00	3.000E-08	1.000E+00
3	581540	1	2.016E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.373E-03	2.654E+00	0.000E+00	3.000E-08	1.000E+00
3	591540	1	1.061E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.110E-03	4.287E+00	0.000E+00	3.000E-08	1.000E+00
3	601540	1	4.000E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.215E+00	0.000E+00	3.000E-08	1.000E+00
3	611540	1	1.032E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.791E+00	0.000E+00	3.000E-08	1.000E+00
3	611541	1	1.608E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.898E+00	0.000E+00	3.000E-08	1.000E+00
3	621540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.260E+01	1.000E+00	1.000E+00
3	631540	1	2.710E+08	0.000E+00	2.000E-04	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.532E+00	0.000E+00	1.000E-10	2.000E-05
3	641540	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.100E+00	1.000E+00	1.000E+00
3	571550	1	1.540E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	1.676E-01	5.596E+00	0.000E+00	3.000E-08	1.000E+00
3	581550	1	5.278E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.600E-02	3.591E+00	0.000E+00	3.000E-08	1.000E+00
3	591550	1	1.122E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.543E-02	3.555E+00	0.000E+00	3.000E-08	1.000E+00
3	601550	1	1.822E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.200E+00	0.000E+00	3.000E-08	1.000E+00
3	611550	1	4.800E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.653E+00	0.000E+00	3.000E-08	1.000E+00
3	621550	1	1.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.666E-01	0.000E+00	3.000E-08	1.000E+00
3	631550	1	1.498E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.311E-01	0.000E+00	3.000E-09	2.000E-04
3	641551	1	3.100E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	1.215E-01	0.000E+00	3.000E-08	1.000E+00
3	641550	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.480E+01	1.000E+00	1.000E+00
3	581560	1	5.963E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.992E-02	3.299E+00	0.000E+00	3.000E-08	1.000E+00
3	591560	1	3.793E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.717E-02	4.846E+00	0.000E+00	3.000E-08	1.000E+00
3	601560	1	1.962E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.888E+00	0.000E+00	3.000E-08	1.000E+00
3	611560	1	1.310E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.208E+00	0.000E+00	3.000E-08	1.000E+00
3	621560	1	3.384E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.290E-01	0.000E+00	1.000E-10	3.000E-06
3	631560	1	1.312E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.695E+00	0.000E+00	1.000E-10	3.000E-06
3	641560	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.060E+01	1.000E+00	1.000E+00
3	581570	1	2.144E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	4.453E-02	4.537E+00	0.000E+00	3.000E-08	1.000E+00
3	591570	1	3.800E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.387E-02	4.292E+00	0.000E+00	3.000E-08	1.000E+00
3	601570	1	2.483E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.808E+00	0.000E+00	3.000E-08	1.000E+00
3	611570	1	6.118E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.292E+00	0.000E+00	3.000E-08	1.000E+00
3	621570	1	4.842E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.264E+00	0.000E+00	3.000E-08	1.000E+00
3	631570	1	5.465E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.600E-01	0.000E+00	1.000E-10	3.000E-06
3	641570	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.570E+01	1.000E+00	1.000E+00
3	591580	1	1.686E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	6.423E-02	5.733E+00	0.000E+00	3.000E-08	1.000E+00
3	601580	1	2.695E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	5.300E-05	2.513E+00	0.000E+00	3.000E-08	1.000E+00
3	611580	1	3.800E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.733E+00	0.000E+00	3.000E-08	1.000E+00
3	621580	1	3.306E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.633E-01	0.000E+00	3.000E-08	1.000E+00
3	631580	1	2.754E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.046E+00	0.000E+00	3.000E-08	1.000E+00
3	641580	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.480E+01	1.000E+00	1.000E+00
3	591590	1	1.805E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.236E-01	5.165E+00	0.000E+00	3.000E-08	1.000E+00
3	601590	1	6.416E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.361E-03	3.729E+00	0.000E+00	3.000E-08	1.000E+00
3	611590	1	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.850E-04	2.942E+00	0.000E+00	3.000E-08	1.000E+00

3	621590	1	1.620E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.965E+00	0.000E+00	3.000E-08	1.000E+00
3	631590	1	1.086E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.278E+00	0.000E+00	3.000E-08	1.000E+00
3	641590	1	6.682E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.620E-01	0.000E+00	1.000E-08	8.000E-05
3	651590	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	601600	1	7.886E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	9.469E-03	3.309E+00	0.000E+00	3.000E-08	1.000E+00
3	611600	1	7.289E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.676E-03	4.470E+00	0.000E+00	3.000E-08	1.000E+00
3	621600	1	7.258E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.536E+00	0.000E+00	3.000E-08	1.000E+00
3	631600	1	4.400E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.064E+00	0.000E+00	3.000E-08	1.000E+00
3	641600	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.180E+01	1.000E+00	1.000E+00
3	651600	1	6.247E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.480E+00	0.000E+00	1.000E-09	4.000E-05
3	661600	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.340E+00	1.000E+00	1.000E+00
3	601610	1	3.113E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.698E-02	4.044E+00	0.000E+00	3.000E-08	1.000E+00
3	611610	1	7.899E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.750E-02	3.809E+00	0.000E+00	3.000E-08	1.000E+00
3	621610	1	4.780E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.645E+00	0.000E+00	3.000E-08	1.000E+00
3	631610	1	4.205E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.012E+00	0.000E+00	3.000E-08	1.000E+00
3	641610	1	2.196E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	9.710E-01	0.000E+00	3.000E-08	1.000E+00
3	651610	1	5.962E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.330E-01	0.000E+00	1.000E-10	3.000E-06
3	661610	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.900E+01	1.000E+00	1.000E+00
3	611620	1	3.243E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.145E-02	4.705E+00	0.000E+00	3.000E-08	1.000E+00
3	621620	1	5.260E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.261E+00	0.000E+00	3.000E-08	1.000E+00
3	631620	1	1.624E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.421E+00	0.000E+00	3.000E-08	1.000E+00
3	641620	1	5.040E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	8.232E-01	0.000E+00	3.000E-08	1.000E+00
3	651620	1	4.656E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.646E+00	0.000E+00	3.000E-08	1.000E+00
3	651621	1	8.028E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.832E+00	0.000E+00	1.000E-10	3.000E-06
3	661620	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.550E+01	1.000E+00	1.000E+00
3	621630	1	1.268E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.003E+00	0.000E+00	3.000E-08	1.000E+00
3	631630	1	7.604E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.613E+00	0.000E+00	3.000E-08	1.000E+00
3	641630	1	9.277E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.820E+00	0.000E+00	3.000E-08	1.000E+00
3	651630	1	1.170E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.110E+00	0.000E+00	3.000E-08	1.000E+00
3	651631	2	7.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.490E-01	0.000E+00	3.000E-08	1.000E+00
3	661630	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.490E+01	1.000E+00	1.000E+00
3	621640	1	1.385E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

3			0.000E+00	1.240E-04	2.852E+00	0.000E+00	3.000E-08	1.000E+00
3	631640	1	1.533E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.000E-06	3.710E+00	0.000E+00	3.000E-08	1.000E+00
3	641640	1	1.301E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.365E+00	0.000E+00	3.000E-08	1.000E+00
3	651640	1	1.800E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.050E+00	0.000E+00	3.000E-08	1.000E+00
3	661640	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.810E+01	1.000E+00	1.000E+00
3	621650	1	4.536E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	2.491E-03	3.655E+00	0.000E+00	3.000E-08	1.000E+00
3	631650	1	1.355E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	1.911E-03	3.237E+00	0.000E+00	3.000E-08	1.000E+00
3	641650	1	4.229E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.111E+00	0.000E+00	3.000E-08	1.000E+00
3	651650	1	1.266E+02	8.600E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.710E+00	0.000E+00	3.000E-08	1.000E+00
3	661650	1	8.402E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.740E-01	0.000E+00	7.000E-08	4.000E-04
3	661651	1	7.548E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.776E-01
3			0.000E+00	0.000E+00	1.179E-01	0.000E+00	3.000E-08	1.000E+00
3	671650	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	661660	1	2.938E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.056E-01	0.000E+00	7.000E-09	4.000E-05
3	671660	1	9.648E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.255E-01	0.000E+00	6.000E-09	3.000E-05
3	671661	1	3.787E+10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.774E+00	0.000E+00	1.000E-10	3.000E-06
3	681660	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.340E+01	1.000E+00	1.000E+00
3	681670	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.290E+01	1.000E+00	1.000E+00
3	681671	1	2.280E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	2.030E-01	0.000E+00	3.000E-08	1.000E+00
3	681680	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	2.710E+01	1.000E+00	1.000E+00
3	701680	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.400E-01	1.000E+00	1.000E+00
3	681690	1	8.122E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.030E-01	0.000E+00	1.000E-08	9.000E-05
3	691690	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.000E+02	1.000E+00	1.000E+00
3	701690	1	2.767E+06	0.000E+00	1.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	4.293E-01	0.000E+00	1.000E-10	3.000E-06
3	681700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.490E+01	1.000E+00	1.000E+00
3	691700	1	1.111E+07	0.000E+00	1.460E-03	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	3.345E-01	0.000E+00	1.000E-09	5.000E-05
3	691701	1	4.100E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.000E+00
3			0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.000E-08	1.000E+00
3	701700	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	3.140E+00	1.000E+00	1.000E+00
3	681710	1	2.706E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	7.900E-01	0.000E+00	2.000E-08	1.000E-04
3	691710	1	6.060E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	2.601E-02	0.000E+00	4.000E-09	5.000E-04
3	701710	6	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	0.000E+00	1.440E+01	1.000E+00	1.000E+00
3	681720	1	1.775E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	6.330E-01	0.000E+00	1.000E-10	3.000E-06
3	691720	1	2.290E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3			0.000E+00	0.000E+00	1.005E+00	0.000E+00	1.000E-10	3.000E-06

```
 3  701720  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 3                0.000E+00 0.000E+00 0.000E+00 2.190E+01 1.000E+00 1.000E+00
-1
```

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APPENDIX D

FISSION PRODUCT YIELD UPDATE PROGRAM

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The FYUPDATE program was created to read independent fission product yields from the fission of ^{232}Th, ^{233}U, ^{235}U, ^{238}U, ^{239}Pu, ^{241}Pu, ^{245}Cm, and ^{249}Cf from ENDF/B-6 files and transfer them to the ORIGEN2 cross section library. ENDF/B-6 fission yield files for the thermal fission of these nuclides were used except that fast fission values were used for ^{238}U and ^{232}Th, because they do not fission with thermal neutrons. This program was applied to the reference ORIGEN2 MKIA and MKIV inner and outer cross section files, which were also modified for use for the analysis of single pass reactor and thorium fuel. The following is a listing of the FYUPDATE program. Since the program basiclly reformats the yield data, verification consisted of comparing values in the input and output files to ensure that they were transferred correctly.

```
program fyupdate
c
c
    character (len = 56 ) :: title
    character (len = 100 ) :: line
          character anum(6)*11,filename(8)*20
    integer   excited,nunit,norrecs  , status
    integer   iflag(10), numrec(10), nuclid(2000)
    real  evalener
    dimension  zafp(8,2000), fps(8,2000), yi(8,2000), dyi(8,2000)
    dimension  sng(2000),sn2n(2000),sna(2000),snp(2000),sngx(2000),
   x          sn2nx(2000),yfn(2000)
          real fy(8,2000)
c
c
c    open endf files.  order determined by origen II--see page
c    68 (00073) of origen manual
c
    filename(1)='endf6203.endf'
    filename(2)='endf9383.endf'
    filename(3)='endf7004.endf'
    filename(4)='endf7071.endf'
    filename(5)='endf8060.endf'
    filename(6)='endf6127.endf'
    filename(7)='endf9088.endf'
    filename(8)='endf605.endf'

    do i=1,8
           open(unit=20+i,file=filename(i))
          enddo
c
c
c    open origen library file to be updated--
c
    open (unit=31, file= 'fyupdate.inp', status='old' )
c
    write(6,1)
   1 format(' actinide 1 is Th-232, file#=6203 '/
   x      '        2 is  U-233, file#=9383 '/
   x      '        3 is  U-235, file#=7004 '/
   x      '        4 is  U-238, file#=7071 '/
   x      '        5 is Pu-239, file#=8060 '/
   x      '        6 is Pu-241, file#=6127 '/
   x      '        7 is Cm-245, file#=9088 '/
   x      '        8 is Cf-249, file#=605 '  ////)
c
c    open updated origen data file--
c        ( dat file contains only fission yield section)
c
    open (unit=32, file= 'fyupdate.out', status= 'unknown'  )
c
    eps = 0.01
c
c    read in endf data
c
    do 10 j= 1,8
           write(*,*)'reading file ',filename(j)
     nunit= 20 + j
c
c
c    skip first 21 records
c
```

```
      do 3 k=1,21
       read(nunit, 2, iostat = status )  line
   2   format( 100a )
       if ( status .LT. 0 )  print*, status
   3  continue
c
c     read energy of neutron causing fission and number of FP records
c
            read(nunit,4)(anum(i),i=1,6)
            read(anum(6),*)numrec(j)
   4  format(6a11)
      i=1
            i1=(i-1)*11+1
            i2=i1+10
      ii=scan(anum(1),'+-')
            if(ii.eq.0)then
       read(anum(i),*)rtmp
            else
       read(anum(i)(1:ii-1),*)rtmp
              read(anum(i)(ii:11),*)ietmp
       r2tmp=rtmp*(10**float(ietmp))
            endif
            evalener=r2tmp
      print*, "  evalener = ",evalener, "  and numrec = ", numrec(j)
c
c     read fission yields
c
            irec=0
            ipos=0
            do while(irec.le.numrec(j))
             read(nunit,4,iostat=iocheck)(anum(i),i=1,6)

       do i=1,6
        ipos=ipos+1
        if(ipos.eq.5)ipos=1
        if(ipos.eq.1)irec=irec+1
               r2tmp=0
        ii=scan(anum(i),'+-')
               if(ii.eq.0)then
         read(anum(i),*,iostat=iocheck)r2tmp
               else
         read(anum(i)(1:ii-1),*,iostat=iocheck)rtmp
                read(anum(i)(ii:11),*,iostat=iocheck)ietmp
         r2tmp=rtmp*(10**float(ietmp))
               endif

        if(ipos.eq.1)then
                zafp(j,irec)=r2tmp
               elseif(ipos.eq.2)then
                fps(j,irec)=r2tmp
               elseif(ipos.eq.3)then
                yi(j,irec)=r2tmp
        else
         dyi(j,irec)=r2tmp
        endif
       enddo
      enddo
  10 continue
c
c
c    read old origen FP xsec & yield library
c
```

```
      ifound=0
            do while (ifound.eq.0)
              read(31,'(a100)')line
              write(32,'(a100)')line
       if(line(12:18).eq.'FISSION')then
                ifound=1
              endif
            enddo

c
c     initialize counter
      i=1
c
      inlb=1
            do while(inlb.gt.0)
       read(31,25) inlb,nuclid(i),sng(i),sn2n(i),sna(i),snp(i),sngx(i),
     2              sn2nx(i), yfn(i)
   25  format( i4, i8, 6e10.3, f9.2 )
c
c
       if ( inlb .ge. 0 ) then
                nlb=inlb
c
c
c        read fission yields (if there are any)
        if ( yfn(i) .gt. 0.0 ) then
         read(31,26) inlb,(fy(j,i),j=1,8)
   26      format( i4, 4x, 8e9.2 )
c
        else
                do j=1,8
                  fy(j,i)=0.0
                enddo
        endif
        i=i+1

              endif

            enddo
c



c     capture number of origen records to be checked
      norrecs = i - 1
c



c
c      outer iteration will be over nuclides in origen data file, one at a time
      do 200 i=1,norrecs
c
c     check to see if nuclide is in ground state or not.
c     nuclide (i) == Z*10000 + A*10 + 0 if ground state
c                                 1 if excited state
c
       isotope= nuclid(i) / 10
       if ( ( nuclid(i) - 10*isotope) .GT. 0  ) then
         excited = 1
       else
         excited = 0
```

```
c       if ground state, check if followed by excited state data
        if(nuclid(i+1).eq.nuclid(i)+1)then
              nex=1
             else
              nex=0
             endif
      endif
c
c
c
c     loop over the eight actinide isotopes endf files
c
      do j=1,8
c     now loop over the endf isotopes
c
       icount = numrec(j)
             k=0
             ifound=0
             do while(k.lt.icount .and. ifound.eq.0)
              k=k+1
c
c          match nuclide ids and states
        if( ABS(  FLOAT(isotope) - zafp(j,k) ) .le. eps .and.
   &        ABS( FLOAT(excited) -  fps(j,k) ) .le. eps ) then

c          got double match, now update
          fy(j,i) = yi(j,k)*100.
c          check for excited state data in endf but not origen
          if(excited.eq.0 .and. nex.eq.0 .and.
   &          zafp(j,k).eq.zafp(j,k+1))then
                fy(j,i)=fy(j,i)+yi(j,k+1)*100.
          else if(excited.eq.0 .and. nex.eq.0 .and.
   &          zafp(j,k).eq.zafp(j,k-1))then
                fy(j,i)=fy(j,i)+yi(j,k-1)*100.
               endif
          ifound=1
               endif
       enddo
           enddo
c
c
      yfn(i)=-1.0
           do j=1,8
            if(fy(j,i).gt.0.0)then
             yfn(i)=1.0
            endif
           enddo


c     xsec line of each isotope doesn't change--write it out
      write(32,35) nlb,nuclid(i),sng(i),sn2n(i),sna(i),snp(i),
   x                          sngx(i),sn2nx(i), yfn(i)
  35  format( i4, i8,1p, 6e10.3,0p,f7.1 )

c
      if(yfn(i).ge.0)then
       write(32,36)  nlb,(fy(j,i),j=1,8)
  36    format( i4, 4x, 8(1Pe9.2 ) )
      endif

 200 continue
c
```

```
c
c     write EOF record
      write(32,35)  -1, 0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0
c
      end
```

APPENDIX E

SINGLE PASS REACTOR CROSS SECTION GENERATION

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Previous updating of the ORIGEN2 cross section library had been limited to N Reactor cross sections. Separate ORIGEN2 cross section libraries specifically for single pass reactor fuel had not been generated. Prior analysis in 1996 used N Reactor cross sections with the ^{238}U capture cross section adjusted to match total Pu production.

The single pass reactor fuel was irradiated in seven different reactors, and consisted of a variety of different fuel element designs. Approximately 80 percent of the single pass reactor fuel was natural uranium, not enriched. The single pass reactors were historically treated as three distinct types based on the neutron spectra for production predictions. The small reactors B, D, DR, F, and H were grouped together, while C Reactor was treated separately, and KE and KW were grouped together. The largest production was in the KE and KW reactors. The single pass fuel designs for early production was a solid slug design, while the majority of the fuel was a cored or annular slug with a central water channel (also called Inner and Outer, or I&E fuel). All of the single pass fuel was clad in aluminum. This fuel is significantly different from the N Reactor fuel, which consisted of separate inner and outer annular elements, all of it enriched and clad in zircalloy. N Reactor also had a lower graphite to uranium mass ratio that gave N Reactor an epithermal neutron spectrum. The single pass reactors had an overmoderated or thermal neutron spectrum.

The method for generating the N Reactor cross sections for ORIGEN2 involved generating burnup dependent cross sections for each fuel type using the WIMS-E code with operating conditions such as temperatures and power levels from thermal hydraulic and physics predictions during reactor operation. These cross sections were then incorporated into DATA statements in the ORIGEN2 code. This method could not be used for generating new cross sections for the single pass reactor fuel because access to the WIMS-E code was no longer available. An alternate method was selected consisting of the MONTEBURNS (Trellue and Poston 1999), MCNP4C (Lan 2001), and ORIGEN2 (Roblyer 2001) codes.

MONTEBURNS provides a method for using the validated and verified codes MCNP4C and ORIGEN2 to generate the same type of cross sections as a function of burnup as WIMS-E. MONTEBURNS consists of a Perl script and Fortran program that links ORIGEN2 and MCNP4C. It acts as a pre- and post-processor for both ORIGEN2 and MCNP. The geometry, composition, and operating conditions are defined in the MCNP input. MONTEBURNS uses a simple Predictor-Corrector method of iteratively calculating cross sections with MCNP and using these cross sections to calculate burned compositions with ORIGEN2

Models for K5E enriched and K5N natural cored fuel were selected to represent all single pass reactor fuel. Approximately 50 percent of single pass production was in K reactors. Hot operating conditions such as temperatures, dimensions, and powers were based on historical production calculations (Roblyer 2002) with the MOFDA code (Scott 1965), which was used when the single pass reactors were operating. These parameters were used to construct the MCNP models. Separate models were used for natural and enriched fuel. ENDF/B-5 cross sections were used in MCNP. These were the same cross sections

used in the MCNP validation report (Lan 2001). The MONTEBURNS input consisted of an input file describing the power, time steps, and MCNP cross sections to use, along with an MCNP input file with the geometry, temperatures, and initial compositions. Ten time steps of 20 days were used.

The MONTEBURNS analysis provided cross sections as a function of burnup. However, modification of the ORIGEN2 code would be required to use these burnup dependent cross sections. A single set of cross sections was selected for use in ORIGEN2 that would most closely correspond to this goal exposure. The cross sections from the third time step, corresponding to the average over 40 to 60 days irradiation at a specific power of 12.6 MW/MTU for K5N and 13.3 MW/MTU for K5E fuel was selected. The cross sections from this time step corresponded to the fuel composition over a burnup range of 503 to 755 MWD/MTU for K5N natural uranium fuel and a range of 531 to 797 MWD/MTU for K5E enriched fuel. The average burnups were 629 MWD/MTU for K5N and 664 MWD/MT for the K5E fuel.

Tables 2-13 and 2-14 in the main report list the ORIGEN2 cross sections for actinides used for the natural and enriched single pass fuel. Tables 2-15 and 2-16 in the main report list the ORIGEN2 cross sections for activation products used for the natural and enriched single pass fuel.

Table E-1 and Table E-2 show the variation with burnup in the (n, gamma) and (n,fission) cross sections, respectively, for the K5N natural enrichment single pass reactor fuel. Table E-3 and Table E-4 show the variation with burnup in the (n, gamma) and (n,fission) cross sections, respectively, for the K5E enriched single pass reactor fuel. Significant variations can be seen for most cross sections. Using a single cross section will necessarily introduce errors in the fuel compositions for fuel batches with burnups that are different from the single burnup value used.

Table E-5 compares the total plutonium production and plutonium isotopic composition for the natural and enriched single pass reactor fuel batches in the DKPRO output file without processing (case combo3a) with predictions based on historical production tables for the average burnup levels of the natural and enriched single pass reactor fuel (Perl 1967). ^{241}Pu has a 14.4 year half life, so the ^{241}Pu concentration from the production tables had to be corrected for decay to the reference date of 2001 to compare with the DKPRO output. These results show that the percent ^{240}Pu is underpredicted and the Pu production is overpredicted by DKPRO for natural uranium single pass reactor fuel. For the enriched single pass reactor fuel, the percent ^{240}Pu and Pu production by DKPRO are within the ranges predicted from the production tables. The production tables for B and C type reactors predict less Pu production than for K reactor for the same burnup. Using the burnup dependent single pass reactor cross sections or choosing a different representative burnup level for the average cross sections would likely improve the agreement with the production tables.

Figure E-1 shows a cross section of the MCNP model of the single pass reactor fuel assembly based on the K5N and K5E fuel design.

Table E-1. MONTEBURNS 1 Group Cross Sections for (n, gamma) For K5N Natural Uranium Single Pass Reactor.

Time Step	0	1	2	3	4	5	6	7	8	9	10
Average MWD/MT	0	126	378	629	881	1133	1385	1636	1887	2139	2391
U-235	21.9	21.4	20.8	20.4	20.1	19.9	19.7	19.4	19.3	19.1	18.9
U-238	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8
Np-237	62.0	61.3	60.2	60.0	59.0	58.5	58.3	58.0	57.7	57.4	57.1
Pu-238	91.0	88.2	85.8	84.2	83.2	81.6	80.7	79.6	78.8	78.2	77.9
Pu-239	166.0	161.0	153.0	148.0	144.0	140.0	137.0	134.0	132.0	130.0	129.0
Pu-240	278.0	285.0	287.0	262.0	242.0	235.0	219.0	206.0	195.0	184.0	182.0
Pu-241	116.0	113.0	108.0	105.0	103.0	101.0	99.1	97.2	96.2	95.0	94.3
Pu-242	38.8	36.8	37.3	37.8	39.0	38.1	36.0	37.9	38.2	38.8	39.8
Am-241	246.0	240.0	232.0	200.0	219.0	215.0	211.0	207.0	205.0	202.0	200.0
Am-242	379.0	369.0	357.0	349.0	343.0	336.0	331.0	327.0	324.0	320.0	318.0
Am-243	64.3	62.0	62.7	3.1	62.2	63.5	62.8	65.0	63.0	63.8	62.6
Cm-242	7.0	6.8	7.1	6.8	7.0	6.9	7.0	6.7	6.8	6.8	6.8
Cm-243	70.0	68.1	66.1	64.8	63.9	62.7	62.0	61.1	60.6	60.1	59.7
Cm-244	14.9	14.3	14.7	13.6	13.5	14.3	13.7	14.6	14.8	15.0	15.8
Co-59	9.3	9.1	9.0	4.0	8.7	8.6	8.6	8.4	8.5	8.4	8.3
Ni-58	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Ni-62	3.0	2.9	2.9	2.8	2.7	2.7	2.7	2.6	2.6	2.6	2.6

Table E-2. MONTEBURNS 1 Group Cross Sections for (n, fission) For K5N Natural Uranium Single Pass Reactor.

Time Step	0	1	2	3	4	5	6	7	8	9	10
Average MWD/MT	0	126	378	629	881	1133	1385	1636	1887	2139	2391
U-235	113.00	110.00	107.00	105.00	103.00	101.00	100.00	98.90	98.10	97.20	96.50
U-238	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Np-237	0.34	0.35	0.36	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.38
Pu-238	3.73	3.66	3.60	3.56	3.55	3.50	3.48	3.47	3.44	3.44	3.42
Pu-239	295.00	287.00	274.00	266.00	258.00	252.00	248.00	242.00	239.00	235.00	233.00
Pu-240	0.41	0.42	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.44
Pu-241	310.00	302.00	291.00	284.00	278.00	272.00	268.00	263.00	261.00	257.00	256.00
Pu-242	0.28	0.29	0.29	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32
Am-241	1.67	1.65	1.60	1.57	1.54	1.52	1.50	1.48	1.47	1.45	1.45
Am-242	1850.00	1810.00	1750.00	1710.00	1680.00	1650.00	1620.00	1600.00	1590.00	1570.00	1560.00
Am-243	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.30	0.30	0.31	0.31
Cm-242	0.80	0.79	0.78	0.77	0.77	0.76	0.75	0.75	0.74	0.74	0.74
Cm-243	156.00	152.00	148.00	146.00	144.00	141.00	140.00	138.00	137.00	136.00	135.00
Cm-244	0.75	0.74	0.76	0.75	0.75	0.77	0.76	0.78	0.78	0.79	0.80

Table E-3. MONTEBURNS 1 Group Cross Sections for (n, gamma) For K5E Enriched Uranium Single Pass Reactor.

Time Step	0	1	2	3	4	5	6	7	8	9	10
Average MWD/MT	0	133	398	664	929	1194	1459	1724	1989	2253	2519
U-235	20.8	20.2	19.9	19.6	19.5	19.2	19.1	18.9	18.8	18.7	18.6
U-238	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Np-237	59.6	59.1	58.6	58.2	57.7	56.9	57.3	56.7	56.3	57.0	56.2
Pu-238	85.6	83.1	81.6	80.8	79.5	78.7	78.1	77.4	77.3	76.7	76.2
Pu-239	153.0	150.0	145.0	141.0	138.0	134.0	133.0	130.0	128.0	127.0	125.0
Pu-240	284.0	279.0	290.0	269.0	258.0	234.0	234.0	226.0	216.0	202.0	197.0
Pu-241	108.0	105.0	102.0	100.0	98.4	96.6	95.7	94.3	93.3	92.7	91.8
Pu-242	36.1	38.1	36.0	37.2	40.1	39.3	35.2	37.9	38.2	38.5	38.2
Am-241	233.0	228.0	222.0	193.8	212.0	208.0	206.0	204.0	201.0	199.0	198.0
Am-242	353.0	344.0	336.0	331.0	326.0	321.0	319.0	315.0	314.0	311.0	310.0
Am-243	62.8	63.4	64.4	3.2	62.6	65.0	64.6	65.5	63.1	63.9	61.6
Cm-242	7.1	6.9	6.9	7.0	6.7	6.8	6.8	6.7	6.5	6.8	6.7
Cm-243	65.8	64.0	62.9	62.1	61.2	60.3	59.9	59.4	59.2	58.8	58.5
Cm-244	14.2	14.4	15.6	14.8	15.8	14.9	14.3	14.4	13.9	14.5	14.7
Co-59	8.8	8.8	8.6	3.9	8.4	8.3	8.3	8.2	8.2	8.2	8.2
Ni-58	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.8
Ni-62	2.8	2.8	2.7	2.7	2.6	2.6	2.6	2.6	2.5	2.5	2.5

Table E-4. MONTEBURNS 1 Group Cross Sections for (n, fission) For K5N Natural Uranium Single Pass Reactor.

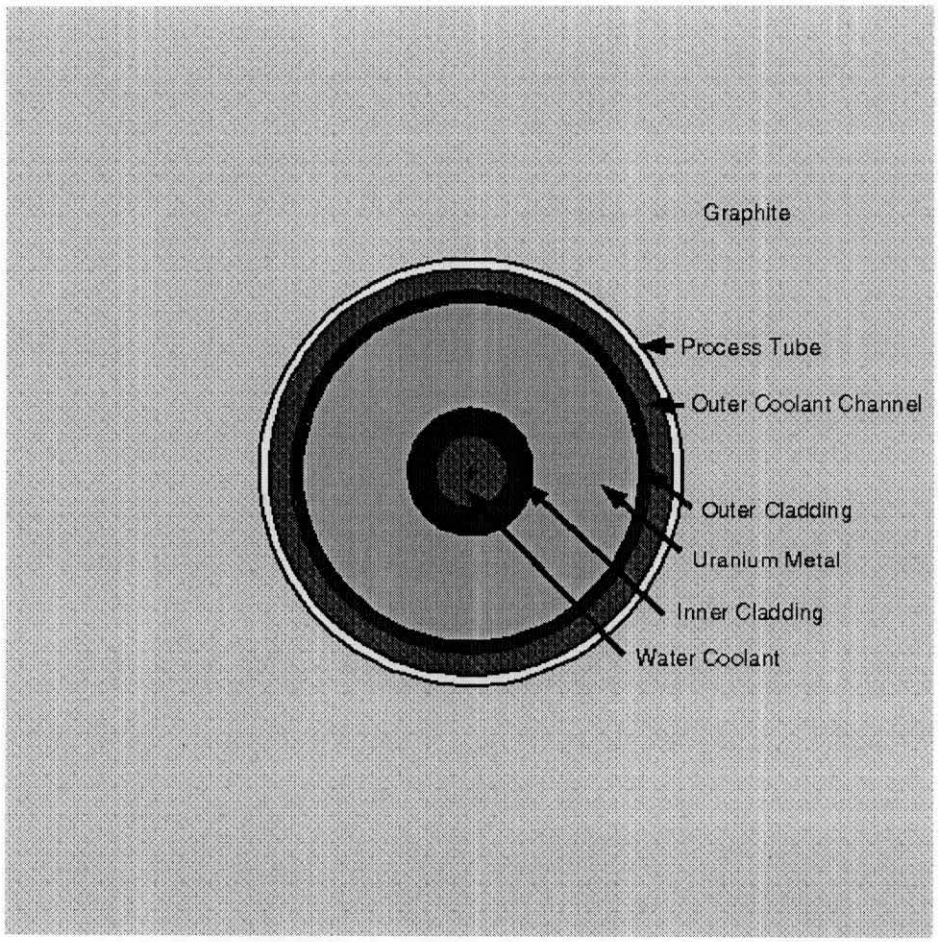
Time Step	0	1	2	3	4	5	6	7	8	9	10
Average MWD/MT	0	133	398	664	929	1194	1459	1724	1989	2253	2519
U-235	107.00	104.00	102.00	101.00	99.20	97.60	97.20	96.20	95.80	95.10	94.60
U-238	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Np-237	0.36	0.37	0.37	0.37	0.38	0.38	0.38	0.39	0.39	0.39	0.39
Pu-238	3.60	3.53	3.50	3.49	3.47	3.46	3.43	3.41	3.42	3.41	3.39
Pu-239	274.00	268.00	260.00	253.00	248.00	242.00	239.00	236.00	232.00	230.00	228.00
Pu-240	0.43	0.44	0.44	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Pu-241	289.00	282.00	275.00	270.00	266.00	261.00	259.00	255.00	253.00	251.00	249.00
Pu-242	0.30	0.30	0.31	0.31	0.31	0.32	0.32	0.32	0.32	0.32	0.32
Am-241	1.62	1.59	1.57	1.55	1.52	1.50	1.49	1.47	1.46	1.45	1.44
Am-242	1730.00	1690.00	1650.00	1620.00	1600.00	1570.00	1570.00	1550.00	1540.00	1530.00	1520.00
Am-243	0.29	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.32	0.32
Cm-242	0.78	0.77	0.76	0.76	0.75	0.75	0.75	0.74	0.74	0.74	0.74
Cm-243	147.00	144.00	142.00	140.00	138.00	137.00	136.00	135.00	134.00	134.00	133.00
Cm-244	0.76	0.77	0.79	0.78	0.80	0.79	0.79	0.79	0.78	0.79	0.80

Table E-5. Comparison of DKPRO Plutonium Production and Isotopics with Historical Production Tables for Single Pass Reactors.

	%Pu240	%Pu241	Pu/MWd	Pu/MTU
AL-0.71U at average of 665 MWd/MTU				
DKPRO	5.551	0.070	0.931	619
Production Table K natural	5.789	0.071 [a]	0.916	609
Production Table B natural	6.091	0.062 [a]	0.843	561
Production Table C natural	5.696	0.060 [a]	0.858	571
AL-0.94U at average of 923 MWd/MTU				
DKPRO	5.831	0.096	0.746	687
Production Table K enriched	5.707	0.076 [a]	0.743	686
Production Table B enriched	5.959	0.065 [a]	0.686	634
Production Table C enriched	5.882	0.064 [a]	0.693	640

[a] corrected for approximately 40 years decay of ^{241}Pu from end of irradiation to 2001

Figure E-1. MCNP Model of K5N and K5E Single Pass Reactor Fuel Assembly.



MONTEBURNS Code

MONTEBURNS processes input from the user that specifies the system geometry, initial material compositions, feed/removal specifications, and other code-specific parameters. Various results from MCNP, ORIGEN2, and other calculations are then output successively as the code runs. The principle function of MONTEBURNS is to transfer one-group cross-section and flux values from MCNP to ORIGEN2, and then transfer the resulting material compositions (after irradiation and/or decay) from ORIGEN2 back to MCNP in a repeated, cyclic fashion (a simple predictor-corrector method is used during this process).

The MONTEBURNS code was obtained from the RSICC as Code Package PSR-455. During testing of this code, it was discovered that the neutron capture cross section was not treated correctly for nuclides with capture cross sections to metastable states of the daughter nuclides. The capture cross sections calculated with MCNP4C are for the total (n,gamma) reaction. The ORIGEN2 cross section libraries have separate cross sections for (n,gamma) reactions to ground and metastable states of the daughter nuclides. MONTEBURNS was treating this total (n,gamma) cross section as the cross section for just the capture to ground state. Discussions with the code author (Holly Trellue) provided a patch to fix this problem. These fixes are included in the MONTEB.F listing of the Fortran code.

The PERL script that provides the overall MONTEBURNS interface and file manipulation was converted to the MONTEBURNSC2D.BAT file and modified to match the local file names for the files used to execute ORIGEN2 Version S.2 and MCNP4C.

Listing of MONTEBURNSC2D.BAT

```
@rem = '--*-Perl-*--
@echo off
if "%OS%" == "Windows_NT" goto WinNT
perl -x -S "%0" %1 %2 %3 %4 %5 %6 %7 %8 %9
goto endofperl
:WinNT
perl -x -S "%0" %*
if NOT "%COMSPEC%" == "%SystemRoot%\system32\cmd.exe" goto endofperl
if %errorlevel% == 9009 echo You do not have Perl in your PATH.
if errorlevel 1 goto script_failed_so_exit_with_non_zero_val 2>nul
goto endofperl
@rem ';
#!c:\perl\bin\perl
#line 15
use File::Copy;
use File::Path;
#  Version 5 May 1999
# print "Enter base name of input files\n";
# chomp ($basename = <STDIN>);
$basename = "monte";
$infile = join ('',$basename,'.inp');
print "The basename is  $basename\n";
print "The infile  is  $infile\n";
copy ("$infile","mb.inp");
```

```
#
# Determine which OS is being used (from monteburns input)
#
open(MBINP, "mb.inp");
$line = <MBINP>;
read MBINP, $OS, 2;
print "OS = $OS \n";
# CLEAR LOGFILE
open (LOGFILE, ">log.txt");
close (LOGFILE);
# redirect standard output to LOGFILE
open (LOGFILE, ">>log.txt");
$old_fh = select(LOGFILE);
#
# Show date and/or time if not a PC system (too messy on
#   the PC).
if ($OS =~ /UN/) {
 system ("date");
}
elsif ($OS =~ /VM/) {
 system ("show time");
}
#
# Get shell variables ----------------------------
# Run monteb, directing output & errors to a single file. The main
# log file is then appended by this info.
#
if ($OS !~ /VM/) {
 system ("monteb2c a 1>mblog.txt 2>&1");
}
else {
 system ("monteb2c 'a' 1>mblog.txt 2>&1");
}
open (MBLOG, "<mblog.txt");
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
$filen = "params.dat";
open(PARAMS, "$filen");
read PARAMS, $var, 4;
$nout = int $var;
read PARAMS, $buf, 8;
read PARAMS, $var, 3;
$npre = int $var;
read PARAMS, $buf, 8;
read PARAMS, $var, 3;
$nrst = int $var;
read PARAMS, $buf, 8;
read PARAMS, $var, 3;
$nkeff = int $var;
read PARAMS, $buf, 8;
read PARAMS, $var, 4;
$nmat = int $var;
read PARAMS, $buf, 8;
close (PARAMS);
print "$nout $npre $nrst $nkeff $nmat\n";
#
# File management ---------------------------------
$feedfile = join ('',$basename,'.feed');
if (-e "$feedfile") {
 copy ("$feedfile", "feed");
```

```
}
# Assign "tmpfile" affiliation for system
if ($nrst != 0) {
 if (!-e "tmpfile") {
  die "Restart run requires old files from previous run in 'tmpfile' subdirectory";
 }
}
if ($OS =~ /VM/) {
 $tmpfile = "[.tmpfile]";
}
else {
 $tmpfile = "./tmpfile/";
}
# Determine if beginning of step MCNP runs are done or not
#  (mb13exist parameter will be set to 1 if so)
$mb13exist = 0;
#
# Remove old cumulative files for multi-materials
$filen = $tmpfile . "mb1.txt";
if (-e "$filen") {
 unlink "$filen";
 $filen = $tmpfile . "mb2.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb3.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb4b.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb4a.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb5.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb6.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb7.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb8.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb9.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb10.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb12.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb14.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb15.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb16.txt";
 unlink "$filen";
 $filen = $tmpfile . "mb17.txt";
 unlink "$filen";
}
#
if ($nrst == 0) {
# Create clean 'tmpfile' directory ---------------------------------
 if (!-e "tmpfile") {
  mkdir ("tmpfile", 0777);
 }
 else {
  rmtree("tmpfile");
  mkdir ("tmpfile", 0777);
 }
```

```
}
# Set up initial run -----------------------------
print "...MonteBurns: Write natural element and origen input files\n";
system ("monteb2c e 1>mblog.txt 2>&1");
open (MBLOG, "<mblog.txt");
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
system ("monteb2c 5 1>mblog.txt 2>&1");
open (MBLOG, "<mblog.txt");
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
#
if ($nrst == 0) {
# Set up initial run -----------------------------
# ..Backup TAPE9.INP
#
 for ($i3 = 1; $i3 <= $nmat; $i3++) {
  $tape9 = "TAPE9_$i3.INP";
  if (-e "TAPE9_0.INP") {
   copy ("TAPE9_0.INP", $tape9);
  }
  else {
   copy ($tape9, "TAPE9_0.INP");
  }
 }
 print "...MonteBurns: Delete Old MCNP Files\n";
 if ($OS !~ /VM/) {
  if (-e "mbmcm") {
   unlink "mbmcm";
  }
  if (-e "mbmco") {
   unlink "mbmco";
  }
  if (-e "mbmcr") {
   unlink "mbmcr";
  }
  if (-e "mbmcs") {
   unlink "mbmcs";
  }
 }
 else {
  if (-e "mbmcm.dat") {
   unlink "mbmcm.dat";
  }
  if (-e "mbmco.dat") {
   unlink "mbmco.dat";
  }
  if (-e "mbmcr.dat") {
   unlink "mbmcr.dat";
  }
  if (-e "mbmcs") {
   unlink "mbmcs.dat";
  }
 }
 print "...MonteBurns: Check Print Card and create skeleton mcnp input\n";
 system ("monteb2c 1 < $basename 1>mblog.txt 2>&1");
 open (MBLOG, "<mblog.txt");
 while ($line = <MBLOG>) {
```

```
  print "$line";
 }
 close (MBLOG);
 print "...MonteBurns: Run MCNP Input Module to get initial comps\n";
 select($old_fh);
 print "...MonteBurns: Run MCNP Input Module to get initial comps\n";
 $old_fh = select(LOGFILE);
 system ("mcnp8_lfw ix n=mbmc 1>mblog.txt 2>&1");
 open (MBLOG, "<mblog.txt");
 while ($line = <MBLOG>) {
  print "$line";
 }
 close (MBLOG);
 print "...MonteBurns: Write tally file tal2.inp\n";
 # Get number of predictors from status
 system ("monteb2c 2 1>mblog.txt 2>&1");
 open (MBLOG, "<mblog.txt");
 while ($line = <MBLOG>) {
  print "$line";
 }
 close (MBLOG);
# Save initial MCNP input information for restart
 $filen = $tmpfile . "mbmc.skl";
 copy ("mbmc.skl", "$filen");
 print "...MonteBurns: Write initial origen comp file TAPE7 and nat isos\n";
 system ("monteb2c 4 1>mblog.txt 2>&1");
 open (MBLOG, "<mblog.txt");
 while ($line = <MBLOG>) {
  print "$line";
 }
 close (MBLOG);
 $i1 = 0
}
else {
#
# Set up restart run -------------------------
 $i1 = $nrst + 1;
 for ($i3 = 1; $i3 <= $nmat; $i3++) {
  if ($nrst < 10) {
   $tape7 = $tmpfile . "TAPE7_$i3.OU$nrst";
   $tape9 = $tmpfile . "TAPE9_$i3.IN$nrst";
  }
  elsif ($nrst < 100) {
   $tape7 = $tmpfile . "TAPE7_$i3.O$nrst";
   $tape9 = $tmpfile . "TAPE9_$i3.I$nrst";
  }
  else {
   $tape7 = $tmpfile . "TAPE7_$i3.$nrst";
   $tape9 = $tmpfile . "TAPE9_$i3.$nrst";
  }
  if ($i1 < 10) {
   $tape5t = $tmpfile . "TAPE5_$i3.t$i1";
   $tape5 = $tmpfile . "TAPE5_$i3.IN$i1";
  }
  elsif ($i1 < 100) {
   $tape5t = $tmpfile . "TAPE5_$i3.t$i1";
   $tape5 = $tmpfile . "TAPE5_$i3.I$i1";
  }
  else {
   $tape5t = $tmpfile . "TAPE5_$i3.t$i1";
   $tape5 = $tmpfile . "TAPE5_$i3.$i1";
  }
```

```
    copy ("$tape7", "TAPE7_$i3.OUT");
    copy ("$tape9", "TAPE9_$i3.INP");
    if (!-e "$tape5t") {
      copy ("$tape5", "$tape5t");
    }
  }
  $filen = $tmpfile . "mbinp.$nrst";
  copy ("$filen", "mb.inp");
# Recover initial MCNP input information
  $filen = $tmpfile . "mbmc.skl";
  copy ("$filen", "mbmc.skl");
}
#
# Beginning of outer loop ----------------------
for ($i = $i1; $i <= $nout; $i++) {
#
# redirect standard output to LOGFILE at the beginning
#   each step so old errors can be viewed after each step
  select($old_fh);
  close (LOGFILE);
  open (LOGFILE, ">>log.txt");
  $old_fh = select(LOGFILE);
#
  print "...MonteBurns: Begin outer loop $i\n";
#
# tally nrst in mb.inp so monteburn knows what step
#
  if ($i > 0) {
    system ("monteb2c 9 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
#
# determine material in each MCNP region
#
    system ("monteb2c c 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
    for ($i3 = 1; $i3 <= $nmat; $i3++) {
      if ($i < 10 ) {
        $tape5t = $tmpfile . "TAPE5_$i3.t$i";
        $tape5i = $tmpfile . "TAPE5_$i3.IN$i";
      }
      elsif ($i < 100 ) {
        $tape5t = $tmpfile . "TAPE5_$i3.t$i";
        $tape5i = $tmpfile . "TAPE5_$i3.I$i";
      }
      else {
        $tape5t = $tmpfile . "TAPE5_$i3.t$i";
        $tape5i = $tmpfile . "TAPE5_$i3.$i";
      }
      move ("$tape5t", "$tape5i");
      copy ("$tape5i", "TAPE5_$i3.INP");
      $filen = $tmpfile . "para3_$i3.dat";
      open(PARAM3, "$filen");
      read PARAM3, $var, 4;
      $nval = int $var;
```

```
    close(PARAM3);
#
# see if the same material is present in each region and if not,
# copy new material to current $i3 value TAPE.7 file
#
    copy ("TAPE7_$nval.OUT", "TAPE7_$i3.TMP");
    $mnat = $tmpfile . "mnat_$nval.tmp";
    $mnat2 = $tmpfile . "mnat_$i3.tem";
    copy ("$mnat", "$mnat2");
   }
  }
  for ($i3 = 1; $i3 <= $nmat; $i3++) {
   if ($i > 0) {
    $mnat2 = $tmpfile . "mnat_$i3.tem";
    $mnat = $tmpfile . "mnat_$i3.tmp";
    move ("TAPE7_$i3.TMP", "TAPE7_$i3.OUT");
    move ("$mnat2", "$mnat");
   }
   copy ("TAPE7_$i3.OUT", "TAPE4_$i3.INP");
  }
#
  if ($i == 1)  {
   $npre2 = $npre + 1;
  }
  elsif ($i == 0) {
   $npre2 = 1;
  }
  else {
   $npre2 = $npre;
  }
#
  $ndsc = 0;
  for ($i3 = 1; $i3 <= $nmat; $i3++) {
   $param = $tmpfile . "param_$i3.$i";
   if (-e "$param") {
    open(PARAM, "$param");
    read PARAM, $var, 4;
    $ndisc = int $var;
    close(PARAM);
    if ($ndisc == 1) {
     $ndsc = 1;
    }
   }
  }
  if ($ndsc == 1) {
   print "...Monteburns: Add discrete feed to TAPE7\n";
   system ("monteb2c b 1>mblog.txt 2>&1");
   open (MBLOG, "<mblog.txt");
   while ($line = <MBLOG>) {
    print "$line";
   }
   close (MBLOG);
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    move ("TAPE7_$i3.TMP", "TAPE7_$i3.OUT");
    copy ("TAPE7_$i3.OUT", "TAPE4_$i3.INP");
   }
   if ($nkeff == 1) {
# Indicate that a beginning MCNP run has been done
#
    $mb13exist = 1;
    print "...Monteburns: Add discrete feed to mcnp input file\n";
    if ($OS =~ /UN/) {
```

```
 system ("date");
}
elsif ($OS =~ /VM/) {
 system ("show time");
}
system ("monteb2c 7b 1>mblog.txt 2>&1");
open (MBLOG, "<mblog.txt");
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
if ($OS =~ /UN/) {
 system ("date");
}
elsif ($OS =~ /VM/) {
 system ("show time");
}
copy ("mbmc.tmp", "mbmc.skl");
copy ("mbmc.skl", "mbmc");
open (MBMC, ">>mbmc");
for ($i3 = 1; $i3 <= $nmat; $i3++) {
 $filen = $tmpfile . "mb7t_$i3.out";
 $filen2 = $tmpfile . "mb7_$i3.out";
 open (MB7T, ">>$filen");
 open (MB7, "<$filen2");
 while ($line = <MB7>) {
  print MB7T "$line";
 }
 close (MB7);
 close (MB7T);
 $filen = $tmpfile . "mat_$i3.inp";
 open (MAT, "<$filen");
 while ($line = <MAT>) {
  print MBMC "$line";
 }
 close (MAT);
}
close (MBMC);
print "...MonteBurns: Run MCNP for discrete feed\n";
select($old_fh);
print "...MonteBurns: Run MCNP for discrete feed\n";
$old_fh = select(LOGFILE);
if ($OS !~ /VM/) {
 if (-e "mbmcm") {
   unlink "mbmcm";
 }
 if (-e "mbmco") {
  unlink "mbmco";
 }
 if (-e "mbmcr") {
  unlink "mbmcr";
 }
 if (-e "mbmcs") {
  unlink "mbmcs";
 }
}
else {
 if (-e "mbmcm.dat") {
   unlink "mbmcm.dat";
 }
 if (-e "mbmco.dat") {
  unlink "mbmco.dat";
```

```
      }
      if (-e "mbmcr.dat") {
        unlink "mbmcr.dat";
      }
      if (-e "mbmcs") {
        unlink "mbmcs.dat";
      }
    }
    system ("mcnp8_lfw n=mbmc 1>mblog.txt 2>&1");
    copy ("mbmc", $tmpfile . "mbmc.beg$i");
    copy ("mbmco", $tmpfile . "mbmco.beg$i");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
    if ($OS =~ /UN/) {
      system ("date");
    }
    elsif ($OS =~ /VM/) {
      system ("show time");
    }
    system ("monteb2c 6b 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
    if ($OS =~ /UN/) {
      system ("date");
    }
    elsif ($OS =~ /VM/) {
      system ("show time");
    }
    $filen = $tmpfile . "mb11t.out";
    $filen2 = $tmpfile . "mb11.out";
    open (MB11T, ">>$filen");
    open (MB11, "<$filen2");
    while ($line = <MB11>) {
     print MB11T "$line";
    }
    close (MB11);
    close (MB11T);
    $filen = $tmpfile . "mb13t.out";
    open (MB13T, ">>$filen");
    open (MB11, "<$filen2");
    while ($line = <MB11>) {
      print MB13T "$line";
    }
    close (MB11);
    close (MB13T);
   }
  }
#
# Determine grams of feed at the beginning of each step
#
  system ("monteb2c 8b 1>mblog.txt 2>&1");
  open (MBLOG, "<mblog.txt");
  while ($line = <MBLOG>) {
    print "$line";
  }
  close (MBLOG);
```

```
 for ($i3 = 1; $i3 <= $nmat; $i3++) {
  $filen = $tmpfile . "mb12t_$i3.out";
  $filen2 = $tmpfile . "mb12_$i3.out";
  open (MB12T, ">>$filen");
  open (MB12, "<$filen2");
  while ($line = <MB12>) {
   print MB12T "$line";
  }
  close (MB12);
  close (MB12T);
  $filen = $tmpfile . "mb12a_$i3.out";
  $filen2 = $tmpfile . "mb12x_$i3.out";
  open (MB12A, ">>$filen");
  open (MB12X, "<$filen2");
  while ($line = <MB12X>) {
   print MB12A "$line";
  }
  close (MB12X);
  close (MB12A);
 }
#
# Beginning of inner loop ----------------------
#
 for ($i2 = 1; $i2 <= $npre2; $i2++) {
  if ($i > 0) {
   print "...MonteBurns: Run origen predictor $i2 for outer $i \n";
   select($old_fh);
   print "...MonteBurns: Run origen predictor $i2 for outer $i \n";
   $old_fh = select(LOGFILE);
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    copy ("TAPE5_$i3.INP", "fort.5");
    copy ("TAPE9_$i3.INP", "fort.9");
    copy ("TAPE4_$i3.INP", "fort.4");
    system ("origen2s.2 <fort.5  1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
     print "$line";
    }
    close (MBLOG);
    print "\n";
    move ("fort.7", "TAPE7_$i3.OUT");
   }
  }
  print "...Monteburns: Determine important players / make new mcnp mat\n";
  if ($OS =~ /UN/) {
   system ("date");
  }
  elsif ($OS =~ /VM/) {
   system ("show time");
  }
  system ("monteb2c 7m 1>mblog.txt 2>&1");
  open (MBLOG, "<mblog.txt");
  while ($line = <MBLOG>) {
   print "$line";
  }
  close (MBLOG);
  if ($OS =~ /UN/) {
   system ("date");
  }
  elsif ($OS =~ /VM/) {
   system ("show time");
  }
```

```
copy ("mbmc.tmp", "mbmc.skl");
print "...MonteBurns: Write new mcnp tallies and cat new mcnp input\n";
system ("monteb2c 3 1>mblog.txt 2>&1");
open (MBLOG, "<mblog.txt");
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
print "...MonteBurns: Create complete MCNP input file\n";
copy ("mbmc.skl", "mbmc");
open (MBMC, ">>mbmc");
for ($i3 = 1; $i3 <= $nmat; $i3++) {
 $filen = $tmpfile . "mb7t_$i3.out";
 $filen2 = $tmpfile . "mb7_$i3.out";
 open (MB7T, ">>$filen");
 open (MB7, "<$filen2");
 while ($line = <MB7>) {
  print MB7T "$line";
 }
 close (MB7);
 close (MB7T);
 $filen = $tmpfile . "mat_$i3.inp";
 $filen1 = $tmpfile . "tal1_$i3.inp";
 $filen2 = $tmpfile . "tal2_$i3.inp";
 $filen3 = $tmpfile . "tal3_$i3.inp";
 open (MAT, "<$filen");
 open (TAL1, "<$filen1");
 open (TAL2, "<$filen2");
 open (TAL3, "<$filen3");
 while ($line = <MAT>) {
  print MBMC "$line";
 }
 while ($line = <TAL1>) {
  print MBMC "$line";
 }
 while ($line = <TAL2>) {
  print MBMC "$line";
 }
 while ($line = <TAL3>) {
  print MBMC "$line";
 }
 close (MAT);
 close (TAL1);
 close (TAL2);
 close (TAL3);
 unlink ("$filen1");
 unlink ("$filen3");
}
close (MBMC);
print "...MonteBurns: Run MCNP for outer step $i\n";
select($old_fh);
print "\n...MonteBurns: Run MCNP for outer step $i\n";
$old_fh = select(LOGFILE);
if ($OS !~ "VM") {
 if (-e "mbmcm") {
  unlink "mbmcm";
 }
 if (-e "mbmco") {
  unlink "mbmco";
 }
 if (-e "mbmcr") {
  unlink "mbmcr";
```

```
    }
    if (-e "mbmcs") {
     unlink "mbmcs";
    }
   }
   else {
    if (-e "mbmcm.dat") {
     unlink "mbmcm.dat";
    }
    if (-e "mbmco.dat") {
     unlink "mbmco.dat";
    }
    if (-e "mbmcr.dat") {
     unlink "mbmcr.dat";
    }
    if (-e "mbmcs") {
     unlink "mbmcs.dat";
    }
   }
   system ("mcnp8_lfw n=mbmc 1>mblog.txt 2>&1");
   copy ("mbmc", $tmpfile . "mbmc.mid$i");
   copy ("mbmco", $tmpfile . "mbmco.mid$i");
   open (MBLOG, "<mblog.txt");
   while ($line = <MBLOG>) {
    print "$line";
   }
   close (MBLOG);
   print ("...MonteBurns: Modify orig xs file TAPE9 and TAPE5 with new flux\n");
   if ($OS =~ /UN/) {
    system ("date");
   }
   elsif ($OS =~ /VM/) {
    system ("show time");
   }
   system ("monteb2c 6m 1>mblog.txt 2>&1");
   open (MBLOG, "<mblog.txt");
   while ($line = <MBLOG>) {
    print "$line";
   }
   close (MBLOG);
   if ($OS =~ /UN/) {
    system ("date");
   }
   elsif ($OS =~ /VM/) {
    system ("show time");
   }
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    if ($i > 0 ) {
     move ("TAPE5_$i3.TMP", "TAPE5_$i3.INP");
    }
    move ("TAPE9_$i3.TMP", "TAPE9_$i3.INP");
    $filen = $tmpfile . "mb4a_$i3.out";
    $filen2 = $tmpfile . "mb6_$i3.out";
    open (MB4A, ">>$filen");
    open (MB6, "<$filen2");
    while ($line = <MB6>) {
     print MB4A "$line";
    }
    close (MB6);
    close (MB4A);
   }
}
```

```
  $filen = $tmpfile . "mb11t.out";
  $filen2 = $tmpfile . "mb11.out";
  open (MB11T, ">>$filen");
  open (MB11, "<$filen2");
  while ($line = <MB11>) {
   print MB11T "$line";
  }
  close (MB11);
  close (MB11T);
  if ($i == 0) {
   if ($nkeff == 1) {
    $filen = $tmpfile . "mb13t.out";
    open (MB13T, ">>$filen");
    open (MB11, "<$filen2");
    while ($line = <MB11>) {
     print MB13T "$line";
    }
    close (MB11);
    close (MB13T);
   }
  }
# End of inner loop -----------------------------
#
  if ($i > 0) {
   print "...MonteBurns: Run origen to compare 1/2 way comps\n";
   select($old_fh);
   print "...MonteBurns: Run origen to compare 1/2 way comps\n";
   $old_fh = select(LOGFILE);
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    copy ("TAPE9_$i3.INP", "fort.9");
    copy ("TAPE4_$i3.INP", "fort.4");
    copy ("TAPE5_$i3.INP", "fort.5");
    system ("origen2s.2 <fort.5 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
     print "$line";
    }
    close (MBLOG);
    print "\n";
    move ("fort.7", "TAPE7_$i3.OUT");
   }
#
   system ("monteb2c 8e 1>mblog.txt 2>&1");
   open (MBLOG, "<mblog.txt");
   while ($line = <MBLOG>) {
    print "$line";
   }
   close (MBLOG);
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    $filen = $tmpfile . "mb4b_$i3.out";
    $filen2 = $tmpfile . "mb5_$i3.out";
    open (MB4B, ">>$filen");
    open (MB5, "<$filen2");
    while ($line = <MB5>) {
     print MB4B "$line";
    }
    close (MB5);
    close (MB4B);
   }
#
# Remove 1/2 way predictor stuff in TAPE5
   system ("monteb2c 0 1>mblog.txt 2>&1");
```

```
  open (MBLOG, "<mblog.txt");
  while ($line = <MBLOG>) {
   print "$line";
  }
  close (MBLOG);
  print "...MonteBurns: Run origen for complete outer step $i\n";
  select($old_fh);
  print "...MonteBurns: Run origen for complete outer step $i\n";
  $old_fh = select(LOGFILE);
  for ($i3 = 1; $i3 <= $nmat; $i3++) {
   move ("TAPE5_$i3.TMP", "TAPE5_$i3.INP");
   copy ("TAPE9_$i3.INP", "fort.9");
   copy ("TAPE4_$i3.INP", "fort.4");
   copy ("TAPE5_$i3.INP", "fort.5");
   system ("origen2s.2 <fort.5 1>mblog.txt 2>&1");
   open (MBLOG, "<mblog.txt");
   while ($line = <MBLOG>) {
    print "$line";
   }
   close (MBLOG);
   print "\n";
   move ("fort.7", "TAPE7_$i3.OUT");
   if ($i < 10) {
    $filen = $tmpfile . "TAPE9_$i3.IN$i";
    copy ("TAPE9_$i3.INP", "$filen");
   }
   elsif ($i < 100) {
    $filen = $tmpfile . "TAPE9_$i3.I$i";
    copy ("TAPE9_$i3.INP", "$filen");
   }
   else {
    $filen = $tmpfile . "TAPE9_$i3.$i";
    copy ("TAPE9_$i3.INP", "$filen");
   }
  }
#
# Save stuff for restart ------------------
#
  $filen = $tmpfile . "mbinp.$i";
  $filen2 = $tmpfile . "mbmc.skl";
  $filen3 = $tmpfile . "mbmc.$i";
  copy ("mb.inp", "$filen");
  copy ("mbmc.skl", "$filen2");
  if ($OS !~ /VM/) {
   copy ("mbmc", "$filen3");
  }
  else {
   copy ("mbmc.dat", "$filen3");
  }
#
# Calculate k-eff at end of burn step ------
#
  if ($nkeff == 1) {
   print "...MonteBurns: Determine important players / make new mcnp mat\n";
   if ($OS =~ /UN/) {
    system ("date");
   }
   elsif ($OS =~ /VM/) {
    system ("show time");
   }
   system ("monteb2c 7e 1>mblog.txt 2>&1");
   open (MBLOG, "<mblog.txt");
```

```
while ($line = <MBLOG>) {
 print "$line";
}
close (MBLOG);
if ($OS =~ /UN/) {
 system ("date");
}
elsif ($OS =~ /VM/) {
 system ("show time");
}
copy ("mbmc.tmp", "mbmc.skl");
copy ("mbmc.skl", "mbmc");
open (MBMC, ">>mbmc");
for ($i3 = 1; $i3 <= $nmat; $i3++) {
 $filen = $tmpfile . "mb7t_$i3.out";
 $filen2 = $tmpfile . "mb7_$i3.out";
 open (MB7T, ">>$filen");
 open (MB7, "<$filen2");
 while ($line = <MB7>) {
  print MB7T "$line";
 }
 close (MB7);
 close (MB7T);
 $filen = $tmpfile . "mat_$i3.inp";
 open (MAT, "<$filen");
 while ($line = <MAT>) {
  print MBMC "$line";
 }
 close (MAT);
}
close (MBMC);
print "...MonteBurns: Run MCNP for complete outer step $i\n";
select($old_fh);
print "...MonteBurns: Run MCNP for complete outer step $i\n";
$old_fh = select(LOGFILE);
if ($OS !~ /VM/) {
 if (-e "mbmcm") {
   unlink "mbmcm";
 }
 if (-e "mbmco") {
  unlink "mbmco";
 }
 if (-e "mbmcr") {
  unlink "mbmcr";
 }
 if (-e "mbmcs") {
  unlink "mbmcs";
 }
}
else {
 if (-e "mbmcm.dat") {
   unlink "mbmcm.dat";
 }
 if (-e "mbmco.dat") {
  unlink "mbmco.dat";
 }
 if (-e "mbmcr.dat") {
  unlink "mbmcr.dat";
 }
 if (-e "mbmcs") {
  unlink "mbmcs.dat";
 }
```

```
    }
    system ("mcnp8_lfw n=mbmc 1>mblog.txt 2>&1");
    copy ("mbmc", $tmpfile . "mbmc.end$i");
    copy ("mbmco", $tmpfile . "mbmco.end$i");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
    if ($OS =~ /UN/) {
      system ("date");
    }
    elsif ($OS =~ /VM/) {
      system ("show time");
    }
    system ("monteb2c 6e 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
      print "$line";
    }
    close (MBLOG);
    if ($OS =~ /UN/) {
      system ("date");
    }
    elsif ($OS =~ /VM/) {
      system ("show time");
    }
    $filen = $tmpfile . "mb11t.out";
    $filen2 = $tmpfile . "mb11.out";
    open (MB11T, ">>$filen");
    open (MB11, "<$filen2");
    while ($line = <MB11>) {
      print MB11T "$line";
    }
    close (MB11);
    close (MB11T);
  }
#
#  Remove discrete removal group elements
#
  system ("monteb2c d 1>mblog.txt 2>&1");
  open (MBLOG, "<mblog.txt");
  while ($line = <MBLOG>) {
    print "$line";
  }
  close (MBLOG);
  for ($i3 = 1; $i3 <= $nmat; $i3++) {
    if (-e "TAPE7_$i3.TEM") {
      move ("TAPE7_$i3.TEM", "TAPE7_$i3.OUT");
    }
  }
 }
#
 system ("monteb2c 8e 1>mblog.txt 2>&1");
 open (MBLOG, "<mblog.txt");
 while ($line = <MBLOG>) {
   print "$line";
 }
 close (MBLOG);
 for ($i3 = 1; $i3 <= $nmat; $i3++) {
   $filen = $tmpfile . "mb5t_$i3.out";
   $filen2 = $tmpfile . "mb5_$i3.out";
```

```
    open (MB5T, ">>$filen");
    open (MB5, "<$filen2");
    while ($line = <MB5>) {
     print MB5T "$line";
    }
    close (MB5);
    close (MB5T);
    $filen = $tmpfile . "mb5tx_$i3.out";
    $filen2 = $tmpfile . "mb5x_$i3.out";
    open (MB5TX, ">>$filen");
    open (MB5X, "<$filen2");
    while ($line = <MB5X>) {
     print MB5TX "$line";
    }
    close (MB5X);
    close (MB5TX);
   }
   if ($i > 0) {
    system ("monteb2c z 1>mblog.txt 2>&1");
    open (MBLOG, "<mblog.txt");
    while ($line = <MBLOG>) {
     print "$line";
    }
    close (MBLOG);
    for ($i3 = 1; $i3 <= $nmat; $i3++) {
     $filen = $tmpfile . "mb9t_$i3.out";
     $filen2 = $tmpfile . "mb9_$i3.out";
     open (MB9T, ">>$filen");
     open (MB9, "<$filen2");
     while ($line = <MB9>) {
      print MB9T "$line";
     }
     close (MB9);
     close (MB9T);
    }
   }
#
# Copy to output files ----------------------
   for ($i3 = 1; $i3 <= $nmat; $i3++) {
    $filen = $tmpfile . "mb1t_$i3.out";
    $filen2 = $tmpfile . "mb1_$i3.out";
    open (MB1T, ">>$filen");
    open (MB1, "<$filen2");
    while ($line = <MB1>) {
     print MB1T $line;
    }
    close (MB1);
    close (MB1T);
#
    if ($i < 10) {
     $filen = $tmpfile . "TAPE7_$i3.OU$i";
    }
    elsif ($i < 100) {
     $filen = $tmpfile . "TAPE7_$i3.O$i";
    }
    else {
     $filen = $tmpfile . "TAPE7_$i3.$i";
    }
    copy ("TAPE7_$i3.OUT", "$filen");
    $filen = $tmpfile . "mb6t_$i3.out";
    $filen2 = $tmpfile . "mb6_$i3.out";
    open (MB6T, ">>$filen");
```

```
open (MB6, "<$filen2");
while ($line = <MB6>) {
 print MB6T $line;
}
close (MB6);
close (MB6T);
$filen = $tmpfile . "mb2t_$i3.out";
$filen2 = $tmpfile . "mb2_$i3.out";
open (MB2T, ">>$filen");
open (MB2, "<$filen2");
while ($line = <MB2>) {
 print MB2T $line;
}
close (MB2);
close (MB2T);
$filen = $tmpfile . "mb3t_$i3.out";
$filen2 = $tmpfile . "mb3_$i3.out";
open (MB3T, ">>$filen");
open (MB3, "<$filen2");
while ($line = <MB3>) {
 print MB3T $line;
}
close (MB3);
close (MB3T);
$filen = $tmpfile . "mb8t_$i3.out";
$filen2 = $tmpfile . "mb8_$i3.out";
open (MB8T, ">>$filen");
open (MB8, "<$filen2");
while ($line = <MB8>) {
 print MB8T $line;
}
close (MB8);
close (MB8T);
$filen = $tmpfile . "mb4b_$i3.out";
$filen2 = $tmpfile . "mb4_$i3.out";
open (MB4B, ">>$filen");
open (MB4, "<$filen2");
while ($line = <MB4>) {
 print MB4B $line;
}
close (MB4);
close (MB4B);
$filen = $tmpfile . "mb14t_$i3.out";
$filen2 = $tmpfile . "mb14_$i3.out";
open (MB14T, ">>$filen");
open (MB14, "<$filen2");
while ($line = <MB14>) {
 print MB14T $line;
}
close (MB14);
close (MB14T);
$filen = $tmpfile . "mb15t_$i3.out";
$filen2 = $tmpfile . "mb15_$i3.out";
open (MB15T, ">>$filen");
open (MB15, "<$filen2");
while ($line = <MB15>) {
 print MB15T $line;
}
close (MB15);
close (MB15T);
$filen = $tmpfile . "mb16t_$i3.out";
$filen2 = $tmpfile . "mb16_$i3.out";
```

```
    open (MB16T, ">>$filen");
    open (MB16, "<$filen2");
    while ($line = <MB16>) {
     print MB16T $line;
    }
    close (MB16);
    close (MB16T);
    $filen = $tmpfile . "mb17t_$i3.out";
    $filen2 = $tmpfile . "mb17_$i3.out";
    open (MB17T, ">>$filen");
    open (MB17, "<$filen2");
    while ($line = <MB17>) {
     print MB17T $line;
    }
    close (MB17);
    close (MB17T);
   }
#
  $val = $i + 1;
  print "$nout $val\n";
}
# End of outer loop ----------------------------------
$filen = $tmpfile . "mb1.txt";
open (MB1, ">>$filen");
$filen = $tmpfile . "mb2.txt";
open (MB2, ">>$filen");
$filen = $tmpfile . "mb3.txt";
open (MB3, ">>$filen");
$filen = $tmpfile . "mb4a.txt";
open (MB4A, ">>$filen");
$filen = $tmpfile . "mb4b.txt";
open (MB4B, ">>$filen");
$filen = $tmpfile . "mb5.txt";
open (MB5, ">>$filen");
$filen = $tmpfile . "mb6.txt";
open (MB6, ">>$filen");
$filen = $tmpfile . "mb7.txt";
open (MB7, ">>$filen");
$filen = $tmpfile . "mb8.txt";
open (MB8, ">>$filen");
$filen = $tmpfile . "mb9.txt";
open (MB9, ">>$filen");
$filen = $tmpfile . "mb10.txt";
open (MB10, ">>$filen");
$filen = $tmpfile . "mb12.txt";
open (MB12, ">>$filen");
$filen = $tmpfile . "mb14.txt";
open (MB14, ">>$filen");
$filen = $tmpfile . "mb15.txt";
open (MB15, ">>$filen");
$filen = $tmpfile . "mb16.txt";
open (MB16, ">>$filen");
$filen = $tmpfile . "mb17.txt";
open (MB17, ">>$filen");
for ($i3 = 1; $i3 <= $nmat; $i3++) {
 $filen = $tmpfile . "mb1t_$i3.out";
 open (MB1T, "<$filen");
 while ($line = <MB1T>) {
  print MB1 $line;
 }
 close (MB1T);
 $filen = $tmpfile . "mb2t_$i3.out";
```

```
open (MB2T, "<$filen");
while ($line = <MB2T>) {
 print MB2 $line;
}
close (MB2T);
$filen = $tmpfile . "mb3t_$i3.out";
open (MB3T, "<$filen");
while ($line = <MB3T>) {
 print MB3 $line;
}
close (MB3T);
$filen = $tmpfile . "mb4a_$i3.out";
open (MB4AT, "<$filen");
while ($line = <MB4AT>) {
 print MB4A $line;
}
close (MB4AT);
$filen = $tmpfile . "mb4b_$i3.out";
open (MB4BT, "<$filen");
while ($line = <MB4BT>) {
 print MB4B $line;
}
close (MB4BT);
$filen = $tmpfile . "mb5t_$i3.out";
open (MB5T, "<$filen");
while ($line = <MB5T>) {
 print MB5 $line;
}
close (MB5T);
$filen = $tmpfile . "mb6t_$i3.out";
open (MB6T, "<$filen");
while ($line = <MB6T>) {
 print MB6 $line;
}
close (MB6T);
$filen = $tmpfile . "mb7t_$i3.out";
open (MB7T, "<$filen");
while ($line = <MB7T>) {
 print MB7 $line;
}
close (MB7T);
$filen = $tmpfile . "mb8t_$i3.out";
open (MB8T, "<$filen");
while ($line = <MB8T>) {
 print MB8 $line;
}
close (MB8T);
$filen = $tmpfile . "mb9t_$i3.out";
open (MB9T, "<$filen");
while ($line = <MB9T>) {
 print MB9 $line;
}
close (MB9T);
$filen = $tmpfile . "mb10t_$i3.out";
open (MB10T, "<$filen");
while ($line = <MB10T>) {
 print MB10 $line;
}
close (MB10T);
$filen = $tmpfile . "mb12t_$i3.out";
open (MB12T, "<$filen");
while ($line = <MB12T>) {
```

```
    print MB12 $line;
   }
   close (MB12T);
   $filen = $tmpfile . "mb14t_$i3.out";
   open (MB14T, "<$filen");
   while ($line = <MB14T>) {
    print MB14 $line;
   }
   close (MB14T);
   $filen = $tmpfile . "mb15t_$i3.out";
   open (MB15T, "<$filen");
   while ($line = <MB15T>) {
    print MB15 $line;
   }
   close (MB15T);
   $filen = $tmpfile . "mb16t_$i3.out";
   open (MB16T, "<$filen");
   while ($line = <MB16T>) {
    print MB16 $line;
   }
   close (MB16T);
   $filen = $tmpfile . "mb17t_$i3.out";
   open (MB17T, "<$filen");
   while ($line = <MB17T>) {
    print MB17 $line;
   }
   close (MB17T);
  }
  close (MB1);
  close (MB2);
  close (MB3);
  close (MB4A);
  close (MB4B);
  close (MB5);
  close (MB6);
  close (MB7);
  close (MB8);
  close (MB9);
  close (MB10);
  close (MB12);
  close (MB14);
  close (MB15);
  close (MB16);
  close (MB17);
  #
  # Make $1.mbout
  $filen = $tmpfile . "mb11t.out";
  copy ("$filen", "crit.txt");
  open (CRIT, ">>crit.txt");
  if ($mb13exist == 1) {
   $filen = $tmpfile . "mb13t.out";
   open (MB13, "<$filen");
   while ($line = <MB13>) {
    print CRIT $line;
   }
   close (MB13);
  }
  #
  $filen = $tmpfile . "mb1.txt";
  open (MB1, "<$filen");
  while ($line = <MB1>) {
   print CRIT $line;
```

```
}
close (MB1);
#
$filen = $tmpfile . "mb6.txt";
open (MB6, "<$filen");
while ($line = <MB6>) {
 print CRIT $line;
}
close (MB6);
#
$filen = $tmpfile . "mb2.txt";
open (MB2, "<$filen");
while ($line = <MB2>) {
 print CRIT $line;
}
close (MB2);
#
$filen = $tmpfile . "mb3.txt";
open (MB3, "<$filen");
while ($line = <MB3>) {
 print CRIT $line;
}
close (MB3);
#
$filen = $tmpfile . "mb8.txt";
open (MB8, "<$filen");
while ($line = <MB8>) {
 print CRIT $line;
}
close (MB8);
#
$filen = $tmpfile . "mb12.txt";
open (MB12, "<$filen");
while ($line = <MB12>) {
 print CRIT $line;
}
close (MB12);
#
$filen = $tmpfile . "mb5.txt";
open (MB5, "<$filen");
while ($line = <MB5>) {
 print CRIT $line;
}
close (MB5);
#
$filen = $tmpfile . "mb14.txt";
open (MB14, "<$filen");
while ($line = <MB14>) {
 print CRIT $line;
}
close (MB14);
#
$filen = $tmpfile . "mb15.txt";
open (MB15, "<$filen");
while ($line = <MB15>) {
 print CRIT $line;
}
close (MB15);
#
$filen = $tmpfile . "mb16.txt";
open (MB16, "<$filen");
while ($line = <MB16>) {
```

```
  print CRIT $line;
 }
 close (MB16);
 #
 $filen = $tmpfile . "mb17.txt";
 open (MB17, "<$filen");
 while ($line = <MB17>) {
  print CRIT $line;
 }
 close (MB17);
 #
 $filen = $tmpfile . "mb9.txt";
 open (MB9, "<$filen");
 while ($line = <MB9>) {
  print CRIT $line;
 }
 close (MB9);
 #
 $filen = $tmpfile . "mb10.txt";
 open (MB10, "<$filen");
 while ($line = <MB10>) {
  print CRIT $line;
 }
 close (MB10);
 #
 if (-e "feed") {
  open (FEED, "<feed");
  while ($line = <FEED>) {
   print CRIT $line;
  }
  close (FEED);
 }
 close (CRIT);
 #
 move ("crit.txt", "$basename.out");
 # Make $1.chk
 if (-e "$basename.chk") {
  unlink "$basename.chk";
 }
 open (MBTMP, ">>$basename.chk");
 #
 $filen = $tmpfile . "mb4a.txt";
 open (MB4A, "<$filen");
 while ($line = <MB4A>) {
  print MBTMP $line;
 }
 close (MB4A);
 #
 $filen = $tmpfile . "mb4b.txt";
 open (MB4B, "<$filen");
 while ($line = <MB4B>) {
  print MBTMP $line;
 }
 close (MB4B);
 #
 $filen = $tmpfile . "mb7.txt";
 open (MB7, "<$filen");
 while ($line = <MB7>) {
  print MBTMP $line;
 }
 close (MB7);
 #
```

```
if (-e "txt2ps-sw") {
  system ("txt2ps-sw $1.mbout > $1.ps");
  system ("txt2ps-sw $1.mbchk > $1c.ps");
  system ("txt2ps-xs $1.mbout > $1.pss");
  system ("txt2ps-xs $1.mbchk > $1c.pss");
}
#
# Clean files with tool "cleanmb"
#
# print "...Cleaning Files with 'cleanmb'\n";
# system ("cleanmb 1");
#
print "...Monteburns: Completed\n";
if ($OS =~ /UN/) {
  system ("date");
}
elsif ($OS =~ /VM/) {
  system ("show time");
}
close (LOGFILE);
#
# Clean files
#
select($old_fh);
print "...Cleaning up Files \n";
#
if (-e "mblog.txt") {
   unlink "mblog.txt";
}
if (-e "mbmc.tmp") {
   unlink "mbmc.tmp";
}
if (-e "mbmc.skl") {
  unlink "mbmc.skl";
}
if ($OS !~ /VM/) {
  if (-e "mbmc") {
     unlink "mbmc";
  }
  if (-e "mbmcm") {
     unlink "mbmcm";
  }
  if (-e "mbmco") {
    unlink "mbmco";
  }
  if (-e "mbmcr") {
    unlink "mbmcr";
  }
  if (-e "mbmcs") {
    unlink "mbmcs";
  }
}
else {
  if (-e "mbmc.dat") {
    unlink "mbmc.dat";
  }
  if (-e "mbmcm.dat") {
    unlink "mbmcm.dat";
  }
  if (-e "mbmco.dat") {
    unlink "mbmco.dat";
  }
```

```
  if (-e "mbmcr.dat") {
   unlink "mbmcr.dat";
  }
  if (-e "mbmcs.dat") {
   unlink "mbmcs.dat";
  }
 }
 if (-e "feed") {
  unlink "feed";
 }
 if (-e "feed.dat") {
  unlink "feed.dat";
 }
 if (-e "TAPE10.INP") {
  unlink "TAPE10.INP";
 }
 if (-e "TAPE11.OUT") {
  unlink "TAPE11.OUT";
 }
 if (-e "TAPE12.OUT") {
  unlink "TAPE12.OUT";
 }
 if (-e "TAPE13.OUT") {
  unlink "TAPE13.OUT";
 }
 if (-e "TAPE15.OUT") {
  unlink "TAPE15.OUT";
 }
 if (-e "TAPE16.OUT") {
  unlink "TAPE16.OUT";
 }
 if (-e "TAPE9.INP") {
  unlink "TAPE9.INP";
 }
 if (-e "TAPE3.INP") {
  unlink "TAPE3.INP";
 }
 if (-e "TAPE4.INP") {
   unlink "TAPE4.INP";
 }
 if (-e "TAPE5.INP") {
  unlink "TAPE5.INP";
 }
 if (-e "TAPE50.OUT") {
   unlink "TAPE50.OUT";
 }
 if (-e "TAPE6.OUT") {
  unlink "TAPE6.OUT";
 }
 if (-e "TAPE7.OUT") {
   unlink "TAPE7.OUT";
 }
 if (-e "TAPE9_0.INP") {
  unlink "TAPE9_0.INP";
 }
 if (-e "params.dat") {
  unlink "params.dat";
 }
 $filen = $tmpfile . "natelem";
 unlink "natelem";
 unlink "mb.inp";
 for ($i3 = 1; $i3 <= $nmat; $i3++) {
```

```
  unlink "TAPE4_$i3.INP";
  unlink "TAPE5_$i3.INP";
  unlink "TAPE7_$i3.OUT";
  unlink "TAPE9_$i3.INP";
}

__END__
:endofperl
```

