

RFA Ringversuch AMIS, Südafrika - Heavy Minerals Sands Concentrate, AMIS0616


Veranstalter des Ringversuchs:	AMIS - African Mineral Standard - Südafrika
Ringversuchsmaterial:	AMIS0616, Heavy Minerals Sands Concentrate, Tronox, Mineral Sands Mine, Australia
RV geschlossen:	2019 - 5
Literatur:	Proficiency Testing Final Report (Laborcode CRB = E)

Hauptelemente [MA%]

	CRB	RV	1sRV
SiO ₂	19,646	18,140	0,710
Al ₂ O ₃	3,927	3,805	0,110
Fe ₂ O ₃	24,001	22,990	0,610
TiO ₂	41,814	42,950	0,670
P ₂ O ₅	0,535	0,550	0,070
SO ₃	0,056	0,060	0,005
CaO	0,089	0,080	0,010
MgO	0,379	0,340	0,030
K ₂ O	0,065	0,070	0,010
Na ₂ O	0,053	0,040	0,010
V ₂ O ₅	0,163	0,170	0,010
Cr ₂ O ₃	0,150	0,130	0,010
MnO	0,697	0,640	0,030
ZrO ₂	6,288	6,360	0,060
Nb ₂ O ₅	0,103	0,120	0,020
BaO	0,045	0,044	0,002
La ₂ O ₃	0,240	0,230	0,013
CeO ₂	0,470	0,496	0,030
Nd ₂ O ₃	0,194	0,1784	0,007
HfO ₂	0,131	0,153	0,006
PbO	0,033	0,0262	0,004

Legende

CRB: Ergebnisse CRB – **RV:** Ergebnisse Ringversuch -- **1s-RV:** Standardabweichung Ringversuch
Z-Score: Differenz des Messwertes vom Mittelwert des Ringversuchs -- * Wert nicht zertifiziert

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Proficiency Testing Final Report

Report to participating laboratories on the results from

AMIS0616
Proficiency Testing

Heavy Mineral Sands Concentrate, Tronox Australia
Mineral Sands Mine, Australia.

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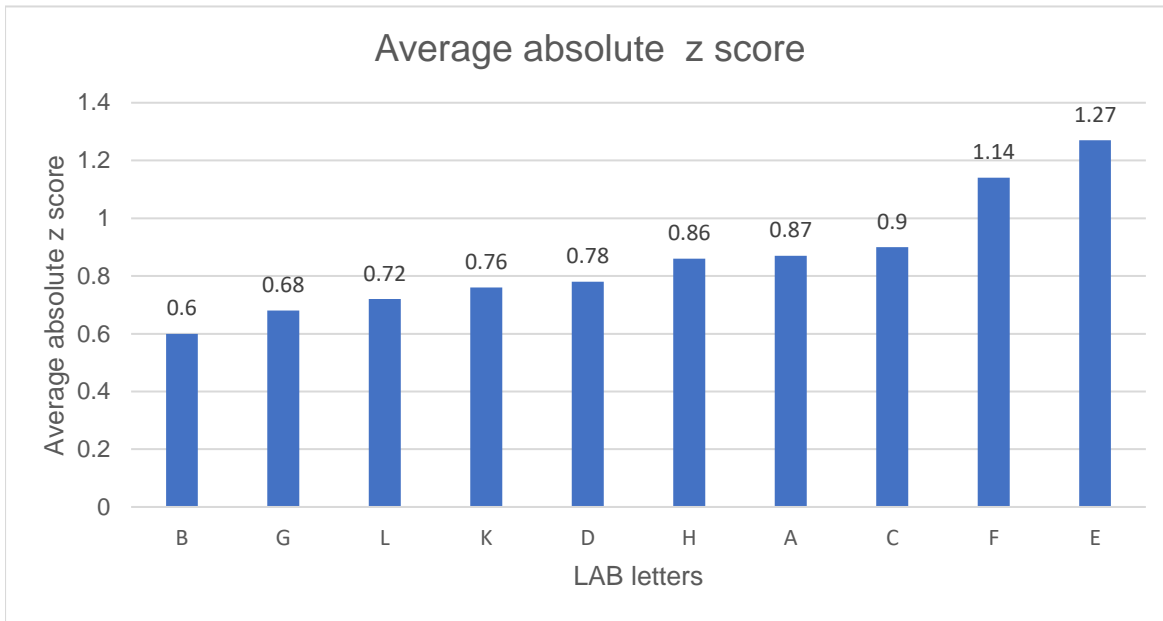
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11.42	Pb FUS	90
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11.47	SG	100

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11.52	Sn FUS	110
11.53	SO ₃ XRF	112
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1. Confidentiality

This report is strictly confidential. Individual laboratories are not identified in this report. Individual laboratories will be given their own identifying codes for the different tables and graphs, but not the codes for other laboratories.

2. Absolute average z scores



Based on the average of the absolute value of the z-scores

It is recommended by AMIS that should a laboratory's absolute average z-score be greater than 2, an internal investigation of possible root causes should be carried out by the laboratory.

The values highlighted in red on the data are considered outliers.

Labs that participated-NOT the same order as Lab Letter
Argetest Mineral Processing, R&D and Analysis Services
CRB Analyse Service GmbH
Intertek Perth
JAEC Chemical and Physical Analytical Lab
LC2M – Pôle Analyses Chimiques de spécialité
Samancor Ltd
SGS Brazil
SGS Vancouver (Canada)
Shiva Analyticals India
Tronox Chandala Australia

3.Explanation of statistical analysis

Twelve laboratories were each sent 8 samples of material taken scientifically from throughout the batch. Results from ten of the laboratories were received in time for the Proficiency Testing.

Laboratories are indicated by letters A through to K and are not listed in alphabetical order.

3.1 The data tables contain raw assay data from those labs plus:

- 3.1.1 The lab mean,
- 3.1.2 The lab standard deviation,
- 3.1.3 The lab RSD (the laboratory standard deviation divided by the lab mean, expressed as a percentage),
- 3.1.4 The z-scores of the individual analyses (the individual value minus the mean of the whole data divided by the SD of the whole data),
- 3.1.5 A laboratory ranking based on the average of the absolute values for the z-score of the AMIS0616 data,
- 3.1.6 Statistics for the un-iterated data set (mean, standard deviation and RSD),
- 3.1.7 Statistics for the iterated data (mean, RSD percent, number of results, SD, 2SD, 3SD, Std mean \pm 2SD and Std mean \pm 3SD)-This data can be used in conjunction with the graph
- 3.1.8 Simple statistics of the lab statistics (mean, standard deviation and RSD),
- 3.1.9 Measurement of uncertainty

3.2 Some results were removed for the calculation of the mean and standard deviation presented on the graph. The general rules for exclusion were:

- If the z score $>\pm 2$, the result is an outlier and it is removed.
- If 50% or less of the results from one laboratory have z scores $>\pm 2$, those results are removed
- If 50% or more of the results from one laboratory have z scores $>\pm 2$, the entire laboratory's results are removed.

3.3 Statistics on these tables are those for the whole data set. They differ from the "recommended concentrations" and two "between laboratory standard deviations" on the certificate independently calculated by the certifying geochemist. Some outlying results were excluded for the calculation of those values.

3.4 An independent geochemist Allan Fraser, was retained to provide recommended concentrations and limits at two standard deviations. These represent the values that a "good lab" should report, within acceptable limits of analytical accuracy. Allan Fraser was provided with the electronic versions of all assay reports and a spreadsheet containing the compiled data prepared by Ms Makhosi Khoza (PT Scheme Coordinator).

Disclaimer: While every precaution has been taken to ensure the accuracy of this data AMIS will not be held responsible for any errors. Laboratory managers are requested to carefully vet this report and to draw the author's attention to any mistakes or omissions that may be present.

4. Subcontracted activities

The following activities were subcontracted:

- 4.1 Preparation of Certified Reference Material
- 4.2 QC analysis to determine ranges for individual elements
- 4.3 Proficiency testing analysis performed by participating laboratories

5. Method of preparation, Homogeneity and Stability assessment

The particle size distribution for this material was shown to have a nominal top size of 54µm (95% passing 54µm). The procedure of preparation in brief is as follows: the material was crushed, dry-milled and air-classified to <54µm. It was then blended in a bi-conical mixer, systematically divided and sealed into 1kg Laboratory Packs. Explorer Packs are then subdivided from the Laboratory Packs as required. Final packaged units were then selected on a random basis and submitted for analysis to an independent laboratory accredited with the ISO17025 standard of general requirements for the competence of testing and calibration laboratories. The results obtained from this laboratory are then evaluated statistically by AMIS for homogeneity. The stability of the material will be subject to continuous testing for the duration of the inventory. Should product stability become an issue, all customers will be notified and notification to that effect will be placed on the www.amis.co.za website.

6. Assigned value

The assigned values for the PT report are expressed as the mean calculated from the software as follows:

6.1 Calculated from all the raw data including outliers

6.2 Calculated after removal of outliers using z-scores (Refer to 3.1.4)

Standard Deviation For Proficiency Assessment

The Standard Deviation is a representation of the population standard deviation and provides the estimate of the repeatability of the data and it is calculated as follows:

The Standard deviation is calculated from the software

Standard Deviation from individual laboratories is calculated and represented as LAB_SD for that lab

The Standard Deviation For Proficiency Assessment is then calculated as a weighted mean standard deviation

The standard deviations are converted to variances by squaring the standard deviations and added by taking the root sum of squares and the number of labs into consideration

7. Metrological traceability and measurement of uncertainty

The values quoted herein are based on the consensus values derived from statistical analysis of the data from an inter-laboratory measurement program. Traceability to SI units is via the standards used by the individual laboratories the majority of which are accredited to the ISO17025 general requirements for the competence of testing and calibration laboratories and who have maintained measurement traceability during the analytical process.

The samples used in this PT process have been selected in such a way as to represent the entire batch of material and were taken from the final packaged units; therefore all possible sources of uncertainty (sample uncertainty and measurement uncertainty) are included in the final combined standard uncertainty determination. The uncertainty measurement takes into consideration the between lab and the within lab variances.

8.Design and implementation of the PT Scheme

- 9.1 At the beginning of each year, the Technical Personnel and Managing Director plan what possible Proficiency Testing Schemes will be sent to laboratories.
- 9.2 The samples are sent to an external laboratory to determine the range of the elements of interest and homogeneity.
- 9.3 An analysis request letter is compiled and sent to participating laboratories.
- 9.4 Samples are dispatched and results are returned within the given time frame by participating laboratories electronically.
- 9.5 Results are loaded onto the software.
- 9.6 A PT report is compiled and sent to participating laboratories.

9.Concentration ranges

For informational Purposes only

Oxide/Element	Unit	Range	
Ag	ppm	28	38
Al	%	1.7	2.4
Al ₂ O ₃ *	%	3.2	4.4
As	ppm	48	65
B	ppm	233	315
Ba	ppm	352	477
Be	ppm	5	6.8
Bi	ppm	0.75	1.01
C	%	0.1	0.14
CaO*	%	0.05	0.1
Ce	ppm	3800	4200
Cr	%	0.05	0.11
Cr ₂ O ₃ *	%	0.1	0.14
Cs	ppm	0.18	0.24
Dy	ppm	87	117
Er	ppm	48	65
Eu	ppm	9.4	12.8
Fe	%	14	18
Fe	%	14	19
Fe ₂ O ₃ *	%	20	27
Ga	ppm	26	35
Gd	ppm	141	191
Hf	ppm	927	1254
Ho	ppm	17	22
In	ppm	0.39	0.53
K	%	0.04	0.08
K ₂ O*	%	0.05	0.09
La	ppm	1900	2100
Li	ppm	18	24
LOI	%	1	1.4
Lu	ppm	8.5	11.4
Mg	%	0.14	0.19
MgO*	%	0.26	0.35
Mn	%	0.33	0.45

Oxide/Element	Unit	Range	
MnO*	%	0.54	0.72
Na ₂ O*	%	0.02	0.05
Nb	ppm	648	876
Nd	ppm	1400	1700
P	%	0.22	0.3
P ₂ O ₅ *	%	0.5	0.68
Pb	ppm	243	329
Pr	ppm	373	505
Rb	ppm	2.1	2.8
S	%	0.01	0.04
Sb	ppm	8.4	11.3
Sc	ppm	61	83
SG	No unit	3.5	4.8
Si	%	7.2	9.8
SiO ₂ *	%	15	21
Sm	ppm	210	285
Sn	ppm	31	41
SO ₃ *	%	0.04	0.08
Sr	ppm	22	30
Ta	ppm	49	66
Tb	ppm	17	23
Te	ppm	5.5	7.5
Th	ppm	1060	1434
Ti	%	22	29
Ti	%	22	29
TiO ₂ *	%	40	46
Tm	ppm	7.3	9.8
U	ppm	85	114
V	ppm	789	1067
V ₂ O ₅ *	%	0.14	0.19
W	ppm	26	36
Y	ppm	442	598
Yb	ppm	52	70
Zr*	ppm	46000	50000

10. Abbreviations

Symbol	Meaning
Ag	Silver
Al	Aluminum
Ar	Argon
As	Arsenic
Au	Gold
Ba	Barium
Be	Beryllium
Bi	Bismuth
Br	Bromine
C	Carbon
Ca	Calcium
Cd	Cadmium
Ce	Cerium
Cl	Chlorine
Co	Cobalt
Cr	Chromium
Cs	Cesium
Cu	Copper
Dy	Dysprosium
Er	Erbium
Es	Einsteinium
Eu	Europium
F	Fluorine
Fe	Iron
Ga	Gallium
Gd	Gadolinium
Ge	Germanium
Hf	Hafnium
Hg	Mercury
Ho	Holmium
In	Indium
Ir	Iridium
K	Potassium
La	Lanthanum
Li	Lithium
Lu	Lutetium
Mg	Magnesium
Mn	Manganese
Mo	Molybdenum
Na	Sodium
Nb	Niobium
Nd	Neodymium
Ni	Nickel
Os	Osmium
P	Phosphorus
Pb	Lead

Symbol	Meaning
Pd	Palladium
Pm	Promethium
Pr	Praseodymium
Pt	Platinum
Rb	Rubidium
Re	Rhenium
Rh	Rhodium
Ru	Ruthenium
S	Sulfur
Sb	Antimony
Sc	Scandium
Se	Selenium
Si	Silicon
Sm	Samarium
Sn	Tin
Sr	Strontium
Ta	Tantalum
Tb	Terbium
Tc	Technetium
Te	Tellurium
Th	Thorium
Ti	Titanium
Tl	Thallium
Tm	Thulium
U	Uranium
V	Vanadium
W	Tungsten
Y	Yttrium
Yb	Ytterbium
Zn	Zinc
Zr	Zirconium
Al ₂ O ₃	Aluminium Oxide
BaO	Barium Oxide
CaO	Calcium Oxide
Cr ₂ O ₃	Chrome (III) Oxide
Fe ₂ O ₃	Iron (III) Oxide
K ₂ O	Potassium Oxide
Na ₂ O	Sodium Oxide
P ₂ O ₅	Phosphorus (V) Oxide
MgO	Magnesium Oxide
MnO	Manganese Oxide
SiO ₂	Silicon Dioxide
SO ₃	Sulphur Trioxide
TiO ₂	Titanium Dioxide
V ₂ O ₅	Vanadium Pentoxide
U ₃ O ₈	Triuranium octoxide

Symbol	Meaning
Gen Method	Method of analysis
NiS	Nickel Sulphide
n	Number of results
4A_MICP	4 acid digest
GOI	Gain on Ignition
LOI	Loss on Ignition
FUS	Fusion
Pb Collection	Lead Collection
SG	Specific Gravity
RSD	Relative Standard Deviation
SAL	Sulphuric Acid Leach
CL	Cyanide Leach

Version 0.00-20.11.2018

Version 1.00- 21.11.2018-Addition of Lab A results

11. Element statistics (Include comments)

11.1. AI FUS

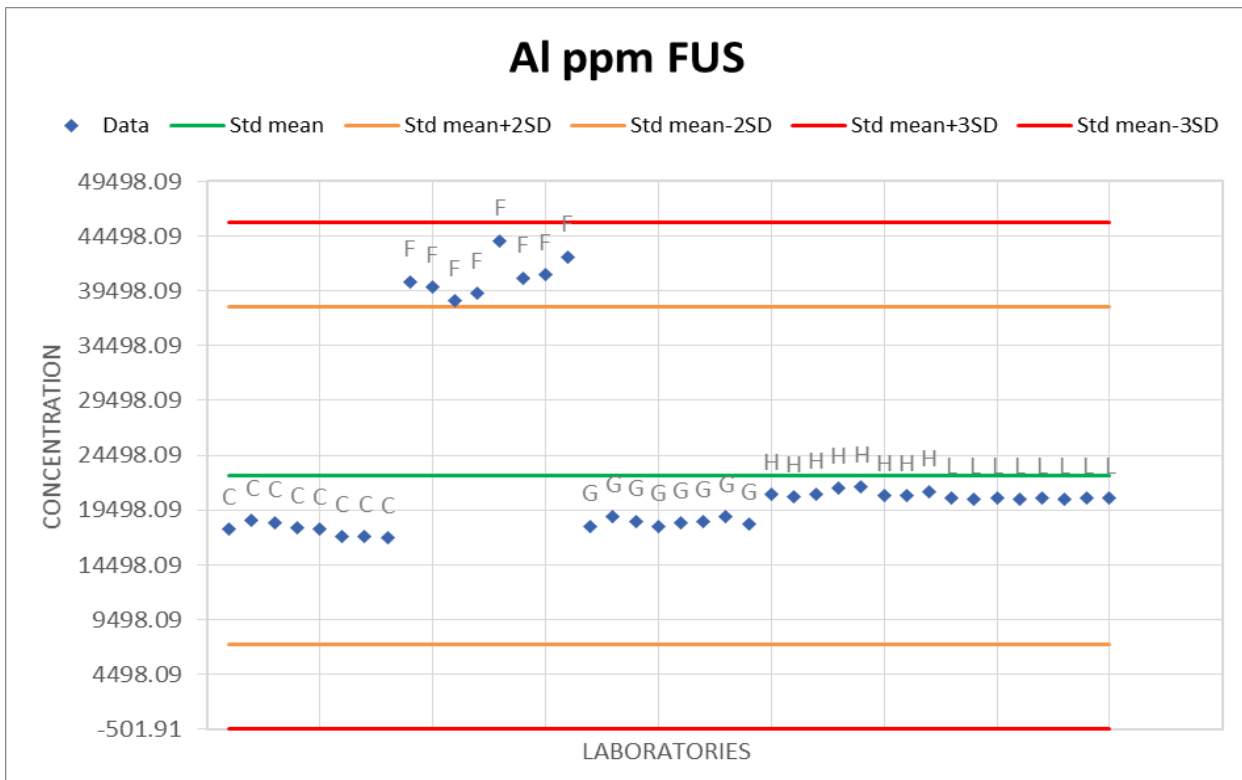
Lab_ID	Z_Score	Data
C	-0.67	17761.00
C	-0.59	18539.00
C	-0.61	18362.00
C	-0.67	17830.00
C	-0.68	17720.00
C	-0.75	17069.00
C	-0.76	17045.00
C	-0.77	16926.00
F	1.89	40338.83
F	1.83	39811.48
F	1.69	38563.33
F	1.77	39252.86
F	2.32	44075.98
F	1.93	40703.47
F	1.96	40950.98
F	2.15	42614.65
G	-0.65	18000.00
G	-0.55	18900.00
G	-0.59	18500.00
G	-0.65	18000.00
G	-0.61	18300.00
G	-0.60	18400.00
G	-0.55	18900.00
G	-0.62	18200.00

Lab_ID	Z_Score	Data
H	-0.31	20935.00
H	-0.34	20670.00
H	-0.31	20988.00
H	-0.25	21465.00
H	-0.24	21571.00
H	-0.33	20829.00
H	-0.33	20776.00
H	-0.28	21200.00
L	-0.35	20600.00
L	-0.36	20500.00
L	-0.35	20600.00
L	-0.36	20500.00
L	-0.35	20600.00
L	-0.36	20500.00
L	-0.35	20600.00
L	-0.35	20600.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
AI	FUS	40	23692.44	8792.16	37	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
AI	FUS	C	8	17656.500	606.431	0.034	3.435
AI	FUS	F	8	40788.947	1798.504	0.044	4.409
AI	FUS	G	8	18400.000	354.562	0.019	1.927
AI	FUS	H	8	21054.250	327.634	0.016	1.556
AI	FUS	L	8	20562.500	51.755	0.003	0.252
Average				23692.439	876.140	0.023	2.316

11.1. Al FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Al	FUS	38	22658.08	7712.03	34	ppm

Std mean	22658.078
SD	7712.028
2SD	15424.055
3SD	23136.083
Std mean+2SD	38082.133
Std mean-2SD	7234.022
Std mean+3SD	45794.161
Std mean-3SD	-478.005

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Al	FUS	4681.740	109560076.783	10467.095	503.694	ppm

Comments: 2 results out of 40 were rejected as outliers using z score

11.2. Al₂O₃ FUS

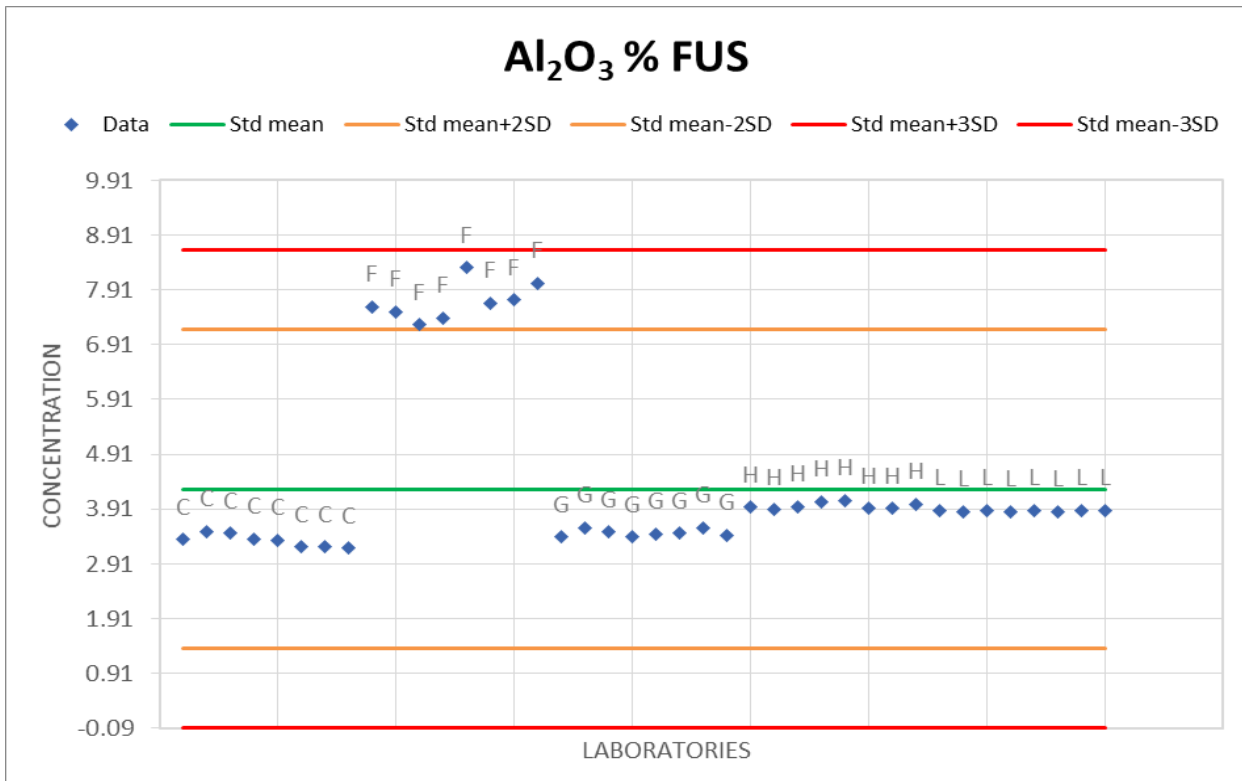
Lab_ID	Z_Score	Data
C	-0.67	3.36
C	-0.59	3.50
C	-0.61	3.47
C	-0.67	3.37
C	-0.68	3.35
C	-0.75	3.23
C	-0.76	3.22
C	-0.77	3.20
F	1.89	7.61
F	1.83	7.51
F	1.69	7.28
F	1.77	7.41
F	2.32	8.32
F	1.93	7.68
F	1.96	7.73
F	2.15	8.04
G	-0.65	3.40
G	-0.54	3.57
G	-0.59	3.50
G	-0.65	3.40
G	-0.61	3.46
G	-0.60	3.48
G	-0.54	3.57
G	-0.62	3.44

Lab_ID	Z_Score	Data
H	-0.32	3.95
H	-0.35	3.90
H	-0.31	3.96
H	-0.26	4.05
H	-0.24	4.07
H	-0.33	3.93
H	-0.33	3.92
H	-0.29	4.00
L	-0.35	3.89
L	-0.36	3.87
L	-0.35	3.89
L	-0.36	3.87
L	-0.35	3.89
L	-0.36	3.87
L	-0.35	3.89
L	-0.35	3.89

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Al ₂ O ₃	FUS	40	4.47	1.66	37	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Al ₂ O ₃	FUS	C	8	3.336	0.115	0.034	3.435
Al ₂ O ₃	FUS	F	8	7.696	0.339	0.044	4.409
Al ₂ O ₃	FUS	G	8	3.477	0.067	0.019	1.927
Al ₂ O ₃	FUS	H	8	3.973	0.062	0.016	1.556
Al ₂ O ₃	FUS	L	8	3.885	0.010	0.003	0.252
Average				4.473	0.165	0.023	2.316

11.2. Al₂O₃ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Al ₂ O ₃	FUS	38	4.28	1.45	34	%

Std mean	4.278
SD	1.454
2SD	2.907
3SD	4.361
Std mean+2SD	7.185
Std mean-2SD	1.371
Std mean+3SD	8.639
Std mean-3SD	-0.082

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Al ₂ O ₃	FUS	0.882	3.892	1.973	0.095	%

Comments: 2 results out of 40 were rejected as outliers using z score

11.3. Al₂O₃ XRF

Lab_ID	Z_Score	Data
A	1.22	3.94
A	1.18	3.94
A	2.00	4.03
A	1.40	3.97
A	2.09	4.04
A	1.61	3.99
A	1.70	4.00
A	1.32	3.96
B	-0.72	3.72
B	-0.30	3.77
B	-0.10	3.79
B	-0.18	3.78
B	-0.42	3.76
B	-0.11	3.79
B	-0.43	3.76
B	-0.35	3.77
C	-0.20	3.78
C	0.38	3.85
C	0.87	3.90
C	0.61	3.87
C	0.02	3.81
C	-0.13	3.79
C	-0.48	3.75
C	-0.39	3.76

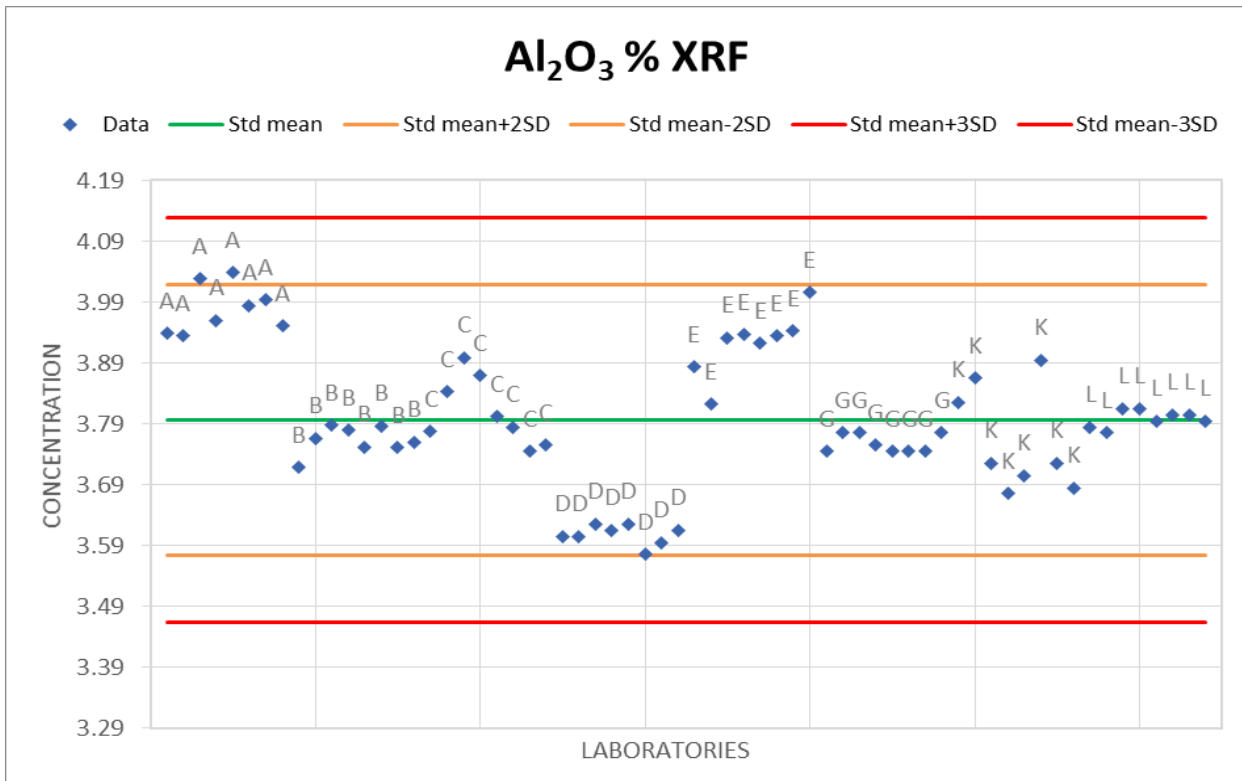
Lab_ID	Z_Score	Data
D	-1.71	3.61
D	-1.71	3.61
D	-1.53	3.63
D	-1.62	3.62
D	-1.53	3.63
D	-1.97	3.58
D	-1.80	3.60
D	-1.62	3.62
E	0.73	3.89
E	0.19	3.83
E	1.15	3.94
E	1.20	3.94
E	1.07	3.93
E	1.18	3.94
E	1.25	3.95
E	1.81	4.01
G	-0.48	3.75
G	-0.22	3.78
G	-0.22	3.78
G	-0.39	3.76
G	-0.48	3.75
G	-0.48	3.75
G	-0.48	3.75
G	-0.22	3.78

Lab_ID	Z_Score	Data
K	0.22	3.83
K	0.57	3.87
K	-0.66	3.73
K	-1.09	3.68
K	-0.83	3.71
K	0.83	3.90
K	-0.66	3.73
K	-1.01	3.69
L	-0.13	3.79
L	-0.22	3.78
L	0.13	3.82
L	0.13	3.82
L	-0.04	3.80
L	0.05	3.81
L	0.05	3.81
L	-0.04	3.80

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Al ₂ O ₃	XRF	64	3.80	0.11	3	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Al ₂ O ₃	XRF	A	8	3.983	0.040	0.010	0.994
Al ₂ O ₃	XRF	B	8	3.768	0.023	0.006	0.615
Al ₂ O ₃	XRF	C	8	3.814	0.055	0.015	1.453
Al ₂ O ₃	XRF	D	8	3.613	0.017	0.005	0.462
Al ₂ O ₃	XRF	E	8	3.927	0.053	0.013	1.343
Al ₂ O ₃	XRF	G	8	3.763	0.015	0.004	0.395
Al ₂ O ₃	XRF	K	8	3.768	0.086	0.023	2.282
Al ₂ O ₃	XRF	L	8	3.804	0.014	0.004	0.370
Average				3.805	0.045	0.010	0.989

11.3. Al₂O₃ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Al ₂ O ₃	XRF	63	3.80	0.11	3	%

Std mean	3.801
SD	0.111
2SD	0.222
3SD	0.333
Std mean+2SD	4.023
Std mean-2SD	3.579
Std mean+3SD	4.134
Std mean-3SD	3.468

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Al ₂ O ₃	XRF	0.038	0.011	0.107	0.044	%

Comment: 1 result out of 64 was rejected as an outlier using z-score

11.4. Ba FUS

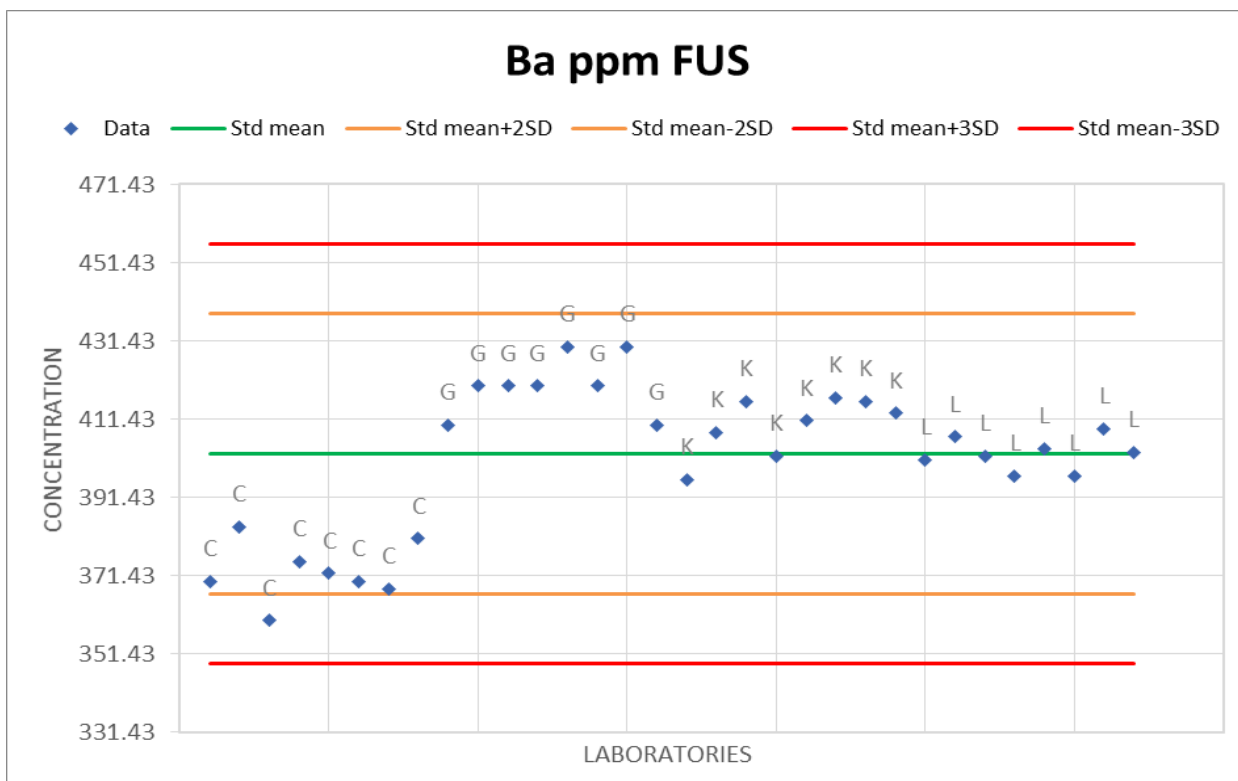
Lab_ID	Z_Score	Data
C	-1.63	370.00
C	-0.90	384.00
C	-2.15	360.00
C	-1.37	375.00
C	-1.53	372.00
C	-1.63	370.00
C	-1.74	368.00
C	-1.06	381.00
G	0.46	410.00
G	0.98	420.00
G	0.98	420.00
G	0.98	420.00
G	1.50	430.00
G	0.98	420.00
G	1.50	430.00
G	0.46	410.00
K	-0.27	396.00
K	0.35	408.00
K	0.77	416.00
K	0.04	402.00
K	0.51	411.00
K	0.82	417.00
K	0.77	416.00
K	0.62	413.00

Lab_ID	Z_Score	Data
L	-0.01	401.00
L	0.30	407.00
L	0.04	402.00
L	-0.22	397.00
L	0.15	404.00
L	-0.22	397.00
L	0.41	409.00
L	0.09	403.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ba	FUS	32	401.22	19.14	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Ba	FUS	C	8	372.500	7.559	0.020	2.029
Ba	FUS	G	8	420.000	7.559	0.018	1.800
Ba	FUS	K	8	409.875	7.511	0.018	1.832
Ba	FUS	L	8	402.500	4.276	0.011	1.062
Average				401.219	6.874	0.017	1.681

11.4. Ba FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Ba	FUS	31	402.55	17.89	4	ppm

Std mean	402.548
SD	17.890
2SD	35.780
3SD	53.670
Std mean+2SD	438.329
Std mean-2SD	366.768
Std mean+3SD	456.219
Std mean-3SD	348.878

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Ba	FUS	13.225	694.186	26.347	6.510	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

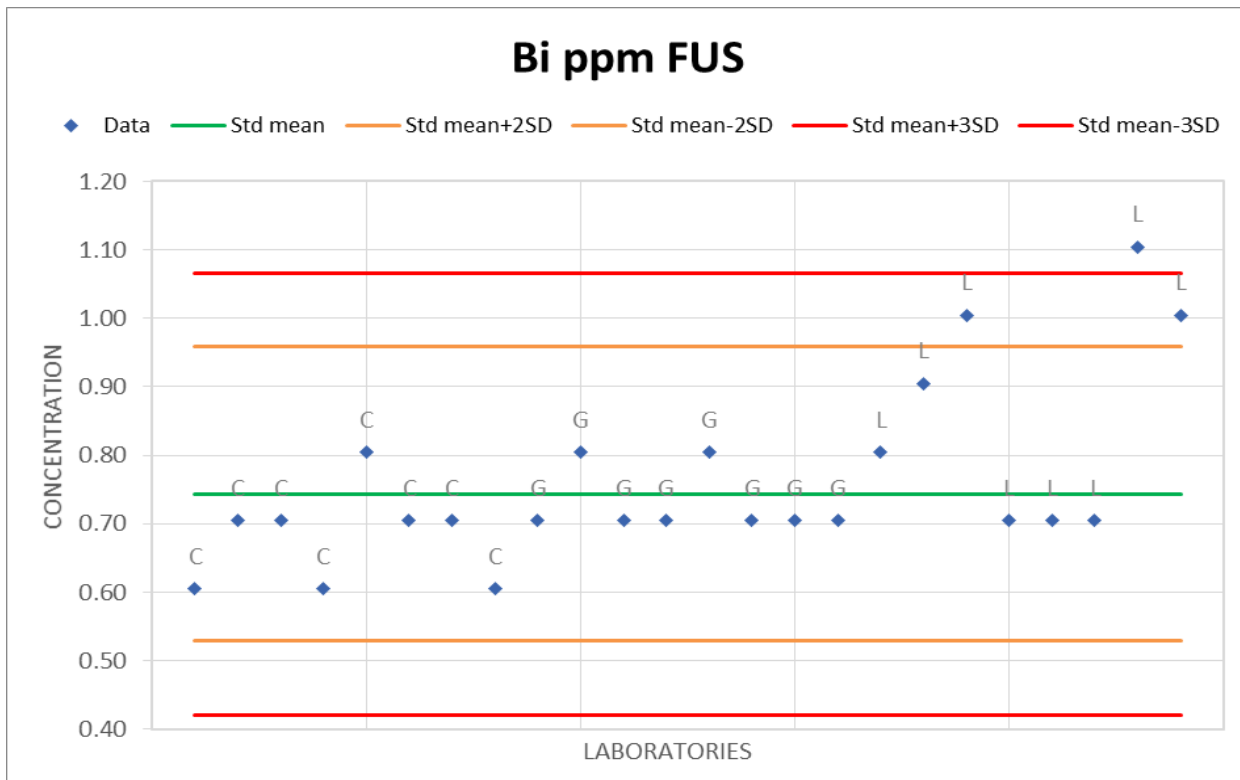
11.5. Bi FUS

Lab_ID	Z_Score	Data
C	-1.20	0.60
C	-0.42	0.70
C	-0.42	0.70
C	-1.20	0.60
C	0.36	0.80
C	-0.42	0.70
C	-0.42	0.70
C	-1.20	0.60
G	-0.42	0.70
G	0.36	0.80
G	-0.42	0.70
G	-0.42	0.70
G	0.36	0.80
G	-0.42	0.70
G	-0.42	0.70
G	-0.42	0.70
L	0.36	0.80
L	1.14	0.90
L	1.91	1.00
L	-0.42	0.70
L	-0.42	0.70
L	-0.42	0.70
L	-0.42	0.70
L	2.69	1.10
L	1.91	1.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Bi	FUS	24	0.75	0.13	17	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Bi	FUS	C	8	0.675	0.071	0.105	10.476
Bi	FUS	G	8	0.725	0.046	0.064	6.385
Bi	FUS	L	8	0.863	0.160	0.185	18.527
Average				0.754	0.104	0.118	11.796

11.5. Bi FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Bi	FUS	23	0.74	0.11	15	ppm

Std mean	0.739
SD	0.108
2SD	0.215
3SD	0.323
Std mean+2SD	0.954
Std mean-2SD	0.524
Std mean+3SD	1.062
Std mean-3SD	0.416

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Bi	FUS	0.067	0.012	0.111	0.091	ppm

