

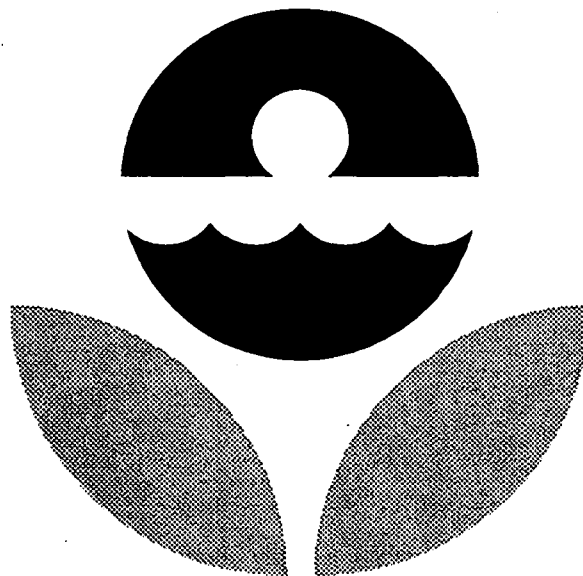


Gamma in Water Intercomparison Study

A Statistical Evaluation of the February 14, 1992 Data



Gamma in Water
Intercomparison Study
February 14, 1992



Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY-LAS VEGAS
P.O. BOX 93478
LAS VEGAS, NEVADA 89193-3478
(702/798-2100)

Dear Participant,

Enclosed are the results of the Nuclear Radiation Assessment Division (EMSL-LV) Intercomparison Study for *Gamma in Water; February 14, 1992*.

Please take a few minutes to review this report and the analytical data your laboratory submitted to us. If there are any apparent discrepancies, please notify us immediately.

We encourage you to make use of the computer-automated data-entry system that has been in place for some time now. As the number of participants increases, and it becomes unrealistic for us to receive results by mail or FAX, the computer system will be our only avenue for accepting data.

If you have any questions or comments, please send a message via the data-entry system or contact Frank Novielli at 702/798-2159 or Patricia Honsa at 702/798-2141.

Sincerely,

A handwritten signature in cursive script, appearing to read "George Dillebeck".

for Frank Novielli
Senior Chemist
Radioanalysis Branch

Enclosure

NOTICE

This material has been funded wholly by the U.S. Environmental Protection Agency. It has been subject to the Agency's review, and it has been approved for publication as an EPA document.

The following pages consist of separate sections for each of the nuclides in this study with four parts per section. After the first, each part is separated from the next by a new page or a thick horizontal bar. The first page of each section is a statistical summary for the nuclide and starts with a statement of the known value, the control limits, and the warning limits.

The warning limits are placed at two normalized standard deviations above and below the known value and the control limits are three normalized standard deviations above and below the known value. If you keep control charts, these values will be useful for anticipating problems with the accuracy of your analytical methods.

The coin shaped pie chart at the top of the summary page shows the fate of all the samples sent out in number and percentage terms. The pie chart starts at the top and rotates clockwise. The first sector represents those participants who submitted analytical results within both the warning and control limits. The next sector represents those who are in the warning region but not out of control. The third sector represents those who are out of control, but have passed the outlier test. The fourth sector represents those who have failed the outlier test. The last sector represents those participants who have failed to respond properly. This is the case if no analytical results were returned, or less than three determinations were reported, or if the results were received too late. The reeding on the edge of the coin is spaced at one percent intervals, and the sector shading becomes darker as the data reliability decreases. Sectors with zero width are not shown.

The table in the center shows a number of statistical quantities calculated from the submitted data based on the mean and median values in relation to the known value, both before and after outlier removal. The lower pie chart uses the same construction as the upper chart and shows the distribution of properly submitted data in terms of deviation from the known value divided into sectors representing one, two, three, and greater than three normalized standard deviations.

The second part is an alphabetical listing, in lab-code order, of submitted data and several calculated quantities. An entry that is shaded has been rejected because of one of the reasons listed above or failure of the outlier test. The fifth and sixth columns are a measure of laboratory precision. The Range analysis is a normalized value that you may use to keep precision control charts. If this value is between 2.0 and 3.0, your analytical process precision is in the warning zone; if it exceeds 3.0 it is out of control. The eighth and ninth columns are the differences from the mean of all non-outliers and from the known value, respectively. A tag symbol may appear in the last column. Each page with tags has a symbol definition summary at the bottom. If there is no tag symbol, the data is within the control limits, but it may be in the warning zone.

The third part is a three-column listing of result average, tag symbol, and lab-code in average order excluding those labs not responding properly. In this order, all outliers and out-of-control results appear at the top or bottom of the list.

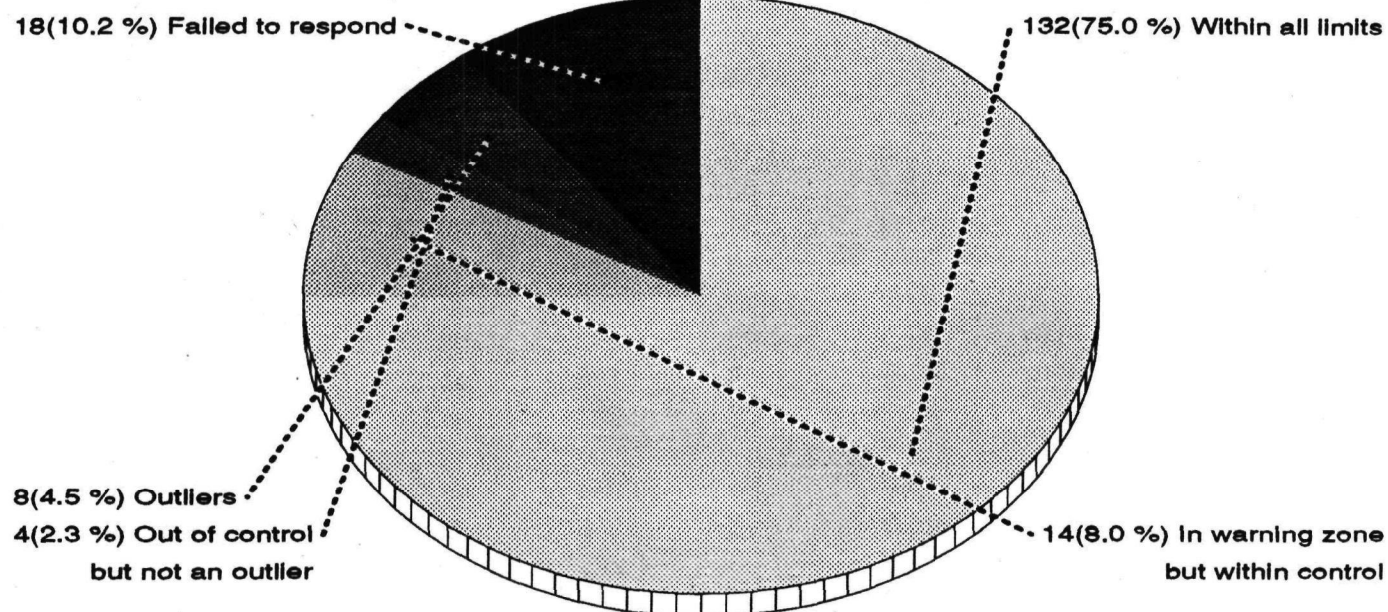
The last part is two bar chart displays showing frequency distributions of responding participants. The first chart places the known value at the center and a bar at each 0.2 unit of expected precision. The second chart places the mean of the reported measurements at the center and a bar at each 0.2 unit of standard deviation. In both cases, a bar includes those results within 0.1 unit up to the maximum of six. Any results more than six units from the center value are shown cumulatively by a shaded bar one past the sixth unit. If the central tendency of the known value distribution falls away from the center, an error in accuracy is indicated. If the distribution is broad, poor precision is indicated. The mean value distribution is similar but uses the average and standard deviation of reported results as its basis.

Cobalt-60

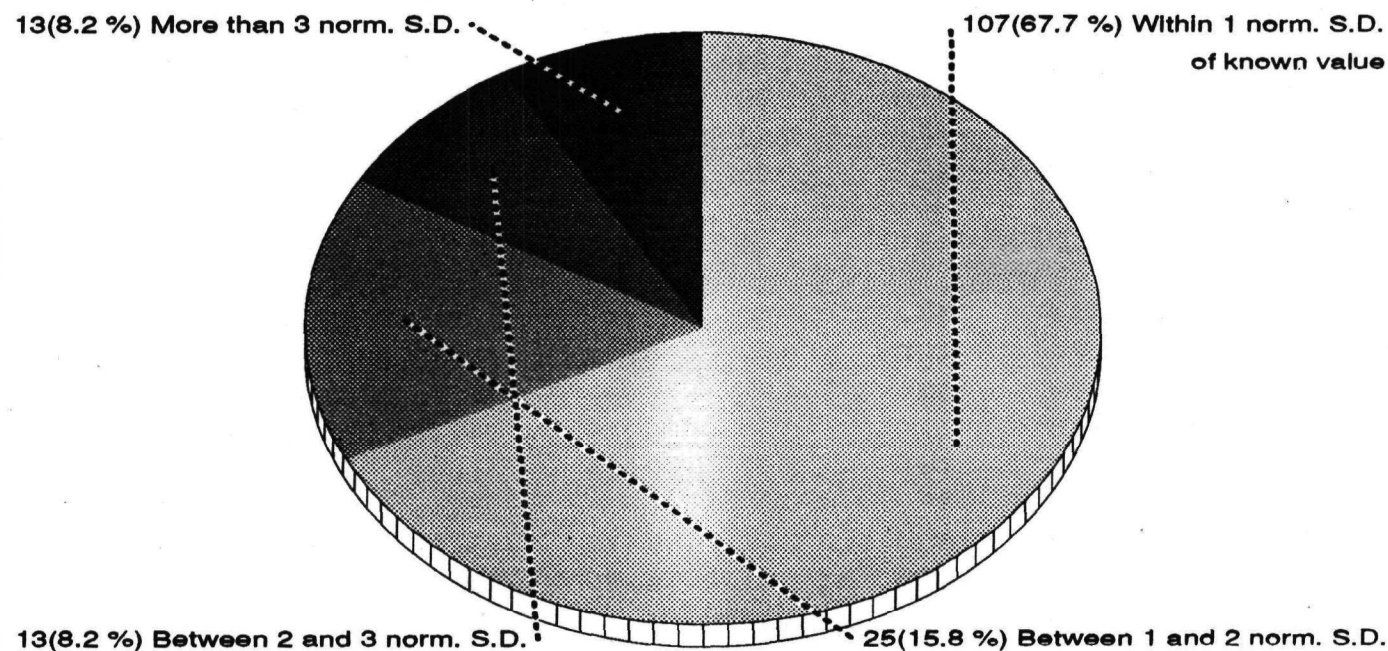
Statistical Summary

176 Participants

The known value of this nuclide is 40.0 pCi/l with an expected precision of 5.0; the control limits are 31.3 to 48.7; the warning regions are 31.3 to 34.2 and 45.8 to 48.7



Statistic	Respondents	Non-outliers
Mean	70.40	Grand Avg 40.08
Std. Dev.	336.82	3.38
Variance	113448.17	11.40
% Coef. of Var.	478.43	8.42
% deviation of mean from known value	76.00	0.19
Norm. dev. of mean from known value	0.09	0.02
Median	40.00	40.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
A	40.0	39.0	40.0	0.58	0.118	39.67	-0.14	-0.12	
AB	43.0	44.0	40.0	2.08	0.473	42.33	0.78	0.81	
AE	37.0	41.0	39.0	2.00	0.473	39.00	-0.37	-0.35	
AF	41.0	40.0	40.0	0.58	0.118	40.33	0.09	0.12	
AI	39.0	40.0	39.0	0.58	0.118	39.33	-0.26	-0.23	
AJ	42.0	44.0	42.0	1.15	0.236	42.67	0.90	0.92	
AK	40.0	37.0	38.0	1.53	0.354	38.33	-0.60	-0.58	
AL	27.0	34.0	31.0	3.51	0.827	30.67	-3.26	-3.23	↓
AN	50.0	47.0	50.0	1.73	0.354	49.00	3.09	3.12	↑
AP	43.0	42.0	41.0	1.00	0.236	42.00	0.67	0.69	
AU	41.0	38.0	37.0	2.08	0.473	38.67	-0.49	-0.46	
AW	41.0	42.0	41.0	0.58	0.118	41.33	0.43	0.46	
AY	39.0	42.0	37.0	2.52	0.591	39.33	-0.26	-0.23	
AZ									
BA	49.0	47.0	50.0	1.53	0.354	48.67	2.98	3.00	
BB	38.0	40.0	40.0	1.15	0.236	39.33	-0.26	-0.23	
BC	45.0	47.0	46.0	1.00	0.236	46.00	2.05	2.08	
BG	23.0	39.0	41.0	9.87	3.146	34.33	-1.99	-1.96	
BH	43.0	40.0	41.0	1.53	0.354	41.33	0.43	0.46	
BI	35.0	36.0	36.0	0.58	0.118	35.67	-1.53	-1.50	
BK	42.0	43.0	42.0	0.58	0.118	42.33	0.78	0.81	
BL	40.0	38.0	38.0	1.15	0.236	38.67	-0.49	-0.46	
BM	38.0	40.0	39.0	1.00	0.236	39.00	-0.37	-0.35	
BN	43.0	51.0	46.0	4.04	0.945	46.67	2.28	2.31	
BO	40.0	37.0	40.0	1.73	0.354	39.00	-0.37	-0.35	
BW	40.0	40.0	40.0	0.00	0.000	40.00	-0.03	0.00	
C	40.0	39.0	40.0	0.58	0.118	39.67	-0.14	-0.12	
CA	38.0	43.0	40.0	2.52	0.591	40.33	0.09	0.12	
CC	32.0	32.0	34.0	1.15	0.236	32.67	-2.57	-2.54	
CE	47.0	47.0	48.0	0.58	0.118	47.33	2.51	2.54	
CJ	41.0	36.0	37.0	2.65	0.591	38.00	-0.72	-0.69	
CK	35.0	34.0	41.0	3.79	0.827	36.67	-1.18	-1.15	
CO	39.0	45.0	38.0	3.79	0.827	40.67	0.20	0.23	
CP	42.0	42.0	42.0	0.00	0.000	42.00	0.67	0.69	
CQ	41.0	42.0	44.0	1.53	0.354	42.33	0.78	0.81	
CS	39.0	41.0	39.0	1.15	0.236	39.67	-0.14	-0.12	
CU									
CX	45.0	43.0	40.0	2.52	0.591	42.67	0.90	0.92	
D	42.0	42.0	42.0	0.00	0.000	42.00	0.67	0.69	
DD	40.0	34.0	39.0	3.21	0.709	37.67	-0.84	-0.81	
DE	40.0	40.0	41.0	0.58	0.118	40.33	0.09	0.12	
DG	48.0	44.0	46.0	2.00	0.473	46.00	2.05	2.08	
DH	36.0	36.0	36.0	0.00	0.000	36.00	-1.41	-1.39	
DL	37.0	37.0	38.0	0.58	0.118	37.33	-0.95	-0.92	
DM	40.0	41.0	38.0	1.53	0.354	39.67	-0.14	-0.12	

• = No data submitted

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Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
DO	43.0	39.0	40.0	2.08	0.473	40.67	0.20	0.23
DR	39.0	43.0	44.0	2.65	0.591	42.00	0.67	0.69
DT	39.0	37.0	40.0	1.53	0.354	38.67	-0.49	-0.46
DZ								•
E	42.0	42.0	40.0	1.15	0.236	41.33	0.43	0.46
EA	38.0	39.0	38.0	0.58	0.118	38.33	-0.60	-0.58
EB	40.0	40.0	40.0	0.00	0.000	40.00	-0.03	0.00
EH	41.0	38.0	39.0	1.53	0.354	39.33	-0.26	-0.23
EL	38.0	40.0	37.0	1.53	0.354	38.33	-0.60	-0.58
EN	4230.0	4250.0	4290.0	30.55	12.596	4256.67	1460.67	1460.70 ×
EW	40.0	39.0	41.0	1.00	0.236	40.00	-0.03	0.00
EX	47.0	45.0	46.0	1.00	0.236	46.00	2.05	2.08
EZ	35.0	30.0	32.0	2.52	0.591	32.33	-2.68	-2.66
FE	39.0	38.0	34.0	2.65	0.591	37.00	-1.07	-1.04
FJ	45.0	41.0	48.0	3.51	0.827	44.67	1.59	1.62
FL	41.0	42.0	41.0	0.58	0.118	41.33	0.43	0.46
FU	42.0	39.0	42.0	1.73	0.354	41.00	0.32	0.35
FZ	45.0	43.0	44.0	1.00	0.236	44.00	1.36	1.39
GE	38.0	37.0	37.0	0.58	0.118	37.33	-0.95	-0.92
GI	38.0	34.0	39.0	2.65	0.591	37.00	-1.07	-1.04
GL	39.0	40.0	42.0	1.53	0.354	40.33	0.09	0.12
HE	37.0	35.0	36.0	1.00	0.236	36.00	-1.41	-1.39
HI	38.0	42.0	38.0	2.31	0.473	39.33	-0.26	-0.23
HJ	43.0	44.0	46.0	1.53	0.354	44.33	1.47	1.50
HK	40.0	41.0	40.0	0.58	0.118	40.33	0.09	0.12
HL	40.0	40.0	40.0	0.00	0.000	40.00	-0.03	0.00
HP	31.0	37.0	31.0	3.46	0.709	33.00	-2.45	-2.42
HU								•
I	42.0	41.0	42.0	0.58	0.118	41.67	0.55	0.58
IC	41.0	39.0	42.0	1.53	0.354	40.67	0.20	0.23
II	37.0	37.0	36.0	0.58	0.118	36.67	-1.18	-1.15
IU	42.0	40.0	40.0	1.15	0.236	40.67	0.20	0.23
J	40.0	39.0	39.0	0.58	0.118	39.33	-0.26	-0.23
JE	42.0	40.0	40.0	1.15	0.236	40.67	0.20	0.23
JG								•
JR	40.0	41.0	42.0	1.00	0.236	41.00	0.32	0.35
JS	29.0	34.0	30.0	2.65	0.591	31.00	-3.14	-3.12 ↓
JY								•
K	43.0	44.0	43.0	0.58	0.118	43.33	1.13	1.15
KF	34.0	39.0	45.0	5.51	1.570	39.33	-0.26	-0.23
KH								•
KL	39.0	38.0	39.0	0.58	0.118	38.67	-0.49	-0.46
KM	41.0	39.0	38.0	1.53	0.354	39.33	-0.26	-0.23
KX	40.0	43.0	39.0	2.08	0.473	40.67	0.20	0.23
L	40.0	37.0	40.0	1.73	0.354	39.00	-0.37	-0.35