Listing of MONTEB.F

```
C23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c  Version 5B September 1999
c  For info please contact Dave Poston (505)-667-4336 - poston@lanl.gov
c  or  Holly Trellue (505)-665-9539 - trellue@lanl.gov
c
c...MONTEB call a variety of subroutines based on call line ARG
c
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &     arg*6,machin*4,tmpfile*10
c
c...Read in command line argument getarg for sun, igetarg for HP
c
      m = iargc()
c  for non-VMS and non-HP systems:
      if (m.eq.1) call getarg(1,arg)
c Note:  for a UNIX HP system, uncomment the line above
c    and comment out the next one (i.e. put a 'c' at the beginning of
c    each of these lines).
!     if (m.eq.1) call igetarg(1, arg, 6)
c Note:  for a VMS system, uncomment the following 3 lines and comment
c   out the two above.
c      character arg*8
c      ilib=LIB$GET_FOREIGN(arg)
c      read*, arg
     write(6,'(" Monteb option ", a6, "selected")')arg
c
c...Read in input file into common block data from standard input (initial
c... read (with arg = a) is different than preceding ones b/c nauto
c... has not yet been defined.
c
     if (arg(1:1).eq.'a'.or.arg.eq.'wparam') then
       call readc
     else
       call readco
     endif
c
c...Set temporary file directory name (system-dependent)
c
     if (machin(1:3).eq.'VMS') then
       tmpfile = '[.tmpfile]'
     else
       tmpfile = './tmpfile/'
     endif
c
c...execute based on arg
c
     if (arg(1:1).eq.'1'.or.arg.eq.'pcard ')  call pcard
     if (arg(1:1).eq.'2'.or.arg.eq.'wtall2')  call wtal2
     if (arg(1:1).eq.'3'.or.arg.eq.'wtally')  call wtally
     if (arg(1:1).eq.'4'.or.arg.eq.'worcom')  call worcom
     if (arg(1:1).eq.'5'.or.arg.eq.'worinp')  call worinp
     if (arg(1:2).eq.'6b'.or.arg.eq.'worxsb')  then
       posit = 'b'
       call worxs
     elseif (arg(1:2).eq.'6m'.or.arg.eq.'worxsm') then
       posit = 'm'
```

```
      call worxs
    elseif (arg(1:2).eq.'6e'.or.arg.eq.'worxse') then
      posit = 'e'
      call worxs
    endif
    if (arg(1:2).eq.'7b'.or.arg.eq.'wmcinb') then
      posit = 'b'
      call wmcinp
    elseif (arg(1:2).eq.'7m'.or.arg.eq.'wmcinm') then
      posit = 'm'
      call wmcinp
    elseif (arg(1:2).eq.'7e'.or.arg.eq.'wmcine') then
      posit = 'e'
      call wmcinp
    endif
    if (arg(1:2).eq.'8b'.or.arg.eq.'gramsb') then
      posit = 'b'
      call grams
    elseif (arg(1:2).eq.'8e'.or.arg.eq.'gramse') then
      posit = 'e'
      call grams
    endif

    if (arg(1:1).eq.'9'.or.arg.eq.'wmbinp') then
     nrst=nrst+1
     call wmbinp
    end if
    if (arg(1:1).eq.'0'.or.arg.eq.'rmhalf')  call rmhalf(nmat)
    if (arg(1:1).eq.'b'.or.arg.eq.'discre') call discr
    if (arg(1:1).eq.'c'.or.arg.eq.'region')  call region
    if (arg(1:1).eq.'d'.or.arg.eq.'discre') call dremo
    if (arg(1:1).eq.'e'.or.arg.eq.'natele')  call natele
    if (arg(1:1).eq.'z'.or.arg.eq.'burnca') call burnca
c
c...Write variables 'params' to be read by shell and make more detailed
c... user's input file
c
    if (arg.eq.'a'.or.arg.eq.'wparams')  then
      call wparam
      call wmbinp
    endif
c
    end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WPARAMS writes scratch file containing variables to be read by
c...shell with the AWK command
c
    subroutine wparam
    common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
   & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
   & nisnr(999,49), machin,tmpfile
    character machin*4,tmpfile*10,filen*10

c
    filen = 'params.dat'
    open (11,file=filen,status='unknown')
    write (11,902) nouter
    write (11,903) npre
    write (11,904) nrst
    write (11,905) nkeff
```

```
      write (11,906) nmat
      close (11)
c
  902 format (i4,'  nout')
  903 format (i4,'  npre')
  904 format (i4,'  nrst')
  905 format (i4,'  nkeff')
  906 format (i4,'  nmat')
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...READC reads in common block data from input file without ntot
c   (initial)
c
      subroutine readc
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &     machin*4,nisor5*5,met*1,tmpfile*10
c
c...Read mburn input file, read twice to get niso & nisn, have to
c...read as real variable first and then convert to integer so that it
c...works both on Sun and HP.
c
      open (11,file='mb.inp',status='old')
      read (11,'(a72)') title
      read (11,'(a4)') machin
      read (11,*) nmat
      do 20 j=1,nmat
   20 read (11,*) mt(j)
      do 30 j=1,nmat
   30 read (11,*) voli(j)
      read (11,*) pow
      read (11,*) qu235
      read (11,*) days
      read (11,*) nouter
      read (11,*) ninner
      read (11,*) npre
      read (11,*) nrst
      read (11,'(a10)') olib
      read (11,'(a72)') locale
      read (11,*) frimp
      read (11,*) nkeff
      do 60 j=1,nmat
      read (11,*) nauto(j)
      ntot(j) = nauto(j)
      do 60 i=1,ntot(j)
      read (11,'(a10)') niso(i,j)
      backspace (11)
      read (11,'(f6.1)',err=999,end=999) x
   60 nisn(i,j)=x
      close (11)
c
c...Assign origin iso names
c
      do 10 j=1,nmat
      do 10 i=1,ntot(j)
      nisor5=niso(i,j)
```

```
      met='0'
      if (nisor5.eq.'95242') met='1'
   10 nisor(i,j)=nisor5//met
c
      do 15 j=1,nmat
      do 15 i=1,ntot(j)
      nisnr(i,j)=nisn(i,j)*10
      if (nisnr(i,j).eq.952420) nisnr(i,j)=nisnr(i,j)+1
   15 continue
      goto 998
c
  999 write (6,*) '***** MB ERROR: Problem with monteburns input file'
      stop
  998 return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...READCOM reads in common block data from input file with ntot
c
      subroutine readco
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &     machin*4,nisor5*5,met*1,tmpfile*10
c
c...Read mburn input file, read twice to get niso & nisn, have to
c...read as real variable first and then convert to integer so that it
c...works both on Sun and HP.
c
      open (11,file='mb.inp',status='old')
      read (11,'(a72)') title
      read (11,'(a4)') machin
      read (11,*) nmat
      do 20 j=1,nmat
   20 read (11,*) mt(j)
      do 30 j=1,nmat
   30 read (11,*) voli(j)
      read (11,*) pow
      read (11,*) qu235
      read (11,*) days
      read (11,*) nouter
      read (11,*) ninner
      read (11,*) npre
      read (11,*) nrst
      read (11,'(a10)') olib
      read (11,'(a72)') locale
      read (11,*) frimp
      read (11,*) nkeff
      do 60 j=1,nmat
      read (11,*) nauto(j)
      read (11,*) ntot(j)
      do 60 i=1,ntot(j)
      read (11,'(a10)') niso(i,j)
      backspace (11)
      read (11,'(f6.1)') x
   60 nisn(i,j)=x
      close (11)
c
c...Assign origin iso names
```

```
c
      do 10 j=1,nmat
      do 10 i=1,ntot(j)
      nisor5=niso(i,j)
      met='0'
      if (nisor5.eq.'95242') met='1'
   10 nisor(i,j)=nisor5//met
c
      do 15 j=1,nmat
      do 15 i=1,ntot(j)
      nisnr(i,j)=nisn(i,j)*10
      if (nisnr(i,j).eq.952420) nisnr(i,j)=nisnr(i,j)+1
   15 continue
c
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...PCARD checks mcnp input file for print card, and alters or adds one
c...(only run once at beginning of monteburns)
c
      subroutine pcard
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &        ju5*5,ju80*80,m(30)*1,file1t*22,file2t*22,tmpfile*10,
     &        file3t*22,file4a*22,file4b*22,file5t*22,file5x*22,
     &        file7t*22,file8t*22,fname*22,fil12t*22,fil12a*22,
     &        fil14t*22,fil15t*22,fil16t*22,fil17t*22,machin*4,
     &        filen*19
      integer first
c
c... Used to keep track if materials have been processed yet or
c...   not (blank lines following materials are removed)
c
      iflag = 0
      k = 0
      if (machin(1:3).ne.'VMS') then
        open (12,file='mbmc',status='unknown')
c
   10   k=k+1
        read (5,'(a5)',end=15) ju5
        if (ju5.eq.'print'.or.ju5.eq.'PRINT') ni=k
        goto 10
   15   rewind (5)
   20   do 25 n=1,k-1
        read (5,'(a80)') ju80
c
        if (n.ne.ni) then
c         if (ju80(1:20).ne.'                    ') then
          write (12,'(a80)') ju80
c         endif
        else
          write (12,'(a8)') 'print 40'
        end if
   25 continue
      if (ni.eq.0) write (12,'(a8)') 'print 40'
c
c... Obtain initial file for VMS system
```

```
c
     elseif (machin(1:3).eq.'VMS') then
      open (12,file='mbmc.dat',status='unknown')
c
  30  k=k+1
      read (55,'(a5)',end=32) ju5
      if (ju5.eq.'print'.or.ju5.eq.'PRINT') ni=k
      goto 30
  32  rewind (55)
  34  do 38 n=1,k-1
      read (55,'(a80)') ju80
      if (n.ne.ni) then
c        if (ju80(1:20).ne.'                    ') then
         write (12,'(a80)') ju80
c        endif
      else
       write (12,'(a8)') 'print 40'
      end if
  38  continue
      if (ni.eq.0) write (12,'(a8)') 'print 40'
     endif
c
     close (12)
c
c...Remove mt card and write mbmc.skl
c
     if (machin(1:3).ne.'VMS') then
      open (11,file='mbmc',status='unknown')
     elseif (machin(1:3).eq.'VMS') then
      open (11,file='mbmc.dat',status='unknown')
     endif
     open (12,file='mbmc.skl',status='unknown')
c
     n = 0
     first = 0
  40 read (11,'(30a1)',end=50) (m(i),i=1,30)
     ifd = 0
     nogo=0
     do 45 i=1,30
  45 if (m(i).ne.' ') nogo=1
c
     if (nogo.eq.0.and.iflag.eq.1) goto 40
     if ((m(1).eq.'m'.or.m(1).eq.'M').and.first.ne.0) then
      iflag = 1
      do 47 i=6,2,-1
       if (m(i).eq.' ') ii=i
  47  continue
      matr=0
      do 48 i=2,ii-1
  48  matr=matr+(ichar(m(i))-48)*10**(ii-1-i)
c
c... Identify if MCNP material is one of the user requested materials
c
      do 49 j=1,nmat
  49    if (matr.eq.abs(mt(j))) ifd=1
     end if
     first = 1
c
c... Print lines excluding user-specified material identifiers to skeleton
c...     removing blank lines as you go (except for first two, which
c...     separate cell cards from surface cards and surface cards from
c...     material cards)
```

```
c
    if (ifd.eq.0) then
      backspace(11)
      read (11,'(a80)') ju80
      write (12,'(a80)') ju80
      goto 40
    else
c
c... If MCNP material is equal to user specified one, then print material
c... identification cards to appropriate output file.
c
c     if (iflag.eq.1) then
      do 52 j=1,nmat
      if (matr.eq.abs(mt(j))) then
        if (j.lt.10) then
          fname = tmpfile//'mat_'//char(j+48)//'.inp'
        elseif (j.ge.10) then
          j1 = j/10
          j2 = j - j1*10
          fname = tmpfile//'mat_'//char(j1+48)//char(j2+48)//'.inp'
        endif
        open (13,file=fname,status='unknown')
        n = n + 1
      endif
  52  continue
    endif
    backspace(11)
    read (11,'(a80)') ju80
    write (13,'(a80)') ju80
  51 read (11,'(20a1)',end=50) (m(i),i=1,20)
    nomat=0
    nomat2=0
    do 53 i=1,5
  53    if (m(i).ne.' ') nomat=1
    do 54 i=1,20
  54    if (m(i).ne.' ') nomat2=1
    if (nomat.eq.1.or.nomat2.eq.0) then
      backspace (11)
      goto 40
    else
      backspace (11)
      read (11,'(a80)') ju80
      write (13,'(a80)') ju80
      goto 51
    endif
c   end if
c   goto 40
c
  50 close(12)
    close (11)
c
c... Create output files and label them. "mb11t.out" does not depend on the
c... material, the others do. mb13t.out contains only beginning of step
c
      if (frimp.lt.0.) frimp = abs(frimp)
      filen = tmpfile//'mb11t.out'
      open (14,file=filen,status='unknown')
      write (14,'(a72)') title
      write (14,961) pow,days,nouter,ninner,npre,frimp
      write (14,'(a33)') 'Monteburns MCNP k-eff Versus Time'
      write (14,'(a34,a28)') '       days    k-eff     rel err ',
   &                '   nu      avQfis      eta'
```

```
      close (14)
c
      filen = tmpfile//'mb13t.out'
      open (14,file=filen,status='unknown')
      write (14,'(/,a34,a8)') 'Monteburns MCNP k-eff at Beginning',
     &    ' of Step'
      write (14,'(a34,a6)') '       days    k-eff     rel err ',
     &              '   nu'
      close (14)
c
c... Create file names
c
      do 70 j=1,nmat
      if (j.lt.10) then
        file1t = tmpfile//'mb1t_'//char(j+48)//'.out'
        file2t = tmpfile//'mb2t_'//char(j+48)//'.out'
        file3t = tmpfile//'mb3t_'//char(j+48)//'.out'
        file4a = tmpfile//'mb4a_'//char(j+48)//'.out'
        file4b = tmpfile//'mb4b_'//char(j+48)//'.out'
        file5t = tmpfile//'mb5t_'//char(j+48)//'.out'
        file5x = tmpfile//'mb5tx_'//char(j+48)//'.out'
        file7t = tmpfile//'mb7t_'//char(j+48)//'.out'
        file8t = tmpfile//'mb8t_'//char(j+48)//'.out'
        fil12t = tmpfile//'mb12t_'//char(j+48)//'.out'
        fil12a = tmpfile//'mb12a_'//char(j+48)//'.out'
        fil14t = tmpfile//'mb14t_'//char(j+48)//'.out'
        fil15t = tmpfile//'mb15t_'//char(j+48)//'.out'
        fil16t = tmpfile//'mb16t_'//char(j+48)//'.out'
        fil17t = tmpfile//'mb17t_'//char(j+48)//'.out'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        file1t = tmpfile//'mb1t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file2t = tmpfile//'mb2t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file3t = tmpfile//'mb3t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file4a = tmpfile//'mb4a_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file4b = tmpfile//'mb4b_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file5t = tmpfile//'mb5t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file5x = tmpfile//'mb5tx_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file7t = tmpfile//'mb7t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        file8t = tmpfile//'mb8t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil12t = tmpfile//'mb12t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil12a = tmpfile//'mb12a_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil14t = tmpfile//'mb14t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil15t = tmpfile//'mb15t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil16t = tmpfile//'mb16t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
        fil17t = tmpfile//'mb17t_'//char(j1+48)//
     &                 char(j2+48)//'.out'
```

```
      endif
c
      filen = tmpfile//'mb1.txt'
      open (14,file=tmpfile//'mb1.txt',status='unknown')
      write (14,'(/,a29)') 'Monteburns Transport History '
      close (14)
      open (14,file=file1t,status='unknown')
      write (14,'(/,a29,a12,i3,22x,a14,32x,a20)')
     & 'Monteburns Transport History ',
     & 'for material',j,'total material','for actinide   '
      write (14,'(a25,a60,a58,a17)') '    Qfis    Flux    ',
     & 'SigmaF   Power   Pow.Den.   Burnup  n,gamma  n,fission',
     & ' fis/cap  n2n      eta     n,gamma  n,fission fis/cap',
     & '  n2n      eta'
      write (14,'(a25,a60,a58,a11)') '    (MeV)  (n/cm^3)   ',
     & '(1/cm)   (MW)    (W/cc)    (GWd/MTU) (barns)  (barns) ',
     & '         (barns)          (barns)  (barns)      ',
     & '  (barns) '
      close (14)
      filen = tmpfile//'mb2.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a41)') 'Monteburns 1-group n,gamma Cross Sections'
      close (14)
      open (14,file=file2t,status='unknown')
      write (14,'(/,a33,a21,i3)')
     & 'Monteburns 1-group n,gamma Cross ',
     & 'Sections for material',j
      write (14,'(3x,a9,250(1x,a9))') (niso(i,j),i=1,nauto(j))
      close (14)
      filen = tmpfile//'mb3.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a41)') 'Monteburns 1-group Fission Cross Sections'
      close (14)
      open (14,file=file3t,status='unknown')
      write (14,'(/,a33,a21,i3)')
     & 'Monteburns 1-group Fission Cross ',
     & 'Sections for material',j
      write (14,'(3x,a9,250(1x,a9))') (niso(i,j),i=1,nauto(j))
      close (14)
      filen = tmpfile//'mb4a.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a72)') title
      write (14,961) pow,days,nouter,ninner,npre,frimp
      write (14,'(a43)') 'Monteburns Spectrum for Each Predictor Step'
      close (14)
      open (14,file=file4a,status='unknown')
      write (14,'(/,a29,a27,i3)')
     &   'Monteburns Spectrum for Each ',
     &   'Predictor Step for material',j
      write (14,'(a5,a58)') '    ',
     & '  <.1eV    <1eV   <100eV  <100keV    <1MeV   <20MeV'
      close (14)
      filen = tmpfile//'mb4b.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a28)') 'Monteburns Grams at Midpoint'
      close (14)
      open (14,file=file4b,status='unknown')
      write (14,'(/,a28,a13,i3)')
     & 'Monteburns Grams at Midpoint',
     & ' for material',j
      write (14,'(a40)') '1st row is actual, 2nd row was predicted'
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
```

```
& 'actinide'
  close (14)
  filen = tmpfile//'mb5.txt'
  open (14,file=filen,status='unknown')
  write (14,'(/,a44)')
& 'Monteburns Grams of Material at End of Steps'
  close (14)
  filen = tmpfile//'mb12.txt'
  open (14,file=filen,status='unknown')
  write (14,'(/,a50)')
& 'Monteburns Grams of Material at Beginning of Steps'
  close (14)
  open (14,file=file5t,status='unknown')
  write (14,'(/,a44,a13,i3)')
& 'Monteburns Grams of Material at End of Steps',
& ' for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
  open (14,file=fil12t,status='unknown')
  write (14,'(/,a47,a13,i3)')
& 'Monteburns Grams of Material at Begin. of Steps',
& ' for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
  open (14,file=file5x,status='unknown')
  write (14,'(/,a44,a13,i3)')
& 'Monteburns Grams of Material at End of Steps',
& ' for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
  open (14,file=fil12a,status='unknown')
  write (14,'(/,a47,a13,i3)')
& 'Monteburns Grams of Material at Begin. of Steps',
& ' for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
  filen = tmpfile//'mb14.txt'
  open (14,file=filen,status='unknown')
  write (14,'(/,a52)')
& 'Monteburns Activity (Ci) of Material at End of Steps'
  close (14)
  open (14,file=fil14t,status='unknown')
  write (14,'(/,a39,i3)')
& 'Monteburns Activities (Ci) for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
  filen = tmpfile//'mb15.txt'
  open (14,file=filen,status='unknown')
  write (14,'(/,a51)')
& 'Monteburns Heatload (W) of Material at End of Steps'
  close (14)
  open (14,file=fil15t,status='unknown')
  write (14,'(/,a37,i3)')
& 'Monteburns Heatloads (W) for material',j
  write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
& 'actinide'
  close (14)
```

```
      filen = tmpfile//'mb16.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a60,a8)')
     & 'Monteburns Inhalation Toxicity (m^3 air) of Material at End ',
     & 'of Steps'
      close (14)
      open (14,file=fil16t,status='unknown')
      write (14,'(/,a55,i3)')
     & 'Monteburns Inhalation Toxicities (m^3 air) for material',j
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
     & 'actinide'
      close (14)
      filen = tmpfile//'mb17.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a61,a9)')
     & 'Monteburns Ingestion Toxicity (m^3 water) of Material at End',
     & ' of Steps'
      close (14)
      open (14,file=fil17t,status='unknown')
      write (14,'(/,a57,i3)')
     & 'Monteburns Ingestion Toxicities (m^3 water) for material',j
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),
     & 'actinide'
      close (14)
      filen = tmpfile//'mb7.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a30,a34,i3)') 'Fractional Importance of Radio'
     &   ,'nuclides Sent From ORIGEN2 to MCNP'
      close (14)
      open (14,file=file7t,status='unknown')
      write (14,'(/,a57,/,a20,i3)')
     &   'Fractional Importance of Radionuclides Sent From ORIGEN2 ',
     &   'to MCNP for material',j
      write (14,'(/,a5,a55,a7)') 'step#',
     &   '     isotope grams     mass fra  atom fra  capture   ',
     &   'fission'
      close (14)
      filen = tmpfile//'mb8.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a29,a6,i3)') 'Monteburns Fission-to-Capture',
     &   ' Ratio'
      close (14)
      open (14,file=file8t,status='unknown')
      write (14,'(/,a29,a19,i3)') 'Monteburns Fission-to-Capture',
     & ' Ratio for material',j
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j))
      close (14)
  961 format (/'Total Power (MW) =',1pe10.2,'  Days =',1pe10.2,/
     & '# outer steps =',i3,',  # inner steps =',i3,
     & ',  # predictor steps =',i2,/
     & 'Importance Fraction = ',0pf6.4/)
   70 continue
c
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WTALLY2 writes the tally cards to tal2.inp which is appended
c...to mcnp input file, and creates new mbmc file that does not
c...include tallied materials (run only once at beginning of monteburns)
c
```

```
      subroutine wtal2
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &     machin*4,ju6*6,tcell(999,49)*6,ncell*6,file6t*22,file2*22,
     &     tmpfile*10,filen*18
      dimension vol(49),ntc(49)
c
c...Determine cells to tally
c
      do 12 j=1,nmat
        ntc(j)=0
        vol(j)=0.0
   12 continue
c
      if (machin(1:3).ne.'VMS') then
        open (55,file='mbmco',status='old')
      elseif (machin(1:3).eq.'VMS') then
        open (55,file='mbmco.dat',status='old')
      endif
   40 read (55,'(a6)') ju6
      if (ju6.ne.'1cells') goto 40
c
      read (55,'(///)')
   50 read (55,'(i6,a6,i5,1x,1p3e12.5)') n,ncell,nmt,aden,gden,vol1
      do 55 j=1,nmat
      if (nmt.eq.abs(mt(j))) then
        ntc(j)=ntc(j)+1
        tcell(ntc(j),j)=ncell
        vol(j)=vol(j)+vol1
      end if
   55 continue
      if (n.ne.0) goto 50
c
c...Write tally2 file
c
      do 100 j=1,nmat
      if (j.lt.10) then
        file2  = tmpfile//'tal2_'//char(j+48)//'.inp'
        file6t = tmpfile//'mb6t_'//char(j+48)//'.out'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        file2  = tmpfile//'tal2_'//char(j1+48)//char(j2+48)//'.inp'
        file6t = tmpfile//'mb6t_'//char(j1+48)//char(j2+48)//'.out'
      endif
      if (voli(j).ne.0.) vol(j)=voli(j)
      if (vol(j).eq.0) then
        write (6,*) '***** MB ERROR: No tally volume'
        stop
      end if
      open (11,file=file2,status='unknown')
c
c...Write energy tallies (tally numbers range from 14 to 494)
c... (1 to 49 represents material number)
c
      write (11,911) (10+j)
  911 format ('c'/'f',i2,'4:n  (')
      do 80 i=1,ntc(j)
   80 write (11,912) tcell(i,j)
```

```
 912 format (7x,a6,' ')
    write (11,913)
 913 format (14x,')')
    write (11,915) (10+j),(10+j),vol(j),(10+j)
 915 format ('fc',i2,'4  MonteBurns Energy Spectrum Tallies'/
   & 'sd',i2,'4  ',1pe12.5/
   & 'e',i2,'4   1.0e-7 1.0e-6 1.0e-4 1.0e-1 1.0 20.0')
c
c...Write header for xs tallies
c
    write (11,911) (50+j)
    do 90 i=1,ntc(j)
  90 write (11,922) tcell(i,j)
 922 format (7x,a6,' ')
    write (11,923)
 923 format (14x,')')
    write (11,924) (50+j),(50+j),vol(j),(50+j)
 924 format ('fc',i2,'4  MonteBurns Cross Section Tallies'/
   & 'sd',i2,'4  ',1pe12.5/'fm',i2,'4  (1)')
c
    filen = tmpfile//'mb6.txt'
    open (14,file=filen,status='unknown')
    write (14,'(/,a24)') 'Monteburns Flux Spectrum'
    close (14)
    open (14,file=file6t,status='unknown')
    write (14,'(/,a25,a12,i3)') 'Monteburns Flux Spectrum ',
   & 'for material',j
    write (14,'(a63)')
   & '     <.1eV    <1eV   <100eV  <100keV    <1MeV   <20MeV'
    close (14)
 100 continue
    close (11)
c
    return
    end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WTALLY writes the tally cards to tal1.inp and tal3.inp which
c...are appended to mcnp input file
c
    subroutine wtally
    common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
   & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
   & nisnr(999,49),machin,tmpfile
    common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
    character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
   &     machin*4,file1*22,file3*22,tmpfile*10
c
c...Write tally files 1 and 3
c
    ii = 100
    ij = 9900
    do 100 j=1,nmat
    iflag = 0
    if (j.lt.10) then
     file1 = tmpfile//'tal1_'//char(j+48)//'.inp'
     file3 = tmpfile//'tal3_'//char(j+48)//'.inp'
    elseif (j.ge.10) then
     j1 = j/10
     j2 = j - j1*10
     file1 = tmpfile//'tal1_'//char(j1+48)//char(j2+48)//'.inp'
```

```
      file3 = tmpfile//'tal3_'//char(j1+48)//char(j2+48)//'.inp'
     endif
     open (11,file=file1,status='unknown')
     open (12,file=file3,status='unknown')
     do 90 i=1,ntot(j)
     ii=ii+1
     if (ii.gt.999) then
      write (11,902) ii,niso(i,j)
     else
      write (11,901) ii,niso(i,j)
     endif
  901 format ('m',i3,4x,a10,'  1.0')
  902 format ('m',i4,4x,a10,'  1.0')
c
c  Equate (n,t) reaction to (n,alpha) for Lithium-6
c  All others are true (n,alpha) cross sections
c
     if (nisn(i,j).eq.3006) then
       write (12,920) ii
     elseif (nisn(i,j).lt.89000) then
       write (12,921) ii
     elseif (nisn(i,j).ge.89000) then
       iflag = 1
       write (12,922) ii
     endif
   90 continue
     ij = ij + 1
     if (iflag.eq.1) write (12,923) ij
     write (12,923) abs(mt(j))
     close (11)
  100 continue
c
c      -2 is the total capture cross section
c      16 is (n,2n) cross section
c      105 is (n,t) cross section
c      107 is (n,alpha) cross section
c      103 is (n,p) cross section (for activation products)
c      17 is (n,3n) cross section
c      -6 is the total fission cross section (for actinides)
c      452 is nu bar - only used for verification purposes
c
  920 format (8x,'(1 ',i4,' (102)  (16)  (105) (103))')
  921 format (8x,'(1 ',i4,' (102)  (16)  (107) (103))')
  922 format (8x,'(1 ',i4,' (102)  (16)  (17)  (-6))')
  923 format (8x,'(1 ',i4,' (-2)  (16)  (17) (-6))')
c
     return
     end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WORCOMP writes composition input file for origen TAPE7, which is
c...read by origen as TAPE4.  Units are g-atoms (grams / atomic mass)
c...(one time execute at beginning of monteburns)
c
     subroutine worcom
c
     common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
    & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
    & nisnr(999,49),machin,tmpfile
     common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
     character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
```

```
     &     machin*4,fmcnp*22,nmcnp*20,ju30*30,vers*2,tmpfile*10,
     &     ju6*6,ju10*10,met*1,ninat*10,fname*12,fnat*22,filen*17
      dimension nuc(99,49),f(99,49),gden(49),vol(49),nc(99),fn(99)
      dimension ij(49),nelem(999,49),nisop(999,49),atomfr(999,49,20),
     & nisot(999,49,20),naix(999,49,20),iflag(999,49),gmat(999,49,20),
     & aix(999,49,20)
c
      if (machin(1:3).ne.'VMS') then
        open (55,file='mbmco',status='old')
      elseif (machin(1:3).eq.'VMS') then
        open (55,file='mbmco.dat',status='old')
      endif
      read (55,'(a30)') ju30
      if (ju30(19:20).eq.'4b') vers = '4b'
      if (ju30(19:20).eq.'4c') vers = '4c'
      if (ju30(6:6).eq.'x'.and.ju30(19:19).eq.'2') vers = 'x5'
      if (ju30(19:20).eq.'4a') vers = '4a'
   10 read (55,'(32x,a10)') ju10
      if (ju10.ne.'mass fract') goto 10
c
c...Read mass fractions for material
c
      ifd = 0
      read (55,*)
   20 if (vers.eq.'4a') then
c
c... The next line is for MCNP4A
c
        read (55,'(i6,5x,4(6x,i5,2x,f8.5))')
     & mtn,(nc(i),fn(i),i=1,4)
      elseif (vers.eq.'x5') then
c
c... The next line is for MCNPX, Vers.2.1.5
c
        read (55,'(i6,5x,4(6x,i5,2x,1pe17.11))')
     & mtn,(nc(i),fn(i),i=1,4)
      else
c
c... The next line is for MCNP4B or 4C
c
        read (55,'(i6,5x,4(6x,i5,2x,1pe11.5))')
     & mtn,(nc(i),fn(i),i=1,4)
      endif
      ii = 0
      im = 0
      do 25 j=1,nmat
      if (mtn.eq.abs(mt(j))) then
        do 22 i=1,4
        nuc(i,j) = nc(i)
   22   f(i,j) = fn(i)
        nmt = j
        im = 1
        ifd = ifd + 1
      endif
   25 continue
      if (im.eq.0) goto 20
c
   30 ii=ii+4
      read (55,'(a6)') ju6
      if (ju6.eq.'1cells') then
        ii=ii-4
        ij(nmt) = ii
```

```
      goto 42
    else
      backspace (55)
    endif
c
c... The next line is for MCNP4A
c
    if (vers.eq.'4a') then
      read (55,'(i6,5x,4(6x,i5,2x,f8.5))')
     & mtn,(nuc(i,nmt),f(i,nmt),i=1+ii,4+ii)
    elseif (vers.eq.'x5') then
c
c... The next line is for MCNPX, Vers.2.1.5
c
      read (55,'(i6,5x,4(6x,i5,2x,1pe17.11))')
     & mtn,(nuc(i,nmt),f(i,nmt),i=1+ii,4+ii)
c
c... The next line is for MCNP4B and 4C
c
    else
      read (55,'(i6,5x,4(6x,i5,2x,1pe11.5))')
     & mtn,(nuc(i,nmt),f(i,nmt),i=1+ii,4+ii)
    endif
    if (mtn.gt.0.and.mtn.ne.abs(mt(nmt))) ii=ii-4
    if (mtn.eq.0.and.nuc(4+ii,nmt).ne.0) goto 30
    ij(nmt) = ii
    if (ifd.ne.nmat) then
     backspace(55)
     goto 20
    endif
c
c...Determine gram density and volume of cells (for now just 1)
c
  40 read (55,'(a6)') ju6
    if (ju6.ne.'1cells') goto 40
c
  42 read (55,'(///)')
  50 read (55,'(2i6,i5,1x,1p3e12.5)') n,ncell,nmt,aden,gden1,vol1
    do 51 j=1,nmat
    if (nmt.eq.abs(mt(j))) then
      vol(j)=vol(j)+vol1
      gden(j)=gden1
    end if
  51 continue
    if (n.ne.0) goto 50
c
c...Make sure isos have been read correctly, erase spurios readings
c
    do 80 j=1,nmat
    do 52 i=1,4+ij(j)
    nogo=0
    if (nuc(i,j).lt.1000) nogo=1
    if (nogo.eq.1) nuc(i,j)=0
  52 continue
c
c...Write grams of material to TAPE7 (origen comp file) or mnat.tmp
c...if a natural iso appears in mcnp input file
c
    if (voli(j).ne.0.) vol(j)=voli(j)
    voli(j) = vol(j)
    call wmbinp
c
```

```
  if (j.lt.10) then
   fnat = tmpfile//'mnat_'//char(j+48)//'.tmp'
   fname = 'TAPE7_'//char(j+48)//'.OUT'
  elseif (j.ge.10) then
   j1 = j/10
   j2 = j - j1*10
   fnat = tmpfile//'mnat_'//char(j1+48)//char(j2+48)//'.tmp'
   fname = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
  endif
  open (11,file=fname,status='unknown')
  open (12,file=fnat,status='unknown')
  do 58 i=1,4+ij(j)
  iflag(i,j) = 0
  if (nuc(i,j)-1000*(nuc(i,j)/1000).eq.0.and.nuc(i,j).gt.0) then
   filen = tmpfile//'natelem'
   open (16,file=filen,status='unknown')
   read (16,*)
   read (16,*)
54  read (16,*) nelem(i,j)
   read (16,*) nisop(i,j)
   do 56 n=1,nisop(i,j)
56  read (16,'(i5,3x,f10.5)',err=56,end=53)
 &      nisot(i,j,n),atomfr(i,j,n)
   if (nelem(i,j).eq.nuc(i,j)/1000) then
    iflag(i,j) = 1
    goto 53
   else
    goto 54
   endif
53  close (16)
   open (13,file='mbxs.inp',status='unknown')
   ifd=0
55  read (13,'(i5)',end=57) nixs
   if (nixs.eq.nuc(i,j)) ifd=1
   if (ifd.eq.0) goto 55
   backspace (13)
   read (13,'(a10)') ninat
   write (12,'(i2,4x,a10)') nelem(i,j),ninat
57  if (ifd.eq.0) write (6,*)
 & '***** MB WARNING: Natural iso xs not found ',nuc(i,j)
   close (13)
  elseif (nuc(i,j).ne.0) then
   if (j.lt.10) then
   fmcnp = tmpfile//'mcnp_'//char(j+48)//'.inp'
   elseif (j.ge.10) then
   j1 = j/10
   j2 = j - j1*10
   fmcnp = tmpfile//'mcnp_'//char(j1+48)//char(j2+48)//'.inp'
   endif
   open (17,file=fmcnp,status='unknown')
   open (13,file='mbxs.inp',status='unknown')
   ifd=0
66 read (13,'(i5)',end=67) nixs
   if (nixs.eq.nuc(i,j)) ifd=1
   if (ifd.eq.0) goto 66
   backspace (13)
   read (13,'(a10)') nmcnp
   write (17,'(a5,2x,a10)') nmcnp(1:5),nmcnp
67 if (ifd.eq.0) write (6,*)
 & '***** MB WARNING: Iso xs not found ',nuc(i,j)
   close (13)
  end if
```

```
 58 continue
    close (12)
    close (17)
c
c...Write non-actinides to TAPE7, sort numerically for xs file read
c
    do 65 k=1,4+ij(j)
    nmin=99999
    ni=0
    do 60 i=1,4+ij(j)
    a=float(nuc(i,j))-float(1000*(nuc(i,j)/1000))
    if (nuc(i,j).lt.83000.and.nuc(i,j).gt.1000) then
     if (nuc(i,j).lt.nmin) then
      nmin=nuc(i,j)
      if (iflag(i,j).ne.1) then
        ai=a
      else
        do 59 n=1,nisop(i,j)
        naix(i,j,n)=nisot(i,j,n) - 1000*(nisot(i,j,n)/1000)
 59       aix(i,j,n) = float(nisot(i,j,n))
  &          - float(1000*(nisot(i,j,n)/1000))
      endif
      ni=i
     end if
    end if
 60 continue
    if (ni.gt.0) then
     kxs=1
     met='0'
     if (iflag(ni,j).eq.1) then
      do 62 n=1,nisop(ni,j)
      gmat(ni,j,n) = f(ni,j)*gden(j)*vol(j)/aix(ni,j,n)
      gmat(ni,j,n) = gmat(ni,j,n)*atomfr(ni,j,n)
      if (naix(ni,j,n).lt.10) then
        write (11,912) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      elseif (naix(ni,j,n).lt.100) then
        write (11,913) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      else
        write (11,914) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      endif
 62   continue
     else
      gma=f(ni,j)*gden(j)*vol(j)/ai
      write (11,911) kxs,nuc(ni,j),met,gma
     endif
     nuc(ni,j)=0
    end if
 65 continue
c
c...Write actinides to TAPE7, sort numerically for xs file read
c
    do 75 k=1,4+ij(j)
    nmin=99999
    ni=0
    do 70 i=1,4+ij(j)
    a=float(nuc(i,j))-float(1000*(nuc(i,j)/1000))
    if (nuc(i,j).ge.83000.and.a.gt.0.) then
     if (nuc(i,j).lt.nmin) then
      nmin=nuc(i,j)
      if (iflag(i,j).ne.1) then
        ai=a
      else
```

```
        do 69 n=1,nisop(i,j)
        naix(i,j,n)=nisot(i,j,n) - 1000*(nisot(i,j,n)/1000)
 69       aix(i,j,n) = float(nisot(i,j,n))
  &          - float(1000*(nisot(i,j,n)/1000))
      endif
      ni=i
    end if
  end if
 70 continue
  if (ni.gt.0) then
    kxs=2
    met='0'
    if (nuc(ni,j).eq.95242) met='1'
    if (iflag(ni,j).eq.1) then
      do 72 n=1,nisop(ni,j)
      gmat(ni,j,n) = f(ni,j)*gden(j)*vol(j)/aix(ni,j,n)
      gmat(ni,j,n) = gmat(ni,j,n)*atomfr(ni,j,n)
      if (naix(ni,j,n).lt.10) then
        write (11,912) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      elseif (naix(ni,j,n).lt.100) then
        write (11,913) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      else
        write (11,914) kxs,nelem(ni,j),naix(ni,j,n),met,gmat(ni,j,n)
      endif
 72   continue
    else
      gma=f(ni,j)*gden(j)*vol(j)/ai
      write (11,911) kxs,nuc(ni,j),met,gma
    endif
    nuc(ni,j)=0
  end if
 75 continue
  write (11,'(a12)') '0  0  0  0'
  close (11)
911 format (i4,i6,a1,1pe12.4,
  & '     0  0.0000E+00     0  0.0000E+00     0  0.0000E+00')
912 format (i4,i3,'00',i1,a1,1pe12.4,
  & '     0  0.0000E+00     0  0.0000E+00     0  0.0000E+00')
913 format (i4,i3,'0',i2,a1,1pe12.4,
  & '     0  0.0000E+00     0  0.0000E+00     0  0.0000E+00')
914 format (i4,i3,i3,a1,1pe12.4,
  & '     0  0.0000E+00     0  0.0000E+00     0  0.0000E+00')
 80 continue
c
  return
  end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WORINP writes the origen input files.
c...put GTO 9 card 1/2 way for predictor step.
c...Do not write over restart files
c
  subroutine worinp
c
  common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
 & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
 & nisnr(999,49),machin,tmpfile
  common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
  character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
 &     machin*4,libnam*80,xslib*14,lib(99)*10,decayl*80,
 &     ju3*3,fname*22,flname*22,file9t*22,dec80*80,lib2(99)*10
```

```
     &      ,tmpfile*10,filen*21
      integer endy,olibn
      logical caps
      dimension day(999),nfeed(999,49),gf1(999,49),gf2(999,49),
     & kfeed(10),kfeed1(10,30),kfeed2(10,30),tmst(999),mfeed(10),
     & ifeed(10,30),ffeed(10,30),tfeed(999,49),ttfeed(999,49),
     & nf1(999,49),rf(999,49),pfra(999),lb(99,4),nmt(49)
c
c...Determine library of interest (to get numbers of Activation product,
c...    actinide, and fission product cross section libraries).  This
c...    may be input as an integer (20 to 66) or as a character string
c...    in all caps or one cap & then lowercase letters.  Define which
c...    library numbers are associated with each character name below.
c
      data (lb(22,ii),ii=1,3),lib(22),lib2(22) /204,205,206,
     &      'PWRU','Pwru'/
      data (lb(23,ii),ii=1,3),lib(23),lib2(23) /207,208,209,
     &      'PWRPUU','Pwrpuu'/
      data (lb(24,ii),ii=1,3),lib(24),lib2(24) /210,211,212,
     &      'PWRPUPU','Pwrpupu'/
      data (lb(25,ii),ii=1,3),lib(25),lib2(25) /213,214,215,
     &      'PWRDU3TH','Pwrdu3th'/
      data (lb(26,ii),ii=1,3),lib(26),lib2(26) /225,226,227,
     &      'PWRD5D33','Pwrd5d33'/
      data (lb(27,ii),ii=1,3),lib(27),lib2(27) /222,223,224,
     &      'PWRD5D35','Pwrd5d35'/
      data (lb(28,ii),ii=1,3),lib(28),lib2(28) /216,217,218,
     &      'PWRPUTH','Pwrputh'/
      data (lb(29,ii),ii=1,3),lib(29),lib2(29) /219,220,221,
     &      'PWRU50','Pwru50'/
      data (lb(30,ii),ii=1,3),lib(30),lib2(30) /251,252,253,
     &      'BWRU','Bwru'/
      data (lb(31,ii),ii=1,3),lib(31),lib2(31) /254,255,256,
     &      'BWRPUU','Bwrpuu'/
      data (lb(32,ii),ii=1,3),lib(32),lib2(32) /257,258,259,
     &      'BWRPUPU','Bwrpupu'/
      data (lb(33,ii),ii=1,3),lib(33),lib2(33) /201,202,203,
     &      'THERMAL','Thermal'/
      data (lb(34,ii),ii=1,3),lib(34),lib2(34) /401,402,403,
     &      'CANDUNAU','Candunau'/
      data (lb(35,ii),ii=1,3),lib(35),lib2(35) /404,405,406,
     &      'CANDUSEU','Canduseu'/
      data (lb(36,ii),ii=1,3),lib(36),lib2(36) /311,312,313,
     &      'AMOPUUUC','Amopuuuc'/
      data (lb(37,ii),ii=1,3),lib(37),lib2(37) /314,315,316,
     &      'AMOPUUUA','Amopuuua'/
      data (lb(38,ii),ii=1,3),lib(38),lib2(38) /317,318,319,
     &      'AMOPUUUR','Amopuuur'/
      data (lb(39,ii),ii=1,3),lib(39),lib2(39) /301,302,303,
     &      'EMOPUUUC','Emopuuuc'/
      data (lb(40,ii),ii=1,3),lib(40),lib2(40) /304,305,306,
     &      'EMOPUUUA','Emopuuua'/
      data (lb(41,ii),ii=1,3),lib(41),lib2(41) /307,308,309,
     &      'EMOPUUUR','Emopuuur'/
      data (lb(42,ii),ii=1,3),lib(42),lib2(42) /321,322,323,
     &      'AMORUUUC','Amoruuuc'/
      data (lb(43,ii),ii=1,3),lib(43),lib2(43) /324,325,326,
     &      'AMORUUUA','Amoruuua'/
      data (lb(44,ii),ii=1,3),lib(44),lib2(44) /327,328,329,
     &      'AMORUUUR','Amoruuur'/
      data (lb(45,ii),ii=1,3),lib(45),lib2(45) /331,332,333,
     &      'AMOPUUTC','Amopuutc'/
```

```
      data (lb(46,ii),ii=1,3),lib(46),lib2(46) /334,335,336,
     &     'AMOPUUTA','Amopuuta'/
      data (lb(47,ii),ii=1,3),lib(47),lib2(47) /337,338,339,
     &     'AMOPUUTR','Amopuutr'/
      data (lb(48,ii),ii=1,3),lib(48),lib2(48) /341,342,343,
     &     'AMOPTTTC','Amopttc'/
      data (lb(49,ii),ii=1,3),lib(49),lib2(49) /344,345,346,
     &     'AMOPTTTA','Amoptta'/
      data (lb(50,ii),ii=1,3),lib(50),lib2(50) /347,348,349,
     &     'AMOPTTTR','Amoptttr'/
      data (lb(51,ii),ii=1,3),lib(51),lib2(51) /361,362,363,
     &     'AMOITTTC','Amoitttc'/
      data (lb(52,ii),ii=1,3),lib(52),lib2(52) /364,365,366,
     &     'AMOITTTA','Amoittta'/
      data (lb(53,ii),ii=1,3),lib(53),lib2(53) /367,368,369,
     &     'AMOITTTR','Amoitttr'/
      data (lb(54,ii),ii=1,3),lib(54),lib2(54) /371,372,373,
     &     'AMO2TTTC','Amo2tttc'/
      data (lb(55,ii),ii=1,3),lib(55),lib2(55) /374,375,376,
     &     'AMO2TTTA','Amo2ttta'/
      data (lb(56,ii),ii=1,3),lib(56),lib2(56) /377,378,379,
     &     'AMO2TTTR','Amo2tttr'/
      data (lb(57,ii),ii=1,3),lib(57),lib2(57) /351,352,353,
     &     'AMOXTTTC','Amoxtttc'/
      data (lb(58,ii),ii=1,3),lib(58),lib2(58) /354,355,356,
     &     'AMOXTTTA','Amoxttta'/
      data (lb(59,ii),ii=1,3),lib(59),lib2(59) /357,358,359,
     &     'AMOXTTTR','Amoxtttr'/
      data (lb(60,ii),ii=1,3),lib(60),lib2(60) /381,382,383,
     &     'FFTFC','Fftfc'/
      data (lb(65,ii),ii=1,3),lib(65),lib2(65) /381,382,383,
     &     'ATW','Atw'/
      data (lb(66,ii),ii=1,3),lib(66),lib2(66) /204,205,206,
     &     'PWRSPEC','Pwrspec'/
c
c...Add cross section values to existing TAPE9 file, which previously only
c...contained the origen2 decay library.
c
      open (15,file='TAPE9_0.INP',status='unknown')
      do 10 i=72,1,-1
   10 if (locale(i:i).eq.' ') endy=i-1
c
c...Now determine which type of origen2 library files were input by the
c...  user (see first comment in this subroutine)
c
      do i=1,14
        xslib(i:i) = ' '
      enddo
      if (olib(1:1).eq.'2'.or.olib(1:1).eq.'3'.or.
     &   olib(1:1).eq.'4'.or.olib(1:1).eq.'5'.or.
     &   olib(1:1).eq.'6') then
        decayl = locale(1:endy)//'/orig21'
        if (olib(2:2).eq.' ') olibn=ichar(olib(1:1))-48
        if (olib(2:2).ne.' ') olibn=(ichar(olib(1:1))-48)*10+
     &     ichar(olib(2:2))-48
        xslib(1:4)='orig'
        xslib(5:6) = olib(1:2)
      else
              olibn = 0
        do 20 jj=1,66
   20     if (olib.eq.lib(jj)) olibn = jj
        if (olibn.ne.0) then
```

```
        caps = .TRUE.
      else
        do 21 jj=1,66
 21       if (olib.eq.lib2(jj)) olibn = jj
        if (olibn.ne.0) then
          caps = .FALSE.
        else
          write (6,*) '***** MB ERROR:  Initial ORIGEN2 library ',
  &             'was not found'
        endif
      endif
c   Remove blank lines at the end of lib
      do 30 i=10,1,-1
 30     if (olib(i:i).eq.' ') oend = i-1
            if (caps) then
        decayl = locale(1:endy)//'/DECAY.LIB'
        xslib = olib(1:oend)//'.LIB'
      else
        decayl = locale(1:endy)//'/Decay.lib'
        xslib = olib(1:oend)//'.lib'
      endif
    endif
    do i=1,80
      libnam(i:i)=' '
    enddo
    libnam=locale(1:endy)//'/'//xslib
    open (12,file=decayl,status='old')
 40 read (12,'(a80)',end=44) dec80
    write (15,'(a80)') dec80
    goto 40
 44 open (18,file=libnam,status='old')
 50 read (18,'(a80)',end=60) dec80
    write (15,'(a80)') dec80
    goto 50
 60 close(12)
    close(15)
    close(18)
c
c...Create data file from scratch ; First read feed rate data file
c
    nfd = 0
    if(days.eq.0.0) then
    nfd = 1
    open (11,file='feed',status='old')
c
c...First read the two lines of headings
c...
    read (11,*)
    read (11,*)
    do 80 i=1,nouter
      do 70 j=1,nmat
      if (j.eq.1) then
        read (11,*,err=999,end=999) tmst(i),day(i),
  &   pfra(i),nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
      elseif (j.ge.2) then
        read (11,*) nmt(j),
  &   nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
      endif
    ndisc = 0
    if (gf1(i,j).eq.-2.) ndisc = 1
    if (j.lt.10) then
     if (i.lt.10) then
```

```
      flname = tmpfile//'param_'//char(j+48)//'.'//char(i+48)
     elseif (i.lt.100) then
      i1 = i/10
      i2 = i - i1*10
      flname = tmpfile//'param_'//char(j+48)//'.'
     &          //char(i1+48)//char(i2+48)
     else
      i1 = i/100
      i2 = (i - i1*100)/10
      i3 = i - i2*10 - i1*100
      flname = tmpfile//'param_'//char(j+48)//'.'
     &         //char(i1+48)//char(i2+48)//char(i3+48)
     endif
     elseif (j.ge.10) then
     j1 = j/10
     j2 = j - j1*10
     if (i.lt.10) then
      flname = tmpfile//'param_'//char(j1+48)//char(j2+48)//'.'
     &          //char(i+48)
     elseif (i.lt.100) then
      i1 = i/10
      i2 = i - i1*10
      flname = tmpfile//'param_'//char(j1+48)//char(j2+48)//'.'
     &           //char(i1+48)//char(i2+48)
     else
      i1 = i/100
      i2 = (i - i1*100)/10
      i3 = i - i2*10 - i1*100
      flname = tmpfile//'param_'//char(j1+48)//char(j2+48)//'.'
     &         //char(i1+48)//char(i2+48)//char(i3+48)
     endif
     endif
     open (16,file=flname,status='unknown')
     write (16,910) ndisc
  910 format (i4,' ndisc')
     close (16)
   70 if (i.gt.1.and.gf1(i,j).eq.-1.) gf1(i,j)=gf2(i-1,j)
   80 days=days+day(i)
     read (11,*) nfs
     do 90 n=1,nfs
     read (11,*) mfeed(n)
     do 90 m=1,mfeed(n)
   90 read (11,*) ifeed(n,m),ffeed(n,m)
     read (11,*) nrs
     do 100 n=1,nrs
     read (11,*) kfeed(n)
     do 100 k=1,kfeed(n)
  100 read (11,*) kfeed1(n,k),kfeed2(n,k)
c
c...Rewrite mb.inp with new days (later add feed data to output)
c
     call wmbinp
     else
      do 110 i=1,nouter
  110  day(i) = days/float(nouter)
     endif
     close (11)
c
c...Write flag to file that indicates whether a feed file
c...exists or not
c
     filen = tmpfile//'params2.dat'
```

```
      open (17,file=filen,status='unknown')
      write (17,950) nfd
  950 format (i4,' nfd')
      close (17)
c
c...Write origen input file for each step and write feed data to mb9.out
c
      do 200 j=1,nmat
      if (j.lt.10) then
        file9t = tmpfile//'mb9t_'//char(j+48)//'.out'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        file9t = tmpfile//'mb9t_'//char(j1+48)//char(j2+48)//'.out'
      endif
      filen = tmpfile//'mb9.txt'
      open (14,file=filen,status='unknown')
      write (14,'(/,a21)') 'Monteburns Inventory '
      close (14)
      open (14,file=file9t,status='unknown')
      write (14,'(/,a33,a13,i3)')
     & 'Monteburns Grams of Feed per Step',
     & ' for material',j
      write (14,'(a5,2x,a4,5x,a9,250(1x,a9))')
     &        'mat #','days',(niso(i,j),i=1,nauto(j)),'actinide'
      do 190 i=1,nouter
      zero= 0.0
c     if (i.le.nrst) goto 48
c     if (nrst.eq.0) goto 13
c
c...If restart read flux from old tape5 and put in new tape5
c
      if (i.eq.nrst+1.and.nrst.gt.0) then
       if (j.lt.10) then
        if (i.lt.10) then
          fname=tmpfile//'TAPE5_'//char(j+48)//'.IN'//char(i+48)
        elseif (i.lt.100) then
          i1 = i/10
          i2 = i - i1*10
          fname=tmpfile//'TAPE5_'//char(j+48)//'.I'
     &        //char(i1+48)//char(i2+48)
        else
          i1 = i/100
          i2 = (i - i1*100)/10
          i3 = i - i2*10 - i1*100
          flname = tmpfile//'TAPE5_'//char(j+48)//'.'
     &        //char(i1+48)//char(i2+48)//char(i3+48)
        end if
       elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        if (i.lt.10) then
          fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.IN'
     &        //char(i+48)
        elseif (i.lt.100) then
          i1 = i/10
          i2 = i - i1*10
          fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.I'
     &        //char(i1+48)//char(i2+48)
        else
          i1 = i/100
          i2 = (i - i1*100)/10
```

```
        i3 = i - i2*10 - i1*100
        flname = tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.'
     &          //char(i1+48)//char(i2+48)//char(i3+48)
       endif
      endif
      open (11,file=fname,status='unknown')
  120 read (11,'(a3)',end=140) ju3
      if (ju3.ne.'IRF') goto 120
      backspace (11)
      read (11,900) zero
  140 close (11)
  900 format (19x,1pe13.5)
      end if
c
  130 n=nfeed(i,j)
      dstep=day(i)/float(ninner)
      do 150 m=1,nauto(j)+1
  150 tfeed(m,j)=0.
c
      if (j.lt.10) then
       if (i.lt.10) then
        fname=tmpfile//'TAPE5_'//char(j+48)//'.IN'//
     &      char(i+48)
       elseif (i.lt.100) then
        i1 = i/10
        i2 = i - i1*10
        fname=tmpfile//'TAPE5_'//char(j+48)//
     &      '.I'//char(i1+48)//char(i2+48)
       else
        i1 = i/100
        i2 = (i - i1*100)/10
        i3 = i - i2*10 - i1*100
        fname=tmpfile//'TAPE5_'//char(j+48)//
     &      '.'//char(i1+48)//char(i2+48)//char(i3+48)
       end if
      elseif (j.ge.10) then
       j1 = j/10
       j2 = j - j1*10
       if (i.lt.10) then
        fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &      '.IN'//char(i+48)
       elseif (i.lt.100) then
        i1 = i/10
        i2 = i - i1*10
        fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &      '.I'//char(i1+48)//char(i2+48)
       else
        i1 = i/100
        i2 = (i - i1*100)/10
        i3 = i - i2*10 - i1*100
        fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &      '.'//char(i1+48)//char(i2+48)//char(i3+48)
       endif
      endif
      open (13,file=fname,status='unknown')
c
c...Write group info to new file, then write initial commands.
c
      write (13,921)
      nn = abs(nf1(i,j))
      if(nf1(i,j).le.0) then
         write (13,921)
```

```
      goto 185
    endif
    do 160 m=1,9
160 write (13,918) m
    do 170 m=10,14
170 write (13,922) m
    write (13,920) (1.0 - rf(i,j))
    write (13,921)
    if(nn.gt.nrs) then
      write (6,919) i
919   format ('***** MB ERROR:  Invalid removal group ',
   &          'entered for outer step number',i4)
      stop
    endif
    do 180 k=1,kfeed(nn)
    do 180 m=abs(kfeed1(nn,k)),abs(kfeed2(nn,k))
180 write (13,923) m
185 write (13,921)
    write (13,924)
    write (13,925)
    write (13,926) lb(olibn,1),lb(olibn,2),lb(olibn,3),lib(olibn)
    write (13,927) lb(olibn,1),lb(olibn,2),lb(olibn,3)
    write (13,928)
    write (13,929)
    write (13,930)
    write (13,931)
    write (13,932)
    write (13,933)
    write (13,934)
    write (13,935)
    write (13,905)
    kk=2
    icont=0
    if (n.gt.0.and.gf1(i,j).ne.-2) icont=1
    if (icont.eq.1) kk=10
c
c... Write various loops into origen input file
c
    do 220 k=1,kk
     write (13,901)
     if (icont.eq.1) then
      write (13,911)
      write (13,902) ninner/10
      dburn=dstep*float(ninner/10)
     else
      write (13,902) ninner/2
      dburn=dstep*float(ninner/2)
     end if
     write (13,903) dstep,zero
     write (13,904)
     write (13,905)
c
     if (n.gt.0) then
     do 210 m=1,mfeed(n)
      nm=2
      if (ifeed(n,m).lt.89000) nm=1
      ifd6=ifeed(n,m)*10
      if (ifd6.eq.952420) ifd6=ifd6+1
      if (gf1(i,j).ne.-2) then
        gfs=(float(k)-.5)/float(kk)*(gf2(i,j)-gf1(i,j))+gf1(i,j)
        gfeed=ffeed(n,m)*gfs*dburn
      else
```

```
        if (k.eq.1) then
          gfeed=ffeed(n,m)*gf2(i,j)*day(i)
        else
          gfeed = 0.0
        endif
      endif
      if (ifeed(n,m).ge.89000) then
       tfeed(nauto(j)+1,j)=tfeed(nauto(j)+1,j)+gfeed
      endif
      do 205 mm=1,nauto(j)
      if (ifd6.eq.nisnr(mm,j))  then
        tfeed(mm,j)=tfeed(mm,j)+gfeed
      endif
 205   continue
c
      if (icont.eq.1) write (13,913) nm,ifd6,ffeed(n,m)*gfs
 210   continue
      if (icont.eq.1) write (13,914)
     end if
c
c... Write end of run 1/2 way through for predictor step
c
      ihalf = 0
      if (k.eq.5) ihalf = 1
      if (k.eq.1.and.icont.eq.0) ihalf=1
      if (ihalf.eq.1) then
       write (13,938)
       if (nf1(i,j).gt.0) write (13,936)
       write (13,937)
       write (13,939)
      end if
c
 220  continue
c
c    complete end of origen input file
c
     if(nf1(i,j).gt.0) write (13,936)
     write (13,937)
c
     close (13)
     write (14,'(i3,1x,f8.2,3x,1pe9.2,250e10.2)')
    &            i,day(i),(tfeed(m,j),m=1,nauto(j)+1)
     do 188 m=1,nauto(j)+1
 188 ttfeed(m,j)=ttfeed(m,j)+tfeed(m,j)
 190 continue
     write (14,'(a3,f8.2,3x,1pe9.2,250e10.2)')
    &        'tot',days,(ttfeed(m,j),m=1,nauto(j)+1)
     write (14,'(/,a41,a13,i3)')
    & 'Monteburns Grams Produced (or Destroyed) per Step',
    & ' for material',j
     write (14,'(3x,a9,250(1x,a9))')
    &        (niso(i,j),i=1,nauto(j)),'actinide'
     close (14)
c
 901 format ('BUP')
 902 format ('DOL   1  ',i4)
 903 format ('IRF   ',1p2e13.5,'   2  3  4  1')
 904 format ('MOV   3 2 0 1.0'/'CON   1'/'BUP')
 905 format ('STP 2')
 911 format ('INP   1  0  1 -1  4  4')
 913 format (i1,i8,1pe12.4,'  0  0.0')
 914 format ('0')
```

```
 918 format (i1,t4,'1 1.0')
 920 format ('15',t4,'1 ',f7.3)
 921 format ('-1')
 922 format (i2,t4,'1 1.0')
 923 format (i2,'  15')
 924 format ('TIT    ORIGEN2 input file for monteburns')
 925 format ('LIP    0 1 0')
 926 format ('RDA *** Libs ',i3,',',i3,',',i3,' = ',a10)
 927 format ('LIB    0 1 2 3 ',3(i3,1x),'9 3 0 3 0')
 928 format ('RDA     1 Bundle of fuel',/,
   &      'RDA    Read initial comps into vector 1 from TAPE4 in ',
   &            'gram-atoms')
 929 format ('INP    1 -2 0 -1 4 4')
 930 format ('MOV     1 2 0 1.0',/,
   &      'MOV    1 3 0 0.0',/,
   &      'MOV    1 4 0 0.0')
 931 format ('RDA ***',/,
   &      'RDA *** Set output options (print in grams)')
 932 format ('HED    1  INITIAL')
 933 format ('CUT    5  1.0-10  -1')
 934 format ('OPTA   4*8 7 19*8',/,
   &      'OPTL   4*8 7 19*8',/,
   &      'OPTF   4*8 7 19*8')
 935 format ('RDA ***',/,
   &      'RDA    Begin burn, add cards after STP 2, remove FP at',
   &            ' end of burn')
 936 format ('PRO    2  3  4  -1')
 937 format ('MOV    3  2  0  1.0',/,
   &      'OUT    4  1  1  0  ',/,
   &      'PCH    2  2  2     ',/,
   &      'RDA                ',/,
   &      'END                ')
 938 format ('RDA First of 1/2 way predictor cards')
 939 format ('RDA Last of 1/2 way predictor cards')
c
 200 continue
    goto 998
 999 write (6,*) '***** MB ERROR: Problem with feed input file'
    stop
 998 return
    end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WORXS calculates new xs from mcnp and modifies the cross
c...sections in TAPE9.  Also calculates flux and modifies TAPE5
c...for 1/2 step
c
    subroutine worxs
c
    common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
   & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
   & nisnr(999,49),machin,tmpfile
    common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
    character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
   &        machin*4,tmpfile*10,filen*21,ju30*30,
   &        tal*3,nm*2,file8*22,file6*22,fname*22,fname2*23,
   &        ju17*17,file14*22,file15*22,file16*22,file17*22,
   &        tape9*12,t9tmp*15,file1*22,file2*22,file3*22,file1t*22,
   &        ju10*10,ju80*80,ju3*3,tape7*12,ju6*6,blanks*4,mtuf*20,
   &        vers*2
    dimension xs(999,5,49),eflx(7,49),day(999),nfeed(99,49),flx(49),
```

```
     &        gf1(999,49),gf2(999,49),nf1(999,49),rf(999,49),
     &        nmt(49),nisq(49),gad(49),fismac(49),tmst(999),pfra(999),
     &        qfis(49),flux(49),flux2(49),fiscap(999),vol(49),pwr(49),
     &        absmac(49),frfast(49),frth(49),n2nmac(49),
     &        burnup(0:999,49),fluxy(49),fluxy2(49),pwrden(49),
     &        nuc(99999),iu(99999),thalf(99999),fbx(99999),
     &        fpec(99999),fpecx(99999),fa(99999),fit(99999),
     &        fsf(99999),fn(99999),qrec(99999),abund(99999),
     &        arcg(99999),wrcg(99999),gramat(99999),grmatf(99999),
     &        act(99999),nucl(99999),atomwe(99999),nucli(99999),
     &        xsec(6,99999),nuclf(99999)
     real number(99999),htld(99999),inha(99999),inge(99999),nperp,
     &    keff,nu,macfis,macabs,macn2n,kinfin(49),kinf,mtu(49)
c
c...First obtain data from feed input file
c
     filen = tmpfile//'params2.dat'
     open (17,file=filen,status='unknown')
     read (17,'(i4)') nfd
     if (nfd.eq.1) then
       open (11,file='feed',status='old')
       read (11,*)
       read (11,*)
       daynum = 0.0
       do 10 i=1,nouter
        do 5 j=1,nmat
         if (j.eq.1) then
          read (11,*) tmst(i),day(i),pfra(i),
     &      nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
         elseif (j.ge.2) then
          read (11,*)
     &      nmt(j),nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
         endif
   5   continue
       if (i.eq.nrst+1) goto 15
  10   daynum = daynum + day(i)
     else
       do 12 i=1,nouter
        day(i) = days/float(nouter)
        pfra(i) = 1.0
        if (i.eq.nrst+1) goto 15
  12    daynum = daynum + day(i)
     endif
c
c...Read mass fraction section to get volume of each material
c
     do 13 j=1,nmat
  13 vol(j) = 0.0
  15 close (11)
     if (machin(1:3).ne.'VMS') then
       open (11,file='mbmco',status='old')
     elseif (machin(1:3).eq.'VMS') then
       open (11,file='mbmco.dat',status='old')
     endif
     read (11,'(a30)') ju30
     if (ju30(19:20).eq.'4b') vers = '4b'
     if (ju30(19:20).eq.'4c') vers = '4c'
     if (ju30(6:6).eq.'x'.and.ju30(19:19).eq.'2') vers = 'x5'
     if (ju30(19:20).eq.'4a') vers = '4a'
 280 read (11,'(a6)') ju6
     if (ju6.ne.'1cells') goto 280
c
```

```
      read (11,'(///)')
  290 read (11,'(i6,a6,i5,1x,1p3e12.5)') n,ncell,nt,aden,gden,vol1
      do 295 j=1,nmat
      if (nt.eq.abs(mt(j))) then
        vol(j)=vol(j)+vol1
      end if
  295 continue
      if (n.ne.0) goto 290
c
c...Read keff and calculate nu
c
   20 read (11,'(a17)') ju17
      if (ju17.ne.' neutron creation') goto 20
c
      read (11,'(/)')
      read (11,'(31x,1pe10.4)') src
      if (pow.lt.0.0) then
        read (11,'(31x,1pe10.4)') nperp
        read (11,'(//////////)')
      else
        read (11,'(//////////)')
      endif
      read (11,'(31x,1pe10.4,54x,1pe10.4)') fsrc,floss
      if (vers.eq.'x5') then
        read (11,'(//////)')
      else
        read (11,'(////)')
      endif
      read (11,'(35x,1pe10.4,0p,f7.4)') fmult,err
c
c
      if (fsrc.ne.0.) then
        nu=fsrc/floss
        keff = (fmult-1.)/(fmult-1./nu)
        relerr = (fmult*(1.+err)-1.)/(fmult*(1.+err)-1./nu)
        relerr = (relerr - keff)/keff
      else
   30   read (11,'(a10)') ju10
        if (ju10.ne.' ---------') goto 30
        read (11,'(/73x,f7.5,41x,f7.5)') keff,relerr
        nu=keff*src/floss
      endif
c
c...Read energy spectrum tallies (if tallies don't exist in mbmco,
c...then tal='yes' (used in later commands)
c
      if (posit.eq.'m') then
      do 68 j=1,nmat
   55 read (11,'(a10)',end=67) ju10
      if (ju10(1:6).ne.'1tally') goto 55
      tal = 'yes'
      mat = 0
      do 60 m=1,nmat
      if (m.ge.10) then
        m1 = m/10
        m2 = m - m1*10
        m1 = m1 + 1
        nm = char(m1+48)//char(m2+48)
      elseif (m.lt.10) then
        nm = '1'//char(m+48)
      endif
      if (nm.eq.ju10(8:9)) then
```

```
      mat = m
      goto 61
     endif
   60 continue
     if (mat.eq.0) goto 55
c
   61 read (11,'(a10)') ju10
     if (ju10.ne.'     ener') goto 61
c
     do 65 i=1,7
   65 read (11,'(17x,1pe11.5)') eflx(i,mat)
     frfast(mat) = 0.
     frth(mat) = (eflx(1,mat)+eflx(2,mat))/eflx(7,mat)
     do 66 i=3,6
   66 frfast(mat) = frfast(mat) + eflx(i,mat)/eflx(7,mat)
c
     if (mat.lt.10) then
       file6 = tmpfile//'mb6_'//char(mat+48)//'.out'
     elseif (mat.ge.10) then
       j1 = mat/10
       j2 = mat - j1*10
       file6 = tmpfile//'mb6_'//char(j1+48)//char(j2+48)//'.out'
     endif
     open (14,file=file6,status='unknown')
     write (14,'(i3,1x,6f10.2)') nrst,
    &              (100.*eflx(i,mat)/eflx(7,mat),i=1,6)
     close (14)
     goto 68
   67 write (6,*) '***** MB ERROR:  Not all user-specified MCNP',
    &          ' materials were found in MCNP output file'
     stop
   68 continue
c
c...Read tallies and calculate new cross sections
c
     do 86 j=1,nmat
     iflag = 0
   70 read (11,'(a10)') ju10
     if (ju10(1:6).ne.'1tally') goto 70
     mat = 0
     do 72 m=1,nmat
     if (m.ge.10) then
       m1 = m/10
       m2 = m - m1*10
       m1 = m1 + 5
       nm = char(m1+48)//char(m2+48)
     elseif (m.lt.10) then
       nm = '5'//char(m+48)
     endif
     if (nm.eq.ju10(8:9)) then
       mat = m
       goto 74
     endif
   72 continue
     if (mat.eq.0) goto 70
c
c
   74 read (11,'(a10)') ju10
     if (ju10.ne.' multiplie') goto 74
c
     read (11,'(17x,1pe11.5)') flx(mat)
     if (flx(mat).eq.0) write (6,*) '***** MB: Tally read error'
```

```
      do 80 i=1,ntot(j)
      do 80 m=1,4
   76 read (11,'(a10)') ju10
      if (ju10.ne.' multiplie') goto 76
      read (11,'(17x,1pe11.5)') xs(i,m,j)
      xs(i,m,j)=xs(i,m,j)/flx(j)
      if (nisn(i,j).ge.89000) iflag = 1
   80 continue
      if  (iflag.eq.1) then
       do 83 m=1,4
   82  read (11,'(a10)') ju10
        if (ju10.ne.' multiplie') goto 82
        read (11,'(17x,1pe11.5)') xs(ntot(j)+1,m,j)
        xs(ntot(j)+1,m,j)=xs(ntot(j)+1,m,j)/flx(j)
   83  continue
      else
        do 81 m=1,4
        xs(ntot(j)+1,m,j)= 0.0
   81  continue
      endif
      do 85 m=1,4
   84  read (11,'(a10)') ju10
       if (ju10.ne.' multiplie') goto 84
       read (11,'(17x,1pe11.5)') xs(ntot(j)+2,m,j)
       xs(ntot(j)+2,m,j)=xs(ntot(j)+2,m,j)/flx(j)
   85 continue
      if (xs(ntot(j)+2,1,j) + xs(ntot(j)+2,4,j).ne.0.0) then
       kinfin(j) = (nu*xs(ntot(j)+2,4,j) + 2.0*xs(ntot(j)+2,2,j)
     &          + 3.0*xs(ntot(j)+2,3,j))/
     &          (xs(ntot(j)+2,1,j) + xs(ntot(j)+2,4,j))
      else
        write (6,*) '***** MB ERROR:  Cross Section Tallies Not Correct'
      endif
   86 continue
      close (11)
      endif
c
c...Modify library
c
      totpwr = 0.0
      totfis = 0.0
      if (posit.eq.'m') then
      do 260 j=1,nmat
      mtu(j) = 0.0
      write (6,*) '...MB: Modifying Library for material ',j
      if (j.lt.10) then
        tape7 = 'TAPE7_'//char(j+48)//'.OUT'
        tape9 = 'TAPE9_'//char(j+48)//'.INP'
        t9tmp = 'TAPE9_'//char(j+48)//'.TMP'
        mtuf  = tmpfile//'mtu_'//char(j+48)//'.tmp'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        tape7 = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
        tape9 = 'TAPE9_'//char(j1+48)//char(j2+48)//'.INP'
        t9tmp = 'TAPE9_'//char(j1+48)//char(j2+48)//'.TMP'
        mtuf  = tmpfile//'mtu_'//char(j1+48)//char(j2+48)//'.tmp'
      endif
      open (12,file=tape9,status='old')
      open (13,file=t9tmp,status='unknown')
      if (nrst.eq.0) open (17,file=mtuf,status='unknown')
c
```

```
c
c... Read halflife information for each isotope from decay library
c
      l = 1
   87 read (12,913,err=87,end=90) nflag,blanks
      if (nflag.le.3) then
c
c... write first line of decay information to modified TAPE9
c...    for each isotope (or non-isotope line in TAPE9)
c
       if (blanks.ne.'  '.and.nflag.ne.-1) then
        backspace (12)
        read (12,'(a80)') ju80
        write (13,'(a80)') ju80
        backspace(12)
   88   read (12,922,err=88)
c
c... See ORIGEN2 manual for meaning of other variables -
c...   thalf(l) is halflife of isotope and iu(l) is units
c...   qrec(l) is "average, total, recoverable energy released by
c...    each decay event (MeV)"
c
    &     nxs,nuc(l),iu(l),thalf(l),fbx(l),fpec(l),
    &     fpecx(l),fa(l),fit(l)
   89   read (12,923,err=89)
    &     nxs,fsf(l),fn(l),qrec(l),abund(l),arcg(l),wrcg(l)
c
c... Convert all halflife values to seconds (iu = 1)
c
       if (iu(l).eq.2) thalf(l) = thalf(l)*60.0
       if (iu(l).eq.3) thalf(l) = thalf(l)*3600.0
       if (iu(l).eq.4) thalf(l) = thalf(l)*3600.0*24.0
       if (iu(l).eq.5) thalf(l) = thalf(l)*3600.0*24.0*365.24
       if (iu(l).eq.6) thalf(l) = 0.0
       if (iu(l).eq.7) then
         thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+3
       elseif (iu(l).eq.8) then
         thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+6
       elseif (iu(l).eq.9) then
         thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+9
       endif
       l = l + 1
c
c... Print last data line read to modified TAPE9 file
c
       backspace (12)
       read (12,'(a80)') ju80
       write (13,'(a80)') ju80
       goto 87
      else
       backspace(12)
       read (12,'(a80)') ju80
       write (13,'(a80)') ju80
       goto 87
      endif
     else
      backspace (12)
      goto 90
     endif
   90 mn = 0
   91 ixs=0
     read (12,913,err=97,end=99) nflag,blanks
```

```
 92 if (nflag.gt.3.and.blanks.ne.'    ') then
      backspace(12)
 93   read (12,921,err=93)
     & nxs,nnuc,xs1,xs2,xs3,xs4,xs5,xs6,xflag
      mn = mn + 1
      nucli(mn) = nnuc
      xsec(1,mn) = xs1
      xsec(2,mn) = xs2
      xsec(3,mn) = xs3
      xsec(4,mn) = xs4
      xsec(5,mn) = xs5
      xsec(6,mn) = xs6
      do 95 i=1,ntot(j)
      if (nisnr(i,j).eq.nnuc) then
       if (xs1.eq.0) then
        ratio=1.0
       else
        ratio = xs1/(xs5+xs1)
       endif
       xs(i,5,j) = xs(i,1,j)*(1.0-ratio)
       xs(i,1,j) = xs(i,1,j)*ratio
       ixs=1
       write (13,921) nxs,nnuc,(xs(i,m,j),m=1,5),xs6,xflag
       xsec(1,mn) = xs(i,1,j)
       xsec(2,mn) = xs(i,2,j)
       xsec(3,mn) = xs(i,3,j)
       xsec(4,mn) = xs(i,4,j)
       xsec(5,mn) = xs(i,5,j)
      end if
 95   continue
     end if
 97 if (ixs.eq.0) then
      backspace (12)
      read (12,'(a80)') ju80
      write (13,'(a80)') ju80
     end if
     goto 91
913 format (i4,a4)
921 format (i4,i8,1p6e10.3,f7.1)
922 format (i4,i8,i3,4x,1p6e10.3)
923 format (i4,15x,1p6e10.3)
c
 99 continue
     close (12)
     close (13)
c
c...Calculate the macroscopic fission cross section of the
c...isotopes from the "number densities" multiplied by the
c...microscopic fission cross section
c
c...Read TAPE7 and TAPE9 to get density and fis xs
c
     open (16,file=tape7,status='old')
     nact = 27
c
c...Calc relative fission per nuclide
c
     fismac(j) = 0.
     n2nmac(j) = 0.
     absmac(j) = 0.
     n = 0
     nn = 0
```

```
c
c... Read nuclide compositions from tape7
c
 220 read (16,911,err=220,end=250) kxs,(nisq(m),gad(m),m=1,4)
    do 240 m=1,4
     ixs=0
     do 235 k=1,mn
      if (nucli(k).eq.nisq(m)) then
       ixs=1
       xs1 = xsec(1,k)
       xs2 = xsec(2,k)
       xs4 = xsec(4,k)
       goto 236
      endif
 235 continue
 236 if (ixs.eq.0) then
c       write (6,*) 'Warning:  Isotope',nisq(m),
c    &              ' not found in xs lib'
     else
c
      if (voli(j).eq.0.0) voli(j) = vol(j)
      aval = gad(m)*0.6022/voli(j)
      absmac(j) = absmac(j) + aval*xs1
      n2nmac(j) = n2nmac(j) + aval*xs2
      if (kxs.eq.2) then
       fismac(j) = fismac(j) + aval*xs4
      endif
c
c... Perform additional calculations and create an array of data
c...  from TAPE7 so that it does not have to be run again
c
      nisq1=nisq(m)/10
      nz=nisq1/1000
      a=float(nisq1)-float(1000*(nisq1/1000))
      if (nrst.eq.0) then
       if (nz.ge.90) then
        mtu(j) = mtu(j) + gad(m)*a
       endif
      endif
      n = n + 1
      gramat(n) =  gad(m)
c
c... For fissionable material, obtain the special number density,
c...  used for calculating Qfis.  Also calculate the number of
c...  atoms of each isotope for toxicity ("number" is in atoms)
c
      if (kxs.eq.2) then
       nn = nn + 1
       nuclf(nn) = nisq(m)
       grmatf(nn) = gad(m)
      endif
      nucl(n) = nisq(m)
      number(n) = aval*1.0e+24*voli(j)
     endif
c
 240 continue
    goto 220
c
c...Calculate energy per fission qfis and flux norm factor
c...need to determine contribution of each iso to fission
c
 250 qrat=1.0
```

```
      if (qu235.lt.0.)call calcq(qrat,nuclf,grmatf,nucli,xsec,nn,mn)
      qfis(j)=abs(qu235)*qrat
c
c...Two different fluxes must be calculated:  one for the end
c...of step nrst, and one for the beginning of step (nrst+1)
c...The reason these two values are different is that the
c...power fraction for each outer loop step is different
c
      totpwr = totpwr + (qfis(j)*flx(j)*fismac(j)*voli(j))
      totfis = totfis + (flx(j)*fismac(j)*voli(j))
      qave = totpwr/totfis
      if (nrst.eq.0) write (17,'(1pe10.3)') mtu(j)
c
c...  Write heatload and toxicity information to a file
c
      do 258 i=1,nauto(j)
       nisq1 = nisnr(i,j)/10
       atomwe(i) = float(nisq1)-float(1000*(nisq1/1000))
      thalf(i) = 0.0
      qrec(i) = 0.0
      do 252 ll=1,l-1
      if (nuc(ll).eq.nisnr(i,j)) then
        thalf(i) = thalf(ll)
        qrec(i) = qrec(ll)
        goto 254
      endif
 252  continue
 254  do 256 m=1,n
      if (nisnr(i,j).eq.nucl(m)) then
        call activ(nucl(m),thalf(i),number(m),atomwe(i),gramat(m),
     &        qrec(i),act(i),inha(i),inge(i),htld(i))
        goto 257
      endif
 256  continue
 257  act(nauto(j)+1) = act(nauto(j)+1) + act(i)
      htld(nauto(j)+1) = htld(nauto(j)+1) + htld(i)
      inha(nauto(j)+1) = inha(nauto(j)+1) + inha(i)
      inge(nauto(j)+1) = inge(nauto(j)+1) + inge(i)
 258 continue
     if (j.lt.10) then
      file14 = tmpfile//'mb14_'//char(j+48)//'.out'
      file15 = tmpfile//'mb15_'//char(j+48)//'.out'
      file16 = tmpfile//'mb16_'//char(j+48)//'.out'
      file17 = tmpfile//'mb17_'//char(j+48)//'.out'
     elseif (j.ge.10) then
      j1 = j/10
      j2 = j - j1*10
      file14 = tmpfile//'mb14_'//char(j1+48)//char(j2+48)//'.out'
      file15 = tmpfile//'mb15_'//char(j1+48)//char(j2+48)//'.out'
      file16 = tmpfile//'mb16_'//char(j1+48)//char(j2+48)//'.out'
      file17 = tmpfile//'mb17_'//char(j1+48)//char(j2+48)//'.out'
     endif
     open (14,file=file14,status='unknown')
     open (15,file=file15,status='unknown')
     open (16,file=file16,status='unknown')
     open (17,file=file17,status='unknown')
c
     write (14,'(i3,1x,1pe9.2,250e10.2)')nrst,(act(i),i=1,nauto(j)+1)
     write (15,'(i3,1x,1pe9.2,250e10.2)')nrst,(htld(i),i=1,nauto(j)+1)
     write (16,'(i3,1x,1pe9.2,250e10.2)')nrst,(inha(i),i=1,nauto(j)+1)
     write (17,'(i3,1x,1pe9.2,250e10.2)')nrst,(inge(i),i=1,nauto(j)+1)
     close (14)
```

```
      close (15)
      close (16)
      close (17)
  260 continue
c
c
      if (nrst.eq.0) then
        pfrac1 = pfra(1)
        pfrac2 = pfra(1)
      elseif (nrst.eq.nouter) then
        pfrac1 = pfra(nrst)
        pfrac2 = pfra(nrst)
      else
        pfrac1 = pfra(nrst)
        pfrac2 = pfra(nrst+1)
      endif
c
c... Normalize the flux obtained from MCNP by using the factors "nu"
c... power, energy per fission, and k-eff
c
      if (fsrc.eq.0.) then
        fnorm = nu*1.0e+6*pow*pfrac1/1.602e-13/qave/keff
        f2norm = nu*1.0e+6*pow*pfrac2/1.602e-13/qave/keff
      elseif (pow.lt.0.0) then
        fnorm =  (abs(pow)/1.0e+03)*pfrac1/1.602e-19
        f2norm = (abs(pow)/1.0e+03)*pfrac2/1.602e-19
      else
        fnorm = src*1.0e+6*pow*pfrac1/1.602e-13/qave/floss
        f2norm = src*1.0e+6*pow*pfrac2/1.602e-13/qave/floss
      endif
c
c... Write xs data to various mb files
c
      do 160 j=1,nmat
      if (tal.ne.'yes') goto 120
      fsabs=xs(ntot(j)+1,1,j)
      fsfis=xs(ntot(j)+1,4,j)
      fsn3n=xs(ntot(j)+1,3,j)
      fsn2n=xs(ntot(j)+1,2,j)
      falabs=xs(ntot(j)+2,1,j)
      falfis=xs(ntot(j)+2,4,j)
      faln3n=xs(ntot(j)+2,3,j)
      faln2n=xs(ntot(j)+2,2,j)
c
      if (j.lt.10) then
        file1 = tmpfile//'mb1_'//char(j+48)//'.out'
        file1t= tmpfile//'mb1t_'//char(j+48)//'.out'
        file2 = tmpfile//'mb2_'//char(j+48)//'.out'
        file3 = tmpfile//'mb3_'//char(j+48)//'.out'
        file8 = tmpfile//'mb8_'//char(j+48)//'.out'
        mtuf  = tmpfile//'mtu_'//char(j+48)//'.tmp'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        file1 = tmpfile//'mb1_'//char(j1+48)//char(j2+48)//'.out'
        file1t= tmpfile//'mb1t_'//char(j1+48)//char(j2+48)//'.out'
        file2 = tmpfile//'mb2_'//char(j1+48)//char(j2+48)//'.out'
        file3 = tmpfile//'mb3_'//char(j1+48)//char(j2+48)//'.out'
        file8 = tmpfile//'mb8_'//char(j1+48)//char(j2+48)//'.out'
        mtuf  = tmpfile//'mtu_'//char(j1+48)//char(j2+48)//'.tmp'
      endif
      open (14,file=file2,status='unknown')
```

```
      write (14,'(i3,1x,1pe9.2,250e10.2)')nrst,(xs(i,1,j),i=1,nauto(j))
      close (14)
      open (14,file=file3,status='unknown')
      write (14,'(i3,1x,1pe9.2,250e10.2)')nrst,(xs(i,4,j),i=1,nauto(j))
      close (14)
      do 119 i=1,nauto(j)
      if (xs(i,1,j).ne.0.0.and.nisn(i,j).ge.89000) then
        fiscap(i) = (xs(i,4,j)/xs(i,1,j))
      else
        fiscap(i) = 0.0
      endif
  119 continue
      open (14,file=file8,status='unknown')
      write (14,'(i3,1x,0pf9.4,250f10.4)')
     & nrst,(fiscap(i),i=1,nauto(j))
      close (14)
c
c... Write mcnp output to mb1t.out
c
  120 flux(j)=fnorm*flx(j)
      flux2(j)=f2norm*flx(j)
      pwr(j)=qave*flux(j)*fismac(j)*voli(j)*1.602e-13/1.0e+6
c
c... Calculate power density in W/cc (multiply power by 10^6 and
c...  divide by volume)
c
      pwrden(j) = pwr(j)*1.0e+06/voli(j)
c
c.. Calculate total accumulated burnup
c
      open (14,file=file1t,status='unknown')
      read (14,*)
      read (14,*)
      read (14,*)
      read (14,*)
      do 121 i=0,nrst-1
  121 read (14,'(54x,e10.3)') burnup(i,j)
      close (14)
      if (nrst.ge.1) then
        open (17,file=mtuf,status='unknown')
        read (17,'(1pe10.3)') mtu(j)
      endif
      if (mtu(j).ne.0.0.and.nrst.ne.0) then
       burnup(nrst,j) = burnup(nrst-1,j)
     &            + pwr(j)*1000.0*day(nrst)/mtu(j)
      else
       burnup(nrst,j) = 0.0
      endif
      write (6,900) j,flux(j),fismac(j),pwr(j),burnup(nrst,j)
c
c
      if (fsfis.ne.0.0.and.fsabs.ne.0.0) then
        fisabs = fsfis/fsabs
      else
        fisabs = 0.0
      endif
      if ((nu*fsfis+2.*fsn2n+3.*fsn3n).ne.0.0.and.
     &                    (fsabs+fsfis).ne.0.0) then
        eta = (nu*fsfis+2.*fsn2n+3.*fsn3n)/(fsabs+fsfis)
      else
        eta = 0.0
      endif
```

```
      if (falfis.ne.0.0.and.falabs.ne.0.0) then
        fisall = falfis/falabs
      else
        fisall = 0.0
      endif
      if ((nu*falfis+2.*faln2n+3.*faln3n).ne.0.0.and.
     &                    (falabs+falfis).ne.0.0) then
        aeta = (nu*falfis+2.*faln2n+3.*faln3n)/(falabs+falfis)
      else
        aeta = 0.0
      endif
      open (14,file=file1,status='unknown')
      write (14,902) nrst,qfis(j),flux(j),fismac(j),pwr(j),pwrden(j),
     & burnup(nrst,j),
     & falabs,falfis,fisall,faln2n,aeta,fsabs,fsfis,fisabs,fsn2n,eta
      close (14)
c
c...Modify flux in origen files
c
      do 150 ii=1,2
      if (ii.eq.1) then
       if (j.lt.10) then
        fname='TAPE5_'//char(j+48)//'.INP'
        fname2='TAPE5_'//char(j+48)//'.TMP'
       elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        fname='TAPE5_'//char(j1+48)//char(j2+48)//'.INP'
        fname2='TAPE5_'//char(j1+48)//char(j2+48)//'.TMP'
       endif
      else
       i=nrst+1
       if (j.lt.10) then
        if (i.lt.10) then
         fname=tmpfile//'TAPE5_'//char(j+48)//'.IN'
     &        //char(i+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'
     &        //char(i+48)
        elseif (i.lt.100) then
         i1 = i/10
         i2 = i - i1*10
         fname=tmpfile//'TAPE5_'//char(j+48)//
     &       '.I'//char(i1+48)//char(i2+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'
     &       //char(i1+48)//char(i2+48)
        else
         i1 = i/100
         i2 = (i - i1*100)/10
         i3 = i - i2*10 - i1*100
         fname=tmpfile//'TAPE5_'//char(j+48)//
     &       '.'//char(i1+48)//char(i2+48)//char(i3+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
        endif
       elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        if (i.lt.10) then
         fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &       '.IN'//char(i+48)
         fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i+48)
```

```
      elseif (i.lt.100) then
       i1 = i/10
       i2 = i - i1*10
       fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &       '.I'//char(i1+48)//char(i2+48)
       fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i1+48)//char(i2+48)
      else
       i1 = i/100
       i2 = (i - i1*100)/10
       i3 = i - i2*10 - i1*100
       fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &       '.'//char(i1+48)//char(i2+48)//char(i3+48)
       fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
      endif
     endif
    end if
c
    open (12,file=fname,status='old',err=140)
    open (13,file=fname2,status='unknown')
    if (mt(j).lt.0) then
     flux(j) = 0.0
     flux2(j) = 0.0
    endif
c
  130 read (12,'(a3)',end=140) ju3
    if (ju3.eq.'IRF') then
     backspace(12)
     read (12,'(a6,1pe13.5)',end=140) ju6,dstep
     if (ii.eq.1) then
      write (13,992) dstep,flux(j)
     else
      write (13,992) dstep,flux2(j)
     endif
    else
     backspace(12)
     read (12,'(a80)',end=140) ju80
     write (13,'(a80)') ju80
    end if
    goto 130
  140 continue
    close (12)
    close (13)
  150 continue
  160 continue
c
c... Obtain power fraction for ALL steps for flux calculations
c...  if zero predictor steps are used
c
    if (npre.eq.0) then
    if (nfd.eq.1) then
     open (15,file='feed',status='old')
     read (15,*)
     read (15,*)
     do 111 i=1,nouter
      do 111 j=1,nmat
       if (j.eq.1) then
        read (15,*) tmst(i),day(i),pfra(i),
     &     nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
       elseif (j.ge.2) then
        read (15,*)
```

```
     &     nmt(j),nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
        endif
 111   continue
       close (15)
      else
       do 112 i=1,nouter
 112     pfra(i) = 1.0
      endif
c
c...Modify flux in origen files.  For zero predictor steps, modify all fluxes
c
      do 170 j=1,nmat
      do 168 i=2,nouter
       if (j.lt.10) then
        if (i.lt.10) then
         fname=tmpfile//'TAPE5_'//char(j+48)//'.IN'
     &       //char(i+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'//char(i+48)
        elseif (i.lt.100) then
         i1 = i/10
         i2 = i - i1*10
         fname=tmpfile//'TAPE5_'//char(j+48)//'.I'
     &       //char(i1+48)//char(i2+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'
     &       //char(i1+48)//char(i2+48)
        else
         i1 = i/100
         i2 = (i - i1*100)/10
         i3 = i - i2*10 - i1*100
         fname=tmpfile//'TAPE5_'//char(j+48)//'.'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
         fname2=tmpfile//'TAPE5_'//char(j+48)//'.t'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
        end if
       elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        if (i.lt.10) then
         fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//
     &       '.IN'//char(i+48)
         fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i+48)
        elseif (i.lt.100) then
         i1 = i/10
         i2 = i - i1*10
         fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.I'
     &       //char(i1+48)//char(i2+48)
         fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i1+48)//char(i2+48)
        else
         i1 = i/100
         i2 = (i - i1*100)/10
         i3 = i - i2*10 - i1*100
         fname=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
         fname2=tmpfile//'TAPE5_'//char(j1+48)//char(j2+48)//'.t'
     &       //char(i1+48)//char(i2+48)//char(i3+48)
        end if
       endif
c
c
c... Normalize the flux obtained from MCNP by using the factors "nu"
```

```
c... power, energy per fission, and k-eff
c
    if (fsrc.eq.0.) then
     fnrm = nu*1.0e+6*pow*pfra(i)/1.602e-13/qave/keff
     f2nrm = nu*1.0e+6*pow*pfra(i)/1.602e-13/qave/keff
    else
     fnrm = src*1.0e+6*pow*pfra(i)/1.602e-13/qave/floss
     f2nrm = src*1.0e+6*pow*pfra(i)/1.602e-13/qave/floss
    endif
    fluxy(j)=fnrm*flx(j)
    fluxy2(j)=f2nrm*flx(j)
    if (mt(j).lt.0) then
      fluxy(j) = 0.0
      fluxy2(j) = 0.0
    endif
    open (12,file=fname,status='old',err=166)
    open (13,file=fname2,status='unknown')
c
  164 read (12,'(a3)',end=166) ju3

    if (ju3.eq.'IRF') then
     backspace(12)
     read (12,'(a6,1pe13.5)',end=166) ju6,dstep
     if (ii.eq.1) then
       write (13,992) dstep,fluxy(j)
     else
       write (13,992) dstep,fluxy2(j)
     endif
    else
     backspace(12)
     read (12,'(a80)',end=166) ju80
     write (13,'(a80)') ju80
    end if
    goto 164
  166 continue
    close (12)
    close (13)
  168 continue
  170 continue
    endif
    endif
c
    open (15,file=tmpfile//'mb11.out',status='unknown')
    if (nrst.eq.0) then
      time = 0.0
    else
     if (posit.eq.'b') then
      time = daynum - day(nrst) + 0.01
     elseif (posit.eq.'m') then
      time = daynum - day(nrst)/2.0
     else
      time = daynum
     endif
    endif
c
c...Calculate k infinity and output results
c
    if (posit.eq.'m') then
      macfis = 0.0
      macabs = 0.0
      macn2n = 0.0
      do 167 j=1,nmat
```

```
      macn2n = macn2n + n2nmac(j)
      macabs = macabs + absmac(j)
 167  macfis = macfis + fismac(j)
      kinf = (nu*macfis + 2.0*macn2n)/(macfis + macabs)
      write (15,903) nrst,posit,time,keff,relerr,nu,qave,kinf
     else
      write (15,904) nrst,posit,time,keff,relerr,nu
     endif
     close (15)
     write (6,901) keff,nu
 900 format (' ...MB: mcnp flux for material ',i3,' = ',1pe9.2,
    &      ' SigmaF = ',1pe9.2,' power = ',0pf10.3
    &      'MW Burnup = ',1pe10.3,' GWd/MTHM')
 901 format (' ...MB: mcnp keff = ',f7.5,' nu = ',f5.3)
 902 format (i3,1x,0pf10.3,1p3e10.2,1p2e10.3,1x,1p4e10.2,
    &           0pf8.3,2x,1p4e10.2,0pf8.3)
 903 format (i3,a1,1x,f8.2,1x,2f10.5,f10.3,1x,2f10.3)
 904 format (i3,a1,1x,f8.2,1x,2f10.5,f10.3)
 911 format (i4,4(1x,i6,2x,1pe10.4))
 992 format ('IRF  ',1p2e13.5,'  2 3 4 1')
     return
     end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...CALCQ calculates the MeV per fission based on fission distribution
c...and qu235 (recov. MeV per U235 fission)
c
     subroutine calcq(qrat,nuclf,grmatf,nucli,xsec,nn,mn)
c
     common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
    & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
    & nisnr(999,49),machin,tmpfile
     common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
     character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
    &        machin*4,tmpfile*10
     dimension nisact(0:50),qract(0:50),fis(0:50),nuclf(99999),
    &        grmatf(99999),xsec(6,99999),nucli(99999)
c
     data (nisact(i),qract(i),i=0,31) /
    & 0,1.0,
    & 90227,0.9043, 90229,0.9247,
    & 90232,0.9573, 91231,0.9471,
    & 91233,0.9850, 92232,0.9553,
    & 92233,0.9881, 92234,0.9774,
    & 92235,1.0000, 92236,0.9973,
    & 92237,1.0074, 92238,1.0175,
    & 93237,1.0073, 93238,1.0175,
    & 94238,1.0175, 94239,1.0435,
    & 94240,1.0379, 94241,1.0536,
    & 94242,1.0583, 95241,1.0513,
    & 95242,1.0609, 95243,1.0685,
    & 96242,1.0583, 96243,1.0685,
    & 96244,1.0787, 96245,1.0889,
    & 96246,1.0991, 96248,1.1195,
    & 96249,1.1296, 98251,1.1501,
    & 99254,1.1807  /
     qrat=0.
     nact=31
c
c...Read tape7 and tape9 to get density and fis xs
c
```

```
c
c...Calc relative fission per nuclide
c
      do 10 k=0,nact
   10 fis(k)=0.
      fistot=0.
      do 40 j=1,nn
       ixs=0
       do 20 m=1,mn
         if (nuclf(j).eq.nucli(m)) then
          ixs=1
          xs4 = xsec(4,m)
          gad = grmatf(j)
          nisq1 = nuclf(j)/10
c          goto 24
         endif
   20  continue
c
   24  if (ixs.ne.0) then
        kk=0
        do 37 k=1,nact
          if (nisact(k).eq.nisq1) kk=k
   37     continue
c
c... Obtain fission contribution of each actinide
c... If actinide does not have a specific actinide fraction,
c...   then it is added into the total fissionable material
c...   and its Q is considered to be equal to that of U235
c...   and is kept in array 0
c
         fis(kk)=fis(kk)+gad*xs4
         fistot=fistot+gad*xs4
        else
c          write (6,*) 'Warning:  isotope', nuclf(j),' was not ',
c     &              'found in both libraries'
        endif
c
   40 continue
c
c...Calculate Q based on fission percentage
c
      if (fistot.eq.0.) then
       qrat = 0.
      else
       do 60 k=0,nact
        qrat = qrat + fis(k)/fistot*qract(k)
   60  continue
      end if
c
  911 format (i4,4(1x,i6,2x,1pe10.4))
  913 format (i4,a4)
  921 format (i4,i8,1p6e10.3,f7.1)
c
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c... ACTIV calculate activity, heatload, inhalation and ingestion
c...   radiotoxicities
c
      subroutine activ(nuclid,thalf,number,atomwe,gad,qrec,
```

```
     &            curies,inhala,ingest,heatlo)
      dimension isot(56)
      real inhal(56),inges(56),number,ingest,inhala
c
c... This toxicity data was taken from:
c...   Benedict, Pigford, and Levi, "Nuclear Chemical Engineering"
c...   Second edition, McGraw-Hill Book Company, New York, 1981
c...   Appendix D, which was taken from U.S. Nuclear Regulatory
c...   Commission, Rules and Regulations 10CFR20, Appendix B,
c...   Table II, Federal Register, Dec. 1, 1978, (except for
c...   Ra-225).
c
      data isot(1),inhal(1),inges(1) /952410,2.0e-13,4.0e-6/
      data isot(2),inhal(2),inges(2) /952421,2.0e-13,4.0e-6/
      data isot(3),inhal(3),inges(3) /952430,2.0e-13,4.0e-6/
      data isot(4),inhal(4),inges(4) /952420,1.0e-9,1.0e-4/
      data isot(5),inhal(5),inges(5) / 60140,1.0e-7,8.0e-4/
      data isot(6),inhal(6),inges(6) /551340,1.0e-9,9.0e-6/
      data isot(7),inhal(7),inges(7) /551370,2.0e-9,2.0e-5/
      data isot(8),inhal(8),inges(8) /962420,4.0e-12,2.0e-5/
      data isot(9),inhal(9),inges(9) /962430,2.0e-13,5.0e-6/
      data isot(10),inhal(10),inges(10) /962440,3.0e-13,7.0e-6/
      data isot(11),inhal(11),inges(11) /10030,2.0e-7,3.0e-3/
      data isot(12),inhal(12),inges(12) /531290,2.0e-11,6.0e-8/
      data isot(13),inhal(13),inges(13) /531310,1.0e-10,3.0e-7/
      data isot(14),inhal(14),inges(14) /531330,4.0e-10,1.0e-6/
      data isot(15),inhal(15),inges(15) /360851,1.0e-7,0.0/
      data isot(16),inhal(16),inges(16) /360850,3.0e-7,0.0/
      data isot(17),inhal(17),inges(17) /571400,5.0e-9,2.0e-5/
      data isot(18),inhal(18),inges(18) /932370,1.0e-13,3.0e-6/
      data isot(19),inhal(19),inges(19) /410931,4.0e-9,4.0e-4/
      data isot(20),inhal(20),inges(20) /410950,2.0e-8,1.0e-4/
      data isot(21),inhal(21),inges(21) /942380,7.0e-14,5.0e-6/
      data isot(22),inhal(22),inges(22) /942390,6.0e-14,5.0e-6/
      data isot(23),inhal(23),inges(23) /942400,6.0e-14,5.0e-6/
      data isot(24),inhal(24),inges(24) /942410,3.0e-12,2.0e-4/
      data isot(25),inhal(25),inges(25) /942420,6.0e-14,5.0e-6/
      data isot(26),inhal(26),inges(26) /912310,4.0e-14,9.0e-7/
      data isot(27),inhal(27),inges(27) /912330,2.0e-8,1.0e-4/
      data isot(28),inhal(28),inges(28) /882240,2.0e-10,2.0e-6/
      data isot(29),inhal(29),inges(29) /882250,0.0,5.0e-7/
      data isot(30),inhal(30),inges(30) /882260,3.0e-12,3.0e-8/
      data isot(31),inhal(31),inges(31) /882280,2.0e-12,3.0e-8/
      data isot(32),inhal(32),inges(32) /862200,1.0e-8,0.0/
      data isot(33),inhal(33),inges(33) /862220,3.0e-9,0.0/
      data isot(34),inhal(34),inges(34) /451031,3.0e-6,1.0e-2/
      data isot(35),inhal(35),inges(35) /441030,2.0e-8,8.0e-5/
      data isot(36),inhal(36),inges(36) /441060,3.0e-9,1.0e-5/
      data isot(37),inhal(37),inges(37) /380890,3.0e-10,3.0e-6/
      data isot(38),inhal(38),inges(38) /380900,3.0e-11,3.0e-7/
      data isot(39),inhal(39),inges(39) /430990,7.0e-8,3.0e-4/
      data isot(40),inhal(40),inges(40) /521290,2.0e-7,8.0e-4/
      data isot(41),inhal(41),inges(41) /521311,1.0e-8,6.0e-5/
      data isot(42),inhal(42),inges(42) /902280,3.0e-13,7.0e-6/
      data isot(43),inhal(43),inges(43) /902300,8.0e-14,2.0e-6/
      data isot(44),inhal(44),inges(44) /902310,5.0e-8,2.0e-4/
      data isot(45),inhal(45),inges(45) /902320,1.0e-12,2.0e-6/
      data isot(46),inhal(46),inges(46) /902340,2.0e-9,2.0e-5/
      data isot(47),inhal(47),inges(47) /922320,3.0e-12,3.0e-5/
      data isot(48),inhal(48),inges(48) /922330,2.0e-11,3.0e-5/
      data isot(49),inhal(49),inges(49) /922340,2.0e-11,3.0e-5/
      data isot(50),inhal(50),inges(50) /922350,2.0e-11,3.0e-5/
```

```
      data isot(51),inhal(51),inges(51) /922360,2.0e-11,3.0e-5/
      data isot(52),inhal(52),inges(52) /922380,3.0e-12,4.0e-5/
      data isot(53),inhal(53),inges(53) /541330,3.0e-7,0.0/
      data isot(54),inhal(54),inges(54) /390900,4.0e-9,2.0e-5/
      data isot(55),inhal(55),inges(55) /400930,4.0e-9,8.0e-4/
      data isot(56),inhal(56),inges(56) /400950,4.0e-9,6.0e-5/
      iflag = 0
      do 10 i=1,56
        if (nuclid.eq.isot(i)) then
          iflag = i
          goto 20
        endif
   10 continue
c
c... Determine activation power(?). (not valid if isotope is stable)
c
   20 if (thalf.ne.0.0) then
c
c... Specific activity in Bq/g
c... Turner, James E. "Atoms, Radiation, and Radiation Protection",
c...      pg. 64
c
        specac = log(2.0)*6.022e+23/(atomwe*thalf)
c
c... Convert grams of material to Curies (1 Ci = 3.7e+10 Bq)
c
        curies = gad*atomwe*specac/3.7e+10
        ingest = 0.0
        inhala = 0.0
        if (iflag.ne.0) then
          if (inges(iflag).gt.0.0) then
            ingest = log(2.0)*number/(thalf*inges(iflag)*3.7e+10)
          endif
          if (inhal(iflag).gt.0.0)  then
            inhala = log(2.0)*number/(thalf*inhal(iflag)*3.7e+10)
          endif
        endif
      else
        curies = 0.0
        ingest = 0.0
        inhala = 0.0
      endif
      heatlo = curies*3.7e+10*qrec*1.0e+6*1.60219e-19
c
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WMCINP modifies the mcnp input file with new compositions, materials
c...are added if they are deemed "important players". Data is
c...read from tape7 in gram-atoms, and put into mass fractions.
c
      subroutine wmcinp
c
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &        machin*4,line*80,numcnp*10,nnat*10,
     &        ninat*10,tape7*12,tape9*12,file7*22,file4*22,
```

```
     &        fnat*22,finp*22,fmcnp*22,nmcnp*10,blanks*4,
     &        nPufp*10,nUfp*10,f9err*22,line80*80,char5*5,tmpfile*10
      dimension nisq(4),gad(4),gden(49),nis(9999),
     &        neleme(9999),nnat(9999),numcnp(9999),numc(9999),
     &        xsec(6,9999),nucli(9999),xs(5,9999),kx(9999)
      double precision gramat(9999),gmnat(9999),gm(9999,49),
     &        gmcnp(9999),gmtot,gmtot2
      integer o,b(10),e(10),nele
c
c...Read TAPE7, and TAPE9.  sum total gamma and fission, and
c...then step back through and determine contributors, sum mass
c...of each contibutor.
c
      do 180 j=1,nmat
      gfp = 0.
      iflag = 0
      iflg = 0
      if (j.lt.10) then
        tape7 = 'TAPE7_'//char(j+48)//'.OUT'
        tape9 = 'TAPE9_'//char(j+48)//'.INP'
        if (machin(1:3).ne.'VMS') then
          f9err = './tmpfile/T9err_'//char(j+48)//'.TXT'
        elseif (machin(1:3).eq.'VMS') then
          f9err = '[.tmpfile]T9err_'//char(j+48)//'.TXT'
        endif
        file4 = tmpfile//'mb4_'//char(j+48)//'.out'
        file7 = tmpfile//'mb7_'//char(j+48)//'.out'
        fnat = tmpfile//'mnat_'//char(j+48)//'.tmp'
        fmcnp = tmpfile//'mcnp_'//char(j+48)//'.inp'
        finp = tmpfile//'mat_'//char(j+48)//'.inp'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        tape7 = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
        tape9 = 'TAPE9_'//char(j1+48)//char(j2+48)//'.INP'
        if (machin(1:3).ne.'VMS') then
          f9err = './tmpfile/T9err_'//char(j1+48)//char(j2+48)//'.TXT'
        elseif (machin(1:3).eq.'VMS') then
          f9err = '[.tmpfile]T9err_'//char(j1+48)//char(j2+48)//'.TXT'
        endif
        file4 = tmpfile//'mb4_'//char(j1+48)//char(j2+48)//'.out'
        file7 = tmpfile//'mb7_'//char(j1+48)//char(j2+48)//'.out'
        fnat = tmpfile//'mnat_'//char(j1+48)//char(j2+48)//'.tmp'
        fmcnp = tmpfile//'mcnp_'//char(j1+48)//char(j2+48)//'.inp'
        finp = tmpfile//'mat_'//char(j1+48)//char(j2+48)//'.inp'
      endif
c
c... Read data about natural elements and other isotopes initially
c...   in the MCNP input file
c
      mm = 0
      nn = 0
      open (17,file=fmcnp,status='unknown')
   16 read (17,'(i5,2x,a10)',err=16,end=18) nmc,nmcnp
      mm = mm + 1
      numcnp(mm) = nmcnp
      numc(mm) = nmc
      goto 16
   18 close (17)
c
c... Natural elements initially contained in MCNP input file
c
```

```
      open (11,file=fnat,status='unknown')
   26 read (11,'(i2,4x,a10)',err=26,end=28) nelem,ninat
      nn = nn + 1
      neleme(nn) = nelem
      nnat(nn) = ninat
      goto 26
   28 close (11)
c
c... Open TAPE9 and TAPE7 files and a file for error messages
c
      open (12,file=tape7,status='old')
      open (13,file=tape9,status='old')
      open (11,file=f9err,status='unknown')
c
c... Read cross section data from TAPE9
c
      mn = 0
   91 ixs=0
      read (13,913,err=91,end=94) nflag,blanks
      if (nflag.gt.3.and.blanks.ne.'  ') then
       backspace(13)
   92  read (13,921,err=92)
     & nxs,nnuc,xs1,xs2,xs3,xs4,xs5,xs6,xflag
       mn = mn + 1
       nucli(mn) = nnuc
       xsec(1,mn) = xs1
       xsec(2,mn) = xs2
       xsec(3,mn) = xs3
       xsec(4,mn) = xs4
       xsec(5,mn) = xs5
       xsec(6,mn) = xs6
      end if
      goto 91
   94 close (13)
c
c...Sum total density, gamma and fission
c
      tden=0.
      tmas=0.
      tabs=0.
      tfis=0.
      nm = 0
      do 15 n=1,999
      gmcnp(n) = 0.
   15 gmnat(n) = 0.
   20 read (12,911,err=20,end=50) kxs,(nisq(k),gad(k),k=1,4)
      do 40 k=1,4
      nm = nm + 1
      kx(nm) = kxs
      nis(nm) = nisq(k)
      gramat(nm) = gad(k)
      if (nisq(k).gt.0) then
       ixs=0
       do 30 m=1,mn
       if (nucli(m).eq.nisq(k)) then
        ixs=m
        goto 32
       endif
   30  continue
   32  if (ixs.ne.0) then
        xs(1,nm) = xsec(1,ixs)
        xs(4,nm) = xsec(4,ixs)
```

```
      else
        xs(1,nm) = 0.0
        xs(4,nm) = 0.0
      endif
c
      nisq1=nisq(k)/10
      a=float(nisq1)-float(1000*(nisq1/1000))
      tmas=tmas+gad(k)*a
      tden=tden+gad(k)
      tabs=tabs+gad(k)*xs(1,nm)
      if (kxs.eq.2) then
        iflg = 1
        tfis=tfis+gad(k)*xs(4,nm)
      endif
c
c... Obtain composition (in grams) of all isotopes in MCNP input file
c...   to transfer them in case they are not found "important"
c
      if (kxs.eq.1.or.kxs.eq.2) then
      id = 0
      do 36 m=1,mm
       if (numc(m).eq.nisq1) then
        id = 1
        gmcnp(m)= a*gad(k)
       endif
   36 continue
      elseif (kxs.eq.3) then
        gfp = gfp + a*gad(k)
      endif
      end if
c
c... Add up gram totals for natural isotopes
c
      if (kxs.eq.1.or.kxs.eq.2) then
        nele = nisq(k)/10000
        do 47 n=1,nn
         if (nele.eq.neleme(n)) then
          nisq1=nisq(k)/10
          a=float(nisq1)-float(1000*(nisq1/1000))
          gmnat(n)=gmnat(n)+a*gad(k)
         endif
   47   continue
      endif
   40 continue
      goto 20
c
   50 close (12)
  911 format (i4,4(1x,i6,2x,1pe10.4))
c 912 format (i4,4(1x,i2,i4,2x,1pe10.4))
  913 format (i4,a4)
  921 format (i4,i8,1p6e10.3,f7.1)
c
c...Begin list of mcnp input isos with automatic tallies list
c
      ntot(j)=nauto(j)
c
c...Now determine which iso's contribute based on frimp or are
c..already selected (auto due to input or may occur twice in table)
c
      gmtot=0.
      U235f=0.
      Pu239f=0.
```

```
      open (16,file=file7,status='unknown')
      write (16,*)
      do 80 k=1,nm
c
      if (nis(k).gt.0) then
       ixs=0
       do 70 m=1,mn
       if (nucli(m).eq.nis(k)) then
        ixs=1
        goto 79
       endif
   70 continue
   79 if (ixs.eq.0) then
        if (kx(k).ne.3) then
          write (11,'(a27,i6,a20)') '***** MB WARNING: Isotope ',
     &        nis(k),' not found in TAPE9'
        endif
       endif
c
c...Determine which isos qualify, or are automatic or repeat.
c
       icon=0
       nisq1=nis(k)/10
       a=float(nisq1)-float(1000*(nisq1/1000))
       gmtot=gmtot+a*gramat(k)
       gpct=gramat(k)*a/tmas
       dpct=gramat(k)/tden
       if (tabs.ne.0.) then
        apct=gramat(k)*xs(1,k)/tabs
       else
        apct = 0.0
       endif
       fpct=0.
       nz = nisq1/1000
       if (kx(k).eq.2.and.tfis.ne.0.) then
        fpct=gramat(k)*xs(4,k)/tfis
        if (nz.le.92) U235f = U235f + fpct
        if (nz.gt.92) Pu239f = Pu239f + fpct
       endif
c
       if (gpct.gt.abs(frimp)) icon=1
       if (dpct.gt.abs(frimp)) icon=1
       if (apct.gt.abs(frimp)) icon=1
       if (fpct.gt.abs(frimp)) icon=1
       kk=0
       do 77 m=1,ntot(j)
        if (nisnr(m,j).eq.nis(k)) then
          kk=m
c
c... If a fission product is flagged "automatic", then don't include it in
c... lump sum of FPs.  Otherwise, do. (kk=0 indicates it was not "automatic")
c
          if (kx(k).eq.3) gfp = gfp - a*gramat(k)
        endif
   77 continue
c
c... Make sure natural isotopes are not deemed "important" since they are
c...  included later
c
      nele = nis(k)/10000
      do 96 n=1,nn
      if (nele.eq.neleme(n)) then
```

```
      icon = 0
     endif
  96 continue
c
c...If repeat or automatic isotope
c
     if (kk.gt.0) then
      gm(kk,j)=gm(kk,j)+a*gramat(k)
      if (gm(kk,j).gt.a*gramat(k)) then
      write (6,953) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,dpct,apct,fpct
      write (16,953) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,dpct,apct,fpct
      else
      if (icon.eq.1) write(6,951) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,
   &        dpct,apct,fpct
      if (icon.eq.0) write(6,952) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,
   &        dpct,apct,fpct
      if (icon.eq.1) write(16,951) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,
   &        dpct,apct,fpct
      if (icon.eq.0) write(16,952) nrst,kk,nisnr(kk,j),gm(kk,j),gpct,
   &        dpct,apct,fpct
      end if
     end if
c
c...Fission products that were not previously deemed "important" will
c...  be treated as a lump sum
c
     if (kx(k).eq.3.and.kk.eq.0.and.frimp.lt.0.0) then
     else
c
c...If new qualifying isotope, first check if xs exists then add to ntot
c
     if (icon.eq.1.and.kk.eq.0) then

      open (15,file='mbxs.inp',status='unknown')
      ifd=0
  95  read (15,'(i5)',end=105) nixs
      nixs10 = nixs*10
      if (nixs.eq.95242) nixs10 = nixs10 + 1
      if (nis(k).eq.nixs10) ifd=1
      if (ifd.eq.0) goto 95
      backspace (15)
      read (15,'(a10)') niso(ntot(j)+1,j)
c
 105   if (ifd.eq.0) then
       write (6,*) '***** MB WARNING: mcnp xs not found ', nis(k)
       write (16,*) '***** MB WARNING: mcnp xs not found ', nis(k)
      end if
      close (15)
c
      if (ifd.eq.1) then
       ntot(j)=ntot(j)+1
       nisnr(ntot(j),j)=nis(k)
       nisn(ntot(j),j)=nisnr(ntot(j),j)/10
       gm(ntot(j),j)=a*gramat(k)
       write (6,951) nrst,ntot(j),nisnr(ntot(j),j),gm(ntot(j),j),
   &            gpct,dpct,apct,fpct
       write (16,951) nrst,ntot(j),nisnr(ntot(j),j),gm(ntot(j),j),
   &            gpct,dpct,apct,fpct
      end if
     end if
    endif
   end if
```

```
  80 continue
c
  90 continue
 951 format (i4,i4,i10,1p5e10.2)
 952 format (i4,i4,i10,1p5e10.2,'automatic')
 953 format (i4,i4,i10,1p5e10.2,'repeat')
    close (16)
c
c...Write grams of material
c
    if (posit.eq.'m') then
      open (14,file=file4,status='unknown')
      write (14,'(i3,1x,1pe9.2,250e10.2)')nrst,(gm(i,j),i=1,nauto(j))
      close (14)
    endif
c
    close (12)
    close (13)
c
c...Rewrite mb.inp
c
    call wmbinp
c
c...Check if mass of isos sent back to mcnp is same as came in.
c
    gmtot2=0.
    do 140 i=1,ntot(j)
 140 gmtot2=gmtot2+gm(i,j)
c
c...Read natural iso file and add to total mass
c
    do 144 n=1,nn
c
c... Delete isotopes specified as "automatic" by the user
c...  from the natural element concentrations if need be
c
    do 143 i=1,ntot(j)
     nz=nisn(i,j)/1000
     if (nz.eq.neleme(n)) then
       gmnat(n) = gmnat(n) - gm(i,j)
     endif
 143 continue
    gmtot2=gmtot2+gmnat(n)
 144 continue
c
c... Add isotopes in original MCNP input file
c
    do 148 m=1,mm
    ifg = 0
    do 147 i=1,ntot(j)
     if (nisn(i,j).eq.numc(m)) ifg = 1
 147 continue
    if (ifg.ne.1) then
     gmtot2=gmtot2+gmcnp(m)
    endif
 148 continue
c
c... Add fission products to gram total, then separate into U-235 & Pu-239 ones
c
    if (gfp.gt.0.0.and.frimp.lt.0.0) then
     gmtot2=gmtot2 + gfp
     gUff = U235f*gfp
```

```
      gPuff = Pu239f*gfp
      endif
c
c... Compare total of isotopes to total included in MCNP input file
c... Calculate gram density of material
c
      write (6,*) 'mass not accounted for and % ',gmtot-gmtot2,
     & (gmtot-gmtot2)/gmtot
      gden(j) = -gmtot2/voli(j)
c
c...Modify mt card with input file mat.inp
c
  160 open (12,file=finp,status='unknown')
      if (abs(mt(j)).lt.10) write (12,931) abs(mt(j))
      if (abs(mt(j)).ge.10.and.abs(mt(j)).lt.100)
     &          write (12,932) abs(mt(j))
      if (abs(mt(j)).ge.100.and.abs(mt(j)).lt.1000)
     &          write (12,933) abs(mt(j))
      if (abs(mt(j)).ge.1000.and.abs(mt(j)).lt.10000)
     &          write (12,934) abs(mt(j))
  931 format ('c'/'m',i1)
  932 format ('c'/'m',i2)
  933 format ('c'/'m',i3)
  934 format ('c'/'m',i4)
c
c... Add isotopes in original MCNP input file
c
      do 152 m=1,mm
      ifg = 0
       do 151 i=1,ntot(j)
        if (nisn(i,j).eq.numc(m)) ifg = 1
  151  continue
       if (ifg.ne.1) then
        if (gmcnp(m).eq.0.) gmcnp(m)=1.0e-20*gmtot2
        write (12,'(6x,a10,1pe13.4)') numcnp(m),-gmcnp(m)/gmtot2
       endif
  152 continue
c
c...Add natural isos
c
      do 154 n=1,nn
      iflg = 0
      do 153 i=1,ntot(j)
       aa=(nisn(i,j)-1000*(nisn(i,j)/1000))
       if (aa.eq.0) then
         nz=nisn(i,j)/1000
         if (nz.eq.neleme(n)) then
           iflg = 1
           gm(i,j) = gm(i,j) + gmnat(n)
         endif
       endif
  153 continue
      if (iflg.ne.1) then
        if (gmnat(n).eq.0.) gmnat(n)=1.0e-20*gmtot2
        write (12,'(6x,a10,1pe13.4)') nnat(n),-gmnat(n)/gmtot2
      endif
  154 continue
c
c... Add "important" isotopes
c
      do 150 i=1,ntot(j)
      if (gm(i,j).eq.0.) gm(i,j)=1.0e-20*gmtot2
```

```
      if (nisn(i,j).ne.45117.and.nisn(i,j).ne.46119) then
        write (12,'(6x,a10,1pe13.4)') niso(i,j),-gm(i,j)/gmtot2
      endif
  150 continue
c
c... Add fission products to mat.inp files
c
      if (gfp.gt.0.0.and.frimp.lt.0.0) then
      open (18,file='mbxs.inp',status='unknown')
      if (gUff.ne.0) then
       ifd=0
  158  read (18,'(i5)',end=159) nixs
       if (nixs.eq.45117) ifd = 1
       if (ifd.eq.0) goto 158
       backspace (18)
       read (18,'(a10)') nUfp
  159  if (ifd.eq.0) then
        write (6,*) '***** MB WARNING: No Uranium Fission Product ',
     &            'library was provided in mbxs.inp'
       else
        write (12,'(6x,a10,1pe13.4)') nUfp,-gUff/gmtot2
       endif
       rewind (18)
      endif
c
      if (gPuff.ne.0) then
       ifd=0
  161  read (18,'(i5)',end=162) nixs
       if (nixs.eq.46119) ifd = 1
       if (ifd.eq.0) goto 161
       backspace (18)
       read (18,'(a10)') nPufp
  162  if (ifd.eq.0) then
        write (6,*) '***** MB WARNING: No Plutonium Fission Product ',
     &            'library was provided in mbxs.inp'
       else
        write (12,'(6x,a10,1pe13.4)') nPufp,-gPuff/gmtot2
       endif
       close (18)
      endif
     endif
c
c... End main material input section
c
     write (12,'(a1)') 'c'

c
c...Write actinide tally material
c
     if (posit.eq.'m') then
      ii = 9900 + j
      do 165 i=1,ntot(j)
  165  if (nisn(i,j).ge.89000) iflag = 1
       if (iflag.eq.1) then
        write (12,'(a1,i4)') 'm',ii
        do 170 i=1,ntot(j)
        if (nisn(i,j).ge.89000) then
        if (gm(i,j).eq.0.) gm(i,j)=1.0e-10*gmtot2
        write (12,'(6x,a10,1pe13.4)') niso(i,j),-gm(i,j)/gmtot2
        end if
  170    continue
        write (12,'(a1)') 'c'
```

```
      endif
     endif
c
     close (11)
     close (12)
     close (17)
  180 continue
c
c
c... Rewrite density(s) in MCNP input file
c
     nflag = 0
     open (15,file='mbmc.skl',status='unknown')
     open (17,file='mbmc.tmp',status='unknown')
  181 read (15,'(a5)',end=190) char5
     if (char5(1:1).eq.'C'.or.char5(1:1).eq.'c'.or.
    &   char5.eq.'    '.or.nflag.eq.1) then
      backspace (15)
      read (15,'(a80)') line80
      if (line80(1:42).eq.'                                        '
    &  .and.line80(43:76).eq.'                                    ') then
        nflag = 1
        write (17,'(a80)') line80
      else
        write (17,'(a80)') line80
      endif
     else
     backspace (15)
     read (15,*,err=185,end=190) ncell,nmater
     ident = 0
     do 187 j=1,nmat
     if (nmater.eq.abs(mt(j))) then
      ident = 1
      backspace (15)
      read (15,'(a80)') line80
      o = 1
      n = 1
      ncount = 1
c
c... First find the first number (ncount allows it to always start in same position)
c
  183    if (line80(n:n).ne.' ') goto 182
       n = n + 1
       ncount = ncount + 1
       goto 183
c
c... Then identify the location of the next two numbers relative to blanks
c
  182    if (line80(n:n).eq.' ') then
         b(o) = n
         if (o.eq.3) goto 185
         m = n
  184      if (line80(m+1:m+1).eq.' ') then
           m = m + 1
           goto 184
         else
           e(o) = m
         endif
         o = o + 1
         n = m + 1
         goto 182
       else
```

```
        n = n + 1
        goto 182
       endif
     else
       goto 187
     endif
 187 continue
 185 if (ident.eq.1) then
c.... Replace values before density, density, and then those after density
      nident = 0
      do 188 i=b(3),80
      line(i:i) = line80(i:i)
 188  if (line80(i:i).ne.' ') nident = 1
      if (ncount.ge.2) then
       do 191 i=1,ncount-1
 191    line80(i:i) = ' '
      endif
      if (e(2).le.24) then
       do 192 i=e(2)+1,25
 192    line80(i:i) = ' '
      endif
      if (nident.eq.1) then
       write (17,'(a25,f10.5)') line80(1:25),gden(j)
       do 189 i=1,(b(3)-1)
 189    line(i:i) = ' '
       write (17,'(a80)') line
      else
       write (17,'(a25,f10.5)') line80(1:25),gden(j)
      endif
     else
      backspace (15)
      read (15,'(a80)') line80
      write (17,'(a80)') line80
     endif
     endif
     goto 181
 190 return
     end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...GRAMS reads TAPE7 and prints out grams of tracked material to mb5
c
     subroutine grams
c
     common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
    & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
    & nisnr(999,49),machin,tmpfile
     common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
     character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
    &        machin*4,tcell(999,49)*6,ncell*6,ju6*6,tmpfile*10,
    &        tape7*12,tape9*12,file5*22,file12*22,fil12x*22,
    &        file5x*22,file14*22,file15*22,file16*22,file17*22
     dimension nisq(4),gad(4),gm(999,49),thalf(99999),qrec(99999),
    &        nucl(99999),gramat(99999),iu(99999),fbx(99999),
    &        fpec(99999),fpecx(99999),fa(99999),fit(99999),
    &        fsf(99999),fn(99999),abund(99999),nuc(99999),
    &        arcg(99999),wrcg(99999),atomwe(99999),act(99999),
    &        ntc(49)
     real number(99999),htld(99999),inha(99999),inge(99999),vol1,
    &        vol(49)
c
```

```
c... Determine volume of each material from MCNP output file
c     for atom density calculations (will be done later)
c
      if (posit.eq.'e') then
       if (machin(1:3).ne.'VMS') then
        open (55,file='mbmco',status='old')
       elseif (machin(1:3).eq.'VMS') then
        open (55,file='mbmco.dat',status='old')
       endif
   45  read (55,'(a6)') ju6
       if (ju6.ne.'1cells') goto 45
c
       read (55,'(///)')
   50  read (55,'(i6,a6,i5,1x,1p3e12.5)') n,ncell,nmt,aden,gden,vol1
       do 55 j=1,nmat
        ntc(j) = 0
        if (nmt.eq.abs(mt(j))) then
         ntc(j)=ntc(j)+1
         tcell(ntc(j),j)=ncell
         vol(j)=vol(j)+vol1
        end if
   55  continue
       if (n.ne.0) goto 50
      endif
c
      do 40 j=1,nmat
      if (j.lt.10) then
       tape7 = 'TAPE7_'//char(j+48)//'.OUT'
       tape9 = 'TAPE9_'//char(j+48)//'.INP'
       file5  = tmpfile//'mb5_'//char(j+48)//'.out'
       file12 = tmpfile//'mb12_'//char(j+48)//'.out'
       fil12x = tmpfile//'mb12x_'//char(j+48)//'.out'
       file5x = tmpfile//'mb5x_'//char(j+48)//'.out'
       file14 = tmpfile//'mb14_'//char(j+48)//'.out'
       file15 = tmpfile//'mb15_'//char(j+48)//'.out'
       file16 = tmpfile//'mb16_'//char(j+48)//'.out'
       file17 = tmpfile//'mb17_'//char(j+48)//'.out'
      elseif (j.ge.10) then
       j1 = j/10
       j2 = j - j1*10
       tape7 = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
       tape9 = 'TAPE9_'//char(j1+48)//char(j2+48)//'.INP'
       file5  = tmpfile//'mb5_'//char(j1+48)//char(j2+48)//'.out'
       file12 = tmpfile//'mb12_'//char(j1+48)//char(j2+48)//'.out'
       fil12x = tmpfile//'mb12x_'//char(j1+48)//char(j2+48)//'.out'
       file5x = tmpfile//'mb5x_'//char(j1+48)//char(j2+48)//'.out'
       file14 = tmpfile//'mb14_'//char(j1+48)//char(j2+48)//'.out'
       file15 = tmpfile//'mb15_'//char(j1+48)//char(j2+48)//'.out'
       file16 = tmpfile//'mb16_'//char(j1+48)//char(j2+48)//'.out'
       file17 = tmpfile//'mb17_'//char(j1+48)//char(j2+48)//'.out'
      endif
      n = 0
      open (12,file=tape7,status='old')
c
   10 read (12,911,err=10,end=30) kxs,(nisq(m),gad(m),m=1,4)
c
      do 20 m=1,4
       kk=0
       do 15 k=1,nauto(j)
        if (nisnr(k,j).eq.nisq(m)) kk=k
   15  continue
c
```

```
c... To print data (activity, heatload, toxicities) after each burnup step
c
      if (posit.eq.'e') then
       if (voli(j).eq.0.0) voli(j) = vol(j)
c
c... Add data to array of isotopes from TAPE7
c
       if (nisq(m).ne.0) then
        aval = gad(m)*0.6022/voli(j)
        n = n + 1
        gramat(n) =  gad(m)
        nucl(n) = nisq(m)
        number(n) = aval*1.0e+24*voli(j)
       endif
      endif
c
c... Calculate grams of each isotope
c
      if (kk.gt.0.or.nisq(m).ge.890000) then
       nisq1=nisq(m)/10
       a=float(nisq1)-float(1000*(nisq1/1000))
       if (kk.gt.0) gm(kk,j)=gm(kk,j)+a*gad(m)
       if (nisq(m).ge.890000) gm(nauto(j)+1,j)=
    &        gm(nauto(j)+1,j)+a*gad(m)
      endif
c
  20 continue
    goto 10
c
  30 continue
c
 911 format (i4,4(1x,i6,2x,1pe10.4))
 913 format (i4,a4)
 922 format (i4,i8,i3,4x,1p6e10.3)
 923 format (i4,15x,1p6e10.3)
c
     if (posit.eq.'e') then
      open (14,file=file5,status='unknown')
      open (15,file=file5x,status='unknown')
      write (14,'(i3,1x,1pe9.2,250e10.2)')
    &              nrst, (gm(i,j),i=1,nauto(j)+1)
      write (15,'(i3,1x,1pe13.7,250e14.7)')
    &              nrst, (gm(i,j),i=1,nauto(j)+1)
      close (14)
      close (15)
c
c... Get heatload, activity, and other information
c
      l = 1
      open (13,file=tape9,status='old')
  87  read (13,913,err=87,end=90) nflag,blanks
      if (nflag.le.3) then
       if (blanks.ne.'   '.and.nflag.ne.-1) then
        backspace (13)
  88     read (13,922,err=88)
c
c...  See ORIGEN2 manual for meaning of other variables -
c...   thalf(l) is halflife of isotope and iu(l) is units
c...   qrec(l) is "average, total, recoverable energy released by
c...     each decay event (MeV)"
c
    &       nxs,nuc(l),iu(l),thalf(l),fbx(l),fpec(l),
```

```
  &       fpecx(l),fa(l),fit(l)
 89     read (13,923,err=89)
  &       nxs,fsf(l),fn(l),qrec(l),abund(l),arcg(l),wrcg(l)
c
c... Convert all halflife values to seconds (iu = 1)
c
        if (iu(l).eq.2) thalf(l) = thalf(l)*60.0
        if (iu(l).eq.3) thalf(l) = thalf(l)*3600.0
        if (iu(l).eq.4) thalf(l) = thalf(l)*3600.0*24.0
        if (iu(l).eq.5) thalf(l) = thalf(l)*3600.0*24.0*365.24
        if (iu(l).eq.6) thalf(l) = 0.0
        if (iu(l).eq.7) then
          thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+3
        elseif (iu(l).eq.8) then
          thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+6
        elseif (iu(l).eq.9) then
          thalf(l) = thalf(l)*3600.0*24.0*365.24*1.0e+9
        endif
        l = l + 1
        goto 87
      else
        goto 87
      endif
    else
      goto 90
    endif
c
c... Write heatload and toxicity information to a file
c
 90   do 258 i=1,nauto(j)
      nisq1 = nisnr(i,j)/10
      atomwe(i) = float(nisq1)-float(1000*(nisq1/1000))
      thalf(i) = 0.0
      qrec(i) = 0.0
      do 252 ll=1,l-1
        if (nuc(ll).eq.nisnr(i,j)) then
          thalf(i) = thalf(ll)
          qrec(i) = qrec(ll)
          goto 254
        endif
 252    continue
 254    do 256 m=1,n
        if (nisnr(i,j).eq.nucl(m)) then
          call activ(nucl(m),thalf(i),number(m),atomwe(i),gramat(m),
  &         qrec(i),act(i),inha(i),inge(i),htld(i))
          goto 257
        endif
 256    continue
 257    act(nauto(j)+1) = act(nauto(j)+1) + act(i)
      htld(nauto(j)+1) = htld(nauto(j)+1) + htld(i)
      inha(nauto(j)+1) = inha(nauto(j)+1) + inha(i)
      inge(nauto(j)+1) = inge(nauto(j)+1) + inge(i)
 258  continue
      open (14,file=file14,status='unknown')
      open (15,file=file15,status='unknown')
      open (16,file=file16,status='unknown')
      open (17,file=file17,status='unknown')
c
      write (14,'(i3,1x,1pe9.2,250e10.2)')
  &         nrst, (act(i),i=1,nauto(j)+1)
      write (15,'(i3,1x,1pe9.2,250e10.2)')
  &         nrst, (htld(i),i=1,nauto(j)+1)
```

```
      write (16,'(i3,1x,1pe9.2,250e10.2)')
     &          nrst, (inha(i),i=1,nauto(j)+1)
      write (17,'(i3,1x,1pe9.2,250e10.2)')
     &          nrst, (inge(i),i=1,nauto(j)+1)
      close (13)
      close (14)
      close (15)
      close (16)
      close (17)
c
     elseif (posit.eq.'b') then
      open (14,file=file12,status='unknown')
      open (15,file=fil12x,status='unknown')
      write (14,'(i3,1x,1pe9.2,250e10.2)')
     &          nrst, (gm(i,j),i=1,nauto(j)+1)
      write (15,'(i3,1x,1pe13.7,250e14.7)')
     &          nrst, (gm(i,j),i=1,nauto(j)+1)
      close (14)
      close (15)
     endif
c
     close (12)
   40 continue
c
     return
     end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...RMHALF removes 1/2 way predictor cards in TAPE5
c
     subroutine rmhalf(nmat)
     character ju8*8,ju80*80,fname*12,f2name*12
c
     do 140 j=1,nmat
     if (j.lt.10) then
      fname = 'TAPE5_'//char(j+48)//'.INP'
      f2name = 'TAPE5_'//char(j+48)//'.TMP'
     elseif (j.ge.10) then
      j1 = j/10
      j2 = j - j1*10
      fname = 'TAPE5_'//char(j1+48)//char(j2+48)//'.INP'
      f2name = 'TAPE5_'//char(j1+48)//char(j2+48)//'.TMP'
     endif
     open (12,file=fname,status='old')
     open (13,file=f2name,status='unknown')
c
     ino = 0
  120 read (12,'(a8)',end=125) ju8
c
     if (ju8.eq.'RDA Firs') ino=1
     if (ino.eq.0) then
      backspace(12)
      read (12,'(a80)',end=125) ju80
      write (13,'(a80)') ju80
     end if
     if (ju8.eq.'RDA Last') ino=0
     goto 120
  125 continue
     close (12)
     close (13)
  140 continue
```

```
c
      return
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...BURNCALC calculates material burned/produced based on feed and inven
c
      subroutine burnca
c
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &        machin*4,fil12a*22,tmpfile*10,filen*21,
     &        file10*22,file9t*22,file5x*22,file9*22
      dimension tfeed(999),g1(999),g2(999),bb(999),bb2(999),day(999)
      dimension dfeed(999),totbb(999)
c
c...Read feed data
c
      do 100 j=1,nmat
      do 3 m=1,nauto(j)+1
    3 totbb(m) = 0.0
      if (j.lt.10) then
        file9t=tmpfile//'mb9t_'//char(j+48)//'.out'
        file5x=tmpfile//'mb5tx_'//char(j+48)//'.out'
        fil12a=tmpfile//'mb12a_'//char(j+48)//'.out'
        file9 =tmpfile//'mb9_'//char(j+48)//'.out'
        file10=tmpfile//'mb10t_'//char(j+48)//'.out'
      elseif (j.ge.10) then
        j1 = j/10
        j2 = j - j1*10
        file9t=tmpfile//'mb9t_'//char(j1+48)//char(j2+48)//'.out'
        file5x=tmpfile//'mb5tx_'//char(j1+48)//char(j2+48)//'.out'
        fil12a=tmpfile//'mb12a_'//char(j1+48)//char(j2+48)//'.out'
        file9 =tmpfile//'mb9_'//char(j1+48)//char(j2+48)//'.out'
        file10=tmpfile//'mb10t_'//char(j1+48)//char(j2+48)//'.out'
      endif
      open (11,file=file9t,status='unknown')
      read (11,'(//)')
      do 10 i=1,nrst
   10 read (11,'(4x,f8.2,3x,1pe9.2,250e10.2)')
     &        day(i),(tfeed(m),m=1,nauto(j)+1)
      close (11)
c
c...Read inventory data
c
      open (11,file=file5x,status='unknown')
      read (11,'(//)')
      do 20 i=0,nrst
   20 read (11,'(4x,1pe13.7,250e14.7)') (g2(m),m=1,nauto(j)+1)
      close (11)
      open (11,file=fil12a,status='unknown')
      read (11,'(//)')
      do 22 i=0,nrst
   22 read (11,'(4x,1pe13.7,250e14.7)') (g1(m),m=1,nauto(j)+1)
      close (11)
c
c...Write burn data
c
```

```
      do 30 m=1,nauto(j)+1
      bb(m)=g2(m)-g1(m)
   30 totbb(m) = totbb(m) + bb(m)
      open (14,file=file9,status='unknown')
      write (14,'(i3,1x,1pe9.2,250e10.2)')
     &        nrst,(bb(m),m=1,nauto(j)+1)
c
c...Write final burn data if last step
c
      if (nrst.eq.nouter) then
c
      open (11,file=file9t,status='unknown')
      read (11,'(//)')
      do 40 i=1,nrst
   40 read (11,*)
      read (11,'(4x,f8.2,3x,1pe9.2,250e10.2)')
     &       day(nrst),(tfeed(m),m=1,nauto(j)+1)
      close (11)
c
      open (11,file=file5x,status='unknown')
      read (11,'(//)')
      read (11,'(4x,1pe13.7,250e14.7)') (g1(m),m=1,nauto(j)+1)
      close (11)
c
      write (14,'(a3,1pe9.2,250e10.2)') 'tot',(totbb(m),m=1,nauto(j)+1)
      write (14,'(/,a36,a13,i3,a22,i3,a1)')
     & 'Summary of Inventory/Feed/Production',
     & ' for material',j,' (MCNP Material Number',abs(mt(j)),')'
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),'actinide'
c
      write (14,'(a3,1pe9.2,250e10.2)') 'ini',(g1(m),m=1,nauto(j)+1)
      write (14,'(a3,1pe9.2,250e10.2)') 'fin',(g2(m),m=1,nauto(j)+1)
      write (14,'(a3,1pe9.2,250e10.2)') 'fed',(tfeed(m),m=1,nauto(j)+1)
      write (14,'(a3,1pe9.2,250e10.2)') 'net',(totbb(m),m=1,nauto(j)+1)
c
      end if
c
      close (14)
c
c...Write mb10.out containing feed/burn rates
c
      if (nrst.eq.nouter) then
      open (14,file=tmpfile//'mb10.txt',status='unknown')
      write (14,'(/,a28)') 'Monteburns Inventory (cont.)'
      close (14)
      open (14,file=file10,status='unknown')
c
c...Read data and divide by time interval
c
      open (11,file=file9t,status='unknown')
      read (11,'(//)')
      write (14,'(/,a17,a13,i3,a22,i3,a1)') 'Feed Rate (g/day)',
     & ' for material',j,' (MCNP Material Number',abs(mt(j)),')'
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),'actinide'
      do 80 i=1,nouter
      read (11,'(4x,f8.2,3x,1pe9.2,250e10.2)')
     &         day(i),(tfeed(m),m=1,nauto(j)+1)
c
c... Determine if a feed input file exists or not
c
      filen = tmpfile//'params2.dat'
      open (17,file=filen,status='unknown')
```

```
      read (17,'(i4)') nfd
      close (17)
      if (nfd.eq.1) then
       write (14,'(i3,1x,1pe9.2,250e10.2)') i,
     & (tfeed(m)/day(i),m=1,nauto(j)+1)
      else
        do 77 m=1,nauto(j)+1
   77   dfeed(m) = 0.0
        write (14,'(i3,1x,1pe9.2,250e10.2)') i,
     & (dfeed(m),m=1,nauto(j)+1)
      endif
   80 continue
      read (11,'(///)')
      write (14,'(/,a35,a13,i3,a22,i3,a1)')
     & 'Production/Destruction Rate (g/day)',
     & ' for material',j,' (MCNP Material Number',abs(mt(j)),')'
      write (14,'(3x,a9,250(1x,a9))')(niso(i,j),i=1,nauto(j)),'actinide'
      do 90 i=1,nouter-1
      read (11,'(4x,1pe9.2,250e10.2)') (bb2(m),m=1,nauto(j)+1)
   90 write (14,'(i3,1x,1pe9.2,250e10.2)') i,
     & (bb2(m)/day(i),m=1,nauto(j)+1)
      write (14,'(i3,1x,1pe9.2,250e10.2)') nouter,
     & (bb(m)/day(nouter),m=1,nauto(j)+1)
      close (11)
      write (14,*)
      close (14)
      end if
  100 continue
c
      return
      end
c
c...DISCRETE makes additions in TAPE7 and mat.inp for discrete feed
c
      subroutine discr
c
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      character line*80,tape7*12,t7tmp*15,met*1,machin*4,tmpfile*10,
     &   filen*21
      dimension nisq(4),gad(4),gmafed(999,49),ifd6(99,49),a(99),
     & day(999),nfeed(999,49),gf1(999,49),gf2(999,49),mfeed(999),
     & kfeed(99),kfeed1(99,99),kfeed2(99,99),ifeed(99,99),ncount(99,49),
     & nf1(999,49),rf(999,49),pfra(999),nmt(49),ffeed(99,99),
     & nelem(99,49),tmst(999),weight(99),
     & nisoto(99,49,99),nisop(99,49),atomfr(99,49,99),
     & iflag(99,49),imfeed(99,99),fmfeed(99,99),mmfeed(99),gfeed(99,49)
c...
c... Determine if feed file exists
c...
      filen = tmpfile//'params2.dat'
      open (17,file=filen,status='unknown')
      read (17,'(i4)') nfd
      close (17)
      if (nfd.eq.1) then
       open (11,file='feed',status='old')
       read (11,*)
       read (11,*)
       do 10 i=1,nouter
        do 10 j=1,nmat
         if (j.eq.1) then
```

```
        read (11,*) tmst(i),day(i),
  &       pfra(i),nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
      elseif (j.ge.2) then
        read (11,*) nmt(j),
  &       nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
      endif
 10   continue
      read (11,*) nfs
      do 12 n=1,nfs
        read (11,*) mfeed(n)
      do 12 m=1,mfeed(n)
 12     read (11,*) ifeed(n,m),ffeed(n,m)
        read (11,*) nrs
      do 15 n=1,nrs
        read (11,*) kfeed(n)
      do 15 k=1,kfeed(n)
 15     read (11,*) kfeed1(n,k),kfeed2(n,k)
    endif
c
c...Rewrite TAPE7
c
    do 100 j=1,nmat
    i = nrst
    n = nfeed(i,j)
    if (j.lt.10) then
      tape7 = 'TAPE7_'//char(j+48)//'.OUT'
      t7tmp = 'TAPE7_'//char(j+48)//'.TMP'
    elseif (j.ge.10) then
      j1 = j/10
      j2 = j - j1*10
      tape7 = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
      t7tmp = 'TAPE7_'//char(j1+48)//char(j2+48)//'.TMP'
    endif
    open (12,file=tape7,status='unknown')
    if (n.eq.0) then
      goto 90
    endif
    open (13,file='tape.tmp',status='unknown')
c
c... Check to see if any feed materials are natural elements
c
    mmfeed(n) = mfeed(n)
    do 25 m=1,mfeed(n)
    iflag(m,j) = 0
    nai = ifeed(n,m)-1000*(ifeed(n,m)/1000)
    if (nai.eq.0.and.ifeed(n,m).gt.0) then
      filen = tmpfile//'natelem'
      open (16,file=filen,status='unknown')
      read (16,*)
      read (16,*)
 18   read (16,*) nelem(m,j)
      read (16,*) nisop(m,j)
      totwe = 0.0
      do 20 mm=1,nisop(m,j)
      read (16,'(i5,3x,f10.5)',err=20,end=23)
  &   nisoto(m,j,mm),atomfr(m,j,mm)
      weight(mm) = nisoto(m,j,mm)-1000*(nisoto(m,j,mm)/1000)
 20   totwe = totwe + atomfr(m,j,mm)*weight(mm)
      if (nelem(m,j).eq.ifeed(n,m)/1000) then
        iflag(m,j) = 1
        imfeed(n,m) = nisoto(m,j,1)
        weigfra = atomfr(m,j,1)*weight(1)/totwe
```

```
        fmfeed(n,m) = ffeed(n,m)*weigfra
        do 22 mn=1,(nisop(m,j)-1)
          weigfra = atomfr(m,j,1+mn)*weight(1+mn)/totwe
          mmfeed(n) = mmfeed(n) + 1
          imfeed(n,mmfeed(n)) = nisoto(m,j,1+mn)
 22         fmfeed(n,mmfeed(n)) = ffeed(n,m)*weigfra
        goto 23
      else
        goto 18
      endif
 23   close (16)
    else
      imfeed(n,m) = ifeed(n,m)
      fmfeed(n,m) = ffeed(n,m)
    endif
 25 continue
c
c...Convert grams of feed to gram-atoms of feed
c
      do 28 m=1,mmfeed(n)
      ifd6(n,m) = imfeed(n,m)*10
      if (ifd6(n,m).eq.952420) ifd6(n,m)=ifd6(n,m)+1
      gfeed(m,j)=fmfeed(n,m)*gf2(i,j)*day(i)
      ai = float(imfeed(n,m))-float(1000*(imfeed(n,m)/1000))
      gmafed(m,j) = gfeed(m,j)/ai
      ncount(m,j) = 0
 28   continue
 30 read (12,901,err=45,end=50) kxs,(nisq(k),gad(k),k=1,4)
901 format (i4,4(1x,i6,2x,1pe10.4))
    if (kxs.eq.0) goto 45
    do 40 k=1,4
     do 40 m=1,mmfeed(n)
     if (nisq(k).eq.ifd6(n,m).and.kxs.le.2) then
       if (ncount(m,j).eq.0) gad(k) = gad(k) + gmafed(m,j)
       ncount(m,j) = 1
     endif
 40  continue
    write (13,901) kxs,(nisq(k),gad(k),k=1,4)
    goto 30
 45 backspace (12)
    read (12,'(a80)') line
    write (13,'(a80)') line
    goto 30
 50 close (12)
    close (13)
c
c...Write non-actinides to TAPE7 that are part of discrete feed but did not
c... previously exist
c
    open (13,file='tape.tmp',status='unknown')
    open (14,file=t7tmp,status='unknown')
    kxsold = 1
    nadd = 0
 63 read (13,'(i4)',err=80,end=99) kxs
    if (kxs.eq.kxsold) then
      backspace (13)
      read (13,'(a80)') line
      write (14,'(a80)') line
      kxsold = kxs
    else
    kxsold = kxs
    if (nadd.eq.0) then
```

```
      do 65 k=1,mmfeed(n)
       nmin=99999
       ni=0
       do 60 m=1,mmfeed(n)
        a(m)=float(imfeed(n,m))-float(1000*(imfeed(n,m)/1000))
        if (imfeed(n,m).lt.83000.and.imfeed(n,m).gt.1000) then
         if (a(m).gt.0) then
          if (imfeed(n,m).lt.nmin) then
           nmin=imfeed(n,m)
           ni=m
          end if
         endif
        end if
   60  continue
       if (ni.gt.0) then
        kxs=1
        met='0'
        if (ncount(ni,j).eq.0) then
         ncount(ni,j) = 1
         write (14,912) kxs,ifd6(n,ni),gmafed(ni,j)
        endif
        imfeed(n,ni)=0
       end if
   65  continue
c
c...Write actinides to TAPE7, sort numerically for xs file read
c
      do 75 k=1,mmfeed(n)
       nmin=99999
       ni=0
       do 70 m=1,mmfeed(n)
        a(m)=float(imfeed(n,m))-float(1000*(imfeed(n,m)/1000))
        if (imfeed(n,m).ge.83000.and.a(m).gt.0.) then
         if (imfeed(n,m).lt.nmin) then
          nmin=imfeed(n,m)
          ni=m
         end if
        end if
   70  continue
       if (ni.gt.0) then
        kxs=2
        met='0'
        if (ncount(ni,j).eq.0) then
         ncount(ni,j) = 1
         write (14,912) kxs,ifd6(n,ni),gmafed(ni,j)
        endif
        imfeed(n,ni)=0
       end if
   75 continue
      nadd = 1
      endif
      if (kxsold.eq.0) goto 80
      backspace(13)
      read (13,'(a80)') line
      write (14,'(a80)') line
      endif
      goto 63
   80 backspace(13)
      read (13,'(a80)') line
      write (14,'(a80)') line
      goto 63
   90 open (14,file=t7tmp,status='unknown')
```

```
 95 read (12,'(a80)',end=99) line
   write (14,'(a80)') line
   goto 95
 99 close (13)
   close (14)
100 continue
911 format (i4,i6,a1,1pe12.4,
  & '    0 0.0000E+00    0 0.0000E+00    0 0.0000E+00')
912 format (i4,1x,i6,1pe12.4,
  & '    0 0.0000E+00    0 0.0000E+00    0 0.0000E+00')
   end
c
   subroutine dremo
c
   common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
  & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
  & nisnr(999,49),machin,tmpfile
   character line*72,tape7*12,t7tmp*15,nisq2(4)*4,machin*4
  &       ,tmpfile*10,filen*21
   dimension nisq1(4),gad(4),nisq3(4)
   dimension day(999),nfeed(999,49),gf1(999,49),gf2(999,49),
  & kfeed(99),kfeed1(99,99),kfeed2(99,99),ifeed(99,99),tmst(999),
  & nf1(999,49),rf(999,49),pfra(999),nmt(49),ffeed(99,99),mfeed(99)
c...
c... Determine if feed file exists
c...
   filen = tmpfile//'params2.dat'
   open (17,file=filen,status='unknown')
   read (17,'(i4)') nfd
   close (17)
   if (nfd.eq.1) then
     open (11,file='feed',status='old')
     read (11,*)
     read (11,*)
     do 10 i=1,nouter
      do 10 j=1,nmat
       if (j.eq.1) then
        read (11,*) tmst(i),day(i),pfra(i),
  &      nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
       elseif (j.ge.2) then
        read (11,*)
  &      nmt(j),nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
       endif
 10   continue
      read (11,*) nfs
      do 12 n=1,nfs
       read (11,*) mfeed(n)
      do 12 m=1,mfeed(n)
 12     read (11,*) ifeed(n,m),ffeed(n,m)
       read (11,*) nrs
      do 15 n=1,nrs
       read (11,*) kfeed(n)
      do 15 k=1,kfeed(n)
 15     read (11,*) kfeed1(n,k),kfeed2(n,k)
   endif
c
c...Rewrite TAPE7
c
   do 60 j=1,nmat
   if (nf1(nrst,j).ge.0) goto 60
   if (j.lt.10) then
     tape7 = 'TAPE7_'//char(j+48)//'.OUT'
```

```
      t7tmp = 'TAPE7_'//char(j+48)//'.TEM'
     elseif (j.ge.10) then
      j1 = j/10
      j2 = j - j1*10
      tape7 = 'TAPE7_'//char(j1+48)//char(j2+48)//'.OUT'
      t7tmp = 'TAPE7_'//char(j1+48)//char(j2+48)//'.TEM'
     endif
     open (12,file=tape7,status='unknown')
     open (13,file=t7tmp,status='unknown')
c...
c... Remove elements in removal group from TAPE7
c...
  30 read (12,901,err=45,end=50) kxs,(nisq1(k),nisq2(k),gad(k),k=1,4)
     backspace (12)
     read (12,903,err=45,end=50) kxs,(nisq3(k),nisq2(k),gad(k),k=1,4)
 901 format (i4,4(1x,i2,a4,2x,1pe10.4))
 903 format (i4,4(1x,a2,a4,2x,1pe10.4))
     nrem = abs(nf1(nrst,j))
     do 40 k=1,4
      do 40 n=1,kfeed(nrem)
       do 40 m=abs(kfeed1(nrem,n)),abs(kfeed2(nrem,n))
       if (nisq1(k).eq.m) then
        if ((kfeed1(nrem,n).lt.0.and.kxs.eq.3)
    &                    .or.kfeed1(nrem,n).ge.0) then
          gad(k) = gad(k) - gad(k)*rf(nrst,j)
        endif
       endif
  40 continue
     if (kxs.eq.0) then
       write (13,902) kxs,(nisq2(k),gad(k),k=1,4)
 902 format (i4,4(1x,2x,a4,2x,1pe10.4))
     else
       write (13,903) kxs,(nisq3(k),nisq2(k),gad(k),k=1,4)
     endif
     goto 30
  45 backspace (12)
     read (12,'(a72)') line
     write (13,'(a72)') line
     goto 30
  50 close (12)
     close (13)
  60 continue
     end

c
c...REGION makes indicates what materials are substituted in various
c... regions
c
     subroutine region
c
     common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
    & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
    & nisnr(999,49),machin,tmpfile
     character fname*22,machin*4,tmpfile*10,filen*21
     dimension day(999),pfra(999),nmt(49),nfeed(999,49),gf1(999,49),
    &         gf2(999,49),nf1(999,49),rf(999,49),tmst(999)
c
c...First discover if feed input file exists
c
     filen = tmpfile//'params2.dat'
     open (17,file=filen,status='unknown')
     read (17,'(i4)') nfd
```

```
      if (nfd.eq.1) then
c
c...First read the two lines of headings
c...
      open (11,file='feed',status='unknown')
      read (11,*)
      read (11,*)
      do 8 i=1,nrst
        do 8 j=1,nmat
        if (j.eq.1) then
         read (11,*) tmst(i),day(i),
     &   pfra(i),nmt(1),nfeed(i,1),gf1(i,1),gf2(i,1),nf1(i,1),rf(i,1)
        elseif (j.ge.2) then
         read (11,*) nmt(j),
     &   nfeed(i,j),gf1(i,j),gf2(i,j),nf1(i,j),rf(i,j)
        endif
    8 continue
      close (11)
      else
      do 10 j=1,nmat
   10 nmt(j) = 0
      endif
c
      do 20 j=1,nmat
      if (j.lt.10) then
       fname = tmpfile//'para3_'//char(j+48)//'.dat'
      elseif (j.ge.10) then
       j1 = j/10
       j2 = j - j1*10
       fname = tmpfile//'para3_'//char(j1+48)//char(j2+48)//'.dat'
      endif
      open (12,file=fname,status='unknown')
      write (12,905) nmt(j)
  905 format (i4,'  nval')
   20 continue
      end
c
c23456789*123456789*123456789*123456789*123456789*123456789*123456789*12
c
c...WMBINP rewrites mb.inp
c
      subroutine wmbinp
c
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      common /mbinp2/niso(999,49),nisor(999,49),title,olib,locale,posit
      character niso*10,nisor*6,title*72,olib*10,locale*72,posit*1,
     &          machin*4,tmpfile*10
c
c...Rewrite mb.inp
c
      open (11,file='mb.inp',status='unknown')
      write (11,'(a72)') title
      write (11,'(a4)') machin
      write (11,*) nmat
      do 20 j=1,nmat
   20 write (11,*) mt(j)
      do 30 j=1,nmat
   30 write (11,*) voli(j)
      write (11,*) pow
      write (11,*) qu235
```

```
      write (11,*) days
      write (11,*) nouter
      write (11,*) ninner
      write (11,*) npre
      write (11,*) nrst
      write (11,'(a10)') olib
      write (11,'(a72)') locale
      write (11,*) frimp
      write (11,*) nkeff
      do 60 j=1,nmat
      write (11,*) nauto(j)
      write (11,*) ntot(j)
      do 60 i=1,ntot(j)
   60 write (11,'(a10)') niso(i,j)
      close (11)
c
      return
      end
c
c This subroutine creates a file containig isotopic breakdowns
c for natural elements
c
      subroutine natele
      common /mbinp/nmat,mt(49),voli(49),pow,qu235,days,nouter,ninner,
     & npre,nrst,frimp,nauto(49),ntot(49),nkeff,nisn(999,49),
     & nisnr(999,49),machin,tmpfile
      character machin*4,tmpfile*10
      dimension nelem(40),nisot(40,40),atomfr(40,40),nisop(40)
c
c Isotopic compositions of natural elements
c Ref:  Nuclides and Isotopes, Fifteenth Edition
c
      open (16,file=tmpfile//'natelem',status='unknown')
      data (nelem(i),i=1,33) /
     &   6, 12, 14, 16, 17, 18, 19, 20, 22,
     &  23, 24, 25, 26, 28, 29, 30, 31, 40,
     &  42, 47, 48, 49, 50, 51, 54, 63, 64,
     &  72, 74, 77, 78, 80, 82   /
      write (16,*)
      write (16,*)
      do 80 i=1,33
      nz = nelem(i)
      if (nz.eq.6) then              ! Carbon
        niso = 2              ! Number of isotopes in natural carbon
        data (nisot(1,n),atomfr(1,n),n=1,2) /
     &   6012,  0.98900,
     &   6013,  0.01100   /
      endif
      if (nz.eq.12) then             ! Magnesium
        niso = 3              ! Number of isotopes
        data (nisot(2,n),atomfr(2,n),n=1,3) /
     &   12024,  0.78990,
     &   12025,  0.10000,
     &   12026,  0.11010  /
      endif
      if (nz.eq.14) then             ! Silicon
        niso = 3              ! Number of isotopes
        data (nisot(3,n),atomfr(3,n),n=1,3) /
     &   14028,  0.92230,
     &   14029,  0.04670,
     &   14030,  0.03100  /
      endif
```

```
 if (nz.eq.16) then            ! Sulfur
  niso = 4             ! Number of isotopes
  data (nisot(4,n),atomfr(4,n),n=1,4) /
&   16032,  0.95020,
&   16033,  0.00750,
&   16034,  0.04210,
&   16036,  0.00020  /
 endif
 if (nz.eq.17) then            ! Chlorine
  niso = 2             ! Number of isotopes
  data (nisot(5,n),atomfr(5,n),n=1,2) /
&   17035,  0.75770,
&   17037,  0.24230  /
 endif
 if (nz.eq.18) then            ! Argon
  niso = 3             ! Number of isotopes
  data (nisot(6,n),atomfr(6,n),n=1,3) /
&   18036,  0.00337,
&   18038,  0.00063,
&   18040,  0.99600  /
 endif
 if (nz.eq.19) then            ! Potassium
  niso = 3             ! Number of isotopes
  data (nisot(7,n),atomfr(7,n),n=1,3) /
&   19039,  0.93258,
&   19040,  0.00012,
&   19041,  0.06730  /
 endif
 if (nz.eq.20) then            ! Calcium
  niso = 6             ! Number of isotopes
  data (nisot(8,n),atomfr(8,n),n=1,6) /
&   20040,  0.96941,
&   20042,  0.00647,
&   20043,  0.00135,
&   20044,  0.02086,
&   20046,  0.00004,
&   20048,  0.00187  /
 endif
 if (nz.eq.22) then            ! Titanium
  niso = 5             ! Number of isotopes
  data (nisot(9,n),atomfr(9,n),n=1,5) /
&   22046,  0.08250,
&   22047,  0.07440,
&   22048,  0.73720,
&   22049,  0.05410,
&   22050,  0.05180  /
 endif
 if (nz.eq.23) then            ! Vanadium
  niso = 2             ! Number of isotopes
  data (nisot(10,n),atomfr(10,n),n=1,2) /
&   23050,  0.00250,
&   23051,  0.99750  /
 endif
 if (nz.eq.24) then            ! Chromium
  niso = 4             ! Number of isotopes
  data (nisot(11,n),atomfr(11,n),n=1,4) /
&   24050,  0.04350,
&   24052,  0.83790,
&   24053,  0.09500,
&   24054,  0.02360  /
 endif
 if (nz.eq.25) then            ! Manganese
```

```
  niso = 1              ! Number of isotopes
  data (nisot(12,n),atomfr(12,n),n=1,1) /
&   25055,  0.10000  /
 endif
 if (nz.eq.26) then             ! Iron
  niso = 4              ! Number of isotopes
  data (nisot(13,n),atomfr(13,n),n=1,4) /
&   26054,  0.05850,
&   26056,  0.91750,
&   26057,  0.02120,
&   26058,  0.00280  /
 endif
 if (nz.eq.28) then             ! Nickel
  niso = 5              ! Number of isotopes
  data (nisot(14,n),atomfr(14,n),n=1,5) /
&   28058,  0.68080,
&   28060,  0.26220,
&   28061,  0.01140,
&   28062,  0.03630,
&   28064,  0.00930  /
 endif
 if (nz.eq.29) then             ! Copper
  niso = 2              ! Number of isotopes
  data (nisot(15,n),atomfr(15,n),n=1,2) /
&   29063,  0.69170,
&   29065,  0.30830  /
 endif
 if (nz.eq.30) then             ! Zinc
  niso = 4              ! Number of isotopes
  data (nisot(16,n),atomfr(16,n),n=1,4) /
&   30064,  0.48600,
&   30066,  0.27900,
&   30067,  0.04100,
&   30068,  0.18800  /
 endif
 if (nz.eq.31) then             ! Gallium
  niso = 2              ! Number of isotopes
  data (nisot(17,n),atomfr(17,n),n=1,2) /
&   31069,  0.60110,
&   31071,  0.39890  /
 endif
 if (nz.eq.40) then             ! Zirconium
  niso = 5              ! Number of isotopes
  data (nisot(18,n),atomfr(18,n),n=1,5) /
&   40090,  0.51450,
&   40091,  0.11220,
&   40092,  0.17150,
&   40094,  0.17380,
&   40096,  0.02800  /
 endif
 if (nz.eq.42) then             ! Molybdenum
  niso = 7              ! Number of isotopes
  data (nisot(19,n),atomfr(19,n),n=1,7) /
&   42092,  0.14840,
&   42094,  0.09250,
&   42095,  0.15920,
&   42096,  0.16680,
&   42097,  0.09550,
&   42098,  0.24130,
&   42100,  0.09630  /
 endif
 if (nz.eq.47) then             ! Silver
```

```
  niso = 2              ! Number of isotopes
  data (nisot(20,n),atomfr(20,n),n=1,2) /
&   47107,  0.51839,
&   47109,  0.48161  /
 endif
 if (nz.eq.48) then             ! Cadmium
  niso = 8              ! Number of isotopes
  data (nisot(21,n),atomfr(21,n),n=1,8) /
&   48106,  0.01250,
&   48108,  0.00890,
&   48110,  0.12490,
&   48111,  0.12800,
&   48112,  0.24130,
&   48113,  0.12220,
&   48114,  0.28730,
&   48116,  0.07490  /
 endif
 if (nz.eq.49) then             ! Indium
  niso = 2              ! Number of isotopes
  data (nisot(22,n),atomfr(22,n),n=1,2) /
&   49113,  0.04290,
&   49115,  0.95710  /
 endif
 if (nz.eq.50) then             ! Tin
  niso = 10             ! Number of isotopes
  data (nisot(23,n),atomfr(23,n),n=1,10) /
&   50112,  0.00970,
&   50114,  0.00650,
&   50115,  0.00340,
&   50116,  0.14540,
&   50117,  0.07680,
&   50118,  0.24220,
&   50119,  0.08590,
&   50120,  0.32590,
&   50122,  0.04630,
&   50124,  0.05790  /
 endif
 if (nz.eq.51) then             ! Antimony
  niso = 2              ! Number of isotopes
  data (nisot(24,n),atomfr(24,n),n=1,2) /
&   51121,  0.57300,
&   51123,  0.42700  /
 endif
 if (nz.eq.54) then             ! Xenon
  niso = 9              ! Number of isotopes
  data (nisot(25,n),atomfr(25,n),n=1,9) /
&   54124,  0.00100,
&   54126,  0.00090,
&   54128,  0.01910,
&   54129,  0.26400,
&   54130,  0.04100,
&   54131,  0.21200,
&   54132,  0.26900,
&   54134,  0.10400,
&   54136,  0.08900  /
 endif
 if (nz.eq.63) then             ! Europium
  niso = 2              ! Number of isotopes
  data (nisot(26,n),atomfr(26,n),n=1,2) /
&   63151,  0.47800,
&   63153,  0.52200  /
 endif
```

```
 if (nz.eq.64) then            ! Gadolinium
  niso = 7              ! Number of isotopes
  data (nisot(27,n),atomfr(27,n),n=1,7) /
&   64152,  0.00200,
&   64154,  0.02180,
&   64155,  0.14800,
&   64156,  0.20470,
&   64157,  0.15650,
&   64158,  0.24840,
&   64160,  0.21860  /
 endif
 if (nz.eq.72) then            ! Hafnium
  niso = 6              ! Number of isotopes
  data (nisot(28,n),atomfr(28,n),n=1,6) /
&   72174,  0.00162,
&   72176,  0.05206,
&   72177,  0.18606,
&   72178,  0.27297,
&   72179,  0.13629,
&   72180,  0.35100  /
 endif
 if (nz.eq.74) then            ! Tungsten
  niso = 5              ! Number of isotopes
  data (nisot(29,n),atomfr(29,n),n=1,5) /
&   74180,  0.00120,
&   74182,  0.26498,
&   74183,  0.14314,
&   74184,  0.30642,
&   74186,  0.28426  /
 endif
 if (nz.eq.77) then            ! Iridium
  niso = 2              ! Number of isotopes
  data (nisot(30,n),atomfr(30,n),n=1,2) /
&   77191,  0.37300,
&   77193,  0.62700  /
 endif
 if (nz.eq.78) then            ! Platinum
  niso = 6              ! Number of isotopes
  data (nisot(31,n),atomfr(31,n),n=1,6) /
&   78190,  0.00010,
&   78192,  0.00790,
&   78194,  0.32900,
&   78195,  0.33800,
&   78196,  0.25300,
&   78198,  0.07200  /
 endif
 if (nz.eq.80) then            ! Mercury
  niso = 7              ! Number of isotopes
  data (nisot(32,n),atomfr(32,n),n=1,7) /
&   80196,  0.00150,
&   80198,  0.09970,
&   80199,  0.16870,
&   80200,  0.23100,
&   80201,  0.13180,
&   80202,  0.29860,
&   80204,  0.06870  /
 endif
 if (nz.eq.82) then            ! Lead
  niso = 4              ! Number of isotopes
  data (nisot(33,n),atomfr(33,n),n=1,4) /
&   82204,  0.01400,
&   82206,  0.24100,
```

```
     &   82207,  0.22100,
     &   82208,  0.52400  /
      endif
c
      nisop(i) = niso
      write (16,*) nelem(i)
      write (16,*) nisop(i)
      do 60 n=1,nisop(i)
   60 write (16,'(i5,3x,f10.5)')
     &       nisot(i,n),atomfr(i,n)
   80 continue
      close (16)
c
      return
      end
```