Comment: 1 result out of 24 was rejected as an outlier using z-score

11.6. C Combustion LECO

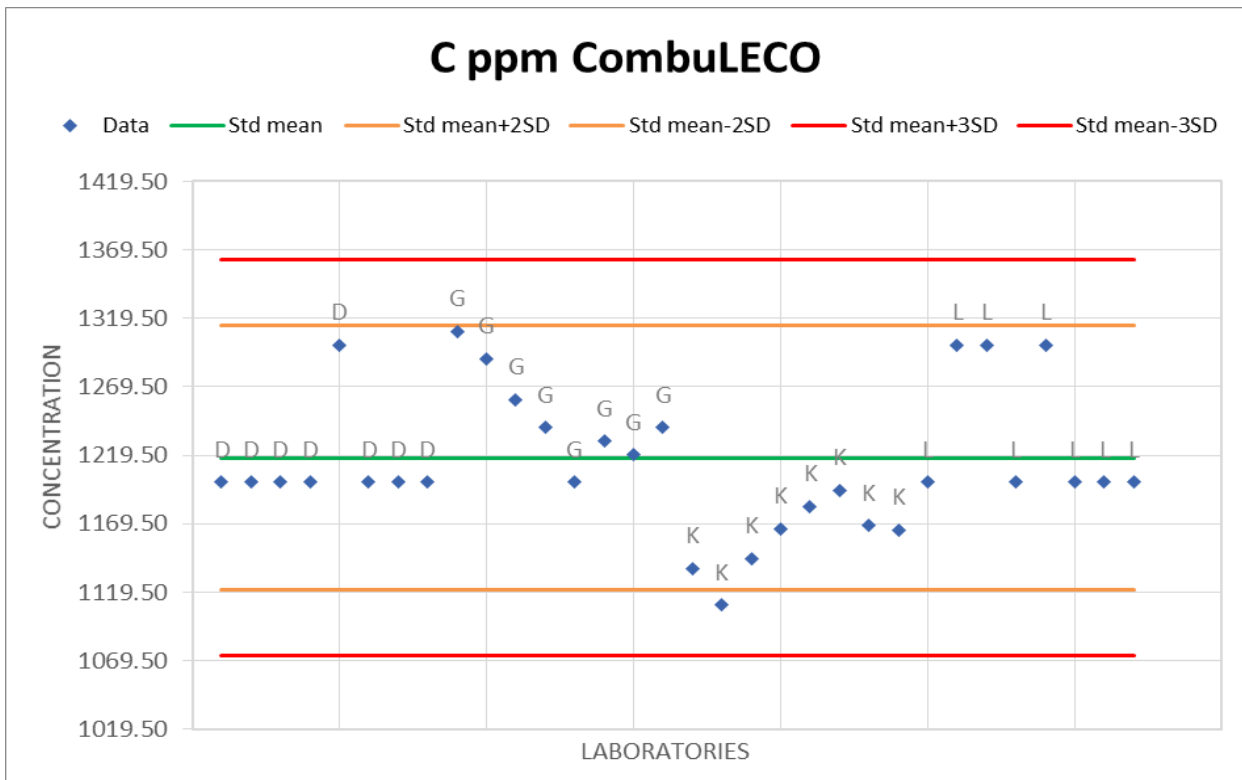
Lab_ID	Z_Score	Data
D	-0.28	1200.00
D	-0.28	1200.00
D	-0.28	1200.00
D	-0.28	1200.00
D	1.68	1300.00
D	-0.28	1200.00
D	-0.28	1200.00
D	-0.28	1200.00
D	-0.28	1200.00
G	1.88	1310.00
G	1.48	1290.00
G	0.90	1260.00
G	0.50	1240.00
G	-0.28	1200.00
G	0.31	1230.00
G	0.11	1220.00
G	0.50	1240.00
K	-1.51	1137.00
K	-2.04	1110.00
K	-1.38	1144.00
K	-0.95	1166.00
K	-0.63	1182.00
K	-0.40	1194.00
K	-0.91	1168.00
K	-0.96	1165.00

Lab_ID	Z_Score	Data
L	-0.28	1200.00
L	1.68	1300.00
L	1.68	1300.00
L	-0.28	1200.00
L	1.68	1300.00
L	-0.28	1200.00
L	-0.28	1200.00
L	-0.28	1200.00
L	-0.28	1200.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
C	Combustion/LECO	32	1214.25	51.04	4	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
C	Combustion/LECO	D	8	1212.500	35.355	0.029	2.916
C	Combustion/LECO	G	8	1248.750	36.425	0.029	2.917
C	Combustion/LECO	K	8	1158.250	26.794	0.023	2.313
C	Combustion/LECO	L	8	1237.500	51.755	0.042	4.182
Average				1214.250	38.644	0.031	3.082

11.6. C Combustion LECO (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
C	Combustion/LECO	31	1217.61	48.15	4	ppm

Std mean	1217.613
SD	48.150
2SD	96.300
3SD	144.451
Std mean+2SD	1313.913
Std mean-2SD	1121.312
Std mean+3SD	1362.064
Std mean-3SD	1073.162

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
C	Combustion/LECO	24.280	2170.895	46.593	38.080	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

11.7. CaO XRF

Lab_ID	Z_Score	Data
A	-0.04	0.08
A	-0.02	0.08
A	-0.63	0.07
A	-0.20	0.08
A	-0.35	0.08
A	-0.45	0.08
A	-0.39	0.08
A	-0.26	0.08
C	-0.45	0.08
C	-0.33	0.08
C	-0.09	0.08
C	-0.93	0.07
C	-0.57	0.08
C	0.27	0.08
C	-0.93	0.07
C	-0.93	0.07
D	-1.17	0.07
D	0.03	0.08
D	-1.17	0.07
D	-1.17	0.07
D	-1.17	0.07
D	-1.17	0.07
D	-1.17	0.07
D	-1.17	0.07

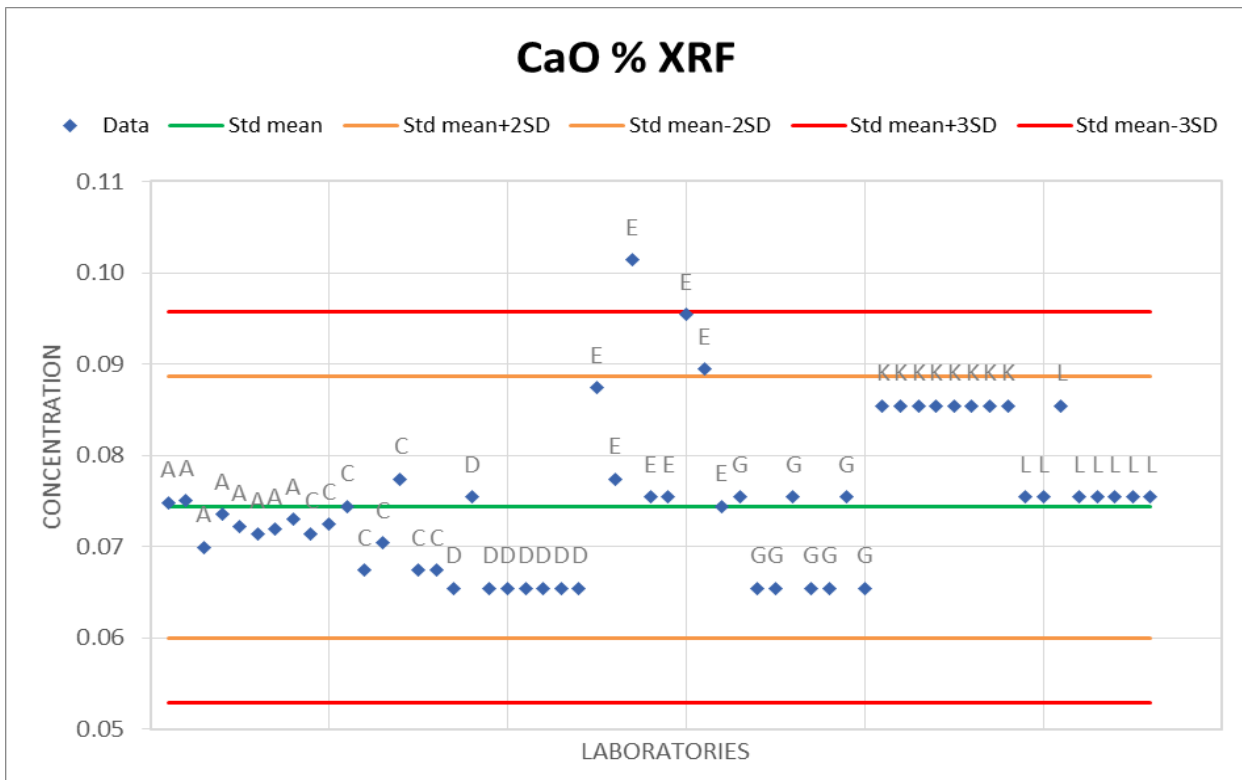
Lab_ID	Z_Score	Data
E	1.46	0.09
E	0.27	0.08
E	3.14	0.11
E	0.03	0.08
E	0.03	0.08
E	2.42	0.10
E	1.70	0.09
E	-0.09	0.08
G	0.03	0.08
G	-1.17	0.07
G	-1.17	0.07
G	0.03	0.08
G	-1.17	0.07
G	-1.17	0.07
G	0.03	0.08
G	-1.17	0.07
K	1.23	0.09
K	1.23	0.09
K	1.23	0.09
K	1.23	0.09
K	1.23	0.09
K	1.23	0.09
K	1.23	0.09

Lab_ID	Z_Score	Data
L	0.03	0.08
L	0.03	0.08
L	1.23	0.09
L	0.03	0.08
L	0.03	0.08
L	0.03	0.08
L	0.03	0.08
L	0.03	0.08

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
CaO	XRF	56	0.08	0.01	10	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
CaO	XRF	A	8	0.077	0.002	0.022	2.232
CaO	XRF	C	8	0.076	0.004	0.048	4.842
CaO	XRF	D	8	0.071	0.004	0.050	4.962
CaO	XRF	E	8	0.089	0.010	0.117	11.652
CaO	XRF	G	8	0.074	0.005	0.070	7.018
CaO	XRF	K	8	0.090	N/A	N/A	N/A
CaO	XRF	L	8	0.081	0.004	0.044	4.351
Average				0.080	0.005	0.050	5.008

11.7. CaO XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
CaO	XRF	54	0.08	0.01	9	%

Std mean	0.079
SD	0.007
2SD	0.014
3SD	0.021
Std mean+2SD	0.093
Std mean-2SD	0.065
Std mean+3SD	0.100
Std mean-3SD	0.057

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
CaO	XRF	0.003	N/A	0.007	0.004	%

Comments: 2 results out of 56 were rejected as outliers using z score

11.8. Ce FUS

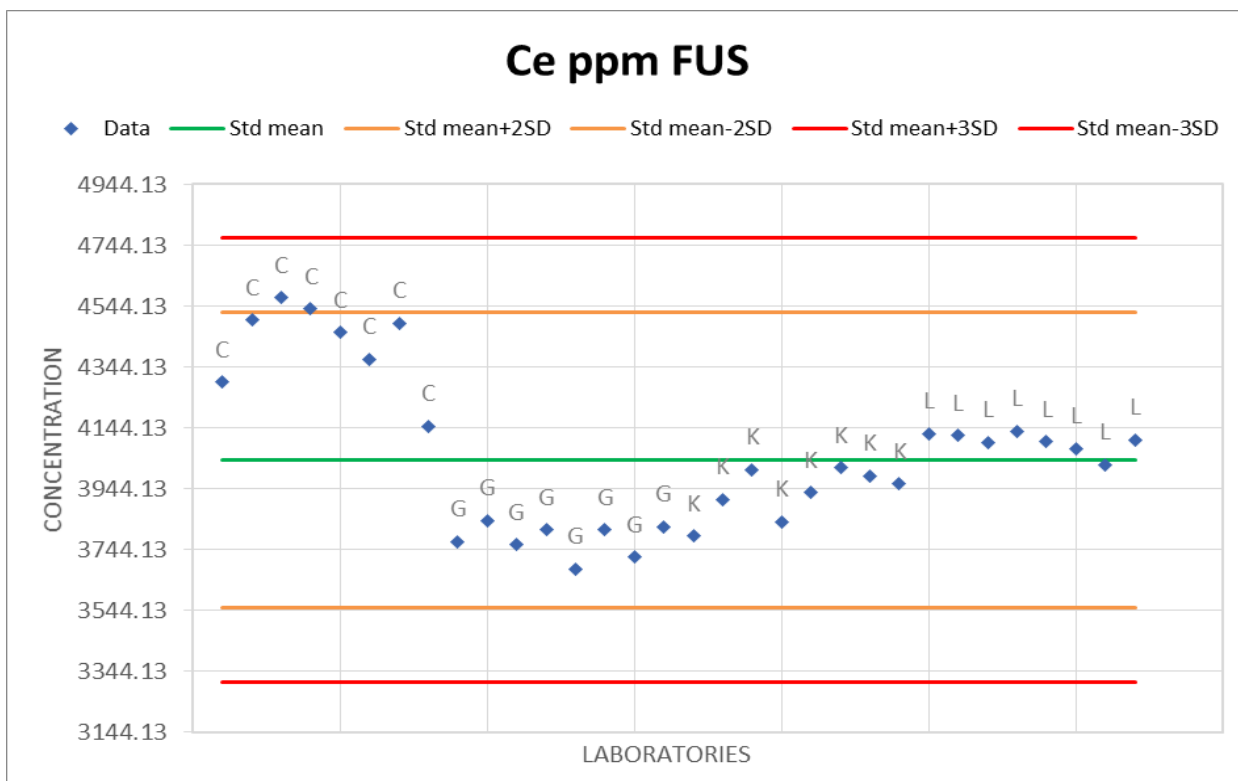
Lab_ID	Z_Score	Data
C	0.93	4295.10
C	1.72	4498.70
C	2.00	4571.00
C	1.86	4534.30
C	1.57	4458.70
C	1.22	4369.80
C	1.68	4488.70
C	0.37	4150.00
G	-1.11	3770.00
G	-0.84	3840.00
G	-1.15	3760.00
G	-0.96	3810.00
G	-1.46	3680.00
G	-0.96	3810.00
G	-1.31	3720.00
G	-0.92	3820.00
K	-1.04	3789.00
K	-0.57	3909.00
K	-0.19	4006.00
K	-0.85	3836.00
K	-0.49	3931.00
K	-0.17	4013.00
K	-0.27	3986.00
K	-0.37	3961.00

Lab_ID	Z_Score	Data
L	0.27	4124.40
L	0.24	4118.50
L	0.16	4096.20
L	0.30	4133.50
L	0.17	4098.50
L	0.08	4076.70
L	-0.12	4023.70
L	0.19	4105.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ce	FUS	32	4055.75	257.03	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Ce	FUS	C	8	4420.788	141.063	0.032	3.191
Ce	FUS	G	8	3776.250	54.756	0.015	1.450
Ce	FUS	K	8	3928.875	80.986	0.021	2.061
Ce	FUS	L	8	4097.100	34.645	0.008	0.846
Average				4055.753	87.544	0.019	1.887

11.8. Ce FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ce	FUS	31	4039.13	243.17	6	ppm

Std mean	4039.132
SD	243.173
2SD	486.345
3SD	729.518
Std mean+2SD	4525.477
Std mean-2SD	3552.787
Std mean+3SD	4768.650
Std mean-3SD	3309.615

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Ce	FUS	181.144	130350.284	361.041	83.623	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

11.9. Cr FUS

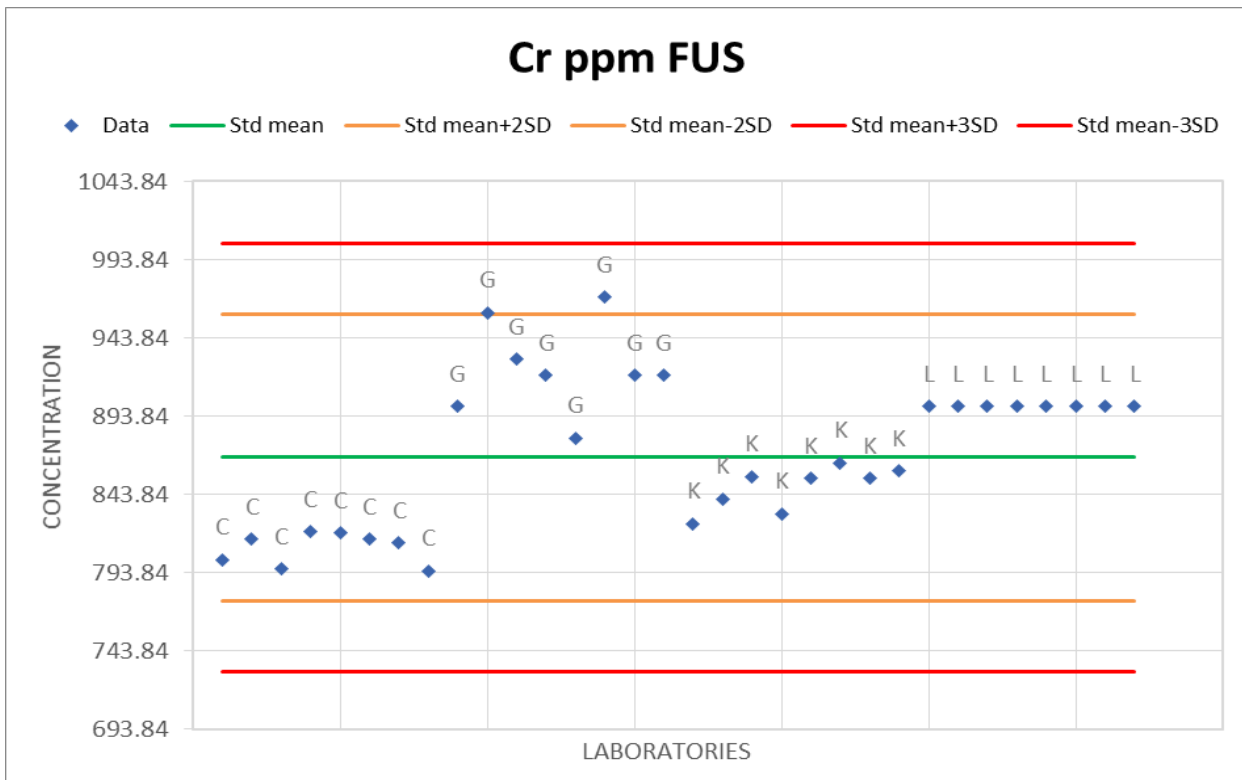
Lab_ID	Z_Score	Data
C	-1.42	802.00
C	-1.15	815.00
C	-1.54	796.00
C	-1.04	820.00
C	-1.06	819.00
C	-1.15	815.00
C	-1.19	813.00
C	-1.56	795.00
G	0.61	900.00
G	1.85	960.00
G	1.23	930.00
G	1.02	920.00
G	0.19	880.00
G	2.05	970.00
G	1.02	920.00
G	1.02	920.00
K	-0.94	825.15
K	-0.61	840.88
K	-0.32	855.25
K	-0.81	831.30
K	-0.34	853.88
K	-0.13	864.14
K	-0.34	853.88
K	-0.25	858.67

Lab_ID	Z_Score	Data
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00
L	0.61	900.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cr	FUS	32	870.57	48.45	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Cr	FUS	C	8	809.375	10.155	0.013	1.255
Cr	FUS	G	8	925.000	29.277	0.032	3.165
Cr	FUS	K	8	847.895	13.877	0.016	1.637
Cr	FUS	L	8	900.000	N/A	N/A	N/A
Average				870.567	16.977	0.015	1.514

11.9. Cr FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Cr	FUS	31	867.36	45.67	5	ppm

Std mean	867.360
SD	45.668
2SD	91.335
3SD	137.003
Std mean+2SD	958.695
Std mean-2SD	776.025
Std mean+3SD	1004.363
Std mean-3SD	730.357

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Cr	FUS	51.606	7951.986	89.174	16.964	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

11.10. Cr₂O₃ FUS

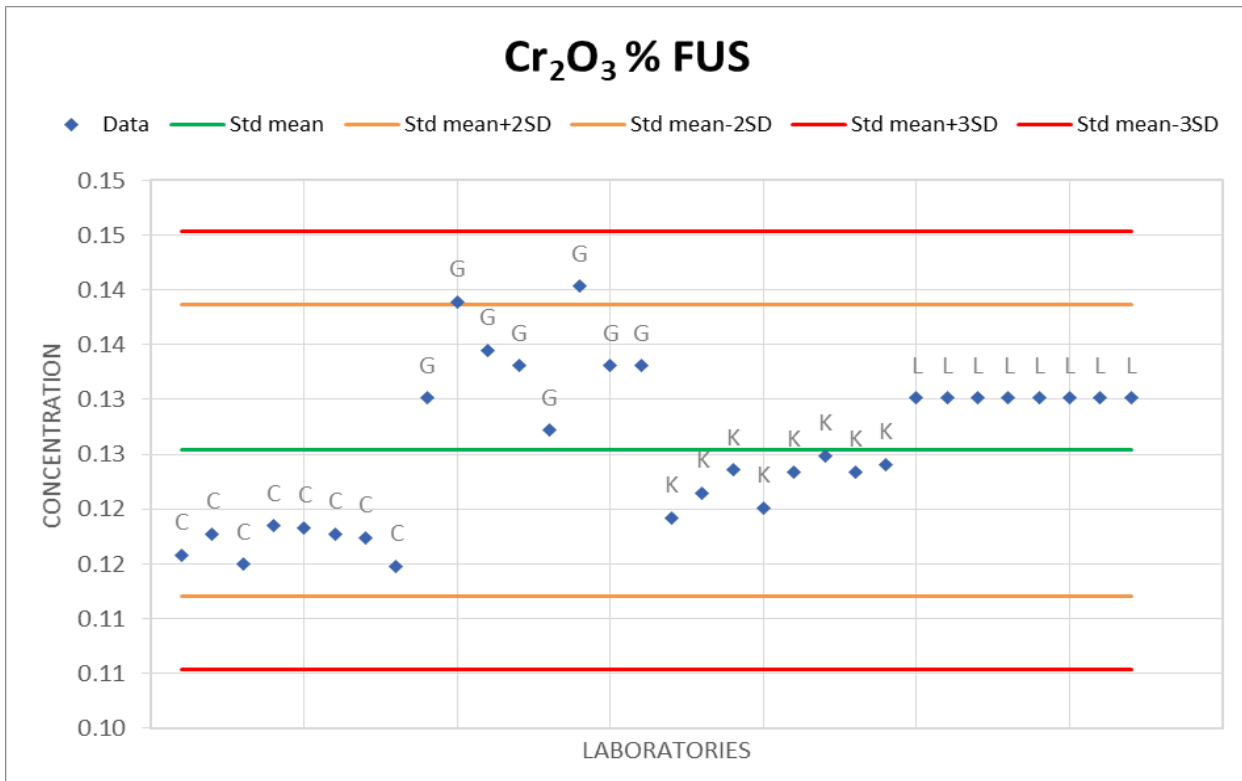
Lab_ID	Z_Score	Data
C	-1.42	0.12
C	-1.15	0.12
C	-1.54	0.12
C	-1.04	0.12
C	-1.06	0.12
C	-1.15	0.12
C	-1.19	0.12
C	-1.56	0.12
G	0.61	0.13
G	1.85	0.14
G	1.23	0.14
G	1.02	0.13
G	0.19	0.13
G	2.05	0.14
G	1.02	0.13
G	1.02	0.13
K	-0.94	0.12
K	-0.61	0.12
K	-0.32	0.13
K	-0.81	0.12
K	-0.34	0.12
K	-0.13	0.13
K	-0.34	0.12
K	-0.25	0.13

Lab_ID	Z_Score	Data
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13
L	0.61	0.13

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cr ₂ O ₃	FUS	32	0.13	0.01	6	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Cr ₂ O ₃	FUS	C	8	0.118	0.001	0.013	1.255
Cr ₂ O ₃	FUS	G	8	0.135	0.004	0.032	3.165
Cr ₂ O ₃	FUS	K	8	0.124	0.002	0.016	1.637
Cr ₂ O ₃	FUS	L	8	0.132	N/A	N/A	N/A
Average				0.127	0.002	0.015	1.514

11.10. Cr₂O₃ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cr ₂ O ₃	FUS	31	0.13	0.01	5	%

Std mean	0.127
SD	0.007
2SD	0.013
3SD	0.020
Std mean+2SD	0.140
Std mean-2SD	0.113
Std mean+3SD	0.147
Std mean-3SD	0.107

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Cr ₂ O ₃	FUS	0.008	N/A	0.013	0.002	%

Comment: 1 result out of 32 was rejected as an outlier using z-score

11.11. Cr₂O₃ XRF

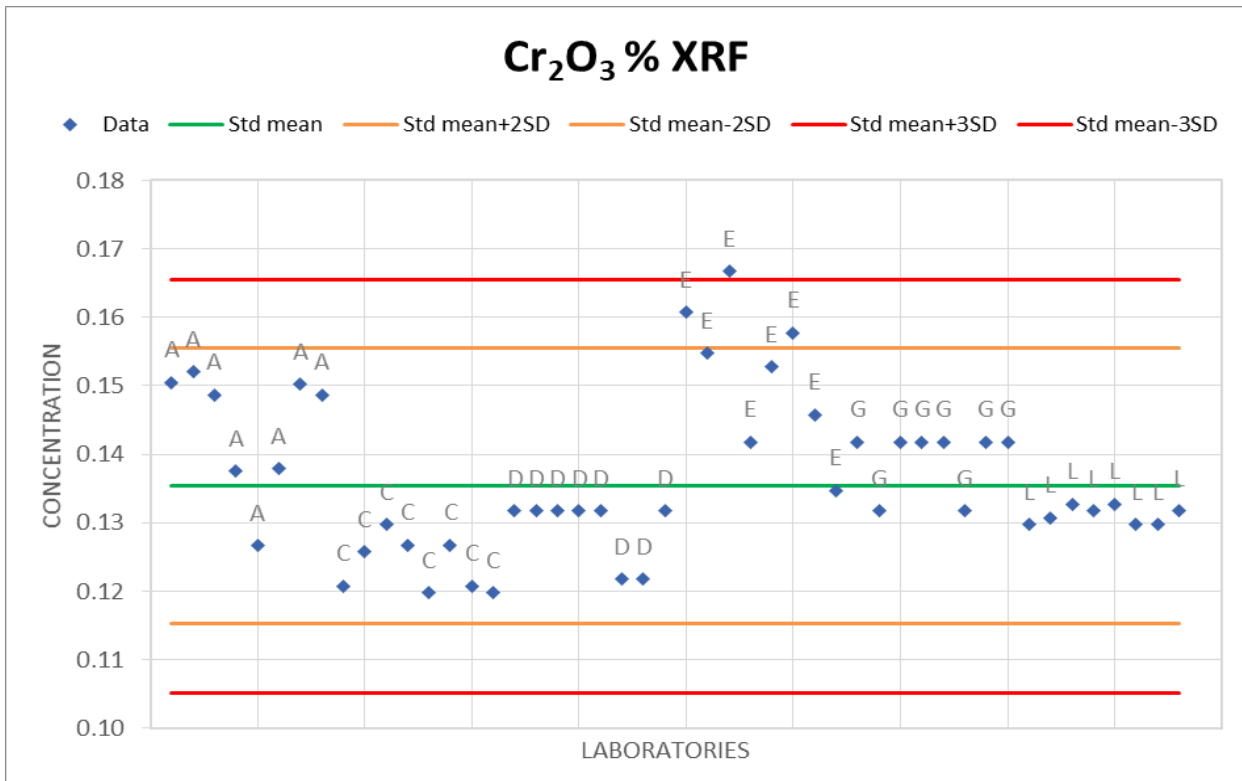
Lab_ID	Z_Score	Data
A	1.22	0.15
A	1.36	0.15
A	1.06	0.15
A	0.09	0.14
A	-0.87	0.12
A	0.11	0.14
A	1.20	0.15
A	1.06	0.15
C	-1.38	0.12
C	-0.95	0.12
C	-0.60	0.13
C	-0.86	0.13
C	-1.47	0.12
C	-0.86	0.13
C	-1.38	0.12
C	-1.47	0.12
D	-0.42	0.13
D	-0.42	0.13
D	-0.42	0.13
D	-0.42	0.13
D	-0.42	0.13
D	-1.30	0.12
D	-1.30	0.12
D	-0.42	0.13

Lab_ID	Z_Score	Data
E	2.12	0.16
E	1.60	0.15
E	2.65	0.17
E	0.46	0.14
E	1.42	0.15
E	1.86	0.16
E	0.81	0.14
E	-0.16	0.13
G	0.46	0.14
G	-0.42	0.13
G	0.46	0.14
G	0.46	0.14
G	0.46	0.14
G	-0.42	0.13
G	0.46	0.14
G	0.46	0.14
L	-0.60	0.13
L	-0.51	0.13
L	-0.33	0.13
L	-0.42	0.13
L	-0.33	0.13
L	-0.60	0.13
L	-0.60	0.13
L	-0.42	0.13

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cr ₂ O ₃	XRF	48	0.13	0.01	8	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Cr ₂ O ₃	XRF	A	8	0.142	0.009	0.063	6.338
Cr ₂ O ₃	XRF	C	8	0.122	0.004	0.032	3.220
Cr ₂ O ₃	XRF	D	8	0.128	0.005	0.036	3.631
Cr ₂ O ₃	XRF	E	8	0.150	0.011	0.070	7.017
Cr ₂ O ₃	XRF	G	8	0.138	0.005	0.034	3.367
Cr ₂ O ₃	XRF	L	8	0.129	0.001	0.010	1.007
Average				0.135	0.006	0.041	4.097

11.11. Cr₂O₃ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cr ₂ O ₃	XRF	46	0.13	0.01	8	%

Std mean	0.134
SD	0.010
2SD	0.020
3SD	0.030
Std mean+2SD	0.154
Std mean-2SD	0.113
Std mean+3SD	0.164
Std mean-3SD	0.103

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Cr ₂ O ₃	XRF	0.004	N/A	0.010	0.006	%

Comments: 2 results out of 48 were rejected as outliers using z score

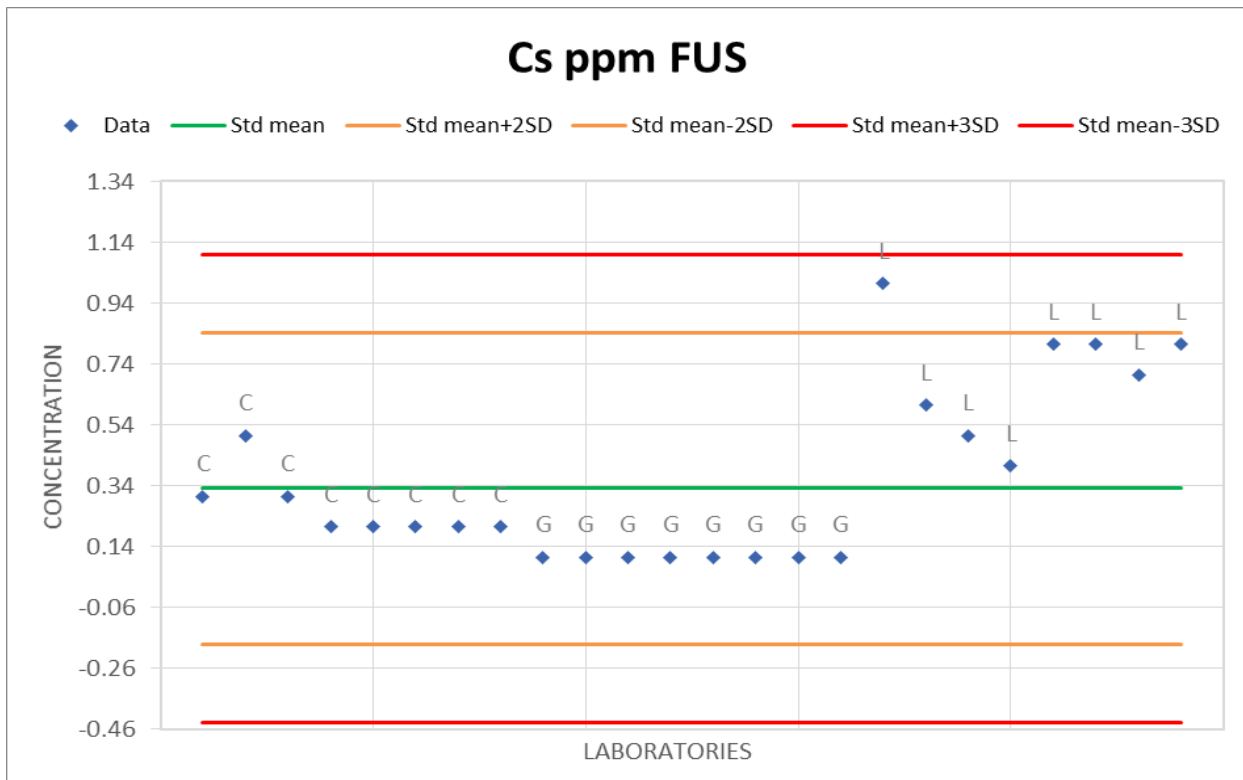
11.12. Cs FUS

Lab_ID	Z_Score	Data
C	-0.19	0.30
C	0.51	0.50
C	-0.19	0.30
C	-0.54	0.20
C	-0.54	0.20
C	-0.54	0.20
C	-0.54	0.20
C	-0.54	0.20
C	-0.54	0.20
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
G	-0.89	0.10
L	2.26	1.00
L	0.86	0.60
L	0.51	0.50
L	0.16	0.40
L	1.56	0.80
L	1.56	0.80
L	1.21	0.70
L	1.56	0.80

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cs	FUS	24	0.35	0.29	81	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Cs	FUS	C	8	0.263	0.106	0.404	40.406
Cs	FUS	G	8	0.100	N/A	N/A	N/A
Cs	FUS	L	8	0.700	0.193	0.275	27.532
Average				0.354	0.127	0.226	22.646

11.12. Cs FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Cs	FUS	23	0.33	0.26	79	ppm

Std mean	0.326
SD	0.256
2SD	0.512
3SD	0.769
Std mean+2SD	0.839
Std mean-2SD	-0.186
Std mean+3SD	1.095
Std mean-3SD	-0.443

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Cs	FUS	0.258	0.197	0.444	0.109	ppm

Comment: 1 result out of 24 was rejected as an outlier using z-score

11.13. Dy FUS

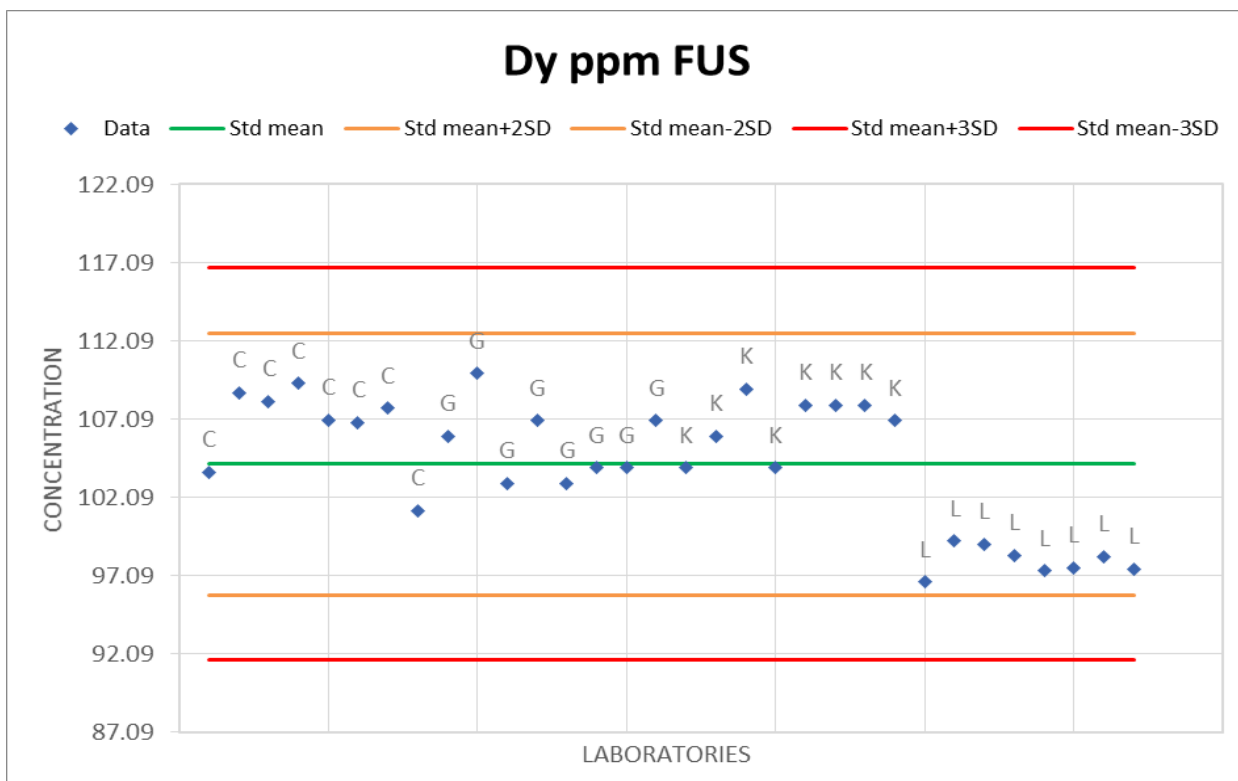
Lab_ID	Z_Score	Data
C	-0.13	103.69
C	1.08	108.76
C	0.95	108.22
C	1.23	109.39
C	0.67	107.02
C	0.63	106.88
C	0.85	107.80
C	-0.71	101.25
G	0.42	106.00
G	1.38	110.00
G	-0.29	103.00
G	0.66	107.00
G	-0.29	103.00
G	-0.05	104.00
G	-0.05	104.00
G	0.66	107.00
K	-0.05	104.00
K	0.42	106.00
K	1.14	109.00
K	-0.05	104.00
K	0.90	108.00
K	0.90	108.00
K	0.90	108.00
K	0.66	107.00

Lab_ID	Z_Score	Data
L	-1.80	96.70
L	-1.18	99.30
L	-1.22	99.10
L	-1.39	98.40
L	-1.63	97.40
L	-1.58	97.60
L	-1.42	98.30
L	-1.61	97.50

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Dy	FUS	32	104.23	4.19	4	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Dy	FUS	C	8	106.626	2.774	0.026	2.601
Dy	FUS	G	8	105.500	2.449	0.023	2.322
Dy	FUS	K	8	106.750	1.909	0.018	1.788
Dy	FUS	L	8	98.038	0.894	0.009	0.912
Average				104.228	2.129	0.019	1.906

11.13. Dy FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Dy	FUS	32	104.23	4.19	4	ppm

Std mean	104.228
SD	4.187
2SD	8.373
3SD	12.560
Std mean+2SD	112.602
Std mean-2SD	95.855
Std mean+3SD	116.788
Std mean-3SD	91.668

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Dy	FUS	2.921	33.568	5.794	2.129	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.14. Er FUS

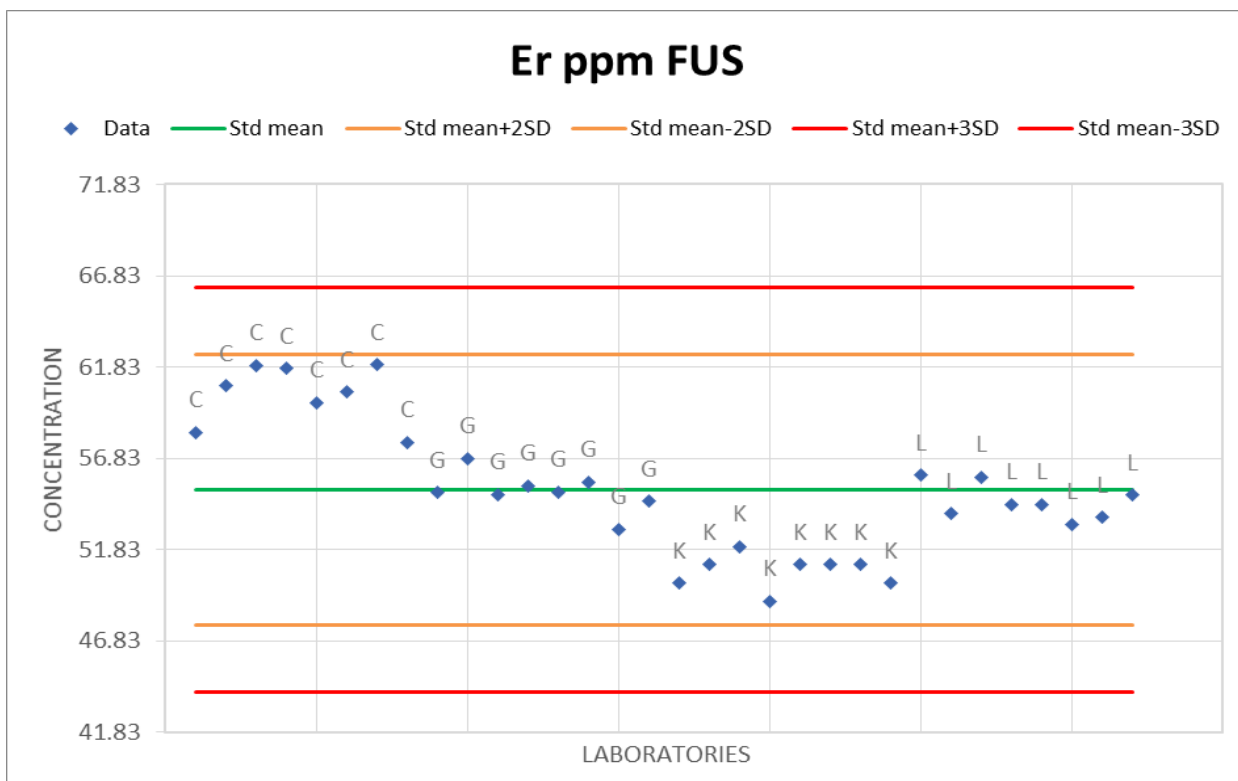
Lab_ID	Z_Score	Data
C	0.85	58.24
C	1.54	60.79
C	1.84	61.91
C	1.80	61.74
C	1.30	59.89
C	1.45	60.45
C	1.86	61.95
C	0.70	57.70
G	-0.04	54.95
G	0.47	56.82
G	-0.07	54.86
G	0.06	55.32
G	-0.03	54.98
G	0.11	55.51
G	-0.58	52.95
G	-0.17	54.48
K	-1.38	50.00
K	-1.11	51.00
K	-0.84	52.00
K	-1.65	49.00
K	-1.11	51.00
K	-1.11	51.00
K	-1.11	51.00
K	-1.38	50.00

Lab_ID	Z_Score	Data
L	0.22	55.90
L	-0.35	53.80
L	0.19	55.80
L	-0.22	54.30
L	-0.22	54.30
L	-0.52	53.20
L	-0.41	53.60
L	-0.08	54.80

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Er	FUS	32	55.10	3.69	7	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Er	FUS	C	8	60.334	1.639	0.027	2.717
Er	FUS	G	8	54.984	1.080	0.020	1.965
Er	FUS	K	8	50.625	0.916	0.018	1.810
Er	FUS	L	8	54.463	0.986	0.018	1.810
Average				55.101	1.190	0.021	2.075

11.14. Er FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Er	FUS	32	55.10	3.69	7	ppm

Std mean	55.101
SD	3.691
2SD	7.382
3SD	11.073
Std mean+2SD	62.484
Std mean-2SD	47.719
Std mean+3SD	66.175
Std mean-3SD	44.028