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Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	41.0	39.0	44.0	2.52	0.591	41.33	0.43	0.46	
LE	62.0	68.0	61.0	3.79	0.827	63.67	8.17	8.20	×
LF	44.0	38.0	40.0	3.06	0.709	40.67	0.20	0.23	
LM									•
LR	15.0	20.0	17.0	2.52	0.591	17.33	-7.88	-7.85	×
LT	35.0	36.0	35.0	0.58	0.118	35.33	-1.64	-1.62	
M	36.0	37.0	39.0	1.53	0.354	37.33	-0.95	-0.92	
MA	40.0	40.0	41.0	0.58	0.118	40.33	0.09	0.12	
ME	40.0	38.0	41.0	1.53	0.354	39.67	-0.14	-0.12	
MN									•
MP	39.0	40.0	42.0	1.53	0.354	40.33	0.09	0.12	
MQ	38.0	38.0	39.0	0.58	0.118	38.33	-0.60	-0.58	
MS	40.0	43.0	39.0	2.08	0.473	40.67	0.20	0.23	
MT	36.0	35.0	36.0	0.58	0.118	35.67	-1.53	-1.50	
MV									•
N	41.0	40.0	40.0	0.58	0.118	40.33	0.09	0.12	
NB	360.0	363.0	364.0	2.08	0.473	362.33	111.63	111.66	×
NH	40.0	40.0	41.0	0.58	0.118	40.33	0.09	0.12	
NI	46.0	47.0	45.0	1.00	0.236	46.00	2.05	2.08	
NJ	39.0	40.0	38.0	1.00	0.236	39.00	-0.37	-0.35	
NK									•
NO									•
NP	38.0	46.0	39.0	4.36	0.945	41.00	0.32	0.35	
NZ	51.0	45.0	46.0	3.21	0.709	47.33	2.51	2.54	
O	42.0	42.0	42.0	0.00	0.000	42.00	0.67	0.69	
OA	39.0	38.0	39.0	0.58	0.118	38.67	-0.49	-0.46	
OB	39.0	38.0	39.0	0.58	0.118	38.67	-0.49	-0.46	
OL	41.0	40.0	40.0	0.58	0.118	40.33	0.09	0.12	
OM	42.0	38.0	40.0	2.00	0.473	40.00	-0.03	0.00	
OO	40.0	41.0	38.0	1.53	0.354	39.67	-0.14	-0.12	
OT	40.0	42.0	45.0	2.52	0.591	42.33	0.78	0.81	
OZ	78.0	76.0	78.0	1.15	0.236	77.33	12.91	12.93	×
PB	39.0	38.0	38.0	0.58	0.118	38.33	-0.60	-0.58	
PC	13.0	18.0	14.0	0.58	0.118	13.33	-9.26	-9.24	×
PD	43.0	42.0	32.0	6.08	1.570	39.00	-0.37	-0.35	
PM	44.0	42.0	49.0	3.61	0.827	45.00	1.71	1.73	
PP	45.0	47.0	42.0	2.52	0.591	44.67	1.59	1.62	
PQ	40.0	39.0	44.0	2.65	0.591	41.00	0.32	0.35	
PV	46.0	45.0	45.0	0.58	0.118	45.33	1.82	1.85	
PW	39.0	36.0	37.0	1.53	0.354	37.33	-0.95	-0.92	
PX	39.0	36.0	39.0	1.73	0.354	38.00	-0.72	-0.69	
Q	37.0	38.0	40.0	1.53	0.354	38.33	-0.60	-0.58	
QB	41.0	41.0	40.0	0.58	0.118	40.67	0.20	0.23	
QJ	42.0	41.0	43.0	1.00	0.236	42.00	0.67	0.69	
QK	33.0	33.0	33.0	0.00	0.000	33.00	-2.45	-2.42	

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Cobalt-60

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
QL	40.0	40.0	43.0	1.73	0.354	41.00	0.32	0.35
QM	43.0	39.0	46.0	3.51	0.827	42.67	0.90	0.92
QO								•
QP	43.0	44.0	43.0	0.58	0.118	43.33	1.13	1.15
QT	35.0	31.0	36.0	2.65	0.591	34.00	-2.11	-2.08
QX								•
QZ	41.0	39.0	41.0	1.15	0.236	40.33	0.09	0.12
R	40.0	43.0	39.0	2.08	0.473	40.67	0.20	0.23
RH	37.0	38.0	39.0	1.00	0.236	38.00	-0.72	-0.69
RK	40.0	41.0	37.0	2.08	0.473	39.33	-0.26	-0.23
RN	38.0	42.0	39.0	2.08	0.473	39.67	-0.14	-0.12
RO	42.0	43.0	41.0	1.00	0.236	42.00	0.67	0.69
RQ	43.0	43.0	43.0	0.00	0.000	43.00	1.01	1.04
RR	40.0	41.0	38.0	1.53	0.354	39.67	-0.14	-0.12
RS								•
RU	38.0	35.0	38.0	1.73	0.354	37.00	-1.07	-1.04
RY	45.0	45.0	47.0	1.15	0.236	45.67	1.94	1.96
RZ	36.0	35.0	36.0	0.58	0.118	35.67	-1.53	-1.50
S	38.0	39.0	40.0	1.00	0.236	39.00	-0.37	-0.35
SA	22.0	15.0	24.0	4.73	1.120	20.33	-6.84	-6.81 ×
SC	44.0	42.0	40.0	2.00	0.473	42.00	0.67	0.69
SD								•
SF	37.0	36.0	40.0	2.08	0.473	37.67	-0.84	-0.81
SH								•
SI	45.0	47.0	45.0	1.15	0.236	45.67	1.94	1.96
SK	37.0	41.0	37.0	2.31	0.473	38.33	-0.60	-0.58
SM	42.0	44.0	41.0	1.53	0.354	42.33	0.78	0.81
SN	41.0	40.0	39.0	1.00	0.236	40.00	-0.03	0.00
SR	54.0	47.0	48.0	3.79	0.827	49.67	3.32	3.35 ↑
SS	38.0	41.0	40.0	1.53	0.354	39.67	-0.14	-0.12
ST	38.0	38.0	39.0	0.58	0.118	38.33	-0.60	-0.58
SU	299.0	305.0	298.0	3.79	0.827	300.67	90.27	90.30 ×
SV	42.0	45.0	40.0	2.52	0.591	42.33	0.78	0.81
SW								•
SY	31.0	32.0	35.0	2.08	0.473	32.67	-2.57	-2.54
T	37.0	36.0	38.0	1.00	0.236	37.00	-1.07	-1.04
U	36.0	40.0	39.0	2.08	0.473	38.33	-0.60	-0.58
W	37.0	38.0	38.0	0.58	0.118	37.67	-0.84	-0.81
X	43.0	43.0	45.0	1.15	0.236	43.67	1.24	1.27
Y	39.0	37.0	39.0	1.15	0.236	38.33	-0.60	-0.58
Z	40.0	40.0	39.0	0.58	0.118	39.67	-0.14	-0.12

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
13.33	×	PC	17.33	×	LR	20.33	×	SA

• = No data submitted

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Cobalt-60**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
30.67	↓	AL	38.67		DT	40.33		CA
31.00	↓	JS	38.67		BL	40.33		AF
32.33		EZ	38.67		AU	40.67		R
32.67		SY	39.00		S	40.67		QB
32.67		CC	39.00		PD	40.67		MS
33.00		QK	39.00		NJ	40.67		LF
33.00		HP	39.00		L	40.67		KX
34.00		QT	39.00		BO	40.67		JE
34.33		BG	39.00		BM	40.67		IU
35.33		LT	39.00		AE	40.67		IC
35.67		RZ	39.33		RK	40.67		DO
35.67		MT	39.33		KM	40.67		CO
35.67		BI	39.33		KF	41.00		QL
36.00		HE	39.33		J	41.00		PQ
36.00		DH	39.33		HI	41.00		NP
36.67		II	39.33		EH	41.00		JR
36.67		CK	39.33		BB	41.00		FU
37.00		T	39.33		AY	41.33		LA
37.00		RU	39.33		AI	41.33		FL
37.00		GI	39.67		Z	41.33		E
37.00		FE	39.67		SS	41.33		BH
37.33		PW	39.67		RR	41.33		AW
37.33		M	39.67		RN	41.67		I
37.33		GE	39.67		OO	42.00		SC
37.33		DL	39.67		ME	42.00		RO
37.67		W	39.67		DM	42.00		QJ
37.67		SF	39.67		CS	42.00		O
37.67		DD	39.67		C	42.00		DR
38.00		RH	39.67		A	42.00		D
38.00		PX	40.00		SN	42.00		CP
38.00		CJ	40.00		OM	42.00		AP
38.33		Y	40.00		HL	42.33		SV
38.33		U	40.00		EW	42.33		SM
38.33		ST	40.00		EB	42.33		OT
38.33		SK	40.00		BW	42.33		CQ
38.33		Q	40.33		QZ	42.33		BK
38.33		PB	40.33		OL	42.33		AB
38.33		MQ	40.33		NH	42.67		QM
38.33		EL	40.33		N	42.67		CX
38.33		EA	40.33		MP	42.67		AJ
38.33		AK	40.33		MA	43.00		RQ
38.67		OB	40.33		HK	43.33		QP
38.67		OA	40.33		GL	43.33		K
38.67		KL	40.33		DE	43.67		X

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

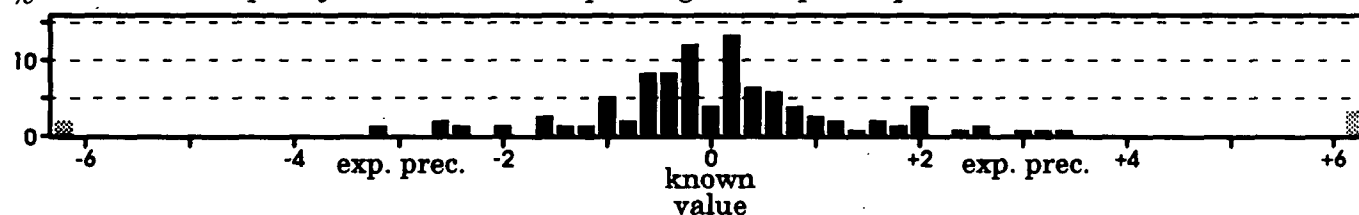
× = Determined to be an outlier

↓ = Below control limit

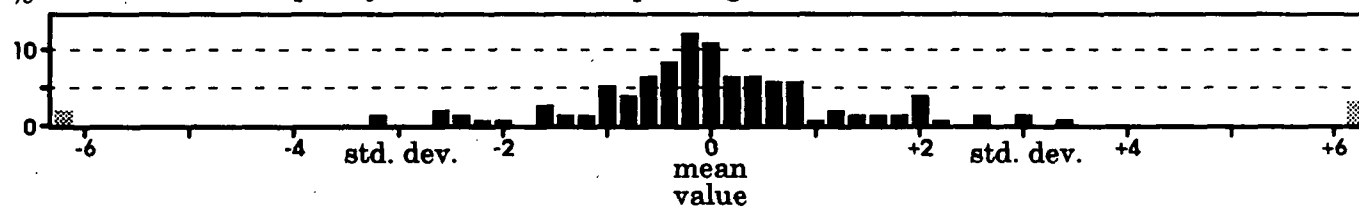
Cobalt-60**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
44.00		FZ	45.67		RY	48.67		BA
44.33		HJ	46.00		NI	49.00	↑	AN
44.67		PP	46.00		EX	49.67	↑	SR
44.67		FJ	46.00		DG	63.67	×	LE
45.00		PM	46.00		BC	77.33	×	OZ
45.33		PV	46.67		BN	300.67	×	SU
45.67		SI	47.33		NZ	362.33	×	NB
			47.33		CE	4256.67	×	EN

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



• ≡ No data submitted

○ ≡ Insufficient data

TAG SYMBOLS

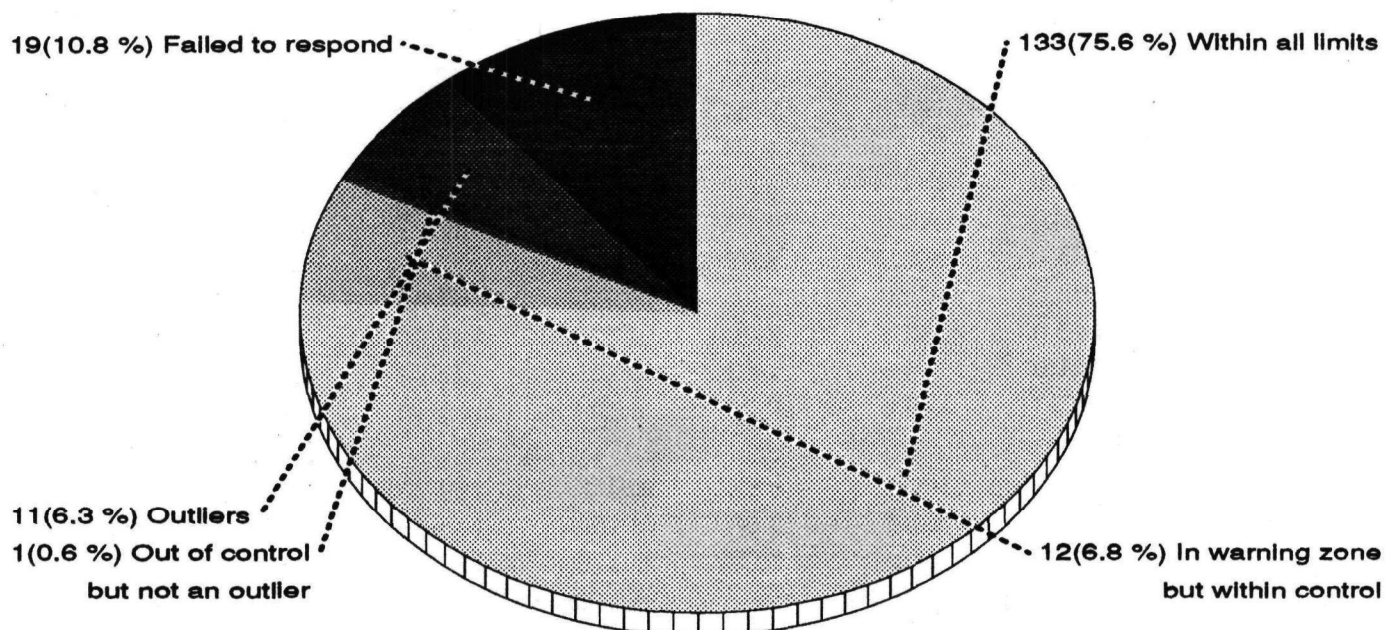
× ≡ Determined to be an outlier

↑ ≡ Above control limit

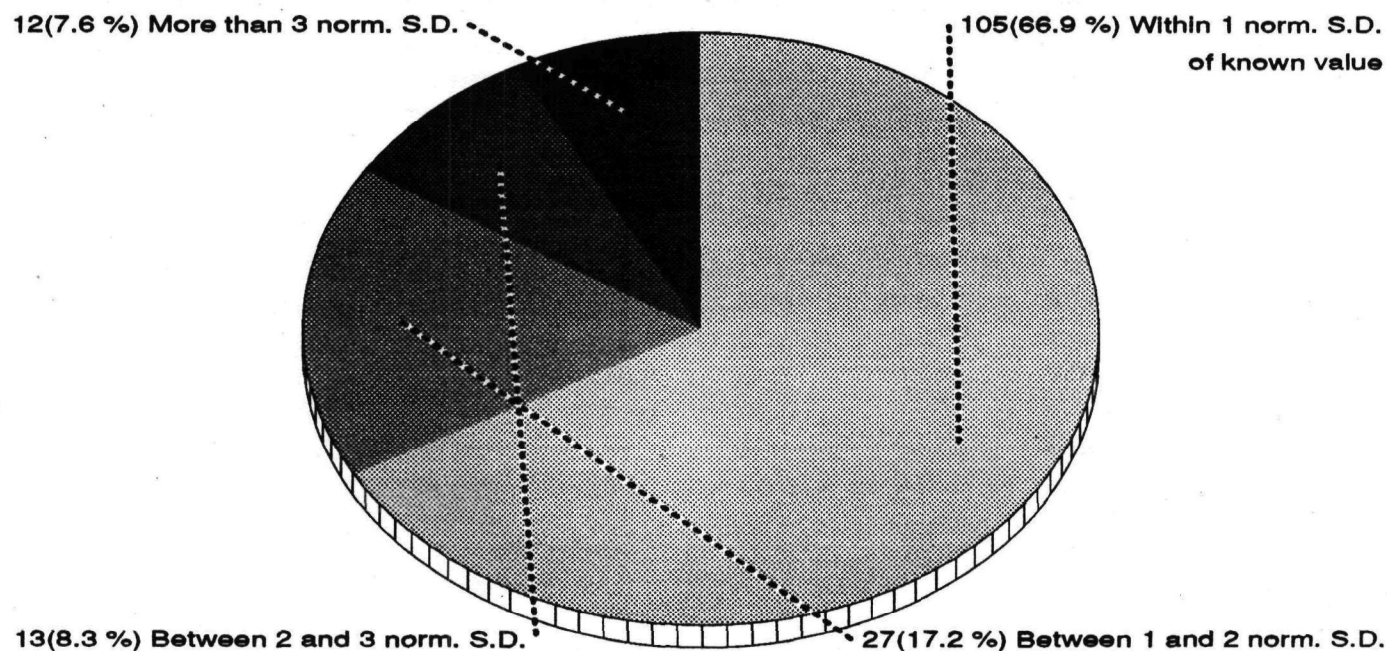
↓ ≡ Below control limit

Zinc-65**Statistical Summary****176 Participants**

The known value of this nuclide is 148.0 pCi/l with an expected precision of 15.0; the control limits are 122.0 to 174.0; the warning regions are 122.0 to 130.6 and 165.4 to 174.0



Statistic	Respondents	Non-outliers
Mean	156.06	Grand Avg 148.85
Std. Dev.	85.28	9.10
Variance	7273.28	82.75
% Coef. of Var.	54.65	6.11
% deviation of mean from known value	5.44	0.57
Norm. dev. of mean from known value	0.09	0.09
Median	148.00	148.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
A	140.0	150.0	150.0	5.77	0.394	146.67	-0.25	-0.15	
AB	138.0	145.0	151.0	6.51	0.512	144.67	-0.48	-0.38	
AE	151.0	157.0	151.0	3.46	0.236	153.00	0.48	0.58	
AF	155.0	148.0	145.0	5.13	0.394	149.33	0.06	0.15	
AI	151.0	145.0	149.0	3.06	0.236	148.33	-0.06	0.04	
AJ	161.0	165.0	169.0	4.00	0.315	165.00	1.87	1.96	
AK	143.0	142.0	137.0	3.21	0.236	140.67	-0.94	-0.85	
AL	137.0	136.0	146.0	5.51	0.394	139.67	-1.06	-0.96	
AN	179.0	175.0	162.0	8.89	0.669	172.00	2.67	2.77	
AP	153.0	153.0	151.0	1.15	0.079	152.33	0.40	0.50	
AU	140.0	144.0	142.0	2.00	0.158	142.00	-0.79	-0.69	
AW	142.0	141.0	144.0	1.53	0.118	142.33	-0.75	-0.65	
AY	138.0	143.0	148.0	5.00	0.394	143.00	-0.68	-0.58	
AZ									•
BA	171.0	163.0	174.0	5.69	0.433	169.33	2.37	2.46	
BB	147.0	148.0	151.0	2.08	0.158	148.67	-0.02	0.08	
BC	177.0	177.0	180.0	1.73	0.118	178.00	3.37	3.46	↑
BG	108.0	95.0	99.0	6.66	0.512	100.67	-5.56	-5.47	×
BH	157.0	145.0	148.0	6.24	0.473	150.00	0.13	0.23	
BI	135.0	136.0	136.0	0.58	0.039	135.67	-1.52	-1.42	
BK	153.0	150.0	159.0	4.58	0.354	154.00	0.60	0.69	
BL	145.0	144.0	136.0	4.93	0.354	141.67	-0.83	-0.73	
BM	144.0	145.0	150.0	3.21	0.236	146.33	-0.29	-0.19	
BN	144.0	150.0	158.0	7.02	0.551	150.67	0.21	0.31	
BO	150.0	150.0	160.0	5.77	0.394	153.33	0.52	0.62	
BW	120.0	130.0	125.0	5.00	0.394	125.00	-2.75	-2.66	
C	160.0	158.0	164.0	3.06	0.236	160.67	1.36	1.46	
CA	148.0	150.0	154.0	3.06	0.236	150.67	0.21	0.31	
CC	114.0	106.0	122.0	8.00	0.630	114.00	-4.02	-3.93	×
CE	430.0	413.0	443.0	15.04	1.345	428.67	32.31	32.41	×
CJ	144.0	147.0	144.0	1.73	0.118	145.00	-0.44	-0.35	
CK	127.0	142.0	149.0	11.24	0.866	139.33	-1.10	-1.00	
CO	151.0	145.0	168.0	11.93	0.906	154.67	0.67	0.77	
CP	156.0	156.0	156.0	0.00	0.000	156.00	0.83	0.92	
CQ	158.0	158.0	162.0	2.31	0.158	159.33	1.21	1.31	
CS	150.0	160.0	160.0	5.77	0.394	156.67	0.90	1.00	
CU									•
CX	151.0	157.0	140.0	8.62	0.669	149.33	0.06	0.15	
D	166.0	163.0	166.0	1.73	0.118	165.00	1.87	1.96	
DD	151.0	140.0	153.0	7.00	0.512	148.00	-0.10	0.00	
DE	150.0	150.0	150.0	0.00	0.000	150.00	0.13	0.23	
DG	144.0	148.0	153.0	4.51	0.354	148.33	-0.06	0.04	
DH	145.0	146.0	146.0	0.58	0.039	145.67	-0.37	-0.27	
DL	136.0	139.0	145.0	4.58	0.354	140.00	-1.02	-0.92	
DM	147.0	146.0	151.0	2.65	0.197	148.00	-0.10	0.00	