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Comparison of MONTEBURNS Calculated Isotopic Fuel Compositions with Measurements for N Reactor Fuel

Figure E-2 shows a cross section of an MCNP model of N Reactor MKIV fuel assembly. This model was used in MONTEBURNS to verify the code operation through comparisons with detailed fuel isotopic measurements. The following figures illustrate the comparison that was made between MONTEBURNS calculated isotopic compositions and measured isotopic compositions for N Reactor MKIV inner fuel elements (Wittekind 1988). Similar agreement was found for MKIV outer fuel elements. ENDF/B-V cross sections were used in the MONTEBURNS analysis. The MCNP model for the MKIV fuel was based on the same WIMS-E models used to generate the ORIGEN2 cross sections for N Reactor fuel as described in the ORIGEN2 Verification and Validation documentation. The physics parameters such as temperatures, dimensions, and powers were based on hot operating conditions from the DCODE reactor physics codes. The irradiation periods were 60 days with an intermediate shutdown period of 7 days for a total irradiation of 500 days. The assembly power was 10.83 kw. The scaling factors were used to convert the isotope masses to g/MTU. The ^{241}Pu was corrected for decay based on a cooling time of 2884 days prior to being measured in the laboratory.

These figures show excellent agreement between the calculated and measured isotopic compositions for both actinides and fission products over a wide range of burnup values. Deviations noted for ^{234}U and ^{236}U can be attributed to the historical variation over time in the concentration of these nuclides in the uranium feed material containing varying amounts of recycled uranium. Further investigation could better match the initial fuel composition used in the model with the concentrations in the actual fuel samples analyzed for the measured values.

These results show that the MONTEBURNS methodology of calculating isotopic compositions and effective ORIGEN2 one group cross sections for graphite-moderated, water cooled Hanford production reactors can provide excellent agreement with measured data from destructive fuel assembly analysis.

Figure E-2. MCNP Model of N Reactor MKIV Fuel Assembly.

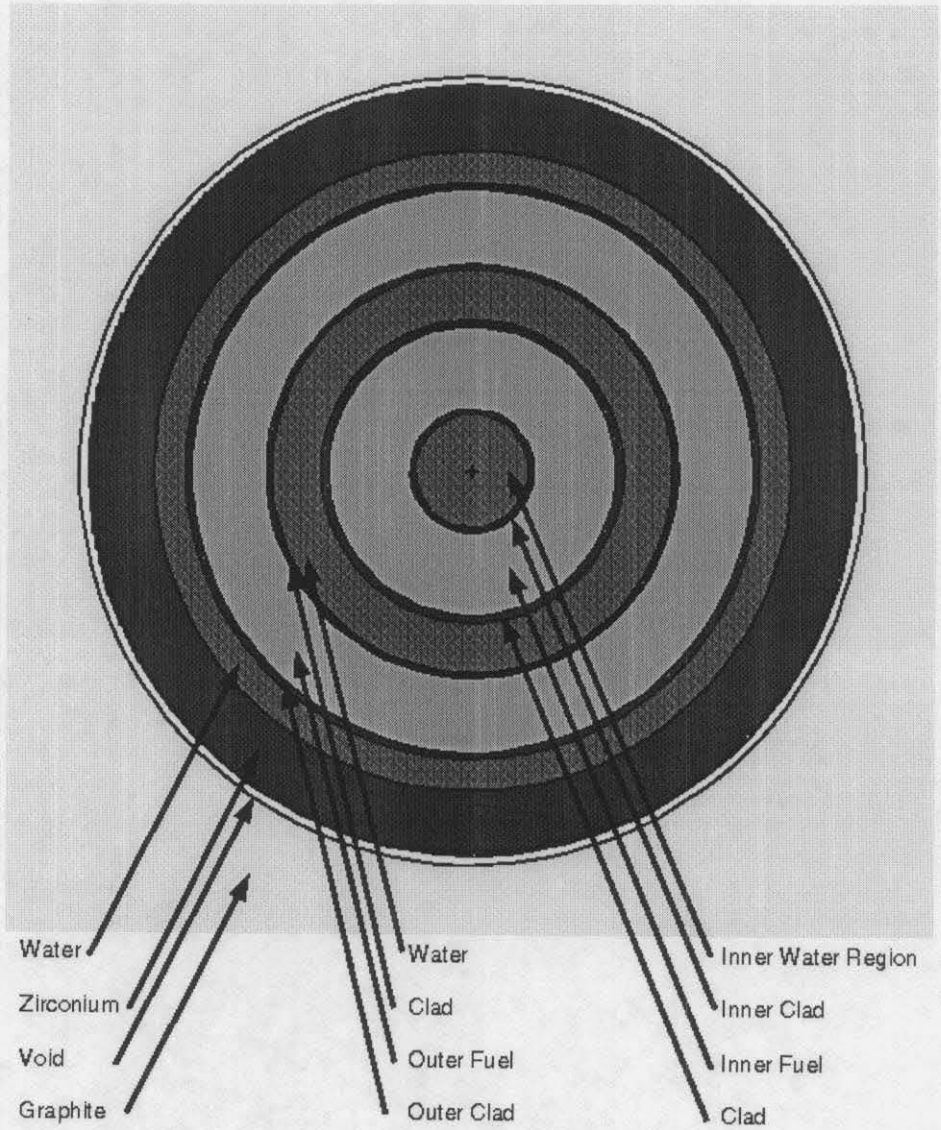


Figure E-3. Comparison of MONTEBURNS and Measurements for ^{234}U.

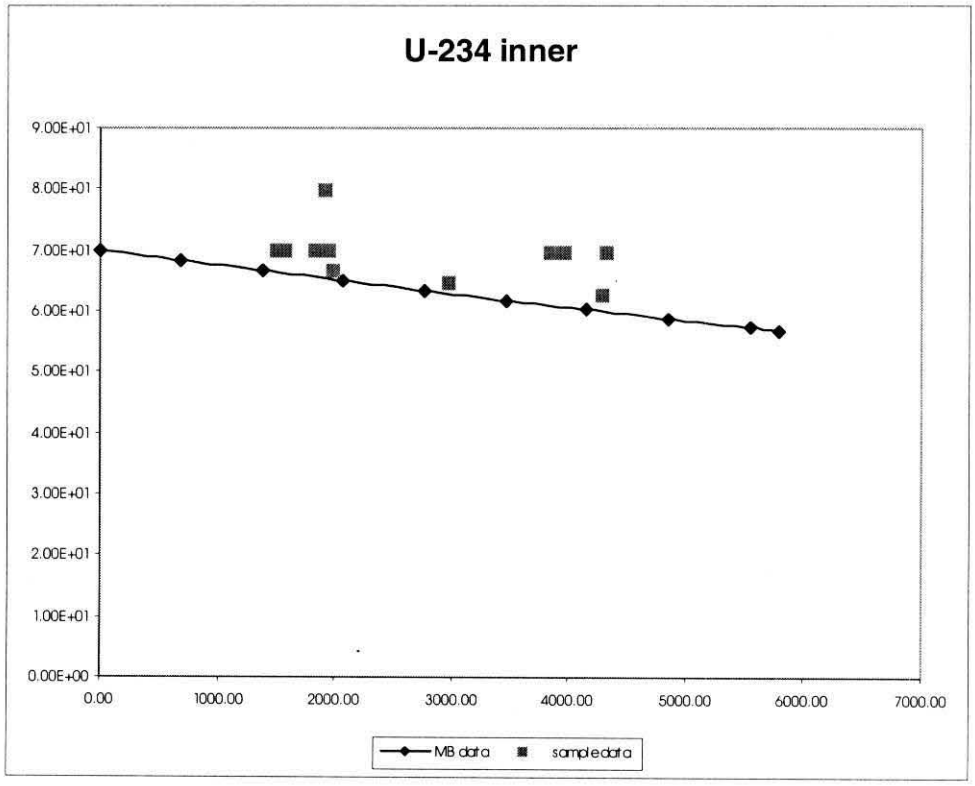


Figure E-4. Comparison of MONTEBURNS and Measurements for ^{235}U.

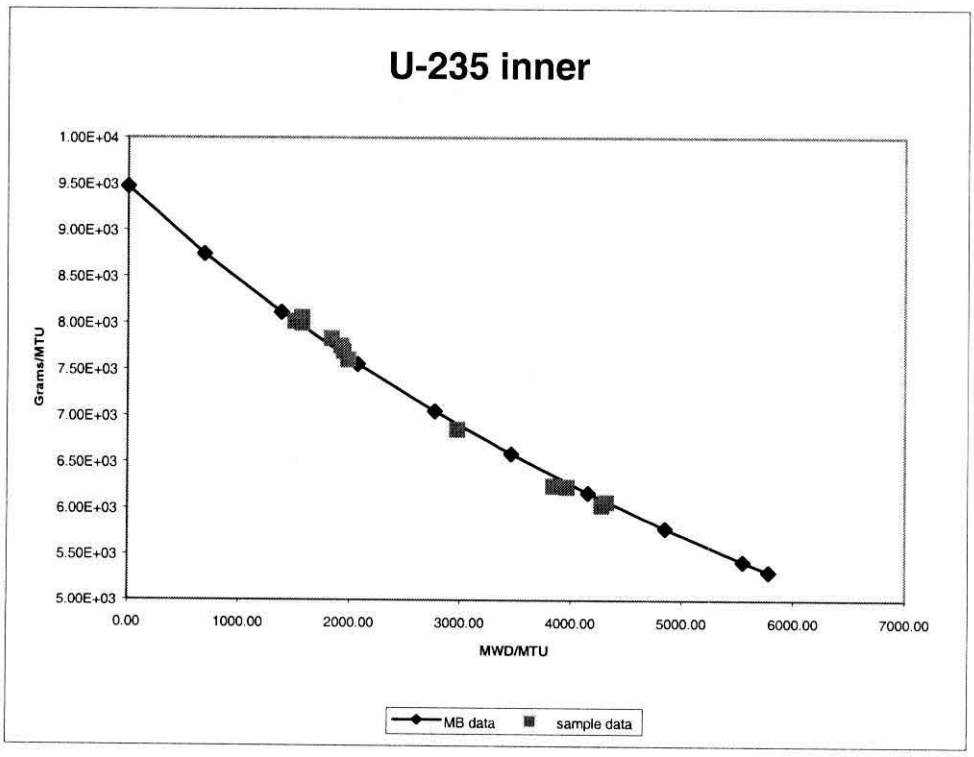


Figure E-5. Comparison of MONTEBURNS and Measurements for ^{236}U.

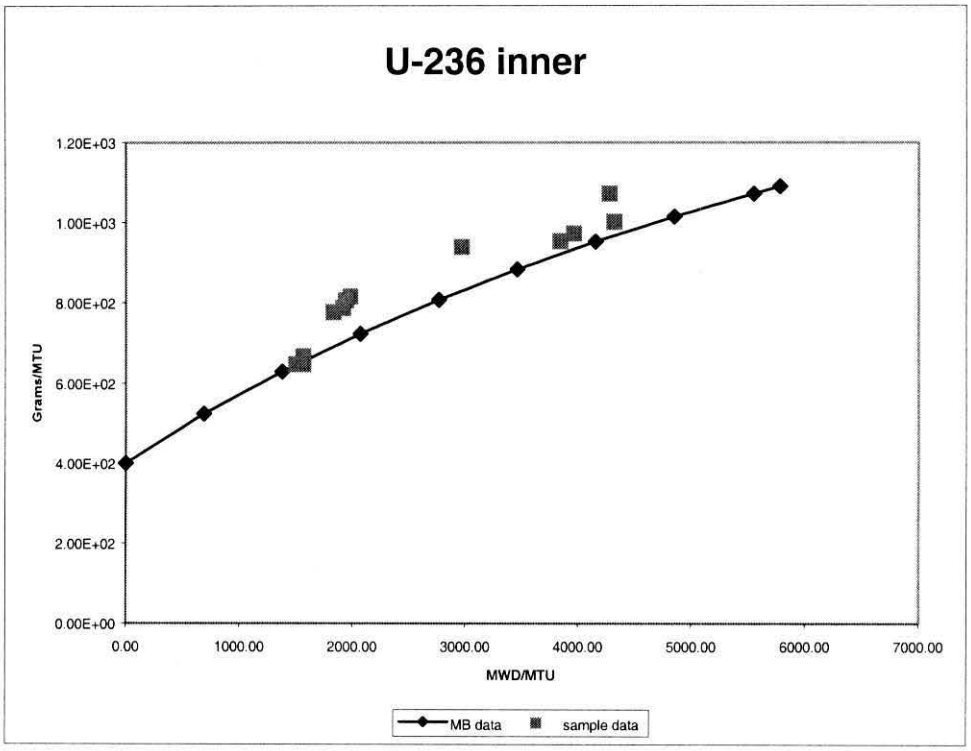


Figure E-6. Comparison of MONTEBURNS and Measurements for ^{238}U.

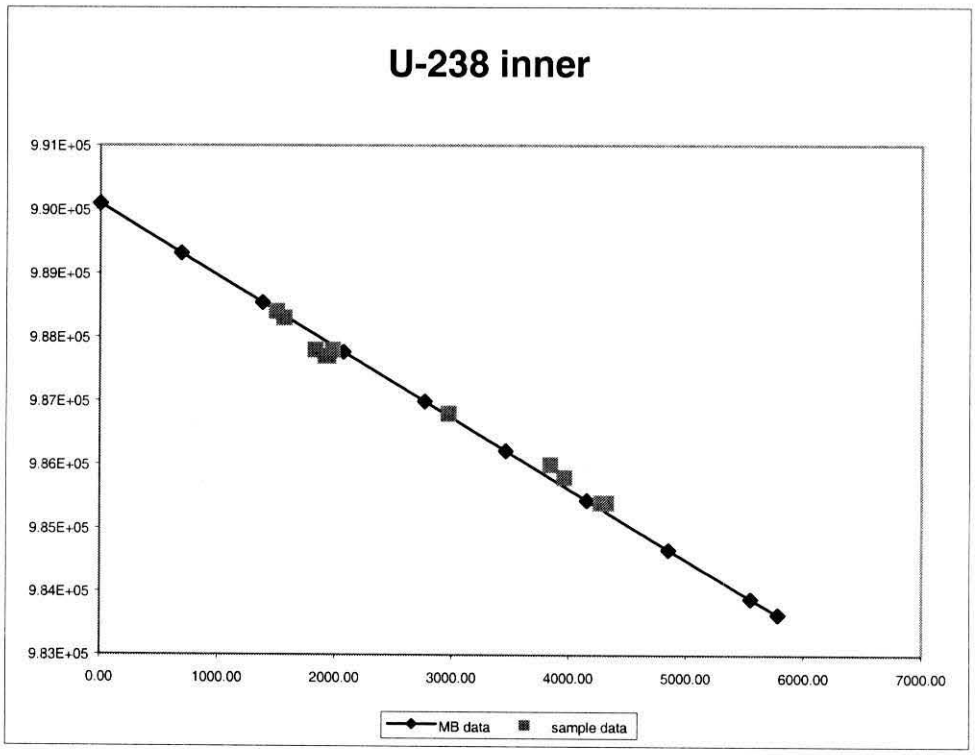


Figure E-7. Comparison of MONTEBURNS and Measurements for ^{238}Pu.

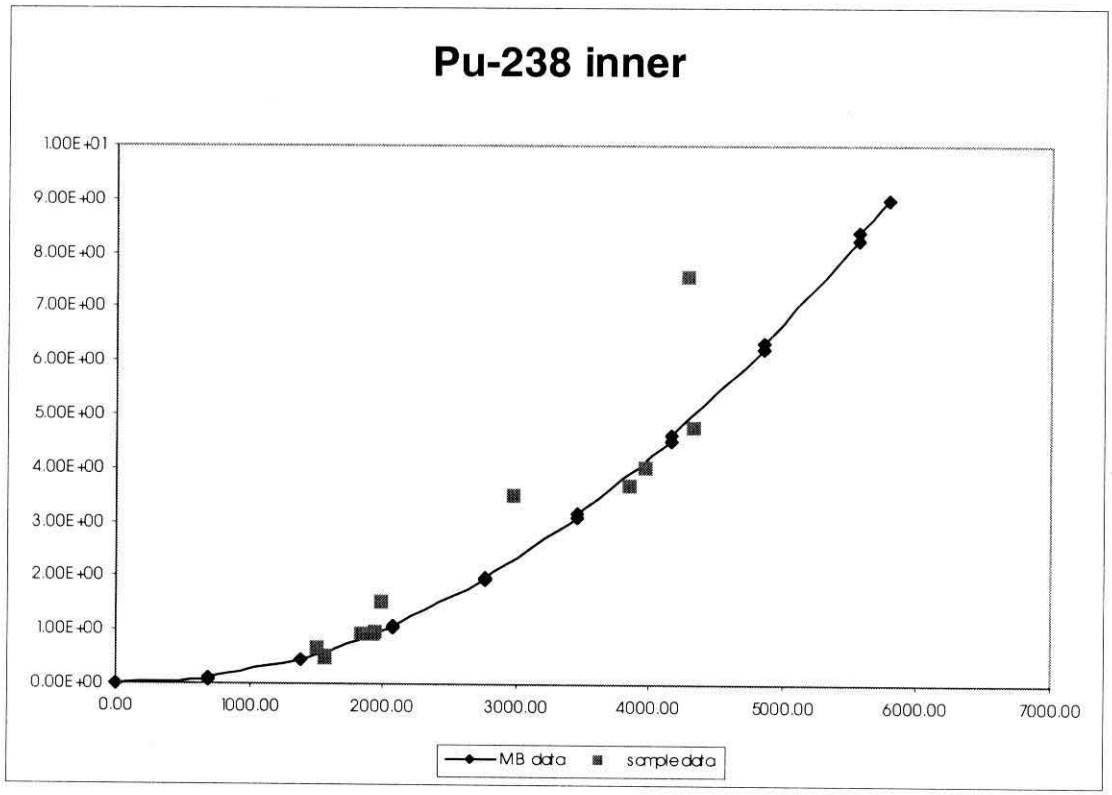


Figure E-8. Comparison of MONTEBURNS and Measurements for ^{239}Pu.

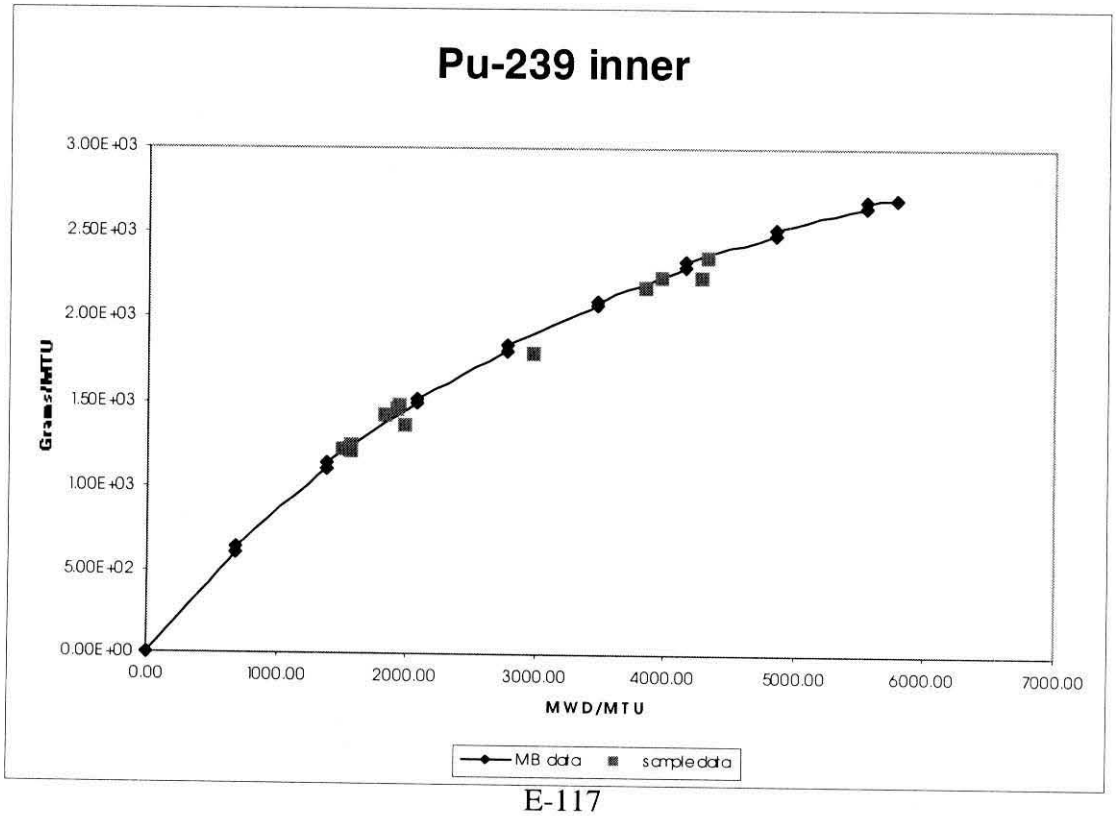


Figure E-9. Comparison of MONTEBURNS and Measurements for ^{240}Pu.

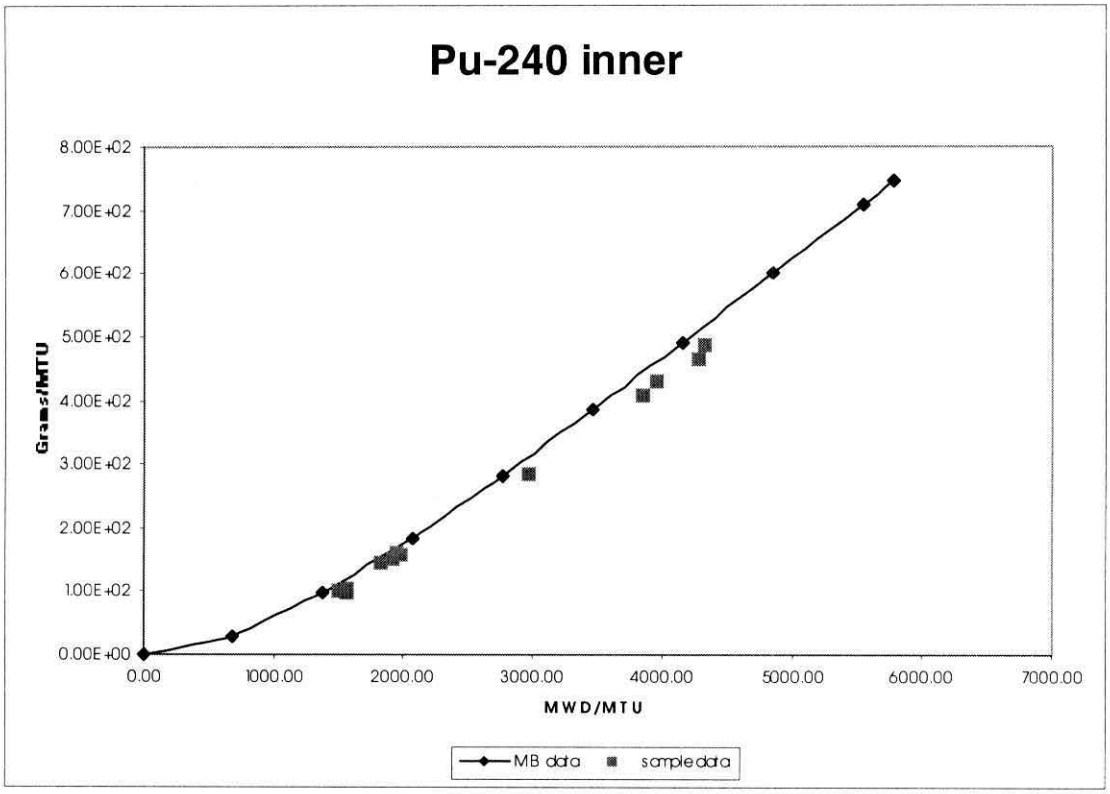


Figure E-10. Comparison of MONTEBURNS and Measurements for ^{241}Pu.

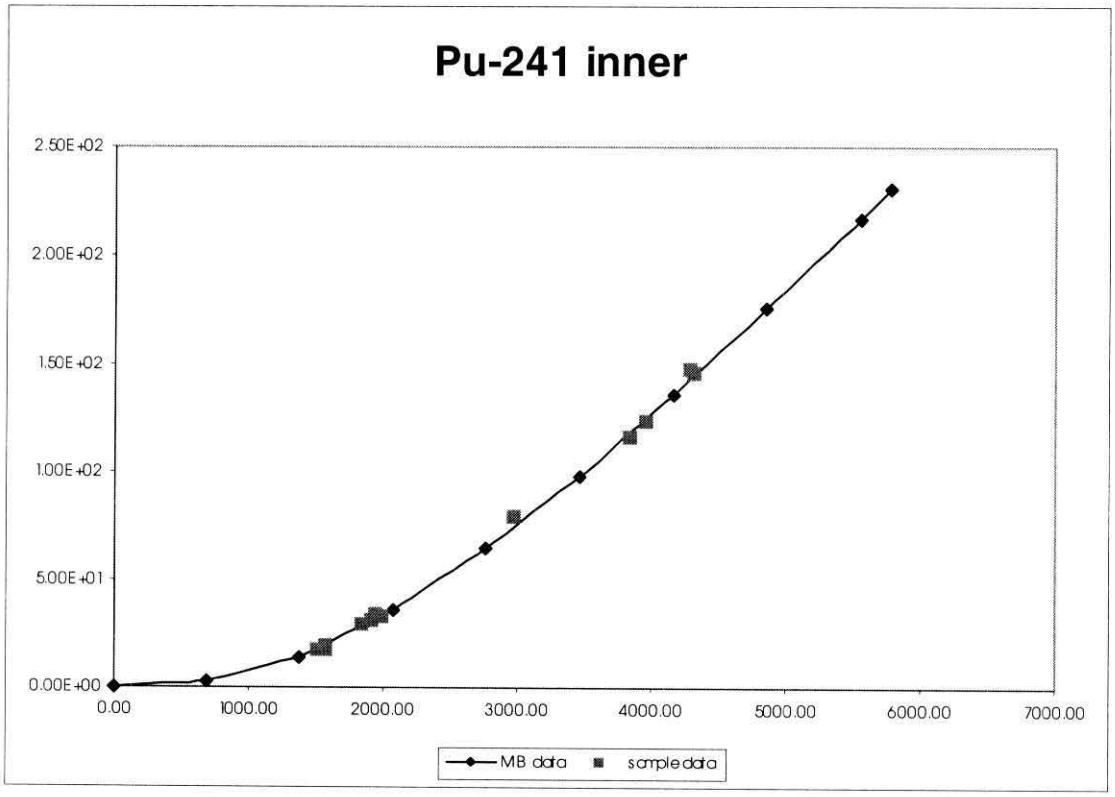


Figure E-11. Comparison of MONTEBURNS and Measurements for ^{242}Pu.

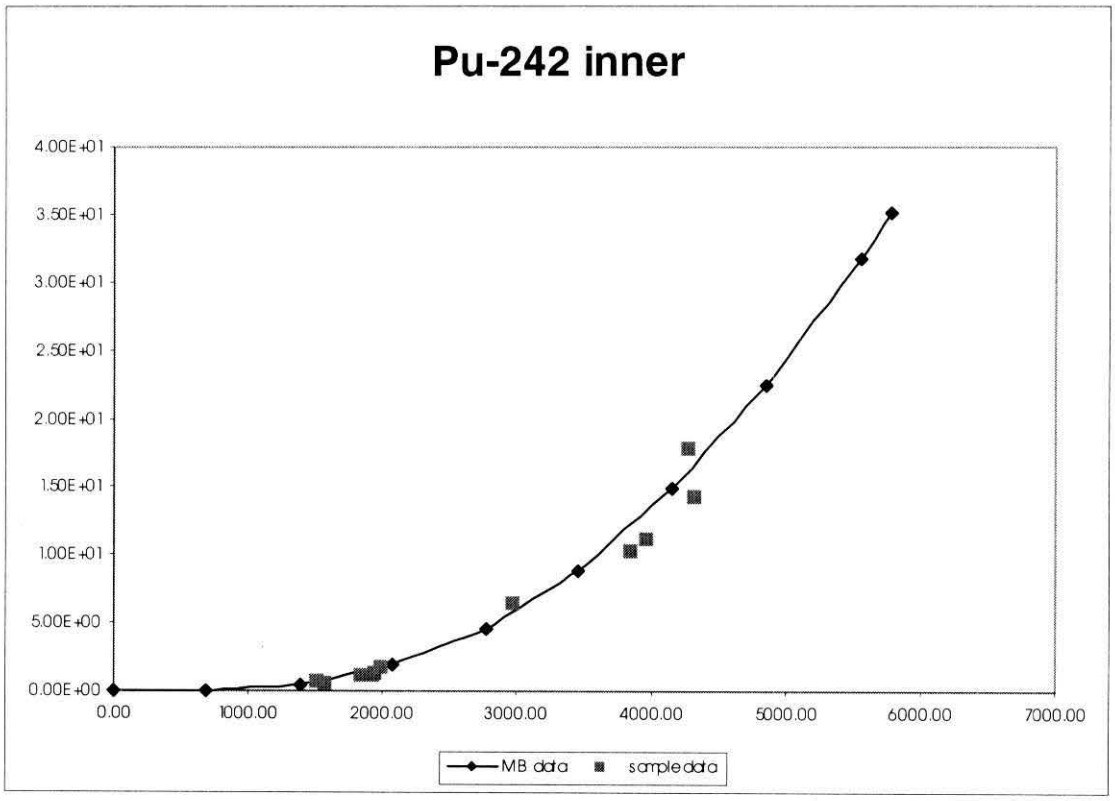


Figure E-12. Comparison of MONTEBURNS and Measurements for ^{143}Nd.

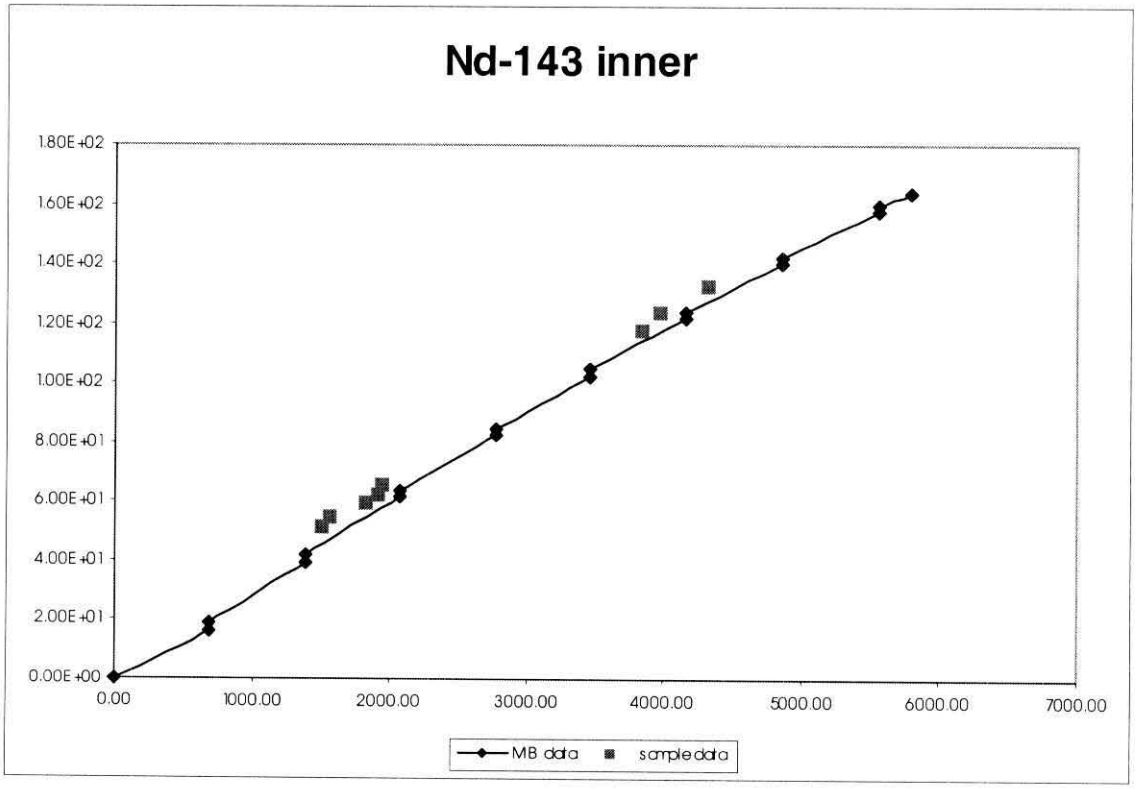


Figure E-13. Comparison of MONTEBURNS and Measurements for ^{144}Nd.

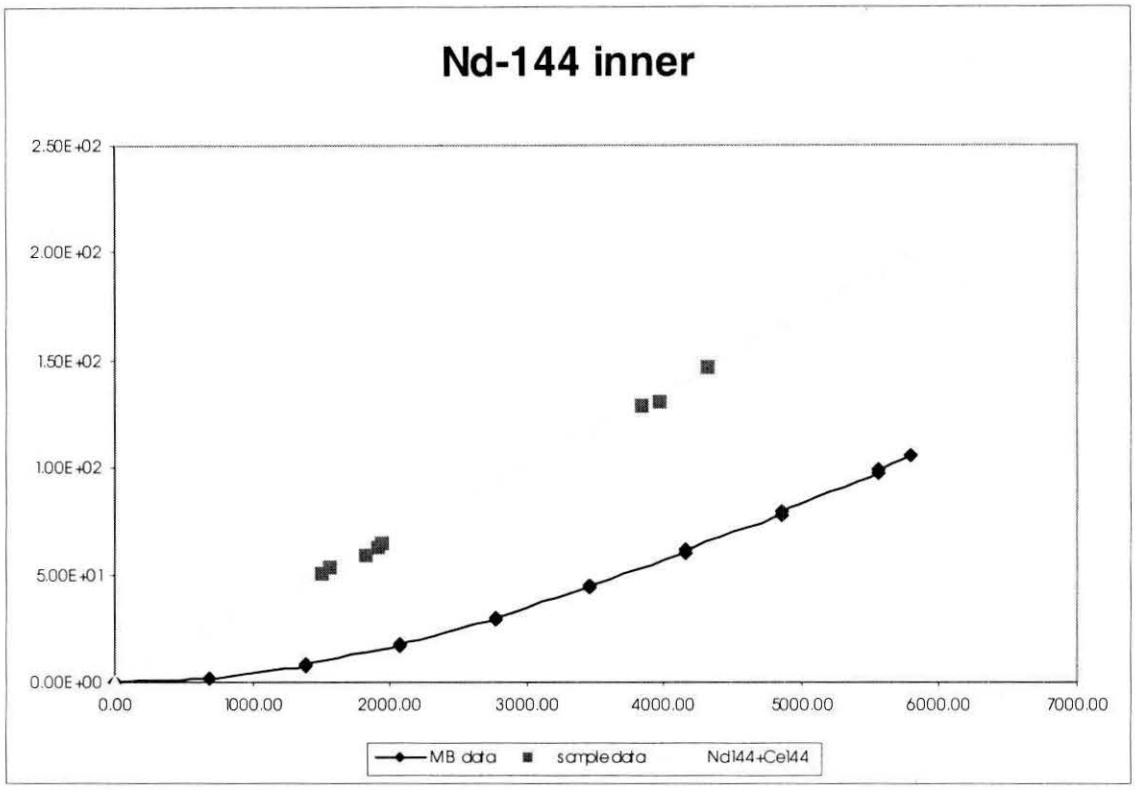


Figure E-14. Comparison of MONTEBURNS and Measurements for ^{145}Nd.

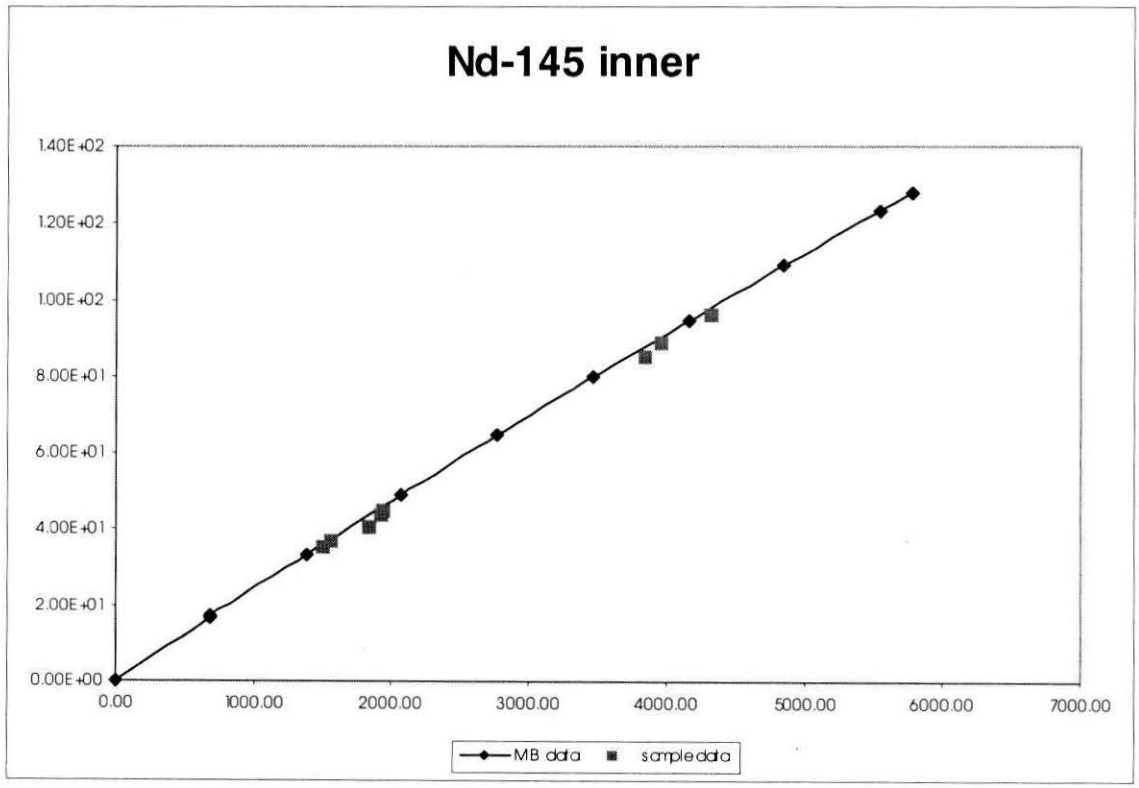


Figure E-15. Comparison of MONTEBURNS and Measurements for ^{146}Nd.

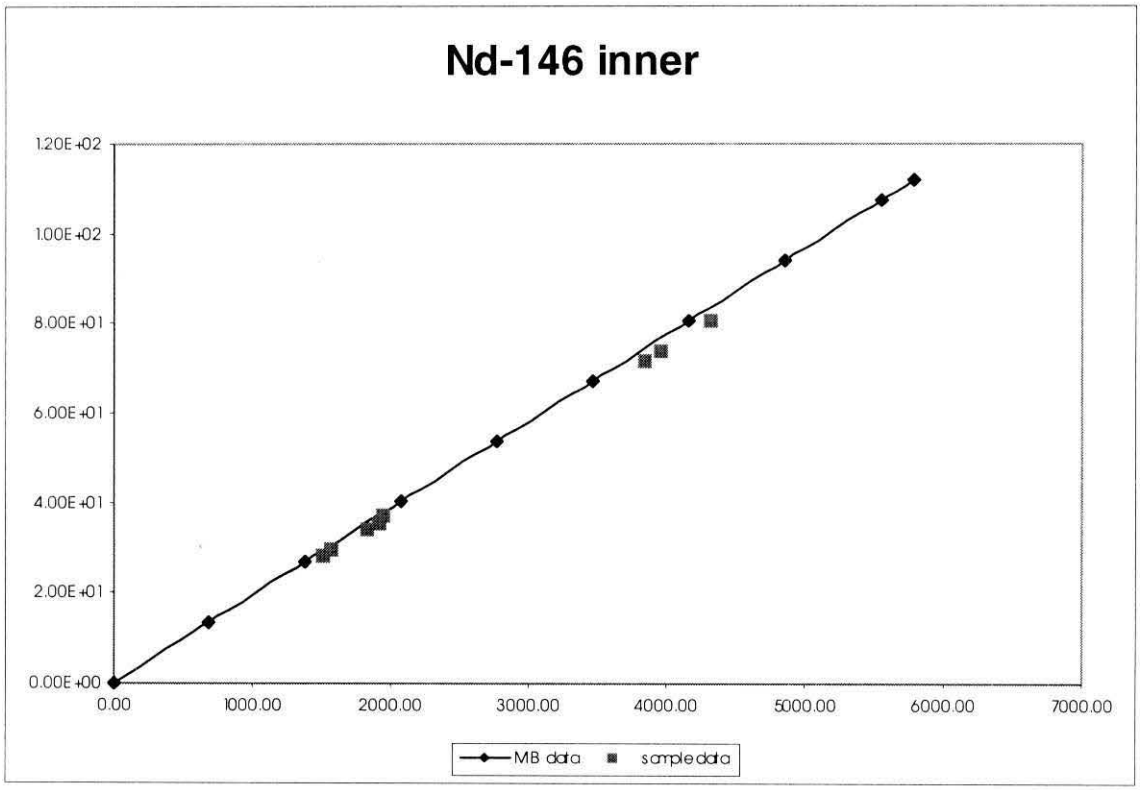


Figure E-16. Comparison of MONTEBURNS and Measurements for ^{148}Nd.

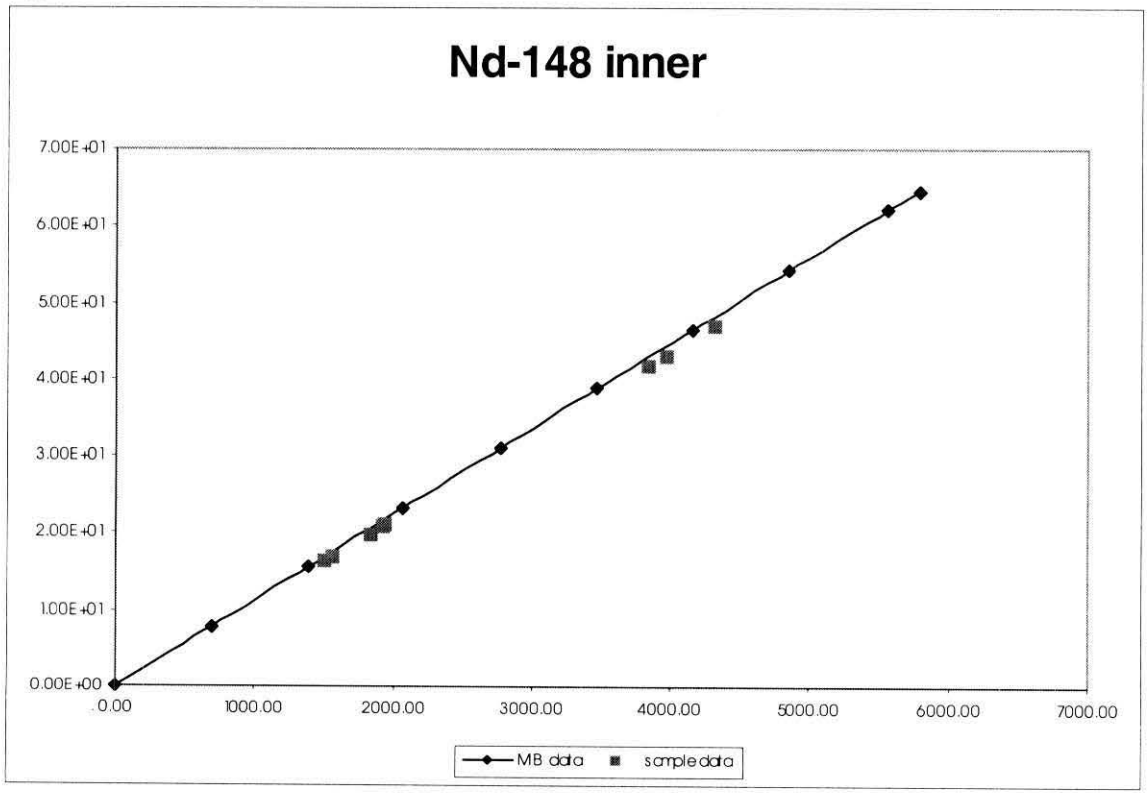
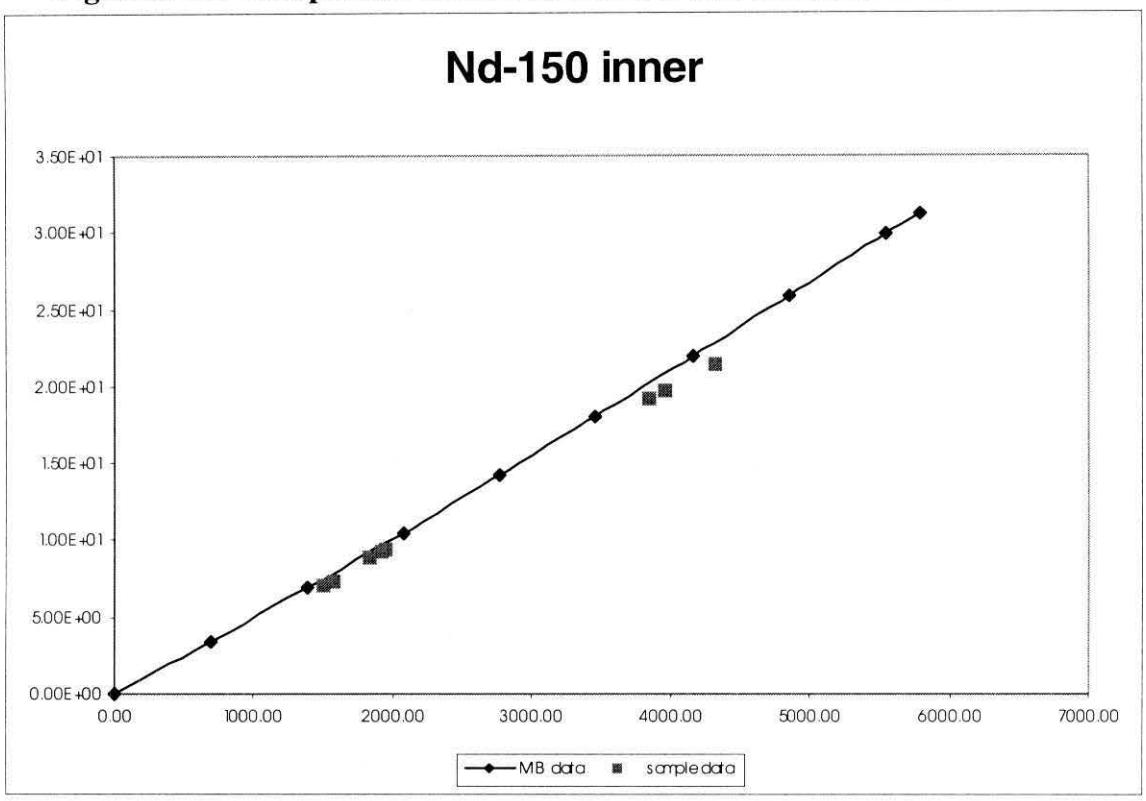


Figure E-17. Comparison of MONTEBURNS and Measurements for ^{150}Nd.



Input Files For Single Pass Reactor Cross Section Generation

K5n1a.inp

```
K Reactor K5N using PWR-U starting cross sections to 2420 MWD/MT ann1
PC          ! Type of Operating System
1           ! Number of MCNP materials to burn
3           ! MCNP material number #1 (will burn all cells with this mat)
181.025     ! Material #1 volume (cc), input 0 to use mcnp value (if exists)
0.039968    ! Power in MWt (for the entire system modeled in mcnp deck)
-200.       ! Recov. energy/fis (MeV); if negative use for U235, ratio other isos
200.0       ! Total number of days burned (used if no feed)
10           ! Number of outer burn steps
40          ! Number of internal burn steps (multiple of 10)
1           ! Number of predictor steps (+1 on first step), 1 usually sufficient
0           ! Step number to restart after (0=beginning)
PWRU        ! number of default origen2 lib - next line is origen2 lib location
e:\mb\newtests\k5n1
.001        ! fractional importance (track isos with abs,fis,atom,mass fraction)
0           ! Intermediate keff calc. 0) No 1) Yes
28           ! Number of automatic tally isotopes, followed by list.
92235.50c
92238.50c
93237.55c
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
43099.50c
45103.50c
54131.50c
55133.50c
54135.50c
60143.50c
60145.50c
61147.50c
62149.50c
62151.50c
62152.50c
27059.50c
28058.60c
28062.60c
28           ! Number of automatic tally isotopes, followed by list.
92235.50c
92238.50c
93237.55c
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
43099.50c
45103.50c
54131.50c
55133.50c
54135.50c
60143.50c
60145.50c
```

```
61147.50c
62149.50c
62151.50c
62152.50c
27059.50c
28058.60c
28062.60c
```

k5n1

```
k reactor hot conditions       k5n1 ann1
1    1  -0.9732  -1   11 -12                $ inner water
2    2  -2.70    1 -2 11 -12                $ al clad inner
3    3  -17.5158 2 -3 11 -12                $ u metal fuel
4    2  -4.023    3 -4 11 -12                $ al clad outer
5    1  -0.9940  4 -5 11 -12                $ outer water
6    4  -6.40    5 -6 11 -12                $ zr process tube
7    0           6 -7 11 -12                $ void
8    5  -1.610   7 -8 11 -12                $ graphite
9    0           8:-11:12           $ outside world

1    cz 0.39688                $ inner water
2    cz 0.67869                $ al clad inner
3    cz 1.82804                $ u metal fuel
4    cz 1.94107                $ al clad outer
5    cz 2.18999                $ outer water
6    cz 2.29540                $ zr process tube
7    cz 2.50241                $ void
*8       cz 10.7478            $ graphite
*11      pz -10
*12      pz  10

m1    1001.50 2.0    8016.50 1.0                          $water
mt1   lwtr.01t
m2   13027.50 1.                                          $al
m3   92235.50 -0.711 92236.50 -0.0285  92238.50 -99.2605  $u metal fuel
m4   40000.60 1.0                                         $zr
m5    6012.50 1.0                                         $graphite
mt5   grph.05t
mode n
kcode  500 1. 3
ksrc   1 0 0
imp:n  1 7r 0
totnu
tmp1  3.102e-8 3.447e-8 4.653e-8 3.016e-8 2.757e-8 2.844e-8 7.092e-8
      7.092e-8 7.092e-8
ctme  10.
```

k5e1.inp

```
K Reactor K5E using PWR-U starting cross sections to 400 days ann1
PC          ! Type of Operating System
1           ! Number of MCNP materials to burn
3           ! MCNP material number #1 (will burn all cells with this mat)
176.243     ! Material #1 volume (cc), input 0 to use mcnp value (if exists)
0.039968    ! Power in MWt (for the entire system modeled in mcnp deck)
-200.       ! Recov. energy/fis (MeV); if negative use for U235, ratio other isos
400       ! Total number of days burned (used if no feed)
20           ! Number of outer burn steps
40          ! Number of internal burn steps (multiple of 10)
1           ! Number of predictor steps (+1 on first step), 1 usually sufficient
0           ! Step number to restart after (0=beginning)
PWRU        ! number of default origen2 lib - next line is origen2 lib location
e:\mb\newtests\k5e1
.001        ! fractional importance (track isos with abs,fis,atom,mass fraction)
0           ! Intermediate keff calc. 0) No 1) Yes
28           ! Number of automatic tally isotopes, followed by list.
92235.50c
92238.50c
93237.55c
```

```
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
43099.50c
45103.50c
54131.50c
55133.50c
54135.50c
60143.50c
60145.50c
61147.50c
62149.50c
62151.50c
62152.50c
27059.50c
28058.60c
28062.60c
28          ! Number of automatic tally isotopes, followed by list.
92235.50c
92238.50c
93237.55c
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
43099.50c
45103.50c
54131.50c
55133.50c
54135.50c
60143.50c
60145.50c
61147.50c
62149.50c
62151.50c
62152.50c
27059.50c
28058.60c
28062.60c
```

k5e1

```
k reactor hot conditions       k5e1 ann1
1    1  -0.9903  -1   11 -12                $ inner water
2    2  -2.70    1 -2 11 -12                $ al clad inner
3    3  -17.1150 2 -3 11 -12                $ u metal fuel
4    2  -4.1521   3 -4 11 -12                $ al clad outer
5    1  -0.9921  4 -5 11 -12                $ outer water
6    4  -6.40    5 -6 11 -12                $ zr process tube
7    0           6 -7 11 -12                $ void
8    5  -1.610   7 -8 11 -12                $ graphite
9    0           8:-11:12           $ outside world

1    cz 0.55055                 $ inner water
2    cz 0.69406                 $ al clad inner
3    cz 1.81293                 $ u metal fuel
```

```
4     cz 1.92723                $ al clad outer
5     cz 2.19012                $ outer water
6     cz 2.29553                $ zr process tube
7     cz 2.50241                $ void
*8        cz 10.7478            $ graphite
*11       pz -10
*12       pz  10

m1     1001.50 2.0    8016.50 1.0                          $water
mt1    lwtr.01t
m2    13027.50 1.                                          $al
m3    92235.50 -0.947 92236.50 -0.0285  92238.50 -99.0245  $u metal fuel
m4    40000.60 1.0                                         $zr
m5     6012.50 1.0                                         $graphite
mt5    grph.05t
mode n
kcode  1000 1. 3
ksrc   1 0 0
imp:n  1 7r 0
totnu
tmp1  2.864e-8 3.287e-8 4.517e-8 3.133e-8 2.832e-8 2.886e-8 7.092e-8
      7.092e-8 7.092e-8
ctme  10.
```

Input Files For N Reactor Comparison With Measurements

mkiv500-1d2.inp

```
N Reactor MKIV using new PWR-U starting cross sections to 500 days
PC          ! Type of Operating System
2           ! Number of MCNP materials to burn
3           ! MCNP material number #1 (will burn all cells with this mat)
5           !
268.084     ! Material #1 volume (cc), input 0 to use mcnp value (if exists)
125.009     !
0.078030    ! Power in MWt (for the entire system modeled in mcnp deck)
-200.       ! Recov. energy/fis (MeV); if negative use for U235, ratio other isos
0           ! Total number of days burned (used if no feed)
17          ! Number of outer burn steps
40          ! Number of internal burn steps (multiple of 10)
1           ! Number of predictor steps (+1 on first step), 1 usually sufficient
0           ! Step number to restart after (0=beginning)
PWRU        ! number of default origen2 lib - next line is origen2 lib location
\\NW40057224\working\batch\kess8042
0.000001      ! fractional importance (track isos with abs,fis,atom,mass fraction)
0           ! Intermediate keff calc. 0) No 1) Yes
68           ! Number of automatic tally isotopes, followed by list- from endf/b5.
92234.50c
92235.50c
92236.50c
92238.50c
93237.55c
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
96245.35c
42095.50c
43099.50c
44101.50c
45103.50c
47109.50c
54131.50c
```

```
55133.50c
54135.50c
60143.50c
60145.50c
61147.50c
61149.50c
62147.50c
62149.50c
62150.50c
62151.50c
62152.50c
63153.55c
64155.50c
35081.55c
36083.59c
36084.59c
36086.59c
37085.55c
37087.55c
39089.60c
40093.50c
46105.50c
46108.50c
53127.55c
53129.60c
54134.35c
55134.60c
55135.50c
55137.60c
56138.50c
59141.50c
63151.55c
63154.50c
63155.50c
64154.50c
64156.50c
64157.50c
64158.50c
60148.50c
92237.51c
93239.60c
44103.50c
45105.50c
60147.50c
61148.50c
68          ! Number of automatic tally isotopes, followed by list- from endf/b5.
92234.50c
92235.50c
92236.50c
92238.50c
93237.55c
94238.50c
94239.55c
94240.50c
94241.50c
94242.50c
95241.50c
95242.50c
95243.50c
96242.50c
96243.35c
96244.50c
96245.35c
42095.50c
43099.50c
44101.50c
45103.50c
47109.50c
54131.50c
55133.50c
54135.50c
```

```
60143.50c
60145.50c
61147.50c
61149.50c
62147.50c
62149.50c
62150.50c
62151.50c
62152.50c
63153.55c
64155.50c
35081.55c
36083.59c
36084.59c
36086.59c
37085.55c
37087.55c
39089.60c
40093.50c
46105.50c
46108.50c
53127.55c
53129.60c
54134.35c
55134.60c
55135.50c
55137.60c
56138.50c
59141.50c
63151.55c
63154.50c
63155.50c
64154.50c
64156.50c
64157.50c
64158.50c
60148.50c
92237.51c
93239.60c
44103.50c
45105.50c
60147.50c
61148.50c
```

mkiv500-1d2.feed

Step	Time	PowFr.	mat#	Feed	Beg.Rate	End	Rem#	Fract.Rem.	
int	real	real	int	int	real	real	int	real	
1	60.0	1.000	1	0	0.0	0.0	0	0.000	
			2	0	0.0	0.0	0	0.000	
2	7.0	0.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
3	60.0	1.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
4	7.0	0.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
5	60.0	1.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
6	7.0	0.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
7	60.0	1.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
8	7.0	0.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
9	60.0	1.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
10	7.0	0.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
11	60.0	1.000	1	0	0.0	0.0	0	0.000	!
			2	0	0.0	0.0	0	0.000	
12	7.0	0.000	1	0	0.0	0.0	0	0.000	!

```
                        2   0     0.0       0.0     0  0.000
  13     60.0  1.000    1   0     0.0       0.0     0  0.000 !
                        2   0     0.0       0.0     0  0.000
  14      7.0  0.000    1   0     0.0       0.0     0  0.000 !
                        2   0     0.0       0.0     0  0.000
  15     60.0  1.000    1   0     0.0       0.0     0  0.000 !
                        2   0     0.0       0.0     0  0.000
  16      7.0  0.000    1   0     0.0       0.0     0  0.000 !
                        2   0     0.0       0.0     0  0.000
  17     20.0  1.000    1   0     0.0       0.0     0  0.000 !
                        2   0     0.0       0.0     0  0.000
   0                                ! # of feed specs
   0                                ! # isos in Feed #1
   0                                ! # of removal groups
! # of ranges in removal group
```

mkiv500-1d2

```
N reactor hot conditions mkiv, endf/b-5
c  old Cm-243 and 245 xs
c  new origen2 libraries, more complete mbxs
c  500 day irradiation at 60 day intervals
c  with 7 day intermediate shutdowns
1    1  -0.838   -1    15 -16                  $ inner water
2    2  -6.520    1 -2 15 -16                  $ zr clad inner
3    5  -18.329   2 -3 15 -16                  $ inner metal fuel
4    2  -6.520    3 -4 15 -16                  $ zr clad inner
5    1  -0.833    4 -5 15 -16                  $ middle water
6    2  -6.519    5 -6 15 -16                  $ zr clad outer
7    3  -18.329   6 -7 15 -16                  $ outer fuel
8    2  -6.519    7 -8 15 -16                  $ zr clad outer
9    1  -0.835    8 -9 15 -16                  $ outer water
10   2  -6.523    9 -10 15 -16                 $ zr process tube
11   0           10 -11 15 -16                 $ void
12   4  -1.710   11 -12 15 -16                 $graphite
13   0           12 -13 15 -16                 $void
14   4  -1.710   13 15 -16 -20                 $ graphite
15   0           20:-15:16                     $ outside world

1    cz 0.614                $ inner water
2    cz 0.664                $ zr clad inner
3    cz 1.559                $ inner metal fuel
4    cz 1.635                $ zr clad outer
5    cz 2.174                $ middle water
6    cz 2.225                $ zr clad outer
7    cz 3.036                $ outer metal fuel
8    cz 3.101                $ zr clad outer
9    cz 3.444                $ outer water
10   cz 4.144                $ zr process tube
11   cz 4.242                $ void
12   cz 8.598                $ graphite
13   cz 10.206               $ void
*15   pz -10.
*16   pz  10.
*20   cz  12.160          $ graphite

m1    1001.50c -0.1111    8016.50c -0.8889                 $water
mt1   lwtr.03t
m2   40000.60c 1.                                          $zr
m3   92234.50c -0.00007 92235.50c -0.00947 92236.50c -0.00040
     92238.50c -0.99006                                     $u .95% metal fuel
m4    6012.50c 1.0                                         $graphite
mt4   grph.05t
m5   92234.50c -0.00007 92235.50c -0.00947 92236.50c -0.00040
     92238.50c -0.99006                                     $u .95% metal fuel
mode n
kcode  1000 1. 10 210
ksrc  1 0 0
imp:n  1 13r 0
totnu
tmp1  4.300e-8 4.601e-8 5.239e-8 4.619e-8 4.334e-8 4.636e-8 5.239e-8
```

```
4.636e-8 4.317e-8 4.429e-8 4.429e-8 6.316e-8 6.316e-8 6.833e-8
6.833e-8
```

REFERENCES

Lan, J. S., 2001, *MCNP Version 4C Approval For Use Documentation and Authorized User List*, FFS-LEJ-02-002, July 26, Fluor Federal Services, Inc., Richland, Washington.

Perl, E. R., 1967, *Reactor Processing Isotope Production and Fuel Conversion Tables*, DUN-2625, Douglas United Nuclear, Inc., Richland, Washington.

Roblyer, S. P., 2001, *Software Certification Report for ORIGEN2 Version S.2*, HNF-8696, Rev. 0, Fluor Hanford, Richland, Washington.

Roblyer, S. P., 2002, Private Communication of printed output from historical MOFDA single pass reactor calculations.

Scott, J. H., 1965, *MOFDA A Reactor Design-Analysis Code*, RL-NRD-497, General Electric Hanford Atomic Products Operation, Richland, Washington.

Trellue, H. R., and D. I. Poston, 1999, *User's Manual, Version 2.0 For MONTEBURNS, Version 5B*, LA-UR-99-4999, Los Alamos National Laboratory, Los Alamos, New Mexico.

Wittekind, W. D., 1988, *Spent Fuel Isotopic and Chemical Analysis (Working Papers)*, WHC88-00049, Westinghouse Hanford Company, Richland, Washington.

APPENDIX F

DKPRO VERSION 3.1 VERIFICATION AND VALIDATION

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Table of Contents

F1.0 INTRODUCTION F-5

F2.0 VERIFICATION AND VALIDATION PLAN F-6

F3.0 CODE CONFIGURATION MANAGEMENT PLAN F-6

F4.0 VERIFICATION AND VALIDATION F-7

F4.1 TEST CASES F-8
F4.1.1 Base Case F-8
F4.1.2 Process Directive: Select F-9
F4.1.3 Process Directive: Reprocess F-9
F4.1.4 Process Directive: Scale F-9
F4.1.5 Process Directive: Split F-10
F4.1.6 Summary Directive: Stime F-10
F4.1.7 Summary Directive: Time F-10
F4.1.8 Interpolation Model F-11
F4.1.9 Process Directive: Decay F-11
F4.1.10 Process Directive: Final F-12
F4.1.11 Validation Test F-12

F4.2 SCOPE OF USE AND LIMITATIONS ON USE F-13

F5.0 REFERENCES F-14

ATTACHMENTS:

ATTACHMENT A. VERIFICATION AND VALIDATION TEST FILES FA-1

ATTACHMENT B. INSTALLATION TEST FILES FB-1

ATTACHMENT C. DKPRO EXECUTABLE STANDARD LIBRARY FILES FC-1

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F1.0 INTRODUCTION

This document serves to describe the use of the DKPRO code, version 3.1. It is based on HNF-SD-WM-CSWD-082, Rev. 0 (Wootan and Schmittroth 1997), which dealt with version 1.0 of the code (version 2.0 was never formally released).

The DKPRO code solves the general problem of modeling complex nuclear waste streams using ORIGEN2 (Croff 1980, Wittekind 1994) radionuclide production files. There is a continuing need for estimates of Hanford Site radionuclide inventories in various waste streams. Physical measurements provide one method of determining nuclide inventories; however, this is an expensive approach and vulnerable to heterogeneity in the waste. Calculational estimates, the approach represented here, provides an alternative method of determining the inventories. Given a known nuclear fuel history, it is relatively straightforward to calculate radionuclide inventories with codes such as the widely used Oak Ridge National Laboratory code ORIGEN2. However, the Hanford Site waste tanks typically contain mixtures of various waste streams coming from different fuel types and different separation processes. Resolving this complex history into predicted inventories for a particular tank would be an extremely time consuming process using ORIGEN2 alone. There is a need, therefore, for a method to easily and efficiently model these processes. As a response to this need, the DKPRO code was developed. This code takes ORIGEN2 calculated initial radionuclide inventories for each fuel discharge and then applies subsequent decay and reprocessing activities as appropriate.

This approach has already been implemented in another context by the RADNUC (Schwarz 1995) code, which has been used to estimate radionuclide inventories in the Hanford Site waste tanks and spent-fuel in the K-Basins. While RADNUC could be modified to treat the more general problem addressed here, much of the RADNUC code includes specific assumptions and approximations that limit its extension.

The DKPRO code uses the decay and transmutation subroutine from ISOCALC (Schmittroth 1995). Unlike RADNUC, the decay and transmutation chains are solved completely and can use the same nuclear data as ORIGEN2 ensuring consistency with ORIGEN2 calculations. Another design advantage of DKPRO is the inclusion of ORIGEN2-based initial inventories in external files that can be easily added or changed without the need for code modifications.

The DKPRO code, used in conjunction with the ORIGEN2 code, provides an efficient method for modeling radionuclide generation, decay, and reprocessing. The capability to simplify complex processes and the flexibility of this method allow for many potential applications. The primary intended application of the DKPRO code is in the generation of input for global radionuclide inventory estimates for Hanford Site tank wastes. The inclusion in one code of the whole process of generating global tank inventories, from radionuclide generation and decay through reprocessing, provides opportunities for easy sensitivity studies and evaluation of what-if scenarios for global tank inventories. The global inventories can also be categorized by reprocessing plant and by specified time periods. In addition to the cumulative totals, inventory listings are produced for each of the discharge records in the fuel history data file.

The radionuclide inventories generated by the DKPRO code are entirely dependent on the assumptions and accuracy of the historical data represented by the input parameters. These parameters include fuel history, fuel and cladding compositions and impurities, and the effects of the various waste reprocessing splits and recovery factors. The inventories are also dependant on the physical parameters (such as half-lives and cross sections) included in the ORIGEN2 data libraries. Varying any of these parameters can significantly impact the DKPRO results.

The version 3.1 release of DKPRO differs from the previous version primarily in its ability to differentiate between primary and secondary streams (resulting from the "split" directive) when executing the "reprocess" directive (i.e., different reprocessing factors can be applied to the different streams). The version 3.1 documentation also covers modifications that were originally labeled as versions 3.0 and 2.0 but were never formally released. Version 3.0 was a port to the Intel/NT operating environment. At the same time a number of cosmetic modifications were added to the code output (such as time/date stamps, input echoes, etc.) to facilitate validation and configuration control. Version 2.0 added the 'subtype' process directive, and implemented Y2K compliance updates.

The use of DKPRO version 3.1 is described in a separate document (Finfrock 2002).

F2.0 VERIFICATION AND VALIDATION PLAN

DKPRO will be verified and validated according to the following procedure:

The initial compilation of the code will be tested and compared to independent data to verify its correctness and validate its intended use. These tests (described in Section F4.0 and Attachment A) should show that the results, ignoring interpolation, agree with the expected values to within a fractional difference of 0.001, however differences up to 0.01 are acceptable. Interpolation will introduce larger errors depending on the database that is used, which is case dependant. The maximum allowable errors including interpolation is case dependant and must be determined as part of the analysis; however, typically these errors should be less than 0.1 for nuclides of interest (e.g., those specified in the input file). If larger errors are found, then they must be documented and their implications included in any analysis using the code.

Any new version of the code must be tested by running the installation test (documented in Attachment B) and comparing the results to the expected results. Fractional differences should be no greater than 1.0e-3. If larger differences are found, then they (and their implications) should be documented and a revised installation test case issued for use in future tests.

F3.0 CODE CONFIGURATION MANAGEMENT PLAN

Code configuration management is an essential part of the effective use of any code. This function helps to ensure that the correct version of the code (and associated data library) is used, and that the user is aware of any changes in the code and any limitations in the use of the code.

For DKPRO the code configuration management plan consists of the following elements:

1. Each version of the code executable is assigned a unique identifier. A copy of the code shall be considered a new version if it represents a new compilation and is made available for use.

2. Each version of the code will uniquely identify itself when executed.

3. Any new version or installation of the code will be tested (see Section F2.0), and the results documented, before it is approved for use.

4. The source code associated with each version (including inactive versions) of the code will be preserved separately.

5. Access to the source code and any inactive versions of the executable will be limited to the code custodian, to the extent practical.

6. Each data library file will be assigned a unique identifier, or its name and creation date will be documented. These files shall be protected from unauthorized modification, to the extent practical.

7. A list of authorized users will be maintained. Access to the code will be limited to authorized users, to the extent practical. In the event of upgrades, changes, or problems with the code, the authorized users will be notified.

F4.0 VERIFICATION AND VALIDATION

The DKPRO code functions primarily as a database. It is given a database file containing historical fuel records and, based on inputs to the code, performs various database like functions such as sorting, summing, and multiplying the fuel data. These type of functions, being simple algebraic functions, are exact and can be verified to be functioning correctly by comparing the results of simple cases to hand calculations. The code does, however, have two more complex functions. The first is an interpolation on its database of nuclide content versus fuel exposure, and the second is modeling the radioactive decay of the nuclides over time. Because both of these functions are too complex to be checked with hand calculations, their accuracy must be validated against data from another source.

Verification and validation for the original version (1.00) of DKPRO has been previously documented (Schmittroth et al. 1995). This earlier work consisted of the replication of an ORIGEN2 calculation of all single-pass reactor and N reactor operations. This calculation supported preliminary radionuclide estimates for the Low-level Waste (LLW) program and included multiple fuel types as well as variable reprocessing coefficients and cooling times. Because this was a replication of an ORIGEN2 calculation, the results could be compared directly in order to evaluate the accuracy of the code.

An additional validation of the code was performed (Watrous and Wootan 1997) by running a case summarizing the inventories corresponding to all of the fuel that had passed through the various processing plants. This is the type of calculation that is performed to provide data to the Standard Tank Inventory characterization effort and is characteristic of the typical use of the code. Because of the very complex nature of this type of calculation, the results were evaluated, on an isotope-by-isotope basis, for "reasonableness" but were not explicitly checked for accuracy. The case was also summarized to determine the total fuel (MTU) and total burnup (MWd) for each year for both the single pass reactors and the N Reactor. These results were then compared to published data from other sources and found to be acceptably close.

This verification and validation effort uses an approach similar to the original. A set of cases were developed and executed using only a small subset of the fuel records available (typically one or two batches). These cases could be modeled exactly using the Origen2 code. The Origen cases were also run and the results compared to the DKPRO results using a spreadsheet. This comparison serves as validation that the code models the fuel processing correctly. The various directives (options) employed by the code were similarly tested and verified to function correctly by executing an arbitrary case with and without the directive and comparing the results with a spreadsheet. All of these cases were performed using the computer, executable, and standard library files identified in Attachment C. The individual cases, including the features they test and the results, are described in Section F4.1.

F4.1 TEST CASES

F4.1.1 Base Case

This case (named valid1) tests the basic functions of the code. It also serves as a base case for comparison with many of the verification tests described in subsequent sections.

For this case, a fuel record file (valid1.prn) was created by selecting a single fuel batch from the archive fuel record file. Input, process, and summary directive input files were created that would result in this batch being processed. These files are listed in Attachment A.

An Origen2 model was then created and executed to model this fuel batch. The resulting fuel data file was then provided to DKPRO as an input by modifying the fuel dictionary file (these files are also shown in Attachment A). The remainder of the input files (e.g., the other Origen fuel data files and the decay library) were from the standard DKPRO library (see Attachment C).

The nuclide amounts in the Origen file (which are normalized to 1 mtu of fuel) were multiplied by the amount of fuel in the batch (3413 mtu) and the resulting total amount of each nuclide compared to the DKPRO results. The DKPRO 'output' file was first compared to the DKPRO 'runlog' file. The fractional difference (equal to the absolute value of the difference between the two files, divided by the 'output' file value) was calculated for each nuclide in the 'output' file and found to be less than 1.0e-3 for all nuclides. The 'runlog' file was then compared to the origen data file. The fractional difference was calculated for all nuclides appearing in either file.

The fractional difference was found to be less than 1.0e-3 for all nuclides. The 'runlog' file is included in Attachment A.

F4.1.2 Process Directive: Select

This case (named valid2) serves to verify that the process directive 'select' functions correctly. The case was set up to select uranium (i.e., to only include uranium and parent nuclides in the calculations, and only uranium in the results). The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

The results of this case were compared to those from Section F4.1.1 (for uranium nuclides only). The fractional differences were found to be less than 1.0e-3 for all nuclides.

F4.1.3 Process Directive: Reprocess

The 'reprocess' directive has two modes that it can be used in. It can either specify a fraction of the total mass of one nuclide to be considered in the calculation, or, using the keyword 'given', it can specify that the fractions provided in the fuel record file (for thorium, uranium, neptunium, and plutonium) be used. Two separate cases were created, one to test each mode.

The first case (named valid3) tests the 'reprocess' directive with an explicit reprocessing factor. The case was set up to consider 10 percent of all uranium (i.e., to remove 90 percent of the uranium from the calculation and results). The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

The results of this case were compared to those from Section F4.1.1 (the uranium results from Section F4.1.1 were multiplied by 0.1 before comparing). The fractional differences were found to be less than 1.0e-3 for all nuclides.

The second case (named valid3a) tests the 'reprocess' directive with the 'given' keyword. The reprocessing factors given in the fuel record file are 1.00000, 0.00284, 0.28352, and 0.01024 for Th, U, Np, and Pu, respectively. The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

The results of this case were compared to those from Section F4.1.1 (the Th, U, Np, and Pu results from Section F4.1.1 were multiplied by the appropriate factor before comparing). The fractional differences were found to be less than 1.0e-3 for all nuclides.

