CH0015

0057809

CANBERRA

CH-015
Batch Data Report
For
233-S ISOCS NDA Assays

Measurement and Analysis by: _____ **Date:** 5-15-02
Martin Winterrose

Data Review by: _____ **Date:** 5-15-02
Michael G. Cantaloub

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COGEMA GROUP

1. Introduction

This report documents results for a single item assayed by Canberra Hanford using the In Situ Object Counting System (ISOCS). The measurements were performed in accordance with the "Sampling and Analysis Plan for the 233-S Plutonium Concentration Facility" (DOE/RL-97-87 Rev. 1) and the Canberra Hanford Quality Control Plan and procedure. The item, an Eruo Vac was assayed at the 233-S facility on April 10, 2002.

2. Technical Information

The Euro Vac was assayed within the assay trailer at the 233-S facility grounds. Due to the vacuum's shape, it was treated like a drum, however; it was not rotate during data acquisition. Rather, the item was assayed once for 1800 seconds live time, then rotated 180 degrees and assayed a second time. The results were averaged. The detector was positioned a 24 inches from the vacuum with the detector face visually centered on the largest surface area of the package. The detector sides were shielded with a lead collimator to minimize scatter and background.

An individual ISOCS efficiency calibration was created for the vacuum utilizing a cylindrical geometry. The model matrix was varied or the expected activity distribution adjusted to obtain reasonable correlation between the low and high-energy peaks from the same nuclide. Normally Pu-239 and/or Am-241 emissions are used. Pu-239 was not detected above the efficiency calculated MDA. Only one reliable Am-241 peak was identified. However the efficiency model was verified via Eu-152 which was positively identified in every measurement spectrum. The nine gamma emissions, spanning 122 keV to 1400 KeV provided an excellent internal consistency check for the model. It is worth noting that this is the first item to show Eu-152.

The final package results were calculated using the Analysis V3.0b spreadsheet. Data analysis was conservative. Though Pu-239 was not positively identified in the spectra, the vacuum was characterized via the Pu-239 MDA and the measured Am-241. This is most probably an overestimation of the TRU activity within the vacuum. Despite this, the waste does not meet the definition for TRU waste.

As noted above, Eu-152 was positively identified in the assay, however; the analysis V3.0b spreadsheet was coded to handle a limited number of nuclides. The average Eu-152 activity for the two assays is 7.95E-03 nCi/g ± 2.91E-04 nCi/g. This is recorded in the "comment" box at the bottom of the printout. The Eu-152 does not effect the final waste classification.

3. Quality Control Results

A background and quality control (QC) check source measurement were performed on the system prior to each the item measurement. Charts for these measurements, covering

the time period of April 1 to April 11, 2002 are on pages 4 - 10. The peak area and centroid control charts indicate a very stable system.

4. Summary of Results

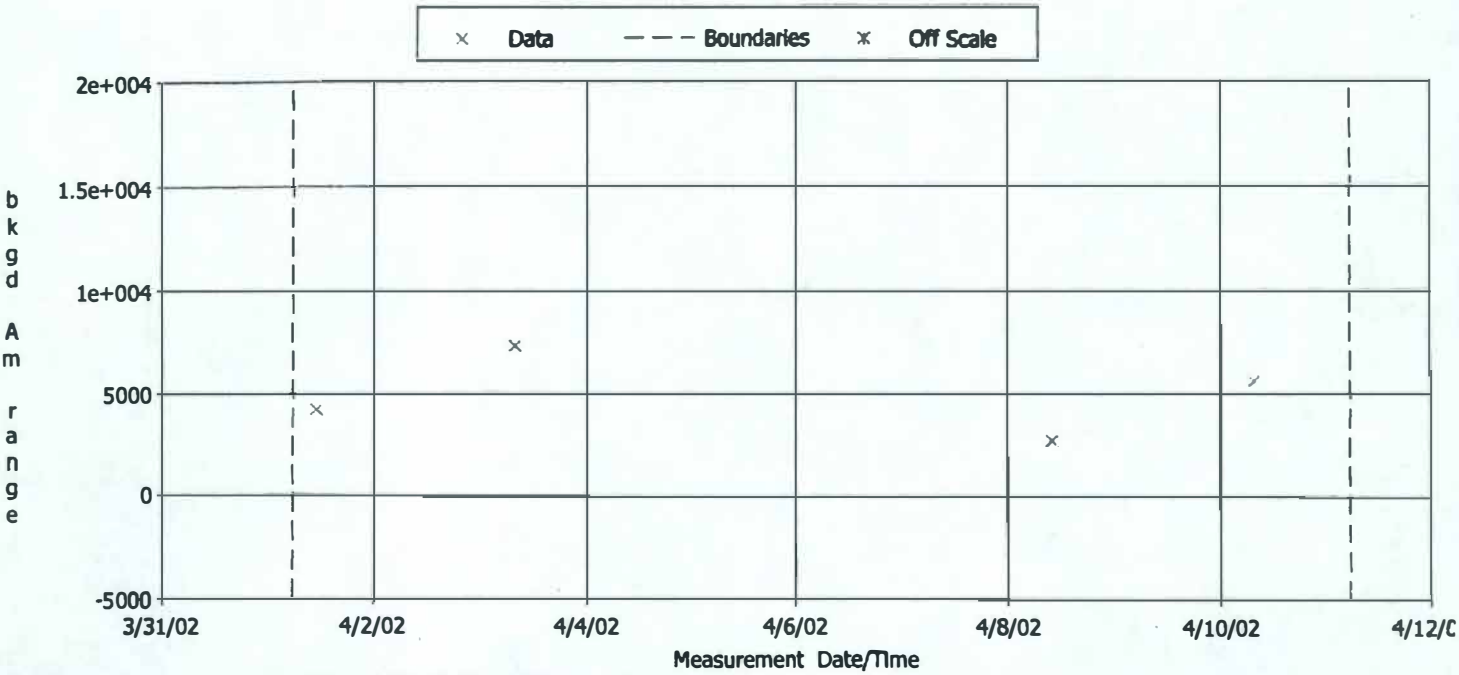
The full data package is included as an attachment beginning on page 11. The following table summarizes the total TRU activity results and plutonium gram values for each item. The 'Pu Mass + 3-sigma' values in the table are based solely on counting statistics. The 'Pu Mass + 3-sigma TMU' values are not included here, but are reported on the final result spreadsheets.