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Er	FUS	2.816	31.538	5.616	1.190	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.15. Eu FUS

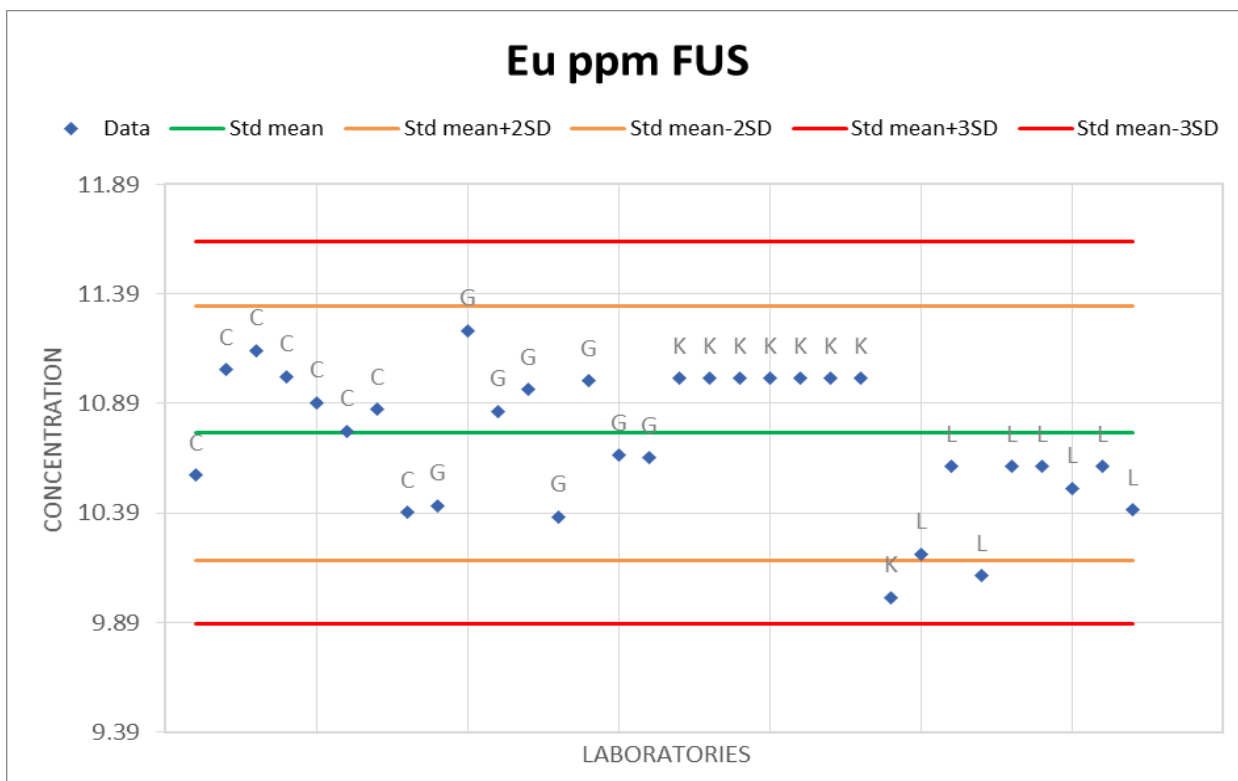
Lab_ID	Z_Score	Data
C	-0.54	10.56
C	0.99	11.04
C	1.27	11.13
C	0.89	11.01
C	0.51	10.89
C	0.10	10.76
C	0.42	10.86
C	-1.08	10.39
G	-0.98	10.42
G	1.56	11.22
G	0.38	10.85
G	0.70	10.95
G	-1.14	10.37
G	0.83	10.99
G	-0.25	10.65
G	-0.28	10.64
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	0.86	11.00
K	-2.31	10.00

Lab_ID	Z_Score	Data
L	-1.68	10.20
L	-0.41	10.60
L	-1.99	10.10
L	-0.41	10.60
L	-0.41	10.60
L	-0.73	10.50
L	-0.41	10.60
L	-1.04	10.40

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Eu	FUS	32	10.73	0.32	3	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Eu	FUS	C	8	10.830	0.251	0.023	2.321
Eu	FUS	G	8	10.761	0.293	0.027	2.727
Eu	FUS	K	8	10.875	0.354	0.033	3.251
Eu	FUS	L	8	10.450	0.200	0.019	1.914
Average				10.729	0.280	0.026	2.553

11.15. Eu FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Eu	FUS	31	10.75	0.29	3	ppm

Std mean	10.753
SD	0.291
2SD	0.581
3SD	0.872
Std mean+2SD	11.334
Std mean-2SD	10.171
Std mean+3SD	11.625
Std mean-3SD	9.881

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Eu	FUS	0.197	0.109	0.330	0.251	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

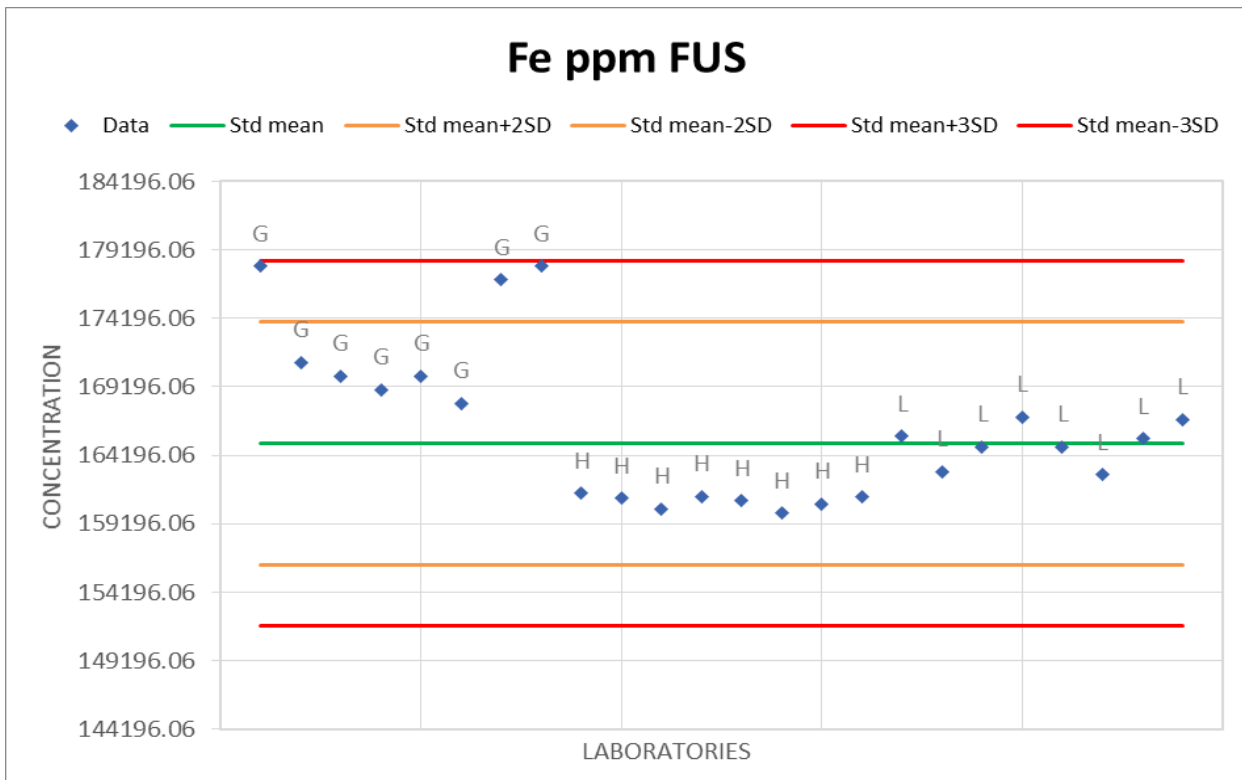
11.16. Fe FUS

Lab_ID	Z_Score	Data
G	2.12	178000.00
G	0.87	171000.00
G	0.69	170000.00
G	0.51	169000.00
G	0.69	170000.00
G	0.33	168000.00
G	1.94	177000.00
G	2.12	178000.00
H	-0.85	161421.52
H	-0.91	161071.82
H	-1.05	160302.48
H	-0.89	161211.70
H	-0.95	160862.00
H	-1.11	159952.78
H	-0.99	160652.18
H	-0.90	161141.76
L	-0.10	165600.00
L	-0.57	163000.00
L	-0.24	164800.00
L	0.15	167000.00
L	-0.24	164800.00
L	-0.60	162800.00
L	-0.14	165400.00
L	0.11	166800.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Fe	FUS	24	166159.01	5589.13	3	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Fe	FUS	G	8	172625.000	4274.091	0.025	2.476
Fe	FUS	H	8	160827.030	497.368	0.003	0.309
Fe	FUS	L	8	165025.000	1543.419	0.009	0.935
Average				166159.010	2639.279	0.012	1.240

11.16. Fe FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Fe	FUS	22	165082.56	4432.41	3	ppm

Std mean	165082.556
SD	4432.408
2SD	8864.817
3SD	13297.225
Std mean+2SD	173947.373
Std mean-2SD	156217.740
Std mean+3SD	178379.781
Std mean-3SD	151785.331

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Fe	FUS	4339.895	56007122.753	7483.791	1908.981	ppm

Comments: 2 results out of 24 were rejected as outliers using z score

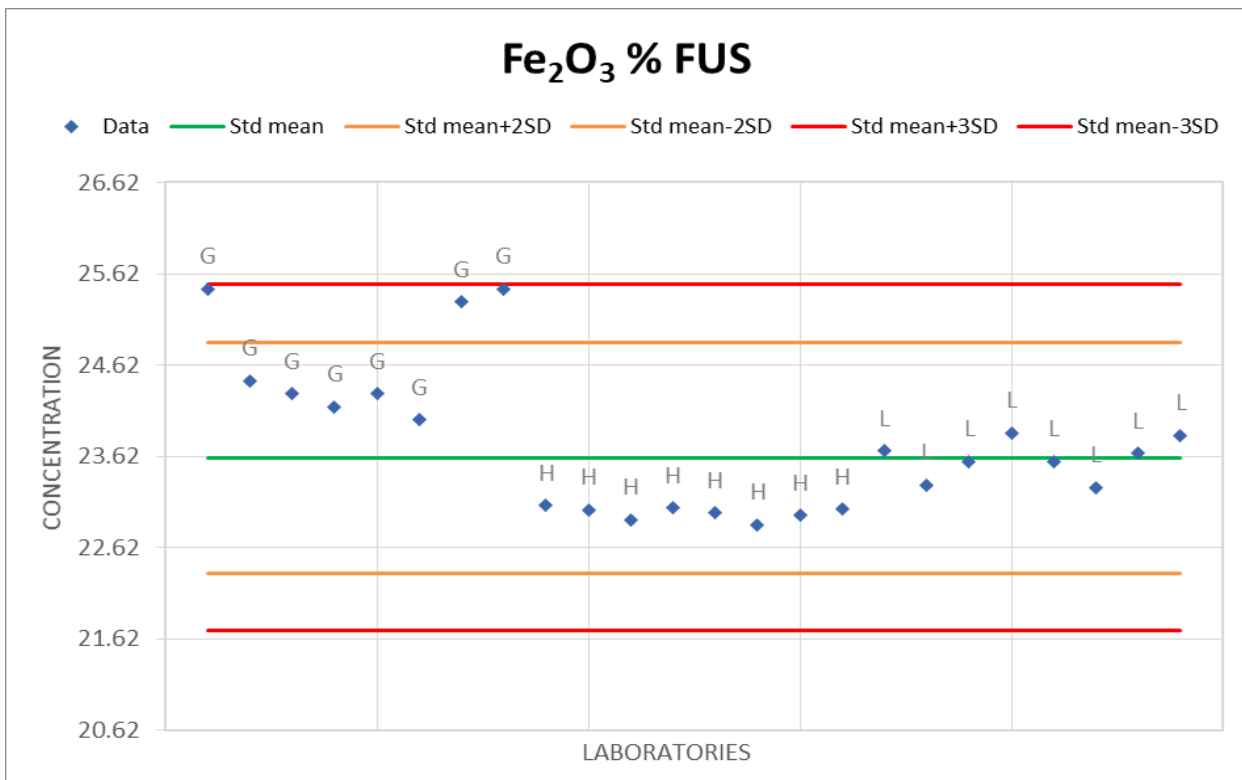
11.17. Fe₂O₃ FUS

Lab_ID	Z_Score	Data
G	2.12	25.45
G	0.87	24.45
G	0.69	24.30
G	0.51	24.16
G	0.69	24.30
G	0.33	24.02
G	1.94	25.31
G	2.12	25.45
H	-0.85	23.08
H	-0.91	23.03
H	-1.05	22.92
H	-0.88	23.05
H	-0.95	23.00
H	-1.11	22.87
H	-0.98	22.97
H	-0.90	23.04
L	-0.10	23.68
L	-0.57	23.30
L	-0.24	23.56
L	0.15	23.88
L	-0.24	23.56
L	-0.60	23.28
L	-0.14	23.65
L	0.11	23.85

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Fe ₂ O ₃	FUS	24	23.76	0.80	3	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Fe ₂ O ₃	FUS	G	8	24.680	0.611	0.025	2.476
Fe ₂ O ₃	FUS	H	8	22.995	0.071	0.003	0.309
Fe ₂ O ₃	FUS	L	8	23.594	0.221	0.009	0.935
Average				23.756	0.377	0.012	1.240

11.17. Fe₂O₃ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Fe ₂ O ₃	FUS	22	23.60	0.63	3	%

Std mean	23.602
SD	0.633
2SD	1.266
3SD	1.899
Std mean+2SD	24.869
Std mean-2SD	22.336
Std mean+3SD	25.502
Std mean-3SD	21.703

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Fe ₂ O ₃	FUS	0.620	1.142	1.069	0.273	%

Comments: 2 results out of 24 were rejected as outliers using z score

11.18. Fe₂O₃ XRF

Lab_ID	Z_Score	Data
A	-1.68	21.96
A	-1.27	22.21
A	-1.88	21.84
A	-1.91	21.82
A	-1.48	22.08
A	-1.25	22.23
A	-1.73	21.93
A	-1.93	21.81
B	-0.30	22.81
B	-0.37	22.77
B	-0.37	22.77
B	-0.32	22.80
B	-0.30	22.81
B	-0.59	22.63
B	-0.40	22.75
B	-0.64	22.60
C	0.14	23.08
C	-0.09	22.94
C	-0.22	22.86
C	-0.21	22.87
C	-0.37	22.77
C	0.21	23.12
C	-0.24	22.85
C	-0.10	22.93

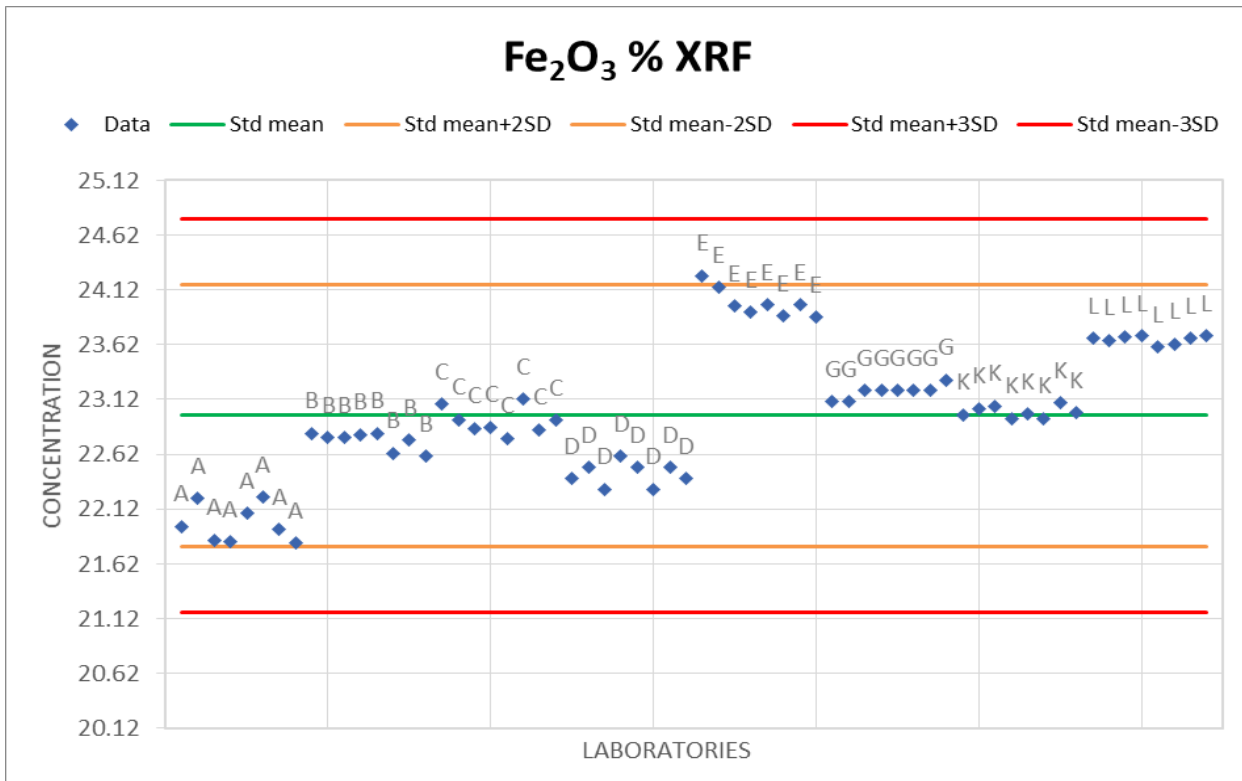
Lab_ID	Z_Score	Data
D	-0.97	22.40
D	-0.80	22.50
D	-1.13	22.30
D	-0.64	22.60
D	-0.80	22.50
D	-1.13	22.30
D	-0.80	22.50
D	-0.97	22.40
E	2.05	24.25
E	1.87	24.14
E	1.59	23.97
E	1.50	23.92
E	1.61	23.99
E	1.44	23.88
E	1.61	23.98
E	1.43	23.87
G	0.17	23.10
G	0.17	23.10
G	0.33	23.20
G	0.33	23.20
G	0.33	23.20
G	0.33	23.20
G	0.33	23.20
G	0.50	23.30

Lab_ID	Z_Score	Data
K	-0.02	22.98
K	0.07	23.04
K	0.11	23.06
K	-0.07	22.95
K	-0.01	22.99
K	-0.07	22.95
K	0.16	23.09
K	0.01	23.00
L	1.12	23.68
L	1.08	23.66
L	1.13	23.69
L	1.15	23.70
L	0.99	23.60
L	1.03	23.63
L	1.12	23.68
L	1.15	23.70

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Fe ₂ O ₃	XRF	64	22.99	0.61	3	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Fe ₂ O ₃	XRF	A	8	21.986	0.171	0.008	0.779
Fe ₂ O ₃	XRF	B	8	22.743	0.082	0.004	0.360
Fe ₂ O ₃	XRF	C	8	22.926	0.121	0.005	0.528
Fe ₂ O ₃	XRF	D	8	22.438	0.106	0.005	0.473
Fe ₂ O ₃	XRF	E	8	24.001	0.132	0.006	0.551
Fe ₂ O ₃	XRF	G	8	23.188	0.064	0.003	0.276
Fe ₂ O ₃	XRF	K	8	23.008	0.051	0.002	0.223
Fe ₂ O ₃	XRF	L	8	23.668	0.036	0.002	0.151
Average				22.994	0.105	0.004	0.418

11.18. Fe₂O₃ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Fe ₂ O ₃	XRF	63	22.97	0.60	3	%

Std mean	22.974
SD	0.598
2SD	1.196
3SD	1.795
Std mean+2SD	24.171
Std mean-2SD	21.778
Std mean+3SD	24.769
Std mean-3SD	21.180

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Fe ₂ O ₃	XRF	0.220	0.385	0.621	0.099	%

Comment: 1 result out of 64 was rejected as an outlier using z-score

11.19. Gd FUS

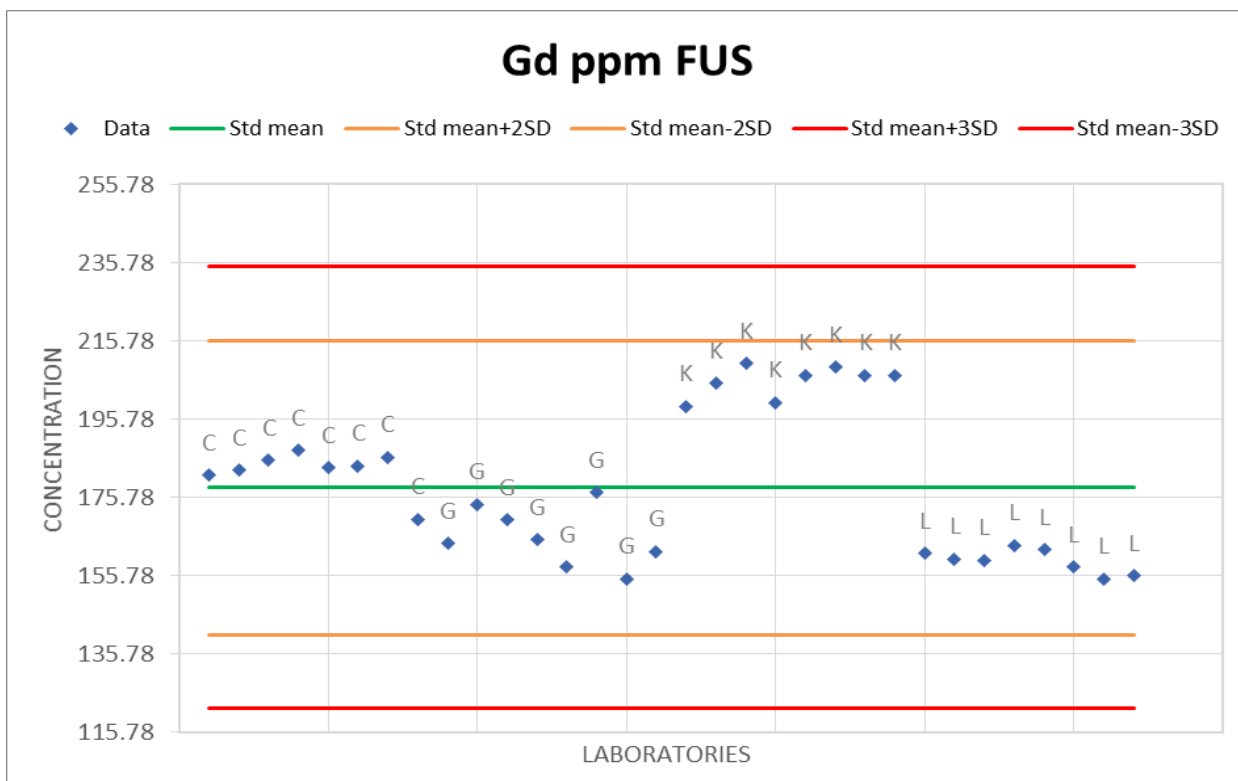
Lab_ID	Z_Score	Data
C	0.16	181.39
C	0.24	182.74
C	0.37	185.20
C	0.50	187.75
C	0.27	183.37
C	0.29	183.77
C	0.42	186.13
C	-0.43	170.18
G	-0.76	164.00
G	-0.23	174.00
G	-0.44	170.00
G	-0.71	165.00
G	-1.08	158.00
G	-0.07	177.00
G	-1.24	155.00
G	-0.87	162.00
K	1.10	199.00
K	1.42	205.00
K	1.69	210.00
K	1.15	200.00
K	1.53	207.00
K	1.63	209.00
K	1.53	207.00
K	1.53	207.00

Lab_ID	Z_Score	Data
L	-0.89	161.50
L	-0.97	160.10
L	-0.99	159.70
L	-0.79	163.50
L	-0.84	162.50
L	-1.08	158.00
L	-1.24	155.00
L	-1.20	155.70

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Gd	FUS	32	178.30	18.81	11	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Gd	FUS	C	8	182.566	5.391	0.030	2.953
Gd	FUS	G	8	165.625	7.615	0.046	4.597
Gd	FUS	K	8	205.500	4.000	0.019	1.946
Gd	FUS	L	8	159.500	3.078	0.019	1.930
Average				178.298	5.304	0.029	2.857

11.19. Gd FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Gd	FUS	32	178.30	18.81	11	ppm

Std mean	178.298
SD	18.807
2SD	37.614
3SD	56.421
Std mean+2SD	215.912
Std mean-2SD	140.684
Std mean+3SD	234.719
Std mean-3SD	121.877

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Gd	FUS	14.531	841.058	29.001	5.304	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.20. Hf FUS

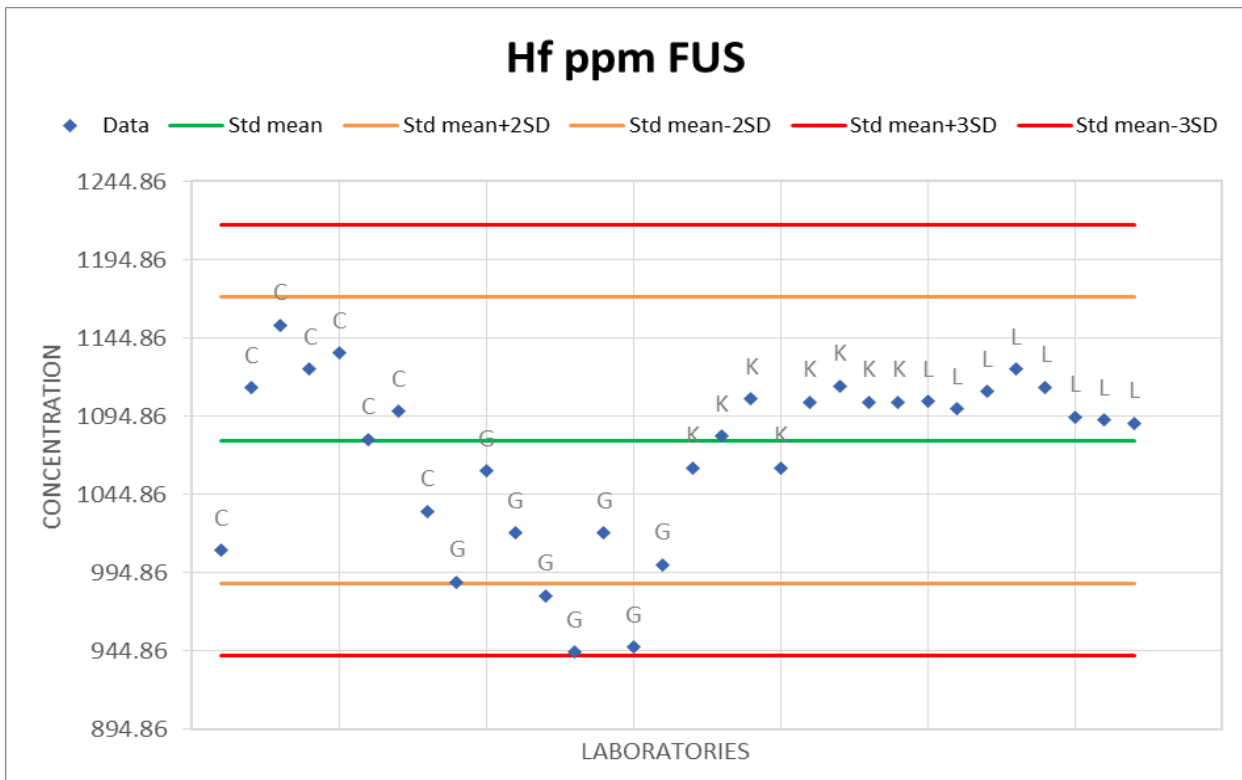
Lab_ID	Z_Score	Data
C	-1.12	1009.00
C	0.76	1113.00
C	1.48	1153.00
C	0.98	1125.00
C	1.16	1135.00
C	0.16	1080.00
C	0.49	1098.00
C	-0.67	1034.00
G	-1.49	989.00
G	-0.20	1060.00
G	-0.92	1020.00
G	-1.65	980.00
G	-2.30	944.00
G	-0.92	1020.00
G	-2.25	947.00
G	-1.29	1000.00
K	-0.16	1062.00
K	0.20	1082.00
K	0.63	1106.00
K	-0.16	1062.00
K	0.60	1104.00
K	0.78	1114.00
K	0.60	1104.00
K	0.60	1104.00

Lab_ID	Z_Score	Data
L	0.60	1104.20
L	0.51	1099.30
L	0.71	1110.40
L	0.97	1124.90
L	0.76	1113.30
L	0.42	1094.50
L	0.39	1092.50
L	0.35	1090.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Hf	FUS	32	1071.08	55.23	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Hf	FUS	C	8	1093.375	50.026	0.046	4.575
Hf	FUS	G	8	995.000	39.035	0.039	3.923
Hf	FUS	K	8	1092.250	20.742	0.019	1.899
Hf	FUS	L	8	1103.675	11.927	0.011	1.081
Average				1071.075	33.907	0.029	2.870

11.20. Hf FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Hf	FUS	30	1079.45	45.83	4	ppm

Std mean	1079.447
SD	45.830
2SD	91.661
3SD	137.491
Std mean+2SD	1171.108
Std mean-2SD	987.786
Std mean+3SD	1216.938
Std mean-3SD	941.955

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Hf	FUS	26.567	2691.672	51.881	31.411	ppm

Comments: 2 results out of 32 were rejected as outliers using z score

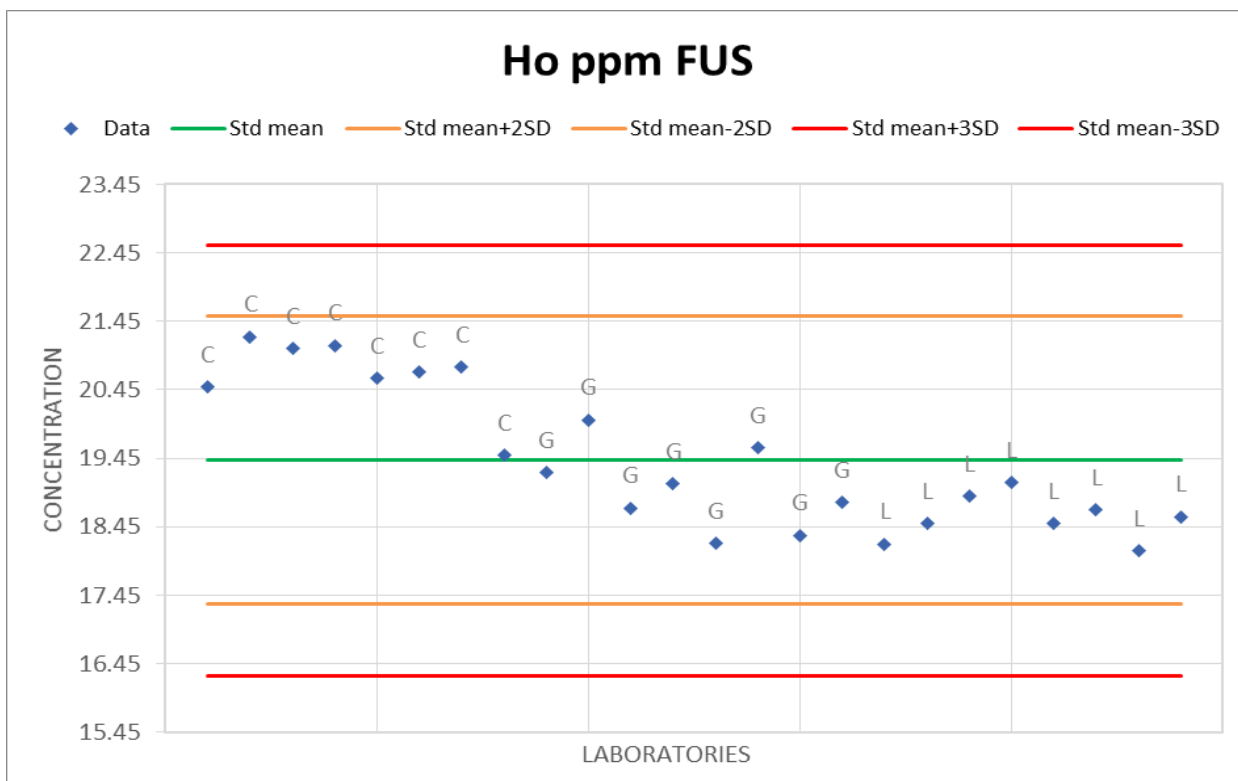
11.21. Ho FUS

Lab_ID	Z_Score	Data
C	1.02	20.49
C	1.72	21.23
C	1.56	21.06
C	1.60	21.10
C	1.14	20.62
C	1.23	20.71
C	1.29	20.78
C	0.07	19.50
G	-0.17	19.24
G	0.56	20.01
G	-0.66	18.73
G	-0.32	19.08
G	-1.15	18.21
G	0.18	19.61
G	-1.04	18.33
G	-0.58	18.81
L	-1.16	18.20
L	-0.88	18.50
L	-0.50	18.90
L	-0.31	19.10
L	-0.88	18.50
L	-0.69	18.70
L	-1.26	18.10
L	-0.78	18.60

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ho	FUS	24	19.42	1.05	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Ho	FUS	C	8	20.686	0.543	0.026	2.626
Ho	FUS	G	8	19.003	0.614	0.032	3.231
Ho	FUS	L	8	18.575	0.333	0.018	1.791
Average				19.421	0.511	0.025	2.549

11.21. Ho FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ho	FUS	24	19.42	1.05	5	ppm

Std mean	19.421
SD	1.051
2SD	2.102
3SD	3.153
Std mean+2SD	21.524
Std mean-2SD	17.319
Std mean+3SD	22.575
Std mean-3SD	16.268

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Ho	FUS	1.044	3.235	1.799	0.511	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

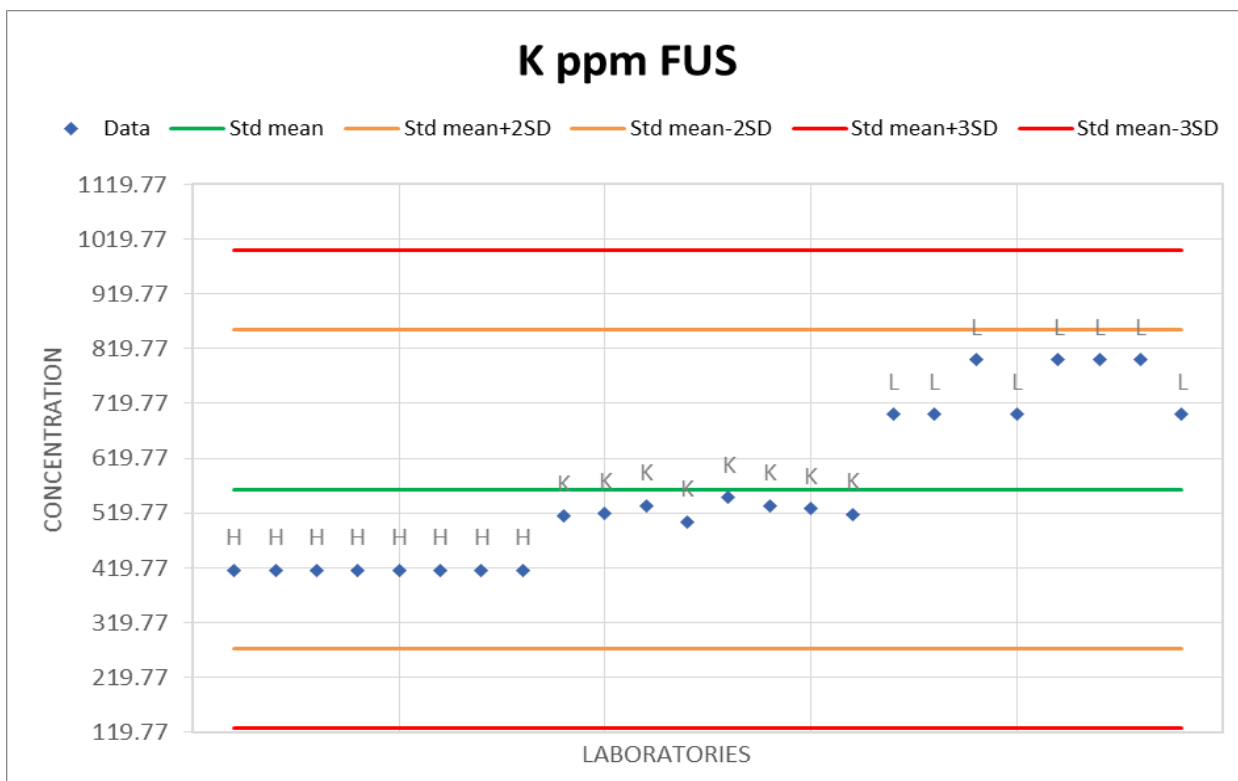
11.22. K FUS

Lab_ID	Z_Score	Data
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
H	-1.02	415.00
K	-0.34	513.77
K	-0.30	518.75
K	-0.20	533.69
K	-0.41	503.81
K	-0.11	547.80
K	-0.21	532.86
K	-0.24	527.88
K	-0.32	517.09
L	0.94	700.00
L	0.94	700.00
L	1.63	800.00
L	0.94	700.00
L	1.63	800.00
L	1.63	800.00
L	1.63	800.00
L	0.94	700.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
K	FUS	24	563.15	145.69	26	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
K	FUS	H	8	415.000	N/A	N/A	N/A
K	FUS	K	8	524.456	13.835	0.026	2.638
K	FUS	L	8	750.000	53.452	0.071	7.127
Average				563.152	31.878	0.033	3.255

11.22. K FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
K	FUS	24	563.15	145.69	26	ppm

Std mean	563.152
SD	145.693
2SD	291.386
3SD	437.079
Std mean+2SD	854.538
Std mean-2SD	271.766
Std mean+3SD	1000.231
Std mean-3SD	126.073

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
K	FUS	269.320	144875.909	380.626	39.042	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.23. K₂O FUS

Lab_ID	Z_Score	Data
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
H	-1.02	0.05
K	-0.34	0.06
K	-0.30	0.06
K	-0.20	0.06
K	-0.41	0.06
K	-0.11	0.07
K	-0.21	0.06
K	-0.24	0.06
K	-0.32	0.06
L	0.94	0.08
L	0.94	0.08
L	1.63	0.10
L	0.94	0.08
L	1.63	0.10
L	1.63	0.10
L	1.63	0.10
L	0.94	0.08

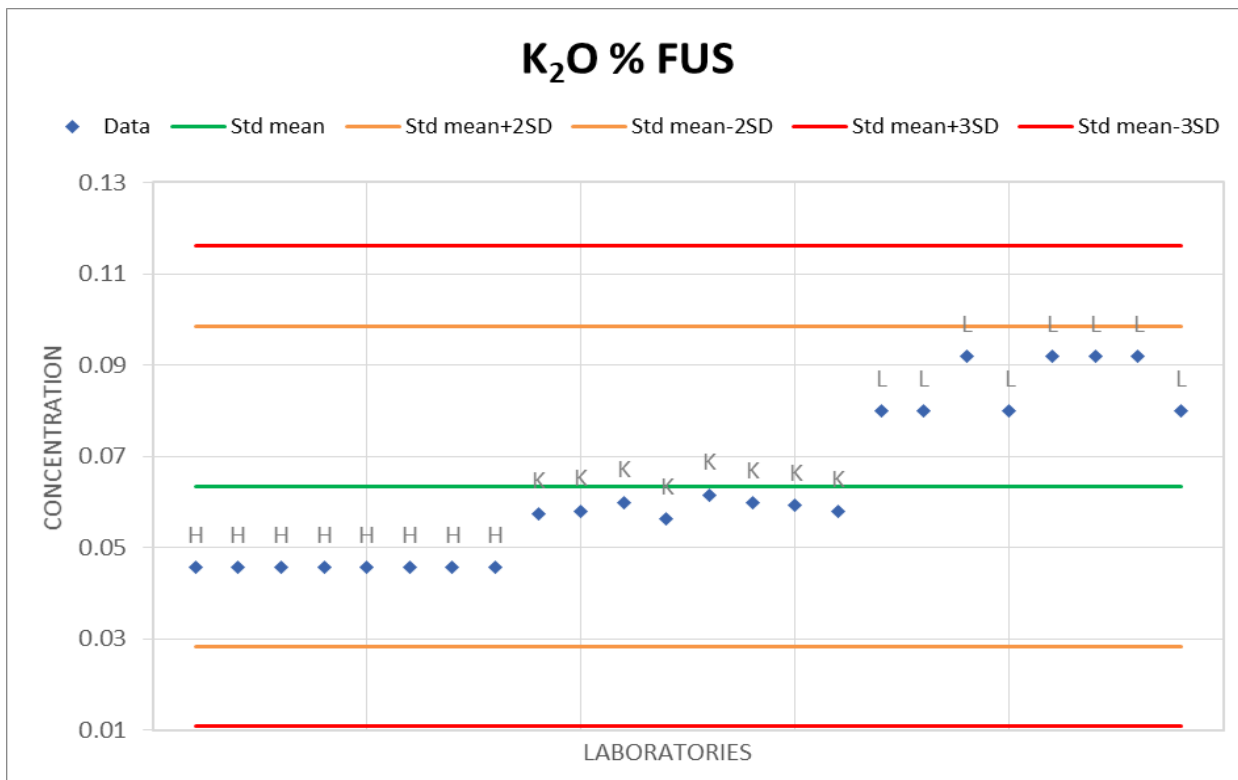
Results with outliers

Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
K ₂ O	FUS	24	0.07	0.02	26	%

Between Laboratory Statistics

Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
K ₂ O	FUS	H	8	0.050	N/A	N/A	N/A
K ₂ O	FUS	K	8	0.063	0.002	0.026	2.638
K ₂ O	FUS	L	8	0.090	0.006	0.071	7.127
Average				0.068	0.004	0.033	3.255

11.23. K₂O FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
K ₂ O	FUS	24	0.07	0.02	26	%

Std mean	0.068
SD	0.018
2SD	0.035
3SD	0.053
Std mean+2SD	0.103
Std mean-2SD	0.033
Std mean+3SD	0.120
Std mean-3SD	0.015

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
K ₂ O	FUS	0.019	0.001	0.034	0.004	%

Comment: No results rejected as outliers using z score. All results are within the mean \pm 3SD