F4.1.4 Process Directive: Scale

This case (named valid4) serves to verify that the process directive 'scale' functions correctly. This directive multiplies the amount of all nuclides present by a constant value. The case was set up to scale the results by a factor of 0.1. The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

The results of this case were compared to those from Section F4.1.1 (the results from Section F4.1.1 were multiplied by 0.1 before comparing). The fractional differences were found to be less than 1.0e-3 for all nuclides.

F4.1.5 Process Directive: Split

This case (named valid5) serves to verify that the process directive 'split' functions correctly. This directive splits the results into two parts, with the sum equal to the unsplit value. The case was set up to create one output stream with 90 percent of the total for all nuclides except uranium, which would have only 10 percent. All of the remaining material would go to the second stream. The input for this case was the same as described in Section F4.1.1 except for the input and process directive files, which are shown in Attachment A.

The results of this case (each stream and the total) were compared to the totals from Section F4.1.1 (the results from Section F4.1.1 were multiplied by the appropriate factors before comparing to the split streams). The fractional differences were found to be less than 1.0e-3 for all nuclides.

F4.1.6 Summary Directive: Stime

This case (named valid6) serves to verify that the summary directive 'stime' functions correctly. This directive allows the summary output (to the file 'runlog') to be limited by the separation date of the fuel. The case was set up to create an additional column of summary output, with the second column limited to fuel batches with a separation date from 1/1967 to 1/1968. The input for this case was the same as described in Section F4.1.1 except for the input and summary directive files, which are shown in Attachment A. Also, this case used the full fuel record file (as indicated in the input directive file) rather than the abbreviated one described in Section F4.1.1.

To check the results of this case, the fuel record file was examined. All of the batches with the appropriate plant, fuel type, and separation date were found, and the total amount of uranium represented by these batches determined. This value was compared to the amount of uranium shown in the summary output (41.57 MTU). These two values agreed exactly. This comparison confirmed that only the batches with separation dates in the appropriate range were processed (for the second summary column).

F4.1.7 Summary Directive: Time

This case (named valid7) serves to verify that the summary directive 'time' functions correctly. This directive allows the summary output (to the file 'runlog') to be limited by the discharge date of the fuel. The case was set up to create an additional column of summary output, with the second column limited to fuel batches with a discharge date from 1/1967 to 1/1968. The input for this case was the same as described in Section F4.1.6 except for the summary directive file, which is shown in Attachment A.

To check the results of this case, the fuel record file was examined. All of the batches with the appropriate plant, fuel type, and discharge date were found, and the total amount of uranium represented by these batches determined. This value was compared to the amount of uranium shown in the summary output (85.13 MTU). These two values agreed exactly. This comparison confirmed that only the batches with discharge dates in the appropriate range were processed (for the second summary column).

F4.1.8 Interpolation Model

This case (named valid8) tests the DKPRO interpolation model. DKPRO uses a database relating fuel composition to fuel exposure. The actual exposures of the fuel batches in the fuel record file typically don't correspond to the exposures in the database so interpolation is required. This case is similar to the one described in Section F4.1.1 except that the data file with the same exposure as the fuel batch is not included in the database. The input for this case was the same as described in Section F4.1.1 except that the fuel dictionary file and all fuel database files come from the standard DKPRO library (see Attachment C).

The nuclide amounts in the Origen file were multiplied by the amount of fuel in the batch (as in Section F4.1.1) and the resulting total amount of each nuclide compared to the DKPRO results. The fractional difference was calculated for each nuclide as in the other cases. In this case, 13 nuclides were found to have fractional differences in the range of 0.1 to 1.0. These discrepancies, however, all occurred in nuclides with very high atomic weights (>248) and/or short half-lives (< 1 month). None of these nuclides were in the list of nuclides that are typically of interest in the DKPRO evaluations (i.e., the nuclides listed in the input directive file). Considering only the nuclides of interest, the highest fractional difference was 0.026 for ^{241}Am (a discrepancy of less than 3 percent).

F4.1.9 Process Directive: Decay

The 'decay' directive is used to model the radioactive decay that occurs in the fuel after it is discharged from the reactor. The directive has two modes: it can specify a period of time to decay the fuel for, or it can, using the keyword 'given', cause the fuel to be decayed for a period of time (the cooling period) included in the fuel record file for each batch. Two cases were created to test this directive, one for each mode.

The first case (named valid9) tests the DKPRO 'decay' directive with a fixed decay period. This case was set up to cause the fuel to be decayed for a period of 30 days. The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

An Origen2 model was then created and executed to model this fuel batch (including the decay period). The nuclide amounts in the Origen file were compared to the DKPRO results as in the case described in Section F4.1.1. The fractional difference was calculated for all nuclides appearing in either file. The fractional differences exceeded 0.1 for approximately 80 nuclides. These discrepancies, however, mostly occurred in nuclides with short half-lives (< 1 month).

A few stable nuclides (e.g., ^{3}He) had errors on this order but they were present only in very small amounts (<1e-5 mol). None of the nuclides with large errors were in the list of nuclides that are typically of interest in the DKPRO evaluations (i.e., the nuclides listed in the input directive file). Considering only the nuclides of interest, the highest fractional difference was 0.009 for ^{241}Am (a discrepancy of less than 1 percent).

The second case (named valid9a) tests the DKPRO 'decay' directive with 'given' keyword. The cooling period for the fuel batch in the fuel record file was 194 days. The input for this case was the same as for case valid9 except for the process directive file, which is shown in Attachment A.

As in the above case, an Origen2 model was created and executed to model this fuel batch (including the decay period). The nuclide amounts in the Origen file were compared to the DKPRO results as in the case described in Section F4.1.1. The fractional difference was calculated for all nuclides appearing in either file. The fractional differences exceeded 0.1 for approximately 40 nuclides. These discrepancies, as in case 9 above, occurred only with nuclides that have short half-lives or were otherwise unimportant. None of these nuclides were in the list of nuclides that are typically of interest in the DKPRO evaluations (i.e., the nuclides listed in the input directive file). Considering only the nuclides of interest, the highest fractional difference was 0.005 for ^{228}Ra (a discrepancy of less than 1 percent).

F4.1.10 Process Directive: Final

This case (named valid10) tests the DKPRO 'final' directive. The 'final' directive is similar to the 'decay' directive in that it initiates a radioactive decay model. The length of the decay period is determined by taking the end date (provided as a parameter to the directive), and then subtracting the fuel discharge date and any preliminary decay periods. The end time specified for this case was 1/2001, which has a HAPO number of 20551. This date, along with the fuel discharge date of HAPO 8134.7 implies a decay period of 12,416 days. The input for this case was the same as described in Section F4.1.1 except for the process directive file, which is shown in Attachment A.

An Origen2 model was then created and executed to model this fuel batch (including the decay period). The nuclide amounts in the Origen file were compared to the DKPRO results as in the case described in Section F4.1.1. The fractional difference was calculated for all nuclides appearing in either file. The fractional differences exceeded 0.1 for approximately 20 nuclides. These discrepancies, as in Section F4.1.9, occurred only with nuclides that have short half-lives or were otherwise unimportant. None of these nuclides were in the list of nuclides that are typically of interest in the DKPRO evaluations (i.e., the nuclides listed in the input directive file). Considering only the nuclides of interest, the highest fractional difference was 0.004 for ^{242}Cm (a discrepancy of less than 1 percent).

F4.1.11 Validation Test

This case (named valid13) tests the overall ability of DKPRO to model the Hanford Site waste stream. This case uses a fuel record file (valid13.prn) with two batches, uses the standard

DKPRO library (so interpolation is required), and uses the 'decay given' and 'final' process directives. The input, process, and summary directive files are included in Attachment A.

The Origen2 model described in Section F4.1.10 was used as validation data, along with a similar model created to model the other batch used in this case. The nuclide amounts in the Origen files were compared to the DKPRO results. The fractional difference was calculated for all nuclides.

The fractional differences exceeded 0.1 for approximately 30 nuclides. These discrepancies, however, all occurred in nuclides that have short half-lives and/or were present in very small amounts. None of these nuclides were in the list of nuclides that are typically of interest in the DKPRO evaluations (i.e., the nuclides listed in the input directive file). Considering only the nuclides of interest, the highest fractional difference was 0.021 for ^{14}C (a discrepancy of less than 3 percent).

F4.2 SCOPE OF USE AND LIMITATIONS ON USE

The DKPRO code is validated for use with input data representing historical Hanford Site fuel types and exposures as documented in the fuel record file (unified6rep.prn – see Attachment C).

The accuracy of the results will be dependant on the fuel database used (due to the effects of interpolation over exposure). This database should be tested prior to use to ensure that it produces results that have a degree of accuracy sufficient for the intended analysis. This typically takes about 20 exposure points for each fuel type.

In addition, the following limitations on code use have been identified:

- The code has not been tested with a fuel record file format other than "lanl", and, therefore, is not approved for use with such a file.
- All fuel exposures used in creating the fuel data files should be greater than 0.0.
- All exposures in the fuel record file, for fuels other than MKII, should be greater than 0.0.

F5.0 REFERENCES

Croff, A. G., 1980, *ORIGEN2- A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code*, ORNL-5621, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Finfrock, S. H., 2002, *DKPRO Version 3.1 User's Manual*, Fluor Federal Services, Richland, Washington.

Schmittroth, F., 1995, *ISOCALC: A Decay and Transmutation Code*, WHC-SD-ER-CSWD-0008, Westinghouse Hanford Company, Richland, Washington.

Schmittroth, F., T. H. DeLorenzo, D. W. Wootan, and D. Y. Garbrick, 1995, *Inventories for Low-Level Waste Tank Waste*, WHC-SD-WM-RPT-164, Westinghouse Hanford Company, Richland, Washington.

Schwarz, R. A., 1995, *Certification of RADNUC*, WHC-SD-HWV-SWD-001, Westinghouse Hanford Company, Richland, Washington.

Watrous, R. A., and D. W. Wootan, 1997, *Activity of Fuel Batches Processed Through Hanford Separations Plants, 1944 Through 1989*, HNF-SD-WM-TI-794, Rev. 0, Lockheed Martin Hanford Corporation, Richland, Washington.

Wittekind, W. D., 1994, *Software Certification Package for the ORIGEN2 Code*, WHC-SD-NR-SWD-006, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Wootan, D. W., and F. Schmittroth, 1997, *DKPRO: A Radionuclide Decay and Reprocessing Code*, HNF-SD-WM-CSWD-082, Rev. 0, Fluor Daniel Northwest, Richland, Washington.

ATTACHMENT A

VERIFICATION AND VALIDATION TEST FILES

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Base Case Files:

valid1.inp:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures

PATH    p:\dkpro\lib

FILE    u:\data\dkpro\validation\v31\valid1\valid1.prn

DICTIONARY origdict.valid1

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

OUTPUT
   H3     C14    NI59   CO60   NI63
   SE79   SR90   Y90    ZR93   NB93*  TC99  RU106
   CD113* SB125  SN126  I129   CS134
   CS137  BA137* SM151  EU152  EU154  EU155
   RA226  AC227  RA228  TH229  PA231
   TH232  U232   U233   U234   U235
   U236   NP237  PU238  U238   PU239  PU240
   AM241  PU241  PU242  CM242  AM243
   CM243  CM244
```

valid1.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures


PROCESS PUREX ZR-1.1U
```

valid1.summary.dir:

```
SUMMARY Purex
   PLANT PUREX
```

valid1.prn:

```
                                                                    SEP DATE:
WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
       KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT   MO YR.  SEP KEY
DAYS                      Ref.                    Th       U      Np      Pu
Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ----------------- ----
---- ----------------------------------------   ------------------------------------
-------------
    TABLE 1 -- UNIFIED SEPARATIONS PRODUCTION FILE -- (Fuel Input and Losses 1944-1989
             (Records Sorted by Sep'n Date.)
    RUN AT:  08/04/96   12:36:14            [Note: MWd/MTU after 11/83 are
backcalculated from %Pu-240.]

    SAVED AS:"UNIFIED6"


                                                                    SEP DATE:
WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
       KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT   MO YR.  SEP KEY
DAYS                      Ref.                    Th       U      Np      Pu
Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ----------------- ----
---- ----------------------------------------   ------------------------------------
-------------

      8134.7 ZR-1.1U   1.654E+01             3.413E+03 PUREX      7  67   8329.09
194  ISO-263 RD AND ARH-18 RD (MCDONALD LOGS) 1.000000.002840.283520.01024 Generic
factor for PUREX-Zr clad -- derived from core sa
```

origdict.valid1:

```
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'ZR-1.1UA'     26.4  'CORE.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'CORE.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CORE.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CORE.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CORE.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CORE.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CORE.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CORE.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CORE.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CORE.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CORE.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CORE.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'CORE.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'CORE.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CORE.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CORE.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CORE.MK1AA230.ORG'
'ZR-1.1UA'   3413.0  'CORE.MK1AA259.ORG'
'ZR-1.1UA'   3960.0  'CORE.MK1AA300.ORG'
'ZR-1.1UB'     19.8  'CORE.MK1AB001A.ORG'
'ZR-1.1UB'     26.4  'CORE.MK1AB002.ORG'
'ZR-1.1UB'     39.6  'CORE.MK1AB003.ORG'
'ZR-1.1UB'     66.0  'CORE.MK1AB005.ORG'
'ZR-1.1UB'     92.4  'CORE.MK1AB007.ORG'
'ZR-1.1UB'    132.0  'CORE.MK1AB010.ORG'
'ZR-1.1UB'    198.0  'CORE.MK1AB015.ORG'
'ZR-1.1UB'    264.0  'CORE.MK1AB020.ORG'
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'ZR-1.1UB'    396.0  'CORE.MK1AB030.ORG'
'ZR-1.1UB'    528.0  'CORE.MK1AB040.ORG'
'ZR-1.1UB'    660.0  'CORE.MK1AB050.ORG'
'ZR-1.1UB'    924.0  'CORE.MK1AB070.ORG'
'ZR-1.1UB'   1320.0  'CORE.MK1AB100.ORG'
'ZR-1.1UB'   1518.0  'CORE.MK1AB115.ORG'
'ZR-1.1UB'   1716.0  'CORE.MK1AB130.ORG'
'ZR-1.1UB'   2640.0  'CORE.MK1AB200.ORG'
'ZR-1.1UB'   3036.0  'CORE.MK1AB230.ORG'
'ZR-1.1UB'   3604.0  'CORE.MK1AB273.ORG'
'ZR-1.1UB'   3960.0  'CORE.MK1AB300.ORG'
'ZR-1.1UC'     19.8  'CORE.MK1AC001A.ORG'
'ZR-1.1UC'     26.4  'CORE.MK1AC002.ORG'
'ZR-1.1UC'     39.6  'CORE.MK1AC003.ORG'
'ZR-1.1UC'     66.0  'CORE.MK1AC005.ORG'
'ZR-1.1UC'     92.4  'CORE.MK1AC007.ORG'
'ZR-1.1UC'    132.0  'CORE.MK1AC010.ORG'
'ZR-1.1UC'    198.0  'CORE.MK1AC015.ORG'
'ZR-1.1UC'    264.0  'CORE.MK1AC020.ORG'
'ZR-1.1UC'    330.0  'CORE.MK1AC025.ORG'
'ZR-1.1UC'    396.0  'CORE.MK1AC030.ORG'
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'ZR-1.1UC'   1716.0  'CORE.MK1AC130.ORG'
'ZR-1.1UC'   2640.0  'CORE.MK1AC200.ORG'
'ZR-1.1UC'   3036.0  'CORE.MK1AC230.ORG'
'ZR-1.1UC'   3604.0  'CORE.MK1AC273.ORG'
'ZR-1.1UC'   3960.0  'CORE.MK1AC300.ORG'
'ZR-2.1U'      19.8  'CORE.MKII001A.ORG'
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'ZR-2.1U'	66.0	'CORE.MKII005.ORG'
'ZR-2.1U'	92.4	'CORE.MKII007.ORG'
'ZR-2.1U'	132.0	'CORE.MKII010.ORG'
'ZR-2.1U'	198.0	'CORE.MKII015.ORG'
'ZR-2.1U'	264.0	'CORE.MKII020.ORG'
'ZR-2.1U'	330.0	'CORE.MKII025.ORG'
'ZR-2.1U'	396.0	'CORE.MKII030.ORG'
'ZR-2.1U'	528.0	'CORE.MKII040.ORG'
'ZR-2.1U'	660.0	'CORE.MKII050.ORG'
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'ZR-2.1U'	1518.0	'CORE.MKII115.ORG'
'ZR-2.1U'	1716.0	'CORE.MKII130.ORG'
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'ZR-0.94UA'	77.0	'CORE.MKIVA007.ORG'
'ZR-0.94UA'	110.0	'CORE.MKIVA010.ORG'
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'ZR-0.94UA'	220.0	'CORE.MKIVA020.ORG'
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'ZR-0.94UA'	770.0	'CORE.MKIVA070.ORG'
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'ZR-0.94UB'	165.0	'CORE.MKIVB015.ORG'
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'ZR-0.94UB'	275.0	'CORE.MKIVB025.ORG'
'ZR-0.94UB'	330.0	'CORE.MKIVB030.ORG'
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'ZR-0.94UB'	3960.0	'CORE.MKIVB360.ORG'
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'ZR-0.94UC'	22.0	'CORE.MKIVC002.ORG'
'ZR-0.94UC'	33.0	'CORE.MKIVC003.ORG'
'ZR-0.94UC'	55.0	'CORE.MKIVC005.ORG'

'ZR-0.94UC'	77.0	'CORE.MKIVC007.ORG'
'ZR-0.94UC'	110.0	'CORE.MKIVC010.ORG'
'ZR-0.94UC'	165.0	'CORE.MKIVC015.ORG'
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'ZR-0.94UC'	3960.0	'CORE.MKIVC360.ORG'
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'AL-0.71UA'	50.0	'CORE.SPNA005.ORG'
'AL-0.71UA'	70.0	'CORE.SPNA007.ORG'
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'AL-0.71UA'	300.0	'CORE.SPNA030.ORG'
'AL-0.71UA'	400.0	'CORE.SPNA040.ORG'
'AL-0.71UA'	500.0	'CORE.SPNA050.ORG'
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'AL-0.71UA'	2000.0	'CORE.SPNA200.ORG'
'AL-0.71UA'	2500.0	'CORE.SPNA250.ORG'
'AL-0.71UA'	3000.0	'CORE.SPNA300.ORG'
'AL-0.71UA'	3200.0	'CORE.SPNA320.ORG'
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'AL-0.71UB'	20.0	'CORE.SPNB002.ORG'
'AL-0.71UB'	30.0	'CORE.SPNB003.ORG'
'AL-0.71UB'	50.0	'CORE.SPNB005.ORG'
'AL-0.71UB'	70.0	'CORE.SPNB007.ORG'
'AL-0.71UB'	100.0	'CORE.SPNB010.ORG'
'AL-0.71UB'	150.0	'CORE.SPNB015.ORG'
'AL-0.71UB'	200.0	'CORE.SPNB020.ORG'
'AL-0.71UB'	250.0	'CORE.SPNB025.ORG'
'AL-0.71UB'	300.0	'CORE.SPNB030.ORG'
'AL-0.71UB'	400.0	'CORE.SPNB040.ORG'
'AL-0.71UB'	500.0	'CORE.SPNB050.ORG'
'AL-0.71UB'	700.0	'CORE.SPNB070.ORG'
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'AL-0.71UB'	1250.0	'CORE.SPNB125.ORG'
'AL-0.71UB'	1500.0	'CORE.SPNB150.ORG'
'AL-0.71UB'	2000.0	'CORE.SPNB200.ORG'
'AL-0.71UB'	2500.0	'CORE.SPNB250.ORG'
'AL-0.71UB'	3000.0	'CORE.SPNB300.ORG'
'AL-0.71UB'	3200.0	'CORE.SPNB320.ORG'
'AL-0.71UC'	15.0	'CORE.SPNC001A.ORG'
'AL-0.71UC'	20.0	'CORE.SPNC002.ORG'
'AL-0.71UC'	30.0	'CORE.SPNC003.ORG'
'AL-0.71UC'	50.0	'CORE.SPNC005.ORG'
'AL-0.71UC'	70.0	'CORE.SPNC007.ORG'
'AL-0.71UC'	100.0	'CORE.SPNC010.ORG'
'AL-0.71UC'	150.0	'CORE.SPNC015.ORG'

```
'AL-0.71UC'   200.0  'CORE.SPNC020.ORG'
'AL-0.71UC'   250.0  'CORE.SPNC025.ORG'
'AL-0.71UC'   300.0  'CORE.SPNC030.ORG'
'AL-0.71UC'   400.0  'CORE.SPNC040.ORG'
'AL-0.71UC'   500.0  'CORE.SPNC050.ORG'
'AL-0.71UC'   700.0  'CORE.SPNC070.ORG'
'AL-0.71UC'  1000.0  'CORE.SPNC100.ORG'
'AL-0.71UC'  1250.0  'CORE.SPNC125.ORG'
'AL-0.71UC'  1500.0  'CORE.SPNC150.ORG'
'AL-0.71UC'  2000.0  'CORE.SPNC200.ORG'
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'AL-0.71UC'  3000.0  'CORE.SPNC300.ORG'
'AL-0.71UC'  3200.0  'CORE.SPNC320.ORG'
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'AL-0.94U'     20.0  'CORE.SPE002.ORG'
'AL-0.94U'     30.0  'CORE.SPE003.ORG'
'AL-0.94U'     50.0  'CORE.SPE005.ORG'
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core.mk1aa259.org (fuel data file):

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3	611470	2.1553E-01	621470	2.5146E-02	601480	2.5717E-01	611480	1.9544E-03
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3	621490	4.6155E-03	601500	1.1459E-01	611500	1.6617E-09	621500	1.7213E-01
3	631500	8.6411E-11	611510	3.0897E-04	621510	2.6175E-02	631510	3.4725E-05
3	621520	9.2828E-02	631520	4.3493E-05	631521	1.5028E-08	641520	1.3282E-05
3	621530	5.5691E-04	631530	4.1694E-02	641530	2.3682E-06	621540	1.8470E-02
3	631540	5.5509E-03	641540	1.1942E-04	631550	2.0523E-03	641550	1.4306E-05
3	621560	3.1169E-06	631560	1.7486E-03	641560	1.3548E-02	631570	6.3718E-06
3	641570	9.2684E-05	631580	1.9013E-16	641580	5.5037E-03	641590	2.3419E-06
3	651590	8.2761E-04	641600	3.6490E-04	651600	9.8416E-06	661600	8.8414E-06
3	651610	9.1845E-06	661610	1.4597E-04	651621	4.3961E-13	661620	7.8225E-05
3	661630	3.5346E-05	661640	8.7070E-06	661650	8.4105E-12	671650	9.3121E-06
3	661660	1.1328E-08	671660	7.5937E-09	671661	1.9087E-08	681660	7.7458E-07
3	681670	7.4588E-09	681680	1.7669E-09	681690	3.0325E-13	691690	1.6615E-12
3	681700	4.1962E-10	691700	8.0148E-13	701700	5.3372E-13	681710	2.3763E-13
3	691710	7.2870E-10	701710	8.8553E-11	681720	1.8660E-15	691720	1.1392E-13
3	701720	5.3304E-12	0	0.0000E+00	0	0.0000E+00	0	0.0000E+00
0		0.00000E+00	0.00000E+00	0.00E+00				

valid1.log:

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020826 run time = 151909.111
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid1

 <==============================================>
 **** Reading Input Commands from Standard Input File ****
#validation case; test prn with 1 batch, use core origen files w/ specific expos

PATH    p:\dkpro\lib

FILE    u:\data\dkpro\validation\v31\valid1\valid1.prn

DICTIONARY origdict.valid1

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

OUTPUT
   H3     C14    NI59   CO60   NI63
   SE79   SR90   Y90    ZR93   NB93*  TC99  RU106
   CD113* SB125  SN126  I129   CS134
   CS137  BA137* SM151  EU152  EU154  EU155
   RA226  AC227  RA228  TH229  PA231
   TH232  U232   U233   U234   U235
   U236   NP237  PU238  U238   PU239  PU240
   AM241  PU241  PU242  CM242  AM243
   CM243  CM244
 **** End of Input ****

**** Reading Process Directives from file: process.dir
 #validation case; test prn with 1 batch, use core origen files w/ specific expo
 s
 PROCESS PUREX ZR-1.1U
 **** End of Process Directives ****

**** Reading Summary Directives from file: summary.dir
 SUMMARY Purex
    PLANT PUREX
 **** End of Summary Directives ****

 List Library Directory:
 Volume in drive P is Applications
 Volume Serial Number is B831-5A78

 Directory of p:\dkpro\lib

08/23/02  03:25p        <DIR>          .
08/23/02  03:25p        <DIR>          ..
08/15/02  08:26a                 1,935 CLAD.MK1AA000.org
08/15/02  08:26a                 5,789 CLAD.MK1AA001A.org
08/15/02  08:26a                 5,871 CLAD.MK1AA002.org
08/15/02  08:26a                 5,871 CLAD.MK1AA003.org
08/15/02  08:26a                 6,035 CLAD.MK1AA005.org
```

```
08/15/02  08:26a              6,117 CLAD.MK1AA007.org
08/15/02  08:26a              6,035 CLAD.MK1AA010.org
08/15/02  08:26a              6,281 CLAD.MK1AA015.org
08/15/02  08:26a              6,445 CLAD.MK1AA020.org
08/15/02  08:26a              6,445 CLAD.MK1AA025.org
08/15/02  08:26a              6,445 CLAD.MK1AA030.org
08/15/02  08:26a              6,527 CLAD.MK1AA040.org
08/15/02  08:26a              6,609 CLAD.MK1AA050.org
08/15/02  08:26a              6,773 CLAD.MK1AA070.org
08/15/02  08:26a              6,855 CLAD.MK1AA100.org
08/15/02  08:26a              6,855 CLAD.MK1AA115.org
08/15/02  08:26a              6,937 CLAD.MK1AA130.org
08/15/02  08:26a              7,101 CLAD.MK1AA200.org
08/15/02  08:26a              7,019 CLAD.MK1AA230.org
08/15/02  08:26a              7,101 CLAD.MK1AA273.org
08/15/02  08:26a              7,101 CLAD.MK1AA300.org
08/15/02  08:26a              1,935 CLAD.MK1AB000.org
08/15/02  08:26a              5,789 CLAD.MK1AB001A.org
08/15/02  08:26a              5,871 CLAD.MK1AB002.org
08/15/02  08:26a              5,871 CLAD.MK1AB003.org
08/15/02  08:26a              6,035 CLAD.MK1AB005.org
08/15/02  08:26a              6,035 CLAD.MK1AB007.org
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08/15/02  08:26a              6,855 CLAD.MK1AB100.org
08/15/02  08:26a              6,937 CLAD.MK1AB115.org
08/15/02  08:26a              6,937 CLAD.MK1AB130.org
08/15/02  08:26a              7,101 CLAD.MK1AB200.org
08/15/02  08:26a              7,101 CLAD.MK1AB230.org
08/15/02  08:26a              7,101 CLAD.MK1AB273.org
08/15/02  08:26a              7,101 CLAD.MK1AB300.org
08/15/02  08:26a              1,935 CLAD.MK1AC000.org
08/15/02  08:26a              5,789 CLAD.MK1AC001A.org
08/15/02  08:26a              5,871 CLAD.MK1AC002.org
08/15/02  08:26a              5,871 CLAD.MK1AC003.org
08/15/02  08:26a              6,035 CLAD.MK1AC005.org
08/15/02  08:26a              6,117 CLAD.MK1AC007.org
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08/15/02  08:26a              6,937 CLAD.MK1AC130.org
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08/15/02  08:26a              1,935 CLAD.MKII000.org
08/15/02  08:26a              5,789 CLAD.MKII001A.org
08/15/02  08:26a              5,789 CLAD.MKII002.org
08/15/02  08:26a              5,871 CLAD.MKII003.org
08/15/02  08:26a              5,871 CLAD.MKII005.org
```

```
08/15/02  08:26a                5,953 CLAD.MKII007.org
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08/15/02  08:26a                6,117 CLAD.MKII015.org
08/15/02  08:26a                6,199 CLAD.MKII020.org
08/15/02  08:26a                6,281 CLAD.MKII025.org
08/15/02  08:26a                6,363 CLAD.MKII030.org
08/15/02  08:26a                6,445 CLAD.MKII040.org
08/15/02  08:26a                6,527 CLAD.MKII050.org
08/15/02  08:26a                6,609 CLAD.MKII070.org
08/15/02  08:26a                6,691 CLAD.MKII100.org
08/15/02  08:26a                6,855 CLAD.MKII115.org
08/15/02  08:26a                6,773 CLAD.MKII130.org
08/15/02  08:26a                6,855 CLAD.MKII150.org
08/15/02  08:26a                6,937 CLAD.MKII180.org
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08/15/02  08:26a                5,871 CLAD.MKIVA002.org
08/15/02  08:26a                5,871 CLAD.MKIVA003.org
08/15/02  08:26a                5,953 CLAD.MKIVA005.org
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08/15/02  08:26a                6,773 CLAD.MKIVA070.org
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08/15/02  08:26a                6,937 CLAD.MKIVA115.org
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08/15/02  08:26a                7,101 CLAD.MKIVA300.org
08/15/02  08:26a                7,183 CLAD.MKIVA360.org
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08/15/02  08:26a                5,789 CLAD.MKIVB001A.org
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08/15/02  08:26a                5,871 CLAD.MKIVB003.org
08/15/02  08:26a                6,035 CLAD.MKIVB005.org
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```

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08/15/02  08:26a          6,691 CLAD.MKIVC050.org
08/15/02  08:26a          6,691 CLAD.MKIVC070.org
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08/15/02  08:26a          4,231 CLAD.SPNA002.org
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08/15/02  08:26a          4,395 CLAD.SPNA015.org
08/15/02  08:26a          4,477 CLAD.SPNA020.org
08/15/02  08:26a          4,477 CLAD.SPNA025.org
08/15/02  08:26a          4,477 CLAD.SPNA030.org
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08/15/02	08:26a	4,313	CLAD.SPNB010.org
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08/15/02	08:26a	4,477	CLAD.SPNB020.org
08/15/02	08:26a	4,477	CLAD.SPNB025.org
08/15/02	08:26a	4,395	CLAD.SPNB030.org
08/15/02	08:26a	4,477	CLAD.SPNB040.org
08/15/02	08:26a	4,477	CLAD.SPNB050.org
08/15/02	08:26a	4,477	CLAD.SPNB070.org
08/15/02	08:26a	4,559	CLAD.SPNB100.org
08/15/02	08:26a	4,559	CLAD.SPNB125.org
08/15/02	08:26a	4,559	CLAD.SPNB150.org
08/15/02	08:26a	4,559	CLAD.SPNB200.org
08/15/02	08:26a	4,641	CLAD.SPNB250.org
08/15/02	08:26a	4,641	CLAD.SPNB300.org
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08/15/02	08:26a	1,525	CLAD.SPNC000.org
08/15/02	08:26a	4,231	CLAD.SPNC001A.org
08/15/02	08:26a	4,231	CLAD.SPNC002.org
08/15/02	08:26a	4,231	CLAD.SPNC003.org
08/15/02	08:26a	4,231	CLAD.SPNC005.org
08/15/02	08:26a	4,313	CLAD.SPNC007.org
08/15/02	08:26a	4,313	CLAD.SPNC010.org
08/15/02	08:26a	4,395	CLAD.SPNC015.org
08/15/02	08:26a	4,477	CLAD.SPNC020.org
08/15/02	08:26a	4,477	CLAD.SPNC025.org
08/15/02	08:26a	4,395	CLAD.SPNC030.org
08/15/02	08:26a	4,477	CLAD.SPNC040.org
08/15/02	08:26a	4,477	CLAD.SPNC050.org
08/15/02	08:26a	4,477	CLAD.SPNC070.org
08/15/02	08:26a	4,559	CLAD.SPNC100.org
08/15/02	08:26a	4,559	CLAD.SPNC125.org
08/15/02	08:26a	4,559	CLAD.SPNC150.org
08/15/02	08:26a	4,559	CLAD.SPNC200.org
08/15/02	08:26a	4,641	CLAD.SPNC250.org
08/15/02	08:26a	4,641	CLAD.SPNC300.org
08/15/02	08:26a	4,641	CLAD.SPNC320.org
08/13/02	04:35p	158	CLAD.TH1.org
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08/15/02	08:24a	14,844	COMBO.MK1AA001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AA002.ORG
08/15/02	08:24a	15,172	COMBO.MK1AA003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AA005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AA007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AA010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AA015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AA030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AA040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AA050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AA070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AA200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AA300.ORG
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08/15/02	08:24a	15,176	COMBO.MK1AB003.ORG

08/15/02	08:24a	15,258	COMBO.MK1AB005.ORG
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08/15/02	08:24a	15,750	COMBO.MK1AB015.ORG
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08/15/02	08:24a	15,832	COMBO.MK1AB025.ORG
08/15/02	08:24a	15,914	COMBO.MK1AB030.ORG
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08/15/02	08:24a	16,406	COMBO.MK1AB070.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB100.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB115.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB130.ORG
08/15/02	08:24a	16,899	COMBO.MK1AB200.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB230.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB273.ORG
08/15/02	08:24a	17,063	COMBO.MK1AB300.ORG
08/15/02	08:24a	1,970	COMBO.MK1AC000.ORG
08/15/02	08:24a	14,844	COMBO.MK1AC001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AC002.ORG
08/15/02	08:24a	15,172	COMBO.MK1AC003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AC005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AC007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AC010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AC015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AC030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AC040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AC050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AC070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AC200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AC300.ORG
08/15/02	08:24a	1,964	COMBO.MKII000.ORG
08/15/02	08:24a	14,838	COMBO.MKII001A.ORG
08/15/02	08:24a	14,839	COMBO.MKII002.ORG
08/15/02	08:24a	15,002	COMBO.MKII003.ORG
08/15/02	08:24a	15,248	COMBO.MKII005.ORG
08/15/02	08:24a	15,248	COMBO.MKII007.ORG
08/15/02	08:24a	15,412	COMBO.MKII010.ORG
08/15/02	08:24a	15,494	COMBO.MKII015.ORG
08/15/02	08:24a	15,576	COMBO.MKII020.ORG
08/15/02	08:24a	15,658	COMBO.MKII025.ORG
08/15/02	08:24a	15,740	COMBO.MKII030.ORG
08/15/02	08:24a	15,822	COMBO.MKII040.ORG
08/15/02	08:24a	15,904	COMBO.MKII050.ORG
08/15/02	08:24a	16,150	COMBO.MKII070.ORG
08/15/02	08:24a	16,315	COMBO.MKII100.ORG
08/15/02	08:24a	16,397	COMBO.MKII115.ORG
08/15/02	08:24a	16,397	COMBO.MKII130.ORG
08/15/02	08:24a	16,479	COMBO.MKII150.ORG
08/15/02	08:24a	16,561	COMBO.MKII180.ORG
08/15/02	08:24a	16,561	COMBO.MKII200.ORG
08/15/02	08:24a	16,725	COMBO.MKII220.ORG
08/15/02	08:24a	1,970	COMBO.MKIVA000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVA001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVA002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVA003.ORG

08/15/02	08:24a	15,254	COMBO.MKIVA005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVA007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVA010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVA015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVA030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVA040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVA050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVA070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVA200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVA250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA360.ORG
08/15/02	08:24a	1,974	COMBO.MKIVB000.ORG
08/15/02	08:24a	14,848	COMBO.MKIVB001A.ORG
08/15/02	08:24a	15,013	COMBO.MKIVB002.ORG
08/15/02	08:24a	15,176	COMBO.MKIVB003.ORG
08/15/02	08:24a	15,258	COMBO.MKIVB005.ORG
08/15/02	08:24a	15,422	COMBO.MKIVB007.ORG
08/15/02	08:24a	15,504	COMBO.MKIVB010.ORG
08/15/02	08:24a	15,750	COMBO.MKIVB015.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB020.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB025.ORG
08/15/02	08:24a	15,914	COMBO.MKIVB030.ORG
08/15/02	08:24a	16,078	COMBO.MKIVB040.ORG
08/15/02	08:24a	16,160	COMBO.MKIVB050.ORG
08/15/02	08:24a	16,324	COMBO.MKIVB070.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB100.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB115.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB130.ORG
08/15/02	08:24a	16,899	COMBO.MKIVB200.ORG
08/15/02	08:24a	16,981	COMBO.MKIVB250.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB300.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB360.ORG
08/15/02	08:24a	1,970	COMBO.MKIVC000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVC001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVC002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVC003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVC005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVC007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVC010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVC015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVC030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVC040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVC050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVC070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVC200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVC250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC360.ORG
08/15/02	08:25a	1,552	COMBO.SPE000.ORG
08/15/02	08:25a	13,114	COMBO.SPE001A.ORG
08/15/02	08:25a	13,115	COMBO.SPE002.ORG
08/15/02	08:25a	13,360	COMBO.SPE003.ORG

08/15/02	08:25a	13,524	COMBO.SPE005.ORG
08/15/02	08:25a	13,606	COMBO.SPE007.ORG
08/15/02	08:25a	13,606	COMBO.SPE010.ORG
08/15/02	08:25a	13,770	COMBO.SPE015.ORG
08/15/02	08:25a	13,770	COMBO.SPE020.ORG
08/15/02	08:25a	13,770	COMBO.SPE025.ORG
08/15/02	08:25a	13,770	COMBO.SPE030.ORG
08/15/02	08:25a	13,852	COMBO.SPE040.ORG
08/15/02	08:25a	13,852	COMBO.SPE050.ORG
08/15/02	08:25a	13,934	COMBO.SPE070.ORG
08/15/02	08:25a	14,099	COMBO.SPE100.ORG
08/15/02	08:25a	14,099	COMBO.SPE125.ORG
08/15/02	08:25a	14,181	COMBO.SPE150.ORG
08/15/02	08:25a	14,181	COMBO.SPE200.ORG
08/15/02	08:25a	14,345	COMBO.SPE250.ORG
08/15/02	08:25a	14,509	COMBO.SPE300.ORG
08/15/02	08:25a	14,509	COMBO.SPE320.ORG
08/15/02	08:24a	1,558	COMBO.SPNA000.ORG
08/15/02	08:24a	13,202	COMBO.SPNA001A.ORG
08/15/02	08:24a	13,285	COMBO.SPNA002.ORG
08/15/02	08:24a	13,366	COMBO.SPNA003.ORG
08/15/02	08:24a	13,530	COMBO.SPNA005.ORG
08/15/02	08:24a	13,612	COMBO.SPNA007.ORG
08/15/02	08:24a	13,612	COMBO.SPNA010.ORG
08/15/02	08:24a	13,858	COMBO.SPNA015.ORG
08/15/02	08:24a	13,858	COMBO.SPNA020.ORG
08/15/02	08:24a	13,858	COMBO.SPNA025.ORG
08/15/02	08:24a	13,940	COMBO.SPNA030.ORG
08/15/02	08:24a	13,940	COMBO.SPNA040.ORG
08/15/02	08:24a	13,940	COMBO.SPNA050.ORG
08/15/02	08:24a	14,022	COMBO.SPNA070.ORG
08/15/02	08:24a	14,187	COMBO.SPNA100.ORG
08/15/02	08:24a	14,187	COMBO.SPNA125.ORG
08/15/02	08:24a	14,269	COMBO.SPNA150.ORG
08/15/02	08:24a	14,351	COMBO.SPNA200.ORG
08/15/02	08:24a	14,597	COMBO.SPNA250.ORG
08/15/02	08:24a	14,597	COMBO.SPNA300.ORG
08/15/02	08:24a	14,597	COMBO.SPNA320.ORG
08/15/02	08:25a	1,562	COMBO.SPNB000.ORG
08/15/02	08:25a	13,124	COMBO.SPNB001A.ORG
08/15/02	08:25a	13,207	COMBO.SPNB002.ORG
08/15/02	08:25a	13,370	COMBO.SPNB003.ORG
08/15/02	08:25a	13,534	COMBO.SPNB005.ORG
08/15/02	08:25a	13,616	COMBO.SPNB007.ORG
08/15/02	08:25a	13,616	COMBO.SPNB010.ORG
08/15/02	08:25a	13,780	COMBO.SPNB015.ORG
08/15/02	08:25a	13,780	COMBO.SPNB020.ORG
08/15/02	08:25a	13,780	COMBO.SPNB025.ORG
08/15/02	08:25a	13,862	COMBO.SPNB030.ORG
08/15/02	08:25a	13,862	COMBO.SPNB040.ORG
08/15/02	08:25a	13,862	COMBO.SPNB050.ORG
08/15/02	08:25a	14,026	COMBO.SPNB070.ORG
08/15/02	08:25a	14,109	COMBO.SPNB100.ORG
08/15/02	08:25a	14,109	COMBO.SPNB125.ORG
08/15/02	08:25a	14,191	COMBO.SPNB150.ORG
08/15/02	08:25a	14,273	COMBO.SPNB200.ORG
08/15/02	08:25a	14,519	COMBO.SPNB250.ORG
08/15/02	08:25a	14,519	COMBO.SPNB300.ORG
08/15/02	08:25a	14,519	COMBO.SPNB320.ORG
08/15/02	08:25a	1,558	COMBO.SPNC000.ORG
08/15/02	08:25a	13,120	COMBO.SPNC001A.ORG
08/15/02	08:25a	13,203	COMBO.SPNC002.ORG
08/15/02	08:25a	13,366	COMBO.SPNC003.ORG

08/15/02	08:25a	13,530	COMBO.SPNC005.ORG
08/15/02	08:25a	13,612	COMBO.SPNC007.ORG
08/15/02	08:25a	13,612	COMBO.SPNC010.ORG
08/15/02	08:25a	13,776	COMBO.SPNC015.ORG
08/15/02	08:25a	13,776	COMBO.SPNC020.ORG
08/15/02	08:25a	13,776	COMBO.SPNC025.ORG
08/15/02	08:25a	13,858	COMBO.SPNC030.ORG
08/15/02	08:25a	13,858	COMBO.SPNC040.ORG
08/15/02	08:25a	13,858	COMBO.SPNC050.ORG
08/15/02	08:25a	14,022	COMBO.SPNC070.ORG
08/15/02	08:25a	14,105	COMBO.SPNC100.ORG
08/15/02	08:25a	14,105	COMBO.SPNC125.ORG
08/15/02	08:25a	14,187	COMBO.SPNC150.ORG
08/15/02	08:25a	14,269	COMBO.SPNC200.ORG
08/15/02	08:25a	14,515	COMBO.SPNC250.ORG
08/15/02	08:25a	14,515	COMBO.SPNC300.ORG
08/15/02	08:25a	14,515	COMBO.SPNC320.ORG
08/15/02	08:25a	9,286	COMBO.TH1.ORG
08/15/02	08:25a	1,150	CORE.MK1AA000.ORG
08/15/02	08:25a	12,630	CORE.MK1AA001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AA002.ORG
08/15/02	08:25a	12,958	CORE.MK1AA003.ORG
08/15/02	08:25a	13,040	CORE.MK1AA005.ORG
08/15/02	08:25a	13,122	CORE.MK1AA007.ORG
08/15/02	08:25a	13,204	CORE.MK1AA010.ORG
08/15/02	08:25a	13,368	CORE.MK1AA015.ORG
08/15/02	08:25a	13,368	CORE.MK1AA020.ORG
08/15/02	08:25a	13,450	CORE.MK1AA025.ORG
08/15/02	08:25a	13,532	CORE.MK1AA030.ORG
08/15/02	08:25a	13,614	CORE.MK1AA040.ORG
08/15/02	08:25a	13,614	CORE.MK1AA050.ORG
08/15/02	08:25a	13,942	CORE.MK1AA070.ORG
08/15/02	08:25a	14,025	CORE.MK1AA100.ORG
08/15/02	08:25a	14,107	CORE.MK1AA115.ORG
08/15/02	08:25a	14,107	CORE.MK1AA130.ORG
08/15/02	08:25a	14,271	CORE.MK1AA200.ORG
08/15/02	08:25a	14,353	CORE.MK1AA230.ORG
08/15/02	08:25a	14,353	CORE.MK1AA273.ORG
08/15/02	08:25a	14,435	CORE.MK1AA300.ORG
08/15/02	08:25a	1,154	CORE.MK1AB000.ORG
08/15/02	08:25a	12,634	CORE.MK1AB001A.ORG
08/15/02	08:25a	12,717	CORE.MK1AB002.ORG
08/15/02	08:25a	12,962	CORE.MK1AB003.ORG
08/15/02	08:25a	13,044	CORE.MK1AB005.ORG
08/15/02	08:25a	13,126	CORE.MK1AB007.ORG
08/15/02	08:25a	13,208	CORE.MK1AB010.ORG
08/15/02	08:25a	13,372	CORE.MK1AB015.ORG
08/15/02	08:25a	13,372	CORE.MK1AB020.ORG
08/15/02	08:25a	13,454	CORE.MK1AB025.ORG
08/15/02	08:25a	13,536	CORE.MK1AB030.ORG
08/15/02	08:25a	13,618	CORE.MK1AB040.ORG
08/15/02	08:25a	13,618	CORE.MK1AB050.ORG
08/15/02	08:25a	13,946	CORE.MK1AB070.ORG
08/15/02	08:25a	14,029	CORE.MK1AB100.ORG
08/15/02	08:25a	14,111	CORE.MK1AB115.ORG
08/15/02	08:25a	14,111	CORE.MK1AB130.ORG
08/15/02	08:25a	14,275	CORE.MK1AB200.ORG
08/15/02	08:25a	14,357	CORE.MK1AB230.ORG
08/15/02	08:25a	14,357	CORE.MK1AB273.ORG
08/15/02	08:25a	14,439	CORE.MK1AB300.ORG
08/15/02	08:25a	1,150	CORE.MK1AC000.ORG
08/15/02	08:25a	12,630	CORE.MK1AC001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AC002.ORG

08/15/02	08:25a	12,958	CORE.MK1AC003.ORG
08/15/02	08:25a	13,040	CORE.MK1AC005.ORG
08/15/02	08:25a	13,122	CORE.MK1AC007.ORG
08/15/02	08:25a	13,204	CORE.MK1AC010.ORG
08/15/02	08:25a	13,368	CORE.MK1AC015.ORG
08/15/02	08:25a	13,368	CORE.MK1AC020.ORG
08/15/02	08:25a	13,450	CORE.MK1AC025.ORG
08/15/02	08:25a	13,532	CORE.MK1AC030.ORG
08/15/02	08:25a	13,614	CORE.MK1AC040.ORG
08/15/02	08:25a	13,614	CORE.MK1AC050.ORG
08/15/02	08:25a	13,942	CORE.MK1AC070.ORG
08/15/02	08:25a	14,025	CORE.MK1AC100.ORG
08/15/02	08:25a	14,107	CORE.MK1AC115.ORG
08/15/02	08:25a	14,107	CORE.MK1AC130.ORG
08/15/02	08:25a	14,271	CORE.MK1AC200.ORG
08/15/02	08:25a	14,353	CORE.MK1AC230.ORG
08/15/02	08:25a	14,353	CORE.MK1AC273.ORG
08/15/02	08:25a	14,435	CORE.MK1AC300.ORG
08/15/02	08:25a	1,144	CORE.MKII000.ORG
08/15/02	08:25a	12,542	CORE.MKII001A.ORG
08/15/02	08:25a	12,707	CORE.MKII002.ORG
08/15/02	08:25a	12,706	CORE.MKII003.ORG
08/15/02	08:25a	13,034	CORE.MKII005.ORG
08/15/02	08:25a	13,034	CORE.MKII007.ORG
08/15/02	08:25a	13,116	CORE.MKII010.ORG
08/15/02	08:25a	13,198	CORE.MKII015.ORG
08/15/02	08:25a	13,280	CORE.MKII020.ORG
08/15/02	08:25a	13,362	CORE.MKII025.ORG
08/15/02	08:25a	13,362	CORE.MKII030.ORG
08/15/02	08:25a	13,444	CORE.MKII040.ORG
08/15/02	08:25a	13,526	CORE.MKII050.ORG
08/15/02	08:25a	13,608	CORE.MKII070.ORG
08/15/02	08:25a	13,855	CORE.MKII100.ORG
08/15/02	08:25a	13,937	CORE.MKII115.ORG
08/15/02	08:25a	13,937	CORE.MKII130.ORG
08/15/02	08:25a	13,937	CORE.MKII150.ORG
08/15/02	08:25a	13,937	CORE.MKII180.ORG
08/15/02	08:25a	14,019	CORE.MKII200.ORG
08/15/02	08:25a	14,183	CORE.MKII220.ORG
08/15/02	08:25a	1,150	CORE.MKIVA000.ORG
08/15/02	08:25a	12,630	CORE.MKIVA001A.ORG
08/15/02	08:25a	12,713	CORE.MKIVA002.ORG
08/15/02	08:25a	12,958	CORE.MKIVA003.ORG
08/15/02	08:25a	13,040	CORE.MKIVA005.ORG
08/15/02	08:25a	13,122	CORE.MKIVA007.ORG
08/15/02	08:25a	13,204	CORE.MKIVA010.ORG
08/15/02	08:25a	13,368	CORE.MKIVA015.ORG
08/15/02	08:25a	13,450	CORE.MKIVA020.ORG
08/15/02	08:25a	13,450	CORE.MKIVA025.ORG
08/15/02	08:25a	13,532	CORE.MKIVA030.ORG
08/15/02	08:25a	13,614	CORE.MKIVA040.ORG
08/15/02	08:25a	13,614	CORE.MKIVA050.ORG
08/15/02	08:25a	13,860	CORE.MKIVA070.ORG
08/15/02	08:25a	13,943	CORE.MKIVA100.ORG
08/15/02	08:25a	14,025	CORE.MKIVA115.ORG
08/15/02	08:25a	14,025	CORE.MKIVA130.ORG
08/15/02	08:25a	14,271	CORE.MKIVA200.ORG
08/15/02	08:25a	14,353	CORE.MKIVA250.ORG
08/15/02	08:25a	14,435	CORE.MKIVA300.ORG
08/15/02	08:25a	14,435	CORE.MKIVA360.ORG
08/15/02	08:25a	1,154	CORE.MKIVB000.ORG
08/15/02	08:25a	12,634	CORE.MKIVB001A.ORG
08/15/02	08:25a	12,717	CORE.MKIVB002.ORG

08/15/02	08:25a	12,962	CORE.MKIVB003.ORG
08/15/02	08:25a	13,044	CORE.MKIVB005.ORG
08/15/02	08:25a	13,126	CORE.MKIVB007.ORG
08/15/02	08:25a	13,208	CORE.MKIVB010.ORG
08/15/02	08:25a	13,372	CORE.MKIVB015.ORG
08/15/02	08:25a	13,454	CORE.MKIVB020.ORG
08/15/02	08:25a	13,454	CORE.MKIVB025.ORG
08/15/02	08:25a	13,536	CORE.MKIVB030.ORG
08/15/02	08:25a	13,618	CORE.MKIVB040.ORG
08/15/02	08:25a	13,618	CORE.MKIVB050.ORG
08/15/02	08:25a	13,864	CORE.MKIVB070.ORG
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08/15/02	08:26a	14,029	CORE.MKIVB130.ORG
08/15/02	08:26a	14,275	CORE.MKIVB200.ORG
08/15/02	08:26a	14,357	CORE.MKIVB250.ORG
08/15/02	08:26a	14,439	CORE.MKIVB300.ORG
08/15/02	08:26a	14,439	CORE.MKIVB360.ORG
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08/15/02	08:26a	12,713	CORE.MKIVC002.ORG
08/15/02	08:26a	12,958	CORE.MKIVC003.ORG
08/15/02	08:26a	13,040	CORE.MKIVC005.ORG
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08/15/02	08:26a	14,353	CORE.MKIVC250.ORG
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08/15/02	08:26a	11,071	CORE.SPNA002.ORG

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08/15/02  08:26a                 11,809 CORE.SPNA125.ORG
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08/15/02  08:26a                 11,562 CORE.SPNC050.ORG
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08/15/02  08:26a                 11,809 CORE.SPNC125.ORG
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08/15/02  08:26a                 12,219 CORE.SPNC320.ORG
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07/24/02  09:18a                1,620 fort.3.spe
07/24/02  09:53a                1,621 fort.3.spn
06/07/02  07:42p                   82 fort.3.th
06/07/02  09:23p              278,843 FT27F001rev1
07/22/02  01:42p              278,830 ft27f001rev2
07/19/02  02:13p              183,210 mkiai.20020719
07/19/02  02:16p              183,210 mkiao.20020719
07/19/02  02:16p              183,210 mkivi.20020719
07/19/02  02:16p              183,210 mkivo.20020719
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08/08/02  02:12p        <DIR>         oldxs
11/27/96  11:30a              265,783 orig21
07/24/02  11:05a                9,171 origdict.clad
07/24/02  11:05a                9,392 origdict.combo
08/07/02  09:02a                9,171 origdict.core
07/24/02  01:29p                  359 subtype.20020724
03/24/99  05:31p                  319 subtype.june2002
03/29/99  05:07p              334,310 unified6.prn
08/23/02  03:10p              393,138 unified6rep.prn
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08/21/02  03:55p                    0 valid1.PRN
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                          1,112,158,208 bytes free
                          1,112,158,208 bytes free
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'ZR-1.1UA'     39.6  'CORE.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CORE.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CORE.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CORE.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CORE.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CORE.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CORE.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CORE.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CORE.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CORE.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CORE.MK1AA070.ORG'
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'ZR-1.1UA'   1518.0  'CORE.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CORE.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CORE.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CORE.MK1AA230.ORG'
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'ZR-1.1UA'   3960.0  'CORE.MK1AA300.ORG'
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'ZR-1.1UB'     39.6  'CORE.MK1AB003.ORG'
'ZR-1.1UB'     66.0  'CORE.MK1AB005.ORG'
'ZR-1.1UB'     92.4  'CORE.MK1AB007.ORG'
'ZR-1.1UB'    132.0  'CORE.MK1AB010.ORG'
'ZR-1.1UB'    198.0  'CORE.MK1AB015.ORG'
'ZR-1.1UB'    264.0  'CORE.MK1AB020.ORG'
'ZR-1.1UB'    330.0  'CORE.MK1AB025.ORG'
'ZR-1.1UB'    396.0  'CORE.MK1AB030.ORG'
'ZR-1.1UB'    528.0  'CORE.MK1AB040.ORG'
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'ZR-0.94UC'	1265.0	'CORE.MKIVC115.ORG'
'ZR-0.94UC'	1430.0	'CORE.MKIVC130.ORG'
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'AL-0.71UB'   250.0  'CORE.SPNB025.ORG'
'AL-0.71UB'   300.0  'CORE.SPNB030.ORG'
'AL-0.71UB'   400.0  'CORE.SPNB040.ORG'
'AL-0.71UB'   500.0  'CORE.SPNB050.ORG'
'AL-0.71UB'   700.0  'CORE.SPNB070.ORG'
'AL-0.71UB'  1000.0  'CORE.SPNB100.ORG'
'AL-0.71UB'  1250.0  'CORE.SPNB125.ORG'
'AL-0.71UB'  1500.0  'CORE.SPNB150.ORG'
'AL-0.71UB'  2000.0  'CORE.SPNB200.ORG'
'AL-0.71UB'  2500.0  'CORE.SPNB250.ORG'
'AL-0.71UB'  3000.0  'CORE.SPNB300.ORG'
'AL-0.71UB'  3200.0  'CORE.SPNB320.ORG'
'AL-0.71UC'    15.0  'CORE.SPNC001A.ORG'
'AL-0.71UC'    20.0  'CORE.SPNC002.ORG'
'AL-0.71UC'    30.0  'CORE.SPNC003.ORG'
'AL-0.71UC'    50.0  'CORE.SPNC005.ORG'
'AL-0.71UC'    70.0  'CORE.SPNC007.ORG'
'AL-0.71UC'   100.0  'CORE.SPNC010.ORG'
'AL-0.71UC'   150.0  'CORE.SPNC015.ORG'
'AL-0.71UC'   200.0  'CORE.SPNC020.ORG'
'AL-0.71UC'   250.0  'CORE.SPNC025.ORG'
'AL-0.71UC'   300.0  'CORE.SPNC030.ORG'
'AL-0.71UC'   400.0  'CORE.SPNC040.ORG'
'AL-0.71UC'   500.0  'CORE.SPNC050.ORG'
'AL-0.71UC'   700.0  'CORE.SPNC070.ORG'
'AL-0.71UC'  1000.0  'CORE.SPNC100.ORG'
'AL-0.71UC'  1250.0  'CORE.SPNC125.ORG'
'AL-0.71UC'  1500.0  'CORE.SPNC150.ORG'
'AL-0.71UC'  2000.0  'CORE.SPNC200.ORG'
'AL-0.71UC'  2500.0  'CORE.SPNC250.ORG'
'AL-0.71UC'  3000.0  'CORE.SPNC300.ORG'
'AL-0.71UC'  3200.0  'CORE.SPNC320.ORG'
'AL-0.94U'     15.0  'CORE.SPE001A.ORG'
'AL-0.94U'     20.0  'CORE.SPE002.ORG'
'AL-0.94U'     30.0  'CORE.SPE003.ORG'
'AL-0.94U'     50.0  'CORE.SPE005.ORG'
'AL-0.94U'     70.0  'CORE.SPE007.ORG'
'AL-0.94U'    100.0  'CORE.SPE010.ORG'
'AL-0.94U'    150.0  'CORE.SPE015.ORG'
'AL-0.94U'    200.0  'CORE.SPE020.ORG'
'AL-0.94U'    250.0  'CORE.SPE025.ORG'
'AL-0.94U'    300.0  'CORE.SPE030.ORG'
'AL-0.94U'    400.0  'CORE.SPE040.ORG'
'AL-0.94U'    500.0  'CORE.SPE050.ORG'
'AL-0.94U'    700.0  'CORE.SPE070.ORG'
'AL-0.94U'   1000.0  'CORE.SPE100.ORG'
'AL-0.94U'   1250.0  'CORE.SPE125.ORG'
'AL-0.94U'   1500.0  'CORE.SPE150.ORG'
'AL-0.94U'   2000.0  'CORE.SPE200.ORG'
'AL-0.94U'   2500.0  'CORE.SPE250.ORG'
'AL-0.94U'   3000.0  'CORE.SPE300.ORG'
'AL-0.94U'   3200.0  'CORE.SPE320.ORG'
'AL-0.0TH'      1.0  'CORE.TH1.ORG'
**** End of Fuel Type Dictionary ****
```

```
**** Fuel Subtypes ****
opening file p:\dkpro\lib\subtype.20020724
AL-0.71U 1920 1 1 1954 12 31 AL-0.71UA
AL-0.71U 1954 1 1 1958 12 31 AL-0.71UB
AL-0.71U 1959 1 1 3000 12 31 AL-0.71UC
ZR-0.94U 1920 1 1 1971 12 31 ZR-0.94UA
ZR-0.94U 1972 1 1 1980 12 31 ZR-0.94UB
ZR-0.94U 1981 1 1 3000 12 31 ZR-0.94UC
ZR-1.1U  1920 1 1 1971 12 31 ZR-1.1UA
ZR-1.1U  1972 1 1 1980 12 31 ZR-1.1UB
ZR-1.1U  1981 1 1 3000 12 31 ZR-1.1UC
**** End of Fuel Subtypes ****

**** Nuclide Inventory Library Files ****

opening file p:\dkpro\lib\CORE.MK1AA001A.ORG
Mk-1AA:  B = 19.8 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA002.ORG
Mk-1AA:  B =  26.4 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA003.ORG
Mk-1AA:  B = 39.6 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA005.ORG
Mk-1AA:  B = 66.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA007.ORG
Mk-1AA:  B = 92.4 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA010.ORG
Mk-1AA:  B = 132. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA015.ORG
Mk-1AA:  B = 198. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA020.ORG
Mk-1AA:  B = 264. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA025.ORG
Mk-1AA:  B = 330. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA030.ORG
Mk-1AA:  B = 396. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA040.ORG
Mk-1AA:  B = 528. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA050.ORG
Mk-1AA:  B = 660. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA070.ORG
Mk-1AA:  B = 924. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA100.ORG
Mk-1AA:  B = 1320. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA115.ORG
Mk-1AA:  B = 1518. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA130.ORG
Mk-1AA:  B = 1716. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA200.ORG
Mk-1AA:  B = 2640. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA230.ORG
Mk-1AA:  B = 3036. MWd/MTU  <1972
opening file CORE.MK1AA259.ORG
Mk-1AA:  B = 3413. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA300.ORG
Mk-1AA:  B = 3960. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AB001A.ORG
Mk-1AB:  B = 19.8 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB002.ORG
Mk-1AB:  B =  26.4 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB003.ORG
Mk-1AB:  B = 39.6 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB005.ORG
```

```
Mk-1AB:  B = 66.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB007.ORG
Mk-1AB:  B = 92.4 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB010.ORG
Mk-1AB:  B = 132. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB015.ORG
Mk-1AB:  B = 198. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB020.ORG
Mk-1AB:  B = 264. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB025.ORG
Mk-1AB:  B = 330. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB030.ORG
Mk-1AB:  B = 396. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB040.ORG
Mk-1AB:  B = 528. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB050.ORG
Mk-1AB:  B = 660. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB070.ORG
Mk-1AB:  B = 924. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB100.ORG
Mk-1AB:  B = 1320. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB115.ORG
Mk-1AB:  B = 1518. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB130.ORG
Mk-1AB:  B = 1716. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB200.ORG
Mk-1AB:  B = 2640. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB230.ORG
Mk-1AB:  B = 3036. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB273.ORG
Mk-1AB:  B = 3604. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB300.ORG
Mk-1AB:  B = 3960. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AC001A.ORG
Mk-1AC:  B = 19.8 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC002.ORG
Mk-1AC:  B =  26.4 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC003.ORG
Mk-1AC:  B = 39.6 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC005.ORG
Mk-1AC:  B = 66.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC007.ORG
Mk-1AC:  B = 92.4 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC010.ORG
Mk-1AC:  B = 132. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC015.ORG
Mk-1AC:  B = 198. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC020.ORG
Mk-1AC:  B = 264. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC025.ORG
Mk-1AC:  B = 330. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC030.ORG
Mk-1AC:  B = 396. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC040.ORG
Mk-1AC:  B = 528. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC050.ORG
Mk-1AC:  B = 660. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC070.ORG
Mk-1AC:  B = 924. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC100.ORG
Mk-1AC:  B = 1320. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC115.ORG
Mk-1AC:  B = 1518. MWd/MTU  >1980
```

```
opening file p:\dkpro\lib\CORE.MK1AC130.ORG
Mk-1AC:  B = 1716. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC200.ORG
Mk-1AC:  B = 2640. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC230.ORG
Mk-1AC:  B = 3036. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC273.ORG
Mk-1AC:  B = 3604. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC300.ORG
Mk-1AC:  B = 3960. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKII001A.ORG
Mk-II:  B = 19.8 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII002.ORG
Mk-II:  B =  26.4 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII003.ORG
Mk-II:  B = 39.6 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII005.ORG
Mk-II:  B = 66.0 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII007.ORG
Mk-II:  B = 92.4 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII010.ORG
Mk-II:  B = 132. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII015.ORG
Mk-II:  B = 198. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII020.ORG
Mk-II:  B = 264. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII025.ORG
Mk-II:  B = 330. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII030.ORG
Mk-II:  B = 396. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII040.ORG
Mk-II:  B = 528. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII050.ORG
Mk-II:  B = 660. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII070.ORG
Mk-II:  B = 924. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII100.ORG
Mk-II:  B = 1320. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII115.ORG
Mk-II:  B = 1518. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII130.ORG
Mk-II:  B = 1716. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII150.ORG
Mk-II:  B = 1980. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII180.ORG
Mk-II:  B = 2376. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII200.ORG
Mk-II:  B = 2640. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII220.ORG
Mk-II:  B = 2904. MWd/MTU
opening file p:\dkpro\lib\CORE.MKIVA001A.ORG
Mk-IVA:  B = 16.5 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA002.ORG
Mk-IVA:  B =  22.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA003.ORG
Mk-IVA:  B = 33.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA005.ORG
Mk-IVA:  B = 55.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA007.ORG
Mk-IVA:  B = 77.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA010.ORG
Mk-IVA:  B = 110. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA015.ORG
```

```
Mk-IVA:  B = 165. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA020.ORG
Mk-IVA:  B = 220. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA025.ORG
Mk-IVA:  B = 275. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA030.ORG
Mk-IVA:  B = 330. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA040.ORG
Mk-IVA:  B = 440. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA050.ORG
Mk-IVA:  B = 550. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA070.ORG
Mk-IVA:  B = 770. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA100.ORG
Mk-IVA:  B = 1100. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA115.ORG
Mk-IVA:  B = 1265. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA130.ORG
Mk-IVA:  B = 1430. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA200.ORG
Mk-IVA:  B = 2200. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA250.ORG
Mk-IVA:  B = 2750. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA300.ORG
Mk-IVA:  B = 3300. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA360.ORG
Mk-IVA:  B = 3960. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVB001A.ORG
Mk-IVB:  B = 16.5 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB002.ORG
Mk-IVB:  B =  22.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB003.ORG
Mk-IVB:  B = 33.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB005.ORG
Mk-IVB:  B = 55.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB007.ORG
Mk-IVB:  B = 77.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB010.ORG
Mk-IVB:  B = 110. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB015.ORG
Mk-IVB:  B = 165. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB020.ORG
Mk-IVB:  B = 220. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB025.ORG
Mk-IVB:  B = 275. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB030.ORG
Mk-IVB:  B = 330. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB040.ORG
Mk-IVB:  B = 440. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB050.ORG
Mk-IVB:  B = 550. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB070.ORG
Mk-IVB:  B = 770. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB100.ORG
Mk-IVB:  B = 1100. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB115.ORG
Mk-IVB:  B = 1265. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB130.ORG
Mk-IVB:  B = 1430. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB200.ORG
Mk-IVB:  B = 2200. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB250.ORG
Mk-IVB:  B = 2750. MWd/MTU  1972-1980
```

```
opening file p:\dkpro\lib\CORE.MKIVB300.ORG
Mk-IVB:  B = 3300. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB360.ORG
Mk-IVB:  B = 3960. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVC001A.ORG
Mk-IVC:  B = 16.5 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC002.ORG
Mk-IVC:  B =  22.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC003.ORG
Mk-IVC:  B = 33.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC005.ORG
Mk-IVC:  B = 55.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC007.ORG
Mk-IVC:  B = 77.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC010.ORG
Mk-IVC:  B = 110. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC015.ORG
Mk-IVC:  B = 165. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC020.ORG
Mk-IVC:  B = 220. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC025.ORG
Mk-IVC:  B = 275. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC030.ORG
Mk-IVC:  B = 330. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC040.ORG
Mk-IVC:  B = 440. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC050.ORG
Mk-IVC:  B = 550. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC070.ORG
Mk-IVC:  B = 770. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC100.ORG
Mk-IVC:  B = 1100. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC115.ORG
Mk-IVC:  B = 1265. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC130.ORG
Mk-IVC:  B = 1430. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC200.ORG
Mk-IVC:  B = 2200. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC250.ORG
Mk-IVC:  B = 2750. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC300.ORG
Mk-IVC:  B = 3300. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC360.ORG
Mk-IVC:  B = 3960. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.SPNA001A.ORG
SPNA:  B = 15.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA002.ORG
SPNA:  B =  20.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA003.ORG
SPNA:  B = 30.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA005.ORG
SPNA:  B = 50.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA007.ORG
SPNA:  B = 70.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA010.ORG
SPNA:  B = 100. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA015.ORG
SPNA:  B = 150. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA020.ORG
SPNA:  B = 200. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA025.ORG
SPNA:  B = 250. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA030.ORG
```

```
SPNA:  B = 300. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA040.ORG
SPNA:  B = 400. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA050.ORG
SPNA:  B = 500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA070.ORG
SPNA:  B = 700. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA100.ORG
SPNA:  B = 1000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA125.ORG
SPNA:  B = 1250. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA150.ORG
SPNA:  B = 1500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA200.ORG
SPNA:  B = 2000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA250.ORG
SPNA:  B = 2500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA300.ORG
SPNA:  B = 3000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA320.ORG
SPNA:  B = 3200. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNB001A.ORG
SPNB:  B = 15.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB002.ORG
SPNB:  B =  20.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB003.ORG
SPNB:  B = 30.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB005.ORG
SPNB:  B = 50.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB007.ORG
SPNB:  B = 70.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB010.ORG
SPNB:  B = 100. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB015.ORG
SPNB:  B = 150. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB020.ORG
SPNB:  B = 200. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB025.ORG
SPNB:  B = 250. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB030.ORG
SPNB:  B = 300. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB040.ORG
SPNB:  B = 400. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB050.ORG
SPNB:  B = 500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB070.ORG
SPNB:  B = 700. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB100.ORG
SPNB:  B = 1000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB125.ORG
SPNB:  B = 1250. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB150.ORG
SPNB:  B = 1500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB200.ORG
SPNB:  B = 2000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB250.ORG
SPNB:  B = 2500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB300.ORG
SPNB:  B = 3000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB320.ORG
SPNB:  B = 3200. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNC001A.ORG
SPNC:  B = 15.0 MWd/MTU  >1958
```

```
opening file p:\dkpro\lib\CORE.SPNC002.ORG
SPNC:  B =  20.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC003.ORG
SPNC:  B = 30.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC005.ORG
SPNC:  B = 50.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC007.ORG
SPNC:  B = 70.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC010.ORG
SPNC:  B = 100. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC015.ORG
SPNC:  B = 150. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC020.ORG
SPNC:  B = 200. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC025.ORG
SPNC:  B = 250. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC030.ORG
SPNC:  B = 300. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC040.ORG
SPNC:  B = 400. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC050.ORG
SPNC:  B = 500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC070.ORG
SPNC:  B = 700. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC100.ORG
SPNC:  B = 1000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC125.ORG
SPNC:  B = 1250. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC150.ORG
SPNC:  B = 1500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC200.ORG
SPNC:  B = 2000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC250.ORG
SPNC:  B = 2500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC300.ORG
SPNC:  B = 3000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC320.ORG
SPNC:  B = 3200. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPE001A.ORG
SPE:  B = 15.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE002.ORG
SPE:  B =  20.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE003.ORG
SPE:  B = 30.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE005.ORG
SPE:  B = 50.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE007.ORG
SPE:  B = 70.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE010.ORG
SPE:  B = 100. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE015.ORG
SPE:  B = 150. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE020.ORG
SPE:  B = 200. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE025.ORG
SPE:  B = 250. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE030.ORG
SPE:  B = 300. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE040.ORG
SPE:  B = 400. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE050.ORG
SPE:  B = 500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE070.ORG
```

```
SPE:  B = 700. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE100.ORG
SPE:  B = 1000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE125.ORG
SPE:  B = 1250. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE150.ORG
SPE:  B = 1500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE200.ORG
SPE:  B = 2000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE250.ORG
SPE:  B = 2500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE300.ORG
SPE:  B = 3000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE320.ORG
SPE:  B = 3200. MWd/MTU
opening file p:\dkpro\lib\CORE.TH1.ORG
Thorium:  1 MT Thorium for 100 d  (created 2/17/98)

**** End Nuclide Inventory Library Files ****

**** ORIGEN2 decay library file ****
opening file p:\dkpro\lib\ft27f001rev2.
number of records:        1308
**** end ORIGEN2 decay library file ****

**** modifications to ORIGEN2 decay library file ****
No decay data modification file specified
**** end modifications to ORIGEN2 decay library file ****


Archive (fuel history) File:
u:\data\dkpro\validation\v31\valid1\valid1.prn

Input Format: LANL
Max. No. of records:       100000
No. of selected nuclides:          46
Output units: G-A

**** archive (fuel history) file ****
opening file u:\data\dkpro\validation\v31\valid1\valid1.prn
archive file header:
```

```
                                                                    SEP DATE:
WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
       KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT   MO YR.  SEP KEY
DAYS                      Ref.                   Th       U      Np      Pu
Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ----------------- ----
---- ----------------------------------------   ----------------------------------------
-------------
    TABLE 1 -- UNIFIED SEPARATIONS PRODUCTION FILE -- (Fuel Input and Losses 1944-1989
              (Records Sorted by Sep'n Date.)
    RUN AT:  08/04/96   12:36:14            [Note: MWd/MTU after 11/83 are
backcalculated from %Pu-240.]

    SAVED AS:"UNIFIED6"
```

SEP DATE:

WASTE FRACTION:

--------"mid-Mo"

COOLING

**** end archive (fuel history) file ****

<==========>

Final decay date: 0/ 0
Output units: G-A

Isotopic Summary

	Purex	Total
H01	3.309E+01	3.309E+01
H02	9.511E-03	9.511E-03
H03	3.262E-02	3.262E-02
HE03	5.304E-06	5.304E-06
HE04	8.230E-02	8.230E-02
LI06	2.338E-03	2.338E-03
LI07	6.090E-02	6.090E-02
BE09	1.837E+01	1.837E+01
BE10	1.106E-04	1.106E-04
B10	1.567E-02	1.567E-02
B11	3.084E-01	3.084E-01
C12	7.490E+02	7.490E+02
C13	8.408E+00	8.408E+00
C14	1.886E-02	1.886E-02
N14	2.057E+01	2.057E+01
N15	7.622E-02	7.622E-02
O16	6.634E-10	6.634E-10
O17	4.086E-17	4.086E-17
O18	6.696E-09	6.696E-09
F19	2.918E-16	2.918E-16
NE20	2.328E-12	2.328E-12
NE21	2.445E-05	2.445E-05
NE22	3.507E-05	3.507E-05
NA23	6.813E-06	6.813E-06
NA24	4.548E-07	4.548E-07
MG24	1.343E+01	1.343E+01
MG25	1.700E+00	1.700E+00
MG26	1.872E+00	1.872E+00
MG28	2.288E-15	2.288E-15
AL27	4.900E+02	4.900E+02
AL28	4.092E-18	4.092E-18
SI28	6.734E+01	6.734E+01
SI29	3.411E+00	3.411E+00
SI30	2.262E+00	2.262E+00
SI31	1.102E-10	1.102E-10
SI32	1.073E-11	1.073E-11
P31	1.008E-04	1.008E-04
P32	1.929E-07	1.929E-07
P33	1.592E-17	1.592E-17
S32	2.414E-06	2.414E-06
S33	2.197E-10	2.197E-10
S34	1.644E-07	1.644E-07
S35	2.824E-05	2.824E-05

S36	9.887E-11	9.887E-11
S250	1.334E-10	1.334E-10
CL35	3.477E-01	3.477E-01
CL36	5.397E-03	5.397E-03
CL37	1.129E-01	1.129E-01
CL38	6.335E-21	6.335E-21
AR36	5.101E-09	5.101E-09
AR37	1.208E-12	1.208E-12
AR38	1.889E-05	1.889E-05
AR39	2.598E-09	2.598E-09
AR40	1.935E-10	1.935E-10
AR41	2.356E-21	2.356E-21
AR42	9.734E-22	9.734E-22
K39	1.886E-12	1.886E-12
K40	3.514E-16	3.514E-16
K41	1.238E-14	1.238E-14
K42	5.769E-21	5.769E-21
CA42	1.529E-18	1.529E-18
CA43	1.660E-22	1.660E-22
CA44	2.364E-12	2.364E-12
CA45	2.238E-16	2.238E-16
CA46	9.033E-13	9.033E-13
CA47	8.071E-17	8.071E-17
SC45	7.422E-17	7.422E-17
SC46	1.083E-19	1.083E-19
SC47	2.870E-13	2.870E-13
SC48	1.370E-13	1.370E-13
SC49	3.069E-23	3.069E-23
TI46	4.620E-20	4.620E-20
TI47	7.061E-07	7.061E-07
TI48	2.634E-10	2.634E-10
TI49	1.837E-06	1.837E-06
TI50	7.163E-06	7.163E-06
V50	2.716E-05	2.716E-05
V51	4.515E-03	4.515E-03
CR50	8.932E-01	8.932E-01
CR51	7.245E-04	7.245E-04
CR52	1.728E+01	1.728E+01
CR53	1.972E+00	1.972E+00
CR54	5.006E-01	5.006E-01
MN54	2.930E-04	2.930E-04
MN55	7.474E+00	7.474E+00
MN56	4.428E-08	4.428E-08
FE54	6.002E+00	6.002E+00
FE55	1.164E-02	1.164E-02
FE56	9.494E+01	9.494E+01
FE57	2.325E+00	2.325E+00
FE58	3.031E-01	3.031E-01
FE59	3.146E-05	3.146E-05
CO58	3.744E-04	3.744E-04
CO59	2.737E-01	2.737E-01
CO60	6.719E-03	6.719E-03
CO61	1.749E-13	1.749E-13
NI58	1.916E+01	1.916E+01
NI59	5.116E-02	5.116E-02
NI60	7.341E+00	7.341E+00
NI61	3.255E-01	3.255E-01
NI62	1.003E+00	1.003E+00
NI63	7.533E-03	7.533E-03
NI64	2.723E-01	2.723E-01
NI65	1.315E-10	1.315E-10
NI66	8.197E-12	8.197E-12
CU63	1.347E+01	1.347E+01

CU64	2.101E-05	2.101E-05
CU65	6.001E+00	6.001E+00
CU66	1.278E-14	1.278E-14
CU67	6.209E-11	6.209E-11
ZN64	9.587E-03	9.587E-03
ZN65	1.420E-06	1.420E-06
ZN66	5.574E-03	5.574E-03
ZN67	9.797E-07	9.797E-07
ZN68	3.234E-09	3.234E-09
ZN69	1.039E-17	1.039E-17
ZN69*	1.420E-16	1.420E-16
ZN70	7.813E-07	7.813E-07
ZN71*	3.525E-17	3.525E-17
ZN72	1.102E-06	1.102E-06
GA69	8.536E-11	8.536E-11
GA71	6.661E-08	6.661E-08
GA72	4.178E-07	4.178E-07
GA73	1.463E-08	1.463E-08
GE70	6.546E-14	6.546E-14
GE71	5.764E-21	5.764E-21
GE72	1.181E-04	1.181E-04
GE73	3.458E-04	3.458E-04
GE73*	4.117E-13	4.117E-13
GE74	9.764E-04	9.764E-04
GE75	5.224E-12	5.224E-12
GE76	7.166E-03	7.166E-03
GE77	3.566E-06	3.566E-06
GE78	1.900E-10	1.900E-10
AS75	2.656E-03	2.656E-03
AS76	9.070E-08	9.070E-08
AS77	1.152E-04	1.152E-04
AS78	2.844E-09	2.844E-09
SE76	1.410E-05	1.410E-05
SE77	1.821E-02	1.821E-02
SE77*	4.601E-11	4.601E-11
SE78	4.921E-02	4.921E-02
SE79	1.079E-01	1.079E-01
SE80	2.862E-01	2.862E-01
SE81	1.124E-13	1.124E-13
SE81*	2.364E-13	2.364E-13
SE82	7.374E-01	7.374E-01
BR79	1.663E-07	1.663E-07
BR80	1.753E-12	1.753E-12
BR80*	2.453E-11	2.453E-11
BR81	4.691E-01	4.691E-01
BR82	3.591E-05	3.591E-05
BR83	6.595E-07	6.595E-07
BR84	6.638E-18	6.638E-18
KR79	1.115E-15	1.115E-15
KR80	8.811E-07	8.811E-07
KR81	1.194E-07	1.194E-07
KR82	3.629E-03	3.629E-03
KR83	1.123E+00	1.123E+00
KR83*	1.925E-06	1.925E-06
KR84	2.424E+00	2.424E+00
KR85	6.048E-01	6.048E-01
KR85*	6.286E-05	6.286E-05
KR86	4.071E+00	4.071E+00
KR87	3.057E-09	3.057E-09
KR88	1.241E-05	1.241E-05
RB85	2.149E+00	2.149E+00
RB86	2.224E-04	2.224E-04
RB87	5.466E+00	5.466E+00

RB88	1.448E-06	1.448E-06
SR86	1.107E-03	1.107E-03
SR87	1.739E-05	1.739E-05
SR87*	9.870E-12	9.870E-12
SR88	7.450E+00	7.450E+00
SR89	2.204E+00	2.204E+00
SR90	1.196E+01	1.196E+01
SR91	4.392E-03	4.392E-03
SR92	1.628E-05	1.628E-05
Y89	7.711E+00	7.711E+00
Y89*	7.536E-10	7.536E-10
Y90	3.091E-03	3.091E-03
Y90*	3.418E-10	3.418E-10
Y91	3.228E+00	3.228E+00
Y91*	2.429E-04	2.429E-04
Y92	3.137E-04	3.137E-04
Y93	6.112E-03	6.112E-03
ZR90	6.189E+00	6.189E+00
ZR91	1.063E+01	1.063E+01
ZR92	1.522E+01	1.522E+01
ZR93	1.423E+01	1.423E+01
ZR94	1.676E+01	1.676E+01
ZR95	4.315E+00	4.315E+00
ZR96	1.533E+01	1.533E+01
ZR97	2.088E-02	2.088E-02
NB92	1.587E-13	1.587E-13
NB93	2.400E-07	2.400E-07
NB93*	2.844E-06	2.844E-06
NB94	8.015E-06	8.015E-06
NB95	2.218E+00	2.218E+00
NB95*	2.705E-03	2.705E-03
NB96	3.149E-05	3.149E-05
NB97	1.492E-03	1.492E-03
NB97*	1.954E-05	1.954E-05
NB98*	6.450E-14	6.450E-14
MO94	1.732E-21	1.732E-21
MO95	8.481E+00	8.481E+00
MO96	6.277E-02	6.277E-02
MO97	1.452E+01	1.452E+01
MO98	1.439E+01	1.439E+01
MO99	1.819E-01	1.819E-01
MO100	1.596E+01	1.596E+01
TC98	1.840E-05	1.840E-05
TC99	1.491E+01	1.491E+01
TC99*	1.594E-02	1.594E-02
RU99	2.033E-05	2.033E-05
RU100	2.443E-01	2.443E-01
RU101	1.344E+01	1.344E+01
RU102	1.202E+01	1.202E+01
RU103	2.073E+00	2.073E+00
RU104	7.326E+00	7.326E+00
RU105	1.714E-04	1.714E-04
RU106	2.646E+00	2.646E+00
RH102	2.637E-06	2.637E-06
RH103	7.324E+00	7.324E+00
RH103*	2.054E-03	2.054E-03
RH105	3.592E-02	3.592E-02
RH105*	1.375E-07	1.375E-07
RH106	2.451E-06	2.451E-06
RH106*	6.215E-08	6.215E-08
RH107	3.531E-24	3.531E-24
PD104	6.791E-01	6.791E-01
PD105	4.625E+00	4.625E+00

PD106	1.306E+00	1.306E+00
PD107	2.151E+00	2.151E+00
PD108	1.273E+00	1.273E+00
PD109	1.294E-03	1.294E-03
PD110	3.901E-01	3.901E-01
PD111	2.852E-10	2.852E-10
PD111*	5.120E-09	5.120E-09
PD112	3.048E-04	3.048E-04
AG107	7.745E-08	7.745E-08
AG108	3.029E-17	3.029E-17
AG108*	9.813E-09	9.813E-09
AG109	7.834E-01	7.834E-01
AG109*	1.039E-06	1.039E-06
AG110	3.630E-11	3.630E-11
AG110*	2.342E-03	2.342E-03
AG111	1.061E-02	1.061E-02
AG111*	1.636E-11	1.636E-11
AG112	5.335E-05	5.335E-05
AG113	5.377E-06	5.377E-06
CD106	4.776E-04	4.776E-04
CD107	2.074E-11	2.074E-11
CD108	3.274E-04	3.274E-04
CD109	2.470E-07	2.470E-07
CD110	6.006E-02	6.006E-02
CD111	1.862E-01	1.862E-01
CD111*	9.496E-19	9.496E-19
CD112	1.070E-01	1.070E-01
CD113	3.818E-03	3.818E-03
CD113*	1.264E-03	1.264E-03
CD114	1.441E-01	1.441E-01
CD115	5.331E-04	5.331E-04
CD115*	4.874E-04	4.874E-04
CD116	5.866E-02	5.866E-02
CD117	3.765E-08	3.765E-08
CD117*	5.658E-08	5.658E-08
CD118	2.415E-14	2.415E-14
IN113	2.233E-05	2.233E-05
IN114	1.127E-12	1.127E-12
IN114*	7.006E-08	7.006E-08
IN115	3.261E-02	3.261E-02
IN115*	4.865E-05	4.865E-05
IN116*	2.663E-14	2.663E-14
IN117	3.964E-08	3.964E-08
IN117*	1.262E-07	1.262E-07
IN118	4.008E-17	4.008E-17
SN114	2.667E-07	2.667E-07
SN115	2.398E-03	2.398E-03
SN116	1.489E-02	1.489E-02
SN117	5.146E-02	5.146E-02
SN117*	9.157E-06	9.157E-06
SN118	4.451E-02	4.451E-02
SN119	4.632E-02	4.632E-02
SN119*	1.386E-04	1.386E-04
SN120	4.417E-02	4.417E-02
SN121	1.877E-04	1.877E-04
SN121*	1.396E-03	1.396E-03
SN122	5.206E-02	5.206E-02
SN123	4.250E-03	4.250E-03
SN123*	1.342E-16	1.342E-16
SN124	9.467E-02	9.467E-02
SN125	2.930E-03	2.930E-03
SN126	2.067E-01	2.067E-01
SN127	6.946E-08	6.946E-08

SN128	1.093E-11	1.093E-11
SB121	4.692E-02	4.692E-02
SB122	1.257E-05	1.257E-05
SB123	5.343E-02	5.343E-02
SB124	1.612E-04	1.612E-04
SB125	1.107E-01	1.107E-01
SB126	1.658E-04	1.658E-04
SB126*	2.989E-11	2.989E-11
SB127	1.191E-02	1.191E-02
SB128	3.605E-05	3.605E-05
SB128*	2.334E-12	2.334E-12
SB129	4.949E-05	4.949E-05
SB130	1.291E-15	1.291E-15
SB131	8.265E-23	8.265E-23
TE122	4.849E-04	4.849E-04
TE123	1.713E-06	1.713E-06
TE123*	6.363E-07	6.363E-07
TE124	2.262E-04	2.262E-04
TE125	1.001E-02	1.001E-02
TE125*	1.044E-03	1.044E-03
TE126	3.933E-03	3.933E-03
TE127	1.237E-03	1.237E-03
TE127*	4.490E-02	4.490E-02
TE128	1.035E+00	1.035E+00
TE129	6.979E-05	6.979E-05
TE129*	5.993E-02	5.993E-02
TE130	4.754E+00	4.754E+00
TE131	1.853E-05	1.853E-05
TE131*	5.925E-03	5.925E-03
TE132	1.686E-01	1.686E-01
TE133	1.322E-12	1.322E-12
TE133*	2.592E-11	2.592E-11
TE134	1.075E-13	1.075E-13
I127	4.976E-01	4.976E-01
I128	4.023E-24	4.023E-24
I129	1.761E+00	1.761E+00
I130	2.947E-05	2.947E-05
I131	3.291E-01	3.291E-01
I132	5.076E-03	5.076E-03
I133	3.763E-02	3.763E-02
I133*	7.179E-15	7.179E-15
I134	9.241E-11	9.241E-11
I135	1.933E-03	1.933E-03
XE127	9.510E-10	9.510E-10
XE128	3.861E-03	3.861E-03
XE129	3.391E-06	3.391E-06
XE129*	3.168E-08	3.168E-08
XE130	2.004E-02	2.004E-02
XE131	6.938E+00	6.938E+00
XE131*	5.387E-03	5.387E-03
XE132	1.177E+01	1.177E+01
XE133	4.565E-01	4.565E-01
XE133*	5.699E-03	5.699E-03
XE134	1.948E+01	1.948E+01
XE135	8.585E-03	8.585E-03
XE135*	1.225E-05	1.225E-05
XE136	2.880E+01	2.880E+01
CS132	1.246E-05	1.246E-05
CS133	1.598E+01	1.598E+01
CS134	4.268E-01	4.268E-01
CS134*	2.002E-07	2.002E-07
CS135	4.179E+00	4.179E+00
CS135*	2.326E-14	2.326E-14

CS136	8.849E-03	8.849E-03
CS137	1.541E+01	1.541E+01
CS138	1.174E-16	1.174E-16
BA132	3.521E-06	3.521E-06
BA134	4.048E-02	4.048E-02
BA135	4.463E-05	4.463E-05
BA135*	5.330E-08	5.330E-08
BA136	7.336E-02	7.336E-02
BA136*	2.688E-10	2.688E-10
BA137	1.526E-01	1.526E-01
BA137*	2.350E-06	2.350E-06
BA138	1.630E+01	1.630E+01
BA139	4.226E-08	4.226E-08
BA140	9.618E-01	9.618E-01
LA138	8.270E-05	8.270E-05
LA139	1.540E+01	1.540E+01
LA140	1.354E-01	1.354E-01
LA141	1.969E-04	1.969E-04
LA142	9.365E-08	9.365E-08
CE140	1.435E+01	1.435E+01
CE141	2.207E+00	2.207E+00
CE142	1.386E+01	1.386E+01
CE143	6.183E-02	6.183E-02
CE144	8.845E+00	8.845E+00
PR141	1.187E+01	1.187E+01
PR142	1.724E-04	1.724E-04
PR143	9.264E-01	9.264E-01
PR144	3.725E-04	3.725E-04
PR144*	2.173E-06	2.173E-06
PR145	7.810E-04	7.810E-04
PR146	1.697E-21	1.697E-21
ND142	4.053E-02	4.053E-02
ND143	1.186E+01	1.186E+01
ND144	4.815E+00	4.815E+00
ND145	9.065E+00	9.065E+00
ND146	7.516E+00	7.516E+00
ND147	3.073E-01	3.073E-01
ND148	4.254E+00	4.254E+00
ND149	7.774E-08	7.774E-08
ND150	1.895E+00	1.895E+00
PM146	2.301E-05	2.301E-05
PM147	3.565E+00	3.565E+00
PM148	3.233E-02	3.233E-02
PM148*	3.365E-02	3.365E-02
PM149	2.928E-02	2.928E-02
PM150	2.748E-08	2.748E-08
PM151	5.110E-03	5.110E-03
SM146	4.347E-06	4.347E-06
SM147	4.159E-01	4.159E-01
SM148	7.697E-01	7.697E-01
SM149	7.634E-02	7.634E-02
SM150	2.847E+00	2.847E+00
SM151	4.329E-01	4.329E-01
SM152	1.535E+00	1.535E+00
SM153	9.211E-03	9.211E-03
SM154	3.055E-01	3.055E-01
SM156	5.155E-05	5.155E-05
EU150	1.429E-09	1.429E-09
EU151	5.744E-04	5.744E-04
EU152	7.194E-04	7.194E-04
EU152*	2.486E-07	2.486E-07
EU153	6.896E-01	6.896E-01
EU154	9.181E-02	9.181E-02

EU155	3.395E-02	3.395E-02
EU156	2.892E-02	2.892E-02
EU157	1.054E-04	1.054E-04
EU158	3.145E-15	3.145E-15
GD152	2.197E-04	2.197E-04
GD153	3.917E-05	3.917E-05
GD154	1.975E-03	1.975E-03
GD155	2.366E-04	2.366E-04
GD156	2.241E-01	2.241E-01
GD157	1.533E-03	1.533E-03
GD158	9.103E-02	9.103E-02
GD159	3.874E-05	3.874E-05
GD160	6.035E-03	6.035E-03
TB159	1.369E-02	1.369E-02
TB160	1.628E-04	1.628E-04
TB161	1.519E-04	1.519E-04
TB162*	7.271E-12	7.271E-12
DY160	1.462E-04	1.462E-04
DY161	2.414E-03	2.414E-03
DY162	1.294E-03	1.294E-03
DY163	5.846E-04	5.846E-04
DY164	1.440E-04	1.440E-04
DY165	1.391E-10	1.391E-10
DY166	1.874E-07	1.874E-07
HO165	1.540E-04	1.540E-04
HO166	1.256E-07	1.256E-07
HO166*	3.157E-07	3.157E-07
ER166	1.281E-05	1.281E-05
ER167	1.234E-07	1.234E-07
ER168	2.922E-08	2.922E-08
ER169	5.016E-12	5.016E-12
ER170	6.941E-09	6.941E-09
ER171	3.930E-12	3.930E-12
ER172	3.086E-14	3.086E-14
TM169	2.748E-11	2.748E-11
TM170	1.326E-11	1.326E-11
TM171	1.205E-08	1.205E-08
TM172	1.884E-12	1.884E-12
YB170	8.828E-12	8.828E-12
YB171	1.465E-09	1.465E-09
YB172	8.816E-11	8.816E-11
TL207	2.180E-18	2.180E-18
TL208	1.461E-15	1.461E-15
TL209	5.676E-21	5.676E-21
PB206	1.812E-17	1.812E-17
PB207	3.845E-14	3.845E-14
PB208	1.304E-10	1.304E-10
PB209	2.281E-17	2.281E-17
PB210	1.070E-14	1.070E-14
PB211	1.654E-17	1.654E-17
PB212	8.317E-13	8.317E-13
PB214	1.422E-18	1.422E-18
BI208	5.453E-21	5.453E-21
BI209	1.004E-14	1.004E-14
BI210	6.157E-18	6.157E-18
BI210*	2.928E-20	2.928E-20
BI211	9.806E-19	9.806E-19
BI212	8.062E-14	8.062E-14
BI213	5.600E-18	5.600E-18
BI214	1.056E-18	1.056E-18
PO210	5.236E-17	5.236E-17
PO211	1.064E-23	1.064E-23
PO212	4.236E-24	4.236E-24

PO215	1.359E-23	1.359E-23
PO216	3.162E-18	3.162E-18
PO218	1.645E-19	1.645E-19
AT217	6.614E-23	6.614E-23
RN218	2.854E-23	2.854E-23
RN219	3.024E-20	3.024E-20
RN220	1.213E-15	1.213E-15
RN222	2.921E-16	2.921E-16
FR221	6.021E-19	6.021E-19
FR223	1.903E-19	1.903E-19
RA222	3.098E-20	3.098E-20
RA223	7.545E-15	7.545E-15
RA224	6.895E-12	6.895E-12
RA225	2.917E-15	2.917E-15
RA226	4.621E-11	4.621E-11
RA228	1.228E-17	1.228E-17
AC225	1.769E-15	1.769E-15
AC227	7.241E-12	7.241E-12
AC228	1.319E-16	1.319E-16
TH226	1.512E-18	1.512E-18
TH227	1.382E-14	1.382E-14
TH228	1.368E-09	1.368E-09
TH229	1.919E-10	1.919E-10
TH230	1.202E-05	1.202E-05
TH231	5.965E-09	5.965E-09
TH232	7.636E-07	7.636E-07
TH234	1.011E-06	1.011E-06
PA231	1.006E-06	1.006E-06
PA232	1.175E-09	1.175E-09
PA233	3.866E-08	3.866E-08
PA234	1.546E-11	1.546E-11
PA234*	3.409E-11	3.409E-11
U230	1.464E-15	1.464E-15
U231	7.139E-14	7.139E-14
U232	4.367E-07	4.367E-07
U233	1.090E-05	1.090E-05
U234	5.238E+00	5.238E+00
U235	5.914E+02	5.914E+02
U236	4.784E+01	4.784E+01
U237	6.275E-02	6.275E-02
U238	6.845E+04	6.845E+04
U239	6.423E-21	6.423E-21
U240	2.904E-07	2.904E-07
NP235	4.963E-09	4.963E-09
NP236	5.015E-07	5.015E-07
NP236*	1.040E-08	1.040E-08
NP237	1.303E+00	1.303E+00
NP238	1.980E-03	1.980E-03
NP239	2.065E+00	2.065E+00
NP240	2.913E-11	2.913E-11
NP240*	2.499E-09	2.499E-09
PU236	8.113E-07	8.113E-07
PU237	8.087E-08	8.087E-08
PU238	1.006E-01	1.006E-01
PU239	1.343E+02	1.343E+02
PU240	1.971E+01	1.971E+01
PU241	4.974E+00	4.974E+00
PU242	3.442E-01	3.442E-01
PU243	1.922E-06	1.922E-06
PU244	9.155E-07	9.155E-07
PU245	2.259E-12	2.259E-12
PU246	3.456E-14	3.456E-14
AM239	2.303E-13	2.303E-13

AM240	6.198E-10	6.198E-10
AM241	5.451E-02	5.451E-02
AM242	4.304E-05	4.304E-05
AM242*	4.746E-04	4.746E-04
AM243	1.102E-02	1.102E-02
AM244	6.383E-08	6.383E-08
AM244*	5.754E-24	5.754E-24
AM245	5.486E-13	5.486E-13
AM246	8.656E-17	8.656E-17
CM241	1.113E-10	1.113E-10
CM242	5.446E-03	5.446E-03
CM243	2.302E-05	2.302E-05
CM244	5.297E-04	5.297E-04
CM245	4.932E-06	4.932E-06
CM246	8.022E-08	8.022E-08
CM247	1.116E-10	1.116E-10
CM248	7.949E-13	7.949E-13
CM250	2.907E-22	2.907E-22
BK249	1.707E-15	1.707E-15
BK250	6.929E-21	6.929E-21
CF249	8.449E-17	8.449E-17
CF250	1.140E-16	1.140E-16
CF251	1.371E-17	1.371E-17
CF252	1.098E-18	1.098E-18
CF253	5.153E-22	5.153E-22
CF254	3.031E-24	3.031E-24
ES253	2.317E-22	2.317E-22
ES254	3.971E-24	3.971E-24
Total:	7.136E+04	7.136E+04

Total Fuel and Exposure Summary:

	Purex	Total
MWd:	5.645E+04	5.645E+04
MTU:	1.654E+01	1.654E+01

DKPRO complete, calculation time = 0.4218750

valid2 case files:

valid2.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: select

Select U

PROCESS PUREX ZR-1.1U
```

valid2.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 151942.251
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid2

 <==============================================>


Final decay date:  0/   0
 Output units: G-A

 Isotopic Summary
```

<portion of file omitted>

```
          Purex       Total
U230      1.464E-15   1.464E-15
U231      7.139E-14   7.139E-14
U232      4.367E-07   4.367E-07
U233      1.090E-05   1.090E-05
U234      5.238E+00   5.238E+00
U235      5.914E+02   5.914E+02
U236      4.784E+01   4.784E+01
U237      6.275E-02   6.275E-02
U238      6.845E+04   6.845E+04
U239      6.423E-21   6.423E-21
U240      2.904E-07   2.904E-07

Total:    6.910E+04   6.910E+04

 Total Fuel and Exposure Summary:

          Purex       Total
MWd:      5.645E+04   5.645E+04
MTU:      1.654E+01   1.654E+01

 DKPRO complete, calculation time =   0.4687500
```

valid3 case files:

valid3.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: reprocess


PROCESS PUREX ZR-1.1U
  reprocess U .1
```

valid3.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 152105.595
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid3

 <==============================================>
```

<portion of file omitted>

```
         Purex       Total
H01      3.309E+01   3.309E+01
H02      9.511E-03   9.511E-03
H03      3.262E-02   3.262E-02
```

<portion of file omitted>

```
PA234*   3.409E-11   3.409E-11
U230     1.464E-16   1.464E-16
U231     7.139E-15   7.139E-15
U232     4.367E-08   4.367E-08
U233     1.090E-06   1.090E-06
U234     5.238E-01   5.238E-01
U235     5.914E+01   5.914E+01
U236     4.784E+00   4.784E+00
U237     6.275E-03   6.275E-03
U238     6.845E+03   6.845E+03
U239     6.423E-22   6.423E-22
U240     2.904E-08   2.904E-08
NP235    4.963E-09   4.963E-09
```

<portion of file omitted>

```
Total:   9.172E+03   9.172E+03

 Total Fuel and Exposure Summary:

         Purex       Total
MWd:     5.645E+04   5.645E+04
MTU:     1.654E+01   1.654E+01

 DKPRO complete, calculation time =   0.6250000
```

valid3a case files:

valid3a.process.dir:

```
#base case, no split or repro, no decay


PROCESS PUREX ZR-1.1U
  reprocess given
```

valid3a.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 152140.814
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid3a

 <==============================================>
```

<portion of file omitted>

```
         Purex       Total
H01      3.309E+01   3.309E+01
H02      9.511E-03   9.511E-03
H03      3.262E-02   3.262E-02
```

<portion of file omitted>

```
AC228    1.319E-16   1.319E-16
TH226    1.512E-18   1.512E-18
TH227    1.382E-14   1.382E-14
TH228    1.368E-09   1.368E-09
TH229    1.919E-10   1.919E-10
TH230    1.202E-05   1.202E-05
TH231    5.965E-09   5.965E-09
TH232    7.636E-07   7.636E-07
TH234    1.011E-06   1.011E-06
PA231    1.006E-06   1.006E-06
PA232    1.175E-09   1.175E-09
PA233    3.866E-08   3.866E-08
PA234    1.546E-11   1.546E-11
PA234*   3.409E-11   3.409E-11
U230     4.157E-18   4.157E-18
U231     2.028E-16   2.028E-16
U232     1.240E-09   1.240E-09
U233     3.097E-08   3.097E-08
U234     1.488E-02   1.488E-02
U235     1.679E+00   1.679E+00
U236     1.359E-01   1.359E-01
U237     1.782E-04   1.782E-04
U238     1.944E+02   1.944E+02
U239     1.824E-23   1.824E-23
U240     8.246E-10   8.246E-10
NP235    1.407E-09   1.407E-09
NP236    1.422E-07   1.422E-07
NP236*   2.950E-09   2.950E-09
```

```
NP237     3.694E-01   3.694E-01
NP238     5.614E-04   5.614E-04
NP239     5.855E-01   5.855E-01
NP240     8.259E-12   8.259E-12
NP240*    7.086E-10   7.086E-10
PU236     8.308E-09   8.308E-09
PU237     8.281E-10   8.281E-10
PU238     1.030E-03   1.030E-03
PU239     1.375E+00   1.375E+00
PU240     2.018E-01   2.018E-01
PU241     5.094E-02   5.094E-02
PU242     3.524E-03   3.524E-03
PU243     1.969E-08   1.969E-08
PU244     9.375E-09   9.375E-09
PU245     2.313E-14   2.313E-14
PU246     3.539E-16   3.539E-16
AM239     2.303E-13   2.303E-13
```

<portion of file omitted>

```
Total:    2.299E+03   2.299E+03

 Total Fuel and Exposure Summary:

          Purex       Total
MWd:      5.645E+04   5.645E+04
MTU:      1.654E+01   1.654E+01

 DKPRO complete, calculation time =   0.6406250
```

valid4 case files:

valid4.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: scale


PROCESS PUREX ZR-1.1U
  scale 0.1
```

valid4.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 152415.892
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid4

 <==============================================>
```

<portion of file omitted>

```
         Purex       Total
H01      3.309E+00   3.309E+00
H02      9.511E-04   9.511E-04
H03      3.262E-03   3.262E-03
```

<portion of file omitted>

```
PA234*   3.409E-12   3.409E-12
U230     1.464E-16   1.464E-16
U231     7.139E-15   7.139E-15
U232     4.367E-08   4.367E-08
U233     1.090E-06   1.090E-06
U234     5.238E-01   5.238E-01
U235     5.914E+01   5.914E+01
U236     4.784E+00   4.784E+00
U237     6.275E-03   6.275E-03
U238     6.845E+03   6.845E+03
U239     6.423E-22   6.423E-22
U240     2.904E-08   2.904E-08
NP235    4.963E-10   4.963E-10
```

<portion of file omitted>

```
Total:   7.136E+03   7.136E+03

 Total Fuel and Exposure Summary:

         Purex       Total
MWd:     5.645E+04   5.645E+04
MTU:     1.654E+01   1.654E+01

 DKPRO complete, calculation time =   0.5000000
```

valid5 case files:

valid5.inp:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: split

PATH    p:\dkpro\lib

FILE    u:\data\dkpro\validation\v31\valid1\valid1.prn

DICTIONARY origdict.valid1

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

split

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

valid5.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: split


PROCESS PUREX ZR-1.1U
  split 0.9 U 0.1
```

valid5.log excerpts:

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020826 run time = 152933.845
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid5

 <==============================================>
```

<portion of file omitted>

```
          Purex        Total
H01       2.978E+01    2.978E+01
H02       8.560E-03    8.560E-03
H03       2.936E-02    2.936E-02
```

<portion of file omitted>

```
PA234*    3.068E-11    3.068E-11
U230      1.464E-16    1.464E-16
U231      7.139E-15    7.139E-15
U232      4.367E-08    4.367E-08
U233      1.090E-06    1.090E-06
U234      5.238E-01    5.238E-01
U235      5.914E+01    5.914E+01
U236      4.784E+00    4.784E+00
U237      6.275E-03    6.275E-03
U238      6.845E+03    6.845E+03
U239      6.423E-22    6.423E-22
U240      2.904E-08    2.904E-08
NP235     4.467E-09    4.467E-09
```

<portion of file omitted>

```
Total:    7.136E+04    7.136E+04

 Total Fuel and Exposure Summary:

          Purex        Total
MWd:      5.645E+04    5.645E+04
MTU:      1.654E+01    1.654E+01

 DKPRO complete, calculation time =   0.5625000
```

valid6 case files:

valid6.inp:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test summary directive: stime

PATH    p:\dkpro\lib

FILE    p:\dkpro\lib\unified6rep.PRN

DICTIONARY origdict.valid1

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

valid6.summary.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test summary directive: stime

SUMMARY Purex
   PLANT PUREX

SUMMARY Purex-67
   PLANT PUREX
   stime 1/1967 1/1968
```

valid6.log excerpts:

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020826 run time = 151658.892
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid6

 <==============================================>
```

<portion of file omitted>

	Purex	Purex-67	Total
H01	1.850E+03	8.316E+01	1.933E+03
H02	4.024E-01	2.206E-02	4.245E-01
H03	8.769E-01	6.843E-02	9.453E-01

<portion of file omitted>

PA234*	1.842E-09	8.552E-11	1.928E-09
U230	2.822E-14	2.789E-15	3.101E-14
U231	1.598E-12	1.429E-13	1.741E-12
U232	9.972E-06	8.748E-07	1.085E-05
U233	3.267E-04	2.353E-05	3.503E-04
U234	3.046E+02	1.333E+01	3.179E+02
U235	3.860E+04	1.561E+03	4.016E+04
U236	2.914E+03	1.078E+02	3.022E+03
U237	3.617E+00	1.480E-01	3.765E+00
U238	3.833E+06	1.721E+05	4.005E+06
U239	3.583E-19	1.617E-20	3.745E-19
U240	1.576E-05	7.279E-07	1.649E-05
NP235	1.016E-07	9.274E-09	1.108E-07

<portion of file omitted>

Total:	3.983E+06	1.792E+05	4.162E+06

Total Fuel and Exposure Summary:

	Purex	Purex-67	Total
MWd:	1.565E+06	1.194E+05	1.685E+06
MTU:	9.263E+02	4.157E+01	9.679E+02

DKPRO complete, calculation time = 10.48438

valid7 case files:

valid7.summary.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test summary directive: time

SUMMARY Purex
   PLANT PUREX

SUMMARY Purex-67
   PLANT PUREX
   time 1/1967 1/1968
```

valid7.log excerpts:

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020826 run time = 154015.111
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid7

 <==============================================>
```

<portion of file omitted>

	Purex	Purex-67	Total
H01	1.850E+03	1.703E+02	2.020E+03
H02	4.024E-01	4.081E-02	4.432E-01
H03	8.769E-01	1.081E-01	9.850E-01

