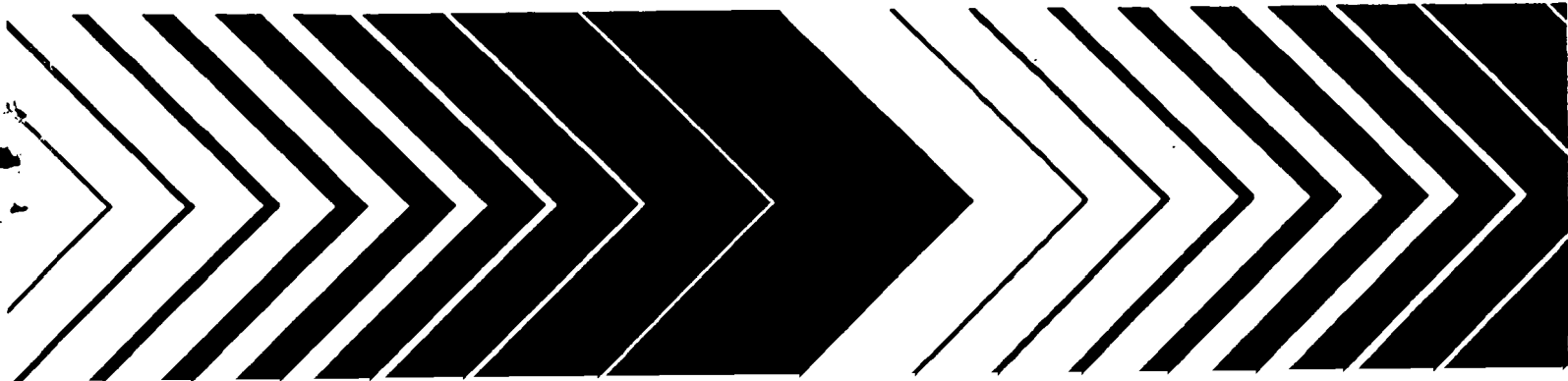


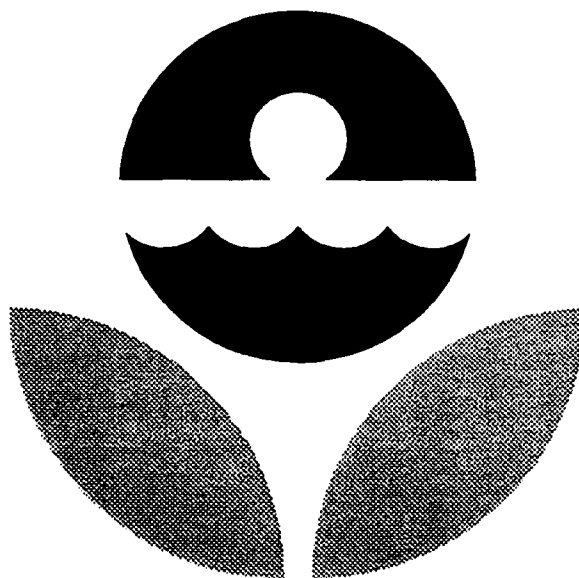


Air Filter Intercomparison Study

A Statistical Evaluation of the August 28, 1992 Data



Air Filter
Intercomparison Study
August 28, 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 *Air Filter; August 28, 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 that reads "Frank Novielli".

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.

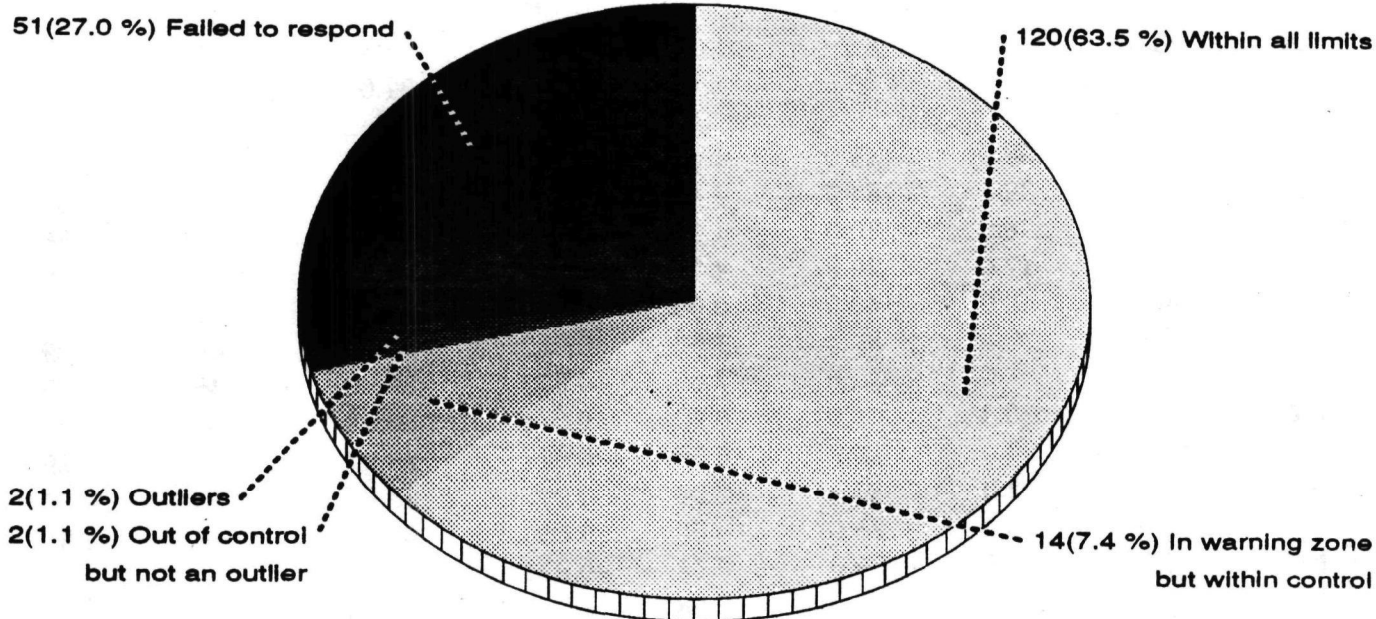
The last part is two bar chart displays showing frequency distributions of responding participants. The first chart places the known value at the center and a bar at each 0.2 unit of expected precision. The second chart places the mean of the reported measurements at the center and a bar at each 0.2 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.

Alpha

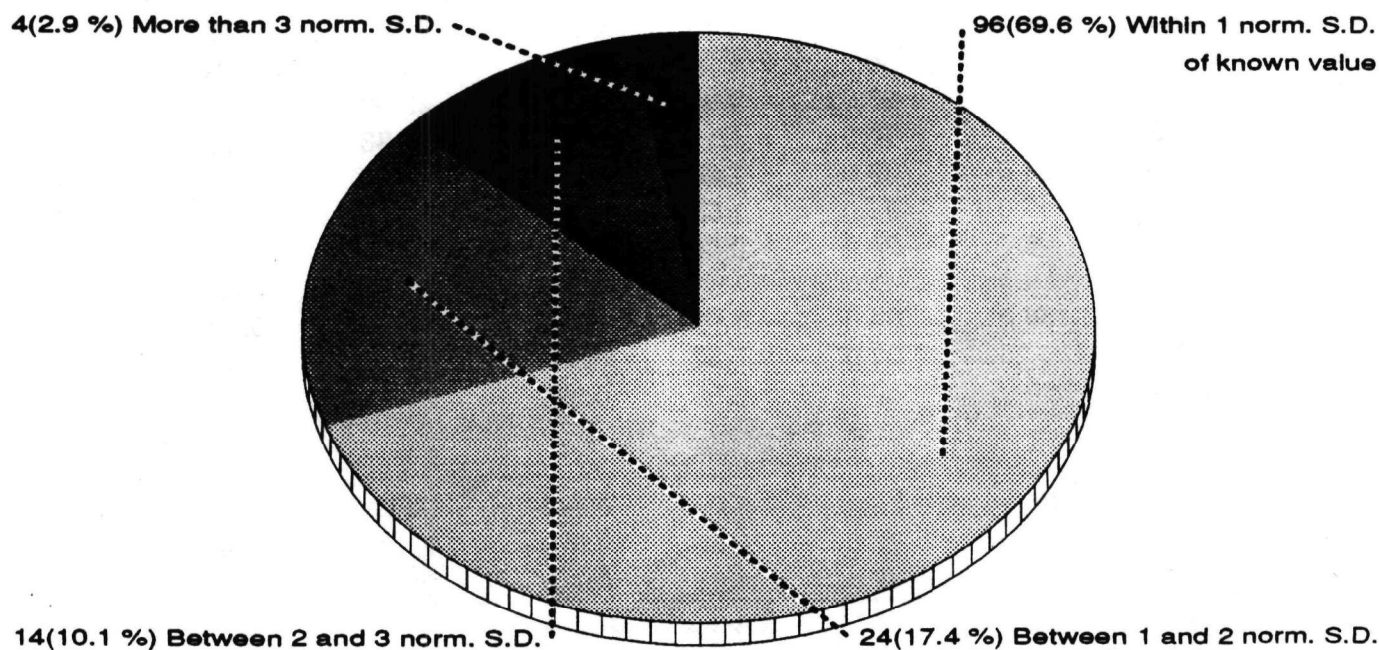
Statistical Summary

189 Participants

The known value of this nuclide is 30.0 pCi/F with an expected precision of 8.0; the control limits are 16.1 to 43.9; the warning regions are 16.1 to 20.7 and 39.3 to 43.9



Statistic	Respondents	Non-outliers
Mean	31.25	Grand Avg 30.87
Std. Dev.	6.10	5.27
Variance	37.20	27.77
% Coef. of Var.	19.52	17.07
% deviation of mean from known value	4.17	2.92
Norm. dev. of mean from known value	0.21	0.17
Median	30.00	30.00
% deviation of median from known value	0.00	0.00
Norm. dev. of median from known value	0.00	0.00



Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	23.0	22.0	22.0	0.58	0.074	22.33	-1.85	-1.66
AA	32.0	30.0	33.0	1.53	0.222	31.67	0.17	0.36
AE	38.0	40.0	38.0	1.15	0.148	38.67	1.69	1.88
AF	36.0	37.0	38.0	1.00	0.148	37.00	1.33	1.52
AG								
AI	36.0	33.0	35.0	1.53	0.222	34.67	0.82	1.01
AJ	33.0	32.0	34.0	1.00	0.148	33.00	0.46	0.65
AK	27.0	28.0	30.0	1.53	0.222	28.33	-0.55	-0.36
AL	19.0	17.0	26.0	4.73	0.665	20.67	-2.21	-2.02
AN	40.0	40.0	40.0	0.00	0.000	40.00	1.98	2.17
AP	27.0	29.0	30.0	1.53	0.222	28.67	-0.48	-0.29
AU	36.0	31.0	32.0	2.65	0.369	33.00	0.46	0.65
AZ	28.0	28.0	29.0	0.58	0.074	28.33	-0.55	-0.36
BA	28.0	29.0	29.0	0.58	0.074	28.67	-0.48	-0.29
BC	32.0	33.0	36.0	2.08	0.295	33.67	0.60	0.79
BG	30.0	28.0	25.0	2.52	0.369	27.67	-0.69	-0.51
BH	26.0	25.0	26.0	0.58	0.074	25.67	-1.13	-0.94
BI	27.0	26.0	26.0	0.58	0.074	26.33	-0.98	-0.79
BK	29.0	28.0	28.0	0.58	0.074	28.33	-0.55	-0.36
BL	31.0	33.0	32.0	1.00	0.148	32.00	0.24	0.43
BM	41.0	42.0	40.0	1.00	0.148	41.00	2.19	2.38
BO	26.0	27.0	25.0	1.00	0.148	26.00	-1.06	-0.87
BW								
CA	26.0	26.0	25.0	0.58	0.074	25.67	-1.13	-0.94
CC	26.0	29.0	24.0	2.52	0.369	26.33	-0.98	-0.79
CC	27.0	28.0	27.0	0.58	0.074	27.33	-0.77	-0.58
CE	29.0	29.0	32.0	1.73	0.222	30.00	-0.19	0.00
CJ	27.0	28.0	27.0	0.58	0.074	27.33	-0.77	-0.58
CM								
CO	28.0	28.0	26.0	1.15	0.148	27.33	-0.77	-0.58
CP	40.0	37.0	40.0	1.73	0.222	39.00	1.76	1.95
CQ	34.0	29.0	33.0	2.65	0.369	32.00	0.24	0.43
CS	38.0	40.0	40.0	1.15	0.148	39.33	1.83	2.02
D	30.0	31.0	29.0	1.00	0.148	30.00	-0.19	0.00
DD	30.0	29.0	32.0	1.53	0.222	30.33	-0.12	0.07
DE	25.0	25.0	25.0	0.00	0.000	25.00	-1.27	-1.08
DG	32.0	34.0	31.0	1.53	0.222	32.33	0.32	0.51
DH	35.0	36.0	34.0	1.00	0.148	35.00	0.89	1.08
DI	29.0	24.0	27.0	2.52	0.369	26.67	-0.91	-0.72
DJ	37.0	36.0	40.0	2.08	0.295	37.67	1.47	1.66
DL								
DM								
DO	34.0	35.0	33.0	1.00	0.148	34.00	0.68	0.87
DP	27.0	28.0	28.0	0.58	0.074	27.67	-0.69	-0.51
DT	28.0	30.0	28.0	1.15	0.148	28.67	-0.48	-0.29

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

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× = Determined to be an outlier

↓ = Below control limit

Alpha									
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
DX	28.0	27.0	26.0	1.00	0.148	27.00	-0.84	-0.65	
DY									•
E									•
EA	33.0	31.0	34.0	1.53	0.222	32.67	0.39	0.58	
EB	26.0	26.0	24.0	1.15	0.148	25.33	-1.20	-1.01	
EF									•
EH	34.0	32.0	35.0	1.53	0.222	33.67	0.60	0.79	
EL	28.0	30.0	27.0	1.53	0.222	28.33	-0.55	-0.36	
EW									•
EX									•
EZ	35.0	32.0	36.0	2.08	0.295	34.33	0.75	0.94	
FE	46.0	50.0	48.0	2.00	0.295	48.00	3.71	3.90	↑
FJ	42.0	39.0	45.0	3.00	0.443	42.00	2.41	2.60	
FK	27.0	28.0	27.0	0.58	0.074	27.33	-0.77	-0.58	
FL	40.0	42.0	42.0	1.15	0.148	41.33	2.26	2.45	
FO	37.0	39.0	35.0	2.00	0.295	37.00	1.33	1.52	
FZ	35.0	29.0	36.0	3.79	0.517	33.33	0.53	0.72	
GE									•
GI	32.0	32.0	29.0	1.73	0.222	31.00	0.03	0.22	
HE	33.0	38.0	35.0	2.52	0.369	35.33	0.97	1.15	
HI	21.0	23.0	21.0	1.15	0.148	21.67	-1.99	-1.80	
HL	53.0	52.0	56.0	2.08	0.295	53.67	4.98	5.12	×
I	33.0	30.0	30.0	1.73	0.222	31.00	0.03	0.22	
IA									•
IC	31.0	31.0	30.0	0.58	0.074	30.67	-0.05	0.14	
IE	32.0	29.0	32.0	1.73	0.222	31.00	0.03	0.22	
IU									•
IY	40.0	39.0	39.0	0.58	0.074	39.33	1.83	2.02	
J	27.0	28.0	26.0	1.00	0.148	27.00	-0.84	-0.65	
JE	42.0	41.0	39.0	1.53	0.222	40.67	2.12	2.31	
JG									•
JS	40.0	41.0	40.0	0.58	0.074	40.33	2.05	2.24	
JU									•
JY	34.0	32.0	31.0	1.53	0.222	32.33	0.32	0.51	
K	31.0	31.0	32.0	0.58	0.074	31.33	0.10	0.29	
KF	28.0	26.0	25.0	1.53	0.222	26.33	-0.98	-0.79	
KH	25.0	25.0	25.0	0.00	0.000	25.00	-1.27	-1.08	
KL									•
KM									•
KX	59.0	59.0	62.0	1.73	0.222	60.00	6.31	6.50	×
L	28.0	26.0	26.0	1.15	0.148	26.67	-0.91	-0.72	
LA	29.0	27.0	30.0	1.53	0.222	28.67	-0.48	-0.29	
LE	32.0	33.0	32.0	0.58	0.074	32.33	0.32	0.51	
LF	30.0	33.0	34.0	2.08	0.295	32.33	0.32	0.51	
LM									•

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Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
LR	41.0	42.0	42.0	0.58	0.074	41.67	2.34	2.53
LT	29.0	29.0	29.0	0.00	0.000	29.00	-0.41	-0.22
LZ	28.0	28.0	29.0	0.58	0.074	28.33	-0.55	-0.36
M	26.0	25.0	27.0	1.00	0.148	26.00	-1.06	-0.87
MA	38.0	40.0	39.0	1.00	0.148	39.00	1.76	1.95
ME	29.0	32.0	30.0	1.53	0.222	30.33	-0.12	0.07
ML	46.0	40.0	47.0	3.79	0.517	44.33	2.91	3.10
MN								•
MP								•
MQ	31.0	35.0	33.0	2.00	0.295	33.00	0.46	0.65
MS	27.0	29.0	27.0	1.15	0.148	27.67	-0.69	-0.51
MV	24.0	23.0	24.0	0.58	0.074	23.67	-1.56	-1.37
N	25.0	26.0	28.0	1.53	0.222	26.33	-0.98	-0.79
NC								•
NH	31.0	30.0	29.0	1.00	0.148	30.00	-0.19	0.00
NJ	27.0	26.0	25.0	1.00	0.148	26.00	-1.06	-0.87
NK	36.0	39.0	38.0	1.53	0.222	37.67	1.47	1.66
NO	28.0	29.0	30.0	1.00	0.148	29.00	-0.41	-0.22
NP	45.0	44.0	41.0	2.08	0.295	43.33	2.70	2.89
NT	25.0	26.0	27.0	1.00	0.148	26.00	-1.06	-0.87
NV								•
NZ	33.0	35.0	34.0	1.00	0.148	34.00	0.68	0.87
O	27.0	28.0	28.0	0.58	0.074	27.67	-0.69	-0.51
OA	31.0	29.0	31.0	1.15	0.148	30.33	-0.12	0.07
OB	27.0	32.0	29.0	2.52	0.369	29.33	-0.33	-0.14
OK								•
OL	29.0	29.0	30.0	0.58	0.074	29.33	-0.33	-0.14
OM								•
OQ								•
OZ								•
P	25.0	23.0	23.0	1.15	0.148	23.67	-1.56	-1.37
PB	26.0	26.0	26.0	0.00	0.000	26.00	-1.06	-0.87
PC	35.0	37.0	37.0	1.15	0.148	36.33	1.18	1.37
PD								•
PE								•
PM	33.0	29.0	35.0	3.06	0.443	32.33	0.32	0.51
PP								•
PS								•
PU	29.0	30.0	25.0	2.65	0.369	28.00	-0.62	-0.43
PV	24.0	26.0	25.0	1.00	0.148	25.00	-1.27	-1.08
PW	32.0	35.0	34.0	1.53	0.222	33.67	0.60	0.79
Q	34.0	30.0	32.0	2.00	0.295	32.00	0.24	0.43
QA	29.0	28.0	29.0	0.58	0.074	28.67	-0.48	-0.29
QB	30.0	26.0	31.0	2.65	0.369	29.00	-0.41	-0.22
QC	27.0	27.0	30.0	1.73	0.222	28.00	-0.62	-0.43

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Alpha									
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
QD									•
QI	24.0	15.0	13.0	5.86	0.812	17.33	-2.93	-2.74	
QJ	33.0	31.0	31.0	1.15	0.148	31.67	0.17	0.36	
QK									•
QM	29.0	29.0	28.0	0.58	0.074	28.67	-0.48	-0.29	
QQ									•
QU	30.0	33.0	31.0	1.53	0.222	31.33	0.10	0.29	
QW	28.0	28.0	33.0	2.89	0.369	29.67	-0.26	-0.07	
QX	28.0	28.0	29.0	0.58	0.074	28.33	-0.55	-0.36	
QZ	31.0	32.0	31.0	0.58	0.074	31.33	0.10	0.29	
R	33.0	33.0	34.0	0.58	0.074	33.33	0.53	0.72	
RA									•
RC									•
RG	30.0	32.0	31.0	1.00	0.148	31.00	0.03	0.22	
RH	28.0	29.0	27.0	1.00	0.148	28.00	-0.62	-0.43	
RJ	24.0	24.0	24.0	0.00	0.000	24.00	-1.49	-1.30	
RK	28.0	24.0	24.0	2.31	0.295	25.33	-1.20	-1.01	
RN	37.0	39.0	42.0	2.52	0.369	39.33	1.83	2.02	
RO	25.0	28.0	27.0	1.53	0.222	26.67	-0.91	-0.72	
RQ	32.0	32.0	32.0	0.00	0.000	32.00	0.24	0.43	
RS									•
RU									•
RW	26.0	24.0	22.0	2.00	0.295	24.00	-1.49	-1.30	
S	28.0	28.0	28.0	0.00	0.000	28.00	-0.62	-0.43	
SA									•
SC	26.0	28.0	27.0	1.00	0.148	27.00	-0.84	-0.65	
SD	28.0	30.0	31.0	1.53	0.222	29.67	-0.26	-0.07	
SF									•
SI	34.0	32.0	32.0	1.15	0.148	32.67	0.39	0.58	
SM									•
SP									•
SQ									•
SR	36.0	36.0	38.0	1.15	0.148	36.67	1.25	1.44	
SS	29.0	28.0	28.0	0.58	0.074	28.33	-0.55	-0.36	
ST									•
SW	25.0	26.0	27.0	1.00	0.148	26.00	-1.06	-0.87	
SY									•
SZ									•
T	29.0	33.0	28.0	2.65	0.369	30.00	-0.19	0.00	
TA	37.0	31.0	32.0	3.21	0.443	33.33	0.53	0.72	
TB									•
TE	33.0	35.0	33.0	1.15	0.148	33.67	0.60	0.79	
TG	33.0	34.0	31.0	1.53	0.222	32.67	0.39	0.58	
TH	24.0	25.0	25.0	0.58	0.074	24.67	-1.34	-1.15	
TI									•