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Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
DO								•
DR	174.0	164.0	162.0	6.43	0.473	166.67	2.06	2.16
DT	141.0	143.0	147.0	3.06	0.236	143.67	-0.60	-0.50
DZ								•
E	150.0	156.0	149.0	3.79	0.276	151.67	0.33	0.42
EA	150.0	149.0	152.0	1.53	0.118	150.33	0.17	0.27
EB	156.0	158.0	159.0	1.53	0.118	157.67	1.02	1.12
EH	141.0	152.0	148.0	5.57	0.433	147.00	-0.21	-0.12
EL	151.0	150.0	142.0	4.93	0.354	147.67	-0.14	-0.04
EN	230.0	259.0	237.0	15.13	1.270	242.00	10.76	10.85 ×
EW	144.0	136.0	138.0	4.16	0.315	139.33	-1.10	-1.00
EX	147.0	183.0	156.0	18.73	1.795	162.00	1.52	1.62
EZ	146.0	131.0	112.0	17.04	1.645	129.67	-2.21	-2.12
FE	140.0	140.0	140.0	0.00	0.000	140.00	-1.02	-0.92
FJ	132.0	136.0	132.0	2.31	0.158	133.33	-1.79	-1.69
FL	159.0	160.0	150.0	5.51	0.394	156.33	0.86	0.96
FU	157.0	158.0	159.0	1.00	0.079	158.00	1.06	1.15
FZ	164.0	159.0	160.0	2.65	0.197	161.00	1.40	1.50
GE	145.0	139.0	136.0	4.58	0.354	140.00	-1.02	-0.92
GI	144.0	135.0	150.0	7.55	0.591	143.00	-0.68	-0.58
GL	147.0	147.0	144.0	1.73	0.118	146.00	-0.33	-0.23
HE	147.0	143.0	144.0	2.08	0.158	144.67	-0.48	-0.38
HI	147.0	151.0	132.0	10.02	0.748	143.33	-0.64	-0.54
HJ	152.0	144.0	166.0	11.14	0.866	154.00	0.60	0.69
HK	147.0	148.0	147.0	0.58	0.039	147.33	-0.17	-0.08
HL	147.0	147.0	147.0	0.00	0.000	147.00	-0.21	-0.12
HP	146.0	144.0	143.0	1.53	0.118	144.33	-0.52	-0.42
HU								•
I	150.0	153.0	149.0	2.08	0.158	150.67	0.21	0.31
IC	153.0	154.0	160.0	3.79	0.276	155.67	0.79	0.89
II	146.0	155.0	153.0	4.73	0.354	151.33	0.29	0.38
IU	143.0	157.0	151.0	7.02	0.551	150.33	0.17	0.27
J	151.0	152.0	150.0	1.00	0.079	151.00	0.25	0.35
JE	148.0	147.0	143.0	2.65	0.197	146.00	-0.33	-0.23
JG								•
JR	150.0	146.0	150.0	2.31	0.158	148.67	-0.02	0.08
JS	152.0	138.0	136.0	8.72	0.630	142.00	-0.79	-0.69
JY								•
K	161.0	163.0	163.0	1.15	0.079	162.33	1.56	1.66
KF	124.0	128.0	173.0	27.21	2.771	141.67	-0.83	-0.73
KH								•
KL	142.0	141.0	140.0	1.00	0.079	141.00	-0.91	-0.81
KM	144.0	149.0	150.0	3.21	0.236	147.67	-0.14	-0.04
KX	143.0	147.0	149.0	3.06	0.236	146.33	-0.29	-0.19
L	142.0	144.0	147.0	2.52	0.197	144.33	-0.52	-0.42

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Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	140.0	147.0	147.0	4.04	0.276	144.67	-0.48	-0.38	
LE	235.0	225.0	266.0	21.38	2.170	242.00	10.76	10.85	x
LF	140.0	150.0	150.0	5.77	0.394	146.67	-0.25	-0.15	
LM									•
LR	73.0	65.0	66.0	4.36	0.315	68.00	-9.34	-9.24	x
LT	161.0	159.0	163.0	2.00	0.158	161.00	1.40	1.50	
M	152.0	151.0	149.0	1.53	0.118	150.67	0.21	0.31	
MA	162.0	149.0	156.0	6.51	0.512	155.67	0.79	0.89	
ME	150.0	151.0	151.0	0.58	0.039	150.67	0.21	0.31	
MN									•
MP	146.0	141.0	142.0	2.65	0.197	143.00	-0.68	-0.58	
MQ	144.0	146.0	147.0	1.53	0.118	145.67	-0.37	-0.27	
MS	152.0	147.0	141.0	5.51	0.433	146.67	-0.25	-0.15	
MT	140.0	143.0	138.0	2.52	0.197	140.33	-0.98	-0.89	
MV									•
N	142.0	144.0	142.0	1.15	0.079	142.67	-0.71	-0.62	
NB	235.0	234.0	230.0	2.65	0.197	233.00	9.72	9.81	x
NH	142.0	138.0	137.0	2.65	0.197	139.00	-1.14	-1.04	
NI	153.0	135.0	138.0	9.64	0.709	142.00	-0.79	-0.69	
NJ	150.0	150.0	150.0	0.00	0.000	150.00	0.13	0.23	
NK									•
NO									•
NP	153.0	155.0	131.0	13.32	0.945	146.33	-0.29	-0.19	
NZ	133.0	136.0	134.0	1.53	0.118	134.33	-1.68	-1.58	
O	156.0	155.0	154.0	1.00	0.079	155.00	0.71	0.81	
OA	147.0	144.0	148.0	2.08	0.158	146.33	-0.29	-0.19	
OB	144.0	141.0	144.0	1.73	0.118	143.00	-0.68	-0.58	
OL	146.0	150.0	146.0	2.31	0.158	147.33	-0.17	-0.08	
OM	149.0	149.0	148.0	0.58	0.039	148.67	-0.02	0.08	
OO	115.0	109.0	115.0	3.46	0.236	113.00	-4.14	-4.04	x
OT	147.0	160.0	166.0	9.71	0.748	157.67	1.02	1.12	
OZ	143.0	144.0	156.0	7.23	0.512	147.67	-0.14	-0.04	
PB	126.0	132.0	133.0	3.79	0.276	130.33	-2.14	-2.04	
PC	55.0	61.0	56.0	3.21	0.236	57.33	-10.57	-10.47	x
PD	122.0	161.0	148.0	19.86	2.020	143.67	-0.60	-0.50	
PM	158.0	143.0	144.0	8.39	0.591	148.33	-0.06	0.04	
PP	163.0	172.0	161.0	5.86	0.433	165.33	1.90	2.00	
PQ	151.0	147.0	157.0	5.03	0.394	151.67	0.33	0.42	
PV	166.0	170.0	169.0	2.08	0.158	168.33	2.25	2.35	
PW	144.0	139.0	128.0	8.19	0.630	137.00	-1.37	-1.27	
PX	145.0	146.0	142.0	2.08	0.158	144.33	-0.52	-0.42	
Q	149.0	149.0	155.0	3.46	0.236	151.00	0.25	0.35	
QB	147.0	146.0	154.0	4.36	0.315	149.00	0.02	0.12	
QJ	151.0	147.0	154.0	3.51	0.276	150.67	0.21	0.31	
QK	124.0	129.0	126.0	2.52	0.197	126.33	-2.60	-2.50	

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Zinc-65

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
QL	160.0	160.0	162.0	1.15	0.079	160.67	1.36	1.46
QM	153.0	148.0	143.0	5.00	0.394	148.00	-0.10	0.00
QO								•
QP	156.0	149.0	153.0	3.51	0.276	152.67	0.44	0.54
QT	135.0	138.0	144.0	4.58	0.354	139.00	-1.14	-1.04
QX								•
QZ	163.0	151.0	161.0	6.43	0.473	158.33	1.10	1.19
R	147.0	152.0	148.0	2.65	0.197	149.00	0.02	0.12
RH	129.0	127.0	132.0	2.52	0.197	129.33	-2.25	-2.16
RK	150.0	147.0	169.0	11.93	0.866	155.33	0.75	0.85
RN	152.0	154.0	157.0	2.52	0.197	154.33	0.63	0.73
RO	163.0	161.0	154.0	4.73	0.354	159.33	1.21	1.31
RQ	160.0	160.0	160.0	0.00	0.000	160.00	1.29	1.39
RR	154.0	154.0	155.0	0.58	0.039	154.33	0.63	0.73
RS								•
RU	135.0	136.0	135.0	0.58	0.039	135.33	-1.56	-1.46
RY	152.0	149.0	157.0	4.04	0.315	152.67	0.44	0.54
RZ	167.0	168.0	167.0	0.58	0.039	167.33	2.13	2.23
S	147.0	143.0	142.0	2.65	0.197	144.00	-0.56	-0.46
SA	25.0	20.0	30.0	5.00	0.394	25.00	-14.30	-14.20 ×
SC	155.0	160.0	150.0	5.00	0.394	155.00	0.71	0.81
SD								•
SF	152.0	139.0	143.0	6.66	0.512	144.67	-0.48	-0.38
SH								•
SI	171.0	166.0	163.0	4.04	0.315	166.67	2.06	2.16
SK	150.0	157.0	146.0	5.57	0.433	151.00	0.25	0.35
SM	142.0	140.0	157.0	9.29	0.669	146.33	-0.29	-0.19
SN	161.0	138.0	148.0	11.53	0.906	149.00	0.02	0.12
SR	138.0	154.0	149.0	8.19	0.630	147.00	-0.21	-0.12
SS	141.0	145.0	154.0	6.66	0.512	146.67	-0.25	-0.15
ST	129.0	134.0	147.0	9.29	0.709	136.67	-1.41	-1.31
SU	1148.0	1142.0	1146.0	3.06	0.236	1145.33	115.06	115.16 ×
SV	185.0	152.0	168.0	16.50	1.570	168.33	2.25	2.35
SW								•
SY	134.0	134.0	152.0	10.39	0.709	140.00	-1.02	-0.92
T	144.0	142.0	142.0	1.15	0.079	142.67	-0.71	-0.62
U	134.0	131.0	142.0	5.69	0.433	135.67	-1.52	-1.42
W	154.0	139.0	144.0	7.64	0.591	145.67	-0.37	-0.27
X	157.0	157.0	155.0	1.15	0.079	156.33	0.86	0.96
Y	145.0	136.0	146.0	5.51	0.394	142.33	-0.75	-0.65
Z	148.0	140.0	149.0	4.93	0.354	145.67	-0.37	-0.27

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
25.00	×	SA	57.33	×	PC	68.00	×	LR

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Zinc-65

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
100.67	×	BG	144.33		PX	149.33		AF
113.00	×	OO	144.33		L	150.00		NJ
114.00	×	CC	144.33		HP	150.00		DE
125.00		BW	144.67		SF	150.00		BH
126.33		QK	144.67		LA	150.33		IU
129.33		RH	144.67		HE	150.33		EA
129.67		EZ	144.67		AB	150.67		QJ
130.33		PB	145.00		CJ	150.67		ME
133.33		FJ	145.67		Z	150.67		M
134.33		NZ	145.67		W	150.67		I
135.33		RU	145.67		MQ	150.67		CA
135.67		U	145.67		DH	150.67		BN
135.67		BI	146.00		JE	151.00		SK
136.67		ST	146.00		GL	151.00		Q
137.00		PW	146.33		SM	151.00		J
139.00		QT	146.33		OA	151.33		II
139.00		NH	146.33		NP	151.67		PQ
139.33		EW	146.33		KX	151.67		E
139.33		CK	146.33		BM	152.33		AP
139.67		AL	146.67		SS	152.67		RY
140.00		SY	146.67		MS	152.67		QP
140.00		GE	146.67		LF	153.00		AE
140.00		FE	146.67		A	153.33		BO
140.00		DL	147.00		SR	154.00		HJ
140.33		MT	147.00		HL	154.00		BK
140.67		AK	147.00		EH	154.33		RR
141.00		KL	147.33		OL	154.33		RN
141.67		KF	147.33		HK	154.67		CO
141.67		BL	147.67		OZ	155.00		SC
142.00		NI	147.67		KM	155.00		O
142.00		JS	147.67		EL	155.33		RK
142.00		AU	148.00		QM	155.67		MA
142.33		Y	148.00		DM	155.67		IC
142.33		AW	148.00		DD	156.00		CP
142.67		T	148.33		PM	156.33		X
142.67		N	148.33		DG	156.33		FL
143.00		OB	148.33		AI	156.67		CS
143.00		MP	148.67		OM	157.67		OT
143.00		GI	148.67		JR	157.67		EB
143.00		AY	148.67		BB	158.00		FU
143.33		HI	149.00		SN	158.33		QZ
143.67		PD	149.00		R	159.33		RO
143.67		DT	149.00		QB	159.33		CQ
144.00		S	149.33		CX	160.00		RQ

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

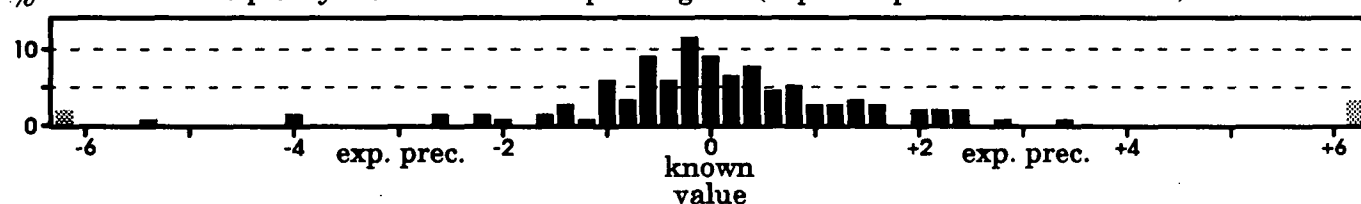
× = Determined to be an outlier

↓ = Below control limit

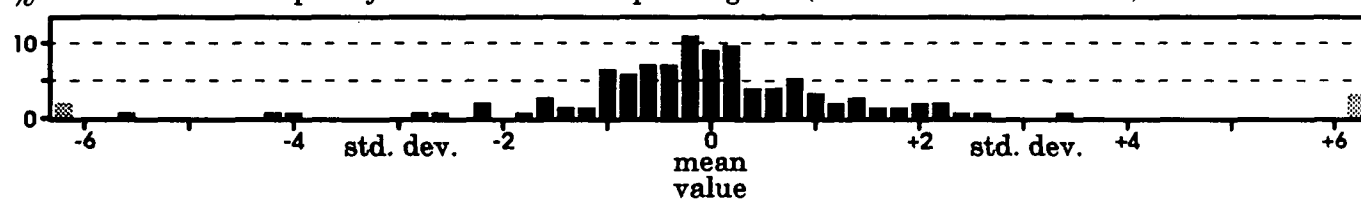
Zinc-65**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
160.67		QL	165.00		AJ	169.33		BA
160.67		C	165.33		PP	172.00		AN
161.00		LT	166.67		SI	178.00	↑	BC
161.00		FZ	166.67		DR	233.00	×	NB
162.00		EX	167.33		RZ	242.00	×	LE
162.33		K	168.33		SV	242.00	×	EN
165.00		D	168.33		PV	428.67	×	CE
						1145.33	×	SU