Summary of package assay results for Data Batch Report CH015

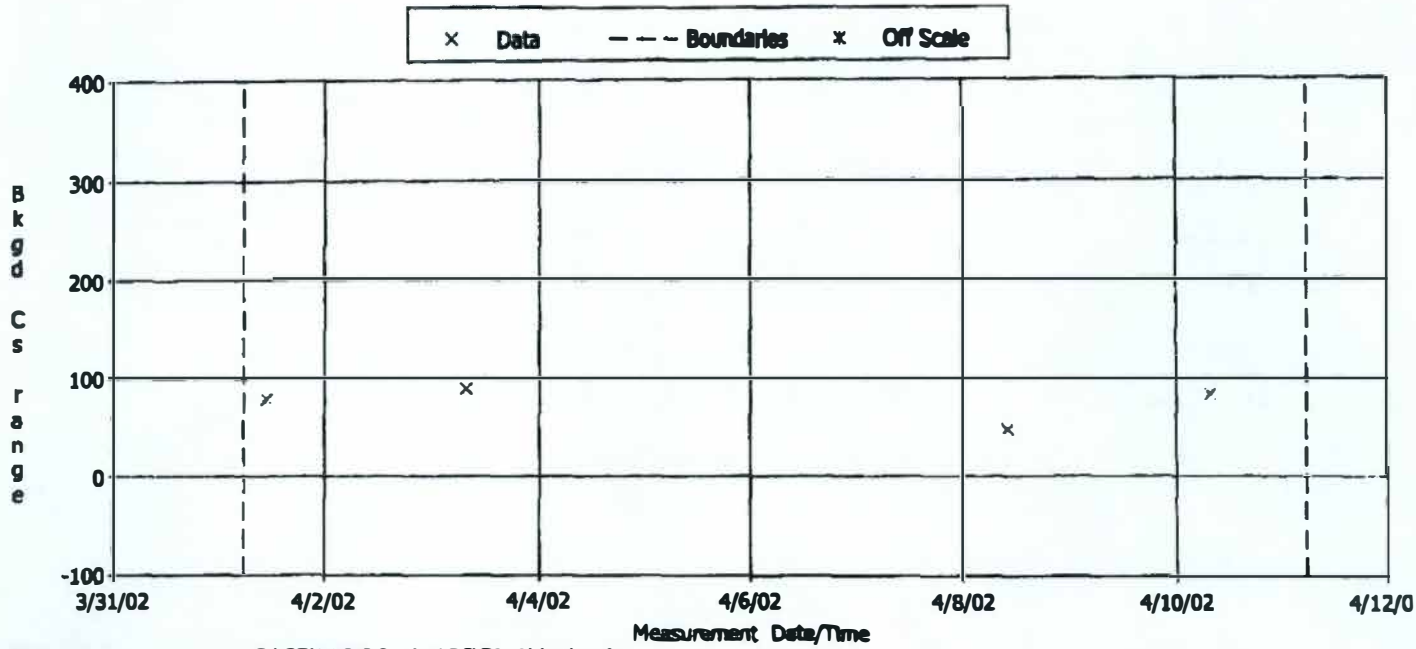
Package Item ID	Assay Weight (kg)	TRU Act (nCi/g)	TRU TMU (nCi/g)	Pu Mass (g)	Pu Mass(g) + 3 sigma	Description, calculation notes
6781	30	4.40E+01 ±	7.76E+00	1.28E-02	1.28E-02	Euro Vac; Pu-239 MDA