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Alpha

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
TK									•
TL	29.0	28.0	27.0	1.00	0.148	28.00	-0.62	-0.43	
TP									•
TS									•
TV	41.0	43.0	42.0	1.00	0.148	42.00	2.41	2.60	
TW									•
X	31.0	30.0	32.0	1.00	0.148	31.00	0.03	0.22	
Y	27.0	30.0	27.0	1.73	0.222	28.00	-0.62	-0.43	
Z	30.0	30.0	30.0	0.00	0.000	30.00	-0.19	0.00	

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
17.33		QI	27.33		CO	30.00		Z
20.67		AL	27.33		CJ	30.00		T
21.67		HI	27.33		CC	30.00		NH
22.33		A	27.67		O	30.00		D
23.67		P	27.67		MS	30.00		CE
23.67		MV	27.67		DP	30.33		OA
24.00		RW	27.67		BG	30.33		ME
24.00		RJ	28.00		Y	30.33		DD
24.67		TH	28.00		TL	30.67		IC
25.00		PV	28.00		S	31.00		X
25.00		KH	28.00		RH	31.00		RG
25.00		DE	28.00		QC	31.00		IE
25.33		RK	28.00		PU	31.00		I
25.33		EB	28.33		SS	31.00		GI
25.67		CA	28.33		QX	31.33		QZ
25.67		BH	28.33		LZ	31.33		QU
26.00		SW	28.33		EL	31.33		K
26.00		PB	28.33		BK	31.67		QJ
26.00		NT	28.33		AZ	31.67		AA
26.00		NJ	28.33		AK	32.00		RQ
26.00		M	28.67		QM	32.00		Q
26.00		BO	28.67		QA	32.00		CQ
26.33		N	28.67		LA	32.00		BL
26.33		KF	28.67		DT	32.33		PM
26.33		CC	28.67		BA	32.33		LF
26.33		BI	28.67		AP	32.33		LE
26.67		RO	29.00		QB	32.33		JY
26.67		L	29.00		NO	32.33		DG
26.67		DI	29.00		LT	32.67		TG
27.00		SC	29.33		OL	32.67		SI
27.00		J	29.33		OB	32.67		EA
27.00		DX	29.67		SD	33.00		MQ
27.33		FK	29.67		QW	33.00		AU

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

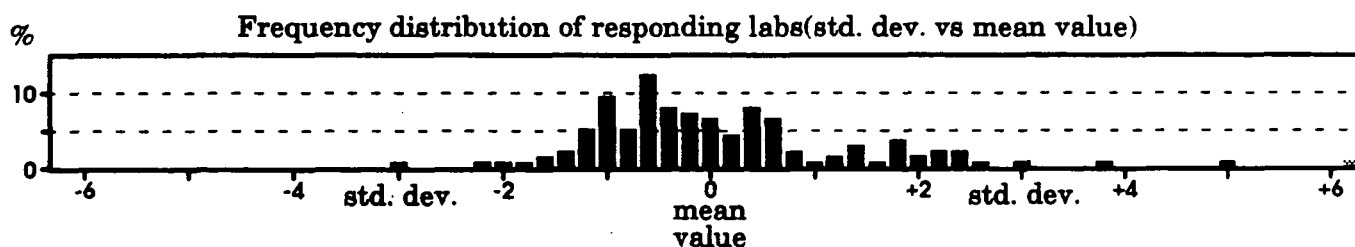
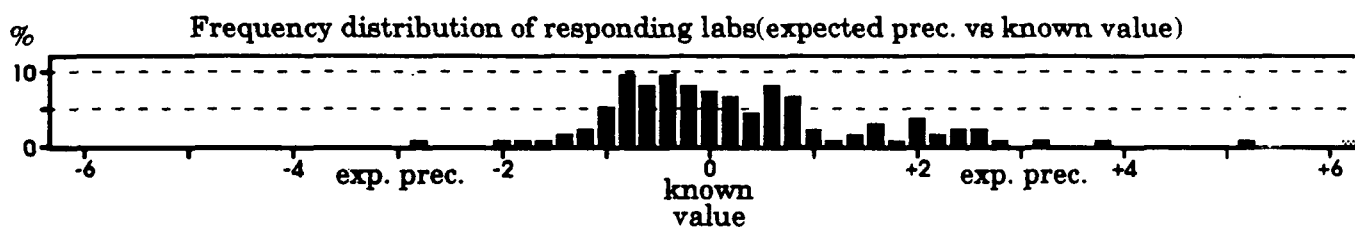
× = Determined to be an outlier

↓ = Below control limit

Alpha

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
33.00		AJ	35.33		HE	40.00		AN
33.33		TA	36.33		PC	40.33		JS
33.33		R	36.67		SR	40.67		JE
33.33		FZ	37.00		FO	41.00		BM
33.67		TE	37.00		AF	41.33		FL
33.67		PW	37.67		NK	41.67		LR
33.67		EH	37.67		DJ	42.00		TV
33.67		BC	38.67		AE	42.00		FJ
34.00		NZ	39.00		MA	43.33		NP
34.00		DO	39.00		CP	44.33	↑	ML
34.33		EZ	39.33		RN	48.00	↑	FE
34.67		AI	39.33		IY	53.67	×	HL
35.00		DH	39.33		CS	60.00	×	KX



• ≡ No data submitted

TAG SYMBOLS

↑ ≡ Above control limit

∅ ≡ Insufficient data

× ≡ Determined to be an outlier

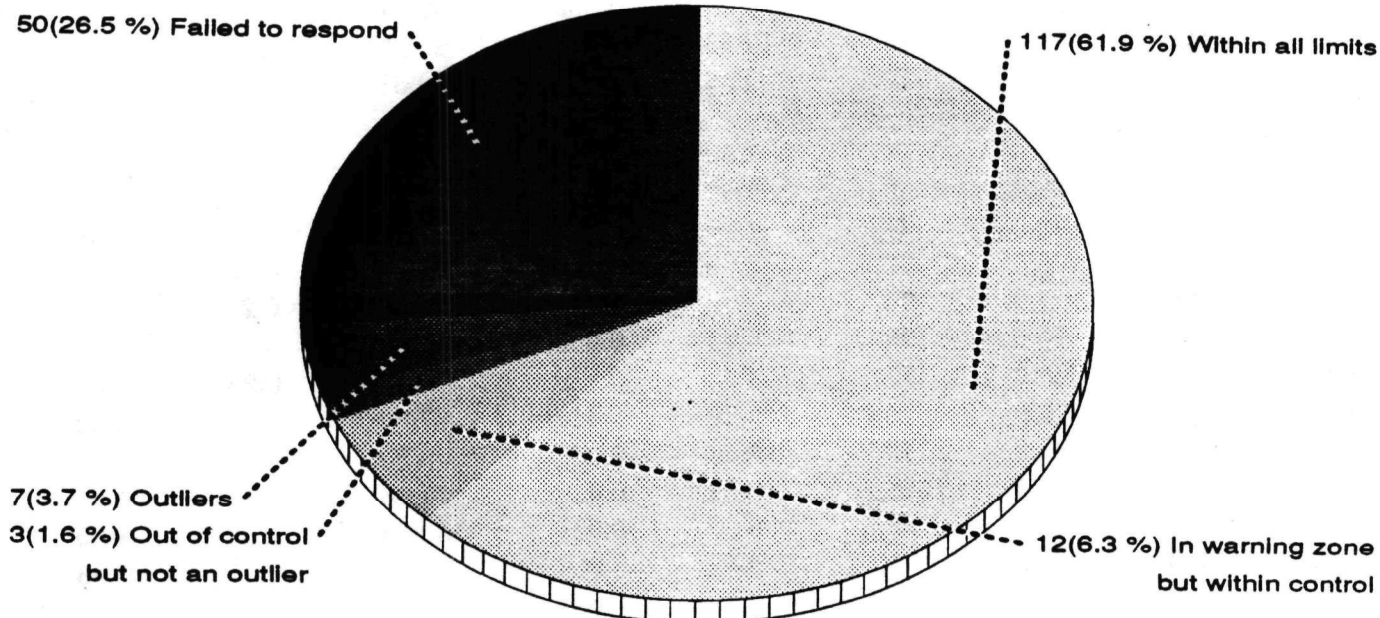
↓ ≡ Below control limit

Beta

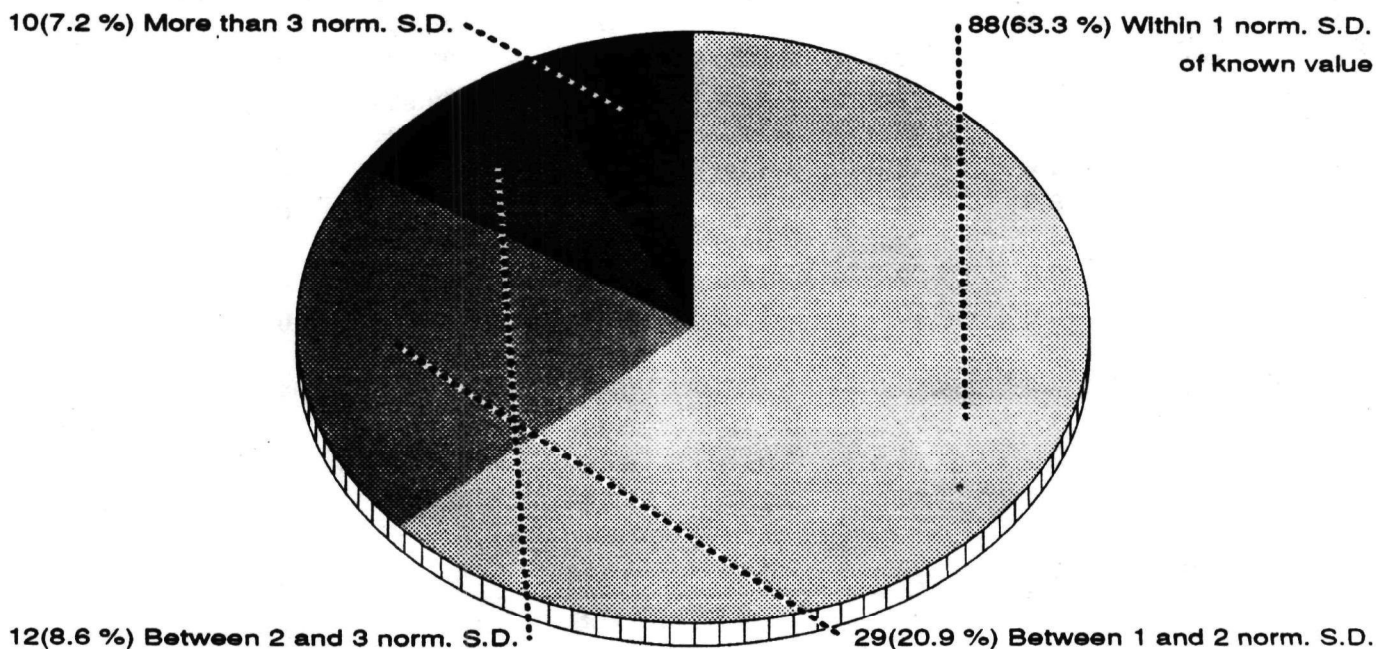
Statistical Summary

189 Participants

The known value of this nuclide is 69.0 pCi/F with an expected precision of 10.0; the control limits are 51.7 to 86.3; the warning regions are 51.7 to 57.4 and 80.6 to 86.3