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



• ≡ No data submitted

TAG SYMBOLS

↑ ≡ Above control limit

∅ ≡ Insufficient data

× ≡ Determined to be an outlier

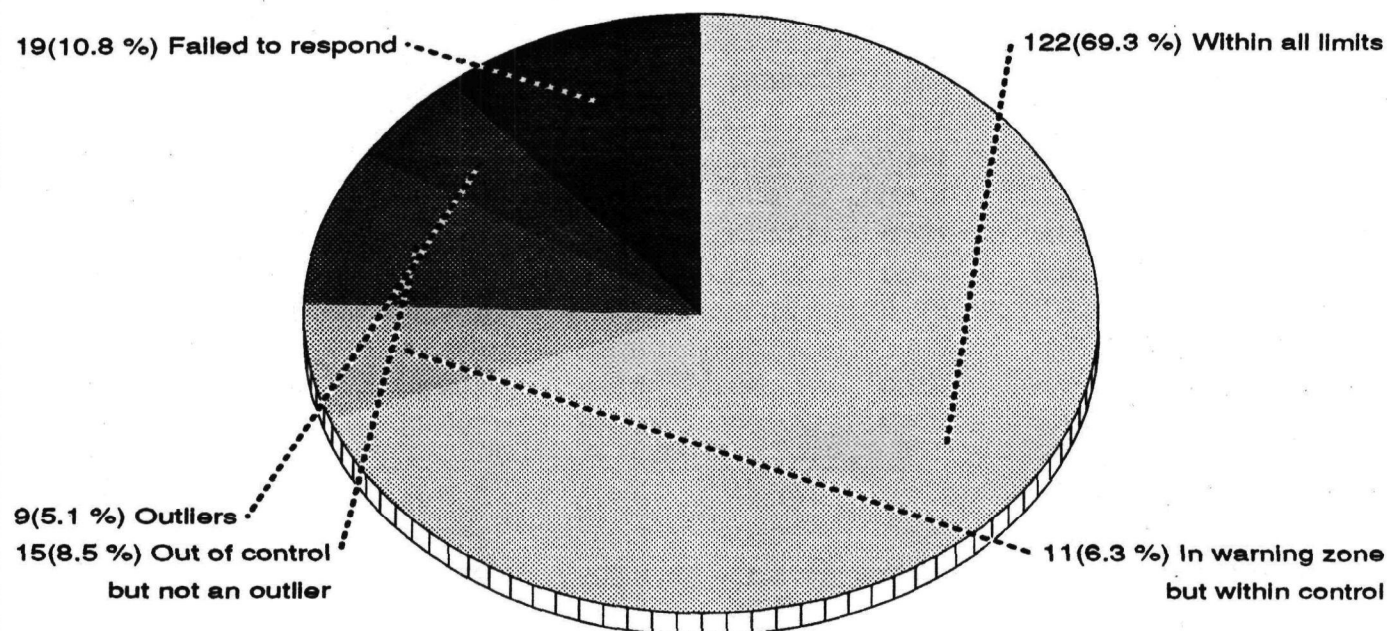
↓ ≡ Below control limit

Ruthenium-106

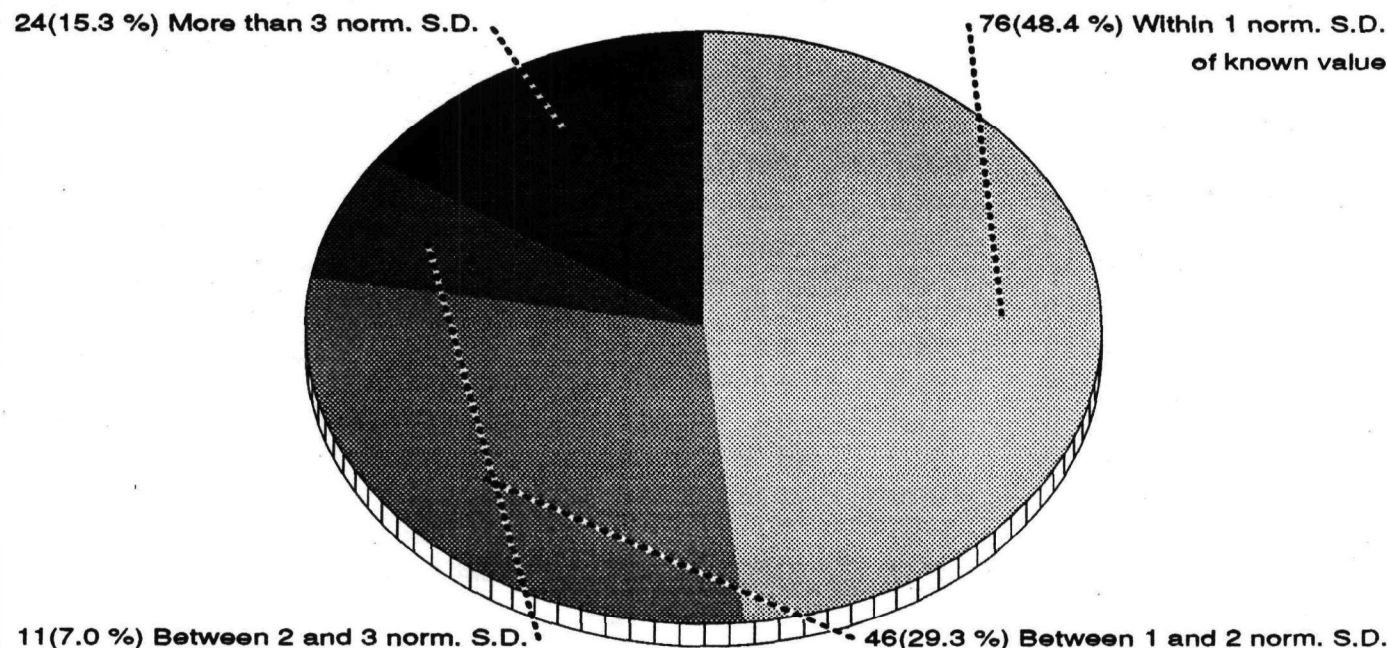
Statistical Summary

176 Participants

The known value of this nuclide is 203.0 pCi/l with an expected precision of 20.0; the control limits are 168.3 to 237.7; the warning regions are 168.3 to 179.8 and 226.2 to 237.7



Statistic	Respondents	Non-outliers
Mean	198.18	Grand Avg 194.62
Std. Dev.	95.70	18.29
Variance	9158.05	334.62
% Coef. of Var.	48.29	9.40
% deviation of mean from known value	-2.38	-4.13
Norm. dev. of mean from known value	-0.05	-0.46
Median	195.33	195.33
% deviation of median from known value	-3.78	-3.78
Norm. dev. of median from known value	-0.08	-0.42



Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
A	196.0	196.0	185.0	6.35	0.325	192.33	-0.20	-0.92	
AB	189.0	183.0	175.0	7.02	0.413	182.33	-1.06	-1.79	
AE	191.0	193.0	188.0	2.52	0.148	190.67	-0.34	-1.07	
AF	226.0	178.0	206.0	24.11	1.795	203.33	0.75	0.03	
AI	195.0	196.0	191.0	2.65	0.148	194.00	-0.05	-0.78	
AJ	190.0	186.0	194.0	4.00	0.236	190.00	-0.40	-1.13	
AK	191.0	184.0	194.0	5.13	0.295	189.67	-0.43	-1.15	
AL	201.0	223.0	229.0	14.74	0.827	217.67	2.00	1.27	
AN	228.0	194.0	215.0	17.16	1.008	212.33	1.53	0.81	
AP	217.0	196.0	175.0	21.00	1.458	196.00	0.12	-0.61	
AU	220.0	210.0	190.0	15.28	0.886	206.67	1.04	0.32	
AW	200.0	208.0	209.0	4.93	0.266	205.67	0.96	0.23	
AY	197.0	221.0	168.0	26.54	2.077	195.33	0.06	-0.66	
AZ									•
BA	190.0	221.0	217.0	16.86	0.916	209.33	1.27	0.55	
BB	186.0	185.0	185.0	0.58	0.030	185.33	-0.80	-1.53	
BC	224.0	220.0	207.0	8.89	0.502	217.00	1.94	1.21	
BG	159.0	123.0	131.0	18.90	1.120	137.67	-4.93	-5.66	↓
BH	230.0	196.0	202.0	18.15	1.008	209.33	1.27	0.55	
BI	171.0	169.0	167.0	2.00	0.118	169.00	-2.22	-2.94	
BK	197.0	212.0	210.0	8.14	0.443	206.33	1.01	0.29	
BL	183.0	169.0	194.0	12.53	0.738	182.00	-1.09	-1.82	
BM	189.0	192.0	199.0	5.13	0.295	193.33	-0.11	-0.84	
BN	204.0	231.0	201.0	16.52	0.886	212.00	1.51	0.78	
BO	180.0	200.0	180.0	11.55	0.591	186.67	-0.69	-1.41	
BW	26.0	23.0	25.0	1.53	0.089	24.67	-14.72	-15.44	×
C	205.0	210.0	207.0	2.52	0.148	207.33	1.10	0.38	
CA	205.0	183.0	178.0	14.36	0.797	188.67	-0.52	-1.24	
CC	131.0	131.0	151.0	11.55	0.591	137.67	-4.93	-5.66	↓
CE	394.0	380.0	401.0	10.69	0.620	391.67	17.06	16.34	×
CJ	171.0	214.0	188.0	21.66	1.514	191.00	-0.31	-1.04	
CK	198.0	178.0	192.0	10.26	0.591	189.33	-0.46	-1.18	
CO	197.0	218.0	172.0	23.03	1.683	195.67	0.09	-0.64	
CP	207.0	207.0	207.0	0.00	0.000	207.00	1.07	0.35	
CQ	170.0	169.0	182.0	7.23	0.384	173.67	-1.81	-2.54	
CS	180.0	210.0	200.0	15.28	0.886	196.67	0.18	-0.55	
CU									•
CX	209.0	214.0	213.0	2.65	0.148	212.00	1.51	0.78	
D	183.0	185.0	178.0	3.61	0.207	182.00	-1.09	-1.82	
DD	176.0	182.0	192.0	8.08	0.473	183.33	-0.98	-1.70	
DE	196.0	197.0	197.0	0.58	0.030	196.67	0.18	-0.55	
DG	169.0	146.0	138.0	16.09	0.916	151.00	-3.78	-4.50	↓
DH	187.0	185.0	187.0	1.15	0.059	186.33	-0.72	-1.44	
DL	147.0	153.0	160.0	6.51	0.384	153.33	-3.58	-4.30	↓
DM	184.0	185.0	185.0	0.58	0.030	184.67	-0.86	-1.59	

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× = Determined to be an outlier

↓ = Below control limit

Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
DO									•
DR	193.0	213.0	218.0	13.23	0.738	208.00	1.16	0.43	
DT	136.0	165.0	190.0	27.02	2.133	163.67	-2.68	-3.41	↓
DZ									•
E	189.0	203.0	196.0	7.00	0.413	196.00	0.12	-0.61	
EA	215.0	211.0	202.0	6.66	0.384	209.33	1.27	0.55	
EB	181.0	188.0	188.0	4.04	0.207	185.67	-0.78	-1.50	
EH	182.0	181.0	194.0	7.23	0.384	185.67	-0.78	-1.50	
EL	198.0	199.0	217.0	10.69	0.561	204.67	0.87	0.14	
EN	373.0	163.0	225.0	107.90	10.909	253.67	5.11	4.39	↑↑
EW	165.0	176.0	192.0	13.58	0.797	177.67	-1.47	-2.19	
EX	246.0	253.0	219.0	17.95	1.008	239.33	3.87	3.15	↑↑
EZ	173.0	156.0	147.0	13.20	0.768	158.67	-3.11	-3.84	↓
FE	170.0	180.0	170.0	5.77	0.295	173.33	-1.84	-2.57	
FJ	142.0	196.0	226.0	42.57	3.821	188.00	-0.57	-1.30	
FL	208.0	199.0	200.0	4.93	0.266	202.33	0.67	-0.06	
FU	174.0	189.0	194.0	10.41	0.591	185.67	-0.78	-1.50	
FZ	189.0	218.0	185.0	18.01	0.975	197.33	0.23	-0.49	
GE	160.0	153.0	147.0	6.51	0.384	153.33	-3.58	-4.30	↓
GI	193.0	189.0	179.0	7.21	0.413	187.00	-0.66	-1.39	
GL	190.0	162.0	188.0	15.62	0.827	180.00	-1.27	-1.99	
HE	201.0	197.0	199.0	2.00	0.118	199.00	0.38	-0.35	
HI	177.0	155.0	150.0	14.36	0.797	160.67	-2.94	-3.67	↓
HJ	170.0	180.0	190.0	10.00	0.591	180.00	-1.27	-1.99	
HK	204.0	202.0	195.0	4.73	0.266	200.33	0.49	-0.23	
HL	193.0	193.0	193.0	0.00	0.000	193.00	-0.14	-0.87	
HP	197.0	215.0	210.0	9.29	0.532	207.33	1.10	0.38	
HU									•
I	206.0	168.0	243.0	37.50	3.314	205.67	0.96	0.23	
IC	176.0	193.0	219.0	21.66	1.514	196.00	0.12	-0.61	
II	96.0	92.0	85.0	5.57	0.325	91.00	-8.97	-9.70	×
IU	187.0	186.0	185.0	1.00	0.059	186.00	-0.75	-1.47	
J	178.0	185.0	182.0	3.51	0.207	181.67	-1.12	-1.85	
JE	208.0	197.0	186.0	11.00	0.650	197.00	0.21	-0.52	
JG									•
JR	205.0	199.0	203.0	3.06	0.177	202.33	0.67	-0.06	
JS	213.0	204.0	219.0	7.55	0.443	212.00	1.51	0.78	
JY									•
K	155.0	183.0	195.0	20.53	1.345	177.67	-1.47	-2.19	
KF	169.0	232.0	245.0	40.65	3.371	215.33	1.79	1.07	
KH									•
KL	196.0	197.0	188.0	4.93	0.266	193.67	-0.08	-0.81	
KM	209.0	198.0	216.0	9.07	0.532	207.67	1.13	0.40	
KX	205.0	226.0	209.0	11.15	0.620	213.33	1.62	0.89	
L	213.0	189.0	184.0	15.50	0.856	195.33	0.06	-0.66	

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Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	192.0	205.0	194.0	7.00	0.384	197.00	0.21	-0.52	
LE	230.0	281.0	205.0	38.73	3.371	238.67	3.81	3.09	↑
LF	190.0	200.0	190.0	5.77	0.295	193.33	-0.11	-0.84	
LM									•
LR	54.0	55.0	52.0	1.53	0.089	53.67	-12.21	-12.93	×
LT	233.0	230.0	233.0	1.73	0.089	232.00	3.24	2.51	
M	179.0	182.0	176.0	3.00	0.177	179.00	-1.35	-2.08	
MA	185.0	183.0	180.0	2.52	0.148	182.67	-1.04	-1.76	
ME	201.0	191.0	189.0	6.43	0.354	193.67	-0.08	-0.81	
MN									•
MP	198.0	195.0	187.0	5.69	0.325	193.33	-0.11	-0.84	
MQ	191.0	204.0	202.0	7.00	0.384	199.00	0.38	-0.35	
MS	184.0	189.0	180.0	4.51	0.266	184.33	-0.89	-1.62	
MT	188.0	188.0	226.0	21.94	1.233	200.67	0.52	-0.20	
MV									•
N	188.0	191.0	194.0	3.00	0.177	191.00	-0.31	-1.04	
NB	28.0	25.0	26.0	1.53	0.089	26.33	-14.57	-15.30	×
NH	208.0	229.0	222.0	10.69	0.620	219.67	2.17	1.44	
NI	156.0	153.0	158.0	2.52	0.148	155.67	-3.37	-4.10	↓
NJ	180.0	180.0	190.0	5.77	0.295	183.33	-0.98	-1.70	
NK									•
NO									•
NP	170.0	215.0	205.0	23.63	1.627	196.67	0.18	-0.55	
NZ	187.0	183.0	140.0	26.06	1.739	170.00	-2.13	-2.86	
O	207.0	208.0	207.0	0.58	0.030	207.33	1.10	0.38	
OA	182.0	181.0	199.0	10.12	0.532	187.33	-0.63	-1.36	
OB	216.0	214.0	216.0	1.15	0.059	215.33	1.79	1.07	
OL	189.0	172.0	211.0	19.55	1.289	190.67	-0.34	-1.07	
OM	215.0	206.0	210.0	4.51	0.266	210.33	1.36	0.64	
OO	165.0	174.0	155.0	9.50	0.561	164.67	-2.59	-3.32	↓
OT	202.0	223.0	219.0	11.15	0.620	214.67	1.74	1.01	
OZ	178.0	194.0	198.0	10.58	0.591	190.00	-0.40	-1.13	
PB	212.0	205.0	198.0	7.00	0.413	205.00	0.90	0.17	
PC	59.0	66.0	57.0	4.73	0.266	60.67	-11.60	-12.33	×
PD	163.0	217.0	227.0	34.43	2.695	202.33	0.67	-0.06	
PM	206.0	175.0	195.0	15.72	0.916	192.00	-0.23	-0.95	
PP	275.0	233.0	245.0	21.63	1.458	251.00	4.88	4.16	↑
PQ	187.0	184.0	178.0	4.58	0.266	183.00	-1.01	-1.73	
PV	206.0	210.0	209.0	2.08	0.118	208.33	1.19	0.46	
PW	190.0	193.0	189.0	2.08	0.118	190.67	-0.34	-1.07	
PX	205.0	200.0	203.0	2.52	0.148	202.67	0.70	-0.03	
Q	198.0	196.0	192.0	3.06	0.177	195.33	0.06	-0.66	
QB	203.0	201.0	209.0	4.16	0.236	204.33	0.84	0.12	
QJ	162.0	228.0	195.0	33.00	2.808	195.00	0.03	-0.69	
QK	179.0	172.0	192.0	10.15	0.591	181.00	-1.18	-1.91	

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↓ = Below control limit

Ruthenium-106

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
QL	159.0	175.0	165.0	8.08	0.473	166.33	-2.45	-3.18	↓
QM	185.0	225.0	199.0	20.30	1.345	203.00	0.73	0.00	
QO									•
QP	205.0	176.0	209.0	18.01	0.975	196.67	0.18	-0.55	
QT	195.0	228.0	190.0	20.65	1.233	204.33	0.84	0.12	
QX									•
QZ	183.0	179.0	186.0	3.51	0.207	182.67	-1.04	-1.76	
R	194.0	196.0	194.0	1.15	0.059	194.67	0.00	-0.72	
RH	175.0	182.0	181.0	3.79	0.207	179.33	-1.32	-2.05	
RK	214.0	217.0	239.0	13.65	0.738	223.33	2.49	1.76	
RN	203.0	198.0	209.0	5.51	0.325	203.33	0.75	0.03	
RO	205.0	197.0	205.0	4.62	0.236	202.33	0.67	-0.06	
RQ	208.0	208.0	208.0	0.00	0.000	208.00	1.16	0.43	
RR	193.0	204.0	205.0	6.66	0.354	200.67	0.52	-0.20	
RS									•
RU	181.0	183.0	185.0	2.00	0.118	183.00	-1.01	-1.73	
RY	96.0	89.0	95.0	3.79	0.207	93.33	-6.77	-9.50	×
RZ	196.0	196.0	195.0	0.58	0.030	195.67	0.09	-0.64	
S	202.0	203.0	204.0	1.00	0.059	203.00	0.73	0.00	
SA	200.0	187.0	142.0	30.44	2.358	176.33	-1.58	-2.31	
SC	195.0	211.0	186.0	12.66	0.738	197.33	0.23	-0.49	
SD									•
SF	213.0	237.0	203.0	17.47	1.008	217.67	2.00	1.27	
SH									•
SI	208.0	182.0	176.0	17.01	0.945	188.67	-0.52	-1.24	
SK	171.0	209.0	168.0	22.85	1.402	182.67	-1.04	-1.76	
SM	171.0	178.0	171.0	4.04	0.207	173.33	-1.84	-2.57	
SN	216.0	230.0	160.0	37.04	3.033	202.00	0.64	-0.09	
SR	226.0	225.0	221.0	2.65	0.148	224.00	2.54	1.82	
SS	200.0	200.0	210.0	5.77	0.295	203.33	0.75	0.03	
ST	189.0	226.0	175.0	26.35	1.964	196.67	0.18	-0.55	
SU	1395.0	1368.0	1136.0	142.38	13.665	1299.67	95.70	94.97	×
SV	265.0	292.0	249.0	21.73	1.514	268.67	6.41	5.69	×
SW									•
SY	223.0	202.0	216.0	10.69	0.620	213.67	1.65	0.92	
T	197.0	197.0	211.0	8.08	0.413	201.67	0.61	-0.12	
U	186.0	198.0	197.0	6.66	0.354	193.67	-0.08	-0.81	
W	189.0	204.0	188.0	8.96	0.473	193.67	-0.08	-0.81	
X	212.0	199.0	212.0	7.51	0.384	207.67	1.13	0.40	
Y	198.0	192.0	186.0	6.00	0.354	192.00	-0.23	-0.95	
Z	198.0	192.0	206.0	7.02	0.413	198.67	0.35	-0.38	

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
24.67	×	BW	26.33	×	NB	53.67	×	LR