11.24. K₂O XRF

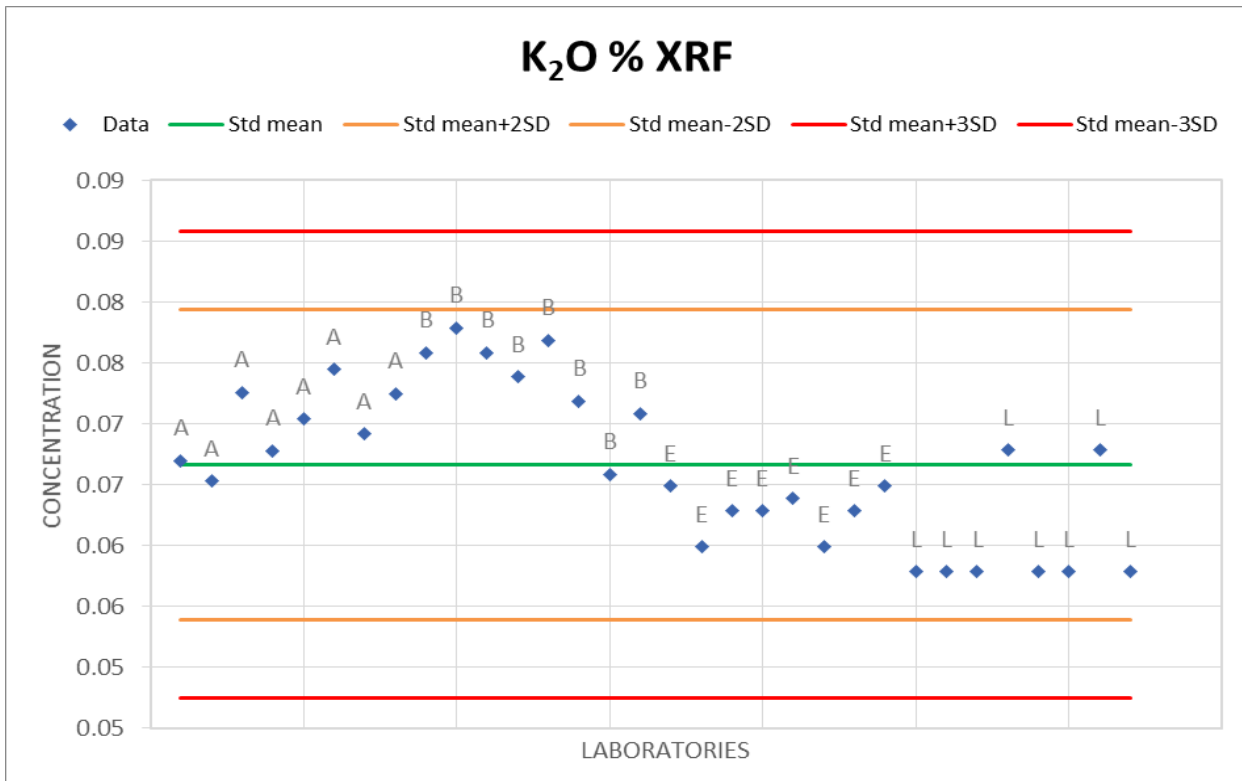
Lab_ID	Z_Score	Data
A	0.05	0.07
A	-0.22	0.07
A	0.93	0.07
A	0.17	0.07
A	0.58	0.07
A	1.22	0.08
A	0.39	0.07
A	0.91	0.07
B	1.44	0.08
B	1.76	0.08
B	1.44	0.08
B	1.13	0.08
B	1.60	0.08
B	0.82	0.07
B	-0.12	0.07
B	0.66	0.07
E	-0.28	0.07
E	-1.06	0.06
E	-0.59	0.07
E	-0.59	0.07
E	-0.44	0.07
E	-1.06	0.06
E	-0.59	0.07
E	-0.28	0.07

Lab_ID	Z_Score	Data
L	-1.37	0.06
L	-1.37	0.06
L	-1.37	0.06
L	0.19	0.07
L	-1.37	0.06
L	-1.37	0.06
L	0.19	0.07
L	-1.37	0.06

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
K ₂ O	XRF	32	0.07	0.01	9	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
K ₂ O	XRF	A	8	0.072	0.003	0.044	4.389
K ₂ O	XRF	B	8	0.076	0.004	0.052	5.221
K ₂ O	XRF	E	8	0.065	0.002	0.030	3.020
K ₂ O	XRF	L	8	0.063	0.005	0.074	7.407
Average				0.069	0.004	0.050	5.009

11.24. K₂O XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
K ₂ O	XRF	32	0.07	0.01	9	%

Std mean	0.069
SD	0.006
2SD	0.013
3SD	0.019
Std mean+2SD	0.082
Std mean-2SD	0.056
Std mean+3SD	0.088
Std mean-3SD	0.050

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
K ₂ O	XRF	0.004	N/A	0.009	0.004	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.25. La FUS

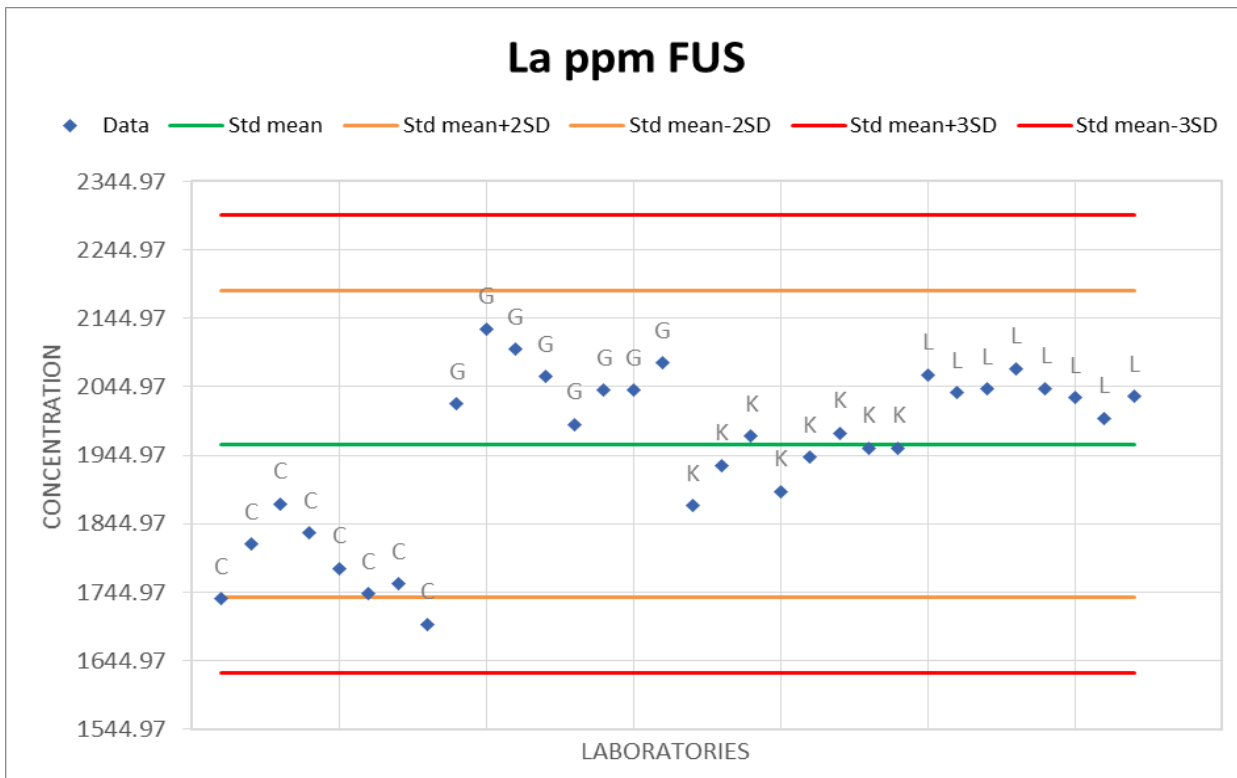
Lab_ID	Z_Score	Data
C	-1.83	1734.90
C	-1.15	1815.50
C	-0.66	1874.00
C	-1.02	1831.30
C	-1.45	1779.70
C	-1.76	1742.60
C	-1.65	1756.80
C	-2.14	1698.30
G	0.56	2020.00
G	1.48	2130.00
G	1.23	2100.00
G	0.89	2060.00
G	0.31	1990.00
G	0.73	2040.00
G	0.73	2040.00
G	1.06	2080.00
K	-0.69	1871.00
K	-0.19	1930.00
K	0.17	1973.00
K	-0.51	1892.00
K	-0.09	1942.00
K	0.20	1977.00
K	0.02	1956.00
K	0.02	1956.00

Lab_ID	Z_Score	Data
L	0.92	2062.40
L	0.69	2036.10
L	0.74	2041.60
L	0.99	2071.70
L	0.75	2042.70
L	0.63	2028.70
L	0.38	1998.70
L	0.65	2030.40

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
La	FUS	32	1953.20	119.33	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
La	FUS	C	8	1779.138	57.778	0.032	3.248
La	FUS	G	8	2057.500	44.960	0.022	2.185
La	FUS	K	8	1937.125	37.934	0.020	1.958
La	FUS	L	8	2039.038	22.200	0.011	1.089
Average				1953.200	42.695	0.021	2.120

11.25. La FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
La	FUS	31	1961.42	111.71	6	ppm

Std mean	1961.423
SD	111.713
2SD	223.426
3SD	335.138
Std mean+2SD	2184.848
Std mean-2SD	1737.997
Std mean+3SD	2296.561
Std mean-3SD	1626.284

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
La	FUS	82.724	27164.892	164.818	40.172	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

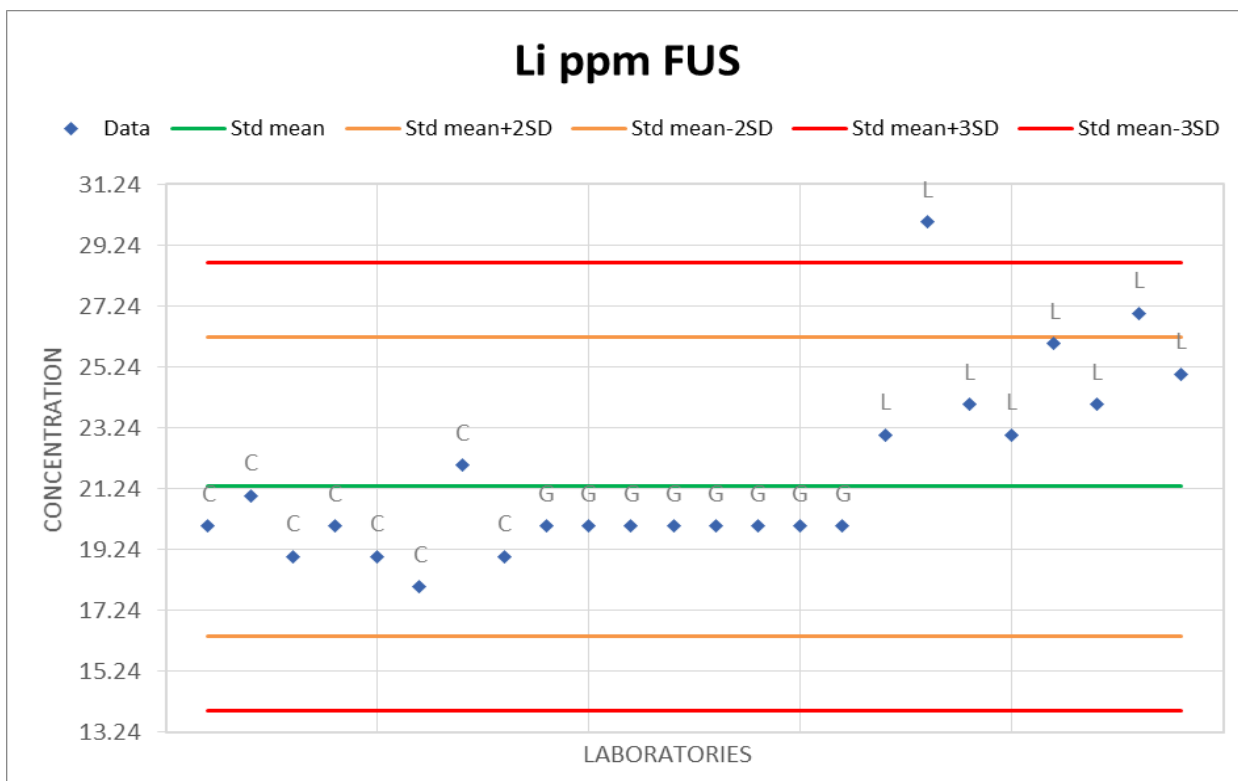
11.26. Li FUS

Lab_ID	Z_Score	Data
C	-0.56	20.00
C	-0.22	21.00
C	-0.89	19.00
C	-0.56	20.00
C	-0.89	19.00
C	-1.23	18.00
C	0.11	22.00
C	-0.89	19.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
G	-0.56	20.00
L	0.45	23.00
L	2.79	30.00
L	0.78	24.00
L	0.45	23.00
L	1.45	26.00
L	0.78	24.00
L	1.78	27.00
L	1.12	25.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Li	FUS	24	21.67	2.99	14	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Li	FUS	C	8	19.750	1.282	0.065	6.490
Li	FUS	G	8	20.000	N/A	N/A	N/A
Li	FUS	L	8	25.250	2.375	0.094	9.408
Average				21.667	1.558	0.053	5.299

11.26. Li FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Li	FUS	23	21.30	2.46	12	ppm

Std mean	21.304
SD	2.458
2SD	4.915
3SD	7.373
Std mean+2SD	26.219
Std mean-2SD	16.389
Std mean+3SD	28.677
Std mean-3SD	13.932

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Li	FUS	4.812	46.053	6.786	1.393	ppm

Comment: 1 result out of 24 was rejected as an outlier using z-score

11.27. LOI

Lab_ID	Z_Score	Data
A	2.38	1.69
A	1.16	1.53
A	1.77	1.61
A	1.69	1.60
A	0.62	1.46
A	1.23	1.54
A	1.39	1.56
A	0.93	1.50
D	-0.67	1.29
D	-1.05	1.24
D	-0.90	1.26
D	-0.82	1.27
D	-0.75	1.28
D	-0.67	1.29
D	-0.60	1.30
D	-0.67	1.29
E	-1.28	1.21
E	-1.21	1.22
E	-1.13	1.23
E	-1.13	1.23
E	-1.13	1.23
E	-1.21	1.22
E	-1.05	1.24
E	-1.05	1.24

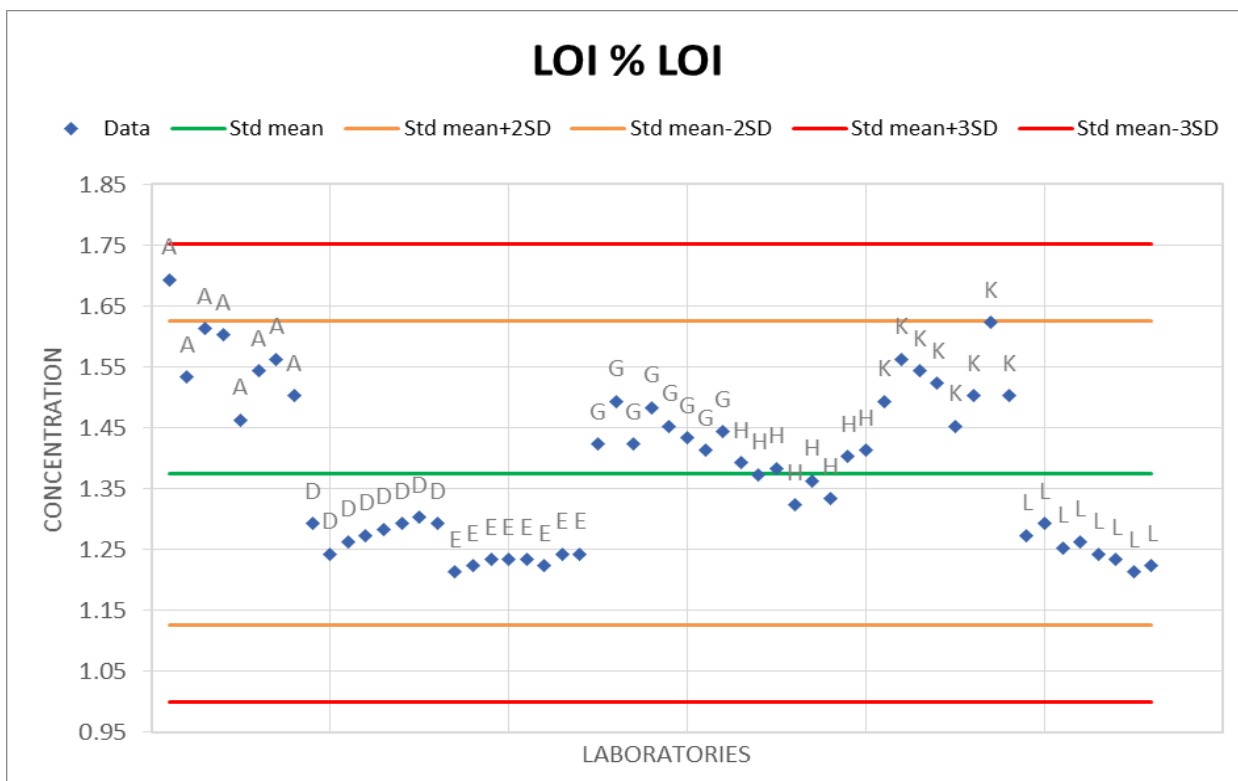
Lab_ID	Z_Score	Data
G	0.32	1.42
G	0.85	1.49
G	0.32	1.42
G	0.78	1.48
G	0.55	1.45
G	0.39	1.43
G	0.24	1.41
G	0.47	1.44
H	0.09	1.39
H	-0.06	1.37
H	0.01	1.38
H	-0.44	1.32
H	-0.14	1.36
H	-0.37	1.33
H	0.17	1.40
H	0.24	1.41
K	0.85	1.49
K	1.39	1.56
K	1.23	1.54
K	1.08	1.52
K	0.55	1.45
K	0.93	1.50
K	1.84	1.62
K	0.93	1.50

Lab_ID	Z_Score	Data
L	-0.82	1.27
L	-0.67	1.29
L	-0.98	1.25
L	-0.90	1.26
L	-1.05	1.24
L	-1.13	1.23
L	-1.28	1.21
L	-1.21	1.22

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
LOI	LOI	56	1.38	0.13	10	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
LOI	LOI	A	8	1.561	0.072	0.046	4.586
LOI	LOI	D	8	1.278	0.020	0.016	1.552
LOI	LOI	E	8	1.228	0.010	0.008	0.843
LOI	LOI	G	8	1.443	0.029	0.020	2.021
LOI	LOI	H	8	1.370	0.032	0.023	2.341
LOI	LOI	K	8	1.523	0.051	0.034	3.381
LOI	LOI	L	8	1.246	0.027	0.021	2.142
Average				1.378	0.039	0.024	2.409

11.27. LOI (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
LOI	LOI	55	1.37	0.13	9	%

Std mean	1.373
SD	0.125
2SD	0.251
3SD	0.376
Std mean+2SD	1.623
Std mean-2SD	1.122
Std mean+3SD	1.748
Std mean-3SD	0.997

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
LOI	LOI	0.052	0.019	0.137	0.035	%

Comment: 1 result out of 56 was rejected as an outlier using z-score

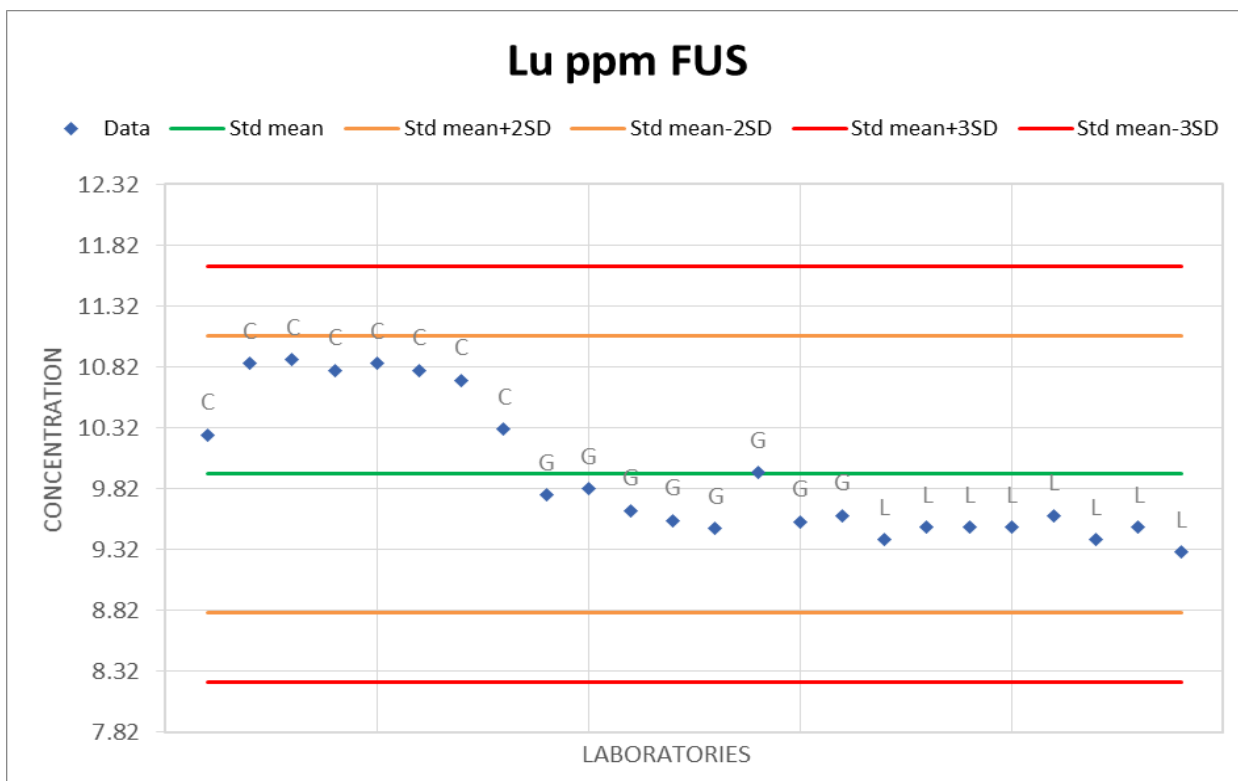
11.28. Lu FUS

Lab_ID	Z_Score	Data
C	0.57	10.26
C	1.60	10.85
C	1.65	10.88
C	1.50	10.79
C	1.60	10.85
C	1.50	10.79
C	1.36	10.71
C	0.65	10.31
G	-0.30	9.77
G	-0.21	9.82
G	-0.52	9.64
G	-0.66	9.56
G	-0.79	9.49
G	0.02	9.95
G	-0.68	9.55
G	-0.59	9.60
L	-0.95	9.40
L	-0.77	9.50
L	-0.77	9.50
L	-0.77	9.50
L	-0.59	9.60
L	-0.95	9.40
L	-0.77	9.50
L	-1.12	9.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Lu	FUS	24	9.94	0.57	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Lu	FUS	C	8	10.680	0.250	0.023	2.337
Lu	FUS	G	8	9.673	0.158	0.016	1.637
Lu	FUS	L	8	9.463	0.092	0.010	0.968
Average				9.938	0.179	0.016	1.648

11.28. Lu FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Lu	FUS	24	9.94	0.57	6	ppm

Std mean	9.938
SD	0.569
2SD	1.138
3SD	1.707
Std mean+2SD	11.076
Std mean-2SD	8.800
Std mean+3SD	11.645
Std mean-3SD	8.231

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Lu	FUS	0.612	1.119	1.058	0.179	ppm

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.29. Mg FUS

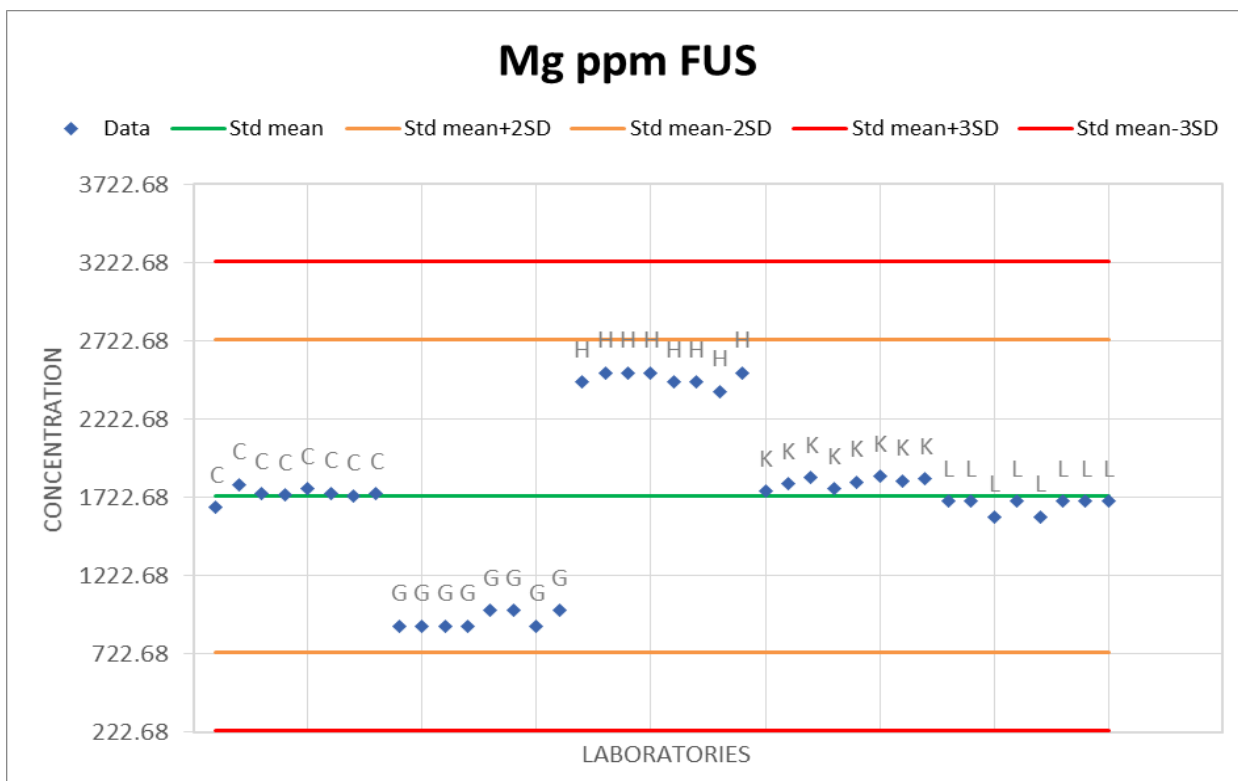
Lab_ID	Z_Score	Data
C	-0.14	1659.00
C	0.15	1804.00
C	0.03	1745.00
C	0.01	1737.00
C	0.10	1779.00
C	0.03	1748.00
C	0.00	1732.00
C	0.03	1746.00
G	-1.67	900.00
G	-1.67	900.00
G	-1.67	900.00
G	-1.67	900.00
G	-1.47	1000.00
G	-1.47	1000.00
G	-1.67	900.00
G	-1.47	1000.00
H	1.46	2460.00
H	1.58	2520.00
H	1.58	2520.00
H	1.58	2520.00
H	1.46	2460.00
H	1.46	2460.00
H	1.34	2400.00
H	1.58	2520.00

Lab_ID	Z_Score	Data
K	0.06	1761.00
K	0.16	1810.80
K	0.24	1849.80
K	0.09	1777.20
K	0.18	1819.20
K	0.25	1854.60
K	0.20	1829.40
K	0.22	1839.00
L	-0.06	1700.00
L	-0.06	1700.00
L	-0.26	1600.00
L	-0.06	1700.00
L	-0.26	1600.00
L	-0.06	1700.00
L	-0.06	1700.00
L	-0.06	1700.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Mg	FUS	40	1731.28	498.96	29	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Mg	FUS	C	8	1743.750	41.856	0.024	2.400
Mg	FUS	G	8	937.500	51.755	0.055	5.521
Mg	FUS	H	8	2482.500	44.641	0.018	1.798
Mg	FUS	K	8	1817.625	33.568	0.018	1.847
Mg	FUS	L	8	1675.000	46.291	0.028	2.764
Average				1731.275	44.030	0.029	2.866

11.29. Mg FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Mg	FUS	40	1731.28	498.96	29	ppm

Std mean	1731.275
SD	498.958
2SD	997.917
3SD	1496.875
Std mean+2SD	2729.192
Std mean-2SD	733.358
Std mean+3SD	3228.150
Std mean-3SD	234.400

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Mg	FUS	310.462	481690.910	694.040	44.030	ppm

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.30. MgO FUS

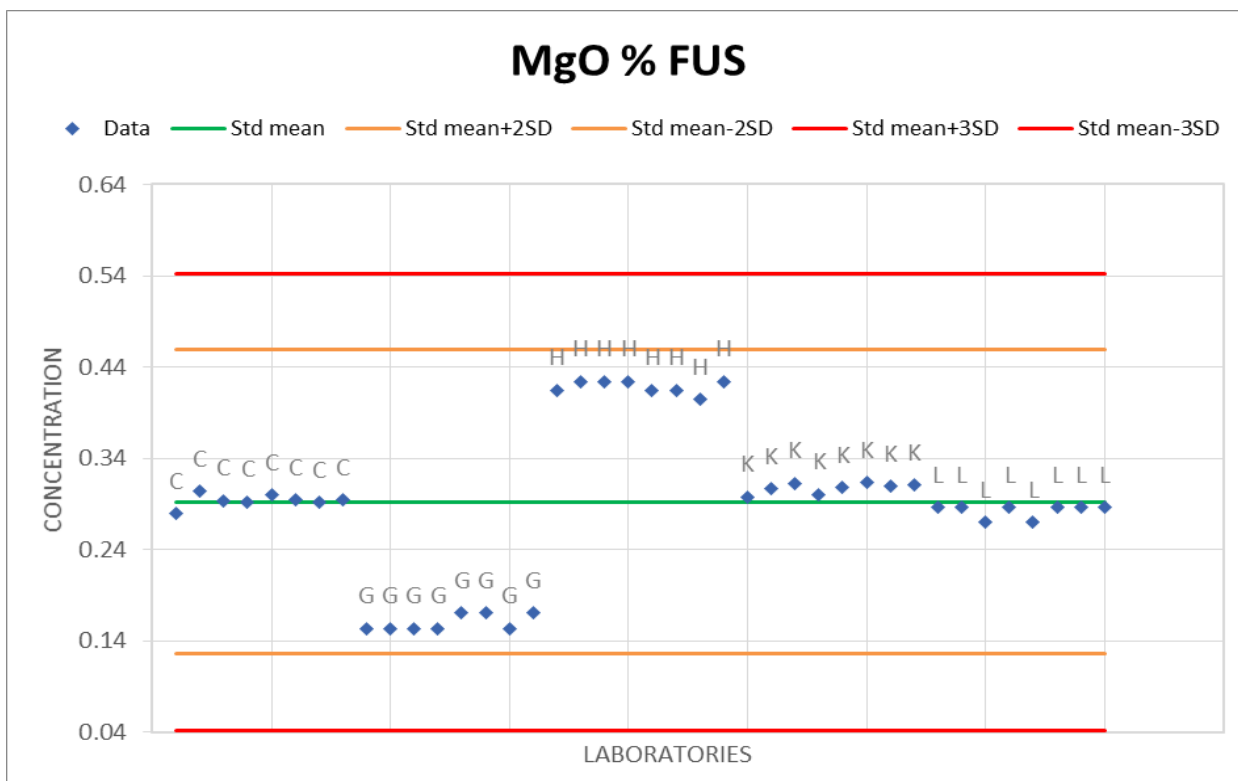
Lab_ID	Z_Score	Data
C	-0.15	0.28
C	0.14	0.30
C	0.02	0.29
C	0.00	0.29
C	0.09	0.29
C	0.02	0.29
C	-0.01	0.29
C	0.02	0.29
G	-1.66	0.15
G	-1.66	0.15
G	-1.66	0.15
G	-1.66	0.15
G	-1.46	0.17
G	-1.46	0.17
G	-1.66	0.15
G	-1.46	0.17
H	1.46	0.41
H	1.58	0.42
H	1.58	0.42
H	1.58	0.42
H	1.46	0.41
H	1.46	0.41
H	1.34	0.40
H	1.58	0.42

Lab_ID	Z_Score	Data
K	0.07	0.29
K	0.17	0.30
K	0.25	0.31
K	0.10	0.30
K	0.18	0.30
K	0.26	0.31
K	0.20	0.30
K	0.22	0.31
L	-0.07	0.28
L	-0.07	0.28
L	-0.27	0.27
L	-0.07	0.28
L	-0.27	0.27
L	-0.07	0.28
L	-0.07	0.28
L	-0.07	0.28

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MgO	FUS	40	0.29	0.08	29	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
MgO	FUS	C	8	0.289	0.007	0.024	2.400
MgO	FUS	G	8	0.155	0.009	0.055	5.521
MgO	FUS	H	8	0.414	0.007	0.018	1.798
MgO	FUS	K	8	0.303	0.006	0.018	1.847
MgO	FUS	L	8	0.278	0.008	0.028	2.764
Average				0.288	0.007	0.029	2.866

11.30. MgO FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MgO	FUS	40	0.29	0.08	29	%

Std mean	0.288
SD	0.083
2SD	0.167
3SD	0.250
Std mean+2SD	0.455
Std mean-2SD	0.121
Std mean+3SD	0.538
Std mean-3SD	0.037

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
MgO	FUS	0.052	0.013	0.116	0.007	%

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.31. MgO XRF

Lab_ID	Z_Score	Data
A	-0.71	0.31
A	-0.76	0.31
A	-0.55	0.32
A	-0.70	0.31
A	-0.47	0.32
A	-0.61	0.31
A	-0.75	0.31
A	-0.44	0.32
B	-1.13	0.30
B	-1.51	0.28
B	-1.13	0.30
B	-1.10	0.30
B	-1.25	0.29
B	-1.10	0.30
B	-1.16	0.30
B	-1.19	0.30
D	-0.15	0.33
D	-0.45	0.32
D	-0.15	0.33
D	-0.45	0.32
D	-0.45	0.32
D	-0.15	0.33
D	-0.45	0.32
D	-0.45	0.32

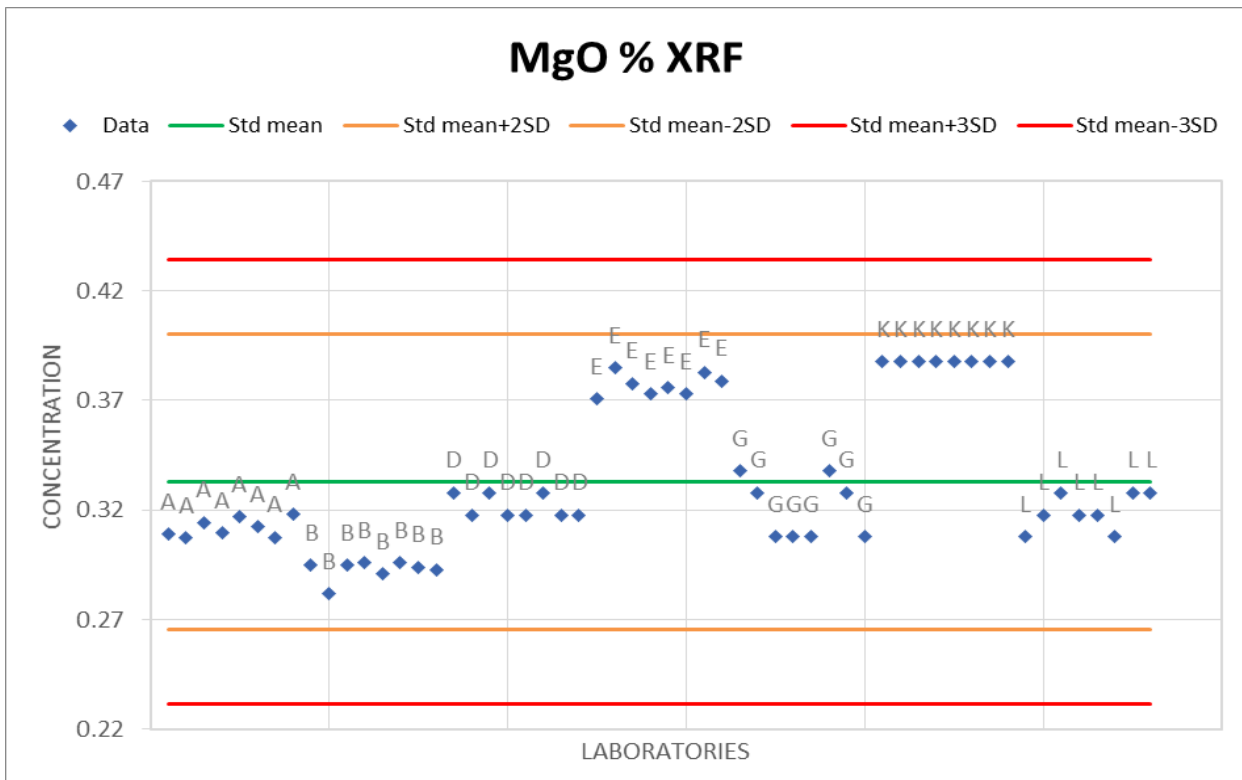
Lab_ID	Z_Score	Data
E	1.12	0.37
E	1.54	0.39
E	1.33	0.38
E	1.18	0.38
E	1.27	0.38
E	1.18	0.38
E	1.48	0.39
E	1.36	0.38
G	0.15	0.34
G	-0.15	0.33
G	-0.74	0.31
G	-0.74	0.31
G	-0.74	0.31
G	0.15	0.34
G	-0.15	0.33
G	-0.74	0.31
K	1.63	0.39
K	1.63	0.39
K	1.63	0.39
K	1.63	0.39
K	1.63	0.39
K	1.63	0.39
K	1.63	0.39

Lab_ID	Z_Score	Data
L	-0.74	0.31
L	-0.45	0.32
L	-0.15	0.33
L	-0.45	0.32
L	-0.45	0.32
L	-0.74	0.31
L	-0.15	0.33
L	-0.15	0.33

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MgO	XRF	56	0.34	0.03	10	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
MgO	XRF	A	8	0.314	0.004	0.013	1.342
MgO	XRF	B	8	0.295	0.005	0.016	1.578
MgO	XRF	D	8	0.324	0.005	0.016	1.599
MgO	XRF	E	8	0.379	0.005	0.013	1.313
MgO	XRF	G	8	0.323	0.014	0.043	4.306
MgO	XRF	K	8	0.390	N/A	N/A	N/A
MgO	XRF	L	8	0.321	0.008	0.026	2.598
Average				0.335	0.007	0.018	1.819

11.31. MgO XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MgO	XRF	56	0.34	0.03	10	%

Std mean	0.335
SD	0.034
2SD	0.067
3SD	0.101
Std mean+2SD	0.403
Std mean-2SD	0.268
Std mean+3SD	0.436
Std mean-3SD	0.234

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
MgO	XRF	0.014	0.001	0.034	0.008	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.32. Mn FUS

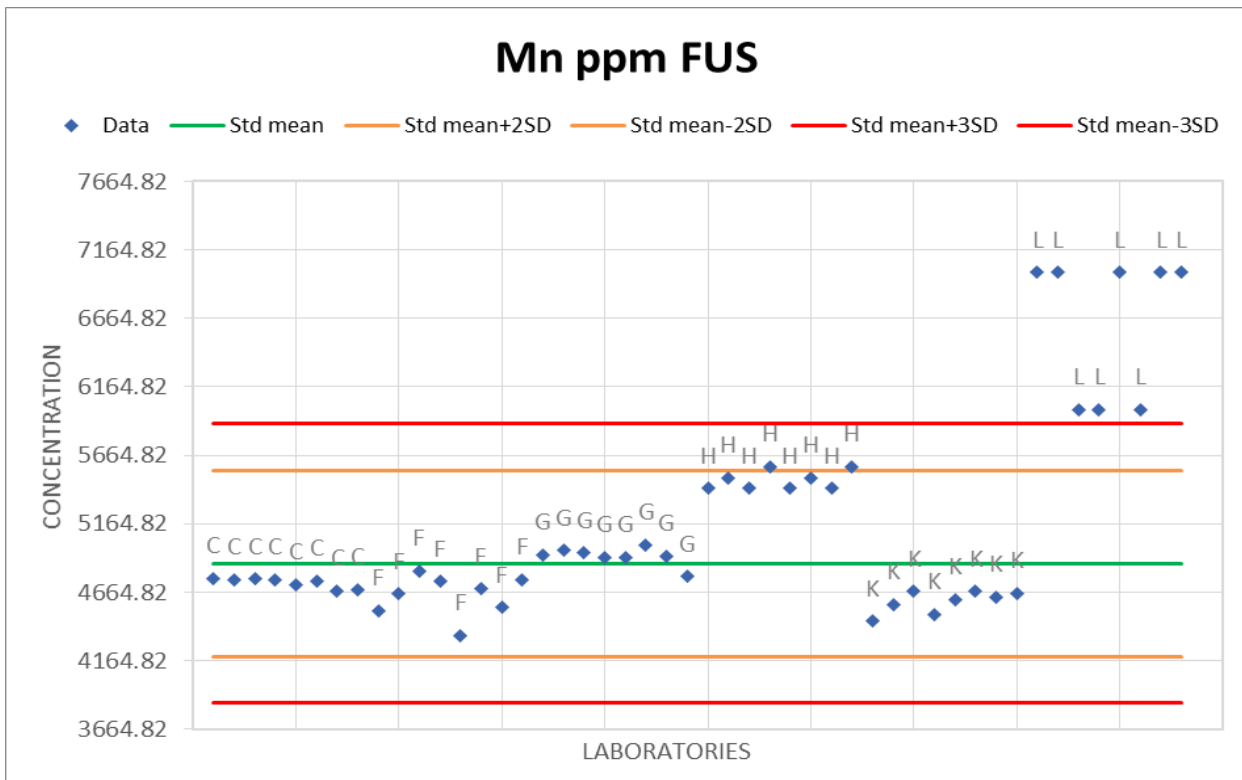
Lab_ID	Z_Score	Data
C	-0.53	4764.00
C	-0.54	4759.00
C	-0.54	4763.00
C	-0.54	4759.00
C	-0.59	4719.00
C	-0.55	4750.00
C	-0.65	4676.00
C	-0.64	4685.00
F	-0.84	4530.65
F	-0.68	4653.88
F	-0.46	4821.28
F	-0.56	4743.86
F	-1.09	4347.75
F	-0.63	4688.75
F	-0.81	4553.90
F	-0.54	4757.73
G	-0.30	4940.00
G	-0.26	4970.00
G	-0.29	4950.00
G	-0.33	4920.00
G	-0.33	4920.00
G	-0.21	5010.00
G	-0.31	4930.00
G	-0.51	4780.00