Statistic	Respondents	Non-outliers
Mean	72.79	Grand Avg 71.98
Std. Dev.	11.62	6.43
Variance	134.92	41.38
% Coef. of Var.	15.96	8.94
% deviation of mean from known value	5.49	4.32
Norm. dev. of mean from known value	0.33	0.46
Median	72.00	71.83
% deviation of median from known value	4.35	4.11
Norm. dev. of median from known value	0.26	0.44



Beta								
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	70.0	70.0	70.0	0.00	0.000	70.00	-0.34	0.17
AA	68.0	69.0	69.0	0.58	0.059	68.67	-0.57	-0.06
AE	64.0	63.0	64.0	0.58	0.059	63.67	-1.44	-0.92
AF	73.0	72.0	72.0	0.58	0.059	72.33	0.06	0.58
•								
AI	66.0	64.0	67.0	1.53	0.177	65.67	-1.09	-0.58
AJ	70.0	69.0	69.0	0.58	0.059	69.33	-0.46	0.06
AK	74.0	72.0	73.0	1.00	0.118	73.00	0.18	0.69
AL	66.0	69.0	70.0	2.08	0.236	68.33	-0.63	-0.12
AN	74.0	72.0	74.0	1.15	0.118	73.33	0.23	0.75
AP	74.0	74.0	73.0	0.58	0.059	73.67	0.29	0.81
AU	73.0	73.0	75.0	1.15	0.118	73.67	0.29	0.81
AZ	66.0	65.0	72.0	3.79	0.413	67.67	-0.75	-0.23
BA	69.0	69.0	70.0	0.58	0.059	69.33	-0.46	0.06
BC	70.0	68.0	75.0	3.61	0.413	71.00	-0.17	0.35
BG	61.0	60.0	60.0	0.58	0.059	60.33	-2.02	-1.50
BH	72.0	72.0	71.0	0.58	0.059	71.67	-0.05	0.46
BI	77.0	76.0	76.0	0.58	0.059	76.33	0.75	1.27
BK	71.0	70.0	69.0	1.00	0.118	70.00	-0.34	0.17
BL	71.0	72.0	72.0	0.58	0.059	71.67	-0.05	0.46
BM	78.0	79.0	79.0	0.58	0.059	78.67	1.16	1.67
BO	63.0	65.0	64.0	1.00	0.118	64.00	-1.38	-0.87
•								
BW								
CA	69.0	70.0	68.0	1.00	0.118	69.00	-0.52	0.00
CC	72.0	73.0	67.0	3.21	0.354	70.67	-0.23	0.29
CC	72.0	74.0	67.0	3.61	0.413	71.00	-0.17	0.35
CE	74.0	75.0	73.0	1.00	0.118	74.00	0.35	0.87
CJ	70.0	69.0	68.0	1.00	0.118	69.00	-0.52	0.00
•								
CM								
CO	60.0	59.0	57.0	1.53	0.177	58.67	-2.31	-1.79
CP	69.0	69.0	68.0	0.58	0.059	68.67	-0.57	-0.06
CQ	73.0	63.0	71.0	5.29	0.591	69.00	-0.52	0.00
CS	69.0	70.0	72.0	1.53	0.177	70.33	-0.29	0.23
D	70.0	72.0	71.0	1.00	0.118	71.00	-0.17	0.35
DD	75.0	75.0	75.0	0.00	0.000	75.00	0.52	1.04
DE	74.0	74.0	74.0	0.00	0.000	74.00	0.35	0.87
DG	74.0	73.0	72.0	1.00	0.118	73.00	0.18	0.69
DH	73.0	72.0	70.0	1.53	0.177	71.67	-0.05	0.46
•								
DI								
DJ	100.0	108.0	102.0	4.16	0.473	103.33	5.43	5.95 ×
DL	71.0	75.0	73.0	2.00	0.236	73.00	0.18	0.69
DM	70.0	70.0	71.0	0.58	0.059	70.33	-0.29	0.23
DO	86.0	86.0	84.0	1.15	0.118	85.33	2.31	2.83
•								
DP								
DT	69.0	70.0	66.0	2.08	0.236	68.33	-0.63	-0.12

• = No data submitted

TAG SYMBOLS

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↓ = Below control limit

Beta								
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
DX	71.0	71.0	69.0	1.15	0.118	70.33	-0.29	0.23
DY								•
E								•
EA	77.0	72.0	69.0	4.04	0.473	72.67	0.12	0.64
EB	72.0	70.0	70.0	1.15	0.118	70.67	-0.23	0.29
EF								•
EH	75.0	74.0	74.0	0.58	0.059	74.33	0.41	0.92
EL	73.0	72.0	73.0	0.58	0.059	72.67	0.12	0.64
EW								•
EX	80.0	78.0	79.0	1.00	0.118	79.00	1.22	1.73
EZ	65.0	65.0	61.0	2.31	0.236	63.67	-1.44	-0.92
FE	69.0	72.0	69.0	1.73	0.177	70.00	-0.34	0.17
FJ	82.0	81.0	84.0	1.53	0.177	82.33	1.79	2.31
FK	67.0	66.0	67.0	0.58	0.059	66.67	-0.92	-0.40
FL	79.0	86.0	84.0	3.61	0.413	83.00	1.91	2.42
FO								•
FZ	73.0	70.0	73.0	1.73	0.177	72.00	0.00	0.52
GE	73.0	75.0	71.0	2.00	0.236	73.00	0.18	0.69
GI								•
HE	85.0	85.0	83.0	1.15	0.118	84.33	2.14	2.66
HI	67.0	69.0	64.0	2.52	0.295	66.67	-0.92	-0.40
HL	81.0	81.0	84.0	1.73	0.177	82.00	1.74	2.25
I	74.0	74.0	73.0	0.58	0.059	73.67	0.29	0.81
IA								•
IC	83.0	83.0	82.0	0.58	0.059	82.67	1.85	2.37
IE	64.0	62.0	63.0	1.00	0.118	63.00	-1.56	-1.04
IU	69.0	67.0	68.0	1.00	0.118	68.00	-0.69	-0.17
IY	88.0	84.0	85.0	2.08	0.236	85.67	2.37	2.89
J	74.0	74.0	71.0	1.73	0.177	73.00	0.18	0.69
JE	84.0	81.0	84.0	1.73	0.177	83.00	1.91	2.42
JG								•
JS	72.0	72.0	73.0	0.58	0.059	72.33	0.06	0.58
JU								•
JY	76.0	75.0	76.0	0.58	0.059	75.67	0.64	1.15
K	72.0	75.0	79.0	3.51	0.413	75.33	0.58	1.10
KF	68.0	66.0	63.0	2.52	0.295	65.67	-1.09	-0.58
KH	72.0	72.0	73.0	0.58	0.059	72.33	0.06	0.58
KL								•
KM								•
KX	67.0	67.0	68.0	0.58	0.059	67.33	-0.80	-0.29
L	70.0	74.0	71.0	2.08	0.236	71.67	-0.05	0.46
LA	73.0	72.0	69.0	2.08	0.236	71.33	-0.11	0.40
LE	79.0	79.0	76.0	1.73	0.177	78.00	1.04	1.56
LF	65.0	67.0	68.0	1.53	0.177	66.67	-0.92	-0.40
LM								•

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Beta									
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LR	88.0	89.0	86.0	1.53	0.177	87.67	2.72	3.23	↑
LT	62.0	62.0	62.0	0.00	0.000	62.00	-1.73	-1.21	
LZ	71.0	73.0	73.0	1.15	0.118	72.33	0.06	0.58	
M	78.0	78.0	79.0	0.58	0.059	78.33	1.10	1.62	
MA	74.0	74.0	71.0	1.73	0.177	73.00	0.18	0.69	
ME	73.0	74.0	73.0	0.58	0.059	73.33	0.23	0.75	
ML	108.0	113.0	115.0	3.61	0.413	112.00	6.93	7.45	×
MN									•
MP									•
MQ	67.0	66.0	63.0	2.08	0.236	65.33	-1.15	-0.64	
MS	78.0	79.0	82.0	2.08	0.236	79.67	1.33	1.85	
MV	69.0	69.0	67.0	1.15	0.118	68.33	-0.63	-0.12	
N	69.0	70.0	72.0	1.53	0.177	70.33	-0.29	0.23	
NC									•
NH	81.0	77.0	83.0	3.06	0.354	80.33	1.45	1.96	
NJ	59.0	58.0	51.0	4.36	0.473	56.00	-2.77	-2.25	
NK	68.0	68.0	70.0	1.15	0.118	68.67	-0.57	-0.06	
NO	63.0	64.0	65.0	1.00	0.118	64.00	-1.38	-0.87	
NP	61.0	57.0	57.0	2.31	0.236	58.33	-2.36	-1.85	
NT	73.0	74.0	75.0	1.00	0.118	74.00	0.35	0.87	
NV									•
NZ	83.0	83.0	83.0	0.00	0.000	83.00	1.91	2.42	
O	76.0	76.0	75.0	0.58	0.059	75.67	0.64	1.15	
OA	79.0	78.0	77.0	1.00	0.118	78.00	1.04	1.56	
OB	76.0	82.0	76.0	3.46	0.354	78.00	1.04	1.56	
OK									•
OL									•
OM									•
OQ									•
OZ									•
P	73.0	70.0	69.0	2.08	0.236	70.67	-0.23	0.29	
PB	70.0	70.0	71.0	0.58	0.059	70.33	-0.29	0.23	
PC	73.0	73.0	73.0	0.00	0.000	73.00	0.18	0.69	
PD									•
PE									•
PM	84.0	79.0	80.0	2.65	0.295	81.00	1.56	2.08	
PP									•
PS									•
PU	75.0	76.0	73.0	1.53	0.177	74.67	0.47	0.98	
PV	68.0	67.0	70.0	1.53	0.177	68.33	-0.63	-0.12	
PW	70.0	80.0	78.0	5.29	0.591	76.00	0.70	1.21	
Q	57.0	58.0	58.0	0.58	0.059	57.67	-2.48	-1.96	
QA	75.0	75.0	73.0	1.15	0.118	74.33	0.41	0.92	
QB	73.0	72.0	73.0	0.58	0.059	72.67	0.12	0.64	
QC	93.0	90.0	92.0	1.53	0.177	91.67	3.41	3.93	↑

