ERIMSA INTERLABORATORY PROFICIENCY TEST REPORT

DETERMINATION OF METALLIC AND NON-METALLIC ELEMENTS IN QUARTZ SAMPLES

30th EDITION

2022

Erimsa

Polígono Industrial A Grela

C/Copérnico 7- 2º A1

15008, A Coruña

Spain

Contact information

Alejandro Arenosa

Lab Manager

Tel.: +34 683 569 520

E-mail: alejandro.arenosa@erimsa.com

http://erimsa.com/

CONTENTS

LIST OF ABBREVIATIONS

ASTM	American Society for Testing and Materials
Avg	Average
ECLab	Erimsa Central Laboratory
ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
ICP-OES	Inductively Coupled Plasma - Optical Emission Spectrometry
ISO	International Organization for Standardization
ITL	Interlaboratory comparison programme
LL	Lower Limit
LLD	Low Limit Detection
PT	Proficiency Test
RM	Reference Material
SD	Standard Deviation
UL	Upper Limit
XRF	X-Ray Fluorescence

1. INTRODUCTION

Interlaboratory comparison programme (ITL) studies are an essential and very important element of laboratory quality assurance, which allow individual laboratories to compare their analytical results with those from other laboratories while providing them objective standards to perform against. This in turn allows them to demonstrate performance.

One of the core duties of Erimsa Central Laboratory (ECLab) is to organize ITLs which allow Erimsa to includes this programme in its quality assurance system as a service to the customer for the correct and updated control of its product.

2. SCOPE

The scope of this comparison is to test the competence of the appointed laboratories to analyze quartz samples, which once analyzed with the report can be used as an important support tool to improve methods and systems.

The reporting results were assessed following the administrative and logistic procedures of the ECLab Unit in charge of the Erimsa ITL, following the rules for PTs according to ISO 17043:2010 [1].

3. PLANNING

3.1. TIME FRAME

The organization of the Erimsa ITL-21 exercise was launched in January 2021 Samples were sent to participants on March 30, 2021. The deadline reporting of results was set to July 31, 2021.

3.2. CONFIDENTIALITY

The procedures used for the organization of PTs are accredited according to ISO 17043:2011 [1] and guarantee that the identity of the participants and the information provided by them is treated as confidential.

Samples for a new exercise were prepared and homogeneity tests were performed. The samples were dispatched to participants together with instruction letter (Annex 1). An email with an excel file were also send for the compilation of results to be return with the analytical results (Annex 2)

3.3. INTRUCTIONS TO PARTICIPANTS

Detailed instructions were given to participants in the “Test item accompanying letter” mentioned above.

Participants were asked to perform two or three independent measurements, to report their calculated mean (x_i) and the associated standard deviation (u) and the analytical technique used for analysis.

Participants received an individual code to report their measurement results.

Participants were informed that the procedure used for the analysis should resemble as closely as possible their routine procedures for this type of matrix/analytes.

The laboratory codes were given randomly and communicated to the participants by e-mail.

4. TEST MATERIAL

4.1. PREPARATION

The preparation of the material was done by ECLab.

The final powder material was mixed in a rotation mixer for 4 hours.

Portions of 35 g were manually filled into 100 mL transparent bag using acid washed plastic spoons.

Each bag was identified with a unique number of the PT exercise.

4.2. HOMOGENITY ASSESSMENT

For testing interlaboratory comparisons the objective of homogeneity testing is to establish suitably small sample variability, where the samples are sufficiently homogenous.

Homogeneity was evaluated according to ISO 13528:2015 [2] and ISO 5725-2:2019 [3]. The test item proved to be adequately homogeneous for the investigated analytes.

Once the samples have been prepared and packaged, at least 10 samples are selected at random for homogeneity testing. The tests selected are those that are considered to best indicate any significant differences in the samples. All testing is performed at least in duplicate and under repeatability conditions i.e., same laboratory; same operator; same method; over as short a time interval as possible.

For the samples to be accepted as suitable for use, the results of this testing and any applicable statistical analysis (e.g., Anova) of the results must indicate that no significant variability existed. Thus, any outlier results subsequently identified in a program will not be attributable to sample variability.

The samples were tested for homogeneity by ECLab.

The statistical treatment of data was performed by the ECLab. Analysis of Variance F test at α=0.05 was used for check statistically significant differences between proficiency test items.

$$H_0: \mu_1 = \mu_2 = \cdots = \mu_j$$

$$H_1: otherwise$$

The expressions for the calculation of the elements that intervene in the Anova are the following:

$$\bar{x} = \frac{\sum_{j=1}^{k}\sum_{i=1}^{nj} x_{ij}}{n} \quad (1)$$

$$M_b = \frac{\sum_{j=1}^{J} n_j(\bar{x}_j - \bar{x})^2}{J-1} \quad (2)$$

$$M_w = \frac{\sum_{j=1}^{J}\sum_{i=1}^{n_j}(x_{ij} - \bar{x}_j)^2}{n-J} \quad (3)$$

$$F_{J-1,n-J} = \frac{M_b}{M_w} \quad (4)$$

Where,

$\bar{x}$ = is the global average.

M_b = Mean square Between-groups.

M_w = Mean square Within-groups.

Assuming true H_0, this statistic follows a F of Snedecor with J-1 and n-J degrees of freedom; so, given a significance level α, critical region will be determinated by values such that $F > F_{J-1,n-J}^{1-\alpha}$, where $P\left[F > F_{J-1,n-J}^{1-\alpha}\right] = 1 - \alpha$.

Homogeneity was tested for those elements that at least eight laboratories, according ASTM E 691-99 [5], have performed the analysis referenced to historical data of ITL (Annex 1).

4.3. DISTRIBUTION

Each participant received:

- Envelope containing 4 samples of the test items (containing approx. 35 g each);
- The "Test item accompanying letter" (Annex 2);
- The "Confirmation of receipt" form to be sent back to Erimsa-ITL-21 Coordinator after receipt of the test items (Annex 3); and
- The form for reporting the results (Annex 4) (via email).

5. LIST OF PARTICIPANTS

In alphabetical order:

List of participants	Country
AJ Edmon Company	USA
AlexStewart International	Spain
Circe	Spain
CRS Laboratories Oy	Finland
Dorfner Anzaplan	Germany
Elkem ASA Tana	Norway
Elkem Iceland	Iceland
Elkem Technology Lab	Norway
Elkem Yongdeng	China
Erimsa	Spain
Ferroglobe Cuarzos Industriales	Spain
FerroPem LCA	France
Metrohm Hispania	Spain
Norwegian University for Science and Technology (NTNU)	Norway
OFZ	Slovaquia
PCC Bakkisilicon	Iceland
Quebec Silicon LP	Canada
Research Institutes of Sweden (RI.SE)	Sweden
SGS	Netherlands
Simcoa	Australia
SINTEF Norlab AS	Norway
Spectro	Germany
University of A Coruña (UdC)	Spain
University of Santiago de Compostela (USC-RIADT)	Spain
University of Vigo (UVigo)	Spain
Wacker Chemicals Holla AS	Norway
XEAL	Spain

6. EVALUATION OF RESULTS

6.1. APPLIED STATISTICAL DESCRIPTION

The guide to the expression of uncertainty in measurement ISO/IEC Guide 98-3 [4] gives guidance on evaluation measurement uncertainties.

When σ_{pt} is calculated as the standard deviation of participant results, the uncertainty componenets due to inhomogeneity, transport and instability are in large reflected in the variability of participant results.

In this case the assigned value x_{pt} for the proficiency test item is derived as a robust analysis. This algorithm yields robust estimates of the mean and standard deviation of the data to which it is applied according to ISO 13528:2015 [2].

Denote the *p* items of data, sorted into increasing order by,

$$x_{\{1\}}, x_{\{2\}}, \ldots, x_{\{p\}}$$

Denote the robust average and robust standard deviation of these data by x^* and s^*.

Calculate initial values for x^* and s^* as:

x^*= median of x_i (i = 1, 2, ..., p) (5)

s^* = 1.483 median of $|x_i - x^*|$ with (i = 1, 2, ..., p) (6)

Update the values of x^* and s^* as follows. Calculate:

$$\delta = 1.5 s^* \quad (7)$$

For each x_i (i = 1, 2, ..., p), calculate:

$$x_i^* = \begin{cases} x^* - \delta \text{ when } x_i < x^* - \delta \\ x^* + \delta \text{ when } x_i > x^* + \delta \\ x_i \text{ otherwise} \end{cases} \quad (8)$$

Calculate the new values of x^* and s^* from:

$$x^* = \sum_{i=1}^{p} \frac{x_i^*}{p} \quad (9)$$

$$s^* = 1.134 \sqrt{\sum_{i=1}^{p} \frac{(x_i^* - x^*)^2}{(p-1)}} \quad (10)$$

The robust estimates x^* and s^* may be derived by an iterative calculation, i.e., by updating the values of x^* and s^* several times until the process converges.

From this result the assigned value and the standard deviation for reproducibility are obtained.

The standard uncertainty of the assigned value is estimated as:

$$u(x_{pt}) = 1.25 \frac{s^*}{\sqrt{p}} \quad (11)$$

where s^* is the robust standard deviation of the results. (Here a “result” for a participant is the average of all their measurements on the proficiency test item.)

For results reported as "smaller than" (< - values), the reported value was not used in any calculations and no evaluation of the measurement results was made. No scores were given.

Values of x^* and s^* will be displayed when there is more than one result.

6.2. SCORES AND EVALUATION CRITERIA

The individual laboratory performance was expressed in terms of z and z' scores according to ISO 13528:2015 [2]:

$$z = \frac{x_i - x_{pt}}{\sigma_{pt}} \quad (12)$$

Where:

x_i = is the measurement results reported by a participant;

x_{pt} = is the assigned value (calculated mean based on participant's results);

σ_{pt} = is the standard deviation for proficiency test assessment (standard deviation based on participant's results);

According to ISO 13528:2015 [2], when $u(x_{pt}) > 0.3\sigma_{pt}$ the uncertainty of the assigned value ($u(x_{pt})$) can be taken into account by expanding the denominator of the z score and calculating the z' score, as follows:

$$z' = \frac{x_i - x_{pt}}{\sqrt{\sigma_{pt}^2 + u^2(x_{pt})}} \quad (13)$$

Where:

x_i = is the measurement results reported by a participant;

x_{pt} = is the assigned value (calculated mean based on participant's results);

σ_{pt} = is the standard deviation for proficiency test assessment (standard deviation based on participant's results);

$u(x_{pt})$ = is the standard measurement uncertainty of the assigned value.

$$u(x_{pt}) = \sqrt{\frac{\sum_{k=1}^{n}(x_i - x_{pt})^2}{n(n-1)}} \quad (14)$$

The interpretation of the z (or z') performance scores is done according ISO 13528:2015 [2]:

	|score|	≤ 2	Satisfactory performance	
2 <	|score|	< 3	Questionable performance	
	|score|	≥ 3	Unsatisfactory performance	

The z (or z') scores compare the participant's deviation from the assigned value with the standard deviation for proficiency test assessment (σ_{pt}) used as common quality criterion. The scores and charts for those elements that at least eight laboratories, according ASTM E 691-99 [5], have performed the analysis on are shown. The z (or z') scores higher than 100 will not be represented in the charts, since such values completely distort the scales and make it impossible to correctly display the performance of different labs.

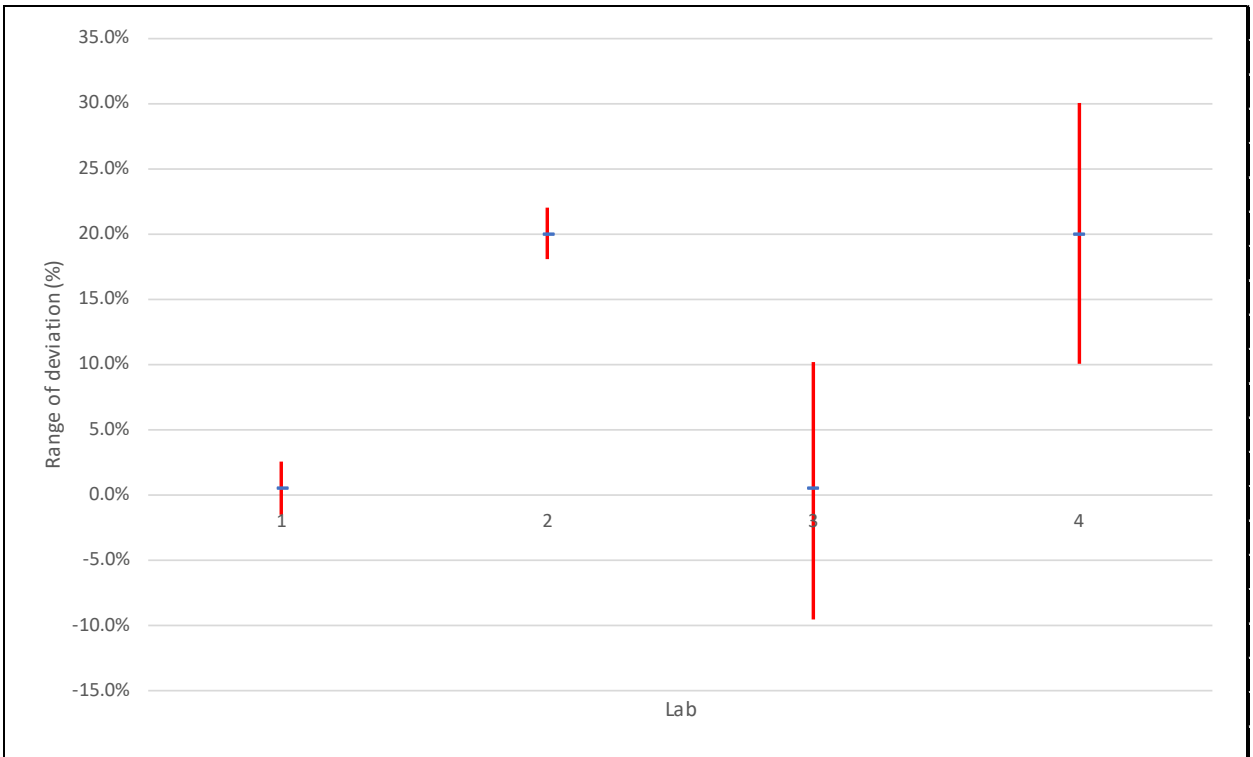
6.3. INTERSAMPLE AVERAGES

Intersamples Average of differences show the trend of the laboratory. The charts show the accuracy (capacity of getting the real value) as the average of the differences, and the precision (capacity of getting the same results on different tests) as the range of deviations (Annex 6).

They can be balanced if some of the differences of the same laboratory and elements are positive and some other are negative if it shows big differences referring to the true analysis.

In this case the intersample standard deviation must be checked, because that means that the above-mentioned laboratory could get analysis too deviated from the real value (the average is considered as the real value in the present study), although in a long term (more analysis) the deviation could be balanced. At any case, even if the average of differences trends to zero, they would never be sure when they are getting the correct result. Usually, this fact is due to random errors which are difficult to solve. They can be due to the method or the equipment used to have not enough precision for the value pretended to be measured.

Example: In the attached chart the intersample averages of an analysis can be seen for four laboratories. In the case of lab 3, the intersample average is 0.5%, however the standard deviation is 10.0%. In such case the differences for the samples A, B, C and D could be something like 20.0%, -22.0%, 12.0% and -16.0%. That is, the analysis varies around +25 and -25 %. Hence the intersample average is 0.5 % even though the individual analysis performed by this lab are more deviated.



Lab	1	2	3	4
Upper Limit	2.5%	-1.5%	0.5%	2.0%
Lower Limit	22.0%	18.0%	20.0%	2.0%
Average	10.2%	-9.5%	0.5%	10.0%
Std. Dev.	30.0%	10.0%	20.0%	10.0%

See the lab 2 analysis in the attached chart where the intersample average of differences is too high, 20.0%, but the standard deviation is only 2.0%.

The opposite situation would take place when a laboratory gets an intersample average considerably far from 0, but the standard deviation of differences is too low. In this case the solution of

the problem seems to be easier, because the lab gets analysis deviated, but the deviation is always the same. This fact usually implies the evidence of systematic error. This kind of error is often easy to solve by finding the fact creating the error or using a correction factor.

Referring to the differences as percentage, they must be considered taking into account the absolute value of the analysis and the accuracy of the equipment used. For instance, a difference of +10% for Fe_2O_3 in a sample with 0.010% Fe_2O_3 means to give 0.011% Fe_2O_3 as a result. This error could be considered as an acceptable precision for the equipment or the purpose of the laboratory depending of its needs and usual products.

Of course, the best situation is to get low intersample average of differences and low standard deviation. Consistently, the worst situation would be to get high intersample average and standard deviation of differences.

6.4. ANALYTICAL METHODS

It has been noticed along the using of the interlab programme that some deviations or trends are shown very often whenever the analytical procedures of the participants labs are the same. Data with average's deviation upper than 1000% will be not represented in charts. In order to get all the participants aware of this fact a new chart displaying the analytical methods/equipments of each element analysis is included in the report (Annex 7).

7. CERTIFICATE VALUES

Referring to this point the aim of this certified value is to offer the possibility of making use of the samples sent as RM to calibrate additionally the equipment of each lab. In order to achieve a certain level of security the uncertainty of each sample was calculated according EURACHEM / CITAC Guide CG 4 [6]. Certified value is obtained as follows:

$$Cv = x_{pt} \pm U \quad (15)$$

Where,

Cv = Certified value;

x_{pt} = is the assigned value (calculated mean based on participant's results);

U = Expanded Uncertainty

The expanded uncertainty provides an interval within which the value of the measurand is believed to lie with a higher level of confidence. U is obtained as follows:

$$U = k * u_{pt} \quad (16)$$

Where,

k = is a factor depending of the level of confidence and the number of the data used and it is equivalent to t-Student for 95% confidence range.

u_{pt} = is the standard uncertainty of the sample, and it is calculated as follows:

$$u_{pt} = \frac{\sigma_{pt}}{\sqrt{n}} \quad (17)$$

Where,

σ_{pt} = is the standard deviation for proficiency test assessment (standard deviation based on participant's results);

n = number of data performed for each sample and analysis.

With this certified value the samples can be used as a comparison system but not as exclusive calibration standard samples (Annex 8).

8. REFERENCES

[1] ISO/IEC 17043 *"Conformity assessment – General requirements for proficiency testing"*, issued by ISO-Geneva (CH), International Organization for Standardization, 2010.

[2] ISO 13528:2015 *"Statistical methods for use in proficiency testing by interlaboratory comparisons"*, issued by ISO-Geneva (CH), International Organization for Standardization, 2015.

[3] ISO 5725-2:2019 *"Accuracy (trueness and precision) of measurement method sand results"*. *Part2: Basic methods for determination of repeatability and reproducibility of a standard measurement method*, issued by ISO-Geneva (CH), International Organization for Standardization, 2019.

[4] ISO/IEC Guide 98-3 *"Uncertainty of measurement". Part3: Guide to the expression of uncertainty in measurement*, issued by ISO-Geneva (CH), International Organization for Standardization, 2008.

[5] ASTM E 691-99, *"Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method"*.

[6] EURACHEM / CITAC Guide CG 4 *"Quantifying Uncertainty in Analytical Measurement"*.

ANNEX 1: HOMOGENEITY

	Al_2O_3		Fe_2O_3		TiO_2		CaO		Na_2O	
	%		%		%		%		%	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
1	0.931	0.961	0.036	0.038	259.73	253.06	0.008	0.008	0.005	0.004
2	0.828	0.909	0.034	0.037	246.36	244.05	0.008	0.008	0.005	0.004
3	0.920	0.941	0.035	0.037	250.21	252.35	0.009	0.008	0.005	0.005
4	0.930	0.986	0.035	0.037	258.31	255.51	0.009	0.009	0.005	0.005
5	0.936	0.983	0.035	0.038	257.41	259.75	0.008	0.009	0.005	0.005
6	0.930	0.979	0.035	0.037	248.23	257.38	0.008	0.009	0.005	0.005
7	0.918	0.979	0.035	0.037	249.62	250.50	0.008	0.008	0.005	0.005
8	0.912	0.968	0.036	0.037	262.29	254.91	0.008	0.008	0.005	0.004
9	0.949	0.933	0.036	0.037	260.40	223.22	0.008	0.009	0.005	0.005
10	1.015	0.989	0.035	0.038	252.04	217.95	0.009	0.009	0.005	0.005
M_b	0.003195928		9.59051E-06		144.1170951		1.29907E-07		6.31097E-07	
M_w	0.494034658		0.000659322		30226.3642		4.20019E-05		1.53282E-05	
F	0.006		0.015		0.005		0.003		0.041	
F_{crit}	3.592		3.592		3.592		3.592		3.592	
Sample A	passed		passed		passed		passed		passed	

	Al_2O_3		Fe_2O_3		TiO_2		CaO		Na_2O	
	%		%		%		%		%	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
1	0.088	0.092	0.034	0.035	19.840	21.001	0.001	0.002	0.088	0.092
2	0.087	0.091	0.034	0.036	18.896	18.446	0.001	0.002	0.087	0.091
3	0.090	0.091	0.033	0.036	18.824	19.836	0.001	0.002	0.090	0.091
4	0.090	0.090	0.034	0.036	20.682	18.387	0.002	0.002	0.090	0.090
5	0.090	0.092	0.033	0.035	20.294	19.236	0.001	0.002	0.090	0.092
6	0.087	0.090	0.033	0.036	19.262	19.132	0.002	0.002	0.087	0.090
7	0.088	0.091	0.035	0.037	18.862	19.258	0.001	0.002	0.088	0.091
8	0.089	0.091	0.033	0.037	18.470	19.784	0.001	0.002	0.089	0.091
9	0.089	0.089	0.034	0.036	20.134	18.611	0.001	0.002	0.089	0.089
10	0.088	0.089	0.035	0.036	21.941	18.339	0.001	0.002	0.088	0.089
M_b	7.90732E-06		1.1221E-05		0.669377905		1.92086E-06		2.99333E-08	
M_w	0.004152661		0.000683493		179.1573196		1.0155E-06		4.51872E-06	
F	0.002		0.016		0.004		1.892		0.007	
F_{crit}	3.592		3.592		3.592		3.592		3.592	
Sample B	passed		passed		passed		passed		passed	

	Al_2O_3		Fe_2O_3		TiO_2		CaO		Na_2O	
	%		%		%		%		%	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
1	0.038	0.040	0.074	0.079	20.177	17.973	0.014	0.015	0.008	0.007
2	0.040	0.039	0.077	0.077	17.516	18.649	0.014	0.015	0.007	0.007
3	0.038	0.039	0.076	0.077	20.763	17.765	0.014	0.014	0.007	0.007
4	0.038	0.041	0.074	0.080	17.040	19.157	0.015	0.015	0.007	0.007
5	0.037	0.041	0.079	0.077	17.911	18.562	0.015	0.015	0.007	0.007
6	0.039	0.040	0.075	0.076	17.522	18.943	0.015	0.015	0.007	0.007
7	0.039	0.040	0.074	0.076	18.167	18.801	0.014	0.015	0.007	0.007
8	0.038	0.040	0.076	0.078	20.376	18.057	0.015	0.015	0.007	0.007
9	0.038	0.039	0.076	0.079	17.245	21.081	0.014	0.015	0.007	0.007
10	0.038	0.040	0.075	0.077	21.137	19.444	0.014	0.014	0.007	0.007
M_b	6.25666E-06		8.55618E-06		0.008385932		2.10903E-07		3.7375E-09	
M_w	0.000738578		0.003358541		185.1857899		0.000129281		3.30038E-05	
F	0.008		0.003		0.000		0.002		0.000	
F_{crit}	3.592		3.592		3.592		3.592		3.592	
Sample C	passed		passed		passed		passed		passed	

	Al_2O_3		Fe_2O_3		TiO_2		CaO		Na_2O	
	%		%		%		%		%	
	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
1	0.240	0.237	0.019	0.017	20.039	22.335	0.006	0.007	0.004	0.004
2	0.238	0.239	0.017	0.018	19.953	20.951	0.007	0.007	0.004	0.004
3	0.237	0.239	0.019	0.018	20.890	21.356	0.007	0.007	0.004	0.004
4	0.216	0.239	0.016	0.022	20.065	20.588	0.006	0.007	0.004	0.004
5	0.227	0.238	0.016	0.018	18.725	21.664	0.006	0.007	0.003	0.004
6	0.232	0.235	0.016	0.017	20.339	23.605	0.006	0.007	0.004	0.004
7	0.231	0.239	0.015	0.018	18.625	22.864	0.005	0.007	0.003	0.004
8	0.231	0.231	0.015	0.018	19.323	21.887	0.006	0.007	0.003	0.004
9	0.230	0.242	0.016	0.018	19.580	21.419	0.006	0.007	0.003	0.004
10	0.233	0.232	0.015	0.015	19.242	20.877	0.006	0.070	0.004	0.004
M_b	7.29546E-05		3.72741E-06		10.7794969		0.000123633		3.56952E-07	
M_w	0.031050743		0.000142771		244.2130088		0.000230093		1.22975E-05	
F	0.002		0.026		0.044		0.537		0.029	
F_{crit}	3.592		3.592		3.592		3.592		3.592	
Sample D	passed		passed		passed		passed		passed	

ANNEX 2: TEST ITEM ACCOMPANYING LETTER

A Coruña, 31 January 2022

<<Title>> <<Firstname>> <<Surname>>
<<Organisation>>
<<Department>>
<<Address>>
<< Address 2>>
<<Zip>> <<Town>>
<<Country>>

Subject: Participation in Erimsa Interlaboratory comparison programme (Erimsa-ITL-22)

Dear <<Title>> <<Surname>>,

Thank you for participation in the Erimsa-ITL-21 Interlaboratory comparison programme.

The parcel you receive contains, in addition to this letter:

- 4 samples of the test item (approx. 35 g each); and
- The "Confirmation of receipt" form.

Upon arrival of this parcel, please check whether the test item is undamaged after transport, and send us by email the "Confirmation of receipt" form at your earliest convenience.

The procedure used for the analyses should resemble as closely as possible the one you use in routine analyses.

Perform two or three independent measurements and report:

- the mean of your two or three measurements results,
- the associated standard deviation,
- the analytical technique used.

Excel file to report the results will be sent to email. In case you have not received them or the file is damaged, please contact to us as soon as possible.

The deadline for submission of results is **July 31, 2022**.

Your participation in this project is greatly appreciated.

Do not to hesitate to contact us, in case of questions/doubts,

Yours sincerely,

/signed electronically /

Alejandro Arenosa

Lab Manager, Erimsa-ITL-22 Coordinator

ANNEX 3: CONFIRMATION OF RECEIPT

A Coruña, 31 January 2022

Attn.: <<Title>> <<Firstname>> <<Surname>>
<<Organisation>>
<<Department>>
<<Address>>
<< Address 2>>
<<Zip>> <<Town>>
<<Country>>

Subject: "Confirmation receipt" form Erimsa Interlaboratory comparison programme (Erimsa-ITL-22)

Please return this form at your earliest convenience, to confirm that the package arrived well. If samples are damaged, mention it under "Remarks" and contact us as soon as possible.

Date of package arrival _____

Remarks _____

_____

Signature _____

Thank you for returning this form by email to:

Mr. Alejandro Arenosa

Lab Manager, Erimsa-ITL-22 Coordinator

e-mail: alejandro.arenosa@erimsa.com

ANNEX 4: FORM FOR REPORTING THE RESULTS

Interlab 2022 LabX Sample A
Main Elements

Element	Units	Average	StdDev	Ner Data
Al_2O_3	%			
As_2O_3	%			
B_2O_3	%			
BaO_2	%			
Bi_2O_3	%			
CaO	%			
CdO	%			
CoO	%			
Cr_2O_3	%			
CuO	%			
Fe_2O_3	%			
K_2O	%			
La_2O_3	%			
LOI	%			
MgO	%			
MnO	%			
MoO_3	%			
Na_2O	%			
NiO	%			
P_2O_5	%			
PbO	%			
Sb_2O_3	%			
SiO_2	%			
SnO_2	%			
SrO	%			
TiO_2	%			
V_2O_5	%			
ZnO	%			
ZrO_2	%			

Additional Elements

Element	Units	Average	StdDev	Ner Data
	%			
	%			
	%			
	%			
	%			

ANNEX 5

ANNEX 5.1. MEASUREMENTS SAMPLE A

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
x_{pt}	0.9868	0.0392	0.0242	0.0093	0.0054	0.0847	0.0224	5.39	21.25	1.33
σ_{pt}	0.1079	0.0084	0.0027	0.0029	0.0024	0.0098	0.0065	1.82	8.80	0.65
N	27	27	26	27	23	28	25	19	20	6

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
Lab 1	0.9283	0.0376	0.0223	0.0081	0.0030	0.0831	0.0190	4.0	19.9	1.1
Lab 2	1.0957	0.0382	0.0259	0.0099	0.0053	0.0961	0.0252	4.3	19.4	
Lab 3	0.9352	0.0369	0.0227	0.0083	0.0023	0.0807	0.0181	4.0	15.1	0.8
Lab 4										
Lab 5	1.1190	0.0520	0.0240	0.0102	0.0051	0.0870	0.0251	10.0	37.0	
Lab 6	1.0269	0.0350	0.0242	0.0047	0.0049	0.0830	0.0221	4.0	15.0	1.0
Lab 7	0.8730	0.0320	0.0221	0.0076	0.0045	0.0869	0.0216	3.7	14.0	
Lab 8										
Lab 9	0.9337	0.0452	0.0258	0.0094	0.0065	0.0799	0.0226	6.0	11.0	
Lab 10	0.1061		0.0026	0.0071	0.0023	0.0481	0.0084			
Lab 11	0.9662	0.0417	0.0268	0.0049	0.0021	0.0800	0.0181	9.0	18.0	
Lab 12	0.8965	0.0257	0.0235	0.0063			0.0186			
Lab 13										
Lab 14	0.9950	0.0490	0.0260	0.0300	0.0340	0.0540	0.0730		60.0	
Lab 15	0.9880	0.0460	0.0220	0.0130		0.0470	0.0420			
Lab 16	0.9027	0.0374	0.0245	0.0087	0.0058	0.0974	0.0178		23.0	
Lab 17	0.9057	0.0360	0.0255	0.0100	0.0079	0.0778	0.0250	3.8	14.0	1.1
Lab 18	0.6750	0.0320	0.0220	0.0040	0.0484	0.0850	0.0100		20.0	
Lab 19										
Lab 20	1.4240	0.0478	0.0334	0.0184	0.0039	0.1060	0.0231	17.0	105.0	
Lab 21	1.0053	0.0373	0.0254	0.0100	0.0055	0.0801	0.0259	4.5	20.8	6.6
Lab 22										
Lab 23	0.9800	0.0340	0.0250	0.0110	0.0031	0.0760			13.0	
Lab 24	1.0166	0.0364	0.0235	0.0047	0.0045	0.0878	0.0230	4.3	14.5	
Lab 25	0.9957	0.0219	0.0182	0.0093		0.0852	0.0136			
Lab 26	1.4250	0.0315	0.0226	0.0361	0.0138	0.1039	0.0263	6.7		
Lab 27		0.0300	0.0240		0.0044	0.0850	0.0110	4.2		
Lab 28	0.8500	0.0390	0.0270	0.0110		0.0798		4.1	19.7	
Lab 29										
Lab 30		0.0899		0.0070		0.0833				
Lab 31	1.1900	0.0700	0.0300	0.0200	0.0200	0.1500	0.0400	100.0		
Lab 32	0.9985	0.0530	0.0310	0.0145	0.0090	0.0670	0.0280	10.0	30.0	
Lab 33	1.0569	0.0396		0.0090	0.0058	0.0913	0.0264	7.2		4.5
Lab 34	1.0300	0.0420	0.0180	0.0085	0.0060	0.0930	0.0257	6.0	23.0	
Lab 35	1.0498					0.7556			10638	

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	2.25	7.26	2.25	16.14	5.59	1.46	2.05	10.36	92.23	1.83
σ_{pt}	0.61	1.17	1.25	19.96	1.64	0.89	2.17	2.31	147.57	1.83
N	9	9	12	9	13	8	4	16	2	14

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lab 1	2.1	6.5	1.5		5.0	0.8	0.4	10.1	0.2	6.3
Lab 2		7.8	2.0		4.3			8.8		
Lab 3										3.8
Lab 4										
Lab 5										
Lab 6		7.0	1.0		4.0			9.0		
Lab 7								8.1		
Lab 8										
Lab 9										7.2
Lab 10										
Lab 11										7.0
Lab 12										
Lab 13										
Lab 14										
Lab 15								40.0		
Lab 16										
Lab 17	1.8	7.1	1.4	0.8	4.8	0.7		8.7		0.7
Lab 18										
Lab 19										
Lab 20				40.0	29.0			34.0		
Lab 21	2.0		4.5	6.0	7.1	4.8	0.4	9.9		0.7
Lab 22										
Lab 23										
Lab 24	2.1		1.8		4.5			8.8		0.6
Lab 25		23.0		80.0						
Lab 26	6.2	7.1	2.0	1.2	5.1	1.0		10.5	184.3	0.6
Lab 27	1.8	6.9	1.0		4.0	1.0		10.0		1.0
Lab 28	1.7	1.5	1.7	1.1	4.7	1.3		11.4		
Lab 29										
Lab 30				956.0				67.0		2018.2
Lab 31			100.0							0.0
Lab 32	70.0	10.0	70.0	50.0	90.0	10.0	4.0	6.0		1.0
Lab 33	6.5		5.1	7.2	6.7	3.9	3.4	13.3		0.9
Lab 34								10.0		0.7
Lab 35					123.5					

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	25.98	41.96	7.13	3.40	990.00	11.41	2.61	16.93	10.56	5.04
σ_{pt}	19.44	45.48	8.85	5.27		8.73	2.44	17.18	15.14	7.96
N	2	4	4	2	1	10	6	4	2	2

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lab 1	13.9	18.8	1.6	6.7	<1.7	30.1				
Lab 2										
Lab 3										
Lab 4										
Lab 5		100.0								
Lab 6										
Lab 7										
Lab 8										
Lab 9		12.0				19.0				
Lab 10										
Lab 11						15.0				
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	38.1		0.1			3.7	0.7			
Lab 18										
Lab 19										
Lab 20		37.0								
Lab 21						5.7		12.1		
Lab 22										
Lab 23										
Lab 24						3.8				
Lab 25										
Lab 26				0.1		7.7	3.3	0.2	1.1	0.1
Lab 27						4.7	0.7			
Lab 28							0.8			
Lab 29										
Lab 30					990.0		368.0			
Lab 31										
Lab 32			280.0			20.0		19.0	20.0	10.0
Lab 33								206.2		
Lab 34			10.0			10.0				
Lab 35							234.9			

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
x_{pt}	1.42	1.83	0.70	706.23	50.49	1.40	1783.00	11931	0.0126	0.7233	0.5014	98.4154
σ_{pt}	0.48			1120.63	79.41						0.0361	0.6438
N	7	1	1	2	2	1	1	1	1	1	7	15

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
Lab 1											0.4799	98.9547
Lab 2												
Lab 3												
Lab 4												
Lab 5												98.6720
Lab 6												
Lab 7												98.9500
Lab 8												
Lab 9												98.8650
Lab 10												
Lab 11											0.5000	98.8500
Lab 12												
Lab 13												
Lab 14											0.4900	98.2800
Lab 15											0.5400	98.2500
Lab 16												
Lab 17	1.1					1.4						
Lab 18												
Lab 19												
Lab 20									0.0126			95.2600
Lab 21	1.2											59.6853
Lab 22												
Lab 23												
Lab 24	1.0											
Lab 25	73.0										0.5000	98.0460
Lab 26		1.8	0.7	7.5	1.0							
Lab 27												
Lab 28	1.2											98.8000
Lab 29												
Lab 30				1405.0			1783.0	11931.0		0.7233		94.1630
Lab 31											0.4200	98.2900
Lab 32	10.0				100.0						0.7040	97.8900
Lab 33	1.8											
Lab 34												97.8800
Lab 35												

ANNEX 5.1.1. Z-SCORE SAMPLE A

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5
Lab 1	-0.5	-0.2	-0.7	-0.4	-1.0	-0.2	-0.5	-0.7	-0.1
Lab 2	1.0	-0.1	0.6	0.2	-0.1	1.2	0.4	-0.6	-0.2
Lab 3	-0.5	-0.3	-0.6	-0.3	-1.3	-0.4	-0.7	-0.8	-0.7
Lab 4									
Lab 5	1.2	1.5	-0.1	0.3	-0.1	0.2	0.4	2.5	1.8
Lab 6	0.4	-0.5	0.0	-1.6	-0.2	-0.2	0.0	-0.8	-0.7
Lab 7	-1.1	-0.9	-0.8	-0.6	-0.4	0.2	-0.1	-0.9	-0.8
Lab 8									
Lab 9	-0.5	0.7	0.6	0.0	0.4	-0.5	0.0	0.3	-1.2
Lab 10	-8.2		-7.9	-0.8	-1.3	-3.7	-2.2		
Lab 11	-0.2	0.3	1.0	-1.5	-1.4	-0.5	-0.7	2.0	-0.4
Lab 12	-0.8	-1.6	-0.3	-1.0			-0.6		
Lab 13									
Lab 14	0.1	1.2	0.7	7.0	11.8	-3.1	7.8		4.4
Lab 15	0.0	0.8	-0.8	1.2		-3.8	3.0		
Lab 16	-0.8	-0.2	0.1	-0.2	0.2	1.3	-0.7		0.2
Lab 17	-0.8	-0.4	0.5	0.2	1.0	-0.7	0.4	-0.9	-0.8
Lab 18	-2.9	-0.9	-0.8	-1.8	17.8	0.0	-1.9		-0.1
Lab 19									
Lab 20	4.1	1.0	3.4	3.1	-0.6	2.2	0.1	6.4	9.5
Lab 21	0.2	-0.2	0.5	0.2	0.0	-0.5	0.5	-0.5	0.0
Lab 22									
Lab 23	-0.1	-0.6	0.3	0.6	-1.0	-0.9			-0.9
Lab 24	0.3	-0.3	-0.3	-1.6	-0.4	0.3	0.1	-0.6	-0.8
Lab 25	0.1	-2.1	-2.2	0.0		0.0	-1.4		
Lab 26	4.1	-0.9	-0.6	9.1	3.5	2.0	0.6	0.7	
Lab 27		-1.1	-0.1		-0.4	0.0	-1.8	-0.7	
Lab 28	-1.3	0.0	1.0	0.6		-0.5		-0.7	-0.2
Lab 29									
Lab 30		6.0		-0.8		-0.1			
Lab 31	1.9	3.7	2.1	3.6	6.0	6.6	2.7	51.9	
Lab 32	0.1	1.6	2.5	1.8	1.5	-1.8	0.9	2.5	1.0
Lab 33	0.6	0.0		-0.1	0.2	0.7	0.6	1.0	
Lab 34	0.4	0.3	-2.3	-0.3	0.2	0.8	0.5	0.3	0.2
Lab 35	0.6					68.2			1206.9

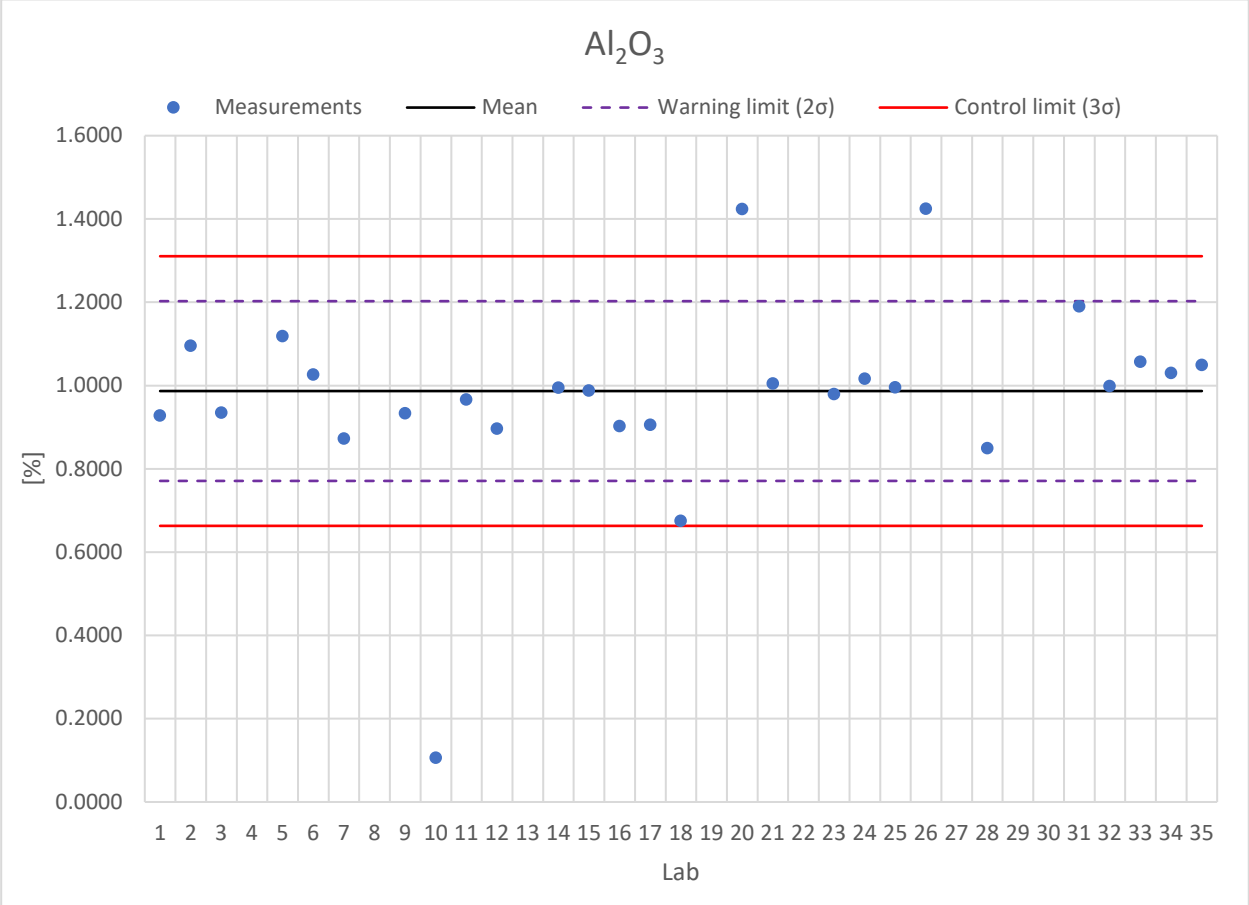
Satisfactory performance
Questionable performance
Unsatisfactory performance