0	TRU packages
1	LLW packages

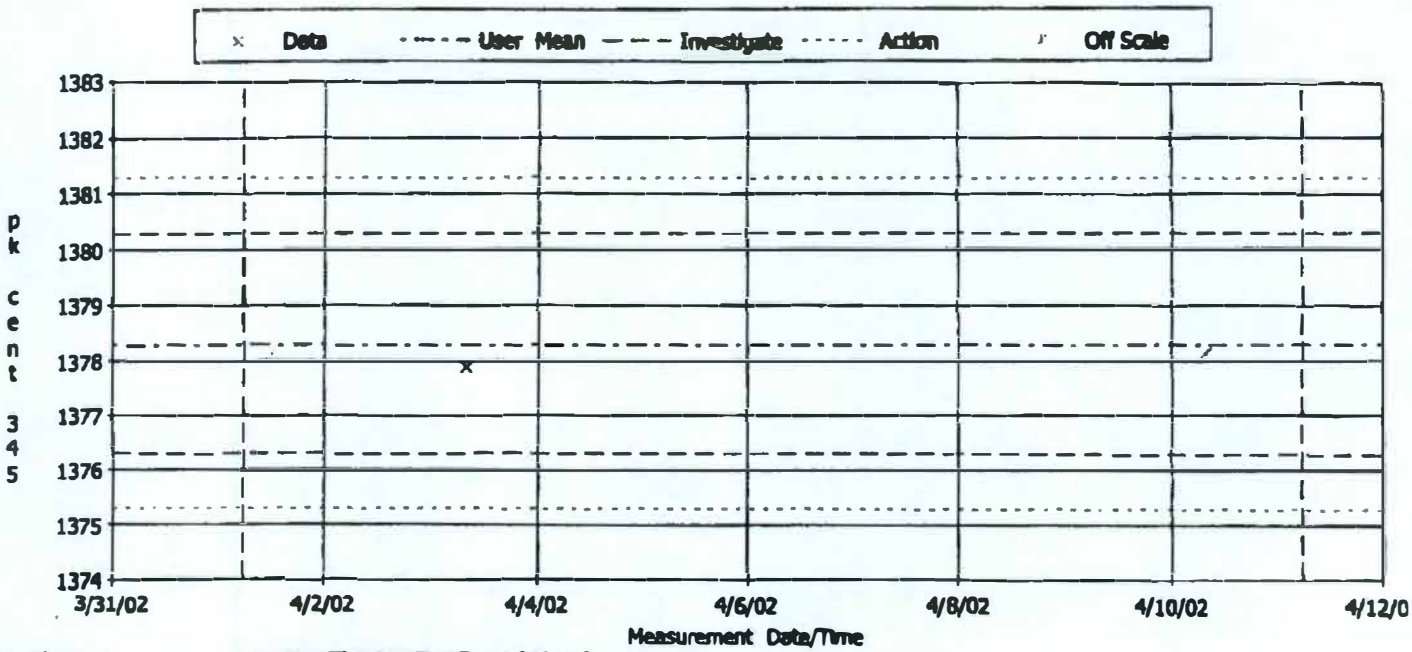
Control Charts



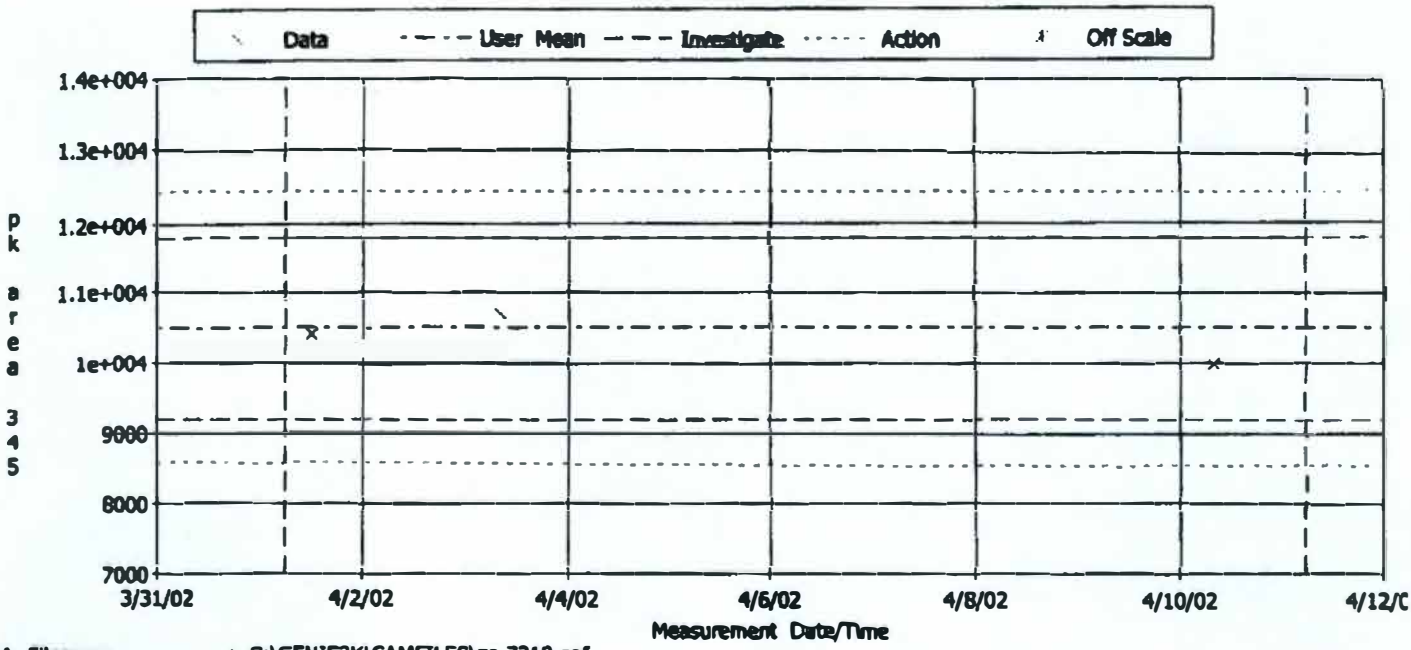
QA Filename : C:\GENIE2K\CAMFILES\7219bkgd.qaf
Parameter Description : bkgd Am range (counts)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
Lower/Upper Boundaries : 0.000 - 15000.000