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Ruthenium-106**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
60.67	×	PC	186.00		IU	197.00		LA
91.00	×	II	186.33		DH	197.00		JE
93.33	×	RY	186.67		BO	197.33		SC
137.67	↓	CC	187.00		GI	197.33		FZ
137.67	↓	BG	187.33		OA	198.67		Z
151.00	↓	DG	188.00		FJ	199.00		MQ
153.33	↓	GE	188.67		SI	199.00		HE
153.33	↓	DL	188.67		CA	200.33		HK
155.67	↓	NI	189.33		CK	200.67		RR
158.67	↓	EZ	189.67		AK	200.67		MT
160.67	↓	HI	190.00		OZ	201.67		T
163.67	↓	DT	190.00		AJ	202.00		SN
164.67	↓	OO	190.67		PW	202.33		RO
166.33	↓	QL	190.67		OL	202.33		PD
169.00		BI	190.67		AE	202.33		JR
170.00		NZ	191.00		N	202.33		FL
173.33		SM	191.00		CJ	202.67		PX
173.33		FE	192.00		Y	203.00		S
173.67		CQ	192.00		PM	203.00		QM
176.33		SA	192.33		A	203.33		SS
177.67		K	193.00		HL	203.33		RN
177.67		EW	193.33		MP	203.33		AF
179.00		M	193.33		LF	204.33		QT
179.33		RH	193.33		BM	204.33		QB
180.00		HJ	193.67		W	204.67		EL
180.00		GL	193.67		U	205.00		PB
181.00		QK	193.67		ME	205.67		I
181.67		J	193.67		KL	205.67		AW
182.00		D	194.00		AI	206.33		BK
182.00		BL	194.67		R	206.67		AU
182.33		AB	195.00		QJ	207.00		CP
182.67		SK	195.33		Q	207.33		O
182.67		QZ	195.33		L	207.33		HP
182.67		MA	195.33		AY	207.33		C
183.00		RU	195.67		RZ	207.67		X
183.00		PQ	195.67		CO	207.67		KM
183.33		NJ	196.00		IC	208.00		RQ
183.33		DD	196.00		E	208.00		DR
184.33		MS	196.00		AP	208.33		PV
184.67		DM	196.67		ST	209.33		EA
185.33		BB	196.67		QP	209.33		BH
185.67		FU	196.67		NP	209.33		BA
185.67		EH	196.67		DE	210.33		OM
185.67		EB	196.67		CS	212.00		JS

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

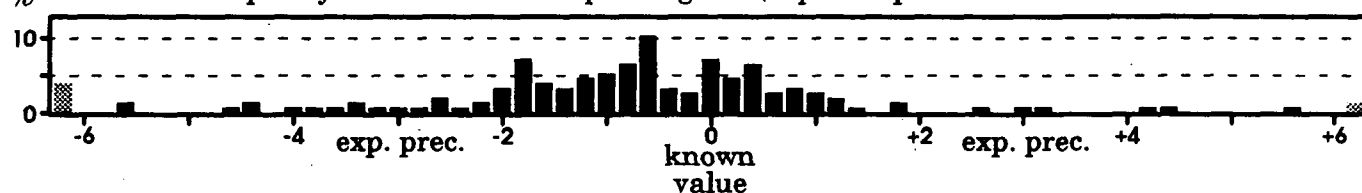
× = Determined to be an outlier

↓ = Below control limit

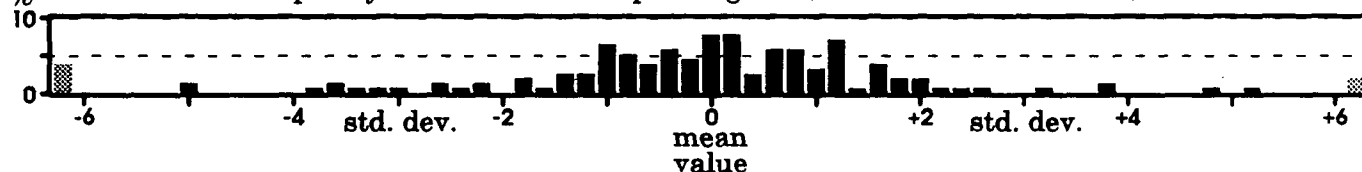
Ruthenium-106**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
212.00		CX	215.33		KF	232.00		LT
212.00		BN	217.00		BC	238.67	↑↑	LE
212.33		AN	217.67		SF	239.33	↑↑	EX
213.33		KX	217.67		AL	251.00	↑↑	PP
213.67		SY	219.67		NH	253.67	↑↑	EN
214.67		OT	223.33		RK	268.67	×	SV
215.33		OB	224.00		SR	391.67	×	CE
						1299.67	×	SU

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



• ≡ No data submitted

◊ ≡ Insufficient data

TAG SYMBOLS

× ≡ Determined to be an outlier

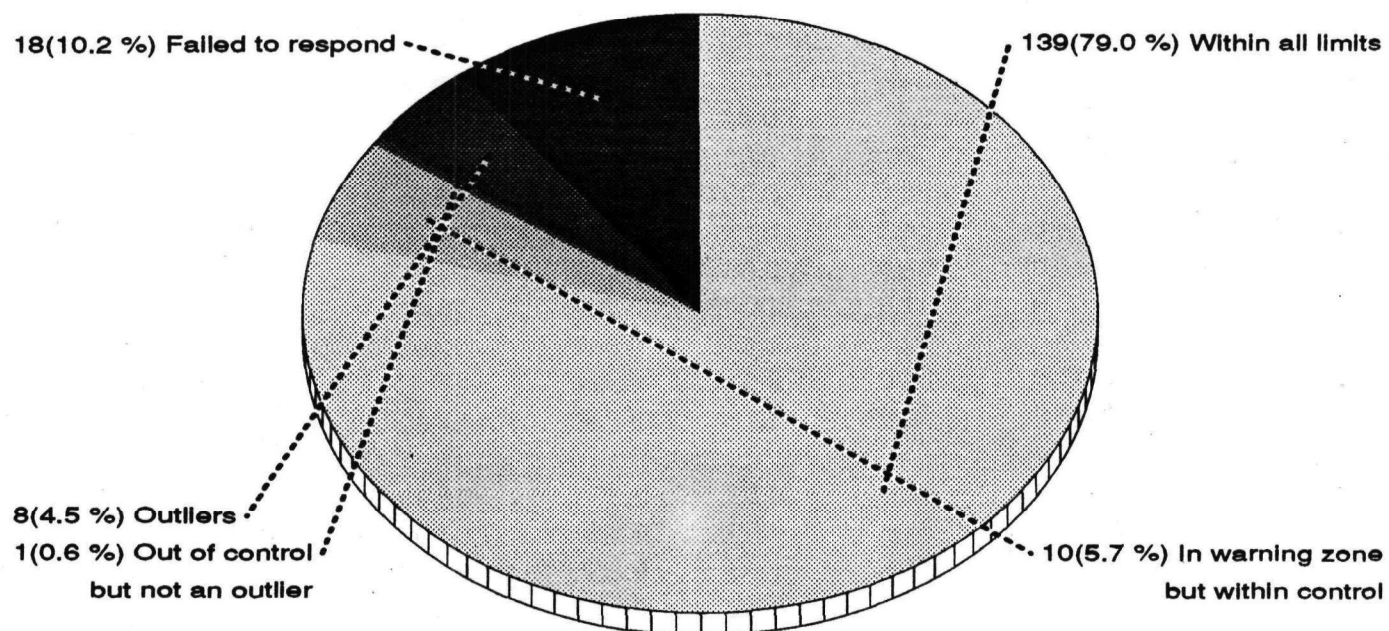
↑↑ ≡ Above control limit

↓↓ ≡ Below control limit

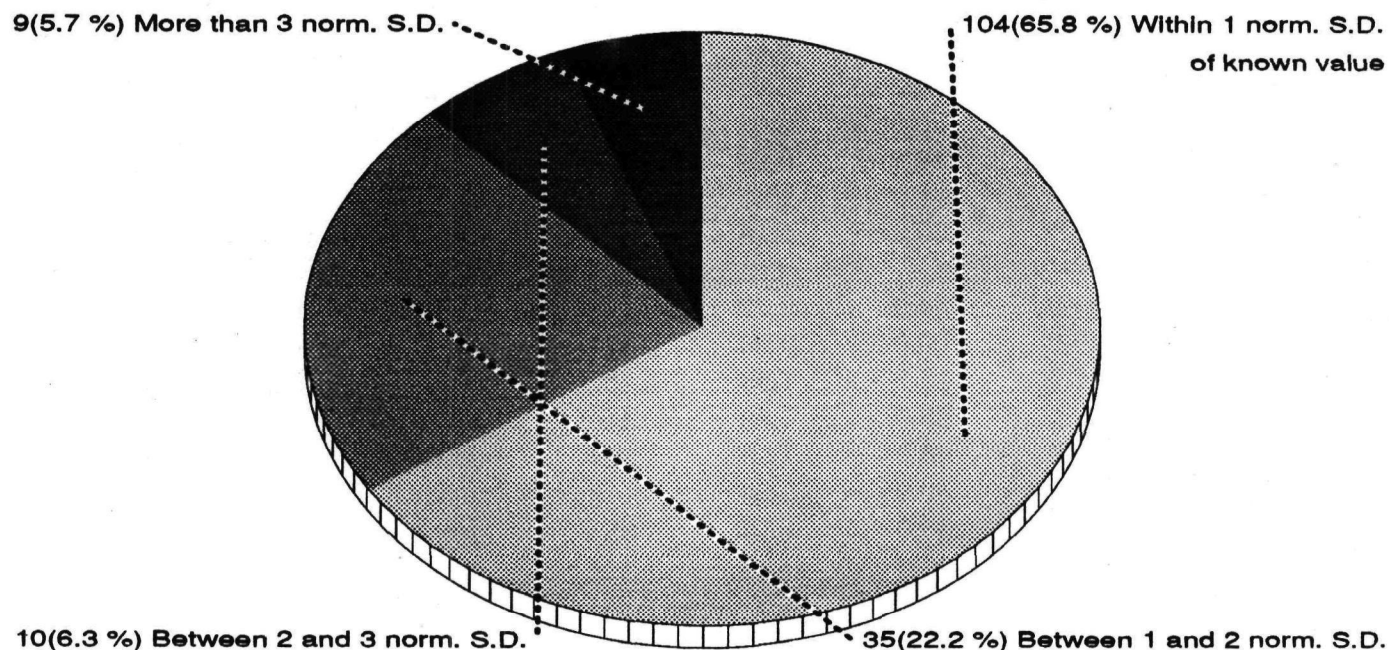
Cesium-134**Statistical Summary**

176 Participants

The known value of this nuclide is **31.0 pCi/l** with an expected precision of **5.0**; the control limits are 22.3 to 39.7; the warning regions are 22.3 to 25.2 and 36.8 to 39.7



Statistic	Respondents	Non-outliers
Mean	30.24	Grand Avg 29.44
Std. Dev.	15.25	2.69
Variance	232.61	7.23
% Coef. of Var.	50.43	9.14
% deviation of mean from known value	-2.45	-5.03
Norm. dev. of mean from known value	-0.05	-0.58
Median	29.33	29.50
% deviation of median from known value	-5.38	-4.84
Norm. dev. of median from known value	-0.11	-0.56



Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	29.0	28.0	29.0	0.58	0.118	28.67	-0.27	-0.81
AB	28.0	29.0	29.0	0.58	0.118	28.67	-0.27	-0.81
AE	31.0	29.0	32.0	1.53	0.354	30.67	0.42	-0.12
AF	27.0	28.0	29.0	1.00	0.236	28.00	-0.50	-1.04
AI	28.0	28.0	28.0	0.00	0.000	28.00	-0.50	-1.04
AJ	28.0	29.0	29.0	0.58	0.118	28.67	-0.27	-0.81
AK	28.0	28.0	28.0	0.00	0.000	28.00	-0.50	-1.04
AL	45.0	34.0	34.0	6.35	1.570	37.67	2.85	2.31
AN	32.0	32.0	31.0	0.58	0.118	31.67	0.77	0.23
AP	29.0	30.0	31.0	1.00	0.236	30.00	0.19	-0.35
AU	31.0	28.0	30.0	1.53	0.354	29.67	0.08	-0.46
AW	28.0	31.0	26.0	2.52	0.591	28.33	-0.38	-0.92
AY	24.0	24.0	26.0	1.15	0.236	24.67	-1.65	-2.19
AZ								
BA	38.0	33.0	29.0	4.51	1.120	33.33	1.35	0.81
BB	28.0	28.0	28.0	0.00	0.000	28.00	-0.50	-1.04
BC	31.0	34.0	32.0	1.53	0.354	32.33	1.00	0.46
BG	28.0	25.0	30.0	2.52	0.591	27.67	-0.62	-1.15
BH	27.0	25.0	29.0	2.00	0.473	27.00	-0.85	-1.39
BI	31.0	31.0	31.0	0.00	0.000	31.00	0.54	0.00
BK	34.0	32.0	31.0	1.53	0.354	32.33	1.00	0.46
BL	29.0	28.0	28.0	0.58	0.118	28.33	-0.38	-0.92
BM	29.0	31.0	30.0	1.00	0.236	30.00	0.19	-0.35
BN	28.0	29.0	27.0	1.00	0.236	28.00	-0.50	-1.04
BO	27.0	28.0	27.0	0.58	0.118	27.33	-0.73	-1.27
BW	24.0	27.0	26.0	1.53	0.354	25.67	-1.31	-1.85
C	24.0	24.0	24.0	0.00	0.000	24.00	-1.89	-2.42
CA	34.0	31.0	30.0	2.08	0.473	31.67	0.77	0.23
CC	21.0	20.0	23.0	1.53	0.354	21.33	-2.81	-3.35
CE	38.0	40.0	40.0	1.15	0.236	39.33	3.43	2.89
CJ	31.0	27.0	29.0	2.00	0.473	29.00	-0.15	-0.69
CK	28.0	24.0	24.0	2.31	0.473	25.33	-1.42	-1.96
CO	34.0	27.0	32.0	3.61	0.827	31.00	0.54	0.00
CP	31.0	31.0	31.0	0.00	0.000	31.00	0.54	0.00
CQ	28.0	29.0	31.0	1.53	0.354	29.33	-0.04	-0.58
CS	29.0	30.0	30.0	0.58	0.118	29.67	0.08	-0.46
CU								
CX	32.0	29.0	34.0	2.52	0.591	31.67	0.77	0.23
D	30.0	29.0	30.0	0.58	0.118	29.67	0.08	-0.46
DD	29.0	27.0	29.0	1.15	0.236	28.33	-0.38	-0.92
DE	28.0	28.0	29.0	0.58	0.118	28.33	-0.38	-0.92
DG	36.0	39.0	38.0	1.53	0.354	37.67	2.85	2.31
DH	29.0	30.0	30.0	0.58	0.118	29.67	0.08	-0.46
DL	27.0	28.0	25.0	1.53	0.354	26.67	-0.96	-1.50
DM	29.0	29.0	30.0	0.58	0.118	29.33	-0.04	-0.58

• = No data submitted

TAG SYMBOLS

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× = Determined to be an outlier

↓ = Below control limit

Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
DO	29.0	33.0	28.0	2.65	0.591	30.00	0.19	-0.35
DR	29.0	31.0	32.0	1.53	0.354	30.67	0.42	-0.12
DT	29.0	28.0	25.0	2.08	0.473	27.33	-0.73	-1.27
DZ								•
E	28.0	32.0	31.0	2.08	0.473	30.33	0.31	-0.23
EA	29.0	31.0	31.0	1.15	0.236	30.33	0.31	-0.23
EB	28.0	29.0	29.0	0.58	0.118	28.67	-0.27	-0.81
EH	25.0	30.0	29.0	2.65	0.591	28.00	-0.50	-1.04
EL	30.0	32.0	29.0	1.53	0.354	30.33	0.31	-0.23
EN	33.0	40.0	30.0	5.13	1.345	34.33	1.69	1.15
EW	28.0	25.0	26.0	1.53	0.354	26.33	-1.08	-1.62
EX	41.0	39.0	35.0	3.06	0.709	38.33	3.08	2.54
EZ	31.0	23.0	23.0	4.62	0.945	25.67	-1.31	-1.85
FE	25.0	26.0	27.0	1.00	0.236	26.00	-1.19	-1.73
FJ	31.0	29.0	31.0	1.15	0.236	30.33	0.31	-0.23
FL	30.0	30.0	31.0	0.58	0.118	30.33	0.31	-0.23
FU	29.0	29.0	29.0	0.00	0.000	29.00	-0.15	-0.69
FZ	31.0	29.0	30.0	1.00	0.236	30.00	0.19	-0.35
GE	25.0	28.0	27.0	1.53	0.354	26.67	-0.96	-1.50
GI	30.0	27.0	28.0	1.53	0.354	28.33	-0.38	-0.92
GL	29.0	30.0	31.0	1.00	0.236	30.00	0.19	-0.35
HE	29.0	31.0	30.0	1.00	0.236	30.00	0.19	-0.35
HI	31.0	31.0	30.0	0.58	0.118	30.67	0.42	-0.12
HJ	32.0	35.0	34.0	1.53	0.354	33.67	1.46	0.92
HK	32.0	30.0	31.0	1.00	0.236	31.00	0.54	0.00
HL	30.0	30.0	30.0	0.00	0.000	30.00	0.19	-0.35
HP	28.0	29.0	32.0	2.08	0.473	29.67	0.08	-0.46
HU								•
I	32.0	33.0	30.0	1.53	0.354	31.67	0.77	0.23
IC	37.0	30.0	31.0	3.79	0.827	32.67	1.12	0.58
II	16.0	13.0	15.0	1.53	0.354	14.67	-5.12	-5.66 ×
IU	30.0	30.0	31.0	0.58	0.118	30.33	0.31	-0.23
J	28.0	27.0	27.0	0.58	0.118	27.33	-0.73	-1.27
JE	31.0	30.0	29.0	1.00	0.236	30.00	0.19	-0.35
JG								•
JR	32.0	31.0	28.0	2.08	0.473	30.33	0.31	-0.23
JS	20.0	23.0	29.0	4.58	1.120	24.00	-1.89	-2.42
JY								•
K	27.0	28.0	27.0	0.58	0.118	27.33	-0.73	-1.27
KF	28.0	35.0	36.0	4.36	0.945	33.00	1.23	0.69
KH								•
KL	29.0	28.0	28.0	0.58	0.118	28.33	-0.38	-0.92
KM	29.0	31.0	30.0	1.00	0.236	30.00	0.19	-0.35
KX	29.0	31.0	30.0	1.00	0.236	30.00	0.19	-0.35
L	30.0	30.0	29.0	0.58	0.118	29.67	0.08	-0.46

• = No data submitted

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Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	21.0	22.0	33.0	6.66	1.795	25.33	-1.42	-1.96	
LE	44.0	49.0	51.0	3.61	0.827	48.00	6.43	5.89	×
LF	27.0	30.0	27.0	1.73	0.354	28.00	-0.50	-1.04	
LM									•
LR	10.0	13.0	13.0	1.73	0.354	12.00	-6.04	-6.58	×
LT	38.0	38.0	39.0	0.58	0.118	38.33	3.08	2.54	
M	27.0	26.0	27.0	0.58	0.118	26.67	-0.96	-1.50	
MA	28.0	30.0	28.0	1.15	0.236	28.67	-0.27	-0.81	
ME	31.0	29.0	29.0	1.15	0.236	29.67	0.08	-0.46	
MN									•
MP	29.0	26.0	29.0	1.73	0.354	28.00	-0.50	-1.04	
MQ	30.0	30.0	30.0	0.00	0.000	30.00	0.19	-0.35	
MS	28.0	32.0	31.0	2.08	0.473	30.33	0.31	-0.23	
MT	29.0	31.0	30.0	1.00	0.236	30.00	0.19	-0.35	
MV									•
N	28.0	29.0	28.0	0.58	0.118	28.33	-0.38	-0.92	
NB	10.0	12.0	12.0	1.15	0.236	11.33	-6.27	-6.81	×
NH	31.0	21.0	20.0	6.08	1.570	24.00	-1.89	-2.42	
NI	24.0	25.0	26.0	1.00	0.236	25.00	-1.54	-2.08	
NJ	29.0	28.0	30.0	1.00	0.236	29.00	-0.15	-0.69	
NK									•
NO									•
NP	28.0	32.0	30.0	2.00	0.473	30.00	0.19	-0.35	
NZ	35.0	29.0	25.0	5.03	1.345	29.67	0.08	-0.46	
O	29.0	30.0	29.0	0.58	0.118	29.33	-0.04	-0.58	
OA	29.0	29.0	28.0	0.58	0.118	28.67	-0.27	-0.81	
OB	32.0	34.0	33.0	1.00	0.236	33.00	1.23	0.69	
OL	29.0	30.0	27.0	1.53	0.354	28.67	-0.27	-0.81	
OM	29.0	30.0	31.0	1.00	0.236	30.00	0.19	-0.35	
OO	26.0	26.0	26.0	0.00	0.000	26.00	-1.19	-1.73	
OT	30.0	33.0	33.0	1.73	0.354	32.00	0.89	0.35	
OZ	30.0	28.0	29.0	1.00	0.236	29.00	-0.15	-0.69	
PB	27.0	30.0	28.0	1.53	0.354	28.33	-0.38	-0.92	
PC	12.0	12.0	13.0	0.58	0.118	12.33	-5.93	-6.47	×
PD	32.0	27.0	30.0	2.52	0.591	29.67	0.08	-0.46	
PM	40.0	29.0	30.0	6.08	1.570	33.00	1.23	0.69	
PP	40.0	31.0	35.0	4.51	1.120	35.33	2.04	1.50	
PQ	29.0	30.0	30.0	0.58	0.118	29.67	0.08	-0.46	
PV	33.0	30.0	33.0	1.73	0.354	32.00	0.89	0.35	
PW	29.0	27.0	25.0	2.00	0.473	27.00	-0.85	-1.39	
PX	30.0	30.0	30.0	0.00	0.000	30.00	0.19	-0.35	
Q	28.0	28.0	31.0	1.73	0.354	29.00	-0.15	-0.69	
QB	33.0	30.0	30.0	1.73	0.354	31.00	0.54	0.00	
QJ	29.0	28.0	30.0	1.00	0.236	29.00	-0.15	-0.69	
QK	26.0	28.0	27.0	1.00	0.236	27.00	-0.85	-1.39	