ANNEX 5.1.2. Z'-SCORE SAMPLE A

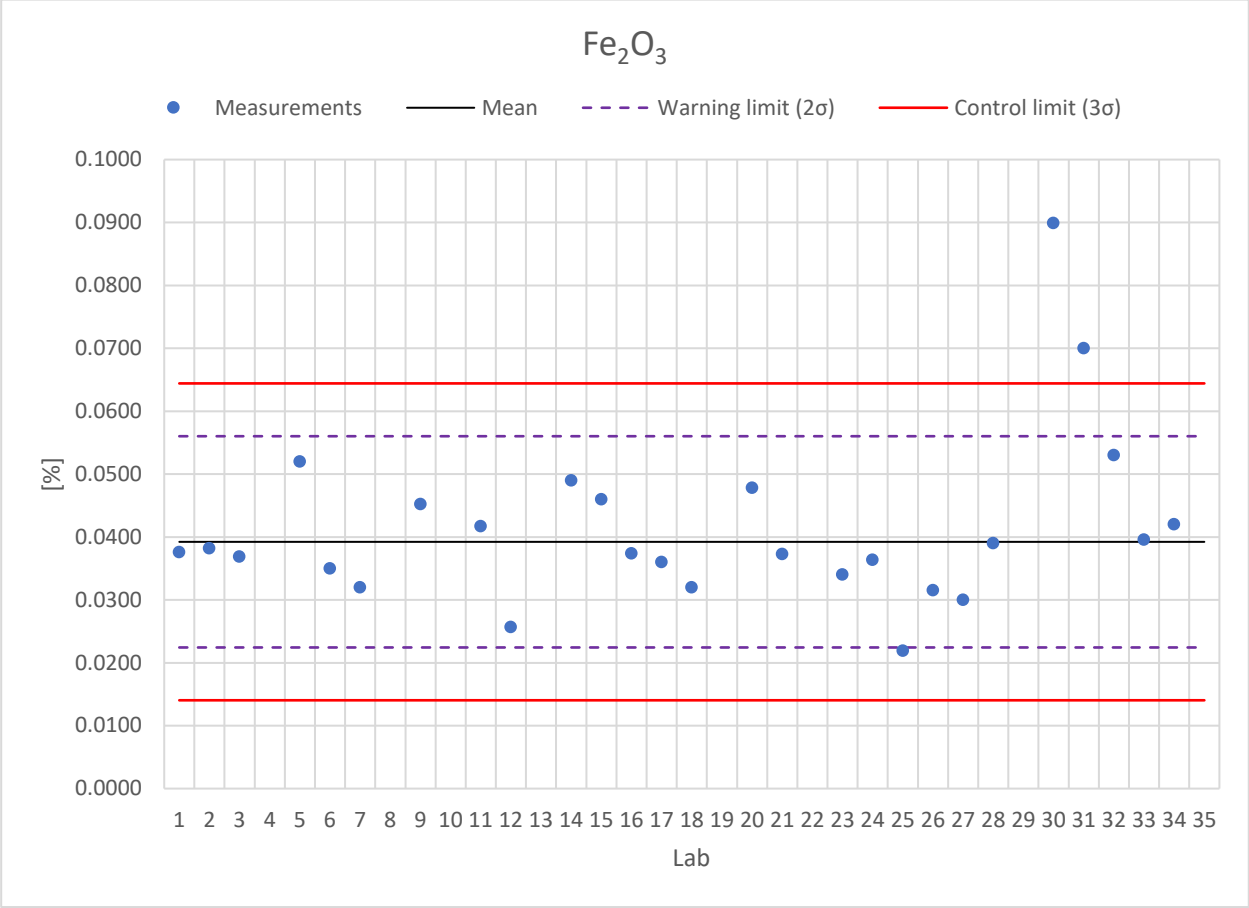
	ZnO	V_2O_5	NiO	PbO	CuO	CoO	Cr_2O_3	BaO	ZrO_2	SiO_2
Lab 1	-0.2	-0.6	-0.6		-0.4	-0.8	-0.1	2.4	2.1	0.8
Lab 2		0.5	-0.2		-0.8		-0.7			
Lab 3								1.1		
Lab 4										
Lab 5										0.4
Lab 6		-0.2	-1.0		-1.0		-0.6			
Lab 7							-1.0			0.8
Lab 8										
Lab 9								2.9	0.9	0.7
Lab 10										
Lab 11								2.8	0.4	0.7
Lab 12										
Lab 13										
Lab 14										-0.2
Lab 15							12.8			-0.3
Lab 16										
Lab 17	-0.7	-0.1	-0.7	-0.8	-0.5	-0.9	-0.7	-0.6	-0.9	
Lab 18										
Lab 19										
Lab 20				1.2	14.2		10.2			-4.9
Lab 21	-0.5		1.8	-0.5	0.9	3.8	-0.2	-0.6	-0.6	-60.2
Lab 22										
Lab 23										
Lab 24	-0.2		-0.4		-0.7		-0.7	-0.7	-0.9	
Lab 25		13.4		3.2						-0.6
Lab 26	6.4	-0.1	-0.2	-0.8	-0.3	-0.6	0.1	-0.6	-0.4	
Lab 27	-0.7	-0.3	-1.0		-1.0	-0.5	-0.2	-0.5	-0.8	
Lab 28	-0.9	-4.9	-0.4	-0.8	-0.5	-0.2	0.5			0.6
Lab 29										
Lab 30				47.1			24.5	1101.7		-6.6
Lab 31			78.3					-1.0		-0.2
Lab 32	110.4	2.3	54.3	1.7	51.4	9.6	-1.9	-0.5	1.0	-0.8
Lab 33	6.9		2.3	-0.4	0.7	2.8	1.3	-0.5		
Lab 34							-0.2	-0.6	-0.2	-0.8
Lab 35					71.7					

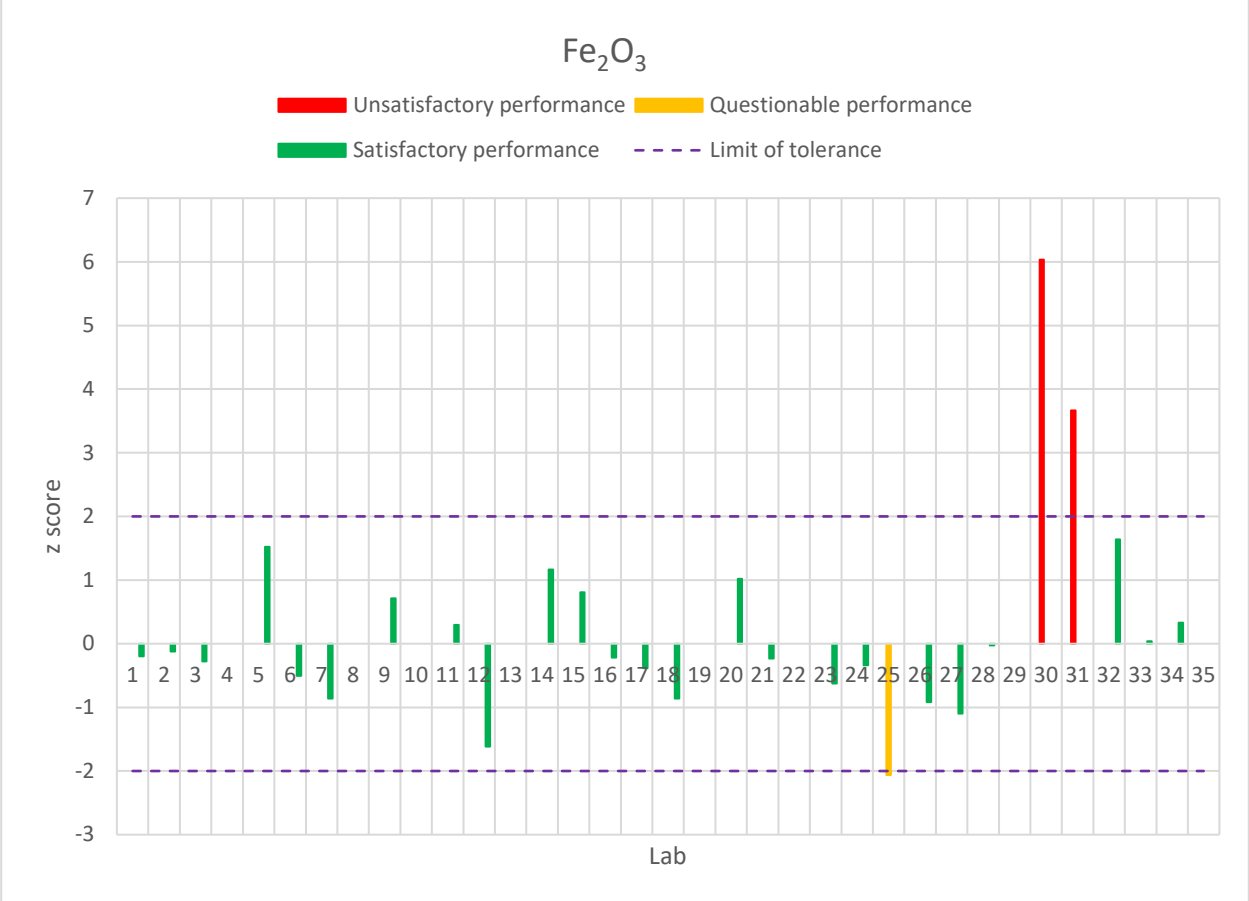
Satisfactory performance
Questionable performance
Unsatisfactory performance