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Beta									
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
QD									•
QI	21.0	11.0	11.0	5.77	0.591	14.33	-9.98	-9.47	×
QJ	68.0	72.0	56.0	8.33	0.945	65.33	-1.15	-0.64	
QK									•
QM	64.0	69.0	69.0	2.89	0.295	67.33	-0.80	-0.29	
QQ									•
QU	72.0	68.0	70.0	2.00	0.236	70.00	-0.34	0.17	
QW	74.0	72.0	68.0	3.06	0.354	71.33	-0.11	0.40	
QX	76.0	75.0	77.0	1.00	0.118	76.00	0.70	1.21	
QZ	80.0	84.0	77.0	3.51	0.413	80.33	1.45	1.96	
R	72.0	73.0	73.0	0.58	0.059	72.67	0.12	0.64	
RA									•
RC									•
RG	77.0	77.0	77.0	0.00	0.000	77.00	0.87	1.39	
RH	67.0	68.0	70.0	1.53	0.177	68.33	-0.63	-0.12	
RJ	70.0	71.0	71.0	0.58	0.059	70.67	-0.23	0.29	
RK	51.0	52.0	51.0	0.58	0.059	51.33	-3.58	-3.06	↓
RN	68.0	68.0	71.0	1.73	0.177	69.00	-0.52	0.00	
RO	82.0	84.0	82.0	1.15	0.118	82.67	1.85	2.37	
RQ	76.0	76.0	76.0	0.00	0.000	76.00	0.70	1.21	
RS									•
RU									•
RW	72.0	71.0	72.0	0.58	0.059	71.67	-0.05	0.46	
S	76.0	75.0	72.0	2.08	0.236	74.33	0.41	0.92	
SA									•
SC	60.0	56.0	61.0	2.65	0.295	59.00	-2.25	-1.73	
SD	73.0	76.0	76.0	1.73	0.177	75.00	0.52	1.04	
SF									•
SI	73.0	70.0	73.0	1.73	0.177	72.00	0.00	0.52	
SM									•
SP									•
SQ									•
SR	107.0	100.0	116.0	8.02	0.945	107.67	6.18	6.70	×
SS	78.0	78.0	78.0	0.00	0.000	78.00	1.04	1.56	
ST									•
SW	41.0	40.0	40.0	0.58	0.059	40.33	-5.48	-4.97	×
SY									•
SZ									•
T	67.0	68.0	65.0	1.53	0.177	66.67	-0.92	-0.40	
TA	75.0	74.0	73.0	1.00	0.118	74.00	0.35	0.87	
TB	80.0	75.0	75.0	2.89	0.295	76.67	0.81	1.33	
TE	136.0	139.0	135.0	2.08	0.236	136.67	11.20	11.72	×
TG	70.0	70.0	69.0	0.58	0.059	69.67	-0.40	0.12	
TH	77.0	75.0	76.0	1.00	0.118	76.00	0.70	1.21	
TI									•

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Beta									
Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
TK									•
TL	70.0	68.0	67.0	1.53	0.177	68.33	-0.63	-0.12	
TP									•
TS									•
TV	104.0	101.0	102.0	1.53	0.177	102.33	5.28	5.77	×
TW									•
X	68.0	65.0	60.0	4.04	0.473	64.33	-1.32	-0.81	
Y	69.0	61.0	68.0	4.36	0.473	66.00	-1.04	-0.52	
Z	73.0	73.0	70.0	1.73	0.177	72.00	0.00	0.52	

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
14.33	×	QI	68.33		DT	71.67		BL
40.33	×	SW	68.33		AL	71.67		BH
51.33	↓	RK	68.67		NK	72.00		Z
56.00		NJ	68.67		CP	72.00		SI
57.67		Q	68.67		AA	72.00		FZ
58.33		NP	69.00		RN	72.33		LZ
58.67		CO	69.00		CQ	72.33		KH
59.00		SC	69.00		CJ	72.33		JS
60.33		BG	69.00		CA	72.33		AF
62.00		LT	69.33		BA	72.67		R
63.00		IE	69.33		AJ	72.67		QB
63.67		EZ	69.67		TG	72.67		EL
63.67		AE	70.00		QU	72.67		EA
64.00		NO	70.00		FE	73.00		PC
64.00		BO	70.00		BK	73.00		MA
64.33		X	70.00		A	73.00		J
65.33		QJ	70.33		PB	73.00		GE
65.33		MQ	70.33		N	73.00		DL
65.67		KF	70.33		DX	73.00		DG
65.67		AI	70.33		DM	73.00		AK
66.00		Y	70.33		CS	73.33		ME
66.67		T	70.67		RJ	73.33		AN
66.67		LF	70.67		P	73.67		I
66.67		HI	70.67		EB	73.67		AU
66.67		FK	70.67		CC	73.67		AP
67.33		QM	71.00		D	74.00		TA
67.33		KX	71.00		CC	74.00		NT
67.67		AZ	71.00		BC	74.00		DE
68.00		IU	71.33		QW	74.00		CE
68.33		TL	71.33		LA	74.33		S
68.33		RH	71.67		RW	74.33		QA
68.33		PV	71.67		L	74.33		EH
68.33		MV	71.67		DH	74.67		PU

• = No data submitted

TAG SYMBOLS

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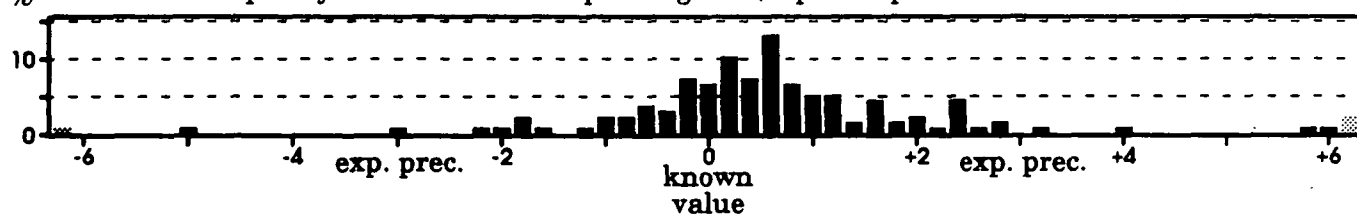
× = Determined to be an outlier

↓ = Below control limit

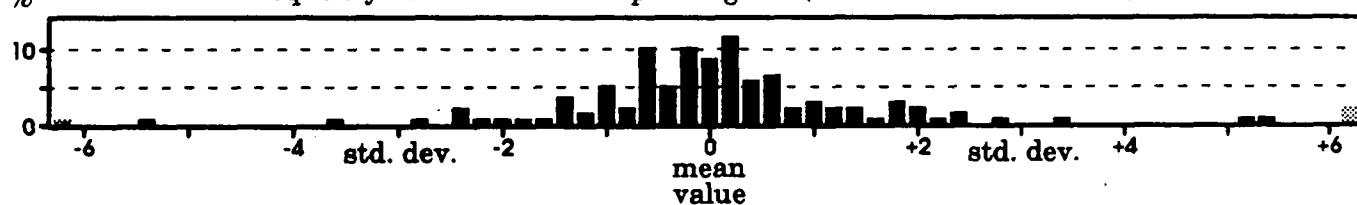
Beta**Data sorted by Laboratory Average**

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
75.00		SD	78.00		OB	82.67		IC
75.00		DD	78.00		OA	83.00		NZ
75.33		K	78.00		LE	83.00		JE
75.67		O	78.33		M	83.00		FL
75.67		JY	78.67		BM	84.33		HE
76.00		TH	79.00		EX	85.33		DO
76.00		RQ	79.67		MS	85.67		IY
76.00		QX	80.33		QZ	87.67	↑	LR
76.00		PW	80.33		NH	91.67	↑	QC
76.33		BI	81.00		PM	102.33	×	TV
76.67		TB	82.00		HL	103.33	×	DJ
77.00		RG	82.33		FJ	107.67	×	SR
78.00		SS	82.67		RO	112.00	×	ML
						136.67	×	TE

