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Results of the Excreta Bioassay Quality Control Program For April 1, 2006 Through March 31, 2007

CL Antonio

January 2008

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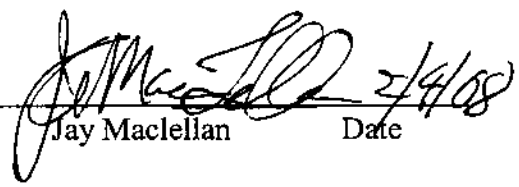
RESULTS OF THE EXCRETA BIOASSAY QUALITY CONTROL PROGRAM FOR APRIL 1, 2006 THROUGH MARCH 31, 2007

Cheryl L. Antonio

January 2008

Peer Reviewed by  2/4/08

Jay Maclellan Date

SUMMARY

A total of 66 urine samples, 6 blank fecal and 6 spiked artificial fecal samples were submitted during the report period (April 1, 2006 through March 31, 2007) to General Engineering Laboratories, South Carolina by the Hanford Internal Dosimetry Program (IDP) to check the accuracy, precision, and detection levels of their analyses. Urine analyses for tritium, Sr, ^{238}Pu, ^{239}Pu, ^{241}Am, ^{243}Am ^{235}U, ^{238}U, elemental uranium and fecal analyses for ^{241}Am, ^{238}Pu and ^{239}Pu were tested this year. The number of QC urine samples submitted during the report period represented 1.7% of the total samples submitted.

In addition to the samples provided by IDP, GEL was also required to conduct their own QC program, and submit the results of analyses to IDP. About 36% of the analyses processed by GEL during the second year of this contract were quality control samples. GEL tested the performance of 16 radioisotopes, all of which met or exceeded the specifications in the Statement of Work (Table 4).

IDP concluded that GEL was performing well for all analyses tested, and concerns identified earlier were satisfactorily resolved (see section on Follow-up on Concerns During the Second Contract Year).

The isotopic uranium analysis reports on three uranium isotopes: ^{234}U, ^{235}U, and ^{238}U. The isotopes are differentiated only during counting by alpha spectrometry. GEL reported that the calculated minimum detectable activity (MDA) for ^{233,234}U for the year slightly exceeded the contract required detection limit. This was consistently seen in the first, second and third quarters. The cause was attributed to low tracer recoveries. The standard operating procedure was revised November 30, 2006 to improve the separation chemistry. GEL then reviewed the MDAs for the fourth quarter and showed that all three isotopes met the acceptance criteria.

IDP did not submit isotopic uranium samples to review the ^{233,234}U performance indicators. However, the performance statistics for ^{235}U and ^{238}U were reviewed and the MDA for ^{235}U and the bias and precision for ^{238}U were acceptable. The percentage of analyses with low yields were reviewed and found not to meet the criteria in the statement of work for the first, second and third quarters. In line with GEL's changes to the standard operating procedure, the low yield rate in the fourth quarter was significantly improved upon and the low yield rate met the criteria in the statement of work. A review of the data from April 1, 2007

through December 31, 2007, also showed improvement in tracer recoveries for isotopic uranium urinalyses. Of the 398 urinalyses processed during this time, all had tracer recoveries at 40% or greater. With the implementation of the revised standard operating procedure, the isotopic uranium analysis program is considered acceptable

No concerns were identified with the elemental uranium urinalysis program and it was considered acceptable. The bias and precision for uranium spiked at 0.06 μg, as tested by IDP, did not meet the acceptance criteria. However, only 2 samples were tested and environmental contamination was thought to be an interference. Because IDP uses a 0.2 μg screening level for elemental uranium, samples spiked at 0.06 μg were discontinued. The MDA at the contractual level of 0.06 μg was evaluated through GEL's program and was found to be acceptable. The bias and precision was tested by IDP at 0.2 μg and by GEL at 0.1 μg and was also found to be acceptable. For the third contract year, GEL will begin evaluating the bias and precision for elemental uranium at levels of 0.06 μg, in accordance with the contractual level.

The total strontium procedure is used to screen samples to determine which will require analysis for ^{90}Sr. Samples with total strontium results less than 15 dpm do not undergo further analysis. Samples with results greater than or equal to 15 dpm may undergo ^{90}Y in growth to specifically determine ^{90}Sr levels. The calculated MDA, as reported by GEL, for the total strontium part of the analysis was about 30% of the CL. The relative bias and precision, tested by IDP and GEL for the ^{90}Sr and total Sr procedures were all within limits. The 14 samples spiked at the contractual level were all detected. The strontium urinalysis procedure was concluded to be acceptable.

Samples spiked with ^{238}Pu and ^{239}Pu were analyzed using the same procedures and same reagents. The two isotopes are differentiated only at the end of the procedure by alpha spectrometry. Therefore, laboratory performance is expected to be similar for both isotopes using any of the seven procedures that incorporate plutonium analysis (IPU, IPA, IPS, IPSA, IPSR, IUPU, and ITPAC).

The MDAs and performance statistics for ^{239}Pu and ^{238}Pu in urine were acceptable. The 16 samples spiked at the CL for ^{239}Pu were reported with a result greater than the decision level and the 6 blank samples were reported with results less than the decision level. With the exception of one sample, the 21 blank ^{238}Pu samples were reported with results less than the decision level, giving a false positive rate less than 5%. Overall the plutonium urinalyses were considered acceptable.

The MDA and performance statistics for ^{239}Pu and ^{238}Pu in feces were acceptable. Approximately 15% of the fecal samples analyzed were duplicated to test the consistency of the

aliquoting procedure. A review of the duplicate samples determined that the aliquoting procedure produced results within 3 sigma of the initial results. The fecal aliquoting procedure was acceptable. None of the 12 blank ^{238}Pu or the 6 blank ^{239}Pu fecal analyses were greater than the decision level. There were no fecal samples spiked at the CL with ^{238}Pu. The six fecal samples spiked with ^{239}Pu were reported with a result greater than the decision level. Overall the plutonium fecal analyses were considered acceptable.

The ^{241}Am fecal and urine analysis met the acceptance criteria for MDA, relative bias and precision. With regards to the ^{241}Am urinalysis program there were only 2 blank samples and the resulting MDA exceeded the acceptance criteria, however, this was most likely a result of low-level counting statistics. The MDA as reported by GEL was 50% of the contractual level. The 17 samples spiked by IDP at the contractual detection level were all greater than decision level. The current AM241 urinalysis procedure was considered acceptable.

All the six blank fecal samples were less than the decision level and the four spiked fecal samples were all greater than the decision. The ^{241}Am fecal duplicate samples were evaluated and it was concluded that the aliquoting procedure produced results within the control limits. A review of the routine ^{241}Am results reported, however, consistently found more than 10% of the samples with tracer recoveries at or below 40%. GEL reported that the overall low yield for AM241 fecal analyses was 7.4%. However, GEL was including duplicate samples in their tally, a mistake which will be corrected in subsequent QC reports.

In mid-January 2007, GEL identified a cause for the low tracer recoveries in the $La(F_3)$ precipitation step. GEL modified their standard operating procedure to include an additional 1 mL of HF when performing the $La(F_3)$ step. This correction appeared to have improved the tracer recovery rate. However, in early March there was a batch of 10 fecal samples that were declared failed analyses due to a technician error. To better evaluate the efficiency of the procedure modification fecal analyses from the first few quarters of the third contract year (3/1/07 – 12/31/07) were reviewed and only 3% of the samples had tracer recoveries less than 40%. With the implementation of the revised standard operating procedure, the AM241 fecal analysis program is considered acceptable.

The AM243 procedure was identical to the AM241 procedure, except that a different tracer is used (^{244}Cm instead of ^{243}Am). The 6 blank ^{243}Am QC samples submitted were all reported with results less than the decision level and the calculated MDA was 50% of the contractual detection level.

The performance statistics for the AM243, as tested by GEL, met the acceptance criteria. The AM243 procedure was concluded to be acceptable.

IDP did not submit QC samples to test the isotopic curium program, therefore performance statistics were based on the GEL QC results. GEL tested the MDA for ^{242}Cm and ^{244}Cm and the relative bias and precision for ^{244}Cm. The results met the acceptance criteria and the isotopic curium urinalysis program was considered acceptable.

During the second contract year, no isotopic thorium analyses were requested. Therefore, there were no QC samples to evaluate.

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TABLES

INTRODUCTION

This report summarizes the results of the excreta bioassay quality control program's monitoring of the performance of General Engineering Laboratories (GEL) for samples submitted from April 1, 2006 through March 31, 2007. During the reporting period GEL analyzed, under the contract with Battelle, 4503 urine and 111 fecal samples for various radionuclides. This is about the same workload as reported in the 2006 report.

The results of the analyses are part of a system of legal records concerning internal deposition of radionuclides for workers at the Hanford Site. GEL is required to have a rigorous quality control (QC) program to ensure the accuracy of its results. In addition, the Pacific Northwest National Laboratory's (PNNL) Hanford Internal Dosimetry Program (IDP) has a QC program in place to independently check the accuracy of the results from GEL. The objective of the PNNL excreta bioassay QC program is to provide quantitative data to support the assessment of performance criteria for excreta bioassay analyses, as specified in the Statement of Work (Battelle 2007).

The reliability of the excreta bioassay program depends, to a significant extent, on the adoption and implementation of performance criteria for laboratory accuracy, precision, and detection levels. Such performance criteria are established in the Statement of Work (Battelle 2007) and include the following:

- Actual minimum detectable activities (MDAs) determined from QC samples for the year shall be equal to or less than the contractual detection level (CL) in the Statement of Work, as calculated from blank QC samples.
- The mean relative bias, B_r, shall fall within ± 20% when calculated from 15 to 50 samples spiked at greater than three times the CL, and within ± 10% when calculated from greater than 50 samples.
- The relative precision statistic, S_B, shall be less than or equal to 0.4 for samples spiked at greater than three times the CL, and less than or equal to 0.5 for samples spiked between one and three times the CL.

Formulas for MDA, B_r, and S_B, presented in the next section of this report, are based on recommendations in the Health Physics Society (HPS) Standard N13.30 (1996) and are listed in the Statement of Work. In addition to the Statement of Work (SOW) performance criteria, it is expected that the MDA shall also be such that fewer than 10% of the QC samples spiked at the CL shall be reported with values less than the decision level (i.e., twice the total propagated uncertainty of the result)..

METHODS

GENERAL METHODS

Urine collected from PNNL employees who are not occupationally exposed to radioactive material was prepared in the 325 Building as blank and spiked samples by PNNL Radiochemical Processing Group (RPG), according to the directions given by the PNNL Internal Dosimetry Program (IDP), following Procedure PNL-MA-565-800-20, Rev. 2. Most samples were submitted as double-blind samples, with the exception of isotopic uranium urinalyses and the spiked fecal samples. Double blind samples are scheduled with and collected by GEL as if they were personnel samples. The isotopic uranium urinalyses were scheduled as single-blind intercomparisons, which meant that GEL was aware they were intercomparison samples but unaware of the activity. The samples were scheduled as single-blinds because they were spiked with a depleted uranium source. Since depleted uranium exposures at Hanford are rare, the intercomparison samples would stand out and the QC alias names used could become known and compromise the double-blind intercomparison program. The spiked fecal samples were artificial fecal samples consisting of a soil matrix. Blank fecal samples were scheduled as double-blind samples and were actual fecal samples.

GEL analyzed urine samples for tritium, ^{90}Sr, ^{242}Cm, ^{244}Cm, ^{238}Pu, $^{239,240}Pu$, ^{241}Pu ^{241}Am,^{243}Am, ^{234}U, ^{235}U, ^{238}U and elemental uranium and fecal samples for ^{238}Pu, $^{239,240}Pu$, ^{241}Am, ^{242}Cm and ^{244}Cm. To reduce costs in the intercomparison program, plutonium, americium, and strontium analyses were tested using routine sequential procedures when possible (i.e., where one urine sample is analyzed for several radionuclides). The analysis categories specified in the contract with GEL are shown in Table 1. All urinalysis samples contained approximately 1000 ml of urine, except for the samples analyzed for tritium, which contained approximately 100 ml.

GEL's QC sample total is dependent on the number of analytical batches run during the year, and they were well over the 15% criteria specified in the contract.

Battelle Contract 11530 - Feb-06

Table B-3

Analytical and Reporting Requirements for Routine Processing of Samples

Analysis (Code)	Constituents Reported	Contractual Detection Level (a) (dpm/sample) Urine	Fecal	Determination Time (business days following sample receipt)	Reporting Time			Oral Reporting Level: (dpm/sample) Urine	Fecal
					Oral[g]	Electronic[a]	Written[a]		
Pu(∝) Isotopic (IPU)	Pu-238, Pu-239, 240	0.02	0.2	20	By close of business on day of determination	Within five business days of determination	Within 10 business days of determination	Eq. 1	Eq. 1
Pu(∝) Isotopic (IPUL)	Pu-238, Pu-239, 240	0.005		30				Eq. 1	
Am-241 (AM241)	Am-241	0.02	0.8	20				Eq. 1	Eq. 1
Am-243 (AM243)	Am-243	0.02	0.8	20				Eq. 1	Eq. 1
Cm(∝) Isotopic (ICM)	Cm-242, Cm-244(b)	0.02		20				Eq. 1	
U(∝) Isotopic (IU)	U-233, 234, U-235, U-238	0.02		20				(f)	
Th(∝) Isotopic (ITH)	Th-228, Th-229, Th-230, Th-232	0.1	1	20				Eq. 1	Eq. 1
Tritium (H3)	H-3	20 dpm/ml		5				10dpm/ml	
Sr-total (SR)	Sr (sum Sr-89 + Sr-90)	10		20				5	
Sr-90 (SR90)[c]	Sr-90	10		30				5	
Gamma Spectroscopy (ISPEC)	K-40, Cs-137 + Others(d)	See Table B-5		20				Eq. 1	
Gamma Spectroscopy (LEPD)	Am-241	5		20				Eq. 1	
U-nat (U)	Elemental U	0.06 µg/sample	0.3 µg/sample	20				0.2	0.2
Sequential Analyses:									
Pu(∝) Iso and Sr-total (IPS)	As for individual analyses	As for individual analyses		25	As for individual analyses				
Pu(∝) Iso, Am-241 (IPA)				25					
Pu(∝) Iso, Am-241, Sr-total (IPSA)				25					
Pu(∝) Iso, U-nat (IUPU)				25					
Actinide(∝) Isotopic (ITPAC)[e]				25					
Pu(∝) Iso and U ISO (IPIU)				25					

(a) Time allowed following determination of results to receipt of results by Battelle.

(b) Report measured activity for Cm-246, and Cm-248 upon request of the Battelle Technical Administrator.

(c) If total Strontium is less than 15 dpm, Yingrowth is not required.

(d) Report all isotopes present at levels exceeding Equation 5. If ordered by the Battelle Technical Administrator, report results for radionuclides in Table B-5 specified in the processing instruction, regardless of the activity measured.

(e) Pu (∝) Isotopic, Am-241, and Cm (∝) Isotopic.

(f) 0.16 dpm for U-234, 0.15 dpm for U-238, and the greater of 0.007dpm and Equation 5 for U-235.

(g) Oral report required only when analytical results exceed level specified. **Eq. 1 Lc=2(combined standard uncertainty)**

TABLE 2. Number and Category of Bioassay Samples Analyzed

Procedure Code[a]	FIRST CONTRACT YEAR - GEL 4/1/05 through 3/31/06 Total	IDP QC	%	GEL QC[b]	SECOND CONTRACT YEAR - GEL 4/1/06 through 3/31/07 Total	IDP QC	%	GEL QC[b]
Urine								
H3	795	16	2.0	274	892	3	0.3	276
SR90, SR	202	1	0.5	476	231	3	1.3	482
C14	0	0	0.0	0	0	0	0.0	0
AM241	223	3	1.3	576	103	0	0.0	437
AM243	114	0	0.0	130	85	6	7.1	122
U235	2	0	0.0	0	0	0	0.0	0
ICM	8	0	0.0	0	13	0	0.0	241
IPU	1687	2	0.1	1555	1243	0	0.0	1152
IPUL	0	0	0.0	0	1	0	0.0	0
IPA	357	15	4.2	0	293	4	1.4	N/A
IPS	664	12	1.8	0	553	2	0.4	N/A
IPSA	101	1	1.0	0	152	15	9.9	N/A
IPSR	0	0	0.0	0	0	0	0.0	0
ISPEC	0	0	0.0	0	0	0	0.0	0
ITPAC	96	0	0.0	0	90	0	0.0	N/A
ITH	1	0	0.0	9	0	0	0.0	N/A
IUPU	130	0	0.0	0	108	0	0.0	N/A
IPIU	1	0	0.0	0	4	1	25.0	N/A
IU	517	12	2.3	334	500	14	2.8	279
NP237	0	0	0.0	0	0	0	0.0	0
RA226	0	0	0.0	0	0	0	0.0	0
UNAT	354	11	3.1	557	235	18	7.7	339
LEPD	0	0	0.0	0	0	0	0.0	N/A
PU241	0	0	0.0	0	0	0	0.0	N/A
Total	*5252*	*73*	*1.4*	*3911*	*4503*	*66*	*1.5*	*3328*
Fecal [c]								
U232	0	0	0.0	0	0	0	0.0	0
ICM	0	0	0.0	0	1	0	0.0	0
ITH	0	0	0.0	0	0	0	0.0	0
AM241	9	1	0.0	103	15	0	0.0	133
IPU	16	0	0.0	99	12	0	0.0	138
IPA	72	9	12.5	0	83	12	14.5	N/A
Total	*97*	*10*	*10.3*	*202*	*111*	*12*	*10.8*	*271*

[a] Procedures not specifically tested are evaluated with isotopic results from other procedures.

[b] N/A = not available. QC samples are tracked as isotopic analyses not as multiple analyses.

[c] Analyses not analyzed (IPUBA, IRA, ITPAC, IUPU, UNAT, IU, AM243)

Table 2 presents a breakdown of the numbers and categories for all bioassay samples analyzed, including personnel and QC samples. From 66 urine and 12 fecal QC samples submitted by IDP to GEL during the reporting period, GEL reported 136 analytical urine results for 9 different analytes and 36 fecal results for 3 different analytes. The 78 QC samples represent 1.7% of the total analyses performed by GEL. In addition to these samples, GEL analyzed 3,358 internal QC samples. The QC samples analyzed equaled 36% of the samples analyzed by GEL under their contract with Battelle.

GEL's performance was checked by determining detection level, bias, and precision based on the results of blank and spiked samples. Spiked samples fell into two categories: those spiked near the CL and those spiked at equal to or greater than three times the CL. These two categories were necessary to check compliance with the criteria for relative precision (S_B) specified by the Statement of Work. Satisfying these two categories also verified that GEL could detect sample activities near the CL.

DETECTION LEVELS

Various mathematical expressions and terminology can be used to describe a detection level. The statistical approach specified in the Statement of Work basically follows that of Currie (1968) and HPS N13.30 (HPS 1996). However, the HPS N13.30 formulas were modified to account for the difference between a priori estimates of detection levels based on counts (Currie 1968) and a posteriori estimates based on total activity, where chemical yield is determined specifically for each sample.

Two test criteria were used: the decision level (L_c) and the MDA (also called the detection level). The decision level was defined in the Statement of Work as the quantity of radioactivity or mass above which there is at least 95% confidence that the sample is not a blank (Type I error). If the measured value was greater than the L_c, the sample was considered likely to contain the radionuclide of interest. If the measured value was less than L_c, then the result was considered indistinguishable from a blank. The L_c was determined solely by measuring blank samples. Before the L_c was calculated, results that were significant outliers were eliminated from the data set. Outliers were identified by the use of the criteria of ASTM E178-94 (ASTM 1994).

Mathematically, L_c is defined by the following equation:

$$L_c = 2s_A$$

where, s_A equals the combined standard uncertainty of the net analyte reported.

The MDA was based on a 95% confidence in detecting activity when the actual activity was equal to the MDA. Conversely, the 95% confidence level is the point at which only 5% of the results for samples containing activity equal to the MDA fall below the L_c and, thus, were judged to contain no activity (Type II error). The MDA, expressed in units of disintegrations per minute, is calculated from the same set of blanks as the L_c (outliers excluded), using the following equation:

$$MDA = \overline{X_o} + 2(t_{n-1})\ s_o + \frac{(t_{n-1})^2}{ERT}$$

where E is the typical counter detection efficiency in counts per disintegration, R is the average fractional chemical recovery or yield, and T is the typical counting time. In keeping with the philosophy of HPS N13.30, if t^2 is less than 3, then 3 is used instead. For elemental uranium analyses, the analytical method does not produce count data; the unit for the analysis result and MDA is micrograms. Thus, the "3" term is not an appropriate part of the equation for the elemental uranium analysis.

The present contract with GEL, implemented on April 1, 2005 with GEL, specifies an operational year that ends March 31st, each year. This QC report covers the second operational year of that contract, and includes samples analyzed by GEL during period of April 1, 2006 through March 31, 2007.

The MDA values GEL calculates for their QC reports are based on mean values for parameters of equation 2 of the contract statement of work, and not replicate measurements. GEL also uses synthetic samples, whereas IDP uses real fecal and urine samples.

The IDP QC samples were evaluated by first calculating the L_c from blank samples, excluding outliers. This L_c was compared with the L_c calculated from GEL's own QC samples. Then, the MDA was calculated and compared with the CL and the MDA calculated from GEL's own QC samples. Values used for E, R, and T in the MDA equation were obtained from the laboratory; they are listed in Table 3. Finally, the percentage of QC samples spiked at the CL that were measured by the laboratory as having less than the decision level (i.e., no activity was detected) was determined;

this percentage was then compared with the 5% allowed in the Statement of Work. Outliers were included in this test.

BIAS

Relative bias is defined as the mean fractional deviation of the reported results from the true values of spikes added to the samples. The formulas in the Statement of Work used to measure bias in sample results are the same as those in HPS N13.30 (1996). The mean relative bias, Br, is determined using:

$$B_r = \sum_{i=1}^{m} \sum_{j=1}^{n} \frac{B_{rij}}{N}$$

where n = number of spike samples in each level
m = number of spike levels
N = total number of spiked samples
B_{rij} = bias of a single measurement, defined as:

$$B_{rij} = \frac{(A_{ij} - A_{ai})}{A_{ai}}$$

where A_{ij} = the jth measured value of the ith spike level,
A_{ai} = the true value of the ith spike level

TABLE 3. Typical Chemical Yield (R), Typical Detector Efficiencies (E), and Counting Time (T) Values from GEL Quality Control Report

Matrix	Nuclide/ Method	Count Minutes	Contract Limit[a]	Counter Efficiency 2005-2006	Counter Efficiency 2006-2007	Chemical Yield 2005-2006	Chemical Yield 2006-2007
Urine	^{3}H	30	20	0.24	0.18	---	---
	Total Sr	60	10	0.379	0.396	0.746	0.774
	SR90	60	10	---	---	---	---
	^{241}Am	2520	0.02	0.391	0.385	0.883	0.725
	^{243}Am	2520	0.02	0.391	0.385	0.877	0.885
	$^{242}Cm/^{244}Cm$	2520	0.02	0.391	0.385	0.883	0.725
	^{237}Np	2520	0.02	---	---	---	---
	$^{239}Pu/^{238}Pu$	2520	0.02	0.391	0.385	0.956	0.915
	IPUL	10000	0.005	---	---	---	---
	$^{228}Th/^{230}Th/^{232}Th$	2520	0.1	0.386	NA	0.913	NA
	$^{234}U/^{235}U/^{238}U$	2520	0.02	0.386	0.382	0.718	0.709
	Uranium	--	0.06	NA	NA	NA	NA
Fecal	^{241}Am	960	0.8	0.391	0.385	0.657	0.744
	$^{238}Pu/^{239}Pu$	960	0.2	0.391	0.385	0.88	0.90

(a) Units dpm/sample except dpm/mL for H3, and µg/sample for U.
(b) Only one sample analyzed
(c) NA = Not available. No samples completed.
(d) GEL combined analysis categories with equivalent procedures (e.g., IPU and IPA for plutonium) to improve statistics. Breakdown by analysis is therefore not available.

Outliers were excluded from the test, but not ignored for the procedure evaluation. As stipulated in the Statement of Work, the mean relative bias shall fall within ± 20% when calculated from 15 to 50 spiked samples, and within ± 10% when calculated from over 50 samples.

PRECISION

The precision statistic used for this contract was S_B from HPS N13.30 (1996), but the limits differ from that standard. S_B is given by:

$$S_B = \sqrt{\sum_{i=1}^{m}\sum_{j=1}^{n}\frac{(B_{rij} - B_r)^2}{(N-1)}}$$

where the symbols are the same as for relative bias (B_r).

The above equation is valid for samples spiked at one or more levels, subject to the limits for the relative precision, which depend on the activity of the spikes relative to the CL. Specifically, the relative precision statistics shall be less than or equal to 0.4 for samples spiked greater than three

times the CL and less than or equal to 0.5 for samples spiked between one and three times the CL. Outliers were not included in the determination of precision.

FINDINGS

Results from three types of QC samples were available: 1) those prepared by GEL and analyzed as single-blinds (spike amount unknown to the analyst), 2) those submitted by IDP and analyzed as single-blinds (spike amount unknown to the analyst), and 3) those submitted by IDP and analyzed as double-blinds (spike amount and sample origin unknown to the analyst).

Single-blind samples this year included 10 urines and 6 artificial fecal samples prepared by RPG. The results of the statistical tests (see Table 4 and Appendix A) are discussed below. Statistical results from the present and previous years are compared in Table 5.

OUTLIERS

Analytical results that are biased by "blunders" during the analysis should not be included in the data set used for the statistical evaluation of the analytical procedure, but too many outliers would indicate poor laboratory performance (see Table 6). GEL (see Appendix B) did not identify any outliers and there were no outliers in the IDP data set.

TABLE 4. Summary of Statistical Values by Nuclide

	Sample	Blank (dpm)				Spike level at CL (dpm)			Spike Level > 3CL (dpm)		
Isotope[a]	Source	n	L_c	MDA	CL	n	B_I	S_B	n	B_I	S_B
^{3}H(dpm/mL)	IDP	1	[illegible]	[illegible]	0	[illegible]	0.42	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	138	0.0003	0.6		137	-0.05	0.08	…	…	…
Total Sr	IDP	[illegible]	[illegible]	[illegible]	10	[illegible]	[illegible]	0.23	[illegible]	[illegible]	[illegible]
	GEL	16	0.31	7.13		29	0.05	0.14	…	…	…
^{90}Sr	GEL	147	0.69	7.95	10	55	-0.03	0.17	231	0.083	0.115
^{228}Th	GEL	…	…	…	0.02	…	…	…	…	…	…
^{229}Th	GEL	…	…	…	0.02	…	…	…	…	…	…
^{230}Th	GEL	…	…	…	0.02	…	…	…	…	…	…
^{242}Cm	GEL	31	0.003	0.010	0.02	…	…	…	…	…	…
^{244}Cm	GEL	150	0.003	0.010	0.02	…	…	…	60	0.041	0.101
^{238}Pu-urine	IDP	[illegible]	[illegible]	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	395	0.003	0.008		…	…	…	…	…	…
feces	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	49	0.02	0.122		…	…	…	…	…	…
^{239}Pu-urine	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	395	0.003	0.009		219	0.02	0.25	90	-0.056	0.049
feces	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	49	0.02	0.131		…	…	…	49	-0.054	0.058
^{241}Am-urine	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	150	0.004	0.010		83	0.09	0.37	190	-0.011	0.114
feces	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	41	0.05	0.254		…	…	…	41	-0.068	0.074
^{243}Am-urine	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	42	0.006	0.014		18	0.11	0.31	61	0.026	0.069
^{234}U	IDP	[illegible]	[illegible]	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	94	0.009	0.022[e]		…	…	…	…	…	…
^{235}U	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	94	0.005	0.014		…	…	…	…	…	…
^{238}U	IDP	[illegible]	[illegible]	[illegible]	0.02	[illegible]	[illegible]	[illegible]	[illegible]	0.02	[illegible]
	GEL	94	0.008	0.019					57[g]	-0.04	0.13
									124[h]	0.004	0.084
U-urine [b]	IDP	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	GEL	198	0.006	0.01		65	-0.04	0.14	67	-0.012	0.076

(a) Analyzed in urine matrix unless otherwise noted.

(b) Units for L_c, MDA, and CL are mg per sample.

(c) Failed performance criterion.

(d) Possible environmental contaminant.