ANNEX 5.1.3. CHARTS SAMPLE A

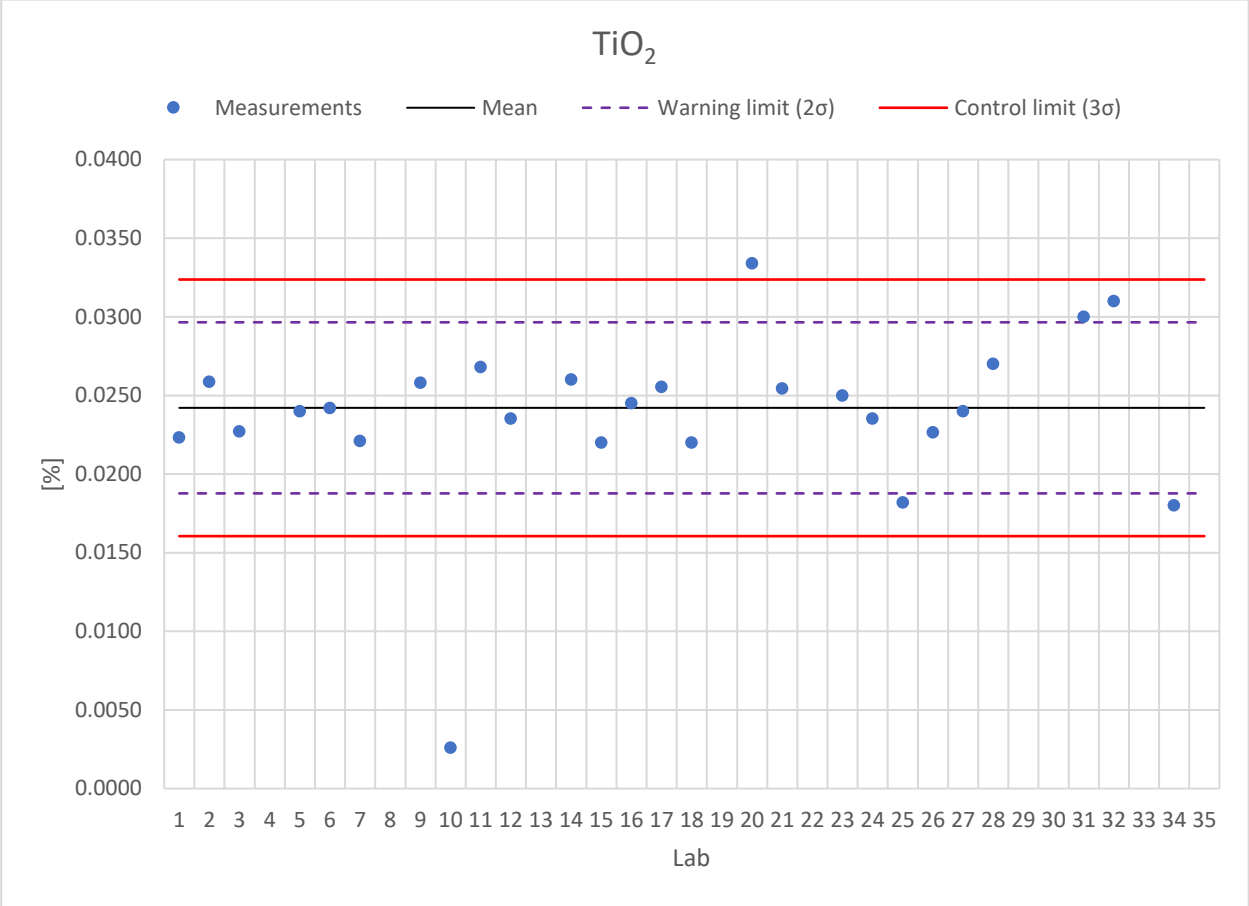


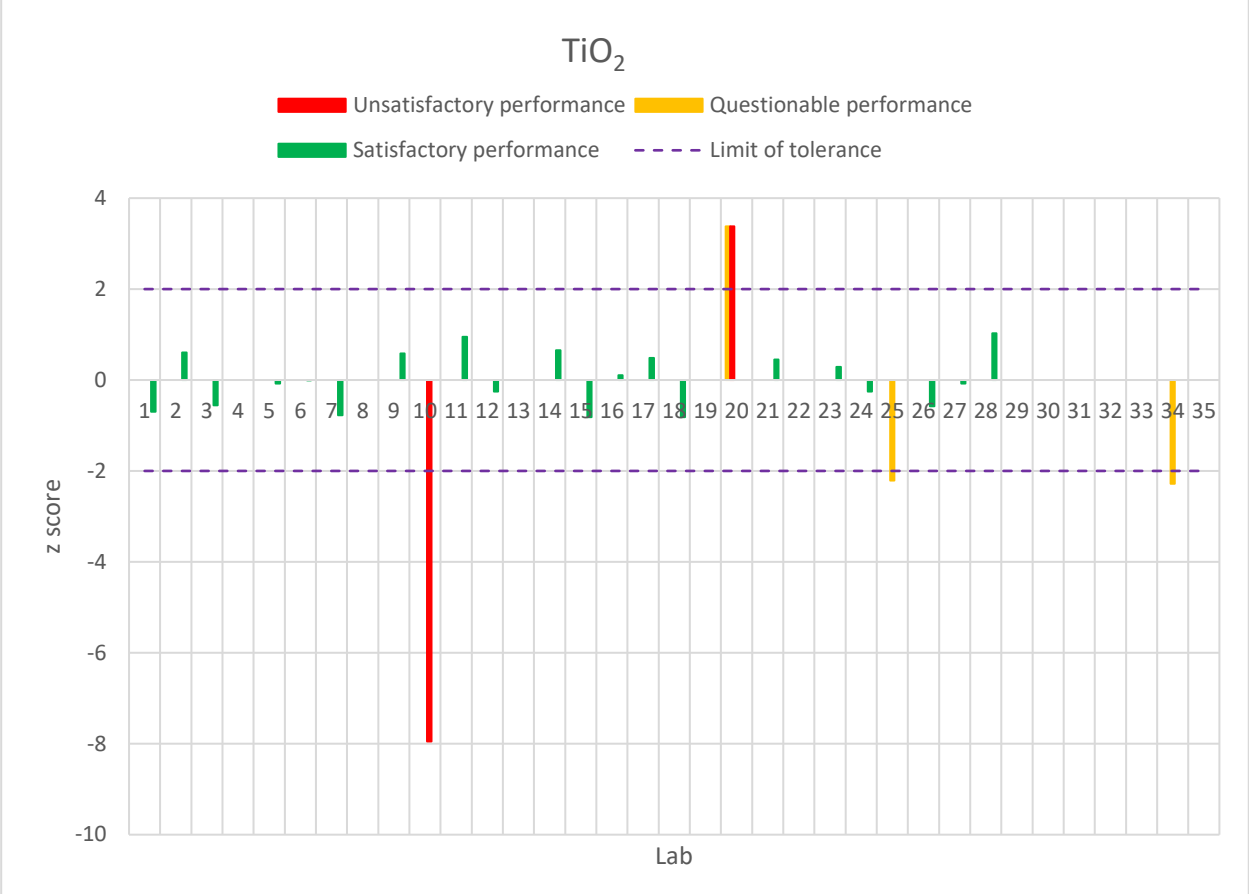
CHARTS SAMPLE A



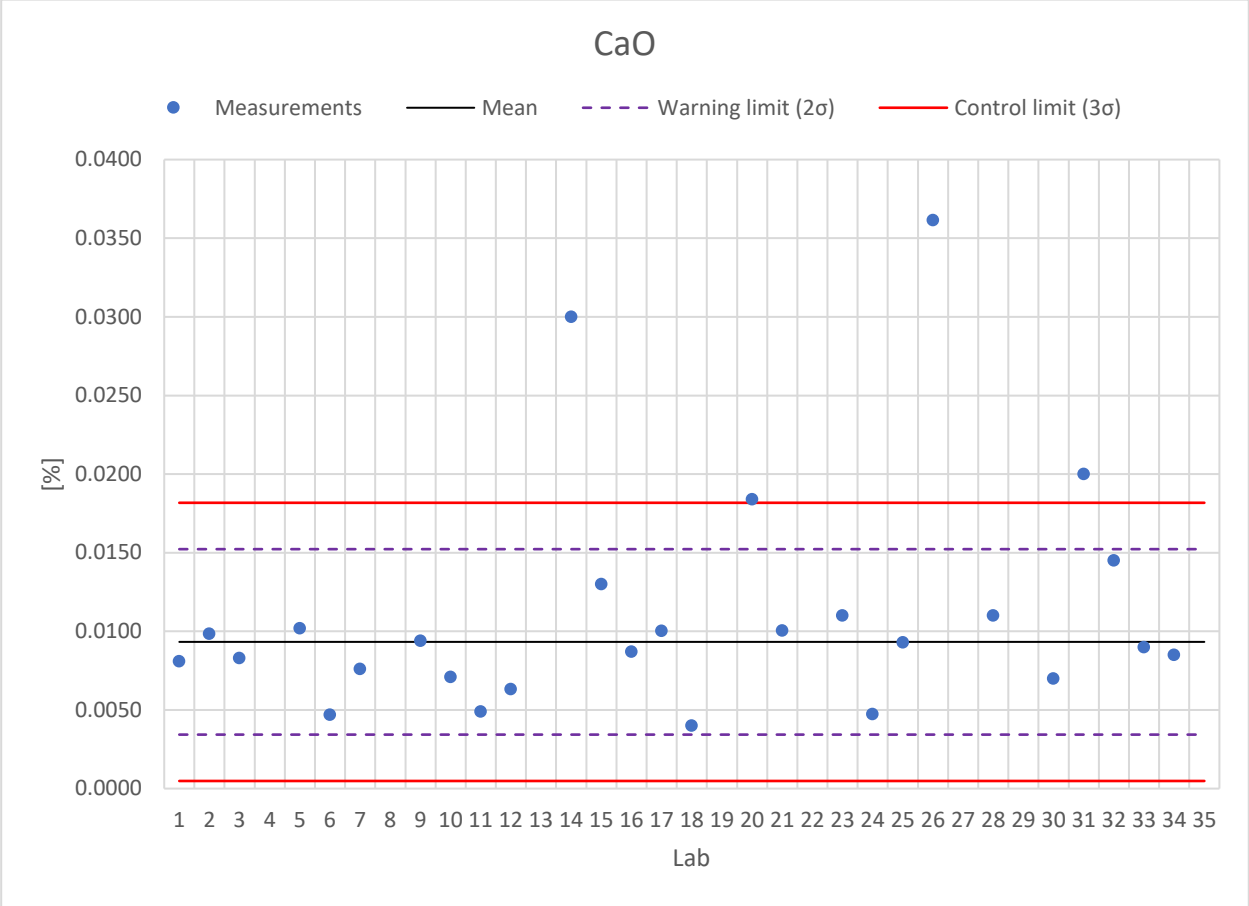


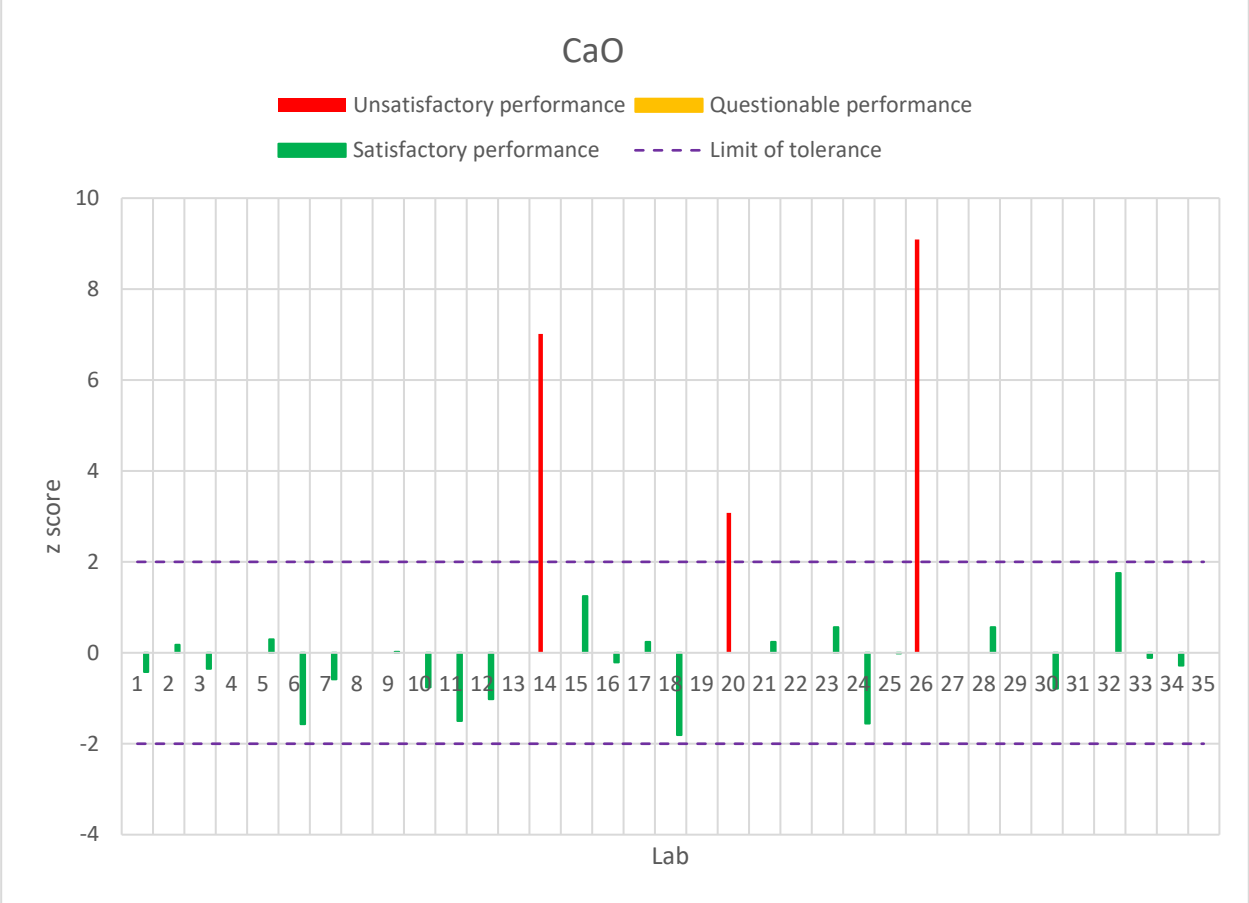
CHARTS SAMPLE A



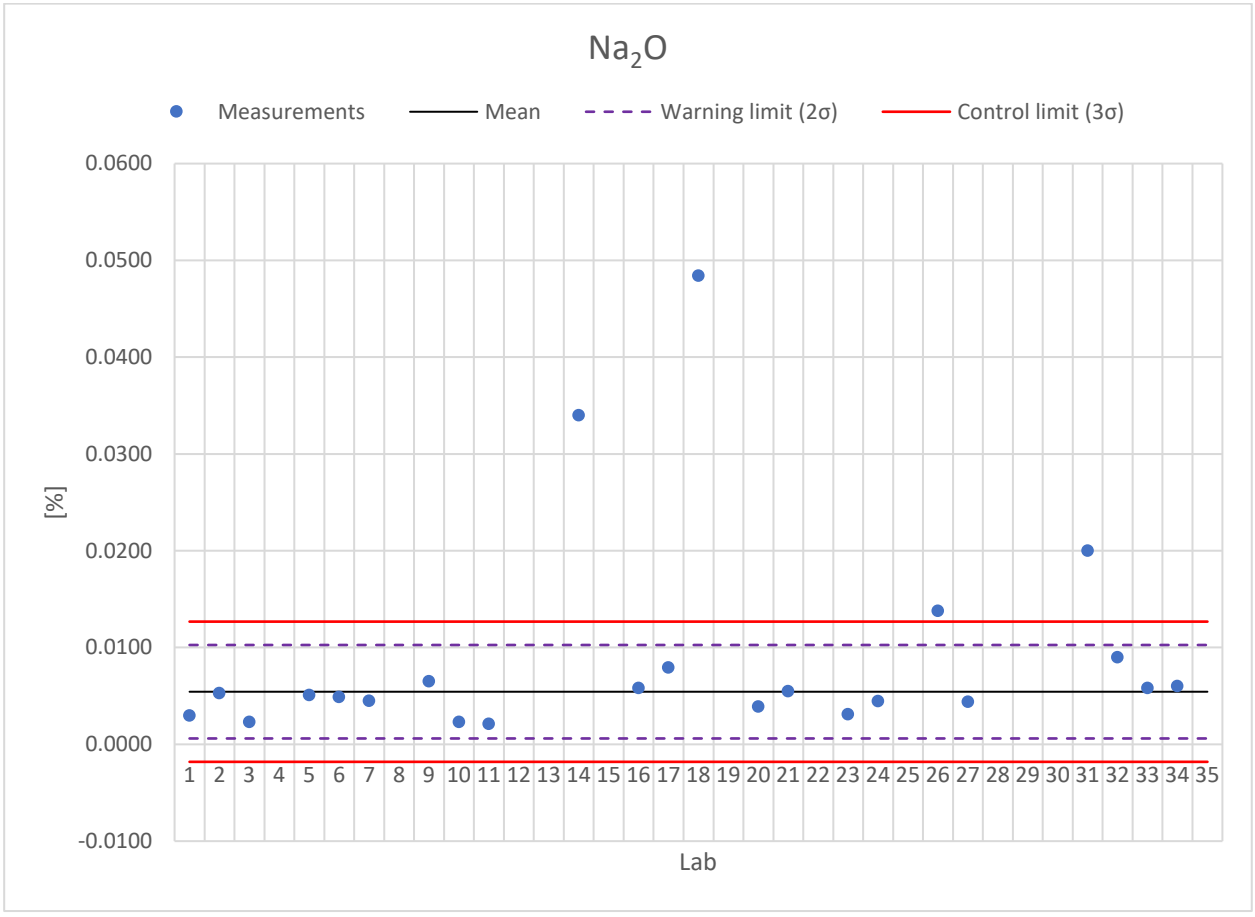


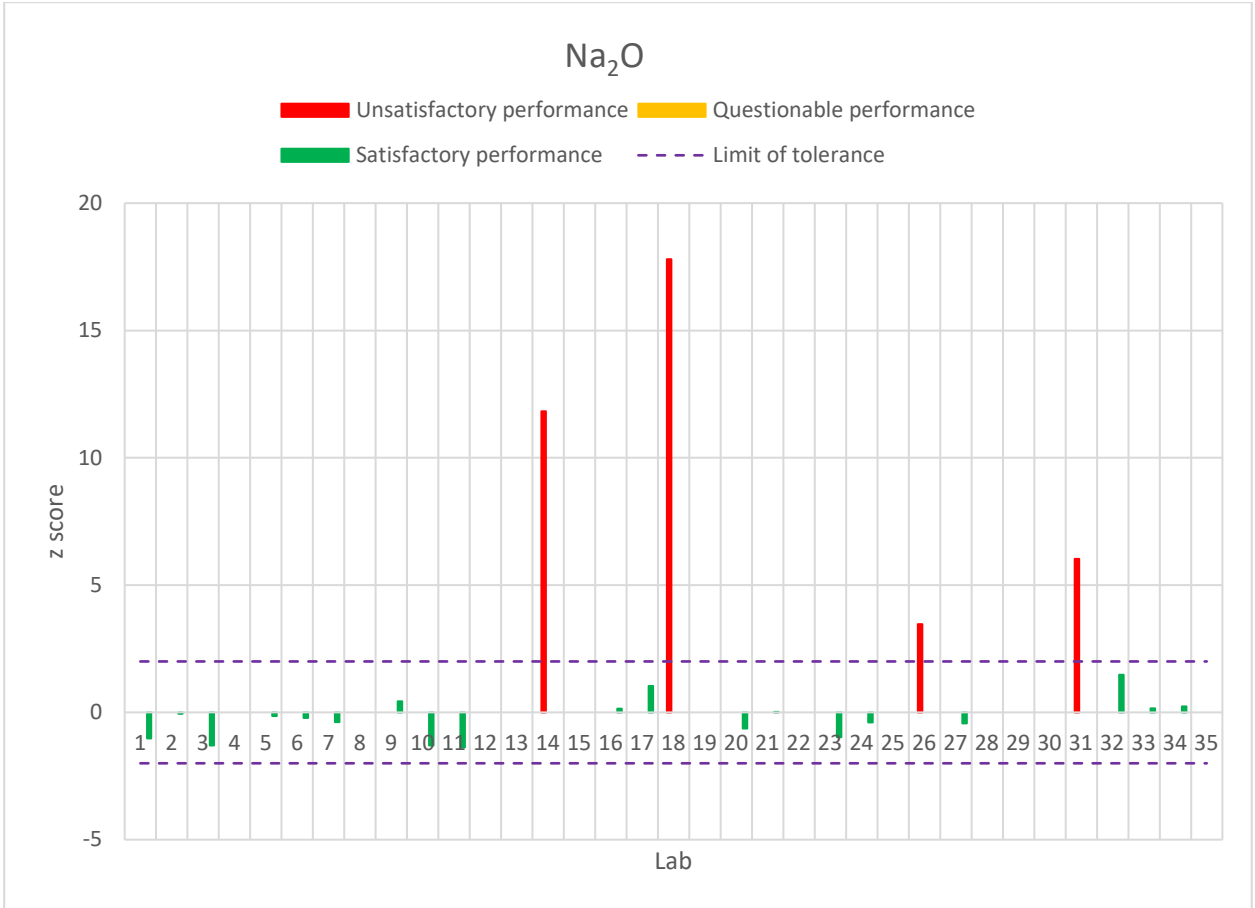
CHARTS SAMPLE A



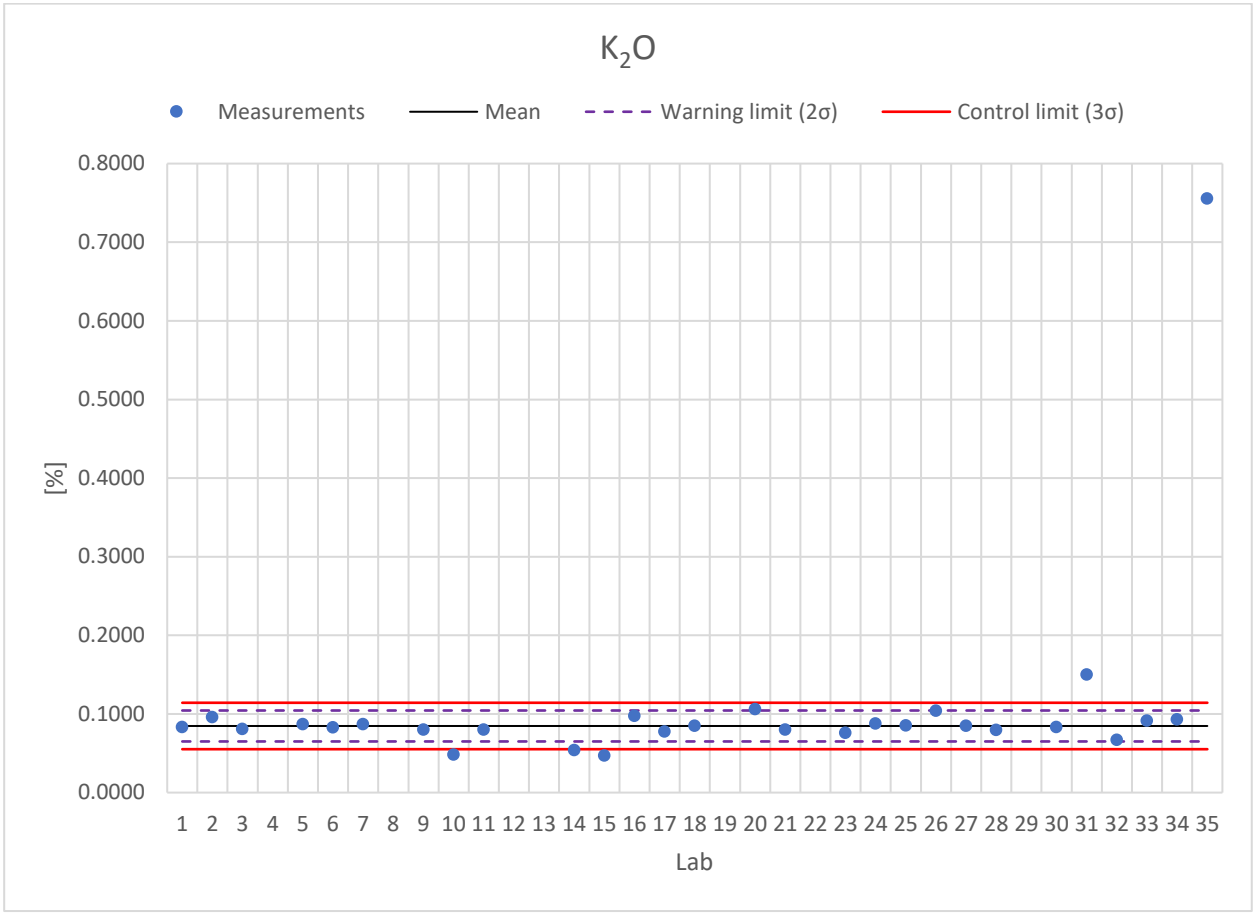


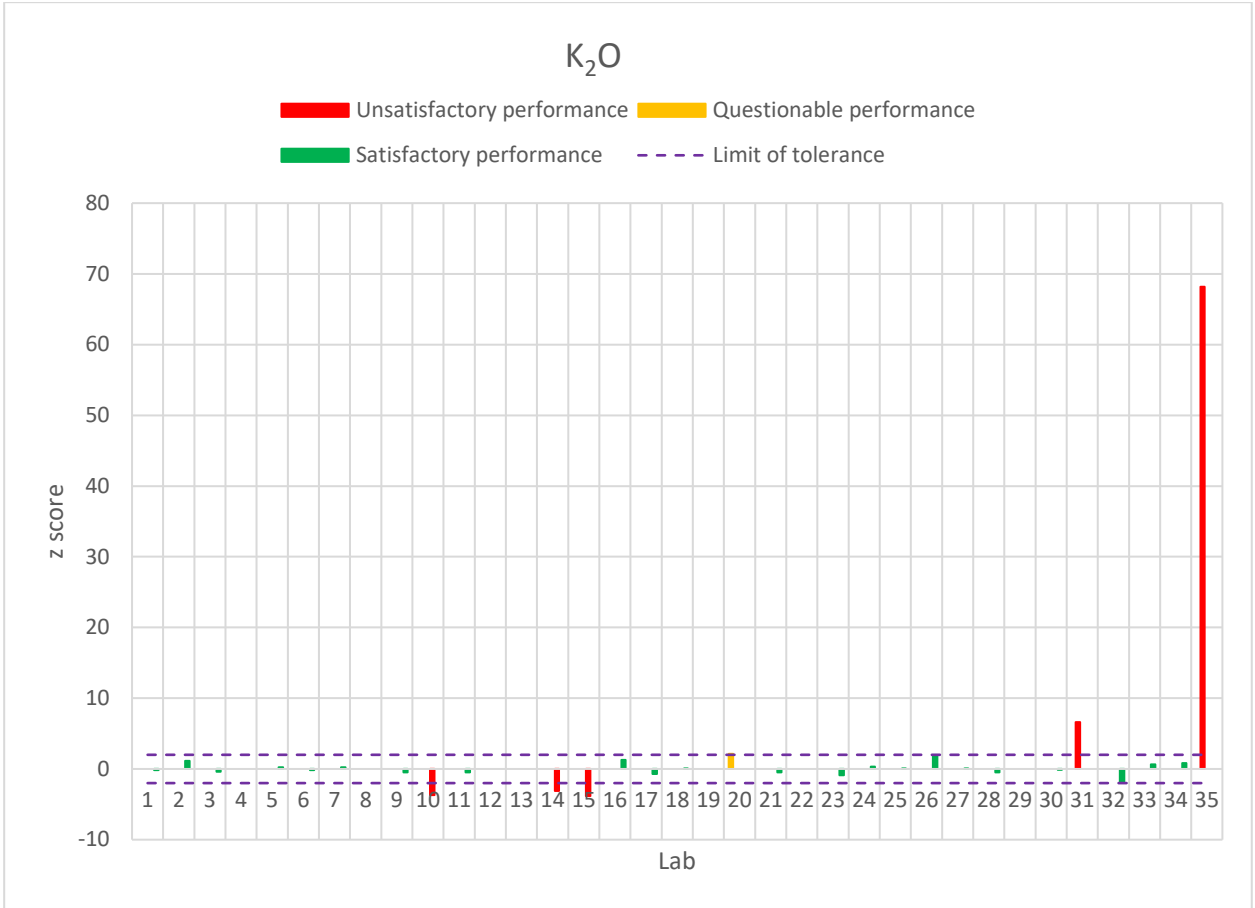
CHARTS SAMPLE A



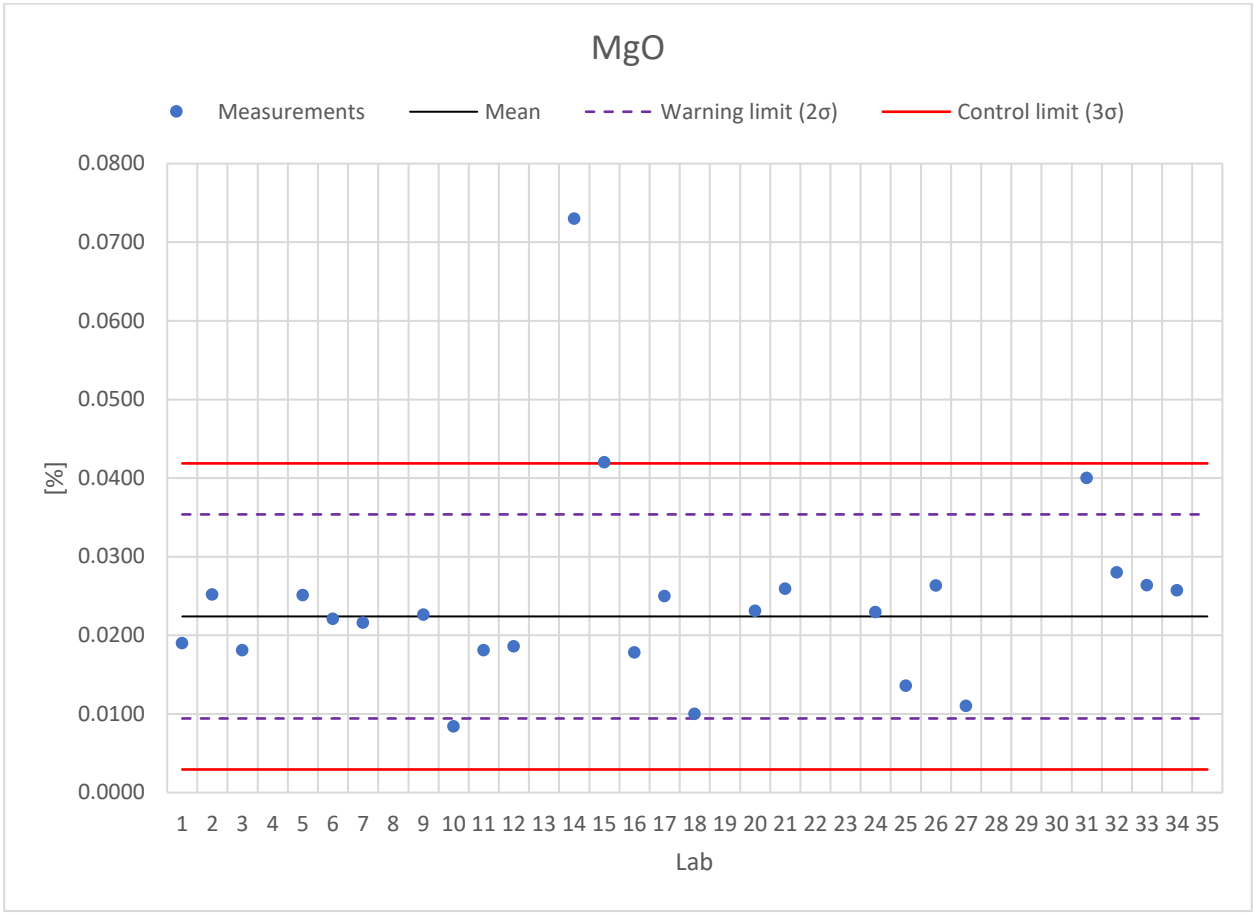


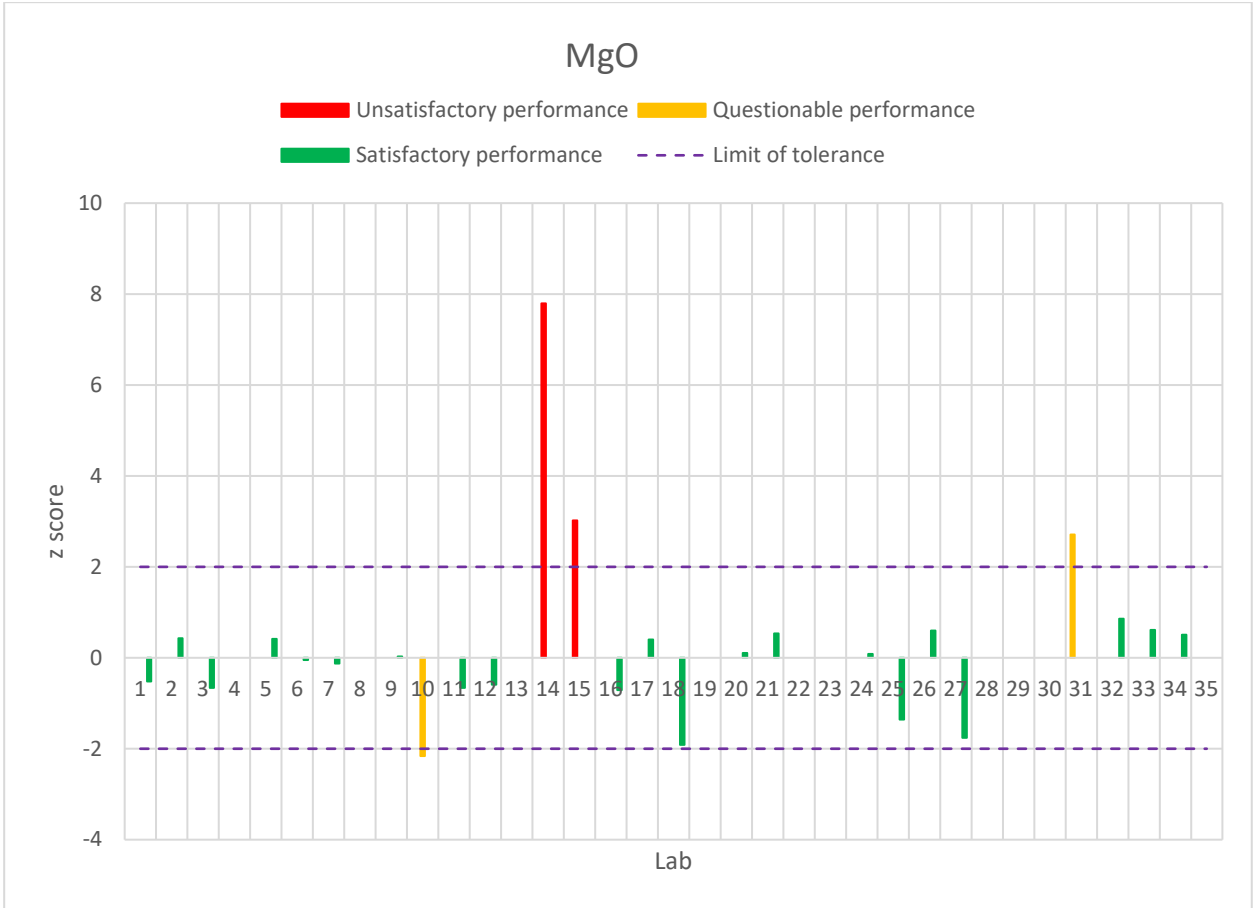
CHARTS SAMPLE A



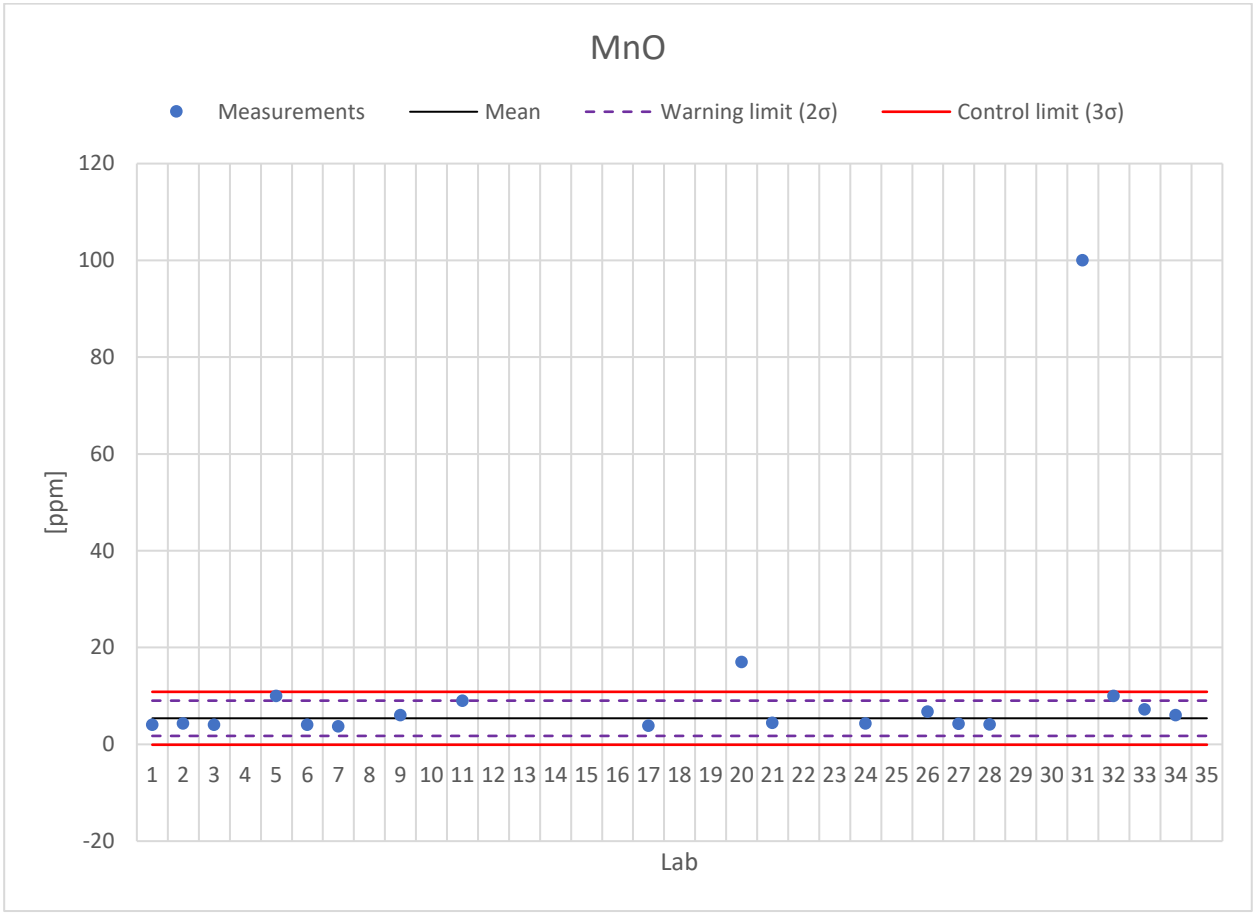


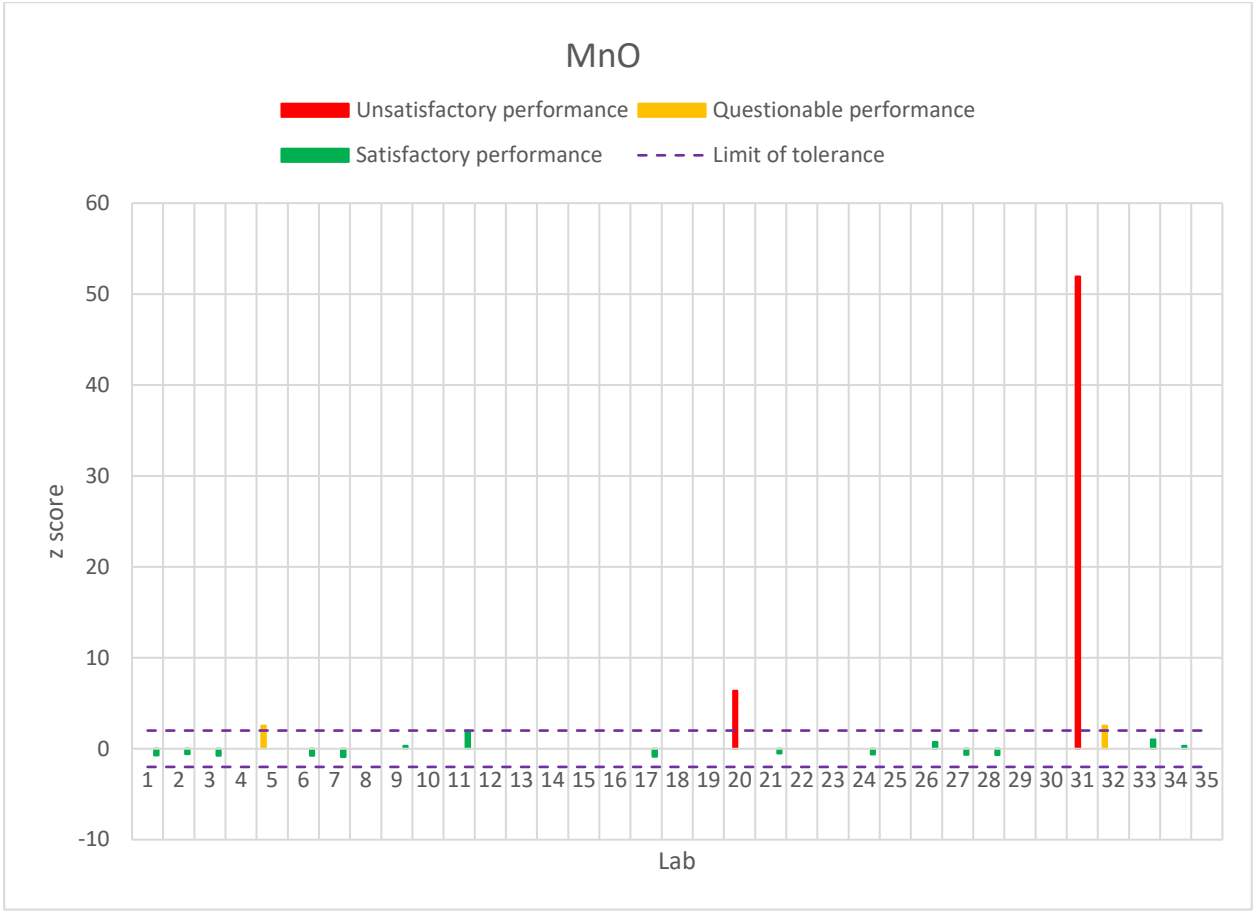
CHARTS SAMPLE A



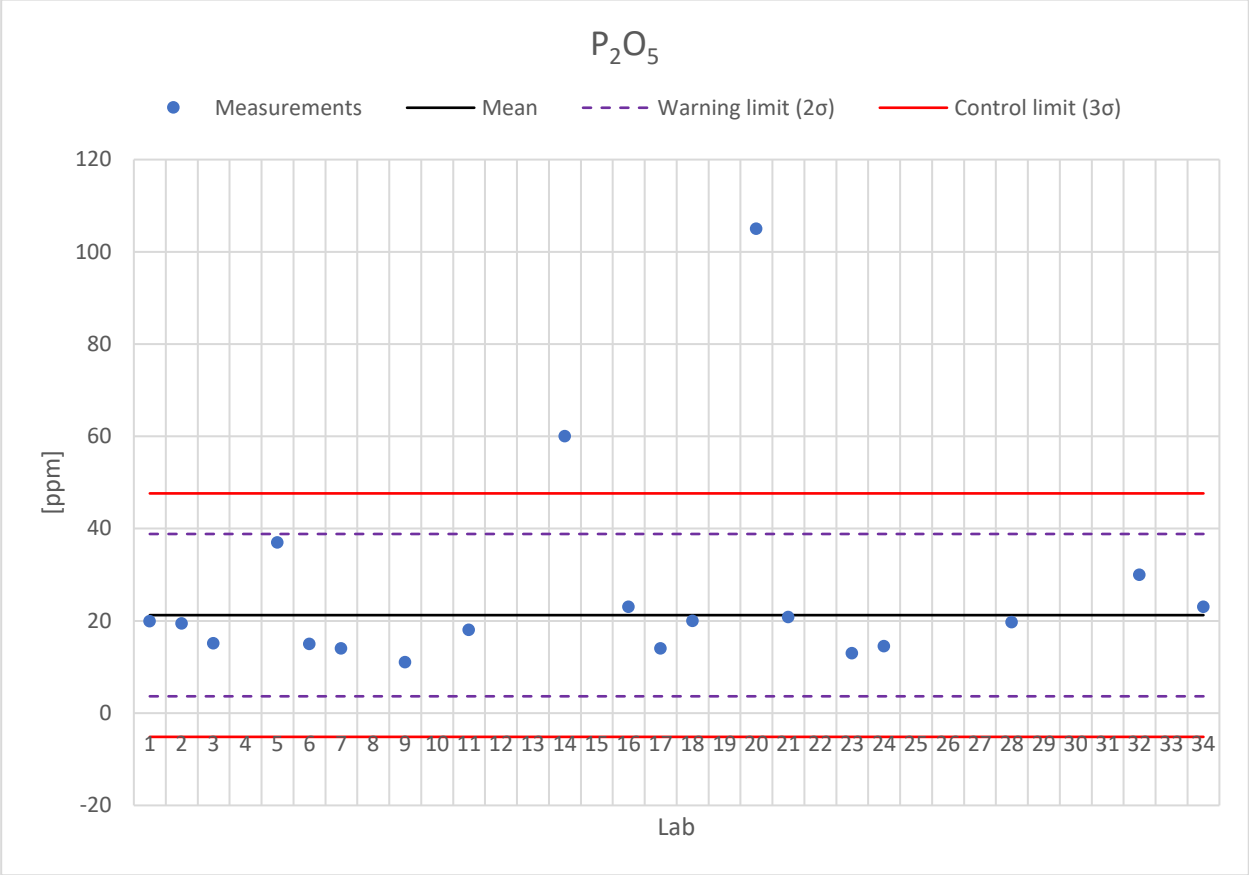


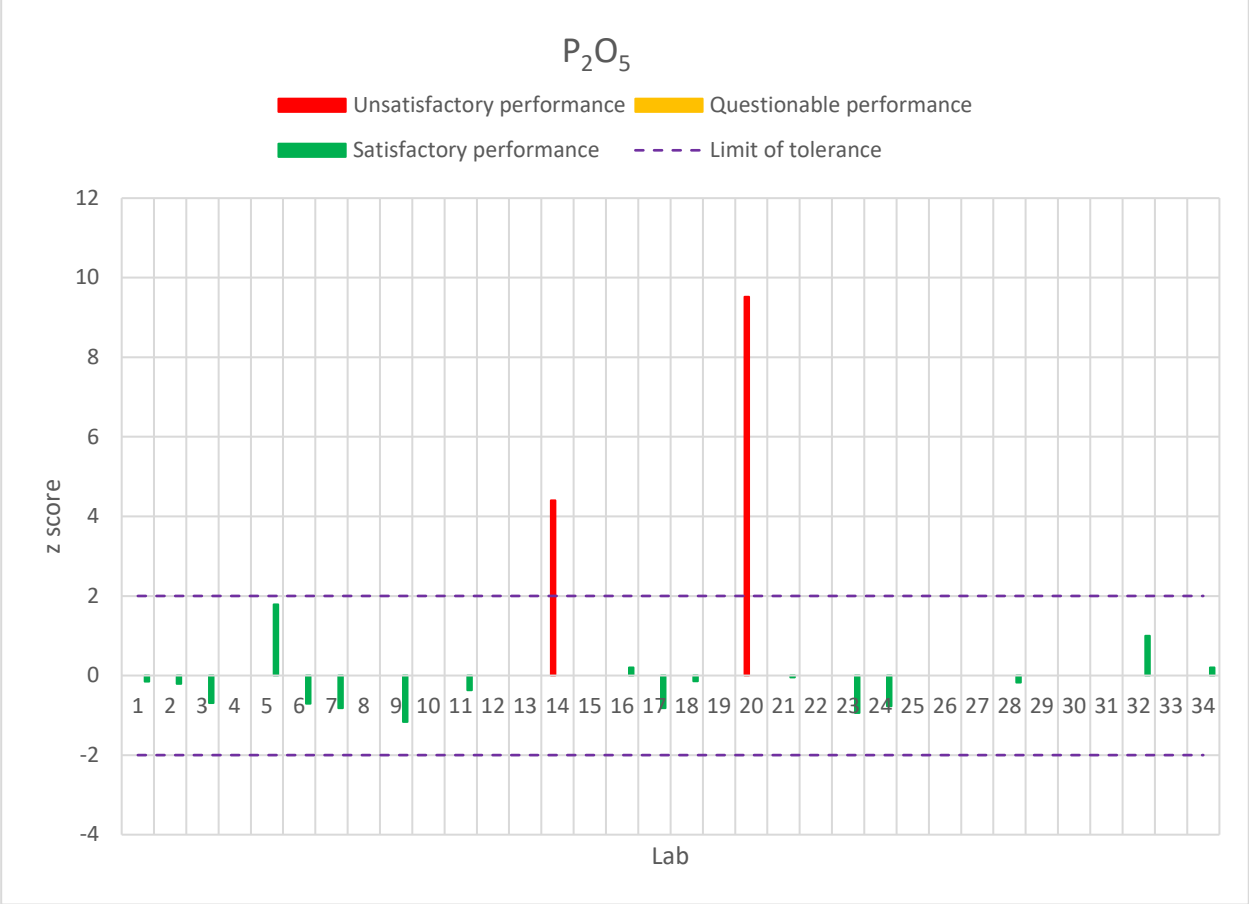
CHARTS SAMPLE A



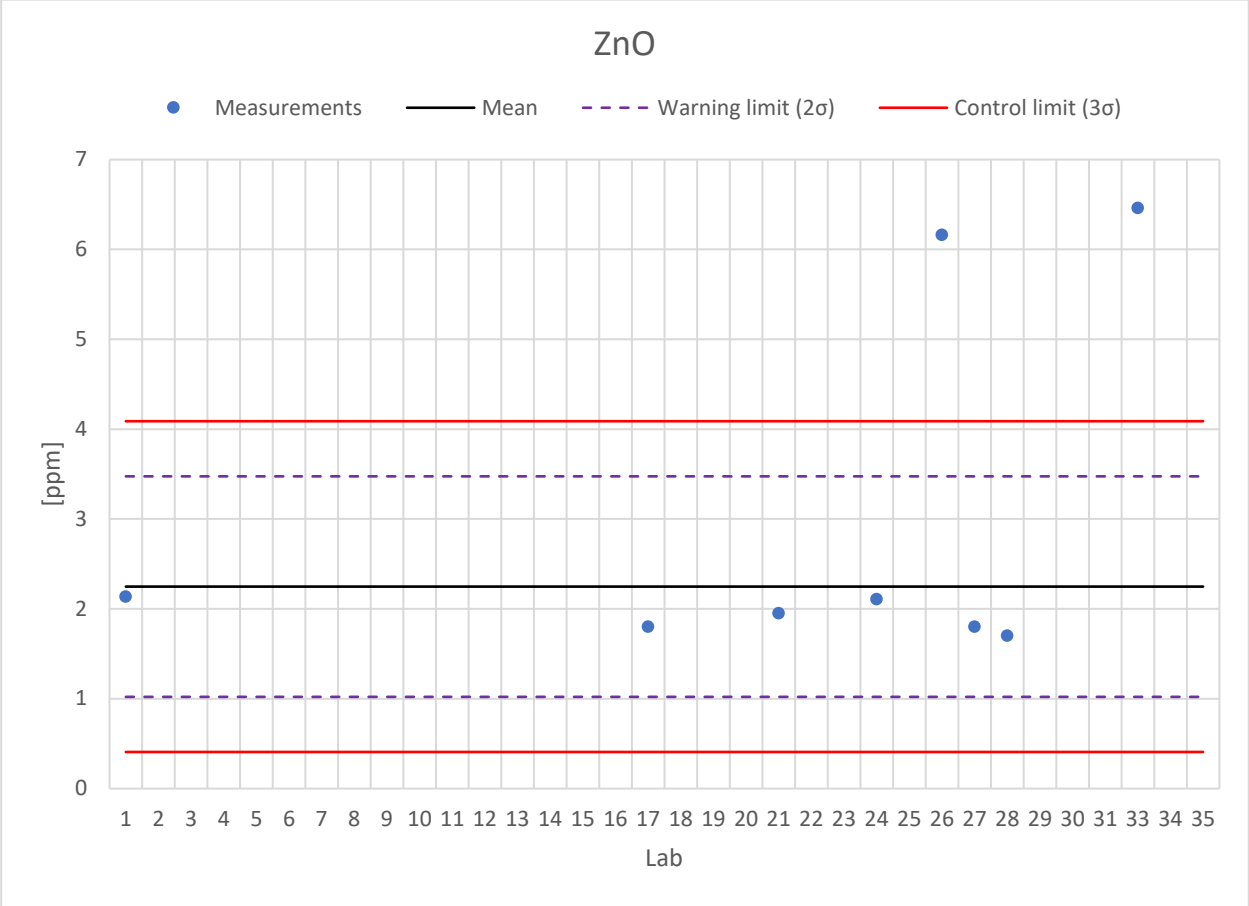


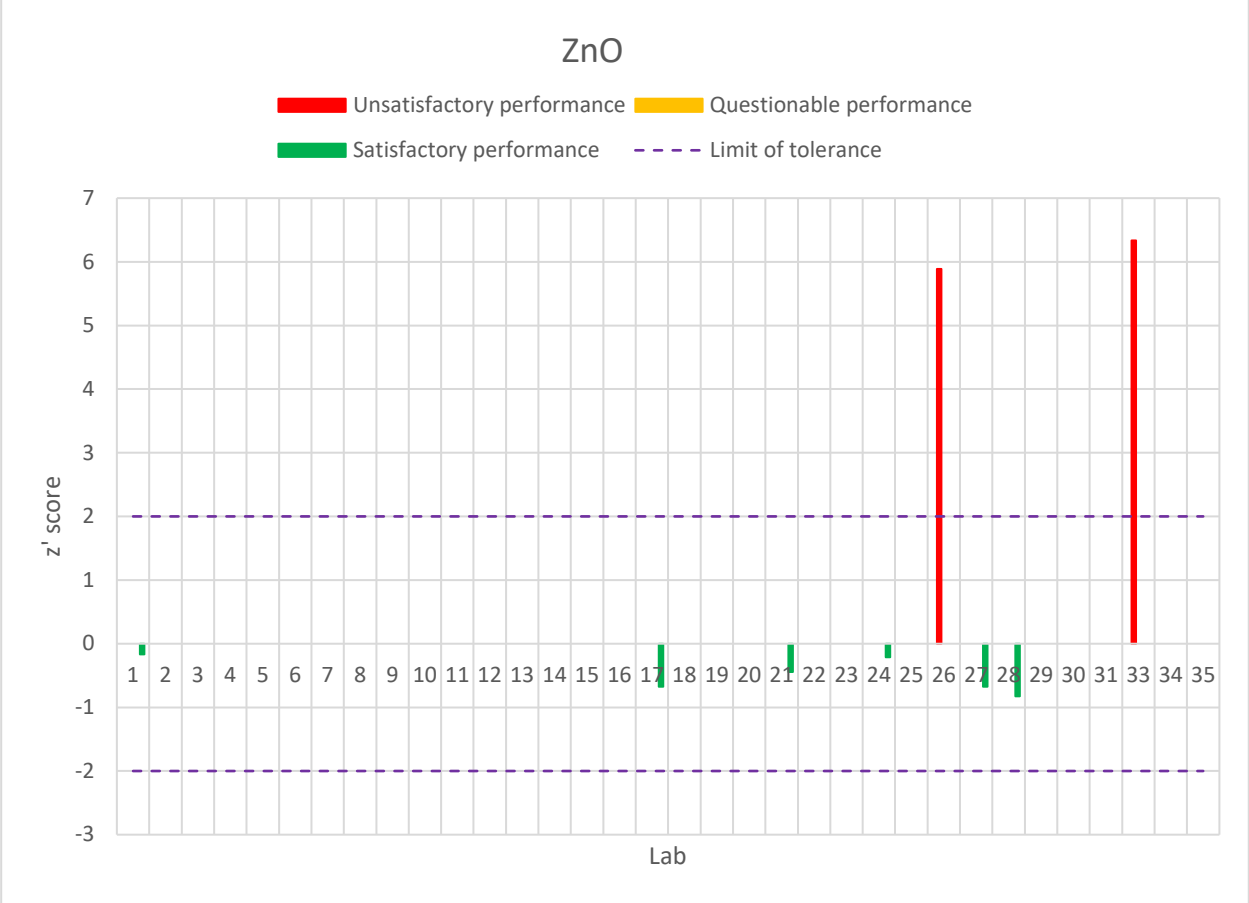
CHARTS SAMPLE A



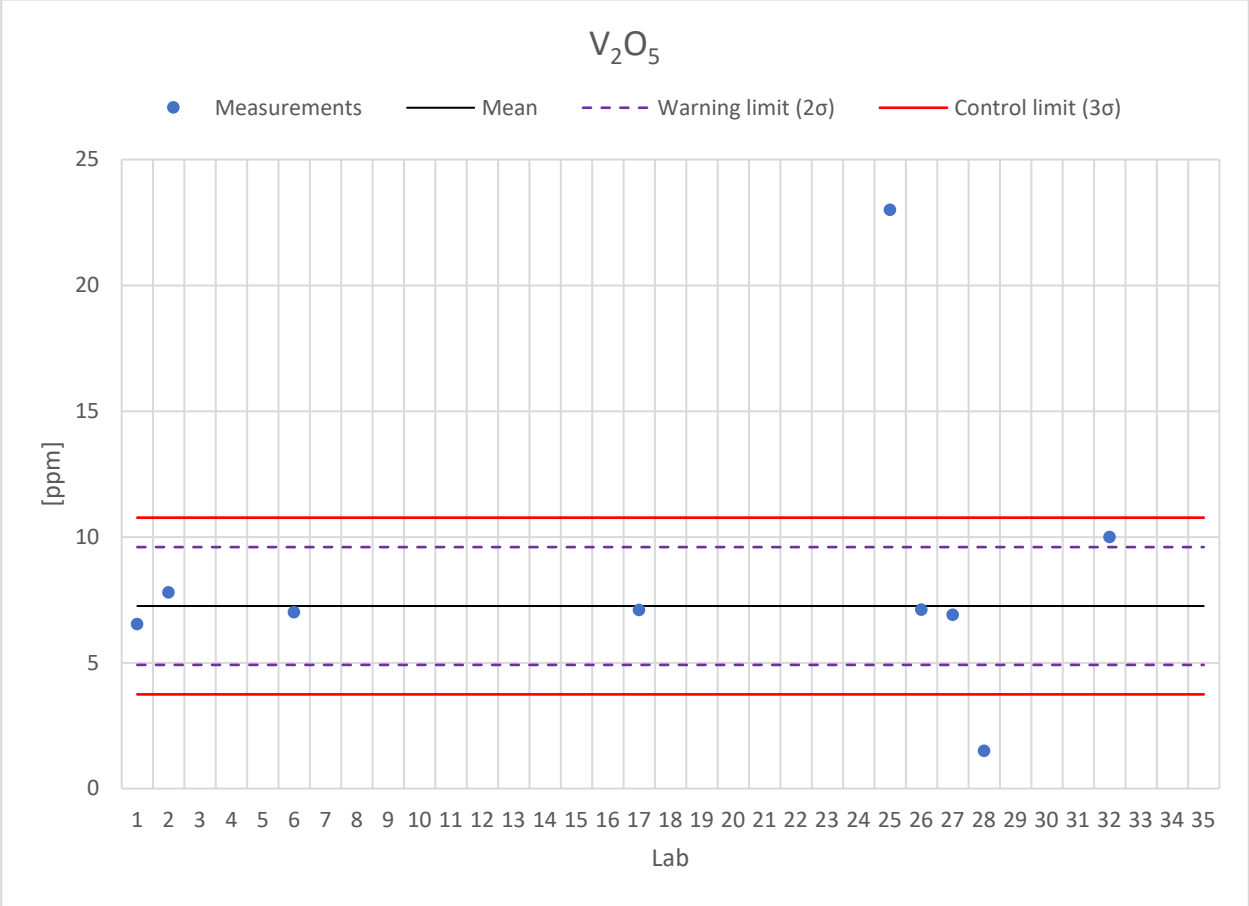


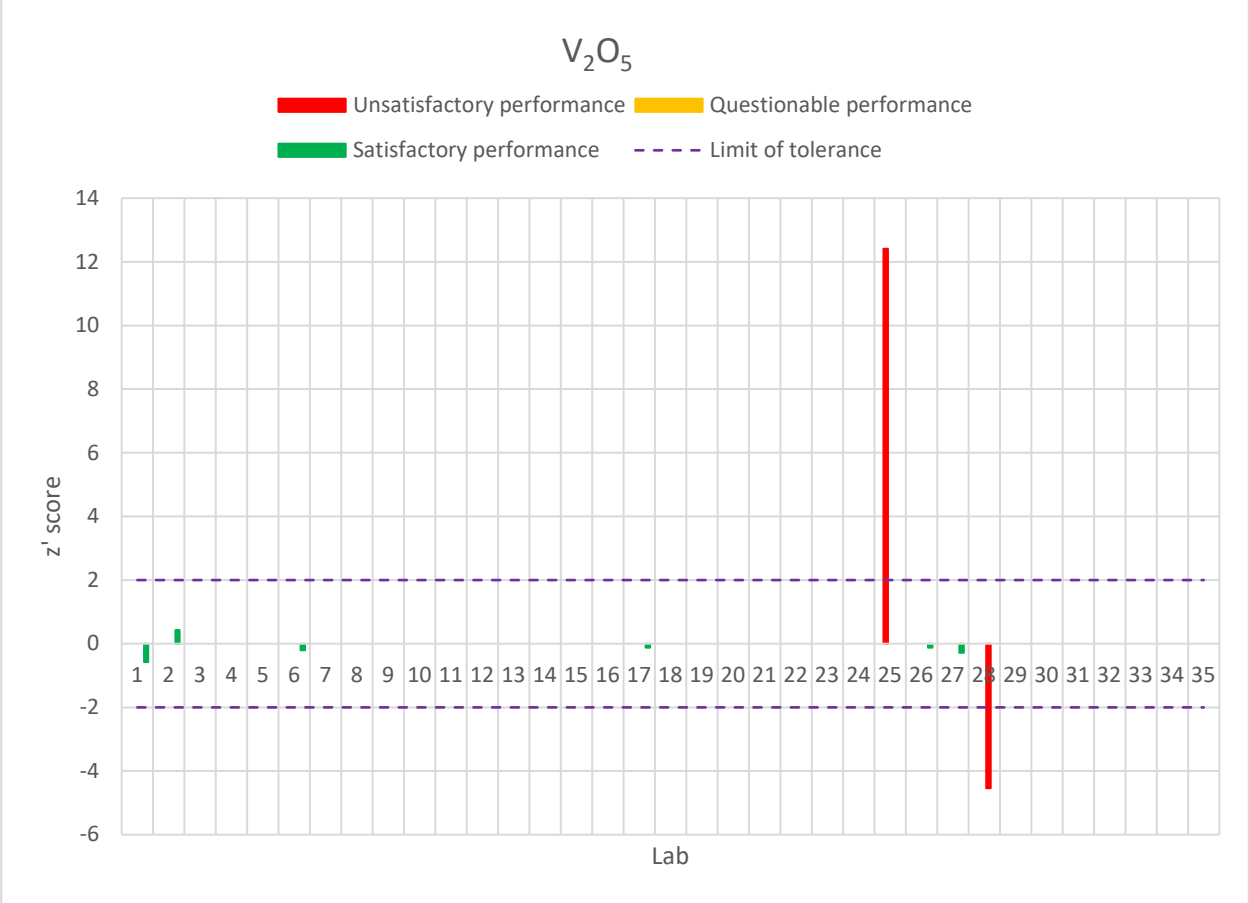
CHARTS SAMPLE A



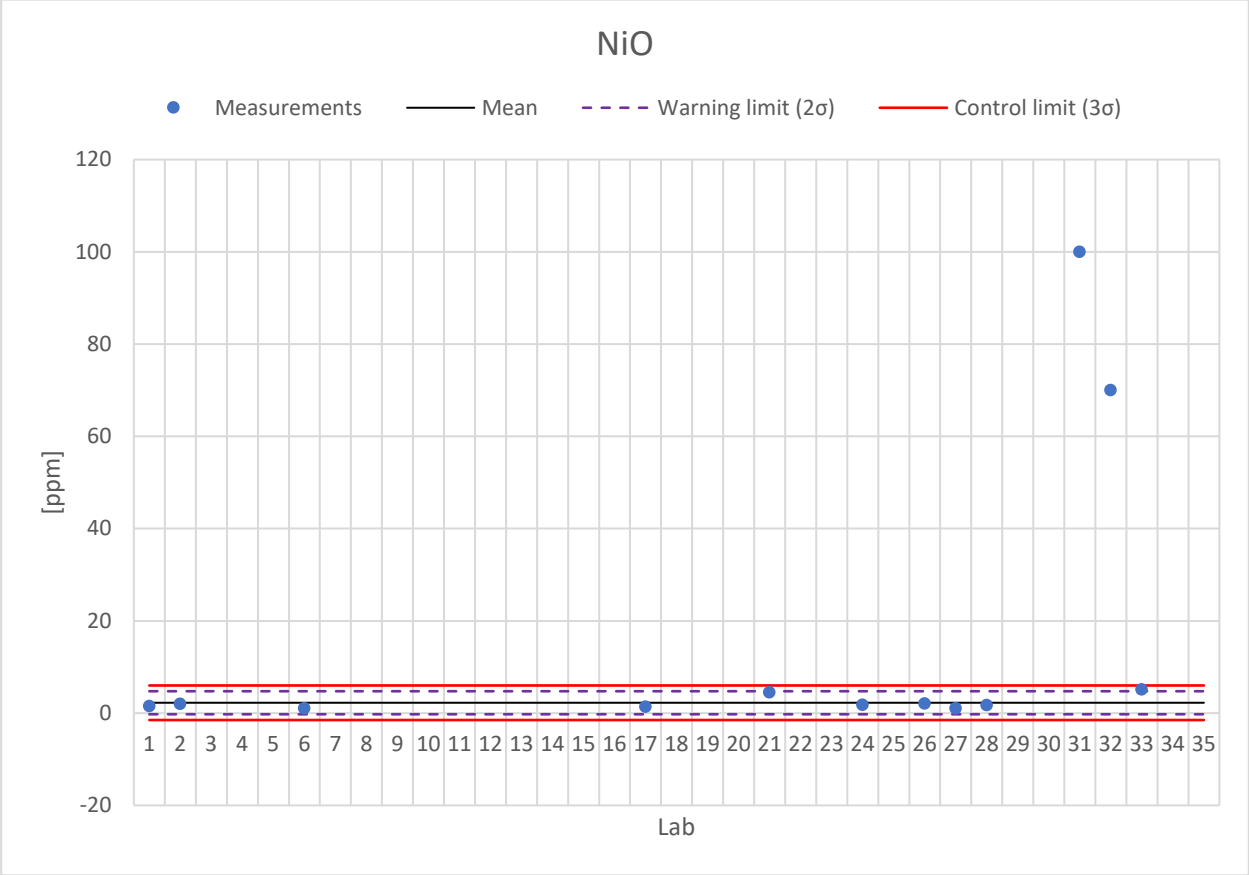


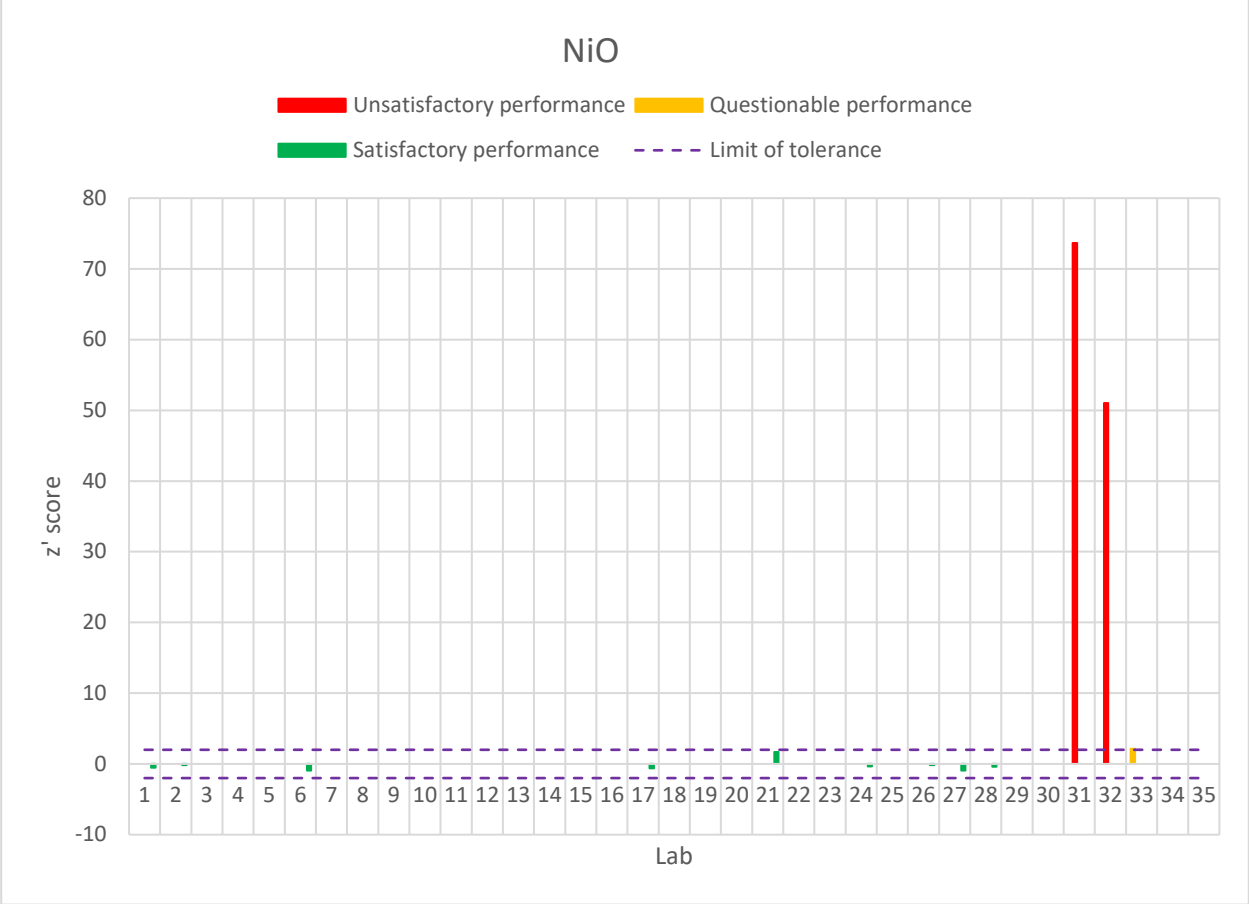
CHARTS SAMPLE A



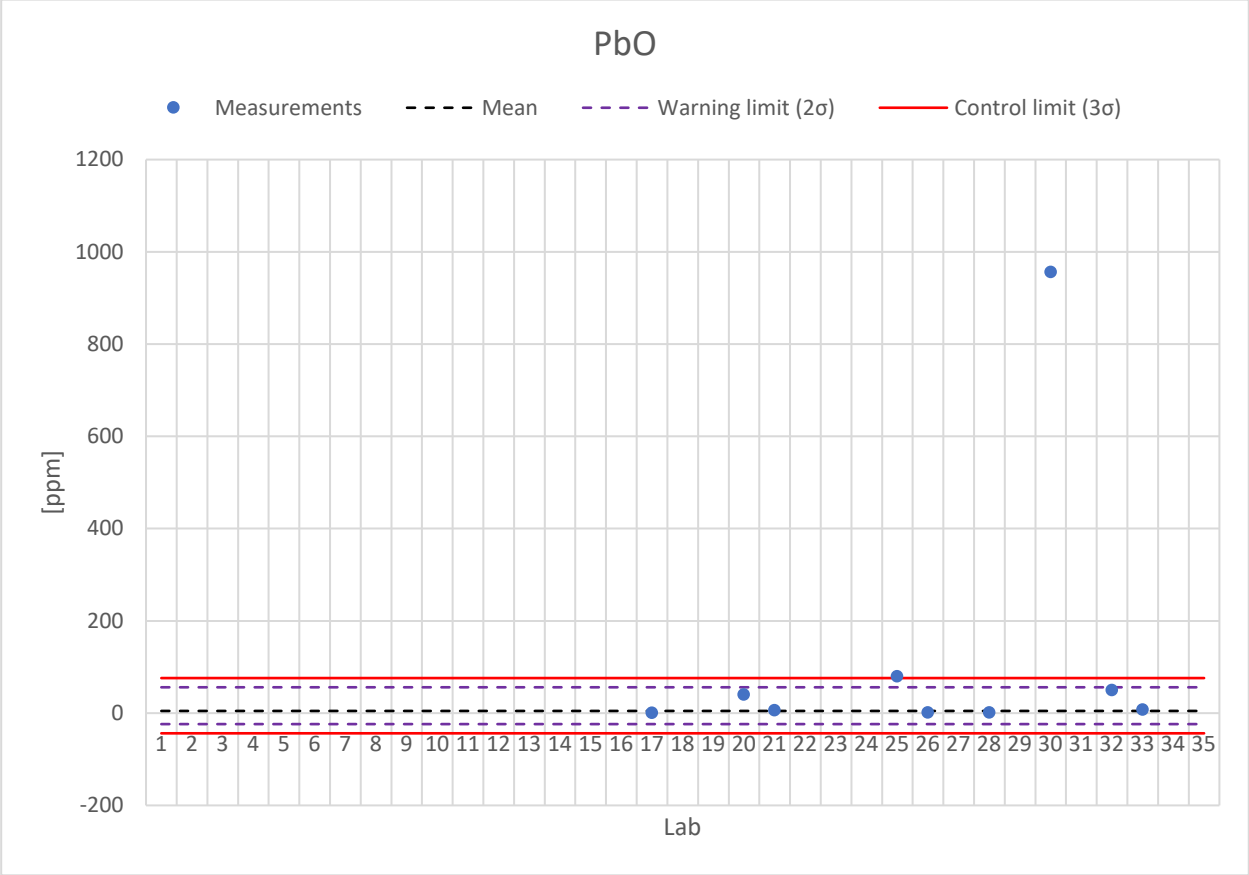


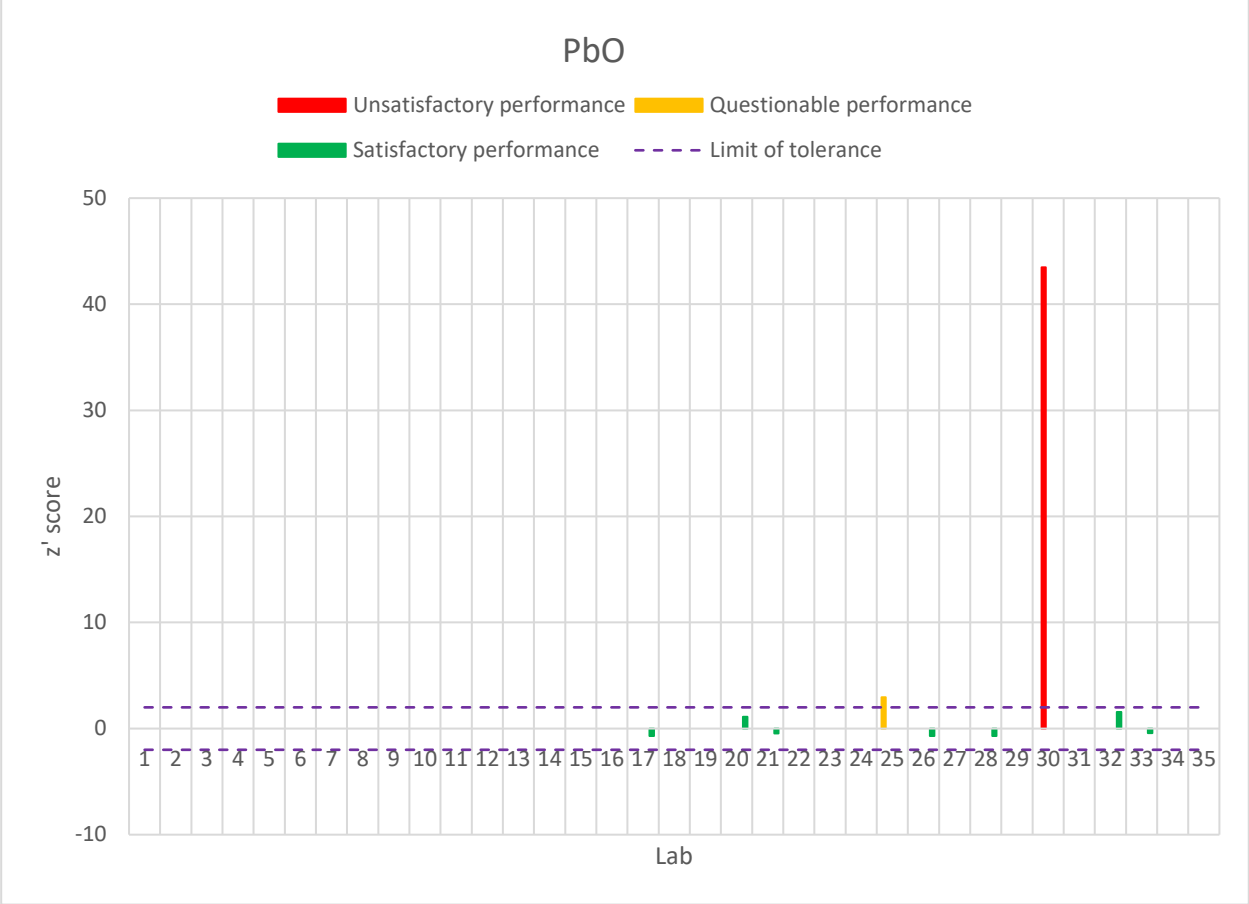
CHARTS SAMPLE A



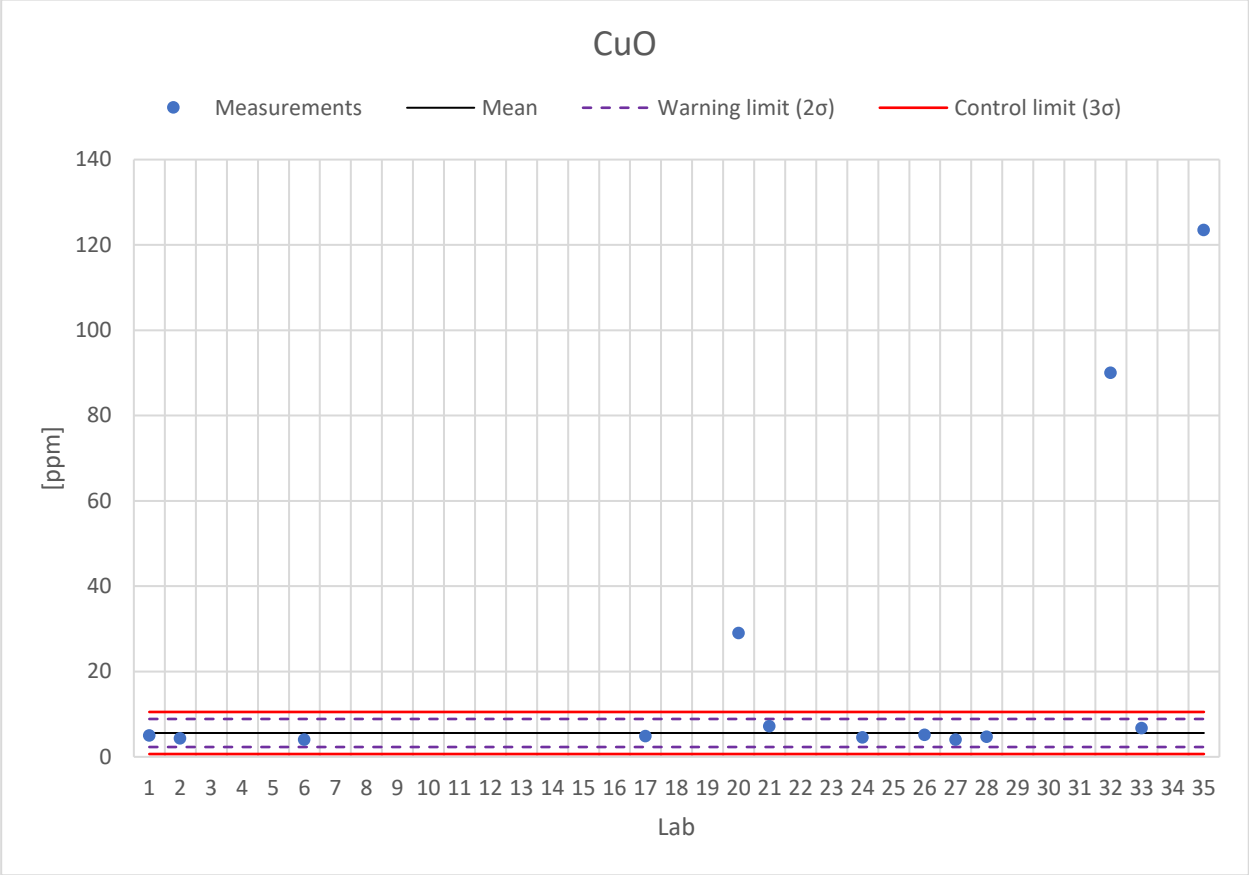


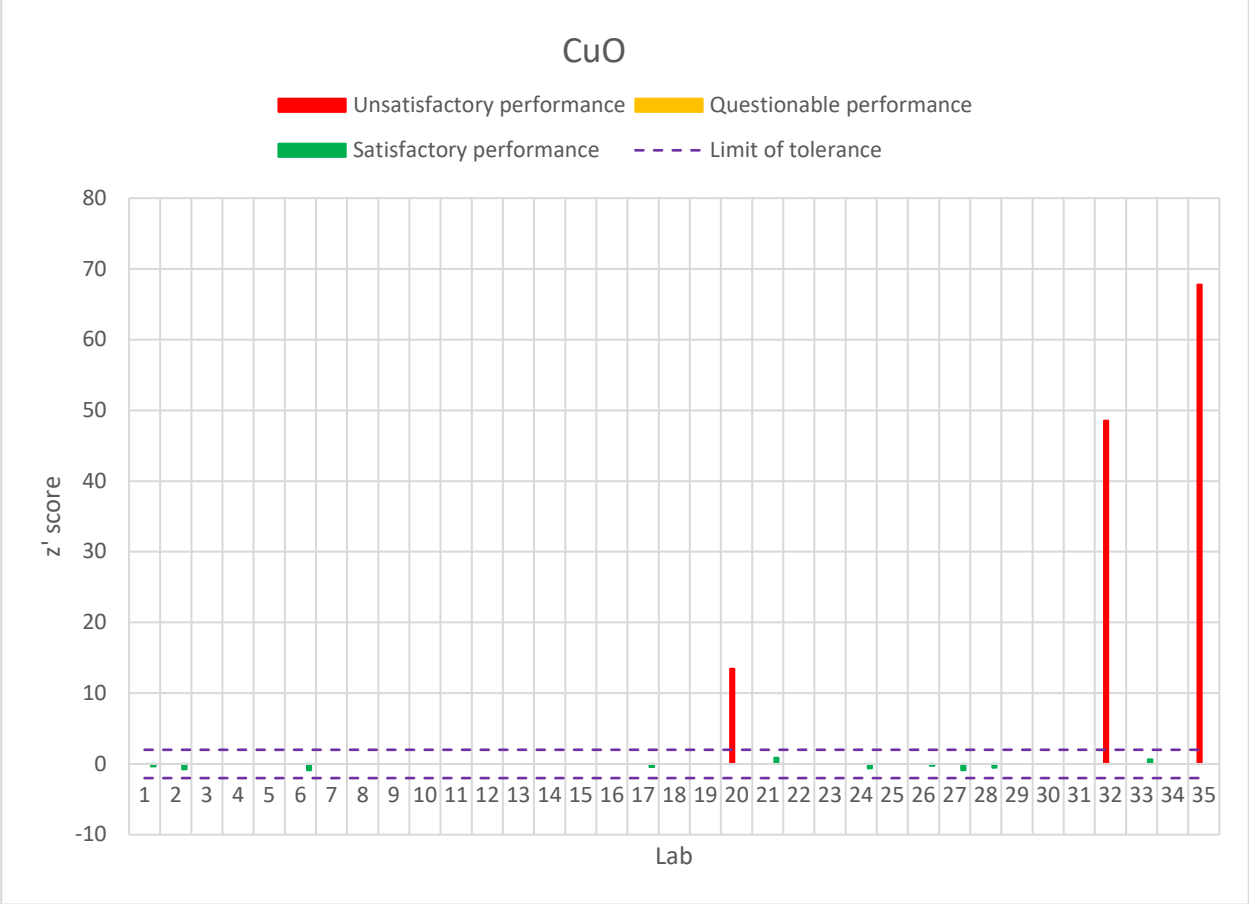
CHARTS SAMPLE A



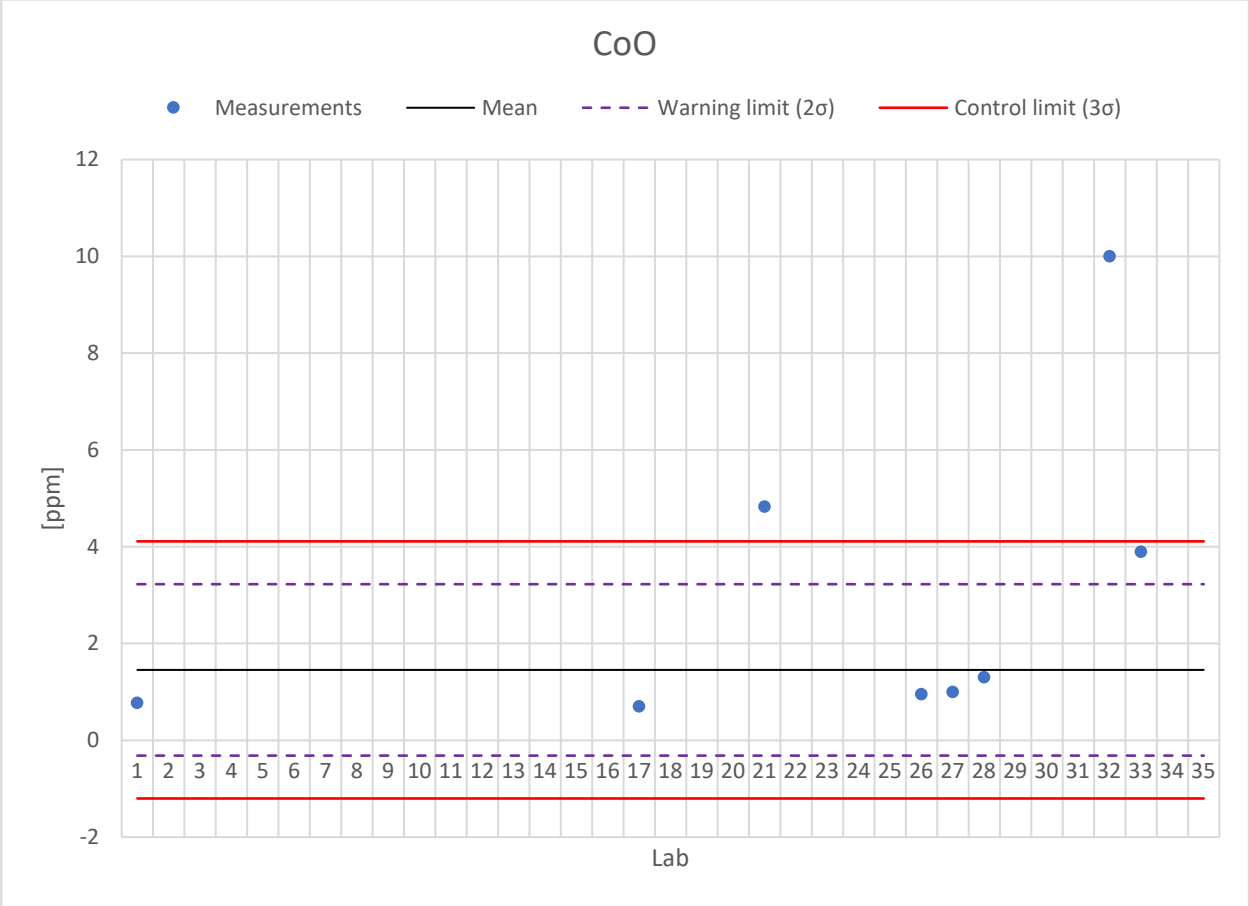


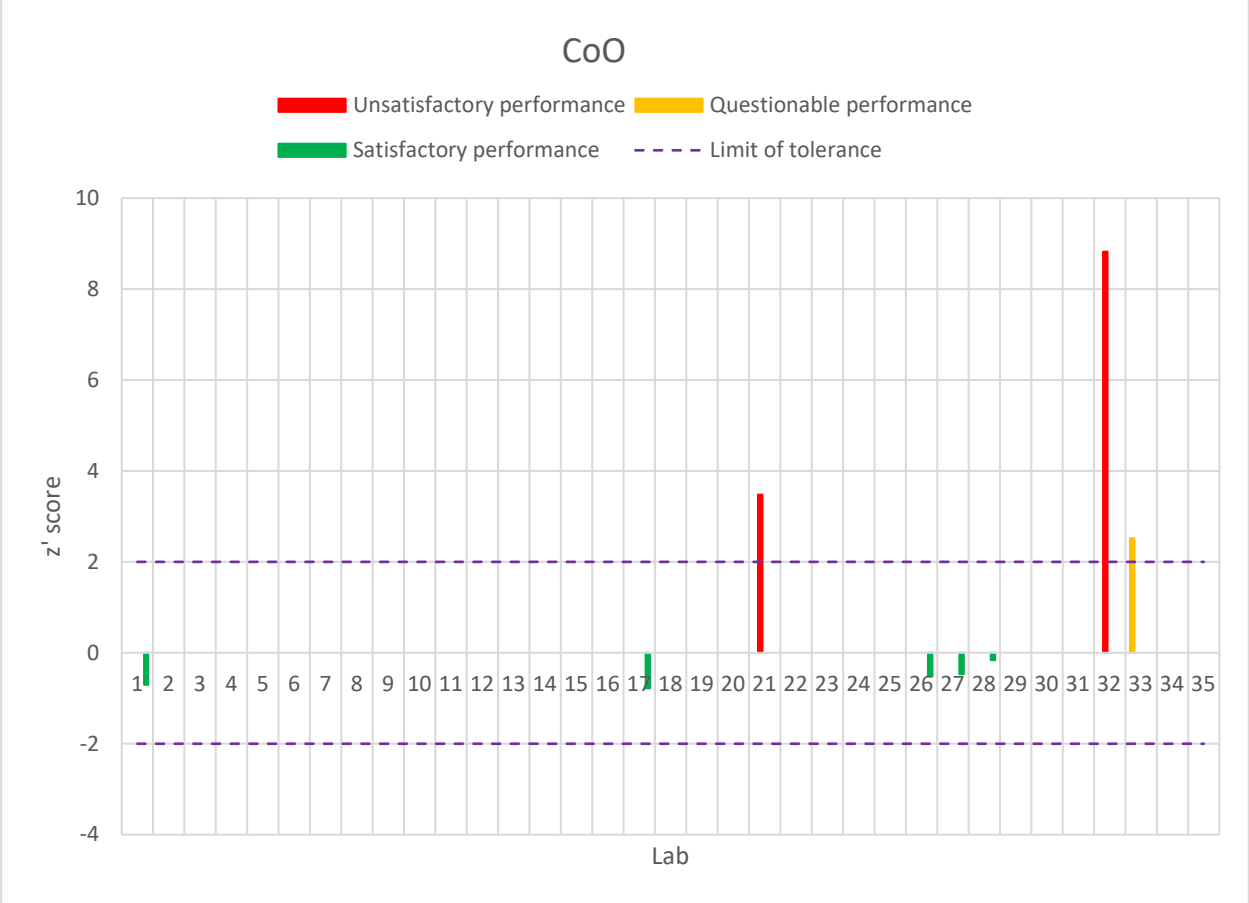
CHARTS SAMPLE A



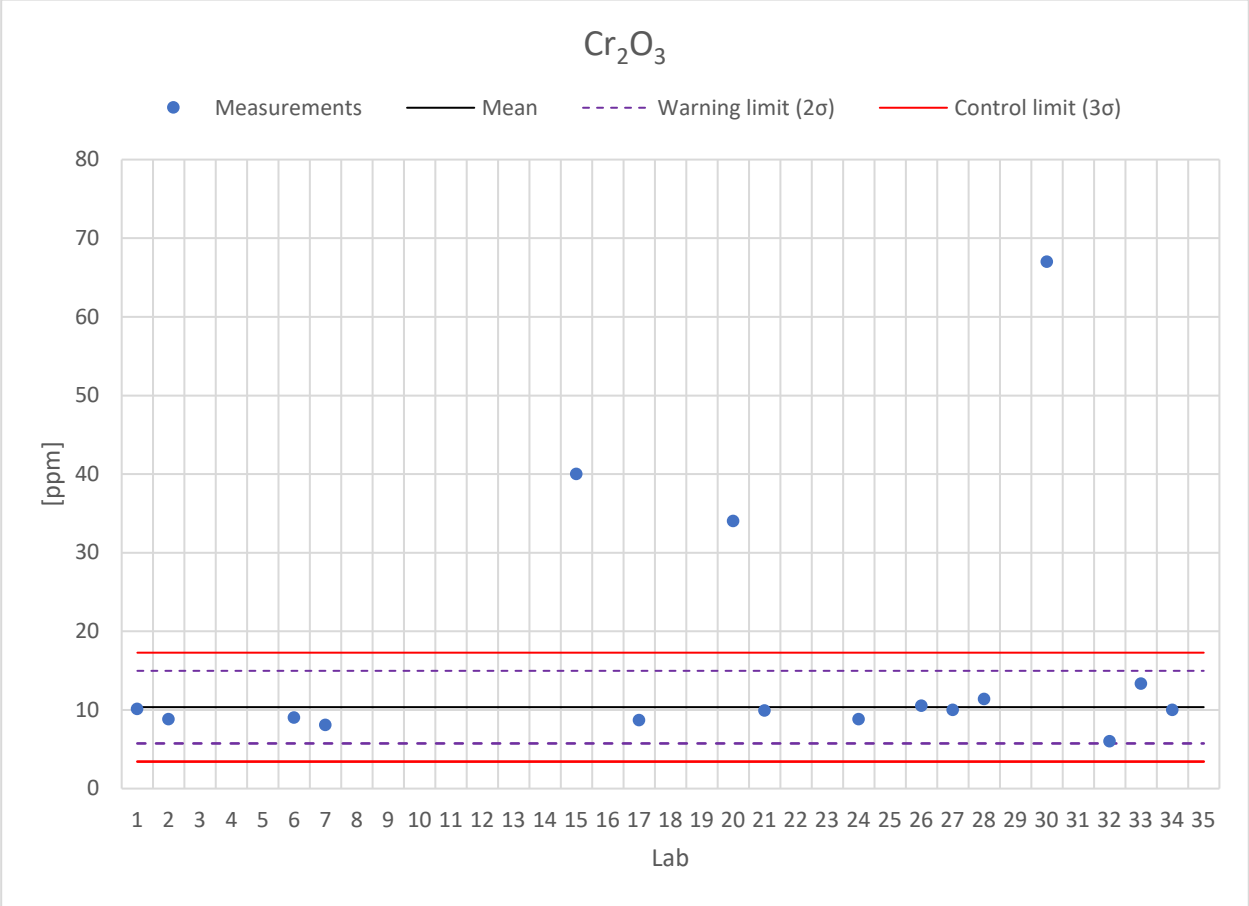


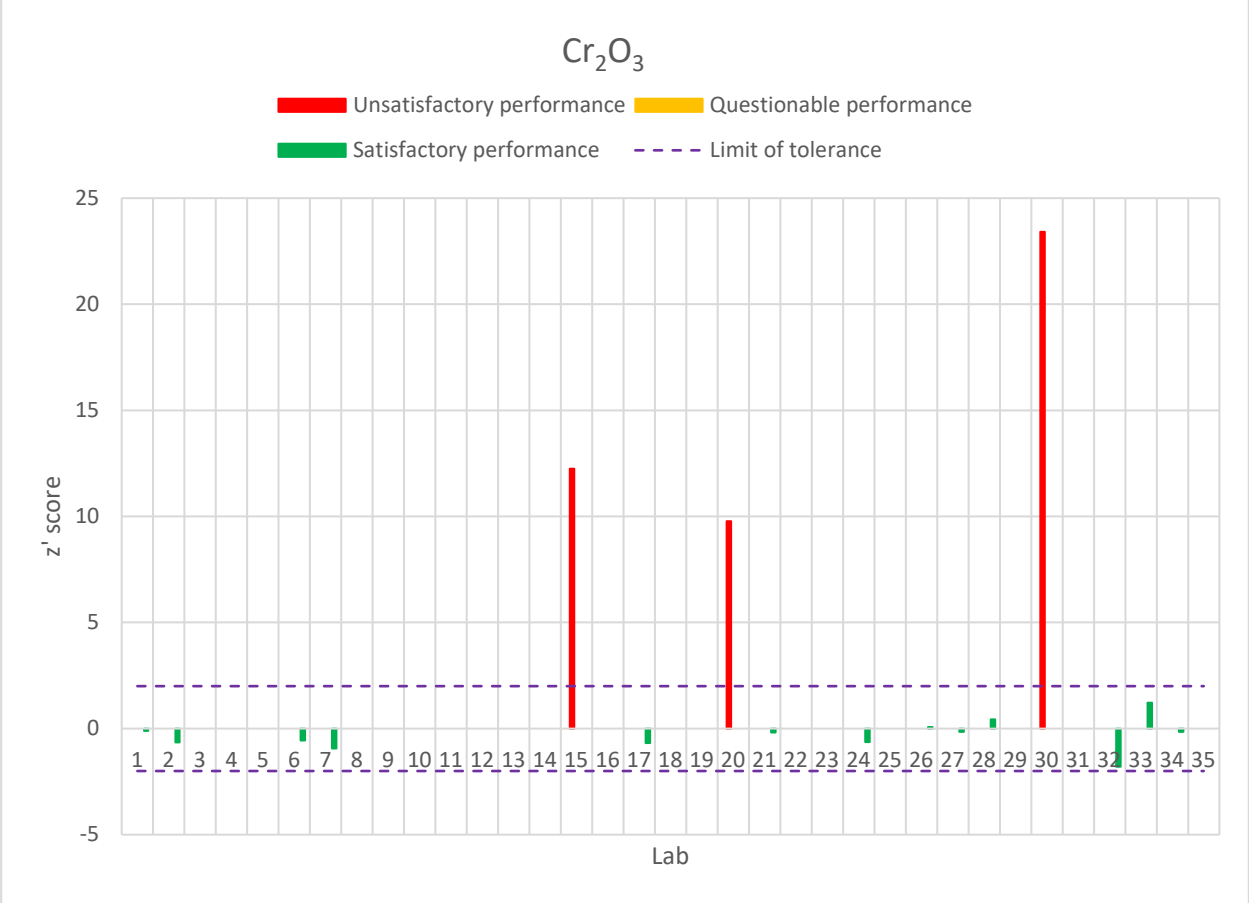
CHARTS SAMPLE A



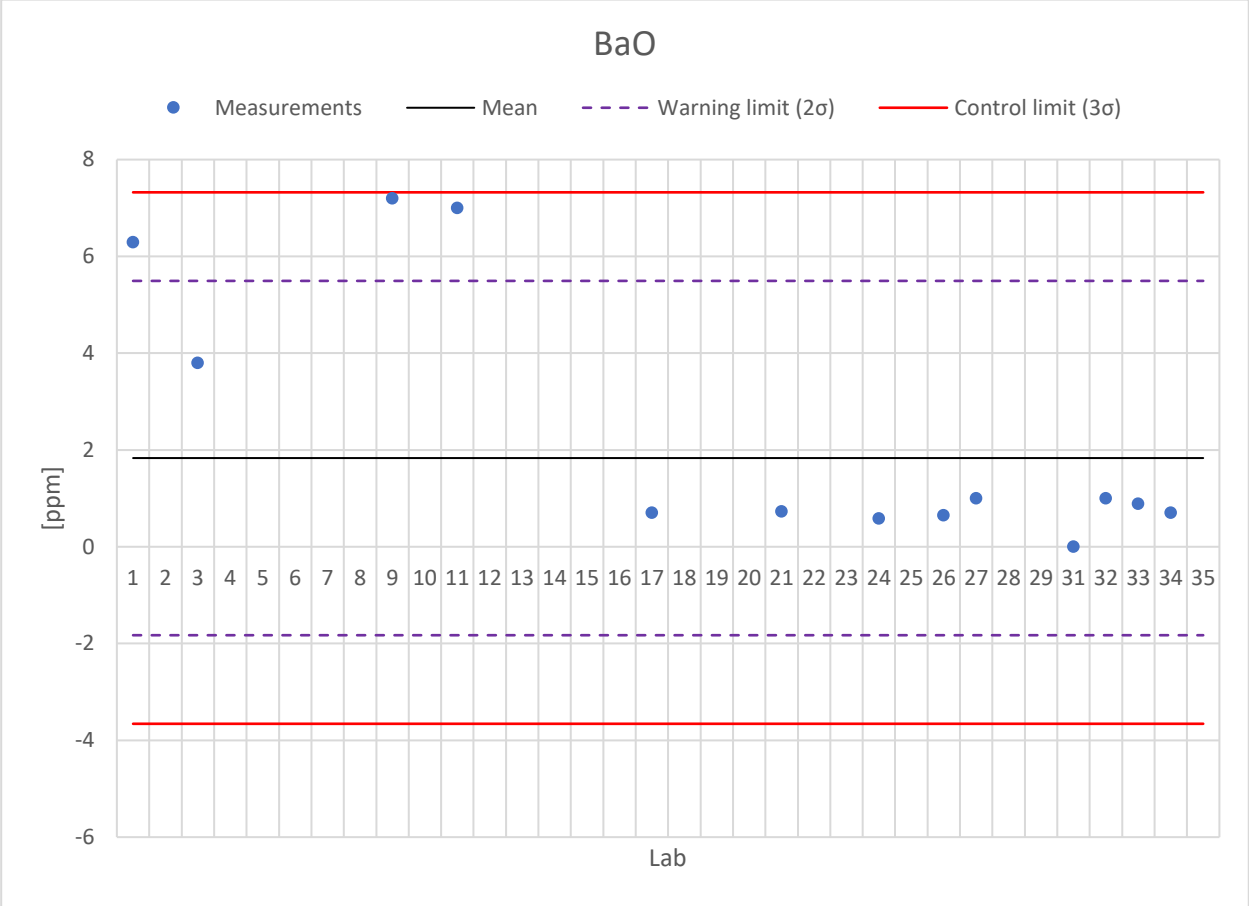


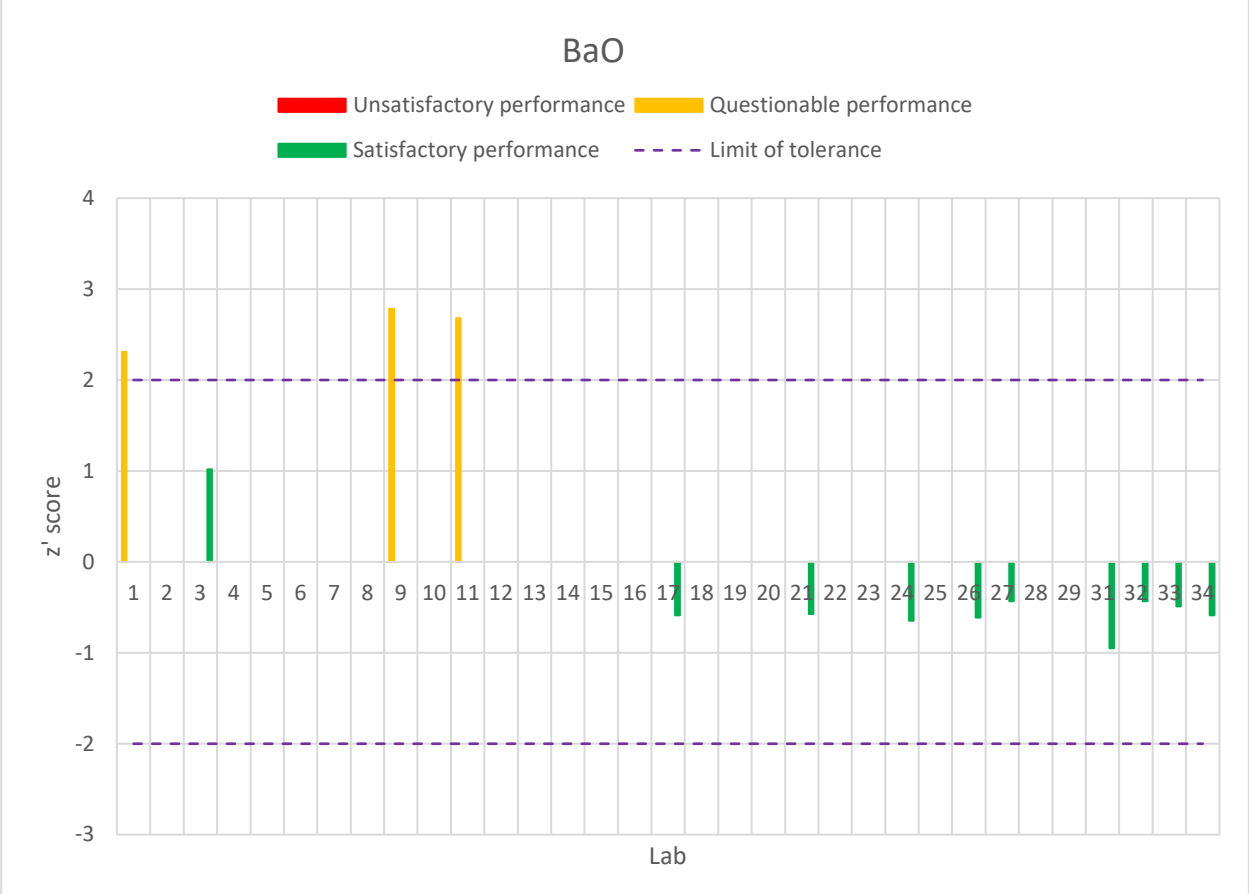
CHARTS SAMPLE A



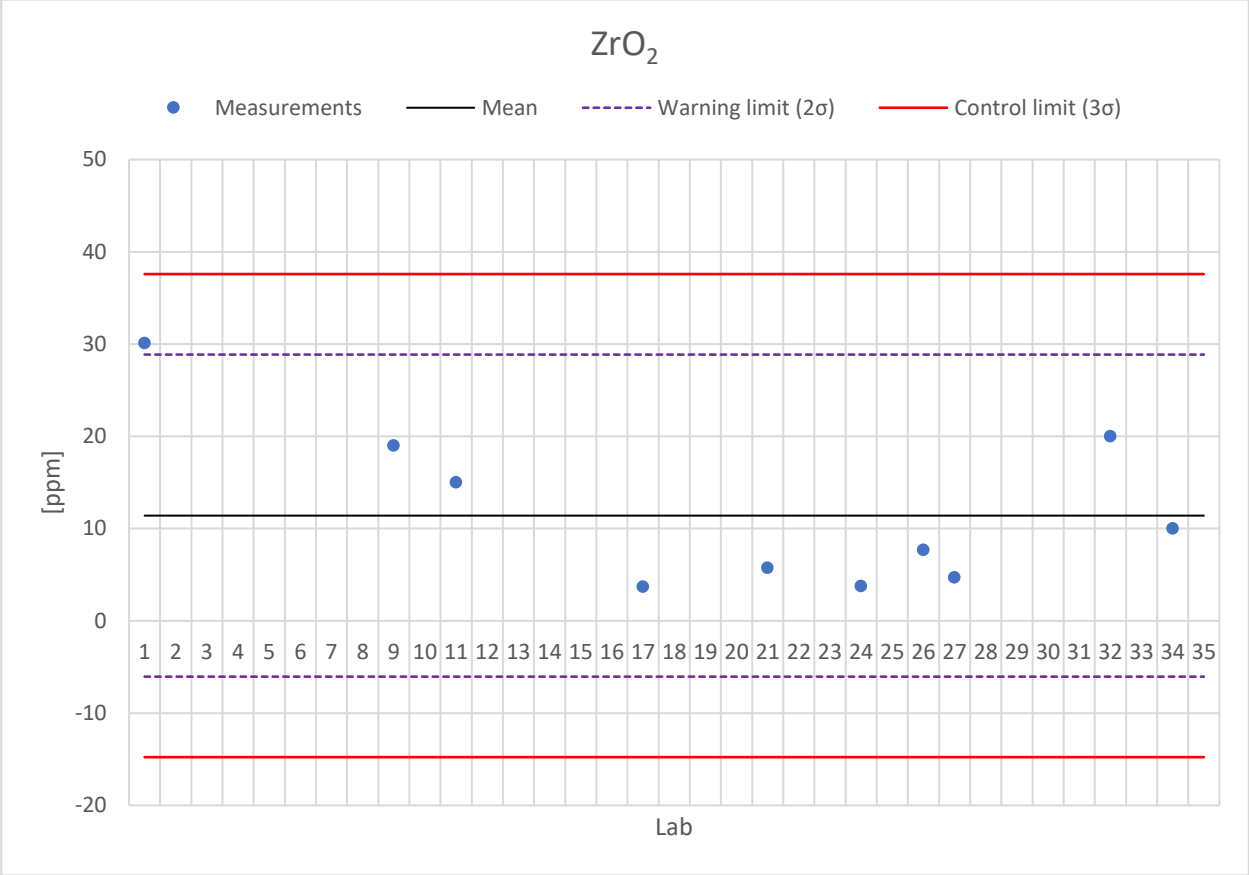


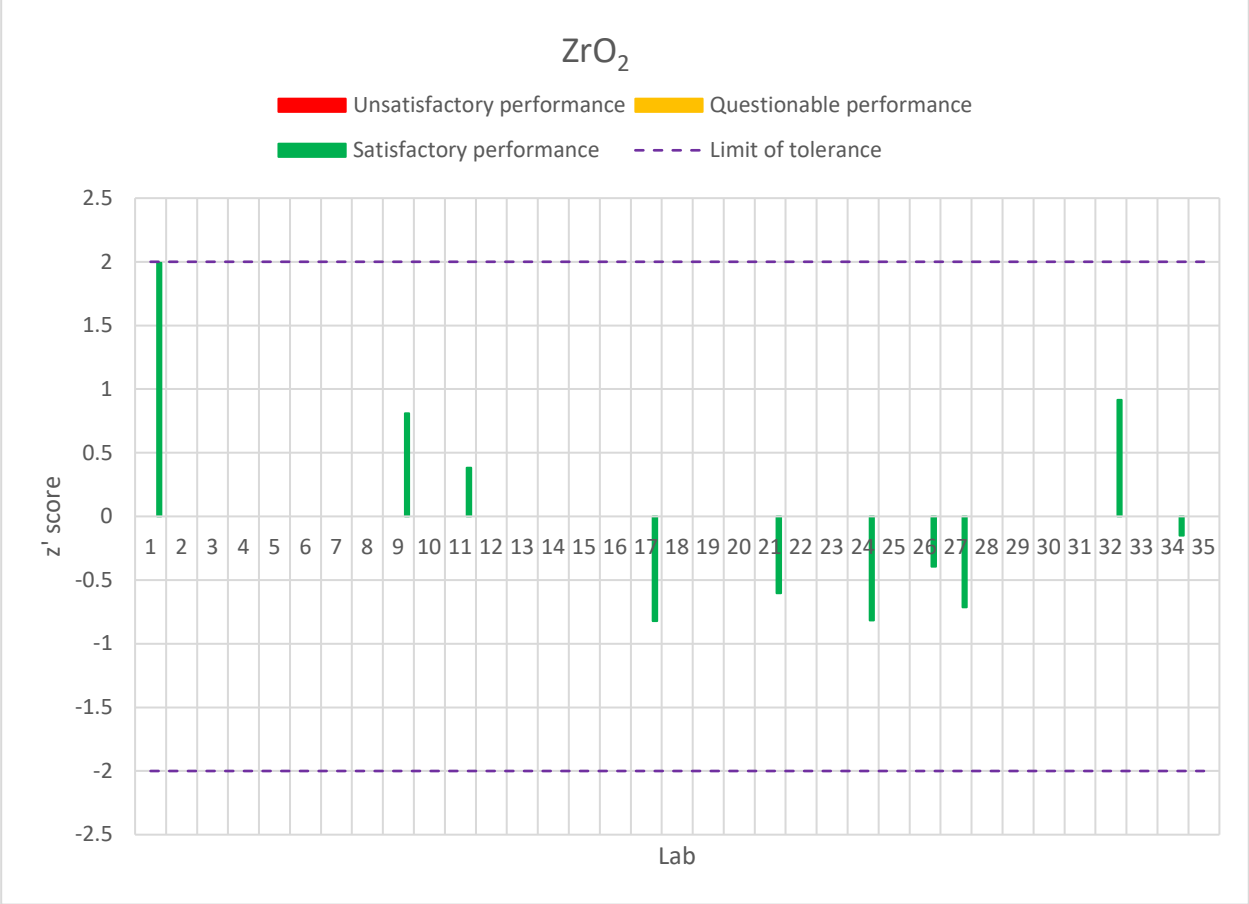
CHARTS SAMPLE A



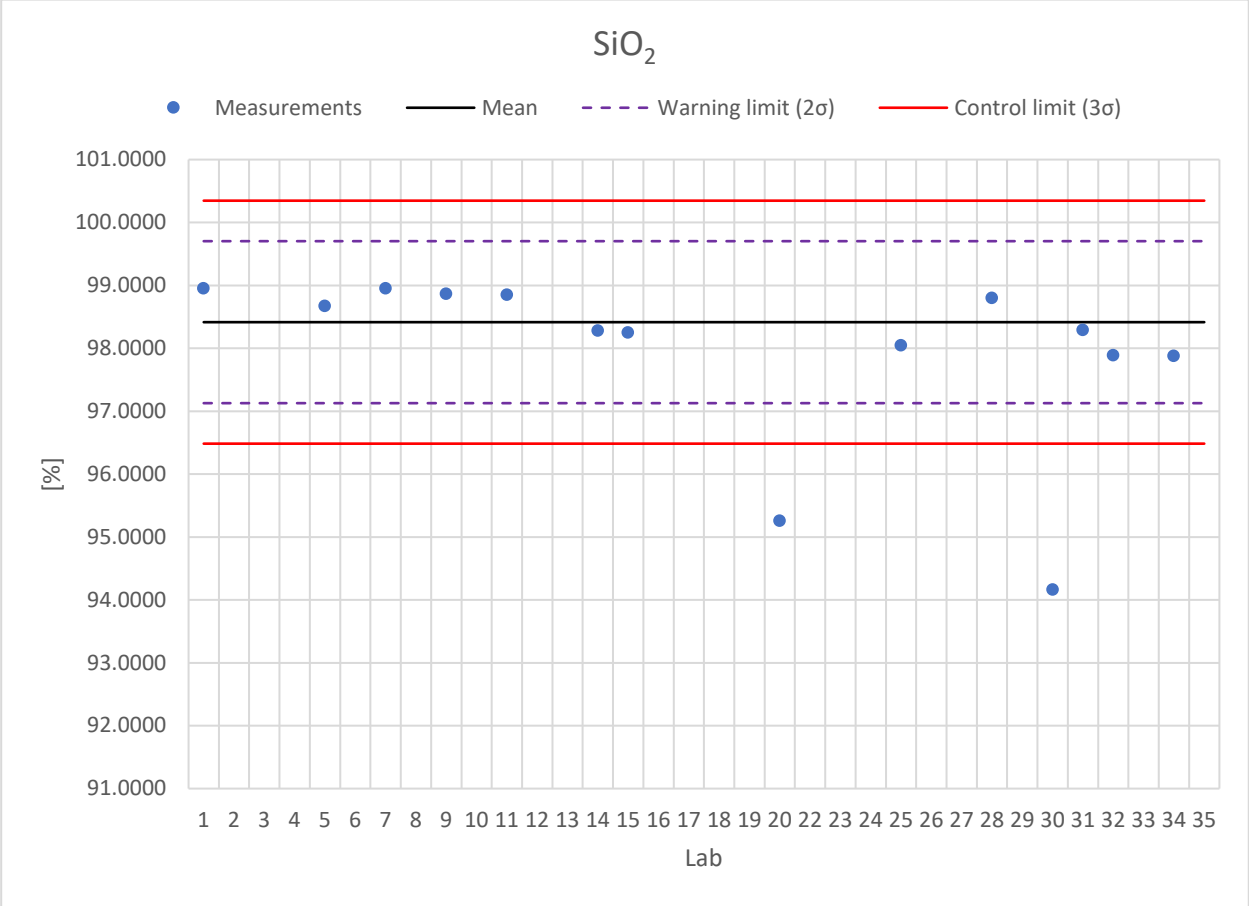


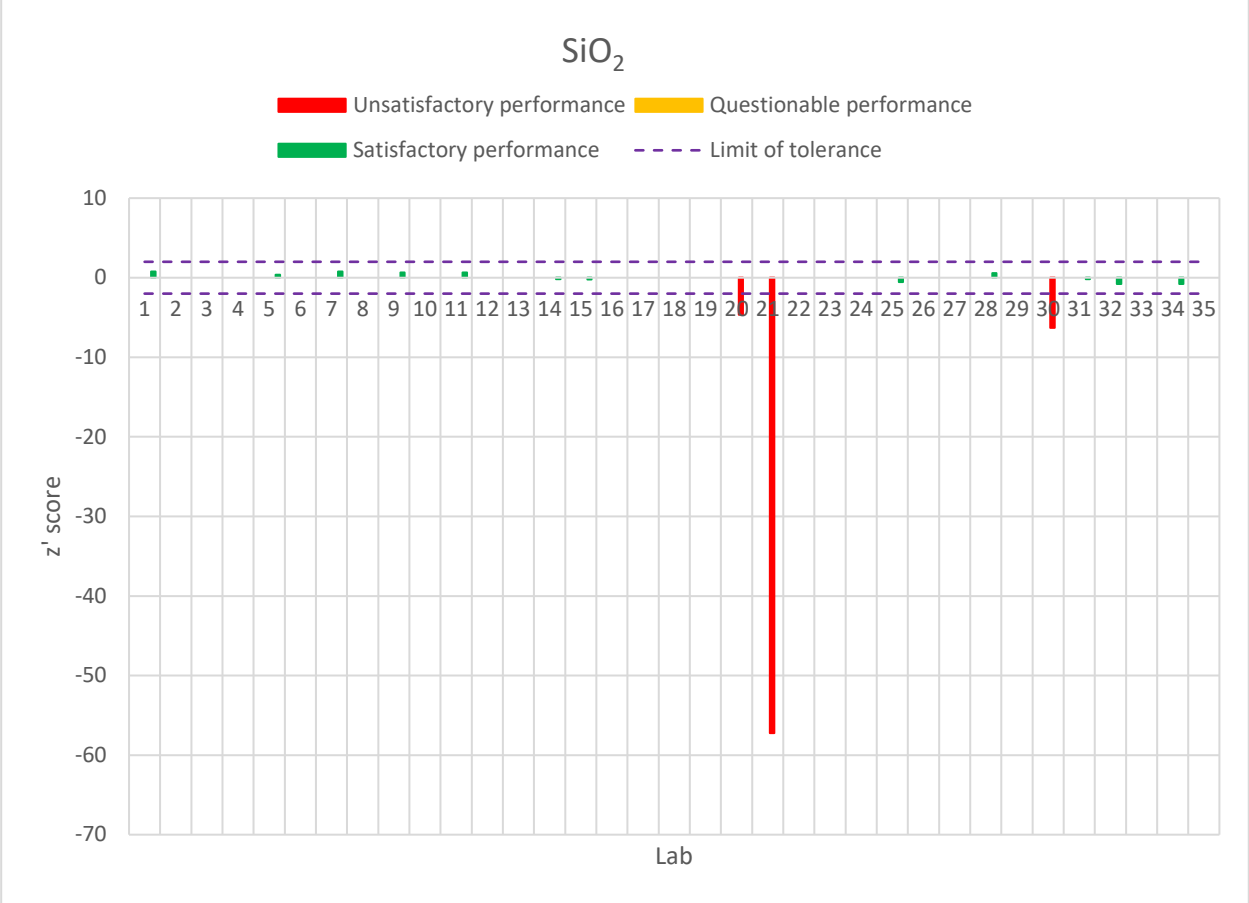
CHARTS SAMPLE A





CHARTS SAMPLE A





ANNEX 5.2. MEASUREMENTS SAMPLE B

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
x_{pt}	0.0906	0.0360	0.0020	0.0021	0.0026	0.0255	0.0050	2.73	18.84	2.46
σ_{pt}	0.0138	0.0039	0.0006	0.0019	0.0018	0.0037	0.0012	2.17	6.85	1.96
N	27	27	21	24	23	28	22	16	20	6

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
Lab 1	0.0829	0.0335	0.0015	0.0004	0.0007	0.0213	0.0045	0.6	18.7	0.8
Lab 2	0.0952	0.0380	0.0020	0.0016	0.0019	0.0218	0.0050	2.0	14.9	
Lab 3	0.1017	0.0382		0.0002	0.0002	0.0258	0.0039	5.0	14.0	1.3
Lab 4										
Lab 5	0.1220	0.0420	0.0010	0.0025	0.0039	0.0270	0.0052		36.0	
Lab 6	0.0851	0.0331	0.0018	0.0015	0.0023	0.0267	0.0046	1.0	15.0	2.0
Lab 7	0.0470	0.0330	0.0017	0.0008	0.0021	0.0250	0.0044	0.7	14.0	
Lab 8										
Lab 9	0.0832	0.0526	0.0020	0.0019	0.0038	0.0239	0.0034	2.0	12.0	
Lab 10	0.0990		0.0020	0.0068	0.0062	0.0302	0.0081			
Lab 11	0.0864	0.0377	0.0060	0.0000	0.0000	0.0232	0.0031	2.0	22.0	
Lab 12	0.0907	0.0218	0.0016	0.0001			0.0015			
Lab 13										
Lab 14	0.1860	0.0410	0.0070	0.0150	0.0300	0.0260	0.0410		50.0	
Lab 15	0.0640	0.0420				0.0270				
Lab 16	0.0871	0.0360	0.0025	0.0012	0.0023	0.0248	0.0051		16.0	
Lab 17	0.0801	0.0328	0.0017	0.0010	0.0025	0.0239	0.0045	0.9	14.0	1.7
Lab 18	0.0820	0.0330	0.0020	0.0030	0.0022	0.0266	0.0050		20.0	
Lab 19										
Lab 20	0.1040	0.0385	0.0038	0.0081	0.0001	0.0119	LOD	15.0	103.0	