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

Ø ≡ Insufficient data

× ≡ Determined to be an outlier

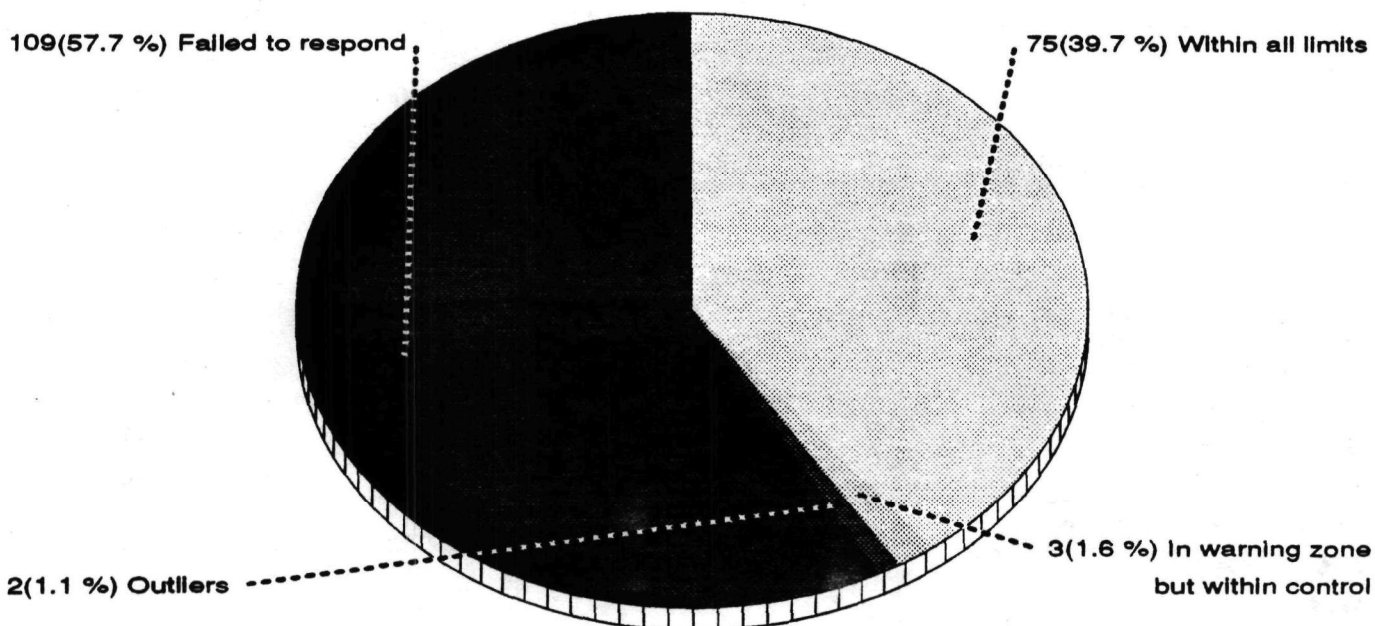
↑ ≡ Above control limit

↓ ≡ Below control limit

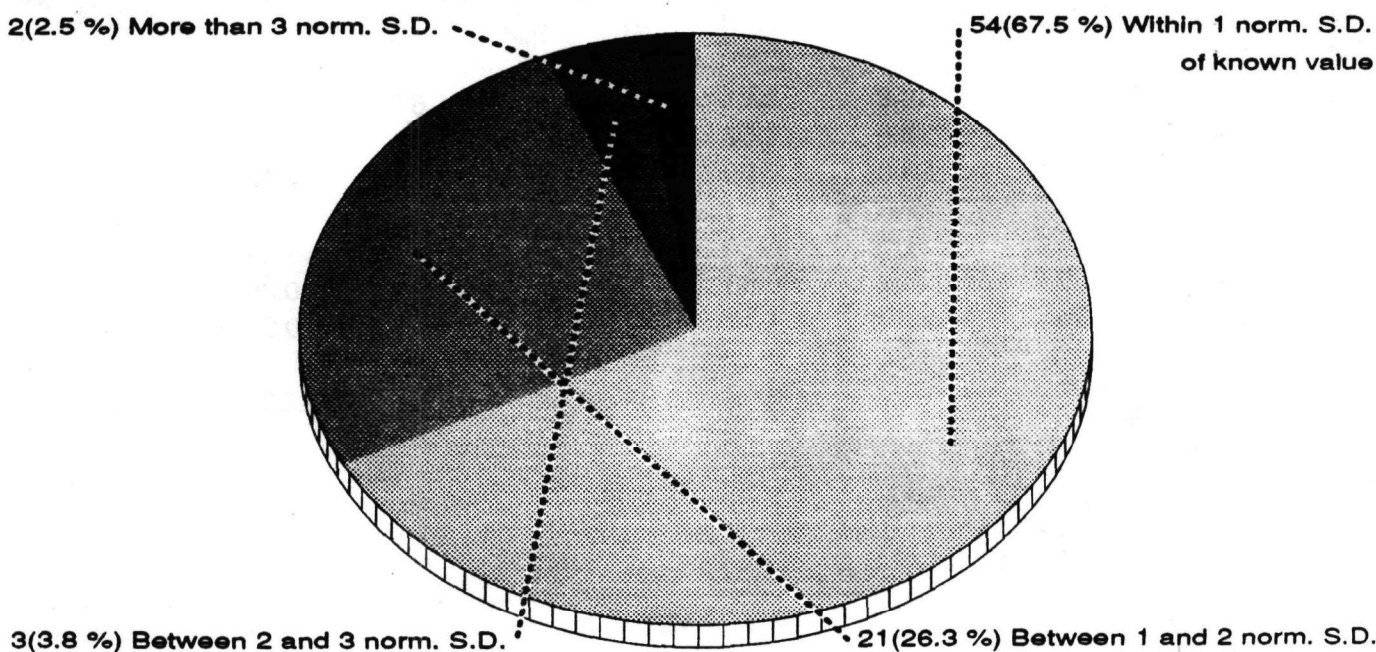
Strontium 90
Statistical Summary

189 Participants

The known value of this nuclide is 25.0 pCi/F with an expected precision of 5.0; the control limits are 16.3 to 33.7; the warning regions are 16.3 to 19.2 and 30.8 to 33.7



Statistic	Respondents	Non-outliers
Mean	25.24	Grand Avg 24.31
Std. Dev.	7.61	2.80
Variance	57.93	7.85
% Coef. of Var.	30.15	11.53
% deviation of mean from known value	0.97	-2.77
Norm. dev. of mean from known value	0.03	-0.25
Median	24.33	24.33
% deviation of median from known value	-2.67	-2.67
Norm. dev. of median from known value	-0.09	-0.24



Strontium 90

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
A	25.0	24.0	24.0	0.58	0.118	24.33	0.01	-0.23	
AA	25.0	21.0	25.0	2.31	0.473	23.67	-0.22	-0.46	
AE									•
AF	25.0	25.0	25.0	0.00	0.000	25.00	0.24	0.00	
AH									•
AI	22.0	22.0	22.0	0.00	0.000	22.00	-0.80	-1.04	
AJ									•
AK	25.0	23.0	26.0	1.53	0.354	24.67	0.12	-0.12	
AL	29.0	24.0	26.0	2.52	0.591	26.33	0.70	0.46	
AN									•
AP									•
AU									•
AZ	25.0	22.0	18.0	3.51	0.827	21.67	-0.91	-1.15	
BA	5.0	23.0	22.0	10.12	3.146	16.67	-2.65	-2.89	
BC	32.0	25.0	31.0	3.79	0.827	29.33	1.74	1.50	
BG	25.0	25.0	23.0	1.15	0.236	24.33	0.01	-0.23	
BH									•
BI									•
BK									•
BL	24.0	22.0	22.0	1.15	0.236	22.67	-0.57	-0.81	
BM	26.0	26.0	26.0	0.00	0.000	26.00	0.59	0.35	
BO	24.0	23.0	24.0	0.58	0.118	23.67	-0.22	-0.46	
BW									•
CA	28.0	26.0	24.0	2.00	0.473	26.00	0.59	0.35	
CC									•
CC									•
CE									•
CJ	22.0	22.0	24.0	1.15	0.236	22.67	-0.57	-0.81	
CM									•
CO									•
CP									•
CQ	24.0	23.0	18.0	3.21	0.709	21.67	-0.91	-1.15	
CS	22.0	25.0	23.0	1.53	0.354	23.33	-0.34	-0.58	
D	21.0	22.0	23.0	1.00	0.236	22.00	-0.80	-1.04	
DD	23.0	23.0	25.0	1.15	0.236	23.67	-0.22	-0.46	
DE	20.0	20.0	21.0	0.58	0.118	20.33	-1.38	-1.62	
DG	26.0	25.0	25.0	0.58	0.118	25.33	0.36	0.12	
DH	26.0	26.0	23.0	1.73	0.354	25.00	0.24	0.00	
DI									•
DJ	84.0	87.0	89.0	2.52	0.591	86.67	21.60	21.36	×
DL									•
DM									•
DO	26.0	24.0	26.0	1.15	0.236	25.33	0.36	0.12	
DP									•
DT									•

• = No data submitted

TAG SYMBOLS

↑ = Above control limit

∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Strontium 90

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
DX									•
DY									•
E	24.0	25.0	25.0	0.58	0.118	24.67	0.12	-0.12	
EA									•
EB	24.0	21.0	24.0	1.73	0.354	23.00	-0.45	-0.69	
EF									•
EH	24.0	26.0	26.0	1.15	0.236	25.33	0.36	0.12	
EL	24.0	24.0	23.0	0.58	0.118	23.67	-0.22	-0.46	
EW									•
EX									•
EZ	27.0	25.0	28.0	1.53	0.354	26.67	0.82	0.58	
FE	25.0	25.0	25.0	0.00	0.000	25.00	0.24	0.00	
FJ	23.0	22.0	26.0	2.08	0.473	23.67	-0.22	-0.46	
FK	27.0	26.0	26.0	0.58	0.118	26.33	0.70	0.46	
FL									•
FO									•
FZ	21.0	24.0	23.0	1.53	0.354	22.67	-0.57	-0.81	
GE									•
GI									•
HE	34.0	33.0	33.0	0.58	0.118	33.33	3.13	2.89	
HI									•
HL									•
I									•
IA									•
IC	25.0	25.0	24.0	0.58	0.118	24.67	0.12	-0.12	
IE									•
IU									•
IY									•
J	27.0	27.0	27.0	0.00	0.000	27.00	0.93	0.69	
JE	18.0	20.0	22.0	2.00	0.473	20.00	-1.49	-1.73	
JG									•
JS	30.0	25.0	26.0	2.65	0.591	27.00	0.93	0.69	
JU									•
JY	21.0	23.0	21.0	1.15	0.236	21.67	-0.91	-1.15	
K	35.0	37.0	38.0	1.53	0.354	36.67	4.28	4.04	×
KF									•
KH	25.0	25.0	23.0	1.15	0.236	24.33	0.01	-0.23	
KL	23.0	22.0	22.0	0.58	0.118	22.33	-0.68	-0.92	
KM									•
KX	21.0	24.0	21.0	1.73	0.354	22.00	-0.80	-1.04	
L									•
LA									•
LE									•
LF									•
LM									•

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TAG SYMBOLS

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∅ = Insufficient data

× = Determined to be an outlier

↓ = Below control limit

Strontium 90

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
LR	32.0	34.0	33.0	1.00	0.236	33.00	3.01	2.77	
LT	22.0	22.0	22.0	0.00	0.000	22.00	-0.80	-1.04	
LZ									•
M	27.0	27.0	28.0	0.58	0.118	27.33	1.05	0.81	
MA									•
ME	25.0	27.0	28.0	1.53	0.354	26.67	0.82	0.58	
ML									•
MN									•
MP									•
MQ	26.0	26.0	26.0	0.00	0.000	26.00	0.59	0.35	
MS	26.0	26.0	26.0	0.00	0.000	26.00	0.59	0.35	
MV									•
N									•
NC									•
NH									•
NJ	28.0	31.0	26.0	2.52	0.591	28.33	1.39	1.15	
NK									•
NO									•
NP	21.0	19.0	18.0	1.53	0.354	19.33	-1.72	-1.96	
NT									•
NV									•
NZ									•
O									•
OA	24.0	25.0	25.0	0.58	0.118	24.67	0.12	-0.12	
OB									•
OK									•
OL	22.0	22.0	24.0	1.15	0.236	22.67	-0.57	-0.81	
OM									•
OQ									•
OZ									•
P									•
PB	25.0	25.0	25.0	0.00	0.000	25.00	0.24	0.00	
PC	23.0	22.0	23.0	0.58	0.118	22.67	-0.57	-0.81	
PD									•
PE									•
PM	19.0	19.0	21.0	1.15	0.236	19.67	-1.61	-1.85	
PP	27.0	26.0	25.0	1.00	0.236	26.00	0.59	0.35	
PS									•
FU									•
PV	19.0	22.0	21.0	1.53	0.354	20.67	-1.26	-1.50	
PW	30.0	26.0	25.0	2.65	0.591	27.00	0.93	0.69	
Q	20.0	21.0	22.0	1.00	0.236	21.00	-1.15	-1.39	
QA									•
QB									•
QC									•

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↓ = Below control limit

Strontium 90

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
QD									•
QI									•
QJ	22.0	23.0	18.0	2.65	0.591	21.00	-1.15	-1.39	
QK									•
QM	24.0	24.0	24.0	0.00	0.000	24.00	-0.11	-0.35	
QQ									•
QU	25.0	26.0	24.0	1.00	0.236	25.00	0.24	0.00	
QW	25.0	25.0	25.0	0.00	0.000	25.00	0.24	0.00	
QX									•
QZ	24.0	24.0	25.0	0.58	0.118	24.33	0.01	-0.23	
R	22.0	22.0	22.0	0.00	0.000	22.00	-0.80	-1.04	
RA	26.0	27.0	25.0	1.00	0.236	26.00	0.59	0.35	
RC									•
RG									•
RH	24.0	25.0	26.0	1.00	0.236	25.00	0.24	0.00	
RJ									•
RK	26.0	25.0	25.0	0.58	0.118	25.33	0.36	0.12	
RN	25.0	21.0	21.0	2.31	0.473	22.33	-0.68	-0.92	
RO									•
RQ									•
RS									•
RU									•
RW									•
S									•
SA									•
SC	21.0	23.0	22.0	1.00	0.236	22.00	-0.80	-1.04	
SD									•
SF									•
SI	25.0	25.0	25.0	0.00	0.000	25.00	0.24	0.00	
SM									•
SP									•
SQ									•
SR									•
SS	24.0	24.0	25.0	0.58	0.118	24.33	0.01	-0.23	
ST									•
SW	24.0	25.0	25.0	0.58	0.118	24.67	0.12	-0.12	
SY									•
SZ									•
T	24.0	23.0	25.0	1.00	0.236	24.00	-0.11	-0.35	
TA	23.0	23.0	24.0	0.58	0.118	23.33	-0.34	-0.58	
TB									•
TE	29.0	31.0	30.0	1.00	0.236	30.00	1.97	1.73	
TG									•
TH									•
TI									•