(e) Within statistical uncertainty

(f) Stats for Cm same as Am-241

(g) Spike level 0.15 dpm/S

(h) Spike level 0.4 dpm/S

TABLE 5.Comparison of Quality Control Statistics Between the First and Second Contract Year with GEL Using QC Samples Submitted by IDP

		Report	Blanks			Spike Level at CL			Spike Level > 3CL		
Nuclide	CL	Year	n	L_c	MDA	n	B_r	S_B	n	B_r	S_B
^{3}H	20 dpm/mL	2005	5	0.17	0.97	11	-0.04	0.18	…	…	…
		2006	1	…	…	2	0.42	0.63	…	…	…
Sr	10 dpm	2005	9	0.43	0.97	5	-0.02	0.15	…	…	…
		2006	1	…	…	14	0.12	0.23	…	…	…
U	0.06 mg	2005	5	…	0.3571 (d)	6	0.01	0.22	…	…	…
(elemental)		2006	1	…	…	2	-1.6 (c)	2.05 (c)	15	-0.14	0.22
^{235}U	0.02 dpm	2005	2	0.01	0.0687 (c)	10	-0.10	1.0307 (c)	…	…	…
		2006	12	0.01	0.02	3	-0.24(c)	0.3	…	…	…
^{238}U	0.02 dpm	2005	2	0.15	0.3508 (d)	10	0.15	0.33	…	…	…
		2006	…	…	…	0	0.00	0.00	15	0.02	0.23
^{238}Pu	0.02 dpm	2005	21	0.003	0.009	9	0.17	0.10	…	…	…
(urine)		2006	21	0.004	0.011	1	-0.18	…	…	…	…
^{239}Pu	0.02 dpm	2005	21	0.003	0.008	9	0.14	0.33	…	…	…
(urine)		2006	6	0.002	0.009	16	0.05	0.23	…	…	…
^{239}Pu	0.2 dpm	2005	5	0.02 5	0.06	…	…	…	4	-0.02	0.12
(fecal)		2006	6	0.02 7	0.07	…	…	…	6	-0.05	0.09
^{241}Am	0.02 dpm	2005	10	0.004	0.012	8	0.05	0.23	…	…	…
(urine)		2006	2	0.005	0.068(c)	17	0.19	0.35	…	…	…
^{241}Am	0.02 dpm	2005	5	0.03	0.085	4	-0.12	0.13	…	…	…
(fecal)		2006	8	0.025	0.063	4	-0.17	0.09	…	…	…
^{243}Am	0.02 dpm	2006	2	0.02 0	0.09	0	…	…	…	…	…

Note: L_c and MDA units same as CL. B_r and S_B are unitless (fractional values).

TABLE 6. Other Indicators of Analytical Uncertainty (IDP Samples)

Nuclide	Analyses	Outliers	Spikes at Contract Level	FALSE Negatives (%)
Urine				
^{3}H	3	0 (0)	2	0 (0)
^{90}Sr	15	0 (0)	14	0 (0)
^{235}U	15	0 (0)	3	0 (0)
^{238}U	0	0 (0)	0	0 (0)
^{238}Pu	22	0 (0)	1	0 (0)
^{239}Pu	22	0 (0)	16	0 (0)
^{241}Am	19	0 (0)	17	0 (0)
^{243}Am	0	0 (0)	0	0 (0)
UNAT	3	0 (0)	15	0 (0)
Total	*99*	0 (0)	*68*	0 (0)
Feces				
^{241}Am	12	0 (0)	4	0 (0)
^{238}Pu	12	0 (0)	...	0 (0)
^{239}Pu	12	0 (0)	6	0 (0)
Total	*36*	*0 (0)*	*10*	*0 (0)*

TRITIUM

Effective June 2006, the tritium intercomparison program by IDP was discontinued, performance indicators will be evaluated through GEL's QC program. Prior to June 2006, 3 tritium intercomparison samples were submitted by IDP, 1 blank and 2 spiked at the CL, the relative bias and precision statistics were all within acceptable values. The control samples run by GEL also met all the acceptance criteria tested as part of the quality control program. The tritium analyses were considered acceptable.

STRONTIUM-90 AND TOTAL STRONTIUM

The total strontium procedure is used to screen samples to determine which will require analysis for ^{90}Sr. Samples with total strontium results less than 15 dpm do not undergo further analysis. Samples with results greater than or equal to 15 dpm may undergo ^{90}Y in growth to specifically determine ^{90}Sr levels. The calculated MDA, as reported by GEL, for the total strontium part of the analysis was about 30% of the CL.

The relative bias and precision, tested by IDP and GEL for the ^{90}Sr and total Sr procedures were all within limits. The 14 samples spiked at the contractual level were all detected. The strontium urinalysis procedure was concluded to be acceptable.

PLUTONIUM-238 AND -239

Samples spiked with ^{238}Pu and ^{239}Pu were analyzed using the same procedures and same reagents. The two isotopes are differentiated only at the end of the procedure by alpha spectrometry. Therefore, laboratory performance is expected to be similar for both isotopes using any of the seven procedures that incorporate plutonium analysis (IPU, IPA, IPS, IPSA, IPSR, IUPU, and ITPAC).

The MDAs and performance statistics for ^{239}Pu and ^{238}Pu in urine were acceptable. The 16 samples spiked at the CL for ^{239}Pu were reported with a result greater than the decision level and the 6 blank samples were reported with results less than the decision level. With the exception of one sample, the 21 blank ^{238}Pu samples were reported with results less than the decision level, giving a false positive rate less than 5%. Overall the plutonium urinalyses were considered acceptable.

The MDA and performance statistics for ^{239}Pu and ^{238}Pu in feces were acceptable. Approximately 15% of the fecal samples analyzed were duplicated to test the consistency of the aliquoting procedure. A review of the duplicate samples determined that the aliquoting procedure produced results within 3 sigma of the initial results. The fecal aliquoting procedure was acceptable. None of the 12 blank ^{238}Pu or the 6 blank ^{239}Pu fecal analyses were greater than the decision level. There were no fecal samples spiked at the CL with ^{238}Pu. The six fecal samples spiked with ^{239}Pu were reported with a result greater than the decision level. Overall the plutonium fecal analyses were considered acceptable.

URANIUM (UNAT)

No concerns were identified with the elemental uranium urinalysis program and it was considered acceptable. The bias and precision for uranium spiked at 0.06 μg, as tested by IDP, did not meet the acceptance criteria. However, only 2 samples were tested and environmental contamination was thought to be an interference. Because IDP uses a 0.2 μg screening level for elemental uranium, samples spiked at 0.06 μg were discontinued. The MDA at the contractual level of 0.06 μg was evaluated through GEL's program and was found to be acceptable. The bias and precision was tested by IDP at 0.2 μg and by GEL at 0.1 μg and was also found to be acceptable. For the third contract year, GEL will begin evaluating the bias and precision for elemental uranium at levels of 0.06 μg, in accordance with the contractual level.

ISOTOPIC URANIUM

The isotopic uranium analysis reports on three uranium isotopes: ^{234}U, ^{235}U, and ^{238}U. The isotopes are differentiated only during counting by alpha spectrometry. GEL reported that the calculated minimum detectable activity (MDA) for $^{233,234}U$ for the year slightly exceeded the contract required detection limit. This was consistently seen in the first, second and third quarters. The cause was attributed to low tracer recoveries. The standard operating procedure was revised November 30, 2006 to improve the separation chemistry. GEL then reviewed the MDAs for the fourth quarter and showed that all three isotopes met the acceptance criteria.

IDP did not submit isotopic uranium samples to review the $^{233,234}U$ performance indicators. However, the performance statistics for ^{235}U and ^{238}U were reviewed and the MDA for ^{235}U and the bias and precision for ^{238}U were acceptable. The percentage of analyses with low yields were reviewed and found not to meet the criteria in the statement of work for the first, second and third quarters (Table 7). In line with GEL's changes to the standard operating procedure, the low yield rate in the fourth quarter was significantly improved upon and it met the criteria in the statement of work. A review of the data from April 1, 2007 through December 31, 2007, also showed improvement in tracer recoveries for isotopic uranium urinalyses. Of the 398 urinalyses processed during this time, all had tracer recoveries at 40% or greater. With the implementation of the revised standard operating procedure, the isotopic uranium analysis program is considered acceptable.

TABLE 7. Low Yields for Isotopic Uranium for the Second Contract Year (4/1/2006 – 3/31/2007) as Broken Down by Quarter. Also included are the summed results for the first few quarters of the Third Contract Year.

First Quarter			Second Quarter			Third Quarter			Fourth quarter			3/1/07 - 12/31/07		
Total Results	Low Yield No.	Low Yield %	Total Results	Low Yield No.	Low Yield %	Total Results	Low Yield No.	Low Yield %	Total Results	Low Yield No.	Low Yield %	Total Results	Low Yield No.	Low Yield %
121	23	**19%**	157	35	**22%**	152	19	**13%**	148	1	**0.7%**	398	0	**0%**

AMERICIUM-241

The ^{241}Am fecal and urine analysis met the acceptance criteria for MDA, relative bias and precision. With regards to the ^{241}Am urinalysis program there were only 2 blank samples and the resulting MDA exceeded the acceptance criteria, however, this was most likely a result of low-level counting statistics. The MDA as reported by GEL was 50% of the contractual level. The 17 samples spiked by IDP at the contractual detection level were all greater than decision level. The current AM241 urinalysis procedure was considered acceptable.

All six blank fecal samples were less than the decision level and the four spiked fecal samples were all greater than the decision. The ^{241}Am fecal duplicate samples were evaluated and it was concluded that the aliquoting procedure produced results within the control limits. A review of the routine ^{241}Am results reported, however, consistently found more than 10% of the samples with tracer recoveries at or below 40% (Table 8). GEL reported that the overall low yield for AM241 fecal analyses was 7.4%. However, GEL was including duplicate samples in their tally, a mistake which will be corrected in subsequent QC reports.

Table 8. Low Yields for AM241 Fecal Analyses for the Second Contract Year (4/1/2006 – 3/31/2007) as Broken Down by Quarter. Also included are the summed results for the first few quarters of the Third Contract Year.

First Quarter			Second Quarter			Third Quarter			Fourth quarter			3/1/07 - 12/31/07		
Total Results	Low Yield No.	%	Total Results	Low Yield No.	%	Total Results	Low Yield No.	%	Total Results	Low Yield No.	%	Total Results	Low Yield No.	%
12	3	**25%**	2	0	**0%**	20	5	**25%**	64	16	**25%**	36	1	**3%**

In mid-January 2007, GEL identified a cause for the low tracer recoveries in the La(F_3) precipitation step. GEL modified their standard operating procedure to include an additional 1 mL of HF when performing the La(F_3) step. This correction appeared to have improved the tracer recovery rate. However, in early March there was a batch of 10 fecal samples that were declared failed analyses due to a technician error. To better evaluate the efficiency of the procedure modification fecal analyses from the first few quarters of the third contract year (3/1/07 – 12/31/07) were reviewed and only 3% of the samples had tracer recoveries less than 40%. With the implementation of the revised standard operating procedure, the AM241 fecal analysis program is considered acceptable.

AMERICIUM-243

The AM243 procedure was identical to the AM241 procedure, except that a different tracer is used (^{244}Cm instead of ^{243}Am). The 6 blank ^{243}Am QC samples submitted were all reported with results less than the decision level and the calculated MDA was 50% of the contractual detection level. The performance statistics for the AM243, as tested by GEL, met the acceptance criteria. The AM243 procedure was concluded to be acceptable.

ISOTOPIC CURIUM

IDP did not submit QC samples to test the isotopic curium program, therefore performance statistics were based on the GEL QC results. GEL tested the MDA for ^{242}Cm and ^{244}Cm and the relative bias and precision for ^{244}Cm. The results met the acceptance criteria and the isotopic curium urinalysis program was considered acceptable.

ISOTOPIC THORIUM

During the second contract year, no isotopic thorium analyses requested. Therefore, there were no QC samples to evaluate.

FOLLOW-UP ON CONCERNS DURING THE SECOND CONTRACT YEAR

There were a few concerns during the second year with General Engineering Laboratories (GEL) dealing mainly with low tracer recoveries seen in the isotopic uranium urinalyses and AM241 fecal analyses. Steps taken by GEL to address both concerns have been sufficient and tracer recoveries are now within acceptable limits (see discussions above).

A minor observation made was that the GEL calculated MDAs for ^{239}Pu, ^{238}Pu and ^{241}Am in feces were between 2 to 4 times greater than the IDP's calculated MDAs. The MDAs for urine were similar between the two QC programs. When comparing the urine and fecal calculated MDAs for the 3 isotopes, a factor of 5 difference was expected based on the shorter counting time and aliquoting associated with fecal analyses. However, the fecal MDAs reported by GEL were 15 times greater in fecal analyses than urinalyses for ^{239}Pu and ^{238}Pu and about 25 times greater in ^{241}Am fecal analyses than urinalyses. GEL is currently investigating this concern and will be evaluated in the third contract year.

A review of Incident reports since the contract with GEL was initiated did not identify a trend or a concern. The majority of incident reports were due to human error and corrective actions were deemed acceptable.

Incident reports issued during the second contract year included:

1. Incident Report for Tagword 06E0067, 06E0184, 06E0233, 06E0319, 06E0325, 06E0327 and 06E0338. closed May 24, 2006
    a. GEL was unable to report the volume received for the above referenced Tagwords as the analyst had recorded the volumes on a loose sheet of paper, which was inadvertently discarded. A bound logbook, RC-O-024, was created to permanently record sample volumes.
2. Incident for Tagword 06G0232 and 06G0042 , closed August 31, 2006
    a. The analyst neglected to add the ^{244}Cm tracer to the sample tagwords referenced. The group leader met with the analysts and their team leader and discussed the error and stressed the importance of following the information provided in the que and pull sheets. In addition, the team leader was to use additional identifying methods for infrequent analyte requests.

SUMMARY OF THE BIOASSAY QUALITY CONTROL REPORT FROM GEL INCORPORATED, FOR THE CONTRACT 11530 SECOND YEAR 2006/2007(1)

GEL reported all analytical batches were analyzed with a reagent blank, matrix blank or both. GEL considered blanks in control when the calculate MDA was less than the Contract Limit (CL) and the L_c was less than ½ CL (see Appendix B). In addition, the chemical tracer yields were evaluated against the yield requirements stated in the subject contract. Overall, GEL believed that the blank and spike data for each analytical process demonstrated that the analyses were in control.

GEL reported that the duplicate fecal samples were evaluated to determine that the aliquot procedure produces results within control limits. One ^{241}Am duplicate was excluded because the results of the parent sample were not reported. Two ^{243}Am tracers were less than the low yield requirement of 40% for isotopic americium. One of the two tracers was below the minimum yield requirement of 20%; however, the sample was a Laboratory Control Sample (LCS) that met the recovery requirements. No correlation between the samples was observed, therefore, no corrective action was necessary. Two isotopic curium samples were not spiked; however, they were spiked with ^{241}Am for the americium portion of the analysis. Since curium and americium are from the same counting source, the curium results were reported based on the acceptable ^{241}Am recoveries. A non-conformance reported was created to document this anomaly.

Fourteen tracers were less than the 50% low yield level for isotopic plutonium. No correlation between the samples was observed so no corrective action was necessary. Two ^{242}Pu tracers were observed to be below the minimum yield requirement of 25%. The failed tracers were for two LCSs with spikes within the recovery requirements, so the results were reported. A non-conformance reports was created to document the anomaly.

Eighteen tracers were less than the 50% low yield for ^{90}Sr. No correlation between the samples was observed, so no corrective action was necessary.

Seventy tracers were less than the 40% low yield for isotopic uranium, in addition the MDA for ^{234}U was slightly greater than the contractual level. The Standard Operating Procedure was revised November 30, 2006 as Revision 25. The revision made involved changing the type of separation chemistry from an AG1X8 anion exchange column to an Eichrom TRU extraction chromatography column. This was discussed in the section on isotopic uranium. Improvements were observed following the corrective actions.

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(1) Summaries are taken from Pifer (2007).

RESULTS FROM INTERCOMPARISON PROGRAMS

GEL participated in 3 intercomparison programs (Attachment D – Intercomparison Programs) in the second contract year. On April 1, 2006 they participated in the National Institute of Standards and Technology's program testing the relative bias and precision for ^{238}Pu, ^{239}Pu, ^{241}Am, ^{230Th}, ^{235}U, ^{238}U, ^{234}U and ^{90}Sr in synthetic feces. GEL met the acceptance criteria for relative bias and precision for all isotopes except for ^{90}Sr, which failed the portion on relative bias but passed on relative precision. Because Hanford does not use fecal samples for strontium analyses, this was not deemed a concern. GEL also participated in the National Institute of Standards and Technology's program testing the relative bias and precision for ^{238}Pu, ^{239}Pu, ^{241}Am, ^{230}Th, ^{235}U, ^{238}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{133}Ba, ^{137}Cs and ^{152}Eu in synthetic urine. GEL met the acceptance criteria for relative bias and precision on all isotopes.

On December 1, 2006 GEL participated in the Department of Energy Laboratory Accreditation Program, Session 10. Isotopes tested in a fecal matrix were ^{238}Pu, ^{239}Pu, ^{241}Am, ^{230}Th, ^{232}Th, ^{2228}Th ^{238}U, ^{234}U, ^{90}Sr, ^{60}Co, and ^{137}Cs. Isotopes tested in a urine matrix were ^{238}Pu, ^{239}Pu, ^{241}Am, ^{230}Th, ^{232}Th, ^{2228}Th, ^{238}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{137}Cs, tritium and U-total. GEL passed the acceptance criteria for all isotopes in both the fecal and urine matrix for relative bias and precision.

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APPENDIX A

QUALITY CONTROL SAMPLE RESULTS

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD 1	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
AM241	0612	17	12/13/2006	06K0411	59882	IPA	67.3	0.0000	0.0000	F	J	0.0104	0.0134	-	
AM241	0612	18	12/13/2006	06L0401	59882	IPA	245.	0.0000	0.0000	F	J	-0.0099	0.0198	-	
AM241	0612	19	01/08/2007	06L0414	99166	IPA	205.	0.0000	0.0000	F	J	-0.0240	0.0583	-	
AM241	0612	21	01/08/2007	06L0412	99180	IPA	186.	0.0000	0.0000	F	J	-0.0099	0.0158	-	
AM241	0612	20	01/08/2007	06L0415	99166	IPA	160.	0.0000	0.0000	F	J	-0.0099	0.0191	-	
AM241	0612	22	01/11/2007	06L0413	99180	IPA	41.3	0.0000	0.0000	F	J	0.0165	0.0153	-	
AM241	0612	15	01/16/2007	06L0437	AU001	IPA	51.8	0.0000	0.0000	F	J	0.0053	0.0044	-	
AM241	0612	16	01/16/2007	06L0438	AU001	IPA	51.7	0.0000	0.0000	F	J	0.0011	0.0034	-	
				8	**F**	**AM241 Count**		**0.0000 8**	**Average Result St Dev**		**-0.0026 0.0133**	**DL MDA**	**0.0251 0.0633**	**Chem Yield 0.74 Det Eff 0.39**	**Time 960**
AM241	0612	11	01/16/2007	06L0435	AU001	IPA	50.2	0.9000	0.0450	F	J	0.8070	0.1800	+	-0.1033
AM241	0612	12	01/16/2007	06L0433	AU001	IPA	50.3	0.9000	0.0450	F	J	0.7560	0.1690	+	-0.1600
AM241	0612	13	01/16/2007	06L0434	AU001	IPA	51.8	0.9000	0.0450	F	J	0.6300	0.1430	+	-0.3000
AM241	0612	14	01/16/2007	06L0436	AU001	IPA	51.6	0.9000	0.0450	F	J	0.8070	0.1800	+	-0.1033
				4	**F**	**AM241 Count**		**0.9000 4**	**Average Result St Dev**		**0.7500 0.0835**			**Mean Rel. Bias Mean Rel. Precision**	**-0.1667 0.0928**
	Number of total F AM241 12														
PU238	0612	17	12/13/2006	06K0411	59882	IPA	67.3	0.0000	0.0000	F	J	-0.0035	0.0049	-	
PU238	0612	18	12/13/2006	06L0401	59882	IPA	245.	0.0000	0.0000	F	J	-0.0035	0.0057	-	
PU238	0612	19	01/05/2007	06L0414	99166	IPA	205.	0.0000	0.0000	F	J	-0.0026	0.0069	-	
PU238	0612	20	01/05/2007	06L0415	99166	IPA	160.	0.0000	0.0000	F	J	0.0144	0.0098	-	
PU238	0612	22	01/05/2007	06L0413	99180	IPA	41.3	0.0000	0.0000	F	J	0.0035	0.0042	-	
PU238	0612	21	01/05/2007	06L0412	99180	IPA	186.	0.0000	0.0000	F	J	-0.0026	0.0052	-	
PU238	0612	11	01/11/2007	06L0435	AU001	IPA	50.2	0.0000	0.0000	F	J	0.0036	0.0044	-	
PU238	0612	13	01/11/2007	06L0434	AU001	IPA	51.8	0.0000	0.0000	F	J	0.0066	0.0060	-	
PU238	0612	16	01/11/2007	06L0438	AU001	IPA	51.7	0.0000	0.0000	F	J	0.0321	0.0182	-	
PU238	0612	12	01/11/2007	06L0433	AU001	IPA	50.3	0.0000	0.0000	F	J	-0.0015	0.0048	-	
PU238	0612	14	01/11/2007	06L0436	AU001	IPA	51.6	0.0000	0.0000	F	J	0.0122	0.0099	-	
PU238	0612	15	01/11/2007	06L0437	AU001	IPA	51.8	0.0000	0.0000	F	J	0.0076	0.0069	-	
				12	**F**	**PU238 Count**		**0.0000 12**	**Average Result St Dev**		**0.0055 0.0104**	**DL MDA**	**0.0186 0.0470**	**Chem Yield 0.90 Det Eff 0.39**	**Time 960**
	Number of total F PU238 12														
PU239	0612	17	12/13/2006	06K0411	59882	IPA	67.3	0.0000	0.0000	F	J	0.0152	0.0086	-	
PU239	0612	18	12/13/2006	06L0401	59882	IPA	245.	0.0000	0.0000	F	J	-0.0107	0.0057	-	
PU239	0612	19	01/05/2007	06L0414	99166	IPA	205.	0.0000	0.0000	F	J	-0.0166	0.0334	-	

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD	I	PAYID	REQ ANAL		VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET		REL BIAS
PU239	0612	20	01/05/2007	06L0415		99166	IPA		160.	0.0000	0.0000	F	J	0.0096	0.0066	-		
PU239	0612	22	01/05/2007	06L0413		99180	IPA		41.3	0.0000	0.0000	F	J	0.0123	0.0084	-		
PU239	0612	21	01/05/2007	06L0412		99180	IPA		186.	0.0000	0.0000	F	J	-0.0074	0.0052	-		
					6	**F**		**PU239 Count**		**0.0000**	**Average Result**		**0.0004**		**DL**	**0.0273**	**Chem Yield**	**0.90**	**Time 960**
										6	**St Dev**		**0.0136**		**MDA**	**0.0669**	**Det Eff**	**0.39**	
PU239	0612	11	01/11/2007	06L0435		AU001	IPA		50.2	1.0000	0.0350	F	J	1.0100	0.1130	+		0.0100
PU239	0612	14	01/11/2007	06L0436		AU001	IPA		51.6	1.0000	0.0350	F	J	0.8420	0.1010	+		-0.1580
PU239	0612	12	01/11/2007	06L0433		AU001	IPA		50.3	1.0000	0.0350	F	J	1.0900	0.1200	+		0.0900
PU239	0612	15	01/11/2007	06L0437		AU001	IPA		51.8	1.0000	0.0350	F	J	0.9440	0.1120	+		-0.0560
PU239	0612	13	01/11/2007	06L0434		AU001	IPA		51.8	1.0000	0.0350	F	J	0.8570	0.1000	+		-0.1430
PU239	0612	16	01/11/2007	06L0438		AU001	IPA		51.7	1.0000	0.0450	F	J	0.9800	0.1260	+		-0.0200
					6	**F**		**PU239 Count**		**1.0000**	**Average Result**		**0.9538**				**Mean Rel. Bias**		**-0.0462**
										6	**St Dev**		**0.0942**				**Mean Rel. Precision**		**0.0942**
	Number of total F PU239 **12**																	
AM241	0605	06	05/26/2006	06E0144		91382	IPA		1184	0.0000	0.0000	U	J	-0.0009	0.0002	-		
AM241	0605	07	05/26/2006	06E0058		3C135	IPA		1346	0.0000	0.0000	U	J	0.0003	0.0021	-		
					2	**U**		**AM241 Count**		**0.0000**	**Average Result**		**-0.0003**		**DL**	**0.0054**	**Chem Yield**	**0.73**	**Time 2520**
										2	**St Dev**		**0.0009**		**MDA**	**0.0675**	**Det Eff**	**0.39**	
AM241	0602	11	04/13/2006	06C0318		59001	IPA		0982	0.0200	0.0006	U	J	0.0222	0.0067	+		0.1100
AM241	0601	05	05/01/2006	06D0152		3G544	IPA		0997	0.0200	0.0006	U	L	0.0212	0.0071	+		0.0600
AM241	0605	09	06/03/2006	06E0102		50575	IPSA		1218	0.0200	0.0008	U	L	0.0263	0.0074	+		0.3150
AM241	0606	05	07/22/2006	06F0121		50807	IPSA		1211	0.0200	0.0005	U	L	0.0267	0.0079	+		0.3350
AM241	0606	09	07/22/2006	06F0295		99156	IPSA		1183	0.0200	0.0005	U	L	0.0232	0.0067	+		0.1600
AM241	0606	08	07/22/2006	06F0294		59621	IPSA		1292	0.0200	0.0005	U	L	0.0159	0.0053	+		-0.2050
AM241	0606	06	07/22/2006	06F0122		50809	IPSA		1090	0.0200	0.0005	U	L	0.0222	0.0071	+		0.1100
AM241	0606	07	07/30/2006	06F0223		31776	IPSA		1458	0.0200	0.0005	U	L	0.0167	0.0060	+		-0.1650
AM241	0607	10	08/01/2006	06G0241		99159	IPSA		1087	0.0200	0.0007	U	L	0.0214	0.0065	+		0.0700
AM241	0607	09	08/14/2006	06G0067		32533	IPSA		1267	0.0200	0.0007	U	L	0.0123	0.0047	+		-0.3850
AM241	0608	09	08/28/2006	06H0109		99162	IPSA		1151	0.0200	0.0006	U	L	0.0305	0.0088	+		0.5250
AM241	0608	11	08/28/2006	06H0140		51077	IPSA		1235	0.0200	0.0006	U	L	0.0362	0.0096	+		0.8100
AM241	0608	10	08/28/2006	06H0115		80109	IPSA		1426	0.0200	0.0006	U	L	0.0331	0.0093	+		0.6550
AM241	0610	07	11/06/2006	06J0051		99161	IPSA		1155	0.0200	0.0006	U	L	0.0370	0.0100	+		0.8500
AM241	0701	09	01/24/2007	07A0418		3C134	IPSA		1371	0.0200	0.0005	U	L	0.0241	0.0071	+		0.2050
AM241	0701	10	01/24/2007	07A0417		3C142	IPSA		1101	0.0200	0.0005	U	L	0.0168	0.0055	+		-0.1600
AM241	0701	11	01/24/2007	07A0419		99158	IPSA		1180	0.0200	0.0005	U	L	0.0196	0.0062	+		-0.0200
					17	**U**		**AM241 Count**		**0.0200**	**Average Result**		**0.0238**				**Mean Rel. Bias**		**0.1924**
										17	**St Dev**		**0.0071**				**Mean Rel. Precision**		**0.3544**

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD_1	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
Number of total U AM241 19															
AM243	0604	03	04/28/2006	06D0145	99120	AM243	1097	0.0000	0.0000	U		-0.0003	0.0017	-	
AM243	0604	04	04/28/2006	06D0146	91386	AM243	1407	0.0000	0.0000	U		-0.0025	0.0001	-	
AM243	0604	05	04/28/2006	06D0146	91386	AM243	1407	0.0000	0.0000	U		-0.0025	0.0001	-	
AM243	0607	01	07/30/2006	06G0247	80098	AM243	1247	0.0000	0.0000	U		0.0007	0.0010	-	
AM243	0608	01	08/28/2006	06H0222	3C136	AM243	1305	0.0000	0.0000	U		0.0001	0.0008	-	
AM243	0609	01	09/28/2006	06I0098	32514	AM243	1300	0.0000	0.0000	U		-0.0023	0.0024	-	
AM243	0609	02	09/28/2006	06I0159	99152	AM243	1171	0.0000	0.0000	U		-0.0011	0.0016	-	
				6	**U**	**AM243 Count**		**0.0000 7**	**Average Result St Dev**		**-0.0011 0.0013**	**DL MDA**	**0.0026 0.0106**	**Chem Yield 0.73 Det Eff 0.39**	**Time 2520**
Number of total U AM243 6															
H 3	0604	02	04/20/2006	06D0142	3C136	H 3	0500	0.0000	0.0000	U		-0.0351	0.2580	-	
				1	**U**	**H 3 Count**		**0.0000 1**	**Average Result St Dev**		**-0.0351 0.0000**	**DL MDA**		**Chem Yield 1.00 Det Eff 0.18**	**Time 20**
H 3	0604	01	04/20/2006	06D0052	32533	H 3	0502	20.0000	0.1780	U		37.3000	0.7810	+	0.8650
H 3	0605	02	05/22/2006	06E0059	3C136	H 3	0500	20.0000	0.1480	U		19.4000	0.8110	+	-0.0300
				2	**U**	**H 3 Count**		**20.0000 2**	**Average Result St Dev**		**####### 12.6572**			**Mean Rel. Bias Mean Rel. Precision**	**0.4175 0.6329**
Number of total U H 3 3															
PU238	0602	11	04/06/2006	06C0318	59001	IPA	0982	0.0000	0.0000	U	J	0.0013	0.0016	-	
PU238	0602	09	04/19/2006	06C0067	32476	IPS	0990	0.0000	0.0000	U	P	0.0021	0.0022	-	
PU238	0601	05	04/24/2006	06D0152	3G544	IPA	0997	0.0000	0.0000	U	L	0.0000	0.0001	-	
PU238	0604	10	04/26/2006	06D0252	99153	IPS	1239	0.0000	0.0000	U	P	0.0000	0.0001	-	
PU238	0605	06	05/19/2006	06E0144	91382	IPA	1184	0.0000	0.0000	U	J	-0.0012	0.0021	-	
PU238	0605	09	05/24/2006	06E0102	50575	IPSA	1218	0.0000	0.0000	U	L	-0.0002	0.0001	-	
PU238	0606	05	07/21/2006	06F0121	50807	IPSA	1211	0.0000	0.0000	U	L	0.0009	0.0019	-	
PU238	0606	08	07/21/2006	06F0294	59621	IPSA	1292	0.0000	0.0000	U	L	-0.0013	0.0019	-	
PU238	0606	09	07/21/2006	06F0295	99156	IPSA	1183	0.0000	0.0000	U	L	0.0019	0.0023	-	
PU238	0606	06	07/21/2006	06F0122	50809	IPSA	1090	0.0000	0.0000	U	L	-0.0002	0.0001	-	
PU238	0606	07	07/28/2006	06F0223	31776	IPSA	1458	0.0000	0.0000	U	L	0.0028	0.0021	-	
PU238	0607	10	08/01/2006	06G0241	99159	IPSA	1087	0.0000	0.0000	U	L	0.0055	0.0026	+	
PU238	0607	09	08/14/2006	06G0067	32533	IPSA	1267	0.0000	0.0000	U	L	0.0008	0.0019	-	
PU238	0608	09	08/28/2006	06H0109	99162	IPSA	1151	0.0000	0.0000	U	L	0.0023	0.0023	-	
PU238	0608	11	08/28/2006	06H0140	51077	IPSA	1235	0.0000	0.0000	U	L	0.0022	0.0027	-	
PU238	0608	10	08/28/2006	06H0115	80109	IPSA	1426	0.0000	0.0000	U	L	-0.0034	0.0008	-	
PU238	0608	08	08/31/2006	06H0304	99151	IPIU	1281	0.0000	0.0000	U	B	0.0000	0.0001	-	