Lab 21	0.0888	0.0341	0.0015	0.0043	0.0019	0.0234	0.0059	1.2	22.0	5.4
Lab 22										
Lab 23	0.0930	0.0330	0.0015	0.0011	0.0013	0.0210			12.0	
Lab 24	0.0903	0.0350	0.0019	0.0015	0.0021	0.0267	0.0042	1.9	14.0	
Lab 25	0.0729	0.0193				0.0243				
Lab 26	0.1056	0.0374		0.0332	0.0114	0.0342	0.0060	8.7		
Lab 27		0.0330	0.0020		0.0020	0.0260	0.0040			
Lab 28	0.0348	0.0335	0.0008	0.0005		0.0147			12.8	
Lab 29										
Lab 30		0.0573		0.0136		0.0267				
Lab 31	0.1000	0.0600		0.0100	0.0300	0.0700	0.0200	100.0		
Lab 32	0.0833	0.0610	0.0030	0.0025	0.0040	0.0170	0.0056	20.0	30.0	
Lab 33	0.0959	0.0347			0.0031	0.0290	0.0056	3.2		4.5
Lab 34	0.0988	0.0350	0.0020	0.0010	0.0035	0.0287	0.0050	2.0	18.0	
Lab 35	0.1078					0.6854			10642.2	

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	1.25	2.87	3.14	17.82	2.65	2.29	0.81	2.29	174.17	6.46
σ_{pt}	1.19	0.51	2.95	21.97	2.47	1.45	0.58	2.47		3.91
N	7	7	8	8	10	8	4	10	1	13

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
Lab 1	0.8	2.3	<0.5	<0.3	0.6	1.2	0.3	<0.5	<0.2	5.8
Lab 2		3.0	0.4		0.3			0.4		
Lab 3										23.1
Lab 4										
Lab 5										
Lab 6		3.0								
Lab 7								0.3		
Lab 8										
Lab 9										39.1
Lab 10										
Lab 11										39.6
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	0.4	2.7	0.2	0.1	0.2	1.2		0.3		3.9
Lab 18										
Lab 19										
Lab 20				40.0	24.0			18.0		
Lab 21	0.3		3.5	5.3	2.5	5.4	0.5	0.9		3.8
Lab 22										
Lab 23										
Lab 24	0.6		1.5		0.4			0.7		3.7
Lab 25				83.0						
Lab 26	4.3	2.4	2.1	0.4	2.0	1.5		4.9	174.2	3.4
Lab 27		3.0				1.2				5.5
Lab 28						2.2				
Lab 29										
Lab 30				901.0				51.0		9946.2
Lab 31			100.0							
Lab 32	50.0	60.0	60.0	40.0	60.0	10.0	1.0	2.0		5.0
Lab 33	4.5		3.9	2.9	2.0	3.5	3.0	3.4		4.8
Lab 34										3.9
Lab 35					61.8					

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	2.10	41.99	2.04		1316.00	7.03	4.13	21.67	20.00	10.00
σ_{pt}		29.39	2.66			8.54	4.20	12.25		
N	1	4	3		1	9	5	3	1	1

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
Lab 1	<1.4	25.0	1.5	<0.5	<1.7	40.3				
Lab 2										
Lab 3										
Lab 4										
Lab 5		80.0								
Lab 6										
Lab 7										
Lab 8										
Lab 9		26.0				14.0				
Lab 10										
Lab 11						11.0				
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	2.1		0.0			0.3	1.0			
Lab 18										
Lab 19										
Lab 20		37.0								
Lab 21						0.4		12.5		
Lab 22										
Lab 23										
Lab 24						0.9				
Lab 25										
Lab 26						0.0	2.9			
Lab 27										
Lab 28							0.6			
Lab 29										
Lab 30					1316.0	641.0	11015.0			
Lab 31										
Lab 32			320.0			4.0		19.0	20.0	10.0
Lab 33								208.8		
Lab 34										
Lab 35							242.6			

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
x_{pt}	1.26	0.83	1.65	676.64	60.26	0.50	2445.00	11694.0	0.0044	0.6060	0.1064	99.6578
σ_{pt}	0.38			1079.88	95.80						0.0251	0.2414
N	7	1	1	2	2	1	1	1	1	1	6	15

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
Lab 1												99.8681
Lab 2												
Lab 3												
Lab 4												
Lab 5												99.7920
Lab 6												
Lab 7												99.8400
Lab 8												
Lab 9												99.8167
Lab 10												
Lab 11											0.1000	99.8300
Lab 12												