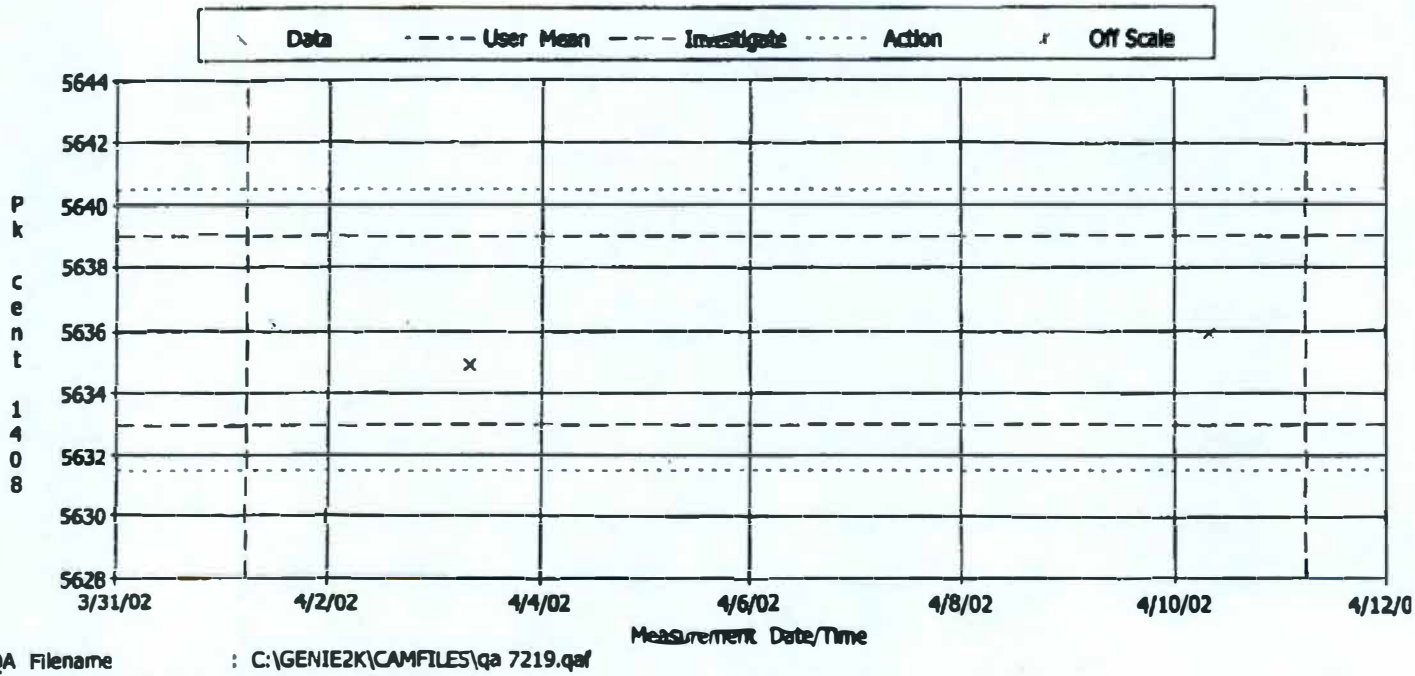
QA Filename : C:\GENIE2K\CAMFILES\7219bkgd.qaf
Parameter Description : Bkgd Cs range (counts)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
Lower/Upper Boundaries : 0.000 - 300.000



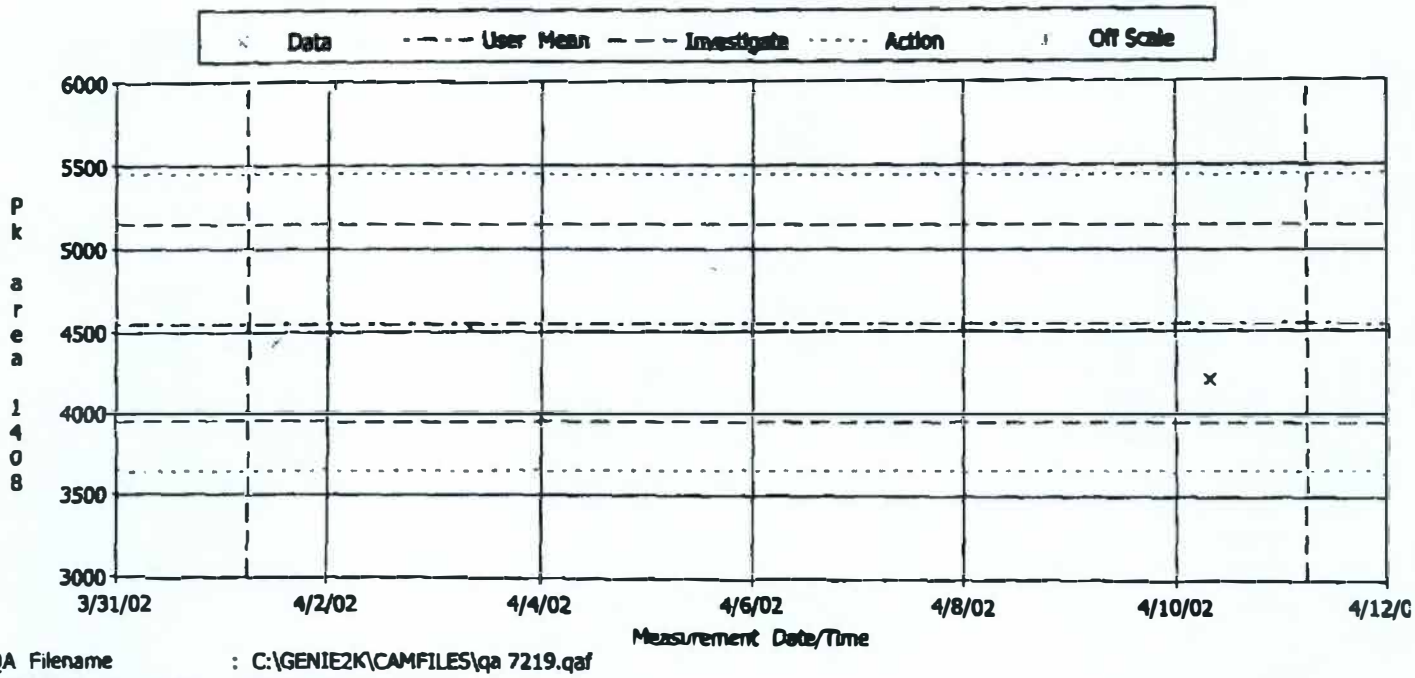
QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
Parameter Description : pk cent 345 (ch)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
User Mean +/- Std Dev : 1378.300 +/- 1.000