<portion of file omitted>

PA234*	1.842E-09	1.741E-10	2.017E-09
U230	2.822E-14	3.976E-15	3.220E-14
U231	1.598E-12	2.107E-13	1.809E-12
U232	9.972E-06	1.292E-06	1.126E-05
U233	3.267E-04	3.870E-05	3.654E-04
U234	3.046E+02	2.769E+01	3.323E+02
U235	3.860E+04	3.382E+03	4.198E+04
U236	2.914E+03	1.900E+02	3.104E+03
U237	3.617E+00	2.791E-01	3.896E+00
U238	3.833E+06	3.527E+05	4.186E+06
U239	3.583E-19	3.316E-20	3.915E-19
U240	1.576E-05	1.482E-06	1.724E-05
NP235	1.016E-07	1.205E-08	1.136E-07

<portion of file omitted>

Total:	3.983E+06	3.668E+05	4.350E+06

Total Fuel and Exposure Summary:

	Purex	Purex-67	Total
MWd:	1.565E+06	1.908E+05	1.756E+06
MTU:	9.263E+02	8.513E+01	1.011E+03

DKPRO complete, calculation time = 10.15625

valid9 case files:

valid9.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: decay

PROCESS PUREX ZR-1.1U
  decay 30 d
```

valid9.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 155805.595
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid9

 <==============================================>
```

<portion of file omitted>

```
          Purex        Total
H01       3.309E+01    3.309E+01
H02       9.511E-03    9.511E-03
H03       3.247E-02    3.247E-02
```

<portion of file omitted>

```
PA234*    3.408E-11    3.408E-11
U230      5.386E-16    5.386E-16
U231      5.059E-16    5.059E-16
U232      4.533E-07    4.533E-07
U233      1.094E-05    1.094E-05
U234      5.238E+00    5.238E+00
U235      5.914E+02    5.914E+02
U236      4.784E+01    4.784E+01
U237      2.882E-03    2.882E-03
U238      6.845E+04    6.845E+04
U240      1.838E-17    1.838E-17
NP235     4.709E-09    4.709E-09
```

<portion of file omitted>

```
Total:    7.136E+04    7.136E+04

 Total Fuel and Exposure Summary:

          Purex        Total
MWd:      5.645E+04    5.645E+04
MTU:      1.654E+01    1.654E+01

 DKPRO complete, calculation time =   0.5937500
```

valid9a case files:

valid9a.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: decay given

PROCESS PUREX ZR-1.1U
  decay given
```

valid9a.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 155952.048
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid9a

 <==============================================>
```

<portion of file omitted>

```
          Purex        Total
H01       3.309E+01    3.309E+01
H02       9.511E-03    9.511E-03
H03       3.166E-02    3.166E-02
```

<portion of file omitted>

```
PA234*    3.408E-11    3.408E-11
U230      2.278E-18    2.278E-18
U231      8.969E-28    8.969E-28
U232      5.326E-07    5.326E-07
U233      1.113E-05    1.113E-05
U234      5.239E+00    5.239E+00
U235      5.914E+02    5.914E+02
U236      4.784E+01    4.784E+01
U237      1.492E-07    1.492E-07
U238      6.845E+04    6.845E+04
U240      1.838E-17    1.838E-17
NP235     3.535E-09    3.535E-09
```

<portion of file omitted>

```
Total:    7.136E+04    7.136E+04

 Total Fuel and Exposure Summary:

          Purex        Total
MWd:      5.645E+04    5.645E+04
MTU:      1.654E+01    1.654E+01

 DKPRO complete, calculation time =   0.6250000
```

valid10 case files:

valid10.process.dir:

```
#validation case; test prn with 1 batch, use core origen files w/ specific exposures
#test process directive: final 1/2001

final 1/2001

PROCESS PUREX ZR-1.1U
```

valid10.log excerpts:

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020826 run time = 160107.329
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid10

<==============================================>
```

<portion of file omitted>

```
          Purex        Total
H01       3.309E+01    3.309E+01
H02       9.511E-03    9.511E-03
H03       4.812E-03    4.812E-03
```

<portion of file omitted>

```
PA234*    3.408E-11    3.408E-11
U232      9.196E-07    9.196E-07
U233      2.651E-05    2.651E-05
U234      5.264E+00    5.264E+00
U235      5.915E+02    5.915E+02
U236      4.791E+01    4.791E+01
U237      2.973E-08    2.973E-08
U238      6.845E+04    6.845E+04
U240      1.838E-17    1.838E-17
NP235     1.825E-18    1.825E-18
```

<portion of file omitted>

```
Total:    7.136E+04    7.136E+04

 Total Fuel and Exposure Summary:

          Purex        Total
MWd:      5.645E+04    5.645E+04
MTU:      1.654E+01    1.654E+01

 DKPRO complete, calculation time =   0.4062500
```

valid13 case files:

valid13.inp:

```
#validation case; test prn with 2 batches, w/ interpolation, decay

PATH    p:\dkpro\lib

FILE    u:\data\dkpro\validation\v31\valid11\valid11.prn

DICTIONARY origdict.core

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

valid13.process.dir:

```
#validation case; test prn with 2 batches, w/ interpolation, decay

final 1/2001

PROCESS PUREX ZR-1.1U
  decay given

PROCESS T AL-0.71U
  decay given
```

valid13.summary.dir:

```
SUMMARY Purex
   PLANT PUREX

SUMMARY T-Plant
   PLANT T
```

valid13.log excerpts:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020826 run time = 161548.345
 cpu = NW40057207
 working directory = U:\DATA\dkpro\validation\v31\valid13

 <==============================================>
```

<portion of file omitted>

```
Final decay date:  1/2001
 Output units: G-A

 Isotopic Summary


          Purex        T-Plant      Total
H01       3.309E+01    1.860E-02    3.311E+01
H02       9.509E-03    8.770E-08    9.509E-03
H03       4.807E-03    2.077E-04    5.015E-03
```

<portion of file omitted>

```
PA234*    3.408E-11    8.268E-11    1.168E-10
U232      9.195E-07    2.156E-08    9.411E-07
U233      2.650E-05    4.088E-06    3.059E-05
U234      5.264E+00    8.989E+00    1.425E+01
U235      5.915E+02    1.165E+03    1.756E+03
U236      4.790E+01    6.569E+00    5.447E+01
U237      2.966E-08    2.616E-11    2.969E-08
U238      6.845E+04    1.661E+05    2.345E+05
U240      1.849E-17    1.394E-22    1.849E-17
NP235     1.818E-18    1.638E-26    1.818E-18
```

<portion of file omitted>

```
Total:    7.136E+04    1.679E+05    2.393E+05

 Total Fuel and Exposure Summary:

          Purex        T-Plant      Total
MWd:      5.645E+04    8.649E+03    6.510E+04
MTU:      1.654E+01    3.982E+01    5.636E+01

 DKPRO complete, calculation time =   0.5156250
```

ATTACHMENT B

INSTALLATION TEST FILES

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The DKPRO installation test consists of two associated cases: core2 and clad2. These cases represent the complete, best-estimate Hanford Site fuel processing waste stream inventory. After running these cases the output files core2.log and clad2.log should be compared to the benchmark files located at p:\dkpro\testcase. The input files and output files are reproduced below:

core2.inp:

```
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.core

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

SPLIT

OUTPUT
   H3     C14    NI59   CO60   NI63
   SE79   SR90   Y90    ZR93   NB93*  TC99  RU106
   CD113* SB125  SN126  I129   CS134
   CS137  BA137* SM151  EU152  EU154  EU155
   RA226  AC227  RA228  TH229  PA231
   TH232  U232   U233   U234   U235
   U236   NP237  PU238  U238   PU239  PU240
   AM241  PU241  PU242  CM242  AM243
   CM243  CM244
```

core2.process.dir:

```
FINAL   1/2001   # Decay to start of 2001 after other steps completed

PROCESS T AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS T ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro primary given
```

```
PROCESS T ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS REDOX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS REDOX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS REDOX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
```

```
   repro primary given

PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94905
    repro primary given

PROCESS PUREX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94905
    repro primary given

PROCESS PUREX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94905
    repro primary given

PROCESS PUREX AL-0.0TH
    decay given          # Use cooling times from archive file
    split 0.97902  U  0.9885  Th 0.9757  Np 0.97902 Pu 0.97902 Am 0.97902
                   H  0.97902 C 0.97902 Tc 0.97902 I 0.97902 Cs 0.97902 Ba 0.97902
    repro primary given
```

core2.summary.dir:

```
SUMMARY  T-plant
   PLANT T

SUMMARY  B-plant
   PLANT B

SUMMARY  Redox
   PLANT REDOX

SUMMARY Purex
   PLANT PUREX
```

core2.log:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020916 run time = 105242.414
 cpu = NW40057207
 working directory = U:\DATA\dkpro\cases\split2

 <==============================================>
 **** Reading Input Commands from Standard Input File ****
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.core

SUBTYPE subtype.20020724

DECAY ft27f001rev2.
```

```
FORMAT  LANL

UNITS  CURIES

SPLIT

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
 **** End of Input ****

**** Reading Process Directives from file: process.dir
 FINAL   1/2001   # Decay to start of 2001 after other steps completed
 PROCESS T AL-0.71U
     decay given         # Use cooling times from archive file
     split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
     repro primary given
 PROCESS T AL-0.94U
     decay given         # Use cooling times from archive file
     split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
     repro primary given
 PROCESS T ZR-0.94U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS T ZR-1.1U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS T ZR-2.1U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS B AL-0.71U
     decay given         # Use cooling times from archive file
     split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
     repro primary given
 PROCESS B AL-0.94U
     decay given         # Use cooling times from archive file
     split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
     repro primary given
 PROCESS B ZR-0.94U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS B ZR-1.1U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS B ZR-2.1U
     decay given         # Use cooling times from archive file
     split 0.999
     repro primary given
 PROCESS REDOX AL-0.71U
     decay given         # Use cooling times from archive file
```

```
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given
PROCESS REDOX AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given
PROCESS REDOX ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given
PROCESS REDOX ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given
PROCESS REDOX ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.94905  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given
PROCESS PUREX AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given
PROCESS PUREX AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999    U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
   repro primary given
PROCESS PUREX ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94
9
    repro primary given
PROCESS PUREX ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94
9
    repro primary given
PROCESS PUREX ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.995975 U  0.9934  Th 0.9934  Np 0.996   Pu 0.996  Am 0.996
                   H  0.94905 C 0.94905 Tc 0.94905 I 0.94905 Cs 0.94905 Ba 0.94
9
    repro primary given
PROCESS PUREX AL-0.0TH
    decay given         # Use cooling times from archive file
    split 0.97902  U  0.9885  Th 0.9757  Np 0.97902 Pu 0.97902 Am 0.97902
                   H  0.97902 C 0.97902 Tc 0.97902 I 0.97902 Cs 0.97902 Ba 0.97
9
    repro primary given
**** End of Process Directives ****

**** Reading Summary Directives from file: summary.dir
SUMMARY  T-plant
   PLANT T
SUMMARY  B-plant
   PLANT B
SUMMARY  Redox
   PLANT REDOX
SUMMARY Purex
   PLANT PUREX
**** End of Summary Directives ****
```

```
List Library Directory:
Volume in drive P is Applications
Volume Serial Number is B831-5A78

Directory of p:\dkpro\lib

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09/16/02  08:29a        <DIR>          ..
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08/15/02  08:26a                 5,789 CLAD.MK1AA001A.org
08/15/02  08:26a                 5,871 CLAD.MK1AA002.org
08/15/02  08:26a                 5,871 CLAD.MK1AA003.org
08/15/02  08:26a                 6,035 CLAD.MK1AA005.org
08/15/02  08:26a                 6,117 CLAD.MK1AA007.org
08/15/02  08:26a                 6,035 CLAD.MK1AA010.org
08/15/02  08:26a                 6,281 CLAD.MK1AA015.org
08/15/02  08:26a                 6,445 CLAD.MK1AA020.org
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08/15/02	08:24a	15,172	COMBO.MK1AC003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AC005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AC007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AC010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AC015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AC030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AC040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AC050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AC070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AC200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AC300.ORG
08/15/02	08:24a	1,964	COMBO.MKII000.ORG
08/15/02	08:24a	14,838	COMBO.MKII001A.ORG
08/15/02	08:24a	14,839	COMBO.MKII002.ORG
08/15/02	08:24a	15,002	COMBO.MKII003.ORG
08/15/02	08:24a	15,248	COMBO.MKII005.ORG
08/15/02	08:24a	15,248	COMBO.MKII007.ORG
08/15/02	08:24a	15,412	COMBO.MKII010.ORG
08/15/02	08:24a	15,494	COMBO.MKII015.ORG
08/15/02	08:24a	15,576	COMBO.MKII020.ORG
08/15/02	08:24a	15,658	COMBO.MKII025.ORG
08/15/02	08:24a	15,740	COMBO.MKII030.ORG
08/15/02	08:24a	15,822	COMBO.MKII040.ORG

08/15/02	08:24a	15,904	COMBO.MKII050.ORG
08/15/02	08:24a	16,150	COMBO.MKII070.ORG
08/15/02	08:24a	16,315	COMBO.MKII100.ORG
08/15/02	08:24a	16,397	COMBO.MKII115.ORG
08/15/02	08:24a	16,397	COMBO.MKII130.ORG
08/15/02	08:24a	16,479	COMBO.MKII150.ORG
08/15/02	08:24a	16,561	COMBO.MKII180.ORG
08/15/02	08:24a	16,561	COMBO.MKII200.ORG
08/15/02	08:24a	16,725	COMBO.MKII220.ORG
08/15/02	08:24a	1,970	COMBO.MKIVA000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVA001A.ORG
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08/15/02	08:24a	15,172	COMBO.MKIVA003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVA005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVA007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVA010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVA015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVA030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVA040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVA050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVA070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVA200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVA250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA360.ORG
08/15/02	08:24a	1,974	COMBO.MKIVB000.ORG
08/15/02	08:24a	14,848	COMBO.MKIVB001A.ORG
08/15/02	08:24a	15,013	COMBO.MKIVB002.ORG
08/15/02	08:24a	15,176	COMBO.MKIVB003.ORG
08/15/02	08:24a	15,258	COMBO.MKIVB005.ORG
08/15/02	08:24a	15,422	COMBO.MKIVB007.ORG
08/15/02	08:24a	15,504	COMBO.MKIVB010.ORG
08/15/02	08:24a	15,750	COMBO.MKIVB015.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB020.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB025.ORG
08/15/02	08:24a	15,914	COMBO.MKIVB030.ORG
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08/15/02	08:24a	16,160	COMBO.MKIVB050.ORG
08/15/02	08:24a	16,324	COMBO.MKIVB070.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB100.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB115.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB130.ORG
08/15/02	08:24a	16,899	COMBO.MKIVB200.ORG
08/15/02	08:24a	16,981	COMBO.MKIVB250.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB300.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB360.ORG
08/15/02	08:24a	1,970	COMBO.MKIVC000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVC001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVC002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVC003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVC005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVC007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVC010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVC015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVC030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVC040.ORG

08/15/02	08:24a	16,156	COMBO.MKIVC050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVC070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVC200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVC250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC360.ORG
08/15/02	08:25a	1,552	COMBO.SPE000.ORG
08/15/02	08:25a	13,114	COMBO.SPE001A.ORG
08/15/02	08:25a	13,115	COMBO.SPE002.ORG
08/15/02	08:25a	13,360	COMBO.SPE003.ORG
08/15/02	08:25a	13,524	COMBO.SPE005.ORG
08/15/02	08:25a	13,606	COMBO.SPE007.ORG
08/15/02	08:25a	13,606	COMBO.SPE010.ORG
08/15/02	08:25a	13,770	COMBO.SPE015.ORG
08/15/02	08:25a	13,770	COMBO.SPE020.ORG
08/15/02	08:25a	13,770	COMBO.SPE025.ORG
08/15/02	08:25a	13,770	COMBO.SPE030.ORG
08/15/02	08:25a	13,852	COMBO.SPE040.ORG
08/15/02	08:25a	13,852	COMBO.SPE050.ORG
08/15/02	08:25a	13,934	COMBO.SPE070.ORG
08/15/02	08:25a	14,099	COMBO.SPE100.ORG
08/15/02	08:25a	14,099	COMBO.SPE125.ORG
08/15/02	08:25a	14,181	COMBO.SPE150.ORG
08/15/02	08:25a	14,181	COMBO.SPE200.ORG
08/15/02	08:25a	14,345	COMBO.SPE250.ORG
08/15/02	08:25a	14,509	COMBO.SPE300.ORG
08/15/02	08:25a	14,509	COMBO.SPE320.ORG
08/15/02	08:24a	1,558	COMBO.SPNA000.ORG
08/15/02	08:24a	13,202	COMBO.SPNA001A.ORG
08/15/02	08:24a	13,285	COMBO.SPNA002.ORG
08/15/02	08:24a	13,366	COMBO.SPNA003.ORG
08/15/02	08:24a	13,530	COMBO.SPNA005.ORG
08/15/02	08:24a	13,612	COMBO.SPNA007.ORG
08/15/02	08:24a	13,612	COMBO.SPNA010.ORG
08/15/02	08:24a	13,858	COMBO.SPNA015.ORG
08/15/02	08:24a	13,858	COMBO.SPNA020.ORG
08/15/02	08:24a	13,858	COMBO.SPNA025.ORG
08/15/02	08:24a	13,940	COMBO.SPNA030.ORG
08/15/02	08:24a	13,940	COMBO.SPNA040.ORG
08/15/02	08:24a	13,940	COMBO.SPNA050.ORG
08/15/02	08:24a	14,022	COMBO.SPNA070.ORG
08/15/02	08:24a	14,187	COMBO.SPNA100.ORG
08/15/02	08:24a	14,187	COMBO.SPNA125.ORG
08/15/02	08:24a	14,269	COMBO.SPNA150.ORG
08/15/02	08:24a	14,351	COMBO.SPNA200.ORG
08/15/02	08:24a	14,597	COMBO.SPNA250.ORG
08/15/02	08:24a	14,597	COMBO.SPNA300.ORG
08/15/02	08:24a	14,597	COMBO.SPNA320.ORG
08/15/02	08:25a	1,562	COMBO.SPNB000.ORG
08/15/02	08:25a	13,124	COMBO.SPNB001A.ORG
08/15/02	08:25a	13,207	COMBO.SPNB002.ORG
08/15/02	08:25a	13,370	COMBO.SPNB003.ORG
08/15/02	08:25a	13,534	COMBO.SPNB005.ORG
08/15/02	08:25a	13,616	COMBO.SPNB007.ORG
08/15/02	08:25a	13,616	COMBO.SPNB010.ORG
08/15/02	08:25a	13,780	COMBO.SPNB015.ORG
08/15/02	08:25a	13,780	COMBO.SPNB020.ORG
08/15/02	08:25a	13,780	COMBO.SPNB025.ORG
08/15/02	08:25a	13,862	COMBO.SPNB030.ORG
08/15/02	08:25a	13,862	COMBO.SPNB040.ORG

08/15/02	08:25a	13,862	COMBO.SPNB050.ORG
08/15/02	08:25a	14,026	COMBO.SPNB070.ORG
08/15/02	08:25a	14,109	COMBO.SPNB100.ORG
08/15/02	08:25a	14,109	COMBO.SPNB125.ORG
08/15/02	08:25a	14,191	COMBO.SPNB150.ORG
08/15/02	08:25a	14,273	COMBO.SPNB200.ORG
08/15/02	08:25a	14,519	COMBO.SPNB250.ORG
08/15/02	08:25a	14,519	COMBO.SPNB300.ORG
08/15/02	08:25a	14,519	COMBO.SPNB320.ORG
08/15/02	08:25a	1,558	COMBO.SPNC000.ORG
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08/15/02	08:25a	13,203	COMBO.SPNC002.ORG
08/15/02	08:25a	13,366	COMBO.SPNC003.ORG
08/15/02	08:25a	13,530	COMBO.SPNC005.ORG
08/15/02	08:25a	13,612	COMBO.SPNC007.ORG
08/15/02	08:25a	13,612	COMBO.SPNC010.ORG
08/15/02	08:25a	13,776	COMBO.SPNC015.ORG
08/15/02	08:25a	13,776	COMBO.SPNC020.ORG
08/15/02	08:25a	13,776	COMBO.SPNC025.ORG
08/15/02	08:25a	13,858	COMBO.SPNC030.ORG
08/15/02	08:25a	13,858	COMBO.SPNC040.ORG
08/15/02	08:25a	13,858	COMBO.SPNC050.ORG
08/15/02	08:25a	14,022	COMBO.SPNC070.ORG
08/15/02	08:25a	14,105	COMBO.SPNC100.ORG
08/15/02	08:25a	14,105	COMBO.SPNC125.ORG
08/15/02	08:25a	14,187	COMBO.SPNC150.ORG
08/15/02	08:25a	14,269	COMBO.SPNC200.ORG
08/15/02	08:25a	14,515	COMBO.SPNC250.ORG
08/15/02	08:25a	14,515	COMBO.SPNC300.ORG
08/15/02	08:25a	14,515	COMBO.SPNC320.ORG
09/05/02	04:05p	13,796	COMBO.TH1.ORG
08/15/02	08:25a	1,150	CORE.MK1AA000.ORG
08/15/02	08:25a	12,630	CORE.MK1AA001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AA002.ORG
08/15/02	08:25a	12,958	CORE.MK1AA003.ORG
08/15/02	08:25a	13,040	CORE.MK1AA005.ORG
08/15/02	08:25a	13,122	CORE.MK1AA007.ORG
08/15/02	08:25a	13,204	CORE.MK1AA010.ORG
08/15/02	08:25a	13,368	CORE.MK1AA015.ORG
08/15/02	08:25a	13,368	CORE.MK1AA020.ORG
08/15/02	08:25a	13,450	CORE.MK1AA025.ORG
08/15/02	08:25a	13,532	CORE.MK1AA030.ORG
08/15/02	08:25a	13,614	CORE.MK1AA040.ORG
08/15/02	08:25a	13,614	CORE.MK1AA050.ORG
08/15/02	08:25a	13,942	CORE.MK1AA070.ORG
08/15/02	08:25a	14,025	CORE.MK1AA100.ORG
08/15/02	08:25a	14,107	CORE.MK1AA115.ORG
08/15/02	08:25a	14,107	CORE.MK1AA130.ORG
08/15/02	08:25a	14,271	CORE.MK1AA200.ORG
08/15/02	08:25a	14,353	CORE.MK1AA230.ORG
08/15/02	08:25a	14,353	CORE.MK1AA273.ORG
08/15/02	08:25a	14,435	CORE.MK1AA300.ORG
08/15/02	08:25a	1,154	CORE.MK1AB000.ORG
08/15/02	08:25a	12,634	CORE.MK1AB001A.ORG
08/15/02	08:25a	12,717	CORE.MK1AB002.ORG
08/15/02	08:25a	12,962	CORE.MK1AB003.ORG
08/15/02	08:25a	13,044	CORE.MK1AB005.ORG
08/15/02	08:25a	13,126	CORE.MK1AB007.ORG
08/15/02	08:25a	13,208	CORE.MK1AB010.ORG
08/15/02	08:25a	13,372	CORE.MK1AB015.ORG
08/15/02	08:25a	13,372	CORE.MK1AB020.ORG
08/15/02	08:25a	13,454	CORE.MK1AB025.ORG
08/15/02	08:25a	13,536	CORE.MK1AB030.ORG

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08/15/02	08:25a	13,618	CORE.MK1AB050.ORG
08/15/02	08:25a	13,946	CORE.MK1AB070.ORG
08/15/02	08:25a	14,029	CORE.MK1AB100.ORG
08/15/02	08:25a	14,111	CORE.MK1AB115.ORG
08/15/02	08:25a	14,111	CORE.MK1AB130.ORG
08/15/02	08:25a	14,275	CORE.MK1AB200.ORG
08/15/02	08:25a	14,357	CORE.MK1AB230.ORG
08/15/02	08:25a	14,357	CORE.MK1AB273.ORG
08/15/02	08:25a	14,439	CORE.MK1AB300.ORG
08/15/02	08:25a	1,150	CORE.MK1AC000.ORG
08/15/02	08:25a	12,630	CORE.MK1AC001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AC002.ORG
08/15/02	08:25a	12,958	CORE.MK1AC003.ORG
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08/15/02	08:25a	13,122	CORE.MK1AC007.ORG
08/15/02	08:25a	13,204	CORE.MK1AC010.ORG
08/15/02	08:25a	13,368	CORE.MK1AC015.ORG
08/15/02	08:25a	13,368	CORE.MK1AC020.ORG
08/15/02	08:25a	13,450	CORE.MK1AC025.ORG
08/15/02	08:25a	13,532	CORE.MK1AC030.ORG
08/15/02	08:25a	13,614	CORE.MK1AC040.ORG
08/15/02	08:25a	13,614	CORE.MK1AC050.ORG
08/15/02	08:25a	13,942	CORE.MK1AC070.ORG
08/15/02	08:25a	14,025	CORE.MK1AC100.ORG
08/15/02	08:25a	14,107	CORE.MK1AC115.ORG
08/15/02	08:25a	14,107	CORE.MK1AC130.ORG
08/15/02	08:25a	14,271	CORE.MK1AC200.ORG
08/15/02	08:25a	14,353	CORE.MK1AC230.ORG
08/15/02	08:25a	14,353	CORE.MK1AC273.ORG
08/15/02	08:25a	14,435	CORE.MK1AC300.ORG
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08/15/02	08:25a	13,362	CORE.MKII025.ORG
08/15/02	08:25a	13,362	CORE.MKII030.ORG
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08/15/02	08:25a	13,937	CORE.MKII130.ORG
08/15/02	08:25a	13,937	CORE.MKII150.ORG
08/15/02	08:25a	13,937	CORE.MKII180.ORG
08/15/02	08:25a	14,019	CORE.MKII200.ORG
08/15/02	08:25a	14,183	CORE.MKII220.ORG
08/15/02	08:25a	1,150	CORE.MKIVA000.ORG
08/15/02	08:25a	12,630	CORE.MKIVA001A.ORG
08/15/02	08:25a	12,713	CORE.MKIVA002.ORG
08/15/02	08:25a	12,958	CORE.MKIVA003.ORG
08/15/02	08:25a	13,040	CORE.MKIVA005.ORG
08/15/02	08:25a	13,122	CORE.MKIVA007.ORG
08/15/02	08:25a	13,204	CORE.MKIVA010.ORG
08/15/02	08:25a	13,368	CORE.MKIVA015.ORG
08/15/02	08:25a	13,450	CORE.MKIVA020.ORG
08/15/02	08:25a	13,450	CORE.MKIVA025.ORG
08/15/02	08:25a	13,532	CORE.MKIVA030.ORG

08/15/02	08:25a	13,614	CORE.MKIVA040.ORG
08/15/02	08:25a	13,614	CORE.MKIVA050.ORG
08/15/02	08:25a	13,860	CORE.MKIVA070.ORG
08/15/02	08:25a	13,943	CORE.MKIVA100.ORG
08/15/02	08:25a	14,025	CORE.MKIVA115.ORG
08/15/02	08:25a	14,025	CORE.MKIVA130.ORG
08/15/02	08:25a	14,271	CORE.MKIVA200.ORG
08/15/02	08:25a	14,353	CORE.MKIVA250.ORG
08/15/02	08:25a	14,435	CORE.MKIVA300.ORG
08/15/02	08:25a	14,435	CORE.MKIVA360.ORG
08/15/02	08:25a	1,154	CORE.MKIVB000.ORG
08/15/02	08:25a	12,634	CORE.MKIVB001A.ORG
08/15/02	08:25a	12,717	CORE.MKIVB002.ORG
08/15/02	08:25a	12,962	CORE.MKIVB003.ORG
08/15/02	08:25a	13,044	CORE.MKIVB005.ORG
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08/15/02	08:25a	13,208	CORE.MKIVB010.ORG
08/15/02	08:25a	13,372	CORE.MKIVB015.ORG
08/15/02	08:25a	13,454	CORE.MKIVB020.ORG
08/15/02	08:25a	13,454	CORE.MKIVB025.ORG
08/15/02	08:25a	13,536	CORE.MKIVB030.ORG
08/15/02	08:25a	13,618	CORE.MKIVB040.ORG
08/15/02	08:25a	13,618	CORE.MKIVB050.ORG
08/15/02	08:25a	13,864	CORE.MKIVB070.ORG
08/15/02	08:26a	13,947	CORE.MKIVB100.ORG
08/15/02	08:26a	14,029	CORE.MKIVB115.ORG
08/15/02	08:26a	14,029	CORE.MKIVB130.ORG
08/15/02	08:26a	14,275	CORE.MKIVB200.ORG
08/15/02	08:26a	14,357	CORE.MKIVB250.ORG
08/15/02	08:26a	14,439	CORE.MKIVB300.ORG
08/15/02	08:26a	14,439	CORE.MKIVB360.ORG
08/15/02	08:26a	1,150	CORE.MKIVC000.ORG
08/15/02	08:26a	12,630	CORE.MKIVC001A.ORG
08/15/02	08:26a	12,713	CORE.MKIVC002.ORG
08/15/02	08:26a	12,958	CORE.MKIVC003.ORG
08/15/02	08:26a	13,040	CORE.MKIVC005.ORG
08/15/02	08:26a	13,122	CORE.MKIVC007.ORG
08/15/02	08:26a	13,204	CORE.MKIVC010.ORG
08/15/02	08:26a	13,368	CORE.MKIVC015.ORG
08/15/02	08:26a	13,450	CORE.MKIVC020.ORG
08/15/02	08:26a	13,450	CORE.MKIVC025.ORG
08/15/02	08:26a	13,532	CORE.MKIVC030.ORG
08/15/02	08:26a	13,614	CORE.MKIVC040.ORG
08/15/02	08:26a	13,614	CORE.MKIVC050.ORG
08/15/02	08:26a	13,860	CORE.MKIVC070.ORG
08/15/02	08:26a	13,943	CORE.MKIVC100.ORG
08/15/02	08:26a	14,025	CORE.MKIVC115.ORG
08/15/02	08:26a	14,025	CORE.MKIVC130.ORG
08/15/02	08:26a	14,271	CORE.MKIVC200.ORG
08/15/02	08:26a	14,353	CORE.MKIVC250.ORG
08/15/02	08:26a	14,435	CORE.MKIVC300.ORG
08/15/02	08:26a	14,435	CORE.MKIVC360.ORG
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08/15/02	08:26a	11,146	CORE.SPE003.ORG
08/15/02	08:26a	11,310	CORE.SPE005.ORG
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08/15/02	08:26a	11,474	CORE.SPE015.ORG
08/15/02	08:26a	11,474	CORE.SPE020.ORG
08/15/02	08:26a	11,474	CORE.SPE025.ORG
08/15/02	08:26a	11,474	CORE.SPE030.ORG

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08/15/02	08:26a	11,556	CORE.SPE050.ORG
08/15/02	08:26a	11,638	CORE.SPE070.ORG
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08/15/02	08:26a	12,223	CORE.SPNB320.ORG
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08/15/02	08:26a	10,988	CORE.SPNC001A.ORG
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08/15/02	08:26a	11,480	CORE.SPNC015.ORG
08/15/02	08:26a	11,480	CORE.SPNC020.ORG
08/15/02	08:26a	11,480	CORE.SPNC025.ORG
08/15/02	08:26a	11,562	CORE.SPNC030.ORG

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08/15/02  08:26a                11,562 CORE.SPNC040.ORG
08/15/02  08:26a                11,562 CORE.SPNC050.ORG
08/15/02  08:26a                11,726 CORE.SPNC070.ORG
08/15/02  08:26a                11,809 CORE.SPNC100.ORG
08/15/02  08:26a                11,809 CORE.SPNC125.ORG
08/15/02  08:26a                11,891 CORE.SPNC150.ORG
08/15/02  08:26a                12,055 CORE.SPNC200.ORG
08/15/02  08:26a                12,219 CORE.SPNC250.ORG
08/15/02  08:26a                12,219 CORE.SPNC300.ORG
08/15/02  08:26a                12,219 CORE.SPNC320.ORG
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06/07/02  07:41p                   162 fort.3.mkiv
07/24/02  09:18a                 1,620 fort.3.spe
07/24/02  09:53a                 1,621 fort.3.spn
09/04/02  04:43p                    80 fort.3.th
06/07/02  09:23p               278,843 FT27F001rev1
07/22/02  01:42p               278,830 ft27f001rev2
07/19/02  02:13p               183,210 mkiai.20020719
07/19/02  02:16p               183,210 mkiao.20020719
07/19/02  02:16p               183,210 mkivi.20020719
07/19/02  02:16p               183,210 mkivo.20020719
12/06/00  05:57p        <DIR>          old
08/08/02  02:12p        <DIR>          oldxs
11/27/96  11:30a               265,783 orig21
07/24/02  11:05a                 9,171 origdict.clad
07/24/02  11:05a                 9,392 origdict.combo
08/07/02  09:02a                 9,171 origdict.core
07/24/02  01:29p                   359 subtype.20020724
03/24/99  05:31p                   319 subtype.june2002
03/29/99  05:07p               334,310 unified6.prn
09/12/02  04:50p               403,302 unified6rep.prn
08/07/02  08:07a        <DIR>          v30
12/06/00  05:57p        <DIR>          valid1
08/21/02  03:55p                     0 valid1.PRN
             723 File(s)      9,853,599 bytes
                          1,090,617,344 bytes free
                          1,090,617,344 bytes free
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**** Dictionary of Fuel Types ****
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'ZR-1.1UA'     26.4  'CORE.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'CORE.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CORE.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CORE.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CORE.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CORE.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CORE.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CORE.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CORE.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CORE.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CORE.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CORE.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'CORE.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'CORE.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CORE.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CORE.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CORE.MK1AA230.ORG'
'ZR-1.1UA'   3604.0  'CORE.MK1AA273.ORG'
'ZR-1.1UA'   3960.0  'CORE.MK1AA300.ORG'
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'ZR-1.1UB'	39.6	'CORE.MK1AB003.ORG'
'ZR-1.1UB'	66.0	'CORE.MK1AB005.ORG'
'ZR-1.1UB'	92.4	'CORE.MK1AB007.ORG'
'ZR-1.1UB'	132.0	'CORE.MK1AB010.ORG'
'ZR-1.1UB'	198.0	'CORE.MK1AB015.ORG'
'ZR-1.1UB'	264.0	'CORE.MK1AB020.ORG'
'ZR-1.1UB'	330.0	'CORE.MK1AB025.ORG'
'ZR-1.1UB'	396.0	'CORE.MK1AB030.ORG'
'ZR-1.1UB'	528.0	'CORE.MK1AB040.ORG'
'ZR-1.1UB'	660.0	'CORE.MK1AB050.ORG'
'ZR-1.1UB'	924.0	'CORE.MK1AB070.ORG'
'ZR-1.1UB'	1320.0	'CORE.MK1AB100.ORG'
'ZR-1.1UB'	1518.0	'CORE.MK1AB115.ORG'
'ZR-1.1UB'	1716.0	'CORE.MK1AB130.ORG'
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'ZR-1.1UB'	3960.0	'CORE.MK1AB300.ORG'
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'ZR-1.1UC'	198.0	'CORE.MK1AC015.ORG'
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'ZR-1.1UC'	1320.0	'CORE.MK1AC100.ORG'
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'ZR-2.1U'	924.0	'CORE.MKII070.ORG'
'ZR-2.1U'	1320.0	'CORE.MKII100.ORG'
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'AL-0.71UB'  2500.0  'CORE.SPNB250.ORG'
'AL-0.71UB'  3000.0  'CORE.SPNB300.ORG'
'AL-0.71UB'  3200.0  'CORE.SPNB320.ORG'
'AL-0.71UC'    15.0  'CORE.SPNC001A.ORG'
'AL-0.71UC'    20.0  'CORE.SPNC002.ORG'
'AL-0.71UC'    30.0  'CORE.SPNC003.ORG'
'AL-0.71UC'    50.0  'CORE.SPNC005.ORG'
'AL-0.71UC'    70.0  'CORE.SPNC007.ORG'
'AL-0.71UC'   100.0  'CORE.SPNC010.ORG'
'AL-0.71UC'   150.0  'CORE.SPNC015.ORG'
'AL-0.71UC'   200.0  'CORE.SPNC020.ORG'
'AL-0.71UC'   250.0  'CORE.SPNC025.ORG'
'AL-0.71UC'   300.0  'CORE.SPNC030.ORG'
'AL-0.71UC'   400.0  'CORE.SPNC040.ORG'
'AL-0.71UC'   500.0  'CORE.SPNC050.ORG'
'AL-0.71UC'   700.0  'CORE.SPNC070.ORG'
'AL-0.71UC'  1000.0  'CORE.SPNC100.ORG'
'AL-0.71UC'  1250.0  'CORE.SPNC125.ORG'
'AL-0.71UC'  1500.0  'CORE.SPNC150.ORG'
'AL-0.71UC'  2000.0  'CORE.SPNC200.ORG'
'AL-0.71UC'  2500.0  'CORE.SPNC250.ORG'
'AL-0.71UC'  3000.0  'CORE.SPNC300.ORG'
'AL-0.71UC'  3200.0  'CORE.SPNC320.ORG'
'AL-0.94U'     15.0  'CORE.SPE001A.ORG'
'AL-0.94U'     20.0  'CORE.SPE002.ORG'
'AL-0.94U'     30.0  'CORE.SPE003.ORG'
'AL-0.94U'     50.0  'CORE.SPE005.ORG'
'AL-0.94U'     70.0  'CORE.SPE007.ORG'
'AL-0.94U'    100.0  'CORE.SPE010.ORG'
'AL-0.94U'    150.0  'CORE.SPE015.ORG'
'AL-0.94U'    200.0  'CORE.SPE020.ORG'
'AL-0.94U'    250.0  'CORE.SPE025.ORG'
```

```
'AL-0.94U'    300.0  'CORE.SPE030.ORG'
'AL-0.94U'    400.0  'CORE.SPE040.ORG'
'AL-0.94U'    500.0  'CORE.SPE050.ORG'
'AL-0.94U'    700.0  'CORE.SPE070.ORG'
'AL-0.94U'   1000.0  'CORE.SPE100.ORG'
'AL-0.94U'   1250.0  'CORE.SPE125.ORG'
'AL-0.94U'   1500.0  'CORE.SPE150.ORG'
'AL-0.94U'   2000.0  'CORE.SPE200.ORG'
'AL-0.94U'   2500.0  'CORE.SPE250.ORG'
'AL-0.94U'   3000.0  'CORE.SPE300.ORG'
'AL-0.94U'   3200.0  'CORE.SPE320.ORG'
'AL-0.0TH'      1.0  'CORE.TH1.ORG'
**** End of Fuel Type Dictionary ****

**** Fuel Subtypes ****
opening file p:\dkpro\lib\subtype.20020724
AL-0.71U 1920 1 1 1954 12 31 AL-0.71UA
AL-0.71U 1954 1 1 1958 12 31 AL-0.71UB
AL-0.71U 1959 1 1 3000 12 31 AL-0.71UC
ZR-0.94U 1920 1 1 1971 12 31 ZR-0.94UA
ZR-0.94U 1972 1 1 1980 12 31 ZR-0.94UB
ZR-0.94U 1981 1 1 3000 12 31 ZR-0.94UC
ZR-1.1U  1920 1 1 1971 12 31 ZR-1.1UA
ZR-1.1U  1972 1 1 1980 12 31 ZR-1.1UB
ZR-1.1U  1981 1 1 3000 12 31 ZR-1.1UC
**** End of Fuel Subtypes ****

**** Nuclide Inventory Library Files ****

opening file p:\dkpro\lib\CORE.MK1AA001A.ORG
Mk-1AA:  B = 19.8 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA002.ORG
Mk-1AA:  B =  26.4 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA003.ORG
Mk-1AA:  B = 39.6 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA005.ORG
Mk-1AA:  B = 66.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA007.ORG
Mk-1AA:  B = 92.4 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA010.ORG
Mk-1AA:  B = 132. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA015.ORG
Mk-1AA:  B = 198. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA020.ORG
Mk-1AA:  B = 264. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA025.ORG
Mk-1AA:  B = 330. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA030.ORG
Mk-1AA:  B = 396. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA040.ORG
Mk-1AA:  B = 528. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA050.ORG
Mk-1AA:  B = 660. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA070.ORG
Mk-1AA:  B = 924. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA100.ORG
Mk-1AA:  B = 1320. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA115.ORG
Mk-1AA:  B = 1518. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA130.ORG
Mk-1AA:  B = 1716. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA200.ORG
Mk-1AA:  B = 2640. MWd/MTU  <1972
```

```
opening file p:\dkpro\lib\CORE.MK1AA230.ORG
Mk-1AA:  B = 3036. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA273.ORG
Mk-1AA:  B = 3604. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AA300.ORG
Mk-1AA:  B = 3960. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MK1AB001A.ORG
Mk-1AB:  B = 19.8 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB002.ORG
Mk-1AB:  B =  26.4 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB003.ORG
Mk-1AB:  B = 39.6 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB005.ORG
Mk-1AB:  B = 66.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB007.ORG
Mk-1AB:  B = 92.4 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB010.ORG
Mk-1AB:  B = 132. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB015.ORG
Mk-1AB:  B = 198. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB020.ORG
Mk-1AB:  B = 264. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB025.ORG
Mk-1AB:  B = 330. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB030.ORG
Mk-1AB:  B = 396. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB040.ORG
Mk-1AB:  B = 528. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB050.ORG
Mk-1AB:  B = 660. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB070.ORG
Mk-1AB:  B = 924. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB100.ORG
Mk-1AB:  B = 1320. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB115.ORG
Mk-1AB:  B = 1518. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB130.ORG
Mk-1AB:  B = 1716. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB200.ORG
Mk-1AB:  B = 2640. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB230.ORG
Mk-1AB:  B = 3036. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB273.ORG
Mk-1AB:  B = 3604. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AB300.ORG
Mk-1AB:  B = 3960. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MK1AC001A.ORG
Mk-1AC:  B = 19.8 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC002.ORG
Mk-1AC:  B =  26.4 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC003.ORG
Mk-1AC:  B = 39.6 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC005.ORG
Mk-1AC:  B = 66.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC007.ORG
Mk-1AC:  B = 92.4 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC010.ORG
Mk-1AC:  B = 132. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC015.ORG
Mk-1AC:  B = 198. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC020.ORG
Mk-1AC:  B = 264. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC025.ORG
```

```
Mk-1AC:  B = 330. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC030.ORG
Mk-1AC:  B = 396. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC040.ORG
Mk-1AC:  B = 528. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC050.ORG
Mk-1AC:  B = 660. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC070.ORG
Mk-1AC:  B = 924. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC100.ORG
Mk-1AC:  B = 1320. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC115.ORG
Mk-1AC:  B = 1518. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC130.ORG
Mk-1AC:  B = 1716. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC200.ORG
Mk-1AC:  B = 2640. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC230.ORG
Mk-1AC:  B = 3036. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC273.ORG
Mk-1AC:  B = 3604. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MK1AC300.ORG
Mk-1AC:  B = 3960. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKII001A.ORG
Mk-II:  B = 19.8 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII002.ORG
Mk-II:  B =  26.4 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII003.ORG
Mk-II:  B = 39.6 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII005.ORG
Mk-II:  B = 66.0 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII007.ORG
Mk-II:  B = 92.4 MWd/MTU
opening file p:\dkpro\lib\CORE.MKII010.ORG
Mk-II:  B = 132. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII015.ORG
Mk-II:  B = 198. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII020.ORG
Mk-II:  B = 264. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII025.ORG
Mk-II:  B = 330. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII030.ORG
Mk-II:  B = 396. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII040.ORG
Mk-II:  B = 528. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII050.ORG
Mk-II:  B = 660. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII070.ORG
Mk-II:  B = 924. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII100.ORG
Mk-II:  B = 1320. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII115.ORG
Mk-II:  B = 1518. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII130.ORG
Mk-II:  B = 1716. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII150.ORG
Mk-II:  B = 1980. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII180.ORG
Mk-II:  B = 2376. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII200.ORG
Mk-II:  B = 2640. MWd/MTU
opening file p:\dkpro\lib\CORE.MKII220.ORG
Mk-II:  B = 2904. MWd/MTU
```

```
opening file p:\dkpro\lib\CORE.MKIVA001A.ORG
Mk-IVA:  B = 16.5 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA002.ORG
Mk-IVA:  B =  22.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA003.ORG
Mk-IVA:  B = 33.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA005.ORG
Mk-IVA:  B = 55.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA007.ORG
Mk-IVA:  B = 77.0 MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA010.ORG
Mk-IVA:  B = 110. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA015.ORG
Mk-IVA:  B = 165. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA020.ORG
Mk-IVA:  B = 220. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA025.ORG
Mk-IVA:  B = 275. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA030.ORG
Mk-IVA:  B = 330. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA040.ORG
Mk-IVA:  B = 440. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA050.ORG
Mk-IVA:  B = 550. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA070.ORG
Mk-IVA:  B = 770. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA100.ORG
Mk-IVA:  B = 1100. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA115.ORG
Mk-IVA:  B = 1265. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA130.ORG
Mk-IVA:  B = 1430. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA200.ORG
Mk-IVA:  B = 2200. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA250.ORG
Mk-IVA:  B = 2750. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA300.ORG
Mk-IVA:  B = 3300. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVA360.ORG
Mk-IVA:  B = 3960. MWd/MTU  <1972
opening file p:\dkpro\lib\CORE.MKIVB001A.ORG
Mk-IVB:  B = 16.5 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB002.ORG
Mk-IVB:  B =  22.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB003.ORG
Mk-IVB:  B = 33.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB005.ORG
Mk-IVB:  B = 55.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB007.ORG
Mk-IVB:  B = 77.0 MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB010.ORG
Mk-IVB:  B = 110. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB015.ORG
Mk-IVB:  B = 165. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB020.ORG
Mk-IVB:  B = 220. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB025.ORG
Mk-IVB:  B = 275. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB030.ORG
Mk-IVB:  B = 330. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB040.ORG
Mk-IVB:  B = 440. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB050.ORG
```

```
Mk-IVB:  B = 550. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB070.ORG
Mk-IVB:  B = 770. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB100.ORG
Mk-IVB:  B = 1100. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB115.ORG
Mk-IVB:  B = 1265. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB130.ORG
Mk-IVB:  B = 1430. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB200.ORG
Mk-IVB:  B = 2200. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB250.ORG
Mk-IVB:  B = 2750. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB300.ORG
Mk-IVB:  B = 3300. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVB360.ORG
Mk-IVB:  B = 3960. MWd/MTU  1972-1980
opening file p:\dkpro\lib\CORE.MKIVC001A.ORG
Mk-IVC:  B = 16.5 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC002.ORG
Mk-IVC:  B =  22.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC003.ORG
Mk-IVC:  B = 33.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC005.ORG
Mk-IVC:  B = 55.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC007.ORG
Mk-IVC:  B = 77.0 MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC010.ORG
Mk-IVC:  B = 110. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC015.ORG
Mk-IVC:  B = 165. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC020.ORG
Mk-IVC:  B = 220. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC025.ORG
Mk-IVC:  B = 275. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC030.ORG
Mk-IVC:  B = 330. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC040.ORG
Mk-IVC:  B = 440. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC050.ORG
Mk-IVC:  B = 550. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC070.ORG
Mk-IVC:  B = 770. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC100.ORG
Mk-IVC:  B = 1100. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC115.ORG
Mk-IVC:  B = 1265. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC130.ORG
Mk-IVC:  B = 1430. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC200.ORG
Mk-IVC:  B = 2200. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC250.ORG
Mk-IVC:  B = 2750. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC300.ORG
Mk-IVC:  B = 3300. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.MKIVC360.ORG
Mk-IVC:  B = 3960. MWd/MTU  >1980
opening file p:\dkpro\lib\CORE.SPNA001A.ORG
SPNA:  B = 15.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA002.ORG
SPNA:  B =  20.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA003.ORG
SPNA:  B = 30.0 MWd/MTU  <1955
```

```
opening file p:\dkpro\lib\CORE.SPNA005.ORG
SPNA:  B = 50.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA007.ORG
SPNA:  B = 70.0 MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA010.ORG
SPNA:  B = 100. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA015.ORG
SPNA:  B = 150. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA020.ORG
SPNA:  B = 200. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA025.ORG
SPNA:  B = 250. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA030.ORG
SPNA:  B = 300. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA040.ORG
SPNA:  B = 400. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA050.ORG
SPNA:  B = 500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA070.ORG
SPNA:  B = 700. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA100.ORG
SPNA:  B = 1000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA125.ORG
SPNA:  B = 1250. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA150.ORG
SPNA:  B = 1500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA200.ORG
SPNA:  B = 2000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA250.ORG
SPNA:  B = 2500. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA300.ORG
SPNA:  B = 3000. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNA320.ORG
SPNA:  B = 3200. MWd/MTU  <1955
opening file p:\dkpro\lib\CORE.SPNB001A.ORG
SPNB:  B = 15.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB002.ORG
SPNB:  B =  20.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB003.ORG
SPNB:  B = 30.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB005.ORG
SPNB:  B = 50.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB007.ORG
SPNB:  B = 70.0 MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB010.ORG
SPNB:  B = 100. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB015.ORG
SPNB:  B = 150. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB020.ORG
SPNB:  B = 200. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB025.ORG
SPNB:  B = 250. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB030.ORG
SPNB:  B = 300. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB040.ORG
SPNB:  B = 400. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB050.ORG
SPNB:  B = 500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB070.ORG
SPNB:  B = 700. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB100.ORG
SPNB:  B = 1000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB125.ORG
```

```
SPNB:  B = 1250. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB150.ORG
SPNB:  B = 1500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB200.ORG
SPNB:  B = 2000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB250.ORG
SPNB:  B = 2500. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB300.ORG
SPNB:  B = 3000. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNB320.ORG
SPNB:  B = 3200. MWd/MTU  1955-1958
opening file p:\dkpro\lib\CORE.SPNC001A.ORG
SPNC:  B = 15.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC002.ORG
SPNC:  B =  20.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC003.ORG
SPNC:  B = 30.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC005.ORG
SPNC:  B = 50.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC007.ORG
SPNC:  B = 70.0 MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC010.ORG
SPNC:  B = 100. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC015.ORG
SPNC:  B = 150. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC020.ORG
SPNC:  B = 200. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC025.ORG
SPNC:  B = 250. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC030.ORG
SPNC:  B = 300. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC040.ORG
SPNC:  B = 400. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC050.ORG
SPNC:  B = 500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC070.ORG
SPNC:  B = 700. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC100.ORG
SPNC:  B = 1000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC125.ORG
SPNC:  B = 1250. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC150.ORG
SPNC:  B = 1500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC200.ORG
SPNC:  B = 2000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC250.ORG
SPNC:  B = 2500. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC300.ORG
SPNC:  B = 3000. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPNC320.ORG
SPNC:  B = 3200. MWd/MTU  >1958
opening file p:\dkpro\lib\CORE.SPE001A.ORG
SPE:  B = 15.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE002.ORG
SPE:  B =  20.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE003.ORG
SPE:  B = 30.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE005.ORG
SPE:  B = 50.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE007.ORG
SPE:  B = 70.0 MWd/MTU
opening file p:\dkpro\lib\CORE.SPE010.ORG
SPE:  B = 100. MWd/MTU
```

```
opening file p:\dkpro\lib\CORE.SPE015.ORG
SPE:  B = 150. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE020.ORG
SPE:  B = 200. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE025.ORG
SPE:  B = 250. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE030.ORG
SPE:  B = 300. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE040.ORG
SPE:  B = 400. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE050.ORG
SPE:  B = 500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE070.ORG
SPE:  B = 700. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE100.ORG
SPE:  B = 1000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE125.ORG
SPE:  B = 1250. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE150.ORG
SPE:  B = 1500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE200.ORG
SPE:  B = 2000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE250.ORG
SPE:  B = 2500. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE300.ORG
SPE:  B = 3000. MWd/MTU
opening file p:\dkpro\lib\CORE.SPE320.ORG
SPE:  B = 3200. MWd/MTU
opening file p:\dkpro\lib\CORE.TH1.ORG
Thorium:  1 MT Thorium for 100 d  (created 2/17/98)

**** End Nuclide Inventory Library Files ****

**** ORIGEN2 decay library file ****
opening file p:\dkpro\lib\ft27f001rev2.
number of records:         1308
**** end ORIGEN2 decay library file ****

**** modifications to ORIGEN2 decay library file ****
No decay data modification file specified
**** end modifications to ORIGEN2 decay library file ****


Archive (fuel history) File:
UNIFIED6REP.PRN

Input Format: LANL
Max. No. of records:       100000
No. of selected nuclides:          46
Output units: CUR
Splitting output records

**** archive (fuel history) file ****
opening file p:\dkpro\lib\UNIFIED6REP.PRN
archive file header:
```

SEP DATE:

WASTE FRACTION:

```
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
      KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT    MO YR.  SEP KEY
DAYS                     Ref.                   Th       U       Np      Pu
Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ---------------- ----
---- ----------------------------------------  ------------------------------------
-------------
    TABLE 1 -- UNIFIED SEPARATIONS PRODUCTION FILE -- (Fuel Input and Losses 1944-1989
              (Records Sorted by Sep'n Date.)
    RUN AT:  08/04/96   12:36:14            [Note: MWd/MTU after 11/83 are
backcalculated from %Pu-240.]

    SAVED AS:"UNIFIED6"  9/12/02



                                                                    SEP DATE:
WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
 **** end archive (fuel history) file ****

 <==============================================>


Final decay date:  1/2001
 Output units: CUR

 Summary for Primary Split
```

	T-plant	B-plant	Redox	Purex	Total
H03	1.627E+03	7.927E+02	2.235E+04	1.330E+05	1.578E+05
BE10	1.457E-04	8.134E-05	1.428E-03	8.316E-03	9.972E-03
C14	2.145E+02	1.197E+02	1.000E+03	2.372E+03	3.707E+03
SI32	2.815E-07	1.557E-07	2.105E-06	1.126E-05	1.380E-05
P32	2.816E-07	1.557E-07	2.105E-06	1.126E-05	1.380E-05
S35	0.000E+00	0.000E+00	0.000E+00	1.216E-15	1.216E-15
CL36	2.021E-01	1.128E-01	1.549E+00	6.799E+00	8.663E+00
AR39	1.250E-05	6.904E-06	1.836E-04	1.017E-03	1.220E-03
AR42	0.000E+00	0.000E+00	2.664E-17	3.526E-16	3.793E-16
K40	1.014E-20	5.202E-21	7.443E-19	7.140E-18	7.900E-18
CA45	0.000E+00	0.000E+00	0.000E+00	1.123E-19	1.123E-19
V50	2.211E-15	1.234E-15	1.694E-14	7.428E-14	9.466E-14
MN54	4.518E-14	1.956E-15	1.327E-09	3.047E-02	3.047E-02
FE55	1.098E-01	3.050E-02	8.901E+00	2.067E+03	2.076E+03
CO58	0.000E+00	0.000E+00	0.000E+00	1.680E-18	1.680E-18
CO60	3.347E+01	1.330E+01	7.303E+02	9.349E+03	1.013E+04
NI59	1.008E+01	5.629E+00	7.485E+01	3.227E+02	4.133E+02
NI63	8.857E+02	4.865E+02	6.920E+03	3.073E+04	3.902E+04
ZN65	8.900E-30	6.413E-31	7.506E-16	2.242E-06	2.242E-06
SE79	1.742E+00	9.727E-01	1.496E+01	6.124E+01	7.891E+01
KR81	1.616E-06	8.975E-07	2.203E-05	1.093E-04	1.339E-04
KR85	2.774E+04	1.320E+04	3.981E+05	2.475E+06	2.914E+06
RB87	1.309E-03	7.308E-04	1.102E-02	4.455E-02	5.761E-02
SR89	0.000E+00	0.000E+00	0.000E+00	2.199E-23	2.199E-23
SR90	1.482E+06	7.810E+05	1.512E+07	7.032E+07	8.771E+07
Y90	1.482E+06	7.812E+05	1.513E+07	7.034E+07	8.773E+07
Y91	0.000E+00	0.000E+00	0.000E+00	3.749E-19	3.749E-19
ZR93	1.056E+02	5.896E+01	8.944E+02	3.633E+03	4.692E+03
ZR95	0.000E+00	0.000E+00	0.000E+00	7.927E-17	7.927E-17

NB92	1.684E-15	9.075E-16	4.240E-14	2.699E-13	3.149E-13
NB93*	9.289E+01	5.257E+01	7.418E+02	2.823E+03	3.711E+03
NB94	1.334E-03	7.415E-04	1.708E-02	8.298E-02	1.021E-01
NB95	0.000E+00	0.000E+00	0.000E+00	1.747E-16	1.747E-16
NB95*	0.000E+00	0.000E+00	0.000E+00	9.325E-19	9.325E-19
TC98	4.724E-06	2.614E-06	8.401E-05	4.254E-04	5.168E-04
TC99	7.620E+02	4.255E+02	6.475E+03	2.636E+04	3.402E+04
RU106	1.678E-07	1.347E-08	1.502E-03	1.051E+03	1.051E+03
RH102	3.272E-06	1.248E-06	1.109E-03	1.306E-01	1.317E-01
RH106	1.678E-07	1.347E-08	1.502E-03	1.051E+03	1.051E+03
PD107	1.631E+00	9.084E-01	1.724E+01	7.968E+01	9.945E+01
AG108	1.452E-05	7.993E-06	2.120E-04	1.093E-03	1.328E-03
AG108*	1.669E-04	9.188E-05	2.436E-03	1.257E-02	1.526E-02
AG109*	4.057E-17	9.500E-18	2.987E-09	1.008E-03	1.008E-03
AG110	3.484E-20	2.007E-21	6.243E-14	3.620E-05	3.620E-05
AG110*	2.562E-18	1.476E-19	4.590E-12	2.662E-03	2.662E-03
CD109	4.057E-17	9.500E-18	2.987E-09	1.008E-03	1.008E-03
CD113	1.962E-11	1.091E-11	1.122E-10	4.271E-10	5.698E-10
CD113*	5.439E+01	2.711E+01	7.704E+02	4.667E+03	5.519E+03
IN115	8.774E-10	4.899E-10	7.528E-09	3.148E-08	4.037E-08
SN119*	3.424E-15	1.324E-16	1.762E-10	5.331E-03	5.331E-03
SN121	7.395E+01	4.011E+01	7.860E+02	3.668E+03	4.568E+03
SN121*	9.529E+01	5.169E+01	1.013E+03	4.727E+03	5.887E+03
SN123	0.000E+00	0.000E+00	1.836E-25	3.711E-08	3.711E-08
SN126	6.575E+00	3.669E+00	6.051E+01	2.577E+02	3.284E+02
SB124	0.000E+00	0.000E+00	0.000E+00	2.546E-23	2.546E-23
SB125	1.880E+00	5.416E-01	1.695E+02	1.737E+04	1.754E+04
SB126	9.205E-01	5.136E-01	8.472E+00	3.607E+01	4.598E+01
SB126*	6.575E+00	3.669E+00	6.051E+01	2.577E+02	3.284E+02
TE123	1.596E-13	8.817E-14	2.688E-12	1.501E-11	1.795E-11
TE123*	0.000E+00	0.000E+00	0.000E+00	2.493E-13	2.493E-13
TE125*	4.589E-01	1.322E-01	4.136E+01	4.240E+03	4.282E+03
TE127	0.000E+00	0.000E+00	0.000E+00	3.525E-09	3.525E-09
TE127*	0.000E+00	0.000E+00	6.970E-30	3.598E-09	3.598E-09
I129	1.030E+00	5.746E-01	9.154E+00	3.824E+01	4.900E+01
CS134	1.788E-02	5.449E-03	1.159E+01	8.121E+03	8.132E+03
CS135	2.180E+01	1.216E+01	1.984E+02	7.662E+02	9.986E+02
CS137	1.718E+06	9.079E+05	1.776E+07	8.275E+07	1.031E+08
BA137*	1.622E+06	8.573E+05	1.677E+07	7.814E+07	9.739E+07
LA138	7.569E-09	4.225E-09	6.705E-08	2.774E-07	3.562E-07
CE142	1.408E-03	7.862E-04	1.203E-02	4.914E-02	6.336E-02
CE144	1.008E-10	3.361E-12	5.947E-06	2.936E+02	2.936E+02
PR144	1.008E-10	3.361E-12	5.948E-06	2.936E+02	2.936E+02
PR144*	1.411E-12	4.705E-14	8.327E-08	4.111E+00	4.111E+00
ND144	6.648E-08	3.712E-08	5.696E-07	2.328E-06	3.001E-06
PM146	8.627E-03	3.923E-03	5.849E-01	1.020E+01	1.080E+01
PM147	6.166E+01	1.659E+01	5.519E+03	6.763E+05	6.819E+05
SM146	7.698E-08	4.219E-08	1.692E-06	8.976E-06	1.079E-05
SM147	5.404E-04	3.018E-04	4.484E-03	1.810E-02	2.343E-02
SM148	1.159E-10	6.393E-11	2.334E-09	1.162E-08	1.414E-08
SM149	9.141E-10	5.052E-10	4.093E-09	1.447E-08	1.998E-08
SM151	7.705E+04	4.225E+04	6.213E+05	2.553E+06	3.294E+06
EU150	8.421E-06	4.444E-06	2.725E-04	1.680E-03	1.966E-03
EU152	2.892E+00	1.465E+00	1.224E+02	9.430E+02	1.070E+03
EU154	2.232E+02	1.078E+02	8.156E+03	8.316E+04	9.165E+04
EU155	1.410E+02	5.286E+01	3.401E+03	4.764E+04	5.124E+04
GD152	2.461E-12	1.337E-12	6.263E-11	3.185E-10	3.849E-10
GD153	9.072E-22	7.987E-23	1.356E-14	1.121E-05	1.121E-05
TB160	0.000E+00	0.000E+00	0.000E+00	2.710E-19	2.710E-19
HO166*	2.266E-04	1.248E-04	3.852E-03	2.189E-02	2.609E-02
TM170	0.000E+00	0.000E+00	0.000E+00	6.976E-17	6.976E-17
TM171	8.463E-10	1.980E-10	3.002E-07	3.197E-04	3.200E-04
TL206	3.851E-09	2.476E-09	4.975E-10	1.820E-09	8.646E-09

TL207	3.796E-02	2.298E-02	3.733E-03	4.480E+00	4.545E+00
TL208	7.619E-03	4.149E-03	4.354E-04	2.771E+00	2.784E+00
TL209	1.124E-07	6.704E-08	2.240E-07	2.279E-02	2.279E-02
PB209	5.352E-06	3.192E-06	1.067E-05	1.085E+00	1.085E+00
PB210	2.921E-03	1.878E-03	3.772E-04	1.380E-03	6.556E-03
PB211	3.806E-02	2.305E-02	3.743E-03	4.493E+00	4.557E+00
PB212	2.120E-02	1.154E-02	1.212E-03	7.711E+00	7.745E+00
PB214	7.992E-03	4.947E-03	8.908E-04	3.460E-03	1.729E-02
BI208	0.000E+00	0.000E+00	2.754E-20	6.639E-16	6.640E-16
BI210	2.918E-03	1.876E-03	3.769E-04	1.379E-03	6.550E-03
BI210*	2.214E-23	9.040E-24	1.875E-20	4.370E-16	4.370E-16
BI211	3.806E-02	2.305E-02	3.743E-03	4.493E+00	4.557E+00
BI212	2.120E-02	1.155E-02	1.212E-03	7.711E+00	7.745E+00
BI213	5.352E-06	3.192E-06	1.067E-05	1.085E+00	1.085E+00
BI214	7.992E-03	4.947E-03	8.908E-04	3.460E-03	1.729E-02
PO210	2.833E-03	1.825E-03	3.683E-04	1.344E-03	6.370E-03
PO211	1.028E-04	6.222E-05	1.011E-05	1.213E-02	1.230E-02
PO212	1.358E-02	7.396E-03	7.761E-04	4.940E+00	4.961E+00
PO213	5.240E-06	3.125E-06	1.044E-05	1.063E+00	1.063E+00
PO214	7.990E-03	4.946E-03	8.906E-04	3.459E-03	1.728E-02
PO215	3.806E-02	2.305E-02	3.743E-03	4.493E+00	4.557E+00
PO216	2.120E-02	1.154E-02	1.212E-03	7.711E+00	7.745E+00
PO218	7.993E-03	4.948E-03	8.910E-04	3.460E-03	1.729E-02
AT217	5.353E-06	3.193E-06	1.067E-05	1.085E+00	1.085E+00
RN219	3.806E-02	2.305E-02	3.743E-03	4.493E+00	4.557E+00
RN220	2.120E-02	1.154E-02	1.212E-03	7.711E+00	7.745E+00
RN222	7.993E-03	4.948E-03	8.910E-04	3.460E-03	1.729E-02
FR221	5.353E-06	3.193E-06	1.067E-05	1.085E+00	1.085E+00
FR223	5.273E-04	3.192E-04	5.174E-05	6.212E-02	6.302E-02
RA223	3.806E-02	2.305E-02	3.743E-03	4.493E+00	4.557E+00
RA224	2.120E-02	1.154E-02	1.212E-03	7.711E+00	7.745E+00
RA225	5.359E-06	3.196E-06	1.069E-05	1.087E+00	1.087E+00
RA226	7.998E-03	4.951E-03	8.913E-04	3.462E-03	1.730E-02
RA228	3.808E-08	2.250E-08	6.563E-09	1.590E+00	1.590E+00
AC225	5.353E-06	3.193E-06	1.067E-05	1.085E+00	1.085E+00
AC227	3.821E-02	2.313E-02	3.750E-03	4.501E+00	4.567E+00
AC228	3.808E-08	2.250E-08	6.563E-09	1.590E+00	1.590E+00
TH227	3.759E-02	2.276E-02	3.694E-03	4.434E+00	4.498E+00
TH228	2.119E-02	1.154E-02	1.211E-03	7.709E+00	7.743E+00
TH229	5.368E-06	3.201E-06	1.071E-05	1.089E+00	1.089E+00
TH230	7.481E-01	4.374E-01	5.560E-02	2.391E-01	1.480E+00
TH231	7.348E+01	4.044E+01	9.924E-01	2.799E+00	1.177E+02
TH232	4.577E-08	2.679E-08	6.837E-09	1.325E+00	1.325E+00
TH234	1.678E+03	9.238E+02	2.241E+01	5.793E+01	2.682E+03
PA231	7.683E-02	4.492E-02	5.514E-03	6.874E+00	7.001E+00
PA233	4.710E+00	2.629E+00	2.582E+01	9.882E+01	1.320E+02
PA234	2.181E+00	1.201E+00	2.913E-02	7.531E-02	3.486E+00
PA234*	1.678E+03	9.238E+02	2.241E+01	5.793E+01	2.682E+03
U232	2.061E-02	1.123E-02	1.178E-03	5.822E+00	5.855E+00
U233	1.648E-03	9.465E-04	4.858E-03	3.526E+02	3.526E+02
U234	1.646E+03	9.064E+02	2.378E+01	7.044E+01	2.647E+03
U235	7.348E+01	4.044E+01	9.924E-01	2.799E+00	1.177E+02
U236	1.873E+01	1.046E+01	5.404E-01	3.400E+00	3.313E+01
U237	1.450E-02	7.580E-03	8.885E-02	2.503E+00	2.614E+00
U238	1.678E+03	9.238E+02	2.241E+01	5.793E+01	2.682E+03
U240	4.702E-12	2.408E-12	8.794E-11	5.468E-09	5.563E-09
NP235	2.112E-16	3.184E-17	9.638E-13	2.707E-06	2.707E-06
NP236	3.603E-06	1.986E-06	4.037E-05	2.428E-04	2.887E-04
NP237	4.710E+00	2.629E+00	2.582E+01	9.882E+01	1.320E+02
NP238	3.614E-04	1.763E-04	3.796E-02	3.596E-01	3.981E-01
NP239	3.850E-02	1.877E-02	3.900E+00	3.815E+01	4.210E+01
NP240	4.076E-15	1.891E-15	9.981E-14	6.545E-12	6.650E-12
NP240*	4.702E-12	2.408E-12	8.794E-11	5.468E-09	5.563E-09

PU236	3.751E-07	1.977E-07	5.202E-06	2.733E-03	2.739E-03
PU238	2.019E+01	1.113E+01	1.252E+02	1.586E+03	1.743E+03
PU239	2.841E+03	1.546E+03	3.678E+03	2.049E+04	2.855E+04
PU240	3.033E+02	1.696E+02	7.588E+02	5.578E+03	6.810E+03
PU241	6.058E+02	3.167E+02	3.713E+03	1.046E+05	1.092E+05
PU242	4.216E-03	2.256E-03	3.020E-02	6.403E-01	6.770E-01
PU243	0.000E+00	0.000E+00	5.005E-12	1.022E-10	1.072E-10
PU244	4.702E-12	2.408E-12	8.794E-11	5.468E-09	5.563E-09
AM241	2.638E+02	1.415E+02	5.474E+03	7.501E+04	8.089E+04
AM242	7.996E-02	3.899E-02	8.396E+00	7.955E+01	8.807E+01
AM242*	8.032E-02	3.917E-02	8.434E+00	7.991E+01	8.846E+01
AM243	3.850E-02	1.877E-02	3.900E+00	3.815E+01	4.210E+01
AM245	0.000E+00	0.000E+00	4.694E-27	8.992E-25	9.039E-25
CM242	6.633E-02	3.235E-02	6.966E+00	6.600E+01	7.306E+01
CM243	8.032E-04	3.660E-04	4.794E-01	7.213E+00	7.694E+00
CM244	1.893E-02	8.543E-03	1.061E+01	1.798E+02	1.904E+02
CM245	4.555E-07	2.047E-07	6.092E-04	9.347E-03	9.957E-03
CM246	2.362E-09	1.033E-09	1.427E-05	2.542E-04	2.685E-04
CM247	1.826E-16	7.829E-17	5.011E-12	1.022E-10	1.072E-10
CM248	1.059E-17	4.474E-18	1.343E-12	3.142E-11	3.276E-11
CM250	0.000E+00	0.000E+00	3.264E-21	9.243E-20	9.569E-20
BK249	0.000E+00	0.000E+00	9.264E-22	4.842E-16	4.842E-16
CF249	0.000E+00	0.000E+00	2.682E-12	7.221E-11	7.489E-11
CF250	0.000E+00	0.000E+00	6.975E-13	3.080E-11	3.150E-11
CF251	0.000E+00	0.000E+00	7.065E-15	2.365E-13	2.436E-13
CF252	0.000E+00	0.000E+00	2.332E-17	9.226E-15	9.249E-15
CF254	0.000E+00	0.000E+00	0.000E+00	7.539E-19	7.539E-19
ES254	0.000E+00	0.000E+00	0.000E+00	9.077E-26	9.077E-26
Total:	6.424E+06	3.391E+06	6.587E+07	3.079E+08	3.836E+08

Summary for Secondary Split

	T-plant	B-plant	Redox	Purex	Total
H03	1.628E+00	7.935E-01	7.586E+01	2.046E+03	2.124E+03
BE10	1.458E-07	8.142E-08	1.290E-05	2.033E-05	3.346E-05
C14	2.147E-01	1.198E-01	1.537E+00	8.172E+00	1.004E+01
SI32	2.818E-10	1.558E-10	1.136E-08	2.108E-08	3.288E-08
P32	2.818E-10	1.559E-10	1.137E-08	2.108E-08	3.289E-08
S35	0.000E+00	0.000E+00	0.000E+00	4.916E-18	4.916E-18
CL36	2.023E-04	1.129E-04	4.620E-03	9.972E-03	1.491E-02
AR39	1.251E-08	6.911E-09	1.306E-06	1.976E-06	3.301E-06
AR42	0.000E+00	0.000E+00	1.110E-18	1.306E-18	2.416E-18
K40	1.015E-23	5.207E-24	2.188E-20	2.312E-20	4.502E-20
CA45	0.000E+00	0.000E+00	0.000E+00	4.537E-22	4.537E-22
V50	2.213E-18	1.236E-18	5.037E-17	1.089E-16	1.627E-16
MN54	4.523E-17	1.958E-18	2.681E-11	1.231E-04	1.231E-04
FE55	1.099E-04	3.053E-05	1.036E-01	8.139E+00	8.243E+00
CO58	0.000E+00	0.000E+00	0.000E+00	6.790E-21	6.790E-21
CO60	3.350E-02	1.332E-02	2.818E+00	2.417E+01	2.703E+01
NI59	1.009E-02	5.634E-03	1.853E-01	4.382E-01	6.392E-01
NI63	8.866E-01	4.870E-01	1.657E+01	4.163E+01	5.957E+01
ZN65	0.000E+00	0.000E+00	4.029E-17	9.061E-09	9.061E-09
SE79	1.744E-03	9.736E-04	3.923E-02	8.988E-02	1.318E-01
KR81	1.617E-09	8.984E-10	9.439E-08	1.753E-07	2.722E-07
KR85	2.777E+01	1.322E+01	1.259E+03	4.791E+03	6.091E+03
RB87	1.310E-06	7.316E-07	2.788E-05	6.483E-05	9.474E-05
SR89	0.000E+00	0.000E+00	0.000E+00	8.886E-26	8.886E-26
SR90	1.483E+03	7.818E+02	4.154E+04	1.112E+05	1.551E+05
Y90	1.484E+03	7.820E+02	4.155E+04	1.113E+05	1.551E+05
Y91	0.000E+00	0.000E+00	0.000E+00	1.515E-21	1.515E-21
ZR93	1.057E-01	5.902E-02	2.296E+00	5.245E+00	7.706E+00

ZR95	0.000E+00	0.000E+00	0.000E+00	3.204E-19	3.204E-19
NB92	1.686E-18	9.084E-19	4.679E-16	6.011E-16	1.072E-15
NB93*	9.298E-02	5.263E-02	1.840E+00	3.848E+00	5.834E+00
NB94	1.335E-06	7.423E-07	6.900E-05	1.307E-04	2.018E-04
NB95	0.000E+00	0.000E+00	0.000E+00	7.059E-19	7.059E-19
NB95*	0.000E+00	0.000E+00	0.000E+00	3.769E-21	3.769E-21
TC98	4.729E-09	2.616E-09	5.408E-07	6.913E-06	7.462E-06
TC99	7.627E-01	4.259E-01	1.693E+01	2.150E+02	2.331E+02
RU106	1.679E-10	1.348E-11	1.707E-05	4.247E+00	4.247E+00
RH102	3.275E-09	1.249E-09	2.033E-05	5.056E-04	5.260E-04
RH106	1.679E-10	1.348E-11	1.707E-05	4.247E+00	4.247E+00
PD107	1.632E-03	9.093E-04	6.235E-02	1.219E-01	1.867E-01
AG108	1.454E-08	8.001E-09	9.346E-07	1.759E-06	2.716E-06
AG108*	1.671E-07	9.197E-08	1.074E-05	2.022E-05	3.122E-05
AG109*	4.061E-20	9.509E-21	1.603E-10	4.074E-06	4.075E-06
AG110	3.438E-23	1.468E-24	1.648E-15	1.463E-07	1.463E-07
AG110*	2.564E-21	1.477E-22	1.212E-13	1.076E-05	1.076E-05
CD109	4.061E-20	9.509E-21	1.603E-10	4.074E-06	4.075E-06
CD113	1.964E-14	1.092E-14	1.976E-13	5.472E-13	7.754E-13
CD113*	5.445E-02	2.714E-02	2.982E+00	8.752E+00	1.182E+01
IN115	8.783E-13	4.904E-13	1.965E-11	4.558E-11	6.660E-11
SN119*	3.427E-18	1.325E-19	1.872E-12	2.154E-05	2.154E-05
SN121	7.402E-02	4.015E-02	2.539E+00	5.767E+00	8.421E+00
SN121*	9.539E-02	5.174E-02	3.272E+00	7.432E+00	1.085E+01
SN123	0.000E+00	0.000E+00	2.582E-27	1.500E-10	1.500E-10
SN126	6.582E-03	3.672E-03	1.772E-01	3.841E-01	5.716E-01
SB124	0.000E+00	0.000E+00	0.000E+00	1.029E-25	1.029E-25
SB125	1.882E-03	5.421E-04	1.032E+00	6.599E+01	6.703E+01
SB126	9.214E-04	5.141E-04	2.481E-02	5.377E-02	8.002E-02
SB126*	6.582E-03	3.672E-03	1.772E-01	3.841E-01	5.716E-01
TE123	1.598E-16	8.825E-17	2.064E-14	2.964E-14	5.052E-14
TE123*	0.000E+00	0.000E+00	0.000E+00	1.008E-15	1.008E-15
TE125*	4.594E-04	1.323E-04	2.519E-01	1.611E+01	1.636E+01
TE127	0.000E+00	0.000E+00	0.000E+00	1.424E-11	1.424E-11
TE127*	0.000E+00	0.000E+00	0.000E+00	1.454E-11	1.454E-11
I129	1.031E-03	5.752E-04	2.590E-02	3.278E-01	3.553E-01
CS134	1.789E-05	5.454E-06	1.712E-01	4.302E+02	4.303E+02
CS135	2.182E-02	1.218E-02	4.737E-01	5.867E+00	6.375E+00
CS137	1.719E+03	9.088E+02	5.111E+04	8.703E+05	9.241E+05
BA137*	1.623E+03	8.582E+02	4.826E+04	8.218E+05	8.726E+05
LA138	7.576E-12	4.229E-12	1.808E-10	4.004E-10	5.930E-10
CE142	1.409E-06	7.869E-07	3.139E-05	7.117E-05	1.048E-04
CE144	1.009E-13	3.364E-15	5.522E-08	1.187E+00	1.187E+00
PR144	1.009E-13	3.364E-15	5.523E-08	1.187E+00	1.187E+00
PR144*	1.413E-15	4.710E-17	7.731E-10	1.661E-02	1.661E-02
ND144	6.654E-11	3.715E-11	1.507E-09	3.389E-09	5.000E-09
PM146	8.636E-06	3.927E-06	6.048E-03	3.209E-02	3.815E-02
PM147	6.172E-02	1.660E-02	2.769E+01	2.590E+03	2.618E+03
SM146	7.706E-11	4.223E-11	1.311E-08	1.828E-08	3.150E-08
SM147	5.409E-07	3.021E-07	1.092E-05	2.564E-05	3.740E-05
SM148	1.161E-13	6.400E-14	1.370E-11	2.181E-11	3.569E-11
SM149	9.150E-13	5.057E-13	6.562E-12	1.824E-11	2.622E-11
SM151	7.713E+01	4.229E+01	1.327E+03	3.538E+03	4.984E+03
EU150	8.429E-09	4.448E-09	2.385E-06	3.758E-06	6.155E-06
EU152	2.895E-03	1.466E-03	1.097E+00	2.302E+00	3.403E+00
EU154	2.234E-01	1.079E-01	7.278E+01	2.204E+02	2.935E+02
EU155	1.411E-01	5.291E-02	1.086E+01	1.307E+02	1.417E+02
GD152	2.463E-15	1.338E-15	4.590E-13	6.321E-13	1.095E-12
GD153	9.081E-25	7.995E-26	4.946E-16	4.530E-08	4.530E-08
TB160	0.000E+00	0.000E+00	0.000E+00	1.095E-21	1.095E-21
HO166*	2.268E-07	1.250E-07	3.008E-05	4.286E-05	7.329E-05
TM170	0.000E+00	0.000E+00	0.000E+00	2.819E-19	2.819E-19
TM171	8.471E-13	1.982E-13	3.000E-09	1.281E-06	1.284E-06

TL206	3.122E-12	2.007E-12	1.001E-11	1.034E-10	1.186E-10
TL207	3.085E-05	1.867E-05	1.130E-04	9.607E-02	9.624E-02
TL208	8.101E-06	4.414E-06	1.703E-04	1.116E+00	1.116E+00
TL209	1.016E-10	6.075E-11	8.247E-10	6.780E-03	6.780E-03
PB209	4.838E-09	2.893E-09	3.927E-08	3.229E-01	3.229E-01
PB210	2.368E-06	1.522E-06	7.602E-06	7.848E-05	8.997E-05
PB211	3.094E-05	1.872E-05	1.133E-04	9.633E-02	9.650E-02
PB212	2.254E-05	1.228E-05	4.738E-04	3.104E+00	3.104E+00
PB214	6.479E-06	4.010E-06	2.353E-05	2.261E-04	2.601E-04
BI208	0.000E+00	0.000E+00	1.061E-21	1.422E-17	1.422E-17
BI210	2.365E-06	1.521E-06	7.593E-06	7.839E-05	8.986E-05
BI210*	2.216E-26	9.049E-27	6.996E-22	9.360E-18	9.361E-18
BI211	3.094E-05	1.872E-05	1.133E-04	9.633E-02	9.650E-02
BI212	2.254E-05	1.228E-05	4.738E-04	3.104E+00	3.104E+00
BI213	4.838E-09	2.893E-09	3.927E-08	3.229E-01	3.229E-01
BI214	6.479E-06	4.010E-06	2.353E-05	2.261E-04	2.601E-04
PO210	2.297E-06	1.479E-06	7.328E-06	7.592E-05	8.702E-05
PO211	8.353E-08	5.055E-08	3.058E-07	2.601E-04	2.605E-04
PO212	1.444E-05	7.868E-06	3.035E-04	1.988E+00	1.989E+00
PO213	4.736E-09	2.832E-09	3.845E-08	3.161E-01	3.161E-01
PO214	6.478E-06	4.009E-06	2.352E-05	2.260E-04	2.600E-04
PO215	3.094E-05	1.872E-05	1.133E-04	9.633E-02	9.650E-02
PO216	2.254E-05	1.228E-05	4.738E-04	3.104E+00	3.104E+00
PO218	6.480E-06	4.011E-06	2.353E-05	2.261E-04	2.602E-04
AT217	4.838E-09	2.893E-09	3.928E-08	3.229E-01	3.229E-01
RN219	3.094E-05	1.872E-05	1.133E-04	9.633E-02	9.650E-02
RN220	2.254E-05	1.228E-05	4.738E-04	3.104E+00	3.104E+00
RN222	6.480E-06	4.011E-06	2.353E-05	2.261E-04	2.602E-04
FR221	4.838E-09	2.893E-09	3.928E-08	3.229E-01	3.229E-01
FR223	4.286E-07	2.593E-07	1.570E-06	1.332E-03	1.334E-03
RA223	3.094E-05	1.872E-05	1.133E-04	9.633E-02	9.650E-02
RA224	2.254E-05	1.228E-05	4.738E-04	3.104E+00	3.104E+00
RA225	4.844E-09	2.896E-09	3.933E-08	3.233E-01	3.233E-01
RA226	6.484E-06	4.014E-06	2.355E-05	2.263E-04	2.603E-04
RA228	3.089E-11	1.825E-11	3.018E-10	1.450E+00	1.450E+00
AC225	4.838E-09	2.893E-09	3.928E-08	3.229E-01	3.229E-01
AC227	3.105E-05	1.879E-05	1.138E-04	9.653E-02	9.669E-02
AC228	3.089E-11	1.824E-11	3.018E-10	1.450E+00	1.450E+00
TH227	3.055E-05	1.849E-05	1.119E-04	9.507E-02	9.524E-02
TH228	2.254E-05	1.228E-05	4.737E-04	3.104E+00	3.104E+00
TH229	4.853E-09	2.901E-09	3.941E-08	3.238E-01	3.238E-01
TH230	6.065E-04	3.546E-04	2.628E-03	2.085E-02	2.444E-02
TH231	5.958E-02	3.278E-02	2.785E-01	1.466E+00	1.837E+00
TH232	3.712E-11	2.173E-11	3.804E-10	1.477E+00	1.477E+00
TH234	1.360E+00	7.489E-01	5.806E+00	2.970E+01	3.761E+01
PA231	6.239E-05	3.647E-05	2.510E-04	1.478E-01	1.481E-01
PA233	4.882E-03	2.725E-03	5.146E-02	3.295E-01	3.885E-01
PA234	1.768E-03	9.736E-04	7.547E-03	3.861E-02	4.889E-02
PA234*	1.360E+00	7.489E-01	5.806E+00	2.970E+01	3.761E+01
U232	2.192E-05	1.194E-05	4.608E-04	1.622E+00	1.623E+00
U233	1.553E-06	8.943E-07	1.459E-05	9.680E+01	9.680E+01
U234	1.335E+00	7.348E-01	6.958E+00	3.621E+01	4.524E+01
U235	5.958E-02	3.278E-02	2.785E-01	1.466E+00	1.837E+00
U236	1.520E-02	8.489E-03	1.931E-01	2.002E+00	2.218E+00
U237	5.479E-04	2.783E-04	3.490E-02	3.974E-01	4.331E-01
U238	1.360E+00	7.489E-01	5.806E+00	2.970E+01	3.761E+01
U240	1.791E-13	8.659E-14	8.331E-11	7.914E-10	8.749E-10
NP235	2.157E-19	3.251E-20	1.055E-14	1.087E-08	1.087E-08
NP236	3.679E-09	2.028E-09	1.129E-07	9.894E-07	1.108E-06
NP237	4.882E-03	2.725E-03	5.147E-02	3.295E-01	3.886E-01
NP238	3.690E-07	1.800E-07	1.195E-04	1.097E-03	1.217E-03
NP239	3.931E-05	1.917E-05	1.230E-02	1.128E-01	1.252E-01
NP240	0.000E+00	0.000E+00	9.408E-14	9.218E-13	1.016E-12

NP240*	1.791E-13	8.659E-14	8.331E-11	7.914E-10	8.749E-10
PU236	2.214E-09	8.775E-10	1.011E-06	3.758E-04	3.768E-04
PU238	7.283E-01	3.965E-01	2.505E+01	2.154E+02	2.415E+02
PU239	1.016E+02	5.678E+01	8.063E+02	4.191E+03	5.156E+03
PU240	1.120E+01	6.228E+00	1.838E+02	1.094E+03	1.295E+03
PU241	2.289E+01	1.163E+01	1.458E+03	1.661E+04	1.810E+04
PU242	1.614E-04	8.280E-05	1.309E-02	1.034E-01	1.168E-01
PU243	0.000E+00	0.000E+00	2.474E-13	3.815E-13	6.289E-13
PU244	1.815E-13	8.841E-14	8.331E-11	7.914E-10	8.749E-10
AM241	6.928E+00	3.752E+00	2.456E+02	1.562E+03	1.818E+03
AM242	8.164E-05	3.981E-05	2.644E-02	2.426E-01	2.692E-01
AM242*	8.201E-05	3.999E-05	2.656E-02	2.437E-01	2.704E-01
AM243	3.931E-05	1.917E-05	1.230E-02	1.128E-01	1.252E-01
CM242	6.773E-05	3.303E-05	2.193E-02	2.013E-01	2.233E-01
CM243	8.040E-07	3.663E-07	2.029E-02	2.600E-02	4.629E-02
CM244	1.895E-05	8.552E-06	4.249E-01	6.298E-01	1.055E+00
CM245	4.559E-10	2.049E-10	2.726E-05	3.351E-05	6.077E-05
CM246	2.364E-12	1.034E-12	6.825E-07	9.408E-07	1.623E-06
CM247	1.828E-19	7.836E-20	2.478E-13	3.857E-13	6.335E-13
CM248	1.060E-20	4.479E-21	6.781E-14	1.202E-13	1.880E-13
CM250	0.000E+00	0.000E+00	1.707E-22	3.631E-22	5.338E-22
BK249	0.000E+00	0.000E+00	4.759E-23	1.957E-18	1.957E-18
CF249	0.000E+00	0.000E+00	1.374E-13	2.791E-13	4.165E-13
CF250	0.000E+00	0.000E+00	3.607E-14	1.210E-13	1.571E-13
CF251	0.000E+00	0.000E+00	3.680E-16	9.272E-16	1.295E-15
CF252	0.000E+00	0.000E+00	1.224E-18	3.712E-17	3.835E-17
CF254	0.000E+00	0.000E+00	0.000E+00	3.047E-21	3.047E-21
ES254	0.000E+00	0.000E+00	0.000E+00	3.665E-28	3.665E-28
Total:	6.568E+03	3.470E+03	1.880E+05	1.953E+06	2.151E+06

Summary for Sum of Splits

	T-plant	B-plant	Redox	Purex	Total
H03	1.628E+03	7.935E+02	2.242E+04	1.351E+05	1.599E+05
BE10	1.458E-04	8.142E-05	1.441E-03	8.337E-03	1.001E-02
C14	2.147E+02	1.198E+02	1.002E+03	2.380E+03	3.717E+03
SI32	2.818E-07	1.558E-07	2.116E-06	1.128E-05	1.383E-05
P32	2.818E-07	1.559E-07	2.116E-06	1.128E-05	1.384E-05
S35	0.000E+00	0.000E+00	0.000E+00	1.221E-15	1.221E-15
CL36	2.023E-01	1.129E-01	1.554E+00	6.809E+00	8.678E+00
AR39	1.251E-05	6.911E-06	1.849E-04	1.019E-03	1.224E-03
AR42	0.000E+00	0.000E+00	2.775E-17	3.539E-16	3.817E-16
K40	1.015E-20	5.207E-21	7.662E-19	7.163E-18	7.945E-18
CA45	0.000E+00	0.000E+00	0.000E+00	1.127E-19	1.127E-19
V50	2.213E-15	1.236E-15	1.699E-14	7.439E-14	9.483E-14
MN54	4.523E-14	1.958E-15	1.353E-09	3.060E-02	3.060E-02
FE55	1.099E-01	3.053E-02	9.004E+00	2.075E+03	2.084E+03
CO58	0.000E+00	0.000E+00	0.000E+00	1.687E-18	1.687E-18
CO60	3.350E+01	1.332E+01	7.332E+02	9.373E+03	1.015E+04
NI59	1.009E+01	5.634E+00	7.504E+01	3.232E+02	4.139E+02
NI63	8.866E+02	4.870E+02	6.936E+03	3.077E+04	3.908E+04
ZN65	8.900E-30	6.413E-31	7.909E-16	2.251E-06	2.251E-06
SE79	1.744E+00	9.737E-01	1.499E+01	6.133E+01	7.905E+01
KR81	1.617E-06	8.984E-07	2.212E-05	1.095E-04	1.341E-04
KR85	2.777E+04	1.322E+04	3.994E+05	2.480E+06	2.920E+06
RB87	1.310E-03	7.316E-04	1.104E-02	4.462E-02	5.770E-02
SR89	0.000E+00	0.000E+00	0.000E+00	2.208E-23	2.208E-23
SR90	1.483E+06	7.818E+05	1.516E+07	7.044E+07	8.787E+07
Y90	1.484E+06	7.820E+05	1.517E+07	7.045E+07	8.789E+07
Y91	0.000E+00	0.000E+00	0.000E+00	3.764E-19	3.764E-19
ZR93	1.057E+02	5.902E+01	8.967E+02	3.638E+03	4.700E+03

ZR95	0.000E+00	0.000E+00	0.000E+00	7.959E-17	7.959E-17
NB92	1.686E-15	9.084E-16	4.286E-14	2.705E-13	3.160E-13
NB93*	9.298E+01	5.263E+01	7.437E+02	2.827E+03	3.716E+03
NB94	1.335E-03	7.423E-04	1.715E-02	8.311E-02	1.023E-01
NB95	0.000E+00	0.000E+00	0.000E+00	1.754E-16	1.754E-16
NB95*	0.000E+00	0.000E+00	0.000E+00	9.363E-19	9.363E-19
TC98	4.729E-06	2.617E-06	8.455E-05	4.323E-04	5.242E-04
TC99	7.627E+02	4.259E+02	6.492E+03	2.657E+04	3.425E+04
RU106	1.679E-07	1.348E-08	1.519E-03	1.055E+03	1.055E+03
RH102	3.275E-06	1.249E-06	1.129E-03	1.311E-01	1.322E-01
RH106	1.679E-07	1.348E-08	1.519E-03	1.055E+03	1.055E+03
PD107	1.632E+00	9.093E-01	1.730E+01	7.980E+01	9.964E+01
AG108	1.454E-05	8.001E-06	2.129E-04	1.095E-03	1.330E-03
AG108*	1.671E-04	9.197E-05	2.447E-03	1.259E-02	1.529E-02
AG109*	4.061E-17	9.509E-18	3.147E-09	1.012E-03	1.012E-03
AG110	3.488E-20	2.008E-21	6.407E-14	3.634E-05	3.634E-05
AG110*	2.564E-18	1.477E-19	4.711E-12	2.672E-03	2.672E-03
CD109	4.061E-17	9.509E-18	3.147E-09	1.012E-03	1.012E-03
CD113	1.964E-11	1.092E-11	1.124E-10	4.277E-10	5.706E-10
CD113*	5.445E+01	2.714E+01	7.734E+02	4.676E+03	5.531E+03
IN115	8.783E-10	4.904E-10	7.547E-09	3.152E-08	4.044E-08
SN119*	3.427E-15	1.325E-16	1.781E-10	5.353E-03	5.353E-03
SN121	7.402E+01	4.015E+01	7.886E+02	3.674E+03	4.577E+03
SN121*	9.539E+01	5.174E+01	1.016E+03	4.734E+03	5.898E+03
SN123	0.000E+00	0.000E+00	1.862E-25	3.726E-08	3.726E-08
SN126	6.582E+00	3.673E+00	6.069E+01	2.580E+02	3.290E+02
SB124	0.000E+00	0.000E+00	0.000E+00	2.556E-23	2.556E-23
SB125	1.882E+00	5.421E-01	1.705E+02	1.744E+04	1.761E+04
SB126	9.215E-01	5.142E-01	8.496E+00	3.613E+01	4.606E+01
SB126*	6.582E+00	3.673E+00	6.069E+01	2.580E+02	3.290E+02
TE123	1.598E-13	8.825E-14	2.709E-12	1.504E-11	1.800E-11
TE123*	0.000E+00	0.000E+00	0.000E+00	2.503E-13	2.503E-13
TE125*	4.594E-01	1.323E-01	4.161E+01	4.256E+03	4.298E+03
TE127	0.000E+00	0.000E+00	0.000E+00	3.539E-09	3.539E-09
TE127*	0.000E+00	0.000E+00	6.970E-30	3.613E-09	3.613E-09
I129	1.031E+00	5.752E-01	9.180E+00	3.857E+01	4.936E+01
CS134	1.789E-02	5.454E-03	1.176E+01	8.551E+03	8.563E+03
CS135	2.182E+01	1.218E+01	1.989E+02	7.721E+02	1.005E+03
CS137	1.719E+06	9.088E+05	1.781E+07	8.362E+07	1.041E+08
BA137*	1.624E+06	8.582E+05	1.682E+07	7.896E+07	9.827E+07
LA138	7.576E-09	4.229E-09	6.723E-08	2.778E-07	3.568E-07
CE142	1.409E-03	7.870E-04	1.207E-02	4.921E-02	6.347E-02
CE144	1.009E-10	3.364E-12	6.003E-06	2.948E+02	2.948E+02
PR144	1.009E-10	3.364E-12	6.003E-06	2.948E+02	2.948E+02
PR144*	1.413E-12	4.710E-14	8.404E-08	4.127E+00	4.127E+00
ND144	6.654E-08	3.715E-08	5.711E-07	2.331E-06	3.006E-06
PM146	8.636E-03	3.927E-03	5.910E-01	1.023E+01	1.084E+01
PM147	6.172E+01	1.660E+01	5.547E+03	6.789E+05	6.845E+05
SM146	7.706E-08	4.223E-08	1.705E-06	8.994E-06	1.082E-05
SM147	5.410E-04	3.021E-04	4.495E-03	1.813E-02	2.346E-02
SM148	1.161E-10	6.400E-11	2.347E-09	1.164E-08	1.417E-08
SM149	9.150E-10	5.057E-10	4.099E-09	1.449E-08	2.001E-08
SM151	7.713E+04	4.229E+04	6.227E+05	2.556E+06	3.299E+06
EU150	8.429E-06	4.449E-06	2.749E-04	1.684E-03	1.972E-03
EU152	2.895E+00	1.466E+00	1.235E+02	9.453E+02	1.073E+03
EU154	2.234E+02	1.079E+02	8.229E+03	8.338E+04	9.194E+04
EU155	1.411E+02	5.291E+01	3.412E+03	4.777E+04	5.138E+04
GD152	2.463E-12	1.338E-12	6.309E-11	3.191E-10	3.860E-10
GD153	9.082E-22	7.995E-23	1.405E-14	1.126E-05	1.126E-05
TB160	0.000E+00	0.000E+00	0.000E+00	2.721E-19	2.721E-19
HO166*	2.269E-04	1.250E-04	3.882E-03	2.193E-02	2.617E-02
TM170	0.000E+00	0.000E+00	0.000E+00	7.004E-17	7.004E-17
TM171	8.471E-10	1.982E-10	3.032E-07	3.209E-04	3.212E-04

TL206	3.854E-09	2.478E-09	5.075E-10	1.924E-09	8.764E-09
TL207	3.799E-02	2.300E-02	3.846E-03	4.576E+00	4.641E+00
TL208	7.627E-03	4.154E-03	6.057E-04	3.887E+00	3.899E+00
TL209	1.125E-07	6.710E-08	2.249E-07	2.957E-02	2.957E-02
PB209	5.357E-06	3.195E-06	1.071E-05	1.408E+00	1.408E+00
PB210	2.923E-03	1.879E-03	3.848E-04	1.459E-03	6.646E-03
PB211	3.809E-02	2.307E-02	3.856E-03	4.589E+00	4.654E+00
PB212	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
PB214	7.998E-03	4.951E-03	9.143E-04	3.686E-03	1.755E-02
BI208	0.000E+00	0.000E+00	2.860E-20	6.782E-16	6.782E-16
BI210	2.920E-03	1.878E-03	3.845E-04	1.457E-03	6.640E-03
BI210*	2.216E-23	9.049E-24	1.945E-20	4.463E-16	4.463E-16
BI211	3.809E-02	2.307E-02	3.856E-03	4.589E+00	4.654E+00
BI212	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
BI213	5.357E-06	3.195E-06	1.071E-05	1.408E+00	1.408E+00
BI214	7.998E-03	4.951E-03	9.143E-04	3.686E-03	1.755E-02
PO210	2.835E-03	1.826E-03	3.756E-04	1.420E-03	6.457E-03
PO211	1.029E-04	6.228E-05	1.041E-05	1.239E-02	1.257E-02
PO212	1.359E-02	7.404E-03	1.080E-03	6.928E+00	6.950E+00
PO213	5.245E-06	3.128E-06	1.048E-05	1.379E+00	1.379E+00
PO214	7.996E-03	4.950E-03	9.141E-04	3.685E-03	1.754E-02
PO215	3.809E-02	2.307E-02	3.856E-03	4.589E+00	4.654E+00
PO216	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
PO218	8.000E-03	4.952E-03	9.145E-04	3.686E-03	1.755E-02
AT217	5.358E-06	3.196E-06	1.071E-05	1.408E+00	1.408E+00
RN219	3.809E-02	2.307E-02	3.856E-03	4.589E+00	4.654E+00
RN220	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
RN222	8.000E-03	4.952E-03	9.145E-04	3.686E-03	1.755E-02
FR221	5.358E-06	3.196E-06	1.071E-05	1.408E+00	1.408E+00
FR223	5.277E-04	3.194E-04	5.331E-05	6.345E-02	6.435E-02
RA223	3.809E-02	2.307E-02	3.856E-03	4.589E+00	4.654E+00
RA224	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
RA225	5.364E-06	3.199E-06	1.073E-05	1.410E+00	1.410E+00
RA226	8.005E-03	4.955E-03	9.149E-04	3.688E-03	1.756E-02
RA228	3.811E-08	2.251E-08	6.865E-09	3.040E+00	3.040E+00
AC225	5.358E-06	3.196E-06	1.071E-05	1.408E+00	1.408E+00
AC227	3.824E-02	2.315E-02	3.863E-03	4.598E+00	4.663E+00
AC228	3.811E-08	2.251E-08	6.865E-09	3.040E+00	3.040E+00
TH227	3.762E-02	2.278E-02	3.806E-03	4.529E+00	4.593E+00
TH228	2.122E-02	1.156E-02	1.685E-03	1.081E+01	1.085E+01
TH229	5.373E-06	3.204E-06	1.075E-05	1.413E+00	1.413E+00
TH230	7.487E-01	4.378E-01	5.823E-02	2.599E-01	1.505E+00
TH231	7.354E+01	4.047E+01	1.271E+00	4.265E+00	1.195E+02
TH232	4.580E-08	2.681E-08	7.217E-09	2.802E+00	2.802E+00
TH234	1.679E+03	9.246E+02	2.821E+01	8.763E+01	2.719E+03
PA231	7.689E-02	4.496E-02	5.765E-03	7.022E+00	7.149E+00
PA233	4.715E+00	2.632E+00	2.587E+01	9.915E+01	1.324E+02
PA234	2.183E+00	1.202E+00	3.667E-02	1.139E-01	3.535E+00
PA234*	1.679E+03	9.246E+02	2.821E+01	8.763E+01	2.719E+03
U232	2.063E-02	1.124E-02	1.639E-03	7.444E+00	7.477E+00
U233	1.649E-03	9.474E-04	4.872E-03	4.494E+02	4.494E+02
U234	1.647E+03	9.071E+02	3.073E+01	1.066E+02	2.692E+03
U235	7.354E+01	4.047E+01	1.271E+00	4.265E+00	1.195E+02
U236	1.874E+01	1.047E+01	7.335E-01	5.402E+00	3.535E+01
U237	1.504E-02	7.858E-03	1.237E-01	2.901E+00	3.047E+00
U238	1.679E+03	9.246E+02	2.821E+01	8.763E+01	2.719E+03
U240	4.881E-12	2.495E-12	1.712E-10	6.259E-09	6.438E-09
NP235	2.114E-16	3.187E-17	9.743E-13	2.718E-06	2.718E-06
NP236	3.607E-06	1.988E-06	4.048E-05	2.437E-04	2.898E-04
NP237	4.715E+00	2.632E+00	2.587E+01	9.915E+01	1.324E+02
NP238	3.618E-04	1.764E-04	3.808E-02	3.607E-01	3.993E-01
NP239	3.854E-02	1.879E-02	3.912E+00	3.826E+01	4.223E+01
NP240	4.076E-15	1.891E-15	1.939E-13	7.467E-12	7.666E-12

NP240*	4.881E-12	2.495E-12	1.712E-10	6.259E-09	6.438E-09
PU236	3.773E-07	1.986E-07	6.213E-06	3.109E-03	3.116E-03
PU238	2.092E+01	1.152E+01	1.502E+02	1.802E+03	1.984E+03
PU239	2.943E+03	1.603E+03	4.484E+03	2.468E+04	3.371E+04
PU240	3.145E+02	1.759E+02	9.426E+02	6.672E+03	8.105E+03
PU241	6.287E+02	3.284E+02	5.171E+03	1.212E+05	1.273E+05
PU242	4.377E-03	2.339E-03	4.330E-02	7.437E-01	7.937E-01
PU243	0.000E+00	0.000E+00	5.253E-12	1.026E-10	1.079E-10
PU244	4.883E-12	2.496E-12	1.712E-10	6.259E-09	6.438E-09
AM241	2.708E+02	1.453E+02	5.719E+03	7.657E+04	8.271E+04
AM242	8.004E-02	3.903E-02	8.423E+00	7.980E+01	8.834E+01
AM242*	8.040E-02	3.921E-02	8.461E+00	8.015E+01	8.874E+01
AM243	3.854E-02	1.879E-02	3.912E+00	3.826E+01	4.223E+01
AM245	0.000E+00	0.000E+00	4.694E-27	8.992E-25	9.039E-25
CM242	6.640E-02	3.238E-02	6.988E+00	6.620E+01	7.329E+01
CM243	8.040E-04	3.663E-04	4.996E-01	7.239E+00	7.740E+00
CM244	1.895E-02	8.552E-03	1.103E+01	1.804E+02	1.915E+02
CM245	4.559E-07	2.049E-07	6.364E-04	9.380E-03	1.002E-02
CM246	2.364E-09	1.034E-09	1.495E-05	2.552E-04	2.701E-04
CM247	1.828E-16	7.836E-17	5.259E-12	1.026E-10	1.079E-10
CM248	1.060E-17	4.479E-18	1.411E-12	3.154E-11	3.295E-11
CM250	0.000E+00	0.000E+00	3.435E-21	9.279E-20	9.623E-20
BK249	0.000E+00	0.000E+00	9.740E-22	4.862E-16	4.862E-16
CF249	0.000E+00	0.000E+00	2.819E-12	7.249E-11	7.531E-11
CF250	0.000E+00	0.000E+00	7.336E-13	3.092E-11	3.165E-11
CF251	0.000E+00	0.000E+00	7.433E-15	2.374E-13	2.449E-13
CF252	0.000E+00	0.000E+00	2.454E-17	9.263E-15	9.287E-15
CF254	0.000E+00	0.000E+00	0.000E+00	7.570E-19	7.570E-19
ES254	0.000E+00	0.000E+00	0.000E+00	9.113E-26	9.113E-26
Total:	6.430E+06	3.395E+06	6.606E+07	3.098E+08	3.857E+08

Total Fuel and Exposure Summary:

	T-plant	B-plant	Redox	Purex	Total
MWd:	1.655E+06	9.241E+05	1.413E+07	5.835E+07	7.506E+07
MTU:	5.033E+03	2.765E+03	1.969E+04	7.185E+04	9.934E+04