Lab_ID	Z_Score	Data
H	0.34	5425.00
H	0.44	5502.50
H	0.34	5425.00
H	0.55	5580.00
H	0.34	5425.00
H	0.44	5502.50
H	0.34	5425.00
H	0.55	5580.00
K	-0.95	4453.15
K	-0.78	4576.38
K	-0.65	4673.25
K	-0.88	4505.08
K	-0.73	4613.58
K	-0.66	4670.15
K	-0.71	4628.30
K	-0.68	4657.75
L	2.43	7000.00
L	2.43	7000.00
L	1.10	6000.00
L	1.10	6000.00
L	2.43	7000.00
L	1.10	6000.00
L	2.43	7000.00
L	2.43	7000.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Mn	FUS	48	5167.40	754.61	15	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Mn	FUS	C	8	4734.375	36.324	0.008	0.767
Mn	FUS	F	8	4637.223	153.435	0.033	3.309
Mn	FUS	G	8	4927.500	66.708	0.014	1.354
Mn	FUS	H	8	5483.125	68.696	0.013	1.253
Mn	FUS	K	8	4597.203	80.780	0.018	1.757
Mn	FUS	L	8	6625.000	517.549	0.078	7.812
Average				5167.404	226.721	0.027	2.709

11.32. Mn FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Mn	FUS	40	4875.89	339.39	7	ppm

Std mean	4875.885
SD	339.393
2SD	678.786
3SD	1018.179
Std mean+2SD	5554.671
Std mean-2SD	4197.099
Std mean+3SD	5894.064
Std mean-3SD	3857.707

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Mn	FUS	204.848	208798.799	456.945	90.062	ppm

Comments: 8 results out of 48 were rejected as outliers using z score

11.33. MnO FUS

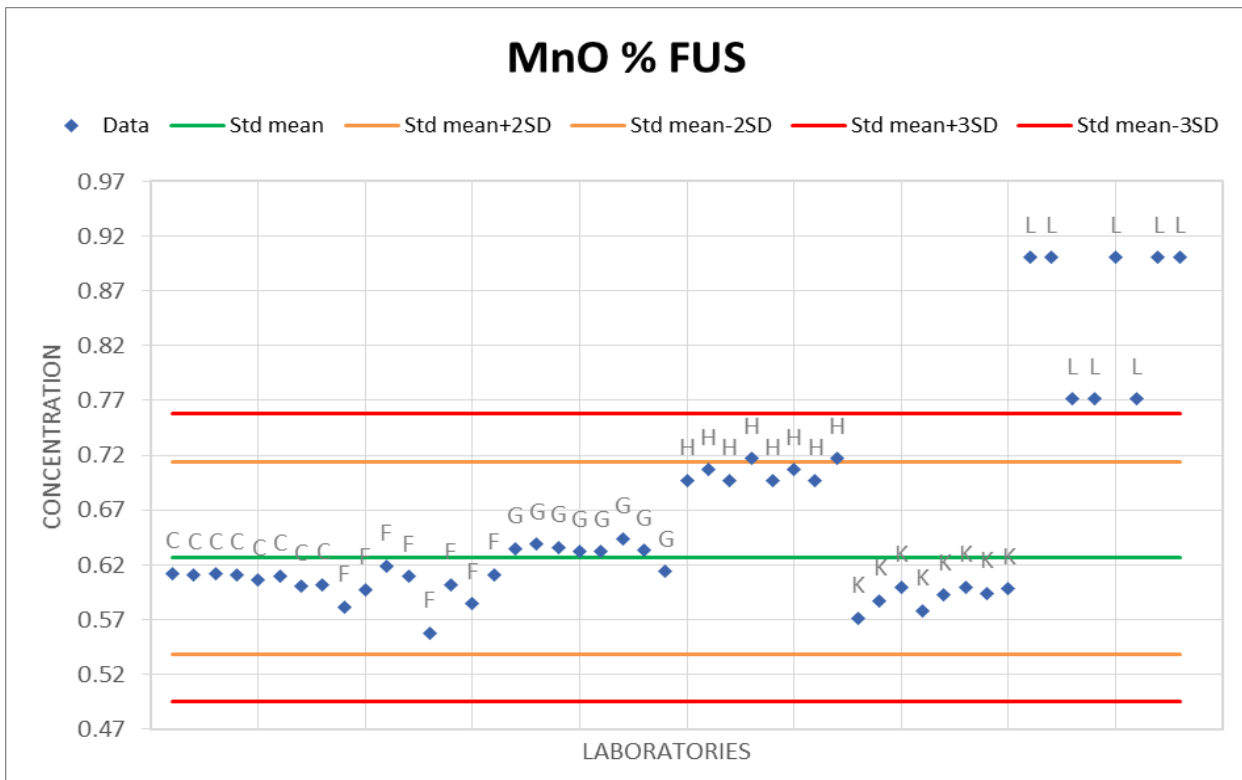
Lab_ID	Z_Score	Data
C	-0.53	0.61
C	-0.54	0.61
C	-0.53	0.61
C	-0.54	0.61
C	-0.59	0.61
C	-0.55	0.61
C	-0.65	0.60
C	-0.64	0.60
F	-0.84	0.58
F	-0.68	0.60
F	-0.46	0.62
F	-0.56	0.61
F	-1.09	0.56
F	-0.64	0.61
F	-0.81	0.59
F	-0.54	0.61
G	-0.30	0.64
G	-0.26	0.64
G	-0.29	0.64
G	-0.33	0.64
G	-0.33	0.64
G	-0.21	0.65
G	-0.31	0.64
G	-0.51	0.62

Lab_ID	Z_Score	Data
H	0.34	0.70
H	0.44	0.71
H	0.34	0.70
H	0.54	0.72
H	0.34	0.70
H	0.44	0.71
H	0.34	0.70
H	0.54	0.72
K	-0.95	0.57
K	-0.78	0.59
K	-0.66	0.60
K	-0.88	0.58
K	-0.73	0.60
K	-0.66	0.60
K	-0.72	0.60
K	-0.68	0.60
L	2.43	0.90
L	2.43	0.90
L	1.10	0.77
L	1.10	0.77
L	2.43	0.90
L	1.10	0.77
L	2.43	0.90
L	2.43	0.90

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MnO	FUS	48	0.67	0.10	15	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
MnO	FUS	C	8	0.611	0.005	0.008	0.767
MnO	FUS	F	8	0.598	0.020	0.033	3.309
MnO	FUS	G	8	0.636	0.009	0.014	1.354
MnO	FUS	H	8	0.708	0.009	0.013	1.253
MnO	FUS	K	8	0.593	0.010	0.018	1.757
MnO	FUS	L	8	0.855	0.067	0.078	7.812
Average				0.667	0.029	0.027	2.709

11.33. MnO FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MnO	FUS	40	0.63	0.04	7	%

Std mean	0.629
SD	0.044
2SD	0.088
3SD	0.131
Std mean+2SD	0.717
Std mean-2SD	0.542
Std mean+3SD	0.761
Std mean-3SD	0.498

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
MnO	FUS	0.026	0.003	0.059	0.012	%

Comments: 8 results out of 48 were rejected as outliers using z score

11.34. MnO XRF

Lab_ID	Z_Score	Data
A	-0.35	0.63
A	0.68	0.66
A	-0.49	0.63
A	-0.49	0.63
A	-0.16	0.64
A	-0.58	0.62
A	-0.37	0.63
A	-0.17	0.64
C	0.16	0.65
C	0.12	0.65
C	0.02	0.64
C	-0.21	0.64
C	-0.01	0.64
C	-0.21	0.64
C	0.09	0.64
C	-0.14	0.64
D	-0.04	0.64
D	-0.37	0.63
D	-0.04	0.64
D	-0.37	0.63
D	-0.37	0.63
D	-0.04	0.64
D	-0.37	0.63
D	-0.04	0.64

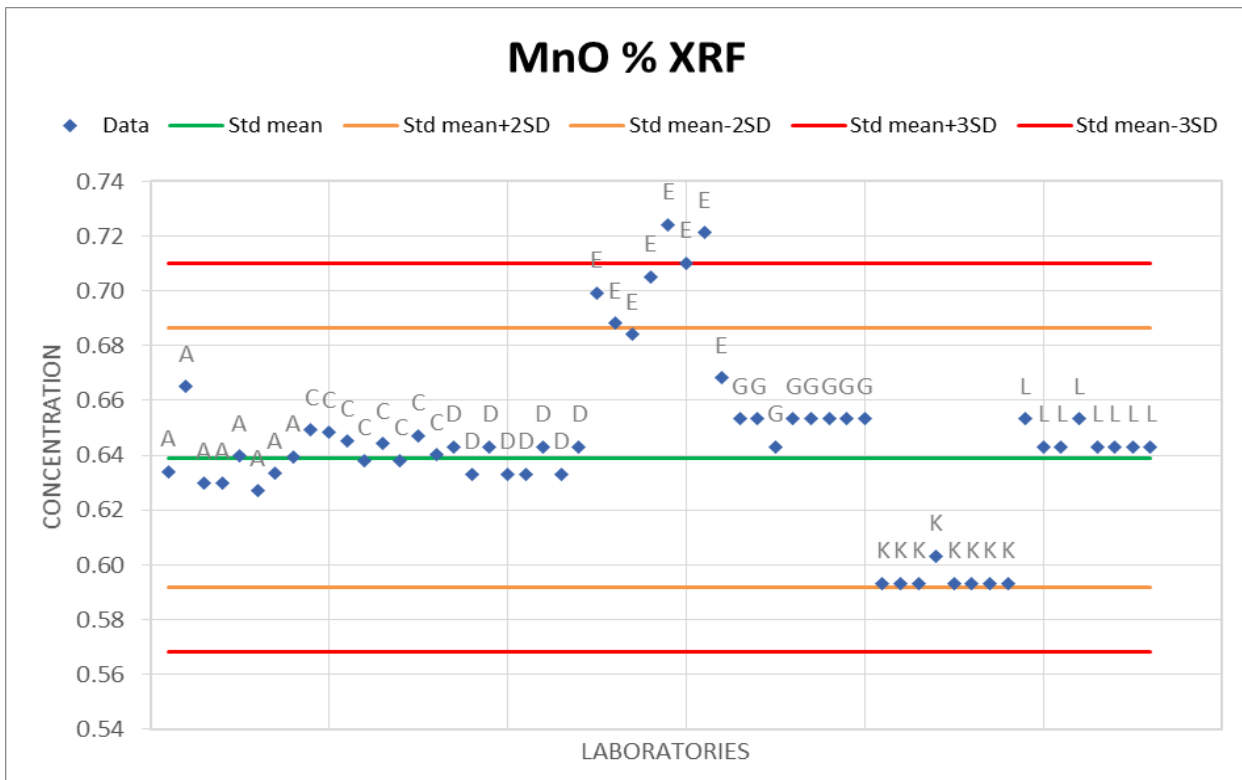
Lab_ID	Z_Score	Data
E	1.81	0.70
E	1.45	0.69
E	1.31	0.68
E	2.01	0.70
E	2.64	0.72
E	2.17	0.71
E	2.54	0.72
E	0.78	0.67
G	0.29	0.65
G	0.29	0.65
G	-0.04	0.64
G	0.29	0.65
G	0.29	0.65
G	0.29	0.65
G	0.29	0.65
G	0.29	0.65
K	-1.70	0.59
K	-1.70	0.59
K	-1.70	0.59
K	-1.37	0.60
K	-1.70	0.59
K	-1.70	0.59
K	-1.70	0.59

Lab_ID	Z_Score	Data
L	0.29	0.65
L	-0.04	0.64
L	-0.04	0.64
L	0.29	0.65
L	-0.04	0.64
L	-0.04	0.64
L	-0.04	0.64
L	-0.04	0.64

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MnO	XRF	56	0.64	0.03	5	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
MnO	XRF	A	8	0.634	0.012	0.019	1.908
MnO	XRF	C	8	0.641	0.004	0.007	0.693
MnO	XRF	D	8	0.635	0.005	0.008	0.842
MnO	XRF	E	8	0.697	0.019	0.027	2.748
MnO	XRF	G	8	0.649	0.004	0.005	0.545
MnO	XRF	K	8	0.591	0.004	0.006	0.598
MnO	XRF	L	8	0.643	0.005	0.007	0.720
Average				0.641	0.009	0.012	1.151

11.34. MnO XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
MnO	XRF	52	0.64	0.02	4	%

Std mean	0.636
SD	0.024
2SD	0.047
3SD	0.071
Std mean+2SD	0.683
Std mean-2SD	0.589
Std mean+3SD	0.707
Std mean-3SD	0.565

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
MnO	XRF	0.009	0.001	0.025	0.007	%

Comments: 4 results out of 56 were rejected as outliers using z score

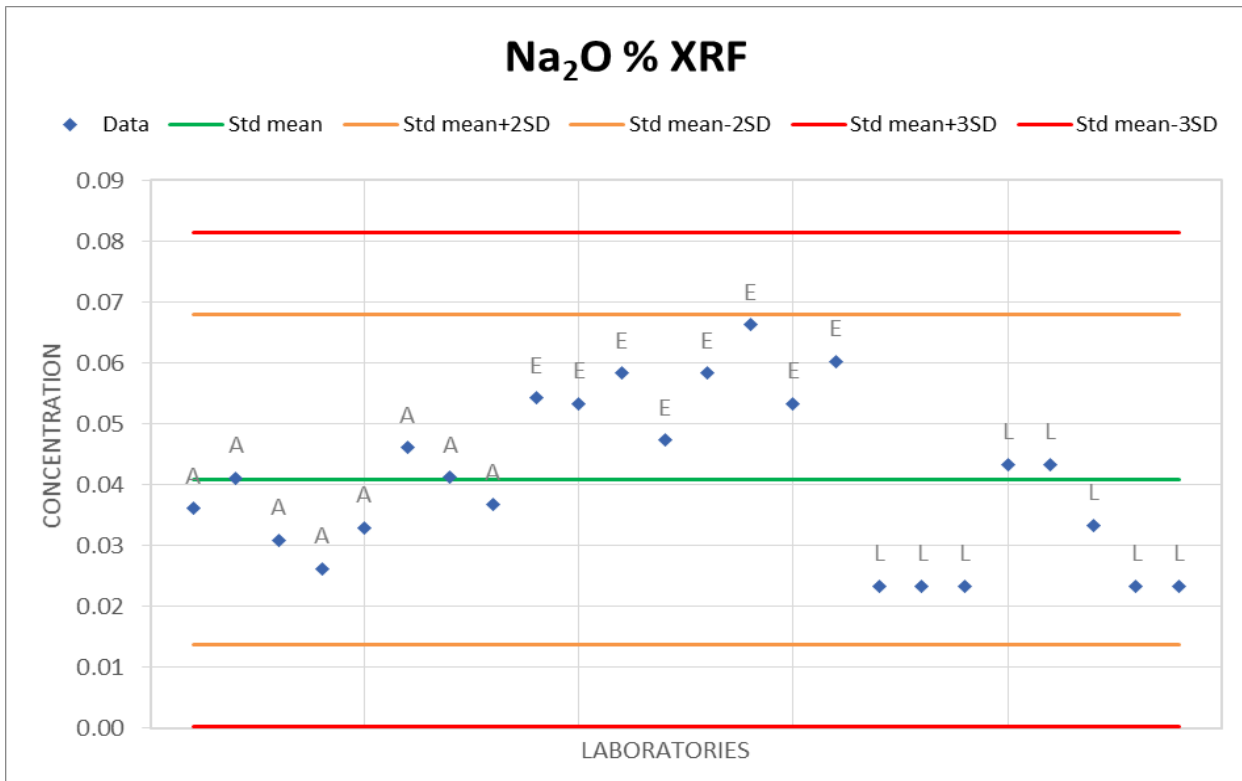
11.35. Na₂O XRF

Lab_ID	Z_Score	Data
A	-0.35	0.03
A	0.02	0.04
A	-0.73	0.03
A	-1.08	0.02
A	-0.58	0.03
A	0.39	0.04
A	0.03	0.04
A	-0.30	0.03
E	1.00	0.05
E	0.92	0.05
E	1.29	0.06
E	0.48	0.04
E	1.29	0.06
E	1.88	0.06
E	0.92	0.05
E	1.44	0.06
L	-1.29	0.02
L	-1.29	0.02
L	-1.29	0.02
L	0.19	0.04
L	0.19	0.04
L	-0.55	0.03
L	-1.29	0.02
L	-1.29	0.02

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Na ₂ O	XRF	24	0.04	0.01	36	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Na ₂ O	XRF	A	8	0.033	0.006	0.193	19.309
Na ₂ O	XRF	E	8	0.053	0.006	0.107	10.716
Na ₂ O	XRF	L	8	0.026	0.009	0.349	34.900
Average				0.037	0.007	0.216	21.642

11.35. Na₂O XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Na ₂ O	XRF	24	0.04	0.01	36	%

Std mean	0.037
SD	0.014
2SD	0.027
3SD	0.041
Std mean+2SD	0.065
Std mean-2SD	0.010
Std mean+3SD	0.078
Std mean-3SD	-0.003

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Na ₂ O	XRF	0.013	0.001	0.022	0.007	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.36. Nb FUS

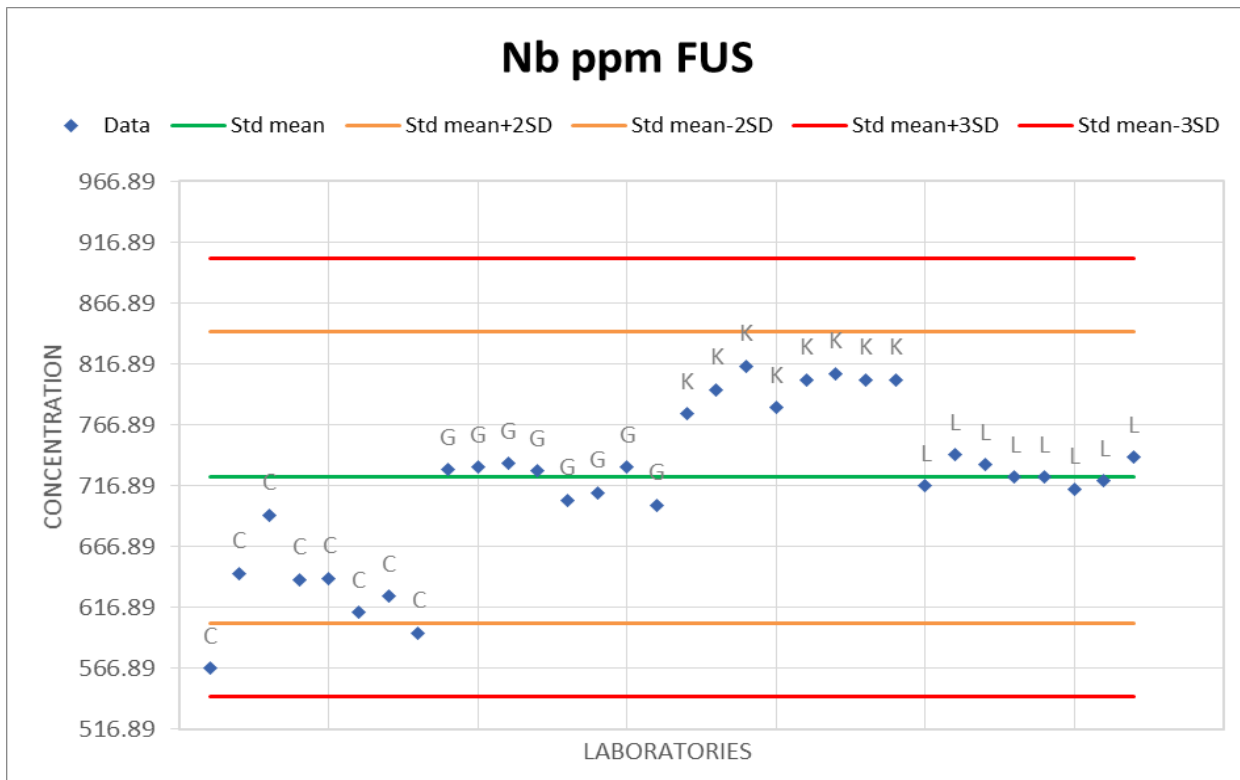
Lab_ID	Z_Score	Data
C	-2.33	567.00
C	-1.13	645.00
C	-0.40	693.00
C	-1.21	640.00
C	-1.20	641.00
C	-1.63	613.00
C	-1.43	626.00
C	-1.89	596.00
G	0.17	730.00
G	0.20	732.00
G	0.25	735.00
G	0.16	729.00
G	-0.21	705.00
G	-0.12	711.00
G	0.20	732.00
G	-0.27	701.00
K	0.88	776.00
K	1.19	796.00
K	1.48	815.00
K	0.96	781.00
K	1.31	804.00
K	1.39	809.00
K	1.31	804.00
K	1.31	804.00

Lab_ID	Z_Score	Data
L	-0.03	717.00
L	0.36	742.00
L	0.23	734.00
L	0.08	724.00
L	0.08	724.00
L	-0.07	714.00
L	0.03	721.00
L	0.33	740.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Nb	FUS	32	718.78	65.08	9	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Nb	FUS	C	8	627.625	37.416	0.060	5.962
Nb	FUS	G	8	721.875	13.799	0.019	1.912
Nb	FUS	K	8	798.625	13.585	0.017	1.701
Nb	FUS	L	8	727.000	10.461	0.014	1.439
Average				718.781	21.705	0.028	2.753

11.36. Nb FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Nb	FUS	31	723.68	59.86	8	ppm

Std mean	723.677
SD	59.862
2SD	119.723
3SD	179.585
Std mean+2SD	843.401
Std mean-2SD	603.954
Std mean+3SD	903.263
Std mean-3SD	544.092

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Nb	FUS	45.192	8126.141	90.145	18.247	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

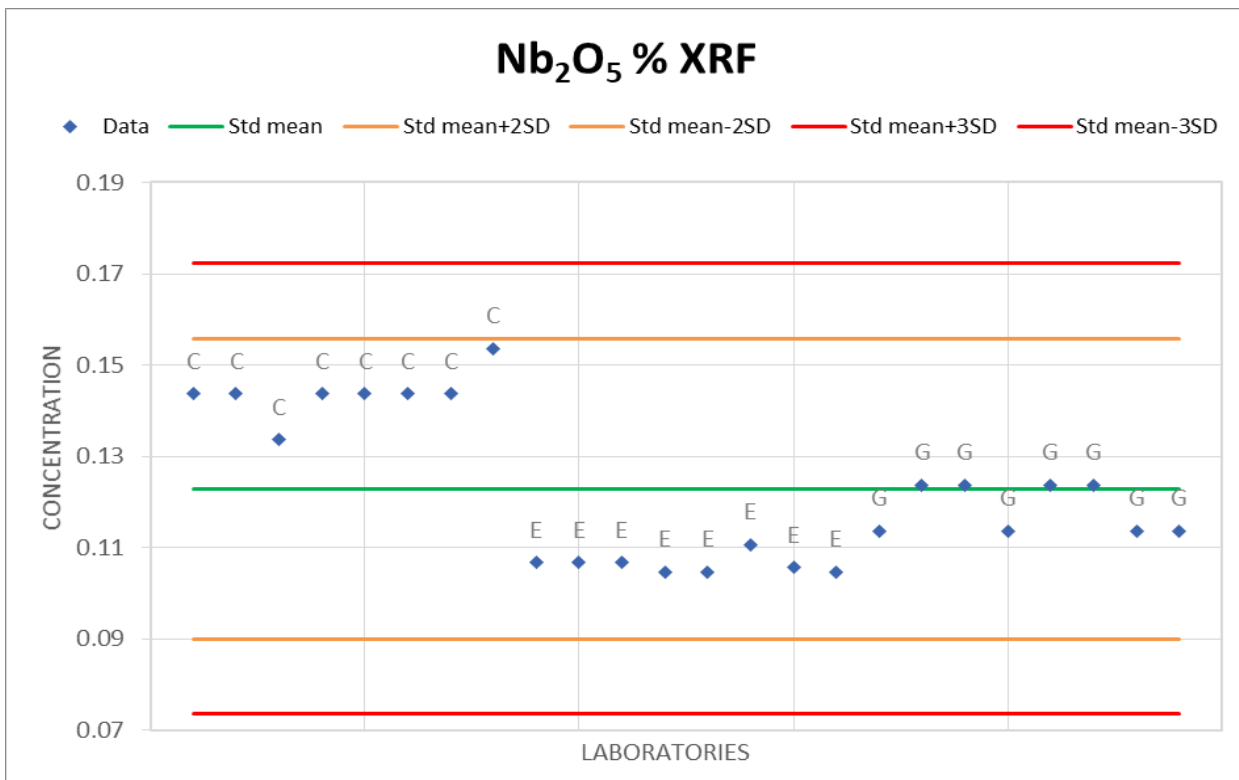
11.37. Nb₂O₅ XRF

Lab_ID	Z_Score	Data
C	1.26	0.14
C	1.26	0.14
C	0.66	0.13
C	1.26	0.14
C	1.26	0.14
C	1.26	0.14
C	1.26	0.14
C	1.87	0.15
E	-0.98	0.10
E	-0.98	0.10
E	-0.98	0.10
E	-1.11	0.10
E	-1.11	0.10
E	-0.74	0.11
E	-1.05	0.10
E	-1.11	0.10
G	-0.56	0.11
G	0.05	0.12
G	0.05	0.12
G	-0.56	0.11
G	0.05	0.12
G	0.05	0.12
G	-0.56	0.11
G	-0.56	0.11

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Nb ₂ O ₅	XRF	24	0.12	0.02	14	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Nb ₂ O ₅	XRF	C	8	0.140	0.005	0.038	3.818
Nb ₂ O ₅	XRF	E	8	0.103	0.002	0.019	1.944
Nb ₂ O ₅	XRF	G	8	0.115	0.005	0.046	4.648
Average				0.119	0.005	0.035	3.470

11.37. Nb₂O₅ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Nb ₂ O ₅	XRF	24	0.12	0.02	14	%

Std mean	0.119
SD	0.016
2SD	0.033
3SD	0.049
Std mean+2SD	0.152
Std mean-2SD	0.086
Std mean+3SD	0.169
Std mean-3SD	0.070

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Nb ₂ O ₅	XRF	0.018	0.001	0.031	0.005	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.38. Nd FUS

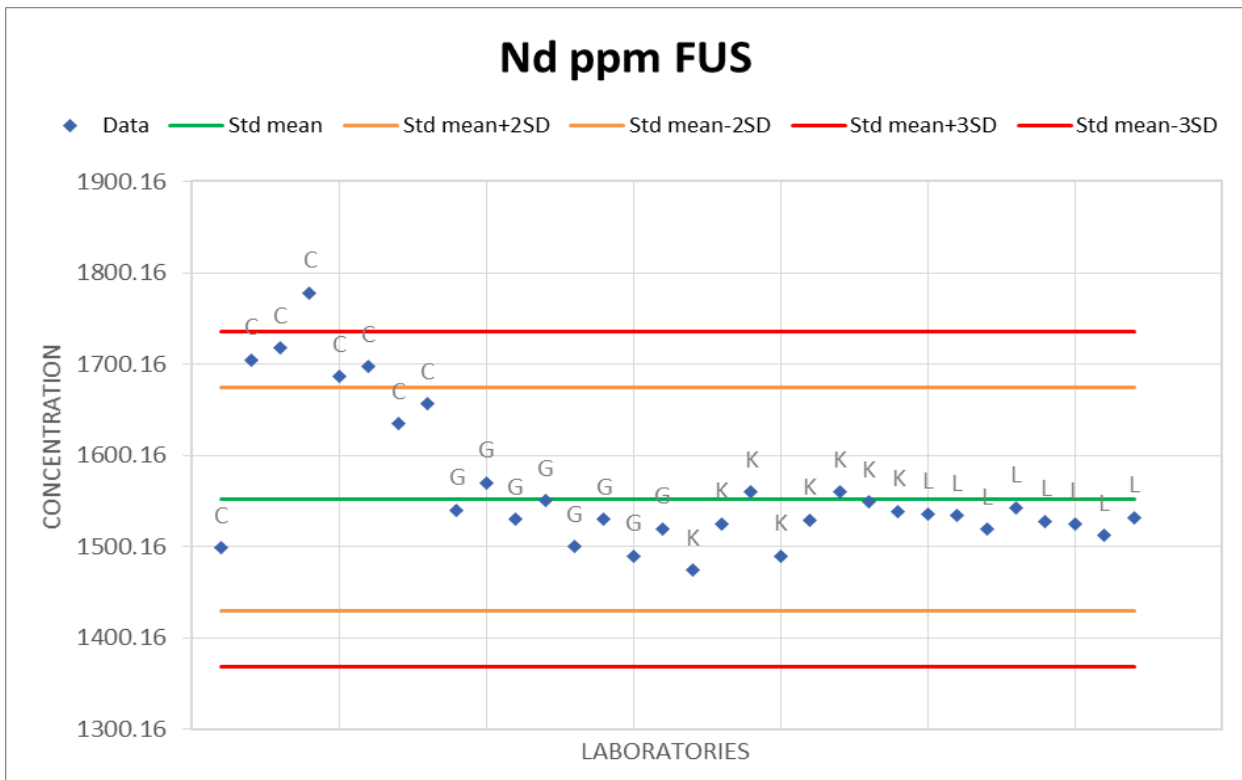
Lab_ID	Z_Score	Data
C	-0.86	1498.70
C	1.83	1704.90
C	2.00	1717.80
C	2.79	1778.30
C	1.59	1686.00
C	1.73	1697.40
C	0.91	1634.40
C	1.20	1656.70
G	-0.32	1540.00
G	0.07	1570.00
G	-0.45	1530.00
G	-0.19	1550.00
G	-0.84	1500.00
G	-0.45	1530.00
G	-0.97	1490.00
G	-0.58	1520.00
K	-1.18	1474.00
K	-0.51	1525.00
K	-0.06	1560.00
K	-0.97	1490.00
K	-0.46	1529.00
K	-0.06	1560.00
K	-0.20	1549.00
K	-0.33	1539.00

Lab_ID	Z_Score	Data
L	-0.37	1536.00
L	-0.39	1534.10
L	-0.59	1519.20
L	-0.28	1542.90
L	-0.47	1528.10
L	-0.51	1525.50
L	-0.68	1512.30
L	-0.42	1531.90

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Nd	FUS	32	1564.38	76.70	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Nd	FUS	C	8	1671.775	81.942	0.049	4.901
Nd	FUS	G	8	1528.750	25.877	0.017	1.693
Nd	FUS	K	8	1528.250	31.576	0.021	2.066
Nd	FUS	L	8	1528.750	9.740	0.006	0.637
Average				1564.381	46.033	0.023	2.324

11.38. Nd FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Nd	FUS	30	1552.14	61.18	4	ppm

Std mean	1552.137
SD	61.184
2SD	122.368
3SD	183.551
Std mean+2SD	1674.504
Std mean-2SD	1429.769
Std mean+3SD	1735.688
Std mean-3SD	1368.585

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Nd	FUS	36.604	5143.976	71.722	40.186	ppm

Comments: 2 results out of 32 were rejected as outliers using z score

11.39. P FUS

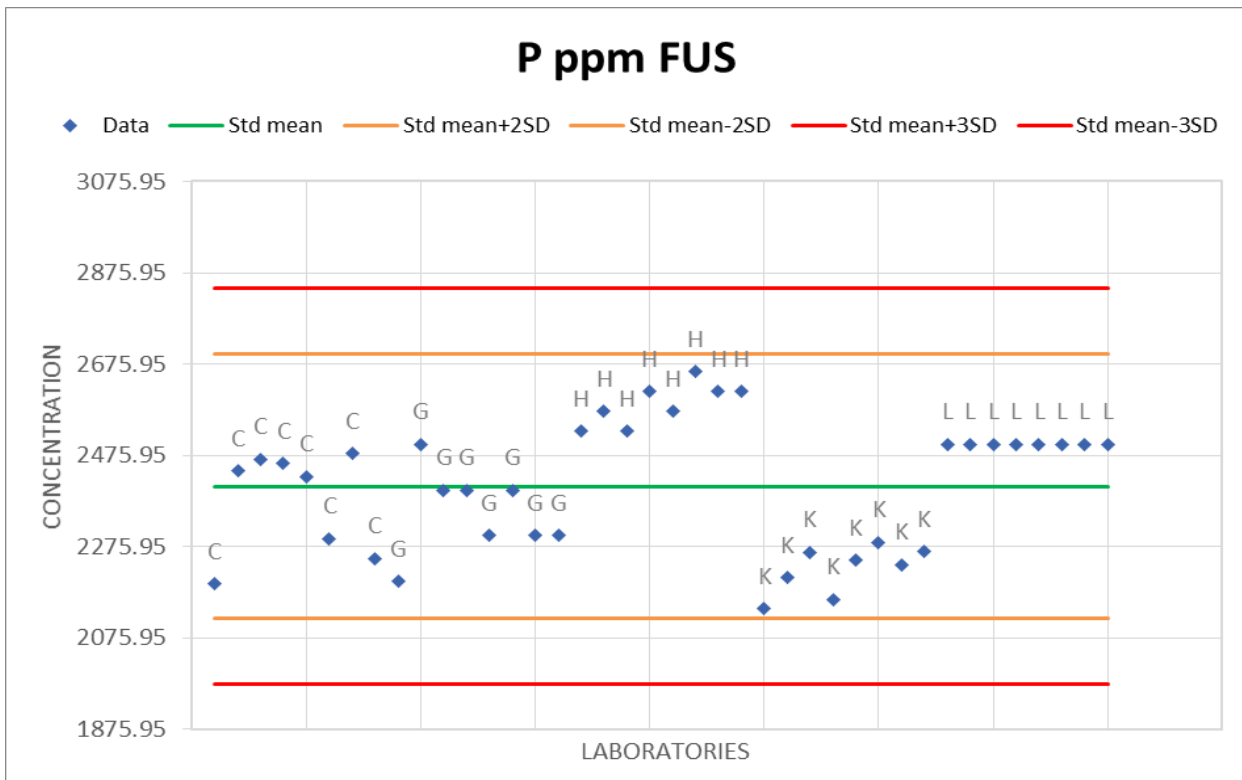
Lab_ID	Z_Score	Data
C	-1.48	2194.00
C	0.23	2441.00
C	0.41	2467.00
C	0.35	2458.00
C	0.14	2429.00
C	-0.80	2293.00
C	0.49	2479.00
C	-1.09	2250.00
G	-1.44	2200.00
G	0.64	2500.00
G	-0.06	2400.00
G	-0.06	2400.00
G	-0.75	2300.00
G	-0.06	2400.00
G	-0.75	2300.00
G	-0.75	2300.00
H	0.84	2528.80
H	1.14	2572.40
H	0.84	2528.80
H	1.44	2616.00
H	1.14	2572.40
H	1.74	2659.60
H	1.44	2616.00
H	1.44	2616.00

Lab_ID	Z_Score	Data
K	-1.86	2139.89
K	-1.39	2207.03
K	-1.00	2263.71
K	-1.72	2159.94
K	-1.13	2245.40
K	-0.85	2285.08
K	-1.19	2235.81
K	-0.99	2264.58
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00
L	0.64	2500.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P	FUS	40	2408.06	144.46	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
P	FUS	C	8	2376.375	112.463	0.047	4.733
P	FUS	G	8	2350.000	92.582	0.039	3.940
P	FUS	H	8	2588.750	46.245	0.018	1.786
P	FUS	K	8	2225.181	52.108	0.023	2.342
P	FUS	L	8	2500.000	N/A	N/A	N/A
Average				2408.061	72.212	0.026	2.560

11.39. P FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P	FUS	40	2408.06	144.46	6	ppm

Std mean	2408.061
SD	144.461
2SD	288.921
3SD	433.382
Std mean+2SD	2696.982
Std mean-2SD	2119.140
Std mean+3SD	2841.443
Std mean-3SD	1974.679

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
P	FUS	107.430	45349.686	212.955	80.736	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.40. P₂O₅ FUS

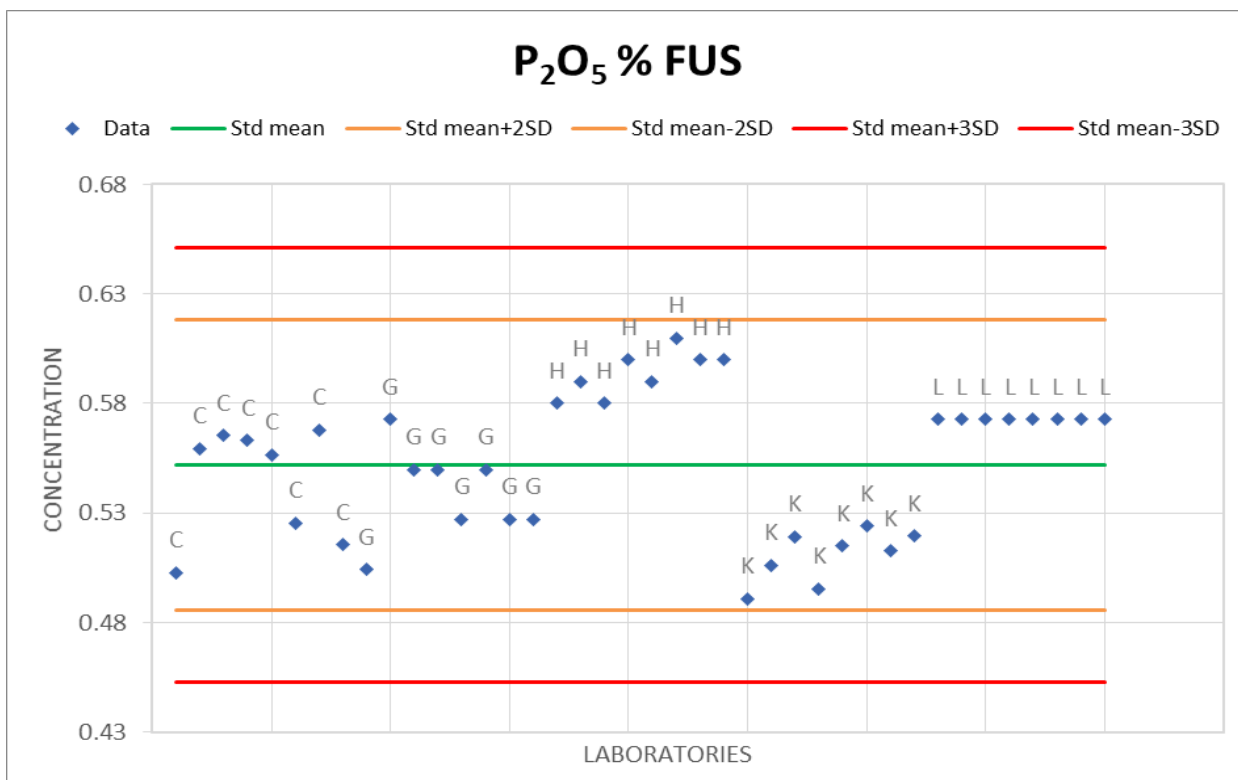
Lab_ID	Z_Score	Data
C	-1.49	0.50
C	0.22	0.56
C	0.40	0.57
C	0.34	0.56
C	0.14	0.56
C	-0.80	0.53
C	0.48	0.57
C	-1.10	0.52
G	-1.45	0.50
G	0.63	0.57
G	-0.06	0.55
G	-0.06	0.55
G	-0.75	0.53
G	-0.06	0.55
G	-0.75	0.53
G	-0.75	0.53
H	0.85	0.58
H	1.15	0.59
H	0.85	0.58
H	1.45	0.60
H	1.15	0.59
H	1.75	0.61
H	1.45	0.60
H	1.45	0.60

Lab_ID	Z_Score	Data
K	-1.85	0.49
K	-1.38	0.51
K	-0.99	0.52
K	-1.71	0.50
K	-1.12	0.52
K	-0.84	0.52
K	-1.18	0.51
K	-0.98	0.52
L	0.63	0.57
L	0.63	0.57
L	0.63	0.57
L	0.63	0.57
L	0.63	0.57
L	0.63	0.57
L	0.63	0.57

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P ₂ O ₅	FUS	40	0.55	0.03	6	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
P ₂ O ₅	FUS	C	8	0.545	0.026	0.047	4.733
P ₂ O ₅	FUS	G	8	0.538	0.021	0.039	3.940
P ₂ O ₅	FUS	H	8	0.594	0.011	0.018	1.786
P ₂ O ₅	FUS	K	8	0.510	0.012	0.023	2.342
P ₂ O ₅	FUS	L	8	0.573	N/A	N/A	N/A
Average				0.552	0.017	0.026	2.560

11.40. P₂O₅ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P ₂ O ₅	FUS	40	0.55	0.03	6	%

Std mean	0.552
SD	0.033
2SD	0.066
3SD	0.099
Std mean+2SD	0.618
Std mean-2SD	0.486
Std mean+3SD	0.651
Std mean-3SD	0.453

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
P ₂ O ₅	FUS	0.025	0.002	0.049	0.019	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.41. P₂O₅ XRF

Lab_ID	Z_Score	Data
A	-1.79	0.43
A	-1.71	0.44
A	-1.79	0.43
A	-1.65	0.44
A	-1.82	0.43
A	-1.76	0.44
A	-1.89	0.43
A	-1.96	0.42
C	1.12	0.63
C	1.12	0.63
C	1.12	0.63
C	1.27	0.64
C	1.12	0.63
C	0.97	0.62
C	1.27	0.64
C	0.83	0.61
D	0.83	0.61
D	0.97	0.62
D	0.83	0.61
D	1.12	0.63
D	0.83	0.61
D	0.83	0.61
D	0.83	0.61
D	0.83	0.61
D	0.97	0.62