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
Parameter Description : pk area 345 (counts)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
User Mean +/- Std Dev : 10500.000 +/- 6.50e+002



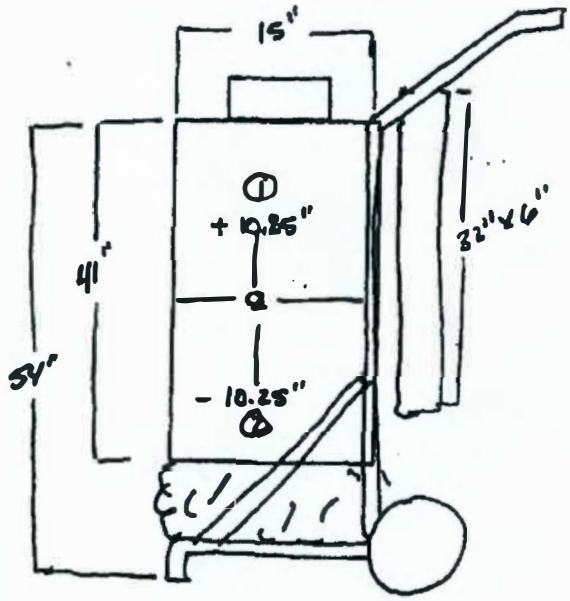
QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
Parameter Description : Pk cent 1408 (ch)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
User Mean +/- Std Dev : 5636.000 +/- 1.500



QA Filename : C:\GENIE2K\CAMFILES\qa 7219.qaf
Parameter Description : Pk area 1408 (counts)
Selection Dates : 4/01/02 6:00:00 AM - 4/11/02 6:00:00 AM
User Mean +/- Std Dev : 4550.000 +/- 3.00e+002

Data Packages

Bldg 233-S
NDA Item Description Sheet
Bottle or Cylinder Geometry



8490

CART & HOSE - WHEELS
81.LBS GROSS
TARE 15LBS EST
NET 66LBS
30 KG

1197.8944

Put Dimensions on Bottle

Item ID: EDDO VAC

Weight (kg): 81 LBS 36.81 KG

Material Description: HEPA VAC - HEPA FILTER

Packaging: NONE

Detector Distance (in): 24"

Detector Filters: ~~1.5~~ N/A

Dose Rate: <.5

Comments: VAC CTI / +12 1800 SEC 1409

233-S Item Analysis Spreadsheet Version 3.0b 1/14/02

Sample Info:

Item ID:	Eruo Vac	Assay Date:	10-Apr-02
File Name:	1409	File Name:	1410

Data Input:

Isotope	Activity (uCi/kg)	Meas Uncert	Activity (uCi/kg)	Meas Uncert
Pu-239 (129)	2.22E+01		2.35E+01	
Pu-239 (414)				
Am-241	6.02E-03	1.84E-03	5.81E-03	1.89E-03
Np-237				
U-238				
U-235				
Cs-137	6.09E-03	3.02E-04	5.53E-03	2.80E-04
Co-60	8.12E-04	7.43E-05	6.39E-04	6.83E-05

Item Parameters:

Contamination: Internal Item Type: Barrel Calcs: Average

Dimensions:

Length (in):	41	Width (in):	15	Depth (in):	15
Weight (lbs):	66	Depth for TMU (in):	4	% Volume:	100

Am-241 Calcs:

Measured	5.91E-03	+/-	4.01E-03	Use Meas
Calculated	3.16E+01	+/-	2.41E+01	

Nuclide Activities:

Isotope	Activity (nCi/g)		Total Unc 1 sigma
Pu-238	9.26E+00	+/-	2.63E+00
Pu-239	2.29E+01	+/-	6.48E+00
Pu-240	1.19E+01	+/-	3.38E+00
Pu-241	4.45E+01	+/-	1.26E+01
Pu-242	1.20E-02	+/-	3.41E-03
Am-241	5.91E-03	+/-	4.01E-03
Np-237	0.00E+00	+/-	0.00E+00
U-238	0.00E+00	+/-	0.00E+00
U-235	0.00E+00	+/-	0.00E+00
Cs-137	5.81E-03	+/-	8.47E-04
Co-60	7.25E-04	+/-	1.14E-04

Results:

Total TRU Activity(nCi/g):	4.40E+01	+/-	7.76E+00	Calc from Pu-239 MDA
Pu (g):	1.28E-02	Pu (g) + 3 sigma TMU:	2.36E-02	
		Pu(g) + 3 sigma:	1.28E-02	

Comments:

EU-152 7.45E-03 ± 2.91E-04 nCi/g [illegible] 5-14-02

MDA value used due to no measured PU value.

Errors:

Analyst: Martin Winterrose **Date:** 4/10/02

```
:Date & Time: Wed Apr 10 09:01:37 2002
-g=SIMPLE_CYLINDER
-description=EROVAC_CAN
-comment=HEPA_VAC
-Ccollimator=50MM-180D
-crpn=4
-Detector=7219
-Convergence in %=1            ~MDRPN=4
~Lunit=IN  ~Tunit=C  ~Dunit=G/CU.C    ~Punit=MM.HG
~at=20        ~ap=760        ~rh=50
~Energies kev=   50.000,  100.000,  128.000,  130.000,  150.000,  200.000,#
                300.000,  500.000,  700.000, 1000.000, 1400.000, 2000.000,#
               4000.000,
~Error in %=     10.000,   10.000,   10.000,   10.000,   10.000,    8.000,#
                  8.000,    6.000,    6.000,    4.000,    4.000,    4.000,#
                  4.000,
~d1.1=0.0416    ~d1.2=15        ~d1.3=41        ~1mater=CSTEEL   ~1den=7.86
~d3.1=41        ~3mater=VAC      ~3den=0.1322    ~3con=1
~sd1=24          ~sd5=-10.25
```

C A N B E R R A I S O C S A N A L Y S I S

:eport Generated On : 4/10/02 9:33:34 AM

;ample Title : Euro Vac CT-1
;pectrum Description :
;ample Identification : 1409
;ample Size : 30.0 kg

;ample Taken On : 4/10/02 9:02:00 AM
\cquisition Started : 4/10/02 9:03:23 AM

Live Time: 1800.0 seconds Real Time: 1802.8 seconds

ISOCS Calabration : EROVAC CAN
Energy Calibration Used Done On : 2/27/01
Efficiency Calibration Used Done On : 4/10/02

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	239.69	60.01	1.39E+002	40.90	2.10E+003
2	340.00	85.08	8.87E+002	71.95	2.86E+003
3	351.20	87.88	2.44E+002	60.64	2.90E+003
4	384.93	96.31	1.54E+002	62.24	2.96E+003
5	393.60	98.47	2.28E+002	60.82	2.96E+003
6	402.26	100.64	2.38E+002	61.75	2.97E+003
7	488.87	122.28	6.38E+002	67.89	2.90E+003
8	955.93	239.01	1.48E+002	22.00	3.88E+002
9	979.37	244.87	1.59E+002	22.00	3.92E+002
10	1377.98	344.49	5.07E+002	26.68	2.02E+002
11	1408.82	352.19	1.09E+002	16.68	1.93E+002
12	1775.98	443.96	5.55E+001	13.61	1.42E+002
13	2042.90	510.66	1.09E+002	15.32	9.93E+001
14	2332.80	583.11	1.07E+002	14.15	8.84E+001
15	2438.04	609.42	1.17E+002	14.65	8.11E+001
16	2647.31	661.72	7.92E+002	30.28	8.17E+001
17	3116.23	778.91	1.52E+002	15.04	5.69E+001
18	3471.43	867.68	5.55E+001	10.98	5.75E+001
19	3645.94	911.29	6.91E+001	11.51	5.17E+001
20	3856.98	964.04	1.49E+002	15.97	5.09E+001
21	4345.88	1086.22	8.18E+001	11.70	3.96E+001
22	4449.66	1112.16	1.32E+002	13.40	4.15E+001
23	4694.56	1173.36	7.96E+001	11.24	3.61E+001
24	5332.19	1332.72	9.98E+001	11.35	1.57E+001
25	5635.11	1408.42	1.98E+002	15.14	1.27E+001
26	5847.05	1461.39	6.47E+002	28.80	9.20E+000
27	7064.10	1765.56	3.87E+001	7.61	1.91E+000

NUCLIDE IDENTIFICATION REPORT

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CO-60	0.998	1173.22*	100.00	7.01219E-004	1.00728E-004
		1332.49*	100.00	9.44345E-004	1.09926E-004
CS-137	1.000	661.65*	85.12	6.09054E-003	3.01695E-004
EU-152	0.969	121.78*	28.40	7.74062E-003	9.30773E-004
		244.69*	7.49	7.95744E-003	1.17889E-003
		344.27*	26.50	8.70117E-003	6.22656E-004
		411.11	2.21		
		443.98*	3.11	9.41273E-003	2.34978E-003
		778.89*	12.74	8.49100E-003	8.95157E-004
		867.32*	4.16	1.00368E-002	2.03632E-003
		964.01*	14.40	8.19638E-003	9.27338E-004
		1085.78*	10.00	6.91113E-003	1.02741E-003
		1112.02*	13.30	8.46844E-003	9.12159E-004
		1407.95*	20.70	9.37216E-003	7.84467E-004
AM-241	0.991	59.54*	35.70	6.01690E-003	1.83862E-003
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	1.44008E+003	7.12280E+001
		722.70	0.00		