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD_I	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
PU238	0610	07	11/03/2006	06J0051	99161	IPSA	1155	0.0000	0.0000	U	L	0.0011	0.0024	-	
PU238	0701	09	01/23/2007	07A0418	3C134	IPSA	1371	0.0000	0.0000	U	L	0.0011	0.0019	-	
PU238	0701	10	01/23/2007	07A0417	3C142	IPSA	1101	0.0000	0.0000	U	L	0.0059	0.0031	-	
PU238	0701	11	01/23/2007	07A0419	99158	IPSA	1180	0.0000	0.0000	U	L	0.0000	0.0001	-	
				21	**U**	**PU238 Count**		**0.0000**	**Average Result**		**0.0010**	**DL**	**0.0036**	**Chem Yield 0.92**	**Time 2520**
								21	**St Dev**		**0.0021**	**MDA**	**0.0106**	**Det Eff 0.39**	
PU238	0605	07	05/19/2006	06E0058	3C135	IPA	1346	0.0200	0.0003	U	J	0.0165	0.0046	+	-0.1750
				1	**U**	**PU238 Count**		**0.0200**	**Average Result**		**0.0165**			**Mean Rel. Bias**	**-0.1750**
								1	**St Dev**		**0.0000**			**Mean Rel. Precision**	
	Number of total U PU238 **22**														
PU239	0602	11	04/06/2006	06C0318	59001	IPA	0982	0.0000	0.0000	U	J	0.0008	0.0028	-	
PU239	0602	09	04/19/2006	06C0067	32476	IPS	0990	0.0000	0.0000	U	P	0.0003	0.0019	-	
PU239	0601	05	04/24/2006	06D0152	3G544	IPA	0997	0.0000	0.0000	U	L	0.0014	0.0020	-	
PU239	0604	10	04/26/2006	06D0252	99153	IPS	1239	0.0000	0.0000	U	P	-0.0006	0.0001	-	
PU239	0605	06	05/19/2006	06E0144	91382	IPA	1184	0.0000	0.0000	U	J	-0.0007	0.0001	-	
PU239	0605	09	05/24/2006	06E0102	50575	IPSA	1218	0.0000	0.0000	U	L	0.0017	0.0021	-	
				6	**U**	**PU239 Count**		**0.0000**	**Average Result**		**0.0005**	**DL**	**0.0020**	**Chem Yield 0.92**	**Time 2520**
								6	**St Dev**		**0.0010**	**MDA**	**0.0087**	**Det Eff 0.39**	
PU239	0605	07	05/19/2006	06E0058	3C135	IPA	1346	0.0200	0.0004	U	J	0.0202	0.0054	+	0.0100
PU239	0606	05	07/21/2006	06F0121	50807	IPSA	1211	0.0200	0.0003	U	L	0.0208	0.0056	+	0.0400
PU239	0606	06	07/21/2006	06F0122	50809	IPSA	1090	0.0200	0.0003	U	L	0.0271	0.0058	+	0.3550
PU239	0606	09	07/21/2006	06F0295	99156	IPSA	1183	0.0200	0.0003	U	L	0.0159	0.0047	+	-0.2050
PU239	0606	08	07/21/2006	06F0294	59621	IPSA	1292	0.0200	0.0003	U	L	0.0238	0.0059	+	0.1900
PU239	0606	07	07/28/2006	06F0223	31776	IPSA	1458	0.0200	0.0003	U	L	0.0221	0.0051	+	0.1050
PU239	0607	10	08/01/2006	06G0241	99159	IPSA	1087	0.0200	0.0059	U	L	0.0130	0.0044	+	-0.3500
PU239	0607	09	08/14/2006	06G0067	32533	IPSA	1267	0.0200	0.0059	U	L	0.0145	0.0045	+	-0.2750
PU239	0608	09	08/28/2006	06H0109	99162	IPSA	1151	0.0200	0.0003	U	L	0.0202	0.0056	+	0.0100
PU239	0608	11	08/28/2006	06H0140	51077	IPSA	1235	0.0200	0.0003	U	L	0.0285	0.0062	+	0.4250
PU239	0608	10	08/28/2006	06H0115	80109	IPSA	1426	0.0200	0.0003	U	L	0.0222	0.0058	+	0.1100
PU239	0608	08	08/31/2006	06H0304	99151	IPIU	1281	0.0200	0.0003	U	B	0.0223	0.0055	+	0.1150
PU239	0610	07	11/03/2006	06J0051	99161	IPSA	1155	0.0200	0.0003	U	L	0.0188	0.0052	+	-0.0600
PU239	0701	09	01/23/2007	07A0418	3C134	IPSA	1371	0.0200	0.0005	U	L	0.0200	0.0053	+	
PU239	0701	10	01/23/2007	07A0417	3C142	IPSA	1101	0.0200	0.0005	U	L	0.0282	0.0064	+	0.4100
PU239	0701	11	01/23/2007	07A0419	99158	IPSA	1180	0.0200	0.0005	U	L	0.0177	0.0055	+	-0.1150
				16	**U**	**PU239 Count**		**0.0200**	**Average Result**		**0.0210**			**Mean Rel. Bias**	**0.0478**
								16	**St Dev**		**0.0045**			**Mean Rel. Precision**	**0.2265**
	Number of total U PU239 **22**														

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD_1	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
SR	0605	09	06/01/2006	06E0102	50575	IPSA	1218	10.0000	0.1980	U	L	8.6800	0.5820	+	-0.1320
SR	0606	05	07/23/2006	06F0121	50807	IPSA	1211	10.0000	0.0668	U	L	11.4000	0.6460	+	0.1400
SR	0606	09	07/23/2006	06F0295	99156	IPSA	1183	10.0000	0.0668	U	L	12.6000	0.6800	+	0.2600
SR	0606	08	07/23/2006	06F0294	59621	IPSA	1292	10.0000	0.0668	U	L	13.6000	0.7790	+	0.3600
SR	0606	06	07/23/2006	06F0122	50809	IPSA	1090	10.0000	0.0668	U	L	13.1000	0.6840	+	0.3100
SR	0606	07	07/26/2006	06F0223	31776	IPSA	1458	10.0000	0.0668	U	L	10.9000	0.5210	+	0.0900
SR	0607	10	08/03/2006	06G0241	99159	IPSA	1087	10.0000	0.2190	U	L	10.4000	0.7960	+	0.0400
SR	0607	09	08/13/2006	06G0067	32533	IPSA	1267	10.0000	0.2190	U	L	7.9400	0.5170	+	-0.2060
SR	0608	09	08/30/2006	06H0109	99162	IPSA	1151	10.0000	0.1120	U	L	12.5000	1.2400	+	0.2500
SR	0608	11	08/30/2006	06H0140	51077	IPSA	1235	10.0000	0.1120	U	L	15.5000	1.4100	+	0.5500
SR	0608	10	08/30/2006	06H0115	80109	IPSA	1426	10.0000	0.1120	U	L	13.0000	1.2900	+	0.3000
SR	0702	13	03/21/2007	07C0406	99214	SR	1146	10.0000	0.0850	U		8.9400	1.2400	+	-0.1060
SR	0702	14	03/21/2007	07C0409	99218	SR	1237	10.0000	0.0850	U		8.3100	0.7090	+	-0.1690
SR	0702	15	03/21/2007	07C0411	99215	SR	1343	10.0000	0.0850	U		9.7600	1.3000	+	-0.0240
				14	**U**	**SR Count**		**10.0000 14**	**Average Result St Dev**		**###### 2.2876**			**Mean Rel. Bias Mean Rel. Precision**	**0.1188 0.2288**
	Number of total U SR **14**														
SR 90	0602	09	04/17/2006	06C0067	32476	IPS	0990	0.0000	0.0000	U	P	0.6780	0.2640	+	
				1	**U**	**SR 90 Count**		**0.0000 1**	**Average Result St Dev**		**0.6780 0.0000**	**DL MDA**		**Chem Yield 0.76 Det Eff 0.40**	**Time 20**
	Number of total U SR 90 **1**														
U	0605	04	05/19/2006	06E0300	99152	U	1410	0.0000	0.0000	U		-0.0040	0.0018	-	
				1	**U**	**U Count**		**0.0000 1**	**Average Result St Dev**		**-0.0040 0.0000**	**DL MDA**		**Chem Yield 1.00 Det Eff 0.39**	**Time 2520**
U	0604	07	05/01/2006	06D0149	80076	U	1193	0.0600	0.0007	U		0.0489	0.0134	+	-0.1850
U	0604	08	05/01/2006	06D0150	3G522	U	1335	0.0600	0.0007	U		-0.1250	0.2780	-	-3.0833
				2	**U**	**U Count**		**0.0600 2**	**Average Result St Dev**		**-0.0381 0.1230**	**MDA**	**1.5528**	**Mean Rel. Bias Mean Rel. Precision**	**-1.6342 2.0494**
U	0606	01	06/26/2006	06F0349	80109	U	1143	0.2000	0.0024	U		0.1340	0.0412	+	-0.3300
U	0606	03	06/26/2006	06F0449	AU001	U	1124	0.2000	0.0024	U		0.1710	0.0506	+	-0.1450
U	0607	04	08/01/2006	06G0234	99157	U	1398	0.2000	0.0026	U		0.1960	0.0415	+	-0.0200
U	0607	03	08/11/2006	06G0127	99158	U	1087	0.2000	0.0026	U		0.2360	0.0164	+	0.1800
U	0608	05	08/22/2006	06H0076	59600	U	1205	0.2000	0.0140	U		0.2390	0.0361	+	0.1950
U	0608	06	09/07/2006	06H0108	99161	U	1323	0.2000	0.0140	U		0.1310	0.0573	+	-0.3450
U	0609	06	10/05/2006	06I0171	91386	U	1358	0.2000	0.0015	U		0.1170	0.0321	+	-0.4150
U	0609	07	10/05/2006	06I0265	99156	U	1097	0.2000	0.0015	U		0.1530	0.0422	+	-0.2350
U	0610	04	10/23/2006	06J0058	80076	U	1116	0.2000	0.0140	U		0.2210	0.0248	+	0.1050

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
U	0610	06	10/23/2006	06J0285		U	1150	0.2000	0.0015	U		0.2320	0.0254	+	0.1600
U	0610	05	10/23/2006	06J0085	50784	U	1255	0.2000	0.0015	U		0.1300	0.0173	+	-0.3500
U	0702	12	02/26/2007	07B0220	99162	U	1108	0.2000	0.0023	U		0.1880	0.0179	+	-0.0600
U	0702	13	03/21/2007	07C0408	99214	U	1146	0.2000	0.0016	U		0.1570	0.0188	+	-0.2150
U	0702	14	03/21/2007	07C0410	99218	U	1237	0.2000	0.0016	U		0.1350	0.0149	+	-0.3250
U	0702	15	03/21/2007	07C0412	99215	U	1343	0.2000	0.0016	U		0.1300	0.0147	+	-0.3500
				15	**U**	**U Count**		**0.2000** **15**	**Average Result** **St Dev**		**0.1713** **0.0440**			**Mean Rel. Bias** **Mean Rel. Precision**	**-0.1433** **0.2198**
	Number of total U U **18**														
U 235	0609	04	10/01/2006	06I0279	3C135	IU	1389	0.0000	0.0000	U	U	0.0052	0.0046	-	
U 235	0609	05	10/01/2006	06I0280	3C137	IU	1246	0.0000	0.0000	U	U	-0.0050	0.0028	-	
U 235	0701	03	02/15/2007	07A0233	91384	IU	1436	0.0000	0.0000	U	U	0.0056	0.0044	-	
U 235	0702	01	02/22/2007	07B0406	99157	IU	1306	0.0000	0.0000	U	U	0.0028	0.0035	-	
U 235	0702	09	03/19/2007	07B0606	AU001	IU	1103	0.0000	0.0000	U	U	-0.0017	0.0045	-	
U 235	0702	02	03/27/2007	07B0600	AU001	IU	1156	0.0000	0.0000	U	U	0.0000	0.0039	-	
U 235	0702	05	03/27/2007	07B0601	AU001	IU	1168	0.0000	0.0000	U	U	0.0049	0.0037	-	
U 235	0702	11	03/27/2007	07B0608	AU001	IU	1298	0.0000	0.0000	U	U	0.0019	0.0033	-	
U 235	0702	10	03/27/2007	07B0607	AU001	IU	1255	0.0000	0.0000	U	U	0.0017	0.0051	-	
U 235	0702	08	03/27/2007	07B0604	AU001	IU	1175	0.0000	0.0000	U	U	0.0000	0.0047	-	
U 235	0702	07	03/27/2007	07B0605	AU001	IU	1315	0.0000	0.0000	U	U	0.0000	0.0031	-	
U 235	0702	04	03/27/2007	07B0602	AU001	IU	1266	0.0000	0.0000	U	U	0.0035	0.0043	-	
				12	**U**	**U 235 Count**		**0.0000** **12**	**Average Result** **St Dev**		**0.0016** **0.0031**	**DL** **MDA**	**0.0056** **0.0159**	**Chem Yield 0.71** **Det Eff 0.38**	**Time 2520**
U 235	0608	08	08/31/2006	06H0304	99151	IPIU	1281	0.0070	0.0000	U	B	0.0030	0.0080	-	-0.5686
U 235	0608	04	09/08/2006	06H0399	3C139	IU	1388	0.0070	0.0000	U	U	0.0077	0.0068	-	0.0986
U 235	0702	06	03/19/2007	07B0603	AU001	IU	1207	0.0070	0.0000	U	U	0.0052	0.0037	-	-0.2600
				3	**U**	**U 235 Count**		**0.0070** **3**	**Average Result** **St Dev**		**0.0053** **0.0023**	**MDA**	**0.0261**	**Mean Rel. Bias** **Mean Rel. Precision**	**-0.2433** **0.3339**
	Number of total U U235 **15**														
U 238	0608	08	08/31/2006	06H0304	99151	IPIU	1281	0.1460	0.0010	U	B	0.1280	0.0217	+	-0.1233
U 238	0608	04	09/08/2006	06H0399	3C139	IU	1388	0.1460	0.0010	U	U	0.1550	0.0222	+	0.0616
U 238	0609	04	10/01/2006	06I0279	3C135	IU	1389	0.1460	0.0011	U	U	0.1260	0.0166	+	-0.1370
U 238	0609	05	10/01/2006	06I0280	3C137	IU	1246	0.1460	0.0011	U	U	0.1440	0.0201	+	-0.0137
U 238	0701	03	02/15/2007	07A0233	91384	IU	1436	0.1460	0.0010	U	U	0.2660	0.0253	+	0.8219
U 238	0702	01	02/22/2007	07B0406	99157	IU	1306	0.1460	0.0008	U	U	0.1420	0.0161	+	-0.0274
U 238	0702	06	03/19/2007	07B0603	AU001	IU	1207	0.1460	0.0008	U	U	0.1340	0.0149	+	-0.0822
U 238	0702	09	03/19/2007	07B0606	AU001	IU	1103	0.1460	0.0008	U	U	0.1380	0.0170	+	-0.0548

ISO CD	YRMO	SEQ	ANAL DATE	TAGWORD 1	PAYID	REQ ANAL	VOL	SPIKE	UNCERT	TYPE	MR	RESULT	UNCERT	DET	REL BIAS
U 238	0702	02	03/27/2007	07B0600	AU001	IU	1156	0.1460	0.0008	U	U	0.1260	0.0155	+	-0.1370
U 238	0702	11	03/27/2007	07B0608	AU001	IU	1298	0.1460	0.0008	U	U	0.1330	0.0172	+	-0.0890
U 238	0702	10	03/27/2007	07B0607	AU001	IU	1255	0.1460	0.0008	U	U	0.1350	0.0166	+	-0.0753
U 238	0702	08	03/27/2007	07B0604	AU001	IU	1175	0.1460	0.0008	U	U	0.1560	0.0183	+	0.0685
U 238	0702	04	03/27/2007	07B0602	AU001	IU	1266	0.1460	0.0008	U	U	0.1650	0.0195	+	0.1301
U 238	0702	07	03/27/2007	07B0605	AU001	IU	1315	0.1460	0.0008	U	U	0.1540	0.0177	+	0.0548
U 238	0702	05	03/27/2007	07B0601	AU001	IU	1168	0.1460	0.0008	U	U	0.1420	0.0169	+	-0.0274
				15	**U**	**U 238 Count**		**0.1460**	**Average Result**		**0.1496**			**Mean Rel. Bias**	**0.0247**
								15	**St Dev**		**0.0343**			**Mean Rel. Precision**	**0.2349**

Number of total U U 238 **15**

Total Samples **78**

Total Results **172**

APPENDIX B

GEL QUALITY CONTROL SAMPLE REPORT SUMMARY

Statistical Parameters Utilized by The GEL Group, Inc

Zone Definitions

Zone A – Area defined as being between 2 and 3 times sigma above the center line
Zone B – Area defined as being between 1 and 2 times sigma above the center line
Zone C – Area defined as being between the center line and 1 times sigma

Data Flag Definitions

1. Nine (9) points on Zone C and beyond on one side of the central line - Indicates that the process average may have changed
2. Six (6) points in a row steadily increasing or decreasing on one side of the central line – Indicates that a drift may be occurring in the process average
3. Fourteen (14) points in a row alternating up or down on either side of the center line – If this test is positive it indicates that two systematically alternating causes may be producing different results
4. Two (2) out of three (3) points in a row are in Zone A or beyond – Indicates an early warning of a process shift
5. Four (4) out of five (5) points are in Zone B or beyond – If positive, this, like flag 4, indicates and early warning of a potential process shift
6. Fifteen (15) points are in Zone C above or below the center line – Indicates a smaller variability than expected
7. Eight (8) points in a row are in Zone B, A or beyond on either side of the center line with no points occurring in Zone C – Indicates that different samples are affected by different factors resulting in bimodal distribution of averages

References

Statistica Software – Data Mining, Statistical Analysis and Quality Control
Quality Control Charts – www.statsoft.com/textbook/stquacon.html

PNNL
ANNUAL
QC PACKAGE

2006/2007
April 1, 2006 – March 31, 2007

Data was reviewed and found acceptable.

[signature]	5-29-09
Reviewed By:	Date:

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Am-241 – LCS Bias High
Am-243 – Tracer Yield
Pu-238 – Blank Activity
Pu-238 – Duplicate RER
Pu-239/240 – Blank Activity
Pu-239/240 – Duplicate RER
Pu-239/240 – LCS Bias High
Pu-242 – Tracer Yield

Legend

#	= the N-value (number of the samples in the data set)
Samp ID	= GEL laboratory sample identification number
Inst	= the analytical instrument identification number/name
Run Date	= the sample analysis date
LCL	= Lower Control Level (minus 3 sigma)
LWL	= Lower Warning Level (minus 2 sigma)
Mean	= the average value of the data set
Numvalue	= Number Value for parameter being monitored
Exclude	= a checked box indicates the data was not used in the calculation of the mean and control limits
Stdev	= Standard Deviation
UWL	= Upper Warning Level (plus 2 sigma)
UCL	= Upper Contol Level (plus 3 sigma)
Dispersion	= the difference of the individual relative bias from the mean
Parent Sample	= the sample that was duplicated
TPU	= Total Proportion Uncertainty (1 sigma combined standard uncertainty)
RER	= Relative Error Ratio (the difference of the individual duplicate pairs based on the combined standard uncertainties of the individual analyses)
Nominal	= the calculated concentration of the spike in the sample geometry
Result	= the actual measured analyte concentration in the sample
Bias	= the deviation of a measured value from the expected value

Duplicate Acceptance Criteria

The RER shall not exceed 3 (standard deviations) in more than one duplicate pairs in a nuclide category.

SECTION 1

CASE NARRATIVE

Annual - QC Report – Operational Year 2006/2007

This report summarizes Quality Control Samples (QC) analyzed with bioassay samples under Contract 11530 during the Contract Year 2006/2007, beginning April 1, 2006 and ending March 31, 2007. Included in the report are listings for the blank, duplicate and spike results. A description of the attached data is provided below.

During this period, the following numbers of samples were analyzed under this contract. The QC samples include blanks, spikes, and duplicates.

Test	Matrix	QC Samples	Total Samples	% QC
Am	URINE	437	1084	40%
Am-243	URINE	122	213	57%
H-3	URINE	276	1168	24%
Pu	URINE	1152	3604	32%
Sr-90	URINE	436	1338	33%
Total Sr	URINE	46	72	64%
Total U	URINE	339	685	49%
U	URINE	279	801	35%
Am	FECAL	133	233	57%
Pu	FECAL	138	241	57%

Blanks

The following table contains the analyses, isotope, matrix, and the calculated MDAs. The alpha spectrometry MDAs are based on the average blank counts and average tracer yields for the year. The Strontium MDAs are adjusted according to the average tracer yield for the year. The total uranium MDAs are based on the standard deviation of the 0.05 ug/L standard analyzed each day throughout the year.

Isotope	Matrix	Number In Set (N#)	MDA	Units	Lc	Sample Volume	Avg. Yield	Detector Efficiency	Count Time (min)
Am-241	Urine	150	0.0103	dpm/s	0.0035	1	0.725	0.385	2520
Am-243	Urine	42	0.0144	dpm/s	0.0059	1	0.885	0.385	2520
Cm-242	Urine	31	0.0095	dpm/s	0.0030	1	0.725	0.385	2520
Cm-243/244	Urine	150	0.0097	dpm/s	0.0030	1	0.725	0.385	2520
Pu-238	Urine	395	0.0083	dpm/s	0.0029	1	0.915	0.385	2520
Pu-239/240	Urine	395	0.0092	dpm/s	0.0034	1	0.915	0.385	2520
U-233/234	Urine	94	0.0216	dpm/s	0.0086	1	0.709	0.382	2520
U-235/236	Urine	94	0.0139	dpm/s	0.0051	1	0.709	0.382	2520
U-238	Urine	94	0.0194	dpm/s	0.0077	1	0.709	0.382	2520
Sr-90	Urine	147	7.95	dpm/s	0.6878	1	0.760	0.396	20
Total Sr	Urine	16	7.13	dpm/s	0.3148	1	0.774	0.396	20
Tritium	Urine	138	610	dpm/L	0.3294	0.01	n/a	0.179	20
Total U	Urine	198	0.0103	ug/s	0.0059	0.05	n/a	n/a	n/a
Am-241	Fecal	41	0.2538	dpm/s	0.0519	0.333	0.744	0.385	960

Pu-238	Fecal	49	0.1220	dpm/s	0.0202	0.333	0.898	0.385	960
Pu-239/240	Fecal	49	0.1306	dpm/s	0.0219	0.333	0.898	0.385	960

The following table contains the analyses, isotope, matrix, and the calculated MDAs for Isotopic Uranium in Urine. The alpha spectrometry MDAs are based on the average blank counts and average tracer yields for the fourth quarter.

Isotope	Matrix	Number In Set (N#)	MDA	Units	Lc	Sample Volume	Avg. Yield	Detector Efficiency	Count Time (min)
U-233/234	Urine	30	0.0198	dpm/s	0.00823	1	0.808	0.382	2520
U-235/236	Urine	30	0.0133	dpm/s	0.00522	1	0.808	0.382	2520
U-238	Urine	30	0.0184	dpm/s	0.00783	1	0.808	0.382	2520

All analytical batches were analyzed with either a reagent blank, matrix blank or both. Blanks are in control when the calculated MDA and blank activity are both less than CRDL (contract required detection limit). In addition, the chemical tracer yields are evaluated against the yield requirements stated in the subject contract.

Overall, the blank data for each analytical process demonstrate the analyses were in control. Processing categories and samples which did not meet contractual requirements are discussed in the **Observations** section of this report.

Laboratory Control Samples (LCS)

The enclosed listing contains the analysis isotope, matrix, average relative bias and the relative precision statistic. One or more LCS sample was analyzed with each batch of samples.

Test	Matrix	Range High (1) (2)	Average Relative Bias	Relative Precision
Am-241	Urine	High[1]	-0.0108	0.1136
Am-243	Urine	High[1]	0.0263	0.0693
Cm-243/244	Urine	High[1]	0.0405	0.1006
Pu-239/240	Urine	High[1]	-0.0562	0.0487
Sr-90	Urine	High[1]	0.0828	0.1149
Total U	Urine	High[1]	-0.0119	0.0755
U-238	Urine	High[2]	0.0037	0.0843
Am-241	Feces	High[1]	-0.0349	0.2686
Pu-239/240	Feces	High[1]	-0.0605	0.0729

(1) High range: nominal > 2 times the Required Detection Limit
(2) High range for U-238: nominal > 0.32 dpm/sample

Test	Matrix	Range Low	Average Relative Bias	Relative Precision
Am-241	Urine	Low	0.0869	0.3748
Am-243	Urine	Low	0.108	0.3115
Pu-239/240	Urine	Low	0.0173	0.2477
Sr-90	Urine	Low	-0.0294	0.1675
Total Sr	Urine	Low	0.052	0.141
Total U	Urine	Low	-0.0396	0.1404
Tritium	Urine	Low	-0.0506	0.0777
U-238	Urine	Low	-0.0446	0.1251

Overall, the LCS data demonstrates the analytical processes were in control. Any LCS outside the limits is discussed in the **Observations** section of this report.

Duplicate Samples (DUP)

The duplicate samples were evaluated to determine that the aliquot procedure produces results within control limits.

Refer to Narrative Attachments 1-3 for DUP tables.

One Am-241 duplicates was excluded due to not reporting the parent sample.

Sample Summary

Overall, the chemical yields for the analytical processes were greater than the minimum yields required in the SOW. Those not meeting the yield requirements are further discussed in the **Observation** section of this report.

OBSERVATIONS

Section 1:

Am Isotopic in Urine

Two Am-243 tracers (0.185%) were less than the low yield for Isotopic Am this year.

One of the two tracers was below the minimum yield requirement of 20%; however, the sample was a Laboratory Control Sample (LCS) that met the recovery requirements. No correlation between the samples was observed, so no corrective action was necessary.

Cm Isotopic in Urine

Two Cm-243/244 LCS samples were not spiked with Curium; however, they were spiked with Am-241 due to analyzing Curium and Americium together. Since Curium and Americium are from the same counting source, the Curium results were reported based on the acceptable Am-241 recoveries. NCR 346848 was created to document this anomaly.

Pu Isotopic in Urine

Fourteen tracers (0.389%) were less than the low yield for Isotopic Pu this year. No correlation between the samples was observed, so no corrective action was necessary.

Two Pu-242 tracers were observed to be below the minimum yield requirement of 25%. The failed tracers were for two LCSs with spikes within the recovery requirements, so the results were reported. NCRs 312489 and 346865 were created to document this anomaly.

Sr-90/Total Sr in Urine

Eighteen tracers (1.69%) were less than the low yield for Sr-90 this year. No correlation between the samples was observed, so no corrective action was necessary.

Th Isotopic in Urine

There was no Isotopic Th analyzed this year.

Total Uranium in Urine

There were no observations made for Total Uranium this year.

Tritium

There were no observations made for Tritium this year.

Uranium Isotopic in Urine

Seventy tracers (8.97%) were less than the low yield for Isotopic Uranium this year.

The MDA for U-233/234 is greater than CRDL (contract required detection limit) for the year due to the low tracer recoveries observed. The Standard Operating Procedure was revised November 30, 2006 as Revision 25. The revision made involved changing the type of separation chemistry from an AG1X8 anion exchange column to an Eichrom ®TRU extraction chromatography column. Since the MDA was greater than the CRDL for the year, the MDA was also calculated for the fourth quarter alone and was found to be in control. Improvements have been observed following the corrective actions in the 2006/2007 year.