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Cesium-134

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
QL	27.0	24.0	25.0	1.53	0.354	25.33	-1.42	-1.96
QM	30.0	28.0	32.0	2.00	0.473	30.00	0.19	-0.35
QO								•
QP	30.0	31.0	26.0	2.65	0.591	29.00	-0.15	-0.69
QT	29.0	29.0	29.0	0.00	0.000	29.00	-0.15	-0.69
QX								•
QZ	27.0	27.0	29.0	1.15	0.236	27.67	-0.62	-1.15
R	28.0	30.0	29.0	1.00	0.236	29.00	-0.15	-0.69
RH	27.0	26.0	29.0	1.53	0.354	27.33	-0.73	-1.27
RK	26.0	26.0	28.0	1.15	0.236	26.67	-0.96	-1.50
RN	31.0	29.0	30.0	1.00	0.236	30.00	0.19	-0.35
RO	29.0	28.0	29.0	0.58	0.118	28.67	-0.27	-0.81
RQ	32.0	32.0	32.0	0.00	0.000	32.00	0.89	0.35
RR	29.0	32.0	31.0	1.53	0.354	30.67	0.42	-0.12
RS								•
RU	26.0	25.0	26.0	0.58	0.118	25.67	-1.31	-1.85
RY	30.0	29.0	27.0	1.53	0.354	28.67	-0.27	-0.81
RZ	32.0	33.0	30.0	1.53	0.354	31.67	0.77	0.23
S	29.0	29.0	30.0	0.58	0.118	29.33	-0.04	-0.58
SA	10.0	7.0	14.0	3.51	0.827	10.33	-6.62	-7.16 ×
SC	32.0	33.0	29.0	2.08	0.473	31.33	0.66	0.12
SD								•
SF	27.0	29.0	30.0	1.53	0.354	28.67	-0.27	-0.81
SH								•
SI	30.0	29.0	28.0	1.00	0.236	29.00	-0.15	-0.69
SK	30.0	28.0	28.0	1.15	0.236	28.67	-0.27	-0.81
SM	31.0	28.0	30.0	1.53	0.354	29.67	0.08	-0.46
SN	25.0	32.0	34.0	4.73	1.120	30.33	0.31	-0.23
SR	31.0	30.0	30.0	0.58	0.118	30.33	0.31	-0.23
SS	30.0	27.0	29.0	1.53	0.354	28.67	-0.27	-0.81
ST	31.0	29.0	30.0	1.00	0.236	30.00	0.19	-0.35
SU	209.0	216.0	213.0	3.51	0.827	212.67	63.47	62.93 ×
SV	44.0	38.0	39.0	3.21	0.709	40.33	3.77	3.23 ×
SW								•
SY	28.0	27.0	33.0	3.21	0.709	29.33	-0.04	-0.58
T	32.0	31.0	30.0	1.00	0.236	31.00	0.54	0.00
U	29.0	28.0	32.0	2.08	0.473	29.67	0.08	-0.46
W	26.0	27.0	27.0	0.58	0.118	26.67	-0.96	-1.50
X	29.0	31.0	29.0	1.15	0.236	29.67	0.08	-0.46
Y	28.0	29.0	29.0	0.58	0.118	28.67	-0.27	-0.81
Z	27.0	29.0	28.0	1.00	0.236	28.00	-0.50	-1.04

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
10.33	×	SA	11.33	×	NB	12.00	×	LR

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Cesium-134

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
12.33	×	PC	28.33		GI	29.67		CS
14.67	×	II	28.33		DE	29.67		AU
21.33	↓	CC	28.33		DD	30.00		ST
24.00		NH	28.33		BL	30.00		RN
24.00		JS	28.33		AW	30.00		QM
24.00		C	28.67		Y	30.00		PX
24.67		AY	28.67		SS	30.00		OM
25.00		NI	28.67		SK	30.00		NP
25.33		QL	28.67		SF	30.00		MT
25.33		LA	28.67		RY	30.00		MQ
25.33		CK	28.67		RO	30.00		KX
25.67		RU	28.67		OL	30.00		KM
25.67		EZ	28.67		OA	30.00		JE
25.67		BW	28.67		MA	30.00		HL
26.00		OO	28.67		EB	30.00		HE
26.00		FE	28.67		AJ	30.00		GL
26.33		EW	28.67		AB	30.00		FZ
26.67		W	28.67		A	30.00		DO
26.67		RK	29.00		SI	30.00		BM
26.67		M	29.00		R	30.00		AP
26.67		GE	29.00		QT	30.33		SR
26.67		DL	29.00		QP	30.33		SN
27.00		QK	29.00		QJ	30.33		MS
27.00		PW	29.00		Q	30.33		JR
27.00		BH	29.00		OZ	30.33		IU
27.33		RH	29.00		NJ	30.33		FL
27.33		K	29.00		FU	30.33		FJ
27.33		J	29.00		CJ	30.33		EL
27.33		DT	29.33		SY	30.33		EA
27.33		BO	29.33		S	30.33		E
27.67		QZ	29.33		O	30.67		RR
27.67		BG	29.33		DM	30.67		HI
28.00		Z	29.33		CQ	30.67		DR
28.00		MP	29.67		X	30.67		AE
28.00		LF	29.67		U	31.00		T
28.00		EH	29.67		SM	31.00		QB
28.00		BN	29.67		PQ	31.00		HK
28.00		BB	29.67		PD	31.00		CP
28.00		AK	29.67		NZ	31.00		CO
28.00		AI	29.67		ME	31.00		BI
28.00		AF	29.67		L	31.33		SC
28.33		PB	29.67		HP	31.67		RZ
28.33		N	29.67		DH	31.67		I
28.33		KL	29.67		D	31.67		CX

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

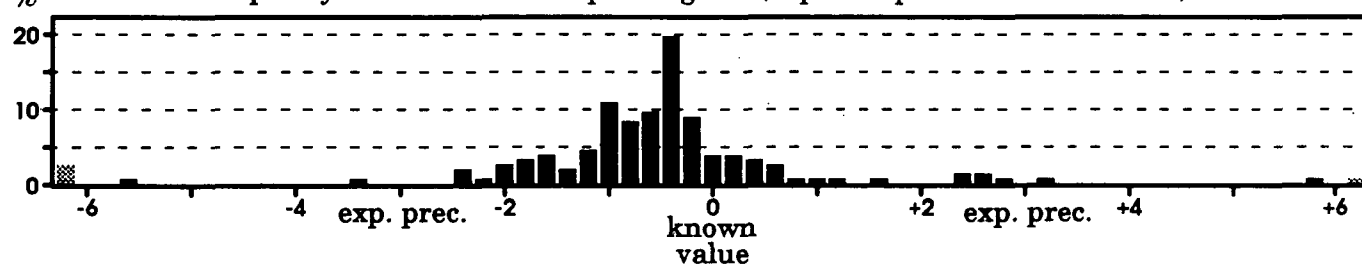
↓ = Below control limit

Cesium-134

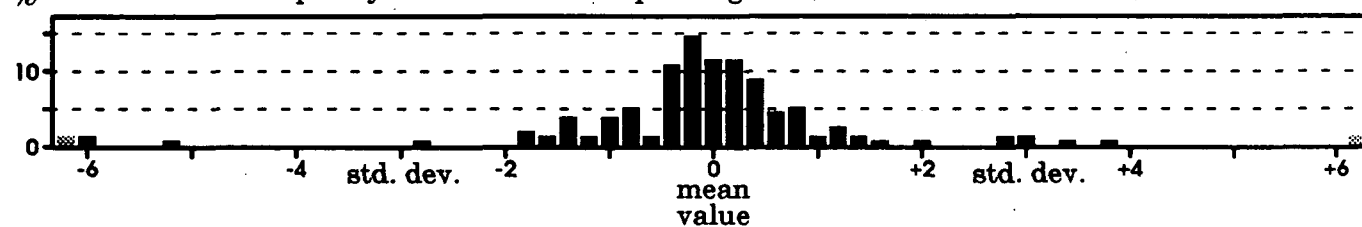
Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
31.67		CA	32.67		IC	37.67		DG
31.67		AN	33.00		PM	37.67		AL
32.00		RQ	33.00		OB	38.33		LT
32.00		PV	33.00		KF	38.33		EX
32.00		OT	33.33		BA	39.33		CE
32.33		BK	33.67		HJ	40.33	×	SV
32.33		BC	34.33		EN	48.00	×	LE
			35.33		PP	212.67	×	SU

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



• ≡ No data submitted

Ø ≡ Insufficient data

TAG SYMBOLS

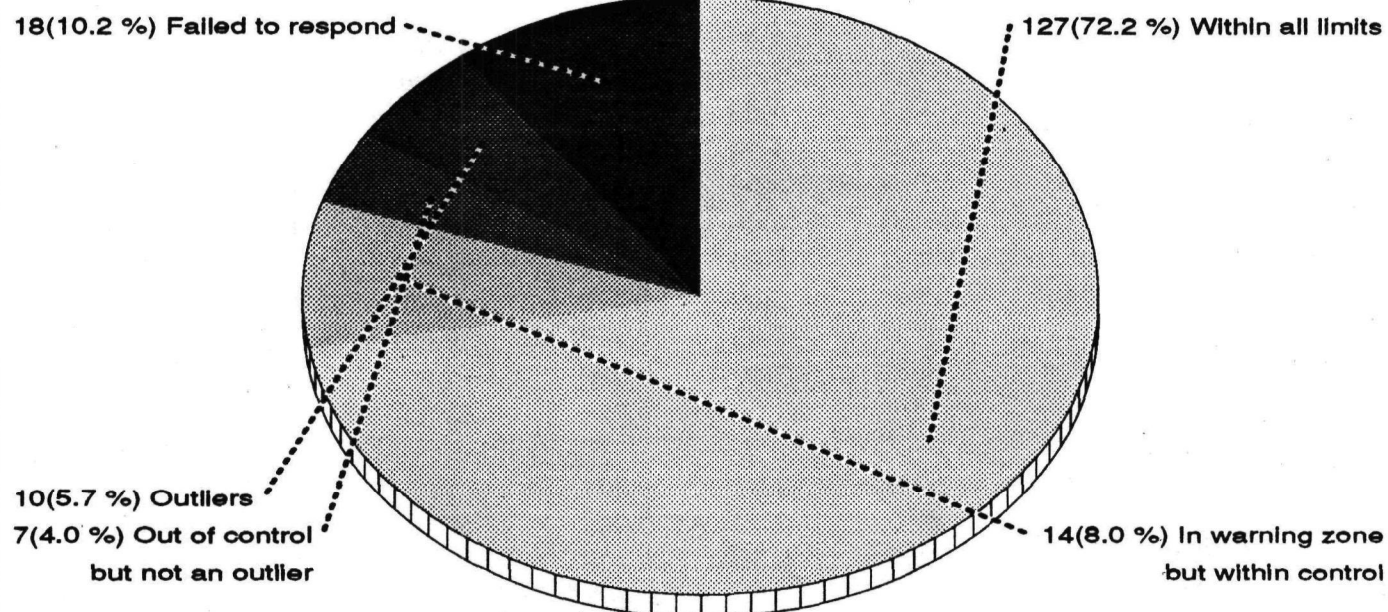
× ≡ Determined to be an outlier

↑ ≡ Above control limit

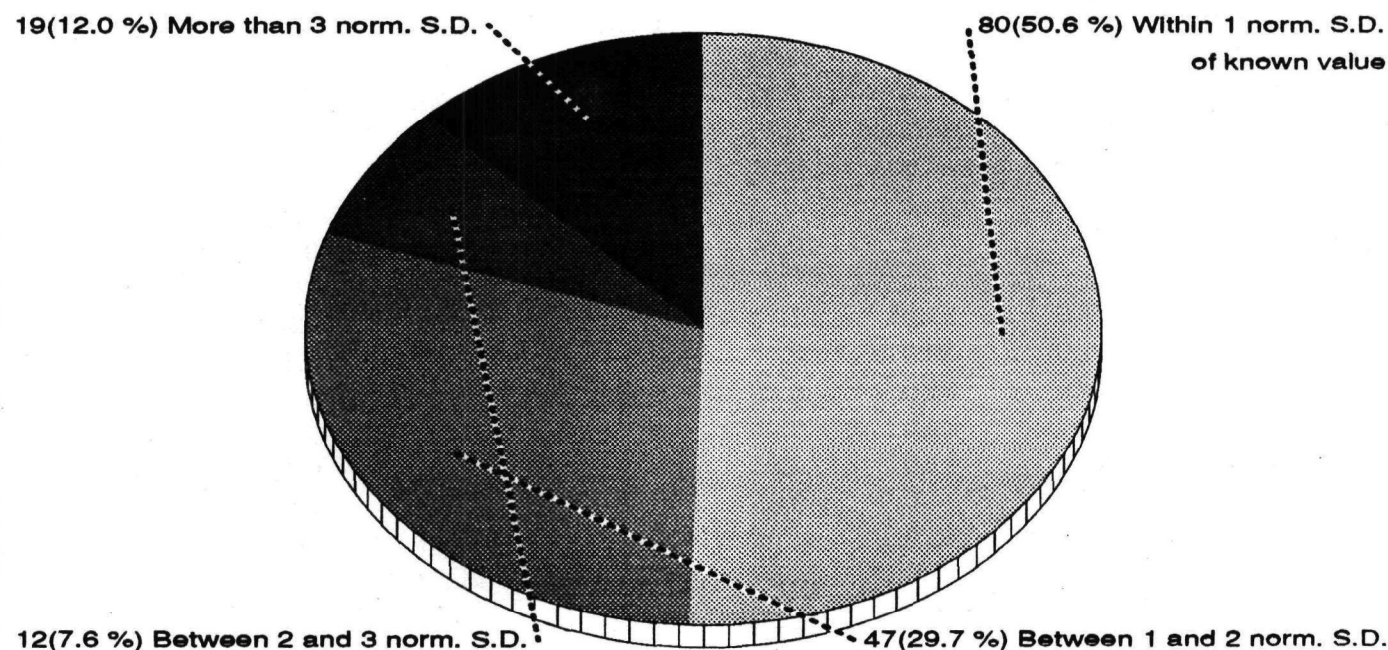
↓ ≡ Below control limit

Cesium-137**Statistical Summary****176 Participants**

The known value of this nuclide is **49.0 pCi/l** with an expected precision of **5.0**; the control limits are 40.3 to 57.7; the warning regions are 40.3 to 43.2 and 54.8 to 57.7



Statistic	Respondents	Non-outliers
Mean	51.82	Grand Avg 50.69
Std. Dev.	26.60	3.69
Variance	707.66	13.60
% Coef. of Var.	51.34	7.28
% deviation of mean from known value	5.75	3.46
Norm. dev. of mean from known value	0.11	0.46
Median	50.33	50.67
% deviation of median from known value	2.72	3.40
Norm. dev. of median from known value	0.05	0.45



Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	49.0	49.0	48.0	0.58	0.118	48.67	-0.70	-0.12
AB	40.0	49.0	46.0	4.58	1.120	45.00	-1.97	-1.39
AE	54.0	50.0	50.0	2.31	0.473	51.33	0.22	0.81
AF	50.0	52.0	51.0	1.00	0.236	51.00	0.11	0.69
AI	49.0	50.0	50.0	0.58	0.118	49.67	-0.36	0.23
AJ	55.0	54.0	53.0	1.00	0.236	54.00	1.15	1.73
AK	48.0	47.0	47.0	0.58	0.118	47.33	-1.16	-0.58
AL	47.0	51.0	45.0	3.06	0.709	47.67	-1.05	-0.46
AN	58.0	60.0	62.0	2.00	0.473	60.00	3.22	3.81 ↑
AP	56.0	54.0	52.0	2.00	0.473	54.00	1.15	1.73
AU	52.0	49.0	48.0	2.08	0.473	49.67	-0.36	0.23
AW	51.0	50.0	52.0	1.00	0.236	51.00	0.11	0.69
AY	46.0	44.0	45.0	1.00	0.236	45.00	-1.97	-1.39
AZ								•
BA	59.0	54.0	59.0	2.89	0.591	57.33	2.30	2.89
BB	49.0	49.0	49.0	0.00	0.000	49.00	-0.59	0.00
BC	61.0	60.0	61.0	0.58	0.118	60.67	3.45	4.04 ↑
BG	30.0	27.0	31.0	2.08	0.473	29.33	-7.40	-6.81 ×
BH	50.0	53.0	52.0	1.53	0.354	51.67	0.34	0.92
BI	44.0	44.0	44.0	0.00	0.000	44.00	-2.32	-1.73
BK	54.0	52.0	56.0	2.00	0.473	54.00	1.15	1.73
BL	51.0	47.0	50.0	2.08	0.473	49.33	-0.47	0.12
BM	49.0	53.0	50.0	2.08	0.473	50.67	-0.01	0.58
BN	57.0	57.0	59.0	1.15	0.236	57.67	2.42	3.00
BO	48.0	51.0	51.0	1.73	0.354	50.00	-0.24	0.35
BW	47.0	45.0	46.0	1.00	0.236	46.00	-1.63	-1.04
C	52.0	52.0	50.0	1.15	0.236	51.33	0.22	0.81
CA	53.0	50.0	50.0	1.73	0.354	51.00	0.11	0.69
CC	39.0	39.0	42.0	1.73	0.354	40.00	-3.70	-3.12 ↓
CE	56.0	48.0	51.0	4.04	0.945	51.67	0.34	0.92
CJ	56.0	54.0	51.0	2.52	0.591	53.67	1.03	1.62
CK	45.0	47.0	50.0	2.52	0.591	47.33	-1.16	-0.58
CO	46.0	53.0	50.0	3.51	0.827	49.67	-0.36	0.23
CP	51.0	51.0	51.0	0.00	0.000	51.00	0.11	0.69
CQ	50.0	54.0	58.0	4.00	0.945	54.00	1.15	1.73
CS	50.0	50.0	51.0	0.58	0.118	50.33	-0.12	0.46
CU								•
CX	48.0	51.0	51.0	1.73	0.354	50.00	-0.24	0.35
D	52.0	51.0	50.0	1.00	0.236	51.00	0.11	0.69
DD	51.0	50.0	51.0	0.58	0.118	50.67	-0.01	0.58
DE	52.0	52.0	52.0	0.00	0.000	52.00	0.45	1.04
DG	51.0	47.0	51.0	2.31	0.473	49.67	-0.36	0.23
DH	44.0	43.0	44.0	0.58	0.118	43.67	-2.43	-1.85
DL	49.0	47.0	48.0	1.00	0.236	48.00	-0.93	-0.35
DM	50.0	50.0	51.0	0.58	0.118	50.33	-0.12	0.46