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CO-60	0.998	8.121867E-004	7.426485E-005
CS-137	1.000	6.090519E-003	3.012461E-004
EU-152	0.969	8.436498E-003	3.006863E-004
AM-241 @	0.991	6.016903E-003	1.838625E-003

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

****
**** N U C L I D E M D A R E P O R T *****
****

	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
+	CO-60	1173.22*	100.00	2.7010E-004	2.00E-004	7.0122E-004
		1332.49*	100.00	2.0018E-004		9.4435E-004
	CS-134	475.35	1.46	3.6207E-002	5.59E-004	-1.2571E-002
		563.23	8.38	5.7434E-003		-2.9501E-003
		569.32	15.43	3.1481E-003		-3.3715E-004
		604.70	97.60	6.0850E-004		-3.7242E-005
		795.84	85.40	5.5910E-004		-8.5697E-005
		801.93	8.73	5.6297E-003		2.1607E-003
		1038.57	1.00	4.8476E-002		3.5753E-002
		1167.94	1.80	3.5322E-002		-3.2465E-003
		1365.15	3.04	1.2042E-002		-4.4638E-004
+	CS-137	661.65*	85.12	3.4433E-004	3.44E-004	6.0905E-003
	NP-237	300.17	6.20	8.9255E-003	1.39E-003	4.7996E-003
		312.00	36.00	1.3928E-003		-1.5436E-003
		340.60	4.20	1.6613E-002		3.9897E-003
		375.00	0.68	7.2310E-002		6.6691E-002
		415.60	1.75	3.0220E-002		-1.0266E-002
	Pu-239	129.28	0.01	2.2222E+001	2.22E+001	-5.5947E+000
		375.00	0.00	3.1075E+001		2.8660E+001
		413.70	0.00	3.5150E+001		2.6851E+001
		451.50	0.00	2.7935E+002		1.1518E+002
+	AM-241	59.54*	35.70	9.3808E-003	9.38E-003	6.0169E-003
		125.28	0.00	3.7751E+001		-2.8213E+001
		335.40	0.00	1.0499E+002		2.7257E+001
		662.42*	0.00	8.1415E+001		1.4401E+003
		722.70	0.00	4.2984E+002		4.3760E+002
	PU-241	114.00	0.02	6.9440E+000	6.94E+000	2.0207E+000
		332.60	0.00	1.7600E+001		-3.0957E+000
	CM-243	209.70	3.27	1.8134E-002	3.83E-003	1.3228E-003
		228.18	10.56	5.5113E-003		4.9500E-003
		277.60	14.00	3.8333E-003		1.0759E-004

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)

```
:Date & Time: Wed Apr 10 09:41:13 2002
-g=SIMPLE_CYLINDER
-description=EROVAC_CAN
-comment=HEPA_VAC
-Ccollimator=50MM-180D
-crpn=4
-Detector=7219
-Convergence in %=1            -MDRPN=4
-Lunit=IN  -Tunit=C  -Dunit=G/CU.C    -Punit=MM.HG
-at=20        -ap=760        -rh=50
-Energies kev=   50.000,  100.000,  128.000,  130.000,  150.000,  200.000,#
                300.000,  500.000,  700.000, 1000.000, 1400.000, 2000.000,#
               4000.000,
-Error in %=     10.000,   10.000,   10.000,   10.000,   10.000,    8.000,#
                 8.000,    6.000,    6.000,    4.000,    4.000,    4.000,#
                 4.000,
-d1.1=0.0416    -d1.2=15        -d1.3=41        -1mater=CSTEEL   -1den=7.86
-d3.1=41        -3mater=VAC      -3den=0.1322    -3con=1
-sd1=24          -sd3=10.25
```

C A N B E R R A I S O C S A N A L Y S I S

.eport Generated On : 4/10/02 10:13:57 AM

;ample Title : Euro Vac CT-2
;pectrum Description :
;ample Identification : 1410
;ample Size : 30.0 kg

;ample Taken On : 4/10/02 9:42:00 AM
\cquisition Started : 4/10/02 9:43:47 AM

Live Time: 1800.0 seconds Real Time: 1803.0 seconds

ISOCS Calabration : EROVAC CAN
Energy Calibration Used Done On : 2/27/01
Efficiency Calibration Used Done On : 4/10/02