Lab 13												
Lab 14											0.0880	99.3100
Lab 15											0.1100	99.7400
Lab 16												
Lab 17	1.0					0.5						
Lab 18												
Lab 19												
Lab 20									0.0044			99.7500
Lab 21	1.0											59.9759
Lab 22												
Lab 23												
Lab 24	0.9											
Lab 25	13.0										0.0800	99.3801
Lab 26		0.8	1.7	3.3	0.5							
Lab 27												
Lab 28	1.1											99.8700
Lab 29												
Lab 30				1350.0			2445.0	11694.0		0.6060		94.4260
Lab 31											0.1200	99.6200
Lab 32	10.0				120.0						0.2620	99.0900
Lab 33	1.6											
Lab 34												99.7800
Lab 35												

ANNEX 5.2.1. Z-SCORE SAMPLE B

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	P_2O_5
Lab 1	-0.6	-0.6	-0.7	-0.9	-1.1	-1.2	-0.4	0.0
Lab 2	0.3	0.5	0.0	-0.3	-0.4	-1.0	0.0	-0.6
Lab 3	0.8	0.6		-1.0	-1.3	0.1	-0.9	-0.7
Lab 4								
Lab 5	2.3	1.6	-1.5	0.2	0.7	0.4	0.2	2.5
Lab 6	-0.4	-0.7	-0.3	-0.3	-0.2	0.3	-0.3	-0.6
Lab 7	-3.2	-0.8	-0.5	-0.7	-0.3	-0.1	-0.5	-0.7
Lab 8								
Lab 9	-0.5	4.3	0.0	-0.1	0.7	-0.4	-1.4	-1.0
Lab 10	0.6		0.0	2.5	2.0	1.3	2.7	
Lab 11	-0.3	0.5	6.4	-1.1	-1.4	-0.6	-1.6	0.5
Lab 12	0.0	-3.7	-0.6	-1.1			-3.0	
Lab 13								
Lab 14	6.9	1.3	8.0	6.8	15.3	0.1	30.8	4.6
Lab 15	-1.9	1.6				0.4		
Lab 16	-0.3	0.0	0.8	-0.5	-0.2	-0.2	0.1	-0.4
Lab 17	-0.8	-0.8	-0.4	-0.6	-0.1	-0.5	-0.4	-0.7
Lab 18	-0.6	-0.8	0.0	0.5	-0.2	0.3	0.0	0.2
Lab 19								
Lab 20	1.0	0.7	2.9	3.2	-1.4	-3.7		12.3
Lab 21	-0.1	-0.5	-0.8	1.1	-0.4	-0.6	0.8	0.5
Lab 22								
Lab 23	0.2	-0.8	-0.7	-0.6	-0.7	-1.2		-1.0
Lab 24	0.0	-0.3	-0.1	-0.4	-0.3	0.3	-0.7	-0.7
Lab 25	-1.3	-4.3				-0.3		
Lab 26	1.1	0.4		16.5	4.9	2.4	0.8	
Lab 27		-0.8	0.0		-0.3	0.1	-0.9	
Lab 28	-4.0	-0.6	-1.9	-0.9		-3.0		-0.9
Lab 29								
Lab 30		5.5		6.1		0.3		
Lab 31	0.7	6.2		4.2	15.3	12.2	12.8	
Lab 32	-0.5	6.5	1.6	0.2	0.8	-2.3	0.5	1.6
Lab 33	0.4	-0.3			0.3	1.0	0.5	
Lab 34	0.6	-0.2	0.0	-0.6	0.5	0.9	0.0	-0.1
Lab 35	1.2					180.3		1551.8

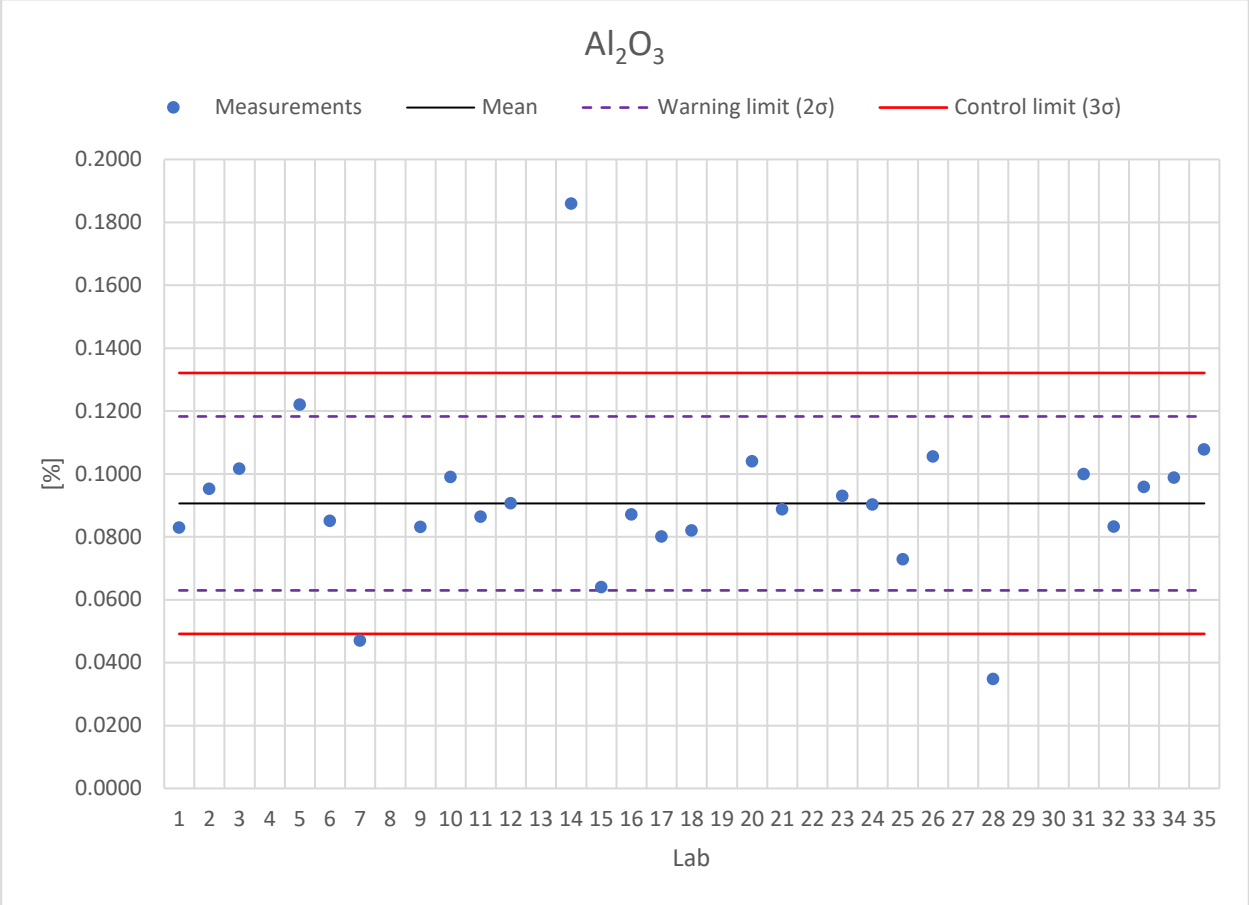
Satisfactory performance
Questionable performance
Unsatisfactory performance

ANNEX 5.2.2. Z'-SCORE SAMPLE B

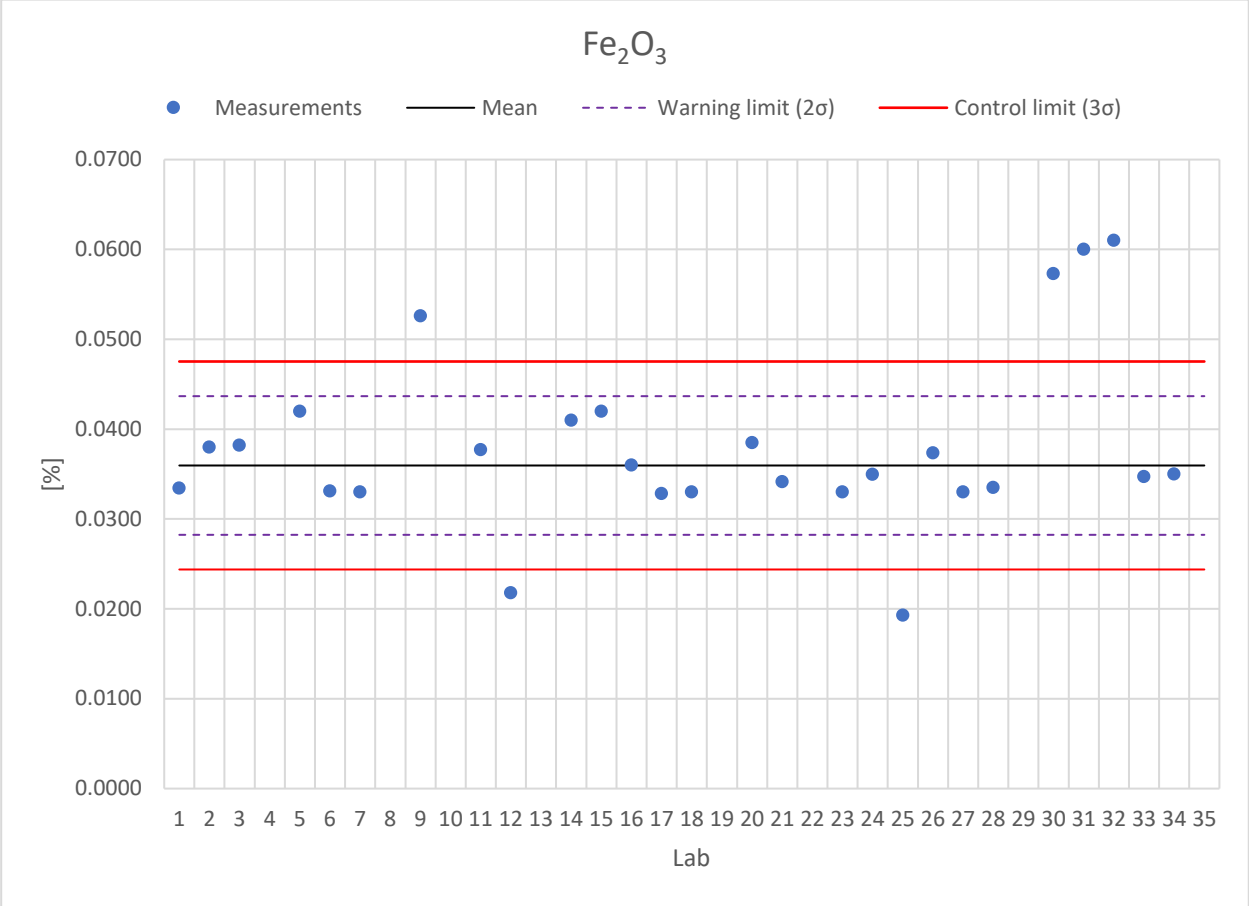
	MnO	NiO	PbO	CuO	CoO	Cr_2O_3	BaO	ZrO_2	SiO_2
Lab 1	-1.0			-0.8	-0.7		-0.2	3.9	0.9
Lab 2	-0.3	-0.9		-1.0		-0.8			
Lab 3	1.0						4.3		
Lab 4									
Lab 5									0.6
Lab 6	-0.8								
Lab 7	-0.9					-0.8			0.8
Lab 8									
Lab 9	-0.3						8.3	0.8	0.7
Lab 10									
Lab 11	-0.3						8.5	0.5	0.7
Lab 12									
Lab 13									
Lab 14									-1.4
Lab 15									0.3
Lab 16									
Lab 17	-0.8	-1.0	-0.8	-1.0	-0.8	-0.8	-0.7	-0.8	
Lab 18									
Lab 19									
Lab 20	5.6		1.0	8.7		6.4			0.4
Lab 21	-0.7	0.1	-0.6	-0.1	2.1	-0.6	-0.7	-0.8	-164.4
Lab 22									
Lab 23									
Lab 24	-0.4	-0.6		-0.9		-0.7	-0.7	-0.7	
Lab 25			3.0						-1.2
Lab 26	2.8	-0.4	-0.8	-0.3	-0.6	1.1	-0.8	-0.8	
Lab 27					-0.8		-0.2		
Lab 28					-0.1				0.9
Lab 29									
Lab 30			40.2			19.7	2544.6	74.2	-21.7
Lab 31	44.8	32.8							-0.2
Lab 32	8.0	19.3	1.0	23.2	5.3	-0.1	-0.4	-0.4	-2.4
Lab 33	0.2	0.3	-0.7	-0.2	0.9	0.5	-0.4		
Lab 34	-0.3						-0.7		0.5
Lab 35				24.0					

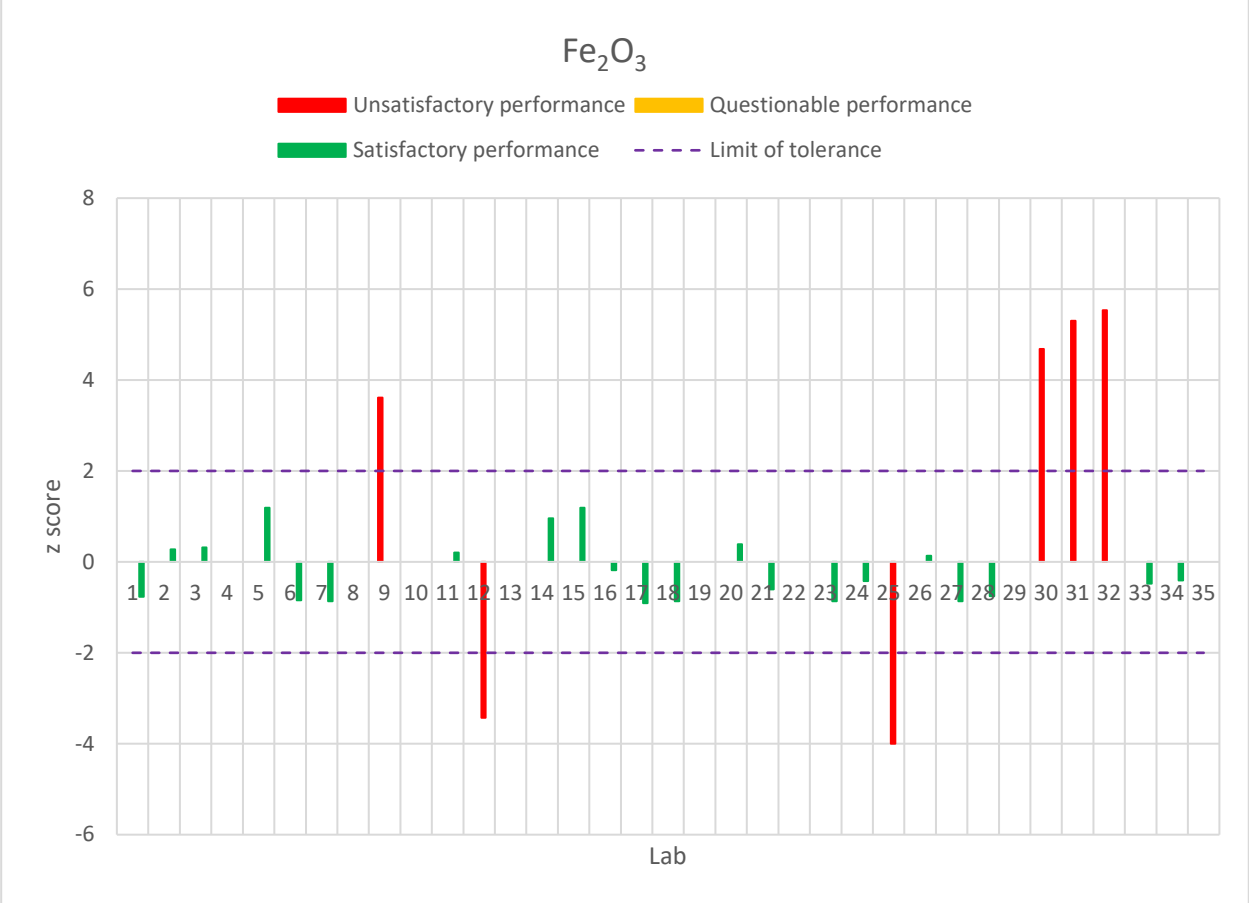
Satisfactory performance
Questionable performance
Unsatisfactory performance