DKPRO complete, calculation time = 53.43750

clad2.inp:

```
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.clad

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

SPLIT

OUTPUT
   H3     C14    NI59   CO60   NI63
   SE79   SR90   Y90    ZR93   NB93*  TC99  RU106
   CD113* SB125  SN126  I129   CS134
   CS137  BA137* SM151  EU152  EU154  EU155
   RA226  AC227  RA228  TH229  PA231
   TH232  U232   U233   U234   U235
   U236   NP237  PU238  U238   PU239  PU240
   AM241  PU241  PU242  CM242  AM243
   CM243  CM244
```

clad2.process.dir:

```
FINAL   1/2001   # Decay to start of 2001 after other steps completed

PROCESS T AL-0.71U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T AL-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-0.94U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS T ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B AL-0.71U
```

```
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS B ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS REDOX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given

PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given

PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
```

```
    repro secondary given

PROCESS PUREX ZR-1.1U
    decay given         # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given

PROCESS PUREX ZR-2.1U
    decay given         # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given

PROCESS PUREX AL-0.0TH
    decay given         # Use cooling times from archive file
    split 0.999
    repro secondary given
```

clad2.summary.dir:

```
SUMMARY  T-plant
   PLANT T

SUMMARY  B-plant
   PLANT B

SUMMARY  Redox
   PLANT REDOX

SUMMARY Purex
   PLANT PUREX
```

clad2.log:

```
<==============================================>

  *** DKPRO ***     Version 3.1
 run date = 20020916 run time = 105955.774
 cpu = NW40057207
 working directory = U:\DATA\dkpro\cases\split2

 <==============================================>
 **** Reading Input Commands from Standard Input File ****
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.clad

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  CURIES

SPLIT
```

```
OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
 **** End of Input ****

**** Reading Process Directives from file: process.dir
 FINAL   1/2001   # Decay to start of 2001 after other steps completed
 PROCESS T AL-0.71U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS T AL-0.94U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS T ZR-0.94U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS T ZR-1.1U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS T ZR-2.1U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS B AL-0.71U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS B AL-0.94U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS B ZR-0.94U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS B ZR-1.1U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS B ZR-2.1U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS REDOX AL-0.71U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS REDOX AL-0.94U
     decay given          # Use cooling times from archive file
     split 0.999
     repro secondary given
 PROCESS REDOX ZR-0.94U
```

```
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given
PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given
PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.998
    repro secondary given
PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given
PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given
PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given
PROCESS PUREX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given
PROCESS PUREX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.07584   U  0.1248  Th 0.1248  Np 0.07584 Pu 0.07584 Am 0.07584
                    H  0.96  C 0.96  Tc 0.96  I 0.96  Cs 0.96  Ba 0.96
    repro secondary given
PROCESS PUREX AL-0.0TH
    decay given          # Use cooling times from archive file
    split 0.999
    repro secondary given
**** End of Process Directives ****

**** Reading Summary Directives from file: summary.dir
SUMMARY  T-plant
   PLANT T
SUMMARY  B-plant
   PLANT B
SUMMARY  Redox
   PLANT REDOX
SUMMARY Purex
   PLANT PUREX
**** End of Summary Directives ****

List Library Directory:
Volume in drive P is Applications
Volume Serial Number is B831-5A78

Directory of p:\dkpro\lib

09/16/02  08:29a        <DIR>          .
09/16/02  08:29a        <DIR>          ..
08/15/02  08:26a                 1,935 CLAD.MK1AA000.org
08/15/02  08:26a                 5,789 CLAD.MK1AA001A.org
08/15/02  08:26a                 5,871 CLAD.MK1AA002.org
08/15/02  08:26a                 5,871 CLAD.MK1AA003.org
```

```
08/15/02  08:26a                6,035 CLAD.MK1AA005.org
08/15/02  08:26a                6,117 CLAD.MK1AA007.org
08/15/02  08:26a                6,035 CLAD.MK1AA010.org
08/15/02  08:26a                6,281 CLAD.MK1AA015.org
08/15/02  08:26a                6,445 CLAD.MK1AA020.org
08/15/02  08:26a                6,445 CLAD.MK1AA025.org
08/15/02  08:26a                6,445 CLAD.MK1AA030.org
08/15/02  08:26a                6,527 CLAD.MK1AA040.org
08/15/02  08:26a                6,609 CLAD.MK1AA050.org
08/15/02  08:26a                6,773 CLAD.MK1AA070.org
08/15/02  08:26a                6,855 CLAD.MK1AA100.org
08/15/02  08:26a                6,855 CLAD.MK1AA115.org
08/15/02  08:26a                6,937 CLAD.MK1AA130.org
08/15/02  08:26a                7,101 CLAD.MK1AA200.org
08/15/02  08:26a                7,019 CLAD.MK1AA230.org
08/15/02  08:26a                7,101 CLAD.MK1AA273.org
08/15/02  08:26a                7,101 CLAD.MK1AA300.org
08/15/02  08:26a                1,935 CLAD.MK1AB000.org
08/15/02  08:26a                5,789 CLAD.MK1AB001A.org
08/15/02  08:26a                5,871 CLAD.MK1AB002.org
08/15/02  08:26a                5,871 CLAD.MK1AB003.org
08/15/02  08:26a                6,035 CLAD.MK1AB005.org
08/15/02  08:26a                6,035 CLAD.MK1AB007.org
08/15/02  08:26a                6,117 CLAD.MK1AB010.org
08/15/02  08:26a                6,281 CLAD.MK1AB015.org
08/15/02  08:26a                6,363 CLAD.MK1AB020.org
08/15/02  08:26a                6,445 CLAD.MK1AB025.org
08/15/02  08:26a                6,527 CLAD.MK1AB030.org
08/15/02  08:26a                6,609 CLAD.MK1AB040.org
08/15/02  08:26a                6,609 CLAD.MK1AB050.org
08/15/02  08:26a                6,691 CLAD.MK1AB070.org
08/15/02  08:26a                6,855 CLAD.MK1AB100.org
08/15/02  08:26a                6,937 CLAD.MK1AB115.org
08/15/02  08:26a                6,937 CLAD.MK1AB130.org
08/15/02  08:26a                7,101 CLAD.MK1AB200.org
08/15/02  08:26a                7,101 CLAD.MK1AB230.org
08/15/02  08:26a                7,101 CLAD.MK1AB273.org
08/15/02  08:26a                7,101 CLAD.MK1AB300.org
08/15/02  08:26a                1,935 CLAD.MK1AC000.org
08/15/02  08:26a                5,789 CLAD.MK1AC001A.org
08/15/02  08:26a                5,871 CLAD.MK1AC002.org
08/15/02  08:26a                5,871 CLAD.MK1AC003.org
08/15/02  08:26a                6,035 CLAD.MK1AC005.org
08/15/02  08:26a                6,117 CLAD.MK1AC007.org
08/15/02  08:26a                6,117 CLAD.MK1AC010.org
08/15/02  08:26a                6,281 CLAD.MK1AC015.org
08/15/02  08:26a                6,445 CLAD.MK1AC020.org
08/15/02  08:26a                6,445 CLAD.MK1AC025.org
08/15/02  08:26a                6,527 CLAD.MK1AC030.org
08/15/02  08:26a                6,527 CLAD.MK1AC040.org
08/15/02  08:26a                6,691 CLAD.MK1AC050.org
08/15/02  08:26a                6,773 CLAD.MK1AC070.org
08/15/02  08:26a                6,937 CLAD.MK1AC100.org
08/15/02  08:26a                6,937 CLAD.MK1AC115.org
08/15/02  08:26a                6,937 CLAD.MK1AC130.org
08/15/02  08:26a                7,101 CLAD.MK1AC200.org
08/15/02  08:26a                7,019 CLAD.MK1AC230.org
08/15/02  08:26a                7,101 CLAD.MK1AC273.org
08/15/02  08:26a                7,101 CLAD.MK1AC300.org
08/15/02  08:26a                1,935 CLAD.MKII000.org
08/15/02  08:26a                5,789 CLAD.MKII001A.org
08/15/02  08:26a                5,789 CLAD.MKII002.org
08/15/02  08:26a                5,871 CLAD.MKII003.org
```

```
08/15/02  08:26a                5,871 CLAD.MKII005.org
08/15/02  08:26a                5,953 CLAD.MKII007.org
08/15/02  08:26a                6,035 CLAD.MKII010.org
08/15/02  08:26a                6,117 CLAD.MKII015.org
08/15/02  08:26a                6,199 CLAD.MKII020.org
08/15/02  08:26a                6,281 CLAD.MKII025.org
08/15/02  08:26a                6,363 CLAD.MKII030.org
08/15/02  08:26a                6,445 CLAD.MKII040.org
08/15/02  08:26a                6,527 CLAD.MKII050.org
08/15/02  08:26a                6,609 CLAD.MKII070.org
08/15/02  08:26a                6,691 CLAD.MKII100.org
08/15/02  08:26a                6,855 CLAD.MKII115.org
08/15/02  08:26a                6,773 CLAD.MKII130.org
08/15/02  08:26a                6,855 CLAD.MKII150.org
08/15/02  08:26a                6,937 CLAD.MKII180.org
08/15/02  08:26a                6,937 CLAD.MKII200.org
08/15/02  08:26a                6,855 CLAD.MKII220.org
08/15/02  08:26a                1,935 CLAD.MKIVA000.org
08/15/02  08:26a                5,789 CLAD.MKIVA001A.org
08/15/02  08:26a                5,871 CLAD.MKIVA002.org
08/15/02  08:26a                5,871 CLAD.MKIVA003.org
08/15/02  08:26a                5,953 CLAD.MKIVA005.org
08/15/02  08:26a                6,035 CLAD.MKIVA007.org
08/15/02  08:26a                6,035 CLAD.MKIVA010.org
08/15/02  08:26a                6,281 CLAD.MKIVA015.org
08/15/02  08:26a                6,363 CLAD.MKIVA020.org
08/15/02  08:26a                6,445 CLAD.MKIVA025.org
08/15/02  08:26a                6,527 CLAD.MKIVA030.org
08/15/02  08:26a                6,527 CLAD.MKIVA040.org
08/15/02  08:26a                6,609 CLAD.MKIVA050.org
08/15/02  08:26a                6,773 CLAD.MKIVA070.org
08/15/02  08:26a                6,937 CLAD.MKIVA100.org
08/15/02  08:26a                6,937 CLAD.MKIVA115.org
08/15/02  08:26a                6,937 CLAD.MKIVA130.org
08/15/02  08:26a                7,019 CLAD.MKIVA200.org
08/15/02  08:26a                7,019 CLAD.MKIVA250.org
08/15/02  08:26a                7,101 CLAD.MKIVA300.org
08/15/02  08:26a                7,183 CLAD.MKIVA360.org
08/15/02  08:26a                1,935 CLAD.MKIVB000.org
08/15/02  08:26a                5,789 CLAD.MKIVB001A.org
08/15/02  08:26a                5,871 CLAD.MKIVB002.org
08/15/02  08:26a                5,871 CLAD.MKIVB003.org
08/15/02  08:26a                6,035 CLAD.MKIVB005.org
08/15/02  08:26a                6,035 CLAD.MKIVB007.org
08/15/02  08:26a                6,117 CLAD.MKIVB010.org
08/15/02  08:26a                6,281 CLAD.MKIVB015.org
08/15/02  08:26a                6,445 CLAD.MKIVB020.org
08/15/02  08:26a                6,363 CLAD.MKIVB025.org
08/15/02  08:26a                6,527 CLAD.MKIVB030.org
08/15/02  08:26a                6,609 CLAD.MKIVB040.org
08/15/02  08:26a                6,609 CLAD.MKIVB050.org
08/15/02  08:26a                6,691 CLAD.MKIVB070.org
08/15/02  08:26a                6,855 CLAD.MKIVB100.org
08/15/02  08:26a                6,937 CLAD.MKIVB115.org
08/15/02  08:26a                6,855 CLAD.MKIVB130.org
08/15/02  08:26a                7,019 CLAD.MKIVB200.org
08/15/02  08:26a                7,101 CLAD.MKIVB250.org
08/15/02  08:26a                7,101 CLAD.MKIVB300.org
08/15/02  08:26a                7,183 CLAD.MKIVB360.org
08/15/02  08:26a                1,935 CLAD.MKIVC000.org
08/15/02  08:26a                5,789 CLAD.MKIVC001A.org
08/15/02  08:26a                5,871 CLAD.MKIVC002.org
08/15/02  08:26a                5,871 CLAD.MKIVC003.org
```

```
08/15/02  08:26a                6,035 CLAD.MKIVC005.org
08/15/02  08:26a                6,035 CLAD.MKIVC007.org
08/15/02  08:26a                6,035 CLAD.MKIVC010.org
08/15/02  08:26a                6,281 CLAD.MKIVC015.org
08/15/02  08:26a                6,445 CLAD.MKIVC020.org
08/15/02  08:26a                6,445 CLAD.MKIVC025.org
08/15/02  08:26a                6,445 CLAD.MKIVC030.org
08/15/02  08:26a                6,609 CLAD.MKIVC040.org
08/15/02  08:26a                6,691 CLAD.MKIVC050.org
08/15/02  08:26a                6,691 CLAD.MKIVC070.org
08/15/02  08:26a                6,937 CLAD.MKIVC100.org
08/15/02  08:26a                6,937 CLAD.MKIVC115.org
08/15/02  08:26a                6,937 CLAD.MKIVC130.org
08/15/02  08:26a                7,019 CLAD.MKIVC200.org
08/15/02  08:26a                7,101 CLAD.MKIVC250.org
08/15/02  08:26a                7,101 CLAD.MKIVC300.org
08/15/02  08:26a                7,183 CLAD.MKIVC360.org
08/15/02  08:26a                1,525 CLAD.SPE000.org
08/15/02  08:26a                4,149 CLAD.SPE001A.org
08/15/02  08:26a                4,231 CLAD.SPE002.org
08/15/02  08:26a                4,231 CLAD.SPE003.org
08/15/02  08:26a                4,313 CLAD.SPE005.org
08/15/02  08:26a                4,313 CLAD.SPE007.org
08/15/02  08:26a                4,313 CLAD.SPE010.org
08/15/02  08:26a                4,313 CLAD.SPE015.org
08/15/02  08:26a                4,313 CLAD.SPE020.org
08/15/02  08:26a                4,477 CLAD.SPE025.org
08/15/02  08:26a                4,477 CLAD.SPE030.org
08/15/02  08:26a                4,477 CLAD.SPE040.org
08/15/02  08:26a                4,477 CLAD.SPE050.org
08/15/02  08:26a                4,559 CLAD.SPE070.org
08/15/02  08:26a                4,559 CLAD.SPE100.org
08/15/02  08:26a                4,559 CLAD.SPE125.org
08/15/02  08:26a                4,559 CLAD.SPE150.org
08/15/02  08:26a                4,559 CLAD.SPE200.org
08/15/02  08:26a                4,559 CLAD.SPE250.org
08/15/02  08:26a                4,559 CLAD.SPE300.org
08/15/02  08:26a                4,559 CLAD.SPE320.org
08/15/02  08:26a                1,525 CLAD.SPNA000.org
08/15/02  08:26a                4,231 CLAD.SPNA001A.org
08/15/02  08:26a                4,231 CLAD.SPNA002.org
08/15/02  08:26a                4,231 CLAD.SPNA003.org
08/15/02  08:26a                4,231 CLAD.SPNA005.org
08/15/02  08:26a                4,313 CLAD.SPNA007.org
08/15/02  08:26a                4,313 CLAD.SPNA010.org
08/15/02  08:26a                4,395 CLAD.SPNA015.org
08/15/02  08:26a                4,477 CLAD.SPNA020.org
08/15/02  08:26a                4,477 CLAD.SPNA025.org
08/15/02  08:26a                4,477 CLAD.SPNA030.org
08/15/02  08:26a                4,559 CLAD.SPNA040.org
08/15/02  08:26a                4,559 CLAD.SPNA050.org
08/15/02  08:26a                4,559 CLAD.SPNA070.org
08/15/02  08:26a                4,641 CLAD.SPNA100.org
08/15/02  08:26a                4,641 CLAD.SPNA125.org
08/15/02  08:26a                4,641 CLAD.SPNA150.org
08/15/02  08:26a                4,723 CLAD.SPNA200.org
08/15/02  08:26a                4,641 CLAD.SPNA250.org
08/15/02  08:26a                4,641 CLAD.SPNA300.org
08/15/02  08:26a                4,641 CLAD.SPNA320.org
08/15/02  08:26a                1,525 CLAD.SPNB000.org
08/15/02  08:26a                4,149 CLAD.SPNB001A.org
08/15/02  08:26a                4,149 CLAD.SPNB002.org
08/15/02  08:26a                4,231 CLAD.SPNB003.org
```

08/15/02	08:26a	4,231	CLAD.SPNB005.org
08/15/02	08:26a	4,313	CLAD.SPNB007.org
08/15/02	08:26a	4,313	CLAD.SPNB010.org
08/15/02	08:26a	4,395	CLAD.SPNB015.org
08/15/02	08:26a	4,477	CLAD.SPNB020.org
08/15/02	08:26a	4,477	CLAD.SPNB025.org
08/15/02	08:26a	4,395	CLAD.SPNB030.org
08/15/02	08:26a	4,477	CLAD.SPNB040.org
08/15/02	08:26a	4,477	CLAD.SPNB050.org
08/15/02	08:26a	4,477	CLAD.SPNB070.org
08/15/02	08:26a	4,559	CLAD.SPNB100.org
08/15/02	08:26a	4,559	CLAD.SPNB125.org
08/15/02	08:26a	4,559	CLAD.SPNB150.org
08/15/02	08:26a	4,559	CLAD.SPNB200.org
08/15/02	08:26a	4,641	CLAD.SPNB250.org
08/15/02	08:26a	4,641	CLAD.SPNB300.org
08/15/02	08:26a	4,641	CLAD.SPNB320.org
08/15/02	08:26a	1,525	CLAD.SPNC000.org
08/15/02	08:26a	4,231	CLAD.SPNC001A.org
08/15/02	08:26a	4,231	CLAD.SPNC002.org
08/15/02	08:26a	4,231	CLAD.SPNC003.org
08/15/02	08:26a	4,231	CLAD.SPNC005.org
08/15/02	08:26a	4,313	CLAD.SPNC007.org
08/15/02	08:26a	4,313	CLAD.SPNC010.org
08/15/02	08:26a	4,395	CLAD.SPNC015.org
08/15/02	08:26a	4,477	CLAD.SPNC020.org
08/15/02	08:26a	4,477	CLAD.SPNC025.org
08/15/02	08:26a	4,395	CLAD.SPNC030.org
08/15/02	08:26a	4,477	CLAD.SPNC040.org
08/15/02	08:26a	4,477	CLAD.SPNC050.org
08/15/02	08:26a	4,477	CLAD.SPNC070.org
08/15/02	08:26a	4,559	CLAD.SPNC100.org
08/15/02	08:26a	4,559	CLAD.SPNC125.org
08/15/02	08:26a	4,559	CLAD.SPNC150.org
08/15/02	08:26a	4,559	CLAD.SPNC200.org
08/15/02	08:26a	4,641	CLAD.SPNC250.org
08/15/02	08:26a	4,641	CLAD.SPNC300.org
08/15/02	08:26a	4,641	CLAD.SPNC320.org
09/05/02	04:06p	4,641	CLAD.TH1.org
08/15/02	08:24a	1,970	COMBO.MK1AA000.ORG
08/15/02	08:24a	14,844	COMBO.MK1AA001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AA002.ORG
08/15/02	08:24a	15,172	COMBO.MK1AA003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AA005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AA007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AA010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AA015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AA030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AA040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AA050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AA070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AA200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AA300.ORG
08/15/02	08:24a	1,974	COMBO.MK1AB000.ORG
08/15/02	08:24a	14,848	COMBO.MK1AB001A.ORG
08/15/02	08:24a	15,013	COMBO.MK1AB002.ORG

08/15/02	08:24a	15,176	COMBO.MK1AB003.ORG
08/15/02	08:24a	15,258	COMBO.MK1AB005.ORG
08/15/02	08:24a	15,422	COMBO.MK1AB007.ORG
08/15/02	08:24a	15,504	COMBO.MK1AB010.ORG
08/15/02	08:24a	15,750	COMBO.MK1AB015.ORG
08/15/02	08:24a	15,832	COMBO.MK1AB020.ORG
08/15/02	08:24a	15,832	COMBO.MK1AB025.ORG
08/15/02	08:24a	15,914	COMBO.MK1AB030.ORG
08/15/02	08:24a	16,078	COMBO.MK1AB040.ORG
08/15/02	08:24a	16,160	COMBO.MK1AB050.ORG
08/15/02	08:24a	16,406	COMBO.MK1AB070.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB100.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB115.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB130.ORG
08/15/02	08:24a	16,899	COMBO.MK1AB200.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB230.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB273.ORG
08/15/02	08:24a	17,063	COMBO.MK1AB300.ORG
08/15/02	08:24a	1,970	COMBO.MK1AC000.ORG
08/15/02	08:24a	14,844	COMBO.MK1AC001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AC002.ORG
08/15/02	08:24a	15,172	COMBO.MK1AC003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AC005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AC007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AC010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AC015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AC030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AC040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AC050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AC070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AC200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AC300.ORG
08/15/02	08:24a	1,964	COMBO.MKII000.ORG
08/15/02	08:24a	14,838	COMBO.MKII001A.ORG
08/15/02	08:24a	14,839	COMBO.MKII002.ORG
08/15/02	08:24a	15,002	COMBO.MKII003.ORG
08/15/02	08:24a	15,248	COMBO.MKII005.ORG
08/15/02	08:24a	15,248	COMBO.MKII007.ORG
08/15/02	08:24a	15,412	COMBO.MKII010.ORG
08/15/02	08:24a	15,494	COMBO.MKII015.ORG
08/15/02	08:24a	15,576	COMBO.MKII020.ORG
08/15/02	08:24a	15,658	COMBO.MKII025.ORG
08/15/02	08:24a	15,740	COMBO.MKII030.ORG
08/15/02	08:24a	15,822	COMBO.MKII040.ORG
08/15/02	08:24a	15,904	COMBO.MKII050.ORG
08/15/02	08:24a	16,150	COMBO.MKII070.ORG
08/15/02	08:24a	16,315	COMBO.MKII100.ORG
08/15/02	08:24a	16,397	COMBO.MKII115.ORG
08/15/02	08:24a	16,397	COMBO.MKII130.ORG
08/15/02	08:24a	16,479	COMBO.MKII150.ORG
08/15/02	08:24a	16,561	COMBO.MKII180.ORG
08/15/02	08:24a	16,561	COMBO.MKII200.ORG
08/15/02	08:24a	16,725	COMBO.MKII220.ORG
08/15/02	08:24a	1,970	COMBO.MKIVA000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVA001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVA002.ORG

08/15/02	08:24a	15,172	COMBO.MKIVA003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVA005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVA007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVA010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVA015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVA030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVA040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVA050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVA070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVA200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVA250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA360.ORG
08/15/02	08:24a	1,974	COMBO.MKIVB000.ORG
08/15/02	08:24a	14,848	COMBO.MKIVB001A.ORG
08/15/02	08:24a	15,013	COMBO.MKIVB002.ORG
08/15/02	08:24a	15,176	COMBO.MKIVB003.ORG
08/15/02	08:24a	15,258	COMBO.MKIVB005.ORG
08/15/02	08:24a	15,422	COMBO.MKIVB007.ORG
08/15/02	08:24a	15,504	COMBO.MKIVB010.ORG
08/15/02	08:24a	15,750	COMBO.MKIVB015.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB020.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB025.ORG
08/15/02	08:24a	15,914	COMBO.MKIVB030.ORG
08/15/02	08:24a	16,078	COMBO.MKIVB040.ORG
08/15/02	08:24a	16,160	COMBO.MKIVB050.ORG
08/15/02	08:24a	16,324	COMBO.MKIVB070.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB100.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB115.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB130.ORG
08/15/02	08:24a	16,899	COMBO.MKIVB200.ORG
08/15/02	08:24a	16,981	COMBO.MKIVB250.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB300.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB360.ORG
08/15/02	08:24a	1,970	COMBO.MKIVC000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVC001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVC002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVC003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVC005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVC007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVC010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVC015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVC030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVC040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVC050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVC070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVC200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVC250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC360.ORG
08/15/02	08:25a	1,552	COMBO.SPE000.ORG
08/15/02	08:25a	13,114	COMBO.SPE001A.ORG
08/15/02	08:25a	13,115	COMBO.SPE002.ORG

08/15/02	08:25a	13,360	COMBO.SPE003.ORG
08/15/02	08:25a	13,524	COMBO.SPE005.ORG
08/15/02	08:25a	13,606	COMBO.SPE007.ORG
08/15/02	08:25a	13,606	COMBO.SPE010.ORG
08/15/02	08:25a	13,770	COMBO.SPE015.ORG
08/15/02	08:25a	13,770	COMBO.SPE020.ORG
08/15/02	08:25a	13,770	COMBO.SPE025.ORG
08/15/02	08:25a	13,770	COMBO.SPE030.ORG
08/15/02	08:25a	13,852	COMBO.SPE040.ORG
08/15/02	08:25a	13,852	COMBO.SPE050.ORG
08/15/02	08:25a	13,934	COMBO.SPE070.ORG
08/15/02	08:25a	14,099	COMBO.SPE100.ORG
08/15/02	08:25a	14,099	COMBO.SPE125.ORG
08/15/02	08:25a	14,181	COMBO.SPE150.ORG
08/15/02	08:25a	14,181	COMBO.SPE200.ORG
08/15/02	08:25a	14,345	COMBO.SPE250.ORG
08/15/02	08:25a	14,509	COMBO.SPE300.ORG
08/15/02	08:25a	14,509	COMBO.SPE320.ORG
08/15/02	08:24a	1,558	COMBO.SPNA000.ORG
08/15/02	08:24a	13,202	COMBO.SPNA001A.ORG
08/15/02	08:24a	13,285	COMBO.SPNA002.ORG
08/15/02	08:24a	13,366	COMBO.SPNA003.ORG
08/15/02	08:24a	13,530	COMBO.SPNA005.ORG
08/15/02	08:24a	13,612	COMBO.SPNA007.ORG
08/15/02	08:24a	13,612	COMBO.SPNA010.ORG
08/15/02	08:24a	13,858	COMBO.SPNA015.ORG
08/15/02	08:24a	13,858	COMBO.SPNA020.ORG
08/15/02	08:24a	13,858	COMBO.SPNA025.ORG
08/15/02	08:24a	13,940	COMBO.SPNA030.ORG
08/15/02	08:24a	13,940	COMBO.SPNA040.ORG
08/15/02	08:24a	13,940	COMBO.SPNA050.ORG
08/15/02	08:24a	14,022	COMBO.SPNA070.ORG
08/15/02	08:24a	14,187	COMBO.SPNA100.ORG
08/15/02	08:24a	14,187	COMBO.SPNA125.ORG
08/15/02	08:24a	14,269	COMBO.SPNA150.ORG
08/15/02	08:24a	14,351	COMBO.SPNA200.ORG
08/15/02	08:24a	14,597	COMBO.SPNA250.ORG
08/15/02	08:24a	14,597	COMBO.SPNA300.ORG
08/15/02	08:24a	14,597	COMBO.SPNA320.ORG
08/15/02	08:25a	1,562	COMBO.SPNB000.ORG
08/15/02	08:25a	13,124	COMBO.SPNB001A.ORG
08/15/02	08:25a	13,207	COMBO.SPNB002.ORG
08/15/02	08:25a	13,370	COMBO.SPNB003.ORG
08/15/02	08:25a	13,534	COMBO.SPNB005.ORG
08/15/02	08:25a	13,616	COMBO.SPNB007.ORG
08/15/02	08:25a	13,616	COMBO.SPNB010.ORG
08/15/02	08:25a	13,780	COMBO.SPNB015.ORG
08/15/02	08:25a	13,780	COMBO.SPNB020.ORG
08/15/02	08:25a	13,780	COMBO.SPNB025.ORG
08/15/02	08:25a	13,862	COMBO.SPNB030.ORG
08/15/02	08:25a	13,862	COMBO.SPNB040.ORG
08/15/02	08:25a	13,862	COMBO.SPNB050.ORG
08/15/02	08:25a	14,026	COMBO.SPNB070.ORG
08/15/02	08:25a	14,109	COMBO.SPNB100.ORG
08/15/02	08:25a	14,109	COMBO.SPNB125.ORG
08/15/02	08:25a	14,191	COMBO.SPNB150.ORG
08/15/02	08:25a	14,273	COMBO.SPNB200.ORG
08/15/02	08:25a	14,519	COMBO.SPNB250.ORG
08/15/02	08:25a	14,519	COMBO.SPNB300.ORG
08/15/02	08:25a	14,519	COMBO.SPNB320.ORG
08/15/02	08:25a	1,558	COMBO.SPNC000.ORG
08/15/02	08:25a	13,120	COMBO.SPNC001A.ORG
08/15/02	08:25a	13,203	COMBO.SPNC002.ORG

08/15/02	08:25a	13,366	COMBO.SPNC003.ORG
08/15/02	08:25a	13,530	COMBO.SPNC005.ORG
08/15/02	08:25a	13,612	COMBO.SPNC007.ORG
08/15/02	08:25a	13,612	COMBO.SPNC010.ORG
08/15/02	08:25a	13,776	COMBO.SPNC015.ORG
08/15/02	08:25a	13,776	COMBO.SPNC020.ORG
08/15/02	08:25a	13,776	COMBO.SPNC025.ORG
08/15/02	08:25a	13,858	COMBO.SPNC030.ORG
08/15/02	08:25a	13,858	COMBO.SPNC040.ORG
08/15/02	08:25a	13,858	COMBO.SPNC050.ORG
08/15/02	08:25a	14,022	COMBO.SPNC070.ORG
08/15/02	08:25a	14,105	COMBO.SPNC100.ORG
08/15/02	08:25a	14,105	COMBO.SPNC125.ORG
08/15/02	08:25a	14,187	COMBO.SPNC150.ORG
08/15/02	08:25a	14,269	COMBO.SPNC200.ORG
08/15/02	08:25a	14,515	COMBO.SPNC250.ORG
08/15/02	08:25a	14,515	COMBO.SPNC300.ORG
08/15/02	08:25a	14,515	COMBO.SPNC320.ORG
09/05/02	04:05p	13,796	COMBO.TH1.ORG
08/15/02	08:25a	1,150	CORE.MK1AA000.ORG
08/15/02	08:25a	12,630	CORE.MK1AA001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AA002.ORG
08/15/02	08:25a	12,958	CORE.MK1AA003.ORG
08/15/02	08:25a	13,040	CORE.MK1AA005.ORG
08/15/02	08:25a	13,122	CORE.MK1AA007.ORG
08/15/02	08:25a	13,204	CORE.MK1AA010.ORG
08/15/02	08:25a	13,368	CORE.MK1AA015.ORG
08/15/02	08:25a	13,368	CORE.MK1AA020.ORG
08/15/02	08:25a	13,450	CORE.MK1AA025.ORG
08/15/02	08:25a	13,532	CORE.MK1AA030.ORG
08/15/02	08:25a	13,614	CORE.MK1AA040.ORG
08/15/02	08:25a	13,614	CORE.MK1AA050.ORG
08/15/02	08:25a	13,942	CORE.MK1AA070.ORG
08/15/02	08:25a	14,025	CORE.MK1AA100.ORG
08/15/02	08:25a	14,107	CORE.MK1AA115.ORG
08/15/02	08:25a	14,107	CORE.MK1AA130.ORG
08/15/02	08:25a	14,271	CORE.MK1AA200.ORG
08/15/02	08:25a	14,353	CORE.MK1AA230.ORG
08/15/02	08:25a	14,353	CORE.MK1AA273.ORG
08/15/02	08:25a	14,435	CORE.MK1AA300.ORG
08/15/02	08:25a	1,154	CORE.MK1AB000.ORG
08/15/02	08:25a	12,634	CORE.MK1AB001A.ORG
08/15/02	08:25a	12,717	CORE.MK1AB002.ORG
08/15/02	08:25a	12,962	CORE.MK1AB003.ORG
08/15/02	08:25a	13,044	CORE.MK1AB005.ORG
08/15/02	08:25a	13,126	CORE.MK1AB007.ORG
08/15/02	08:25a	13,208	CORE.MK1AB010.ORG
08/15/02	08:25a	13,372	CORE.MK1AB015.ORG
08/15/02	08:25a	13,372	CORE.MK1AB020.ORG
08/15/02	08:25a	13,454	CORE.MK1AB025.ORG
08/15/02	08:25a	13,536	CORE.MK1AB030.ORG
08/15/02	08:25a	13,618	CORE.MK1AB040.ORG
08/15/02	08:25a	13,618	CORE.MK1AB050.ORG
08/15/02	08:25a	13,946	CORE.MK1AB070.ORG
08/15/02	08:25a	14,029	CORE.MK1AB100.ORG
08/15/02	08:25a	14,111	CORE.MK1AB115.ORG
08/15/02	08:25a	14,111	CORE.MK1AB130.ORG
08/15/02	08:25a	14,275	CORE.MK1AB200.ORG
08/15/02	08:25a	14,357	CORE.MK1AB230.ORG
08/15/02	08:25a	14,357	CORE.MK1AB273.ORG
08/15/02	08:25a	14,439	CORE.MK1AB300.ORG
08/15/02	08:25a	1,150	CORE.MK1AC000.ORG
08/15/02	08:25a	12,630	CORE.MK1AC001A.ORG

08/15/02	08:25a	12,713	CORE.MK1AC002.ORG
08/15/02	08:25a	12,958	CORE.MK1AC003.ORG
08/15/02	08:25a	13,040	CORE.MK1AC005.ORG
08/15/02	08:25a	13,122	CORE.MK1AC007.ORG
08/15/02	08:25a	13,204	CORE.MK1AC010.ORG
08/15/02	08:25a	13,368	CORE.MK1AC015.ORG
08/15/02	08:25a	13,368	CORE.MK1AC020.ORG
08/15/02	08:25a	13,450	CORE.MK1AC025.ORG
08/15/02	08:25a	13,532	CORE.MK1AC030.ORG
08/15/02	08:25a	13,614	CORE.MK1AC040.ORG
08/15/02	08:25a	13,614	CORE.MK1AC050.ORG
08/15/02	08:25a	13,942	CORE.MK1AC070.ORG
08/15/02	08:25a	14,025	CORE.MK1AC100.ORG
08/15/02	08:25a	14,107	CORE.MK1AC115.ORG
08/15/02	08:25a	14,107	CORE.MK1AC130.ORG
08/15/02	08:25a	14,271	CORE.MK1AC200.ORG
08/15/02	08:25a	14,353	CORE.MK1AC230.ORG
08/15/02	08:25a	14,353	CORE.MK1AC273.ORG
08/15/02	08:25a	14,435	CORE.MK1AC300.ORG
08/15/02	08:25a	1,144	CORE.MKII000.ORG
08/15/02	08:25a	12,542	CORE.MKII001A.ORG
08/15/02	08:25a	12,707	CORE.MKII002.ORG
08/15/02	08:25a	12,706	CORE.MKII003.ORG
08/15/02	08:25a	13,034	CORE.MKII005.ORG
08/15/02	08:25a	13,034	CORE.MKII007.ORG
08/15/02	08:25a	13,116	CORE.MKII010.ORG
08/15/02	08:25a	13,198	CORE.MKII015.ORG
08/15/02	08:25a	13,280	CORE.MKII020.ORG
08/15/02	08:25a	13,362	CORE.MKII025.ORG
08/15/02	08:25a	13,362	CORE.MKII030.ORG
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08/15/02	08:25a	13,526	CORE.MKII050.ORG
08/15/02	08:25a	13,608	CORE.MKII070.ORG
08/15/02	08:25a	13,855	CORE.MKII100.ORG
08/15/02	08:25a	13,937	CORE.MKII115.ORG
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08/15/02	08:25a	13,937	CORE.MKII150.ORG
08/15/02	08:25a	13,937	CORE.MKII180.ORG
08/15/02	08:25a	14,019	CORE.MKII200.ORG
08/15/02	08:25a	14,183	CORE.MKII220.ORG
08/15/02	08:25a	1,150	CORE.MKIVA000.ORG
08/15/02	08:25a	12,630	CORE.MKIVA001A.ORG
08/15/02	08:25a	12,713	CORE.MKIVA002.ORG
08/15/02	08:25a	12,958	CORE.MKIVA003.ORG
08/15/02	08:25a	13,040	CORE.MKIVA005.ORG
08/15/02	08:25a	13,122	CORE.MKIVA007.ORG
08/15/02	08:25a	13,204	CORE.MKIVA010.ORG
08/15/02	08:25a	13,368	CORE.MKIVA015.ORG
08/15/02	08:25a	13,450	CORE.MKIVA020.ORG
08/15/02	08:25a	13,450	CORE.MKIVA025.ORG
08/15/02	08:25a	13,532	CORE.MKIVA030.ORG
08/15/02	08:25a	13,614	CORE.MKIVA040.ORG
08/15/02	08:25a	13,614	CORE.MKIVA050.ORG
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08/15/02	08:25a	14,025	CORE.MKIVA115.ORG
08/15/02	08:25a	14,025	CORE.MKIVA130.ORG
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08/15/02	08:25a	14,435	CORE.MKIVA300.ORG
08/15/02	08:25a	14,435	CORE.MKIVA360.ORG
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08/15/02	08:25a	13,454	CORE.MKIVB025.ORG
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08/15/02	08:25a	13,618	CORE.MKIVB050.ORG
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08/15/02	08:26a	14,439	CORE.MKIVB300.ORG
08/15/02	08:26a	14,439	CORE.MKIVB360.ORG
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08/15/02	08:26a	12,630	CORE.MKIVC001A.ORG
08/15/02	08:26a	12,713	CORE.MKIVC002.ORG
08/15/02	08:26a	12,958	CORE.MKIVC003.ORG
08/15/02	08:26a	13,040	CORE.MKIVC005.ORG
08/15/02	08:26a	13,122	CORE.MKIVC007.ORG
08/15/02	08:26a	13,204	CORE.MKIVC010.ORG
08/15/02	08:26a	13,368	CORE.MKIVC015.ORG
08/15/02	08:26a	13,450	CORE.MKIVC020.ORG
08/15/02	08:26a	13,450	CORE.MKIVC025.ORG
08/15/02	08:26a	13,532	CORE.MKIVC030.ORG
08/15/02	08:26a	13,614	CORE.MKIVC040.ORG
08/15/02	08:26a	13,614	CORE.MKIVC050.ORG
08/15/02	08:26a	13,860	CORE.MKIVC070.ORG
08/15/02	08:26a	13,943	CORE.MKIVC100.ORG
08/15/02	08:26a	14,025	CORE.MKIVC115.ORG
08/15/02	08:26a	14,025	CORE.MKIVC130.ORG
08/15/02	08:26a	14,271	CORE.MKIVC200.ORG
08/15/02	08:26a	14,353	CORE.MKIVC250.ORG
08/15/02	08:26a	14,435	CORE.MKIVC300.ORG
08/15/02	08:26a	14,435	CORE.MKIVC360.ORG
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08/15/02	08:26a	11,310	CORE.SPE005.ORG
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08/15/02	08:26a	11,474	CORE.SPE015.ORG
08/15/02	08:26a	11,474	CORE.SPE020.ORG
08/15/02	08:26a	11,474	CORE.SPE025.ORG
08/15/02	08:26a	11,474	CORE.SPE030.ORG
08/15/02	08:26a	11,556	CORE.SPE040.ORG
08/15/02	08:26a	11,556	CORE.SPE050.ORG
08/15/02	08:26a	11,638	CORE.SPE070.ORG
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08/15/02	08:26a	11,803	CORE.SPE125.ORG
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08/15/02	08:26a	11,967	CORE.SPE200.ORG
08/15/02	08:26a	12,131	CORE.SPE250.ORG
08/15/02	08:26a	12,213	CORE.SPE300.ORG
08/15/02	08:26a	12,213	CORE.SPE320.ORG
08/15/02	08:26a	738	CORE.SPNA000.ORG
08/15/02	08:26a	10,988	CORE.SPNA001A.ORG

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08/15/02  08:26a                 11,071 CORE.SPNA002.ORG
08/15/02  08:26a                 11,152 CORE.SPNA003.ORG
08/15/02  08:26a                 11,316 CORE.SPNA005.ORG
08/15/02  08:26a                 11,398 CORE.SPNA007.ORG
08/15/02  08:26a                 11,398 CORE.SPNA010.ORG
08/15/02  08:26a                 11,480 CORE.SPNA015.ORG
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08/15/02  08:26a                 11,480 CORE.SPNA025.ORG
08/15/02  08:26a                 11,562 CORE.SPNA030.ORG
08/15/02  08:26a                 11,562 CORE.SPNA040.ORG
08/15/02  08:26a                 11,562 CORE.SPNA050.ORG
08/15/02  08:26a                 11,726 CORE.SPNA070.ORG
08/15/02  08:26a                 11,809 CORE.SPNA100.ORG
08/15/02  08:26a                 11,809 CORE.SPNA125.ORG
08/15/02  08:26a                 11,891 CORE.SPNA150.ORG
08/15/02  08:26a                 12,055 CORE.SPNA200.ORG
08/15/02  08:26a                 12,219 CORE.SPNA250.ORG
08/15/02  08:26a                 12,219 CORE.SPNA300.ORG
08/15/02  08:26a                 12,219 CORE.SPNA320.ORG
08/15/02  08:26a                    742 CORE.SPNB000.ORG
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08/15/02  08:26a                 11,075 CORE.SPNB002.ORG
08/15/02  08:26a                 11,156 CORE.SPNB003.ORG
08/15/02  08:26a                 11,320 CORE.SPNB005.ORG
08/15/02  08:26a                 11,402 CORE.SPNB007.ORG
08/15/02  08:26a                 11,402 CORE.SPNB010.ORG
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08/15/02  08:26a                 11,484 CORE.SPNB020.ORG
08/15/02  08:26a                 11,484 CORE.SPNB025.ORG
08/15/02  08:26a                 11,566 CORE.SPNB030.ORG
08/15/02  08:26a                 11,566 CORE.SPNB040.ORG
08/15/02  08:26a                 11,566 CORE.SPNB050.ORG
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08/15/02  08:26a                 12,059 CORE.SPNB200.ORG
08/15/02  08:26a                 12,223 CORE.SPNB250.ORG
08/15/02  08:26a                 12,223 CORE.SPNB300.ORG
08/15/02  08:26a                 12,223 CORE.SPNB320.ORG
08/15/02  08:26a                    738 CORE.SPNC000.ORG
08/15/02  08:26a                 10,988 CORE.SPNC001A.ORG
08/15/02  08:26a                 11,071 CORE.SPNC002.ORG
08/15/02  08:26a                 11,152 CORE.SPNC003.ORG
08/15/02  08:26a                 11,316 CORE.SPNC005.ORG
08/15/02  08:26a                 11,398 CORE.SPNC007.ORG
08/15/02  08:26a                 11,398 CORE.SPNC010.ORG
08/15/02  08:26a                 11,480 CORE.SPNC015.ORG
08/15/02  08:26a                 11,480 CORE.SPNC020.ORG
08/15/02  08:26a                 11,480 CORE.SPNC025.ORG
08/15/02  08:26a                 11,562 CORE.SPNC030.ORG
08/15/02  08:26a                 11,562 CORE.SPNC040.ORG
08/15/02  08:26a                 11,562 CORE.SPNC050.ORG
08/15/02  08:26a                 11,726 CORE.SPNC070.ORG
08/15/02  08:26a                 11,809 CORE.SPNC100.ORG
08/15/02  08:26a                 11,809 CORE.SPNC125.ORG
08/15/02  08:26a                 11,891 CORE.SPNC150.ORG
08/15/02  08:26a                 12,055 CORE.SPNC200.ORG
08/15/02  08:26a                 12,219 CORE.SPNC250.ORG
08/15/02  08:26a                 12,219 CORE.SPNC300.ORG
08/15/02  08:26a                 12,219 CORE.SPNC320.ORG
09/05/02  04:05p                  9,286 CORE.TH1.ORG
12/06/00  05:57p        <DIR>           dk
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06/07/02  07:39p                  160 fort.3.mk1a
06/07/02  07:41p                  162 fort.3.mkiv
07/24/02  09:18a                1,620 fort.3.spe
07/24/02  09:53a                1,621 fort.3.spn
09/04/02  04:43p                   80 fort.3.th
06/07/02  09:23p              278,843 FT27F001rev1
07/22/02  01:42p              278,830 ft27f001rev2
07/19/02  02:13p              183,210 mkiai.20020719
07/19/02  02:16p              183,210 mkiao.20020719
07/19/02  02:16p              183,210 mkivi.20020719
07/19/02  02:16p              183,210 mkivo.20020719
12/06/00  05:57p        <DIR>         old
08/08/02  02:12p        <DIR>         oldxs
11/27/96  11:30a              265,783 orig21
07/24/02  11:05a                9,171 origdict.clad
07/24/02  11:05a                9,392 origdict.combo
08/07/02  09:02a                9,171 origdict.core
07/24/02  01:29p                  359 subtype.20020724
03/24/99  05:31p                  319 subtype.june2002
03/29/99  05:07p              334,310 unified6.prn
09/12/02  04:50p              403,302 unified6rep.prn
08/07/02  08:07a        <DIR>         v30
12/06/00  05:57p        <DIR>         valid1
08/21/02  03:55p                    0 valid1.PRN
             723 File(s)      9,853,599 bytes
                          1,090,617,344 bytes free
                          1,090,617,344 bytes free
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**** Dictionary of Fuel Types ****
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'ZR-1.1UA'     26.4  'CLAD.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'CLAD.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CLAD.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CLAD.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CLAD.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CLAD.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CLAD.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CLAD.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CLAD.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CLAD.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CLAD.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CLAD.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'CLAD.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'CLAD.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CLAD.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CLAD.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CLAD.MK1AA230.ORG'
'ZR-1.1UA'   3604.0  'CLAD.MK1AA273.ORG'
'ZR-1.1UA'   3960.0  'CLAD.MK1AA300.ORG'
'ZR-1.1UB'     19.8  'CLAD.MK1AB001A.ORG'
'ZR-1.1UB'     26.4  'CLAD.MK1AB002.ORG'
'ZR-1.1UB'     39.6  'CLAD.MK1AB003.ORG'
'ZR-1.1UB'     66.0  'CLAD.MK1AB005.ORG'
'ZR-1.1UB'     92.4  'CLAD.MK1AB007.ORG'
'ZR-1.1UB'    132.0  'CLAD.MK1AB010.ORG'
'ZR-1.1UB'    198.0  'CLAD.MK1AB015.ORG'
'ZR-1.1UB'    264.0  'CLAD.MK1AB020.ORG'
'ZR-1.1UB'    330.0  'CLAD.MK1AB025.ORG'
'ZR-1.1UB'    396.0  'CLAD.MK1AB030.ORG'
'ZR-1.1UB'    528.0  'CLAD.MK1AB040.ORG'
'ZR-1.1UB'    660.0  'CLAD.MK1AB050.ORG'
```

'ZR-1.1UB'	924.0	'CLAD.MK1AB070.ORG'
'ZR-1.1UB'	1320.0	'CLAD.MK1AB100.ORG'
'ZR-1.1UB'	1518.0	'CLAD.MK1AB115.ORG'
'ZR-1.1UB'	1716.0	'CLAD.MK1AB130.ORG'
'ZR-1.1UB'	2640.0	'CLAD.MK1AB200.ORG'
'ZR-1.1UB'	3036.0	'CLAD.MK1AB230.ORG'
'ZR-1.1UB'	3604.0	'CLAD.MK1AB273.ORG'
'ZR-1.1UB'	3960.0	'CLAD.MK1AB300.ORG'
'ZR-1.1UC'	19.8	'CLAD.MK1AC001A.ORG'
'ZR-1.1UC'	26.4	'CLAD.MK1AC002.ORG'
'ZR-1.1UC'	39.6	'CLAD.MK1AC003.ORG'
'ZR-1.1UC'	66.0	'CLAD.MK1AC005.ORG'
'ZR-1.1UC'	92.4	'CLAD.MK1AC007.ORG'
'ZR-1.1UC'	132.0	'CLAD.MK1AC010.ORG'
'ZR-1.1UC'	198.0	'CLAD.MK1AC015.ORG'
'ZR-1.1UC'	264.0	'CLAD.MK1AC020.ORG'
'ZR-1.1UC'	330.0	'CLAD.MK1AC025.ORG'
'ZR-1.1UC'	396.0	'CLAD.MK1AC030.ORG'
'ZR-1.1UC'	528.0	'CLAD.MK1AC040.ORG'
'ZR-1.1UC'	660.0	'CLAD.MK1AC050.ORG'
'ZR-1.1UC'	924.0	'CLAD.MK1AC070.ORG'
'ZR-1.1UC'	1320.0	'CLAD.MK1AC100.ORG'
'ZR-1.1UC'	1518.0	'CLAD.MK1AC115.ORG'
'ZR-1.1UC'	1716.0	'CLAD.MK1AC130.ORG'
'ZR-1.1UC'	2640.0	'CLAD.MK1AC200.ORG'
'ZR-1.1UC'	3036.0	'CLAD.MK1AC230.ORG'
'ZR-1.1UC'	3604.0	'CLAD.MK1AC273.ORG'
'ZR-1.1UC'	3960.0	'CLAD.MK1AC300.ORG'
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'ZR-2.1U'	39.6	'CLAD.MKII003.ORG'
'ZR-2.1U'	66.0	'CLAD.MKII005.ORG'
'ZR-2.1U'	92.4	'CLAD.MKII007.ORG'
'ZR-2.1U'	132.0	'CLAD.MKII010.ORG'
'ZR-2.1U'	198.0	'CLAD.MKII015.ORG'
'ZR-2.1U'	264.0	'CLAD.MKII020.ORG'
'ZR-2.1U'	330.0	'CLAD.MKII025.ORG'
'ZR-2.1U'	396.0	'CLAD.MKII030.ORG'
'ZR-2.1U'	528.0	'CLAD.MKII040.ORG'
'ZR-2.1U'	660.0	'CLAD.MKII050.ORG'
'ZR-2.1U'	924.0	'CLAD.MKII070.ORG'
'ZR-2.1U'	1320.0	'CLAD.MKII100.ORG'
'ZR-2.1U'	1518.0	'CLAD.MKII115.ORG'
'ZR-2.1U'	1716.0	'CLAD.MKII130.ORG'
'ZR-2.1U'	1980.0	'CLAD.MKII150.ORG'
'ZR-2.1U'	2244.0	'CLAD.MKII180.ORG'
'ZR-2.1U'	2640.0	'CLAD.MKII200.ORG'
'ZR-2.1U'	2904.0	'CLAD.MKII220.ORG'
'ZR-0.94UA'	16.5	'CLAD.MKIVA001A.ORG'
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'ZR-0.94UA'	33.0	'CLAD.MKIVA003.ORG'
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'ZR-0.94UA'	165.0	'CLAD.MKIVA015.ORG'
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'ZR-0.94UA'	275.0	'CLAD.MKIVA025.ORG'
'ZR-0.94UA'	330.0	'CLAD.MKIVA030.ORG'
'ZR-0.94UA'	440.0	'CLAD.MKIVA040.ORG'
'ZR-0.94UA'	550.0	'CLAD.MKIVA050.ORG'
'ZR-0.94UA'	770.0	'CLAD.MKIVA070.ORG'
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'ZR-0.94UA'	1265.0	'CLAD.MKIVA115.ORG'

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'ZR-0.94UA'  2750.0  'CLAD.MKIVA250.ORG'
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'ZR-0.94UB'    33.0  'CLAD.MKIVB003.ORG'
'ZR-0.94UB'    55.0  'CLAD.MKIVB005.ORG'
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'ZR-0.94UB'  3300.0  'CLAD.MKIVB300.ORG'
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'AL-0.71UC'    50.0  'CLAD.SPNC005.ORG'
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'AL-0.71UC'  1500.0  'CLAD.SPNC150.ORG'
'AL-0.71UC'  2000.0  'CLAD.SPNC200.ORG'
'AL-0.71UC'  2500.0  'CLAD.SPNC250.ORG'
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**** End of Fuel Type Dictionary ****

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AL-0.71U 1959 1 1 3000 12 31 AL-0.71UC
ZR-0.94U 1920 1 1 1971 12 31 ZR-0.94UA
ZR-0.94U 1972 1 1 1980 12 31 ZR-0.94UB
ZR-0.94U 1981 1 1 3000 12 31 ZR-0.94UC
ZR-1.1U  1920 1 1 1971 12 31 ZR-1.1UA
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**** End of Fuel Subtypes ****

**** Nuclide Inventory Library Files ****

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Mk-IVA:  B = 2750. MWd/MTU  <1972  :clad only
opening file p:\dkpro\lib\CLAD.MKIVA300.ORG
Mk-IVA:  B = 3300. MWd/MTU  <1972  :clad only
opening file p:\dkpro\lib\CLAD.MKIVA360.ORG
Mk-IVA:  B = 3960. MWd/MTU  <1972  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB001A.ORG
Mk-IVB:  B = 16.5 MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB002.ORG
Mk-IVB:  B =  22.0 MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB003.ORG
Mk-IVB:  B = 33.0 MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB005.ORG
Mk-IVB:  B = 55.0 MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB007.ORG
Mk-IVB:  B = 77.0 MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB010.ORG
Mk-IVB:  B = 110. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB015.ORG
Mk-IVB:  B = 165. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB020.ORG
Mk-IVB:  B = 220. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB025.ORG
Mk-IVB:  B = 275. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB030.ORG
Mk-IVB:  B = 330. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB040.ORG
Mk-IVB:  B = 440. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB050.ORG
Mk-IVB:  B = 550. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB070.ORG
Mk-IVB:  B = 770. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB100.ORG
Mk-IVB:  B = 1100. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB115.ORG
Mk-IVB:  B = 1265. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB130.ORG
Mk-IVB:  B = 1430. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB200.ORG
Mk-IVB:  B = 2200. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB250.ORG
```

```
Mk-IVB:  B = 2750. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB300.ORG
Mk-IVB:  B = 3300. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVB360.ORG
Mk-IVB:  B = 3960. MWd/MTU  1972-1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC001A.ORG
Mk-IVC:  B = 16.5 MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC002.ORG
Mk-IVC:  B =  22.0 MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC003.ORG
Mk-IVC:  B = 33.0 MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC005.ORG
Mk-IVC:  B = 55.0 MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC007.ORG
Mk-IVC:  B = 77.0 MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC010.ORG
Mk-IVC:  B = 110. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC015.ORG
Mk-IVC:  B = 165. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC020.ORG
Mk-IVC:  B = 220. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC025.ORG
Mk-IVC:  B = 275. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC030.ORG
Mk-IVC:  B = 330. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC040.ORG
Mk-IVC:  B = 440. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC050.ORG
Mk-IVC:  B = 550. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC070.ORG
Mk-IVC:  B = 770. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC100.ORG
Mk-IVC:  B = 1100. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC115.ORG
Mk-IVC:  B = 1265. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC130.ORG
Mk-IVC:  B = 1430. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC200.ORG
Mk-IVC:  B = 2200. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC250.ORG
Mk-IVC:  B = 2750. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC300.ORG
Mk-IVC:  B = 3300. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.MKIVC360.ORG
Mk-IVC:  B = 3960. MWd/MTU  >1980  :clad only
opening file p:\dkpro\lib\CLAD.SPNA001A.ORG
SPNA:  B = 15.0 MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA002.ORG
SPNA:  B =  20.0 MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA003.ORG
SPNA:  B = 30.0 MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA005.ORG
SPNA:  B = 50.0 MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA007.ORG
SPNA:  B = 70.0 MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA010.ORG
SPNA:  B = 100. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA015.ORG
SPNA:  B = 150. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA020.ORG
SPNA:  B = 200. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA025.ORG
SPNA:  B = 250. MWd/MTU  <1955  :clad only
```

```
opening file p:\dkpro\lib\CLAD.SPNA030.ORG
SPNA:  B = 300. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA040.ORG
SPNA:  B = 400. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA050.ORG
SPNA:  B = 500. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA070.ORG
SPNA:  B = 700. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA100.ORG
SPNA:  B = 1000. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA125.ORG
SPNA:  B = 1250. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA150.ORG
SPNA:  B = 1500. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA200.ORG
SPNA:  B = 2000. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA250.ORG
SPNA:  B = 2500. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA300.ORG
SPNA:  B = 3000. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNA320.ORG
SPNA:  B = 3200. MWd/MTU  <1955  :clad only
opening file p:\dkpro\lib\CLAD.SPNB001A.ORG
SPNB:  B = 15.0 MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB002.ORG
SPNB:  B =  20.0 MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB003.ORG
SPNB:  B = 30.0 MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB005.ORG
SPNB:  B = 50.0 MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB007.ORG
SPNB:  B = 70.0 MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB010.ORG
SPNB:  B = 100. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB015.ORG
SPNB:  B = 150. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB020.ORG
SPNB:  B = 200. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB025.ORG
SPNB:  B = 250. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB030.ORG
SPNB:  B = 300. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB040.ORG
SPNB:  B = 400. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB050.ORG
SPNB:  B = 500. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB070.ORG
SPNB:  B = 700. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB100.ORG
SPNB:  B = 1000. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB125.ORG
SPNB:  B = 1250. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB150.ORG
SPNB:  B = 1500. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB200.ORG
SPNB:  B = 2000. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB250.ORG
SPNB:  B = 2500. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB300.ORG
SPNB:  B = 3000. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNB320.ORG
SPNB:  B = 3200. MWd/MTU  1955-1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC001A.ORG
```

```
SPNC:  B = 15.0 MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC002.ORG
SPNC:  B =  20.0 MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC003.ORG
SPNC:  B = 30.0 MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC005.ORG
SPNC:  B = 50.0 MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC007.ORG
SPNC:  B = 70.0 MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC010.ORG
SPNC:  B = 100. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC015.ORG
SPNC:  B = 150. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC020.ORG
SPNC:  B = 200. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC025.ORG
SPNC:  B = 250. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC030.ORG
SPNC:  B = 300. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC040.ORG
SPNC:  B = 400. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC050.ORG
SPNC:  B = 500. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC070.ORG
SPNC:  B = 700. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC100.ORG
SPNC:  B = 1000. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC125.ORG
SPNC:  B = 1250. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC150.ORG
SPNC:  B = 1500. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC200.ORG
SPNC:  B = 2000. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC250.ORG
SPNC:  B = 2500. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC300.ORG
SPNC:  B = 3000. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPNC320.ORG
SPNC:  B = 3200. MWd/MTU  >1958  :clad only
opening file p:\dkpro\lib\CLAD.SPE001A.ORG
SPE:  B = 15.0 MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE002.ORG
SPE:  B =  20.0 MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE003.ORG
SPE:  B = 30.0 MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE005.ORG
SPE:  B = 50.0 MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE007.ORG
SPE:  B = 70.0 MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE010.ORG
SPE:  B = 100. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE015.ORG
SPE:  B = 150. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE020.ORG
SPE:  B = 200. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE025.ORG
SPE:  B = 250. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE030.ORG
SPE:  B = 300. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE040.ORG
SPE:  B = 400. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE050.ORG
SPE:  B = 500. MWd/MTU  :clad only
```

```
opening file p:\dkpro\lib\CLAD.SPE070.ORG
SPE:  B = 700. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE100.ORG
SPE:  B = 1000. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE125.ORG
SPE:  B = 1250. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE150.ORG
SPE:  B = 1500. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE200.ORG
SPE:  B = 2000. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE250.ORG
SPE:  B = 2500. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE300.ORG
SPE:  B = 3000. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.SPE320.ORG
SPE:  B = 3200. MWd/MTU  :clad only
opening file p:\dkpro\lib\CLAD.TH1.ORG
Thorium:  1 MT Thorium for 100 d  (created 2/17/98)  :clad only

**** End Nuclide Inventory Library Files ****

**** ORIGEN2 decay library file ****
opening file p:\dkpro\lib\ft27f001rev2.
number of records:         1308
**** end ORIGEN2 decay library file ****

**** modifications to ORIGEN2 decay library file ****
No decay data modification file specified
**** end modifications to ORIGEN2 decay library file ****


Archive (fuel history) File:
UNIFIED6REP.PRN

Input Format: LANL
Max. No. of records:       100000
No. of selected nuclides:           46
Output units: CUR
Splitting output records

**** archive (fuel history) file ****
opening file p:\dkpro\lib\UNIFIED6REP.PRN
archive file header:
```

```
                                                                    SEP DATE:
WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
      KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT   MO YR.  SEP KEY
DAYS                     Ref.                   Th       U      Np      Pu
Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ----------------- ----
---- ----------------------------------------   ------------------------------------
-------------
    TABLE 1 -- UNIFIED SEPARATIONS PRODUCTION FILE -- (Fuel Input and Losses 1944-1989
              (Records Sorted by Sep'n Date.)
    RUN AT:  08/04/96   12:36:14            [Note: MWd/MTU after 11/83 are
backcalculated from %Pu-240.]
```

SAVED AS:"UNIFIED6" 9/12/02

SEP DATE:

WASTE FRACTION:

--------"mid-Mo"

COOLING

**** end archive (fuel history) file ****

<==========>

Final decay date: 1/2001
Output units: CUR

Summary for Primary Split

	T-plant	B-plant	Redox	Purex	Total
H03	1.367E+04	6.600E+03	1.539E+05	7.668E+05	9.410E+05
BE10	7.920E-06	4.401E-06	9.532E-04	1.376E-03	2.342E-03
C14	4.106E+00	2.280E+00	3.370E+01	1.814E+02	2.215E+02
SI32	4.940E-06	2.732E-06	3.383E-05	1.409E-04	1.824E-04
P32	4.942E-06	2.733E-06	3.384E-05	1.410E-04	1.825E-04
AR39	0.000E+00	0.000E+00	0.000E+00	5.622E-18	5.622E-18
AR42	5.354E-17	2.860E-17	7.961E-16	4.076E-15	4.954E-15
CA45	0.000E+00	0.000E+00	2.483E-24	2.411E-12	2.411E-12
SC46	0.000E+00	0.000E+00	0.000E+00	3.403E-19	3.403E-19
V50	4.232E-16	2.351E-16	1.075E-13	2.029E-13	3.111E-13
MN54	8.208E-14	3.551E-15	1.685E-09	6.616E-04	6.616E-04
FE55	1.946E-01	5.404E-02	1.368E+01	1.794E+02	1.934E+02
CO58	0.000E+00	0.000E+00	0.000E+00	5.208E-20	5.208E-20
CO60	1.402E+01	5.570E+00	3.239E+02	2.242E+03	2.585E+03
NI59	6.272E-01	3.484E-01	1.145E+02	7.843E+02	8.998E+02
NI63	1.264E+02	8.704E+01	1.100E+04	7.521E+04	8.642E+04
ZN65	5.610E-18	1.086E-19	1.129E-12	8.700E-09	8.701E-09
SR89	0.000E+00	0.000E+00	0.000E+00	3.397E-29	3.397E-29
SR90	0.000E+00	0.000E+00	8.022E-04	1.150E-03	1.953E-03
Y90	0.000E+00	0.000E+00	8.024E-04	1.151E-03	1.953E-03
Y91	0.000E+00	0.000E+00	0.000E+00	1.268E-24	1.268E-24
ZR93	0.000E+00	0.000E+00	9.372E-01	1.239E+00	2.176E+00
ZR95	0.000E+00	0.000E+00	0.000E+00	5.842E-20	5.842E-20
NB92	0.000E+00	0.000E+00	6.779E-08	8.917E-08	1.570E-07
NB93*	0.000E+00	0.000E+00	7.382E-01	7.807E-01	1.519E+00
NB94	0.000E+00	0.000E+00	9.757E-06	1.285E-05	2.261E-05
NB95	0.000E+00	0.000E+00	0.000E+00	1.287E-19	1.287E-19
NB95*	0.000E+00	0.000E+00	0.000E+00	6.873E-22	6.873E-22
MO93	0.000E+00	0.000E+00	6.017E-03	7.932E-03	1.395E-02
TC98	0.000E+00	0.000E+00	1.180E-11	1.574E-10	1.692E-10
TC99	0.000E+00	0.000E+00	3.040E-04	5.262E-03	5.566E-03
RU106	0.000E+00	0.000E+00	5.135E-28	2.454E-24	2.454E-24
RH102	0.000E+00	0.000E+00	1.892E-18	2.351E-17	2.540E-17
PD107	4.960E-18	2.740E-18	6.535E-17	2.919E-16	3.649E-16
AG108	3.369E-10	1.844E-10	4.603E-09	2.098E-08	2.610E-08
AG108*	3.872E-09	2.120E-09	5.290E-08	2.411E-07	3.000E-07
AG109*	6.661E-11	7.008E-12	8.119E-08	1.384E-05	1.392E-05
AG110	0.000E+00	0.000E+00	7.334E-21	2.011E-14	2.011E-14
AG110*	3.792E-25	2.575E-26	5.394E-19	1.479E-12	1.479E-12
CD109	6.661E-11	7.008E-12	8.118E-08	1.384E-05	1.392E-05
CD113	2.818E-11	1.464E-11	2.121E-11	3.336E-11	9.739E-11

CD113*	3.987E+00	1.962E+00	4.343E+01	2.101E+02	2.595E+02
IN113*	0.000E+00	0.000E+00	0.000E+00	1.305E-10	1.305E-10
IN115	6.890E-13	3.818E-13	4.022E-12	1.561E-11	2.070E-11
SN113	0.000E+00	0.000E+00	1.034E-29	1.304E-10	1.304E-10
SN119*	5.094E-14	1.654E-14	3.191E-09	4.244E-02	4.244E-02
SN121	4.986E+00	4.114E+00	8.409E+00	3.967E+00	2.148E+01
SN121*	6.425E+00	5.301E+00	1.084E+01	5.112E+00	2.767E+01
SN123	0.000E+00	0.000E+00	9.234E-27	7.436E-10	7.436E-10
SB124	0.000E+00	0.000E+00	0.000E+00	8.619E-27	8.619E-27
SB125	9.018E-02	5.941E-02	1.558E+00	1.046E+02	1.063E+02
TE123	6.988E-15	4.485E-15	9.219E-14	7.533E-14	1.790E-13
TE123*	0.000E+00	0.000E+00	0.000E+00	1.414E-15	1.414E-15
TE125*	2.201E-02	1.450E-02	3.802E-01	2.553E+01	2.595E+01
TE127	0.000E+00	0.000E+00	0.000E+00	2.382E-19	2.382E-19
TE127*	0.000E+00	0.000E+00	0.000E+00	2.432E-19	2.432E-19
I129	2.551E-20	1.410E-20	1.173E-17	1.551E-16	1.668E-16
TM170	0.000E+00	0.000E+00	0.000E+00	2.163E-30	2.163E-30
TM171	0.000E+00	0.000E+00	4.341E-24	3.331E-22	3.375E-22
LU176	0.000E+00	0.000E+00	1.319E-10	1.287E-10	2.605E-10
LU177	0.000E+00	0.000E+00	1.058E-27	3.732E-15	3.732E-15
LU177*	0.000E+00	0.000E+00	4.864E-27	1.703E-14	1.703E-14
HF175	0.000E+00	0.000E+00	0.000E+00	1.842E-20	1.842E-20
HF182	0.000E+00	0.000E+00	3.180E-06	3.735E-06	6.916E-06
TA182	0.000E+00	0.000E+00	3.180E-06	3.735E-06	6.916E-06
W181	0.000E+00	0.000E+00	1.487E-31	8.349E-13	8.349E-13
W185	0.000E+00	0.000E+00	0.000E+00	3.095E-19	3.095E-19
W188	0.000E+00	0.000E+00	0.000E+00	3.032E-22	3.032E-22
RE187	0.000E+00	0.000E+00	3.707E-07	4.916E-07	8.623E-07
RE188	0.000E+00	0.000E+00	0.000E+00	3.063E-22	3.063E-22
OS194	0.000E+00	0.000E+00	2.479E-17	9.088E-17	1.157E-16
IR192	0.000E+00	0.000E+00	2.275E-12	2.688E-12	4.964E-12
IR192*	0.000E+00	0.000E+00	2.274E-12	2.700E-12	4.974E-12
IR194*	0.000E+00	0.000E+00	0.000E+00	4.076E-23	4.076E-23
PT193	0.000E+00	0.000E+00	6.119E-12	9.646E-12	1.576E-11
TL206	1.358E-05	7.540E-06	1.015E-04	4.042E-04	5.268E-04
PB205	2.728E-04	4.285E-06	5.342E-03	2.307E-02	2.869E-02
BI208	2.063E-05	1.146E-05	1.543E-04	6.141E-04	8.005E-04
BI210*	1.358E-05	7.540E-06	1.015E-04	4.042E-04	5.268E-04
PO210	0.000E+00	0.000E+00	1.103E-26	7.072E-19	7.072E-19
Total:	1.383E+04	6.707E+03	1.655E+05	8.458E+05	1.032E+06

Summary for Secondary Split

	T-plant	B-plant	Redox	Purex	Total
H03	1.368E+01	6.606E+00	1.542E+02	8.719E+02	1.046E+03
BE10	7.928E-09	4.405E-09	1.855E-06	1.415E-02	1.415E-02
C14	4.110E-03	2.283E-03	3.729E-02	2.607E+00	2.651E+00
SI32	4.945E-09	2.735E-09	3.387E-08	3.185E-07	3.601E-07
P32	4.946E-09	2.736E-09	3.388E-08	3.186E-07	3.602E-07
AR39	0.000E+00	0.000E+00	0.000E+00	5.627E-21	5.627E-21
AR42	5.360E-20	2.863E-20	8.339E-19	5.853E-16	5.862E-16
CA45	0.000E+00	0.000E+00	2.644E-27	2.938E-11	2.938E-11
SC46	0.000E+00	0.000E+00	0.000E+00	4.147E-18	4.147E-18
V50	4.236E-19	2.353E-19	2.123E-16	2.320E-12	2.320E-12
MN54	8.216E-17	3.555E-18	1.829E-12	8.060E-03	8.060E-03
FE55	1.948E-04	5.409E-05	1.422E-02	5.273E+02	5.274E+02
CO58	0.000E+00	0.000E+00	0.000E+00	6.346E-19	6.346E-19
CO60	1.403E-02	5.576E-03	3.545E-01	3.313E+03	3.313E+03
NI59	6.278E-04	3.487E-04	1.155E-01	1.509E+01	1.520E+01
NI63	1.265E-01	8.712E-02	1.108E+01	1.401E+03	1.412E+03
ZN65	5.615E-21	1.087E-22	1.130E-15	1.026E-07	1.026E-07

SR89	0.000E+00	0.000E+00	0.000E+00	4.445E-28	4.445E-28
SR90	0.000E+00	0.000E+00	1.608E-06	1.402E-02	1.402E-02
Y90	0.000E+00	0.000E+00	1.608E-06	1.402E-02	1.402E-02
Y91	0.000E+00	0.000E+00	0.000E+00	1.545E-23	1.545E-23
ZR93	0.000E+00	0.000E+00	1.878E-03	1.510E+01	1.510E+01
ZR95	0.000E+00	0.000E+00	0.000E+00	7.119E-19	7.119E-19
NB92	0.000E+00	0.000E+00	1.359E-10	1.087E-06	1.087E-06
NB93*	0.000E+00	0.000E+00	1.479E-03	9.514E+00	9.515E+00
NB94	0.000E+00	0.000E+00	1.955E-08	1.566E-04	1.567E-04
NB95	0.000E+00	0.000E+00	0.000E+00	1.569E-18	1.569E-18
NB95*	0.000E+00	0.000E+00	0.000E+00	8.375E-21	8.375E-21
MO93	0.000E+00	0.000E+00	1.206E-05	9.666E-02	9.667E-02
TC98	0.000E+00	0.000E+00	2.364E-14	6.557E-12	6.580E-12
TC99	0.000E+00	0.000E+00	6.092E-07	2.192E-04	2.199E-04
RU106	0.000E+00	0.000E+00	9.331E-31	2.990E-23	2.990E-23
RH102	0.000E+00	0.000E+00	3.791E-21	2.865E-16	2.865E-16
PD107	4.965E-21	2.743E-21	6.570E-20	3.852E-18	3.925E-18
AG108	3.372E-13	1.846E-13	4.626E-12	2.806E-10	2.858E-10
AG108*	3.876E-12	2.122E-12	5.318E-11	3.225E-09	3.285E-09
AG109*	6.668E-14	7.015E-15	8.172E-11	1.379E-04	1.379E-04
AG110	0.000E+00	0.000E+00	6.660E-24	2.450E-13	2.450E-13
AG110*	3.793E-28	2.548E-29	5.628E-22	1.802E-11	1.802E-11
CD109	6.668E-14	7.015E-15	8.172E-11	1.379E-04	1.379E-04
CD113	2.820E-14	1.465E-14	2.123E-14	4.031E-14	1.044E-13
CD113*	3.991E-03	1.964E-03	4.354E-02	2.294E+00	2.343E+00
IN113*	0.000E+00	0.000E+00	0.000E+00	1.591E-09	1.591E-09
IN114*	0.000E+00	0.000E+00	0.000E+00	1.229E-30	1.229E-30
IN115	6.897E-16	3.822E-16	4.031E-15	9.925E-14	1.043E-13
SN113	0.000E+00	0.000E+00	0.000E+00	1.590E-09	1.590E-09
SN119*	5.099E-17	1.656E-17	6.360E-12	5.172E-01	5.172E-01
SN121	4.991E-03	4.118E-03	1.063E-02	4.117E+01	4.119E+01
SN121*	6.432E-03	5.306E-03	1.370E-02	5.305E+01	5.308E+01
SN123	0.000E+00	0.000E+00	1.752E-29	9.061E-09	9.061E-09
SB124	0.000E+00	0.000E+00	0.000E+00	1.050E-25	1.050E-25
SB125	9.027E-05	5.947E-05	2.908E-03	1.271E+03	1.271E+03
TE123	6.995E-18	4.490E-18	1.688E-16	8.895E-13	8.897E-13
TE123*	0.000E+00	0.000E+00	0.000E+00	1.723E-14	1.723E-14
TE125*	2.203E-05	1.451E-05	7.097E-04	3.101E+02	3.101E+02
TE127	0.000E+00	0.000E+00	0.000E+00	2.902E-18	2.902E-18
TE127*	0.000E+00	0.000E+00	0.000E+00	2.963E-18	2.963E-18
I129	2.554E-23	1.411E-23	2.342E-20	6.461E-18	6.485E-18
TM170	0.000E+00	0.000E+00	0.000E+00	4.406E-29	4.406E-29
TM171	0.000E+00	0.000E+00	8.698E-27	4.060E-21	4.060E-21
LU176	0.000E+00	0.000E+00	2.642E-13	1.568E-09	1.568E-09
LU177	0.000E+00	0.000E+00	0.000E+00	4.548E-14	4.548E-14
LU177*	0.000E+00	0.000E+00	9.231E-30	2.075E-13	2.075E-13
HF175	0.000E+00	0.000E+00	0.000E+00	2.244E-19	2.244E-19
HF182	0.000E+00	0.000E+00	6.373E-09	4.552E-05	4.553E-05
TA182	0.000E+00	0.000E+00	6.373E-09	4.552E-05	4.552E-05
W181	0.000E+00	0.000E+00	0.000E+00	1.017E-11	1.017E-11
W185	0.000E+00	0.000E+00	0.000E+00	3.772E-18	3.772E-18
W188	0.000E+00	0.000E+00	0.000E+00	3.695E-21	3.695E-21
RE187	0.000E+00	0.000E+00	7.429E-10	5.990E-06	5.991E-06
RE188	0.000E+00	0.000E+00	0.000E+00	3.733E-21	3.733E-21
OS194	0.000E+00	0.000E+00	4.968E-20	1.107E-15	1.107E-15
IR192	0.000E+00	0.000E+00	4.038E-15	3.292E-11	3.293E-11
IR192*	0.000E+00	0.000E+00	4.557E-15	3.290E-11	3.291E-11
IR194	0.000E+00	0.000E+00	0.000E+00	1.077E-16	1.077E-16
IR194*	0.000E+00	0.000E+00	0.000E+00	4.967E-22	4.967E-22
PT193	0.000E+00	0.000E+00	1.226E-14	1.175E-10	1.176E-10
TL206	1.359E-08	7.547E-09	1.016E-07	4.046E-07	5.274E-07
PB205	2.731E-07	4.289E-09	5.348E-06	3.409E-05	3.971E-05
BI208	2.065E-08	1.147E-08	1.545E-07	6.147E-07	8.013E-07

BI210*	1.359E-08	7.547E-09	1.016E-07	4.046E-07	5.274E-07
PO210	0.000E+00	0.000E+00	1.040E-29	8.616E-18	8.616E-18
Total:	1.385E+01	6.713E+00	1.659E+02	7.834E+03	8.020E+03

Summary for Sum of Splits

	T-plant	B-plant	Redox	Purex	Total
H03	1.368E+04	6.606E+03	1.541E+05	7.677E+05	9.421E+05
BE10	7.928E-06	4.405E-06	9.551E-04	1.552E-02	1.649E-02
C14	4.110E+00	2.283E+00	3.374E+01	1.840E+02	2.242E+02
SI32	4.945E-06	2.735E-06	3.386E-05	1.412E-04	1.828E-04
P32	4.947E-06	2.736E-06	3.387E-05	1.413E-04	1.828E-04
AR39	0.000E+00	0.000E+00	0.000E+00	5.628E-18	5.628E-18
AR42	5.360E-17	2.863E-17	7.970E-16	4.661E-15	5.541E-15
CA45	0.000E+00	0.000E+00	2.486E-24	3.179E-11	3.179E-11
SC46	0.000E+00	0.000E+00	0.000E+00	4.487E-18	4.487E-18
V50	4.236E-16	2.353E-16	1.078E-13	2.522E-12	2.631E-12
MN54	8.217E-14	3.555E-15	1.686E-09	8.722E-03	8.722E-03
FE55	1.948E-01	5.409E-02	1.369E+01	7.068E+02	7.207E+02
CO58	0.000E+00	0.000E+00	0.000E+00	6.867E-19	6.867E-19
CO60	1.403E+01	5.576E+00	3.242E+02	5.554E+03	5.898E+03
NI59	6.278E-01	3.487E-01	1.146E+02	7.994E+02	9.150E+02
NI63	1.265E+02	8.713E+01	1.101E+04	7.661E+04	8.783E+04
ZN65	5.615E-18	1.087E-19	1.130E-12	1.113E-07	1.113E-07
SR89	0.000E+00	0.000E+00	0.000E+00	4.784E-28	4.784E-28
SR90	0.000E+00	0.000E+00	8.038E-04	1.517E-02	1.597E-02
Y90	0.000E+00	0.000E+00	8.040E-04	1.517E-02	1.598E-02
Y91	0.000E+00	0.000E+00	0.000E+00	1.672E-23	1.672E-23
ZR93	0.000E+00	0.000E+00	9.391E-01	1.633E+01	1.727E+01
ZR95	0.000E+00	0.000E+00	0.000E+00	7.703E-19	7.703E-19
NB92	0.000E+00	0.000E+00	6.793E-08	1.176E-06	1.244E-06
NB93*	0.000E+00	0.000E+00	7.397E-01	1.029E+01	1.103E+01
NB94	0.000E+00	0.000E+00	9.777E-06	1.695E-04	1.793E-04
NB95	0.000E+00	0.000E+00	0.000E+00	1.698E-18	1.698E-18
NB95*	0.000E+00	0.000E+00	0.000E+00	9.062E-21	9.062E-21
MO93	0.000E+00	0.000E+00	6.029E-03	1.046E-01	1.106E-01
TC98	0.000E+00	0.000E+00	1.182E-11	1.639E-10	1.757E-10
TC99	0.000E+00	0.000E+00	3.046E-04	5.481E-03	5.786E-03
RU106	0.000E+00	0.000E+00	5.144E-28	3.236E-23	3.236E-23
RH102	0.000E+00	0.000E+00	1.896E-18	3.100E-16	3.119E-16
PD107	4.965E-18	2.743E-18	6.542E-17	2.957E-16	3.688E-16
AG108	3.372E-10	1.846E-10	4.607E-09	2.126E-08	2.639E-08
AG108*	3.876E-09	2.122E-09	5.296E-08	2.444E-07	3.033E-07
AG109*	6.668E-11	7.015E-12	8.127E-08	1.517E-04	1.518E-04
AG110	0.000E+00	0.000E+00	7.341E-21	2.651E-13	2.651E-13
AG110*	3.796E-25	2.578E-26	5.399E-19	1.949E-11	1.949E-11
CD109	6.668E-11	7.015E-12	8.127E-08	1.517E-04	1.518E-04
CD113	2.821E-11	1.465E-11	2.123E-11	3.340E-11	9.749E-11
CD113*	3.991E+00	1.964E+00	4.347E+01	2.124E+02	2.618E+02
IN113*	0.000E+00	0.000E+00	0.000E+00	1.721E-09	1.721E-09
IN114*	0.000E+00	0.000E+00	0.000E+00	1.229E-30	1.229E-30
IN115	6.897E-13	3.822E-13	4.026E-12	1.571E-11	2.081E-11
SN113	0.000E+00	0.000E+00	1.034E-29	1.720E-09	1.720E-09
SN119*	5.099E-14	1.656E-14	3.197E-09	5.596E-01	5.596E-01
SN121	4.991E+00	4.118E+00	8.419E+00	4.514E+01	6.267E+01
SN121*	6.432E+00	5.306E+00	1.085E+01	5.817E+01	8.075E+01
SN123	0.000E+00	0.000E+00	9.251E-27	9.805E-09	9.805E-09
SB124	0.000E+00	0.000E+00	0.000E+00	1.137E-25	1.137E-25
SB125	9.027E-02	5.947E-02	1.561E+00	1.375E+03	1.377E+03
TE123	6.995E-15	4.490E-15	9.236E-14	9.649E-13	1.069E-12
TE123*	0.000E+00	0.000E+00	0.000E+00	1.865E-14	1.865E-14

TE125*	2.203E-02	1.451E-02	3.809E-01	3.357E+02	3.361E+02
TE127	0.000E+00	0.000E+00	0.000E+00	3.140E-18	3.140E-18
TE127*	0.000E+00	0.000E+00	0.000E+00	3.206E-18	3.206E-18
I129	2.554E-20	1.411E-20	1.175E-17	1.615E-16	1.733E-16
TM170	0.000E+00	0.000E+00	0.000E+00	4.622E-29	4.622E-29
TM171	0.000E+00	0.000E+00	4.349E-24	4.393E-21	4.397E-21
LU176	0.000E+00	0.000E+00	1.321E-10	1.697E-09	1.829E-09
LU177	0.000E+00	0.000E+00	1.058E-27	4.921E-14	4.921E-14
LU177*	0.000E+00	0.000E+00	4.873E-27	2.246E-13	2.246E-13
HF175	0.000E+00	0.000E+00	0.000E+00	2.428E-19	2.428E-19
HF182	0.000E+00	0.000E+00	3.187E-06	4.925E-05	5.244E-05
TA182	0.000E+00	0.000E+00	3.187E-06	4.925E-05	5.244E-05
W181	0.000E+00	0.000E+00	1.487E-31	1.101E-11	1.101E-11
W185	0.000E+00	0.000E+00	0.000E+00	4.081E-18	4.081E-18
W188	0.000E+00	0.000E+00	0.000E+00	3.998E-21	3.998E-21
RE187	0.000E+00	0.000E+00	3.714E-07	6.482E-06	6.853E-06
RE188	0.000E+00	0.000E+00	0.000E+00	4.039E-21	4.039E-21
OS194	0.000E+00	0.000E+00	2.484E-17	1.198E-15	1.223E-15
IR192	0.000E+00	0.000E+00	2.280E-12	3.561E-11	3.789E-11
IR192*	0.000E+00	0.000E+00	2.278E-12	3.560E-11	3.788E-11
IR194	0.000E+00	0.000E+00	0.000E+00	1.077E-16	1.077E-16
IR194*	0.000E+00	0.000E+00	0.000E+00	5.374E-22	5.374E-22
PT193	0.000E+00	0.000E+00	6.131E-12	1.272E-10	1.333E-10
TL206	1.359E-05	7.547E-06	1.016E-04	4.046E-04	5.274E-04
PB205	2.731E-04	4.289E-06	5.347E-03	2.310E-02	2.873E-02
BI208	2.065E-05	1.147E-05	1.545E-04	6.147E-04	8.013E-04
BI210*	1.359E-05	7.547E-06	1.016E-04	4.046E-04	5.274E-04
PO210	0.000E+00	0.000E+00	1.104E-26	9.324E-18	9.324E-18
Total:	1.385E+04	6.713E+03	1.657E+05	8.536E+05	1.040E+06

Total Fuel and Exposure Summary:

	T-plant	B-plant	Redox	Purex	Total
MWd:	1.655E+06	9.241E+05	1.413E+07	5.835E+07	7.506E+07
MTU:	5.033E+03	2.765E+03	1.969E+04	7.185E+04	9.934E+04

DKPRO complete, calculation time = 21.32813

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ATTACHMENT C

DKPRO EXECUTABLE AND STANDARD LIBRARY FILES

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The DKPRO executable has been installed and tested on an Intel Pentium III based workstation, cpu id 40057207, which is a node in the Hanford FLAN network. This computer is part of the subnet referred to as the Advanced Computing Center (ACC). All validation testing was performed on this machine. The executable and library files are stored on the hard drive of one of the network servers (ffseng02\\applications). For most machines in the ACC, this directory has been linked and assigned a drive name of "p:".

The executable is stored in the directory p:\dkpro\bin. The name and datestamp of the current version (3.1) are shown in the directory listing below:

```
Volume in drive P is Applications
 Volume Serial Number is B831-5A78

 Directory of P:\Dkpro\bin

08/27/02  01:49p        <DIR>          .
08/27/02  01:49p        <DIR>          ..
07/24/02  01:53p               241,664 combine.exe
08/15/02  09:14a               356,352 dkpro31.exe
07/24/02  09:10a               241,664 extract.exe
               5 File(s)        839,680 bytes
                          1,074,720,768 bytes free
```

The DKPRO standard library files are stored in the directory p:\dkpro\lib. The name and datestamp of the current version of these files are shown in the directory listing below:

```
Volume in drive P is Applications
 Volume Serial Number is B831-5A78

 Directory of P:\Dkpro\lib

09/16/02  08:29a        <DIR>          .
09/16/02  08:29a        <DIR>          ..
08/15/02  08:26a                 1,935 CLAD.MK1AA000.org
08/15/02  08:26a                 5,789 CLAD.MK1AA001A.org
08/15/02  08:26a                 5,871 CLAD.MK1AA002.org
08/15/02  08:26a                 5,871 CLAD.MK1AA003.org
08/15/02  08:26a                 6,035 CLAD.MK1AA005.org
08/15/02  08:26a                 6,117 CLAD.MK1AA007.org
08/15/02  08:26a                 6,035 CLAD.MK1AA010.org
08/15/02  08:26a                 6,281 CLAD.MK1AA015.org
08/15/02  08:26a                 6,445 CLAD.MK1AA020.org
08/15/02  08:26a                 6,445 CLAD.MK1AA025.org
08/15/02  08:26a                 6,445 CLAD.MK1AA030.org
08/15/02  08:26a                 6,527 CLAD.MK1AA040.org
08/15/02  08:26a                 6,609 CLAD.MK1AA050.org
08/15/02  08:26a                 6,773 CLAD.MK1AA070.org
08/15/02  08:26a                 6,855 CLAD.MK1AA100.org
08/15/02  08:26a                 6,855 CLAD.MK1AA115.org
08/15/02  08:26a                 6,937 CLAD.MK1AA130.org
08/15/02  08:26a                 7,101 CLAD.MK1AA200.org
08/15/02  08:26a                 7,019 CLAD.MK1AA230.org
08/15/02  08:26a                 7,101 CLAD.MK1AA273.org
08/15/02  08:26a                 7,101 CLAD.MK1AA300.org
08/15/02  08:26a                 1,935 CLAD.MK1AB000.org
08/15/02  08:26a                 5,789 CLAD.MK1AB001A.org
08/15/02  08:26a                 5,871 CLAD.MK1AB002.org
08/15/02  08:26a                 5,871 CLAD.MK1AB003.org
```

```
08/15/02  08:26a                6,035 CLAD.MK1AB005.org
08/15/02  08:26a                6,035 CLAD.MK1AB007.org
08/15/02  08:26a                6,117 CLAD.MK1AB010.org
08/15/02  08:26a                6,281 CLAD.MK1AB015.org
08/15/02  08:26a                6,363 CLAD.MK1AB020.org
08/15/02  08:26a                6,445 CLAD.MK1AB025.org
08/15/02  08:26a                6,527 CLAD.MK1AB030.org
08/15/02  08:26a                6,609 CLAD.MK1AB040.org
08/15/02  08:26a                6,609 CLAD.MK1AB050.org
08/15/02  08:26a                6,691 CLAD.MK1AB070.org
08/15/02  08:26a                6,855 CLAD.MK1AB100.org
08/15/02  08:26a                6,937 CLAD.MK1AB115.org
08/15/02  08:26a                6,937 CLAD.MK1AB130.org
08/15/02  08:26a                7,101 CLAD.MK1AB200.org
08/15/02  08:26a                7,101 CLAD.MK1AB230.org
08/15/02  08:26a                7,101 CLAD.MK1AB273.org
08/15/02  08:26a                7,101 CLAD.MK1AB300.org
08/15/02  08:26a                1,935 CLAD.MK1AC000.org
08/15/02  08:26a                5,789 CLAD.MK1AC001A.org
08/15/02  08:26a                5,871 CLAD.MK1AC002.org
08/15/02  08:26a                5,871 CLAD.MK1AC003.org
08/15/02  08:26a                6,035 CLAD.MK1AC005.org
08/15/02  08:26a                6,117 CLAD.MK1AC007.org
08/15/02  08:26a                6,117 CLAD.MK1AC010.org
08/15/02  08:26a                6,281 CLAD.MK1AC015.org
08/15/02  08:26a                6,445 CLAD.MK1AC020.org
08/15/02  08:26a                6,445 CLAD.MK1AC025.org
08/15/02  08:26a                6,527 CLAD.MK1AC030.org
08/15/02  08:26a                6,527 CLAD.MK1AC040.org
08/15/02  08:26a                6,691 CLAD.MK1AC050.org
08/15/02  08:26a                6,773 CLAD.MK1AC070.org
08/15/02  08:26a                6,937 CLAD.MK1AC100.org
08/15/02  08:26a                6,937 CLAD.MK1AC115.org
08/15/02  08:26a                6,937 CLAD.MK1AC130.org
08/15/02  08:26a                7,101 CLAD.MK1AC200.org
08/15/02  08:26a                7,019 CLAD.MK1AC230.org
08/15/02  08:26a                7,101 CLAD.MK1AC273.org
08/15/02  08:26a                7,101 CLAD.MK1AC300.org
08/15/02  08:26a                1,935 CLAD.MKII000.org
08/15/02  08:26a                5,789 CLAD.MKII001A.org
08/15/02  08:26a                5,789 CLAD.MKII002.org
08/15/02  08:26a                5,871 CLAD.MKII003.org
08/15/02  08:26a                5,871 CLAD.MKII005.org
08/15/02  08:26a                5,953 CLAD.MKII007.org
08/15/02  08:26a                6,035 CLAD.MKII010.org
08/15/02  08:26a                6,117 CLAD.MKII015.org
08/15/02  08:26a                6,199 CLAD.MKII020.org
08/15/02  08:26a                6,281 CLAD.MKII025.org
08/15/02  08:26a                6,363 CLAD.MKII030.org
08/15/02  08:26a                6,445 CLAD.MKII040.org
08/15/02  08:26a                6,527 CLAD.MKII050.org
08/15/02  08:26a                6,609 CLAD.MKII070.org
08/15/02  08:26a                6,691 CLAD.MKII100.org
08/15/02  08:26a                6,855 CLAD.MKII115.org
08/15/02  08:26a                6,773 CLAD.MKII130.org
08/15/02  08:26a                6,855 CLAD.MKII150.org
08/15/02  08:26a                6,937 CLAD.MKII180.org
08/15/02  08:26a                6,937 CLAD.MKII200.org
08/15/02  08:26a                6,855 CLAD.MKII220.org
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08/15/02  08:26a                5,789 CLAD.MKIVA001A.org
08/15/02  08:26a                5,871 CLAD.MKIVA002.org
08/15/02  08:26a                5,871 CLAD.MKIVA003.org
```

```
08/15/02  08:26a                5,953 CLAD.MKIVA005.org
08/15/02  08:26a                6,035 CLAD.MKIVA007.org
08/15/02  08:26a                6,035 CLAD.MKIVA010.org
08/15/02  08:26a                6,281 CLAD.MKIVA015.org
08/15/02  08:26a                6,363 CLAD.MKIVA020.org
08/15/02  08:26a                6,445 CLAD.MKIVA025.org
08/15/02  08:26a                6,527 CLAD.MKIVA030.org
08/15/02  08:26a                6,527 CLAD.MKIVA040.org
08/15/02  08:26a                6,609 CLAD.MKIVA050.org
08/15/02  08:26a                6,773 CLAD.MKIVA070.org
08/15/02  08:26a                6,937 CLAD.MKIVA100.org
08/15/02  08:26a                6,937 CLAD.MKIVA115.org
08/15/02  08:26a                6,937 CLAD.MKIVA130.org
08/15/02  08:26a                7,019 CLAD.MKIVA200.org
08/15/02  08:26a                7,019 CLAD.MKIVA250.org
08/15/02  08:26a                7,101 CLAD.MKIVA300.org
08/15/02  08:26a                7,183 CLAD.MKIVA360.org
08/15/02  08:26a                1,935 CLAD.MKIVB000.org
08/15/02  08:26a                5,789 CLAD.MKIVB001A.org
08/15/02  08:26a                5,871 CLAD.MKIVB002.org
08/15/02  08:26a                5,871 CLAD.MKIVB003.org
08/15/02  08:26a                6,035 CLAD.MKIVB005.org
08/15/02  08:26a                6,035 CLAD.MKIVB007.org
08/15/02  08:26a                6,117 CLAD.MKIVB010.org
08/15/02  08:26a                6,281 CLAD.MKIVB015.org
08/15/02  08:26a                6,445 CLAD.MKIVB020.org
08/15/02  08:26a                6,363 CLAD.MKIVB025.org
08/15/02  08:26a                6,527 CLAD.MKIVB030.org
08/15/02  08:26a                6,609 CLAD.MKIVB040.org
08/15/02  08:26a                6,609 CLAD.MKIVB050.org
08/15/02  08:26a                6,691 CLAD.MKIVB070.org
08/15/02  08:26a                6,855 CLAD.MKIVB100.org
08/15/02  08:26a                6,937 CLAD.MKIVB115.org
08/15/02  08:26a                6,855 CLAD.MKIVB130.org
08/15/02  08:26a                7,019 CLAD.MKIVB200.org
08/15/02  08:26a                7,101 CLAD.MKIVB250.org
08/15/02  08:26a                7,101 CLAD.MKIVB300.org
08/15/02  08:26a                7,183 CLAD.MKIVB360.org
08/15/02  08:26a                1,935 CLAD.MKIVC000.org
08/15/02  08:26a                5,789 CLAD.MKIVC001A.org
08/15/02  08:26a                5,871 CLAD.MKIVC002.org
08/15/02  08:26a                5,871 CLAD.MKIVC003.org
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08/15/02  08:26a                6,035 CLAD.MKIVC007.org
08/15/02  08:26a                6,035 CLAD.MKIVC010.org
08/15/02  08:26a                6,281 CLAD.MKIVC015.org
08/15/02  08:26a                6,445 CLAD.MKIVC020.org
08/15/02  08:26a                6,445 CLAD.MKIVC025.org
08/15/02  08:26a                6,445 CLAD.MKIVC030.org
08/15/02  08:26a                6,609 CLAD.MKIVC040.org
08/15/02  08:26a                6,691 CLAD.MKIVC050.org
08/15/02  08:26a                6,691 CLAD.MKIVC070.org
08/15/02  08:26a                6,937 CLAD.MKIVC100.org
08/15/02  08:26a                6,937 CLAD.MKIVC115.org
08/15/02  08:26a                6,937 CLAD.MKIVC130.org
08/15/02  08:26a                7,019 CLAD.MKIVC200.org
08/15/02  08:26a                7,101 CLAD.MKIVC250.org
08/15/02  08:26a                7,101 CLAD.MKIVC300.org
08/15/02  08:26a                7,183 CLAD.MKIVC360.org
08/15/02  08:26a                1,525 CLAD.SPE000.org
08/15/02  08:26a                4,149 CLAD.SPE001A.org
08/15/02  08:26a                4,231 CLAD.SPE002.org
08/15/02  08:26a                4,231 CLAD.SPE003.org
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```
08/15/02  08:26a                4,313 CLAD.SPE005.org
08/15/02  08:26a                4,313 CLAD.SPE007.org
08/15/02  08:26a                4,313 CLAD.SPE010.org
08/15/02  08:26a                4,313 CLAD.SPE015.org
08/15/02  08:26a                4,313 CLAD.SPE020.org
08/15/02  08:26a                4,477 CLAD.SPE025.org
08/15/02  08:26a                4,477 CLAD.SPE030.org
08/15/02  08:26a                4,477 CLAD.SPE040.org
08/15/02  08:26a                4,477 CLAD.SPE050.org
08/15/02  08:26a                4,559 CLAD.SPE070.org
08/15/02  08:26a                4,559 CLAD.SPE100.org
08/15/02  08:26a                4,559 CLAD.SPE125.org
08/15/02  08:26a                4,559 CLAD.SPE150.org
08/15/02  08:26a                4,559 CLAD.SPE200.org
08/15/02  08:26a                4,559 CLAD.SPE250.org
08/15/02  08:26a                4,559 CLAD.SPE300.org
08/15/02  08:26a                4,559 CLAD.SPE320.org
08/15/02  08:26a                1,525 CLAD.SPNA000.org
08/15/02  08:26a                4,231 CLAD.SPNA001A.org
08/15/02  08:26a                4,231 CLAD.SPNA002.org
08/15/02  08:26a                4,231 CLAD.SPNA003.org
08/15/02  08:26a                4,231 CLAD.SPNA005.org
08/15/02  08:26a                4,313 CLAD.SPNA007.org
08/15/02  08:26a                4,313 CLAD.SPNA010.org
08/15/02  08:26a                4,395 CLAD.SPNA015.org
08/15/02  08:26a                4,477 CLAD.SPNA020.org
08/15/02  08:26a                4,477 CLAD.SPNA025.org
08/15/02  08:26a                4,477 CLAD.SPNA030.org
08/15/02  08:26a                4,559 CLAD.SPNA040.org
08/15/02  08:26a                4,559 CLAD.SPNA050.org
08/15/02  08:26a                4,559 CLAD.SPNA070.org
08/15/02  08:26a                4,641 CLAD.SPNA100.org
08/15/02  08:26a                4,641 CLAD.SPNA125.org
08/15/02  08:26a                4,641 CLAD.SPNA150.org
08/15/02  08:26a                4,723 CLAD.SPNA200.org
08/15/02  08:26a                4,641 CLAD.SPNA250.org
08/15/02  08:26a                4,641 CLAD.SPNA300.org
08/15/02  08:26a                4,641 CLAD.SPNA320.org
08/15/02  08:26a                1,525 CLAD.SPNB000.org
08/15/02  08:26a                4,149 CLAD.SPNB001A.org
08/15/02  08:26a                4,149 CLAD.SPNB002.org
08/15/02  08:26a                4,231 CLAD.SPNB003.org
08/15/02  08:26a                4,231 CLAD.SPNB005.org
08/15/02  08:26a                4,313 CLAD.SPNB007.org
08/15/02  08:26a                4,313 CLAD.SPNB010.org
08/15/02  08:26a                4,395 CLAD.SPNB015.org
08/15/02  08:26a                4,477 CLAD.SPNB020.org
08/15/02  08:26a                4,477 CLAD.SPNB025.org
08/15/02  08:26a                4,395 CLAD.SPNB030.org
08/15/02  08:26a                4,477 CLAD.SPNB040.org
08/15/02  08:26a                4,477 CLAD.SPNB050.org
08/15/02  08:26a                4,477 CLAD.SPNB070.org
08/15/02  08:26a                4,559 CLAD.SPNB100.org
08/15/02  08:26a                4,559 CLAD.SPNB125.org
08/15/02  08:26a                4,559 CLAD.SPNB150.org
08/15/02  08:26a                4,559 CLAD.SPNB200.org
08/15/02  08:26a                4,641 CLAD.SPNB250.org
08/15/02  08:26a                4,641 CLAD.SPNB300.org
08/15/02  08:26a                4,641 CLAD.SPNB320.org
08/15/02  08:26a                1,525 CLAD.SPNC000.org
08/15/02  08:26a                4,231 CLAD.SPNC001A.org
08/15/02  08:26a                4,231 CLAD.SPNC002.org
08/15/02  08:26a                4,231 CLAD.SPNC003.org
```

08/15/02	08:26a	4,231	CLAD.SPNC005.org
08/15/02	08:26a	4,313	CLAD.SPNC007.org
08/15/02	08:26a	4,313	CLAD.SPNC010.org
08/15/02	08:26a	4,395	CLAD.SPNC015.org
08/15/02	08:26a	4,477	CLAD.SPNC020.org
08/15/02	08:26a	4,477	CLAD.SPNC025.org
08/15/02	08:26a	4,395	CLAD.SPNC030.org
08/15/02	08:26a	4,477	CLAD.SPNC040.org
08/15/02	08:26a	4,477	CLAD.SPNC050.org
08/15/02	08:26a	4,477	CLAD.SPNC070.org
08/15/02	08:26a	4,559	CLAD.SPNC100.org
08/15/02	08:26a	4,559	CLAD.SPNC125.org
08/15/02	08:26a	4,559	CLAD.SPNC150.org
08/15/02	08:26a	4,559	CLAD.SPNC200.org
08/15/02	08:26a	4,641	CLAD.SPNC250.org
08/15/02	08:26a	4,641	CLAD.SPNC300.org
08/15/02	08:26a	4,641	CLAD.SPNC320.org
09/05/02	04:06p	4,641	CLAD.TH1.org
08/15/02	08:24a	1,970	COMBO.MK1AA000.ORG
08/15/02	08:24a	14,844	COMBO.MK1AA001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AA002.ORG
08/15/02	08:24a	15,172	COMBO.MK1AA003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AA005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AA007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AA010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AA015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AA025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AA030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AA040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AA050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AA070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AA130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AA200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AA273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AA300.ORG
08/15/02	08:24a	1,974	COMBO.MK1AB000.ORG
08/15/02	08:24a	14,848	COMBO.MK1AB001A.ORG
08/15/02	08:24a	15,013	COMBO.MK1AB002.ORG
08/15/02	08:24a	15,176	COMBO.MK1AB003.ORG
08/15/02	08:24a	15,258	COMBO.MK1AB005.ORG
08/15/02	08:24a	15,422	COMBO.MK1AB007.ORG
08/15/02	08:24a	15,504	COMBO.MK1AB010.ORG
08/15/02	08:24a	15,750	COMBO.MK1AB015.ORG
08/15/02	08:24a	15,832	COMBO.MK1AB020.ORG
08/15/02	08:24a	15,832	COMBO.MK1AB025.ORG
08/15/02	08:24a	15,914	COMBO.MK1AB030.ORG
08/15/02	08:24a	16,078	COMBO.MK1AB040.ORG
08/15/02	08:24a	16,160	COMBO.MK1AB050.ORG
08/15/02	08:24a	16,406	COMBO.MK1AB070.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB100.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB115.ORG
08/15/02	08:24a	16,653	COMBO.MK1AB130.ORG
08/15/02	08:24a	16,899	COMBO.MK1AB200.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB230.ORG
08/15/02	08:24a	16,981	COMBO.MK1AB273.ORG
08/15/02	08:24a	17,063	COMBO.MK1AB300.ORG
08/15/02	08:24a	1,970	COMBO.MK1AC000.ORG
08/15/02	08:24a	14,844	COMBO.MK1AC001A.ORG
08/15/02	08:24a	15,009	COMBO.MK1AC002.ORG

08/15/02	08:24a	15,172	COMBO.MK1AC003.ORG
08/15/02	08:24a	15,254	COMBO.MK1AC005.ORG
08/15/02	08:24a	15,418	COMBO.MK1AC007.ORG
08/15/02	08:24a	15,500	COMBO.MK1AC010.ORG
08/15/02	08:24a	15,746	COMBO.MK1AC015.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC020.ORG
08/15/02	08:24a	15,828	COMBO.MK1AC025.ORG
08/15/02	08:24a	15,910	COMBO.MK1AC030.ORG
08/15/02	08:24a	16,074	COMBO.MK1AC040.ORG
08/15/02	08:24a	16,156	COMBO.MK1AC050.ORG
08/15/02	08:24a	16,402	COMBO.MK1AC070.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC100.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC115.ORG
08/15/02	08:24a	16,649	COMBO.MK1AC130.ORG
08/15/02	08:24a	16,895	COMBO.MK1AC200.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC230.ORG
08/15/02	08:24a	16,977	COMBO.MK1AC273.ORG
08/15/02	08:24a	17,059	COMBO.MK1AC300.ORG
08/15/02	08:24a	1,964	COMBO.MKII000.ORG
08/15/02	08:24a	14,838	COMBO.MKII001A.ORG
08/15/02	08:24a	14,839	COMBO.MKII002.ORG
08/15/02	08:24a	15,002	COMBO.MKII003.ORG
08/15/02	08:24a	15,248	COMBO.MKII005.ORG
08/15/02	08:24a	15,248	COMBO.MKII007.ORG
08/15/02	08:24a	15,412	COMBO.MKII010.ORG
08/15/02	08:24a	15,494	COMBO.MKII015.ORG
08/15/02	08:24a	15,576	COMBO.MKII020.ORG
08/15/02	08:24a	15,658	COMBO.MKII025.ORG
08/15/02	08:24a	15,740	COMBO.MKII030.ORG
08/15/02	08:24a	15,822	COMBO.MKII040.ORG
08/15/02	08:24a	15,904	COMBO.MKII050.ORG
08/15/02	08:24a	16,150	COMBO.MKII070.ORG
08/15/02	08:24a	16,315	COMBO.MKII100.ORG
08/15/02	08:24a	16,397	COMBO.MKII115.ORG
08/15/02	08:24a	16,397	COMBO.MKII130.ORG
08/15/02	08:24a	16,479	COMBO.MKII150.ORG
08/15/02	08:24a	16,561	COMBO.MKII180.ORG
08/15/02	08:24a	16,561	COMBO.MKII200.ORG
08/15/02	08:24a	16,725	COMBO.MKII220.ORG
08/15/02	08:24a	1,970	COMBO.MKIVA000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVA001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVA002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVA003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVA005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVA007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVA010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVA015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVA025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVA030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVA040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVA050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVA070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVA130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVA200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVA250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVA360.ORG
08/15/02	08:24a	1,974	COMBO.MKIVB000.ORG
08/15/02	08:24a	14,848	COMBO.MKIVB001A.ORG
08/15/02	08:24a	15,013	COMBO.MKIVB002.ORG

08/15/02	08:24a	15,176	COMBO.MKIVB003.ORG
08/15/02	08:24a	15,258	COMBO.MKIVB005.ORG
08/15/02	08:24a	15,422	COMBO.MKIVB007.ORG
08/15/02	08:24a	15,504	COMBO.MKIVB010.ORG
08/15/02	08:24a	15,750	COMBO.MKIVB015.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB020.ORG
08/15/02	08:24a	15,832	COMBO.MKIVB025.ORG
08/15/02	08:24a	15,914	COMBO.MKIVB030.ORG
08/15/02	08:24a	16,078	COMBO.MKIVB040.ORG
08/15/02	08:24a	16,160	COMBO.MKIVB050.ORG
08/15/02	08:24a	16,324	COMBO.MKIVB070.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB100.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB115.ORG
08/15/02	08:24a	16,571	COMBO.MKIVB130.ORG
08/15/02	08:24a	16,899	COMBO.MKIVB200.ORG
08/15/02	08:24a	16,981	COMBO.MKIVB250.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB300.ORG
08/15/02	08:24a	17,063	COMBO.MKIVB360.ORG
08/15/02	08:24a	1,970	COMBO.MKIVC000.ORG
08/15/02	08:24a	14,844	COMBO.MKIVC001A.ORG
08/15/02	08:24a	15,009	COMBO.MKIVC002.ORG
08/15/02	08:24a	15,172	COMBO.MKIVC003.ORG
08/15/02	08:24a	15,254	COMBO.MKIVC005.ORG
08/15/02	08:24a	15,418	COMBO.MKIVC007.ORG
08/15/02	08:24a	15,500	COMBO.MKIVC010.ORG
08/15/02	08:24a	15,746	COMBO.MKIVC015.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC020.ORG
08/15/02	08:24a	15,828	COMBO.MKIVC025.ORG
08/15/02	08:24a	15,910	COMBO.MKIVC030.ORG
08/15/02	08:24a	16,074	COMBO.MKIVC040.ORG
08/15/02	08:24a	16,156	COMBO.MKIVC050.ORG
08/15/02	08:24a	16,320	COMBO.MKIVC070.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC100.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC115.ORG
08/15/02	08:24a	16,567	COMBO.MKIVC130.ORG
08/15/02	08:24a	16,895	COMBO.MKIVC200.ORG
08/15/02	08:24a	16,977	COMBO.MKIVC250.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC300.ORG
08/15/02	08:24a	17,059	COMBO.MKIVC360.ORG
08/15/02	08:25a	1,552	COMBO.SPE000.ORG
08/15/02	08:25a	13,114	COMBO.SPE001A.ORG
08/15/02	08:25a	13,115	COMBO.SPE002.ORG
08/15/02	08:25a	13,360	COMBO.SPE003.ORG
08/15/02	08:25a	13,524	COMBO.SPE005.ORG
08/15/02	08:25a	13,606	COMBO.SPE007.ORG
08/15/02	08:25a	13,606	COMBO.SPE010.ORG
08/15/02	08:25a	13,770	COMBO.SPE015.ORG
08/15/02	08:25a	13,770	COMBO.SPE020.ORG
08/15/02	08:25a	13,770	COMBO.SPE025.ORG
08/15/02	08:25a	13,770	COMBO.SPE030.ORG
08/15/02	08:25a	13,852	COMBO.SPE040.ORG
08/15/02	08:25a	13,852	COMBO.SPE050.ORG
08/15/02	08:25a	13,934	COMBO.SPE070.ORG
08/15/02	08:25a	14,099	COMBO.SPE100.ORG
08/15/02	08:25a	14,099	COMBO.SPE125.ORG
08/15/02	08:25a	14,181	COMBO.SPE150.ORG
08/15/02	08:25a	14,181	COMBO.SPE200.ORG
08/15/02	08:25a	14,345	COMBO.SPE250.ORG
08/15/02	08:25a	14,509	COMBO.SPE300.ORG
08/15/02	08:25a	14,509	COMBO.SPE320.ORG
08/15/02	08:24a	1,558	COMBO.SPNA000.ORG
08/15/02	08:24a	13,202	COMBO.SPNA001A.ORG
08/15/02	08:24a	13,285	COMBO.SPNA002.ORG