P E A K A N A L Y S I S R E P O R T

Peak No.	Peak centroid	Energy (keV)	Net Peak Area	Net Area Uncert.	Continuum Counts
1	238.28	59.66	1.30E+002	40.99	2.19E+003
2	371.01	92.83	1.64E+002	55.11	3.23E+003
3	488.74	122.25	6.27E+002	72.82	3.20E+003
4	979.66	244.94	1.70E+002	22.06	3.87E+002
5	1378.03	344.50	4.25E+002	24.94	2.06E+002
6	1777.01	444.21	5.26E+001	13.18	1.35E+002
7	2044.49	511.06	1.47E+002	15.93	1.19E+002
8	2437.52	609.29	1.33E+002	14.95	9.03E+001
9	2647.21	661.69	7.30E+002	28.94	8.02E+001
10	3116.83	779.06	1.48E+002	14.65	6.03E+001
11	3468.68	866.99	2.85E+001	9.42	4.48E+001
12	3645.45	911.17	8.17E+001	11.50	4.61E+001
13	3857.89	964.26	1.30E+002	15.43	4.19E+001
14	4344.27	1085.82	8.42E+001	11.52	4.11E+001
15	4449.78	1112.19	1.14E+002	12.67	3.60E+001
16	4694.15	1173.26	6.71E+001	10.79	3.91E+001
17	5333.23	1332.98	7.37E+001	10.22	1.42E+001
18	5635.32	1408.48	1.72E+002	14.28	1.43E+001
19	5847.06	1461.39	6.43E+002	25.98	7.59E+000
20	7062.81	1765.23	3.80E+001	7.36	6.19E-001

NUCLIDE IDENTIFICATION REPORT

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (uCi)	Activity Uncertainty
CO-60	0.995	1173.22*	100.00	5.86441E-004	9.54718E-005
		1332.49*	100.00	6.93319E-004	9.76057E-005
CS-137	1.000	661.65*	85.12	5.52928E-003	2.79869E-004
EU-152	0.969	121.78*	28.40	7.55750E-003	9.74212E-004
		244.69*	7.49	8.37187E-003	1.17077E-003
		344.27*	26.50	7.15152E-003	5.44321E-004
		411.11	2.21		
		443.98*	3.11	8.74397E-003	2.22923E-003
		778.89*	12.74	8.15803E-003	8.59785E-004
		867.32*	4.16	5.08982E-003	1.69728E-003
		964.01*	14.40	7.09706E-003	8.78772E-004
		1085.78*	10.00	7.05099E-003	1.00561E-003
		1112.02*	13.30	7.27570E-003	8.47366E-004
		1407.95*	20.70	8.08224E-003	7.26255E-004
AM-241	0.999	59.54*	35.70	5.80999E-003	1.89449E-003
		125.28	0.00		
		335.40	0.00		
		662.42* @	0.00	1.30737E+003	6.60792E+001
		722.70	0.00		

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (uCi/kg)	Wt mean Activity Uncertainty
CO-60	0.995	6.386986E-004	6.825072E-005
CS-137	1.000	5.529256E-003	2.794702E-004
EU-152	0.969	7.472296E-003	2.813624E-004
AM-241 @	0.999	5.809992E-003	1.894493E-003

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

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**** N U C L I D E M D A R E P O R T *****
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	Nuclide Name	Energy (keV)	Yield (%)	Line MDA (uCi/kg)	Nuclide MDA (uCi/kg)	Activity (uCi/kg)
+	CO-60	1173.22*	100.00	2.7794E-004	1.90E-004	5.8644E-004
		1332.49*	100.00	1.9028E-004		6.9332E-004
	CS-134	475.35	1.46	3.4788E-002	5.91E-004	3.1390E-003
		563.23	8.38	5.8272E-003		3.8251E-003
		569.32	15.43	3.2506E-003		1.1155E-003
		604.70	97.60	6.1432E-004		-1.5072E-005
		795.84	85.40	5.9111E-004		-1.2253E-004
		801.93	8.73	5.7666E-003		3.9904E-003
		1038.57	1.00	4.7033E-002		-2.0217E-002
		1167.94	1.80	3.3408E-002		-2.2126E-002
		1365.15	3.04	1.0533E-002		-1.2378E-002
+	CS-137	661.65*	85.12	3.3598E-004	3.36E-004	5.5293E-003
	NP-237	300.17	6.20	8.5137E-003	1.39E-003	-2.0875E-003
		312.00	36.00	1.3884E-003		-4.4694E-004
		340.60	4.20	1.6001E-002		-1.2433E-003
		375.00	0.68	7.1091E-002		6.2681E-002
		415.60	1.75	2.9688E-002		-1.6702E-002
	Pu-239	129.28	0.01	2.3493E+001	2.35E+001	5.1616E+000
		375.00	0.00	3.0551E+001		2.6937E+001
		413.70	0.00	3.4215E+001		-6.1790E+000
		451.50	0.00	2.6515E+002		1.7954E+001
+	AM-241	59.54*	35.70	9.8791E-003	9.88E-003	5.8100E-003
		125.28	0.00	3.9292E+001		-2.7001E+001
		335.40	0.00	1.0383E+002		2.7474E+001
		662.42*	0.00	7.9440E+001		1.3074E+003
		722.70	0.00	3.9770E+002		1.3295E+002
	PU-241	114.00	0.02	7.2833E+000	7.28E+000	-6.3603E-001
		332.60	0.00	1.7525E+001		-2.6104E+001
	CM-243	209.70	3.27	1.8199E-002	3.81E-003	9.3284E-003
		228.18	10.56	5.4999E-003		1.4074E-003
		277.60	14.00	3.8075E-003		2.1549E-003

+ = Nuclide identified during the nuclide identification
* = Energy line found in the spectrum
> = MDA value not calculated
@ = Half-life too short to be able to perform the decay correction

N U C L I D E T O T A L S

Nuclide	Mass (g)