• = No data submitted

TAG SYMBOLS

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↓ = Below control limit

Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
DO	41.0	46.0	47.0	3.21	0.709	44.67	-2.09	-1.50
DR	54.0	51.0	53.0	1.53	0.354	52.67	0.68	1.27
DT	53.0	55.0	48.0	3.61	0.827	52.00	0.45	1.04
DZ								•
E	49.0	55.0	53.0	3.06	0.709	52.33	0.57	1.15
EA	50.0	49.0	50.0	0.58	0.118	49.67	-0.36	0.23
EB	54.0	53.0	55.0	1.00	0.236	54.00	1.15	1.73
EH	49.0	49.0	45.0	2.31	0.473	47.67	-1.05	-0.46
EL	50.0	50.0	49.0	0.58	0.118	49.67	-0.36	0.23
EN	55.0	51.0	61.0	5.03	1.345	55.67	1.72	2.31
EW	47.0	46.0	47.0	0.58	0.118	46.67	-1.40	-0.81
EX	49.0	54.0	52.0	2.52	0.591	51.67	0.34	0.92
EZ	48.0	45.0	36.0	6.24	1.795	43.00	-2.67	-2.08
FE	47.0	47.0	46.0	0.58	0.118	46.67	-1.40	-0.81
FJ	55.0	50.0	49.0	3.21	0.709	51.33	0.22	0.81
FL	51.0	53.0	53.0	1.15	0.236	52.33	0.57	1.15
FU	53.0	53.0	53.0	0.00	0.000	53.00	0.80	1.39
FZ	49.0	51.0	49.0	1.15	0.236	49.67	-0.36	0.23
GE	48.0	47.0	49.0	1.00	0.236	48.00	-0.93	-0.35
GI	51.0	47.0	49.0	2.00	0.473	49.00	-0.59	0.00
GL	50.0	49.0	50.0	0.58	0.118	49.67	-0.36	0.23
HE	51.0	48.0	48.0	1.73	0.354	49.00	-0.59	0.00
HI	49.0	47.0	48.0	1.00	0.236	48.00	-0.93	-0.35
HJ	59.0	52.0	54.0	3.61	0.827	55.00	1.49	2.08
HK	52.0	52.0	53.0	0.58	0.118	52.33	0.57	1.15
HL	52.0	52.0	52.0	0.00	0.000	52.00	0.45	1.04
HP	52.0	52.0	47.0	2.89	0.591	50.33	-0.12	0.46
HU								•
I	55.0	52.0	54.0	1.53	0.354	53.67	1.03	1.62
IC	52.0	50.0	51.0	1.00	0.236	51.00	0.11	0.69
II	31.0	33.0	32.0	1.00	0.236	32.00	-6.48	-5.89 x
IU	51.0	53.0	53.0	1.15	0.236	52.33	0.57	1.15
J	49.0	50.0	49.0	0.58	0.118	49.33	-0.47	0.12
JE	54.0	54.0	49.0	2.89	0.591	52.33	0.57	1.15
JG								•
JR	53.0	51.0	56.0	2.52	0.591	53.33	0.91	1.50
JS	36.0	36.0	32.0	2.31	0.473	34.67	-5.55	-4.97 x
JY								•
K	52.0	57.0	54.0	2.52	0.591	54.33	1.26	1.85
KF	47.0	56.0	53.0	4.58	1.120	52.00	0.45	1.04
KH								•
KL	50.0	51.0	49.0	1.00	0.236	50.00	-0.24	0.35
KM	51.0	51.0	54.0	1.73	0.354	52.00	0.45	1.04
KX	51.0	50.0	50.0	0.58	0.118	50.33	-0.12	0.46
L	53.0	45.0	48.0	4.04	0.945	48.67	-0.70	-0.12

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Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	51.0	48.0	52.0	2.08	0.473	50.33	-0.12	0.46	
LE	79.0	74.0	90.0	8.19	2.695	81.00	10.50	11.09	×
LF	46.0	49.0	51.0	2.52	0.591	48.67	-0.70	-0.12	
LM									•
LR	19.0	18.0	20.0	1.00	0.236	19.00	-10.98	-10.39	×
LT	44.0	43.0	45.0	1.00	0.236	44.00	-2.32	-1.73	
M	49.0	47.0	48.0	1.00	0.236	48.00	-0.93	-0.35	
MA	50.0	50.0	54.0	2.31	0.473	51.33	0.22	0.81	
ME	51.0	52.0	53.0	1.00	0.236	52.00	0.45	1.04	
MN									•
MP	50.0	50.0	50.0	0.00	0.000	50.00	-0.24	0.35	
MQ	52.0	53.0	53.0	0.58	0.118	52.67	0.68	1.27	
MS	50.0	51.0	48.0	1.53	0.354	49.67	-0.36	0.23	
MT	50.0	51.0	49.0	1.00	0.236	50.00	-0.24	0.35	
MV									•
N	47.0	49.0	47.0	1.15	0.236	47.67	-1.05	-0.46	
NB	33.0	35.0	35.0	1.15	0.236	34.33	-5.67	-5.08	×
NH	54.0	57.0	57.0	1.73	0.354	56.00	1.84	2.42	
NI	48.0	43.0	47.0	2.65	0.591	46.00	-1.63	-1.04	
NJ	52.0	51.0	53.0	1.00	0.236	52.00	0.45	1.04	
NK									•
NO									•
NP	48.0	54.0	55.0	3.79	0.827	52.33	0.57	1.15	
NZ	43.0	37.0	36.0	3.79	0.827	38.67	-4.17	-3.58	↓
O	53.0	53.0	53.0	0.00	0.000	53.00	0.80	1.39	
OA	51.0	51.0	50.0	0.58	0.118	50.67	-0.01	0.58	
OB	50.0	49.0	50.0	0.58	0.118	49.67	-0.36	0.23	
OL	50.0	51.0	54.0	2.08	0.473	51.67	0.34	0.92	
OM	57.0	57.0	54.0	1.73	0.354	56.00	1.84	2.42	
OO	43.0	45.0	44.0	1.00	0.236	44.00	-2.32	-1.73	
OT	60.0	60.0	58.0	1.15	0.236	59.33	2.99	3.58	↑
OZ	28.0	29.0	30.0	1.00	0.236	29.00	-7.51	-6.93	×
PB	46.0	42.0	46.0	2.31	0.473	44.67	-2.09	-1.50	
PC	24.0	23.0	22.0	1.00	0.236	23.00	-9.59	-9.01	×
PD	48.0	50.0	57.0	4.73	1.120	51.67	0.34	0.92	
PM	45.0	60.0	46.0	8.39	2.470	50.33	-0.12	0.46	
PP	58.0	61.0	59.0	1.53	0.354	59.33	2.99	3.58	↑
PQ	49.0	49.0	50.0	0.58	0.118	49.33	-0.47	0.12	
PV	55.0	57.0	53.0	2.00	0.473	55.00	1.49	2.08	
PW	47.0	46.0	50.0	2.08	0.473	47.67	-1.05	-0.46	
PX	47.0	48.0	48.0	0.58	0.118	47.67	-1.05	-0.46	
Q	53.0	50.0	50.0	1.73	0.354	51.00	0.11	0.69	
QB	49.0	55.0	48.0	3.79	0.827	50.67	-0.01	0.58	
QJ	54.0	52.0	57.0	2.52	0.591	54.33	1.26	1.85	
QK	45.0	47.0	47.0	1.15	0.236	46.33	-1.51	-0.92	

• = No data submitted

TAG SYMBOLS

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↓ = Below control limit

Cesium-137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
QL	49.0	46.0	45.0	2.08	0.473	46.67	-1.40	-0.81
QM	48.0	45.0	49.0	2.08	0.473	47.33	-1.16	-0.58
QO								•
QP	54.0	49.0	52.0	2.52	0.591	51.67	0.34	0.92
QT	53.0	50.0	54.0	2.08	0.473	52.33	0.57	1.15
QX								•
QZ	51.0	48.0	52.0	2.08	0.473	50.33	-0.12	0.46
R	50.0	52.0	52.0	1.15	0.236	51.33	0.22	0.81
RH	45.0	47.0	46.0	1.00	0.236	46.00	-1.63	-1.04
RK	46.0	49.0	51.0	2.52	0.591	48.67	-0.70	-0.12
RN	57.0	57.0	55.0	1.15	0.236	56.33	1.95	2.54
RO	53.0	54.0	53.0	0.58	0.118	53.33	0.91	1.50
RQ	54.0	54.0	54.0	0.00	0.000	54.00	1.15	1.73
RR	47.0	48.0	49.0	1.00	0.236	48.00	-0.93	-0.35
RS								•
RU	45.0	43.0	43.0	1.15	0.236	43.67	-2.43	-1.85
RY	51.0	55.0	38.0	8.89	2.921	48.00	-0.93	-0.35
RZ	52.0	48.0	51.0	2.08	0.473	50.33	-0.12	0.46
S	54.0	55.0	56.0	1.00	0.236	55.00	1.49	2.08
SA	38.0	14.0	33.0	12.66	4.496	28.33	-7.75	-7.16 ×
SC	53.0	52.0	51.0	1.00	0.236	52.00	0.45	1.04
SD								•
SF	49.0	47.0	55.0	4.16	0.945	50.33	-0.12	0.46
SH								•
SI	54.0	48.0	50.0	3.06	0.709	50.67	-0.01	0.58
SK	49.0	53.0	56.0	3.51	0.827	52.67	0.68	1.27
SM	49.0	49.0	48.0	0.58	0.118	48.67	-0.70	-0.12
SN	55.0	60.0	53.0	3.61	0.827	56.00	1.84	2.42
SR	57.0	53.0	59.0	3.06	0.709	56.33	1.95	2.54
SS	50.0	46.0	47.0	2.08	0.473	47.67	-1.05	-0.46
ST	57.0	57.0	60.0	1.73	0.354	58.00	2.53	3.12 ↑
SU	369.0	374.0	378.0	4.51	1.120	373.67	111.88	112.47 ×
SV	61.0	56.0	56.0	2.89	0.591	57.67	2.42	3.00
SW								•
SY	64.0	54.0	49.0	7.64	2.470	55.67	1.72	2.31
T	47.0	52.0	48.0	2.65	0.591	49.00	-0.59	0.00
U	47.0	49.0	53.0	3.06	0.709	49.67	-0.36	0.23
W	55.0	52.0	49.0	3.00	0.709	52.00	0.45	1.04
X	49.0	55.0	53.0	3.06	0.709	52.33	0.57	1.15
Y	51.0	48.0	49.0	1.53	0.354	49.33	-0.47	0.12
Z	54.0	55.0	55.0	0.58	0.118	54.67	1.38	1.96

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
19.00	×	LR	23.00	×	PC	28.33	×	SA

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

Ø = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Cesium-137

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
29.00	×	OZ	49.00		T	51.00		AF
29.33	×	BG	49.00		HE	51.33		R
32.00	×	II	49.00		GI	51.33		MA
34.33	×	NB	49.00		BB	51.33		FJ
34.67	×	JS	49.33		Y	51.33		C
38.67	⇓	NZ	49.33		PQ	51.33		AE
40.00	⇓	CC	49.33		J	51.67		QP
43.00		EZ	49.33		BL	51.67		PD
43.67		RU	49.67		U	51.67		OL
43.67		DH	49.67		OB	51.67		EX
44.00		OO	49.67		MS	51.67		CE
44.00		LT	49.67		GL	51.67		BH
44.00		BI	49.67		FZ	52.00		W
44.67		PB	49.67		EL	52.00		SC
44.67		DO	49.67		EA	52.00		NJ
45.00		AY	49.67		DG	52.00		ME
45.00		AB	49.67		CO	52.00		KM
46.00		RH	49.67		AU	52.00		KF
46.00		NI	49.67		AI	52.00		HL
46.00		BW	50.00		MT	52.00		DT
46.33		QK	50.00		MP	52.00		DE
46.67		QL	50.00		KL	52.33		X
46.67		FE	50.00		CX	52.33		QT
46.67		EW	50.00		BO	52.33		NP
47.33		QM	50.33		SF	52.33		JE
47.33		CK	50.33		RZ	52.33		IU
47.33		AK	50.33		QZ	52.33		HK
47.67		SS	50.33		PM	52.33		FL
47.67		PX	50.33		LA	52.33		E
47.67		PW	50.33		KX	52.67		SK
47.67		N	50.33		HP	52.67		MQ
47.67		EH	50.33		DM	52.67		DR
47.67		AL	50.33		CS	53.00		O
48.00		RY	50.67		SI	53.00		FU
48.00		RR	50.67		QB	53.33		RO
48.00		M	50.67		OA	53.33		JR
48.00		HI	50.67		DD	53.67		I
48.00		GE	50.67		BM	53.67		CJ
48.00		DL	51.00		Q	54.00		RQ
48.67		SM	51.00		IC	54.00		EB
48.67		RK	51.00		D	54.00		CQ
48.67		LF	51.00		CP	54.00		BK
48.67		L	51.00		CA	54.00		AP
48.67		A	51.00		AW	54.00		AJ

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

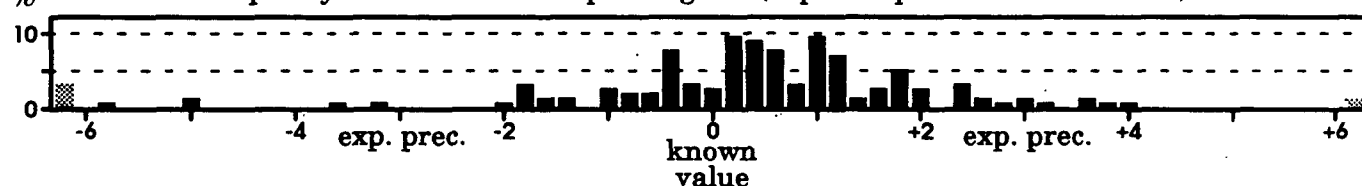
⇓ = Below control limit

Cesium-137

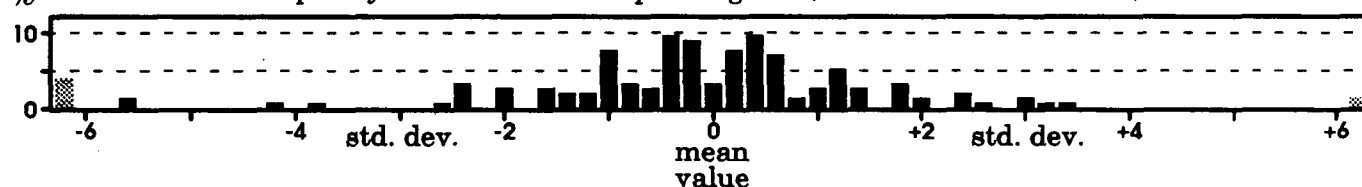
Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
54.33		QJ	55.67		EN	57.67		BN
54.33		K	56.00		SN	58.00	↑↑	ST
54.67		Z	56.00		OM	59.33	↑↑	PP
55.00		S	56.00		NH	59.33	↑↑	OT
55.00		PV	56.33		SR	60.00	↑↑	AN
55.00		HJ	56.33		RN	60.67	↑↑	BC
55.67		SY	57.33		BA	81.00	×	LE
			57.67		SV	373.67	×	SU

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



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Barium-133

Statistical Summary

176 Participants

The known value of this nuclide is **76.0 pCi/l** with an expected precision of **8.0**; the control limits are 62.1 to 89.9; the warning regions are 62.1 to 66.7 and 85.3 to 89.9

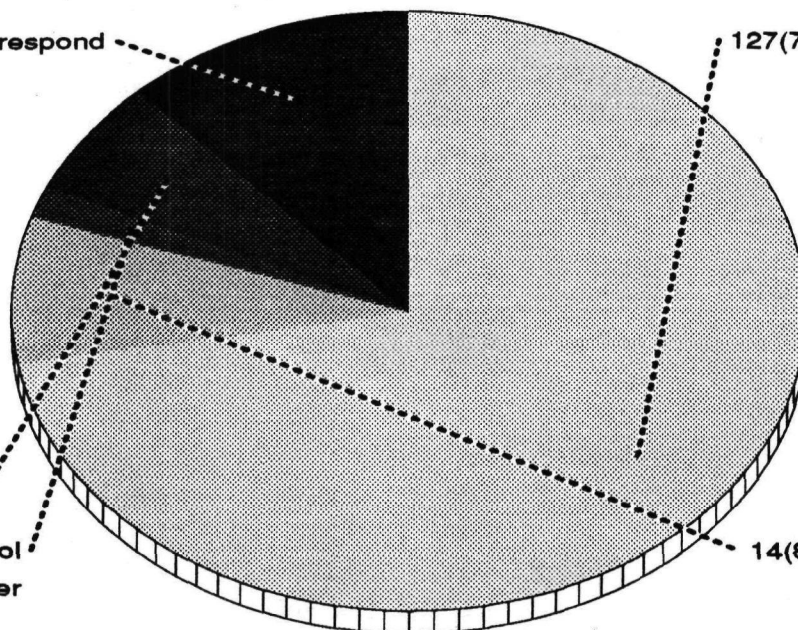
21(11.9 %) Failed to respond

127(72.2 %) Within all limits

11(6.3 %) Outliers

3(1.7 %) Out of control
but not an outlier

14(8.0 %) In warning zone
but within control



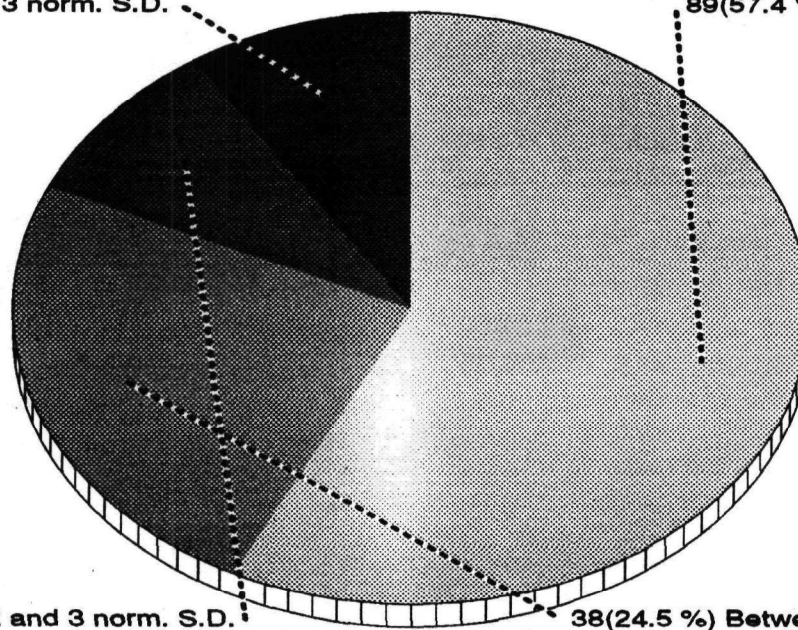
Statistic	Respondents	Non-outliers
Mean	76.26	Grand Avg 75.06
Std. Dev.	38.75	5.77
Variance	1501.72	33.28
% Coef. of Var.	50.82	7.68
% deviation of mean from known value	0.34	-1.23
Norm. dev. of mean from known value	0.01	-0.16
Median	75.67	75.83
% deviation of median from known value	-0.44	-0.22
Norm. dev. of median from known value	-0.01	-0.03

14(9.0 %) More than 3 norm. S.D.