08/15/02	08:24a	13,366	COMBO.SPNA003.ORG
08/15/02	08:24a	13,530	COMBO.SPNA005.ORG
08/15/02	08:24a	13,612	COMBO.SPNA007.ORG
08/15/02	08:24a	13,612	COMBO.SPNA010.ORG
08/15/02	08:24a	13,858	COMBO.SPNA015.ORG
08/15/02	08:24a	13,858	COMBO.SPNA020.ORG
08/15/02	08:24a	13,858	COMBO.SPNA025.ORG
08/15/02	08:24a	13,940	COMBO.SPNA030.ORG
08/15/02	08:24a	13,940	COMBO.SPNA040.ORG
08/15/02	08:24a	13,940	COMBO.SPNA050.ORG
08/15/02	08:24a	14,022	COMBO.SPNA070.ORG
08/15/02	08:24a	14,187	COMBO.SPNA100.ORG
08/15/02	08:24a	14,187	COMBO.SPNA125.ORG
08/15/02	08:24a	14,269	COMBO.SPNA150.ORG
08/15/02	08:24a	14,351	COMBO.SPNA200.ORG
08/15/02	08:24a	14,597	COMBO.SPNA250.ORG
08/15/02	08:24a	14,597	COMBO.SPNA300.ORG
08/15/02	08:24a	14,597	COMBO.SPNA320.ORG
08/15/02	08:25a	1,562	COMBO.SPNB000.ORG
08/15/02	08:25a	13,124	COMBO.SPNB001A.ORG
08/15/02	08:25a	13,207	COMBO.SPNB002.ORG
08/15/02	08:25a	13,370	COMBO.SPNB003.ORG
08/15/02	08:25a	13,534	COMBO.SPNB005.ORG
08/15/02	08:25a	13,616	COMBO.SPNB007.ORG
08/15/02	08:25a	13,616	COMBO.SPNB010.ORG
08/15/02	08:25a	13,780	COMBO.SPNB015.ORG
08/15/02	08:25a	13,780	COMBO.SPNB020.ORG
08/15/02	08:25a	13,780	COMBO.SPNB025.ORG
08/15/02	08:25a	13,862	COMBO.SPNB030.ORG
08/15/02	08:25a	13,862	COMBO.SPNB040.ORG
08/15/02	08:25a	13,862	COMBO.SPNB050.ORG
08/15/02	08:25a	14,026	COMBO.SPNB070.ORG
08/15/02	08:25a	14,109	COMBO.SPNB100.ORG
08/15/02	08:25a	14,109	COMBO.SPNB125.ORG
08/15/02	08:25a	14,191	COMBO.SPNB150.ORG
08/15/02	08:25a	14,273	COMBO.SPNB200.ORG
08/15/02	08:25a	14,519	COMBO.SPNB250.ORG
08/15/02	08:25a	14,519	COMBO.SPNB300.ORG
08/15/02	08:25a	14,519	COMBO.SPNB320.ORG
08/15/02	08:25a	1,558	COMBO.SPNC000.ORG
08/15/02	08:25a	13,120	COMBO.SPNC001A.ORG
08/15/02	08:25a	13,203	COMBO.SPNC002.ORG
08/15/02	08:25a	13,366	COMBO.SPNC003.ORG
08/15/02	08:25a	13,530	COMBO.SPNC005.ORG
08/15/02	08:25a	13,612	COMBO.SPNC007.ORG
08/15/02	08:25a	13,612	COMBO.SPNC010.ORG
08/15/02	08:25a	13,776	COMBO.SPNC015.ORG
08/15/02	08:25a	13,776	COMBO.SPNC020.ORG
08/15/02	08:25a	13,776	COMBO.SPNC025.ORG
08/15/02	08:25a	13,858	COMBO.SPNC030.ORG
08/15/02	08:25a	13,858	COMBO.SPNC040.ORG
08/15/02	08:25a	13,858	COMBO.SPNC050.ORG
08/15/02	08:25a	14,022	COMBO.SPNC070.ORG
08/15/02	08:25a	14,105	COMBO.SPNC100.ORG
08/15/02	08:25a	14,105	COMBO.SPNC125.ORG
08/15/02	08:25a	14,187	COMBO.SPNC150.ORG
08/15/02	08:25a	14,269	COMBO.SPNC200.ORG
08/15/02	08:25a	14,515	COMBO.SPNC250.ORG
08/15/02	08:25a	14,515	COMBO.SPNC300.ORG
08/15/02	08:25a	14,515	COMBO.SPNC320.ORG
09/05/02	04:05p	13,796	COMBO.TH1.ORG
08/15/02	08:25a	1,150	CORE.MK1AA000.ORG
08/15/02	08:25a	12,630	CORE.MK1AA001A.ORG

08/15/02	08:25a	12,713	CORE.MK1AA002.ORG
08/15/02	08:25a	12,958	CORE.MK1AA003.ORG
08/15/02	08:25a	13,040	CORE.MK1AA005.ORG
08/15/02	08:25a	13,122	CORE.MK1AA007.ORG
08/15/02	08:25a	13,204	CORE.MK1AA010.ORG
08/15/02	08:25a	13,368	CORE.MK1AA015.ORG
08/15/02	08:25a	13,368	CORE.MK1AA020.ORG
08/15/02	08:25a	13,450	CORE.MK1AA025.ORG
08/15/02	08:25a	13,532	CORE.MK1AA030.ORG
08/15/02	08:25a	13,614	CORE.MK1AA040.ORG
08/15/02	08:25a	13,614	CORE.MK1AA050.ORG
08/15/02	08:25a	13,942	CORE.MK1AA070.ORG
08/15/02	08:25a	14,025	CORE.MK1AA100.ORG
08/15/02	08:25a	14,107	CORE.MK1AA115.ORG
08/15/02	08:25a	14,107	CORE.MK1AA130.ORG
08/15/02	08:25a	14,271	CORE.MK1AA200.ORG
08/15/02	08:25a	14,353	CORE.MK1AA230.ORG
08/15/02	08:25a	14,353	CORE.MK1AA273.ORG
08/15/02	08:25a	14,435	CORE.MK1AA300.ORG
08/15/02	08:25a	1,154	CORE.MK1AB000.ORG
08/15/02	08:25a	12,634	CORE.MK1AB001A.ORG
08/15/02	08:25a	12,717	CORE.MK1AB002.ORG
08/15/02	08:25a	12,962	CORE.MK1AB003.ORG
08/15/02	08:25a	13,044	CORE.MK1AB005.ORG
08/15/02	08:25a	13,126	CORE.MK1AB007.ORG
08/15/02	08:25a	13,208	CORE.MK1AB010.ORG
08/15/02	08:25a	13,372	CORE.MK1AB015.ORG
08/15/02	08:25a	13,372	CORE.MK1AB020.ORG
08/15/02	08:25a	13,454	CORE.MK1AB025.ORG
08/15/02	08:25a	13,536	CORE.MK1AB030.ORG
08/15/02	08:25a	13,618	CORE.MK1AB040.ORG
08/15/02	08:25a	13,618	CORE.MK1AB050.ORG
08/15/02	08:25a	13,946	CORE.MK1AB070.ORG
08/15/02	08:25a	14,029	CORE.MK1AB100.ORG
08/15/02	08:25a	14,111	CORE.MK1AB115.ORG
08/15/02	08:25a	14,111	CORE.MK1AB130.ORG
08/15/02	08:25a	14,275	CORE.MK1AB200.ORG
08/15/02	08:25a	14,357	CORE.MK1AB230.ORG
08/15/02	08:25a	14,357	CORE.MK1AB273.ORG
08/15/02	08:25a	14,439	CORE.MK1AB300.ORG
08/15/02	08:25a	1,150	CORE.MK1AC000.ORG
08/15/02	08:25a	12,630	CORE.MK1AC001A.ORG
08/15/02	08:25a	12,713	CORE.MK1AC002.ORG
08/15/02	08:25a	12,958	CORE.MK1AC003.ORG
08/15/02	08:25a	13,040	CORE.MK1AC005.ORG
08/15/02	08:25a	13,122	CORE.MK1AC007.ORG
08/15/02	08:25a	13,204	CORE.MK1AC010.ORG
08/15/02	08:25a	13,368	CORE.MK1AC015.ORG
08/15/02	08:25a	13,368	CORE.MK1AC020.ORG
08/15/02	08:25a	13,450	CORE.MK1AC025.ORG
08/15/02	08:25a	13,532	CORE.MK1AC030.ORG
08/15/02	08:25a	13,614	CORE.MK1AC040.ORG
08/15/02	08:25a	13,614	CORE.MK1AC050.ORG
08/15/02	08:25a	13,942	CORE.MK1AC070.ORG
08/15/02	08:25a	14,025	CORE.MK1AC100.ORG
08/15/02	08:25a	14,107	CORE.MK1AC115.ORG
08/15/02	08:25a	14,107	CORE.MK1AC130.ORG
08/15/02	08:25a	14,271	CORE.MK1AC200.ORG
08/15/02	08:25a	14,353	CORE.MK1AC230.ORG
08/15/02	08:25a	14,353	CORE.MK1AC273.ORG
08/15/02	08:25a	14,435	CORE.MK1AC300.ORG
08/15/02	08:25a	1,144	CORE.MKII000.ORG
08/15/02	08:25a	12,542	CORE.MKII001A.ORG

08/15/02	08:25a	12,707	CORE.MKII002.ORG
08/15/02	08:25a	12,706	CORE.MKII003.ORG
08/15/02	08:25a	13,034	CORE.MKII005.ORG
08/15/02	08:25a	13,034	CORE.MKII007.ORG
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08/15/02	08:25a	13,198	CORE.MKII015.ORG
08/15/02	08:25a	13,280	CORE.MKII020.ORG
08/15/02	08:25a	13,362	CORE.MKII025.ORG
08/15/02	08:25a	13,362	CORE.MKII030.ORG
08/15/02	08:25a	13,444	CORE.MKII040.ORG
08/15/02	08:25a	13,526	CORE.MKII050.ORG
08/15/02	08:25a	13,608	CORE.MKII070.ORG
08/15/02	08:25a	13,855	CORE.MKII100.ORG
08/15/02	08:25a	13,937	CORE.MKII115.ORG
08/15/02	08:25a	13,937	CORE.MKII130.ORG
08/15/02	08:25a	13,937	CORE.MKII150.ORG
08/15/02	08:25a	13,937	CORE.MKII180.ORG
08/15/02	08:25a	14,019	CORE.MKII200.ORG
08/15/02	08:25a	14,183	CORE.MKII220.ORG
08/15/02	08:25a	1,150	CORE.MKIVA000.ORG
08/15/02	08:25a	12,630	CORE.MKIVA001A.ORG
08/15/02	08:25a	12,713	CORE.MKIVA002.ORG
08/15/02	08:25a	12,958	CORE.MKIVA003.ORG
08/15/02	08:25a	13,040	CORE.MKIVA005.ORG
08/15/02	08:25a	13,122	CORE.MKIVA007.ORG
08/15/02	08:25a	13,204	CORE.MKIVA010.ORG
08/15/02	08:25a	13,368	CORE.MKIVA015.ORG
08/15/02	08:25a	13,450	CORE.MKIVA020.ORG
08/15/02	08:25a	13,450	CORE.MKIVA025.ORG
08/15/02	08:25a	13,532	CORE.MKIVA030.ORG
08/15/02	08:25a	13,614	CORE.MKIVA040.ORG
08/15/02	08:25a	13,614	CORE.MKIVA050.ORG
08/15/02	08:25a	13,860	CORE.MKIVA070.ORG
08/15/02	08:25a	13,943	CORE.MKIVA100.ORG
08/15/02	08:25a	14,025	CORE.MKIVA115.ORG
08/15/02	08:25a	14,025	CORE.MKIVA130.ORG
08/15/02	08:25a	14,271	CORE.MKIVA200.ORG
08/15/02	08:25a	14,353	CORE.MKIVA250.ORG
08/15/02	08:25a	14,435	CORE.MKIVA300.ORG
08/15/02	08:25a	14,435	CORE.MKIVA360.ORG
08/15/02	08:25a	1,154	CORE.MKIVB000.ORG
08/15/02	08:25a	12,634	CORE.MKIVB001A.ORG
08/15/02	08:25a	12,717	CORE.MKIVB002.ORG
08/15/02	08:25a	12,962	CORE.MKIVB003.ORG
08/15/02	08:25a	13,044	CORE.MKIVB005.ORG
08/15/02	08:25a	13,126	CORE.MKIVB007.ORG
08/15/02	08:25a	13,208	CORE.MKIVB010.ORG
08/15/02	08:25a	13,372	CORE.MKIVB015.ORG
08/15/02	08:25a	13,454	CORE.MKIVB020.ORG
08/15/02	08:25a	13,454	CORE.MKIVB025.ORG
08/15/02	08:25a	13,536	CORE.MKIVB030.ORG
08/15/02	08:25a	13,618	CORE.MKIVB040.ORG
08/15/02	08:25a	13,618	CORE.MKIVB050.ORG
08/15/02	08:25a	13,864	CORE.MKIVB070.ORG
08/15/02	08:26a	13,947	CORE.MKIVB100.ORG
08/15/02	08:26a	14,029	CORE.MKIVB115.ORG
08/15/02	08:26a	14,029	CORE.MKIVB130.ORG
08/15/02	08:26a	14,275	CORE.MKIVB200.ORG
08/15/02	08:26a	14,357	CORE.MKIVB250.ORG
08/15/02	08:26a	14,439	CORE.MKIVB300.ORG
08/15/02	08:26a	14,439	CORE.MKIVB360.ORG
08/15/02	08:26a	1,150	CORE.MKIVC000.ORG
08/15/02	08:26a	12,630	CORE.MKIVC001A.ORG

08/15/02	08:26a	12,713	CORE.MKIVC002.ORG
08/15/02	08:26a	12,958	CORE.MKIVC003.ORG
08/15/02	08:26a	13,040	CORE.MKIVC005.ORG
08/15/02	08:26a	13,122	CORE.MKIVC007.ORG
08/15/02	08:26a	13,204	CORE.MKIVC010.ORG
08/15/02	08:26a	13,368	CORE.MKIVC015.ORG
08/15/02	08:26a	13,450	CORE.MKIVC020.ORG
08/15/02	08:26a	13,450	CORE.MKIVC025.ORG
08/15/02	08:26a	13,532	CORE.MKIVC030.ORG
08/15/02	08:26a	13,614	CORE.MKIVC040.ORG
08/15/02	08:26a	13,614	CORE.MKIVC050.ORG
08/15/02	08:26a	13,860	CORE.MKIVC070.ORG
08/15/02	08:26a	13,943	CORE.MKIVC100.ORG
08/15/02	08:26a	14,025	CORE.MKIVC115.ORG
08/15/02	08:26a	14,025	CORE.MKIVC130.ORG
08/15/02	08:26a	14,271	CORE.MKIVC200.ORG
08/15/02	08:26a	14,353	CORE.MKIVC250.ORG
08/15/02	08:26a	14,435	CORE.MKIVC300.ORG
08/15/02	08:26a	14,435	CORE.MKIVC360.ORG
08/15/02	08:26a	732	CORE.SPE000.ORG
08/15/02	08:26a	10,982	CORE.SPE001A.ORG
08/15/02	08:26a	10,983	CORE.SPE002.ORG
08/15/02	08:26a	11,146	CORE.SPE003.ORG
08/15/02	08:26a	11,310	CORE.SPE005.ORG
08/15/02	08:26a	11,392	CORE.SPE007.ORG
08/15/02	08:26a	11,392	CORE.SPE010.ORG
08/15/02	08:26a	11,474	CORE.SPE015.ORG
08/15/02	08:26a	11,474	CORE.SPE020.ORG
08/15/02	08:26a	11,474	CORE.SPE025.ORG
08/15/02	08:26a	11,474	CORE.SPE030.ORG
08/15/02	08:26a	11,556	CORE.SPE040.ORG
08/15/02	08:26a	11,556	CORE.SPE050.ORG
08/15/02	08:26a	11,638	CORE.SPE070.ORG
08/15/02	08:26a	11,803	CORE.SPE100.ORG
08/15/02	08:26a	11,803	CORE.SPE125.ORG
08/15/02	08:26a	11,885	CORE.SPE150.ORG
08/15/02	08:26a	11,967	CORE.SPE200.ORG
08/15/02	08:26a	12,131	CORE.SPE250.ORG
08/15/02	08:26a	12,213	CORE.SPE300.ORG
08/15/02	08:26a	12,213	CORE.SPE320.ORG
08/15/02	08:26a	738	CORE.SPNA000.ORG
08/15/02	08:26a	10,988	CORE.SPNA001A.ORG
08/15/02	08:26a	11,071	CORE.SPNA002.ORG
08/15/02	08:26a	11,152	CORE.SPNA003.ORG
08/15/02	08:26a	11,316	CORE.SPNA005.ORG
08/15/02	08:26a	11,398	CORE.SPNA007.ORG
08/15/02	08:26a	11,398	CORE.SPNA010.ORG
08/15/02	08:26a	11,480	CORE.SPNA015.ORG
08/15/02	08:26a	11,480	CORE.SPNA020.ORG
08/15/02	08:26a	11,480	CORE.SPNA025.ORG
08/15/02	08:26a	11,562	CORE.SPNA030.ORG
08/15/02	08:26a	11,562	CORE.SPNA040.ORG
08/15/02	08:26a	11,562	CORE.SPNA050.ORG
08/15/02	08:26a	11,726	CORE.SPNA070.ORG
08/15/02	08:26a	11,809	CORE.SPNA100.ORG
08/15/02	08:26a	11,809	CORE.SPNA125.ORG
08/15/02	08:26a	11,891	CORE.SPNA150.ORG
08/15/02	08:26a	12,055	CORE.SPNA200.ORG
08/15/02	08:26a	12,219	CORE.SPNA250.ORG
08/15/02	08:26a	12,219	CORE.SPNA300.ORG
08/15/02	08:26a	12,219	CORE.SPNA320.ORG
08/15/02	08:26a	742	CORE.SPNB000.ORG
08/15/02	08:26a	10,992	CORE.SPNB001A.ORG

```
08/15/02  08:26a                11,075 CORE.SPNB002.ORG
08/15/02  08:26a                11,156 CORE.SPNB003.ORG
08/15/02  08:26a                11,320 CORE.SPNB005.ORG
08/15/02  08:26a                11,402 CORE.SPNB007.ORG
08/15/02  08:26a                11,402 CORE.SPNB010.ORG
08/15/02  08:26a                11,484 CORE.SPNB015.ORG
08/15/02  08:26a                11,484 CORE.SPNB020.ORG
08/15/02  08:26a                11,484 CORE.SPNB025.ORG
08/15/02  08:26a                11,566 CORE.SPNB030.ORG
08/15/02  08:26a                11,566 CORE.SPNB040.ORG
08/15/02  08:26a                11,566 CORE.SPNB050.ORG
08/15/02  08:26a                11,730 CORE.SPNB070.ORG
08/15/02  08:26a                11,813 CORE.SPNB100.ORG
08/15/02  08:26a                11,813 CORE.SPNB125.ORG
08/15/02  08:26a                11,895 CORE.SPNB150.ORG
08/15/02  08:26a                12,059 CORE.SPNB200.ORG
08/15/02  08:26a                12,223 CORE.SPNB250.ORG
08/15/02  08:26a                12,223 CORE.SPNB300.ORG
08/15/02  08:26a                12,223 CORE.SPNB320.ORG
08/15/02  08:26a                   738 CORE.SPNC000.ORG
08/15/02  08:26a                10,988 CORE.SPNC001A.ORG
08/15/02  08:26a                11,071 CORE.SPNC002.ORG
08/15/02  08:26a                11,152 CORE.SPNC003.ORG
08/15/02  08:26a                11,316 CORE.SPNC005.ORG
08/15/02  08:26a                11,398 CORE.SPNC007.ORG
08/15/02  08:26a                11,398 CORE.SPNC010.ORG
08/15/02  08:26a                11,480 CORE.SPNC015.ORG
08/15/02  08:26a                11,480 CORE.SPNC020.ORG
08/15/02  08:26a                11,480 CORE.SPNC025.ORG
08/15/02  08:26a                11,562 CORE.SPNC030.ORG
08/15/02  08:26a                11,562 CORE.SPNC040.ORG
08/15/02  08:26a                11,562 CORE.SPNC050.ORG
08/15/02  08:26a                11,726 CORE.SPNC070.ORG
08/15/02  08:26a                11,809 CORE.SPNC100.ORG
08/15/02  08:26a                11,809 CORE.SPNC125.ORG
08/15/02  08:26a                11,891 CORE.SPNC150.ORG
08/15/02  08:26a                12,055 CORE.SPNC200.ORG
08/15/02  08:26a                12,219 CORE.SPNC250.ORG
08/15/02  08:26a                12,219 CORE.SPNC300.ORG
08/15/02  08:26a                12,219 CORE.SPNC320.ORG
09/05/02  04:05p                 9,286 CORE.TH1.ORG
12/06/00  05:57p        <DIR>          dk
06/07/02  07:39p                   160 fort.3.mk1a
06/07/02  07:41p                   162 fort.3.mkiv
07/24/02  09:18a                 1,620 fort.3.spe
07/24/02  09:53a                 1,621 fort.3.spn
09/04/02  04:43p                    80 fort.3.th
06/07/02  09:23p               278,843 FT27F001rev1
07/22/02  01:42p               278,830 ft27f001rev2
07/19/02  02:13p               183,210 mkiai.20020719
07/19/02  02:16p               183,210 mkiao.20020719
07/19/02  02:16p               183,210 mkivi.20020719
07/19/02  02:16p               183,210 mkivo.20020719
12/06/00  05:57p        <DIR>          old
08/08/02  02:12p        <DIR>          oldxs
11/27/96  11:30a               265,783 orig21
07/24/02  11:05a                 9,171 origdict.clad
07/24/02  11:05a                 9,392 origdict.combo
08/07/02  09:02a                 9,171 origdict.core
07/24/02  01:29p                   359 subtype.20020724
03/24/99  05:31p                   319 subtype.june2002
03/29/99  05:07p               334,310 unified6.prn
09/12/02  04:50p               403,302 unified6rep.prn
```

```
08/07/02  08:07a        <DIR>          v30
12/06/00  05:57p        <DIR>          valid1
08/21/02  03:55p                     0 valid1.PRN
             723 File(s)      9,853,599 bytes
                          1,074,720,768 bytes free
```

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APPENDIX G

DKPRO VERSION 3.0 USER'S GUIDE

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TABLE OF CONTENTS

G1.0 INTRODUCTION G-5

G2.0 DKPRO OPERATION G-6

G3.0 DKPRO INPUT FILES G-7

G3.1 STANDARD INPUT FILE G-7
G3.2 PROCESS DIRECTIVE FILE G-8
G3.3 SUMMARY DIRECTIVE FILE G-8
G3.4 FUEL HISTORY FILE G-8
G3.5 FUEL DICTIONARY FILE G-8
G3.6 FUEL SUBTYPE FILE G-9
G3.7 FUEL NUCLIDE INVENTORY FILES G-10
G3.8 DECAY LIBRARY FILE G-11
G3.9 AUXILIARY DECAY LIBRARY FILE G-11

G4.0 DKPRO OUTPUT FILES G-11

G4.1 OUTPUT TO SCREEN G-11
G4.2 OUTPUT FILE G-11
G4.3 SUMMARY FILE G-11
G4.4 PROCESS LOG FILE G-12
G4.5 LIBRARY LOG FILE G-12

G5.0 DIRECTIVES G-12

G5.1 INPUT DIRECTIVES G-12
G5.1.1 DECAY G-13
G5.1.2 DICTIONARY G-13
G5.1.3 FILE G-13
G5.1.4 FORMAT G-13
G5.1.5 MODIFY G-14
G5.1.6 OUTPUT G-14
G5.1.7 PATH G-14
G5.1.8 RECORD G-15
G5.1.9 SPLIT G-15
G5.1.10 SUBTYPE G-15
G5.1.11 UNIT G-15

G5.2 PROCESS DIRECTIVES G-16
G5.2.1 DECAY G-16
G5.2.2 FINAL G-16
G5.2.3 PROCESS G-17
G5.2.4 REPROCESS G-17
G5.2.5 SCALE G-18
G5.2.6 SELECT G-18
G5.2.7 SPLIT G-18

G5.3 SUMMARY DIRECTIVES G-18
G5.3.1 PLANT G-19
G5.3.2 STIME G-19
G5.3.3 SUMMARY G-20
G5.3.4 TIME G-20

G6.0 REFERENCES G-20

ATTACHMENTS

ATTACHMENT A. FUEL HISTORY FILE FORMAT GA-1

ATTACHMENT B. EXAMPLE DKPRO INPUT AND OUTPUT FILES GB-1

ATTACHMENT C. SPLIT 7 – A CODE FOR CONVERTING ORIGEN OUTPUT TO DKPRO INPUT GC-1

ATTACHMENT D. EXTRACT – A CODE FOR EXTRACTING CLAD COMPOSITION DATA FROM FUEL AND FUEL/CLAD COMBINATION DATA GD-1

ATTACHMENT E. COMBINE – A CODE FOR COMBINING THE PRIMARY OUTPUT STEAM OF ONE DKPRO RUN WITH THE SECONDARY OUTPUT OF ANOTHER GE-1

G1.0 INTRODUCTION

This document serves to describe the use of the DKPRO code, version 3.1. It is based on HNF-SD-WM-CSWD-082, Rev. 0 (Wootan and Schmittroth 1997), which dealt with version 1.0 of the code (versions 2.0 and 3.0 were never formally released).

The DKPRO code solves the general problem of modeling complex nuclear waste streams using ORIGEN2 (Croff 1980, Wittekind 1994) radionuclide production files. There is a continuing need for estimates of Hanford Site radionuclide inventories in various waste streams. Physical measurements provide one method of determining nuclide inventories, however this is an expensive approach and vulnerable to heterogeneity in the waste. Calculational estimates, the approach represented here, provide an alternative method of determining the inventories. Given a known nuclear fuel history, it is relatively straightforward to calculate radionuclide inventories with codes such as the widely used Oak Ridge National Laboratory code ORIGEN2. However, the Hanford Site waste tanks typically contain mixtures of various waste streams coming from different fuel types and different separation processes. Resolving this complex history into predicted inventories for a particular tank would be an extremely time consuming process using ORIGEN2 alone. There is a need, therefore, for a method to easily and efficiently model these processes. As a response to this need, the DKPRO code was developed. This code takes ORIGEN2 calculated initial radionuclide inventories for each fuel discharge and then applies subsequent decay and reprocessing activities as appropriate.

This approach has already been implemented in another context by the RADNUC (Schwarz 1995) code, which has been used to estimate radionuclide inventories in the Hanford Site waste tanks and spent-fuel in the K-Basins. While RADNUC could be modified to treat the more general problem addressed here, much of the RADNUC code includes specific assumptions and approximations that limit its extension.

The DKPRO code uses the decay and transmutation subroutine from ISOCALC (Schmittroth 1995). Unlike RADNUC, the decay and transmutation chains are solved completely and can use the same nuclear data as ORIGEN2 assuring consistency with ORIGEN2 calculations. Another design advantage of DKPRO is the inclusion of ORIGEN2-based initial inventories in external files that can be easily added or changed without the need for code modifications.

The DKPRO code, used in conjunction with the ORIGEN2 code, provides an efficient method for modeling radionuclide generation, decay, and reprocessing. The capability to simplify complex processes and the flexibility of this method allow for many potential applications. The primary intended application of the DKPRO code is in the generation of input for global radionuclide inventory estimates for Hanford Site tank wastes. The inclusion in one code of the whole process of generating global tank inventories, from radionuclide generation and decay through reprocessing, provides opportunities for easy sensitivity studies and evaluation of what-if scenarios for global tank inventories. The global inventories can also be categorized by

reprocessing plant and by specified time periods. In addition to the cumulative totals, inventory listings are produced for each of the discharge records in the fuel history data file.

The radionuclide inventories generated by the DKPRO code are entirely dependent on the assumptions and accuracy of the historical data represented by the input parameters. These parameters include fuel history, fuel and cladding compositions and impurities, and the effects of the various waste reprocessing splits and recovery factors. The inventories are also dependant on the physical parameters (such as half-lives and cross sections) included in the ORIGEN2 data libraries. Varying any of these parameters can significantly impact the DKPRO results.

The version 3.1 release of DKPRO differs from the previous version primarily in its ability to differentiate between primary and secondary streams (resulting from the "split" directive) when executing the "reprocess" directive (i.e., different reprocessing factors can be applied to the different streams). The version 3.1 documentation also covers modifications that were originally labeled as versions 3.0 and 2.0 but were never formally released. Version 3.0 was a port to the Intel/NT operating environment. At the same time, a number of cosmetic modifications were added to the code output (such as time/date stamps, input echoes, etc.) to facilitate validation and configuration control. Version 2.0 added the 'subtype' process directive, and implemented Y2K compliance updates.

Verification and validation of DKPRO version 3.1 is described in a separate document (Finfrock 2002).

G2.0 DKPRO OPERATION

The DKPRO code is executed with the command:

```
dkpro31.exe < input_file
```

The file referred to as 'input_file' (it can have any name the user desires) is read in by redirecting it to the standard input.

User-supplied input instructions (hereafter referred to as directives), which control the general operation of the code, are provided through the standard input and two input files: a file of processing directives (process.dir), and a file of summary directives (summary.dir). In addition, there are several library files that provide necessary input to the code but are not generally changed from case to case. These include an archive file of fuel history records, a set of nuclide inventory files for specific fuel types at various burnups, a dictionary file that correlates fuel types to the inventory files, a subtype file that allows fuel type compositions to be varied over time, and the ORIGEN2 decay library file. All of these files are described in Section G3.0.

The basic function of the DKPRO code is to read the fuel history file and process each record as specified by various input instructions. The results of the processing of all of the records are then summarized (again, as specified by the input instructions) and in various formats in the output files.

Processing an individual record begins with reading the fuel type, mass, date, plant of origin, and burnup from the fuel history file. The burnup is used to interpolate between the nuclide inventory files, which contain the initial normalized nuclide inventories corresponding to the fuel types at a few select burnup levels. The resulting normalized values are then multiplied by the amount of discharged fuel to create an inventory of nuclides corresponding to the fuel record.

The inventory is then processed by a set of user-supplied directives (from the file process.dir) that describe decay and reprocessing steps.

After all of the records have been processed, two output files are created that report the results ("output" and "runlog"). First, for each fuel record, processed inventories are written to the "output" file for each of the nuclides selected by input directive. Second, a summary output, controlled by directives given in the file 'summary.dir', is written to the file "runlog". The summary output can be very useful in providing global checks on the validity of the calculation.

Additionally, two log files are generated that give more detailed information on operations performed by the code. The process log file records processing operations conducted on each record. The library log file records the nuclides accessed while processing the fuel records.

A note on time conventions: Dates given in the format month/year are used in several places in DKPRO. For example "1/91" represents the beginning of January 1991. Internally these dates are converted into the number of days past January 1, 1920. Two digit or four digit year values can be used. Four digit year values are recommended but two digit values are supported for historical compatibility. Two digit year values that are less than 20 are interpreted as being in the 21st century (e.g., 15 represents 2015) and two digit year values that range from 20 to 99 are assumed to be in the 20th century (e.g., 65 represents 1965).

G3.0 DKPRO INPUT FILES

DKPRO uses a number of input files to guide the calculation and to provide look-up tables of data. The code expects to find all of these files in the working directory however alternate locations can be indicated by input directive. Several of these files (as indicated below) are included in the DKPRO standard library. The DKPRO standard library is the set of input data files, including the fuel history and Origen fuel type files that typically are not changed. These files are documented in the DKPRO verification and validation document. Examples of most of the input files are included in the attachments.

G3.1 STANDARD INPUT FILE

The Standard Input Directive file is a free-format keyword-driven text file that provides some basic parameters for the calculation. Note that while these directives are read from the standard input that, in principle, could be entered directly from the keyboard, the code will not work correctly unless they are included in a file that is redirected to the standard input. Typical input

directives include specifying the names and locations of the various input files, the format of the fuel history file, and the units of the calculation. Input directives are described in detail in Section G5.1.

G3.2 PROCESS DIRECTIVE FILE

The Process Directive file (named 'process.dir') is a free-format keyword-driven text file that governs how the records in the fuel history file are processed. Typical process directives include specifying decay times and which plants will be processed. Process directives are described in detail in Section G5.2.

G3.3 SUMMARY DIRECTIVE FILE

The Summary Directive file (named 'summary.dir') is a free-format keyword-driven text file that governs how the calculated inventories, resulting from the processing of the records in the fuel history file, are summarized for output. Typical summary directives allow different combinations of the inventories corresponding to different plants and time periods to be summed and written to the standard output. Summary directives are discussed in detail in Section G5.3.

G3.4 FUEL HISTORY FILE

The fuel history file is an archive file that is included as part of the DKPRO standard library and is generally not changed. Each record of the fuel history file corresponds to a batch of fuel that has been processed at one of the reprocessing plants, or a batch of fuel that has been discharged from a reactor. Each line includes the amount of fuel, the discharge date, the fuel type, and the specific burnup. Detailed fuel history file formats are described in Attachment A.

G3.5 FUEL DICTIONARY FILE

The fuel dictionary file provides a look-up table that relates fuel types from the fuel history file to fuel nuclide inventory files. Each record in the fuel history file corresponds to a particular fuel type, and each fuel type must correspond to an inventory file that contains normalized nuclide inventories for the specified fuel type at a given burnup. This file is included as part of the standard DKPRO library and only needs to be changed if additional inventory files are added (e.g., for finer burnup resolution or to add fuel subtypes). Note that the fuel subtype file (see Section G3.6), if present, may override the fuel type indicated in the fuel history file.

Fuel dictionary file record format:

'fueltype' burnup 'filename'

where:

fueltype = The fuel type name (from the fuel history file), maximum of 20 characters, must be enclosed in quotes (e.g., 'ZR-2.1U').

burnup = The burnup value (in MWD/MT) associated with the given inventory file.

filename = The name (optionally including the path) of the fuel nuclide inventory file. The filename must be no longer than 80 characters and must be enclosed in quotes. If the path is not included, and the input directive 'PATH' is to be used, then the combination of the filename and the path name cannot exceed 80 characters.

G3.6 FUEL SUBTYPE FILE

The fuel subtype file is an optional input file that allows finer resolution of fuel types. This makes it possible to add additional fuel types without altering the fuel history file. In this file, one or more fuel types may be specified along with a subtype name and a range of discharge dates for which that fuel type should be replaced with the subtype. If the fuel type and date from a given record in the fuel history file match an entry in the fuel subtype file, then the subtype name is applied. If a subtype name has been assigned, then the fuel nuclide inventory file indicated for that subtype in the fuel dictionary file is used, otherwise the inventory file specified for the fuel type is used.

Fuel subtype file record format:

'fueltype' startyear startmonth startday endyear endmonth endday 'subfueltype'

where:

fueltype = The fuel type name (from the fuel history file), maximum of 20 characters, must be enclosed in quotes (e.g., 'ZR-2.1U').

startyear = The year (expressed as a 4 digit integer) corresponding to the beginning of the time period of applicability for the subtype.

startmonth = The month (expressed as a 1 or 2 digit integer) corresponding to the beginning of the time period of applicability for the subtype.

startday = The day (expressed as a 1 or 2 digit integer) corresponding to the beginning of the time period of applicability for the subtype. Typically, this has the value '1'.

endyear = The year (expressed as a 4 digit integer) corresponding to the end of the time period of applicability for the subtype.

endmonth = The month (expressed as a 1 or 2 digit integer) corresponding to the end of the time period of applicability for the subtype.

endday = The day (expressed as a 1 or 2 digit integer) corresponding to the end of the time period of applicability for the subtype. This is typically the last day of the month.

subtype = The fuel subtype name, maximum of 20 characters, must be enclosed in quotes (e.g., 'ZR-2.1Ua').

An example fuel subtype entry is shown below:

```
'NAT-U'  1943 1 1  1958 12 31  'NAT-UA'
'NAT-U'  1959 1 1  1980 12 31  'NAT-UB'
```

The first line indicates that any fuel records with a fuel type of 'NAT-U' and a date from 1/1/1943 through 12/31/1958 will have a subtype of 'NAT-UA'. The second line indicates that any fuel records with a fuel type of 'NAT-U' and a date from 1/1/1959 through 12/31/1980 will have a subtype of 'NAT-UB'. Any records with a fuel type of 'NAT-U' that do not fall within these date ranges, and any records with a different fuel type, will not have a subtype assigned.

The corresponding fuel dictionary file entry:

```
'NAT-U'  800  'SP800.ORG'
'NAT-UA' 800  'SP800A.ORG'
'NAT-UB' 800  'SP800B.ORG'
```

G3.7 FUEL NUCLIDE INVENTORY FILES

Fuel nuclide inventory files contain the normalized inventory of each of the nuclides present in a given fuel type for a given burnup. A fuel nuclide inventory file must be present (and referenced in the fuel dictionary file) for each fuel type in the fuel history file. If burnup is to be accounted for (as is typically the case), then at least three files must be present for each fuel type, corresponding to different burnup levels (which DKPRO interpolates on).

The fuel nuclide inventory files are produced with ORIGEN2 using the PCH command (an example ORIGEN2 input file is included in Wootan and Schmittroth (1997). ORIGEN2 creates an output file called fort.7 that includes the nuclide inventory information for the given fuel type and burnup. This file must have a title line added to beginning before it can be used with DKPRO. The title line should include a date and unique identifier for configuration control. The file is then typically given a representative name (e.g., mkiv800.org) for use with DKPRO.

These inventory files are included as part of the DKPRO standard library and are not typically modified.

G3.8 DECAY LIBRARY FILE

The decay library file is taken directly from the ORIGEN2 library. This file provides nuclide half-life and decay parameters. The file is included as part of the DKPRO standard library and should not be modified (but see Section G3.9).

G3.9 AUXILIARY DECAY LIBRARY FILE

The auxiliary decay library file is an optional file that identifies changes to the parameters in the decay library data. Any data provided in this file overrides the data in the decay library file. The file is created by copying the lines pertaining to the nuclides of interest from the decay library file to the auxiliary file and changing the parameters as desired.

G4.0 DKPRO OUTPUT FILES

G4.1 OUTPUT TO SCREEN

DKPRO prints a variety of status messages and other information regarding the calculation to the screen. This includes version identifiers for the code and library files and a summary of the results.

G4.2 OUTPUT FILE

DKPRO creates a file called 'output' that contains selected results of the calculations. Each record from the fuel history file, that matches one of the process blocks in the process directive file, is echoed to the output file. The fuel batch information from the fuel history file is followed by the amount of each selected nuclide determined to be present in the fuel batch (after processing) represented by that record.

G4.3 SUMMARY FILE

DKPRO creates a summary output file (called 'runlog') that contains an echo of all of the input directives, a series of status statements (such as when accessing the various input files), and a final summary of all of the nuclides present in the calculation.

G4.4 PROCESS LOG FILE

DKPRO creates a process log file (named 'process.log'). Each record in the fuel history file is echoed to this file, followed by a summary of the process directives to be applied to that record. DKPRO also prints a statement to this file every time one of the nuclide inventory files is opened.

G4.5 LIBRARY LOG FILE

DKPRO creates a log file (named 'library.log') that keeps a record of all parent/daughter nuclides accessed from the decay library file.

G5.0 DIRECTIVES

Detailed descriptions of DKPRO directives are given in this section. Directives are input instructions that consist of keywords recognized by the code, which may be followed by parameters that further describe their action. There may be no more than one directive per line of input. Directives may be of any length but only the first three letters are significant. Only the first 80 characters on any input line are used. Keywords are separated by one or more blank spaces and they may be entered in either upper or lower case. The '#' symbol is used to indicate a comment and any characters after a '#' (on the same line) are skipped. The '%' symbol is a special 'end-of-record' marker and should not be used. Most other miscellaneous characters, such as parentheses and commas, are ignored and may be used to improve readability of the input.

In the following description of the directives, the keyword is shown in bold type, required parameters are shown in normal type, and optional parameters are enclosed in brackets []. The symbol '[repeat]' is used to signify that the previous parameters may appear multiple times. There are three distinct categories of directives: input directives, process directives, and summary directives. The directive types are described in Sections G5.1, G5.2, and G5.3, respectively.

G5.1 INPUT DIRECTIVES

Input directives specify general assumptions used in the calculation (such as units). They are given through the standard input, which is typically redirected from a file, as shown in the command line at the beginning of Section G2.0. All input directives are optional; however, an input directive file (even if empty) must be redirected to the standard input.

G5.1.1 DECAY

Command line format: **DECAY** file_name

Example of use: **DECAY** ft27f001rev2.

The DECAY directive changes the default decay library file name from 'orig21' to the name given as the file_name parameter. Optionally, the file_name parameter may include a path description. The file_name parameter cannot exceed 80 characters. If the file name is used in conjunction with the **PATH** directive, then the combination of the file name and the path cannot exceed 80 characters.

G5.1.2 DICTIONARY

Command line format: **DICTIONARY** file_name

Example of use: **DICTIONARY** ft27f001rev2.

The DICTIONARY directive changes the default fuel dictionary file name from 'origdict' to the name given as the file_name parameter. Optionally, the file_name parameter may include a path description. The file_name parameter cannot exceed 80 characters. If the file name is used in conjunction with the **PATH** directive, then the combination of the file name and the path cannot exceed 80 characters.

G5.1.3 FILE

Command line format: **FILE** file_name

Example of use: **FILE** unified6rep.prn

The FILE directive changes the default fuel history file name from 'archive.dat' to the name given as the file_name parameter. Optionally, the file_name parameter may include a path description. The file_name parameter cannot exceed 80 characters. If the file name is used in conjunction with the **PATH** directive, then the combination of the file name and the path cannot exceed 80 characters.

G5.1.4 FORMAT

Command line format: **FORMAT** format_type

This directive informs the code that the format of the fuel history file will not be the default format. The valid values for format_type are 'DFLT', 'HAPO' and 'LANL'. DFLT is the

default. The HAPO format is distinguished by dates given in HAPO days (rather than the default of month and year). The LANL format is used to support work with Los Alamos National Laboratory. See Attachment A for detailed descriptions of each of the formats.

G5.1.5 MODIFY

Command line format: **MODIFY** file_name

Example of use: **MODIFY** ft27f001rev2.alternate_pu

The MODIFY directive specifies the (optional) decay library modification file name. Optionally, the file_name parameter may include a path description. The file_name parameter cannot exceed 80 characters. If the file name is used in conjunction with the **PATH** directive, then the combination of the file name and the path cannot exceed 80 characters.

G5.1.6 OUTPUT

Command line format: **OUTPUT** symbol [repeat]

Example of use: OUTPUT H3 C14 NI59 CO60 NI63
SE79 SR90 Y90 ZR93 NB93* TC99 RU106

The OUTPUT directive causes the final nuclide inventory for selected nuclides to be written to the output file 'output'. The symbol parameter is an element designator followed by the atomic mass and an optional "*" for metastable states (e.g., Ba137* representing ^{137*}Ba). The symbol parameter may be repeated as needed (up to a maximum of 500 entries, occupying as many lines as necessary).

G5.1.7 PATH

Command line format: **PATH** library_directory

Example of use: **PATH** p:\dkpro\lib

This directive specifies a directory that contains the DKPRO library files. If this directive is not specified, then the library files must be located in the working directory. If this directive is used, it may be overridden for individual files simply by including those files in the working directory. If the archive file name (specified with the **FILE** directive), or any of the ORIGEN2 fuel type file names (specified in the fuel dictionary file), include a directory path then that will override the **PATH** directive as well. The files affected by this directive are: the fuel history file, the fuel dictionary file, the fuel subtype file, the fuel nuclide inventory files (typically, *fueltype*.org), and the ORIGEN2 decay library files.

G5.1.8 RECORD

Command line format: **RECORD** maxrecord

Example of use: **RECORD** 100

The **RECORD** directive is used to limit the number of records to be read from the fuel history file. The default is 100000.

G5.1.9 SPLIT

Command line format: **SPLIT**

Example of use: **SPLIT**

The SPLIT directive causes two sets of nuclides representing primary and secondary waste streams to be output. It is to be used in conjunction with the same directive given in the process directive file (see Section G5.2). Its purpose is to inform the code, before the process directive file is read, that splitting will be invoked.

G5.1.10 SUBTYPE

Command line format: **SUBTYPE** file_name

Example of use: **SUBTYPE** subtype.20020724

The SUBTYPE directive specifies the (optional) fuel subtype file. Optionally, the file_name parameter may include a path description. The file_name parameter cannot exceed 80 characters. If the file name is used in conjunction with the **PATH** directive, then the combination of the file name and the path cannot exceed 80 characters.

G5.1.11 UNIT

Command line format: **UNIT** units

Example of use: **UNIT** grams

The UNIT directive changes the output units from curies (the default) to those specified by the units parameter. Valid entries are CURIES, G-A (for gram-atom mols), GRAMS, and WATTS.

G5.2 PROCESS DIRECTIVES

Process directives serve as the primary inputs that determine the nature of a particular DKPRO case. Process directives are provided to the code in the process directive file (see Section G3.2).

Two directives, **FINAL** and **SELECT**, must appear before any others if they are used.

Following the **FINAL** and/or **SELECT** directives (if present) may be any number of 'process blocks'. Each block specifies a particular plant or facility and the type of processes that are to be applied to fuel records associated with that plant. The process block begins with a **PROCESS** directive and ends when the next **PROCESS** directive (or the end of the file) is encountered.

The remaining directives (all those other than **FINAL**, **SELECT**, and **PROCESS**) can occur only within a process block and pertain only to the process block(s) within which they occur. These directives generally correspond to a physical process such as a cooling time, clad separation, or fuel reprocessing, and must be specified in the order they actually occurred in order to get the correct results.

If more than one process block is specified that will match the same fuel history record, only the first will be used.

At least one process block must be present.

The individual process directives are described below:

G5.2.1 DECAY

Command line format: **DECAY** time [units]

Example of use: **DECAY** 100 d

This directive specifies that the fuel associated with the current process block will be decayed for the specified time. The time value may be followed by a unit's character (s, d, or y corresponding to seconds, days, or years). 'Seconds' is the default. The parameter time may be replaced by the keyword **GIVEN** ('units' would not be used in this case). In this case the cooling time, in days, is taken from the fuel history file. Use of the **GIVEN** keyword for fuel history file formats other than 'LANL' will result in specifying a decay time of 0.0 s.

G5.2.2 FINAL

Command line format: **FINAL** month year

Example of use: **FINAL** 1 1991

All inventories (associated with all of the process blocks) are decayed to the first day of the month and year specified, following all other requested processing. The month parameter is an integer from 1 to 12. The year parameter should be specified as a four-digit integer. In order to support legacy cases, a two-digit integer is allowed but its interpretation is non-standard (see the note on time conventions in Section G2.0). This directive must appear only before any **'PROCESS'** directive.

G5.2.3 PROCESS

Command line format: **PROCESS** plant [type]

Example of use: **PROCESS** purex al

Initiates a 'process block' of directives that apply to fuel history file records corresponding to the directive parameters. The 'plant' parameter corresponds to a particular plant (e.g., "PUREX") as specified in the fuel history file record. Alternately, the keyword 'ALL' may be used for 'plant' to select all plants in the fuel history file. The 'type' parameter (if present) specifies a particular fuel type (also corresponding to the fuel history file record) that further restricts the records that the process block is applied to. All records in the fuel history file that have a plant specifier (and type specifier if applicable) that match those specified with the **PROCESS** directive are processed with the directives in the corresponding process block. If the number of characters in "type" is less than the number of characters in the type specified in the fuel history file record, then only the given characters must match (e.g., the type "Al" would match both fuel types Al-0.71U and Al-0.94U). Fuel history file records will only be processed with the first matching process block in the process directives file.

G5.2.4 REPROCESS

Command line format: **REPROCESS** [primary/secondary] [given] ss f [repeat]

Example of use: **REPROCESS** PU 0.01

Isotopic inventories for elements matching the two-character element symbol, 'ss', are multiplied by the fractional recovery coefficient 'f'. The fractional recovery coefficient represents the fractional amount of the element remaining in the waste stream following reprocessing and must be a real number from 0.0 to 1.0. The pair (ss, f) can be repeated as necessary. The directive may be followed by either the keyword 'primary' or 'secondary', indicating that the reprocessing factors given in this directive apply to only the primary or secondary streams of a split directive. In addition, the keyword **GIVEN** can be used in place of an ss,f pair. The **GIVEN** keyword is equivalent to specifying four (ss, f) pairs (for the elements TH, U, NP, and PU). The f values for these pairs are taken from the fuel history record (if the fuel history file is anything other than LANL format the f values are set to 1.0). If a particular element is repeated (including those specified with the **GIVEN** keyword), the last entry takes precedence.

G5.2.5 SCALE

Command line format: **SCALE** scale

Example of use: **SCALE** 2.5

Multiply all nuclide inventories (for the given process block) by 'scale'. The value of 'scale' may be any positive real number.

G5.2.6 SELECT

Command line format: **SELECT** ss [repeat]

Example of use: **SELECT** Cs, U

The initial nuclide list is truncated to the selected elements prior to other processing. The two-character element symbol, ss, is repeated as desired. For example, use "SELECT Cs, U" to select all cesium and uranium isotopes. This action is available to reduce the numbers of computations carried out. This directive must appear only before any **'PROCESS'** directive.

G5.2.7 SPLIT

Command line format: **SPLIT** [other] ss f [repeat]

Example of use: **SPLIT** 0.999 U 0.60

The list of nuclides is split into two streams, primary and secondary. For each element designated by the two-character element symbol, 'ss', a fraction 'f' is assigned to the primary stream and a fraction (1-f) is assigned to the secondary stream. If there is more than one entry for nuclide 'ss,' then the last entry is used. The optional value of "other" is a fraction used for all elements not explicitly identified. The default value of "other" is 1.0. The parameters 'f' and 'other' must be real numbers from 0.0 to 1.0.

Important: The **SPLIT** process directive must be used in conjunction with the input directive of the same name (see Section G5.1); otherwise only the primary list of nuclides is output.

G5.3 SUMMARY DIRECTIVES

Summary directives control the information that is written to the standard output. Typically they are used to provide total inventories from all of the processed fuel history records that fall into a particular category (plant of origin, discharge dates, etc.). Summary directives are read in from the summary directive file (see Section G3.3). Summary directives are specified in groups or summary blocks. Each summary block is initiated with an occurrence of the **'SUMMARY'** directive and ends when the next occurrence of the **'SUMMARY'** directive (or end of file) is

encountered. Each summary block results in a data column written to the standard output. In addition, a 'total' column is printed which sums all of the summary block columns (it is possible for a given batch of fuel to be included in more than one column, in which case the total values will exceed the actual amount of fuel). A maximum of 10 summary blocks can be specified. All summary directives (except for **'SUMMARY'**) can occur only within a summary block (i.e., after an occurrence of the **'SUMMARY'** directive).

All of the summary directives are optional, however no summary data will be printed without at least one summary block. A summary block consisting of only the **'SUMMARY'** directive will result in a column that sums the results of all of the processed fuel history records.

A complete list of summary keywords and their actions are given below:

G5.3.1 PLANT

Command line format: **PLANT** plant [repeat]

Example of use: **PLANT** T B REDOX PUREX

This directive limits the summary block to the processed fuel history records with a plant identifier that is the same as the value of 'plant'. The 'plant' parameter may also have the value 'all', which will cause it to match all plant identifiers. Plant names can be any string (as used in the file history record) except that the first three characters of a plant name must not be the same as the first three characters of any DKPRO directive or keyword.

G5.3.2 STIME

Command line format: **STIME** start_date end_date [repeat]

Example of use: **STIME** 3/1960 1/1964

This directive limits the summary block to the processed fuel history records that have a fuel separation date between start_date and end_date. Each date is in a month/year format such as 3/1945 (or 3 1945) for March 1945 and corresponds to the first day of the month. Two digit year values are also allowed (but see the note on time conventions in Section G2.0). If more than one range of dates is given, then fuel history records will be accepted that agree with any of the given ranges.

The separation date is defined as the discharge date plus the cooling time (see the description of fuel history file formats in Attachment A). Note that if the cooling time is zero (or unavailable) the **STIME** directive will give the same results as the **TIME** directive.

G5.3.3 SUMMARY

Command line format: **SUMMARY** title

Example of use: **SUMMARY** SPR-45

Initiates a new summary block. The resulting column in the standard output has a heading of 'title'. Titles are limited to 12 characters.

G5.3.4 TIME

Command line format: **TIME** start_date end_date [repeat]

Example of use: **TIME** 3/1960 1/1964

This directive limits the summary block to the processed fuel history records that have a fuel discharge date between start_date and end_date. Each date is in a month/year format such as 3/1945 (or 3 1945) for March 1945 and corresponds to the first day of the month. Two digit years are also allowed (but see the note on time conventions in Section G2.0). If more than one range of dates is given, then fuel history records will be accepted that agree with any of the given ranges.

G6.0 REFERENCES

Croff, A. G., 1980, *ORIGEN2- A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code*, ORNL-5621, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Finfrock, S. H., 2002, *DKPRO Version 3.1 Verification and Validation*, Fluor Federal Services, Richland, Washington.

Schmittroth, F., 1995, *ISOCALC: A Decay and Transmutation Code*, WHC-SD-ER-CSWD-0008, Westinghouse Hanford Company, Richland, Washington.

Schwarz, R. A., 1995, *Certification of RADNUC*, WHC-SD-HWV-SWD-001, Westinghouse Hanford Company, Richland, Washington.

Wittekind, W. D., 1994, *Software Certification Package for the ORIGEN2 Code*, WHC-SD-NR-SWD-006, Rev. 0A, Westinghouse Hanford Company, Richland, Washington.

Wootan, D. W., and F. Schmittroth, 1997, *DKPRO: A Radionuclide Decay and Reprocessing Code*, HNF-SD-WM-CSWD-082, Rev. 0, Fluor Daniel Northwest, Richland, Washington.

ATTACHMENT A

FUEL HISTORY FILE FORMAT

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The DKPRO code reads records from the fuel history file to determine the fuel type, discharge date, and burnup of each fuel discharge. Three formats of the fuel history file are supported: a default standard format, a standard HAPO format, and a LANL format used to support work at Los Alamos National Laboratory on estimating radionuclide inventories in Hanford waste tanks.

The non-default formats are used when specified with the input directive **FORMAT**.

Standard format (default)

For the first format, archive records consist of the following fields and are read with the indicated Fortran format statement:

Fields: IMON, IYR, TYPE, BU, PLANT, XMWD
Format: (2I6, 3X, A8, F6.0, 3X, A6, E11.3),

where

IMON	= Month fuel was discharged
IYR	= Year fuel was discharged
TYPE	= Fuel type
BU	= Specific burnup, MWd/MTU
PLANT	= Process plant or reactor identifier
XMWD	= Amount of discharged fuel, in MWD.

(Note that the amount of fuel could be in other units such as metric tons of uranium as long as the normalized ORIGEN2 inventories are computed on a consistent basis.)

An alternative format, identified as 'HAPO' format, consists of the following fields and is read with the indicated format:

Fields: IHAPO, TYPE, PLANT, BU, XMTU
Format: (I6, 1X, A8, A8, F10.1, E12.4),

where

IHAPO	= Number of days between 9/26/44 and the discharge date.
XMTU	= Amount of discharged fuel, MTU,

and the remaining fields have the same meaning as in the default format. Note that the amount of discharged fuel is expressed in MTU instead of total MWd as with the default format.

LANL format

Fuel history records in the LANL format consist of the following fields and are read with the indicated format statement:

Fields: KEY, TYPE, XMTU, PCT240, BU, PLANT,
IMON, IYR, SEPKEY, TCOOL, FTH, FU, FNP, FPU

Format: (F12.0, 1X, A8, 3F11.0, 1X, A8, 2I4, F10.0,
F9.0, 43X, 4F7.0)

where

KEY	= HAPO number of discharge date.
TYPE	= Fuel type
XMTU	= Amount of discharged fuel, MTU
PCT240	= % ^{240}Pu
BU	= Specific burnup, MWd/MTU
PLANT	= Process plant or reactor identifier
IMON	= Separation month
IYR	= Separation year
SEPKEY	= HAPO number of separation date
TCOOL	= Cooling time (time between discharge and separation) in days
FTH	= Thorium fractional recovery
FU	= Uranium fractional recovery
FNP	= Neptunium fractional recovery
FPU	= Plutonium fractional recovery.

The cooling time is used for decay by the "**DECAY** GIVEN" process directive. The fractional recovery coefficients are used by the "**REPROCESS** GIVEN" process directive.

ATTACHMENT B

EXAMPLE DKPRO INPUT AND OUTPUT FILES

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This appendix provides a set of input files for an example DKPRO calculation. The files included are test.inp (redirect to standard input), summary.dir, and process.dir. In addition, excerpts from the corresponding output files are included. In order to run this case the user will need access to the DKPRO standard library files, which must be located in the path specified in the file test.inp.

Standard Input File:

```
#base case

PATH    p:\dkpro\lib

FILE    UNIFIED6REP.PRN

DICTIONARY origdict.core

SUBTYPE subtype.20020724

DECAY ft27f001rev2.

FORMAT  LANL

UNITS  G-A

SPLIT

OUTPUT
   H3      C14     NI59    CO60    NI63
   SE79    SR90    Y90     ZR93    NB93*   TC99   RU106
   CD113*  SB125   SN126   I129    CS134
   CS137   BA137*  SM151   EU152   EU154   EU155
   RA226   AC227   RA228   TH229   PA231
   TH232   U232    U233    U234    U235
   U236    NP237   PU238   U238    PU239   PU240
   AM241   PU241   PU242   CM242   AM243
   CM243   CM244
```

Summary directive file (summary.dir):

```
SUMMARY  T-plant
   PLANT T

SUMMARY  B-plant
   PLANT B

SUMMARY  Redox
   PLANT REDOX

SUMMARY Purex
   PLANT PUREX
```

Process directive file (process.dir):

```
FINAL   1/2001   # Decay to start of 2001 after other steps completed
```

```
PROCESS T AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS T ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS T ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS T ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS B ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS B ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.999
    repro primary given

PROCESS REDOX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS REDOX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS REDOX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.93906  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given
```

```
PROCESS REDOX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.93906  U  0.9928  Th 0.9928  Np 0.9948  Pu 0.9948  Am 0.9948
    repro primary given

PROCESS REDOX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.93906
    repro primary given

PROCESS PUREX AL-0.71U
    decay given          # Use cooling times from archive file
    split 0.999   U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS PUREX AL-0.94U
    decay given          # Use cooling times from archive file
    split 0.999     U  0.99919  Th 0.99919  Np 0.99898  Pu 0.99898  Am 0.99898
    repro primary given

PROCESS PUREX ZR-0.94U
    decay given          # Use cooling times from archive file
    split 0.93906   U  0.986   Th 0.986   Np 0.977   Pu 0.977  Am 0.977
    repro primary given

PROCESS PUREX ZR-1.1U
    decay given          # Use cooling times from archive file
    split 0.93906   U  0.986   Th 0.986   Np 0.977   Pu 0.977  Am 0.977
    repro primary given

PROCESS PUREX ZR-2.1U
    decay given          # Use cooling times from archive file
    split 0.93906   U  0.986   Th 0.986   Np 0.977   Pu 0.977  Am 0.977
    repro primary given

PROCESS PUREX AL-0.0TH
    decay given          # Use cooling times from archive file
    split 0.999     U  0.9794  Th 0.9916
    repro primary given
```

Fuel Dictionary File:

```
'ZR-1.1UA'     19.8  'CORE.MK1AA001A.ORG'
'ZR-1.1UA'     26.4  'CORE.MK1AA002.ORG'
'ZR-1.1UA'     39.6  'CORE.MK1AA003.ORG'
'ZR-1.1UA'     66.0  'CORE.MK1AA005.ORG'
'ZR-1.1UA'     92.4  'CORE.MK1AA007.ORG'
'ZR-1.1UA'    132.0  'CORE.MK1AA010.ORG'
'ZR-1.1UA'    198.0  'CORE.MK1AA015.ORG'
'ZR-1.1UA'    264.0  'CORE.MK1AA020.ORG'
'ZR-1.1UA'    330.0  'CORE.MK1AA025.ORG'
'ZR-1.1UA'    396.0  'CORE.MK1AA030.ORG'
'ZR-1.1UA'    528.0  'CORE.MK1AA040.ORG'
'ZR-1.1UA'    660.0  'CORE.MK1AA050.ORG'
'ZR-1.1UA'    924.0  'CORE.MK1AA070.ORG'
'ZR-1.1UA'   1320.0  'CORE.MK1AA100.ORG'
'ZR-1.1UA'   1518.0  'CORE.MK1AA115.ORG'
'ZR-1.1UA'   1716.0  'CORE.MK1AA130.ORG'
'ZR-1.1UA'   2640.0  'CORE.MK1AA200.ORG'
'ZR-1.1UA'   3036.0  'CORE.MK1AA230.ORG'
'ZR-1.1UA'   3604.0  'CORE.MK1AA273.ORG'
'ZR-1.1UA'   3960.0  'CORE.MK1AA300.ORG'
'ZR-1.1UB'     19.8  'CORE.MK1AB001A.ORG'
'ZR-1.1UB'     26.4  'CORE.MK1AB002.ORG'
```

'ZR-1.1UB'	39.6	'CORE.MK1AB003.ORG'
'ZR-1.1UB'	66.0	'CORE.MK1AB005.ORG'
'ZR-1.1UB'	92.4	'CORE.MK1AB007.ORG'
'ZR-1.1UB'	132.0	'CORE.MK1AB010.ORG'
'ZR-1.1UB'	198.0	'CORE.MK1AB015.ORG'
'ZR-1.1UB'	264.0	'CORE.MK1AB020.ORG'
'ZR-1.1UB'	330.0	'CORE.MK1AB025.ORG'
'ZR-1.1UB'	396.0	'CORE.MK1AB030.ORG'
'ZR-1.1UB'	528.0	'CORE.MK1AB040.ORG'
'ZR-1.1UB'	660.0	'CORE.MK1AB050.ORG'
'ZR-1.1UB'	924.0	'CORE.MK1AB070.ORG'
'ZR-1.1UB'	1320.0	'CORE.MK1AB100.ORG'
'ZR-1.1UB'	1518.0	'CORE.MK1AB115.ORG'
'ZR-1.1UB'	1716.0	'CORE.MK1AB130.ORG'
'ZR-1.1UB'	2640.0	'CORE.MK1AB200.ORG'
'ZR-1.1UB'	3036.0	'CORE.MK1AB230.ORG'
'ZR-1.1UB'	3604.0	'CORE.MK1AB273.ORG'
'ZR-1.1UB'	3960.0	'CORE.MK1AB300.ORG'
'ZR-1.1UC'	19.8	'CORE.MK1AC001A.ORG'
'ZR-1.1UC'	26.4	'CORE.MK1AC002.ORG'
'ZR-1.1UC'	39.6	'CORE.MK1AC003.ORG'
'ZR-1.1UC'	66.0	'CORE.MK1AC005.ORG'
'ZR-1.1UC'	92.4	'CORE.MK1AC007.ORG'
'ZR-1.1UC'	132.0	'CORE.MK1AC010.ORG'
'ZR-1.1UC'	198.0	'CORE.MK1AC015.ORG'
'ZR-1.1UC'	264.0	'CORE.MK1AC020.ORG'
'ZR-1.1UC'	330.0	'CORE.MK1AC025.ORG'
'ZR-1.1UC'	396.0	'CORE.MK1AC030.ORG'
'ZR-1.1UC'	528.0	'CORE.MK1AC040.ORG'
'ZR-1.1UC'	660.0	'CORE.MK1AC050.ORG'
'ZR-1.1UC'	924.0	'CORE.MK1AC070.ORG'
'ZR-1.1UC'	1320.0	'CORE.MK1AC100.ORG'
'ZR-1.1UC'	1518.0	'CORE.MK1AC115.ORG'
'ZR-1.1UC'	1716.0	'CORE.MK1AC130.ORG'
'ZR-1.1UC'	2640.0	'CORE.MK1AC200.ORG'
'ZR-1.1UC'	3036.0	'CORE.MK1AC230.ORG'
'ZR-1.1UC'	3604.0	'CORE.MK1AC273.ORG'
'ZR-1.1UC'	3960.0	'CORE.MK1AC300.ORG'
'ZR-2.1U'	19.8	'CORE.MKII001A.ORG'
'ZR-2.1U'	26.4	'CORE.MKII002.ORG'
'ZR-2.1U'	39.6	'CORE.MKII003.ORG'
'ZR-2.1U'	66.0	'CORE.MKII005.ORG'
'ZR-2.1U'	92.4	'CORE.MKII007.ORG'
'ZR-2.1U'	132.0	'CORE.MKII010.ORG'
'ZR-2.1U'	198.0	'CORE.MKII015.ORG'
'ZR-2.1U'	264.0	'CORE.MKII020.ORG'
'ZR-2.1U'	330.0	'CORE.MKII025.ORG'
'ZR-2.1U'	396.0	'CORE.MKII030.ORG'
'ZR-2.1U'	528.0	'CORE.MKII040.ORG'
'ZR-2.1U'	660.0	'CORE.MKII050.ORG'
'ZR-2.1U'	924.0	'CORE.MKII070.ORG'
'ZR-2.1U'	1320.0	'CORE.MKII100.ORG'
'ZR-2.1U'	1518.0	'CORE.MKII115.ORG'
'ZR-2.1U'	1716.0	'CORE.MKII130.ORG'
'ZR-2.1U'	1980.0	'CORE.MKII150.ORG'
'ZR-2.1U'	2244.0	'CORE.MKII180.ORG'
'ZR-2.1U'	2640.0	'CORE.MKII200.ORG'
'ZR-2.1U'	2904.0	'CORE.MKII220.ORG'
'ZR-0.94UA'	16.5	'CORE.MKIVA001A.ORG'
'ZR-0.94UA'	22.0	'CORE.MKIVA002.ORG'
'ZR-0.94UA'	33.0	'CORE.MKIVA003.ORG'
'ZR-0.94UA'	55.0	'CORE.MKIVA005.ORG'
'ZR-0.94UA'	77.0	'CORE.MKIVA007.ORG'
'ZR-0.94UA'	110.0	'CORE.MKIVA010.ORG'
'ZR-0.94UA'	165.0	'CORE.MKIVA015.ORG'
'ZR-0.94UA'	220.0	'CORE.MKIVA020.ORG'
'ZR-0.94UA'	275.0	'CORE.MKIVA025.ORG'

'ZR-0.94UA'	330.0	'CORE.MKIVA030.ORG'
'ZR-0.94UA'	440.0	'CORE.MKIVA040.ORG'
'ZR-0.94UA'	550.0	'CORE.MKIVA050.ORG'
'ZR-0.94UA'	770.0	'CORE.MKIVA070.ORG'
'ZR-0.94UA'	1100.0	'CORE.MKIVA100.ORG'
'ZR-0.94UA'	1265.0	'CORE.MKIVA115.ORG'
'ZR-0.94UA'	1430.0	'CORE.MKIVA130.ORG'
'ZR-0.94UA'	2200.0	'CORE.MKIVA200.ORG'
'ZR-0.94UA'	2750.0	'CORE.MKIVA250.ORG'
'ZR-0.94UA'	3300.0	'CORE.MKIVA300.ORG'
'ZR-0.94UA'	3960.0	'CORE.MKIVA360.ORG'
'ZR-0.94UB'	16.5	'CORE.MKIVB001A.ORG'
'ZR-0.94UB'	22.0	'CORE.MKIVB002.ORG'
'ZR-0.94UB'	33.0	'CORE.MKIVB003.ORG'
'ZR-0.94UB'	55.0	'CORE.MKIVB005.ORG'
'ZR-0.94UB'	77.0	'CORE.MKIVB007.ORG'
'ZR-0.94UB'	110.0	'CORE.MKIVB010.ORG'
'ZR-0.94UB'	165.0	'CORE.MKIVB015.ORG'
'ZR-0.94UB'	220.0	'CORE.MKIVB020.ORG'
'ZR-0.94UB'	275.0	'CORE.MKIVB025.ORG'
'ZR-0.94UB'	330.0	'CORE.MKIVB030.ORG'
'ZR-0.94UB'	440.0	'CORE.MKIVB040.ORG'
'ZR-0.94UB'	550.0	'CORE.MKIVB050.ORG'
'ZR-0.94UB'	770.0	'CORE.MKIVB070.ORG'
'ZR-0.94UB'	1100.0	'CORE.MKIVB100.ORG'
'ZR-0.94UB'	1265.0	'CORE.MKIVB115.ORG'
'ZR-0.94UB'	1430.0	'CORE.MKIVB130.ORG'
'ZR-0.94UB'	2200.0	'CORE.MKIVB200.ORG'
'ZR-0.94UB'	2750.0	'CORE.MKIVB250.ORG'
'ZR-0.94UB'	3300.0	'CORE.MKIVB300.ORG'
'ZR-0.94UB'	3960.0	'CORE.MKIVB360.ORG'
'ZR-0.94UC'	16.5	'CORE.MKIVC001A.ORG'
'ZR-0.94UC'	22.0	'CORE.MKIVC002.ORG'
'ZR-0.94UC'	33.0	'CORE.MKIVC003.ORG'
'ZR-0.94UC'	55.0	'CORE.MKIVC005.ORG'
'ZR-0.94UC'	77.0	'CORE.MKIVC007.ORG'
'ZR-0.94UC'	110.0	'CORE.MKIVC010.ORG'
'ZR-0.94UC'	165.0	'CORE.MKIVC015.ORG'
'ZR-0.94UC'	220.0	'CORE.MKIVC020.ORG'
'ZR-0.94UC'	275.0	'CORE.MKIVC025.ORG'
'ZR-0.94UC'	330.0	'CORE.MKIVC030.ORG'
'ZR-0.94UC'	440.0	'CORE.MKIVC040.ORG'
'ZR-0.94UC'	550.0	'CORE.MKIVC050.ORG'
'ZR-0.94UC'	770.0	'CORE.MKIVC070.ORG'
'ZR-0.94UC'	1100.0	'CORE.MKIVC100.ORG'
'ZR-0.94UC'	1265.0	'CORE.MKIVC115.ORG'
'ZR-0.94UC'	1430.0	'CORE.MKIVC130.ORG'
'ZR-0.94UC'	2200.0	'CORE.MKIVC200.ORG'
'ZR-0.94UC'	2750.0	'CORE.MKIVC250.ORG'
'ZR-0.94UC'	3300.0	'CORE.MKIVC300.ORG'
'ZR-0.94UC'	3960.0	'CORE.MKIVC360.ORG'
'AL-0.71UA'	15.0	'CORE.SPNA001A.ORG'
'AL-0.71UA'	20.0	'CORE.SPNA002.ORG'
'AL-0.71UA'	30.0	'CORE.SPNA003.ORG'
'AL-0.71UA'	50.0	'CORE.SPNA005.ORG'
'AL-0.71UA'	70.0	'CORE.SPNA007.ORG'
'AL-0.71UA'	100.0	'CORE.SPNA010.ORG'
'AL-0.71UA'	150.0	'CORE.SPNA015.ORG'
'AL-0.71UA'	200.0	'CORE.SPNA020.ORG'
'AL-0.71UA'	250.0	'CORE.SPNA025.ORG'
'AL-0.71UA'	300.0	'CORE.SPNA030.ORG'
'AL-0.71UA'	400.0	'CORE.SPNA040.ORG'
'AL-0.71UA'	500.0	'CORE.SPNA050.ORG'
'AL-0.71UA'	700.0	'CORE.SPNA070.ORG'
'AL-0.71UA'	1000.0	'CORE.SPNA100.ORG'
'AL-0.71UA'	1250.0	'CORE.SPNA125.ORG'
'AL-0.71UA'	1500.0	'CORE.SPNA150.ORG'

'AL-0.71UA'	2000.0	'CORE.SPNA200.ORG'
'AL-0.71UA'	2500.0	'CORE.SPNA250.ORG'
'AL-0.71UA'	3000.0	'CORE.SPNA300.ORG'
'AL-0.71UA'	3200.0	'CORE.SPNA320.ORG'
'AL-0.71UB'	15.0	'CORE.SPNB001A.ORG'
'AL-0.71UB'	20.0	'CORE.SPNB002.ORG'
'AL-0.71UB'	30.0	'CORE.SPNB003.ORG'
'AL-0.71UB'	50.0	'CORE.SPNB005.ORG'
'AL-0.71UB'	70.0	'CORE.SPNB007.ORG'
'AL-0.71UB'	100.0	'CORE.SPNB010.ORG'
'AL-0.71UB'	150.0	'CORE.SPNB015.ORG'
'AL-0.71UB'	200.0	'CORE.SPNB020.ORG'
'AL-0.71UB'	250.0	'CORE.SPNB025.ORG'
'AL-0.71UB'	300.0	'CORE.SPNB030.ORG'
'AL-0.71UB'	400.0	'CORE.SPNB040.ORG'
'AL-0.71UB'	500.0	'CORE.SPNB050.ORG'
'AL-0.71UB'	700.0	'CORE.SPNB070.ORG'
'AL-0.71UB'	1000.0	'CORE.SPNB100.ORG'
'AL-0.71UB'	1250.0	'CORE.SPNB125.ORG'
'AL-0.71UB'	1500.0	'CORE.SPNB150.ORG'
'AL-0.71UB'	2000.0	'CORE.SPNB200.ORG'
'AL-0.71UB'	2500.0	'CORE.SPNB250.ORG'
'AL-0.71UB'	3000.0	'CORE.SPNB300.ORG'
'AL-0.71UB'	3200.0	'CORE.SPNB320.ORG'
'AL-0.71UC'	15.0	'CORE.SPNC001A.ORG'
'AL-0.71UC'	20.0	'CORE.SPNC002.ORG'
'AL-0.71UC'	30.0	'CORE.SPNC003.ORG'
'AL-0.71UC'	50.0	'CORE.SPNC005.ORG'
'AL-0.71UC'	70.0	'CORE.SPNC007.ORG'
'AL-0.71UC'	100.0	'CORE.SPNC010.ORG'
'AL-0.71UC'	150.0	'CORE.SPNC015.ORG'
'AL-0.71UC'	200.0	'CORE.SPNC020.ORG'
'AL-0.71UC'	250.0	'CORE.SPNC025.ORG'
'AL-0.71UC'	300.0	'CORE.SPNC030.ORG'
'AL-0.71UC'	400.0	'CORE.SPNC040.ORG'
'AL-0.71UC'	500.0	'CORE.SPNC050.ORG'
'AL-0.71UC'	700.0	'CORE.SPNC070.ORG'
'AL-0.71UC'	1000.0	'CORE.SPNC100.ORG'
'AL-0.71UC'	1250.0	'CORE.SPNC125.ORG'
'AL-0.71UC'	1500.0	'CORE.SPNC150.ORG'
'AL-0.71UC'	2000.0	'CORE.SPNC200.ORG'
'AL-0.71UC'	2500.0	'CORE.SPNC250.ORG'
'AL-0.71UC'	3000.0	'CORE.SPNC300.ORG'
'AL-0.71UC'	3200.0	'CORE.SPNC320.ORG'
'AL-0.94U'	15.0	'CORE.SPE001A.ORG'
'AL-0.94U'	20.0	'CORE.SPE002.ORG'
'AL-0.94U'	30.0	'CORE.SPE003.ORG'
'AL-0.94U'	50.0	'CORE.SPE005.ORG'
'AL-0.94U'	70.0	'CORE.SPE007.ORG'
'AL-0.94U'	100.0	'CORE.SPE010.ORG'
'AL-0.94U'	150.0	'CORE.SPE015.ORG'
'AL-0.94U'	200.0	'CORE.SPE020.ORG'
'AL-0.94U'	250.0	'CORE.SPE025.ORG'
'AL-0.94U'	300.0	'CORE.SPE030.ORG'
'AL-0.94U'	400.0	'CORE.SPE040.ORG'
'AL-0.94U'	500.0	'CORE.SPE050.ORG'
'AL-0.94U'	700.0	'CORE.SPE070.ORG'
'AL-0.94U'	1000.0	'CORE.SPE100.ORG'
'AL-0.94U'	1250.0	'CORE.SPE125.ORG'
'AL-0.94U'	1500.0	'CORE.SPE150.ORG'
'AL-0.94U'	2000.0	'CORE.SPE200.ORG'
'AL-0.94U'	2500.0	'CORE.SPE250.ORG'
'AL-0.94U'	3000.0	'CORE.SPE300.ORG'
'AL-0.94U'	3200.0	'CORE.SPE320.ORG'
'AL-0.0TH'	1.0	'CORE.TH1.ORG'

Fuel subtype file:

```
AL-0.71U 1920 1 1 1954 12 31 AL-0.71UA
AL-0.71U 1954 1 1 1958 12 31 AL-0.71UB
AL-0.71U 1959 1 1 3000 12 31 AL-0.71UC
ZR-0.94U 1920 1 1 1971 12 31 ZR-0.94UA
ZR-0.94U 1972 1 1 1980 12 31 ZR-0.94UB
ZR-0.94U 1981 1 1 3000 12 31 ZR-0.94UC
ZR-1.1U  1920 1 1 1971 12 31 ZR-1.1UA
ZR-1.1U  1972 1 1 1980 12 31 ZR-1.1UB
ZR-1.1U  1981 1 1 3000 12 31 ZR-1.1UC
```

Decay library file excerpts:

(Beginning and end of each section of the file.)

```
  1      decay library: activation products (endf/b-vi)
  1   10010  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
  1                0.000E+00 0.000E+00 0.000E+00 9.998E+01 1.000E+00 1.000E+00
  1   10020  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
  1                0.000E+00 0.000E+00 0.000E+00 1.500E-02 1.000E+00 1.000E+00
```

<* lines omitted *>

```
 -1
  2      decay library: actinides and daughters (endf/b-vi)
  2   20040  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
  2                0.000E+00 0.000E+00 0.000E+00 1.000E+02 1.000E+00 1.000E+00
```

<* lines omitted *>

```
 -1
  3      decay library: fission products (endf/b-vi)
  3   10030  1     3.885E+08 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
                   0.000E+00 0.000E+00 5.690E-03 0.000E+00 2.000E-07 3.000E-03
```

<* lines omitted *>

```
  3  701720  6     0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
  3                0.000E+00 0.000E+00 0.000E+00 2.190E+01 1.000E+00 1.000E+00
 -1
```

Fuel record archive file excerpts:

(Header lines plus first two fuel batches. Each line is 202 characters long.)

```
                                                                    SEP DATE:
                                                            WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
      KEY     TYPE       MTU      %Pu-240    MWd/MTU    PLANT    MO YR.  SEP KEY
DAYS                     Ref.                   Th       U       Np      Pu
          Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ---------------- ----
---- ----------------------------------------   ----------------------------------------
-------------
    TABLE 1 -- UNIFIED SEPARATIONS PRODUCTION FILE -- (Fuel Input and Losses 1944-1989
             (Records Sorted by Sep'n Date.)
    RUN AT:  08/04/96   12:36:14            [Note: MWd/MTU after 11/83 are
backcalculated from %Pu-240.]

    SAVED AS:"UNIFIED6"
```

```
                                                                    SEP DATE:
                                                            WASTE FRACTION:
                                                                    --------"mid-Mo"
COOLING                                                   ----------------------------
       KEY      TYPE        MTU       %Pu-240    MWd/MTU    PLANT    MO YR.  SEP KEY
DAYS                        Ref.                    Th       U       Np      Pu
           Waste Frac. Ref.
    -------- -------- --------    --------- ---------- -------- ---------------- ----
---- ----------------------------------------   -------------------------------------
-------------

        47.3 AL-0.71U  3.265E+00             2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P            1.000001.000001.000000.02781 No data;
Ave. of T Plant, 1953 thru 56.
        73.0 AL-0.71U  3.356E+00             2.977E+01 T           1  45     111.01
  38 SPLANT.DAT 19348 9/30/93 1:19P            1.000001.000001.000000.02781 No data;
Ave. of T Plant, 1953 thru 56.
```

Output file excerpts:

(Header line plus first two fuel batches, each of which consists of two lines, one for the primary split and one for the secondary. Each line is 792 characters long.)

```
       KEY      TYPE        MTU       %Pu-240    MWd/MTU    PLANT    MO YR.  SEP KEY
DAYS                        Ref.                    Th       U       Np      Pu
           Waste Frac. Ref.                                                     H03
  C14         NI59        CO60        NI63        SE79        SR90        Y90
ZR93        NB93*       TC99        RU106       CD113*      SB125       SN126
I129        CS134       CS137       BA137*      SM151       EU152       EU154
EU155       RA226       AC227       RA228       TH229       PA231       TH232
U232        U233        U234        U235        U236        NP237       PU238
U238        PU239       PU240       AM241       PU241       PU242       CM242
AM243       CM243       CM244
        47.3 AL-0.71U  3.265E+00             2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P            1.000001.000001.000000.02781 No data;
Ave. of T Plant, 1953 thru 56.                                                4.203E-05
1.716E-04   1.071E-04   1.518E-05   1.737E-05   1.537E-04   1.958E-02   2.142E-06
2.087E-02   4.832E-11   7.917E-03   1.995E-03   9.578E-07   9.526E-05   1.976E-04
1.784E-03   2.207E-07   2.172E-02   3.312E-09   1.099E-03   9.172E-11   2.330E-07
1.394E-04   8.445E-16   4.207E-17   1.207E-24   1.464E-15   5.495E-10   1.129E-11
3.119E-10   1.457E-08   7.405E-01   9.840E+01   6.292E-02   2.637E-04   4.029E-08
1.362E+04   1.686E-01   2.425E-04   1.199E-10   5.780E-07   4.495E-10   2.674E-14
9.166E-14   3.206E-19   1.882E-17
        73.0 AL-0.71U  3.356E+00             2.977E+01 T           1  45     111.01
  38 SPLANT.DAT 19348 9/30/93 1:19P            1.000001.000001.000000.02781 No data;
Ave. of T Plant, 1953 thru 56.                                                5.302E-05
2.164E-04   1.351E-04   1.914E-05   2.191E-05   1.939E-04   2.468E-02   2.923E-06
2.656E-02   7.057E-11   1.102E-02   2.521E-03   1.211E-06   1.209E-04   2.495E-04
2.255E-03   4.382E-07   2.740E-02   4.177E-09   1.452E-03   1.932E-10   4.203E-07
1.748E-04   1.169E-15   6.346E-17   2.297E-24   2.216E-15   7.039E-10   1.601E-11
3.935E-10   1.837E-08   7.610E-01   1.011E+02   7.932E-02   3.683E-04   7.819E-08
1.400E+04   2.292E-01   4.151E-04   2.591E-10   1.180E-06   1.065E-09   7.221E-14
2.453E-13   9.959E-19   5.718E-17
```

Summary (Runlog) File Excerpts:
(Beginning and end of file only.)

```
<==============================================>

  *** DKPRO ***      Version 3.1
 run date = 20020815 run time = 082857.972
 cpu = NW40057207
 working directory = U:\DATA\dkpro\test\testrun

 <==============================================>
 **** Reading Input Commands from Standard Input File ****
```

<* body of file omitted *>

PU236	1.608E-06	8.857E-07	3.346E-05	2.078E-04	2.438E-04
PU237	1.265E-06	7.074E-07	1.095E-05	6.664E-05	7.956E-05
PU238	2.294E-01	1.260E-01	4.881E+00	2.876E+01	3.400E+01
PU239	6.160E+03	3.446E+03	4.548E+04	1.935E+05	2.486E+05
PU240	2.024E+02	1.126E+02	2.694E+03	1.314E+04	1.615E+04
PU241	9.555E+00	5.152E+00	2.262E+02	1.319E+03	1.560E+03
PU242	1.660E-01	8.513E-02	6.748E+00	4.801E+01	5.501E+01
PU243	6.795E-07	3.497E-07	2.800E-05	2.161E-04	2.452E-04
PU244	3.988E-08	1.942E-08	5.166E-06	5.528E-05	6.051E-05
PU245	7.317E-14	3.574E-14	1.099E-11	1.226E-10	1.337E-10
PU246	4.414E-16	2.093E-16	1.353E-13	1.622E-12	1.758E-12
AM239	5.462E-14	2.805E-14	2.797E-12	2.260E-11	2.548E-11
AM240	1.191E-10	6.052E-11	7.223E-09	5.888E-08	6.628E-08
AM241	1.823E-02	9.366E-03	8.761E-01	6.434E+00	7.337E+00
AM242	1.051E-05	5.411E-06	5.323E-04	4.253E-03	4.801E-03
AM242*	4.031E-05	1.974E-05	4.012E-03	3.668E-02	4.075E-02
AM243	7.968E-04	3.885E-04	8.084E-02	7.902E-01	8.722E-01
AM244	3.385E-09	1.653E-09	3.870E-07	3.992E-06	4.384E-06
AM244*	0.000E+00	0.000E+00	2.179E-23	2.583E-22	2.801E-22
AM245	1.777E-14	8.681E-15	2.670E-12	2.978E-11	3.247E-11
AM246	1.106E-18	5.241E-19	3.388E-16	4.062E-15	4.403E-15
CM241	1.574E-12	7.357E-13	5.153E-10	5.878E-09	6.395E-09
CM242	2.993E-04	1.459E-04	3.726E-02	3.648E-01	4.025E-01
CM243	2.087E-07	9.697E-08	9.549E-05	1.173E-03	1.269E-03
CM244	6.190E-06	2.883E-06	2.212E-03	2.770E-02	2.992E-02
CM245	1.088E-08	4.891E-09	1.517E-05	2.235E-04	2.387E-04
CM246	3.152E-11	1.379E-11	1.990E-07	3.392E-06	3.591E-06
CM247	8.181E-15	3.507E-15	2.354E-10	4.593E-09	4.828E-09
CM248	1.099E-17	4.644E-18	1.462E-12	3.270E-11	3.416E-11
CM249	0.000E+00	0.000E+00	0.000E+00	1.429E-23	1.429E-23
CM250	0.000E+00	0.000E+00	4.289E-22	1.159E-20	1.201E-20
BK249	4.703E-21	1.920E-21	2.822E-15	7.119E-14	7.401E-14
BK250	0.000E+00	0.000E+00	1.089E-20	2.764E-19	2.872E-19
CF249	0.000E+00	0.000E+00	1.346E-16	3.770E-15	3.904E-15
CF250	0.000E+00	0.000E+00	1.728E-16	4.885E-15	5.058E-15
CF251	0.000E+00	0.000E+00	1.918E-17	6.094E-16	6.286E-16
CF252	0.000E+00	0.000E+00	1.408E-18	5.174E-17	5.315E-17
CF253	0.000E+00	0.000E+00	6.052E-22	2.487E-20	2.548E-20
CF254	0.000E+00	0.000E+00	0.000E+00	1.612E-22	1.612E-22
ES253	0.000E+00	0.000E+00	2.639E-22	1.192E-20	1.219E-20
ES254	0.000E+00	0.000E+00	3.630E-24	3.077E-22	3.114E-22
ES254*	0.000E+00	0.000E+00	0.000E+00	1.599E-23	1.599E-23
Total:	2.123E+07	1.169E+07	8.312E+07	3.038E+08	4.199E+08

Total Fuel and Exposure Summary:

	T-plant	B-plant	Redox	Purex	Total

```
MWd:     1.655E+06   9.241E+05   1.413E+07   5.843E+07   7.514E+07
MTU:     5.033E+03   2.765E+03   1.969E+04   7.193E+04   9.942E+04

 DKPRO complete, calculation time =    11.81250
```

ATTACHMENT C

SPLIT7 – A CODE FOR CONVERTING ORIGEN OUTPUT TO DKPRO INPUT

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Split7 is a utility code for converting the fort.7 output from Origen into separate files for use with DKPRO. The code reads in the fort.7 file that contains multiple blocks of fuel composition data, each corresponding to a different exposure from the Origen case. The code also reads an input file that contains an output file name and header line for each block of data in the fort.7 file. The code listing, followed by an example input and output file, are shown below.

Split7 version 1.1 code listing:

```
#include <stdio.h>
#include <string.h>
#define  LLEN  200
#define  FLEN  20

main()
{
/* v1.1 5/14/2002 SHF    changed 'close' to 'fclose', added version number,
                            added check for missing input file*/

   FILE *f7, *fout;
   char line[LLEN], title[LLEN], fname[FLEN];
   int open=0;

   printf("Split7 v1.1 5/14/2002\n\n");

   f7 = fopen("fort.7", "r");

   if(f7==NULL){
       printf("Input file (fort.7) not found - aborting!\n\n");
   }else{
             while( (fgets(line, LLEN, f7)) != NULL ) {

               if (!open) {       /* open output file */
                     if( gets(title)==NULL ) {
                            printf("Not enough names\n");
                            return 1;
                     }
                     sscanf(title, "%s", fname);

                     gets(title);
                     printf("title = %s\n", title);
                     fout = fopen(fname, "w");
                     fprintf(fout, "%s\n", title);
                     open = 1;
               }

               fputs(line, fout);
               if( line[3] == '0' ) {
                     open = 0;
             /*         close(fout); */
                     fclose(fout);
               }

             }  /* end while */
       }

   return 0;
}
```

Example Split7 input file (split.combo.mk1aa1):

```
COMBO.MK1AA000.ORG
Mk-1AA:  B =  0.0 MWd/MTU  <1972
COMBO.MK1AA001A.ORG
Mk-1AA:  B = 19.8 MWd/MTU  <1972
COMBO.MK1AA002.ORG
Mk-1AA:  B =  26.4 MWd/MTU  <1972
COMBO.MK1AA003.ORG
Mk-1AA:  B = 39.6 MWd/MTU  <1972
COMBO.MK1AA005.ORG
Mk-1AA:  B = 66.0 MWd/MTU  <1972
COMBO.MK1AA007.ORG
Mk-1AA:  B = 92.4 MWd/MTU  <1972
COMBO.MK1AA010.ORG
Mk-1AA:  B = 132. MWd/MTU  <1972
```

Example Split7 output file (combo.mk1aa000.org):

```
Mk-1AA:  B =  0.0 MWd/MTU  <1972
   1  10010  4.1418E+00  10020  6.2139E-04  40090  8.7307E+00  50100  5.4233E-03
   1  50110  2.1693E-02  60120  4.7224E+01  60130  5.3006E-01  70140  1.7330E+00
   1  70150  6.3664E-03 110230  7.4539E-02 120240  8.6766E-01 120250  1.0984E-01
   1 120260  1.2094E-01 130270  2.9868E+01 140280  4.3499E+00 140290  2.2026E-01
   1 140300  1.4621E-01 170350  2.1353E-02 170370  6.8283E-03 220460  7.3791E-03
   1 220470  6.6635E-03 220480  6.5920E-02 220490  4.8300E-03 220500  4.6511E-03
   1 230500  2.1011E-04 230510  8.3833E-02 240500  1.2595E-01 240520  2.4260E+00
   1 240530  2.7506E-01 240540  6.8331E-02 250550  5.3247E-01 260540  4.8395E-01
   1 260560  7.6425E+00 260570  1.7909E-01 260580  2.4156E-02 270590  3.1478E-02
   1 280580  1.7098E+00 280600  6.5366E-01 280610  2.8300E-02 280620  8.9909E-02
   1 280640  2.2790E-02 290630  8.6245E-01 290650  3.8387E-01 400900  4.7480E+02
   1 400910  1.0326E+02 400920  1.5765E+02 400940  1.6042E+02 400960  2.5815E+01
   1 420920  6.6059E-03 420940  4.1510E-03 420950  7.0968E-03 420960  7.4539E-03
   1 420970  4.2849E-03 420980  1.0757E-02 421000  4.2849E-03 481060  3.3840E-05
   1 481080  2.3168E-05 481100  3.2539E-04 481110  3.3320E-04 481120  6.2761E-04
   1 481130  3.1758E-04 481140  7.4709E-04 481160  1.9523E-04 501120  1.0464E-01
   1 501140  7.0108E-02 501150  3.9763E-02 501160  1.5382E+00 501170  8.1095E-01
   1 501180  2.5427E+00 501190  8.9989E-01 501200  3.3903E+00 501220  4.8134E-01
   1 501240  5.8598E-01 721740  1.5363E-04 721760  4.9931E-03 721770  1.7860E-02
   1 721780  2.6022E-02 721790  1.3193E-02 721800  3.3799E-02 741800  3.0298E-05
   1 741820  6.1296E-03 741830  3.3328E-03 741840  7.1481E-03 741860  6.6656E-03
   1 822040  5.7907E-04 822060  9.9684E-03 822070  9.1411E-03 822080  2.1674E-02
   2 922340  3.4188E-01 922350  4.8898E+01 922360  7.0636E-01 922380  4.1524E+03
   0        0.00000E+00   0.00000E+00   0.00E+00
```

ATTACHMENT D

EXTRACT – A CODE FOR EXTRACTING CLAD COMPOSITION DATA FROM FUEL AND FUEL/CLAD COMBINATION DATA.

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Extract is a utility code used to create DKPRO input data representing fuel cladding by taking the difference between a fuel only input file and a file representing a combination of fuel and cladding. This approach is necessary because Origen will not readily produce an output file for material that contains no fissionable material (as is the case for the cladding). The code is given the name of two input files (typically produced by the Split7 code), it reads the two files, subtracts the composition of one from the other, and writes out a new file in the proper format to be used as input for DKPRO. This capability is necessary to accurately represent the splitting of the Hanford spent fuel into a cladding waste stream and a separations feed stream. The code listing, followed by example input and output files, are shown below.

Extract code listing:

```
c     Modules (previously include files)

      module lenstr_mod
c  @(#)lenstr.h 1.1 96/04/29
c  @(#)lenstr.h 1.1 94/11/11
c---------- lenstr.h --------------------------
      Parameter (lenid=6, lenstr=10, len20=20, lenfil=80, len_path=80)
      end module

      module param_1
       parameter (nint0=2)
       end module

       module param_2
c     for process_mod - note that globals_mod uses different value for nlist0
       parameter (nlist0=5000,nout0=500)
       end module

      module iounits_mod
c  @(#)iounits.h 1.2 96/06/11
      use lenstr_mod
       integer luninp,lout,lunlog,logall,lundir,lunsum,lundic,lunorg
      integer lunstype,lundk,lundbg,lunrun
      Character*3 unit
       character dfile*lenfil,sfile*lenfil,dictfile*lenfil
      character stypefile*lenfil,fildk*lenfil,fildk2*lenfil
      character dbgfile*lenfil,runlog*lenfil
       character lib_path*len_path,tmp_path*100
      Common /ucom/ unit
      Common /iocom/ luninp, lout, lunlog, logall,lundir,lunsum,
     &  lundic,lunorg,lunstype,lundk,lundbg,lunrun
       common/ionames/dfile,sfile,dictfile,stypefile,fildk,fildk2,
     &  dbgfile,lib_path,runlog
      end module

c++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      program extract
c     read two origen files, take the difference (activation products only) and write
out
c     a new file, resulting file will match origen file format but will be lacking
title line

      use lenstr_mod
      use iounits_mod
      Character*(lenid) adent
       character aname*30,aline*80,heading*80,htmp*80
```

```
      integer nid1,nid2,nid3,id1(5000),id2(5000),id3(5000)
      real amts1(5000), amts2(5000), amts3(5000)

      lunorg=10
      logall=6

      write(*,*)'Extract v0.0 - 5/29/2002'
      write(*,*)

      open(lunorg,file="extract.in1",status="old")
      nid1=0
      call rdorig(nid1,id1,amts1,heading)
      close(lunorg)

      open(lunorg,file="extract.in2",status="old")
      nid2=0
      call rdorig(nid2,id2,amts2,htmp)
      close(lunorg)

      write(*,*)

c     check core for extra nuclides
      do i=1,nid2
         idtmp=id2(i)
         j=1
         do while(j.lt.nid1 .and. id1(j).ne.idtmp)
           j=j+1
         enddo
         if(idtmp.ne.id1(j))then
           write(*,*)'Warning: extra nuclide in core: ',id2(i),amts2(i)
         endif
      enddo

c     extract clad
      nid3=0
      do i=1,nid1
        idtmp=id1(i)
         j=1
         do while(j.lt.nid2 .and. id2(j).ne.idtmp)
           j=j+1
         enddo
         if(idtmp.eq.id2(j))then
           atmp=amts1(i)-amts2(j)
         else
           atmp=amts1(i)
         endif
         if(atmp.gt.0)then
           nid3=nid3+1
           id3(nid3)=idtmp
           amts3(nid3)=atmp
         else if(atmp.lt.0)then
           write(*,*)'Warning: excess nuclide in core: ',id1(i),amts1(i),
     &       amts2(j)
         endif
      enddo

      write(*,*)
      write(*,*)'Total nuclides for new file: ', nid3
      write(*,*)

c     pad array with zeros
      i1=mod(nid3,4)
      do i=1,i1
        nid3=nid3+1
        id3(nid3)=0
        amts3(nid3)=0.
      enddo
```

```
c     write clad file
       open(lunorg,file="extract.out",status="unknown")
c     write title line
      ih=len_trim(heading)
      htmp=heading(1:ih+1)//' :clad only'
      write(lunorg,'(a)')htmp
c     write data
      do i=0,nid3-1,4
        write(lunorg,'("   1",4(I7,1PE12.4))')
     &    (id3(k),amts3(k), k=i+1,i+4)
       enddo


c     write last line
      write(lunorg,'(i4,e18.5,e14.5,e11.2)')0,0.,0.,0.

       close(lunorg)

      end

c=============== rdorig
=====================================================================
c     summary:   read origen nuclide file
c     called by: getorg
c     calls:     NA
c-----------------------------------------------------------------------
      Subroutine RdOrig(n, id, a, heading)
c
      use iounits_mod
      Dimension id(*), a(*)
      Dimension idx(4), ax(4)
      Character heading*80, buffer*80
c
      Read(lunorg, '(a)') heading
      Write(*, '(/''Open ORIGEN2 nuclide file:''/2x, a)') heading
c
c
c  Get next 4 nuclides
      do
        Read(lunorg, '(a)' ) buffer
c       read only activation products
        If( buffer(4:4) .ne. '1' )  Goto 99
c
        Read(buffer, '( 2X, I2, 4(I7,1PE12.4) )', END=99)
     *                            ic, (idx(k), ax(k), k=1,4)
c  Add to list
        Do 1 k = 1,4
           If( idx(k) .ne. 0 ) Then
c           {Search thru the list for nuclide}
              If( n .gt. 0 ) Then
                 Do m=1,n
                    If( idx(k) .eq. id(m) ) Then
c                    {found}
                      a(m) = a(m) + ax(k)
                      Goto 1
                    Endif
                 enddo
              Endif
              n = n + 1
              id(n) = idx(k)
              a(n) = ax(k)
           Endif
    1   Continue
      enddo
c
   99 continue
```

```
      Return
      End
c=============== end rdorig
=============================================================
c=============== itoa
=====================================================================
c     summary:   convert integer identifier to alphanumeric format
c     called by: addtbl, output
c     calls:     ztos
c-----------------------------------------------------------------------
      Subroutine ItoA(identx, adent)
c
c   Converts Integer ident representation to Alphanumeric rep.
c   E.g. 922381 to U238* (ZZAAAM) with M=(0,1).
c
      use lenstr_mod
      Character*(lenid) adent
      Character sym*2, char*1
c
      ident = iabs(identx)
      iz = ident / 10000
      irem = ident - 10000 * iz
      ia = irem / 10
      im = irem - 10 * ia
      Call ZtoS(iz, sym)
c
      adent = sym
c
c     check if more than just elemental symbol
      If( ia .gt. 0 ) then
c
        If( sym(2:2) .eq. ' ') Then
           n = 2
        Else
           n = 3
        Endif
c
        izero = ichar('0')
        ndgt = 3
        Do k = 1, ndgt
           iten = 10**(3-k)
           idigit = ia / iten
           If( (k .NE. 1) .OR. (idigit .NE. 0) ) Then
              adent(n:n) = char(idigit+izero)
              n = n + 1
              ia = ia - iten * idigit
           Endif
         enddo
c
        If( im .NE. 0) adent(n:n) = '*'
        If( identx .lt. 0 ) adent(n:n) = 'f'

       endif


      Return
      End
c============= end itoa
=================================================================
c=============== ztos
=====================================================================
c     summary:   returns symbol corresponding to given z number
c     called by: itoa
c     calls:     NA
c-----------------------------------------------------------------------
      Subroutine ZtoS(iz, sym)
c
```

```
      use iounits_mod
      Parameter (nsym0=100)
      Character*2  symtbl(nsym0), sym
c
      data symtbl  /'H ','HE','LI','BE','B ','C ','N ','O ','F ','NE',
     1              'NA','MG','AL','SI','P ','S ','CL','AR','K ','CA',
     2              'SC','TI','V ','CR','MN','FE','CO','NI','CU','ZN',
     3              'GA','GE','AS','SE','BR','KR','RB','SR','Y ','ZR',
     4              'NB','MO','TC','RU','RH','PD','AG','CD','IN','SN',
     5              'SB','TE','I ','XE','CS','BA','LA','CE','PR','ND',
     6              'PM','SM','EU','GD','TB','DY','HO','ER','TM','YB',
     7              'LU','HF','TA','W ','RE','OS','IR','PT','AU','HG',
     8              'TL','PB','BI','PO','AT','RN','FR','RA','AC','TH',
     9              'PA','U ','NP','PU','AM','CM','BK','CF','ES','FM'/
c
      If( (iz .lt. 0) .or. (iz. gt. nsym0) )then
        write(lunrun,*) 'Z out of range: ', iz
        write(*,*) 'Z out of range: ', iz
       endif
c
c  (iz = 0) reserved for fictitious sink isotope
      If( iz .eq. 0) Then
         sym = 'XX'
      Else
         sym = symtbl(iz)
      Endif
      Return
      End
c
c================ end ztos ==================================================
```

Example fuel/cladding combo input file:

```
Mk-1AA:  B =  0.0 MWd/MTU  <1972
   1  10010  4.1418E+00  10020  6.2139E-04  40090  8.7307E+00  50100  5.4233E-03
   1  50110  2.1693E-02  60120  4.7224E+01  60130  5.3006E-01  70140  1.7330E+00
   1  70150  6.3664E-03 110230  7.4539E-02 120240  8.6766E-01 120250  1.0984E-01
   1 120260  1.2094E-01 130270  2.9868E+01 140280  4.3499E+00 140290  2.2026E-01
   1 140300  1.4621E-01 170350  2.1353E-02 170370  6.8283E-03 220460  7.3791E-03
   1 220470  6.6635E-03 220480  6.5920E-02 220490  4.8300E-03 220500  4.6511E-03
   1 230500  2.1011E-04 230510  8.3833E-02 240500  1.2595E-01 240520  2.4260E+00
   1 240530  2.7506E-01 240540  6.8331E-02 250550  5.3247E-01 260540  4.8395E-01
   1 260560  7.6425E+00 260570  1.7909E-01 260580  2.4156E-02 270590  3.1478E-02
   1 280580  1.7098E+00 280600  6.5366E-01 280610  2.8300E-02 280620  8.9909E-02
   1 280640  2.2790E-02 290630  8.6245E-01 290650  3.8387E-01 400900  4.7480E+02
   1 400910  1.0326E+02 400920  1.5765E+02 400940  1.6042E+02 400960  2.5815E+01
   1 420920  6.6059E-03 420940  4.1510E-03 420950  7.0968E-03 420960  7.4539E-03
   1 420970  4.2849E-03 420980  1.0757E-02 421000  4.2849E-03 481060  3.3840E-05
   1 481080  2.3168E-05 481100  3.2539E-04 481110  3.3320E-04 481120  6.2761E-04
   1 481130  3.1758E-04 481140  7.4709E-04 481160  1.9523E-04 501120  1.0464E-01
   1 501140  7.0108E-02 501150  3.9763E-02 501160  1.5382E+00 501170  8.1095E-01
   1 501180  2.5427E+00 501190  8.9989E-01 501200  3.3903E+00 501220  4.8134E-01
   1 501240  5.8598E-01 721740  1.5363E-04 721760  4.9931E-03 721770  1.7860E-02
   1 721780  2.6022E-02 721790  1.3193E-02 721800  3.3799E-02 741800  3.0298E-05
   1 741820  6.1296E-03 741830  3.3328E-03 741840  7.1481E-03 741860  6.6656E-03
   1 822040  5.7907E-04 822060  9.9684E-03 822070  9.1411E-03 822080  2.1674E-02
   2 922340  3.4188E-01 922350  4.8898E+01 922360  7.0636E-01 922380  4.1524E+03
   0        0.00000E+00   0.00000E+00   0.00E+00
```

Example fuel only input file:

```
Mk-1AA:  B =  0.0 MWd/MTU  <1972
   1  10010  1.9994E+00  10020  2.9997E-04  40090  1.1111E+00  50100  4.6296E-03
   1  50110  1.8519E-02  60120  4.5283E+01  60130  5.0828E-01  70140  1.2451E+00
```

```
1  70150  4.5740E-03 120240  8.1198E-01 120250  1.0280E-01 120260  1.1318E-01
1 130270  2.9630E+01 140280  4.0687E+00 140290  2.0601E-01 140300  1.3675E-01
1 170350  2.1353E-02 170370  6.8283E-03 240500  5.4317E-02 240520  1.0463E+00
1 240530  1.1862E-01 240540  2.9469E-02 250550  4.5455E-01 260540  3.6370E-01
1 260560  5.7435E+00 260570  1.3459E-01 260580  1.8154E-02 270590  1.6949E-02
1 280580  1.1620E+00 280600  4.4422E-01 280610  1.9233E-02 280620  6.1102E-02
1 280640  1.5488E-02 290630  8.1583E-01 290650  3.6312E-01 400900  3.6658E-01
1 400910  7.9721E-02 400920  1.2172E-01 400940  1.2385E-01 400960  1.9930E-02
1 481060  2.8888E-05 481080  1.9777E-05 481100  2.7777E-04 481110  2.8443E-04
1 481120  5.3576E-04 481130  2.7110E-04 481140  6.3775E-04 481160  1.6666E-04
2 922340  3.4188E-01 922350  4.8898E+01 922360  7.0636E-01 922380  4.1524E+03
0       0.00000E+00   0.00000E+00   0.00E+00
```

Example clad only output file:

```
Mk-1AA:  B =  0.0 MWd/MTU  <1972  :clad only
1  10010  2.1424E+00  10020  3.2142E-04  40090  7.6196E+00  50100  7.9370E-04
1  50110  3.1740E-03  60120  1.9410E+00  60130  2.1780E-02  70140  4.8790E-01
1  70150  1.7924E-03 110230  7.4539E-02 120240  5.5680E-02 120250  7.0400E-03
1 120260  7.7600E-03 130270  2.3800E-01 140280  2.8120E-01 140290  1.4250E-02
1 140300  9.4600E-03 220460  7.3791E-03 220470  6.6635E-03 220480  6.5920E-02
1 220490  4.8300E-03 220500  4.6511E-03 230500  2.1011E-04 230510  8.3833E-02
1 240500  7.1633E-02 240520  1.3797E+00 240530  1.5644E-01 240540  3.8862E-02
1 250550  7.7920E-02 260540  1.2025E-01 260560  1.8990E+00 260570  4.4500E-02
1 260580  6.0020E-03 270590  1.4529E-02 280580  5.4780E-01 280600  2.0944E-01
1 280610  9.0670E-03 280620  2.8807E-02 280640  7.3020E-03 290630  4.6620E-02
1 290650  2.0750E-02 400900  4.7443E+02 400910  1.0318E+02 400920  1.5753E+02
1 400940  1.6030E+02 400960  2.5795E+01 420920  6.6059E-03 420940  4.1510E-03
1 420950  7.0968E-03 420960  7.4539E-03 420970  4.2849E-03 420980  1.0757E-02
1 421000  4.2849E-03 481060  4.9520E-06 481080  3.3910E-06 481100  4.7620E-05
1 481110  4.8770E-05 481120  9.1850E-05 481130  4.6480E-05 481140  1.0934E-04
1 481160  2.8570E-05 501120  1.0464E-01 501140  7.0108E-02 501150  3.9763E-02
1 501160  1.5382E+00 501170  8.1095E-01 501180  2.5427E+00 501190  8.9989E-01
1 501200  3.3903E+00 501220  4.8134E-01 501240  5.8598E-01 721740  1.5363E-04
1 721760  4.9931E-03 721770  1.7860E-02 721780  2.6022E-02 721790  1.3193E-02
1 721800  3.3799E-02 741800  3.0298E-05 741820  6.1296E-03 741830  3.3328E-03
1 741840  7.1481E-03 741860  6.6656E-03 822040  5.7907E-04 822060  9.9684E-03
1 822070  9.1411E-03 822080  2.1674E-02       0  0.0000E+00       0  0.0000E+00
0       0.00000E+00   0.00000E+00   0.00E+00
```

ATTACHMENT E

COMBINE – A CODE FOR COMBINING THE PRIMARY OUTPUT STREAM OF ONE DKPRO RUN WITH THE SECONDARY OUTPUT OF ANOTHER.