Isotopic Am in Feces

Fifteen tracers (7.43%) were less than the low yield for Isotopic Am this year.

Due to the low tracers throughout the year, corrective action was necessary and has been taken. The procedure was investigated and revised December 11, 2006 as Revision 10. Improvements have been observed since the end of third quarter.

Isotopic Pu in Feces

Four tracers (1.69%) were less than the low yield for Isotopic Pu this year. No correlation between the samples was observed, so no corrective action was necessary.

Incident Reports
The following incident reports were documented this year:

Incident Report for Tagwords 06E0067, 06E0184, 06E0233, 06E0319, 06E0325, 06E0327, and 06E0338. GEL was unable to report the volume received for the above referenced Tagwords due to the analyst recording the measurements on a loose sheet of paper. The paper was inadvertently discarded prior to the entry of the data into LIMS. A bound logbook, RC-O-024, was created to permanently record the volumes received. The logbook can then be referenced to enter this data into LIMS at a more appropriate time. The incident was closed May 24, 2006.

Incident Report for the Curium spiking error associated with work orders 167241 and 167731. The group leader met with both technicians responsible in the matter and their team leader. The four of them discussed the error and were reminded of the information provided in the que and pull sheets. In addition, the team leader will use additional identifying methods for infrequent analyte requests. The incident was closed August 31,2006.

Corrective Actions

The corrective action regarding low tracer recoveries for Americium in Fecal analyses was closed January 25, 2007 following an investigation and revision of the Standard Operating Procedure. As for the corrective action regarding Uranium in Urine analyses, improvements have been observed following the revision of the procedure and will close during the first quarter of the 2007/2008 year.

NARRATIVE ATTACHMENT 1
Americium-241
Sample Type: RER Attribute Tracked: RER (dec)

Values less than
and greater than

or equal to

#	Samp ID	Inst	Run Date	LCL	LWL	Mean	Numvalue	TPU	Exclude	Stdev	UWL	UCL	Parent Sample	Result	TPU
1	1201062888	1694	11-Apr-06	-0.86	-0.19	1.14	2	0.0048		1.3	2.47	3.14	06C0641	-.0069 and 0.0057	0.00412 and 0.00477
2	1201065026	1659	12-APR-06	-.86	-.19	1.14	1.17	.0047		0	2.47	3.14	06D0330	0.025 and 0.007	0.0146 and 0.00469
3	1201072748	1710	24-APR-06	-.86	-.19	1.14	.37	.0025		-1.2	2.47	3.14	06D0340	-.0117 and -.0099	0.00421 and 0.00249
4	1201067780	1637	16-MAY-06	-.86	-.19	1.14	1.4	.019		.4	2.47	3.14	06E0340	-.0046 and 0.0244	0.00912 and 0.0186
5	1201104166	1635	09-JUN-06				0.00E+00	.085	✓				06E0534	-.0176 and -.0176	0.0639 and 0.0848
6	1201105097	1649	09-JUN-06	-.86	-.19	1.14	.26	.21		-1.3	2.47	3.14	06E0532	-.0137 and -.0712	0.0629 and 0.209
7	1201120001	1635	26-JUN-06	-.86	-.19	1.14	2.48	.017		2	2.47	3.14	06F0561	-.0166 and 0.0283	0.00668 and 0.0168
8	1201128589	1636	17-JUL-06	-.86	-.19	1.14	2.07	.011		1.4	2.47	3.14	06G0265	-.0208 and 0.0151	0.0136 and 0.0107
9	1201131872	1698	19-JUL-06	-.86	-.19	1.14	1.78	.0076		1	2.47	3.14	06G0276	-.0019 and -.0179	0.0049 and 0.00755
10	1201143163	1711	01-AUG-06	-.86	-.19	1.14	.75	.0032		-.6	2.47	3.14	06G0431	-.0206 and -.0053	0.0202 and 0.00318
11	1201146263	1635	07-AUG-06	-.86	-.19	1.14	2.03	.011		1.3	2.47	3.14	06G0440	-.0176 and 0.0167	0.0127 and 0.0112
12	1201145207	1714	08-AUG-06	-.86	-.19	1.14	2.13	.0056		1.5	2.47	3.14	06G0438	-.031 and -.0018	0.0125 and 0.00562
13	1201154413	1682	16-AUG-06	-.86	-.19	1.14	.54	.0027		-.9	2.47	3.14	06H0358	-.0207 and -.0032	0.0321 and 0.00266
14	1201159512	1690	24-AUG-06	-.86	-.19	1.14	1.19	.0048		.1	2.47	3.14	06H0383	-.0045 and 0.0036	0.00489 and 0.00475
15	1201180963	1687	21-SEP-06	-.86	-.19	1.14	.8	.0029		-.5	2.47	3.14	06I0319	-.0145 and -.0009	0.0166 and 0.00292
16	1201198588	1701	12-OCT-06	-.86	-.19	1.14	.36	.37		-1.2	2.47	3.14	06I0535	1.6 and 1.8	0.338 and 0.367
17	1201222272	1691	14-NOV-06	-.86	-.193	1.14	.061	.0037		-1.6	2.473	3.14	06K0326	0.0048 and 0.0044	0.00397 and 0.0037
18	1201224284	1635	16-NOV-06	-.86	-.19	1.14	.33	.0094		-1.2	2.47	3.14	06K0330	-.0187 and -.0063	0.0362 and 0.00937
19	1201236923	1680	12-DEC-06	-.86	-.19	1.14	.57	.043		-.9	2.47	3.14	06K0409	0.033 and 0.061	0.0233 and 0.043
20	1201239188	1714	13-DEC-06	-.86	-.19	1.14	.67	.044		-.7	2.47	3.14	06K0411	0.01 and -.021	0.0134 and 0.044
21	1201247783	1696	26-DEC-06	-.86	-.19	1.14	1.73	.051		.9	2.47	3.14	06L0442	0.068 and 0.168	0.0282 and 0.0508
22	1201249940	1709	29-DEC-06	-.86	-.19	1.14	1.71	.01		.9	2.47	3.14	06L0468	0.021 and -.01	0.0151 and 0.0103
23	1201251761	1640	31-DEC-06	-.86	-.19	1.14	1.44	.0041		.5	2.47	3.14	06L0637	0.031 and 0.004	0.0183 and 0.00414
24	1201243298	1700	08-JAN-07	-.86	-.19	1.14	1.15	.012		0	2.47	3.14	06L0412	-.0099 and 0.0129	0.0158 and 0.012
25	1201253830	1684	16-JAN-07	-.86	-.19	1.14	.69	.14		-.7	2.47	3.14	06L0433	0.8 and 0.6	0.169 and 0.138
26	1201261253	1687	24-JAN-07	-.86	-.19	1.14	.29	.0053		-1.3	2.47	3.14	07A0462	-.0076 and -.0099	0.00587 and 0.00534
27	1201270069	1697	07-FEB-07	-.86	-.19	1.14	1.25	.011		.2	2.47	3.14	07A0686	-.038 and -.0101	0.0194 and 0.0111
28	1201272602	1707	09-FEB-07	-.86	-.19	1.14	1.13	.0095		0	2.47	3.14	07A0697	0.0003 and 0.0135	0.00676 and 0.0095
29	1201274062	1710	15-FEB-07	-.86	-.19	1.14	.9	.013		-.4	2.47	3.14	07B0404	0.0059 and 0.019	0.00595 and 0.0134
30	1201280511	1715	27-FEB-07	-.86	-.19	1.14	1.51	.0067		.6	2.47	3.14	07B0520	0.0015 and -.0099	0.00347 and 0.00667
31	1201282350	1703	01-MAR-07	-.86	-.19	1.14	1.46	.0057		.5	2.47	3.14	07B0563	-.0011 and 0.008	0.00269 and 0.00566
32	1201291669	1689	16-MAR-07	-.86	-.19	1.14	1.58	.0033		.7	2.47	3.14	07C0442	-.0099 and 0.0008	0.00597 and 0.00328
33	1201292403	1693	16-MAR-07	-.86	-.19	1.14	1.93	.011		1.2	2.47	3.14	07C0448	-.0042 and 0.0189	0.00381 and 0.0113
34	1201298266	1715	27-MAR-07	-.86	-.193	1.14	.058	.013		-1.6	2.473	3.14	07B0619	0.024 and 0.023	0.0136 and 0.0134
35	1201298274	1697	28-MAR-07	-.86	-.19	1.14	.94	.11		-.3	2.47	3.14	07B0519	0.6 and 0.5	0.142 and 0.108

NARRATIVE ATTACHMENT 2
Plutonium-238

Sample Type: RER Attribute Tracked: RER (dec)

Values less than
and greater than

or equal to

#	Samp ID	Inst	Run Date	LCL	LWL	Mean	Numvalue	TPU	Exclude	Stdev	UWL	UCL	Parent Sample	Result	TPU
1	1201062891	1696	11-Apr-06	-0.71	-0.31	0.49	0.62	0.014		0.3	1.29	1.69	06C0641	0.0035 and -.0056	0.00431 and 0.0141
2	1201065034	1663	12-Apr-06	-0.71	-0.31	0.49	0.37	0.015		-0.3	1.29	1.69	06D0330	-.0003 and -.0061	0.00554 and 0.0149
3	1201065862	1662	13-APR-06	-.7061	-.3066	.4922	0.00E+00	.0051		-1.2	1.2911	1.6905	06D0346	0 and 0	0.00508 and 0.00507
4	1201072751	1706	24-APR-06	-.71	-.31	.49	.3	.0045		-.5	1.29	1.69	06D0340	-.0024 and -.0045	0.00514 and 0.00449
5	1201087787	1643	18-MAY-06	-.706	-.307	.492	.02	.025		-1.2	1.291	1.69	06E0340	-.0092 and -.0099	0.023 and 0.0253
6	1201104169	1640	08-JUN-06	-.71	-.31	.49	.15	.027		-.9	1.29	1.69	06E0534	-.0138 and -.0097	0.00798 and 0.0267
7	1201105100	1645	09-JUN-06	-.71	-.31	.49	1.01	.012		1.3	1.29	1.69	06E0532	0.0043 and 0.0176	0.00527 and 0.012
8	1201117818	1636	23-JUN-06	-.71	-.31	.49	1.6	.012		2.8	1.29	1.69	06F0560	-.0021 and 0.0172	0.0101 and 0.0117
9	1201128592	1648	17-JUL-06	-.71	-.31	.49	.69	.015		.5	1.29	1.69	06G0265	0.0064 and -.0046	0.00578 and 0.0148
10	1201131875	1702	19-JUL-06	-.71	-.31	.49	1.03	.005		1.3	1.29	1.69	06G0276	0.0083 and -.001	0.00755 and 0.00496
11	1201143166	1715	01-AUG-06	-.71	-.31	.49	.58	.013		.2	1.29	1.69	06G0431	0.0048 and -.0035	0.00584 and 0.0129
12	1201145210	1715	04-AUG-06	-.71	-.31	.49	.59	.014		.3	1.29	1.69	06G0438	0.0051 and -.0038	0.00623 and 0.0137
13	1201146286	1637	07-AUG-06	-.71	-.31	.49	1.01	.011		1.3	1.29	1.69	06G0440	-.0037 and 0.0138	0.0133 and 0.0112
14	1201154416	1715	15-AUG-06	-.71	-.31	.49	.6	.012		.3	1.29	1.69	06H0358	0.0054 and -.003	0.00665 and 0.0122
15	1201156519	1687	24-AUG-06	-.7061	-.3066	.4922	0.00E+00	.0048		-1.2	1.2911	1.6905	06H0383	0 and 0	0.00468 and 0.0048
16	1201180988	1682	21-SEP-06	-.71	-.31	.49	.19	.0068		-.8	1.29	1.69	06I0319	-.0059 and -.01	0.0207 and 0.00677
17	1201196591	1653	11-OCT-06	-.71	-.31	.49	1.01	.012		1.3	1.29	1.69	06I0535	0.036 and 0.009	0.0231 and 0.0122
18	1201222275	1683	13-NOV-06	-.706	-.307	.492	.028	.016		-1.2	1.291	1.69	06K0326	-.0054 and -.0059	0.0133 and 0.0157
19	1201238938	1670	12-DEC-06	-.71	-.31	.49	.27	.039		-.6	1.29	1.69	06K0409	-.0037 and -.0142	0.00684 and 0.0385
20	1201239191	1706	13-DEC-06	-.7061	-.3066	.4922	0.00E+00	.005		-1.2	1.2911	1.6905	06K0411	-.0035 and -.0035	0.00493 and 0.00498
21	1201247785	1703	22-DEC-06	-.706	-.307	.492	.018	.015		-1.2	1.291	1.69	06L0442	0.035 and 0.035	0.0156 and 0.0154
22	1201248653	1692	27-DEC-06	-.71	-.31	.49	.47	.014		0	1.29	1.69	06L0465	0.033 and 0.023	0.0161 and 0.0139
23	1201249947	1669	29-DEC-06	-.71	-.31	.49	.54	.014		.1	1.29	1.69	06L0468	0.015 and 0.025	0.0103 and 0.0139
24	1201251768	1636	31-DEC-06	-.71	-.31	.49	.21	.021		-.7	1.29	1.69	06L0637	0.042 and 0.048	0.0186 and 0.0208
25	1201243301	1675	05-JAN-07	-.71	-.31	.49	.11	.01		-.9	1.29	1.69	06L0412	-.0026 and -.0039	0.0052 and 0.0101
26	1201253833	1696	11-JAN-07	-.71	-.31	.49	.23	.014		-.7	1.29	1.69	06L0433	-.0015 and -.0048	0.00479 and 0.0137
27	1201261256	1709	23-JAN-07	-.71	-.31	.49	.74	.0055		.6	1.29	1.69	07A0462	0.0039 and -.0015	0.00473 and 0.00546
28	1201272605	1696	06-FEB-07	-.71	-.31	.49	.87	.0063		1	1.29	1.69	07A0697	-.0038 and 0.0069	0.0105 and 0.00627
29	1201274085	1695	15-FEB-07	-.71	-.31	.49	.53	.0093		.1	1.29	1.69	07B0404	0.0017 and 0.0073	0.00512 and 0.00932
30	1201278649	1695	22-FEB-07	-.706	-.307	.492	.033	.0061		-1.1	1.291	1.69	07A0702	-.0113 and -.0126	0.038 and 0.00811
31	1201280514	1665	26-FEB-07	-.71	-.31	.49	.58	.016		.2	1.29	1.69	07B0520	0.005 and -.005	0.00611 and 0.0161
32	1201280274	1678	26-FEB-07	-.71	-.31	.49	.33	.044		-.4	1.29	1.69	07B0518	0.2 and 0.2	0.0455 and 0.0441
33	1201282353	1699	01-MAR-07	-.71	-.31	.49	1.04	.0064		1.4	1.29	1.69	07B0563	-.0012 and 0.0071	0.00473 and 0.00639
34	1201290610	1691	14-MAR-07	-.71	-.31	.49	.79	.013		.7	1.29	1.69	07C0425	0.0068 and -.0043	0.00615 and 0.0127
35	1201292406	1671	15-MAR-07	-.71	-.31	.49	.12	.022		-.9	1.29	1.69	07C0448	-.0046 and -.0076	0.0124 and 0.0219
36	1201291676	1697	15-MAR-07	-.71	-.31	.49	1.09	.0043		1.5	1.29	1.69	07C0442	0.0075 and -.0013	0.00682 and 0.0043
37	1201298281	1703	28-MAR-07	-.71	-.31	.49	.45	.022		-.1	1.29	1.69	07B0519	0.07 and 0.055	0.0249 and 0.022

NARRATIVE ATTACHMENT 3
Plutonium-239/240
Sample Type: RER Attribute Tracked: RER (dec)

Values less than
and greater than

or equal to

#	Samp ID	Inst	Run Date	LCL	LWL	Mean	Numvalue	TPU	Exclude	Stdev	UWL	UCL	Parent Sample	Result	TPU
1	1201062891	1698	11-Apr-06	-1.19	-0.46	0.99	0.63	0.027		-0.5	2.44	3.16	06C0641	0.06 and 0.083	0.024 and 0.0267
2	1201065034	1663	12-Apr-06	-1.19	-0.46	0.99	1.6	0.015		0.8	2.44	3.16	06D0330	0.022 and -.009	0.0126 and 0.0149
3	1201065862	1662	13-Apr-06	-1.19	-0.46	0.99	0.61	0.014		-0.5	2.44	3.16	06D0346	-.0007 and -.0096	0.00359 and 0.014
4	1201072751	1706	24-APR-06	-1.19	-.46	.99	1.02	.0081		0	2.44	3.16	06D0340	-.006 and 0.0099	0.0135 and 0.00807
5	1201087787	1643	16-MAY-06	-1.1876	-.4628	.9868	0.00E+00	.0052		-1.4	2.4365	3.1613	06E0340	-.0026 and -.0026	0.00474 and 0.00523
6	1201104169	1640	09-JUN-06	-1.19	-.46	.99	2	.0077		1.4	2.44	3.16	06E0534	0.0013 and -.016	0.00407 and 0.00765
7	1201105100	1645	09-JUN-06	-1.19	-.46	.99	.36	.015		-.9	2.44	3.16	06E0532	-.0024 and -.0082	0.00549 and 0.0149
8	1201117818	1636	23-JUN-06	-1.19	-.46	.99	1.5	.014		.7	2.44	3.16	06F0560	-.0105 and 0.0255	0.0143 and 0.0139
9	1201128592	1648	17-JUL-06	-1.19	-.46	.99	2.46	.0057		2	2.44	3.16	06G0265	0.029 and -.006	0.0128 and 0.00565
10	1201131875	1702	19-JUL-06	-1.19	-.46	.99	.87	.0035		-.2	2.44	3.16	06G0276	0.0008 and -.0031	0.00279 and 0.00351
11	1201143166	1715	01-AUG-06	-1.19	-.46	.99	1.91	.0096		1.3	2.44	3.16	06G0431	-.0025 and 0.017	0.00333 and 0.00963
12	1201145210	1715	04-AUG-06	-1.19	-.46	.99	.68	.0026		-.4	2.44	3.16	06G0438	-.0006 and 0.0025	0.00367 and 0.0026
13	1201146266	1637	07-AUG-06	-1.19	-.46	.99	.82	.013		-.2	2.44	3.16	06G0440	0.0093 and 0.021	0.00631 and 0.0128
14	1201154416	1715	15-AUG-06	-1.19	-.46	.99	.29	.0023		-1	2.44	3.16	06H0358	0.0008 and -.0002	0.00263 and 0.00232
15	1201159519	1687	24-AUG-06	-1.19	-.46	.99	.61	.013		-.5	2.44	3.16	06H0383	-.0041 and -.0124	0.00331 and 0.0133
16	1201180968	1682	21-SEP-06	-1.19	-.46	.99	.25	.0064		-1	2.44	3.16	06I0319	0.012 and 0.009	0.00765 and 0.0064
17	1201198591	1653	11-OCT-06	-1.19	-.46	.99	.27	.034		-1	2.44	3.16	06I0535	0.08 and 0.093	0.0346 and 0.0335
18	1201222275	1683	13-NOV-06	-1.19	-.46	.99	.68	.0088		-.4	2.44	3.16	06K0326	0.024 and 0.013	0.0128 and 0.00875
19	1201238938	1670	12-DEC-06	-1.19	-.46	.99	1.62	.0056		.9	2.44	3.16	06K0409	0.02 and -.003	0.0128 and 0.00563
20	1201239191	1708	13-DEC-06	-1.19	-.46	.99	2.6	.005		2.2	2.44	3.16	06K0411	0.015 and -.011	0.00861 and 0.00498
21	1201247785	1703	22-DEC-06	-1.19	-.46	.99	.79	.039		-.3	2.44	3.16	06L0442	0.1 and 0.2	0.0344 and 0.039
22	1201248853	1692	27-DEC-06	-1.1876	-.4628	.9868	0.00E+00	.11		-1.4	2.4365	3.1613	06L0465	1 and 1	0.113 and 0.114
23	1201249947	1669	29-DEC-06	-1.19	-.46	.99	1.85	.0055		1.2	2.44	3.16	06L0466	0.014 and -.008	0.0103 and 0.00549
24	1201251768	1636	31-DEC-06	-1.19	-.46	.99	1.66	.014		.9	2.44	3.16	06L0637	0.022 and -.011	0.0134 and 0.0143
25	1201243301	1675	05-JAN-07	-1.19	-.46	.99	2.04	.013		1.5	2.44	3.16	06L0412	-.0074 and 0.0218	0.0052 and 0.0133
26	1201253833	1696	11-JAN-07	-1.19	-.46	.99	1.49	.1		.7	2.44	3.16	06L0433	1.1 and 0.9	0.12 and 0.103
27	1201261256	1709	23-JAN-07	-1.19	-.46	.99	.57	.015		-.6	2.44	3.16	07A0462	0.0039 and -.0051	0.00474 and 0.0151
28	1201272605	1698	08-FEB-07	-1.19	-.46	.99	.12	.015		-1.2	2.44	3.16	07A0697	-.0089 and -.0053	0.026 and 0.0147
29	1201274085	1695	15-FEB-07	-1.19	-.46	.99	.66	.0081		-.5	2.44	3.16	07B0404	0.0023 and 0.0081	0.00344 and 0.00807
30	1201278649	1695	22-FEB-07	-1.19	-.46	.99	.63	.0062		-.5	2.44	3.16	07A0702	0.006 and 0	0.0074 and 0.00615
31	1201280514	1665	26-FEB-07	-1.19	-.46	.99	.83	.016		-.2	2.44	3.16	07B0520	0.0034 and -.0103	0.00306 and 0.0161
32	1201280274	1678	26-FEB-07	-1.19	-.46	.99	.78	.14		-.3	2.44	3.16	07B0518	1.6 and 1.4	0.149 and 0.141
33	1201282353	1699	01-MAR-07	-1.19	-.46	.99	.86	.013		-.2	2.44	3.16	07B0563	0.0028 and -.0086	0.00255 and 0.013
34	1201290610	1691	14-MAR-07	-1.19	-.46	.99	.43	.011		-.8	2.44	3.16	07C0425	0.013 and 0.019	0.00957 and 0.0109
35	1201292406	1671	15-MAR-07	-1.19	-.46	.99	2.23	.0063		1.7	2.44	3.16	07C0448	0.0009 and -.0149	0.00334 and 0.00627
36	1201291676	1697	15-MAR-07	-1.188	-.463	.987	.026	.012		-1.3	2.436	3.161	07C0442	-.0092 and -.0087	0.0138 and 0.0119
37	1201298281	1703	28-MAR-07	-1.19	-.46	.99	.74	.077		-.3	2.44	3.16	07B0519	0.6 and 0.6	0.0862 and 0.0768

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr.	Division:	Quality Criteria:	Type:
01-MAY-06	Bioassay	Client Contract	Material
Instrument Type:	**Test / Method:**	**Matrix Type:**	**Client Code:**
BIOASSAY ALPHA	GL-RAD-B-001	Liquid	PNNL/160202
Batch ID:	**Sample Numbers:**		
515206	1201058578		

Potentially affected work order(s)(SDG): 159049,160202,160212

Application Issues:

Failed Recovery for Surrogate or Tracer

Specification and Requirements Nonconformance Description:	NRG Disposition:
1. 1201058578 LCS failed tracer yield.	1. Because the LCS recovery is acceptable, the results are reported.

Originator's Name:
Anson Walsh 01-MAY-06

Data Validator/Group Leader:
Robert Timm 05-MAY-06

Quality Review:
Lonnie Morris 03-JUL-06

Director:
Robert Timm 10-NOV-06

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr.	Division:	Quality Criteria:	Type:
17-AUG-06	Bioassay	SOP	Process
Instrument Type:	**Test / Method:**	**Matrix Type:**	**Client Code:**
BIOASSAY ALPHA	GL-RAD-B-001	Liquid	PNNL
Batch ID:	**Sample Numbers:**		
549167	1201137896, 1201137897		

Potentially affected work order(s)(SDG): 167241,167731

Application Issues:

Failed RPD for LCS/LCSD

Specification and Requirements Nonconformance Description:	NRG Disposition:
1. QCs 1201137896 (LCS) and 1201137897 (LCS) did not meet the spike recovery requirements for Curium due to missing the Cm-244 spike.	1. The PM was informed, and the client was contacted. The data was excepted and is reported due to no positive results within the Curium analyses.

Originator's Name:

Anson Walsh 17-AUG-06

Data Validator/Group Leader:

Sarah Pifer 18-AUG-06

Quality Review:

Director:

COMPANY - WIDE NONCONFORMANCE REPORT

Mo.Day Yr.	Division:	Quality Criteria:	Type:
17-AUG-06	Bioassay	Client Contract	Process
Instrument Type:	**Test / Method:**	**Matrix Type:**	**Client Code:**
BIOASSAY ALPHA	GL-RAD-B-001	Liquid	PNNL
Batch ID:	**Sample Numbers:**		
551506	1201143409		

Potentially affected work order(s)(SDG): 167732,167743,167820

Application Issues:

Failed Recovery for Surrogate or Tracer

Specification and Requirements Nonconformance Description:	NRG Disposition:
1. QC 1201143409 (LCS)'s tracer yield was less than 25%.	1. The LCS was recounted. The recount confirmed the low tracer yield. The results were reported.