• = No data submitted

TAG SYMBOLS

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↓ = Below control limit

Strontium 90

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known)		Tag
TK									•
TL	34.0	27.0	30.0	3.51	0.827	30.33	2.09	1.85	
TP									•
TS									•
TV									•
TW									•
X	23.0	22.0	20.0	1.53	0.354	21.67	-0.91	-1.15	
Y									•
Z	23.0	24.0	24.0	0.58	0.118	23.67	-0.22	-0.46	

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
16.67		BA	23.33		TA	25.00		AF
19.33		NP	23.33		CS	25.33		RK
19.67		PM	23.67		Z	25.33		EH
20.00		JE	23.67		FJ	25.33		DO
20.33		DE	23.67		EL	25.33		DG
20.67		PV	23.67		DD	26.00		RA
21.00		QJ	23.67		BO	26.00		PP
21.00		Q	23.67		AA	26.00		MS
21.67		X	24.00		T	26.00		MQ
21.67		JY	24.00		QM	26.00		CA
21.67		CQ	24.33		SS	26.00		BM
21.67		AZ	24.33		QZ	26.33		FK
22.00		SC	24.33		KH	26.33		AL
22.00		R	24.33		BG	26.67		ME
22.00		LT	24.33		A	26.67		EZ
22.00		KX	24.67		SW	27.00		PW
22.00		D	24.67		OA	27.00		JS
22.00		AI	24.67		IC	27.00		J
22.33		RN	24.67		E	27.33		M
22.33		KL	24.67		AK	28.33		NJ
22.67		PC	25.00		SI	29.33		BC
22.67		OL	25.00		RH	30.00		TE
22.67		FZ	25.00		QW	30.33		TL
22.67		CJ	25.00		QU	33.00		LR
22.67		BL	25.00		PB	33.33		HE
23.00		EB	25.00		FE	36.67	×	K
			25.00		DH	86.67	×	DJ

• = No data submitted

TAG SYMBOLS

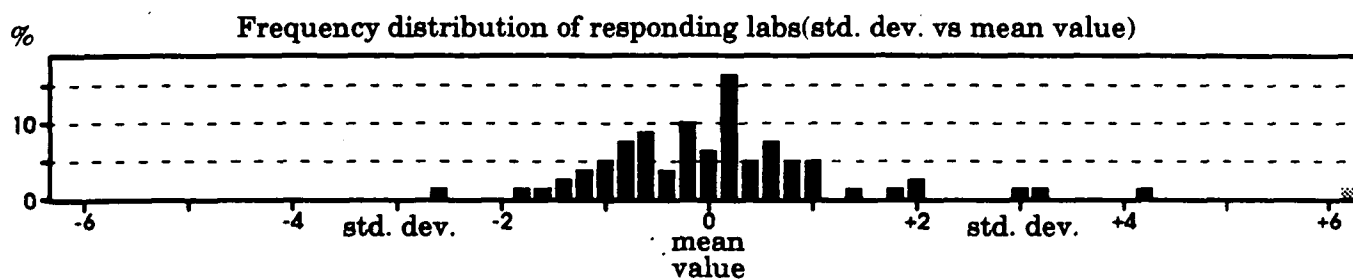
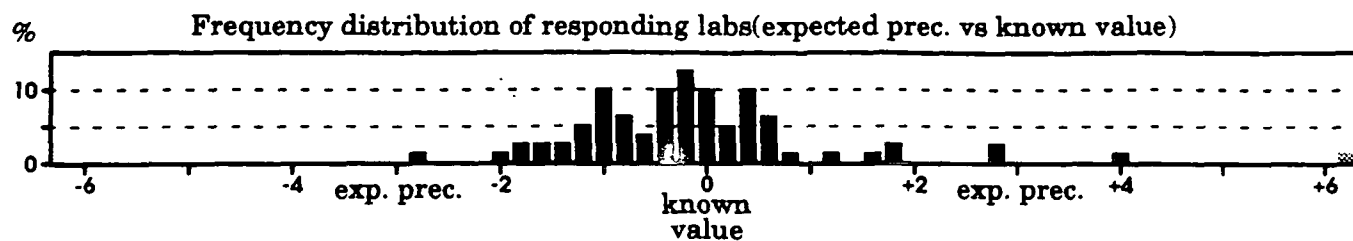
↑ = Above control limit

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× = Determined to be an outlier

↓ = Below control limit

Strontium 90



Cesium 137

Statistical Summary

189 Participants

The known value of this nuclide is 18.0 pCi/F with an expected precision of 5.0; the control limits are 9.3 to 26.7; the warning regions are 9.3 to 12.2 and 23.8 to 26.7

58(30.7 %) Failed to respond

118(62.4 %) Within all limits

5(2.6 %) Outliers

2(1.1 %) Out of control
but not an outlier

6(3.2 %) In warning zone
but within control

Statistic	Respondents	Non-outliers
Mean	235.16	Grand Avg 19.68
Std. Dev.	1954.83	2.94
Variance	3821351.09	8.62
% Coef. of Var.	831.29	14.92
% deviation of mean from known value	1206.42	9.32
Norm. dev. of mean from known value	0.11	0.57
Median	19.67	19.67
% deviation of median from known value	9.26	9.26
Norm. dev. of median from known value	0.00	0.57

7(5.3 %) More than 3 norm. S.D.

86(65.6 %) Within 1 norm. S.D.
of known value

6(4.6 %) Between 2 and 3 norm. S.D.

32(24.4 %) Between 1 and 2 norm. S.D.

Cesium 137

Lab	Res. 1	Res. 2	Res. 3	Exper. Sigma	Rng anal (R + SR)	Average	Normalized deviation (grand-avg) (known) Tag	
A	19.0	20.0	19.0	0.58	0.118	19.33	-0.12	0.46
AA	18.0	18.0	18.0	0.00	0.000	18.00	-0.58	0.00
AE	22.0	21.0	21.0	0.58	0.118	21.33	0.57	1.15
AF	24.0	24.0	21.0	1.73	0.354	23.00	1.15	1.73
AH	20.0	18.0	21.0	1.53	0.354	19.67	0.00	0.58
AI	17.0	17.0	17.0	0.00	0.000	17.00	-0.93	-0.35
AJ								•
AK	23.0	21.0	23.0	1.15	0.236	22.33	0.92	1.50
AL	17.0	20.0	22.0	2.52	0.591	19.67	0.00	0.58
AN	23.0	25.0	24.0	1.00	0.236	24.00	1.50	2.08
AP	22.0	19.0	18.0	2.08	0.473	19.67	0.00	0.58
AU	22.0	20.0	18.0	2.00	0.473	20.00	0.11	0.69
AZ	22.0	17.0	18.0	2.65	0.591	19.00	-0.23	0.35
BA	20.0	19.0	20.0	0.58	0.118	19.67	0.00	0.58
BC	17.0	18.0	18.0	0.58	0.118	17.67	-0.70	-0.12
BG	20.0	24.0	19.0	2.65	0.591	21.00	0.46	1.04
BH	18.0	18.0	17.0	0.58	0.118	17.67	-0.70	-0.12
BI	13.0	18.0	18.0	2.89	0.591	16.33	-1.16	-0.58
BK								•
BL	17.0	18.0	17.0	0.58	0.118	17.33	-0.81	-0.23
BM	19.0	21.0	22.0	1.53	0.354	20.67	0.34	0.92
BO	18.0	17.0	20.0	1.53	0.354	18.33	-0.47	0.12
BW								•
CA	16.0	16.0	16.0	0.00	0.000	16.00	-1.27	-0.69
CC								•
CC								•
CE	15.0	15.0	16.0	0.58	0.118	15.33	-1.50	-0.92
CJ	14.0	18.0	18.0	2.31	0.473	16.67	-1.04	-0.46
CM								•
CO	22.0	23.0	18.0	2.65	0.591	21.00	0.46	1.04
CP	20.0	21.0	19.0	1.00	0.236	20.00	0.11	0.69
CQ	23.0	25.0	22.0	1.53	0.354	23.33	1.27	1.85
CS	17.0	17.0	18.0	0.58	0.118	17.33	-0.81	-0.23
D	20.0	20.0	20.0	0.00	0.000	20.00	0.11	0.69
DD	19.0	21.0	20.0	1.00	0.236	20.00	0.11	0.69
DE	17.0	18.0	18.0	0.58	0.118	17.67	-0.70	-0.12
DG	22.0	24.0	20.0	2.00	0.473	22.00	0.80	1.39
DH	18.0	19.0	18.0	0.58	0.118	18.33	-0.47	0.12
DI								•
DJ	6757.0	6809.0	6768.0	27.46	10.796	6778.00	2341.15	2341.73 ×
DL	21.0	21.0	22.0	0.58	0.118	21.33	0.57	1.15
DM	18.0	18.0	18.0	0.00	0.000	18.00	-0.58	0.00
DO	22.0	22.0	22.0	0.00	0.000	22.00	0.80	1.39
DP								•
DT	18.0	19.0	17.0	1.00	0.236	18.00	-0.58	0.00

• = No data submitted

TAG SYMBOLS

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× = Determined to be an outlier

↓ = 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
DX									•
DY									•
E	20.0	18.0	19.0	1.00	0.236	19.00	-0.23	0.35	
EA	19.0	19.0	19.0	0.00	0.000	19.00	-0.23	0.35	
EB	19.0	18.0	18.0	0.58	0.118	18.33	-0.47	0.12	
EF									•
EH	20.0	20.0	18.0	1.15	0.236	19.33	-0.12	0.46	
EL	18.0	17.0	18.0	0.58	0.118	17.67	-0.70	-0.12	
EW									•
EX	22.0	24.0	21.0	1.53	0.354	22.33	0.92	1.50	
EZ	21887.0	19807.0	22510.0	1415.43	607.314	21401.33	7406.82	7407.40	×
FE	22.0	21.0	21.0	0.58	0.118	21.33	0.57	1.15	
FJ	19.0	18.0	19.0	0.58	0.118	18.67	-0.35	0.23	
FK	17.0	17.0	18.0	0.58	0.118	17.33	-0.81	-0.23	
FL	21.0	22.0	25.0	2.08	0.473	22.67	1.04	1.62	
FO									•
FZ	16.0	16.0	17.0	0.58	0.118	16.33	-1.16	-0.58	
GE	22.0	21.0	21.0	0.58	0.118	21.33	0.57	1.15	
GI	20.0	20.0	20.0	0.00	0.000	20.00	0.11	0.69	
HE	17.0	18.0	18.0	0.58	0.118	17.67	-0.70	-0.12	
HI	16.0	16.0	17.0	0.58	0.118	16.33	-1.16	-0.58	
HL	18.0	16.0	16.0	1.15	0.236	16.67	-1.04	-0.46	
I									•
IA									•
IC	21.0	21.0	21.0	0.00	0.000	21.00	0.46	1.04	
IE									•
IU	19.0	20.0	21.0	1.00	0.236	20.00	0.11	0.69	
IY									•
J	18.0	18.0	17.0	0.58	0.118	17.67	-0.70	-0.12	
JE	19.0	19.0	19.0	0.00	0.000	19.00	-0.23	0.35	
JG									•
JS	19.0	23.0	22.0	2.08	0.473	21.33	0.57	1.15	
JU									•
JY	18.0	16.0	18.0	1.15	0.236	17.33	-0.81	-0.23	
K	2.0	2.0	2.0	0.00	0.000	2.00	-6.12	-5.54	×
KF									•
KH	19.0	20.0	20.0	0.58	0.118	19.67	0.00	0.58	
KL	24.0	25.0	28.0	2.08	0.473	25.67	2.07	2.66	
KM	19.0	20.0	19.0	0.58	0.118	19.33	-0.12	0.46	
KX	21.0	22.0	21.0	0.58	0.118	21.33	0.57	1.15	
L	18.0	19.0	18.0	0.58	0.118	18.33	-0.47	0.12	
LA	20.0	19.0	20.0	0.58	0.118	19.67	0.00	0.58	
LE	26.0	27.0	25.0	1.00	0.236	26.00	2.19	2.77	
LF	21.0	22.0	21.0	0.58	0.118	21.33	0.57	1.15	
LM									•