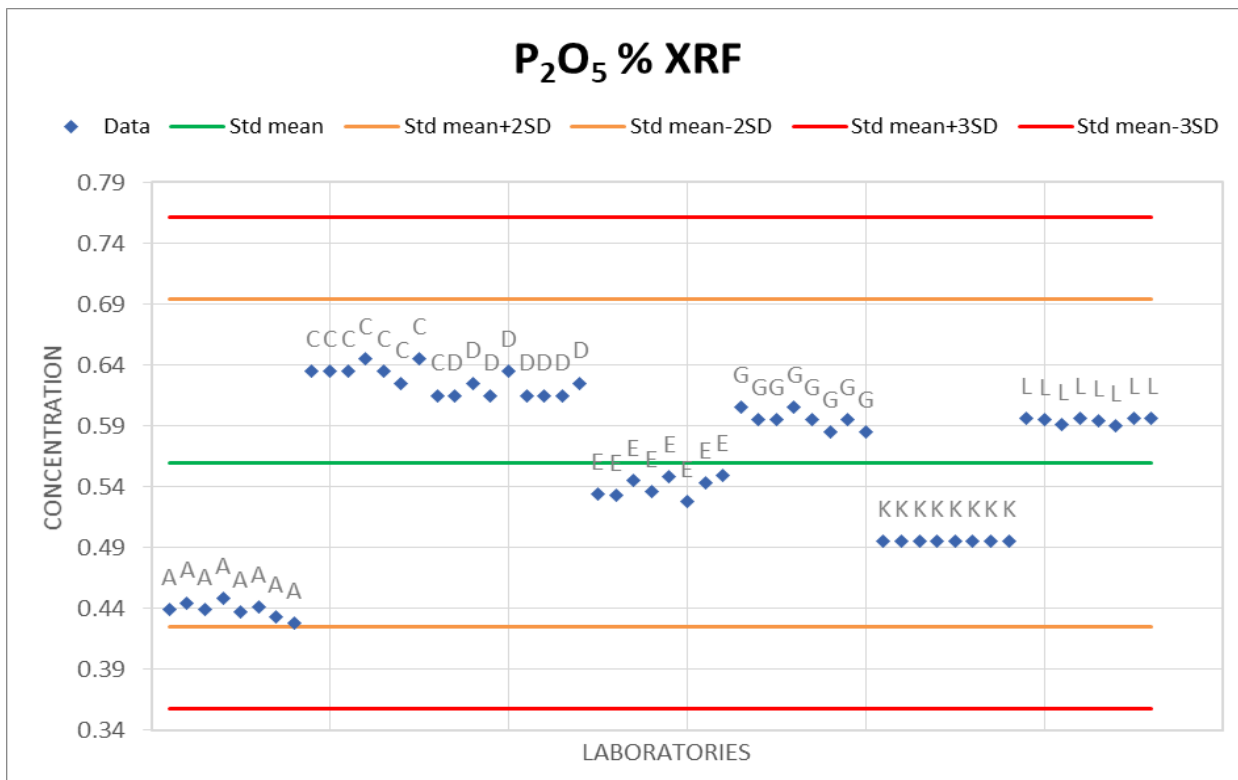
Lab_ID	Z_Score	Data
E	-0.38	0.53
E	-0.39	0.53
E	-0.21	0.54
E	-0.35	0.53
E	-0.17	0.54
E	-0.47	0.52
E	-0.24	0.54
E	-0.16	0.54
G	0.68	0.60
G	0.53	0.59
G	0.53	0.59
G	0.68	0.60
G	0.53	0.59
G	0.38	0.58
G	0.53	0.59
G	0.38	0.58
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49
K	-0.96	0.49

Lab_ID	Z_Score	Data
L	0.54	0.59
L	0.53	0.59
L	0.47	0.59
L	0.54	0.59
L	0.51	0.59
L	0.45	0.59
L	0.54	0.59
L	0.54	0.59

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P ₂ O ₅	XRF	56	0.55	0.07	12	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
P ₂ O ₅	XRF	A	8	0.434	0.006	0.015	1.472
P ₂ O ₅	XRF	C	8	0.629	0.010	0.016	1.576
P ₂ O ₅	XRF	D	8	0.615	0.008	0.012	1.229
P ₂ O ₅	XRF	E	8	0.535	0.008	0.015	1.453
P ₂ O ₅	XRF	G	8	0.590	0.008	0.013	1.281
P ₂ O ₅	XRF	K	8	0.490	N/A	N/A	N/A
P ₂ O ₅	XRF	L	8	0.589	0.002	0.004	0.413
Average				0.554	0.007	0.011	1.061

11.41. P₂O₅ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
P ₂ O ₅	XRF	56	0.55	0.07	12	%

Std mean	0.554
SD	0.067
2SD	0.134
3SD	0.202
Std mean+2SD	0.689
Std mean-2SD	0.420
Std mean+3SD	0.756
Std mean-3SD	0.353

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
P ₂ O ₅	XRF	0.034	0.007	0.084	0.007	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.42. Pb FUS

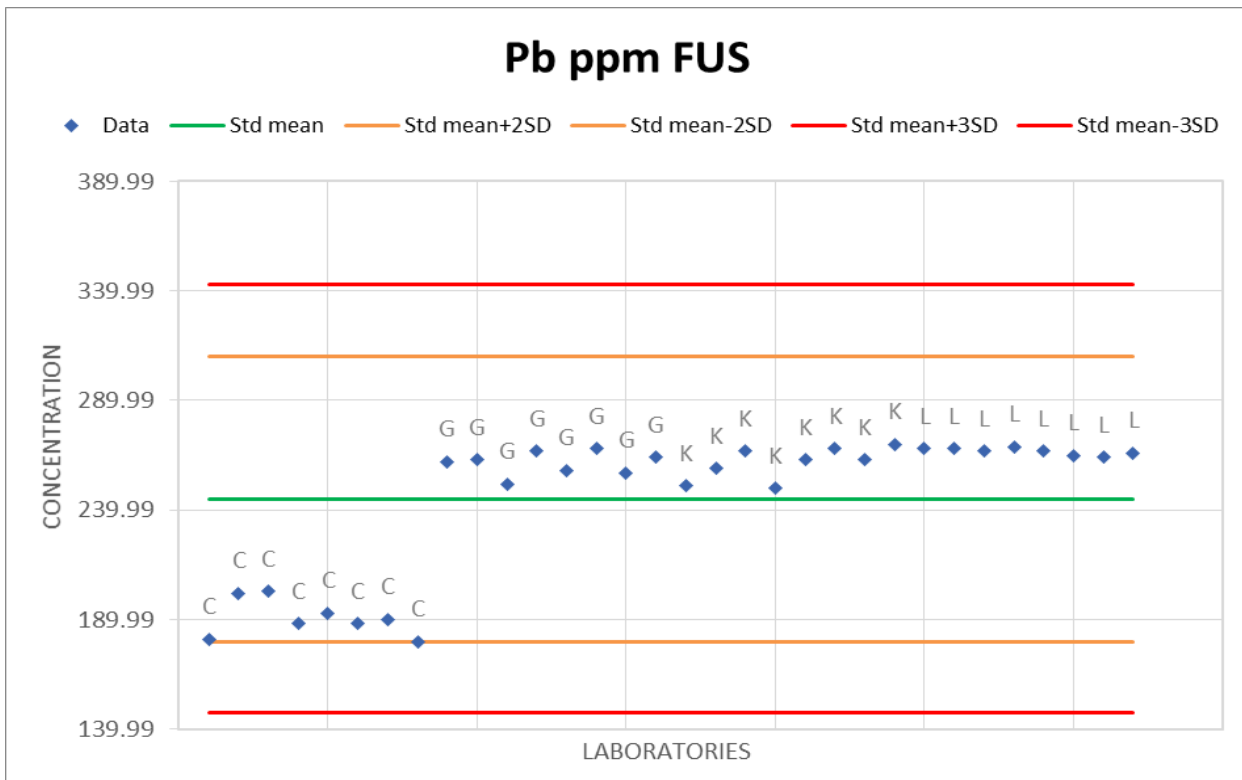
Lab_ID	Z_Score	Data
C	-1.97	181.00
C	-1.32	202.00
C	-1.29	203.00
C	-1.75	188.00
C	-1.60	193.00
C	-1.75	188.00
C	-1.69	190.00
C	-2.00	180.00
G	0.52	262.00
G	0.55	263.00
G	0.21	252.00
G	0.67	267.00
G	0.40	258.00
G	0.71	268.00
G	0.37	257.00
G	0.58	264.00
K	0.18	251.00
K	0.43	259.00
K	0.67	267.00
K	0.15	250.00
K	0.55	263.00
K	0.71	268.00
K	0.55	263.00
K	0.77	270.00

Lab_ID	Z_Score	Data
L	0.71	268.00
L	0.71	268.00
L	0.67	267.00
L	0.74	269.00
L	0.67	267.00
L	0.61	265.00
L	0.58	264.00
L	0.64	266.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Pb	FUS	32	245.03	32.56	13	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Pb	FUS	C	8	190.625	8.518	0.045	4.468
Pb	FUS	G	8	261.375	5.397	0.021	2.065
Pb	FUS	K	8	261.375	7.539	0.029	2.884
Pb	FUS	L	8	266.750	1.669	0.006	0.626
Average				245.031	6.350	0.025	2.511

11.42. Pb FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Pb	FUS	32	245.03	32.56	13	ppm

Std mean	245.031
SD	32.556
2SD	65.112
3SD	97.668
Std mean+2SD	310.144
Std mean-2SD	179.919
Std mean+3SD	342.700
Std mean-3SD	147.363

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Pb	FUS	25.685	2633.906	51.322	6.350	ppm

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

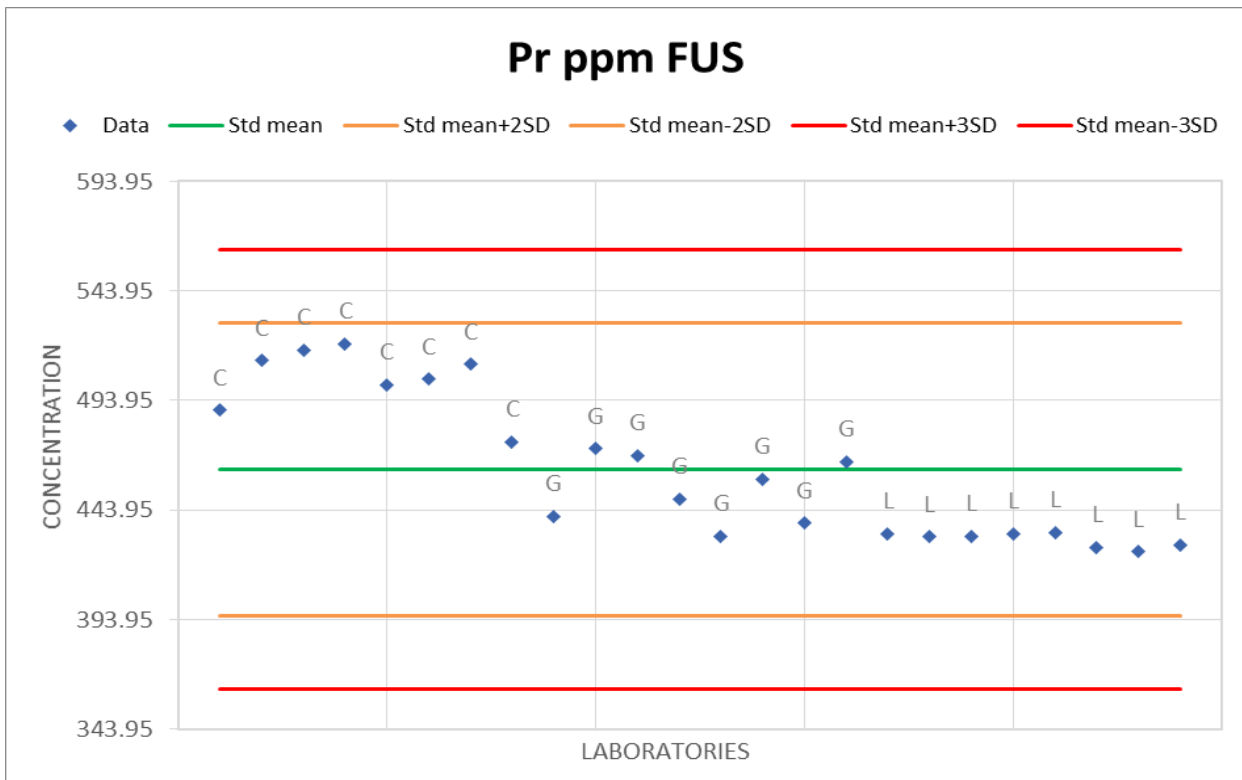
11.43. Pr FUS

Lab_ID	Z_Score	Data
C	0.81	489.51
C	1.49	512.16
C	1.64	517.16
C	1.72	519.84
C	1.16	501.13
C	1.23	503.64
C	1.44	510.54
C	0.38	475.10
G	-0.64	441.00
G	0.29	472.00
G	0.20	469.00
G	-0.40	449.00
G	-0.91	432.00
G	-0.13	458.00
G	-0.73	438.00
G	0.11	466.00
L	-0.87	433.20
L	-0.91	431.90
L	-0.91	432.00
L	-0.88	433.10
L	-0.86	433.80
L	-1.06	427.00
L	-1.12	424.90
L	-1.03	428.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Pr	FUS	24	462.42	33.45	7	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Pr	FUS	C	8	503.635	15.052	0.030	2.989
Pr	FUS	G	8	453.125	15.292	0.034	3.375
Pr	FUS	L	8	430.488	3.360	0.008	0.780
Average				462.416	12.539	0.024	2.381

11.43. Pr FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Pr	FUS	24	462.42	33.45	7	ppm

Std mean	462.416
SD	33.453
2SD	66.907
3SD	100.360
Std mean+2SD	529.322
Std mean-2SD	395.509
Std mean+3SD	562.776
Std mean-3SD	362.056

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Pr	FUS	35.152	3687.267	60.723	12.539	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.44. S Combustion LECO

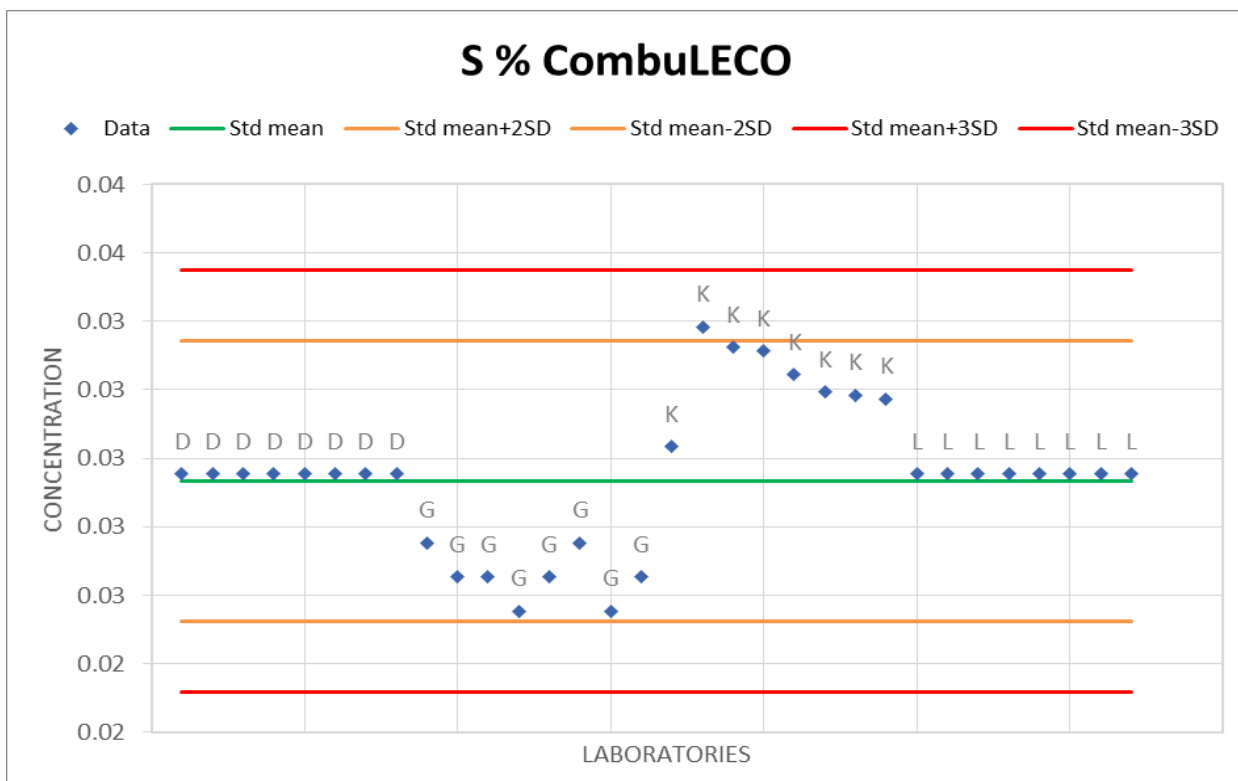
Lab_ID	Z_Score	Data
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
D	0.03	0.03
G	-0.90	0.03
G	-1.36	0.03
G	-1.36	0.03
G	-1.82	0.03
G	-1.36	0.03
G	-0.90	0.03
G	-1.82	0.03
G	-1.36	0.03
K	0.39	0.03
K	2.01	0.03
K	1.73	0.03
K	1.68	0.03
K	1.36	0.03
K	1.13	0.03
K	1.09	0.03
K	1.04	0.03

Lab_ID	Z_Score	Data
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03
L	0.03	0.03

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
S	Combustion/LECO	32	0.03	0.002	7	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
S	Combustion/LECO	D	8	0.030	N/A	N/A	N/A
S	Combustion/LECO	G	8	0.027	0.001	0.028	2.800
S	Combustion/LECO	K	8	0.033	0.001	0.034	3.357
S	Combustion/LECO	L	8	0.030	N/A	N/A	N/A
Average				0.030	0.001	0.015	1.539

11.44. S Combustion LECO (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
S	Combustion/LECO	31	0.03	0.002	7	%

Std mean	0.030
SD	0.002
2SD	0.004
3SD	0.006
Std mean+2SD	0.034
Std mean-2SD	0.026
Std mean+3SD	0.036
Std mean-3SD	0.024

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
S	Combustion/LECO	0.005	N/A	0.008	0.001	%

Comment: 1 result out of 32 was rejected as an outlier using z-score

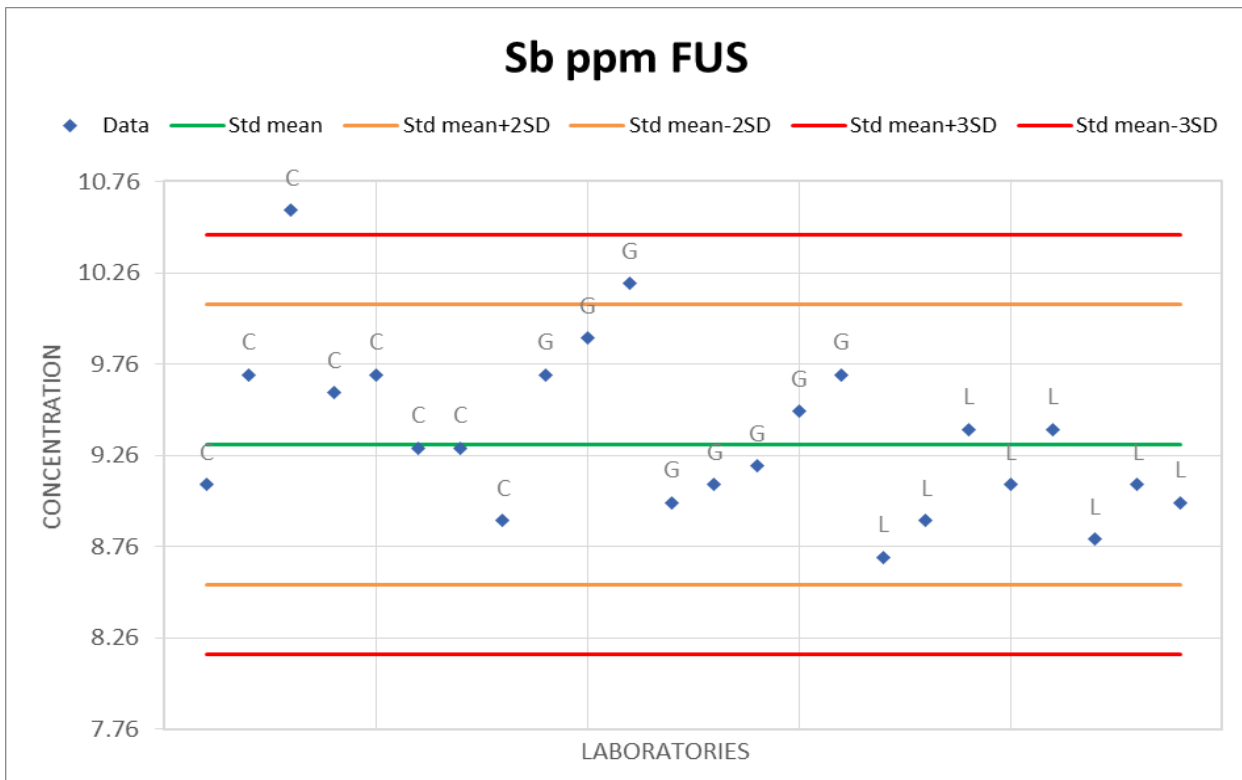
11.45. Sb FUS

Lab_ID	Z_Score	Data
C	-0.59	9.10
C	0.72	9.70
C	2.69	10.60
C	0.50	9.60
C	0.72	9.70
C	-0.15	9.30
C	-0.15	9.30
C	-1.03	8.90
G	0.72	9.70
G	1.16	9.90
G	1.81	10.20
G	-0.81	9.00
G	-0.59	9.10
G	-0.37	9.20
G	0.28	9.50
G	0.72	9.70
L	-1.47	8.70
L	-1.03	8.90
L	0.06	9.40
L	-0.59	9.10
L	0.06	9.40
L	-1.25	8.80
L	-0.59	9.10
L	-0.81	9.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sb	FUS	24	9.37	0.46	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Sb	FUS	C	8	9.525	0.520	0.055	5.462
Sb	FUS	G	8	9.538	0.417	0.044	4.375
Sb	FUS	L	8	9.050	0.256	0.028	2.833
Average				9.371	0.413	0.042	4.223

11.45. Sb FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sb	FUS	23	9.32	0.38	4	ppm

Std mean	9.317
SD	0.383
2SD	0.767
3SD	1.150
Std mean+2SD	10.084
Std mean-2SD	8.551
Std mean+3SD	10.467
Std mean-3SD	8.167

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Sb	FUS	0.216	0.126	0.355	0.336	ppm

Comment: 1 result out of 24 was rejected as an outlier using z-score

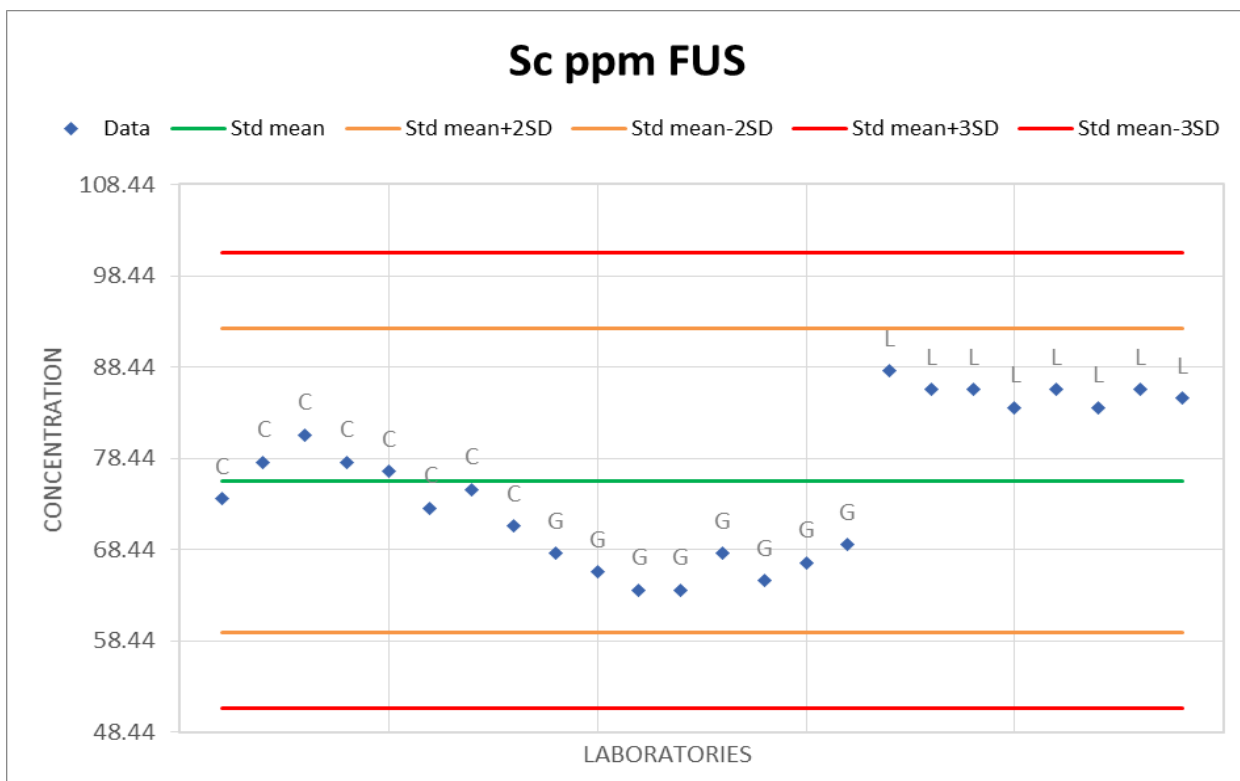
11.46. Sc FUS

Lab_ID	Z_Score	Data
C	-0.24	74.00
C	0.25	78.00
C	0.61	81.00
C	0.25	78.00
C	0.13	77.00
C	-0.36	73.00
C	-0.12	75.00
C	-0.60	71.00
G	-0.96	68.00
G	-1.20	66.00
G	-1.44	64.00
G	-1.44	64.00
G	-0.96	68.00
G	-1.32	65.00
G	-1.08	67.00
G	-0.84	69.00
L	1.45	88.00
L	1.21	86.00
L	1.21	86.00
L	0.97	84.00
L	1.21	86.00
L	0.97	84.00
L	1.21	86.00
L	1.09	85.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sc	FUS	24	75.96	8.32	11	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Sc	FUS	C	8	75.875	3.227	0.043	4.252
Sc	FUS	G	8	66.375	1.923	0.029	2.897
Sc	FUS	L	8	85.625	1.302	0.015	1.521
Average				75.958	2.295	0.029	2.890

11.46. Sc FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sc	FUS	24	75.96	8.32	11	ppm

Std mean	75.958
SD	8.322
2SD	16.644
3SD	24.967
Std mean+2SD	92.603
Std mean-2SD	59.314
Std mean+3SD	100.925
Std mean-3SD	50.992

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Sc	FUS	9.055	245.300	15.662	2.295	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

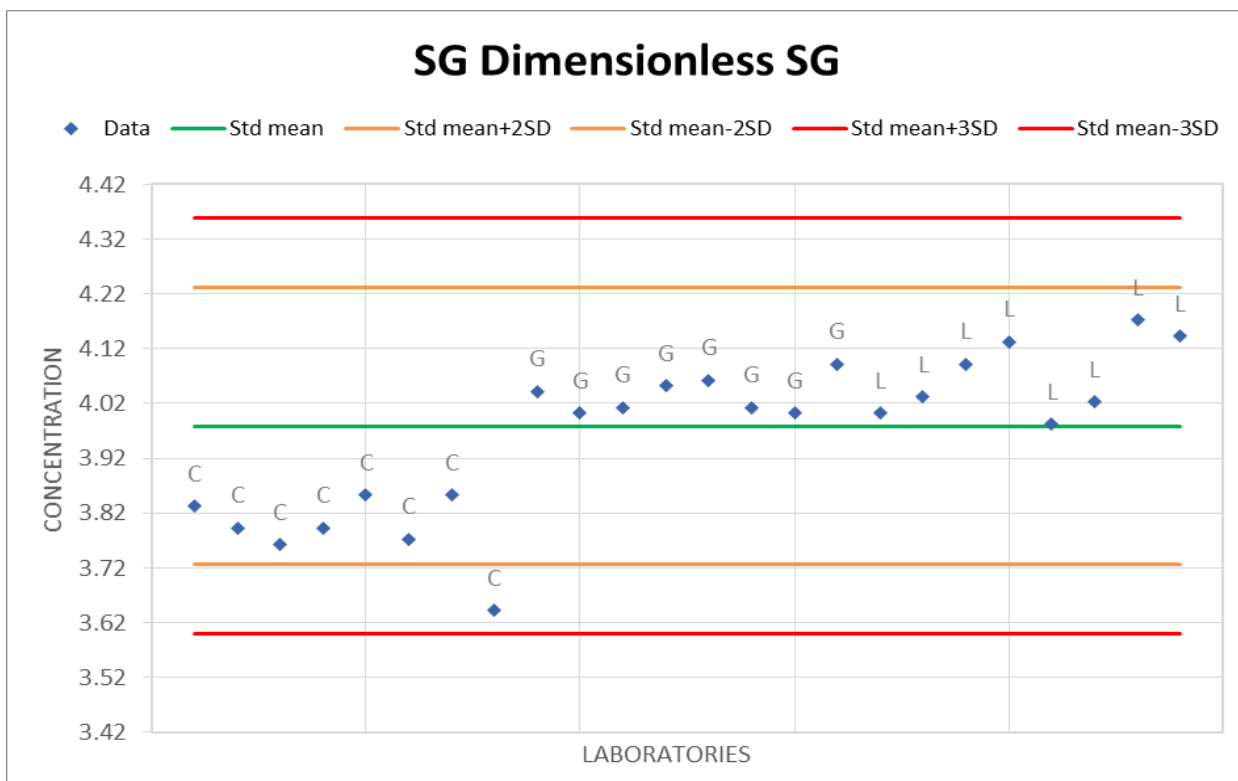
11.47. SG

Lab_ID	Z_Score	Data
C	-0.94	3.83
C	-1.22	3.79
C	-1.43	3.76
C	-1.22	3.79
C	-0.80	3.85
C	-1.36	3.77
C	-0.80	3.85
C	-2.28	3.64
G	0.55	4.04
G	0.27	4.00
G	0.34	4.01
G	0.62	4.05
G	0.69	4.06
G	0.34	4.01
G	0.27	4.00
G	0.90	4.09
L	0.27	4.00
L	0.48	4.03
L	0.90	4.09
L	1.18	4.13
L	0.12	3.98
L	0.41	4.02
L	1.47	4.17
L	1.26	4.14

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SG	SG	24	3.96	0.14	4	Dimensionless

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
SG	SG	C	8	3.785	0.068	0.018	1.797
SG	SG	G	8	4.033	0.033	0.008	0.814
SG	SG	L	8	4.070	0.072	0.018	1.762
Average				3.963	0.060	0.015	1.458

11.47. SG (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
SG	SG	23	3.98	0.13	3	Dimensionless

Std mean	3.977
SD	0.126
2SD	0.253
3SD	0.379
Std mean+2SD	4.229
Std mean-2SD	3.724
Std mean+3SD	4.356
Std mean-3SD	3.598

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
SG	SG	0.128	0.049	0.221	0.051	Dimensionless

Comment: 1 result out of 24 was rejected as an outlier using z-score

11.48. Si FUS

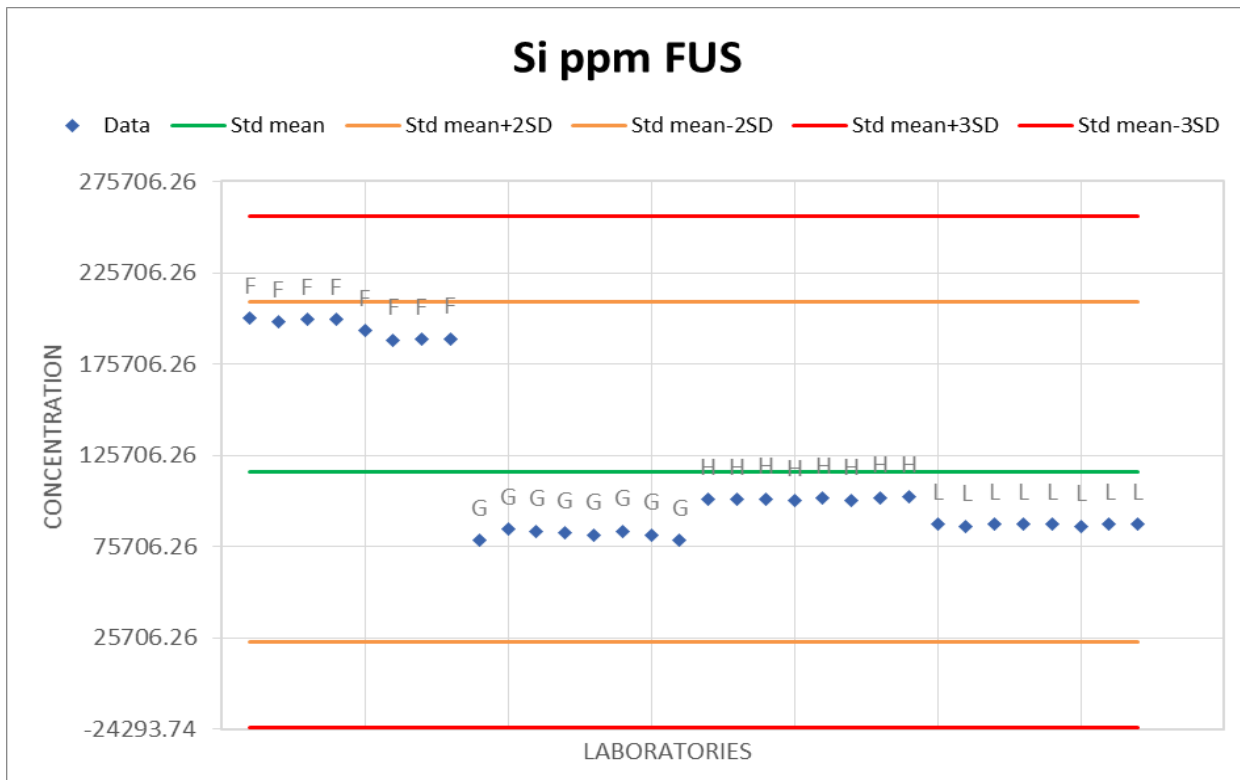
Lab_ID	Z_Score	Data
F	1.80	200580.02
F	1.76	198627.17
F	1.79	199904.63
F	1.79	199989.70
F	1.66	193880.17
F	1.55	188924.49
F	1.55	189040.11
F	1.56	189568.63
G	-0.81	79000.00
G	-0.68	85000.00
G	-0.70	84000.00
G	-0.72	83000.00
G	-0.74	82000.00
G	-0.70	84000.00
G	-0.74	82000.00
G	-0.81	79000.00
H	-0.33	101520.00
H	-0.33	101426.00
H	-0.32	101708.00
H	-0.34	100956.00
H	-0.31	102084.00
H	-0.34	101050.00
H	-0.31	102366.00
H	-0.30	102789.00

Lab_ID	Z_Score	Data
L	-0.62	88000.00
L	-0.64	87000.00
L	-0.62	88000.00
L	-0.62	88000.00
L	-0.62	88000.00
L	-0.64	87000.00
L	-0.62	88000.00
L	-0.62	88000.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Si	FUS	32	116700.43	46612.44	40	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Si	FUS	F	8	195064.364	5296.877	0.027	2.715
Si	FUS	G	8	82250.000	2251.983	0.027	2.738
Si	FUS	H	8	101737.375	638.003	0.006	0.627
Si	FUS	L	8	87750.000	462.910	0.005	0.528
Average				116700.435	2904.723	0.017	1.652

11.48. Si FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Si	FUS	32	116700.43	46612.44	40	ppm

Std mean	116700.435
SD	46612.444
2SD	93224.888
3SD	139837.332
Std mean+2SD	209925.323
Std mean-2SD	23475.547
Std mean+3SD	256537.766
Std mean-3SD	-23136.897

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Si	FUS	37390.232	5591063146.068	74773.412	2904.723	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.49. SiO₂ FUS

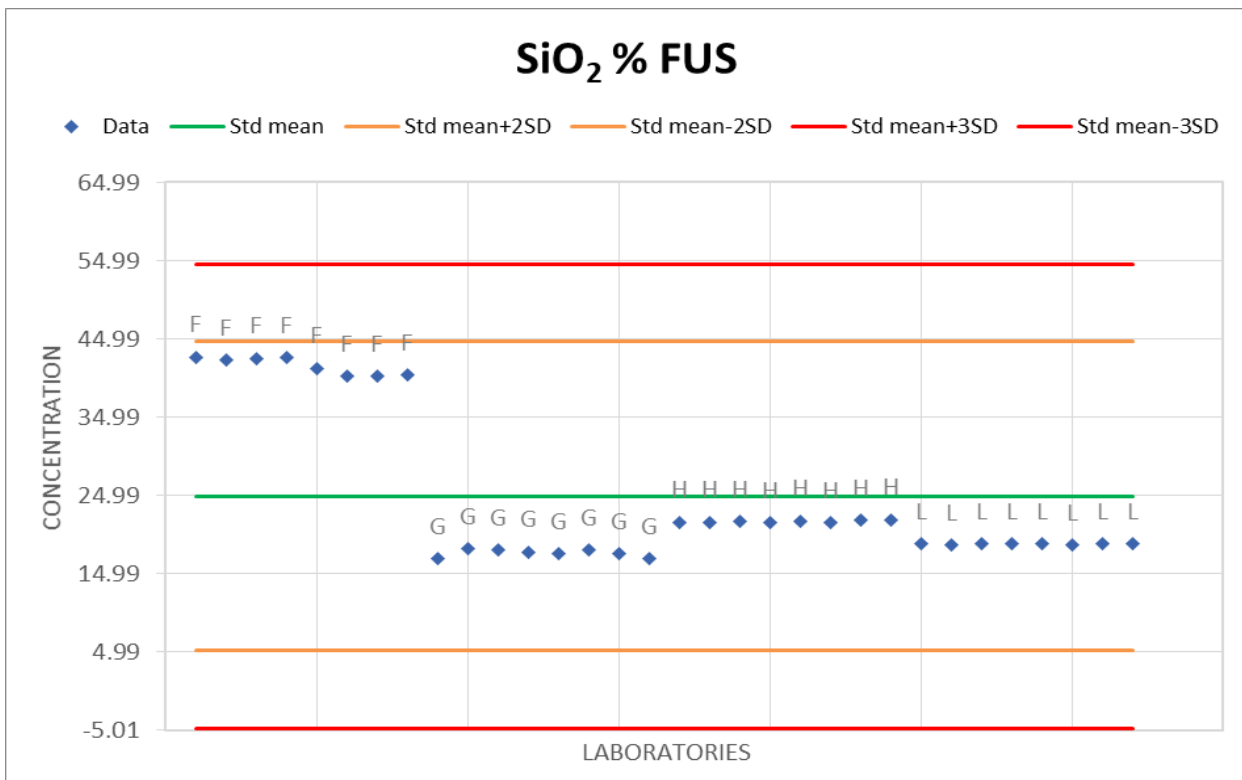
Lab_ID	Z_Score	Data
F	1.80	42.68
F	1.76	42.26
F	1.79	42.53
F	1.79	42.55
F	1.66	41.25
F	1.55	40.20
F	1.55	40.22
F	1.56	40.33
G	-0.81	16.90
G	-0.68	18.18
G	-0.70	17.97
G	-0.72	17.76
G	-0.74	17.54
G	-0.70	17.97
G	-0.74	17.54
G	-0.81	16.90
H	-0.33	21.60
H	-0.33	21.58
H	-0.33	21.64
H	-0.34	21.48
H	-0.32	21.72
H	-0.34	21.50
H	-0.31	21.78
H	-0.30	21.87

Lab_ID	Z_Score	Data
L	-0.61	18.83
L	-0.63	18.61
L	-0.61	18.83
L	-0.61	18.83
L	-0.61	18.83
L	-0.63	18.61
L	-0.61	18.83
L	-0.61	18.83

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SiO ₂	FUS	32	24.88	9.88	40	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
SiO ₂	FUS	F	8	41.503	1.127	0.027	2.715
SiO ₂	FUS	G	8	17.597	0.482	0.027	2.738
SiO ₂	FUS	H	8	21.646	0.136	0.006	0.627
SiO ₂	FUS	L	8	18.773	0.099	0.005	0.528
Average				24.880	0.619	0.017	1.652

11.49. SiO₂ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SiO ₂	FUS	32	24.88	9.88	40	%

Std mean	24.880
SD	9.883
2SD	19.765
3SD	29.648
Std mean+2SD	44.645
Std mean-2SD	5.114
Std mean+3SD	54.528
Std mean-3SD	-4.768

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
SiO ₂	FUS	7.927	251.320	15.853	0.619	%

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.50. SiO₂ XRF

Lab_ID	Z_Score	Data
A	1.04	18.88
A	0.57	18.54
A	0.55	18.53
A	0.44	18.45
A	0.22	18.29
A	1.16	18.96
A	1.32	19.08
A	0.83	18.73
B	0.20	18.28
B	0.17	18.26
B	0.12	18.22
B	0.07	18.19
B	0.06	18.18
B	0.16	18.25
B	0.06	18.18
B	-0.21	17.99
C	-0.48	17.80
C	-0.59	17.72
C	-0.16	18.02
C	-0.28	17.94
C	-0.04	18.11
C	-0.57	17.73
C	-0.65	17.68
C	-0.38	17.87