ANNEX 5.2.3. CHARTS SAMPLE B

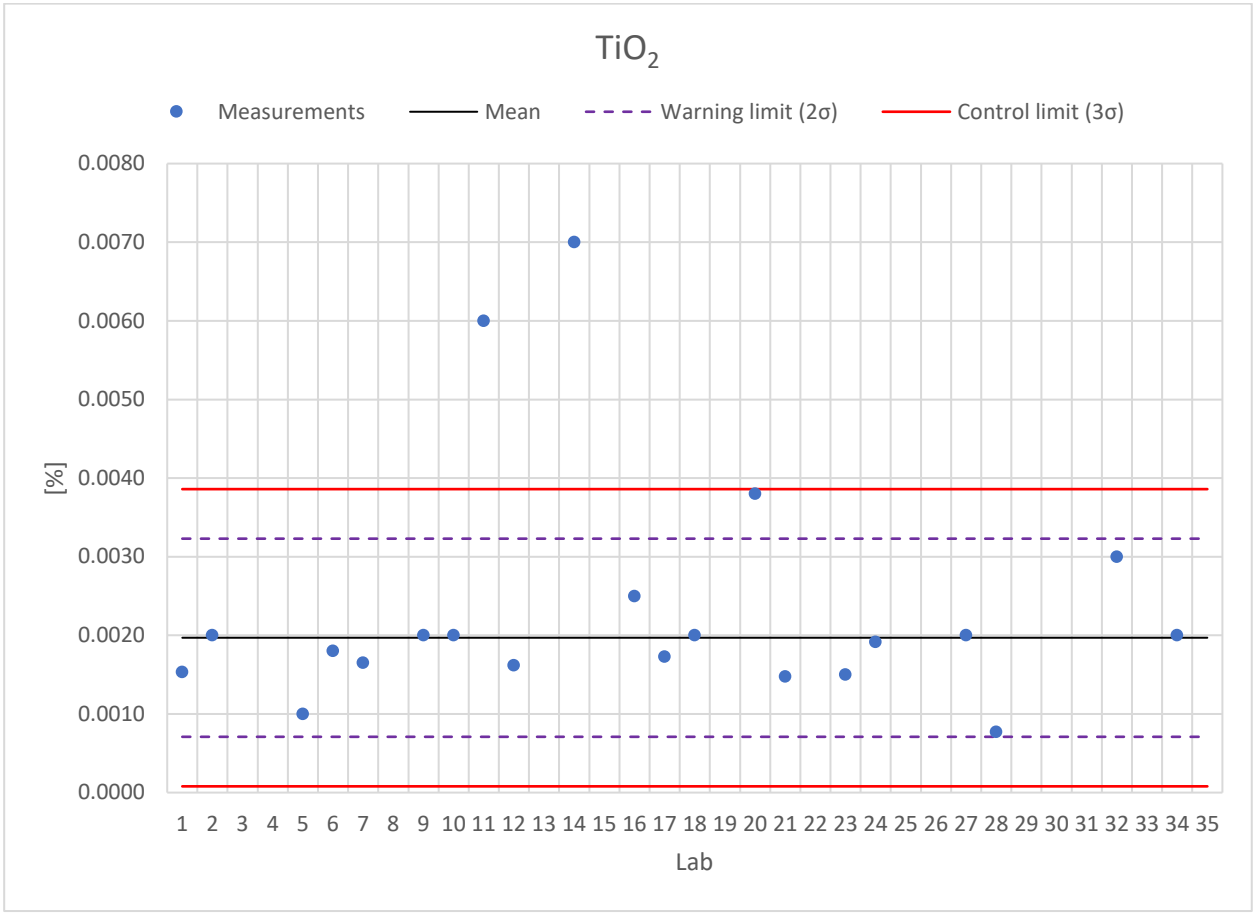


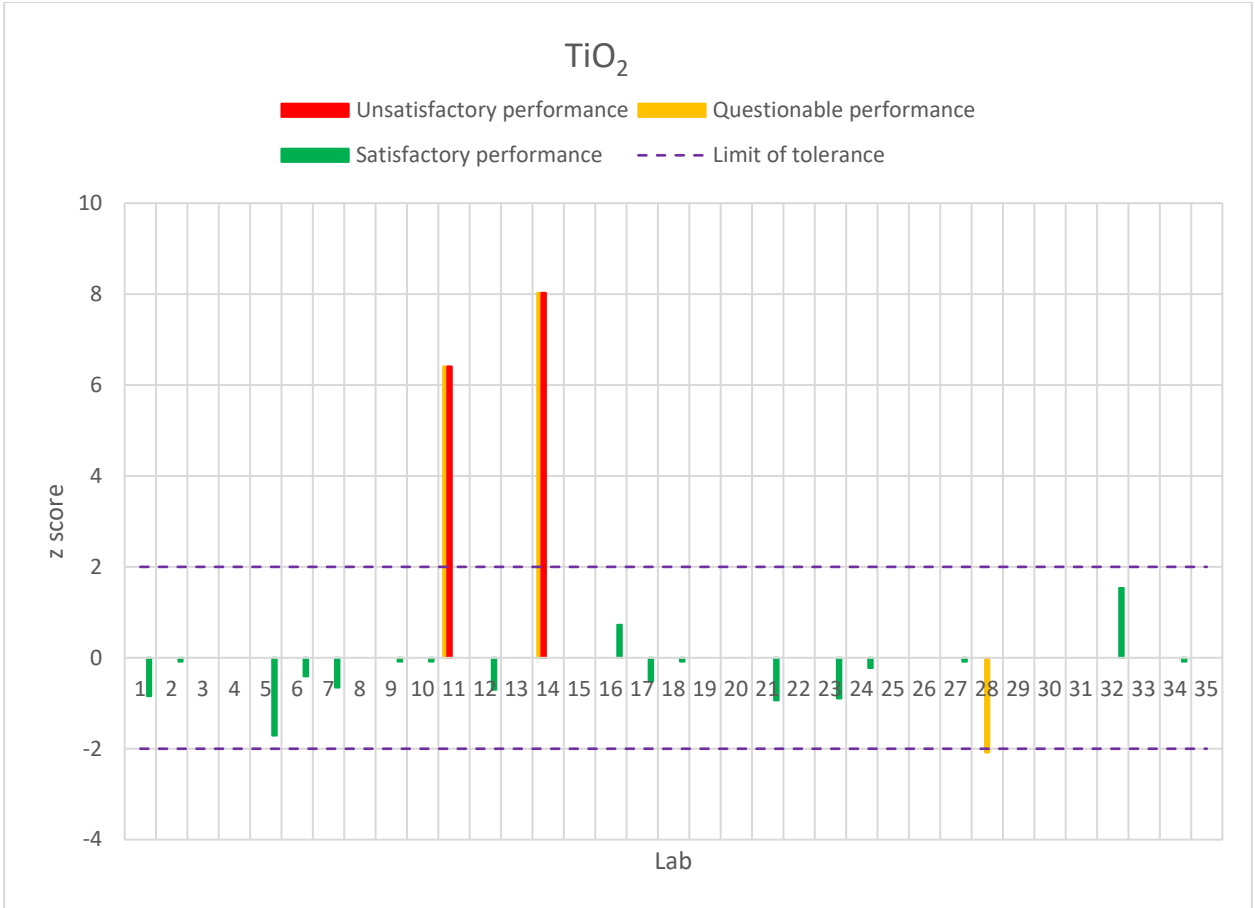
CHARTS SAMPLE B



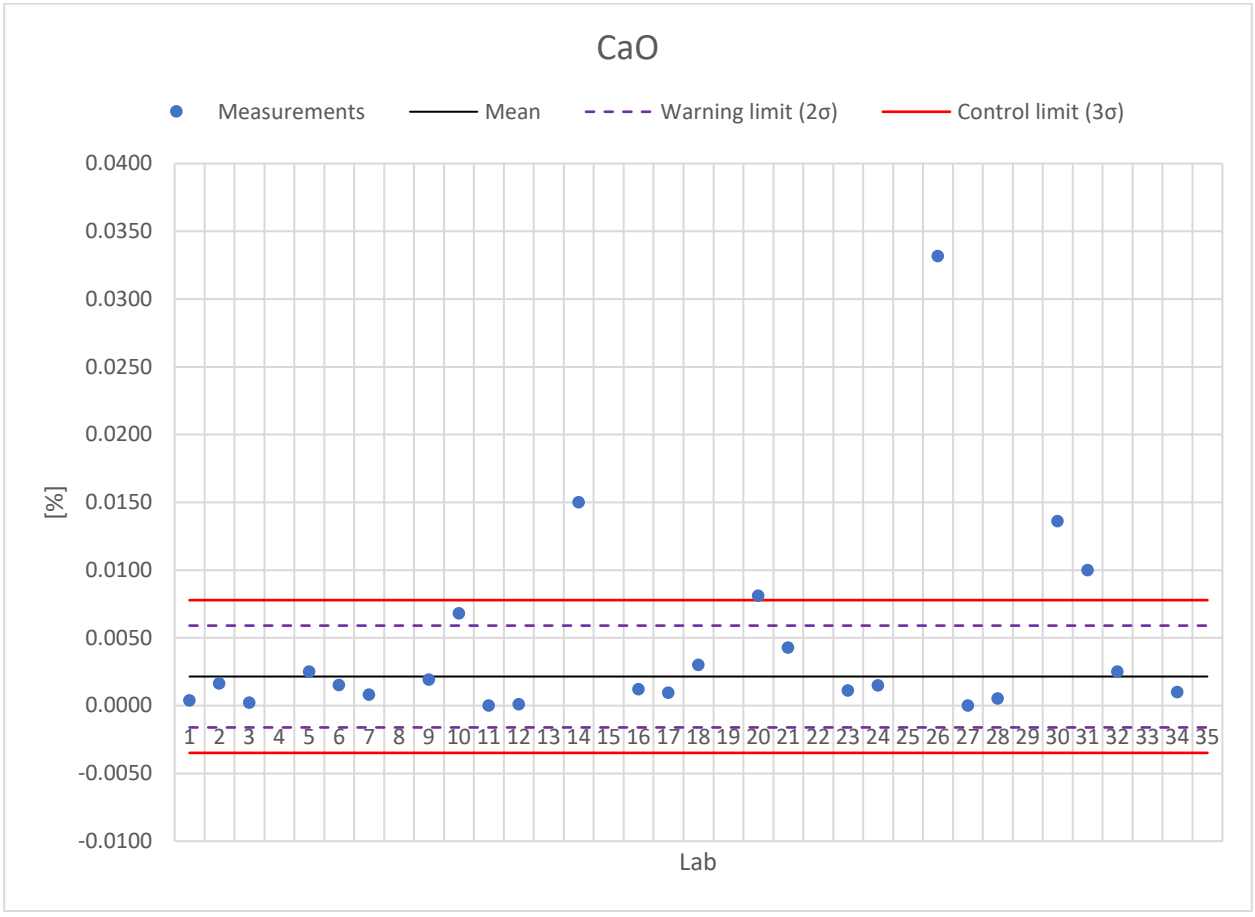


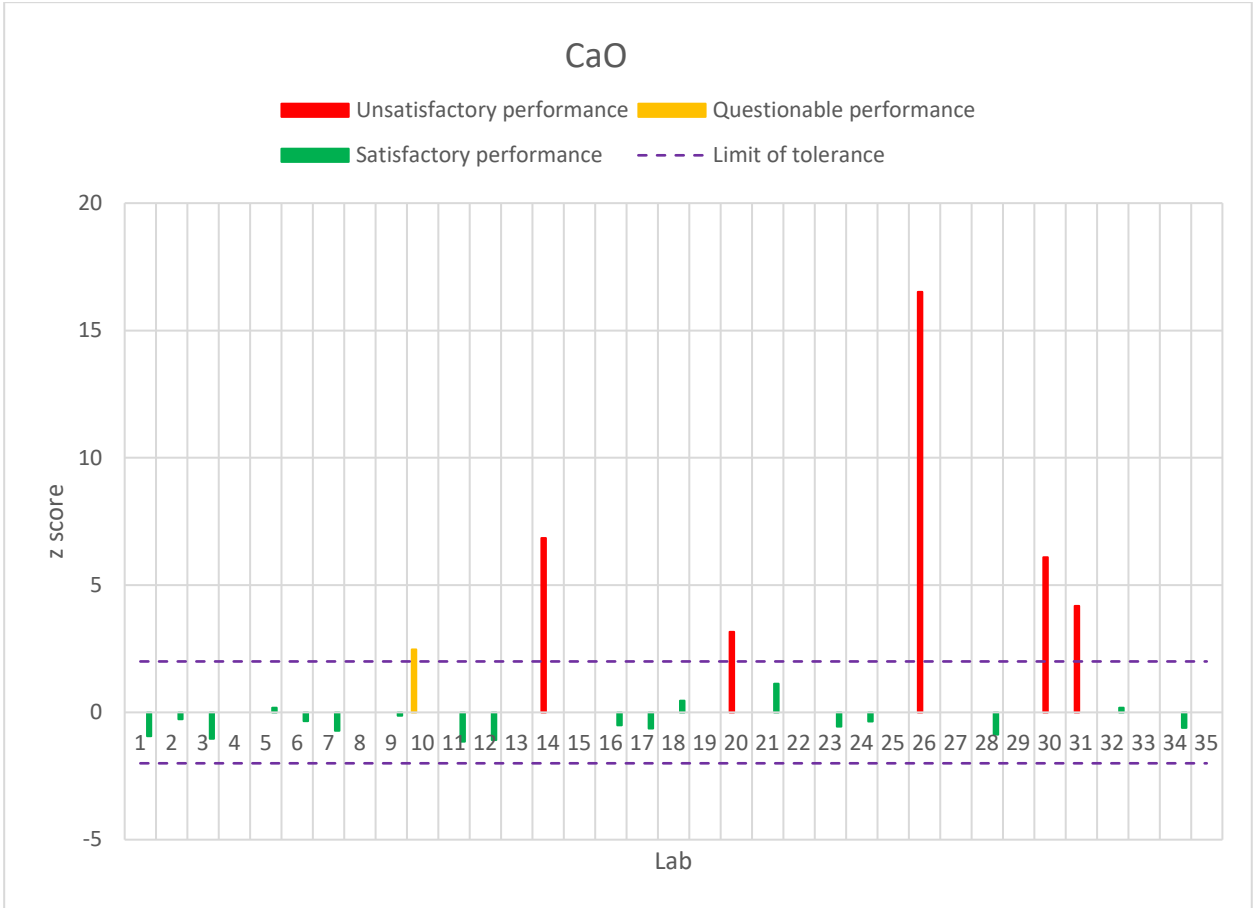
CHARTS SAMPLE B



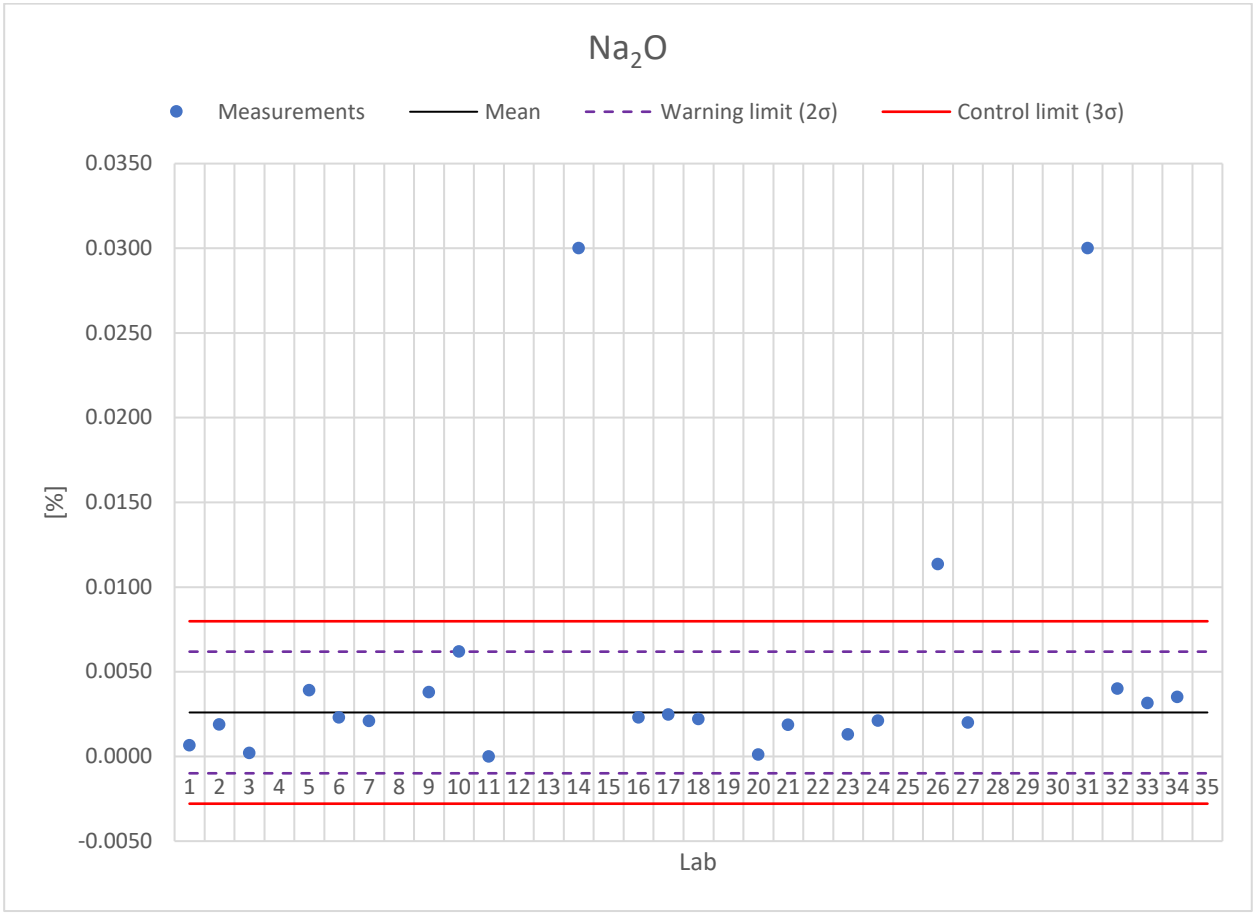


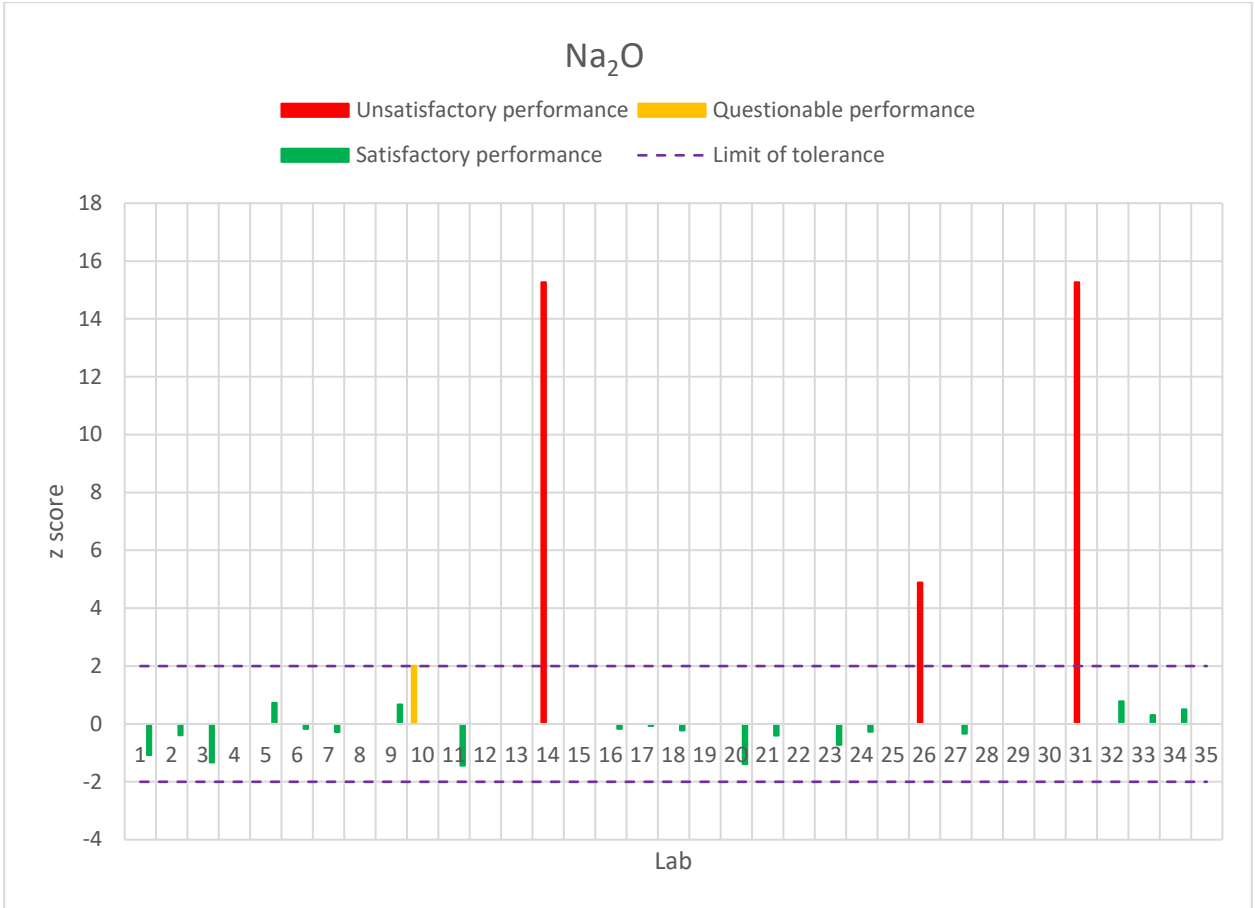
CHARTS SAMPLE B



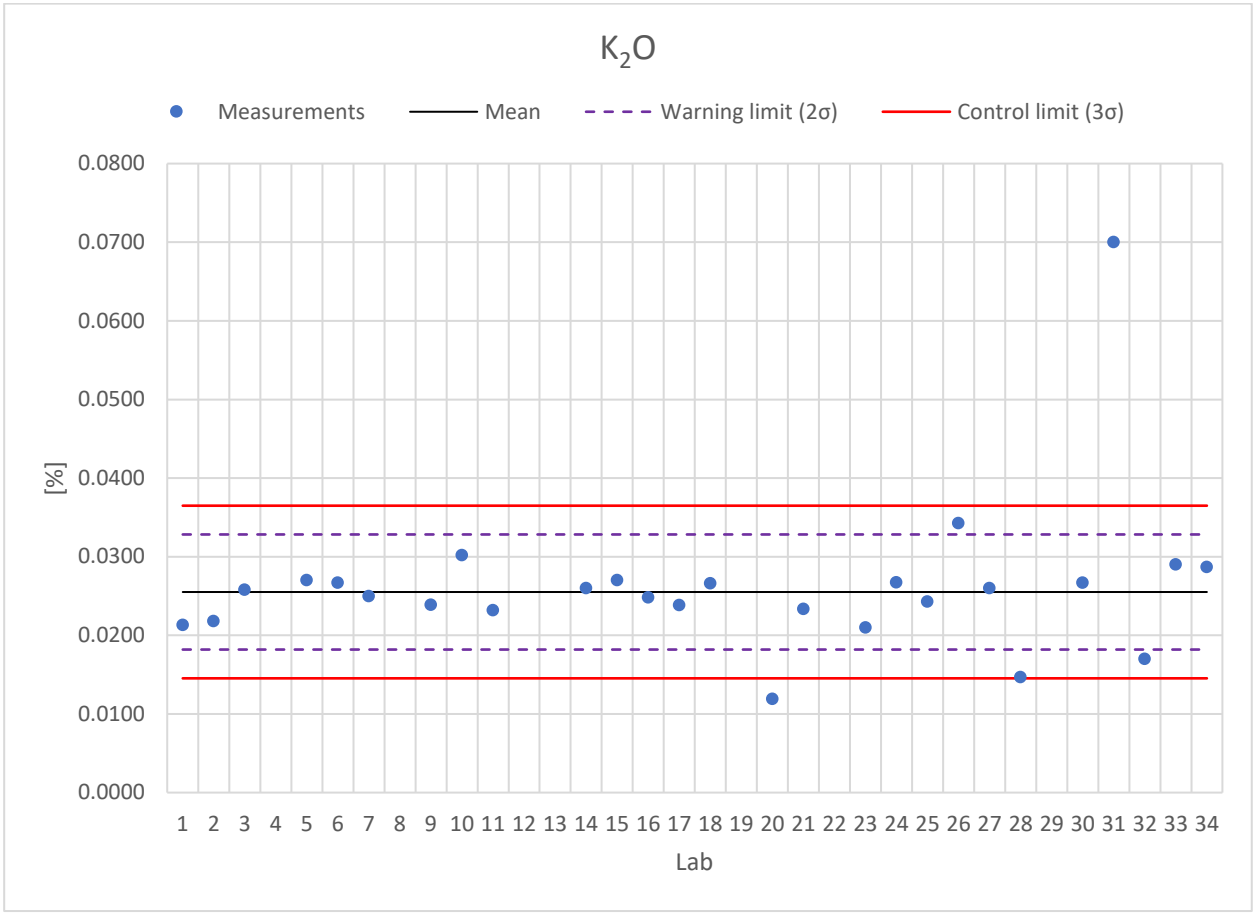


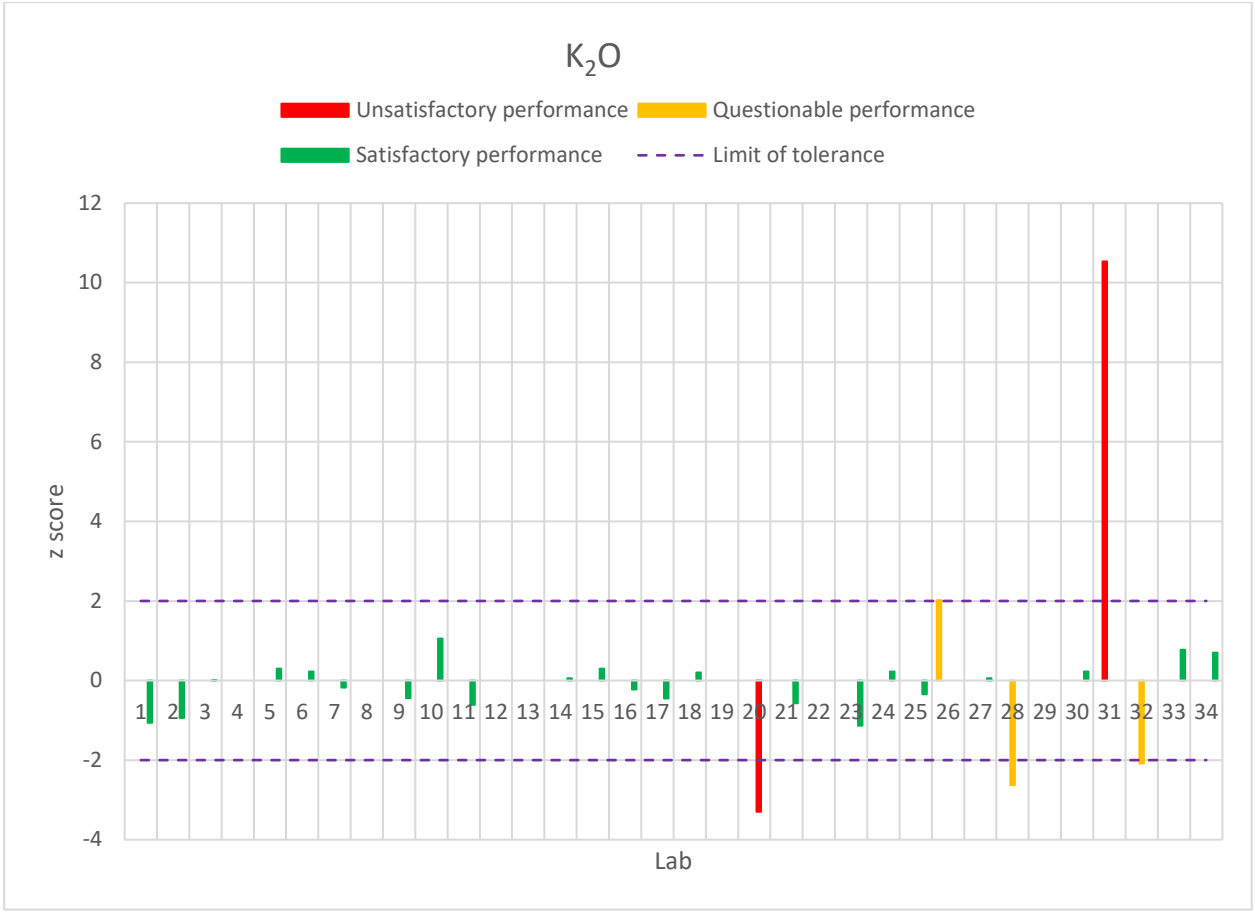
CHARTS SAMPLE B



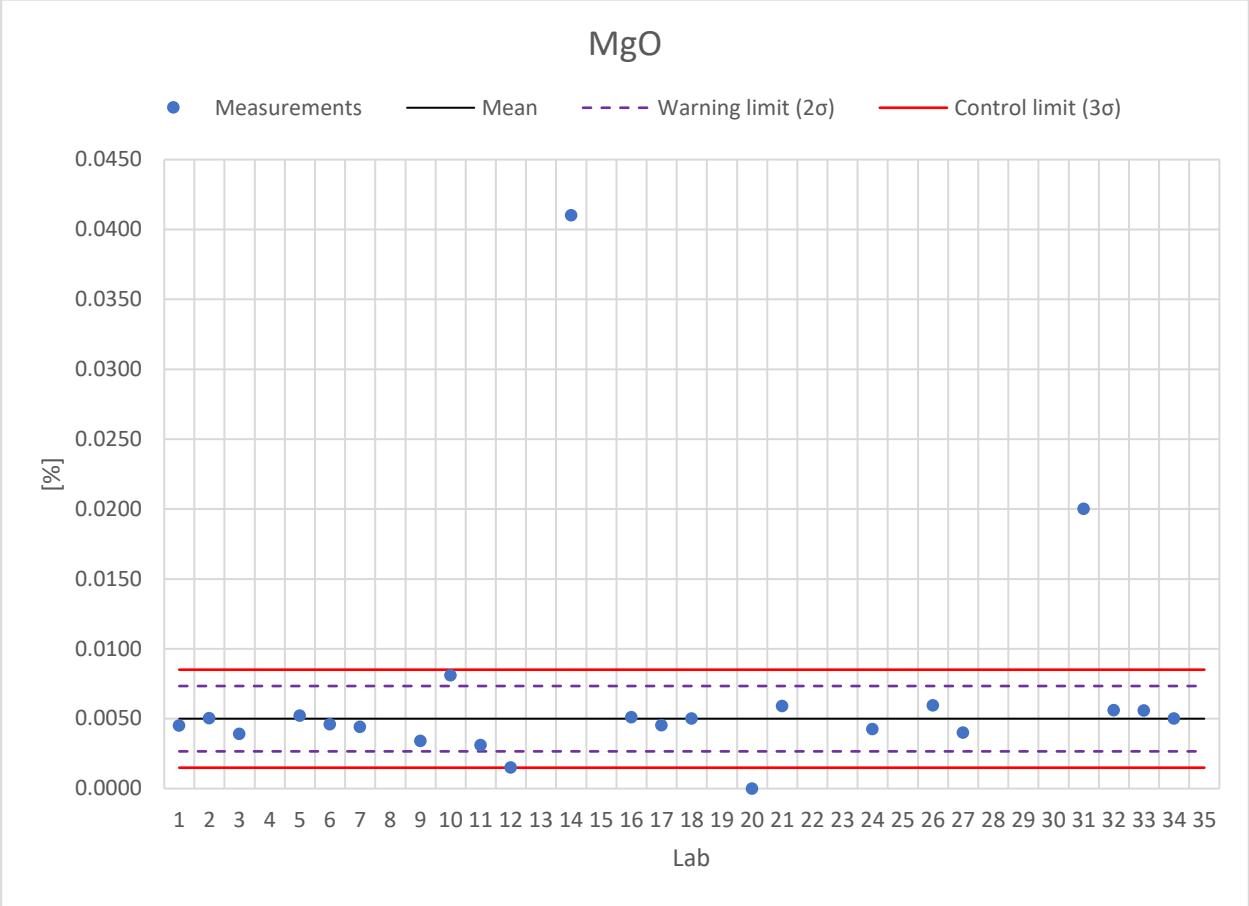


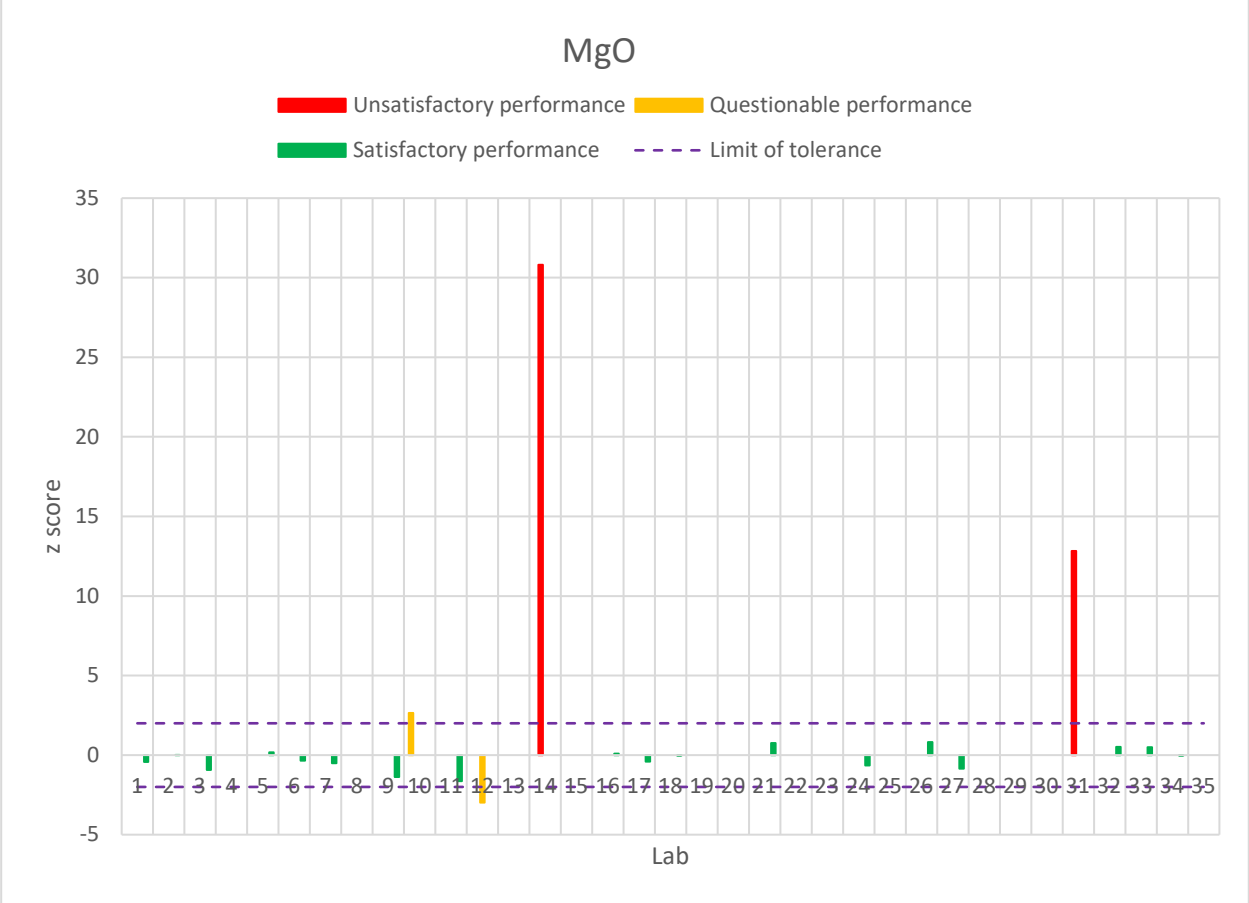
CHARTS SAMPLE B



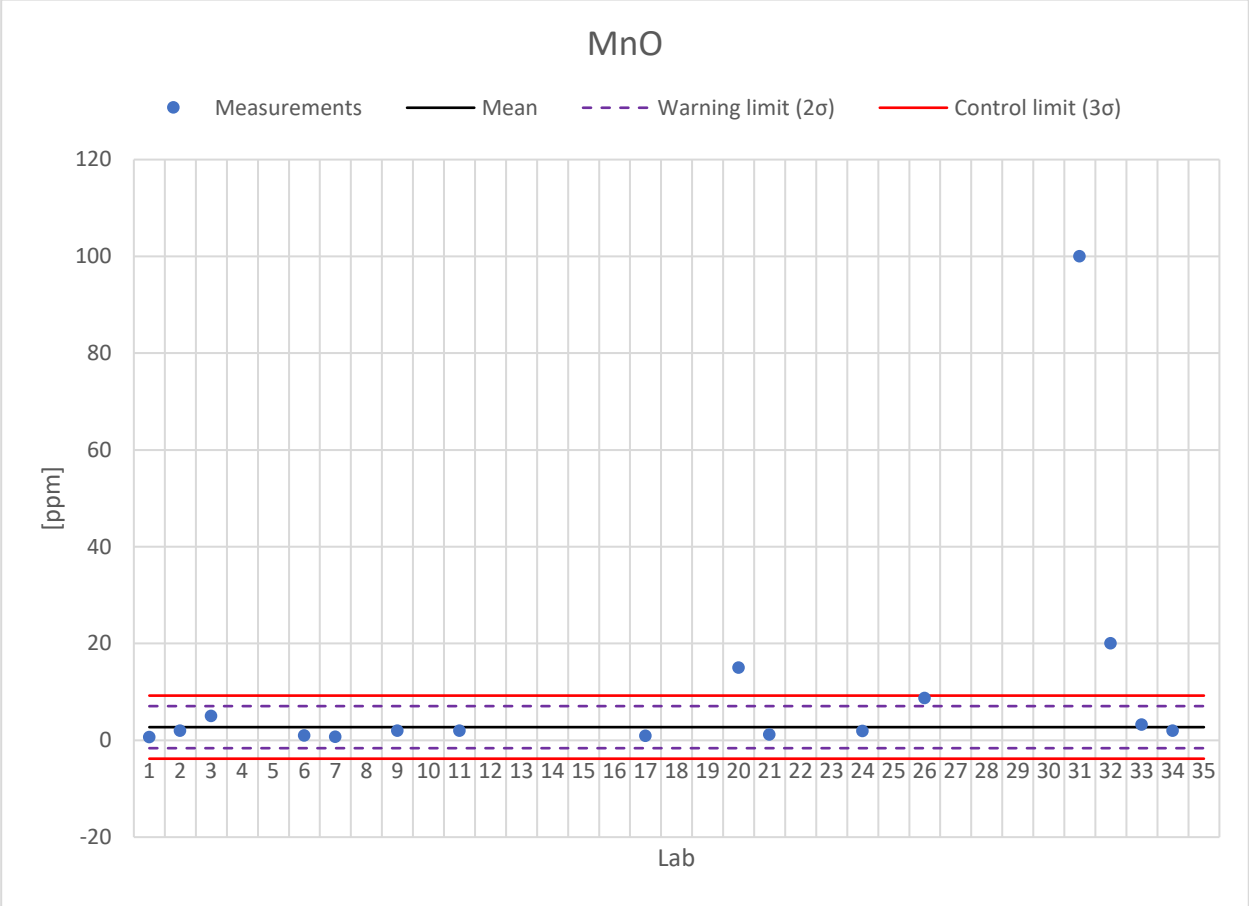


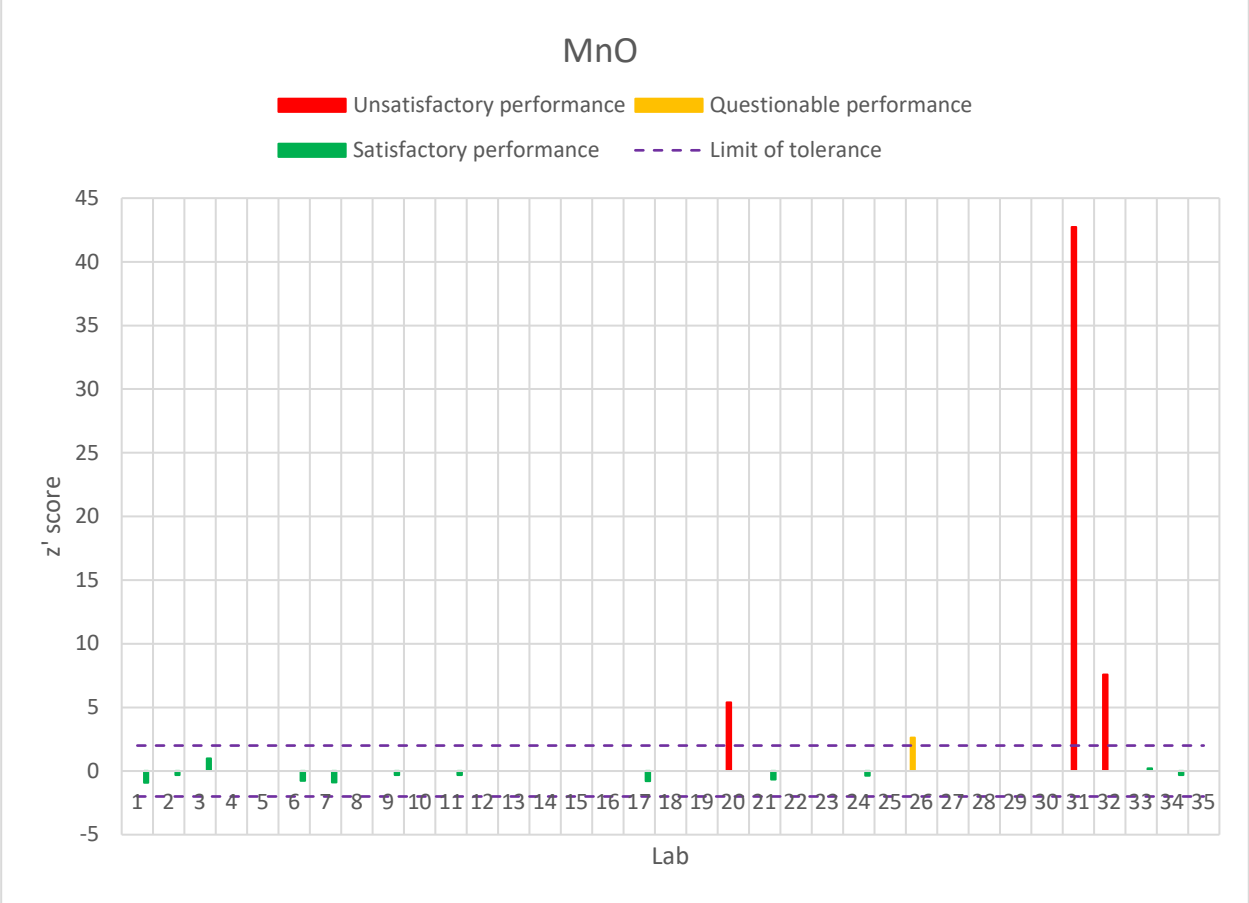
CHARTS SAMPLE B



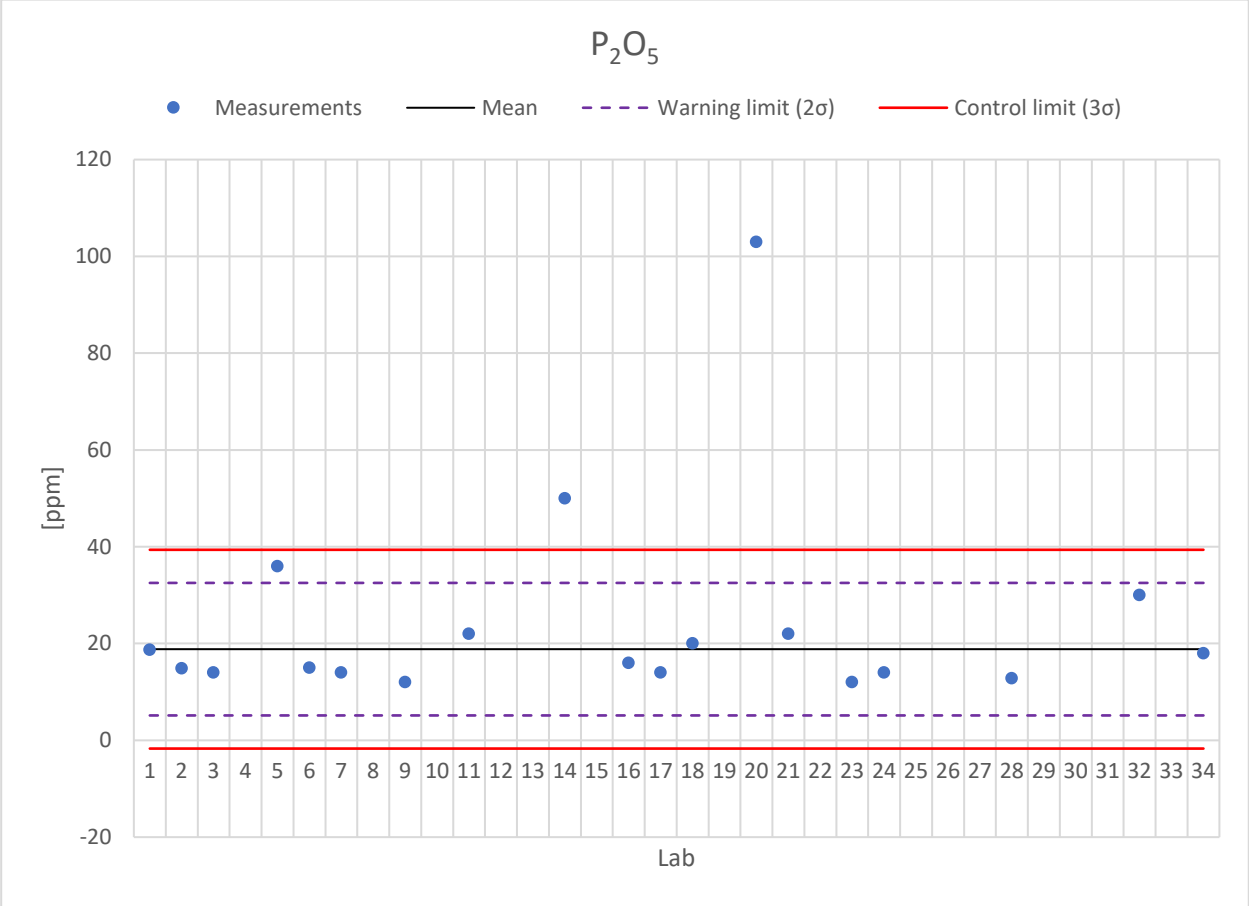


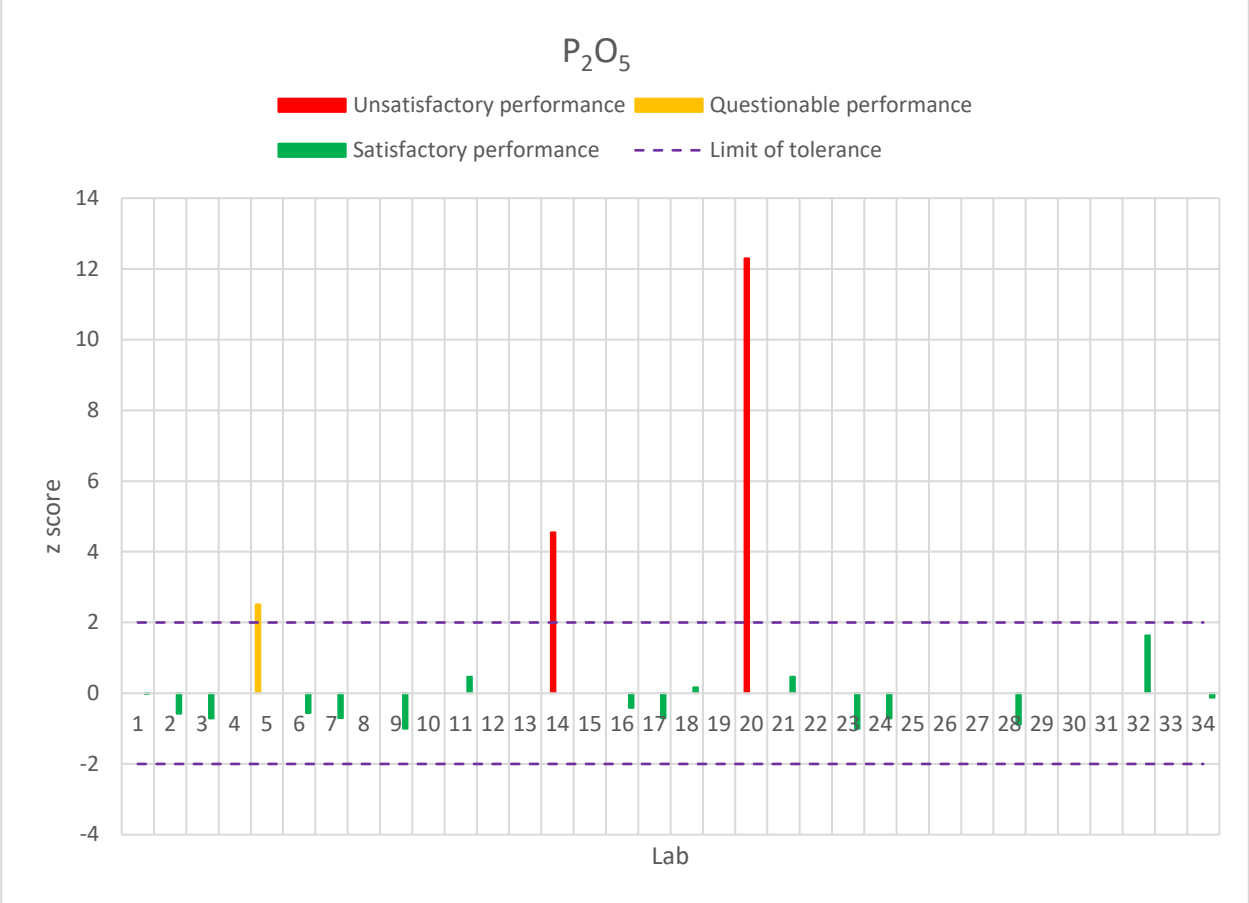
CHARTS SAMPLE B



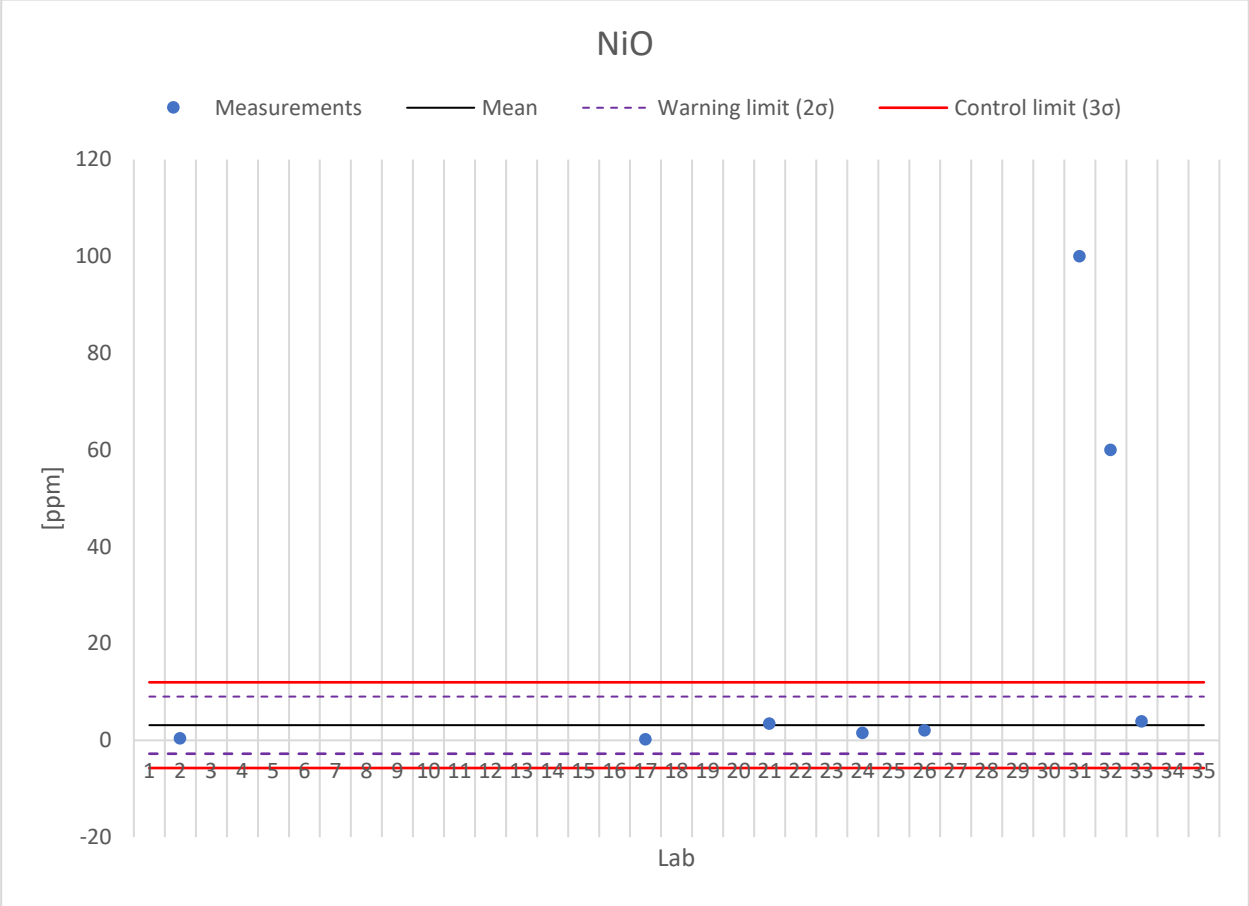


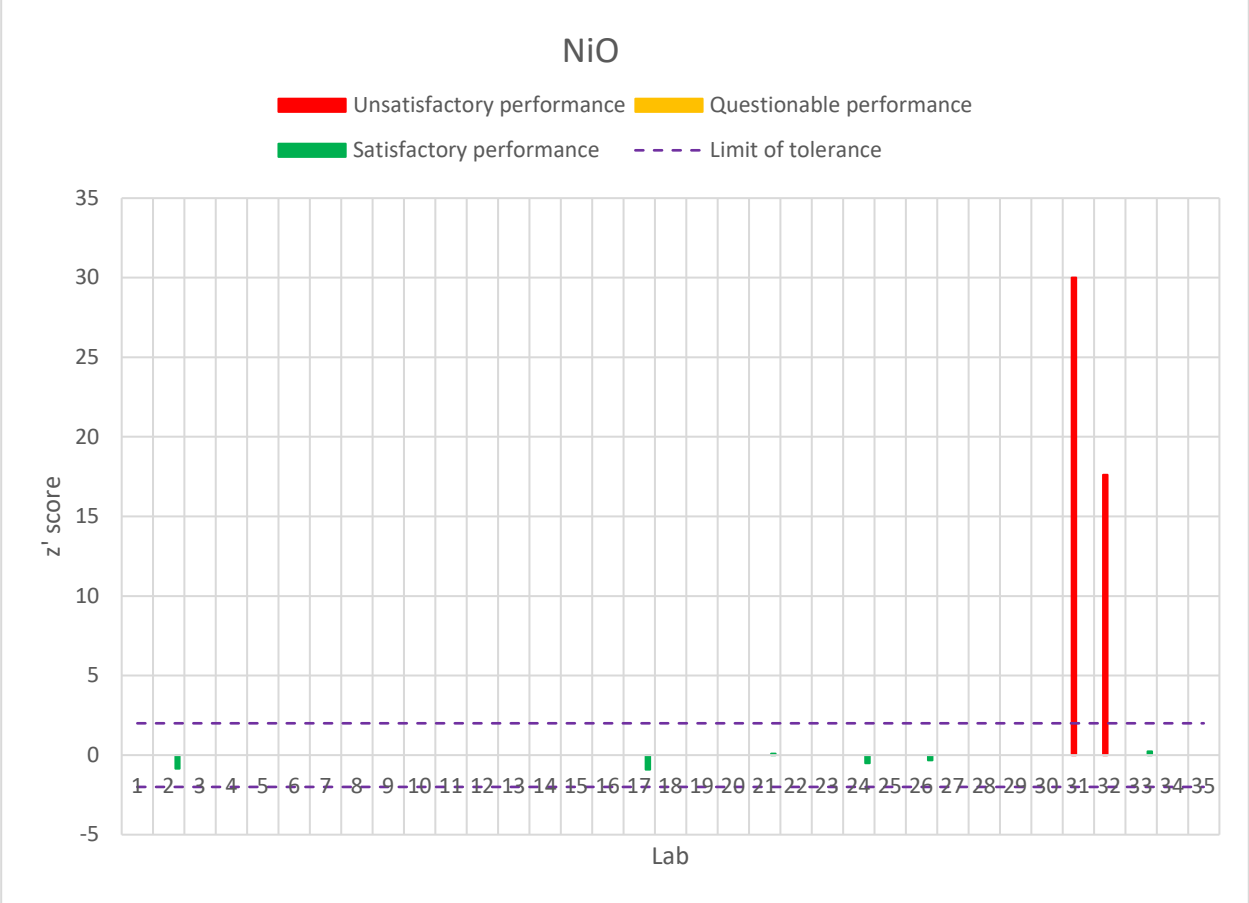
CHARTS SAMPLE B



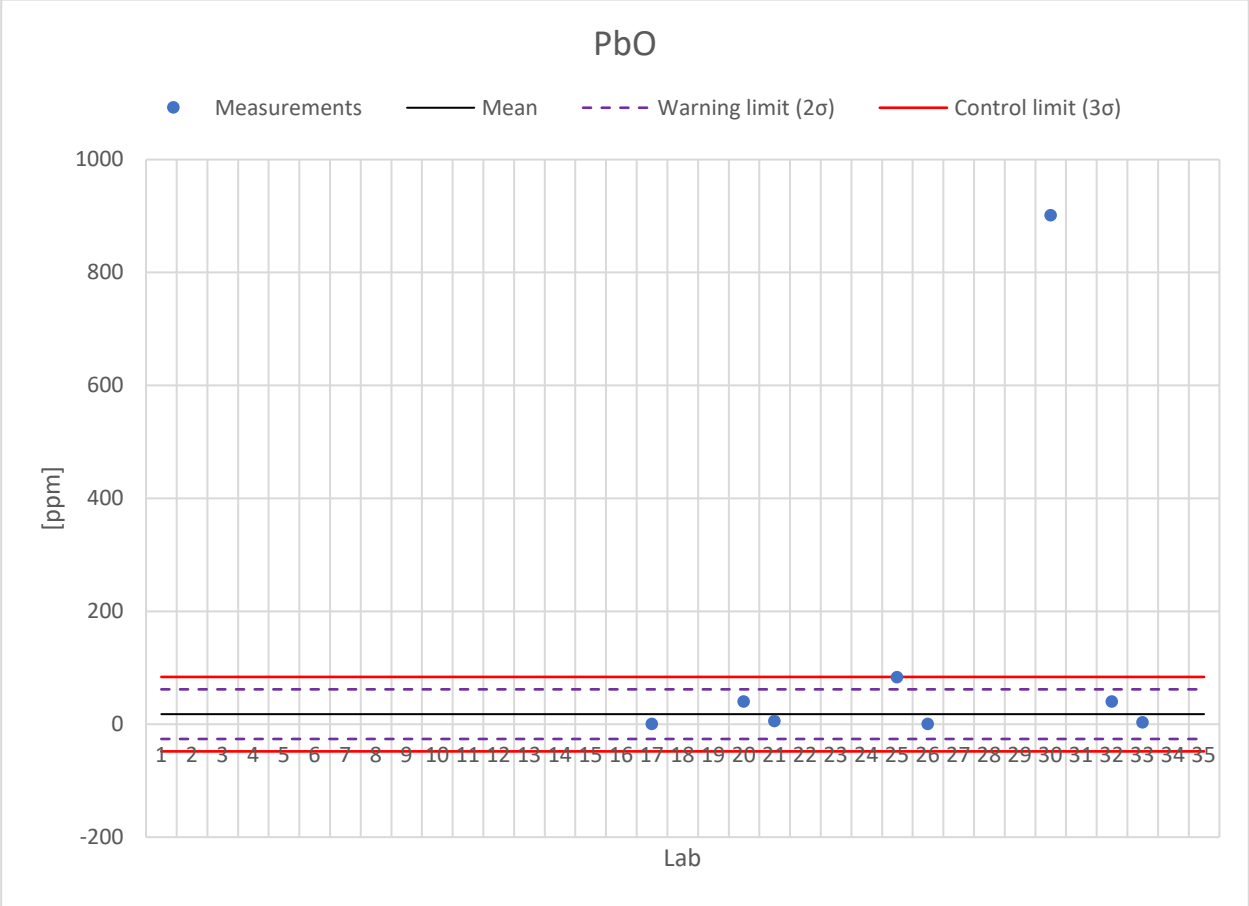


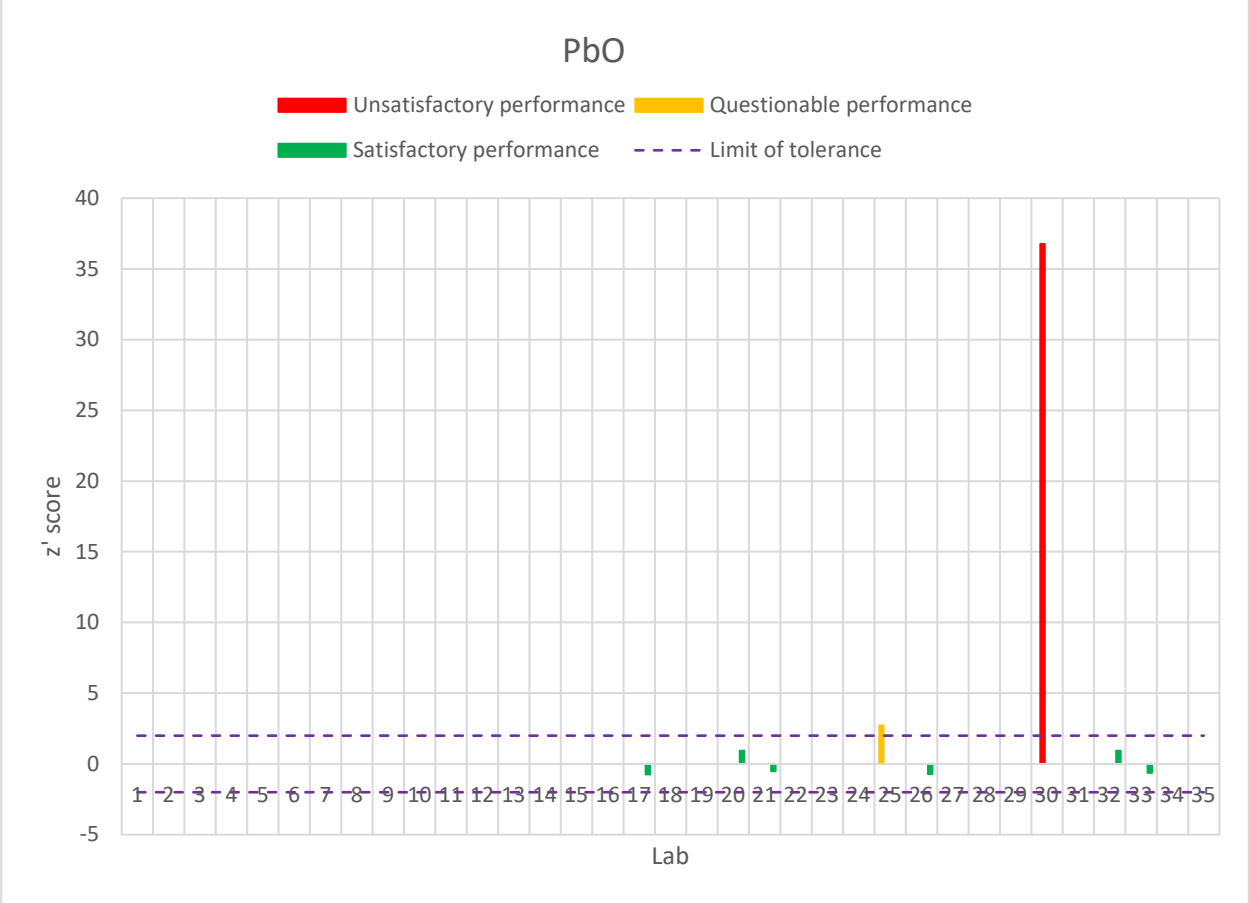
CHARTS SAMPLE B



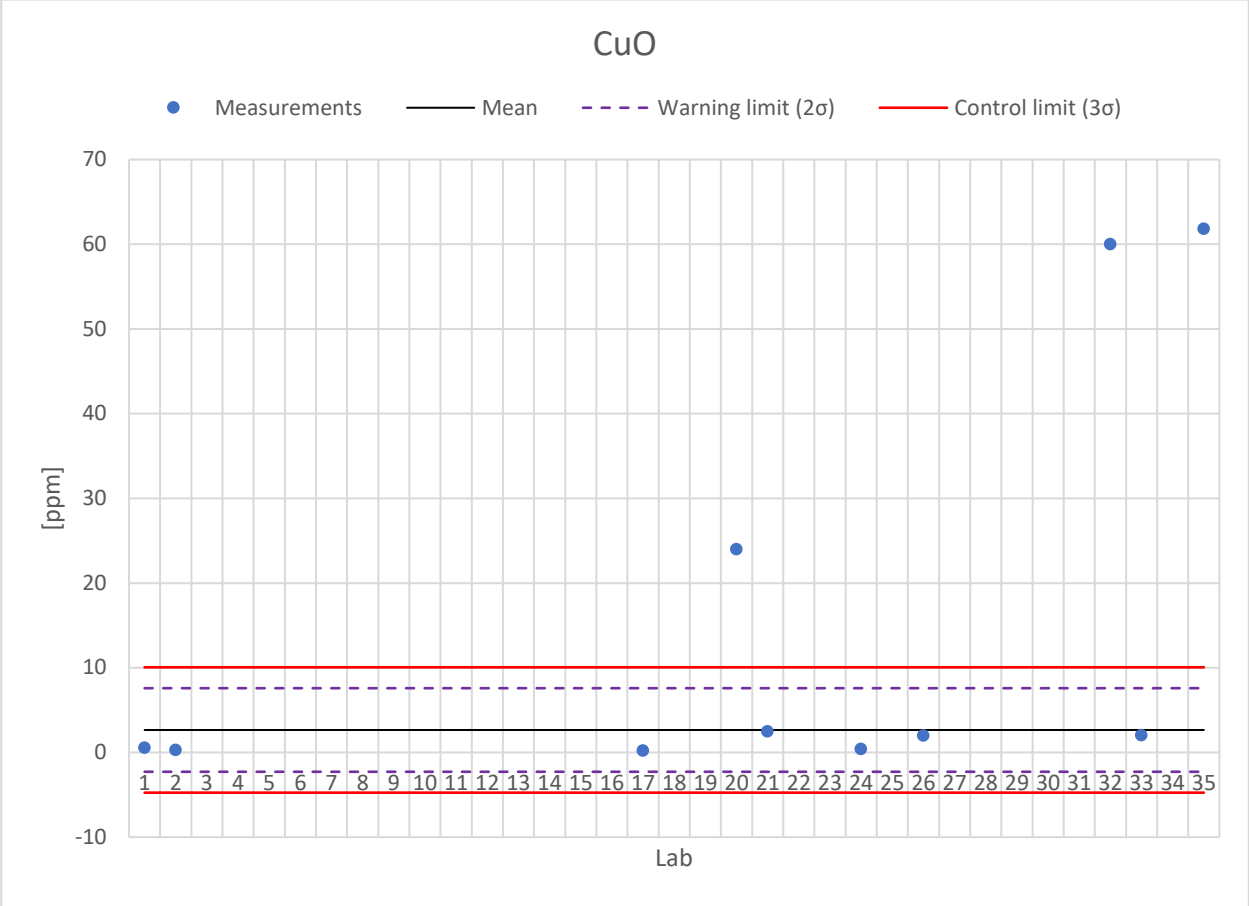


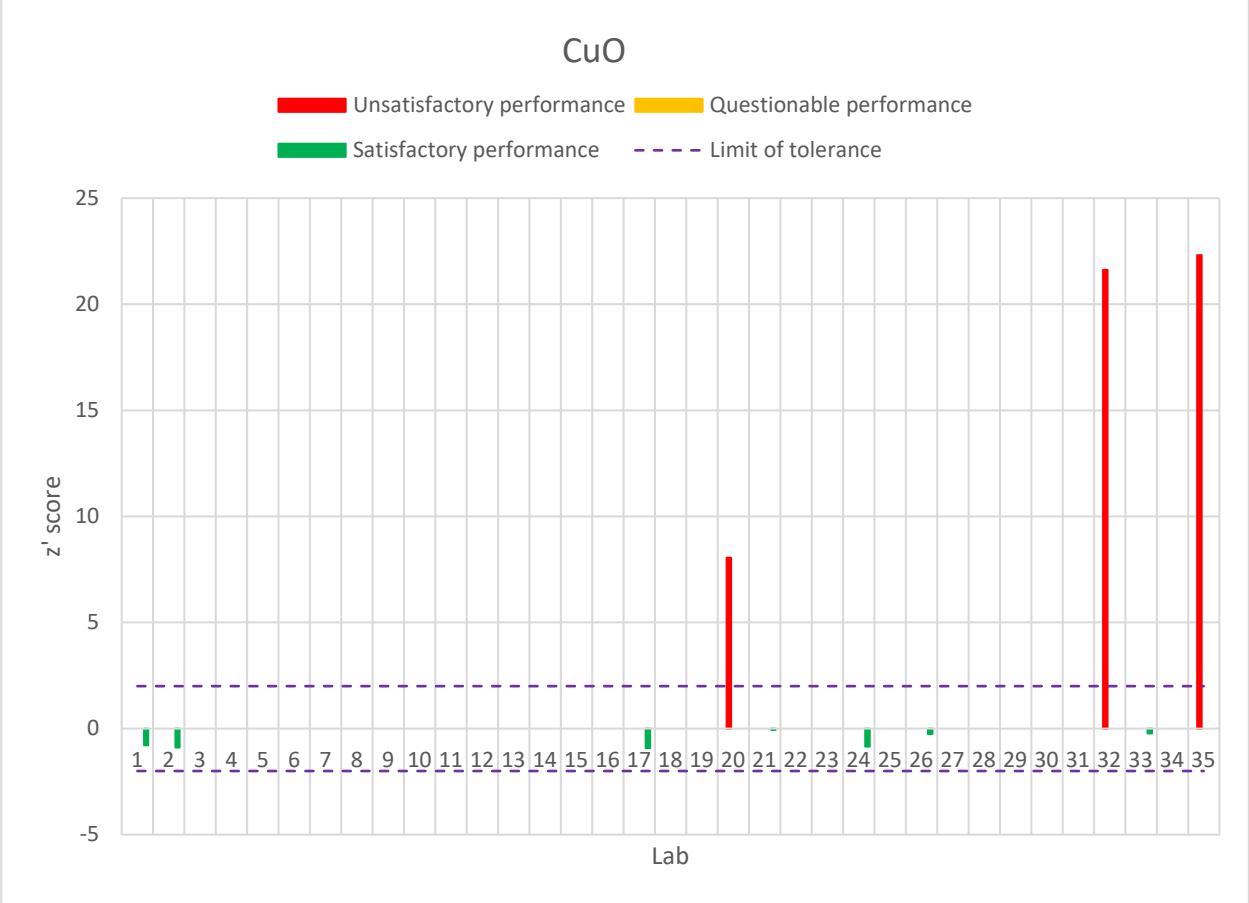
CHARTS SAMPLE B



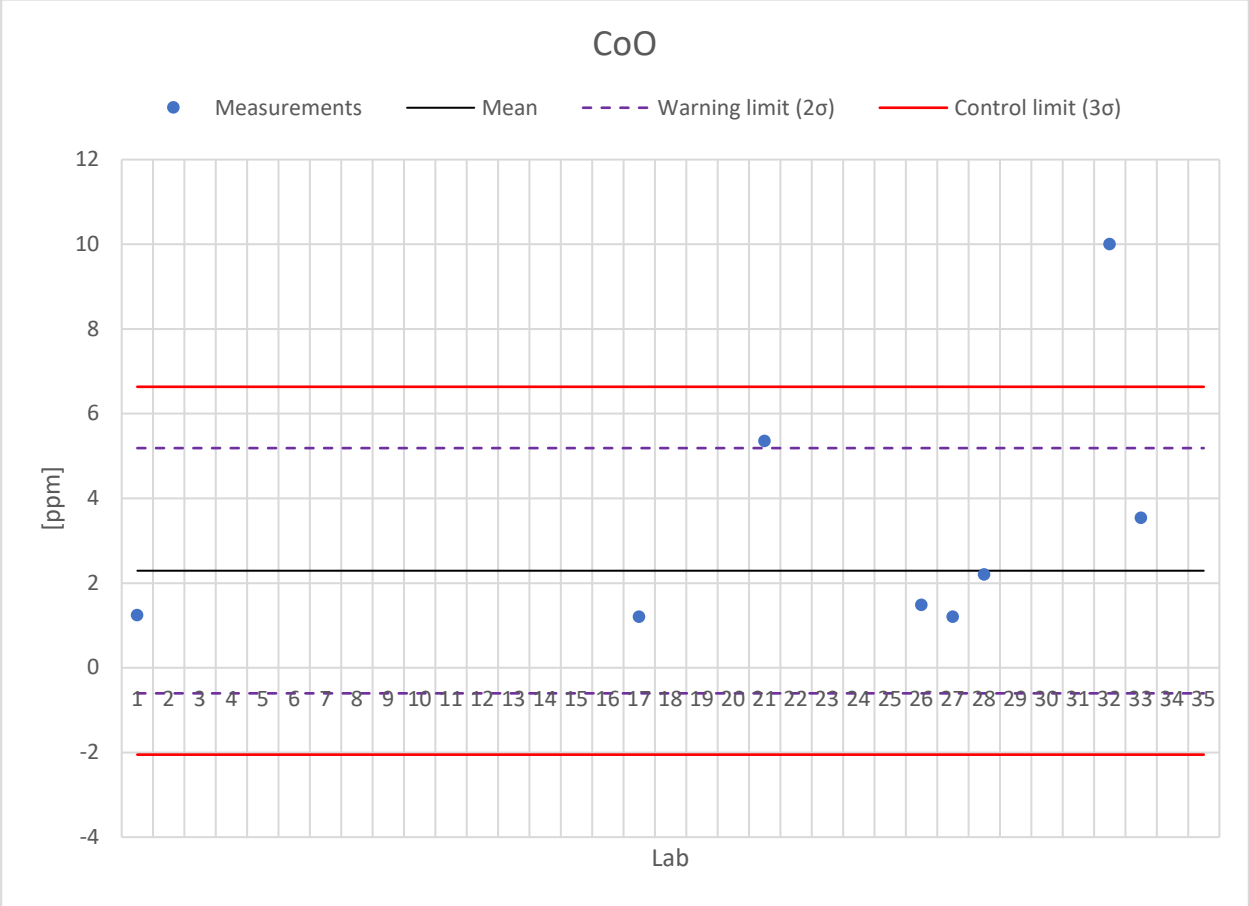


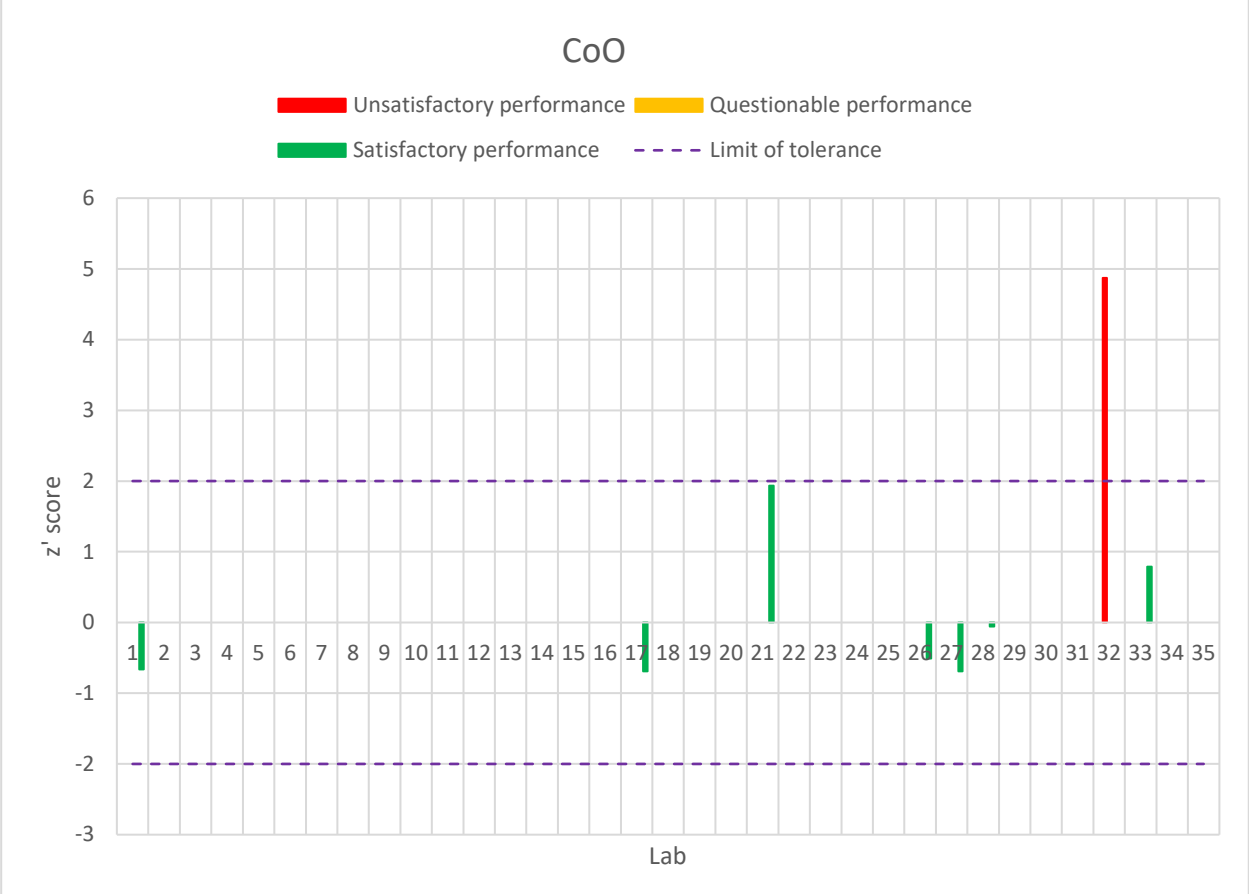
CHARTS SAMPLE B



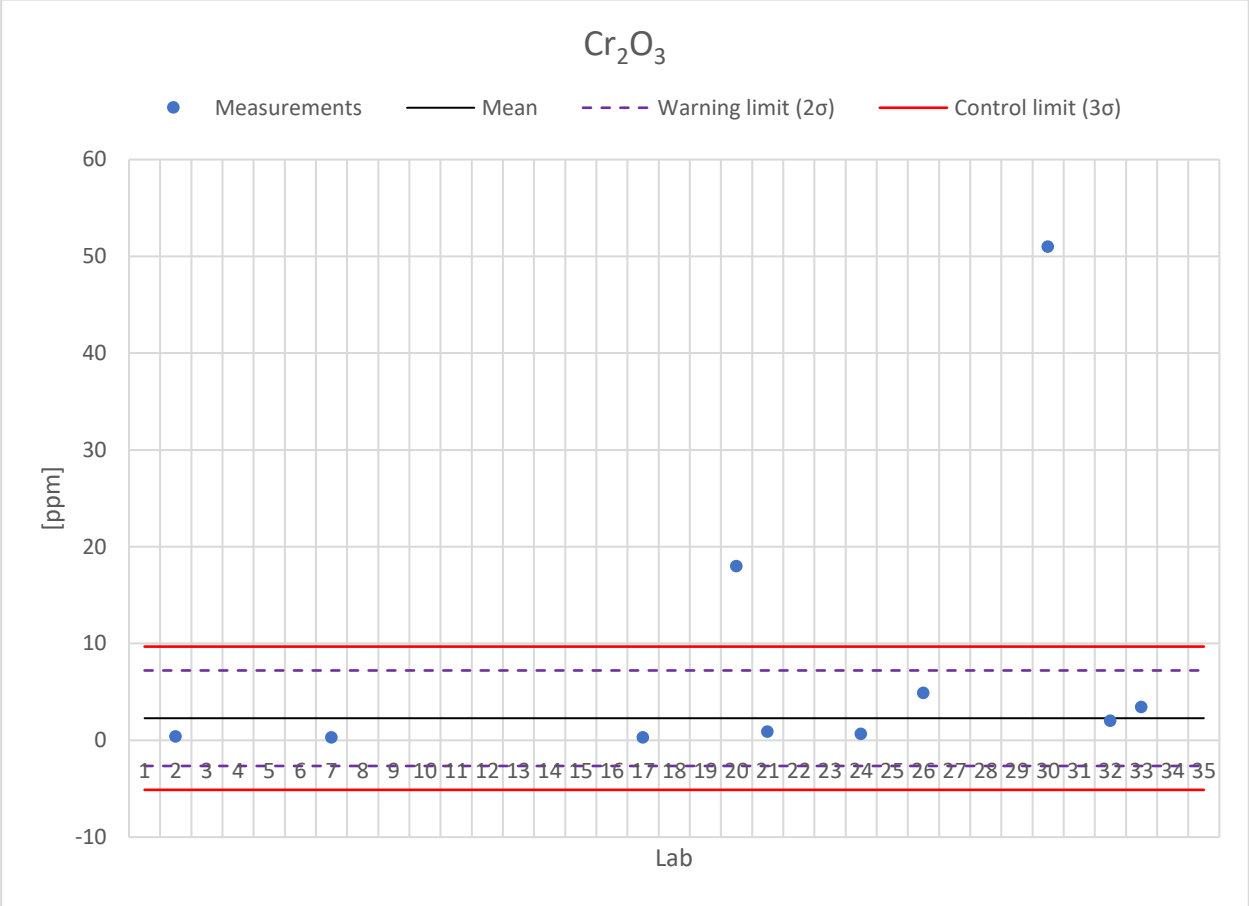


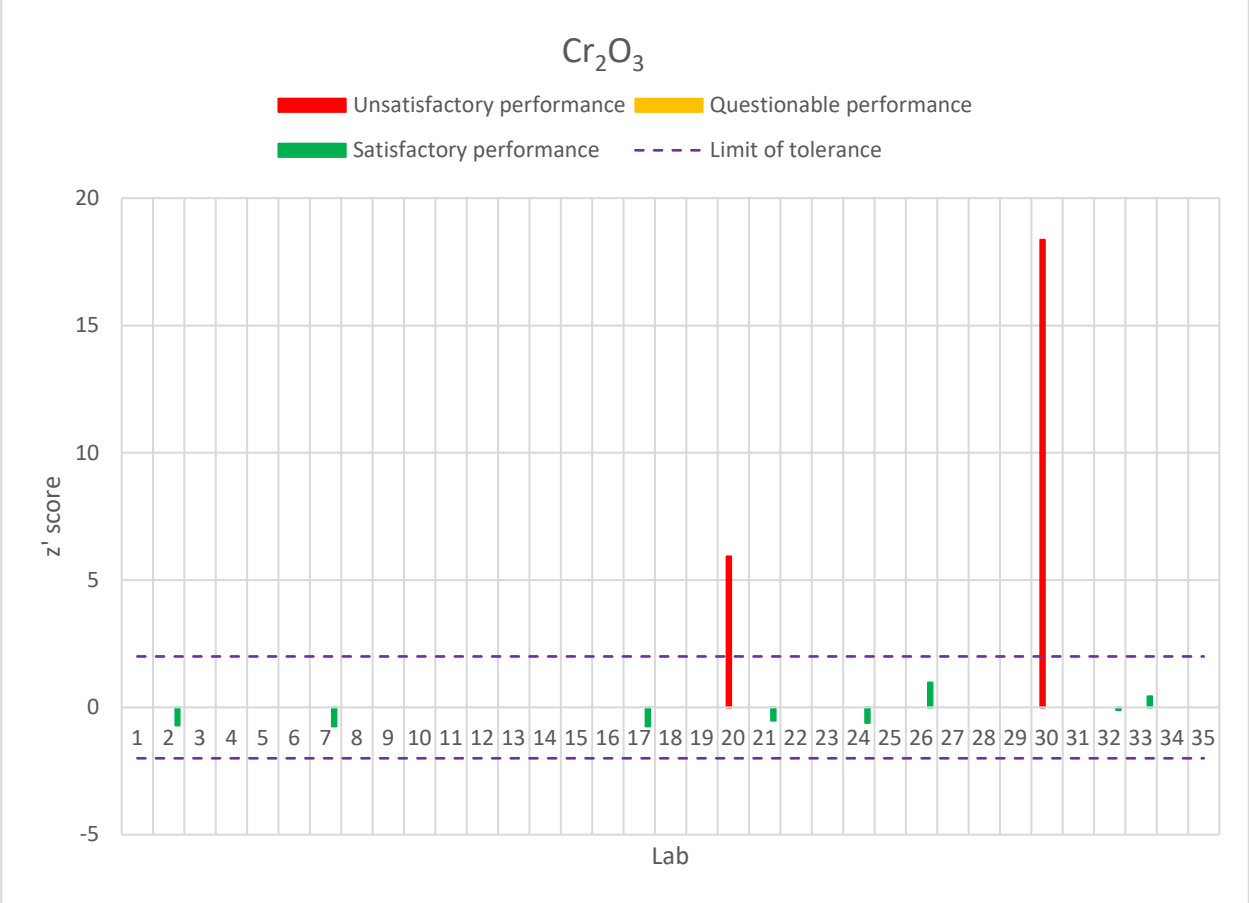
CHARTS SAMPLE B



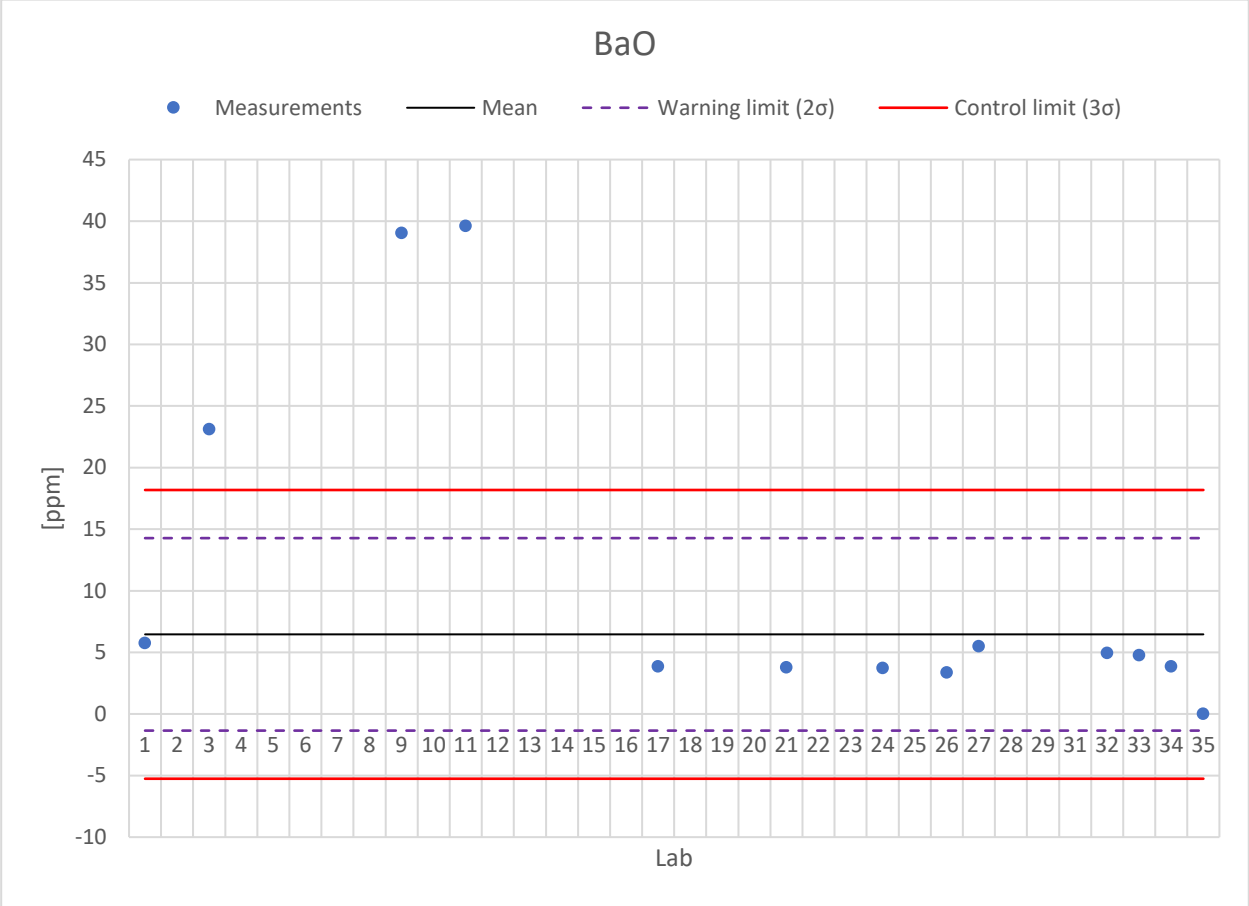


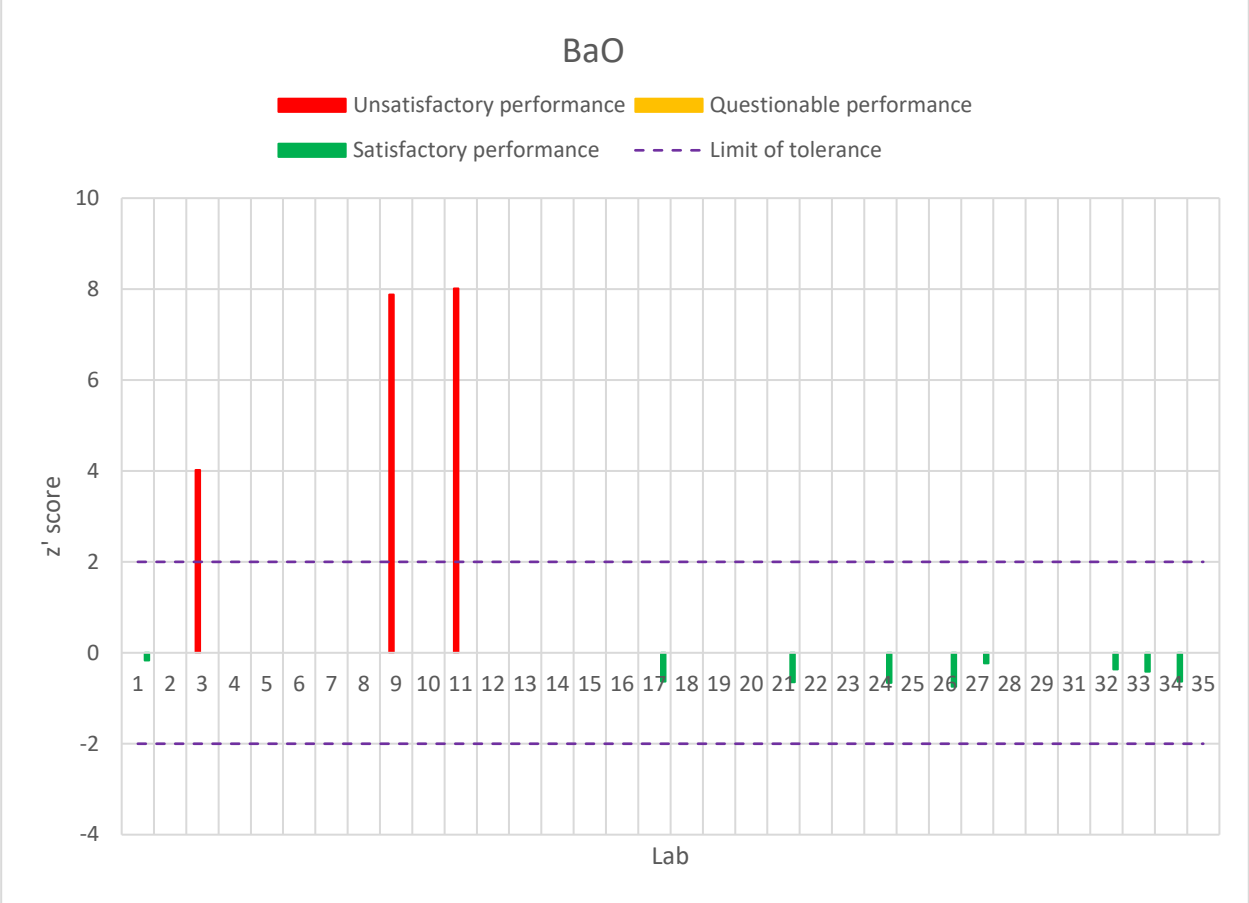
CHARTS SAMPLE B



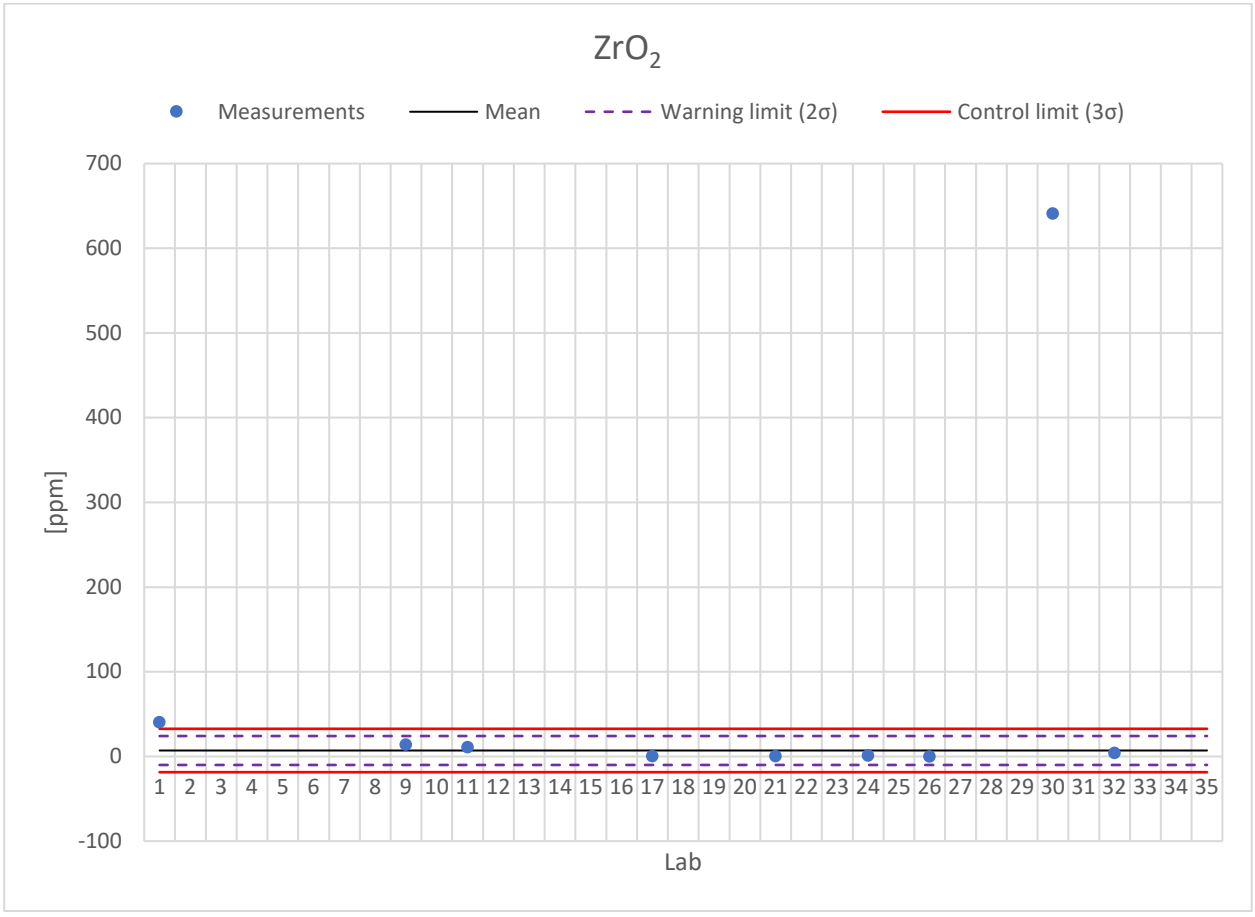


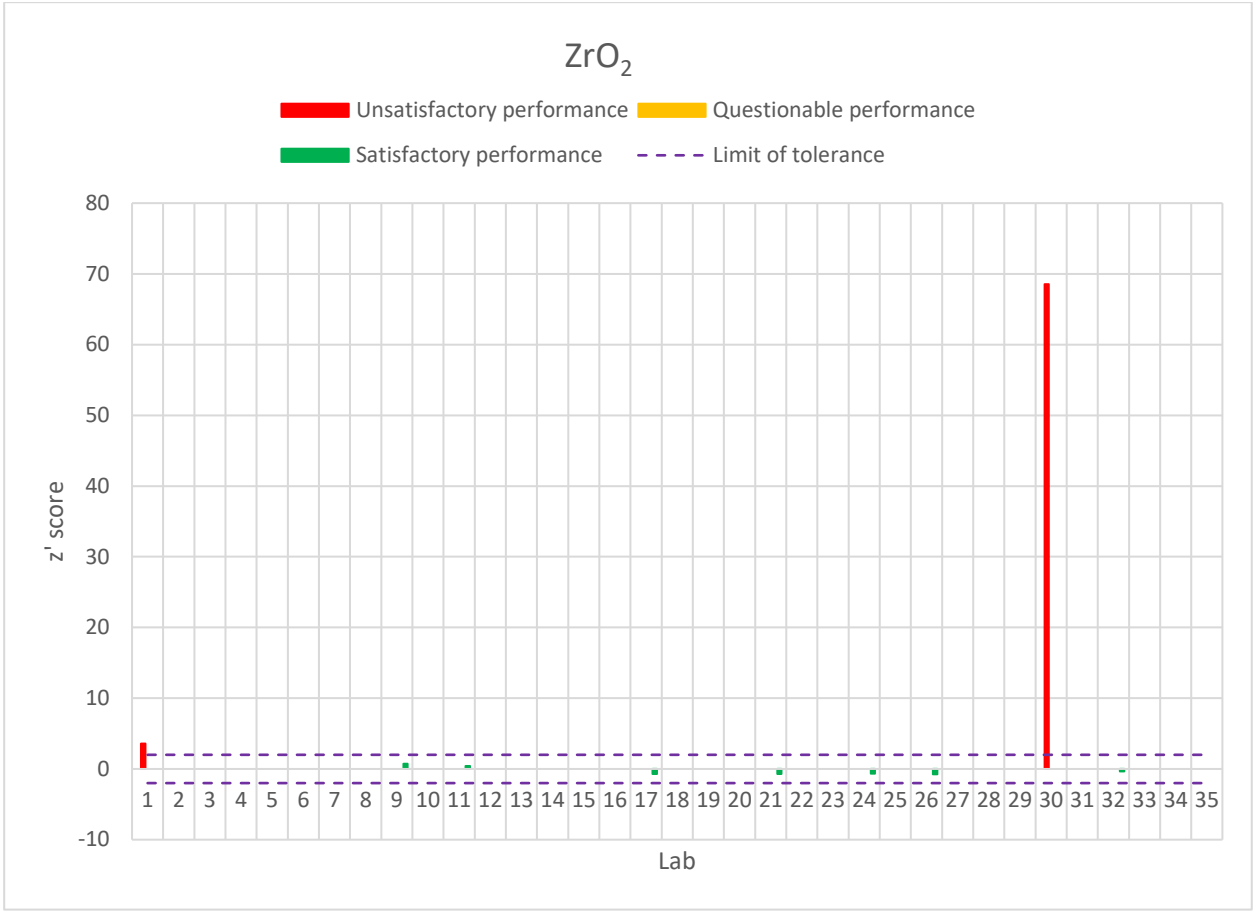
CHARTS SAMPLE B



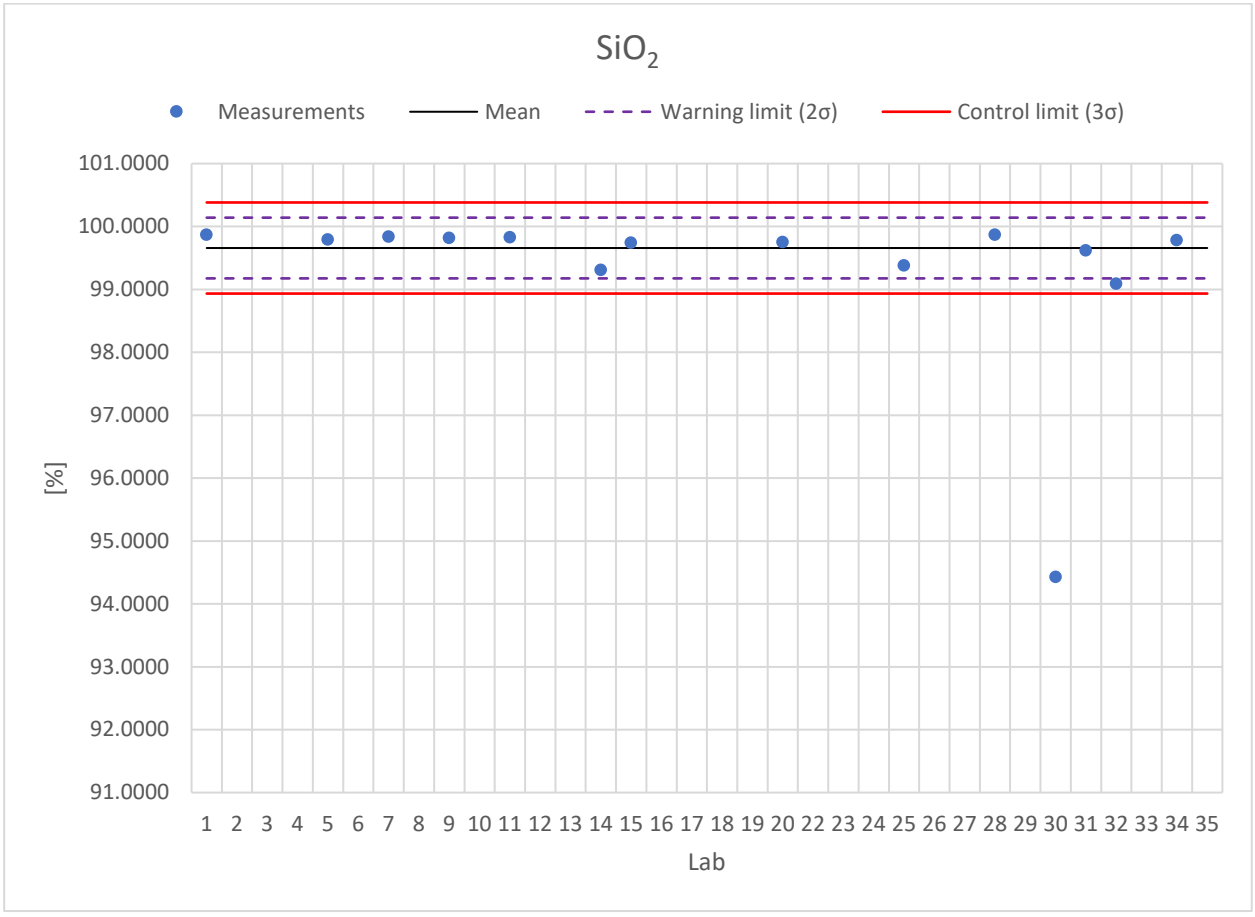


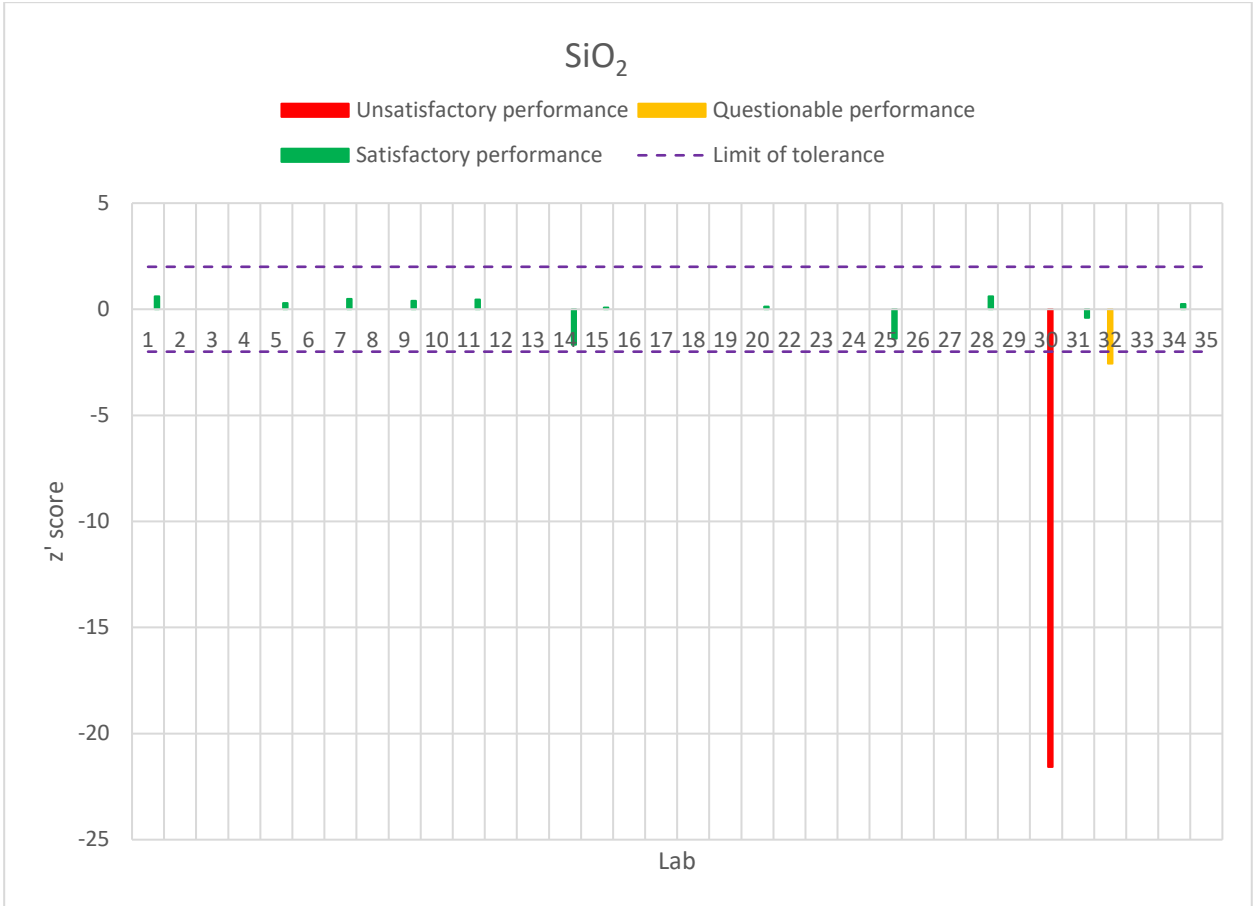
CHARTS SAMPLE B





CHARTS SAMPLE B





ANNEX 5.3. MEASUREMENTS SAMPLE C

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
x_{pt}	0.0428	0.0756	0.0019	0.0150	0.0066	0.0044	0.0048	14.69	14.33	1.99
σ_{pt}	0.0104	0.0065	0.0003	0.0024	0.0019	0.0017	0.0010	1.74	7.57	0.86
N	26	27	21	27	23	24	22	19	19	6

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
Lab 1	0.0360	0.0738	0.0015	0.0132	0.0051		0.0045	13.8	14.3	1.3
Lab 2	0.0407	0.0794	0.0020	0.0153	0.0056	0.0030	0.0048	15.0	8.4	
Lab 3	0.0368	0.0767		0.0112	0.0044	0.0034	0.0056	14.0	9.6	1.1
Lab 4										
Lab 5	0.0540	0.0800	0.0010	0.0147	0.0082	0.0040	0.0045	10.0	37.0	
Lab 6	0.0373	0.0733	0.0018	0.0146	0.0076	0.0040	0.0046	15.0	9.0	2.0
Lab 7	0.0410	0.0720	0.0017	0.0168	0.0039	0.0315	0.0048	15.0	10.0	
Lab 8										
Lab 9	0.0316	0.0794	0.0017	0.0142	0.0078	0.0023	0.0035	14.0	7.0	
Lab 10	0.0570		0.0025	0.0067	0.0053	0.0086	0.0028			
Lab 11	0.0449	0.0750	0.0054	0.0128	0.0048	0.0031	0.0039	12.0	16.0	
Lab 12	0.0497	0.0495	0.0011	0.0099			0.0024			
Lab 13										
Lab 14	0.1650	0.0790	0.0060	0.0310	0.0260	0.0060	0.0420		50.0	
Lab 15		0.0800		0.0184						
Lab 16	0.0366	0.0758	0.0018	0.0146	0.0066	0.0038	0.0046		13.0	
Lab 17	0.0347	0.0706	0.0019	0.0139	0.0072	0.0034	0.0045	13.9	8.7	2.0
Lab 18	0.0390	0.0720	0.0020	0.0160	0.0076	0.0046	0.0050		10.0	
Lab 19										
Lab 20	0.0564	0.0821	0.0038	0.0275	0.0047				103.0	
Lab 21	0.0389	0.0724	0.0018	0.0131	0.0058		0.0066	14.4	15.3	2.4
Lab 22										
Lab 23	0.0600	0.0660	0.0016	0.0160	0.0046	0.0005			8.0	
Lab 24	0.0397	0.0731	0.0019	0.0142	0.0068	0.0041	0.0044	14.5	9.1	