89(57.4 %) Within 1 norm. S.D.
of known value

14(9.0 %) Between 2 and 3 norm. S.D.

38(24.5 %) Between 1 and 2 norm. S.D.



Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	75.0	76.0	73.0	1.53	0.222	74.67	-0.09	-0.29
AB	74.0	71.0	76.0	2.52	0.369	73.67	-0.30	-0.51
AE	69.0	66.0	68.0	1.53	0.222	67.67	-1.60	-1.80
AF	73.0	72.0	68.0	2.65	0.369	71.00	-0.88	-1.08
AI	71.0	68.0	70.0	1.53	0.222	69.67	-1.17	-1.37
AJ	65.0	60.0	62.0	2.52	0.369	62.33	-2.76	-2.96
AK	75.0	75.0	76.0	0.58	0.074	75.33	0.06	-0.14
AL	85.0	90.0	84.0	3.21	0.443	86.33	2.44	2.24
AN	84.0	83.0	88.0	2.65	0.369	85.00	2.15	1.95
AP	69.0	69.0	69.0	0.00	0.000	69.00	-1.31	-1.52
AU	80.0	72.0	71.0	4.93	0.665	74.33	-0.16	-0.36
AW	79.0	79.0	76.0	1.73	0.222	78.00	0.64	0.43
AY	73.0	85.0	72.0	7.23	0.960	76.67	0.35	0.14
AZ								•
BA	73.0	69.0	74.0	2.65	0.369	72.00	-0.66	-0.87
BB	72.0	72.0	71.0	0.58	0.074	71.67	-0.74	-0.94
BC	79.0	77.0	77.0	1.15	0.148	77.67	0.56	0.36
BG	51.0	52.0	45.0	3.79	0.517	49.33	-5.57	-5.77 ×
BH	75.0	75.0	73.0	1.15	0.148	74.33	-0.16	-0.36
BI	77.0	78.0	79.0	1.00	0.148	78.00	0.64	0.43
BK	78.0	77.0	80.0	1.53	0.222	78.33	0.71	0.51
BL	76.0	74.0	81.0	3.61	0.517	77.00	0.42	0.22
BM	77.0	78.0	78.0	0.58	0.074	77.67	0.56	0.36
BN	78.0	71.0	83.0	6.03	0.886	77.33	0.49	0.29
BO	71.0	73.0	70.0	1.53	0.222	71.33	-0.81	-1.01
BW	13.0	11.0	12.0	1.00	0.148	12.00	-13.65	-13.86 ×
C	76.0	81.0	80.0	2.65	0.369	79.00	0.85	0.65
CA	80.0	77.0	80.0	1.73	0.222	79.00	0.85	0.65
CC	58.0	57.0	62.0	2.65	0.369	59.00	-3.48	-3.68 ↓
CE	89.0	86.0	88.0	1.53	0.222	87.67	2.73	2.53
CJ	68.0	83.0	76.0	7.51	1.205	75.67	0.13	-0.07
CK	69.0	61.0	68.0	4.36	0.591	66.00	-1.96	-2.17
CO	63.0	72.0	75.0	6.24	0.886	70.00	-1.10	-1.30
CP	80.0	80.0	80.0	0.00	0.000	80.00	1.07	0.87
CQ	74.0	76.0	79.0	2.52	0.369	76.33	0.27	0.07
CS	72.0	71.0	69.0	1.53	0.222	70.67	-0.95	-1.15
CU								•
CX	74.0	76.0	77.0	1.53	0.222	75.67	0.13	-0.07
D	68.0	66.0	67.0	1.00	0.148	67.00	-1.75	-1.95
DD	72.0	74.0	74.0	1.15	0.148	73.33	-0.37	-0.58
DE	72.0	73.0	73.0	0.58	0.074	72.67	-0.52	-0.72
DG	80.0	86.0	83.0	3.00	0.443	83.00	1.72	1.52
DH	69.0	69.0	70.0	0.58	0.074	69.33	-1.24	-1.44
DL	73.0	76.0	66.0	5.13	0.738	71.67	-0.74	-0.94
DM	80.0	82.0	79.0	1.53	0.222	80.33	1.14	0.94

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Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
DO									•
DR									•
DT	68.0	67.0	72.0	2.65	0.369	69.00	-1.31	-1.52	
DZ									•
E	79.0	82.0	77.0	2.52	0.369	79.33	0.92	0.72	
EA	76.0	79.0	78.0	1.53	0.222	77.67	0.56	0.36	
EB	77.0	79.0	79.0	1.15	0.148	78.33	0.71	0.51	
EH	73.0	73.0	76.0	1.73	0.222	74.00	-0.23	-0.43	
EL	79.0	77.0	76.0	1.53	0.222	77.33	0.49	0.29	
EN	80.0	86.0	82.0	3.06	0.443	82.67	1.65	1.44	
EW	72.0	71.0	71.0	0.58	0.074	71.33	-0.81	-1.01	
EX	80.0	84.0	85.0	2.65	0.369	83.00	1.72	1.52	
EZ	78.0	61.0	59.0	10.44	1.767	66.00	-1.96	-2.17	
FE	62.0	67.0	63.0	2.65	0.369	64.00	-2.40	-2.60	
FJ	80.0	68.0	78.0	6.43	0.886	75.33	0.06	-0.14	
FL	86.0	76.0	80.0	5.03	0.738	80.67	1.21	1.01	
FU	77.0	76.0	75.0	1.00	0.148	76.00	0.20	0.00	
FZ	83.0	79.0	81.0	2.00	0.295	81.00	1.29	1.08	
GE	66.0	76.0	73.0	5.13	0.738	71.67	-0.74	-0.94	
GI	75.0	75.0	74.0	0.58	0.074	74.67	-0.09	-0.29	
GL	76.0	72.0	76.0	2.31	0.295	74.67	-0.09	-0.29	
HE	77.0	76.0	77.0	0.58	0.074	76.67	0.35	0.14	
HI	69.0	81.0	77.0	6.11	0.886	75.67	0.13	-0.07	
HJ	83.0	82.0	79.0	2.08	0.295	81.33	1.36	1.15	
HK	76.0	75.0	77.0	1.00	0.148	76.00	0.20	0.00	
HL	75.0	75.0	75.0	0.00	0.000	75.00	-0.01	-0.22	
HP	72.0	74.0	73.0	1.00	0.148	73.00	-0.45	-0.65	
HU									•
I	82.0	71.0	80.0	5.86	0.812	77.67	0.56	0.36	
IC	79.0	76.0	76.0	1.73	0.222	77.00	0.42	0.22	
II	1.0	2.0	2.0	0.58	0.074	1.67	-15.89	-16.09	×
IU	74.0	79.0	77.0	2.52	0.369	76.67	0.35	0.14	
J	78.0	77.0	78.0	0.58	0.074	77.67	0.56	0.36	
JE	81.0	80.0	71.0	5.51	0.738	77.33	0.49	0.29	
JG									•
JR	67.0	69.0	67.0	1.15	0.148	67.67	-1.60	-1.80	
JS	56.0	51.0	65.0	7.09	1.064	57.33	-3.84	-4.04	↓
JY									•
K	71.0	80.0	80.0	5.20	0.665	77.00	0.42	0.22	
KF	77.0	86.0	89.0	6.24	0.886	84.00	1.93	1.73	
KH									•
KL	76.0	76.0	71.0	2.89	0.369	74.33	-0.16	-0.36	
KM	69.0	70.0	66.0	2.08	0.295	68.33	-1.46	-1.66	
KX	91.0	89.0	84.0	3.61	0.517	88.00	2.80	2.60	
L	69.0	68.0	66.0	1.53	0.222	67.67	-1.60	-1.80	

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Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LA	84.0	76.0	83.0	4.36	0.591	81.00	1.29	1.08	
LE	118.0	105.0	107.0	7.00	0.960	110.00	7.56	7.36	×
LF	80.0	79.0	74.0	3.21	0.443	77.67	0.56	0.36	
LM									•
LR	39.0	38.0	26.0	6.51	0.960	32.67	-9.18	-9.38	×
LT	88.0	88.0	87.0	0.58	0.074	87.67	2.73	2.53	
M	67.0	63.0	66.0	2.08	0.295	65.33	-2.11	-2.31	
MA	76.0	75.0	75.0	0.58	0.074	75.33	0.06	-0.14	
ME	74.0	76.0	74.0	1.15	0.148	74.67	-0.09	-0.29	
MN									•
MP	69.0	71.0	70.0	1.00	0.148	70.00	-1.10	-1.30	
MQ	78.0	80.0	79.0	1.00	0.148	79.00	0.85	0.65	
MS	64.0	72.0	67.0	4.04	0.591	67.67	-1.60	-1.80	
MT	78.0	77.0	77.0	0.58	0.074	77.33	0.49	0.29	
MV									•
N	75.0	73.0	70.0	2.52	0.369	72.67	-0.52	-0.72	
NB	46.0	46.0	49.0	1.73	0.222	47.00	-6.08	-6.28	×
NH	75.0	67.0	73.0	4.16	0.591	71.67	-0.74	-0.94	
NI	67.0	59.0	66.0	4.36	0.591	64.00	-2.40	-2.60	
NJ	69.0	67.0	73.0	3.06	0.443	69.67	-1.17	-1.37	
NK									•
NO									•
NP	67.0	81.0	76.0	7.09	1.064	74.67	-0.09	-0.29	
NZ	50.0	52.0	59.0	4.73	0.665	53.67	-4.63	-4.84	×
O	77.0	77.0	76.0	0.58	0.074	76.67	0.35	0.14	
OA	74.0	77.0	77.0	1.73	0.222	76.00	0.20	0.00	
OB	76.0	77.0	77.0	0.58	0.074	76.67	0.35	0.14	
OL	68.0	70.0	72.0	2.00	0.295	70.00	-1.10	-1.30	
OM	77.0	76.0	78.0	1.00	0.148	77.00	0.42	0.22	
OO	75.0	74.0	75.0	0.58	0.074	74.67	-0.09	-0.29	
OT	86.0	79.0	100.0	10.69	2.049	88.33	2.87	2.67	
OZ									•
PB	84.0	81.0	74.0	5.13	0.738	79.67	1.00	0.79	
PC	41.0	42.0	42.0	0.58	0.074	41.67	-7.23	-7.43	×
PD	81.0	74.0	77.0	3.51	0.517	77.33	0.49	0.29	
PM	69.0	85.0	83.0	8.72	1.345	79.00	0.85	0.65	
PP	102.0	93.0	103.0	5.51	0.738	99.33	5.25	5.05	×
PQ	72.0	75.0	67.0	4.04	0.591	71.33	-0.81	-1.01	
PV	82.0	79.0	79.0	1.73	0.222	80.00	1.07	0.87	
PW	62.0	64.0	65.0	1.53	0.222	63.67	-2.47	-2.67	
PX	74.0	75.0	76.0	1.00	0.148	75.00	-0.01	-0.22	
Q	70.0	70.0	72.0	1.15	0.148	70.67	-0.95	-1.15	
QB	82.0	83.0	81.0	1.00	0.148	82.00	1.50	1.30	
QJ	76.0	74.0	78.0	2.00	0.295	76.00	0.20	0.00	
QK	65.0	65.0	65.0	0.00	0.000	65.00	-2.18	-2.38	

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Barium-133

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
QL	81.0	83.0	81.0	1.15	0.148	81.67	1.43	1.23
QM	82.0	91.0	87.0	4.51	0.665	86.67	2.51	2.31
QO								•
QP	76.0	79.0	73.0	3.00	0.443	76.00	0.20	0.00
QT	75.0	73.0	75.0	1.15	0.148	74.33	-0.16	-0.36
QX								•
QZ	76.0	77.0	78.0	1.00	0.148	77.00	0.42	0.22
R	73.0	72.0	74.0	1.00	0.148	73.00	-0.45	-0.65
RH	73.0	74.0	70.0	2.08	0.295	72.33	-0.59	-0.79
RK	71.0	74.0	76.0	2.52	0.369	73.67	-0.30	-0.51
RN	77.0	76.0	82.0	3.21	0.443	78.33	0.71	0.51
RO	70.0	69.0	67.0	1.53	0.222	68.67	-1.39	-1.59
RQ	78.0	78.0	78.0	0.00	0.000	78.00	0.64	0.43
RR	76.0	77.0	77.0	0.58	0.074	76.67	0.35	0.14
RS								•
RU	69.0	71.0	68.0	1.53	0.222	69.33	-1.24	-1.44
RY	83.0	74.0	78.0	4.51	0.665	78.33	0.71	0.51
RZ	82.0	81.0	80.0	1.00	0.148	81.00	1.29	1.08
S	75.0	76.0	77.0	1.00	0.148	76.00	0.20	0.00
SA	21.0	41.0	31.0	10.00	1.908	31.00	-9.54	-9.74 ×
SC	78.0	78.0	76.0	1.15	0.148	77.33	0.49	0.29
SD								•
SF	79.0	79.0	79.0	0.00	0.000	79.00	0.85	0.65
SH								•
SI	60.0	59.0	59.0	0.58	0.074	59.33	-3.41	-3.61 ↓
SK	78.0	80.0	75.0	2.52	0.369	77.67	0.56	0.36
SM	75.0	75.0	73.0	1.15	0.148	74.33	-0.16	-0.36
SN	78.0	81.0	71.0	5.13	0.738	76.67	0.35	0.14
SR	83.0	74.0	76.0	4.73	0.665	77.67	0.56	0.36
SS	75.0	79.0	78.0	2.08	0.295	77.33	0.49	0.29
ST	86.0	82.0	87.0	2.65	0.369	85.00	2.15	1.95
SU	540.0	532.0	524.0	8.00	1.345	532.00	98.93	98.73 ×
SV	72.0	71.0	70.0	1.00	0.148	71.00	-0.88	-1.08
SW								•
SY	75.0	83.0	90.0	7.51	1.205	82.67	1.65	1.44
T	82.0	79.0	83.0	2.08	0.295	81.33	1.36	1.15
U	70.0	70.0	75.0	2.89	0.369	71.67	-0.74	-0.94
W	71.0	77.0	70.0	3.79	0.517	72.67	-0.52	-0.72
X	75.0	73.0	73.0	1.15	0.148	73.67	-0.30	-0.51
Y	73.0	70.0	72.0	1.53	0.222	71.67	-0.74	-0.94
Z	73.0	70.0	72.0	1.53	0.222	71.67	-0.74	-0.94

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
1.67	×	II	12.00	×	BW	31.00	×	SA

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Barium-133

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
32.67	×	LR	71.67		DL	76.67		IU
41.67	×	PC	71.67		BB	76.67		HE
47.00	×	NB	72.00		BA	76.67		AY
49.33	×	BG	72.33		RH	77.00		QZ
53.67	×	NZ	72.67		W	77.00		OM
57.33	↓	JS	72.67		N	77.00		K
59.00	↓	CC	72.67		DE	77.00		IC
59.33	↓	SI	73.00		R	77.00		BL
62.33		AJ	73.00		HP	77.33		SS
63.67		PW	73.33		DD	77.33		SC
64.00		NI	73.67		X	77.33		PD
64.00		FE	73.67		RK	77.33		MT
65.00		QK	73.67		AB	77.33		JE
65.33		M	74.00		EH	77.33		EL
66.00		EZ	74.33		SM	77.33		BN
66.00		CK	74.33		QT	77.67		SR
67.00		D	74.33		KL	77.67		SK
67.67		MS	74.33		BH	77.67		LF
67.67		L	74.33		AU	77.67		J
67.67		JR	74.67		OO	77.67		I
67.67		AE	74.67		NP	77.67		EA
68.33		KM	74.67		ME	77.67		BM
68.67		RO	74.67		GL	77.67		BC
69.00		DT	74.67		GI	78.00		RQ
69.00		AP	74.67		A	78.00		BI
69.33		RU	75.00		PX	78.00		AW
69.33		DH	75.00		HL	78.33		RY
69.67		NJ	75.33		MA	78.33		RN
69.67		AI	75.33		FJ	78.33		EB
70.00		OL	75.33		AK	78.33		BK
70.00		MP	75.67		HI	79.00		SF
70.00		CO	75.67		CX	79.00		PM
70.67		Q	75.67		CJ	79.00		MQ
70.67		CS	76.00		S	79.00		CA
71.00		SV	76.00		QP	79.00		C
71.00		AF	76.00		QJ	79.33		E
71.33		PQ	76.00		OA	79.67		PB
71.33		EW	76.00		HK	80.00		PV
71.33		BO	76.00		FU	80.00		CP
71.67		Z	76.33		CQ	80.33		DM
71.67		Y	76.67		SN	80.67		FL
71.67		U	76.67		RR	81.00		RZ
71.67		NH	76.67		OB	81.00		LA
71.67		GE	76.67		O	81.00		FZ

• = No data submitted

TAG SYMBOLS

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∅ = Insufficient data

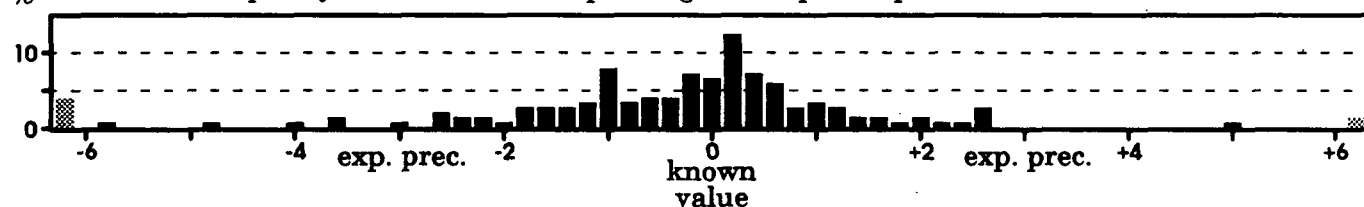
× = Determined to be an outlier

↓ = Below control limit

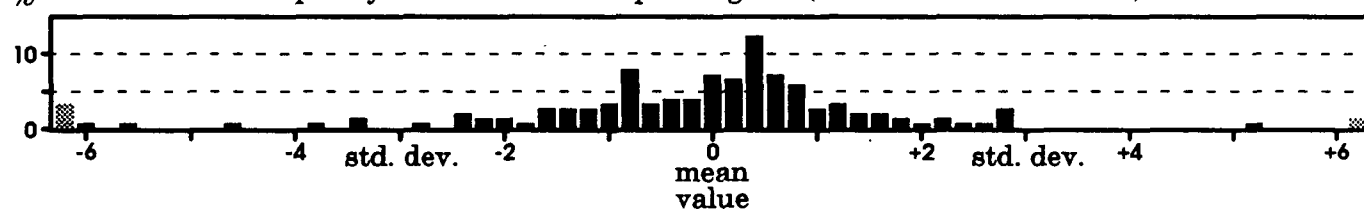
Barium-133**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
81.33		T	83.00		EX	87.67		LT
81.33		HJ	83.00		DG	87.67		CE
81.67		QL	84.00		KF	88.00		KX
82.00		QB	85.00		ST	88.33		OT
82.67		SY	85.00		AN	99.33	×	PP
82.67		EN	86.33		AL	110.00	×	LE
			86.67		QM	532.00	×	SU

Frequency distribution of responding labs(expected prec. vs known value)



Frequency distribution of responding labs(std. dev. vs mean value)



• ≡ No data submitted

TAG SYMBOLS

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↓↓ ≡ Below control limit