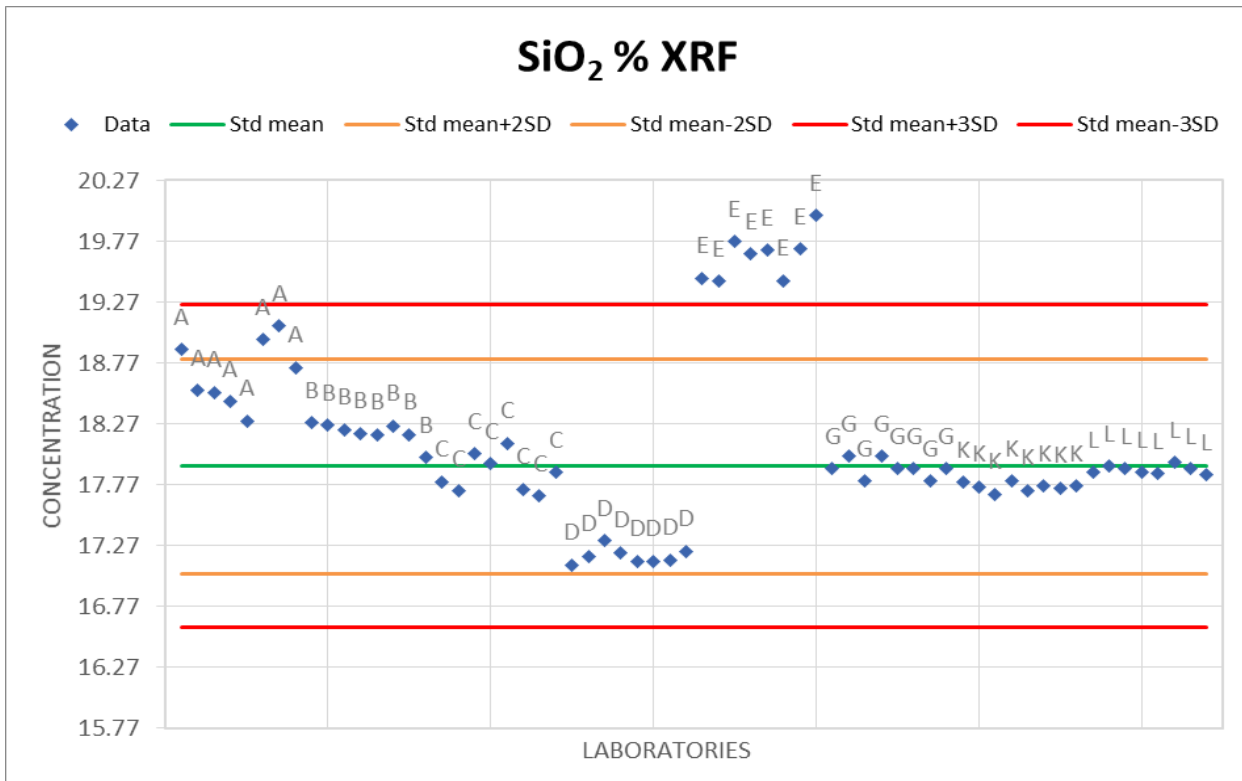
Lab_ID	Z_Score	Data
D	-1.45	17.11
D	-1.35	17.18
D	-1.17	17.31
D	-1.31	17.21
D	-1.41	17.14
D	-1.41	17.14
D	-1.39	17.15
D	-1.29	17.22
E	1.87	19.47
E	1.84	19.44
E	2.30	19.77
E	2.15	19.66
E	2.20	19.70
E	1.84	19.45
E	2.21	19.71
E	2.60	19.98
G	-0.34	17.90
G	-0.19	18.00
G	-0.48	17.80
G	-0.19	18.00
G	-0.34	17.90
G	-0.34	17.90
G	-0.48	17.80
G	-0.34	17.90

Lab_ID	Z_Score	Data
K	-0.49	17.79
K	-0.55	17.75
K	-0.63	17.69
K	-0.48	17.80
K	-0.59	17.72
K	-0.53	17.76
K	-0.56	17.74
K	-0.53	17.76
L	-0.38	17.87
L	-0.31	17.92
L	-0.34	17.90
L	-0.38	17.87
L	-0.39	17.86
L	-0.26	17.95
L	-0.34	17.90
L	-0.41	17.85

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SiO ₂	XRF	64	18.14	0.71	4	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
SiO ₂	XRF	A	8	18.683	0.273	0.015	1.462
SiO ₂	XRF	B	8	18.194	0.090	0.005	0.497
SiO ₂	XRF	C	8	17.857	0.155	0.009	0.869
SiO ₂	XRF	D	8	17.183	0.064	0.004	0.370
SiO ₂	XRF	E	8	19.646	0.188	0.010	0.959
SiO ₂	XRF	G	8	17.900	0.076	0.004	0.422
SiO ₂	XRF	K	8	17.751	0.036	0.002	0.201
SiO ₂	XRF	L	8	17.890	0.034	0.002	0.189
Average				18.138	0.139	0.006	0.621

11.50. SiO₂ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SiO ₂	XRF	56	17.92	0.44	2	%

Std mean	17.923
SD	0.441
2SD	0.883
3SD	1.324
Std mean+2SD	18.805
Std mean-2SD	17.040
Std mean+3SD	19.246
Std mean-3SD	16.599

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
SiO ₂	XRF	0.183	0.233	0.482	0.130	%

Comments: 8 results out of 64 were rejected as outliers using z score

11.51. Sm FUS

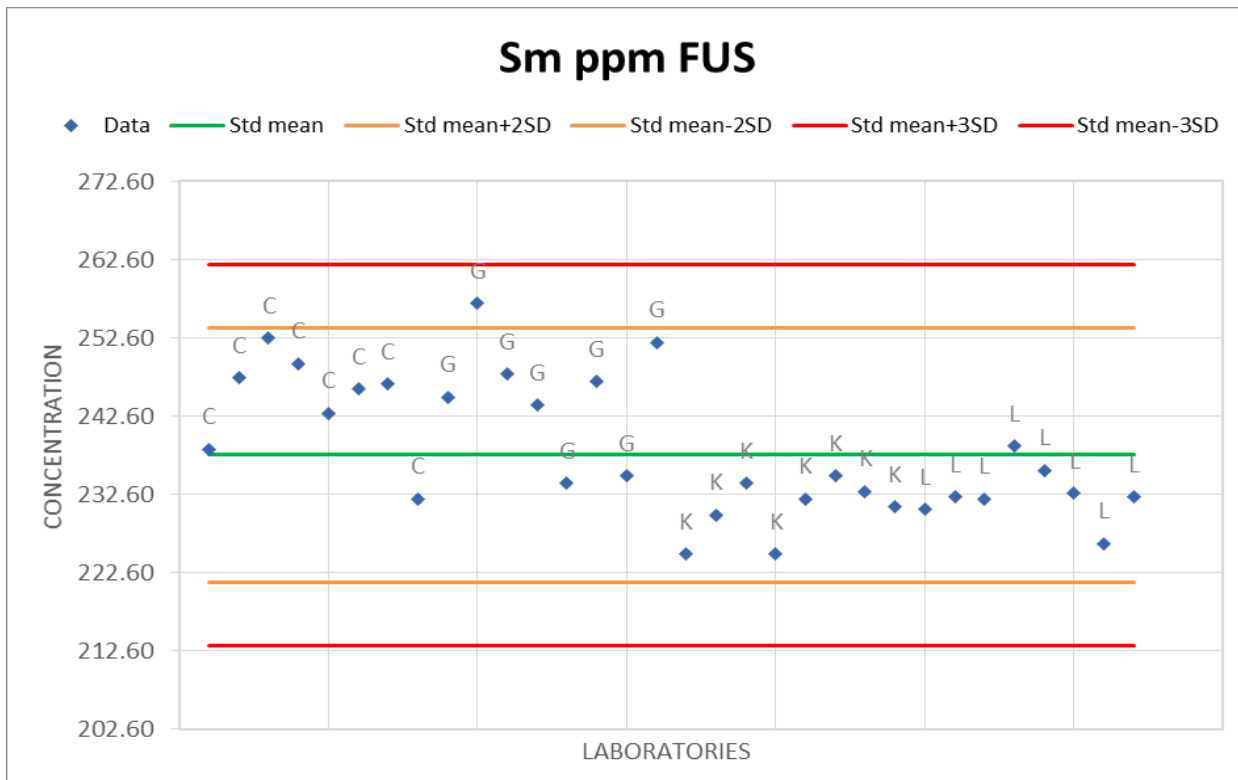
Lab_ID	Z_Score	Data
C	0.02	238.40
C	1.07	247.50
C	1.65	252.60
C	1.27	249.30
C	0.55	243.00
C	0.91	246.10
C	0.97	246.70
C	-0.72	232.00
G	0.78	245.00
G	2.16	257.00
G	1.12	248.00
G	0.66	244.00
G	-0.49	234.00
G	1.01	247.00
G	-0.37	235.00
G	1.58	252.00
K	-1.52	225.00
K	-0.95	230.00
K	-0.49	234.00
K	-1.52	225.00
K	-0.72	232.00
K	-0.37	235.00
K	-0.60	233.00
K	-0.83	231.00

Lab_ID	Z_Score	Data
L	-0.87	230.70
L	-0.68	232.30
L	-0.72	232.00
L	0.07	238.80
L	-0.29	235.70
L	-0.64	232.70
L	-1.37	226.30
L	-0.68	232.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sm	FUS	32	238.23	8.69	4	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Sm	FUS	C	8	244.450	6.555	0.027	2.681
Sm	FUS	G	8	245.250	7.815	0.032	3.186
Sm	FUS	K	8	230.625	3.815	0.017	1.654
Sm	FUS	L	8	232.600	3.623	0.016	1.558
Average				238.231	5.738	0.023	2.270

11.51. Sm FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sm	FUS	31	237.63	8.12	3	ppm

Std mean	237.626
SD	8.121
2SD	16.242
3SD	24.362
Std mean+2SD	253.867
Std mean-2SD	221.384
Std mean+3SD	261.988
Std mean-3SD	213.264

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Sm	FUS	4.944	94.105	9.701	5.320	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

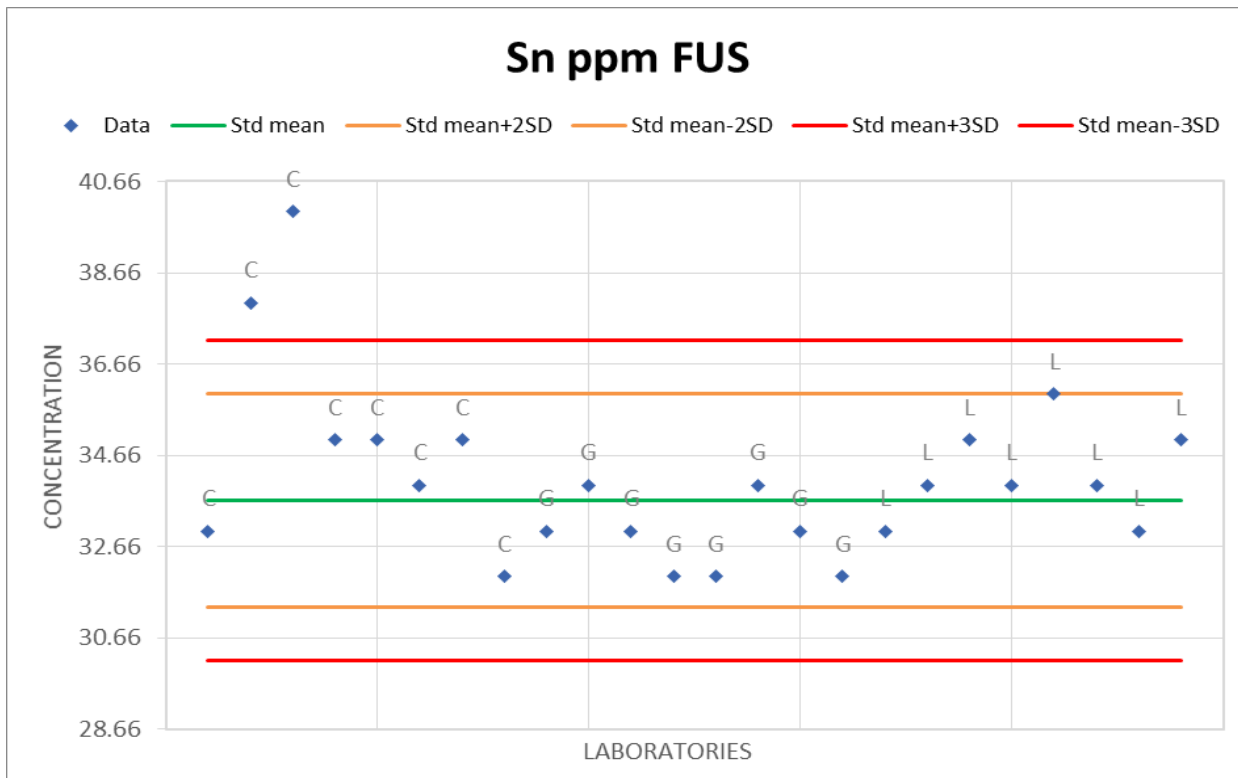
11.52. Sn FUS

Lab_ID	Z_Score	Data
C	-0.59	33.00
C	2.04	38.00
C	3.10	40.00
C	0.46	35.00
C	0.46	35.00
C	-0.07	34.00
C	0.46	35.00
C	-1.12	32.00
G	-0.59	33.00
G	-0.07	34.00
G	-0.59	33.00
G	-1.12	32.00
G	-1.12	32.00
G	-0.07	34.00
G	-0.59	33.00
G	-1.12	32.00
L	-0.59	33.00
L	-0.07	34.00
L	0.46	35.00
L	-0.07	34.00
L	0.99	36.00
L	-0.07	34.00
L	-0.59	33.00
L	0.46	35.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sn	FUS	24	34.13	1.90	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Sn	FUS	C	8	35.250	2.605	0.074	7.390
Sn	FUS	G	8	32.875	0.835	0.025	2.538
Sn	FUS	L	8	34.250	1.035	0.030	3.022
Average				34.125	1.689	0.043	4.317

11.52. Sn FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sn	FUS	22	33.68	1.17	3	ppm

Std mean	33.682
SD	1.171
2SD	2.341
3SD	3.512
Std mean+2SD	36.023
Std mean-2SD	31.341
Std mean+3SD	37.193
Std mean-3SD	30.170

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Sn	FUS	0.629	1.042	1.021	1.036	ppm

Comments: 2 results out of 24 were rejected as outliers using z score

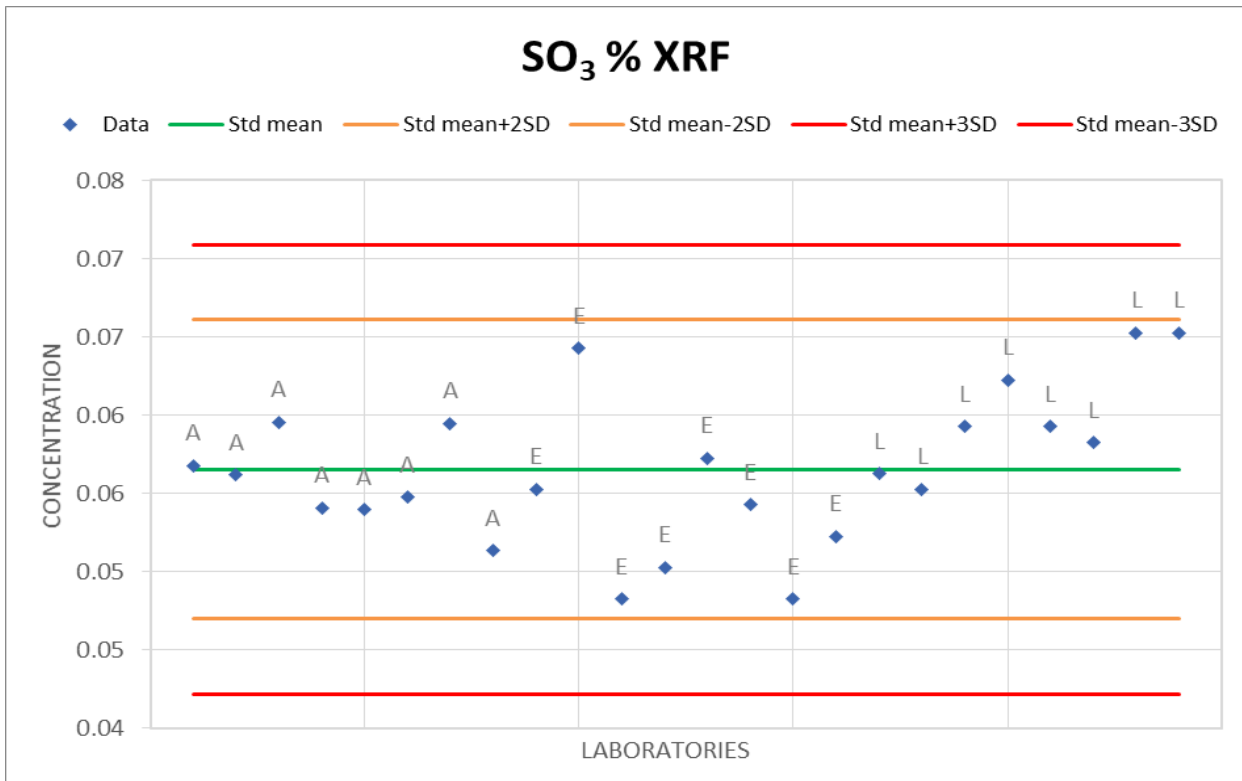
11.53. SO₃ XRF

Lab_ID	Z_Score	Data
A	0.04	0.06
A	-0.08	0.06
A	0.63	0.06
A	-0.52	0.06
A	-0.54	0.06
A	-0.37	0.06
A	0.61	0.06
A	-1.08	0.05
E	-0.27	0.06
E	1.61	0.07
E	-1.73	0.05
E	-1.31	0.05
E	0.15	0.06
E	-0.48	0.06
E	-1.73	0.05
E	-0.90	0.05
L	-0.06	0.06
L	-0.27	0.06
L	0.57	0.06
L	1.19	0.06
L	0.57	0.06
L	0.36	0.06
L	1.82	0.07
L	1.82	0.07

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SO ₃	XRF	24	0.06	0.005	8	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
SO ₃	XRF	A	8	0.058	0.003	0.049	4.909
SO ₃	XRF	E	8	0.056	0.005	0.096	9.631
SO ₃	XRF	L	8	0.062	0.004	0.061	6.135
Average				0.058	0.004	0.069	6.892

11.53. SO₃ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
SO ₃	XRF	24	0.06	0.005	8	%

Std mean	0.058
SD	0.005
2SD	0.010
3SD	0.014
Std mean+2SD	0.068
Std mean-2SD	0.049
Std mean+3SD	0.073
Std mean-3SD	0.044

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
SO ₃	XRF	0.003	N/A	0.005	0.004	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.54. Sr FUS

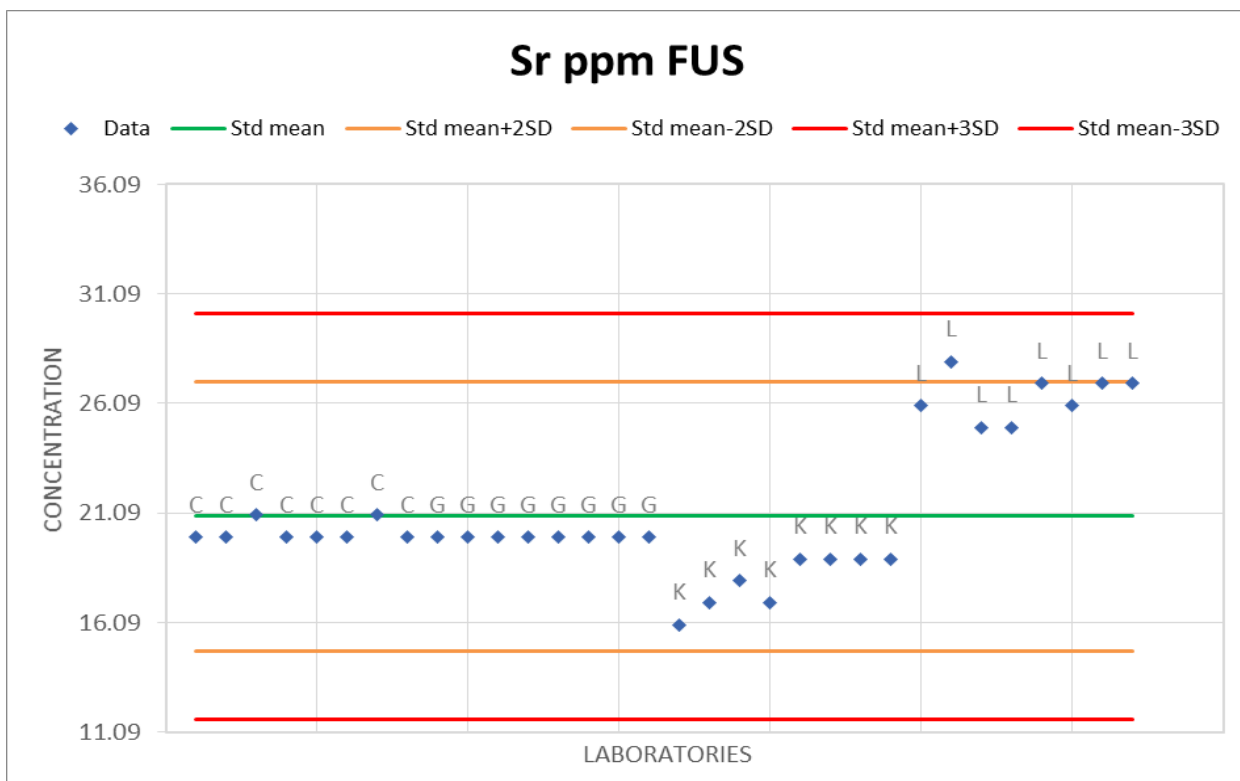
Lab_ID	Z_Score	Data
C	-0.35	20.00
C	-0.35	20.00
C	-0.05	21.00
C	-0.35	20.00
C	-0.35	20.00
C	-0.35	20.00
C	-0.05	21.00
C	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
G	-0.35	20.00
K	-1.57	16.00
K	-1.27	17.00
K	-0.96	18.00
K	-1.27	17.00
K	-0.66	19.00
K	-0.66	19.00
K	-0.66	19.00
K	-0.66	19.00

Lab_ID	Z_Score	Data
L	1.48	26.00
L	2.08	28.00
L	1.17	25.00
L	1.17	25.00
L	1.78	27.00
L	1.48	26.00
L	1.78	27.00
L	1.78	27.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sr	FUS	32	21.16	3.28	16	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Sr	FUS	C	8	20.250	0.463	0.023	2.286
Sr	FUS	G	8	20.000	N/A	N/A	N/A
Sr	FUS	K	8	18.000	1.195	0.066	6.640
Sr	FUS	L	8	26.375	1.061	0.040	4.021
Average				21.156	0.832	0.032	3.237

11.54. Sr FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Sr	FUS	31	20.94	3.09	15	ppm

Std mean	20.935
SD	3.087
2SD	6.174
3SD	9.261
Std mean+2SD	27.109
Std mean-2SD	14.762
Std mean+3SD	30.196
Std mean-3SD	11.675

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Sr	FUS	3.812	43.480	6.594	0.904	ppm

Comment: 1 result out of 32 was rejected as an outlier using z-score

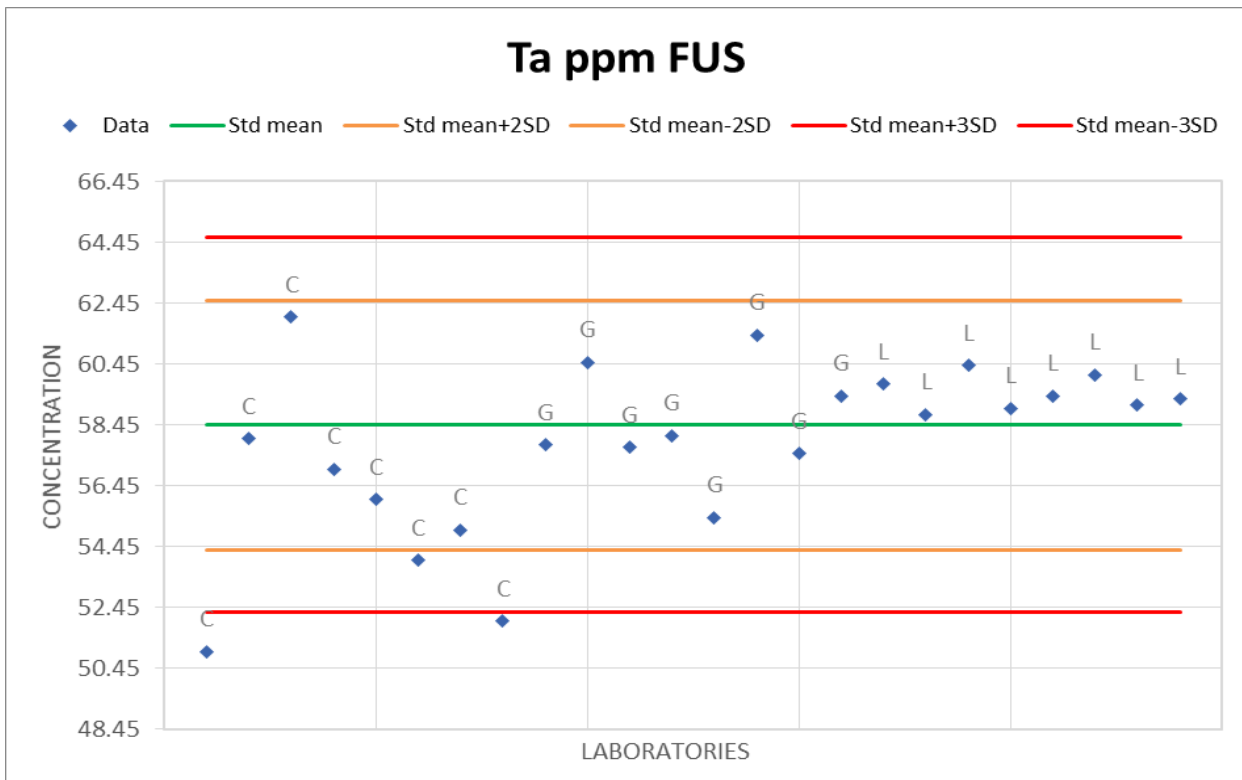
11.55. Ta FUS

Lab_ID	Z_Score	Data
C	-2.47	51.00
C	0.05	58.00
C	1.49	62.00
C	-0.31	57.00
C	-0.67	56.00
C	-1.39	54.00
C	-1.03	55.00
C	-2.11	52.00
G	-0.02	57.80
G	0.95	60.50
G	-0.06	57.70
G	0.09	58.10
G	-0.89	55.40
G	1.27	61.40
G	-0.13	57.50
G	0.55	59.40
L	0.70	59.80
L	0.34	58.80
L	0.91	60.40
L	0.41	59.00
L	0.55	59.40
L	0.81	60.10
L	0.45	59.10
L	0.52	59.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ta	FUS	24	57.86	2.78	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Ta	FUS	C	8	55.625	3.503	0.063	6.297
Ta	FUS	G	8	58.475	1.894	0.032	3.239
Ta	FUS	L	8	59.488	0.562	0.009	0.944
Average				57.863	2.322	0.035	3.493

11.55. Ta FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ta	FUS	22	58.44	2.05	4	ppm

Std mean	58.441
SD	2.053
2SD	4.107
3SD	6.160
Std mean+2SD	62.548
Std mean-2SD	54.334
Std mean+3SD	64.601
Std mean-3SD	52.280

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Ta	FUS	0.973	2.357	1.535	1.882	ppm

Comments: 2 results out of 24 were rejected as outliers using z score

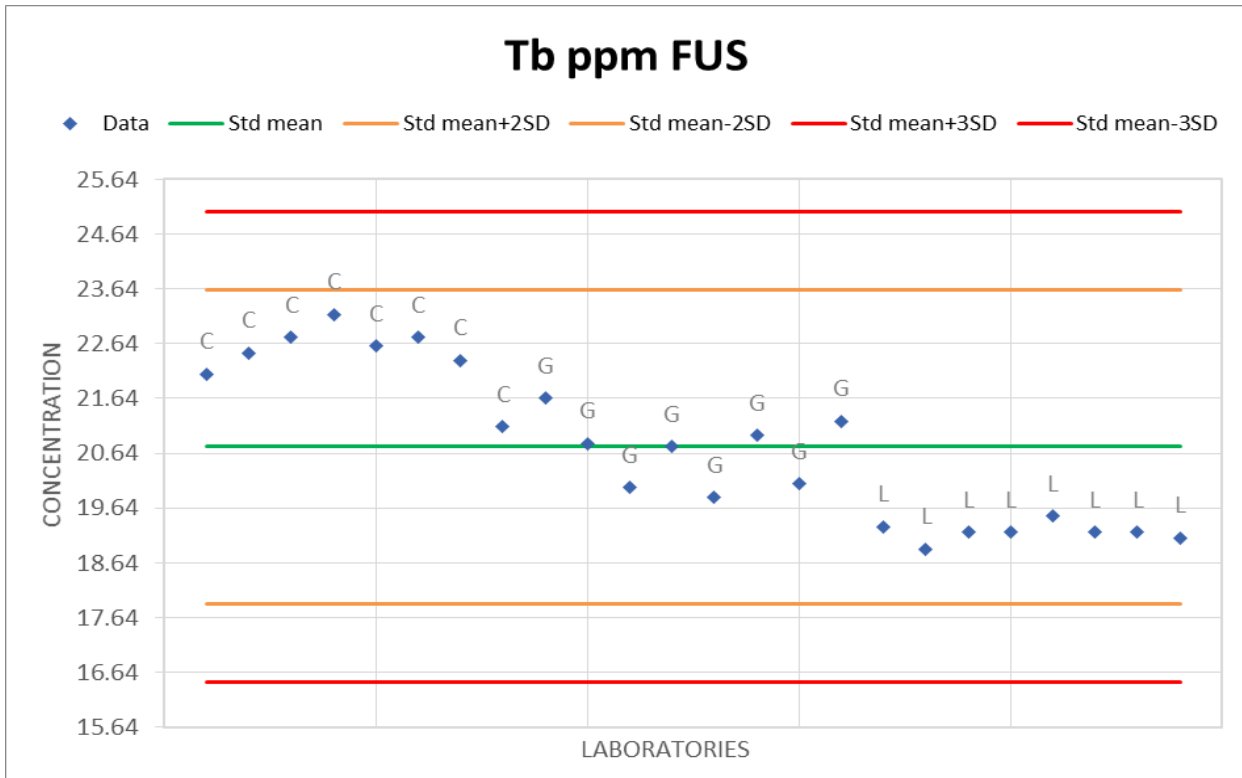
11.56. Tb FUS

Lab_ID	Z_Score	Data
C	0.93	22.09
C	1.20	22.48
C	1.39	22.76
C	1.69	23.18
C	1.28	22.60
C	1.39	22.76
C	1.10	22.34
C	0.26	21.13
G	0.62	21.65
G	0.04	20.82
G	-0.52	20.02
G	0.00	20.76
G	-0.64	19.84
G	0.14	20.97
G	-0.47	20.09
G	0.33	21.23
L	-1.02	19.30
L	-1.30	18.90
L	-1.09	19.20
L	-1.09	19.20
L	-0.88	19.50
L	-1.09	19.20
L	-1.09	19.20
L	-1.16	19.10

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Tb	FUS	24	20.76	1.43	7	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Tb	FUS	C	8	22.418	0.612	0.027	2.731
Tb	FUS	G	8	20.673	0.637	0.031	3.082
Tb	FUS	L	8	19.200	0.169	0.009	0.880
Average				20.763	0.519	0.022	2.231

11.56. Tb FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Tb	FUS	24	20.76	1.43	7	ppm

Std mean	20.763
SD	1.432
2SD	2.864
3SD	4.296
Std mean+2SD	23.628
Std mean-2SD	17.899
Std mean+3SD	25.060
Std mean-3SD	16.467

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Tb	FUS	1.512	6.828	2.613	0.519	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

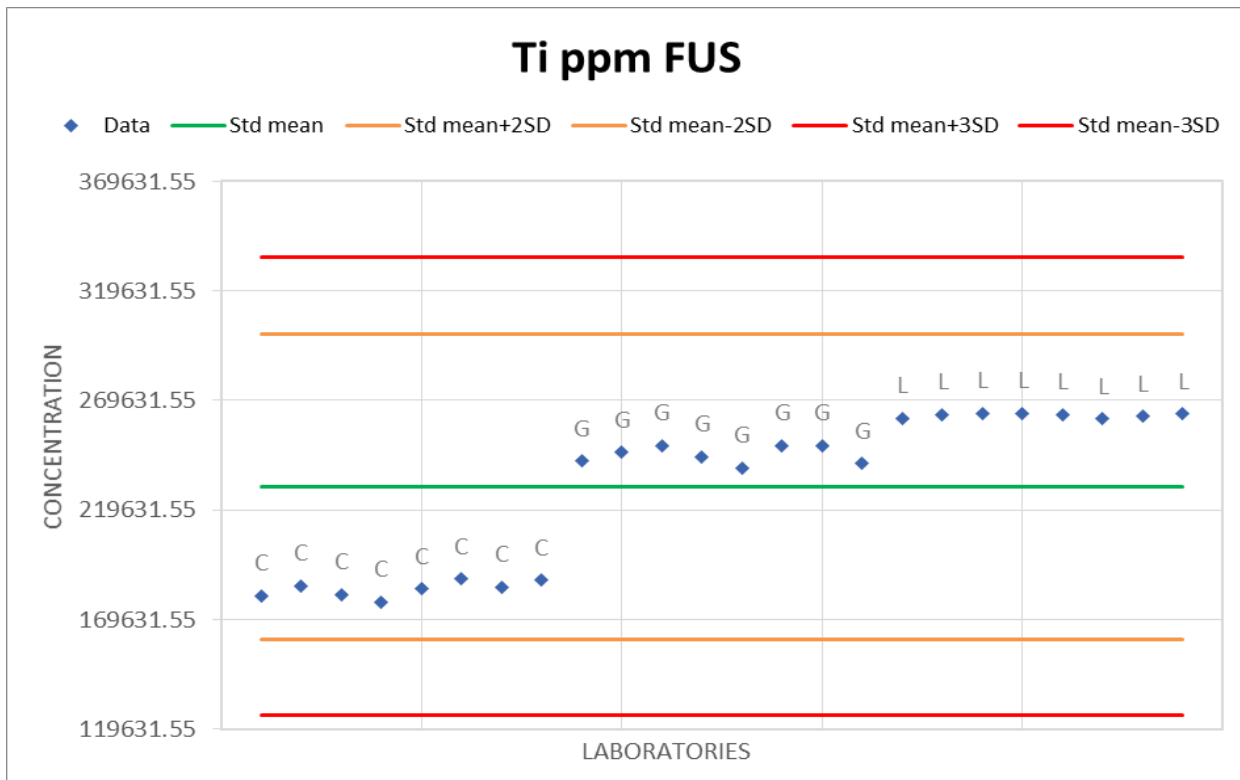
11.57. Ti FUS

Lab_ID	Z_Score	Data
C	-1.43	180465.00
C	-1.30	185093.00
C	-1.42	180974.00
C	-1.51	177691.00
C	-1.34	183710.00
C	-1.21	188150.00
C	-1.32	184545.00
C	-1.23	187521.00
G	0.33	242000.00
G	0.45	246000.00
G	0.53	249000.00
G	0.39	244000.00
G	0.25	239000.00
G	0.53	249000.00
G	0.53	249000.00
G	0.30	241000.00
L	0.90	261600.00
L	0.94	263300.00
L	0.96	263700.00
L	0.96	263900.00
L	0.94	263300.00
L	0.89	261300.00
L	0.92	262400.00
L	0.95	263500.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Ti	FUS	24	230422.88	34831.64	15	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Ti	FUS	C	8	183518.625	3601.554	0.020	1.963
Ti	FUS	G	8	244875.000	3979.860	0.016	1.625
Ti	FUS	L	8	262875.000	986.697	0.004	0.375
Average				230422.875	3150.875	0.013	1.321

11.57. Ti FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Ti	FUS	24	230422.88	34831.64	15	ppm

Std mean	230422.875
SD	34831.640
2SD	69663.280
3SD	104494.920
Std mean+2SD	300086.155
Std mean-2SD	160759.595
Std mean+3SD	334917.795
Std mean-3SD	125927.955

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Ti	FUS	39217.126	4612707997.683	67916.920	3150.875	ppm

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.58. TiO₂ FUS

Lab_ID	Z_Score	Data
C	-1.43	30.10
C	-1.30	30.87
C	-1.42	30.19
C	-1.51	29.64
C	-1.34	30.64
C	-1.21	31.38
C	-1.32	30.78
C	-1.23	31.28
G	0.33	40.37
G	0.45	41.03
G	0.53	41.53
G	0.39	40.70
G	0.25	39.87
G	0.53	41.53
G	0.53	41.53
G	0.30	40.20
L	0.90	43.63
L	0.94	43.92
L	0.96	43.99
L	0.96	44.02
L	0.94	43.92
L	0.89	43.58
L	0.92	43.77
L	0.95	43.95

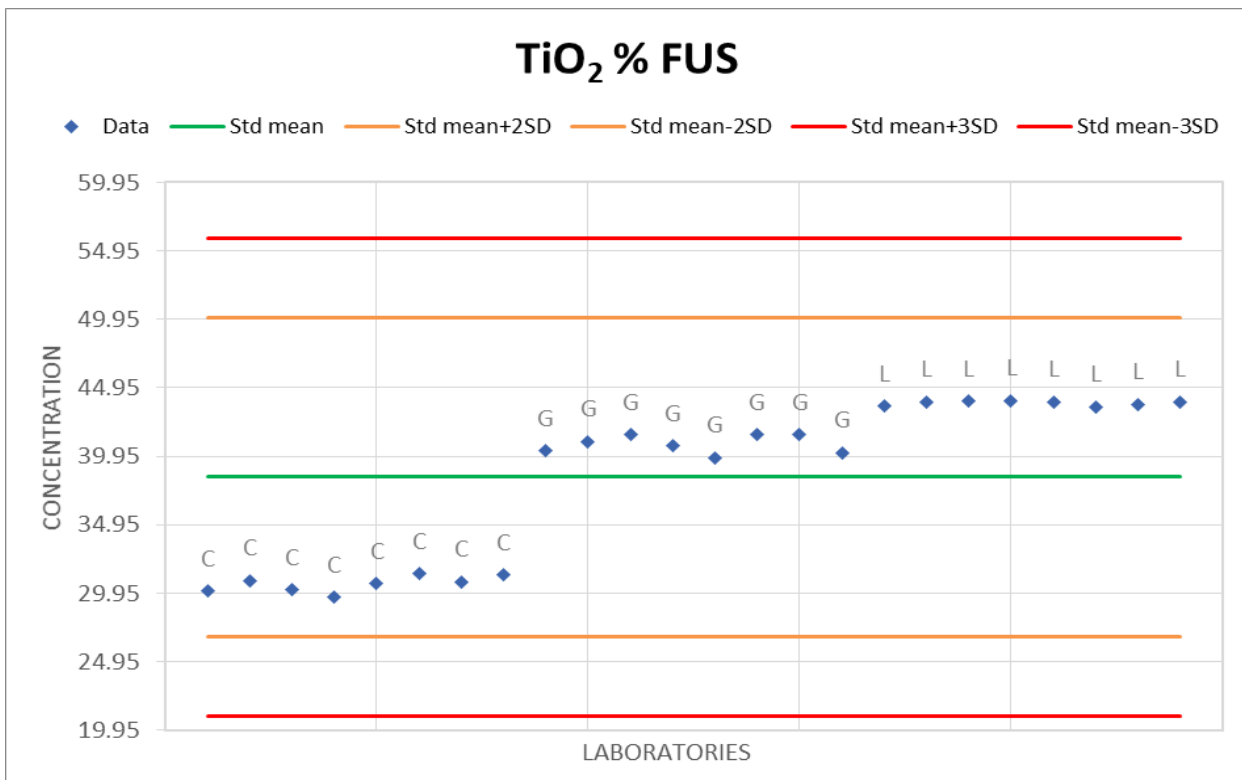
Results with outliers

Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
TiO ₂	FUS	24	38.43	5.81	15	%

Between Laboratory Statistics

Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
TiO ₂	FUS	C	8	30.611	0.601	0.020	1.963
TiO ₂	FUS	G	8	40.845	0.664	0.016	1.625
TiO ₂	FUS	L	8	43.848	0.165	0.004	0.375
Average				38.435	0.526	0.013	1.321

11.58. TiO₂ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
TiO ₂	FUS	24	38.43	5.81	15	%

Std mean	38.435
SD	5.810
2SD	11.620
3SD	17.430
Std mean+2SD	50.054
Std mean-2SD	26.815
Std mean+3SD	55.864
Std mean-3SD	21.005

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
TiO ₂	FUS	6.541	128.336	11.329	0.526	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.59. TiO₂ XRF

Lab_ID	Z_Score	Data
A	1.22	43.77
A	1.52	43.98
A	0.76	43.46
A	1.82	44.17
A	1.64	44.05
A	1.56	44.00
A	0.96	43.59
A	1.24	43.78
B	-0.48	42.62
B	-0.28	42.76
B	-0.32	42.73
B	-0.57	42.56
B	-0.41	42.67
B	-0.44	42.65
B	-0.41	42.67
B	-0.56	42.57
C	0.49	43.28
C	0.37	43.19
C	0.26	43.12
C	0.47	43.26
C	-0.21	42.80
C	0.39	43.21
C	0.24	43.11
C	-0.25	42.78