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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
LR	23.0	20.0	20.0	1.73	0.354	21.00	0.46	1.04	
LT	16.0	16.0	16.0	0.00	0.000	16.00	-1.27	-0.69	
LZ									•
M	21.0	22.0	22.0	0.58	0.118	21.67	0.69	1.27	
MA	20.0	16.0	15.0	2.65	0.591	17.00	-0.93	-0.35	
ME	18.0	18.0	19.0	0.58	0.118	18.33	-0.47	0.12	
ML	22.0	26.0	26.0	2.31	0.473	24.67	1.73	2.31	
MN									•
MP	22.0	23.0	17.0	3.21	0.709	20.67	0.34	0.92	
MQ	21.0	22.0	24.0	1.53	0.354	22.33	0.92	1.50	
MS	19.0	18.0	17.0	1.00	0.236	18.00	-0.58	0.00	
MV	22.0	22.0	22.0	0.00	0.000	22.00	0.80	1.39	
N	21.0	19.0	20.0	1.00	0.236	20.00	0.11	0.69	
NC									•
NH	19.0	19.0	22.0	1.73	0.354	20.00	0.11	0.69	
NJ	22.0	22.0	21.0	0.58	0.118	21.67	0.69	1.27	
NK	18.0	16.0	16.0	1.15	0.236	16.67	-1.04	-0.46	
NO									•
NP	18.0	18.0	19.0	0.58	0.118	18.33	-0.47	0.12	
NT									•
NV									•
NZ	10.0	21.0	17.0	5.57	1.570	16.00	-1.27	-0.69	
O	19.0	19.0	18.0	0.58	0.118	18.67	-0.35	0.23	
OA	18.0	19.0	21.0	1.53	0.354	19.33	-0.12	0.46	
OB	16.0	15.0	15.0	0.58	0.118	15.33	-1.50	-0.92	
OK									•
OL									•
OM									•
OQ									•
OZ									•
P	31.0	28.0	29.0	1.53	0.354	29.33	3.34	3.93	↑
PB	20.0	20.0	20.0	0.00	0.000	20.00	0.11	0.69	
PC	50.0	51.0	50.0	0.58	0.118	50.33	10.62	11.20	×
PD									•
PE									•
PM	27.0	28.0	26.0	1.00	0.236	27.00	2.54	3.12	↑
PP	21.0	22.0	21.0	0.58	0.118	21.33	0.57	1.15	
PS									•
PU	24.0	24.0	28.0	2.31	0.473	25.33	1.96	2.54	
PV	28.0	25.0	26.0	1.53	0.354	26.33	2.31	2.89	
PW	20.0	20.0	21.0	0.58	0.118	20.33	0.23	0.81	
Q	15.0	17.0	19.0	2.00	0.473	17.00	-0.93	-0.35	
QA	17.0	17.0	17.0	0.00	0.000	17.00	-0.93	-0.35	
QB	23.0	22.0	20.0	1.53	0.354	21.67	0.69	1.27	
QC									•

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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
QD									•
QI									•
QJ	19.0	19.0	19.0	0.00	0.000	19.00	-0.23	0.35	
QK									•
QM	20.0	21.0	20.0	0.58	0.118	20.33	0.23	0.81	
QQ									•
QU	19.0	21.0	22.0	1.53	0.354	20.67	0.34	0.92	
QW	21.0	21.0	21.0	0.00	0.000	21.00	0.46	1.04	
QX	21.0	22.0	22.0	0.58	0.118	21.67	0.69	1.27	
QZ	20.0	20.0	20.0	0.00	0.000	20.00	0.11	0.69	
R	21.0	21.0	21.0	0.00	0.000	21.00	0.46	1.04	
RA	19.0	19.0	19.0	0.00	0.000	19.00	-0.23	0.35	
RC									•
RG									•
RH	16.0	17.0	14.0	1.53	0.354	15.67	-1.39	-0.81	
RJ									•
RK	20.0	19.0	19.0	0.58	0.118	19.33	-0.12	0.46	
RN	22.0	23.0	21.0	1.00	0.236	22.00	0.80	1.39	
RO	19.0	18.0	18.0	0.58	0.118	18.33	-0.47	0.12	
RQ	16.0	16.0	16.0	0.00	0.000	16.00	-1.27	-0.69	
RS									•
RU									•
RW									•
S	19.0	19.0	19.0	0.00	0.000	19.00	-0.23	0.35	
SA									•
SC	19.0	19.0	18.0	0.58	0.118	18.67	-0.35	0.23	
SD	22.0	18.0	13.0	4.51	1.120	17.67	-0.70	-0.12	
SE									•
SI	20.0	21.0	27.0	3.79	0.827	22.67	1.04	1.62	
SM									•
SP									•
SQ									•
SR	19.0	20.0	21.0	1.00	0.236	20.00	0.11	0.69	
SS	22.0	19.0	19.0	1.73	0.354	20.00	0.11	0.69	
ST									•
SW	18.0	19.0	20.0	1.00	0.236	19.00	-0.23	0.35	
SY									•
SZ									•
T	20.0	18.0	19.0	1.00	0.236	19.00	-0.23	0.35	
TA	15.0	23.0	22.0	4.36	0.945	20.00	0.11	0.69	
TB	18.0	18.0	20.0	1.15	0.236	18.67	-0.35	0.23	
TE	97.0	94.0	92.0	2.52	0.591	94.33	25.86	26.44	×
TG	22.0	17.0	20.0	2.52	0.591	19.67	0.00	0.58	
TH									•
TI									•

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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	
TK								•
TL	14.0	14.0	14.0	0.00	0.000	14.00	-1.97	-1.39
TP	21.0	20.0	20.0	0.58	0.118	20.33	0.23	0.81
TS	20.0	19.0	19.0	0.58	0.118	19.33	-0.12	0.46
TV	15.0	13.0	14.0	1.00	0.236	14.00	-1.97	-1.39
TW								•
X	23.0	24.0	23.0	0.58	0.118	23.33	1.27	1.85
Y	18.0	18.0	19.0	0.58	0.118	18.33	-0.47	0.12
Z	19.0	19.0	17.0	1.15	0.236	18.33	-0.47	0.12

Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
2.00	x	K	18.00		DM	19.67		BA
14.00		TV	18.00		AA	19.67		AP
14.00		TL	18.33		Z	19.67		AL
15.33		OB	18.33		Y	19.67		AH
15.33		CE	18.33		RO	20.00		TA
15.67		RH	18.33		NP	20.00		SS
16.00		RQ	18.33		ME	20.00		SR
16.00		NZ	18.33		L	20.00		QZ
16.00		LT	18.33		EB	20.00		PB
16.00		CA	18.33		DH	20.00		NH
16.33		HI	18.33		BO	20.00		N
16.33		FZ	18.67		TB	20.00		IU
16.33		BI	18.67		SC	20.00		GI
16.67		NK	18.67		O	20.00		DD
16.67		HL	18.67		FJ	20.00		D
16.67		CJ	19.00		T	20.00		CP
17.00		QA	19.00		SW	20.00		AU
17.00		Q	19.00		S	20.33		TP
17.00		MA	19.00		RA	20.33		QM
17.00		AI	19.00		QJ	20.33		PW
17.33		JY	19.00		JE	20.67		QU
17.33		FK	19.00		EA	20.67		MP
17.33		CS	19.00		E	20.67		BM
17.33		BL	19.00		AZ	21.00		R
17.67		SD	19.33		TS	21.00		QW
17.67		J	19.33		RK	21.00		LR
17.67		HE	19.33		OA	21.00		IC
17.67		EL	19.33		KM	21.00		CO
17.67		DE	19.33		EH	21.00		BG
17.67		BH	19.33		A	21.33		PP
17.67		BC	19.67		TG	21.33		LF
18.00		MS	19.67		LA	21.33		KX
18.00		DT	19.67		KH	21.33		JS

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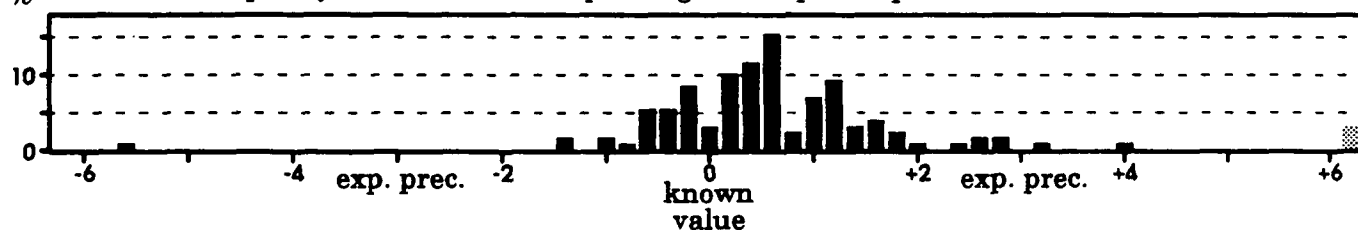
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Cesium 137

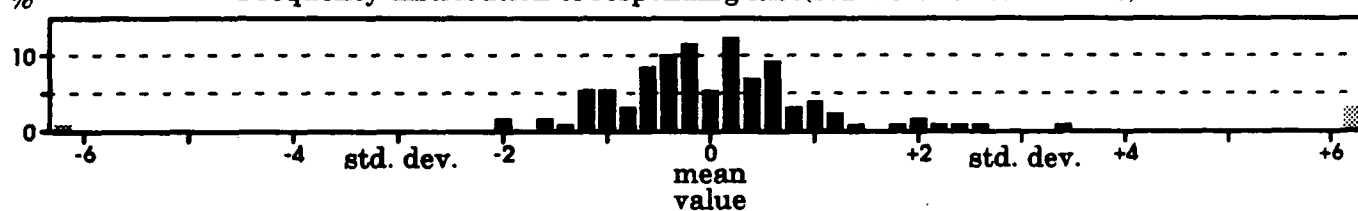
Data sorted by Laboratory Average

Average	Tag	Lab	Average	Tag	Lab	Average	Tag	Lab
21.33		GE	22.00		DO	24.67		ML
21.33		FE	22.00		DG	25.33		PU
21.33		DL	22.33		MQ	25.67		KL
21.33		AE	22.33		EX	26.00		LE
21.67		QX	22.33		AK	26.33		PV
21.67		QB	22.67		SI	27.00	↑	PM
21.67		NJ	22.67		FL	29.33	↑	P
21.67		M	23.00		AF	50.33	×	PC
22.00		RN	23.33		X	94.33	×	TE
22.00		MV	23.33		CQ	6778.00	×	DJ
			24.00		AN	21401.33	×	EZ

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

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