Originator's Name:

Anson Walsh 17-AUG-06

Data Validator/Group Leader:

Robert Timm 28-AUG-06

Quality Review:

Director:

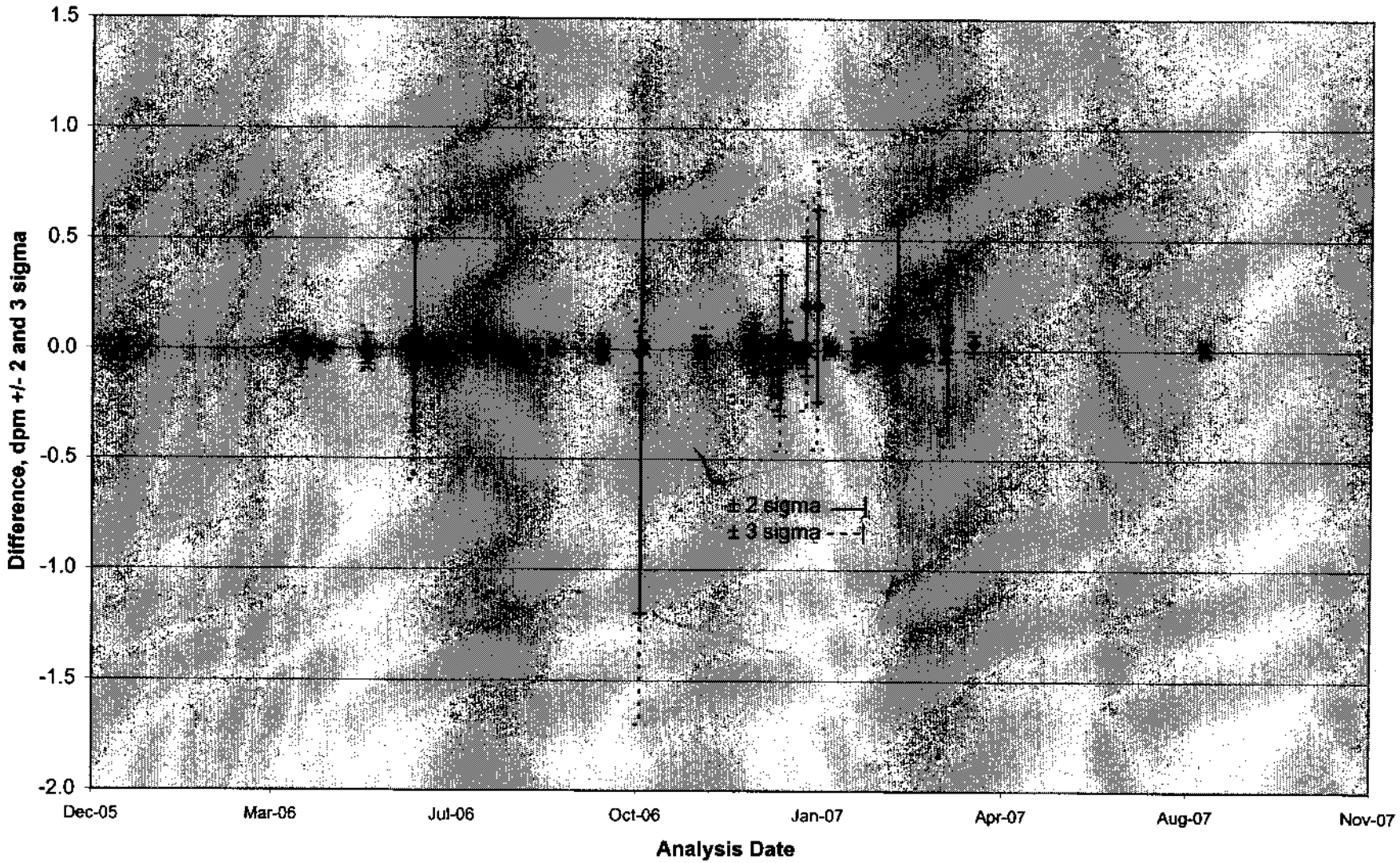
SECTION 2

DATABASE RESULTS

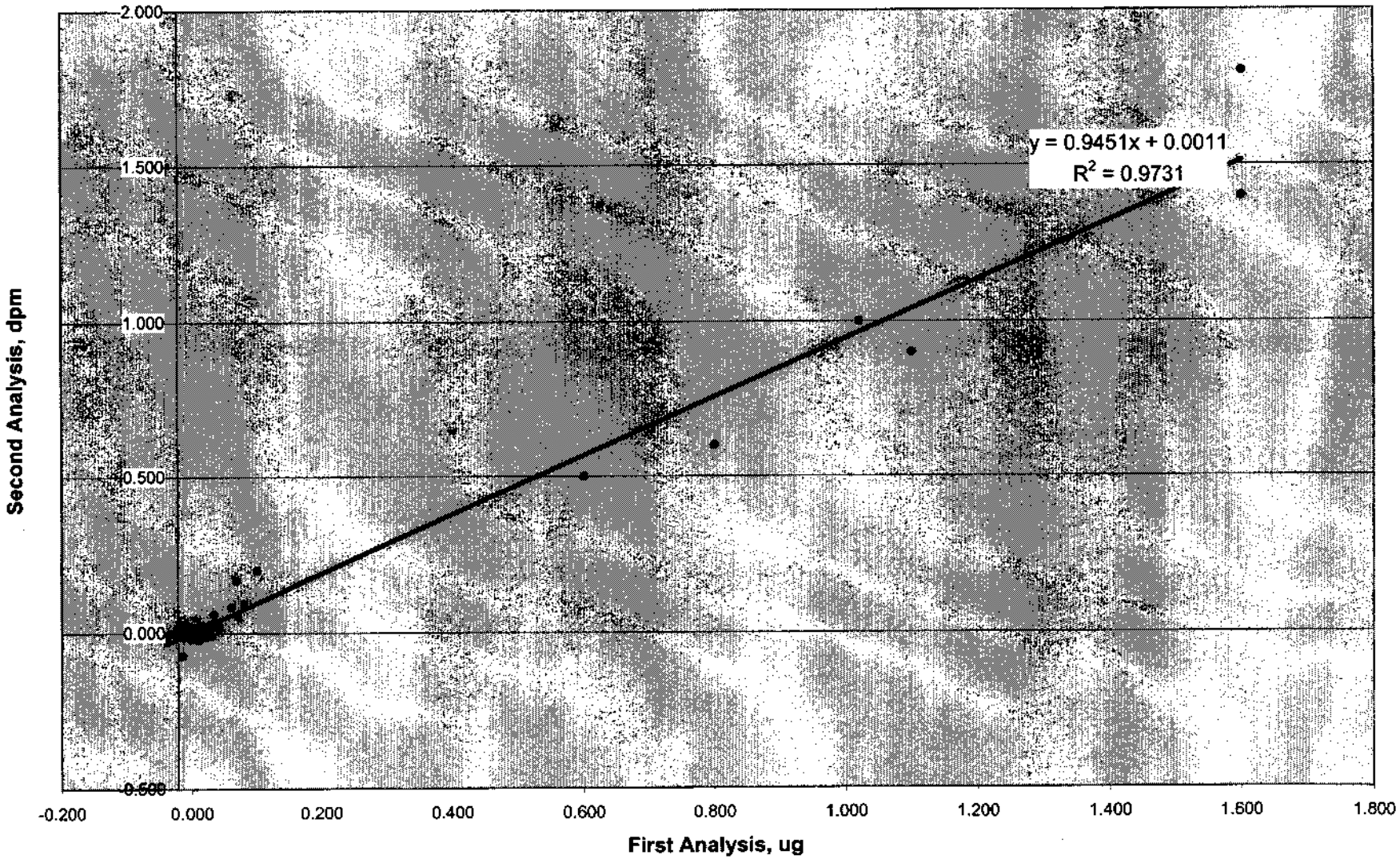
(Maintained electronically in Hanford Internal Dosimetry Program records)

APPENDIX C

GEL Duplicates


GEL Fecal Duplicates Apr. 2006 - Mar. 2007
Difference, dpm +/- 2 and 3 sigma
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
± 2 sigma
± 3 sigma
Dec-05
Mar-06
Jul-06
Oct-06
Jan-07
Apr-07
Aug-07
Nov-07
Analysis Date

GEL Fecal Duplicates, April 2006 - March 2007



APPENDIX D

QUALITY CONTROL INTERCOMPARISON PARTICIPATION RESULTS

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, MD

REPORT OF TRACEABILITY

General Engineering Laboratories, LLC
Charleston, South Caroline

Test Identification: NRIP-06-SF
Test Radionuclides: ^{241}Am, ^{238}Pu, ^{230}Th, ^{238}U, ^{235}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{57}Co, ^{133}Ba, ^{137}Cs, ^{134}Cs, ^{54}Mn
Matrix Description: Synthetic Feces[1]
Test Activity Range: 30mBq•sample^{-1} to 300mBq•sample^{-1}
Reference Time: 12:00 EST, April 1, 2006

Measurement Results

Nuclide	NIST Value [2,3]		Reported Value[4]		Difference[5]
	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	(±% Bias)
^{241}Am	1.081	0.95	0.945	14.10	-12.6
^{238}Pu	0.938	0.68	0.877	14.72	-6.5
^{230}Th	1.630	0.58	1.371	43.91	-15.9
^{238}U	4.255	0.62	4.258	10.88	0.1
^{234}U	4.098	0.98	4.024	11.04	-1.8
^{235}U	0.196	0.64	0.212	31.99	8.1
^{90}Sr	3.920	0.74	2.520	54.48	-35.7

NR= Not Reported NA= Not Applicable

Methods

	NIST[6]	Reporting Laboratory[7]
Activity Measurements	Alpha- and Beta-Spectrometry Mass Spectrometry	Alpha, Beta, and Gamma Spectrometry

Evaluation (per ANSI N42.22 and N13.30)

Nuclide	N42.22[8]		N13.30[9]	
	ANSI N42.22 Traceable	Traceability Limit (±Percent)	Results Acceptable per N13.30 Criteria (Pass/Fail)	
			Bias	Precision
^{241}Am	Yes	19	Pass	Pass
^{238}Pu	Yes	21	Pass	Pass
^{230}Th	Yes	55	Pass	Pass
^{238}U	Yes	16	Pass	Pass
^{234}U	Yes	16	Pass	Pass
^{235}U	Yes	52	Pass	Pass
^{90}Sr	Yes	53	Fail	Pass

Samples Distributed October 21, 2006
Reporting Data Received December 21, 2006

For the Director

Michael Unterweger,
Acting Leader
Radioactivity Group
Physics Laboratory

(Continued)

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, MD

REPORT OF TRACEABILITY

General Engineering Laboratories, LLC
Charleston, South Caroline

Test Identification: NRIP-06-SF
Test Radionuclides: ^{241}Am, ^{238}Pu, ^{230}Th, ^{238}U, ^{235}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{57}Co, ^{133}Ba, ^{137}Cs, ^{134}Cs, ^{54}Mn
Matrix Description: Synthetic Feces[1]
Test Activity Range: 30mBq•sample^{-1} to 300mBq•sample^{-1}
Reference Time: 12:00 EST, April 1, 2006

Measurement Results

Nuclide	NIST Value[2,3]		Reported Value[4]		Difference[5]
	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	(±% Bias)
^{241}Am	1.081	0.95	0.987	14.50	-8.7
^{238}Pu	0.938	0.68	0.852	13.48	-9.2
^{230}Th	1.630	0.58	1.410	11.80	-13.5
^{238}U	4.255	0.62	4.186	10.56	-1.6
^{234}U	4.098	0.98	3.996	10.60	-2.5
^{235}U	0.196	0.64	0.224	23.16	14.6
^{90}Sr	3.920	0.74	3.376	20.62	-13.9

NR= Not Reported NA= Not Applicable

Methods

	NIST[6]	Reporting Laboratory[7]
Activity Measurements	Alpha- and Beta-Spectrometry Mass Spectrometry	Alpha, Beta, and Gamma Spectrometry

Evaluation (per ANSI N42.22 and N13.30)

Nuclide	N42.22[8]		N13.30[9]	
	ANSI N42.22 Traceable	Traceability Limit (±Percent)	Results Acceptable per N13.30 Criteria (Pass/Fail)	
			Bias	Precision
^{241}Am	Yes	20	Pass	Pass
^{238}Pu	Yes	18	Pass	Pass
^{230}Th	Yes	15	Pass	Pass
^{238}U	Yes	16	Pass	Pass
^{234}U	Yes	16	Pass	Pass
^{235}U	Yes	40	Pass	Pass
^{90}Sr	Yes	27	Pass	Pass

Samples Distributed October 21, 2006
Reporting Data Received December 21, 2006

For the Director

Michael Unterweger,
Acting Leader
Radioactivity Group
Physics Laboratory

(Continued)

As guidance for the proper use of this Report, it should be emphasized that the National Institute of Standards and Technology is concerned only with fostering good measurement capability and consistency with the national measurements system. The assurance of the proper application of that capability to the ultimate consumer products is the responsibility of each manufacturer and of the Federal regulatory agencies.

A continuing traceability program in radioactivity demonstrates, to the degree established by the periodic assays of calibrated radioactivity samples, a continuing competence to maintain the instrument systems and standards necessary for accurate measurement. Such a program cannot, however, endorse each and every measurement nor the final product, any more than a spot check can vouch for every unchecked item. Care should be taken, therefore, not to imply such endorsement. The proper use of this Report is governed by section 200.114 of Title 15 of the Code of Federal Regulations. These regulations may be met if Reports are quoted only in their entirety. Excerpts out of context may be misleading.

Notes

(1a) Five test-samples and three (identical matrix) blanks were provided for this test. Each sample consisted of approximately 100 grams of synthetic fecal material contained in a plastic zip-lock bag that was packed in a plastic container.

Composition of the Synthetic Feces

Reagent	g/sample
Calcium Nitrate	0.97
Ferric Ammonium Sulfate	0.04
Magnesium Carbonate	0.61
Potassium Carbonate	0.83
Ammonium Dihydrogen Phosphate	2.1
Sodium Sulfate	0.37
Ammonium Chloride	0.04
Zinc Sulfide	0.01
Stannous Chloride	0.03
Leucine	7.1
Lysine	5.1
Methionine	0.8
Threonine	2
Palmitic Acid	3
Stearic Acid	2
Cellulose	4
Gelatin	5
Oleic Acid (Liquid)	1
Peanut Oil	1.5
Water (distilled)	65

(1b) The test samples were prepared by depositing a known amount of a NIST calibrated "spike" solution (aqueous solution containing known quantities of ^{241}Am, ^{238}Pu, ^{230}Th, ^{238}U, ^{235}U, ^{234}U, ^{90}Sr, ^{57}Co, ^{60}Co, ^{54}Mn, ^{137}Cs, ^{134}Cs, and ^{133}Ba to the center of individual ashless paper filters (37 mm diameter). After deposition of this solution, filters were dried overnight. Once dry, each filter was sandwiched between two unspiked filters. Each sandwich was then slipped into a low-density polyethylene sleeve (wall density ~0.1 mm) and sealed for counting. After confirmation measurement, each spiked filter pack was placed inside of the matrix contained plastic zip-lock bag (1a) for packaging and shipment.

(2a) Solutions of tracers were prepared by gravimetric dilutions of NIST Standard Reference Material SRM's or NIST calibrated solutions. The dilution factors at each step were confirmed by radioactivity measurements.

(2b) The analysis methodology and nomenclature used for the NIST uncertainties are based on uniform guidelines [cf., B.N. Taylor and C. E. Kuyatt, NIST Technical Note 1297 (1994)] and are compatible with those adopted by the principal international metrology standardization bodies. Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The relative combined uncertainty is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximation thereof, for the following component uncertainties:

	Nuclide (SRM Identification)	Uncertainty (%, 1s)
a)	^{241}Am (4322B)	0.48
b)	^{238}Pu (4323A)	0.34
c)	^{230}Th (4342)	0.29
d)	^{238}U (4321C)	0.31
e)	^{235}U (4321C)	0.32
f)	^{234}U (4321C)	0.49
g)	^{90}Sr (4919H)	0.37
h)	^{60}Co (4915E)	0.27
i)	^{57}Co (Analytics, NIST calibration)	0.35
j)	^{133}Ba (4251C)	0.26
k)	^{137}Cs (4233D)	0.34
l)	^{134}Cs (4370C)	0.37
m)	^{54}Mn (Analytics, NIST calibration)	0.34
	Other Sources	
i)	Gravimetrics (dilutions)	0.05

The individual certified uncertainties of standard reference materials are based on the quadratic combination of all sources of uncertainty manifested in the preparation of the material. These uncertainties may result from uncertainties from any or all of the following: alpha-decay emission rate, background, balance calibration, decay corrections, decay-scheme data, extrapolation of alpha-particle-count-rate-versus-energy to zero energy, live time, alpha-particle detection efficiency, alpha-emitting impurities, gamma-emitting impurities.
The **Relative Expanded Uncertainty** is obtained by multiplying the standard uncertainty by a coverage factor of **k=2** and is assumed to provide an uncertainty interval of approximately 95 percent confidence.

(3) Half-lives used

	Nuclide	Half-life
a)	^{241}Am	432.2±0.5 y
b)	^{238}Pu	87.74±0.04 y
c)	^{230}Th	75380±30 y
d)	^{238}U	(4.468±0.003) x 10^9 y
e)	^{235}U	(7.038±0.005) x 10^8 y
f)	^{234}U	(2.455±0.006) x 10^5 y
g)	^{90}Sr	28.78±0.04 y
h)	^{60}Co	5.2713±0.0008 y
i)	^{57}Co	271.79±0.09 d
j)	^{133}Ba	10.52±0.13 y
k)	^{137}Cs	30.07±0.03
l)	^{134}Cs	2.0648±0.001 y
m)	^{54}Mn	312.3±0.4 d

Note: Half-life data are based on NIST certificates (Note 2b) or Evaluated Nuclear Structure Data File (ENSDF 2006). Uncertainties quoted at one sigma level.

(4) The laboratory value represents the mean of five replicate measurements. The reported uncertainty was multiplied by a coverage factor of k=2.

(5) The **Difference** quoted is the difference between the **NIST Value** and **Reported Value**, expressed as a percent relative to the **NIST Value**.

(6) Test samples were prepared by gravimetric dilutions of NIST calibrated solutions and SRM's. These solutions and SRM's were calibrated using the following activity measurement methodologies:

	Nuclide	Methodology
a)	^{241}Am	4πα liquid-scintillation counting system
b)	^{238}Pu	NIST "0.1π"α defined-solid-angle scintillation detector Two 4πα liquid scintillation counting systems
c)	^{230}Th	Two 4πα liquid scintillation counting systems
d)	^{234}U, ^{235}U, ^{238}U	Mass spectrometry, silicon surface barrier alpha-detection, and 4π (α+β) liquid-scintillation counting systems
e)	^{90}Sr	NIST 4πβ liquid-scintillation counting system
f)	^{60}Co, ^{57}Co,	Pressurized "4π" γ ionization chamber "A" calibrated using a cobalt-60 solution whose activity was determined by "4π"-(β+γ)-coincidence and anti-coincidence counting
g)	^{133}Ba	Pressurized "4π" γ ionization chamber "A" calibrated using a barium-133 solution whose activity was determined by "4π"-(e + X)-gamma-anti-coincidence counting
h)	^{137}Cs, ^{134}Cs,	Pressurized "4π"-γ-ionization chamber "A" calibrated using a cesium-137 solution whose activity was determined by "4π"-(e + X)-γ-anti-coincidence counting
i)	^{54}Mn	Pressurized "4π" gamma ionization chamber "A" previously standardized by "4γ" counting with the NBS 8"x8" NaI(Tl) crystals

(7) Summary of the reporting laboratory methodologies.

(8) ANSI N42.22 defines the acceptance criteria for verification testing by NIST as:

$$|V_R - V_N| < 3 * \sqrt{u_c^2(N) + u_c^2(R)}$$

Where: V_N = NIST Value;
V_R = Reported Value;
$u_c(N)$= standard combine uncertainty of the NIST value, V_N;
$u_c(R)$= standard combine uncertainty of the Laboratory value, V_R; and
$3 * \sqrt{u_c^2(N) + u_c^2(R)}$ = Traceability Limit (limit to which measurement traceability may be claimed with 99% confidence)

(9) ANSI N13.30 defines criteria for acceptable bias between -25 and +50 percent, and acceptable precision between -40 and +40 percent, 1 sigma total propagated uncertainty.

Reference:

ANSI National Standards Institute, ANSI N42.22-1995, "Traceability of Radioactive Sources to the National Institute of Standards and Technology (NIST) and Associated Instrument Quality Control."

ANSI National Standards Institute, ANSI N13.30-1996, "Performance Criteria for Radiobioassay."

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Ms. Svetlana Nour (301) 975-4927 Svetlana.nour@nist.gov

U.S. DEPARTMENT OF COMMERCE

National Institute of Standards and Technology
Gaithersburg, MD

REPORT OF TRACEABILITY

General Engineering Laboratories, LLC
Charleston, South Caroline

Test Identification: NRIP-06-SU
Test Radionuclides: ^{241}Am, ^{238}Pu, ^{239}Pu, ^{230}Th, ^{238}U, ^{235}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{133}Ba, ^{137}Cs, ^{152}Eu
Matrix Description: Synthetic Urine[1]
Test Activity Range: 30mBq•sample^{-1} to 300mBq•sample^{-1}
Reference Time: 12:00 EST, April 1, 2006

Measurement Results

Nuclide	NIST Value [2,3]		Reported Value [4]		Difference [5]
	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	(±% Bias)
^{241}Am	1.610	0.95	1.540	10.92	-4.4
^{238}Pu	1.767	0.68	1.624	11.18	-8.1
^{239}Pu	1.685	0.68	1.528	11.28	-9.3
^{230}Th	2.009	0.58	1.870	10.70	-6.9
^{238}U	4.156	0.60	3.980	10.20	-4.2
^{234}U	4.003	0.98	3.764	10.26	-6.0
^{235}U	0.191	0.62	0.220	19.02	15.1
^{90}Sr	3.869	0.74	5.176	18.88	33.8
^{60}Co	692.7	0.54	677.4	11.40	-2.2
^{133}Ba	939.3	0.52	881.6	12.48	-6.1
^{137}Cs	1022.0	0.68	1027.2	11.08	0.5
^{152}Eu	857.6	0.73	785.6	12.86	-8.4

NR= Not Reported NA= Not Applicable

Methods

	NIST [6]	Reporting Laboratory [7]
Activity Measurements	Alpha- and Beta-Spectrometry Mass Spectrometry	Alpha, Beta, and Gamma Spectrometry

Evaluation (per ANSI N42.22 and N13.30)

Nuclide	N42.22 [8]		N13.30 [9]	
	ANSI N42.22 Traceable	Traceability Limit (±Percent)	Results Acceptable per N13.30 Criteria (Pass/Fail)	
			Bias	Precision
^{241}Am	Yes	16	Pass	Pass
^{238}Pu	Yes	15	Pass	Pass
^{239}Pu	Yes	15	Pass	Pass
^{230}Th	Yes	15	Pass	Pass
^{238}U	Yes	15	Pass	Pass
^{234}U	Yes	15	Pass	Pass
^{235}U	Yes	33	Pass	Pass
^{90}Sr	Yes	38	Pass	Pass
^{60}Co	Yes	17	Pass	Pass
^{133}Ba	Yes	18	Pass	Pass
^{137}Cs	Yes	17	Pass	Pass
^{152}Eu	Yes	18	Pass	Pass

Samples Distributed May 16, 2006
Reporting Data Received July 14, 2006

For the Director

Michael Unterweger,
Acting Leader
Radioactivity Group
Physics Laboratory

(Continued)

U.S. DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, MD

REPORT OF TRACEABILITY

General Engineering Laboratories, LLC
Charleston, South Caroline

Test Identification: NRIP-06-SU
Test Radionuclides: ^{241}Am, ^{238}Pu, ^{239}Pu, ^{230}Th, ^{238}U, ^{235}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{133}Ba, ^{137}Cs, ^{152}Eu
Matrix Description: Synthetic Urine[1]
Test Activity Range: 30mBq•sample^{-1} to 300mBq•sample^{-1}
Reference Time: 12:00 EST, April 1, 2006

Measurement Results

Nuclide	NIST Value[2,3]		Reported Value[4]		Difference[5]
	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	Massic Activity Bq•g^{-1}	Relative Expanded Uncertainty (%, k=2)	(±% Bias)
^{241}Am	1.610	0.95	1.474	10.94	-8.5
^{238}Pu	1.767	0.68	1.702	10.90	-3.7
^{239}Pu	1.685	0.68	1.622	10.96	-3.7
^{230}Th	2.009	0.58	1.904	10.72	-5.2
^{238}U	4.156	0.60	4.046	10.28	-2.7
^{234}U	4.003	0.98	3.892	10.30	-2.8
^{235}U	0.191	0.62	0.206	20.36	7.5
^{90}Sr	3.869	0.74	5.490	22.04	41.7
^{60}Co	692.7	0.54	710.2	11.44	2.5
^{133}Ba	939.3	0.52	936.4	13.28	-0.3
^{137}Cs	1022.0	0.68	1062.0	11.44	3.9
^{152}Eu	857.6	0.73	820.6	12.60	-4.3

NR= Not Reported NA= Not Applicable

Methods

	NIST[6]	Reporting Laboratory[7]
Activity Measurements	Alpha- and Beta-Spectrometry Mass Spectrometry	Alpha, Beta, and Gamma Spectrometry

Evaluation (per ANSI N42.22 and N13.30)

Nuclide	N42.22[8]		N13.30[9]	
	ANSI N42.22 Traceable	Traceability Limit (±Percent)	Results Acceptable per N13.30 Criteria (Pass/Fail)	
			Bias	Precision
^{241}Am	Yes	15	Pass	Pass
^{238}Pu	Yes	16	Pass	Pass
^{239}Pu	Yes	16	Pass	Pass
^{230}Th	Yes	15	Pass	Pass
^{238}U	Yes	15	Pass	Pass
^{234}U	Yes	15	Pass	Pass
^{235}U	Yes	33	Pass	Pass
^{90}Sr	Yes	47	Pass	Pass
^{60}Co	Yes	18	Pass	Pass
^{133}Ba	Yes	20	Pass	Pass
^{137}Cs	Yes	18	Pass	Pass
^{152}Eu	Yes	18	Pass	Pass

Samples Distributed May 16, 2006
Reporting Data Received July 14, 2006

For the Director

Michael Unterweger,
Acting Leader
Radioactivity Group
Physics Laboratory

(Continued)

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Notes

(1a) Five test-samples and three (identical matrix) blanks were provided for this test. Each sample consisted of approximately 1000 grams of synthetic urine material contained in a 1-L size polyethylene bottle.

Composition of the Synthetic Urine

Reagent		Weight/Sample (g)
$H_2C_2O_4*2H_2O$	Oxalic Acid	0.02
Pepsin	Pepsin	0.029
$CH_3CHOHCO_2H$	Lactic Acid (Liguid)	0.094
$MgSO_4*7H_2O$	Magnesium Sulfate	0.46
$C_5H_{11}O_5CHO$	Glucose(dextrose)	0.48
Citric Acid	Citric Acid	0.54
$CaCl_2*2H_2O$	Calcium Chloride	0.63
$C_9H_9NO_3$, 98%	Hippuric Acid	0.63
$Na_2SiO_3*9H_2O$	Sodium Silicate	0.071
NH_4Cl, 99%	Ammonium Chloride	1.06
$C_4H_9N_3O_2*H_2O$	Creatine	1.1
NaCl, 99+%	Sodium Chloride	2.32
$NaH_2PO_4*H_2O$	Sodium Dihydrogen Phosphate	2.73
KCl	Potassium Chloride	3.43
Na_2SO_4	Sodium Sulfate	4.31
CH_4N_2O, 98%	Urea	16
HNO_3	Concentrated nitric acid (50 mL)	70.67
H_2O	Water	950
Total		**1054.6**

(1b) The test samples were prepared by depositing a known amount of a NIST calibrated "spike" solution (aqueous solution containing known quantities of ^{241}Am, ^{238}Pu, ^{239}Pu, ^{230}Th, ^{236}U, ^{235}U, ^{234}U, ^{90}Sr, ^{60}Co, ^{133}Ba, ^{137}Cs, and ^{152}Eu) to the bottle with the urine matrix.

(2a) Solutions of tracers were prepared by gravimetric dilutions of NIST Standard Reference Material SRM's or NIST calibrated solutions. The dilution factors at each step were confirmed by radioactivity measurements.

(2b) The analysis methodology and nomenclature used for the NIST uncertainties are based on uniform guidelines [cf., B.N. Taylor and C. E. Kuyatt, NIST Technical Note 1297 (1994)] and are compatible with those adopted by the principal international metrology standardization bodies.

Individual uncertainties have the significance of one standard deviation of the mean, or an approximation thereof. The relative combined uncertainty is the quadratic combination of the standard deviation (or standard deviation of the mean where appropriate), or approximation thereof, for the following component uncertainties:

	Nuclide (SRM Identification)	Uncertainty (%, 1s)
a)	^{60}Co (4915E)	0.35
b)	^{90}Sr (4919H)	0.37
c)	^{133}Ba (4251C)	0.26
d)	^{137}Cs (4233D)	0.34
e)	^{152}Eu (4370C)	0.37
f)	^{230}Th (4342)	0.29
g)	^{234}U (4321C)	0.49
h)	^{235}U (4321C)	0.31
i)	^{238}U (4321C)	0.30
j)	^{238}Pu (4323A)	0.34
k)	^{239}Pu (4330B)	0.34
l)	^{241}Am (4322B)	0.48
	Other Sources	
i)	Gravimetrics (dilutions)	0.05

The individual certified uncertainties of standard reference materials are based on the quadratic combination of all sources of uncertainty manifested in the preparation of the material. These uncertainties may result from uncertainties from any or all of the following: alpha-decay emission rate, background, balance calibration, decay corrections, decay-scheme data, extrapolation of alpha-particle-count-rate-versus-energy to zero energy, live time, alpha-particle detection efficiency, alpha-emitting impurities, gamma-emitting impurities.
The **Relative Expanded Uncertainty** is obtained by multiplying the standard uncertainty by a coverage factor of **k=2** and is assumed to provide an uncertainty interval of approximately 95 percent confidence.

(3) Half-lives used

	Nuclide	Half-life (years)
a)	^{60}Co	5.2713±0.0008
b)	^{90}Sr	28.78±0.04
c)	^{133}Ba	10.51±0.05
d)	^{137}Cs	30.07±0.03
e)	^{152}Eu	15.537±0.006
f)	^{230}Th	75380±30
g)	^{234}U	(2.455±0.006) x 10^5
h)	^{235}U	(7.038±0.005) x 10^8
i)	^{238}U	(4.468±0.003) x 10^9
j)	^{238}Pu	87.74±0.04
k)	^{239}Pu	24110±30
l)	^{241}Am	432.2±0.5

Note: Half-life data are based on NIST certificates (Note 2b). Uncertainties quoted at one sigma level.

(4) The laboratory value represents the mean of five replicate measurements. The reported uncertainty was multiplied by a coverage factor of **k=2**.

(5) The **Difference** quoted is the difference between the **NIST Value** and **Reported Value**, expressed as a percent relative to the **NIST Value**.

(6) Test samples were prepared by gravimetric dilutions of NIST calibrated solutions and SRM's. These solutions and SRM's were calibrated using the following activity measurement methodologies:

	Nuclide	Methodology
a)	^{60}Co	Pressurized "4π" γ ionization chamber "A" calibrated using a cobalt-60 solution whose activity was determined by "4π"-(β+γ)-coincidence and anti-coincidence counting
b)	^{90}Sr	NIST 4πβ liquid-scintillation counting system
c)	^{133}Ba	Pressurized "4π" γ ionization chamber "A" calibrated using a barium-133 solution whose activity was determined by "4π"-(e + X)-gamma-anti-coincidence counting
d)	^{137}Cs	Pressurized "4π"-γ-ionization chamber "A" calibrated using a cesium-137 solution whose activity was determined by "4π"-(c + X)-γ-anti-coincidence counting Pressurized "4π" gamma ionization chamber "A" calibrated using a barium-133 solution whose number of cesium-137 atoms was determined by isotope-dilution mass spectrometry
e)	^{152}Eu	Pressurized "4π" gamma ionization chamber "A" previously standardized by "4γ" counting with the NBS 8"x8" NaI(Tl) crystals
f)	^{230}Th	Two 4πα liquid scintillation counting systems
g)	^{234}U, ^{235}U, ^{238}U	Mass spectrometry, silicon surface barrier alpha-detection, and 4π (α+β) liquid-scintillation counting systems
h)	^{238}Pu	NIST "0.1π"α defined-solid-angle scintillation detector Two 4πα liquid scintillation counting systems
i)	^{239}Pu	Two 4πα liquid scintillation counting systems
j)	^{241}Am	4πα liquid-scintillation counting system

(7) Summary of the reporting laboratory methodologies.

(8) ANSI N42.22 defines the acceptance criteria for verification testing by NIST as:

$$|V_R - V_N| < 3 * \sqrt{u_c^2(N) + u_c^2(R)}$$

Where: V_N = NIST Value;
V_R = Reported Value;
$u_c(N)$= standard combine uncertainty of the NIST value, V_N;
$u_c(R)$= standard combine uncertainty of the Laboratory value, V_R; and
$3 * \sqrt{u_c^2(N) + u_c^2(R)}$ = Traceability Limit (limit to which measurement traceability may be claimed with 99% confidence)

(9) ANSI N13.30 defines criteria for acceptable bias between -25 and +50 percent, and acceptable precision between -40 and +40 percent, 1 sigma total propagated uncertainty.