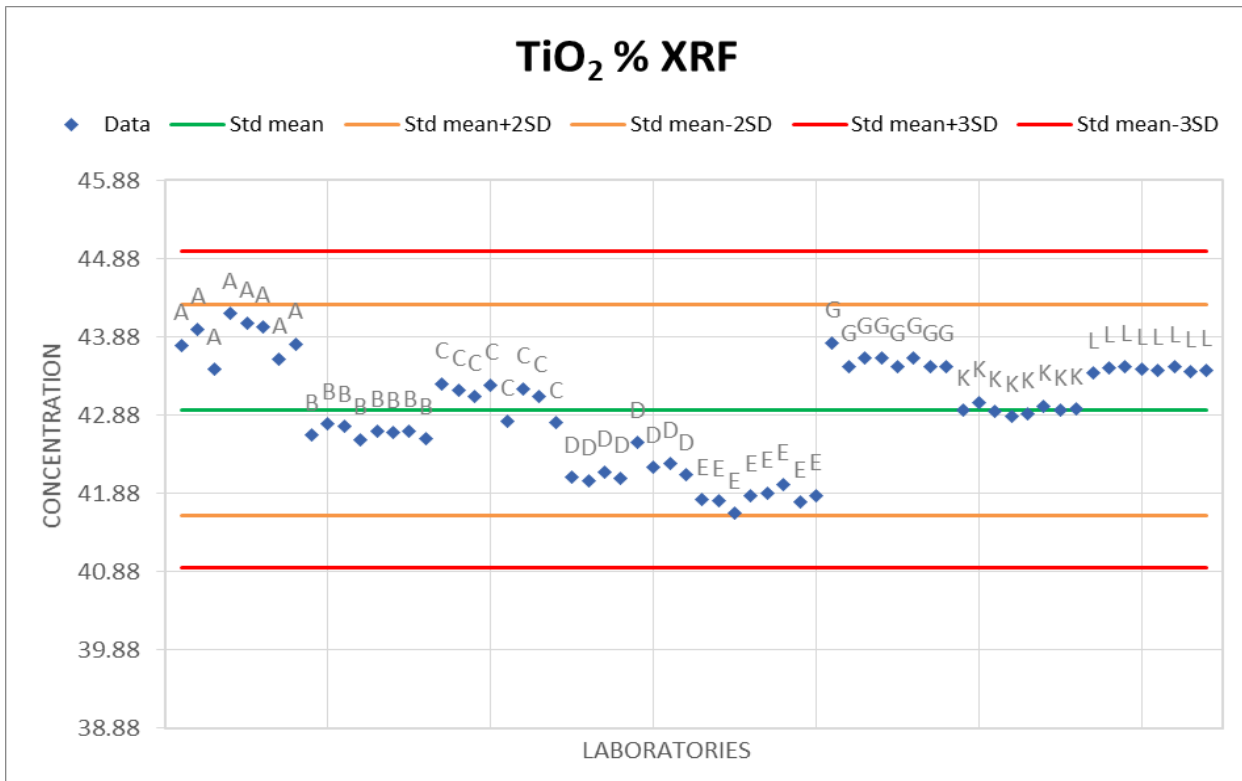
Lab_ID	Z_Score	Data
D	-1.28	42.08
D	-1.34	42.04
D	-1.18	42.15
D	-1.30	42.07
D	-0.63	42.52
D	-1.09	42.21
D	-1.02	42.26
D	-1.24	42.11
E	-1.70	41.80
E	-1.73	41.78
E	-1.96	41.62
E	-1.64	41.84
E	-1.58	41.88
E	-1.43	41.98
E	-1.76	41.76
E	-1.62	41.85
G	1.27	43.80
G	0.82	43.50
G	0.97	43.60
G	0.97	43.60
G	0.82	43.50
G	0.97	43.60
G	0.82	43.50
G	0.97	43.60
G	0.82	43.50

Lab_ID	Z_Score	Data
K	-0.01	42.94
K	0.14	43.04
K	-0.04	42.92
K	-0.13	42.86
K	-0.07	42.90
K	0.07	42.99
K	-0.01	42.94
K	0.01	42.95
L	0.69	43.41
L	0.79	43.48
L	0.82	43.50
L	0.76	43.46
L	0.75	43.45
L	0.81	43.49
L	0.72	43.43
L	0.73	43.44

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
TiO ₂	XRF	64	42.95	0.67	2	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
TiO ₂	XRF	A	8	43.852	0.243	0.006	0.555
TiO ₂	XRF	B	8	42.654	0.070	0.002	0.165
TiO ₂	XRF	C	8	43.095	0.197	0.005	0.458
TiO ₂	XRF	D	8	42.180	0.156	0.004	0.370
TiO ₂	XRF	E	8	41.814	0.104	0.002	0.249
TiO ₂	XRF	G	8	43.575	0.104	0.002	0.238
TiO ₂	XRF	K	8	42.943	0.055	0.001	0.127
TiO ₂	XRF	L	8	43.458	0.031	0.001	0.071
Average				42.946	0.138	0.003	0.279

11.59. TiO₂ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
TiO ₂	XRF	64	42.95	0.67	2	%

Std mean	42.946
SD	0.675
2SD	1.350
3SD	2.025
Std mean+2SD	44.296
Std mean-2SD	41.596
Std mean+3SD	44.971
Std mean-3SD	40.921

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
TiO ₂	XRF	0.248	0.491	0.701	0.138	%

Comment: No results rejected as outliers using z score. All results are within the mean \pm 3SD

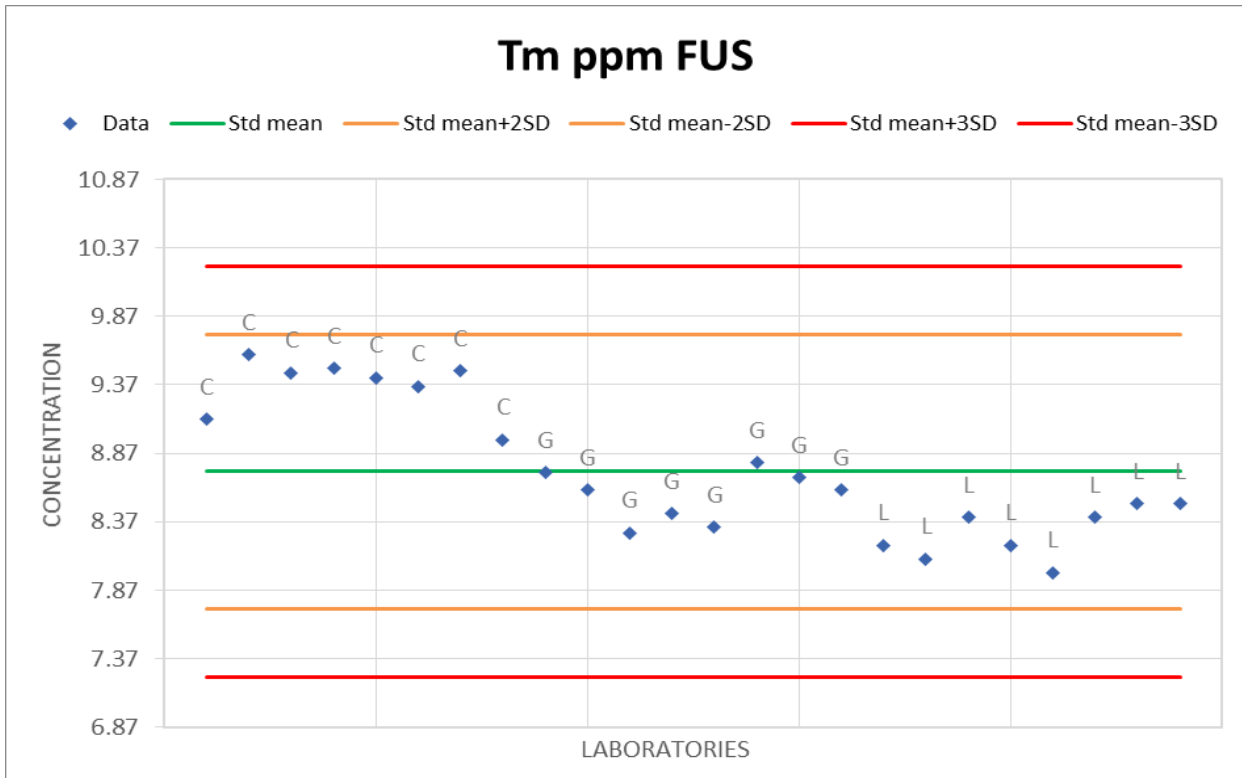
11.60. Tm FUS

Lab_ID	Z_Score	Data
C	0.77	9.12
C	1.70	9.59
C	1.45	9.46
C	1.51	9.49
C	1.37	9.42
C	1.25	9.36
C	1.47	9.47
C	0.47	8.97
G	-0.01	8.73
G	-0.27	8.60
G	-0.89	8.29
G	-0.61	8.43
G	-0.81	8.33
G	0.13	8.80
G	-0.09	8.69
G	-0.27	8.60
L	-1.07	8.20
L	-1.27	8.10
L	-0.67	8.40
L	-1.07	8.20
L	-1.47	8.00
L	-0.67	8.40
L	-0.47	8.50
L	-0.47	8.50

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Tm	FUS	24	8.74	0.50	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Tm	FUS	C	8	9.360	0.209	0.022	2.231
Tm	FUS	G	8	8.559	0.189	0.022	2.205
Tm	FUS	L	8	8.288	0.189	0.023	2.275
Average				8.735	0.196	0.022	2.237

11.60. Tm FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Tm	FUS	24	8.74	0.50	6	ppm

Std mean	8.735
SD	0.501
2SD	1.003
3SD	1.504
Std mean+2SD	9.738
Std mean-2SD	7.733
Std mean+3SD	10.239
Std mean-3SD	7.232

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Tm	FUS	0.523	0.817	0.904	0.196	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

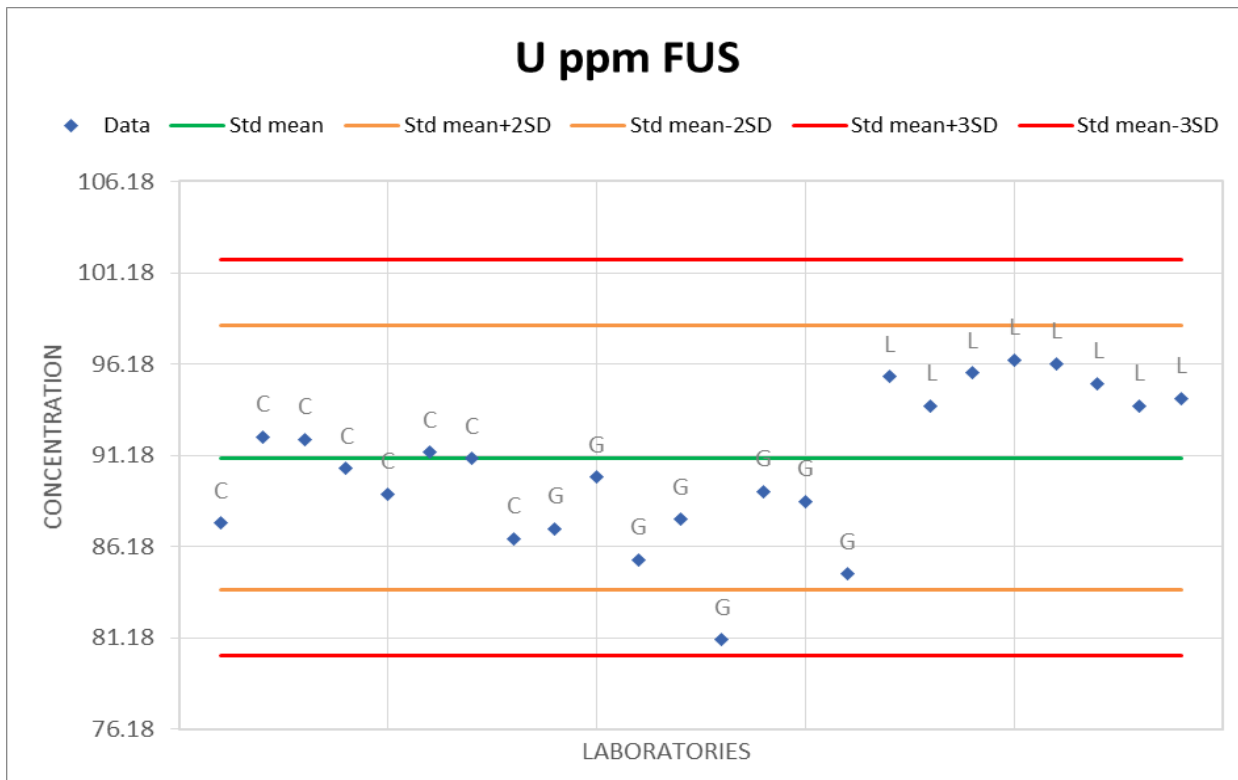
11.61. U FUS

Lab_ID	Z_Score	Data
C	-0.77	87.48
C	0.38	92.18
C	0.35	92.04
C	-0.04	90.47
C	-0.38	89.06
C	0.18	91.35
C	0.09	90.99
C	-0.98	86.61
G	-0.85	87.17
G	-0.16	89.97
G	-1.27	85.45
G	-0.73	87.66
G	-2.34	81.08
G	-0.35	89.19
G	-0.49	88.64
G	-1.46	84.68
L	1.19	95.50
L	0.80	93.90
L	1.24	95.70
L	1.42	96.40
L	1.37	96.20
L	1.10	95.10
L	0.80	93.90
L	0.90	94.30

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
U	FUS	24	90.63	4.08	5	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
U	FUS	C	8	90.023	2.093	0.023	2.325
U	FUS	G	8	86.730	2.904	0.033	3.348
U	FUS	L	8	95.125	0.995	0.010	1.046
Average				90.626	2.145	0.022	2.240

11.61. U FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
U	FUS	23	91.04	3.62	4	ppm

Std mean	91.041
SD	3.617
2SD	7.234
3SD	10.851
Std mean+2SD	98.275
Std mean-2SD	83.807
Std mean+3SD	101.892
Std mean-3SD	80.190

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
U	FUS	3.528	36.943	6.078	1.734	ppm

Comment: 1 result out of 24 was rejected as an outlier using z-score

11.62. V FUS

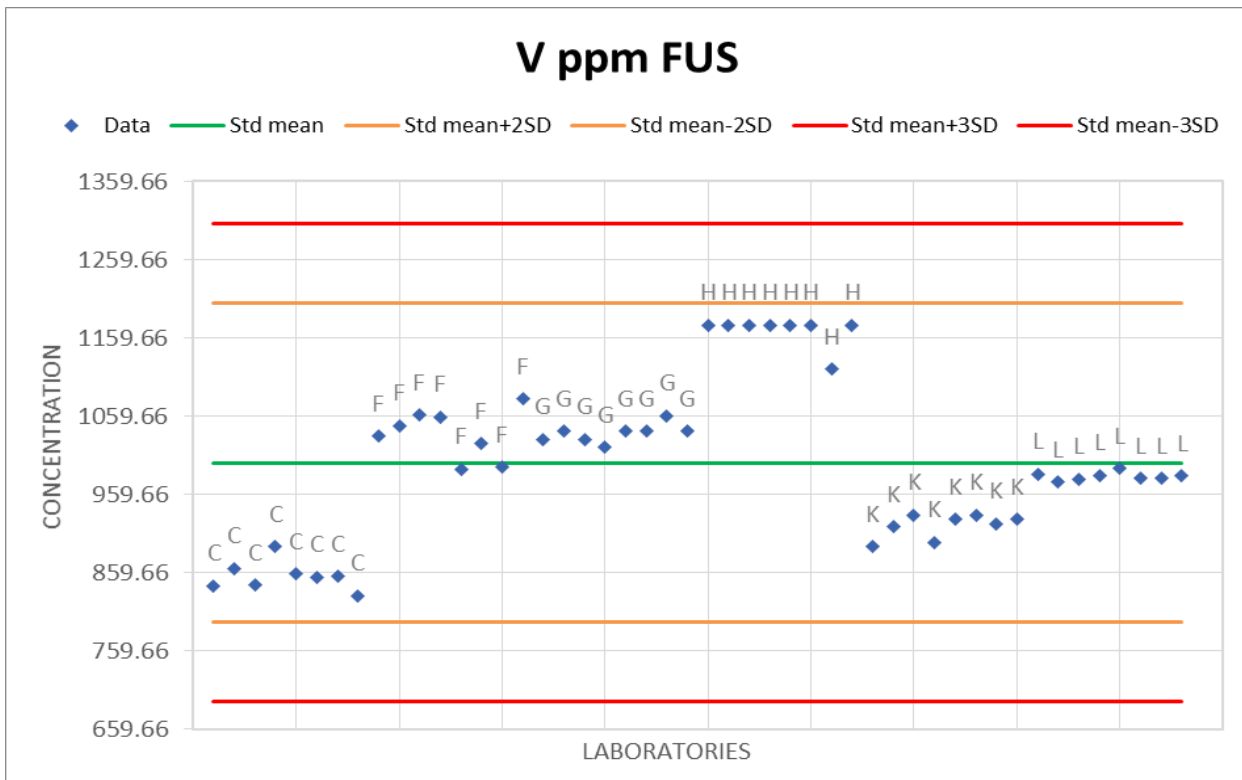
Lab_ID	Z_Score	Data
C	-1.54	843.00
C	-1.33	865.00
C	-1.53	844.00
C	-1.05	893.00
C	-1.39	858.00
C	-1.43	854.00
C	-1.42	855.00
C	-1.67	830.00
F	0.34	1034.32
F	0.47	1047.76
F	0.59	1060.64
F	0.57	1058.40
F	-0.08	992.32
F	0.24	1024.24
F	-0.05	994.56
F	0.80	1081.36
G	0.29	1030.00
G	0.39	1040.00
G	0.29	1030.00
G	0.20	1020.00
G	0.39	1040.00
G	0.39	1040.00
G	0.59	1060.00
G	0.39	1040.00

Lab_ID	Z_Score	Data
H	1.73	1176.00
H	1.73	1176.00
H	1.73	1176.00
H	1.73	1176.00
H	1.73	1176.00
H	1.73	1176.00
H	1.73	1176.00
H	1.18	1120.00
H	1.73	1176.00
K	-1.05	892.64
K	-0.80	918.40
K	-0.66	932.96
K	-1.00	898.24
K	-0.71	927.92
K	-0.65	933.52
K	-0.76	922.32
K	-0.71	927.92
L	-0.14	986.00
L	-0.25	975.00
L	-0.21	979.00
L	-0.16	984.00
L	-0.07	993.00
L	-0.20	980.00
L	-0.20	980.00
L	-0.17	983.00

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
V	FUS	48	1000.03	101.88	10	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
V	FUS	C	8	855.250	18.683	0.022	2.185
V	FUS	F	8	1036.700	31.774	0.031	3.065
V	FUS	G	8	1037.500	11.650	0.011	1.123
V	FUS	H	8	1169.000	19.799	0.017	1.694
V	FUS	K	8	919.240	15.591	0.017	1.696
V	FUS	L	8	982.500	5.425	0.006	0.552
Average				1000.032	18.969	0.017	1.719

11.62. V FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
V	FUS	48	1000.03	101.88	10	ppm

Std mean	1000.032
SD	101.884
2SD	203.767
3SD	305.651
Std mean+2SD	1203.799
Std mean-2SD	796.264
Std mean+3SD	1305.683
Std mean-3SD	694.381

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
V	FUS	51.225	15698.731	125.295	18.969	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

11.63. V₂O₅ FUS

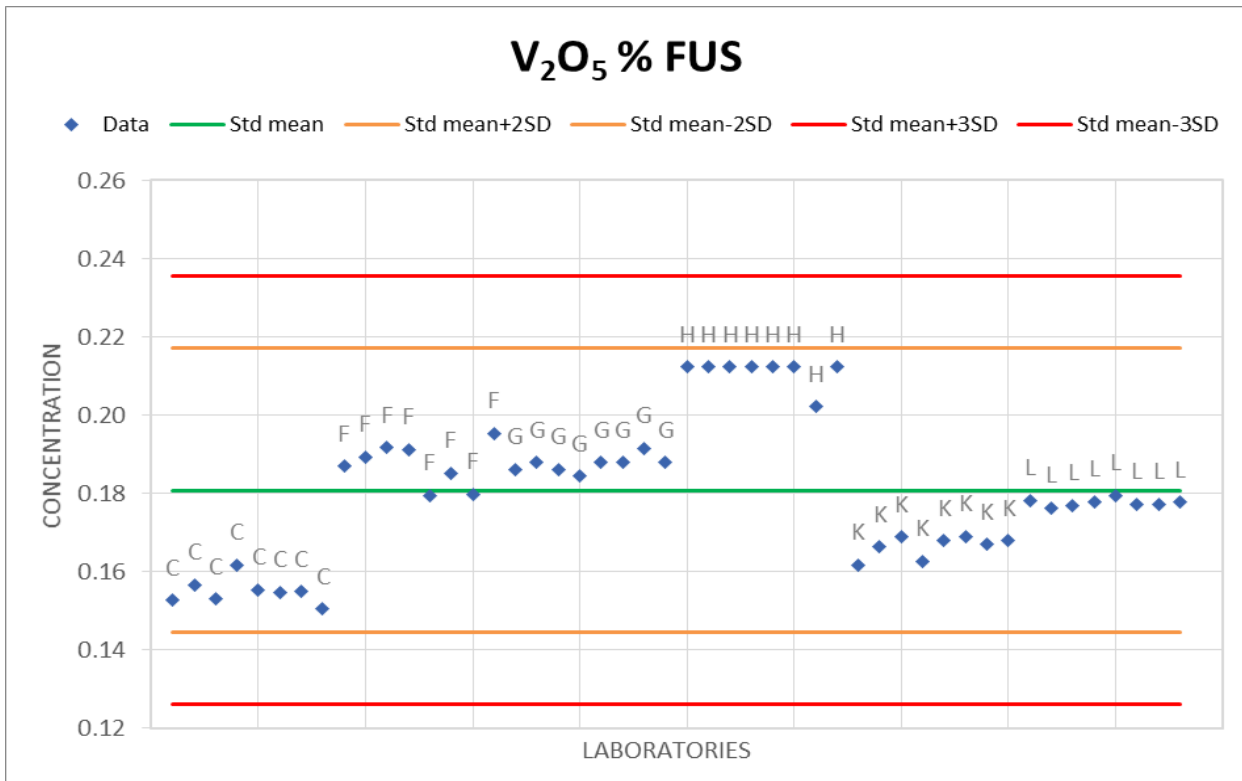
Lab_ID	Z_Score	Data
C	-1.54	0.15
C	-1.33	0.15
C	-1.53	0.15
C	-1.05	0.16
C	-1.39	0.15
C	-1.43	0.15
C	-1.42	0.15
C	-1.67	0.15
F	0.34	0.18
F	0.47	0.19
F	0.60	0.19
F	0.57	0.19
F	-0.07	0.18
F	0.24	0.18
F	-0.05	0.18
F	0.80	0.19
G	0.29	0.18
G	0.39	0.19
G	0.29	0.18
G	0.19	0.18
G	0.39	0.19
G	0.39	0.19
G	0.59	0.19
G	0.39	0.19

Lab_ID	Z_Score	Data
H	1.73	0.21
H	1.73	0.21
H	1.73	0.21
H	1.73	0.21
H	1.73	0.21
H	1.73	0.21
H	1.18	0.20
H	1.73	0.21
K	-1.05	0.16
K	-0.80	0.16
K	-0.66	0.17
K	-1.00	0.16
K	-0.71	0.17
K	-0.65	0.17
K	-0.76	0.16
K	-0.71	0.17
L	-0.14	0.18
L	-0.25	0.17
L	-0.21	0.17
L	-0.16	0.18
L	-0.07	0.18
L	-0.20	0.17
L	-0.20	0.17
L	-0.17	0.18

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
V ₂ O ₅	FUS	48	0.18	0.02	10	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
V ₂ O ₅	FUS	C	8	0.153	0.003	0.022	2.185
V ₂ O ₅	FUS	F	8	0.185	0.006	0.031	3.065
V ₂ O ₅	FUS	G	8	0.185	0.002	0.011	1.123
V ₂ O ₅	FUS	H	8	0.209	0.004	0.017	1.694
V ₂ O ₅	FUS	K	8	0.164	0.003	0.017	1.696
V ₂ O ₅	FUS	L	8	0.175	0.001	0.006	0.552
Average				0.179	0.003	0.017	1.719

11.63. V₂O₅ FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
V ₂ O ₅	FUS	48	0.18	0.02	10	%

Std mean	0.179
SD	0.018
2SD	0.036
3SD	0.055
Std mean+2SD	0.215
Std mean-2SD	0.142
Std mean+3SD	0.233
Std mean-3SD	0.124

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
V ₂ O ₅	FUS	0.009	0.001	0.022	0.003	%

Comment: No results rejected as outliers using z score. All results are within the mean ±3SD

11.64. V₂O₅ XRF

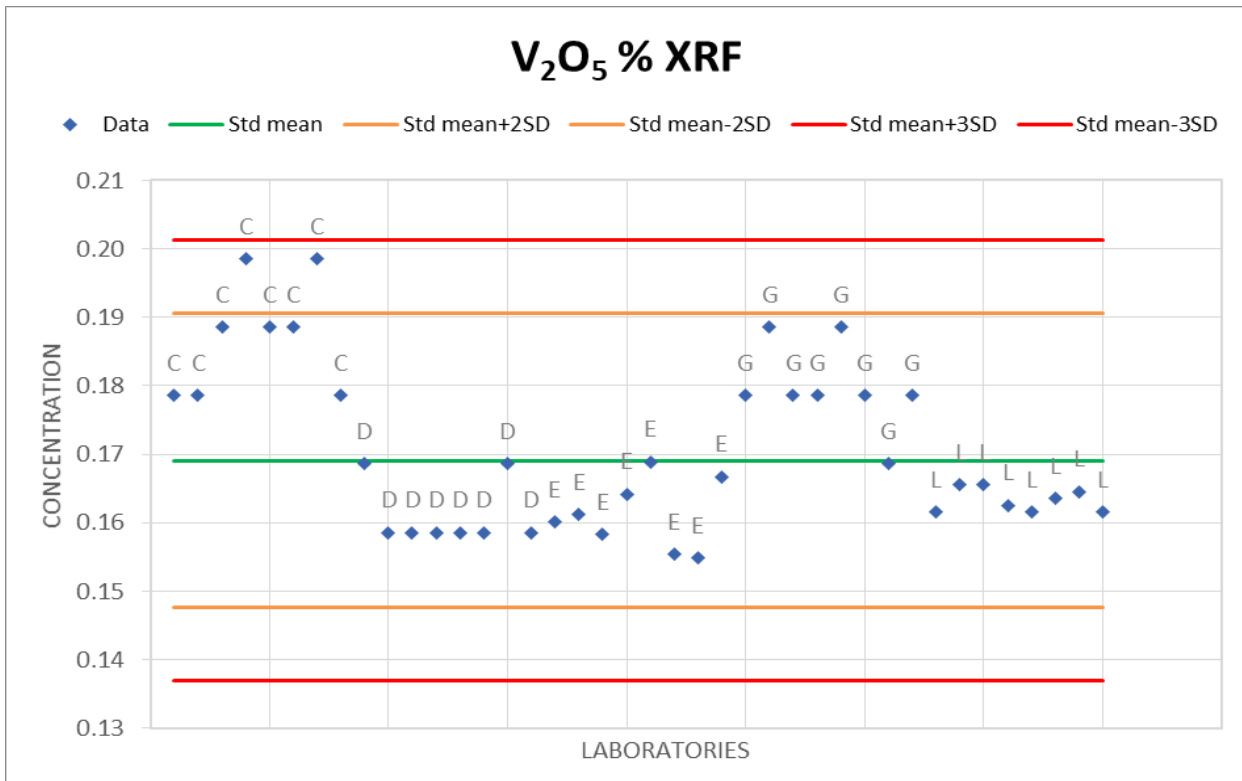
Lab_ID	Z_Score	Data
C	0.65	0.18
C	0.65	0.18
C	1.47	0.19
C	2.28	0.20
C	1.47	0.19
C	1.47	0.19
C	2.28	0.20
C	0.65	0.18
D	-0.16	0.17
D	-0.97	0.16
D	-0.97	0.16
D	-0.97	0.16
D	-0.97	0.16
D	-0.97	0.16
D	-0.16	0.17
D	-0.97	0.16
E	-0.85	0.16
E	-0.76	0.16
E	-1.00	0.16
E	-0.52	0.17
E	-0.14	0.17
E	-1.23	0.16
E	-1.27	0.16
E	-0.31	0.17

Lab_ID	Z_Score	Data
G	0.65	0.18
G	1.47	0.19
G	0.65	0.18
G	0.65	0.18
G	1.47	0.19
G	0.65	0.18
G	-0.16	0.17
G	0.65	0.18
L	-0.73	0.16
L	-0.40	0.17
L	-0.40	0.17
L	-0.65	0.16
L	-0.73	0.16
L	-0.57	0.17
L	-0.49	0.17
L	-0.73	0.16

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
V ₂ O ₅	XRF	40	0.17	0.01	7	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
V ₂ O ₅	XRF	C	8	0.189	0.008	0.044	4.421
V ₂ O ₅	XRF	D	8	0.163	0.005	0.028	2.849
V ₂ O ₅	XRF	E	8	0.163	0.005	0.031	3.131
V ₂ O ₅	XRF	G	8	0.181	0.006	0.035	3.536
V ₂ O ₅	XRF	L	8	0.165	0.002	0.011	1.064
Average				0.172	0.006	0.030	3.000

11.64. V₂O₅ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
V ₂ O ₅	XRF	38	0.17	0.01	6	%

Std mean	0.170
SD	0.011
2SD	0.021
3SD	0.032
Std mean+2SD	0.192
Std mean-2SD	0.149
Std mean+3SD	0.203
Std mean-3SD	0.138

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
V ₂ O ₅	XRF	0.006	N/A	0.013	0.005	%

Comments: 2 results out of 40 were rejected as outliers using z score

11.65. Y FUS

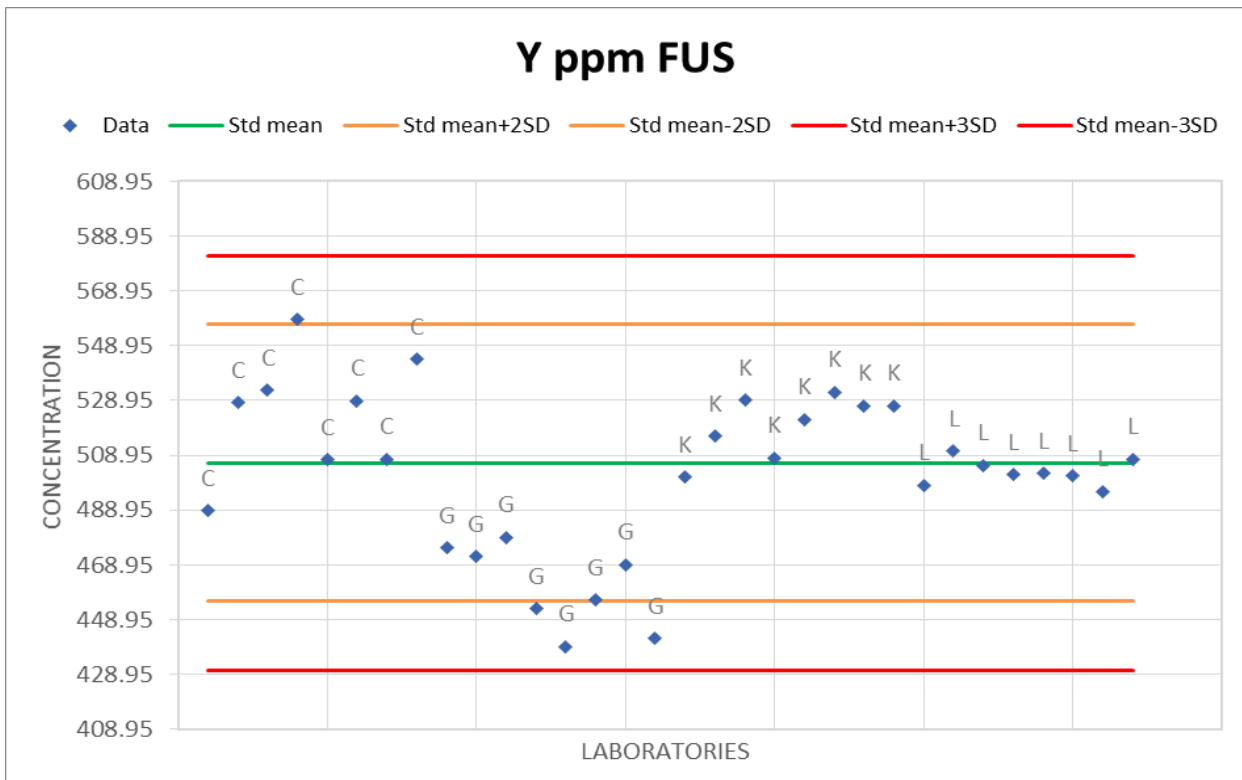
Lab_ID	Z_Score	Data
C	-0.45	488.81
C	0.89	528.05
C	1.05	532.71
C	1.93	558.41
C	0.18	507.35
C	0.91	528.75
C	0.19	507.55
C	1.44	544.04
G	-0.92	475.00
G	-1.03	472.00
G	-0.79	479.00
G	-1.68	453.00
G	-2.15	439.00
G	-1.57	456.00
G	-1.13	469.00
G	-2.05	442.00
K	-0.04	501.00
K	0.48	516.00
K	0.92	529.00
K	0.20	508.00
K	0.68	522.00
K	1.02	532.00
K	0.85	527.00
K	0.85	527.00

Lab_ID	Z_Score	Data
L	-0.14	497.90
L	0.29	510.50
L	0.11	505.30
L	-0.01	501.80
L	0.01	502.40
L	-0.03	501.30
L	-0.21	495.80
L	0.19	507.60

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Y	FUS	32	502.04	29.26	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Y	FUS	C	8	524.459	22.313	0.043	4.254
Y	FUS	G	8	460.625	15.296	0.033	3.321
Y	FUS	K	8	520.250	11.003	0.021	2.115
Y	FUS	L	8	502.825	4.855	0.010	0.966
Average				502.040	14.803	0.027	2.664

11.65. Y FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD %	Unit
Y	FUS	30	506.14	25.22	5	ppm

Std mean	506.142
SD	25.224
2SD	50.449
3SD	75.673
Std mean+2SD	556.591
Std mean-2SD	455.694
Std mean+3SD	581.815
Std mean-3SD	430.469

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Y	FUS	16.538	1068.185	32.683	13.938	ppm

Comments: 2 results out of 32 were rejected as outliers using z score

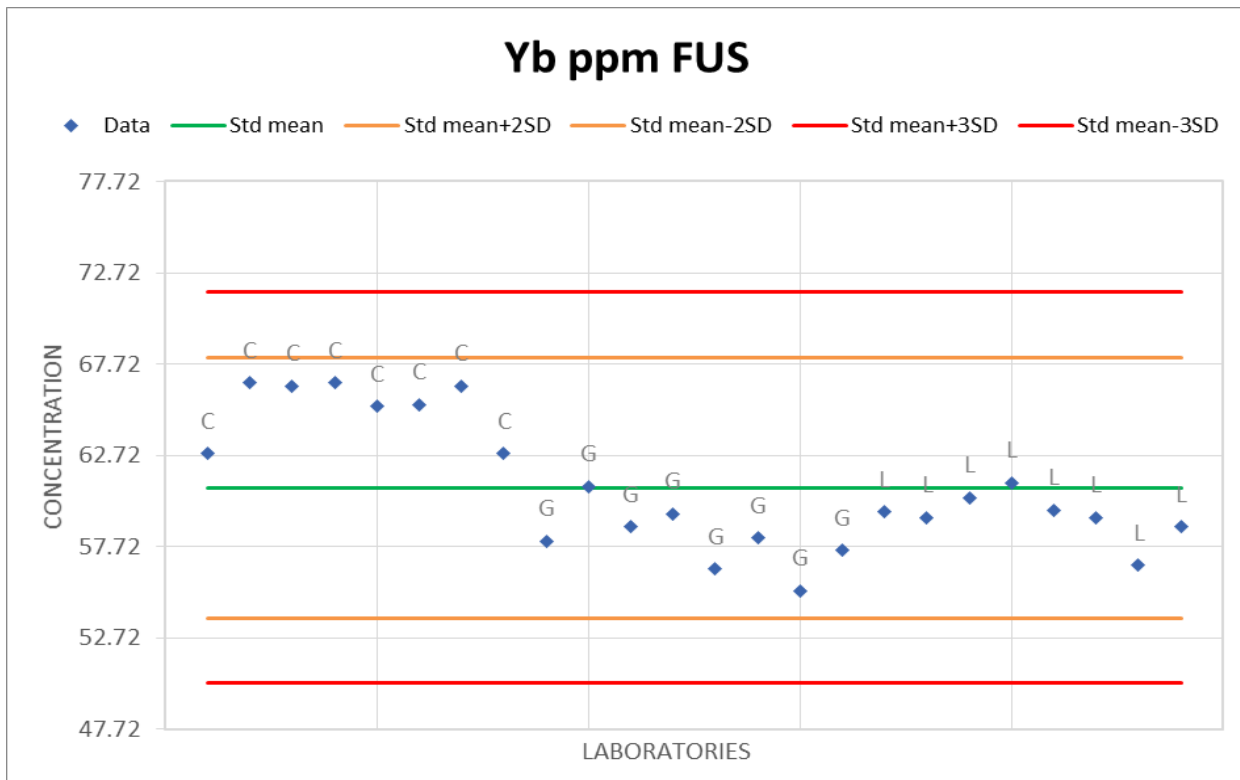
11.66. Yb FUS

Lab_ID	Z_Score	Data
C	0.52	62.80
C	1.61	66.70
C	1.55	66.50
C	1.61	66.70
C	1.25	65.40
C	1.27	65.50
C	1.55	66.50
C	0.52	62.80
G	-0.82	58.00
G	0.02	61.00
G	-0.60	58.80
G	-0.40	59.50
G	-1.24	56.50
G	-0.77	58.20
G	-1.58	55.30
G	-0.96	57.50
L	-0.38	59.60
L	-0.46	59.30
L	-0.15	60.40
L	0.07	61.20
L	-0.35	59.70
L	-0.46	59.30
L	-1.19	56.70
L	-0.60	58.80

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Yb	FUS	24	60.95	3.57	6	ppm

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
Yb	FUS	C	8	65.363	1.661	0.025	2.542
Yb	FUS	G	8	58.100	1.758	0.030	3.026
Yb	FUS	L	8	59.375	1.311	0.022	2.208
Average				60.946	1.589	0.026	2.592

11.66. Yb FUS (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
Yb	FUS	24	60.95	3.57	6	ppm

Std mean	60.946
SD	3.573
2SD	7.145
3SD	10.718
Std mean+2SD	68.091
Std mean-2SD	53.800
Std mean+3SD	71.664
Std mean-3SD	50.228

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
Yb	FUS	3.632	39.256	6.265	1.589	ppm

Comment: No results rejected as outliers using z score. All results are within the mean $\pm 3SD$

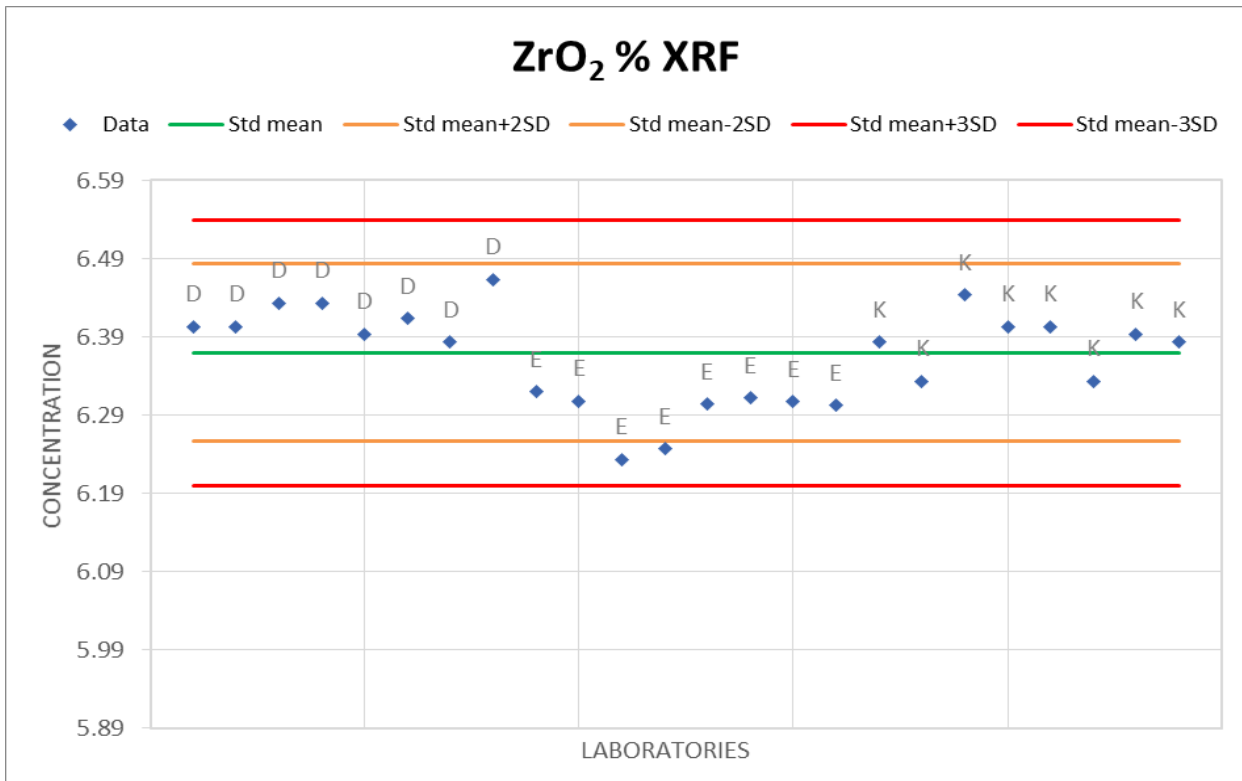
11.67. ZrO₂ XRF

Lab_ID	Z_Score	Data
D	0.63	6.40
D	0.63	6.40
D	1.12	6.43
D	1.12	6.43
D	0.47	6.39
D	0.80	6.41
D	0.31	6.38
D	1.60	6.46
E	-0.71	6.32
E	-0.90	6.30
E	-2.10	6.23
E	-1.90	6.24
E	-0.97	6.30
E	-0.85	6.31
E	-0.92	6.30
E	-0.99	6.30
K	0.31	6.38
K	-0.49	6.33
K	1.28	6.44
K	0.63	6.40
K	0.63	6.40
K	-0.49	6.33
K	0.47	6.39
K	0.31	6.38

Results with outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
ZrO ₂	XRF	24	6.36	0.06	1	%

Between Laboratory Statistics							
Element	Gen Method	Lab ID	N	LAB_Mean	LAB_SD	RSD	RSD_%
ZrO ₂	XRF	D	8	6.413	0.026	0.004	0.406
ZrO ₂	XRF	E	8	6.288	0.032	0.005	0.517
ZrO ₂	XRF	K	8	6.381	0.037	0.006	0.577
Average				6.361	0.032	0.005	0.500

11.67. ZrO₂ XRF (cont.)



Results without outliers						
Element	Gen Method	N	Std_Mean	SD	RSD_%	Unit
ZrO ₂	XRF	23	6.37	0.06	1	%

Std mean	6.366
SD	0.057
2SD	0.113
3SD	0.170
Std mean+2SD	6.480
Std mean-2SD	6.253
Std mean+3SD	6.536
Std mean-3SD	6.196

Measurement of uncertainty						
Element	Gen Method	CSU	BtwnLabVar	BtwnLabSD	WithinLabSD	Unit
ZrO ₂	XRF	0.054	0.009	0.092	0.030	%

Comment: 1 result out of 24 was rejected as an outlier using z-score

End of Report