Lab 25	0.0220	0.0636		0.0150		0.0030		27.0		
Lab 26	0.0524	0.0702		0.0446	0.0253	0.0079	0.0057	16.5		
Lab 27		0.0710	0.0020		0.0070	0.0030	0.0040	10.0		
Lab 28	0.0104	0.0797	0.0012	0.0210		0.0040		14.5		
Lab 29										
Lab 30		0.0951		0.0139		0.0104				
Lab 31	0.0500	0.1300		0.0400	0.0300	0.0500	0.0200	100.0		
Lab 32	0.0347	0.0950	0.0020	0.0186	0.0060	0.0130	0.0053	30.0	40.0	
Lab 33	0.0409	0.0800		0.0146	0.0080	0.0050	0.0054	17.8		4.4
Lab 34	0.0442	0.0745	0.0020	0.0135	0.0065	0.0038	0.0050	17.0	13.0	
Lab 35	0.0451					0.6567			10884	

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	2.01	1.27	2.00	19.72	4.51	3.47	0.86	1.12	176.00	7.17
σ_{pt}	1.45	0.28	1.00	25.37	1.58	2.49	0.58	0.68		6.95
N	8	6	10	8	13	8	4	10	1	13

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
Lab 1	1.0	1.0	1.2		3.8	1.4	0.4		<0.2	1.9
Lab 2		1.4	1.6		3.1			0.7		
Lab 3										40.0
Lab 4										
Lab 5										10.0
Lab 6		1.0	1.0		3.0			1.0		
Lab 7								0.6		
Lab 8										
Lab 9										64.0
Lab 10										
Lab 11										75.0
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	1.4	1.3	1.3	0.1	3.5	1.2		0.6		3.1
Lab 18										
Lab 19										
Lab 20				50.0	28.0			22.0		
Lab 21	0.7		5.0	6.6	6.2	6.0	0.6	0.8		3.4
Lab 22										
Lab 23										
Lab 24	1.9		1.7		3.9			0.8		3.0
Lab 25				57.0						
Lab 26	2.9	1.2	2.4	0.2	4.1	1.5		2.1	176.0	2.6
Lab 27					3.0	2.5				3.0
Lab 28	0.7		1.5		3.7	3.7				
Lab 29										
Lab 30				912.0						
Lab 31										
Lab 32	50.0	2.0	70.0	20.0	50.0	20.0	1.0	1.0		9.0
Lab 33	4.8		4.8	2.4	5.2	4.7	3.0	3.7		4.6
Lab 34										3.0
Lab 35					119.3					

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	0.90	48.29	2.07		655.36	6.54	1.26	19.41	30.00	10.00
σ_{pt}		27.02	2.67		1048.25	8.23	0.44	6.47		
N	1	5	3		2	9	5	3	1	1

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
Lab 1	<1.4	24.4	1.5	<0.5	1.7	33.0				
Lab 2										
Lab 3										
Lab 4										
Lab 5		80.0								
Lab 6										
Lab 7										
Lab 8										
Lab 9		35.0				15.0				
Lab 10										
Lab 11						11.0				
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	0.9		0.1			0.3	1.0			
Lab 18										
Lab 19										
Lab 20		37.0								
Lab 21						0.7		14.5		
Lab 22										
Lab 23										
Lab 24						0.5				
Lab 25										
Lab 26						0.1	0.8			
Lab 27										
Lab 28							1.1			
Lab 29										
Lab 30		210.0			1309.0	645.0	10765.0			
Lab 31										
Lab 32			290.0			3.0		18.0	30.0	10.0
Lab 33								227.4		
Lab 34										
Lab 35							228.7			

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
x_{pt}	1.38	0.29	0.75	657.87	40.03	0.10	2499.00	######	0.0073	0.6909	0.1407	99.5910
σ_{pt}	0.44			1052.24	64.10						0.0542	0.2946
N	7	1	1	2	2	1	1	1	1	1	7	15

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
Lab 1											0.1799	99.8787
Lab 2												
Lab 3												
Lab 4												
Lab 5												99.8280
Lab 6												
Lab 7												99.8300
Lab 8												
Lab 9												98.8462
Lab 10												
Lab 11											0.1600	99.8400
Lab 12												
Lab 13												
Lab 14											0.1080	99.4900
Lab 15											0.1400	99.7500
Lab 16												
Lab 17	1.1					0.1						
Lab 18												