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The Combine code is used to combine the output files of two DKPRO runs into two single-stream, DKPRO format output files. The primary stream from one run is combined with the secondary stream of the other, and vice-versa. This is necessary because the Hanford spent fuel was is represented as two streams (cladding waste and separations waste), requiring two DKPRO runs, but a fraction of each was channeled into the other. The code is given two input files that are both DKPRO two-stream output files. The data is then combined and written out as two single-stream output files.

The code listing and excerpts from sample input and output files are shown below.

Extract code listing:

```
      program combine
c     read two dkpro output files, sum, and write out
c     a new file

      parameter (maxline=3000)
      parameter (maxnuc=100)
      parameter (maxlinelen=1200)

       character line1*maxlinelen, line2*maxlinelen, lntmp*maxlinelen
       character akey1*21,akey2*21
      real rdat(maxnuc,2,3)

      in1=10
       in2=11
       ip1=12
       ip2=13

       write(*,*)'Combine v0.0 - 5/29/2002 -',
     &          ' Creates combined Dkpro output file'
       write(*,*)

       open(in1,file="combine.in1",status="old")
       open(in2,file="combine.in2",status="old")
      open(ip1,file="combine.ip1",status="unknown")
      open(ip2,file="combine.ip2",status="unknown")
c     read and compare headers
      read(in1,'(a1000)',iostat=io1)line1
      read(in2,'(a1000)',iostat=io2)line2
      if(line1.ne.line2)then
         write(*,*)'Headers different - files not compatible!'
         write(*,*)line1
         write(*,*)line2
        stop
       endif
      write(ip1,1020)line1
      write(ip2,1020)line1

c     read first 2 lines to check for length and compatibility
      io1=0
       io2=0
       iline=0
      nsplit=2
      read(in1,'(a1000)',iostat=io1)line1
      read(in2,'(a1000)',iostat=io2)line2
      iln1=len_trim(line1)
      iln2=len_trim(line2)
       if(iln1.ne.iln2)then
         write(*,*)'Error: different number of nuclides!'
```

```
         stop
       endif
      ncols=(iln1-240)/12
      write(*,*)'Number of nuclides: ',ncols
      read(in1,'(a1000)',iostat=io1)line1
      read(in2,'(a1000)',iostat=io2)line2
      if(line1(12:12).ne." " .or. line1(12:12).ne." ")then
         write(*,*)'Error: splitting error in files'
         stop
       endif
      rewind(in1)
       rewind(in2)
c     read headers
      read(in1,'(a1000)',iostat=io1)line1
      read(in2,'(a1000)',iostat=io2)line2

c     read data
      do while (io1.eq.0 .and. io2.eq.0)
         iline=iline+1
         do isplit=1,2
          read(in1,'(a1000)',iostat=io1)line1
          read(in2,'(a1000)',iostat=io2)line2
           if(isplit.eq.1)then
             read(line1,'(a21)')akey1
             read(line2,'(a21)')akey2
             if(akey1.ne.akey2)then
               write(*,*)'key mismatch!, line= ',
     &           iline,' ',akey1,' ',akey2
               stop
             endif
           endif
           if(len_trim(line1).eq.0)io1=-99
           if(len_trim(line2).eq.0)io1=-99
           if(io1.eq.0 .and. io2.eq.0)then
             if(isplit.eq.1)then
               lntmp=line1
             endif
            read(line1,1010)(rdat(i,isplit,1),i=1,ncols)
            read(line2,1010)(rdat(i,isplit,2),i=1,ncols)

          endif
         enddo

         if(io1.eq.0 .and. io2.eq.0)then
          do i=1,ncols
             rdat(i,1,3)=rdat(i,1,1)+rdat(i,2,2)
             rdat(i,2,3)=rdat(i,2,1)+rdat(i,1,2)
           enddo
c     write output files
           write(ip1,1030)lntmp(1:240),(rdat(i,1,3),i=1,ncols)
           write(ip2,1030)lntmp(1:240),(rdat(i,2,3),i=1,ncols)
        endif
      enddo



       if(io1.ne.io2)then
         write(*,*)
         write(*,*)'Error: file lengths different at line: ',
     &     iline,io1,io2
         write(*,*)
       endif

      write(*,*)'batches processed: ',iline

1010  format(240x,<ncols>e12.1)
1020  format(a<maxlinelen>)
```

```
1030  format(a240,1p,<ncols>e12.3)
1035  format(240x,1p,<ncols>e12.3)

      end
```

Excerpt from separations waste input file:

```
       KEY      TYPE        MTU       %Pu-240     MWd/MTU     PLANT    MO YR.   SEP KEY
DAYS                        Ref.                                Th       U      Np      Pu
           Waste Frac. Ref.                                                                H03
  C14         NI59        CO60        NI63        SE79        SR90        Y90
ZR93        NB93*       TC99        RU106       CD113*      SB125       SN126
I129        CS134       CS137       BA137*      SM151       EU152       EU154
EU155       RA226       AC227       RA228       TH229       PA231       TH232
U232        U233        U234        U235        U236        NP237       PU238
U238        PU239       PU240       AM241       PU241       PU242       CM242
AM243       CM243       CM244
        47.3 AL-0.71U  3.265E+00              2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P             0.999190.999190.998980.02778 No data;
Ave. of T Plant, 1953 thru 56.                                                  5.169E-02
1.066E-02   5.032E-04   6.365E-04   4.206E-02   8.450E-05   6.283E+01   6.285E+01
5.223E-03   4.758E-03   3.611E-02   1.851E-14   1.544E-03   1.189E-05   2.824E-04
4.882E-05   2.470E-10   7.072E+01   6.678E+01   4.048E+00   1.365E-07   1.043E-04
2.888E-03   6.702E-06   3.167E-05   2.275E-12   3.159E-10   5.926E-05   2.669E-12
9.141E-07   8.612E-08   1.075E+00   4.992E-02   9.594E-04   2.190E-04   7.104E-06
1.088E+00   1.495E-01   3.648E-04   1.355E-05   2.667E-05   1.189E-11   8.442E-12
4.483E-12   1.033E-15   4.347E-14


                                                                        5.174E-05
1.067E-05   5.037E-07   6.372E-07   4.210E-05   8.458E-08   6.290E-02   6.291E-02
5.229E-06   4.763E-06   3.614E-05   1.853E-17   1.545E-06   1.190E-08   2.827E-07
4.887E-08   2.473E-13   7.079E-02   6.685E-02   4.052E-03   1.366E-10   1.044E-07
2.891E-06   5.437E-09   2.571E-08   1.842E-15   2.854E-13   4.810E-08   2.165E-15
7.435E-10   8.083E-11   8.722E-04   4.051E-05   7.784E-07   2.226E-07   2.610E-07
8.827E-04   5.489E-03   1.341E-05   4.271E-07   9.804E-07   4.372E-13   8.620E-15
4.578E-15   1.034E-18   4.352E-17
```

Excerpt from cladding waste input file:

```
       KEY      TYPE        MTU       %Pu-240     MWd/MTU     PLANT    MO YR.   SEP KEY
DAYS                        Ref.                                Th       U      Np      Pu
           Waste Frac. Ref.                                                                H03
  C14         NI59        CO60        NI63        SE79        SR90        Y90
ZR93        NB93*       TC99        RU106       CD113*      SB125       SN126
I129        CS134       CS137       BA137*      SM151       EU152       EU154
EU155       RA226       AC227       RA228       TH229       PA231       TH232
U232        U233        U234        U235        U236        NP237       PU238
U238        PU239       PU240       AM241       PU241       PU242       CM242
AM243       CM243       CM244
        47.3 AL-0.71U  3.265E+00              2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P             0.999190.999190.998980.02778 No data;
Ave. of T Plant, 1953 thru 56.                                                  4.668E-01
2.029E-04   3.116E-05   2.665E-04   7.523E-03   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   1.395E-04   1.523E-06   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00


                                                                        4.673E-04
2.031E-07   3.119E-08   2.667E-07   7.531E-06   0.000E+00   0.000E+00   0.000E+00
```

```
0.000E+00   0.000E+00   0.000E+00   0.000E+00   1.397E-07   1.524E-09   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0.000E+00   0.000E+00   0.000E+00
```

Excerpt from separations waste output file:

```
       KEY      TYPE        MTU       %Pu-240     MWd/MTU     PLANT    MO YR.   SEP KEY
DAYS                       Ref.                        Th        U       Np       Pu
           Waste Frac. Ref.                                                        H03
  C14        NI59        CO60        NI63        SE79        SR90        Y90
ZR93       NB93*       TC99        RU106       CD113*      SB125       SN126
I129       CS134       CS137       BA137*      SM151       EU152       EU154
EU155      RA226       AC227       RA228       TH229       PA231       TH232
U232       U233        U234        U235        U236        NP237       PU238
U238       PU239       PU240       AM241       PU241       PU242       CM242
AM243      CM243       CM244


        47.3 AL-0.71U  3.265E+00              2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P             0.999190.999190.998980.02778 No data;
Ave. of T Plant, 1953 thru 56.                                                5.216E-02
1.066E-02   5.032E-04   6.368E-04   4.207E-02   8.450E-05   6.283E+01   6.285E+01
5.223E-03   4.758E-03   3.611E-02   1.851E-14   1.544E-03   1.189E-05   2.824E-04
4.882E-05   2.470E-10   7.072E+01   6.678E+01   4.048E+00   1.365E-07   1.043E-04
2.888E-03   6.702E-06   3.167E-05   2.275E-12   3.159E-10   5.926E-05   2.669E-12
9.141E-07   8.612E-08   1.075E+00   4.992E-02   9.594E-04   2.190E-04   7.104E-06
1.088E+00   1.495E-01   3.648E-04   1.355E-05   2.667E-05   1.189E-11   8.442E-12
4.483E-12   1.033E-15   4.347E-14
```

Excerpt from cladding waste output file:

```
       KEY      TYPE        MTU       %Pu-240     MWd/MTU     PLANT    MO YR.   SEP KEY
DAYS                       Ref.                        Th        U       Np       Pu
           Waste Frac. Ref.                                                        H03
  C14        NI59        CO60        NI63        SE79        SR90        Y90
ZR93       NB93*       TC99        RU106       CD113*      SB125       SN126
I129       CS134       CS137       BA137*      SM151       EU152       EU154
EU155      RA226       AC227       RA228       TH229       PA231       TH232
U232       U233        U234        U235        U236        NP237       PU238
U238       PU239       PU240       AM241       PU241       PU242       CM242
AM243      CM243       CM244


        47.3 AL-0.71U  3.265E+00              2.426E+01 T          12  44      80.01
  33 SPLANT.DAT 19348 9/30/93 1:19P             0.999190.999190.998980.02778 No data;
Ave. of T Plant, 1953 thru 56.                                                4.669E-01
2.136E-04   3.166E-05   2.671E-04   7.565E-03   8.458E-08   6.290E-02   6.291E-02
5.229E-06   4.763E-06   3.614E-05   1.853E-17   1.410E-04   1.535E-06   2.827E-07
4.887E-08   2.473E-13   7.079E-02   6.685E-02   4.052E-03   1.366E-10   1.044E-07
2.891E-06   5.437E-09   2.571E-08   1.842E-15   2.854E-13   4.810E-08   2.165E-15
7.435E-10   8.083E-11   8.722E-04   4.051E-05   7.784E-07   2.226E-07   2.610E-07
8.827E-04   5.489E-03   1.341E-05   4.271E-07   9.804E-07   4.372E-13   8.620E-15
4.578E-15   1.034E-18   4.352E-17
```

APPENDIX H

SUMMARY NUCLIDE INVENTORY TABLES

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The following tables summarize the nuclide inventories in units of curies and grams for the total fuel, the fuel filling tank AZ-101, and the fuel filling tank 241-AZ-102. Table H-1 lists the total nuclide inventories in curies for all nuclides in the ORIGEN2 library for all fuel batches. Subtotals are also provided for each processing plant, B, T, REDOX, and PUREX. Table H-2 lists the nuclide inventories in curies for only those fuel batches corresponding to the filling of tanks 241-AZ-101 and 241-AZ-102. Tank 241-AZ-101 inventory was limited to fuel processed from November 1983 through February 1986. Tank 241-AZ-102 inventory was limited to fuel processed from March 1986 through December 1988. Table H-3 lists the total nuclide inventories in grams for all nuclides in the ORIGEN2 library for all fuel batches. Table H-4 lists the tank 241-AZ-101 and tank 241-AZ-102 nuclide inventories in grams.

Table H-1. Summary Activities of All Fuel After Reprocessing (Curies). (5 sheets)

Nuclide	T-Plant	B-Plant	REDOX	PUREX	Total
H03[a]	1.53E+04	7.40E+03	1.77E+05	9.03E+05	1.10E+06
BE10	1.54E-04	8.58E-05	2.40E-03	2.39E-02	2.65E-02
C14	2.19E+02	1.22E+02	1.04E+03	2.56E+03	3.94E+03
SI32	5.23E-06	2.89E-06	3.60E-05	1.53E-04	1.97E-04
P32	5.23E-06	2.89E-06	3.60E-05	1.53E-04	1.97E-04
S35	0.00E+00	0.00E+00	0.00E+00	1.22E-15	1.22E-15
CL36	2.02E-01	1.13E-01	1.55E+00	6.81E+00	8.68E+00
AR39	1.25E-05	6.91E-06	1.85E-04	1.02E-03	1.22E-03
AR42	5.36E-17	2.86E-17	8.25E-16	5.02E-15	5.92E-15
K40	1.02E-20	5.21E-21	7.66E-19	7.16E-18	7.95E-18
CA45	0.00E+00	0.00E+00	2.49E-24	3.18E-11	3.18E-11
SC46	0.00E+00	0.00E+00	0.00E+00	4.49E-18	4.49E-18
V50	2.64E-15	1.47E-15	1.25E-13	2.60E-12	2.73E-12
MN54	1.27E-13	5.51E-15	3.04E-09	3.93E-02	3.93E-02
FE55	3.05E-01	8.46E-02	2.27E+01	2.78E+03	2.81E+03
CO58	0.00E+00	0.00E+00	0.00E+00	2.37E-18	2.37E-18
CO60	4.75E+01	1.89E+01	1.06E+03	1.49E+04	1.61E+04
NI59	1.07E+01	5.98E+00	1.90E+02	1.12E+03	1.33E+03
NI63	1.01E+03	5.74E+02	1.79E+04	1.07E+05	1.27E+05
ZN65	5.62E-18	1.09E-19	1.13E-12	2.36E-06	2.36E-06
SE79	1.74E+00	9.74E-01	1.50E+01	6.13E+01	7.91E+01
KR81	1.62E-06	8.98E-07	2.21E-05	1.10E-04	1.34E-04
KR85	2.78E+04	1.32E+04	3.99E+05	2.48E+06	2.92E+06
RB87	1.31E-03	7.32E-04	1.10E-02	4.46E-02	5.77E-02
SR89	0.00E+00	0.00E+00	0.00E+00	2.21E-23	2.21E-23
SR90	1.48E+06	7.82E+05	1.52E+07	7.04E+07	8.79E+07
Y90	1.48E+06	7.82E+05	1.52E+07	7.05E+07	8.79E+07
Y91	0.00E+00	0.00E+00	0.00E+00	3.77E-19	3.77E-19
ZR93	1.06E+02	5.90E+01	8.98E+02	3.66E+03	4.72E+03
ZR95	0.00E+00	0.00E+00	0.00E+00	8.04E-17	8.04E-17
NB92	1.69E-15	9.08E-16	6.79E-08	1.18E-06	1.24E-06
NB93*	9.30E+01	5.26E+01	7.44E+02	2.84E+03	3.73E+03
NB94	1.34E-03	7.42E-04	1.72E-02	8.33E-02	1.03E-01
NB95	0.00E+00	0.00E+00	0.00E+00	1.77E-16	1.77E-16
NB95*	0.00E+00	0.00E+00	0.00E+00	9.45E-19	9.45E-19
MO93	0.00E+00	0.00E+00	6.03E-03	1.05E-01	1.11E-01
TC98	4.73E-06	2.62E-06	8.46E-05	4.32E-04	5.24E-04
TC99	7.63E+02	4.26E+02	6.49E+03	2.66E+04	3.43E+04
RU106	1.68E-07	1.35E-08	1.52E-03	1.06E+03	1.06E+03
RH102	3.28E-06	1.25E-06	1.13E-03	1.31E-01	1.32E-01
RH106	1.68E-07	1.35E-08	1.52E-03	1.06E+03	1.06E+03
PD107	1.63E+00	9.09E-01	1.73E+01	7.98E+01	9.96E+01
AG108	1.45E-05	8.00E-06	2.13E-04	1.10E-03	1.33E-03
AG108*	1.67E-04	9.20E-05	2.45E-03	1.26E-02	1.53E-02

Table H-1. Summary Activities of All Fuel After Reprocessing (Curies). (5 sheets)

Nuclide	T-Plant	B-Plant	REDOX	PUREX	Total
AG109*	6.67E-11	7.02E-12	8.44E-08	1.16E-03	1.16E-03
AG110	3.49E-20	2.01E-21	6.41E-14	3.63E-05	3.63E-05
AG110*	2.56E-18	1.48E-19	4.71E-12	2.67E-03	2.67E-03
CD109	6.67E-11	7.02E-12	8.44E-08	1.16E-03	1.16E-03
CD113	4.79E-11	2.56E-11	1.34E-10	4.61E-10	6.68E-10
CD113*	5.84E+01	2.91E+01	8.17E+02	4.89E+03	5.79E+03
IN113*	0.00E+00	0.00E+00	0.00E+00	1.72E-09	1.72E-09
IN114*	0.00E+00	0.00E+00	0.00E+00	1.33E-30	1.33E-30
IN115	8.79E-10	4.91E-10	7.55E-09	3.15E-08	4.05E-08
SN113	0.00E+00	0.00E+00	1.04E-29	1.72E-09	1.72E-09
SN119*	5.44E-14	1.67E-14	3.38E-09	5.65E-01	5.65E-01
SN121	7.90E+01	4.43E+01	7.97E+02	3.72E+03	4.64E+03
SN121*	1.02E+02	5.70E+01	1.03E+03	4.79E+03	5.98E+03
SN123	0.00E+00	0.00E+00	1.95E-25	4.71E-08	4.71E-08
SN126	6.58E+00	3.67E+00	6.07E+01	2.58E+02	3.29E+02
SB124	0.00E+00	0.00E+00	0.00E+00	2.57E-23	2.57E-23
SB125	1.97E+00	6.02E-01	1.72E+02	1.88E+04	1.90E+04
SB126	9.22E-01	5.14E-01	8.50E+00	3.61E+01	4.61E+01
SB126*	6.58E+00	3.67E+00	6.07E+01	2.58E+02	3.29E+02
TE123	1.67E-13	9.27E-14	2.80E-12	1.60E-11	1.91E-11
TE123*	0.00E+00	0.00E+00	0.00E+00	2.69E-13	2.69E-13
TE125*	4.81E-01	1.47E-01	4.20E+01	4.59E+03	4.63E+03
TE127	0.00E+00	0.00E+00	0.00E+00	3.54E-09	3.54E-09
TE127*	0.00E+00	0.00E+00	7.05E-30	3.61E-09	3.61E-09
I129	1.03E+00	5.75E-01	9.18E+00	3.86E+01	4.94E+01
CS134	1.79E-02	5.45E-03	1.18E+01	8.55E+03	8.56E+03
CS135	2.18E+01	1.22E+01	1.99E+02	7.72E+02	1.01E+03
CS137	1.72E+06	9.09E+05	1.78E+07	8.36E+07	1.04E+08
BA137*	1.62E+06	8.58E+05	1.68E+07	7.90E+07	9.83E+07
LA138	7.58E-09	4.23E-09	6.72E-08	2.78E-07	3.57E-07
CE142	1.41E-03	7.87E-04	1.21E-02	4.92E-02	6.35E-02
CE144	1.01E-10	3.36E-12	6.00E-06	2.95E+02	2.95E+02
PR144	1.01E-10	3.36E-12	6.00E-06	2.95E+02	2.95E+02
PR144*	1.41E-12	4.71E-14	8.40E-08	4.13E+00	4.13E+00
ND144	6.65E-08	3.72E-08	5.71E-07	2.33E-06	3.01E-06
PM146	8.64E-03	3.93E-03	5.91E-01	1.02E+01	1.08E+01
PM147	6.17E+01	1.66E+01	5.55E+03	6.79E+05	6.85E+05
SM146	7.71E-08	4.22E-08	1.71E-06	8.99E-06	1.08E-05
SM147	5.41E-04	3.02E-04	4.50E-03	1.81E-02	2.35E-02
SM148	1.16E-10	6.40E-11	2.35E-09	1.16E-08	1.42E-08
SM149	9.15E-10	5.06E-10	4.10E-09	1.45E-08	2.00E-08
SM151	7.71E+04	4.23E+04	6.23E+05	2.56E+06	3.30E+06
EU150	8.43E-06	4.45E-06	2.75E-04	1.68E-03	1.97E-03
EU152	2.90E+00	1.47E+00	1.24E+02	9.45E+02	1.07E+03

Table H-1. Summary Activities of All Fuel After Reprocessing (Curies). (5 sheets)

Nuclide	T-Plant	B-Plant	REDOX	PUREX	Total
EU154	2.23E+02	1.08E+02	8.23E+03	8.34E+04	9.19E+04
EU155	1.41E+02	5.29E+01	3.41E+03	4.78E+04	5.14E+04
GD152	2.46E-12	1.34E-12	6.31E-11	3.19E-10	3.86E-10
GD153	9.08E-22	8.00E-23	1.41E-14	1.13E-05	1.13E-05
TB160	0.00E+00	0.00E+00	0.00E+00	2.72E-19	2.72E-19
HO166*	2.27E-04	1.25E-04	3.88E-03	2.19E-02	2.62E-02
TM170	0.00E+00	0.00E+00	0.00E+00	7.00E-17	7.00E-17
TM171	8.47E-10	1.98E-10	3.03E-07	3.21E-04	3.21E-04
LU176	0.00E+00	0.00E+00	1.32E-10	1.70E-09	1.83E-09
LU177	0.00E+00	0.00E+00	1.06E-27	4.92E-14	4.92E-14
LU177*	0.00E+00	0.00E+00	4.87E-27	2.25E-13	2.25E-13
HF175	0.00E+00	0.00E+00	0.00E+00	2.43E-19	2.43E-19
HF182	0.00E+00	0.00E+00	3.19E-06	4.93E-05	5.24E-05
TA182	0.00E+00	0.00E+00	3.19E-06	4.93E-05	5.24E-05
W181	0.00E+00	0.00E+00	1.49E-31	1.10E-11	1.10E-11
W185	0.00E+00	0.00E+00	0.00E+00	4.08E-18	4.08E-18
W188	0.00E+00	0.00E+00	0.00E+00	4.00E-21	4.00E-21
RE187	0.00E+00	0.00E+00	3.71E-07	6.48E-06	6.85E-06
RE188	0.00E+00	0.00E+00	0.00E+00	4.04E-21	4.04E-21
OS194	0.00E+00	0.00E+00	2.48E-17	1.20E-15	1.22E-15
IR192	0.00E+00	0.00E+00	2.28E-12	3.56E-11	3.79E-11
IR192*	0.00E+00	0.00E+00	2.28E-12	3.56E-11	3.79E-11
IR194	0.00E+00	0.00E+00	0.00E+00	1.63E-16	1.63E-16
IR194*	0.00E+00	0.00E+00	0.00E+00	5.37E-22	5.37E-22
PT193	0.00E+00	0.00E+00	6.13E-12	1.27E-10	1.33E-10
TL206	1.36E-05	7.55E-06	1.02E-04	4.05E-04	5.27E-04
TL207	3.80E-02	2.30E-02	3.74E-03	4.58E+00	4.64E+00
TL208	7.63E-03	4.15E-03	4.36E-04	2.81E+00	2.82E+00
TL209	1.13E-07	6.71E-08	2.24E-07	2.31E-02	2.31E-02
PB205	2.73E-04	4.29E-06	5.35E-03	2.31E-02	2.87E-02
PB209	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
PB210	2.92E-03	1.88E-03	3.78E-04	1.39E-03	6.57E-03
PB211	3.81E-02	2.31E-02	3.75E-03	4.59E+00	4.65E+00
PB212	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.86E+00
PB214	8.00E-03	4.95E-03	8.92E-04	3.48E-03	1.73E-02
BI208	2.07E-05	1.15E-05	1.55E-04	6.15E-04	8.01E-04
BI210	2.92E-03	1.88E-03	3.77E-04	1.39E-03	6.56E-03
BI210*	1.36E-05	7.55E-06	1.02E-04	4.05E-04	5.27E-04
BI211	3.81E-02	2.31E-02	3.75E-03	4.59E+00	4.65E+00
BI212	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.86E+00
BI213	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
BI214	8.00E-03	4.95E-03	8.92E-04	3.48E-03	1.73E-02
PO210	2.84E-03	1.83E-03	3.69E-04	1.35E-03	6.38E-03
PO211	1.03E-04	6.23E-05	1.01E-05	1.24E-02	1.26E-02

Table H-1. Summary Activities of All Fuel After Reprocessing (Curies). (5 sheets)

Nuclide	T-Plant	B-Plant	REDOX	PUREX	Total
PO212	1.36E-02	7.40E-03	7.77E-04	5.01E+00	5.03E+00
PO213	5.25E-06	3.13E-06	1.05E-05	1.08E+00	1.08E+00
PO214	8.00E-03	4.95E-03	8.91E-04	3.48E-03	1.73E-02
PO215	3.81E-02	2.31E-02	3.75E-03	4.59E+00	4.65E+00
PO216	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.86E+00
PO218	8.00E-03	4.95E-03	8.92E-04	3.48E-03	1.73E-02
AT217	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
RN219	3.81E-02	2.31E-02	3.75E-03	4.59E+00	4.65E+00
RN220	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.86E+00
RN222	8.00E-03	4.95E-03	8.92E-04	3.48E-03	1.73E-02
FR221	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
FR223	5.28E-04	3.19E-04	5.19E-05	6.35E-02	6.44E-02
RA223	3.81E-02	2.31E-02	3.75E-03	4.59E+00	4.65E+00
RA224	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.86E+00
RA225	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
RA226	8.01E-03	4.96E-03	8.92E-04	3.48E-03	1.73E-02
RA228	3.81E-08	2.25E-08	6.57E-09	1.63E+00	1.63E+00
AC225	5.36E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
AC227	3.82E-02	2.32E-02	3.76E-03	4.60E+00	4.66E+00
AC228	3.81E-08	2.25E-08	6.57E-09	1.63E+00	1.63E+00
TH227	3.76E-02	2.28E-02	3.70E-03	4.53E+00	4.59E+00
TH228	2.12E-02	1.16E-02	1.21E-03	7.82E+00	7.85E+00
TH229	5.37E-06	3.20E-06	1.07E-05	1.10E+00	1.10E+00
TH230	7.49E-01	4.38E-01	5.57E-02	2.40E-01	1.48E+00
TH231	7.35E+01	4.05E+01	9.93E-01	2.81E+00	1.18E+02
TH232	4.58E-08	2.68E-08	6.84E-09	1.36E+00	1.36E+00
TH234	1.68E+03	9.25E+02	2.24E+01	5.81E+01	2.68E+03
PA231	7.69E-02	4.50E-02	5.53E-03	7.02E+00	7.15E+00
PA233	4.72E+00	2.63E+00	2.59E+01	9.90E+01	1.32E+02
PA234	2.18E+00	1.20E+00	2.92E-02	7.55E-02	3.49E+00
PA234*	1.68E+03	9.25E+02	2.24E+01	5.81E+01	2.68E+03
U232	2.06E-02	1.12E-02	1.18E-03	5.89E+00	5.92E+00
U233	1.65E-03	9.47E-04	4.86E-03	3.57E+02	3.57E+02
U234	1.65E+03	9.07E+02	2.38E+01	7.07E+01	2.65E+03
U235	7.35E+01	4.05E+01	9.93E-01	2.81E+00	1.18E+02
U236	1.87E+01	1.05E+01	5.41E-01	3.42E+00	3.32E+01
U237	1.45E-02	7.59E-03	8.90E-02	2.51E+00	2.62E+00
U238	1.68E+03	9.25E+02	2.24E+01	5.81E+01	2.68E+03
U240	4.71E-12	2.41E-12	8.82E-11	5.49E-09	5.59E-09
NP235	2.11E-16	3.19E-17	9.67E-13	2.72E-06	2.72E-06
NP236	3.61E-06	1.99E-06	4.04E-05	2.43E-04	2.89E-04
NP237	4.72E+00	2.63E+00	2.59E+01	9.90E+01	1.32E+02
NP238	3.62E-04	1.76E-04	3.81E-02	3.61E-01	3.99E-01
NP239	3.85E-02	1.88E-02	3.91E+00	3.83E+01	4.22E+01

Table H-1. Summary Activities of All Fuel After Reprocessing (Curies). (5 sheets)

Nuclide	T-Plant	B-Plant	REDOX	PUREX	Total
NP240	4.08E-15	1.89E-15	1.00E-13	6.57E-12	6.68E-12
NP240*	4.71E-12	2.41E-12	8.82E-11	5.49E-09	5.59E-09
PU236	3.76E-07	1.98E-07	5.21E-06	2.74E-03	2.75E-03
PU238	2.02E+01	1.11E+01	1.27E+02	1.59E+03	1.75E+03
PU239	2.84E+03	1.55E+03	3.68E+03	2.05E+04	2.86E+04
PU240	3.04E+02	1.70E+02	7.60E+02	5.60E+03	6.83E+03
PU241	6.06E+02	3.17E+02	3.72E+03	1.05E+05	1.10E+05
PU242	4.22E-03	2.26E-03	3.03E-02	6.43E-01	6.79E-01
PU243	0.00E+00	0.00E+00	5.25E-12	1.03E-10	1.08E-10
PU244	4.71E-12	2.41E-12	8.82E-11	5.49E-09	5.59E-09
AM241	2.64E+02	1.42E+02	5.48E+03	7.53E+04	8.11E+04
AM242	8.00E-02	3.90E-02	8.42E+00	7.98E+01	8.83E+01
AM242*	8.04E-02	3.92E-02	8.46E+00	8.02E+01	8.87E+01
AM243	3.85E-02	1.88E-02	3.91E+00	3.83E+01	4.22E+01
AM245	0.00E+00	0.00E+00	4.95E-27	9.02E-25	9.07E-25
CM242	6.64E-02	3.24E-02	6.99E+00	6.62E+01	7.33E+01
CM243	8.04E-04	3.66E-04	5.00E-01	7.24E+00	7.74E+00
CM244	1.90E-02	8.55E-03	1.10E+01	1.80E+02	1.92E+02
CM245	4.56E-07	2.05E-07	6.36E-04	9.38E-03	1.00E-02
CM246	2.36E-09	1.03E-09	1.50E-05	2.55E-04	2.70E-04
CM247	1.83E-16	7.84E-17	5.26E-12	1.03E-10	1.08E-10
CM248	1.06E-17	4.48E-18	1.41E-12	3.15E-11	3.30E-11
CM250	0.00E+00	0.00E+00	3.44E-21	9.28E-20	9.62E-20
BK249	0.00E+00	0.00E+00	9.74E-22	4.86E-16	4.86E-16
CF249	0.00E+00	0.00E+00	2.82E-12	7.25E-11	7.53E-11
CF250	0.00E+00	0.00E+00	7.34E-13	3.09E-11	3.17E-11
CF251	0.00E+00	0.00E+00	7.43E-15	2.37E-13	2.45E-13
CF252	0.00E+00	0.00E+00	2.45E-17	9.26E-15	9.29E-15
CF254	0.00E+00	0.00E+00	0.00E+00	7.57E-19	7.57E-19
ES254	0.00E+00	0.00E+00	0.00E+00	9.11E-26	9.11E-26

Note:

[a] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding.The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Thus, predictions of tritium levels in cladding waste should be interpreted as bounding values.

Table H-2. Summary Activities of Fuel Filling Tank AZ-101 and AZ-102 After Reprocessing (Curies). (5 sheets)

Nuclide	AZ-101 Curies (11/83 – 2/86)	AZ-102 Curies (3/86 – 12/88)
H03	1.93E+04	1.15E+04
BE10	7.91E-03	4.17E-03
C14	6.42E+01	3.49E+01
SI32	1.47E-06	7.78E-07
P32	1.47E-06	7.78E-07
S35	1.32E-17	1.21E-15
CL36	4.31E-01	2.27E-01
AR39	1.17E-04	5.82E-05
AR42	3.60E-16	1.79E-16
K40	1.65E-18	7.60E-19
CA45	2.78E-12	2.90E-11
SC46	3.79E-20	4.45E-18
V50	1.11E-12	6.61E-13
MN54	1.06E-02	2.88E-02
FE55	1.33E+03	1.20E+03
CO58	8.62E-21	2.37E-18
CO60	4.53E+03	3.18E+03
NI59	2.16E+01	1.17E+01
NI63	2.09E+03	1.14E+03
ZN65	5.04E-07	1.86E-06
SE79	3.35E+00	1.86E+00
KR81	7.73E-06	3.93E-06
KR85	3.53E+05	2.22E+05
RB87	2.39E-03	1.33E-03
SR89	8.26E-27	2.21E-23
SR90	5.54E+06	3.23E+06
Y90	5.54E+06	3.23E+06
Y91	4.07E-22	3.76E-19
ZR93	2.03E+02	1.13E+02
ZR95	1.56E-19	8.02E-17
NB92	4.67E-07	2.59E-07
NB93*	1.14E+02	5.97E+01
NB94	5.75E-03	2.95E-03
NB95	3.44E-19	1.77E-16
NB95*	1.84E-21	9.44E-19
MO93	4.16E-02	2.31E-02
TC98	4.40E-05	2.27E-05
TC99	1.44E+03	8.00E+02
RU106	3.46E+02	7.09E+02
RH102	7.05E-02	4.68E-02
RH106	3.46E+02	7.09E+02
PD107	5.26E+00	2.74E+00
AG108	8.39E-05	4.27E-05

Table H-2. Summary Activities of Fuel Filling Tank AZ-101 and AZ-102 After Reprocessing (Curies). (5 sheets)

Nuclide	AZ-101 Curies (11/83 – 2/86)	AZ-102 Curies (3/86 – 12/88)
AG108*	9.65E-04	4.91E-04
AG109*	4.41E-04	7.20E-04
AG110	8.33E-06	2.80E-05
AG110*	6.12E-04	2.06E-03
CD109	4.41E-04	7.20E-04
CD113	1.62E-11	9.04E-12
CD113*	6.06E+02	3.47E+02
IN113*	5.35E-11	1.67E-09
IN115	1.70E-09	9.28E-10
SN113	5.35E-11	1.67E-09
SN119*	1.38E-01	4.27E-01
SN121	2.85E+02	1.56E+02
SN121*	3.67E+02	2.01E+02
SN123	2.24E-09	4.48E-08
SN126	1.50E+01	8.12E+00
SB124	3.59E-26	2.56E-23
SB125	9.00E+03	8.07E+03
SB126	2.10E+00	1.14E+00
SB126*	1.50E+01	8.12E+00
TE123	1.91E-12	9.43E-13
TE123*	1.08E-14	2.58E-13
TE125*	2.20E+03	1.97E+03
TE127	9.29E-11	3.45E-09
TE127*	9.48E-11	3.52E-09
I129	2.21E+00	1.21E+00
CS134	4.31E+03	4.06E+03
CS135	3.79E+01	2.07E+01
CS137	6.65E+06	3.82E+06
BA137*	6.28E+06	3.61E+06
LA138	1.53E-08	8.42E-09
CE142	2.68E-03	1.49E-03
CE144	6.94E+01	2.25E+02
PR144	6.94E+01	2.25E+02
PR144*	9.72E-01	3.16E+00
ND144	1.29E-07	7.13E-08
PM146	3.77E+00	2.24E+00
PM147	3.17E+05	3.06E+05
SM146	9.55E-07	4.79E-07
SM147	9.37E-04	5.19E-04
SM148	1.12E-09	5.79E-10
SM149	5.16E-10	3.01E-10
SM151	1.34E+05	7.61E+04
EU150	2.37E-04	1.18E-04

Table H-2. Summary Activities of Fuel Filling Tank AZ-101 and AZ-102 After Reprocessing (Curies). (5 sheets)

Nuclide	AZ-101 Curies (11/83 – 2/86)	AZ-102 Curies (3/86 – 12/88)
EU152	1.83E+02	9.36E+01
EU154	2.16E+04	1.19E+04
EU155	1.46E+04	1.10E+04
GD152	3.07E-11	1.54E-11
GD153	2.61E-06	8.65E-06
TB160	1.20E-21	2.71E-19
HO166*	2.38E-03	1.17E-03
TM170	3.51E-18	6.65E-17
TM171	1.55E-04	1.61E-04
LU176	5.42E-10	2.71E-10
LU177	5.03E-15	4.42E-14
LU177*	2.30E-14	2.02E-13
HF175	8.01E-22	2.42E-19
HF182	1.90E-05	1.02E-05
TA182	1.90E-05	1.02E-05
W181	4.08E-13	1.06E-11
W185	1.98E-20	4.06E-18
W188	1.27E-23	3.99E-21
RE187	2.59E-06	1.44E-06
RE188	1.28E-23	4.03E-21
OS194	6.61E-16	1.98E-16
IR192	1.19E-11	5.29E-12
IR192*	1.19E-11	5.29E-12
IR194*	1.36E-22	4.01E-22
PT193	4.83E-11	2.05E-11
TL206	1.02E-10	4.74E-11
TL207	1.47E-03	7.76E-04
TL208	1.70E-03	9.46E-04
TL209	4.12E-08	2.11E-08
PB205	4.73E-06	2.62E-06
PB209	1.96E-06	1.00E-06
PB210	7.61E-05	3.55E-05
PB211	1.48E-03	7.78E-04
PB212	4.74E-03	2.63E-03
PB214	3.01E-04	1.52E-04
BI208	2.05E-12	1.06E-12
BI210	7.60E-05	3.54E-05
BI210*	1.35E-12	7.00E-13
BI211	1.48E-03	7.78E-04
BI212	4.74E-03	2.63E-03
BI213	1.96E-06	1.00E-06
BI214	3.01E-04	1.52E-04
PO210	7.22E-05	3.35E-05

Table H-2. Summary Activities of Fuel Filling Tank AZ-101 and AZ-102 After Reprocessing (Curies). (5 sheets)

Nuclide	AZ-101 Curies (11/83 – 2/86)	AZ-102 Curies (3/86 – 12/88)
PO211	3.99E-06	2.10E-06
PO212	3.04E-03	1.69E-03
PO213	1.92E-06	9.82E-07
PO214	3.01E-04	1.52E-04
PO215	1.48E-03	7.78E-04
PO216	4.74E-03	2.63E-03
PO218	3.01E-04	1.52E-04
AT217	1.96E-06	1.00E-06
RN219	1.48E-03	7.78E-04
RN220	4.74E-03	2.63E-03
RN222	3.01E-04	1.52E-04
FR221	1.96E-06	1.00E-06
FR223	2.05E-05	1.08E-05
RA223	1.48E-03	7.78E-04
RA224	4.74E-03	2.63E-03
RA225	1.97E-06	1.01E-06
RA226	3.01E-04	1.52E-04
RA228	1.71E-08	1.01E-08
AC225	1.96E-06	1.00E-06
AC227	1.49E-03	7.82E-04
AC228	1.71E-08	1.01E-08
TH227	1.46E-03	7.69E-04
TH228	4.74E-03	2.63E-03
TH229	1.98E-06	1.01E-06
TH230	3.67E-02	2.08E-02
TH231	4.63E-01	2.76E-01
TH232	1.94E-08	1.18E-08
TH234	8.51E+00	4.78E+00
PA231	3.30E-03	1.92E-03
PA233	1.96E+01	1.06E+01
PA234	1.11E-02	6.21E-03
PA234*	8.51E+00	4.78E+00
U232	4.28E-03	2.08E-03
U233	1.37E-03	6.43E-04
U234	1.23E+01	6.94E+00
U235	4.63E-01	2.76E-01
U236	1.18E+00	6.86E-01
U237	9.71E-01	4.84E-01
U238	8.51E+00	4.78E+00
U240	1.63E-09	7.51E-10
NP235	9.96E-07	1.72E-06
NP236	7.67E-05	3.90E-05
NP237	1.96E+01	1.06E+01

Table H-2. Summary Activities of Fuel Filling Tank AZ-101 and AZ-102 After Reprocessing (Curies). (5 sheets)

Nuclide	AZ-101 Curies (11/83 – 2/86)	AZ-102 Curies (3/86 – 12/88)
NP238	7.68E-02	3.49E-02
NP239	7.60E+00	3.52E+00
NP240	1.95E-12	8.98E-13
NP240*	1.63E-09	7.51E-10
PU236	1.53E-03	1.12E-03
PU238	5.02E+02	2.52E+02
PU239	4.74E+03	2.54E+03
PU240	1.36E+03	6.94E+02
PU241	4.06E+04	2.02E+04
PU242	1.75E-01	8.34E-02
PU243	3.38E-11	1.52E-11
PU244	1.63E-09	7.51E-10
AM241	2.43E+04	1.58E+04
AM242	1.70E+01	7.72E+00
AM242*	1.71E+01	7.75E+00
AM243	7.60E+00	3.52E+00
CM242	1.41E+01	6.40E+00
CM243	2.18E+00	9.19E-01
CM244	5.65E+01	2.28E+01
CM245	2.63E-03	1.18E-03
CM246	7.85E-05	3.52E-05
CM247	3.38E-11	1.52E-11
CM248	1.10E-11	4.98E-12
CM250	3.49E-20	1.59E-20
BK249	4.57E-16	2.85E-17
CF249	2.67E-11	1.21E-11
CF250	1.43E-11	5.55E-12
CF251	9.24E-14	4.25E-14
CF252	6.94E-15	1.44E-15
CF254	3.54E-19	1.72E-19
ES254	8.80E-26	3.18E-27

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
H01	6.48E+00	3.63E+00	9.21E+02	2.11E+04	2.20E+04
H02	1.10E-04	6.13E-05	4.31E-01	9.13E+00	9.56E+00
H03[a]	1.58E+00	7.65E-01	1.82E+01	9.33E+01	1.14E+02
HE03	2.35E+01	1.32E+01	1.69E+02	6.53E+02	8.59E+02
HE04	5.64E+01	3.14E+01	4.11E+02	1.71E+03	2.21E+03
LI06	9.06E+02	4.95E+02	3.39E+03	1.16E+04	1.64E+04
LI07	1.37E+04	7.51E+03	5.38E+04	1.86E+05	2.61E+05
BE09	9.79E-04	5.47E-04	1.81E+04	4.27E+05	4.45E+05
BE10	6.88E-03	3.84E-03	1.07E-01	1.07E+00	1.19E+00
B10	3.30E+02	1.80E+02	1.12E+03	3.79E+03	5.42E+03
B11	1.71E+03	9.33E+02	6.73E+03	2.43E+04	3.36E+04
C12	4.07E-04	2.26E-04	1.30E+05	3.06E+06	3.19E+06
C13	3.42E-11	1.89E-11	1.58E+03	3.73E+04	3.88E+04
C14	4.89E+01	2.73E+01	2.32E+02	5.74E+02	8.81E+02
N14	3.32E+05	1.83E+05	8.73E+05	1.84E+06	3.23E+06
N15	1.31E+03	7.21E+02	3.45E+03	7.27E+03	1.27E+04
O16	1.25E-06	7.00E-07	6.04E-06	1.54E-05	2.34E-05
O17	5.66E-15	3.14E-15	1.02E-09	1.42E-08	1.53E-08
O18	5.36E-07	2.97E-07	7.77E-06	4.19E-05	5.05E-05
F19	3.62E-15	1.95E-15	1.05E-13	7.49E-13	8.59E-13
NE20	2.07E-10	1.15E-10	1.36E-04	2.35E-03	2.49E-03
NE21	1.85E-02	1.03E-02	1.42E-01	6.19E-01	7.89E-01
NE22	2.78E-02	1.55E-02	2.13E-01	9.29E-01	1.19E+00
NA23	5.64E-03	3.15E-03	3.37E+02	8.06E+03	8.40E+03
MG24	1.13E+05	6.20E+04	4.42E+05	1.59E+06	2.21E+06
MG25	1.49E+04	8.18E+03	5.82E+04	2.10E+05	2.91E+05
MG26	1.70E+04	9.37E+03	6.67E+04	2.41E+05	3.34E+05
AL27	1.89E+08	1.04E+08	7.32E+08	2.52E+09	3.55E+09
SI28	6.43E+06	3.54E+06	2.49E+07	8.48E+07	1.20E+08
SI29	3.37E+05	1.86E+05	1.31E+06	4.45E+06	6.28E+06
SI30	2.32E+05	1.28E+05	8.97E+05	3.05E+06	4.31E+06
SI32	8.05E-08	4.45E-08	5.54E-07	2.35E-06	3.03E-06
P31	1.11E+00	6.19E-01	8.17E+00	3.20E+01	4.19E+01
P32	1.83E-11	1.01E-11	1.26E-10	5.33E-10	6.87E-10
S32	2.63E-03	1.47E-03	2.02E-02	8.87E-02	1.13E-01
S33	1.47E-08	8.03E-09	3.02E-07	1.74E-06	2.06E-06
S34	1.75E-04	9.77E-05	1.35E-03	5.90E-03	7.52E-03
S35	0.00E+00	0.00E+00	0.00E+00	2.87E-20	2.87E-20
S36	1.32E-05	7.74E-06	8.60E-05	3.23E-04	4.30E-04
S250	5.56E-08	3.07E-08	8.11E-07	4.73E-06	5.63E-06
CL35	3.76E+03	2.07E+03	1.47E+04	5.31E+04	7.36E+04
CL36	6.13E+00	3.42E+00	4.71E+01	2.06E+02	2.63E+02

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
CL37	1.27E+03	7.00E+02	4.98E+03	1.80E+04	2.50E+04
AR36	6.83E-04	4.00E-04	4.44E-03	1.67E-02	2.22E-02
AR38	2.25E-02	1.26E-02	1.73E-01	7.58E-01	9.65E-01
AR39	3.67E-07	2.03E-07	5.43E-06	2.99E-05	3.59E-05
AR40	4.89E-09	2.64E-09	1.38E-07	9.87E-07	1.13E-06
AR42	2.07E-19	1.11E-19	3.19E-18	1.94E-17	2.29E-17
K39	4.96E-08	2.84E-08	6.02E-07	2.73E-06	3.41E-06
K40	1.45E-15	7.44E-16	1.10E-13	1.02E-12	1.14E-12
K41	9.67E-12	5.34E-12	1.32E-10	6.52E-10	8.00E-10
CA42	1.36E-14	7.33E-15	3.22E-13	1.71E-12	2.05E-12
CA43	5.10E-04	2.83E-04	3.85E-03	1.58E-02	2.05E-02
CA44	3.92E-03	2.18E-03	2.96E-02	1.22E-01	1.57E-01
CA45	0.00E+00	0.00E+00	1.40E-28	1.79E-15	1.79E-15
CA46	4.38E-04	2.43E-04	3.31E-03	1.36E-02	1.76E-02
SC45	7.98E-05	4.43E-05	6.03E-04	2.48E-03	3.20E-03
SC46	0.00E+00	0.00E+00	0.00E+00	1.33E-22	1.33E-22
TI46	6.62E+03	3.62E+03	2.60E+04	9.11E+04	1.27E+05
TI47	6.11E+03	3.34E+03	2.40E+04	8.41E+04	1.18E+05
TI48	6.17E+04	3.38E+04	2.42E+05	8.49E+05	1.19E+06
TI49	4.64E+03	2.54E+03	1.82E+04	6.41E+04	8.95E+04
TI50	4.54E+03	2.48E+03	1.78E+04	6.25E+04	8.73E+04
V50	5.14E-02	2.87E-02	2.43E+00	5.06E+01	5.32E+01
V51	1.00E+01	5.60E+00	9.19E+02	2.05E+04	2.14E+04
CR50	1.63E+04	8.95E+03	6.44E+04	2.45E+05	3.35E+05
CR52	3.26E+05	1.79E+05	1.29E+06	4.92E+06	6.72E+06
CR53	3.77E+04	2.08E+04	1.49E+05	5.70E+05	7.78E+05
CR54	9.57E+03	5.26E+03	3.80E+04	1.45E+05	1.98E+05
MN54	1.65E-17	7.12E-19	3.92E-13	5.08E-06	5.08E-06
MN55	1.88E+05	1.04E+05	7.38E+05	2.65E+06	3.68E+06
FE54	1.19E+05	6.57E+04	4.68E+05	1.72E+06	2.37E+06
FE55	1.28E-04	3.55E-05	9.53E-03	1.17E+00	1.18E+00
FE56	1.95E+06	1.08E+06	7.67E+06	2.81E+07	3.88E+07
FE57	4.68E+04	2.58E+04	1.85E+05	6.78E+05	9.35E+05
FE58	6.40E+03	3.53E+03	2.52E+04	9.25E+04	1.28E+05
CO58	0.00E+00	0.00E+00	0.00E+00	7.48E-23	7.48E-23
CO59	7.10E+03	3.90E+03	2.79E+04	1.03E+05	1.42E+05
CO60	4.20E-02	1.67E-02	9.35E-01	1.32E+01	1.42E+01
NI58	3.60E+05	1.98E+05	3.21E+06	1.67E+07	2.05E+07
NI59	1.34E+02	7.50E+01	2.38E+03	1.41E+04	1.67E+04
NI60	1.43E+05	7.84E+04	1.27E+06	6.60E+06	8.09E+06
NI61	6.29E+03	3.46E+03	5.62E+04	2.92E+05	3.58E+05
NI62	2.02E+04	1.11E+04	1.80E+05	9.36E+05	1.15E+06

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
NI63	1.78E+01	1.01E+01	3.16E+02	1.89E+03	2.24E+03
NI64	5.50E+03	3.08E+03	4.76E+04	2.46E+05	3.03E+05
CU63	1.40E+06	1.26E+06	1.55E+06	2.62E+06	6.83E+06
CU65	6.45E+05	5.79E+05	7.11E+05	1.20E+06	3.14E+06
ZN64	2.99E+04	1.64E+04	1.17E+05	4.02E+05	5.65E+05
ZN65	6.82E-22	1.32E-23	1.37E-16	2.87E-10	2.87E-10
ZN66	1.77E+04	9.70E+03	6.91E+04	2.38E+05	3.35E+05
ZN67	2.63E+03	1.44E+03	1.03E+04	3.54E+04	4.98E+04
ZN68	1.22E+04	6.69E+03	4.79E+04	1.65E+05	2.32E+05
ZN70	4.16E+02	2.27E+02	1.63E+03	5.60E+03	7.87E+03
GA69	8.48E-01	4.71E-01	6.34E+00	2.52E+01	3.28E+01
GA71	1.49E-03	8.27E-04	1.14E-02	4.56E-02	5.93E-02
GE70	1.09E-04	6.00E-05	1.41E-03	6.32E-03	7.90E-03
GE72	1.86E-01	1.04E-01	1.72E+00	7.43E+00	9.44E+00
GE73	6.25E-01	3.49E-01	5.57E+00	2.35E+01	3.00E+01
GE74	1.89E+00	1.06E+00	1.67E+01	6.96E+01	8.92E+01
GE76	1.61E+01	8.98E+00	1.39E+02	5.66E+02	7.30E+02
AS75	5.63E+00	3.14E+00	4.90E+01	2.02E+02	2.59E+02
SE76	5.42E-03	3.01E-03	7.76E-02	3.85E-01	4.71E-01
SE77	4.24E+01	2.37E+01	3.64E+02	1.48E+03	1.91E+03
SE78	1.14E+02	6.35E+01	9.77E+02	3.99E+03	5.14E+03
SE79	2.50E+02	1.40E+02	2.15E+03	8.81E+03	1.14E+04
SE80	6.99E+02	3.90E+02	5.98E+03	2.43E+04	3.13E+04
SE82	1.85E+03	1.03E+03	1.58E+04	6.41E+04	8.27E+04
BR79	1.33E-02	7.75E-03	9.62E-02	3.42E-01	4.59E-01
BR81	1.14E+03	6.34E+02	9.75E+03	3.97E+04	5.13E+04
KR80	1.09E-03	6.09E-04	1.14E-02	5.16E-02	6.46E-02
KR81	7.81E-05	4.34E-05	1.07E-03	5.28E-03	6.47E-03
KR82	1.59E+00	8.83E-01	2.23E+01	1.09E+02	1.34E+02
KR83	3.09E+03	1.73E+03	2.60E+04	1.05E+05	1.36E+05
KR84	6.30E+03	3.52E+03	5.33E+04	2.17E+05	2.80E+05
KR85	7.08E+01	3.37E+01	1.02E+03	6.32E+03	7.44E+03
KR86	1.12E+04	6.28E+03	9.48E+04	3.83E+05	4.95E+05
RB85	7.41E+03	4.14E+03	6.22E+04	2.49E+05	3.23E+05
RB87	1.53E+04	8.55E+03	1.29E+05	5.21E+05	6.74E+05
SR86	4.89E-01	2.72E-01	7.40E+00	3.69E+01	4.50E+01
SR87	1.71E-02	9.54E-03	2.23E-01	1.35E+00	1.60E+00
SR88	2.12E+04	1.18E+04	1.78E+05	7.20E+05	9.31E+05
SR89	0.00E+00	0.00E+00	0.00E+00	7.61E-28	7.61E-28
SR90	1.07E+04	5.66E+03	1.10E+05	5.10E+05	6.36E+05
Y87	1.32E-15	7.35E-16	7.62E-15	3.27E-14	4.24E-14
Y89	2.85E+04	1.59E+04	2.41E+05	9.70E+05	1.26E+06

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
Y90	2.73E+00	1.44E+00	2.79E+01	1.30E+02	1.62E+02
Y91	0.00E+00	0.00E+00	0.00E+00	1.54E-23	1.54E-23
ZR90	2.44E+04	1.40E+04	8.59E+06	2.02E+08	2.10E+08
ZR91	3.65E+04	2.04E+04	2.16E+06	4.54E+07	4.76E+07
ZR92	3.83E+04	2.14E+04	3.18E+06	6.95E+07	7.28E+07
ZR93	4.12E+04	2.30E+04	3.50E+05	1.43E+06	1.84E+06
ZR94	4.24E+04	2.37E+04	3.33E+06	7.24E+07	7.58E+07
ZR95	0.00E+00	0.00E+00	0.00E+00	3.74E-21	3.74E-21
ZR96	4.34E+04	2.43E+04	8.58E+05	1.32E+07	1.41E+07
NB92	1.52E-11	8.18E-12	6.12E-04	1.06E-02	1.12E-02
NB93	5.51E-01	3.30E-01	3.59E+00	1.18E+01	1.62E+01
NB93*	3.89E-01	2.20E-01	3.12E+00	1.19E+01	1.56E+01
NB94	7.13E-03	3.96E-03	9.16E-02	4.45E-01	5.47E-01
NB95	0.00E+00	0.00E+00	0.00E+00	4.51E-21	4.51E-21
NB95*	0.00E+00	0.00E+00	0.00E+00	2.48E-24	2.48E-24
MO92	0.00E+00	0.00E+00	1.20E+02	2.86E+03	2.98E+03
MO93	0.00E+00	0.00E+00	5.49E-03	9.52E-02	1.01E-01
MO94	1.20E-05	6.90E-06	7.67E+01	1.83E+03	1.91E+03
MO95	4.35E+04	2.43E+04	3.71E+05	1.51E+06	1.95E+06
MO96	7.38E+00	4.04E+00	2.93E+02	4.26E+03	4.56E+03
MO97	4.20E+04	2.34E+04	3.59E+05	1.47E+06	1.90E+06
MO98	4.11E+04	2.30E+04	3.53E+05	1.45E+06	1.87E+06
MO100	4.61E+04	2.57E+04	3.97E+05	1.63E+06	2.10E+06
TC98	5.44E-03	3.01E-03	9.73E-02	4.98E-01	6.03E-01
TC99	4.50E+04	2.51E+04	3.83E+05	1.57E+06	2.02E+06
RU98	4.42E-08	2.52E-08	6.50E-07	2.78E-06	3.50E-06
RU99	7.22E+00	4.22E+00	5.16E+01	1.83E+02	2.46E+02
RU100	7.56E+01	4.18E+01	1.34E+03	6.83E+03	8.29E+03
RU101	3.89E+04	2.17E+04	3.35E+05	1.38E+06	1.77E+06
RU102	3.37E+04	1.88E+04	2.92E+05	1.21E+06	1.55E+06
RU104	1.77E+04	9.85E+03	1.59E+05	6.76E+05	8.63E+05
RU106	5.08E-11	4.07E-12	4.59E-07	3.19E-01	3.19E-01
RH102	2.71E-09	1.03E-09	9.34E-07	1.09E-04	1.09E-04
RH103	2.60E+04	1.45E+04	2.29E+05	9.56E+05	1.23E+06
RH106	4.70E-17	3.77E-18	4.25E-13	2.96E-07	2.96E-07
PD104	7.74E+01	4.18E+01	2.11E+03	1.21E+04	1.43E+04
PD105	1.01E+04	5.64E+03	9.51E+04	4.10E+05	5.21E+05
PD106	6.93E+03	3.86E+03	6.75E+04	3.04E+05	3.82E+05
PD107	3.18E+03	1.77E+03	3.37E+04	1.55E+05	1.94E+05
PD108	1.62E+03	9.00E+02	1.83E+04	8.64E+04	1.07E+05
PD110	5.27E+02	2.94E+02	5.88E+03	2.74E+04	3.41E+04
AG107	1.67E-02	9.68E-03	1.49E-01	5.87E-01	7.62E-01

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
AG107*	2.66E-06	1.45E-06	9.39E-06	3.46E-05	4.81E-05
AG108	1.98E-14	1.09E-14	2.90E-13	1.49E-12	1.81E-12
AG108*	6.41E-06	3.53E-06	9.39E-05	4.83E-04	5.87E-04
AG109	9.71E+02	5.40E+02	1.14E+04	5.40E+04	6.68E+04
AG109*	2.55E-20	2.68E-21	3.23E-17	4.45E-13	4.45E-13
AG110	8.37E-30	4.82E-31	1.54E-23	8.72E-15	8.72E-15
AG110*	5.40E-22	3.11E-23	9.91E-16	5.62E-07	5.62E-07
CD106	7.68E+01	4.20E+01	3.01E+02	1.05E+03	1.47E+03
CD108	5.36E+01	2.93E+01	2.10E+02	7.35E+02	1.03E+03
CD109	2.58E-14	2.71E-15	3.26E-11	4.50E-07	4.50E-07
CD110	7.76E+02	4.24E+02	3.21E+03	1.18E+04	1.62E+04
CD111	1.08E+03	5.92E+02	6.25E+03	2.53E+04	3.32E+04
CD112	1.69E+03	9.26E+02	7.73E+03	2.88E+04	3.92E+04
CD113	1.41E+02	7.52E+01	3.93E+02	1.36E+03	1.96E+03
CD113*	2.60E-01	1.30E-01	3.64E+00	2.18E+01	2.58E+01
CD114	2.76E+03	1.51E+03	1.26E+04	4.66E+04	6.35E+04
CD116	6.30E+02	3.46E+02	3.22E+03	1.23E+04	1.65E+04
IN113	2.21E+01	1.77E+01	5.40E+01	2.21E+02	3.15E+02
IN113*	0.00E+00	0.00E+00	0.00E+00	1.03E-16	1.03E-16
IN114*	0.00E+00	0.00E+00	0.00E+00	5.76E-35	5.76E-35
IN115	1.25E+02	6.96E+01	1.07E+03	4.48E+03	5.74E+03
SN112	3.59E+04	3.39E+04	2.79E+04	5.68E+04	1.55E+05
SN113	0.00E+00	0.00E+00	1.03E-33	1.71E-13	1.71E-13
SN114	2.45E+04	2.32E+04	1.90E+04	3.89E+04	1.06E+05
SN115	1.40E+04	1.32E+04	1.09E+04	2.23E+04	6.04E+04
SN116	5.46E+05	5.17E+05	4.25E+05	8.67E+05	2.36E+06
SN117	2.91E+05	2.75E+05	2.27E+05	4.67E+05	1.26E+06
SN118	9.19E+05	8.70E+05	7.16E+05	1.46E+06	3.97E+06
SN119	3.28E+05	3.10E+05	2.56E+05	5.26E+05	1.42E+06
SN119*	1.45E-17	4.46E-18	9.01E-13	1.51E-04	1.51E-04
SN120	1.25E+06	1.18E+06	9.70E+05	1.98E+06	5.38E+06
SN121	8.26E-05	4.63E-05	8.33E-04	3.89E-03	4.85E-03
SN121*	1.90E+00	1.06E+00	1.91E+01	8.92E+01	1.11E+02
SN122	1.80E+05	1.70E+05	1.41E+05	2.91E+05	7.83E+05
SN123	0.00E+00	0.00E+00	2.38E-29	5.73E-12	5.73E-12
SN124	2.23E+05	2.11E+05	1.76E+05	3.64E+05	9.73E+05
SN126	5.80E+02	3.23E+02	5.34E+03	2.27E+04	2.90E+04
SB121	1.79E+02	1.11E+02	1.31E+03	5.53E+03	7.13E+03
SB123	1.77E+02	9.98E+01	1.54E+03	6.52E+03	8.34E+03
SB124	0.00E+00	0.00E+00	0.00E+00	1.47E-27	1.47E-27
SB125	1.90E-03	5.80E-04	1.66E-01	1.81E+01	1.83E+01
SB126	1.10E-05	6.15E-06	1.02E-04	4.32E-04	5.51E-04

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
SB126*	8.38E-08	4.68E-08	7.73E-07	3.29E-06	4.19E-06
TE122	2.44E-01	1.44E-01	3.43E+00	1.83E+01	2.22E+01
TE123	7.12E-04	3.96E-04	1.20E-02	6.83E-02	8.13E-02
TE123*	0.00E+00	0.00E+00	0.00E+00	3.03E-17	3.03E-17
TE124	2.38E-01	1.32E-01	3.21E+00	1.59E+01	1.95E+01
TE125	3.82E+02	2.20E+02	3.30E+03	1.40E+04	1.79E+04
TE125*	2.67E-05	8.15E-06	2.33E-03	2.55E-01	2.57E-01
TE126	1.34E+01	7.46E+00	1.19E+02	4.90E+02	6.29E+02
TE127	0.00E+00	0.00E+00	0.00E+00	1.34E-15	1.34E-15
TE127*	0.00E+00	0.00E+00	7.47E-34	3.83E-13	3.83E-13
TE128	3.37E+03	1.88E+03	3.00E+04	1.25E+05	1.60E+05
TE130	1.73E+04	9.68E+03	1.50E+05	6.18E+05	7.96E+05
I127	1.64E+03	9.16E+02	1.49E+04	6.33E+04	8.08E+04
I129	5.83E+03	3.26E+03	5.20E+04	2.18E+05	2.79E+05
XE128	1.15E+00	6.32E-01	2.25E+01	1.19E+02	1.44E+02
XE129	1.29E-02	7.50E-03	1.01E-01	3.88E-01	5.10E-01
XE130	1.06E+01	5.88E+00	1.58E+02	8.03E+02	9.78E+02
XE131	2.81E+04	1.57E+04	2.43E+05	9.98E+05	1.29E+06
XE132	4.30E+04	2.40E+04	3.73E+05	1.54E+06	1.98E+06
XE134	7.64E+04	4.27E+04	6.56E+05	2.68E+06	3.46E+06
XE136	1.09E+05	6.11E+04	9.34E+05	3.87E+06	4.98E+06
CS133	6.51E+04	3.64E+04	5.60E+05	2.29E+06	2.96E+06
CS134	1.38E-05	4.22E-06	9.10E-03	6.61E+00	6.62E+00
CS135	1.90E+04	1.06E+04	1.73E+05	6.71E+05	8.73E+05
CS137	1.98E+04	1.05E+04	2.05E+05	9.63E+05	1.20E+06
BA132	1.20E-03	6.64E-04	2.56E-02	1.31E-01	1.58E-01
BA134	1.64E+02	9.03E+01	3.29E+03	1.68E+04	2.04E+04
BA135	2.89E-01	1.69E-01	2.27E+00	8.04E+00	1.08E+01
BA136	1.12E+02	6.23E+01	1.34E+03	6.23E+03	7.75E+03
BA137	4.18E+04	2.39E+04	3.26E+05	1.21E+06	1.60E+06
BA137*	3.02E-03	1.60E-03	3.13E-02	1.47E-01	1.83E-01
BA138	6.65E+04	3.72E+04	5.70E+05	2.33E+06	3.00E+06
LA138	3.07E-01	1.71E-01	2.73E+00	1.13E+01	1.45E+01
LA139	6.37E+04	3.56E+04	5.45E+05	2.23E+06	2.87E+06
CE138	3.36E-11	1.96E-11	2.50E-10	8.92E-10	1.19E-09
CE140	6.27E+04	3.50E+04	5.44E+05	2.22E+06	2.86E+06
CE142	5.87E+04	3.28E+04	5.03E+05	2.05E+06	2.65E+06
CE144	3.17E-14	1.06E-15	1.89E-09	9.26E-02	9.26E-02
PR141	5.90E+04	3.30E+04	5.05E+05	2.06E+06	2.66E+06
PR144	1.34E-18	4.45E-20	7.95E-14	3.90E-06	3.90E-06
PR144*	7.79E-21	2.60E-22	4.63E-16	2.28E-08	2.28E-08
ND142	7.37E+00	4.00E+00	1.91E+02	1.07E+03	1.27E+03

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
ND143	5.96E+04	3.33E+04	5.05E+05	2.05E+06	2.65E+06
ND144	5.61E+04	3.13E+04	4.81E+05	1.96E+06	2.53E+06
ND145	4.06E+04	2.27E+04	3.45E+05	1.41E+06	1.81E+06
ND146	3.20E+04	1.78E+04	2.74E+05	1.12E+06	1.44E+06
ND148	1.84E+04	1.03E+04	1.58E+05	6.46E+05	8.33E+05
ND150	7.80E+03	4.36E+03	6.76E+04	2.80E+05	3.60E+05
PM146	1.95E-05	8.87E-06	1.34E-03	2.31E-02	2.45E-02
PM147	6.66E-02	1.79E-02	5.98E+00	7.32E+02	7.38E+02
SM146	3.24E-03	1.78E-03	7.17E-02	3.78E-01	4.55E-01
SM147	2.36E+04	1.32E+04	1.96E+05	7.90E+05	1.02E+06
SM148	3.81E+02	2.10E+02	7.70E+03	3.82E+04	4.65E+04
SM149	3.81E+03	2.11E+03	1.71E+04	6.03E+04	8.33E+04
SM150	8.48E+03	4.75E+03	8.92E+04	3.77E+05	4.80E+05
SM151	2.93E+03	1.61E+03	2.37E+04	9.71E+04	1.25E+05
SM152	4.10E+03	2.29E+03	4.06E+04	1.75E+05	2.22E+05
SM154	1.07E+03	5.96E+02	9.66E+03	4.12E+04	5.25E+04
EU150	1.27E-07	6.68E-08	4.13E-06	2.53E-05	2.96E-05
EU151	1.35E+03	7.87E+02	8.92E+03	3.11E+04	4.22E+04
EU152	1.67E-02	8.44E-03	7.11E-01	5.44E+00	6.17E+00
EU153	2.14E+03	1.19E+03	1.94E+04	8.27E+04	1.05E+05
EU154	8.27E-01	3.99E-01	3.04E+01	3.09E+02	3.40E+02
EU155	2.91E-01	1.09E-01	7.02E+00	9.83E+01	1.06E+02
GD152	1.13E-01	6.15E-02	2.90E+00	1.47E+01	1.77E+01
GD153	2.57E-25	2.26E-26	3.98E-18	3.19E-09	3.19E-09
GD154	4.23E+01	2.34E+01	7.28E+02	3.61E+03	4.41E+03
GD155	3.58E+02	2.00E+02	2.55E+03	1.00E+04	1.31E+04
GD156	4.61E+02	2.57E+02	5.17E+03	2.37E+04	2.95E+04
GD157	2.75E+01	1.52E+01	1.57E+02	6.15E+02	8.15E+02
GD158	1.94E+02	1.08E+02	2.11E+03	9.61E+03	1.20E+04
GD160	1.22E+01	6.80E+00	1.34E+02	6.23E+02	7.76E+02
TB159	3.04E+01	1.69E+01	3.20E+02	1.47E+03	1.84E+03
TB160	0.00E+00	0.00E+00	0.00E+00	2.41E-23	2.41E-23
DY160	9.99E-02	5.48E-02	1.93E+00	1.10E+01	1.31E+01
DY161	4.83E+00	2.69E+00	5.74E+01	2.70E+02	3.35E+02
DY162	1.84E+00	1.02E+00	2.34E+01	1.14E+02	1.41E+02
DY163	8.27E-01	4.60E-01	1.03E+01	5.03E+01	6.19E+01
DY164	3.22E-01	1.79E-01	3.61E+00	1.70E+01	2.11E+01
HO165	1.86E-01	1.03E-01	2.26E+00	1.12E+01	1.38E+01
HO166*	1.26E-04	6.96E-05	2.16E-03	1.22E-02	1.46E-02
ER166	1.15E-02	6.36E-03	1.67E-01	8.59E-01	1.04E+00
ER167	1.48E-05	7.83E-06	4.62E-04	3.05E-03	3.53E-03
ER168	3.30E-06	1.81E-06	7.73E-05	5.41E-04	6.23E-04

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
ER170	1.15E-05	6.41E-06	1.44E-04	6.98E-04	8.59E-04
TM169	1.01E-08	5.61E-09	1.68E-07	9.73E-07	1.16E-06
TM170	0.00E+00	0.00E+00	0.00E+00	1.17E-20	1.17E-20
TM171	7.78E-13	1.82E-13	2.79E-10	2.95E-07	2.95E-07
YB170	2.87E-08	1.59E-08	4.03E-07	2.01E-06	2.46E-06
YB171	2.87E-05	1.60E-05	3.16E-04	1.50E-03	1.86E-03
YB172	2.63E-08	1.44E-08	5.17E-07	3.09E-06	3.65E-06
YB173	0.00E+00	0.00E+00	3.74E-10	4.63E-09	5.00E-09
YB174	0.00E+00	0.00E+00	2.93E-12	3.81E-11	4.10E-11
YB176	0.00E+00	0.00E+00	6.13E-06	7.84E-05	8.45E-05
LU175	0.00E+00	0.00E+00	5.67E-01	9.97E+00	1.05E+01
LU176	0.00E+00	0.00E+00	2.34E-03	3.01E-02	3.24E-02
LU177	0.00E+00	0.00E+00	9.64E-33	4.48E-19	4.48E-19
LU177*	0.00E+00	0.00E+00	1.06E-30	4.90E-17	4.90E-17
HF174	0.00E+00	0.00E+00	4.68E+00	1.16E+02	1.20E+02
HF175	0.00E+00	0.00E+00	0.00E+00	2.28E-23	2.28E-23
HF176	0.00E+00	0.00E+00	1.64E+02	3.97E+03	4.14E+03
HF177	0.00E+00	0.00E+00	3.66E+02	1.02E+04	1.05E+04
HF178	0.00E+00	0.00E+00	1.03E+03	2.42E+04	2.52E+04
HF179	0.00E+00	0.00E+00	5.85E+02	1.32E+04	1.38E+04
HF180	0.00E+00	0.00E+00	1.22E+03	2.89E+04	3.02E+04
HF182	0.00E+00	0.00E+00	1.46E-02	2.26E-01	2.40E-01
TA181	0.00E+00	0.00E+00	6.68E+00	1.16E+02	1.23E+02
TA182	0.00E+00	0.00E+00	5.11E-10	7.90E-09	8.41E-09
W180	0.00E+00	0.00E+00	1.06E+00	2.54E+01	2.64E+01
W181	0.00E+00	0.00E+00	2.50E-35	1.85E-15	1.85E-15
W182	0.00E+00	0.00E+00	2.10E+02	5.08E+03	5.29E+03
W183	0.00E+00	0.00E+00	1.26E+02	2.98E+03	3.11E+03
W184	0.00E+00	0.00E+00	2.61E+02	6.23E+03	6.49E+03
W185	0.00E+00	0.00E+00	0.00E+00	4.34E-22	4.34E-22
W186	0.00E+00	0.00E+00	2.34E+02	5.66E+03	5.89E+03
W188	0.00E+00	0.00E+00	0.00E+00	4.00E-25	4.00E-25
RE185	0.00E+00	0.00E+00	3.34E-01	5.83E+00	6.16E+00
RE187	0.00E+00	0.00E+00	9.72E+00	1.70E+02	1.79E+02
RE188	0.00E+00	0.00E+00	0.00E+00	4.12E-27	4.12E-27
OS186	0.00E+00	0.00E+00	1.06E-02	1.36E-01	1.47E-01
OS187	0.00E+00	0.00E+00	4.78E-09	5.62E-08	6.09E-08
OS188	0.00E+00	0.00E+00	2.05E-01	2.91E+00	3.12E+00
OS189	0.00E+00	0.00E+00	7.37E-04	9.30E-03	1.00E-02
OS190	0.00E+00	0.00E+00	1.21E-05	1.52E-04	1.64E-04
OS192	0.00E+00	0.00E+00	3.65E-11	5.57E-10	5.94E-10
OS194	0.00E+00	0.00E+00	8.09E-20	3.90E-18	3.98E-18

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
IR191	0.00E+00	0.00E+00	1.35E-08	1.80E-07	1.94E-07
IR192	0.00E+00	0.00E+00	2.48E-16	3.87E-15	4.12E-15
IR192*	0.00E+00	0.00E+00	2.95E-13	4.61E-12	4.90E-12
IR193	0.00E+00	0.00E+00	2.85E-11	4.72E-10	5.00E-10
IR194	0.00E+00	0.00E+00	0.00E+00	1.93E-22	1.93E-22
IR194*	0.00E+00	0.00E+00	0.00E+00	1.37E-25	1.37E-25
PT192	0.00E+00	0.00E+00	7.30E-10	1.11E-08	1.19E-08
PT193	0.00E+00	0.00E+00	1.66E-13	3.43E-12	3.60E-12
PT194	0.00E+00	0.00E+00	5.43E-13	1.02E-11	1.07E-11
PT195	0.00E+00	0.00E+00	3.87E-17	8.28E-16	8.67E-16
PT196	0.00E+00	0.00E+00	1.50E-19	3.72E-18	3.87E-18
HG206	2.97E-13	2.02E-13	4.24E-14	1.43E-13	6.83E-13
TL205	5.03E-06	8.81E-08	8.76E-05	3.48E-04	4.41E-04
TL206	6.26E-14	3.47E-14	4.68E-13	1.86E-12	2.43E-12
TL207	2.00E-10	1.21E-10	1.97E-11	2.40E-08	2.44E-08
TL208	2.58E-11	1.40E-11	1.47E-12	9.50E-09	9.54E-09
TL209	2.75E-16	1.64E-16	5.49E-16	5.64E-11	5.64E-11
TL210	1.30E-08	8.51E-09	1.73E-09	6.20E-09	2.95E-08
PB204	7.68E+04	9.45E+02	6.27E+05	2.37E+06	3.07E+06
PB205	2.38E+00	3.74E-02	4.66E+01	2.01E+02	2.50E+02
PB206	1.33E+06	1.64E+04	1.09E+07	4.11E+07	5.33E+07
PB207	1.23E+06	1.52E+04	1.01E+07	3.80E+07	4.93E+07
PB208	2.93E+06	3.61E+04	2.39E+07	9.04E+07	1.17E+08
PB209	1.16E-12	6.93E-13	2.32E-12	2.38E-07	2.38E-07
PB210	3.83E-05	2.46E-05	4.95E-06	1.82E-05	8.60E-05
PB211	1.54E-09	9.34E-10	1.52E-10	1.86E-07	1.89E-07
PB212	1.53E-08	8.32E-09	8.73E-10	5.63E-06	5.65E-06
PB214	2.44E-10	1.51E-10	2.72E-11	1.06E-10	5.28E-10
BI208	4.42E-03	2.46E-03	3.31E-02	1.32E-01	1.72E-01
BI209	1.88E+04	1.03E+04	7.36E+04	2.54E+05	3.57E+05
BI210	2.35E-08	1.51E-08	3.04E-09	1.12E-08	5.29E-08
BI210*	2.40E-02	1.33E-02	1.79E-01	7.13E-01	9.29E-01
BI211	9.15E-11	5.54E-11	9.01E-12	1.10E-08	1.12E-08
BI212	1.45E-09	7.89E-10	8.28E-11	5.34E-07	5.36E-07
BI213	2.77E-13	1.65E-13	5.52E-13	5.67E-08	5.67E-08
BI214	1.81E-10	1.12E-10	2.02E-11	7.87E-11	3.92E-10
PO210	6.31E-07	4.07E-07	8.21E-08	3.01E-07	1.42E-06
PO211	9.93E-16	6.01E-16	9.78E-17	1.20E-13	1.21E-13
PO212	7.61E-20	4.15E-20	4.35E-21	2.81E-17	2.82E-17
PO213	4.16E-22	2.48E-22	8.29E-22	8.53E-17	8.53E-17
PO214	2.49E-17	1.54E-17	2.78E-18	1.08E-17	5.40E-17
PO215	1.29E-15	7.82E-16	1.27E-16	1.56E-13	1.58E-13

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
PO216	5.89E-14	3.21E-14	3.37E-15	2.17E-11	2.18E-11
PO218	2.88E-11	1.78E-11	3.21E-12	1.25E-11	6.23E-11
AT217	3.33E-18	1.99E-18	6.64E-18	6.83E-13	6.83E-13
AT218	1.13E-08	7.36E-09	1.50E-09	5.37E-09	2.55E-08
AT219	2.49E-10	1.61E-10	3.14E-11	3.18E-08	3.22E-08
RN217	4.78E-12	2.96E-12	7.29E-12	8.21E-07	8.21E-07
RN219	2.93E-12	1.77E-12	2.88E-13	3.53E-10	3.58E-10
RN220	2.30E-11	1.25E-11	1.32E-12	8.48E-09	8.52E-09
RN222	5.20E-08	3.22E-08	5.80E-09	2.26E-08	1.13E-07
FR221	3.09E-14	1.84E-14	6.15E-14	6.33E-09	6.33E-09
FR223	1.36E-11	8.26E-12	1.34E-12	1.64E-09	1.66E-09
FR224	0.00E+00	0.00E+00	0.00E+00	3.56E-09	3.56E-09
RA223	7.44E-07	4.50E-07	7.33E-08	8.96E-05	9.09E-05
RA224	1.33E-07	7.25E-08	7.62E-09	4.91E-05	4.93E-05
RA225	1.37E-10	8.16E-11	2.73E-10	2.81E-05	2.81E-05
RA226	8.09E-03	5.01E-03	9.01E-04	3.51E-03	1.75E-02
RA228	1.40E-10	8.26E-11	2.41E-11	5.98E-03	5.98E-03
AC225	9.23E-11	5.51E-11	1.84E-10	1.89E-05	1.89E-05
AC227	5.28E-04	3.20E-04	5.19E-05	6.35E-02	6.44E-02
AC228	1.71E-14	1.01E-14	2.94E-15	7.29E-07	7.29E-07
TH227	1.22E-06	7.41E-07	1.20E-07	1.47E-04	1.49E-04
TH228	2.59E-05	1.41E-05	1.48E-06	9.54E-03	9.58E-03
TH229	2.51E-05	1.50E-05	5.01E-05	5.15E+00	5.15E+00
TH230	3.63E+01	2.12E+01	2.70E+00	1.16E+01	7.19E+01
TH231	1.38E-04	7.61E-05	1.87E-06	5.28E-06	2.22E-04
TH232	4.16E-01	2.43E-01	6.21E-02	1.23E+07	1.23E+07
TH234	7.25E-02	3.99E-02	9.68E-04	2.51E-03	1.16E-01
PA231	1.63E+00	9.52E-01	1.17E-01	1.49E+02	1.51E+02
PA233	2.27E-04	1.27E-04	1.25E-03	4.77E-03	6.37E-03
PA234	1.09E-06	6.01E-07	1.46E-08	3.78E-08	1.75E-06
PA234*	2.45E-06	1.35E-06	3.27E-08	8.46E-08	3.91E-06
U232	9.34E-04	5.09E-04	5.34E-05	2.67E-01	2.68E-01
U233	1.71E-01	9.82E-02	5.04E-01	3.70E+04	3.70E+04
U234	2.65E+05	1.46E+05	3.83E+03	1.14E+04	4.26E+05
U235	3.40E+07	1.87E+07	4.59E+05	1.30E+06	5.45E+07
U236	2.90E+05	1.62E+05	8.36E+03	5.28E+04	5.13E+05
U237	1.78E-07	9.30E-08	1.09E-06	3.08E-05	3.21E-05
U238	4.99E+09	2.75E+09	6.67E+07	1.73E+08	7.98E+09
U240	5.08E-18	2.60E-18	9.53E-17	5.93E-15	6.03E-15
NP235	1.51E-19	2.27E-20	6.89E-16	1.94E-09	1.94E-09
NP236	2.74E-04	1.51E-04	3.07E-03	1.85E-02	2.20E-02
NP237	6.68E+03	3.73E+03	3.67E+04	1.40E+05	1.88E+05

Table H-3. Summary Activities of All Fuel After Reprocessing (grams). (11 sheets)

	T-Plant	B-Plant	REDOX	PUREX	Total
NP238	1.40E-09	6.81E-10	1.47E-07	1.39E-06	1.54E-06
NP239	1.66E-07	8.10E-08	1.69E-05	1.65E-04	1.82E-04
NP240	3.22E-22	1.50E-22	7.92E-21	5.19E-19	5.28E-19
NP240*	4.34E-20	2.22E-20	8.13E-19	5.06E-17	5.15E-17
PU236	7.19E-10	3.79E-10	9.98E-09	5.25E-06	5.26E-06
PU238	1.18E+00	6.50E-01	7.40E+00	9.29E+01	1.02E+02
PU239	4.58E+04	2.49E+04	5.93E+04	3.31E+05	4.61E+05
PU240	1.34E+03	7.47E+02	3.34E+03	2.46E+04	3.01E+04
PU241	5.88E+00	3.08E+00	3.61E+01	1.02E+03	1.06E+03
PU242	1.07E+00	5.73E-01	7.68E+00	1.63E+02	1.72E+02
PU243	0.00E+00	0.00E+00	2.02E-18	3.94E-17	4.15E-17
PU244	2.57E-07	1.32E-07	4.82E-06	3.00E-04	3.05E-04
AM241	7.70E+01	4.13E+01	1.60E+03	2.19E+04	2.37E+04
AM242	9.90E-08	4.83E-08	1.04E-05	9.87E-05	1.09E-04
AM242*	7.67E-03	3.74E-03	8.08E-01	7.65E+00	8.47E+00
AM243	1.93E-01	9.41E-02	1.96E+01	1.92E+02	2.11E+02
AM245	0.00E+00	0.00E+00	7.93E-34	1.45E-31	1.45E-31
CM242	2.00E-05	9.77E-06	2.11E-03	2.00E-02	2.21E-02
CM243	1.59E-05	7.24E-06	9.88E-03	1.43E-01	1.53E-01
CM244	2.34E-04	1.06E-04	1.36E-01	2.23E+00	2.36E+00
CM245	2.66E-06	1.19E-06	3.71E-03	5.46E-02	5.84E-02
CM246	7.70E-09	3.37E-09	4.87E-05	8.31E-04	8.80E-04
CM247	2.02E-12	8.66E-13	5.81E-08	1.13E-06	1.19E-06
CM248	2.73E-15	1.15E-15	3.63E-10	8.11E-09	8.47E-09
CM250	0.00E+00	0.00E+00	1.07E-19	2.90E-18	3.00E-18
BK246	2.10E-15	9.32E-16	9.74E-12	1.35E-10	1.45E-10
BK249	0.00E+00	0.00E+00	5.94E-25	2.97E-19	2.97E-19
CF249	0.00E+00	0.00E+00	6.88E-13	1.77E-11	1.84E-11
CF250	0.00E+00	0.00E+00	6.72E-15	2.83E-13	2.90E-13
CF251	0.00E+00	0.00E+00	4.69E-15	1.50E-13	1.54E-13
CF252	0.00E+00	0.00E+00	4.72E-20	1.78E-17	1.79E-17
CF254	0.00E+00	0.00E+00	0.00E+00	2.87E-20	2.87E-20
ES250	0.00E+00	0.00E+00	0.00E+00	3.36E-18	3.36E-18
ES254	0.00E+00	0.00E+00	0.00E+00	4.89E-29	4.89E-29

Note:

[a] Tritium is produced both as a ternary fission product and from activation of lithium impurity in the aluminum cladding. The lithium is derived from a maximum specification value in the aluminum cladding and likely overstates the true impurity value. Therefore, predictions of tritium levels in cladding waste should be interpreted as bounding values.

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
H01	9.43E+03	5.44E+03
H02	3.98E+00	2.25E+00
H03	1.99E+00	1.19E+00
HE03	3.83E+00	1.98E+00
HE04	5.48E+01	2.92E+01
LI06	7.93E+00	4.20E+00
LI07	4.52E+01	2.44E+01
BE09	1.96E+05	1.10E+05
BE10	3.54E-01	1.87E-01
B10	6.73E+01	3.98E+01
B11	5.82E+02	3.29E+02
C12	1.40E+06	7.90E+05
C13	1.71E+04	9.61E+03
C14	1.44E+01	7.81E+00
N14	3.73E+04	2.14E+04
N15	1.47E+02	8.45E+01
O16	6.08E-07	3.26E-07
O17	4.99E-09	2.59E-09
O18	4.42E-06	2.20E-06
F19	1.29E-13	6.16E-14
NE20	9.36E-04	5.18E-04
NE21	3.64E-02	1.92E-02
NE22	5.46E-02	2.88E-02
NA23	3.56E+03	2.11E+03
MG24	5.14E+04	2.90E+04
MG25	6.78E+03	3.82E+03
MG26	7.76E+03	4.37E+03
AL27	2.01E+06	1.13E+06
SI28	3.01E+05	1.69E+05
SI29	1.58E+04	8.89E+03
SI30	1.08E+04	6.10E+03
SI32	2.26E-08	1.20E-08
P31	2.21E-01	1.17E-01
P32	5.13E-12	2.72E-12
S32	5.61E-03	2.95E-03
S33	2.19E-07	1.08E-07
S34	3.74E-04	1.97E-04
S35	3.10E-22	2.83E-20
S36	1.12E-05	5.45E-06
S250	6.16E-07	2.88E-07

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
CL35	1.85E+03	1.04E+03
CL36	1.31E+01	6.88E+00
CL37	6.30E+02	3.54E+02
AR36	5.77E-04	2.81E-04
AR38	4.81E-02	2.53E-02
AR39	3.42E-06	1.71E-06
AR40	1.73E-07	8.26E-08
AR42	1.39E-18	6.91E-19
K39	1.84E-07	9.09E-08
K40	2.36E-13	1.09E-13
K41	2.72E-11	1.36E-11
CA42	8.71E-14	4.27E-14
CA43	2.34E-04	1.30E-04
CA44	1.80E-03	9.97E-04
CA45	1.57E-16	1.64E-15
CA46	2.03E-04	1.12E-04
SC45	3.68E-05	2.03E-05
SC46	1.12E-24	1.31E-22
TI46	7.04E+02	4.18E+02
TI47	6.49E+02	3.86E+02
TI48	6.55E+03	3.89E+03
TI49	4.99E+02	2.96E+02
TI50	4.83E+02	2.87E+02
V50	2.17E+01	1.29E+01
V51	8.90E+03	5.28E+03
CR50	1.42E+04	8.20E+03
CR52	2.84E+05	1.65E+05
CR53	3.30E+04	1.91E+04
CR54	8.42E+03	4.87E+03
MN54	1.36E-06	3.71E-06
MN55	7.11E+04	4.02E+04
FE54	6.24E+04	3.55E+04
FE55	5.59E-01	5.05E-01
FE56	1.02E+06	5.82E+05
FE57	2.49E+04	1.41E+04
FE58	3.37E+03	1.91E+03
CO58	2.71E-25	7.45E-23
CO59	4.23E+03	2.43E+03
CO60	4.01E+00	2.81E+00
NI58	2.34E+05	1.33E+05

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
NI59	2.71E+02	1.47E+02
NI60	9.25E+04	5.28E+04
NI61	4.12E+03	2.35E+03
NI62	1.31E+04	7.49E+03
NI63	3.68E+01	2.01E+01
NI64	3.51E+03	2.00E+03
CU63	1.34E+05	7.56E+04
CU65	6.16E+04	3.47E+04
ZN64	4.31E+01	2.27E+01
ZN65	6.11E-11	2.26E-10
ZN66	2.58E+01	1.36E+01
ZN67	2.40E-03	1.19E-03
ZN68	7.30E-06	3.66E-06
ZN70	2.23E-03	1.15E-03
GA69	2.29E-07	1.16E-07
GA71	1.86E-04	9.48E-05
GE70	1.03E-10	4.96E-11
GE72	4.34E-01	2.34E-01
GE73	1.35E+00	7.33E-01
GE74	3.89E+00	2.14E+00
GE76	3.06E+01	1.70E+01
AS75	1.10E+01	6.10E+00
SE76	3.35E-02	1.74E-02
SE77	8.01E+01	4.45E+01
SE78	2.17E+02	1.20E+02
SE79	4.81E+02	2.66E+02
SE80	1.31E+03	7.27E+02
SE82	3.47E+03	1.93E+03
BR79	1.04E-02	5.30E-03
BR81	2.15E+03	1.20E+03
KR80	3.17E-03	1.67E-03
KR81	3.73E-04	1.90E-04
KR82	9.44E+00	4.91E+00
KR83	5.60E+03	3.12E+03
KR84	1.17E+04	6.52E+03
KR85	9.00E+02	5.66E+02
KR86	2.05E+04	1.15E+04
RB85	1.28E+04	7.06E+03
RB87	2.79E+04	1.56E+04
SR86	3.40E+00	1.77E+00

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
SR87	2.28E-01	1.24E-01
SR88	3.85E+04	2.15E+04
SR89	2.85E-31	7.61E-28
SR90	4.01E+04	2.34E+04
Y87	1.48E-15	8.06E-16
Y89	5.18E+04	2.90E+04
Y90	1.02E+01	5.94E+00
Y91	1.66E-26	1.53E-23
ZR90	8.87E+07	5.26E+07
ZR91	1.96E+07	1.16E+07
ZR92	3.02E+07	1.79E+07
ZR93	7.92E+04	4.40E+04
ZR94	3.14E+07	1.86E+07
ZR95	7.28E-24	3.74E-21
ZR96	5.22E+06	3.10E+06
NB92	4.21E-03	2.33E-03
NB93	2.36E-01	1.15E-01
NB93*	4.78E-01	2.50E-01
NB94	3.07E-02	1.57E-02
NB95	8.76E-24	4.50E-21
NB95*	4.83E-27	2.48E-24
MO92	1.26E+03	7.48E+02
MO93	3.79E-02	2.10E-02
MO94	8.09E+02	4.80E+02
MO95	8.41E+04	4.68E+04
MO96	1.60E+03	9.40E+02
MO97	8.25E+04	4.58E+04
MO98	8.17E+04	4.53E+04
MO100	9.06E+04	5.01E+04
TC98	5.07E-02	2.62E-02
TC99	8.51E+04	4.71E+04
RU98	1.69E-07	8.64E-08
RU99	5.40E+00	2.76E+00
RU100	6.73E+02	3.49E+02
RU101	7.62E+04	4.20E+04
RU102	6.77E+04	3.72E+04
RU104	3.97E+04	2.15E+04
RU106	1.05E-01	2.14E-01
RH102	5.83E-05	3.88E-05
RH103	5.41E+04	2.96E+04

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
RH106	9.69E-08	1.99E-07
PD104	1.50E+03	7.48E+02
PD105	2.45E+04	1.31E+04
PD106	1.97E+04	1.04E+04
PD107	1.02E+04	5.32E+03
PD108	5.83E+03	3.01E+03
PD110	1.82E+03	9.46E+02
AG107	2.17E-02	1.08E-02
AG107*	3.75E-07	2.11E-07
AG108	1.14E-13	5.81E-14
AG108*	3.70E-05	1.88E-05
AG109	3.62E+03	1.87E+03
AG109*	1.69E-13	2.76E-13
AG110	2.00E-15	6.72E-15
AG110*	1.29E-07	4.34E-07
CD106	8.72E+00	4.94E+00
CD108	6.09E+00	3.44E+00
CD109	1.70E-07	2.78E-07
CD110	2.36E+02	1.22E+02
CD111	1.05E+03	5.50E+02
CD112	6.83E+02	3.67E+02
CD113	4.76E+01	2.66E+01
CD113*	2.70E+00	1.55E+00
CD114	1.00E+03	5.43E+02
CD116	3.89E+02	2.11E+02
IN113	5.29E+01	2.91E+01
IN113*	3.20E-18	9.97E-17
IN115	2.41E+02	1.32E+02
SN112	2.43E+04	1.44E+04
SN113	5.33E-15	1.66E-13
SN114	1.66E+04	9.84E+03
SN115	9.42E+03	5.60E+03
SN116	3.70E+05	2.20E+05
SN117	1.97E+05	1.17E+05
SN118	6.23E+05	3.70E+05
SN119	2.23E+05	1.32E+05
SN119*	3.69E-05	1.14E-04
SN120	8.44E+05	5.01E+05
SN121	2.98E-04	1.63E-04
SN121*	6.84E+00	3.74E+00

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
SN122	1.22E+05	7.25E+04
SN123	2.72E-13	5.46E-12
SN124	1.51E+05	8.98E+04
SN126	1.32E+03	7.15E+02
SB121	4.03E+02	2.20E+02
SB123	3.88E+02	2.11E+02
SB124	2.05E-30	1.47E-27
SB125	8.68E+00	7.77E+00
SB126	2.51E-05	1.36E-05
SB126*	1.91E-07	1.03E-07
TE122	2.29E+00	1.17E+00
TE123	8.16E-03	4.02E-03
TE123*	1.22E-18	2.91E-17
TE124	1.46E+00	7.53E-01
TE125	8.68E+02	4.67E+02
TE125*	1.22E-01	1.09E-01
TE126	2.73E+01	1.50E+01
TE127	3.52E-17	1.31E-15
TE127*	1.01E-14	3.73E-13
TE128	7.05E+03	3.86E+03
TE130	3.43E+04	1.89E+04
I127	3.63E+03	1.97E+03
I129	1.25E+04	6.82E+03
XE128	1.26E+01	6.43E+00
XE129	1.83E-02	9.09E-03
XE130	7.57E+01	3.88E+01
XE131	5.50E+04	3.03E+04
XE132	8.61E+04	4.74E+04
XE134	1.47E+05	8.16E+04
XE136	2.18E+05	1.21E+05
CS133	1.25E+05	6.93E+04
CS134	3.33E+00	3.14E+00
CS135	3.29E+04	1.80E+04
CS137	7.66E+04	4.40E+04
BA132	1.42E-02	7.29E-03
BA134	1.72E+03	8.84E+02
BA135	2.94E-01	1.46E-01
BA136	4.30E+02	2.23E+02
BA137	4.32E+04	2.22E+04
BA137*	1.17E-02	6.70E-03

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
BA138	1.27E+05	7.06E+04
LA138	6.20E-01	3.41E-01
LA139	1.22E+05	6.74E+04
CE138	2.66E-11	1.36E-11
CE140	1.22E+05	6.77E+04
CE142	1.12E+05	6.20E+04
CE144	2.18E-02	7.08E-02
PR141	1.13E+05	6.25E+04
PR144	9.19E-07	2.98E-06
PR144*	5.36E-09	1.74E-08
ND142	1.28E+02	6.45E+01
ND143	1.10E+05	6.09E+04
ND144	1.08E+05	6.00E+04
ND145	7.62E+04	4.23E+04
ND146	6.17E+04	3.41E+04
ND148	3.57E+04	1.97E+04
ND150	1.58E+04	8.65E+03
PM146	8.50E-03	5.06E-03
PM147	3.42E+02	3.30E+02
SM146	4.02E-02	2.02E-02
SM147	4.08E+04	2.26E+04
SM148	3.67E+03	1.90E+03
SM149	2.15E+03	1.25E+03
SM150	2.24E+04	1.22E+04
SM151	5.09E+03	2.89E+03
SM152	1.11E+04	6.02E+03
SM154	2.43E+03	1.31E+03
EU150	3.56E-06	1.77E-06
EU151	8.07E+02	4.09E+02
EU152	1.06E+00	5.38E-01
EU153	5.05E+03	2.73E+03
EU154	7.98E+01	4.39E+01
EU155	3.01E+01	2.26E+01
GD152	1.41E+00	7.08E-01
GD153	7.38E-10	2.45E-09
GD154	3.17E+02	1.60E+02
GD155	4.11E+02	2.21E+02
GD156	1.66E+03	8.74E+02
GD157	2.50E+01	1.38E+01
GD158	6.43E+02	3.37E+02

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
GD160	4.17E+01	2.16E+01
TB159	9.68E+01	5.04E+01
TB160	1.07E-25	2.40E-23
DY160	1.27E+00	6.29E-01
DY161	1.85E+01	9.51E+00
DY162	8.20E+00	4.17E+00
DY163	3.65E+00	1.86E+00
DY164	1.10E+00	5.68E-01
HO165	9.00E-01	4.55E-01
HO166*	1.32E-03	6.50E-04
ER166	7.09E-02	3.55E-02
ER167	4.40E-04	2.11E-04
ER168	8.76E-05	4.13E-05
ER170	4.84E-05	2.47E-05
TM169	1.16E-07	5.55E-08
TM170	5.88E-22	1.11E-20
TM171	1.42E-07	1.48E-07
YB170	1.43E-07	7.24E-08
YB171	1.02E-04	5.24E-05
YB172	3.93E-07	1.92E-07
YB173	1.40E-09	6.65E-10
YB174	1.16E-11	5.37E-12
YB176	2.49E-05	1.24E-05
LU175	4.00E+00	2.22E+00
LU176	9.61E-03	4.81E-03
LU177	4.58E-20	4.02E-19
LU177*	5.01E-18	4.40E-17
HF174	5.14E+01	3.07E+01
HF175	7.52E-26	2.27E-23
HF176	1.76E+03	1.05E+03
HF177	4.65E+03	2.82E+03
HF178	1.06E+04	6.27E+03
HF179	5.72E+03	3.36E+03
HF180	1.28E+04	7.56E+03
HF182	8.72E-02	4.69E-02
TA181	4.61E+01	2.56E+01
TA182	3.05E-09	1.64E-09
W180	1.12E+01	6.66E+00
W181	6.85E-17	1.78E-15
W182	2.25E+03	1.34E+03

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
W183	1.31E+03	7.76E+02
W184	2.75E+03	1.63E+03
W185	2.11E-24	4.32E-22
W186	2.50E+03	1.49E+03
W188	1.27E-27	3.99E-25
RE185	2.33E+00	1.29E+00
RE187	6.77E+01	3.75E+01
RE188	1.30E-29	4.10E-27
OS186	4.35E-02	2.16E-02
OS187	1.83E-08	9.33E-09
OS188	1.04E+00	5.43E-01
OS189	2.97E-03	1.45E-03
OS190	4.68E-05	2.20E-05
OS192	1.83E-10	8.23E-11
OS194	2.15E-18	6.44E-19
IR191	5.61E-08	2.58E-08
IR192	1.29E-15	5.75E-16
IR192*	1.54E-12	6.85E-13
IR193	1.61E-10	7.22E-11
IR194*	3.47E-26	1.02E-25
PT192	3.67E-09	1.65E-09
PT193	1.30E-12	5.55E-13
PT194	3.61E-12	1.63E-12
PT195	3.06E-16	1.38E-16
PT196	1.43E-18	6.48E-19
HG206	4.07E-15	1.76E-15
TL205	3.67E-08	1.87E-08
TL206	4.68E-19	2.18E-19
TL207	7.74E-12	4.07E-12
TL208	5.75E-12	3.20E-12
TL209	1.01E-16	5.15E-17
TL210	2.93E-10	1.35E-10
PB204	2.45E+02	1.45E+02
PB205	4.12E-02	2.28E-02
PB206	4.24E+03	2.52E+03
PB207	3.94E+03	2.34E+03
PB208	9.35E+03	5.55E+03
PB209	4.26E-13	2.18E-13
PB210	9.97E-07	4.65E-07
PB211	5.99E-11	3.15E-11

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
PB212	3.41E-09	1.89E-09
PB214	9.17E-12	4.63E-12
BI208	4.38E-10	2.28E-10
BI209	7.42E-04	4.12E-04
BI210	6.12E-10	2.85E-10
BI210*	2.38E-09	1.23E-09
BI211	3.55E-12	1.87E-12
BI212	3.24E-10	1.80E-10
BI213	1.01E-13	5.18E-14
BI214	6.81E-12	3.44E-12
PO210	1.61E-08	7.45E-09
PO211	3.85E-17	2.03E-17
PO212	1.70E-20	9.44E-21
PO213	1.52E-22	7.79E-23
PO214	9.36E-19	4.73E-19
PO215	5.02E-17	2.64E-17
PO216	1.32E-14	7.31E-15
PO218	1.08E-12	5.45E-13
AT217	1.22E-18	6.23E-19
AT218	2.53E-10	1.17E-10
AT219	5.72E-12	2.69E-12
RN217	1.00E-12	5.44E-13
RN219	1.14E-13	5.98E-14
RN220	5.14E-12	2.85E-12
RN222	1.95E-09	9.86E-10
FR221	1.13E-14	5.78E-15
FR223	5.30E-13	2.79E-13
RA223	2.89E-08	1.52E-08
RA224	2.98E-08	1.65E-08
RA225	5.02E-11	2.57E-11
RA226	3.04E-04	1.53E-04
RA228	6.29E-11	3.70E-11
AC225	3.38E-11	1.73E-11
AC227	2.05E-05	1.08E-05
AC228	7.67E-15	4.51E-15
TH227	4.75E-08	2.50E-08
TH228	5.78E-06	3.21E-06
TH229	9.23E-06	4.72E-06
TH230	1.78E+00	1.01E+00
TH231	8.70E-07	5.20E-07

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
TH232	1.76E-01	1.07E-01
TH234	3.68E-04	2.06E-04
PA231	6.99E-02	4.06E-02
PA233	9.43E-04	5.13E-04
PA234	5.54E-09	3.11E-09
PA234*	1.24E-08	6.96E-09
U232	1.94E-04	9.44E-05
U233	1.42E-01	6.66E-02
U234	1.99E+03	1.12E+03
U235	2.14E+05	1.28E+05
U236	1.82E+04	1.06E+04
U237	1.19E-05	5.92E-06
U238	2.53E+07	1.42E+07
U240	1.76E-15	8.11E-16
NP235	7.10E-10	1.23E-09
NP236	5.82E-03	2.96E-03
NP237	2.78E+04	1.51E+04
NP238	2.96E-07	1.35E-07
NP239	3.28E-05	1.52E-05
NP240	1.54E-19	7.09E-20
NP240*	1.50E-17	6.92E-18
PU236	2.93E-06	2.15E-06
PU238	2.93E+01	1.47E+01
PU239	7.63E+04	4.09E+04
PU240	5.98E+03	3.06E+03
PU241	3.94E+02	1.96E+02
PU242	4.45E+01	2.12E+01
PU243	1.30E-17	5.85E-18
PU244	8.91E-05	4.11E-05
AM241	7.07E+03	4.59E+03
AM242	2.10E-05	9.55E-06
AM242*	1.63E+00	7.40E-01
AM243	3.81E+01	1.76E+01
CM242	4.25E-03	1.93E-03
CM243	4.30E-02	1.82E-02
CM244	6.98E-01	2.81E-01
CM245	1.53E-02	6.89E-03
CM246	2.56E-04	1.15E-04
CM247	3.74E-07	1.68E-07
CM248	2.83E-09	1.28E-09

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
CM250	1.09E-18	4.96E-19
BK246	3.41E-11	1.75E-11
BK249	2.79E-19	1.74E-20
CF249	6.51E-12	2.94E-12
CF250	1.31E-13	5.08E-14
CF251	5.82E-14	2.68E-14

Table H-4. Summary Activities of Fuel Filling Tank 241-AZ-101 and Tank 241-AZ-102 After Reprocessing (grams). (12 sheets)

	AZ-101 grams (11/83 – 2/86)	AZ-102 grams (3/86 – 12/88)
CF252	1.33E-17	2.77E-18
CF254	1.34E-20	6.52E-21
ES254	4.72E-29	1.70E-30

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