Reference:

ANSI National Standards Institute, ANSI N42.22-1995, "Traceability of Radioactive Sources to the National Institute of Standards and Technology (NIST) and Associated Instrument Quality Control."

ANSI National Standards Institute, ANSI N13.30-1996, "Performance Criteria for Radiobioassay."

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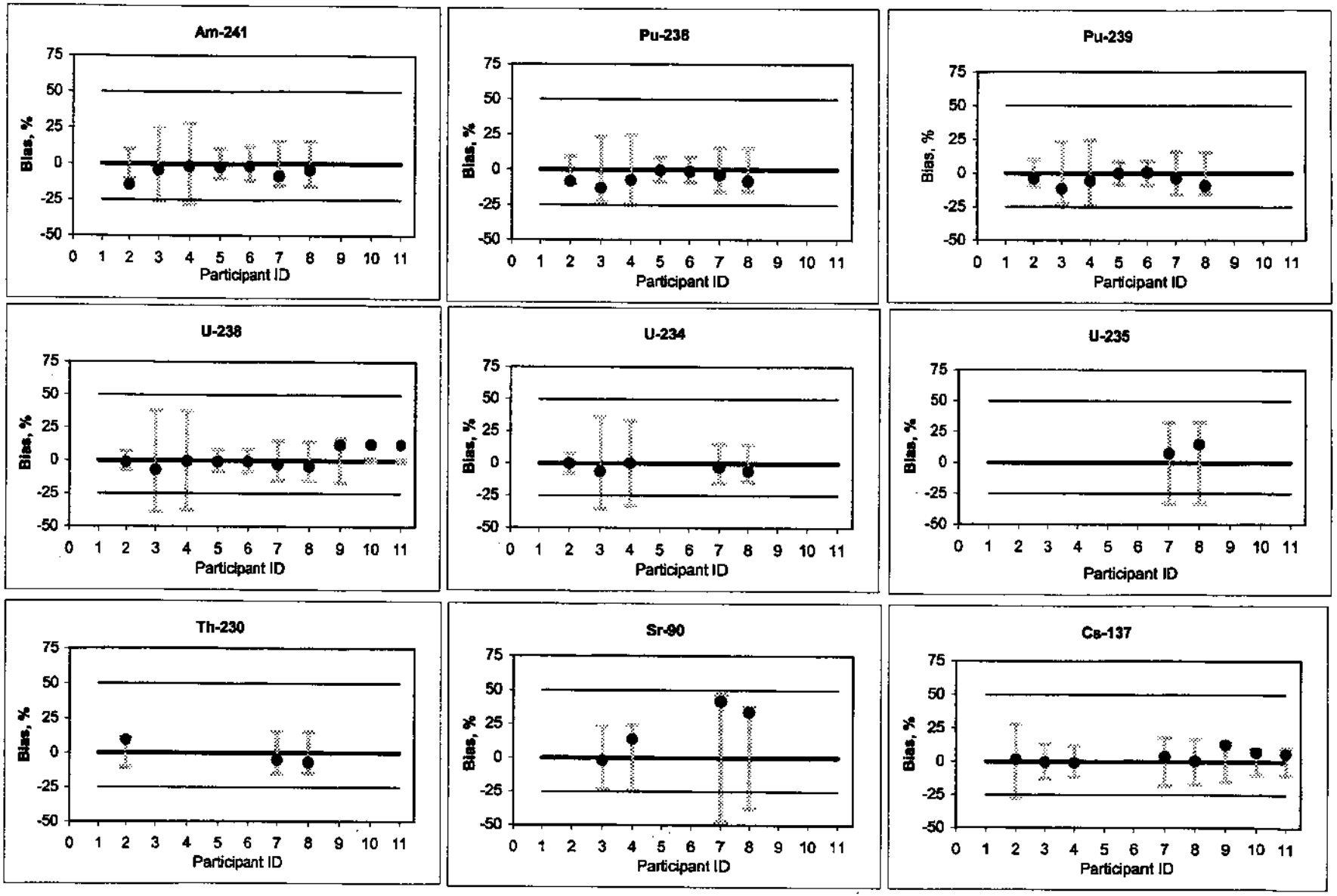
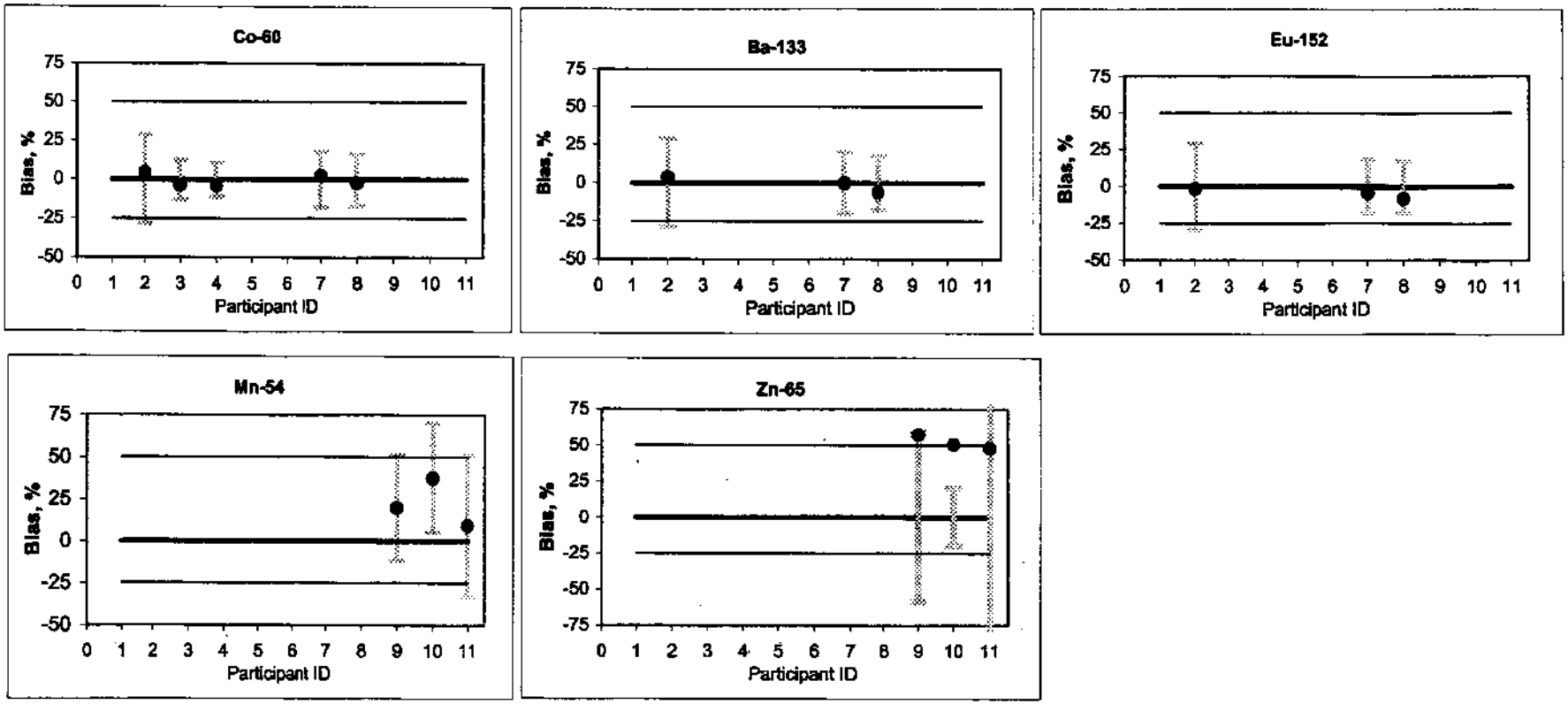
NIST Radiochemistry Intercomparison Program NRIP-2006

Distribution of Reported Results for

^{241}Am, ^{238}Pu, ^{239}Pu, ^{230}Th, ^{238}U, ^{234}U, ^{235}U, ^{90}Sr, ^{60}Co, ^{137}Cs, ^{133}Ba, ^{152}Eu, ^{65}Zn, and ^{54}Mn in Synthetic Urine Samples





Note: Uncertainty bars represent acceptance criteria defined by ANSI N42.22.
Participant ID:

GEL **7 and 8**

DEPARTMENT OF ENERGY
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Performance Evaluation Results

Session 10
In Vitro

RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

DEPARTMENT OF ENERGY

LABORATORY ACCREDITATION PROGRAM

Summary Report

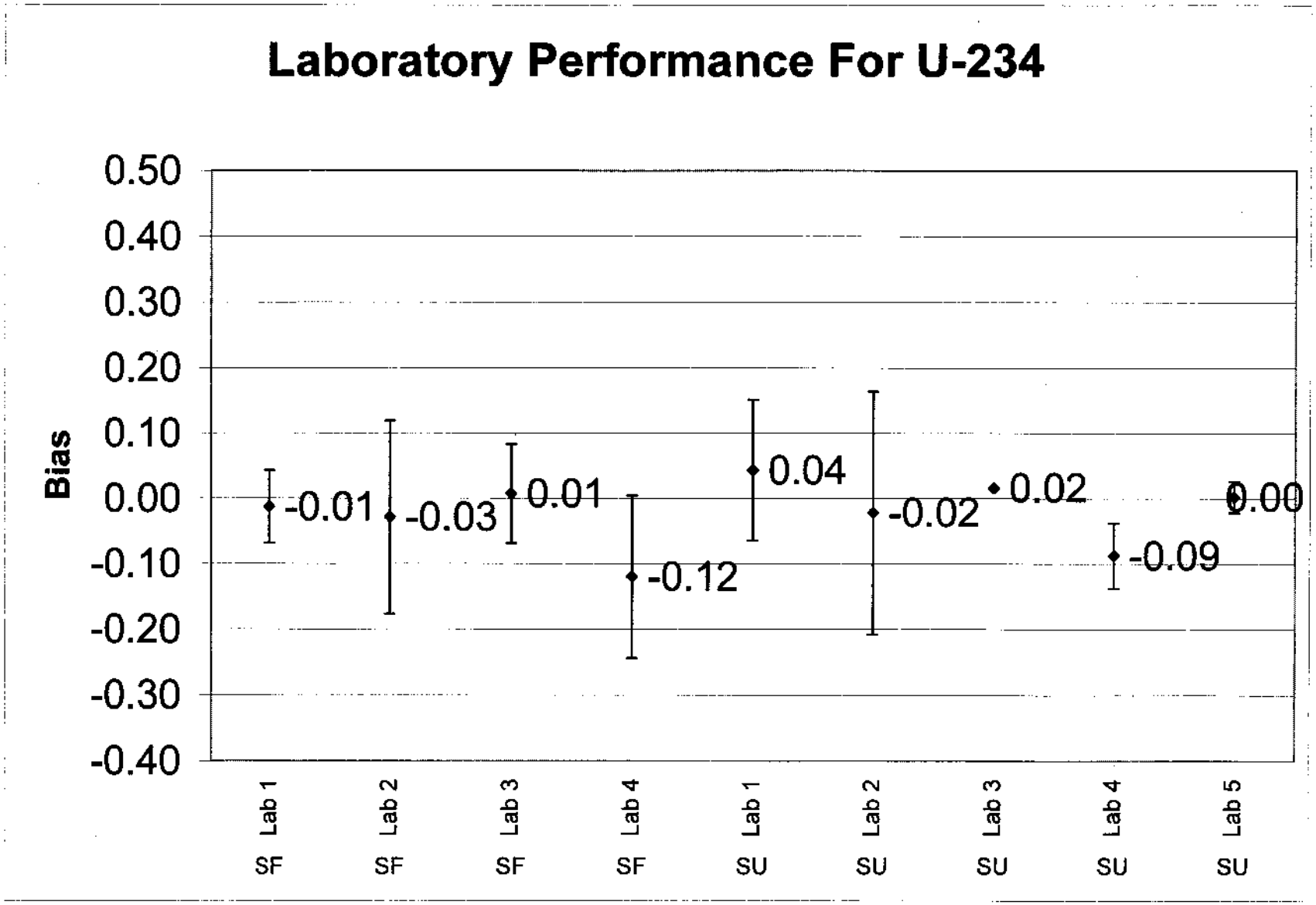
Laboratory: GEL Session: 1006

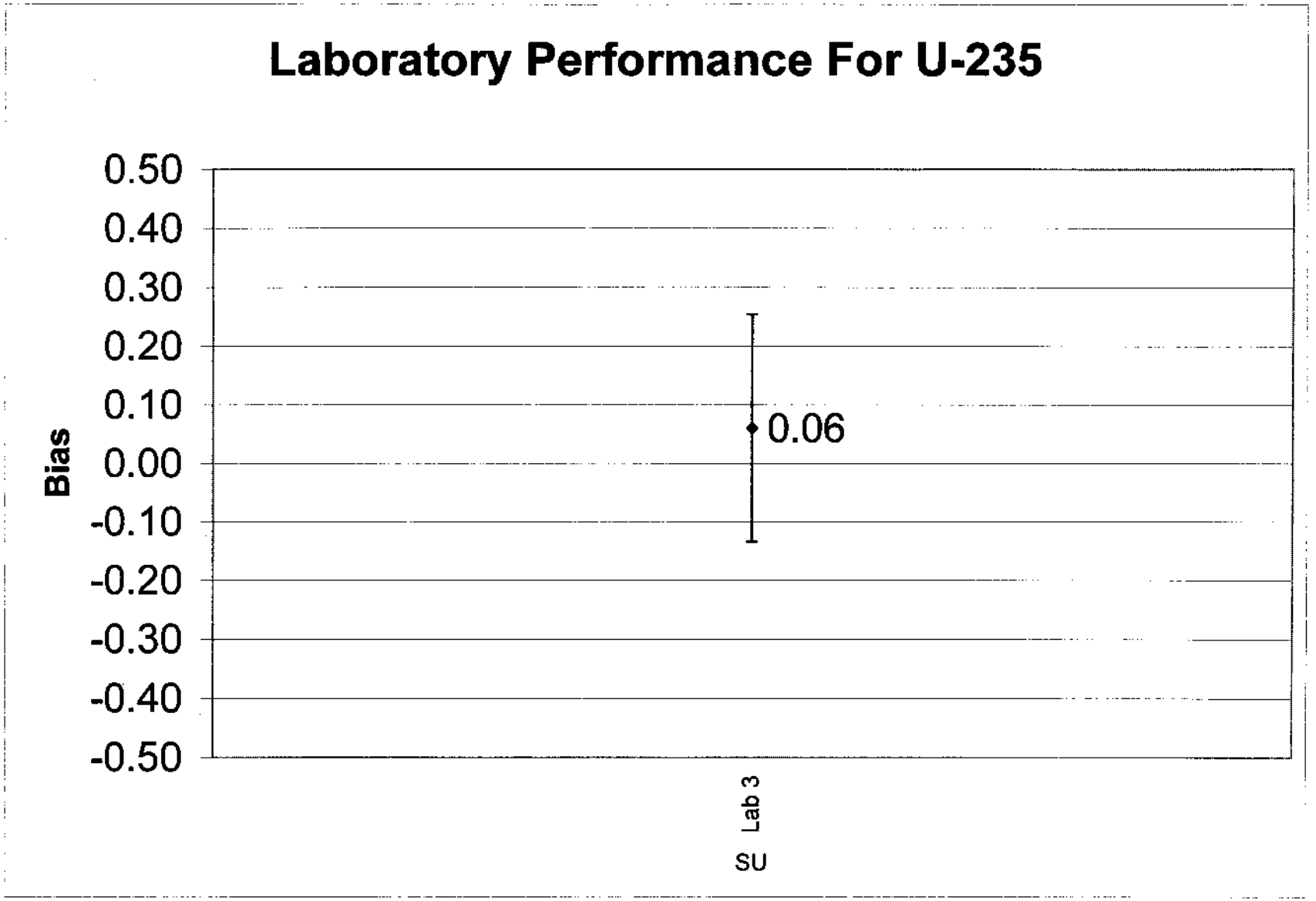
Matrix: SF

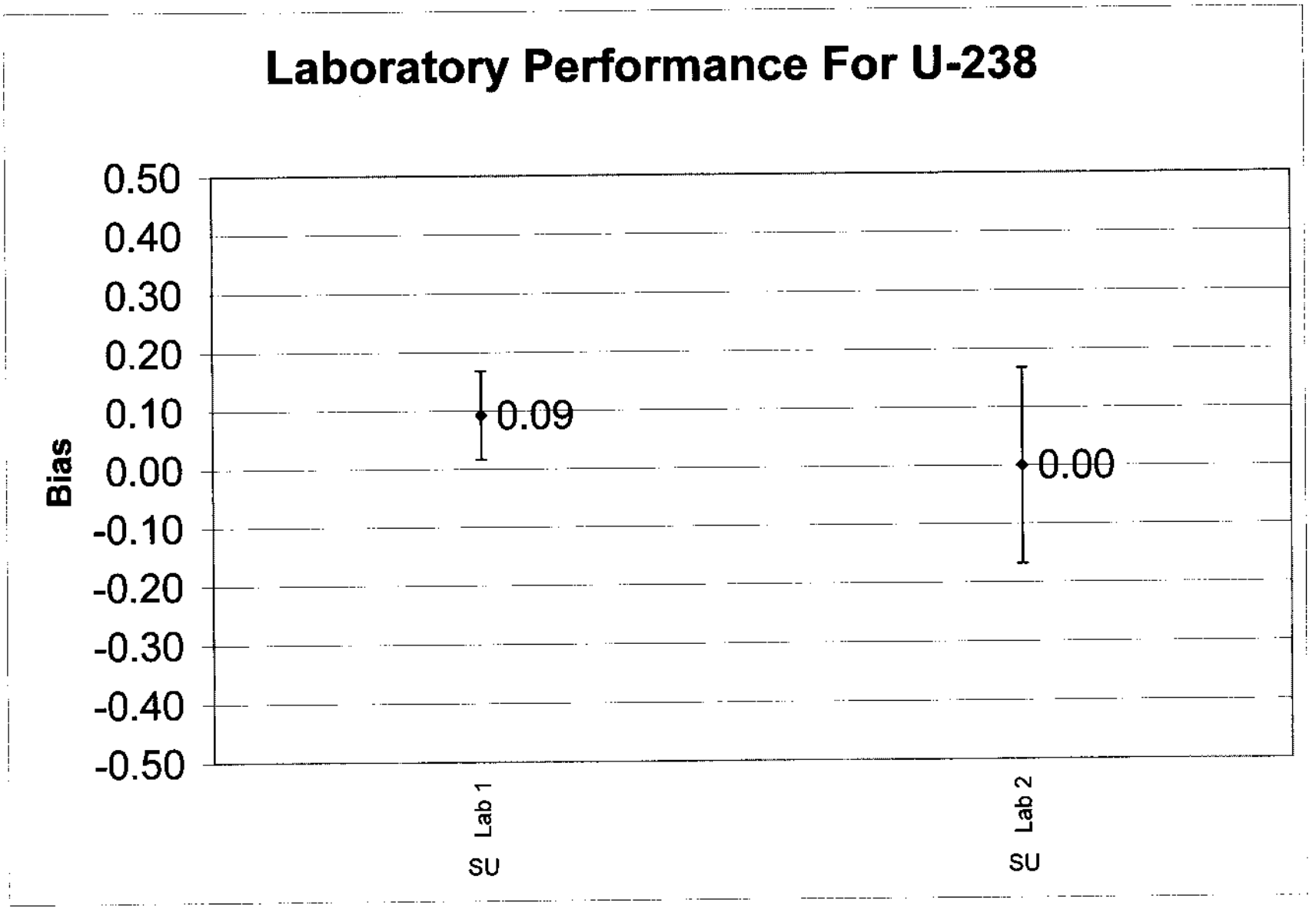
RESL LogNo	Radionuclide	Mean Bias (Br):	St. Dev Bias (Sb)	Pass / Fail
DL191	Am-241	-0.162	0.045	Pass
DL191	Co-60	0.089	0.034	Pass
DL191	Cs-137	0.032	0.022	Pass
DL191	Pu-238	-0.085	0.019	Pass
DL191	Pu-239	-0.060	0.022	Pass
DL191	Sr-90	0.028	0.051	Pass
DL191	Th-228	-0.065	0.014	Pass
DL191	Th-230	0.076	0.035	Pass
DL191	Th-232	-0.100	0.017	Pass
DL191	U-234	-0.013	0.028	Pass
DL191	U-238	0.020	0.022	Pass

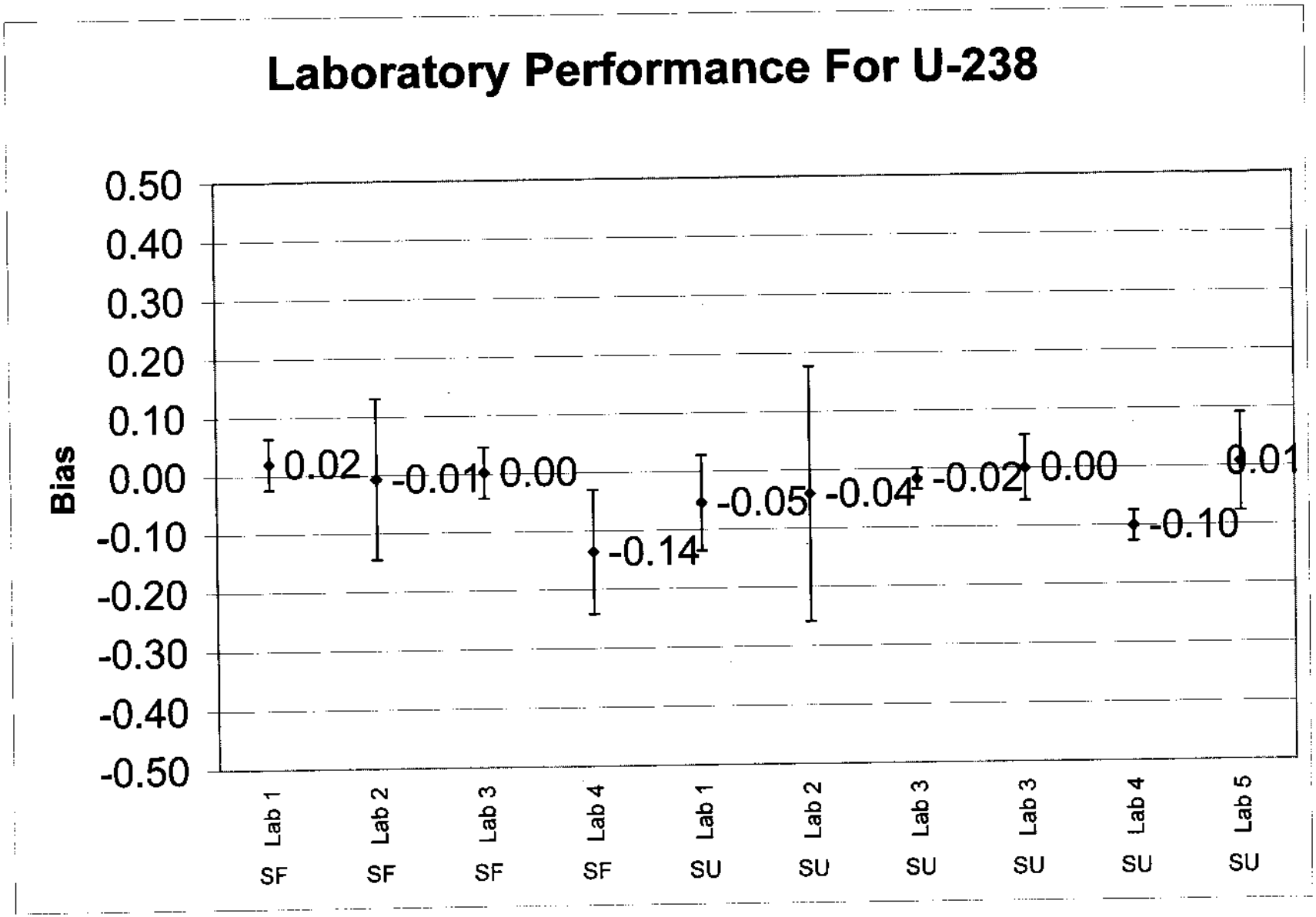
Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY


Laboratory Performance For U-234
Bias
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.01
-0.03
0.01
-0.12
0.04
-0.02
0.02
0.00
-0.09
Lab 1 SF
Lab 2 SF
Lab 3 SF
Lab 4 SF
Lab 1 SU
Lab 2 SU
Lab 3 SU
Lab 4 SU
Lab 5 SU


Laboratory Performance For U-235
Bias
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0.06
Lab 3
SU


Laboratory Performance For U-238
Bias
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0.09
0.00
Lab 1
SU
Lab 2
SU


Laboratory Performance For U-238
Bias
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0.02
-0.01
0.00
-0.14
-0.05
-0.04
-0.02
0.00
-0.10
0.01
Lab 1 SF
Lab 2 SF
Lab 3 SF
Lab 4 SF
Lab 1 SU
Lab 2 SU
Lab 3 SU
Lab 3 SU
Lab 4 SU
Lab 5 SU

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Session Performance Graphs for Each Radionuclide

RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: U-Tot RESL Log # DL188

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006EL-1	1.24 +/- 0.04 E0 ug/L	1.32 +/- 0.03 E0 ug/L	0.065
DL1SU1006EL-2	1.24 +/- 0.04 E0 ug/L	1.32 +/- 0.03 E0 ug/L	0.065
DL1SU1006EL-3	1.24 +/- 0.04 E0 ug/L	1.33 +/- 0.03 E0 ug/L	0.073
DL1SU1006EL-4	1.24 +/- 0.04 E0 ug/L	1.37 +/- 0.03 E0 ug/L	0.105
DL1SU1006EL-6	1.24 +/- 0.04 E0 ug/L	1.43 +/- 0.03 E0 ug/L	0.153

Mean (Br) = 0.092 St. Dev (Sb) = 0.038

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

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INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: U-238 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	4.08 +/- 0.13 E0 pCi/L	3.9 +/- 0.3 E0 pCi/L	-0.044
DL1SU1006MR-2	4.08 +/- 0.13 E0 pCi/L	3.6 +/- 0.2 E0 pCi/L	-0.118
DL1SU1006MR-4	4.08 +/- 0.13 E0 pCi/L	4.0 +/- 0.3 E0 pCi/L	-0.020
DL1SU1006MR-5	4.08 +/- 0.13 E0 pCi/L	3.8 +/- 0.3 E0 pCi/L	-0.069
DL1SU1006MR-6	4.08 +/- 0.13 E0 pCi/L	4.0 +/- 0.3 E0 pCi/L	-0.020

Mean (Br) = -0.054 St. Dev (Sb) = 0.041

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

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LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: U-234 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	3.93 +/- 0.12 E0 pCi/L	4.0 +/- 0.3 E0 pCi/L	0.018
DL1SU1006MR-3	3.93 +/- 0.12 E0 pCi/L	3.8 +/- 0.2 E0 pCi/L	-0.033
DL1SU1006MR-4	3.93 +/- 0.12 E0 pCi/L	4.3 +/- 0.3 E0 pCi/L	0.094
DL1SU1006MR-5	3.93 +/- 0.12 E0 pCi/L	4.3 +/- 0.3 E0 pCi/L	0.094
DL1SU1006MR-6	3.93 +/- 0.12 E0 pCi/L	4.1 +/- 0.3 E0 pCi/L	0.043
	Mean (Br) = 0.043	St. Dev (Sb) = 0.054	

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

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LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-232 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-2	3.46 +/- 0.11 E0 pCi/L	3.19 +/- 0.13 E0 pCi/L	-0.078
DL1SU1006MR-3	3.46 +/- 0.11 E0 pCi/L	3.23 +/- 0.13 E0 pCi/L	-0.066
DL1SU1006MR-4	3.46 +/- 0.11 E0 pCi/L	3.23 +/- 0.13 E0 pCi/L	-0.066
DL1SU1006MR-5	3.46 +/- 0.11 E0 pCi/L	3.44 +/- 0.13 E0 pCi/L	-0.006
DL1SU1006MR-6	3.46 +/- 0.11 E0 pCi/L	3.25 +/- 0.13 E0 pCi/L	-0.061

Mean (Br) = -0.055 St. Dev (Sb) = 0.028

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-230 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	1.82 +/- 0.04 E0 pCi/L	2.22 +/- 0.10 E0 pCi/L	0.220
DL1SU1006MR-2	1.82 +/- 0.04 E0 pCi/L	2.11 +/- 0.10 E0 pCi/L	0.159
DL1SU1006MR-3	1.82 +/- 0.04 E0 pCi/L	2.22 +/- 0.10 E0 pCi/L	0.220
DL1SU1006MR-5	1.82 +/- 0.04 E0 pCi/L	2.22 +/- 0.10 E0 pCi/L	0.220
DL1SU1006MR-6	1.82 +/- 0.04 E0 pCi/L	2.25 +/- 0.10 E0 pCi/L	0.236

Mean (Br) = 0.211 St. Dev (Sb) = 0.030

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-228 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	3.46 +/- 0.11 E0 pCi/L	3.38 +/- 0.14 E0 pCi/L	-0.023
DL1SU1006MR-2	3.46 +/- 0.11 E0 pCi/L	3.41 +/- 0.14 E0 pCi/L	-0.014
DL1SU1006MR-3	3.46 +/- 0.11 E0 pCi/L	3.45 +/- 0.14 E0 pCi/L	-0.003
DL1SU1006MR-4	3.46 +/- 0.11 E0 pCi/L	3.57 +/- 0.14 E0 pCi/L	0.032
DL1SU1006MR-6	3.46 +/- 0.11 E0 pCi/L	3.41 +/- 0.14 E0 pCi/L	-0.014

Mean (Br) = -0.005 St. Dev (Sb) = 0.022

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Sr-90 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	2.02 +/- 0.05 E2 pCi/L	1.99 +/- 0.06 E2 pCi/L	-0.015
DL1SU1006MR-3	2.02 +/- 0.05 E2 pCi/L	2.16 +/- 0.07 E2 pCi/L	0.069
DL1SU1006MR-4	2.02 +/- 0.05 E2 pCi/L	2.13 +/- 0.07 E2 pCi/L	0.054
DL1SU1006MR-5	2.02 +/- 0.05 E2 pCi/L	2.04 +/- 0.06 E2 pCi/L	0.010
DL1SU1006MR-6	2.02 +/- 0.05 E2 pCi/L	2.03 +/- 0.06 E2 pCi/L	0.005

Mean (Br) = 0.025 St. Dev (Sb) = 0.036

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

DEPARTMENT OF ENERGY
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INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Pu-239 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	1.64 +/- 0.04 E0 pCi/L	1.54 +/- 0.10 E0 pCi/L	-0.061
DL1SU1006MR-2	1.64 +/- 0.04 E0 pCi/L	1.55 +/- 0.10 E0 pCi/L	-0.055
DL1SU1006MR-3	1.64 +/- 0.04 E0 pCi/L	1.60 +/- 0.10 E0 pCi/L	-0.024
DL1SU1006MR-5	1.64 +/- 0.04 E0 pCi/L	1.59 +/- 0.10 E0 pCi/L	-0.030
DL1SU1006MR-6	1.64 +/- 0.04 E0 pCi/L	1.57 +/- 0.10 E0 pCi/L	-0.043

Mean (Br) = -0.043 St. Dev (Sb) = 0.016

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

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LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Pu-238 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	3.02 +/- 0.07 E0 pCi/L	2.73 +/- 0.15 E0 pCi/L	-0.096
DL1SU1006MR-2	3.02 +/- 0.07 E0 pCi/L	2.84 +/- 0.16 E0 pCi/L	-0.060
DL1SU1006MR-3	3.02 +/- 0.07 E0 pCi/L	2.77 +/- 0.15 E0 pCi/L	-0.083
DL1SU1006MR-5	3.02 +/- 0.07 E0 pCi/L	2.89 +/- 0.16 E0 pCi/L	-0.043
DL1SU1006MR-6	3.02 +/- 0.07 E0 pCi/L	2.83 +/- 0.16 E0 pCi/L	-0.063

Mean (Br) = -0.069 St. Dev (Sb) = 0.021

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Cs-137 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	1.79 +/- 0.05 E2 pCi/L	1.57 +/- 0.06 E2 pCi/L	-0.123
DL1SU1006MR-2	1.79 +/- 0.05 E2 pCi/L	1.65 +/- 0.06 E2 pCi/L	-0.078
DL1SU1006MR-3	1.79 +/- 0.05 E2 pCi/L	1.60 +/- 0.05 E2 pCi/L	-0.106
DL1SU1006MR-4	1.79 +/- 0.05 E2 pCi/L	1.42 +/- 0.05 E2 pCi/L	-0.207
DL1SU1006MR-6	1.79 +/- 0.05 E2 pCi/L	1.75 +/- 0.05 E2 pCi/L	-0.022

Mean (Br) = -0.107 St. Dev (Sb) = 0.067

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Co-60 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	1.44 +/- 0.05 E2 pCi/L	1.35 +/- 0.07 E2 pCi/L	-0.063
DL1SU1006MR-2	1.44 +/- 0.05 E2 pCi/L	1.27 +/- 0.06 E2 pCi/L	-0.118
DL1SU1006MR-3	1.44 +/- 0.05 E2 pCi/L	1.44 +/- 0.06 E2 pCi/L	0.000
DL1SU1006MR-4	1.44 +/- 0.05 E2 pCi/L	1.39 +/- 0.06 E2 pCi/L	-0.035
DL1SU1006MR-5	1.44 +/- 0.05 E2 pCi/L	1.21 +/- 0.06 E2 pCi/L	-0.160

Mean (Br) = -0.075 St. Dev (Sb) = 0.064

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Am-241 RESL Log # DL180

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006MR-1	2.23 +/- 0.06 E0 pCi/L	2.06 +/- 0.16 E0 pCi/L	-0.076
DL1SU1006MR-2	2.23 +/- 0.06 E0 pCi/L	2.08 +/- 0.16 E0 pCi/L	-0.067
DL1SU1006MR-4	2.23 +/- 0.06 E0 pCi/L	2.10 +/- 0.17 E0 pCi/L	-0.058
DL1SU1006MR-5	2.23 +/- 0.06 E0 pCi/L	1.93 +/- 0.15 E0 pCi/L	-0.135
DL1SU1006MR-6	2.23 +/- 0.06 E0 pCi/L	2.13 +/- 0.17 E0 pCi/L	-0.045

Mean (Br) = -0.076 St. Dev (Sb) = 0.035

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

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LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: H-3 RESL Log # DL177

Laboratory: GEL Matrix: SU Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SU1006LB-1	7.1 +/- 0.2 E4 pCi/L	6.76 +/- 0.10 E4 pCi/L	-0.048
DL1SU1006LB-2	7.1 +/- 0.2 E4 pCi/L	6.80 +/- 0.10 E4 pCi/L	-0.042
DL1SU1006LB-3	7.1 +/- 0.2 E4 pCi/L	6.79 +/- 0.10 E4 pCi/L	-0.044
DL1SU1006LB-5	7.1 +/- 0.2 E4 pCi/L	6.72 +/- 0.10 E4 pCi/L	-0.054
DL1SU1006LB-6	7.1 +/- 0.2 E4 pCi/L	6.68 +/- 0.10 E4 pCi/L	-0.059

Mean (Br) = -0.049 St. Dev (Sb) = 0.007

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY

LABORATORY ACCREDITATION PROGRAM

Summary Report

Laboratory: GEL Session: 1006

Matrix: SU

RESL LogNo		Radionuclide	Mean Bias (Br):	St. Dev Bias (Sb)	Pass / Fail
DL177		H-3	-0.049	0.007	Pass
DL180		Am-241	-0.076	0.035	Pass
DL180		Co-60	-0.075	0.064	Pass
DL180		Cs-137	-0.107	0.067	Pass
DL180		Pu-238	-0.069	0.021	Pass
DL180		Pu-239	-0.043	0.016	Pass
DL180		Sr-90	0.025	0.036	Pass
DL180		Th-228	-0.005	0.022	Pass
DL180		Th-230	0.211	0.030	Pass
DL180		Th-232	-0.055	0.028	Pass
DL180		U-234	0.043	0.054	Pass
DL180		U-238	-0.054	0.041	Pass
DL188	*	U-Tot	0.092	0.038	Pass

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

* Mass Determination

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DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Sr-90 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	2.02 +/- 0.05 E2 pCi	2.10 +/- 0.05 E2 pCi	0.040
DL1SF1006MR-2	2.02 +/- 0.05 E2 pCi	1.98 +/- 0.04 E2 pCi	-0.020
DL1SF1006MR-3	2.02 +/- 0.05 E2 pCi	2.23 +/- 0.05 E2 pCi	0.104
DL1SF1006MR-4	2.02 +/- 0.05 E2 pCi	1.98 +/- 0.04 E2 pCi	-0.020
DL1SF1006MR-6	2.02 +/- 0.05 E2 pCi	2.09 +/- 0.04 E2 pCi	0.035

Mean (Br) = 0.028 St. Dev (Sb) = 0.051

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: U-238 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	4.08 +/- 0.12 E0 pCi	4.1 +/- 0.3 E0 pCi	0.005
DL1SF1006MR-2	4.08 +/- 0.12 E0 pCi	4.1 +/- 0.3 E0 pCi	0.005
DL1SF1006MR-4	4.08 +/- 0.12 E0 pCi	4.3 +/- 0.3 E0 pCi	0.054
DL1SF1006MR-5	4.08 +/- 0.12 E0 pCi	4.2 +/- 0.3 E0 pCi	0.029
DL1SF1006MR-6	4.08 +/- 0.12 E0 pCi	4.1 +/- 0.3 E0 pCi	0.005

Mean (Br) = 0.020 St. Dev (Sb) = 0.022

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Co-60 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	1.44 +/- 0.04 E2 pCi	1.63 +/- 0.04 E2 pCi	0.132
DL1SF1006MR-2	1.44 +/- 0.04 E2 pCi	1.57 +/- 0.04 E2 pCi	0.090
DL1SF1006MR-4	1.44 +/- 0.04 E2 pCi	1.60 +/- 0.04 E2 pCi	0.111
DL1SF1006MR-5	1.44 +/- 0.04 E2 pCi	1.51 +/- 0.05 E2 pCi	0.049
DL1SF1006MR-6	1.44 +/- 0.04 E2 pCi	1.53 +/- 0.04 E2 pCi	0.063

Mean (Br) = 0.089 St. Dev (Sb) = 0.034

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: U-234 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-2	3.93 +/- 0.11 E0 pCi	3.7 +/- 0.3 E0 pCi	-0.059
DL1SF1006MR-3	3.93 +/- 0.11 E0 pCi	3.9 +/- 0.3 E0 pCi	-0.008
DL1SF1006MR-4	3.93 +/- 0.11 E0 pCi	4.0 +/- 0.3 E0 pCi	0.018
DL1SF1006MR-5	3.93 +/- 0.11 E0 pCi	3.9 +/- 0.3 E0 pCi	-0.008
DL1SF1006MR-6	3.93 +/- 0.11 E0 pCi	3.9 +/- 0.3 E0 pCi	-0.008

Mean (Br) = -0.013 St. Dev (Sb) = 0.028

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-232 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	3.03 +/- 0.10 E0 pCi	2.72 +/- 0.11 E0 pCi	-0.102
DL1SF1006MR-2	3.03 +/- 0.10 E0 pCi	2.69 +/- 0.10 E0 pCi	-0.112
DL1SF1006MR-3	3.03 +/- 0.10 E0 pCi	2.82 +/- 0.11 E0 pCi	-0.069
DL1SF1006MR-4	3.03 +/- 0.10 E0 pCi	2.71 +/- 0.11 E0 pCi	-0.106
DL1SF1006MR-6	3.03 +/- 0.10 E0 pCi	2.70 +/- 0.11 E0 pCi	-0.109

Mean (Br) = -0.100 St. Dev (Sb) = 0.017

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-230 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-2	1.60 +/- 0.04 E0 pCi	1.70 +/- 0.10 E0 pCi	0.062
DL1SF1006MR-3	1.60 +/- 0.04 E0 pCi	1.71 +/- 0.10 E0 pCi	0.069
DL1SF1006MR-4	1.60 +/- 0.04 E0 pCi	1.80 +/- 0.10 E0 pCi	0.125
DL1SF1006MR-5	1.60 +/- 0.04 E0 pCi	1.75 +/- 0.10 E0 pCi	0.094
DL1SF1006MR-6	1.60 +/- 0.04 E0 pCi	1.65 +/- 0.10 E0 pCi	0.031

Mean (Br) = 0.076 St. Dev (Sb) = 0.035

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Th-228 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-2	3.03 +/- 0.10 E0 pCi	2.79 +/- 0.11 E0 pCi	-0.079
DL1SF1006MR-3	3.03 +/- 0.10 E0 pCi	2.89 +/- 0.12 E0 pCi	-0.046
DL1SF1006MR-4	3.03 +/- 0.10 E0 pCi	2.86 +/- 0.11 E0 pCi	-0.056
DL1SF1006MR-5	3.03 +/- 0.10 E0 pCi	2.81 +/- 0.11 E0 pCi	-0.073
DL1SF1006MR-6	3.03 +/- 0.10 E0 pCi	2.81 +/- 0.11 E0 pCi	-0.073

Mean (Br) = -0.065 St. Dev (Sb) = 0.014

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Pu-239 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	1.64 +/- 0.04 E0 pCi	1.53 +/- 0.10 E0 pCi	-0.067
DL1SF1006MR-3	1.64 +/- 0.04 E0 pCi	1.55 +/- 0.10 E0 pCi	-0.055
DL1SF1006MR-4	1.64 +/- 0.04 E0 pCi	1.55 +/- 0.10 E0 pCi	-0.055
DL1SF1006MR-5	1.64 +/- 0.04 E0 pCi	1.49 +/- 0.10 E0 pCi	-0.091
DL1SF1006MR-6	1.64 +/- 0.04 E0 pCi	1.59 +/- 0.11 E0 pCi	-0.030

Mean (Br) = -0.060 St. Dev (Sb) = 0.022

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Pu-238 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	3.02 +/- 0.07 E0 pCi	2.77 +/- 0.16 E0 pCi	-0.083
DL1SF1006MR-2	3.02 +/- 0.07 E0 pCi	2.77 +/- 0.17 E0 pCi	-0.083
DL1SF1006MR-3	3.02 +/- 0.07 E0 pCi	2.83 +/- 0.17 E0 pCi	-0.063
DL1SF1006MR-4	3.02 +/- 0.07 E0 pCi	2.77 +/- 0.17 E0 pCi	-0.083
DL1SF1006MR-5	3.02 +/- 0.07 E0 pCi	2.67 +/- 0.16 E0 pCi	-0.116
	Mean (Br) = -0.085	St. Dev (Sb) = 0.019	

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

Reference Date: 12/1/2006 Radionuclide: Cs-137 RESL Log # DL191

Laboratory: GEL Matrix: SF Session: 1006

Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	1.79 +/- 0.04 E2 pCi	1.86 +/- 0.05 E2 pCi	0.039
DL1SF1006MR-2	1.79 +/- 0.04 E2 pCi	1.91 +/- 0.05 E2 pCi	0.067
DL1SF1006MR-3	1.79 +/- 0.04 E2 pCi	1.82 +/- 0.04 E2 pCi	0.017
DL1SF1006MR-4	1.79 +/- 0.04 E2 pCi	1.81 +/- 0.03 E2 pCi	0.011
DL1SF1006MR-6	1.79 +/- 0.04 E2 pCi	1.84 +/- 0.05 E2 pCi	0.028

Mean (Br) = 0.032 St. Dev (Sb) = 0.022

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

DEPARTMENT OF ENERGY
LABORATORY ACCREDITATION PROGRAM
INDIVIDUAL NUCLIDE REPORT

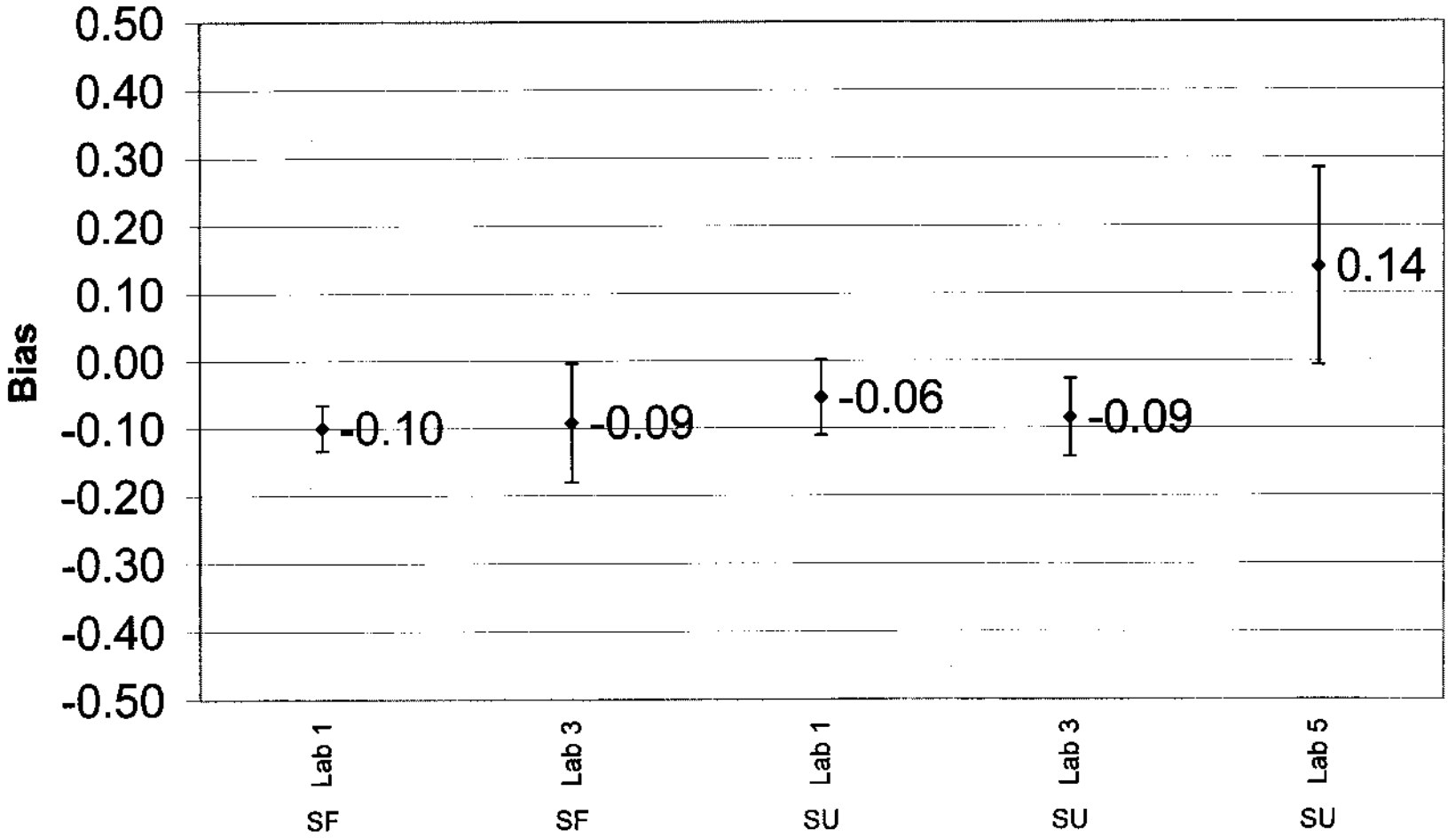
Reference Date: 12/1/2006 Radionuclide: Am-241 RESL Log # DL191

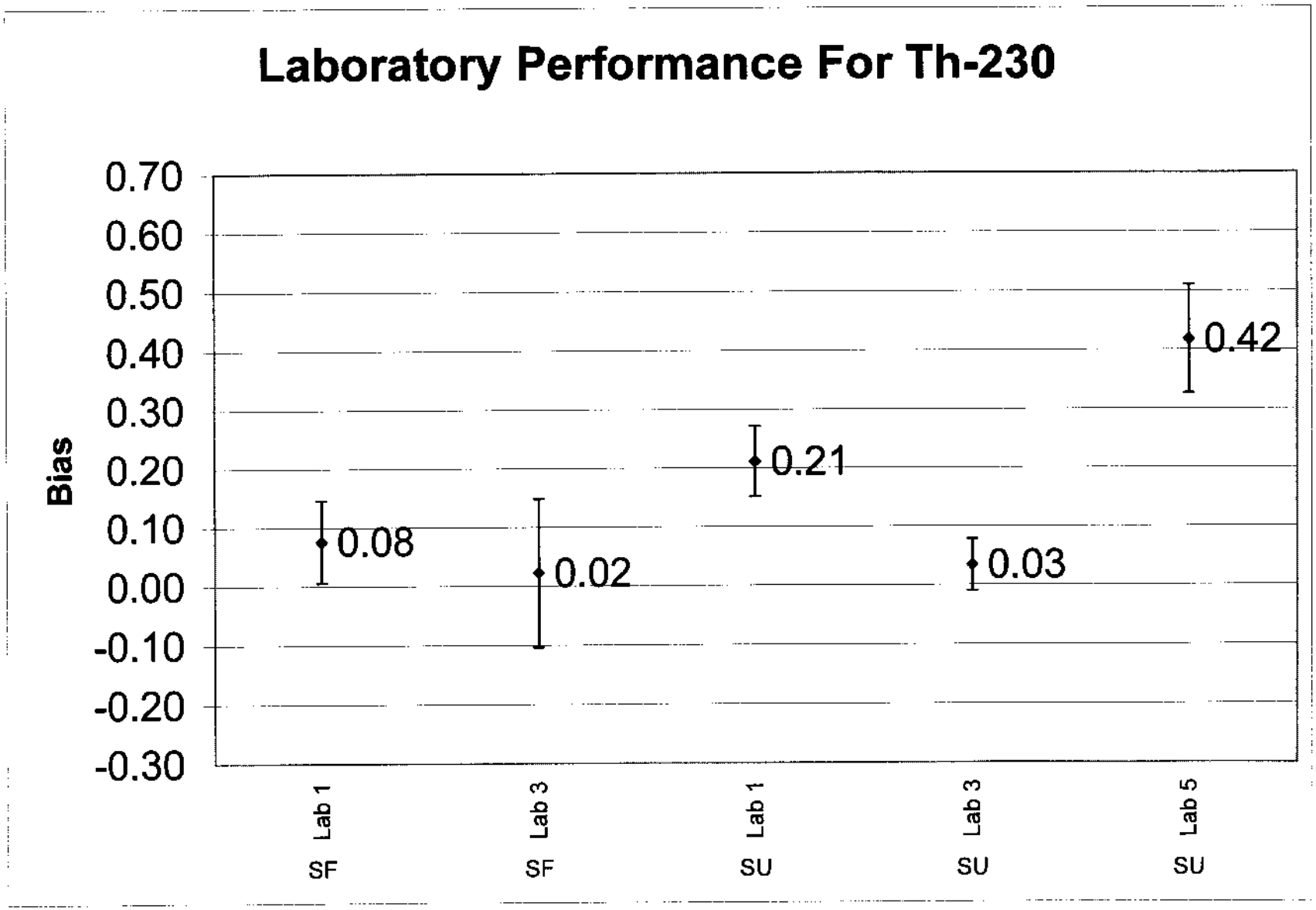
Laboratory: GEL Matrix: SF Session: 1006

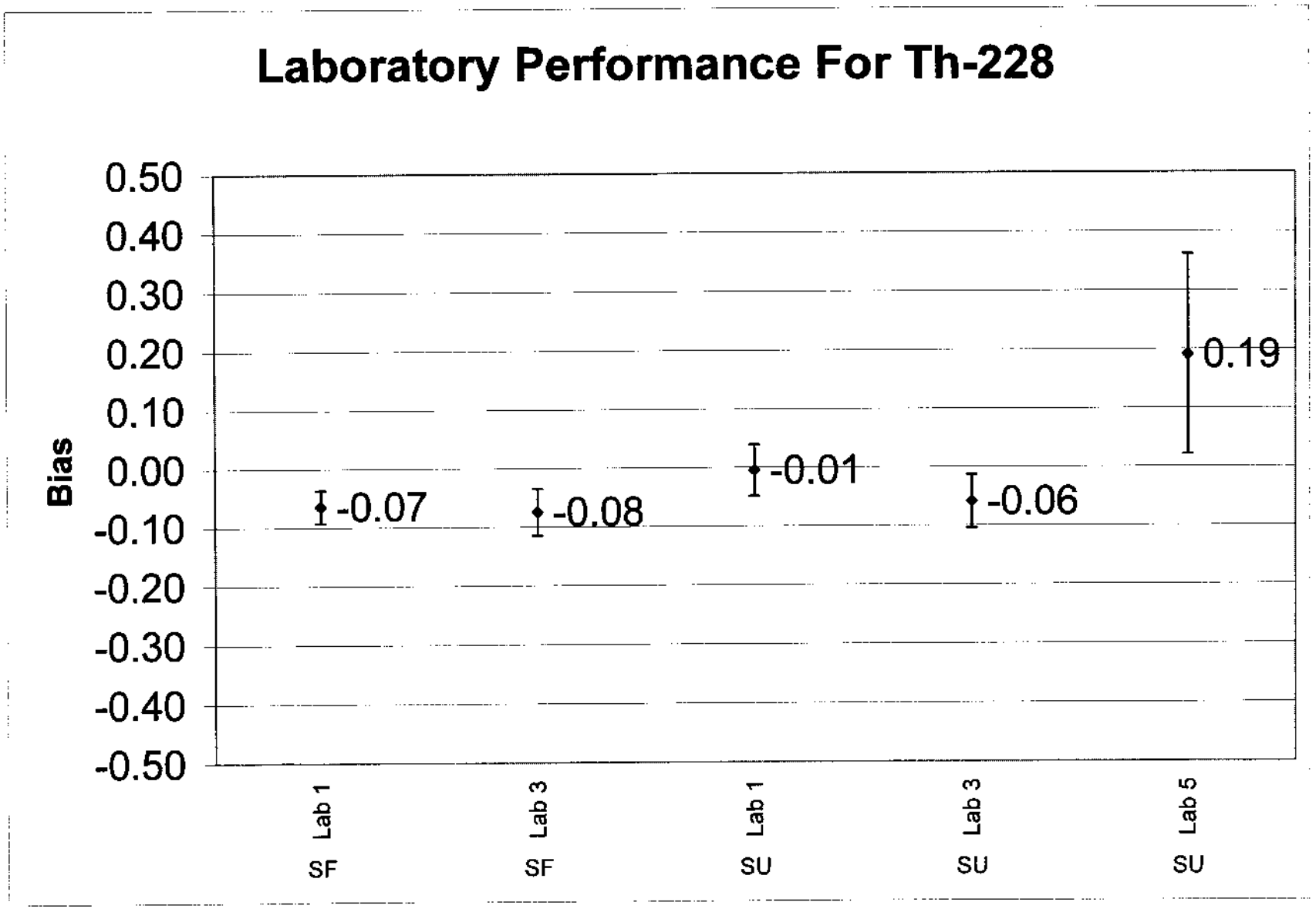
Sample #	Known Values and 1s Uncertainty	Experimental Results and 1s Uncertainty	Bias
DL1SF1006MR-1	2.23 +/- 0.05 E0 pCi	1.88 +/- 0.13 E0 pCi	-0.157
DL1SF1006MR-2	2.23 +/- 0.05 E0 pCi	1.96 +/- 0.13 E0 pCi	-0.121
DL1SF1006MR-4	2.23 +/- 0.05 E0 pCi	1.88 +/- 0.13 E0 pCi	-0.157
DL1SF1006MR-5	2.23 +/- 0.05 E0 pCi	1.92 +/- 0.13 E0 pCi	-0.139
DL1SF1006MR-6	2.23 +/- 0.05 E0 pCi	1.70 +/- 0.12 E0 pCi	-0.238
	Mean (Br) = -0.162	St. Dev (Sb) = 0.045	

Acceptance Criteria: -0.25 =< Br <= 0.50 Sb =< 0.4

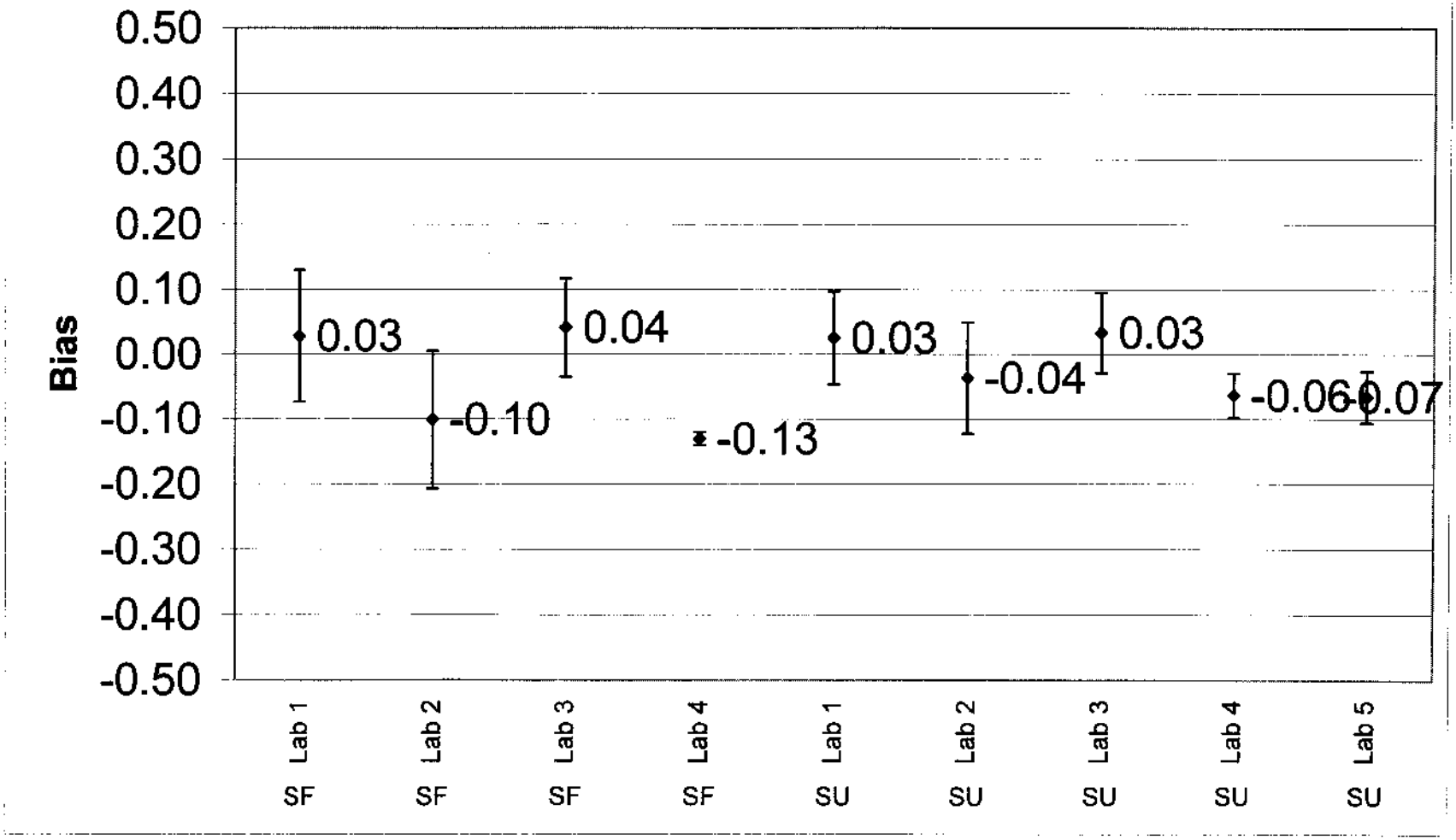
Laboratory Performance For Th-232

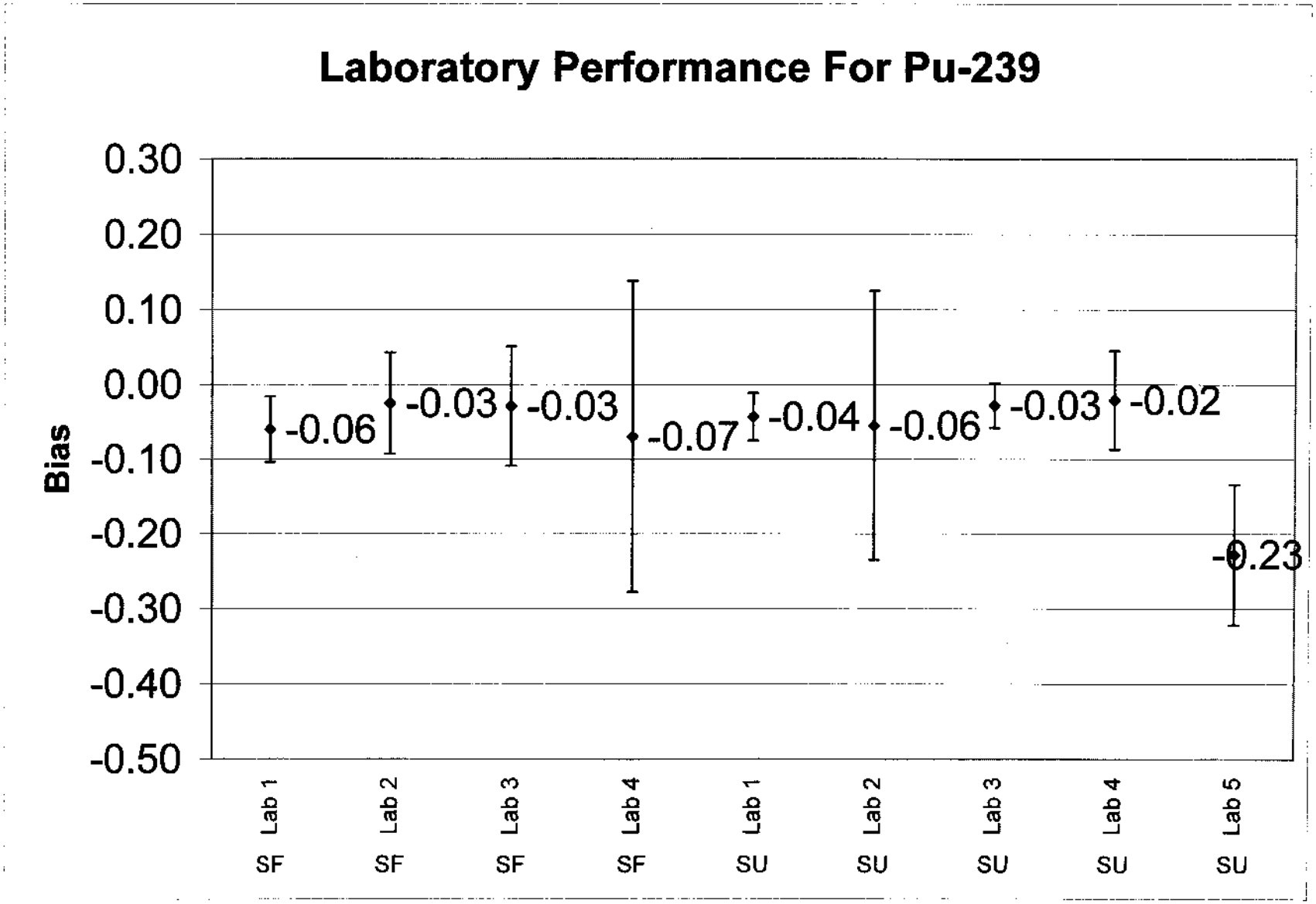


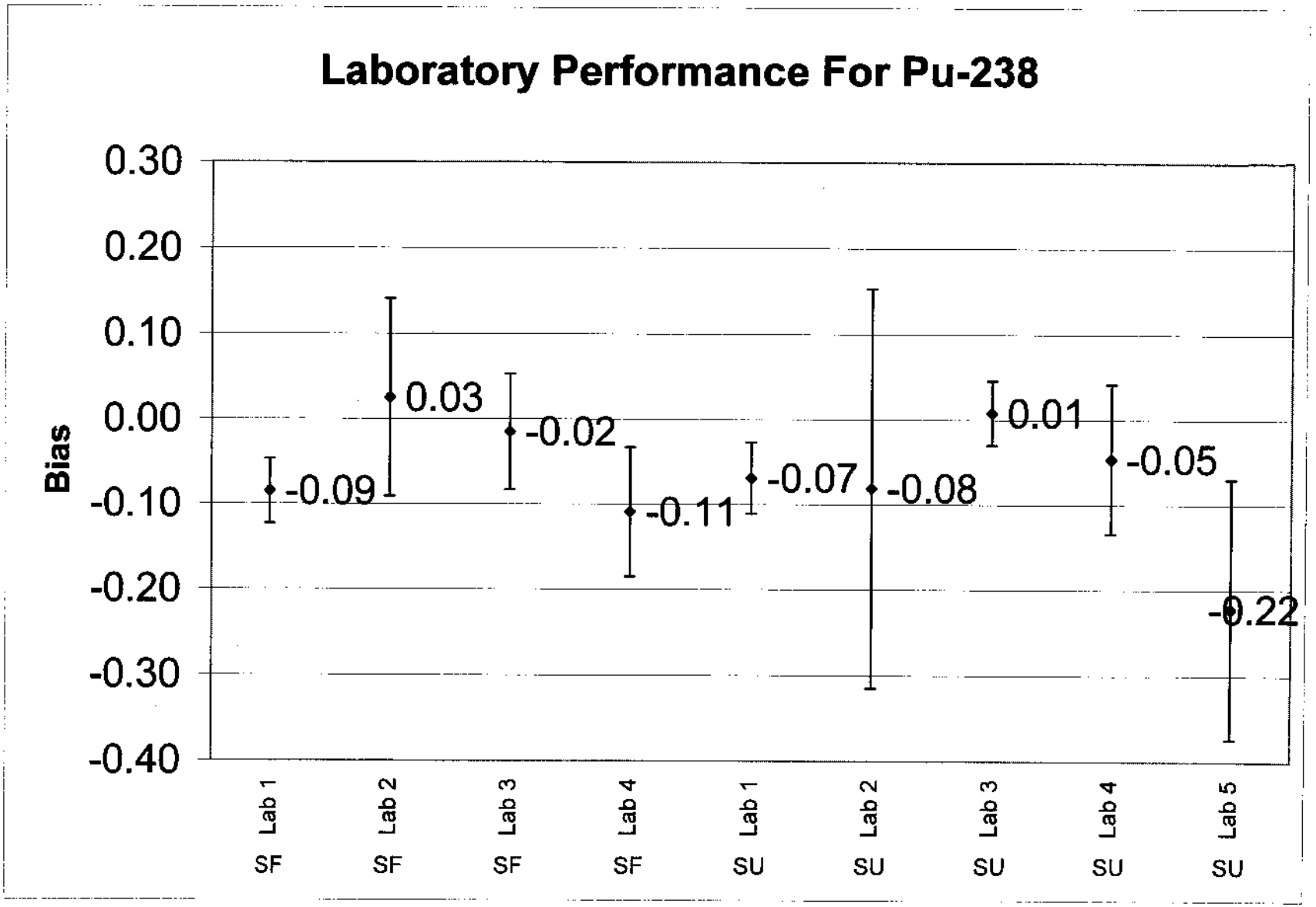

Laboratory Performance For Th-230
Bias
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
0.08
0.02
0.21
0.03
0.42
Lab 1
SF
Lab 3
SF
Lab 1
SU
Lab 3
SU
Lab 5
SU


Laboratory Performance For Th-228
Bias
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.07
-0.08
-0.01
-0.06
0.19
Lab 1 SF
Lab 3 SF
Lab 1 SU
Lab 3 SU
Lab 5 SU

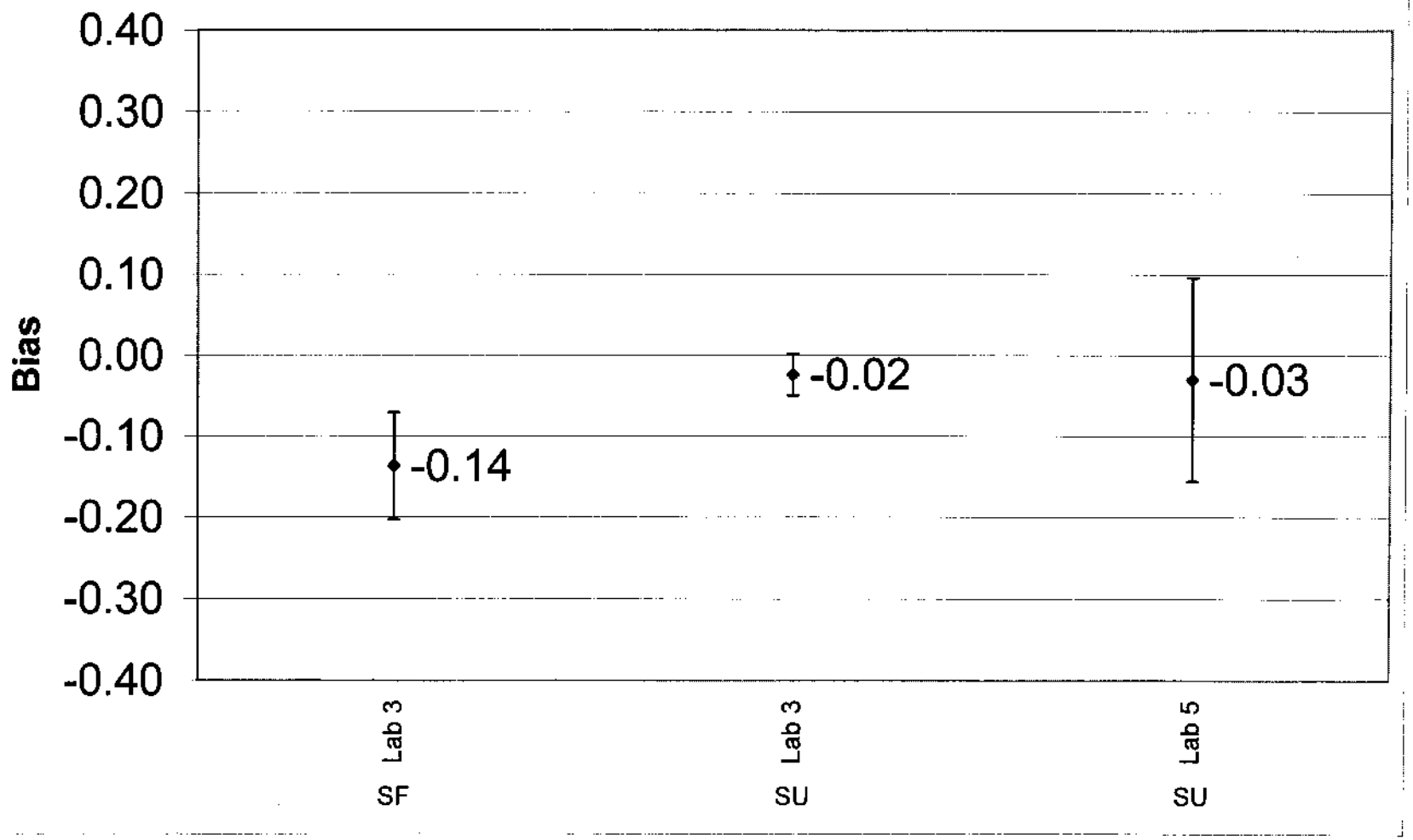
Laboratory Performance For Sr-90

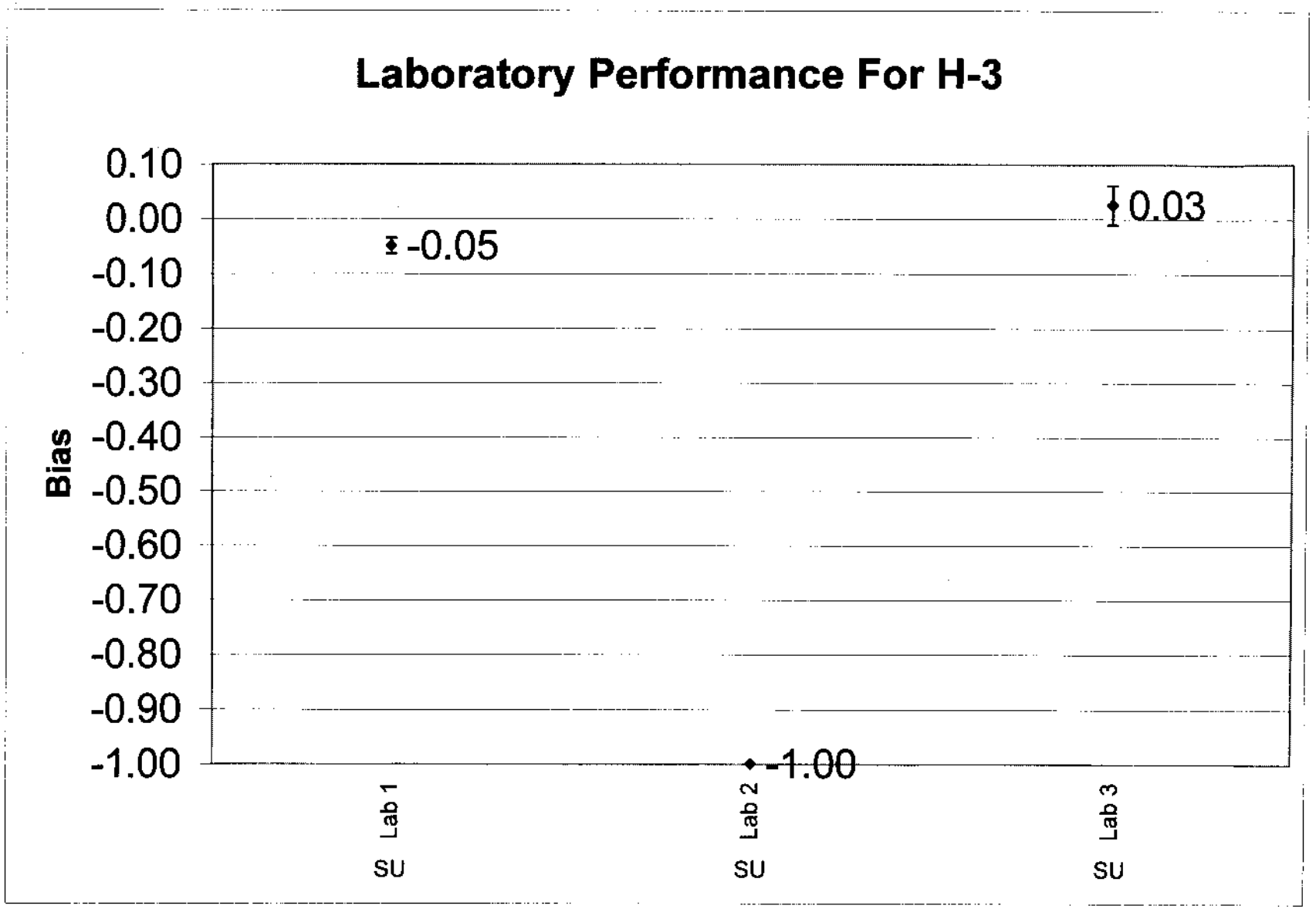


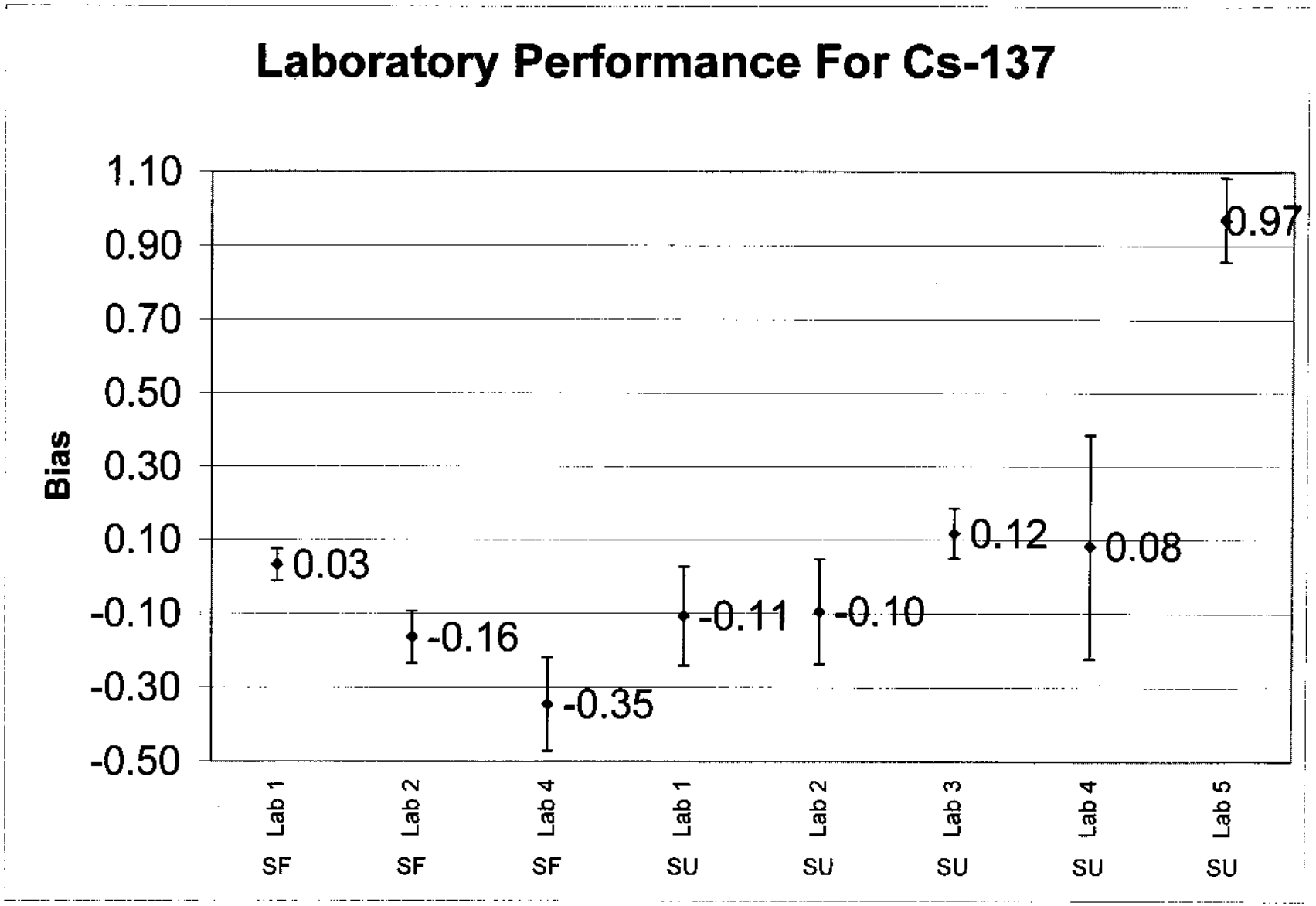

Laboratory Performance For Pu-239
Bias
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.06
-0.03
-0.03
-0.07
-0.04
-0.06
-0.03
-0.02
-0.23
Lab 1 SF
Lab 2 SF
Lab 3 SF
Lab 4 SF
Lab 1 SU
Lab 2 SU
Lab 3 SU
Lab 4 SU
Lab 5 SU


Laboratory Performance For Pu-238
Bias
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.09
0.03
-0.02
-0.11
-0.07
-0.08
0.01
-0.05
-0.22
Lab 1 SF
Lab 2 SF
Lab 3 SF
Lab 4 SF
Lab 1 SU
Lab 2 SU
Lab 3 SU
Lab 4 SU
Lab 5 SU

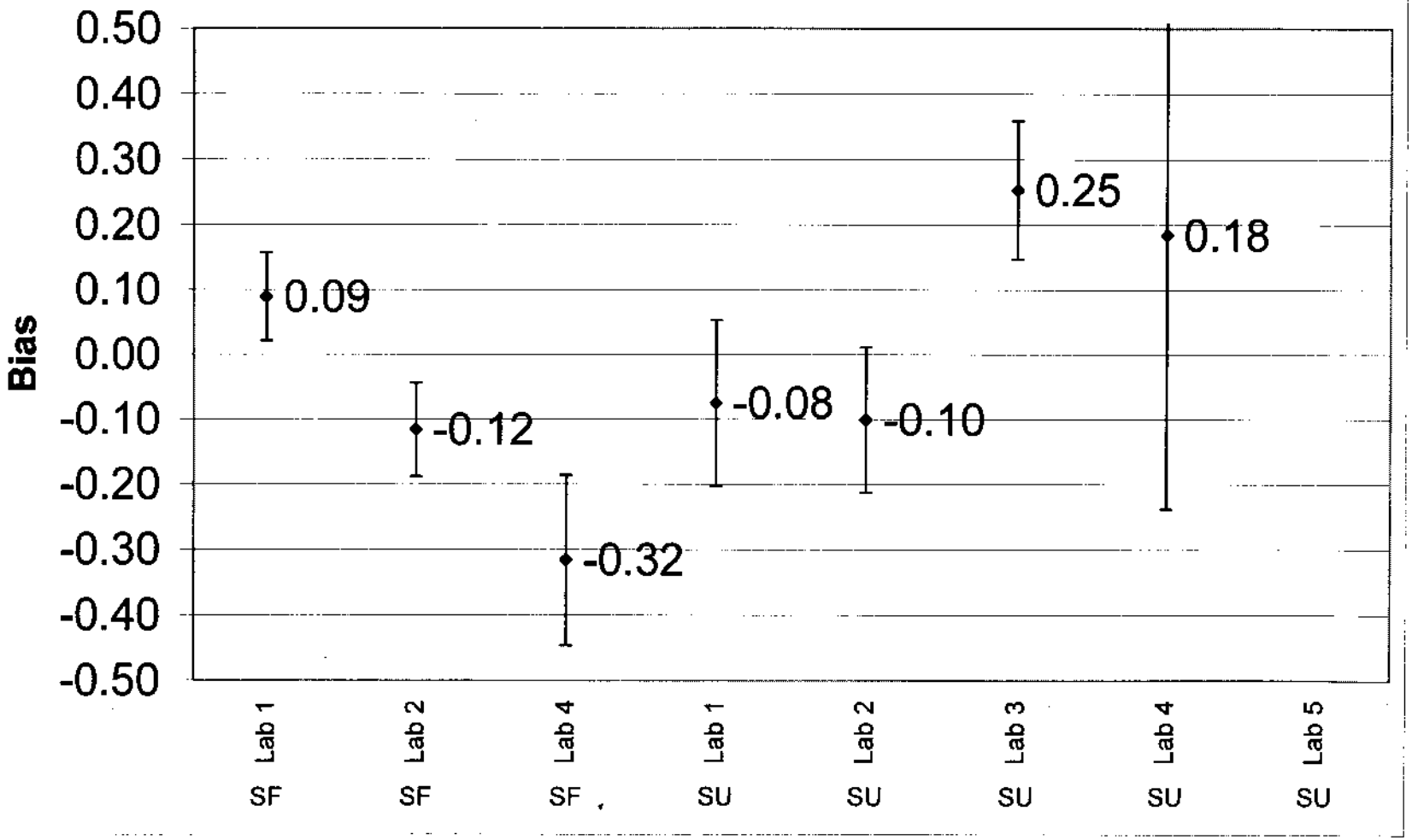
Laboratory Performance For Np-237

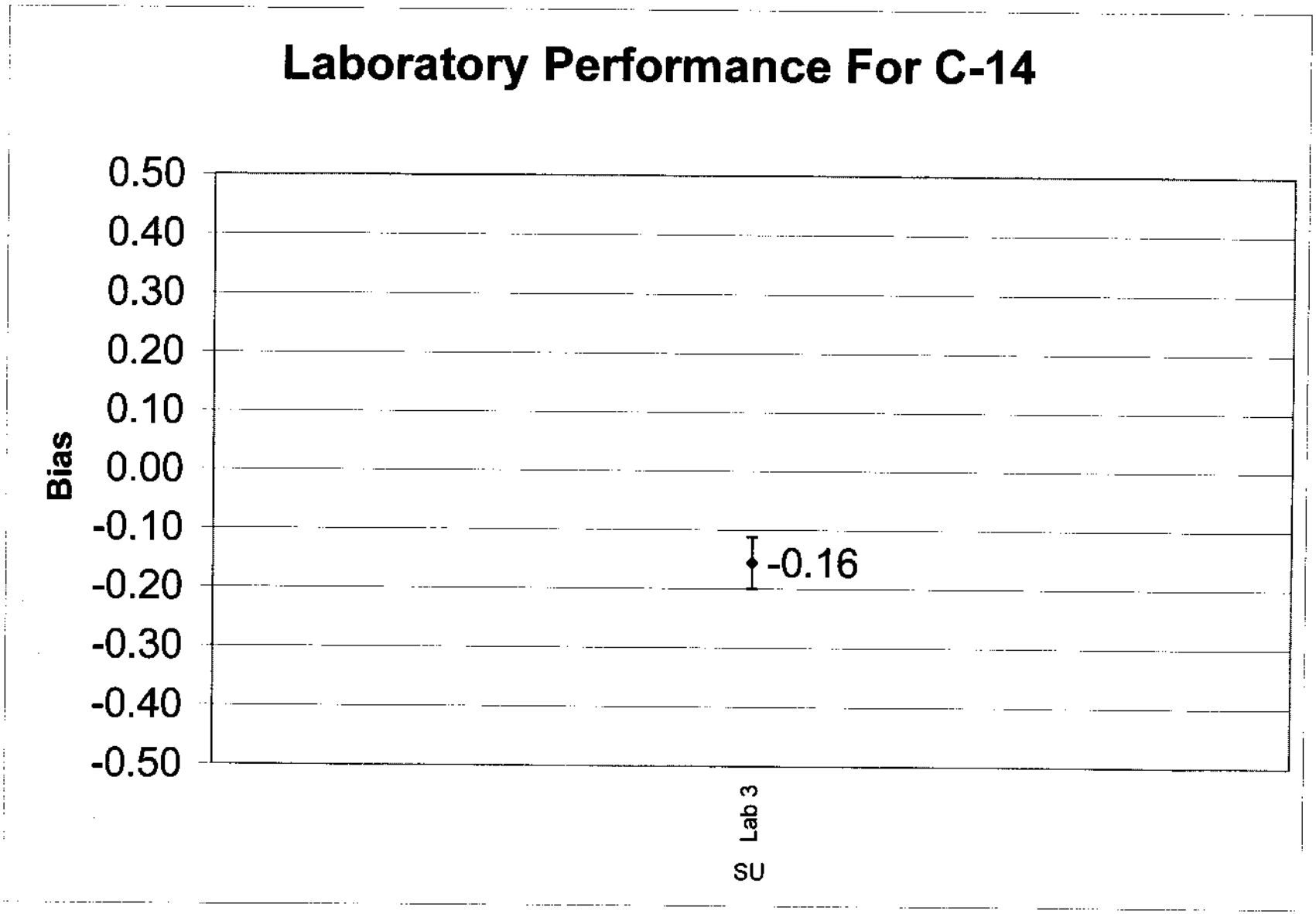



Laboratory Performance For H-3
Bias
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
-0.60
-0.70
-0.80
-0.90
-1.00
-0.05
-1.00
0.03
Lab 1
SU
Lab 2
SU
Lab 3
SU


Laboratory Performance For Cs-137
Bias
1.10
0.90
0.70
0.50
0.30
0.10
-0.10
-0.30
-0.50
0.03
-0.16
-0.35
-0.11
-0.10
0.12
0.08
0.97
Lab 1 SF
Lab 2 SF
Lab 4 SF
Lab 1 SU
Lab 2 SU
Lab 3 SU
Lab 4 SU
Lab 5 SU

Laboratory Performance For Co-60




Laboratory Performance For C-14
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
Bias
-0.16
Lab 3
SU