Lab 19												
Lab 20									0.0073			99.7400
Lab 21	1.1											69.6403
Lab 22												
Lab 23												
Lab 24	1.0											
Lab 25	53.0										0.1167	99.3350
Lab 26		0.3	0.8	1.7	0.1							
Lab 27												
Lab 28	1.2											99.8100
Lab 29												
Lab 30				1314.0			2499.0	11467.0		0.6909		94.1960
Lab 31											0.0500	99.5700
Lab 32	10.0				80.0						0.2380	99.3600
Lab 33	1.6											
Lab 34												99.7200
Lab 35												

ANNEX 5.3.1. Z-SCORE SAMPLE C

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5
Lab 1	-0.6	-0.3	-1.2	-0.8	-0.8		-0.3	-0.5	0.0
Lab 2	-0.2	0.6	0.4	0.1	-0.5	-0.9	0.1	0.2	-0.8
Lab 3	-0.6	0.2		-1.6	-1.2	-0.6	0.9	-0.4	-0.6
Lab 4									
Lab 5	1.1	0.7	-3.0	-0.1	0.8	-0.3	-0.3	-2.7	3.0
Lab 6	-0.5	-0.4	-0.2	-0.2	0.5	-0.3	-0.2	0.2	-0.7
Lab 7	-0.2	-0.6	-0.6	0.8	-1.4	16.3	0.0	0.2	-0.6
Lab 8									
Lab 9	-1.1	0.6	-0.6	-0.3	0.6	-1.3	-1.3	-0.4	-1.0
Lab 10	1.4		2.2	-3.5	-0.7	2.5	-2.0		
Lab 11	0.2	-0.1	12.4	-0.9	-0.9	-0.8	-0.9	-1.5	0.2
Lab 12	0.7	-4.0	-2.6	-2.2			-2.5		
Lab 13									
Lab 14	11.7	0.5	14.5	6.7	10.1	1.0	38.5		4.7
Lab 15		0.7		1.4					
Lab 16	-0.6	0.0	-0.2	-0.2	0.0	-0.4	-0.2		-0.2
Lab 17	-0.8	-0.8	0.0	-0.5	0.3	-0.6	-0.3	-0.5	-0.7
Lab 18	-0.4	-0.6	0.5	0.4	0.5	0.1	0.2		-0.6
Lab 19									
Lab 20	1.3	1.0	6.8	5.3	-1.0				11.7
Lab 21	-0.4	-0.5	-0.2	-0.8	-0.4		1.9	-0.2	0.1
Lab 22									
Lab 23	1.7	-1.5	-0.9	0.4	-1.1	-2.4			-0.8
Lab 24	-0.3	-0.4	0.0	-0.3	0.1	-0.2	-0.4	-0.1	-0.7
Lab 25	-2.0	-1.9		0.0		-0.9		7.1	
Lab 26	0.9	-0.8		12.4	9.8	2.1	1.0	1.0	
Lab 27		-0.7	0.5		0.2	-0.9	-0.8	-2.7	
Lab 28	-3.1	0.6	-2.2	2.5		-0.3		-0.1	
Lab 29									
Lab 30		3.0		-0.5		3.6			
Lab 31	0.7	8.4		10.5	12.2	27.5	15.7	49.0	
Lab 32	-0.8	3.0	0.5	1.5	-0.3	5.2	0.5	8.8	3.4
Lab 33	-0.2	0.7		-0.2	0.7	0.4	0.6	1.8	
Lab 34	0.1	-0.2	0.5	-0.6	-0.1	-0.4	0.2	1.3	-0.2
Lab 35	0.2					393.1			1435.7

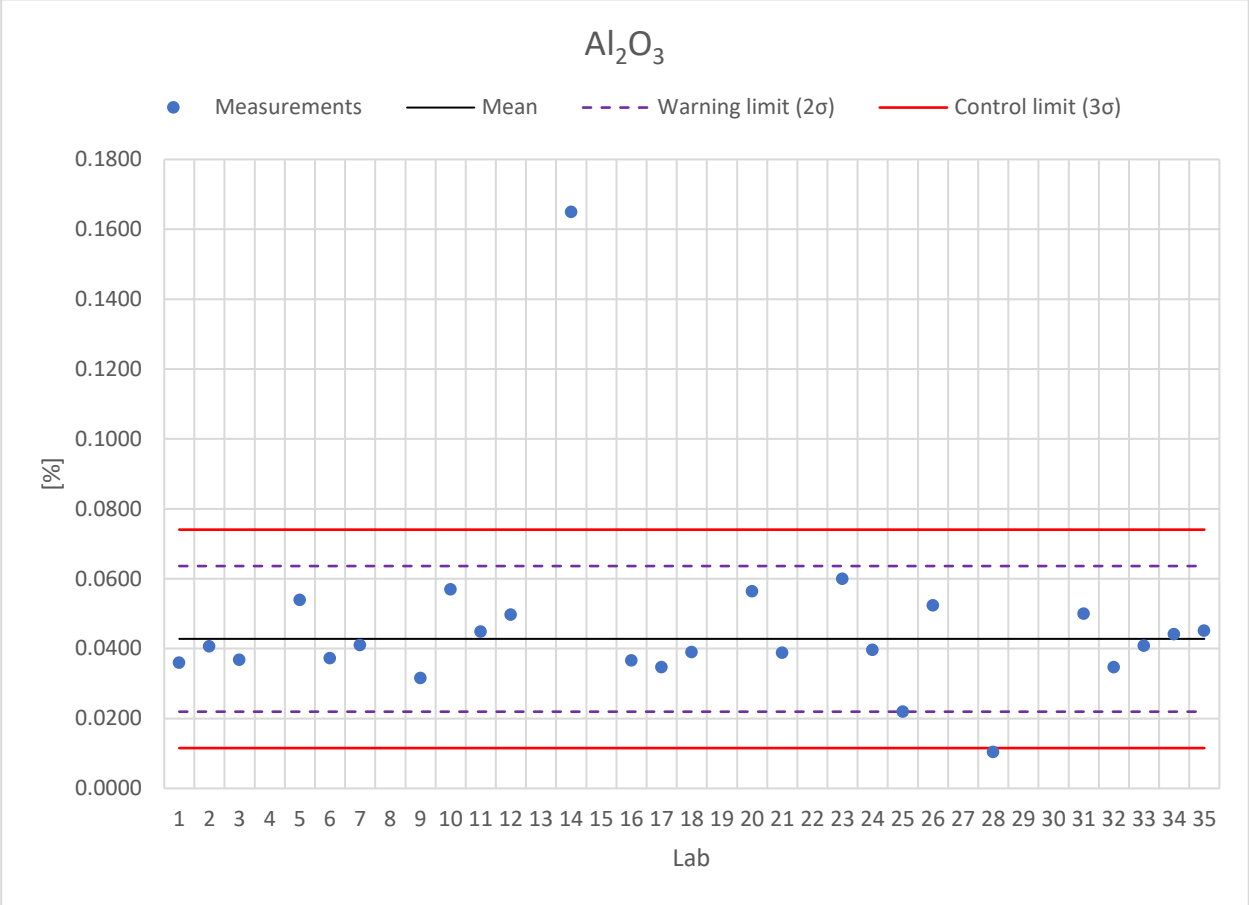
Satisfactory performance
Questionable performance
Unsatisfactory performance

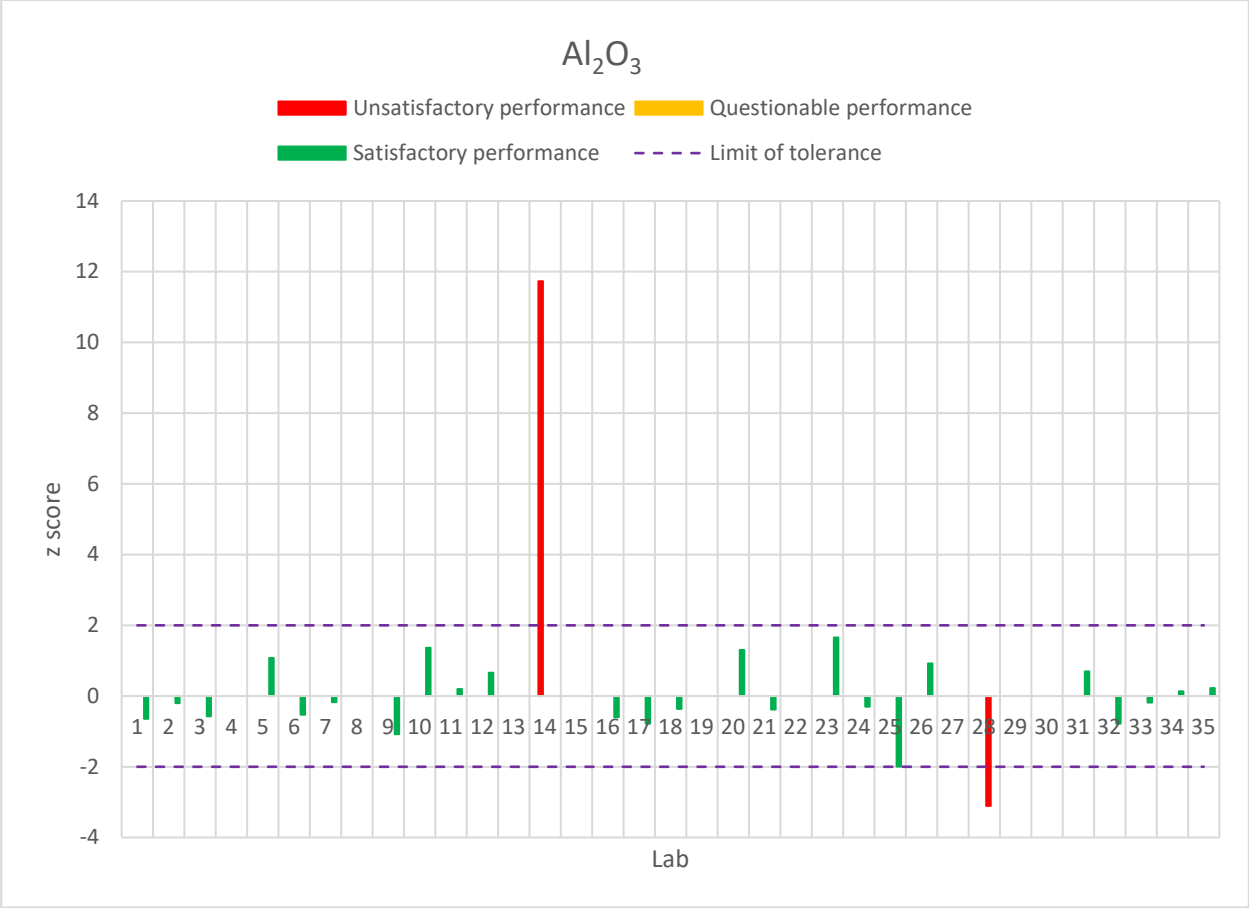
ANNEX 5.3.2. Z'-SCORE SAMPLE C

	ZnO	NiO	PbO	CuO	Cr_2O_3	BaO	ZrO_2	SiO_2
Lab 1	-0.7	-0.8		-0.4		-0.8	3.2	1.0
Lab 2		-0.4		-0.9	-0.6			
Lab 3						4.7		
Lab 4								
Lab 5						0.4		0.8
Lab 6		-1.0		-1.0	-0.2			
Lab 7					-0.8			0.8
Lab 8								
Lab 9						8.2	1.0	-2.5
Lab 10								
Lab 11						9.8	0.5	0.8
Lab 12								
Lab 13								
Lab 14								-0.3
Lab 15								0.5
Lab 16								
Lab 17	-0.4	-0.7	-0.8	-0.6	-0.8	-0.6	-0.8	
Lab 18								
Lab 19								
Lab 20			1.2	14.9	30.9			0.5
Lab 21	-0.9	3.0	-0.5	1.1	-0.4	-0.5	-0.7	-101.7
Lab 22								
Lab 23								
Lab 24	-0.1	-0.3		-0.4	-0.5	-0.6	-0.7	
Lab 25			1.5					-0.9
Lab 26	0.6	0.4	-0.8	-0.2	1.5	-0.7	-0.8	
Lab 27				-1.0		-0.6		
Lab 28	-0.9	-0.5		-0.5				0.7
Lab 29								
Lab 30			35.2				77.6	-18.3
Lab 31								-0.1
Lab 32	33.0	67.7	0.0	28.8	-0.2	0.3	-0.4	-0.8
Lab 33	1.9	2.7	-0.7	0.5	3.8	-0.4		
Lab 34						-0.6		0.4
Lab 35				72.7				

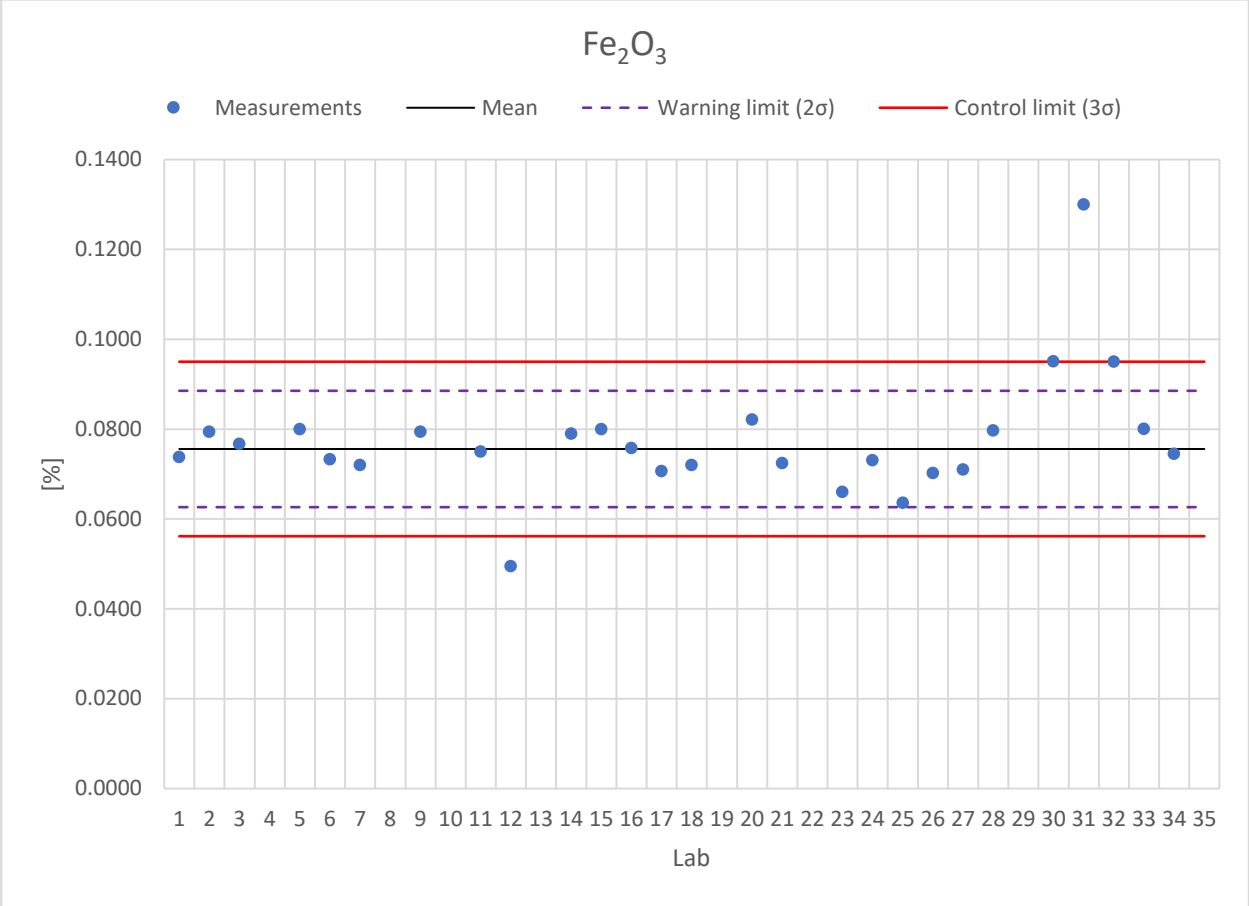
Satisfactory performance
Questionable performance
Unsatisfactory performance

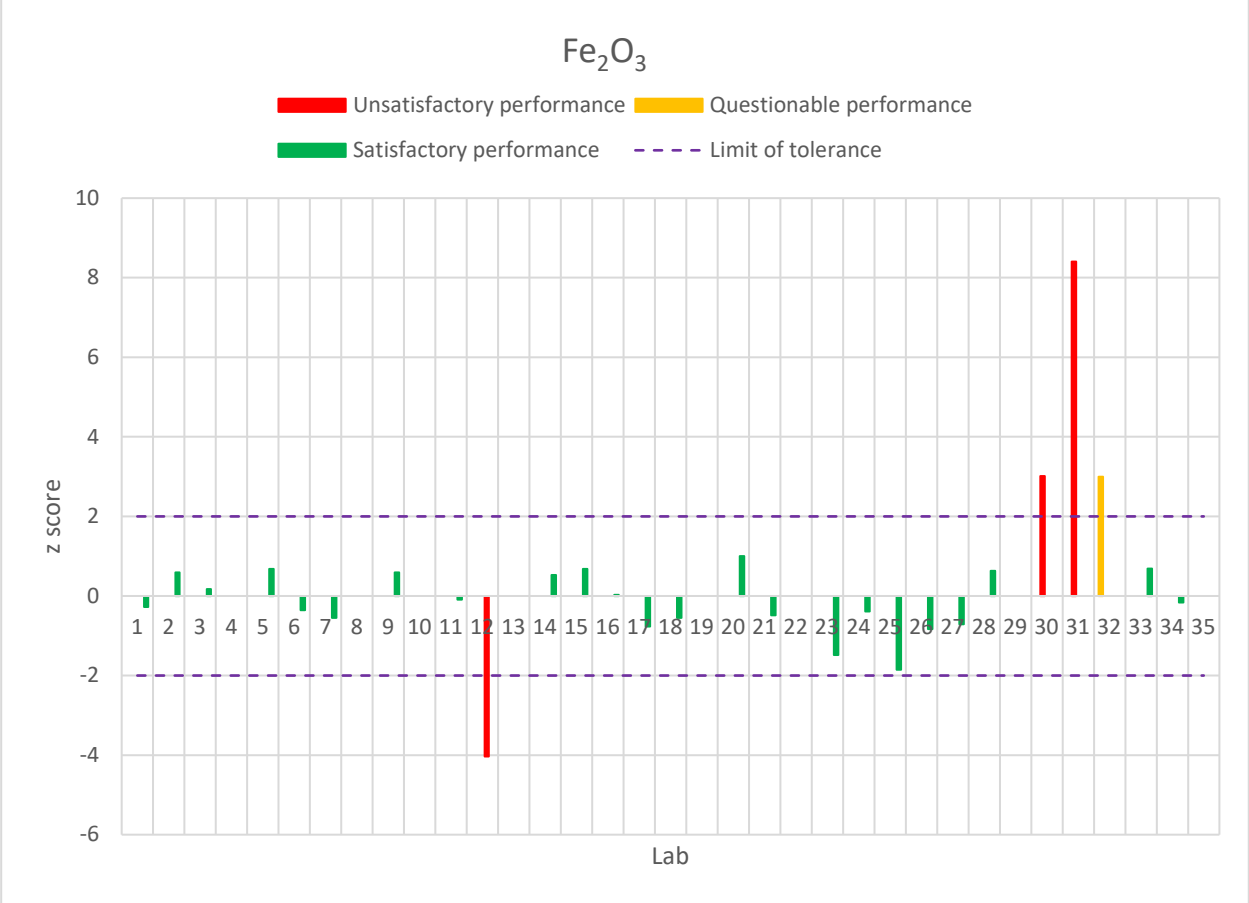
ANNEX 5.3.3. CHARTS SAMPLE C



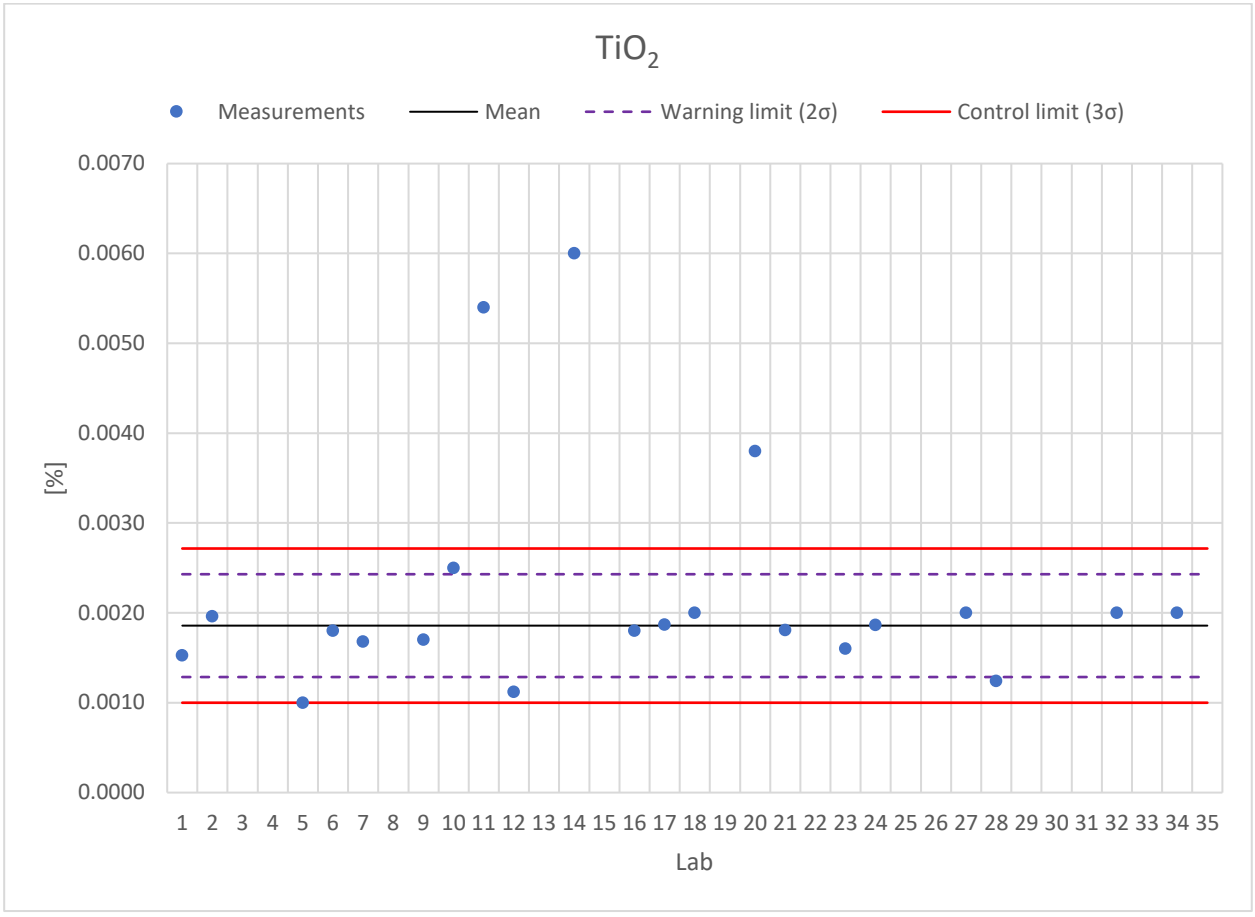


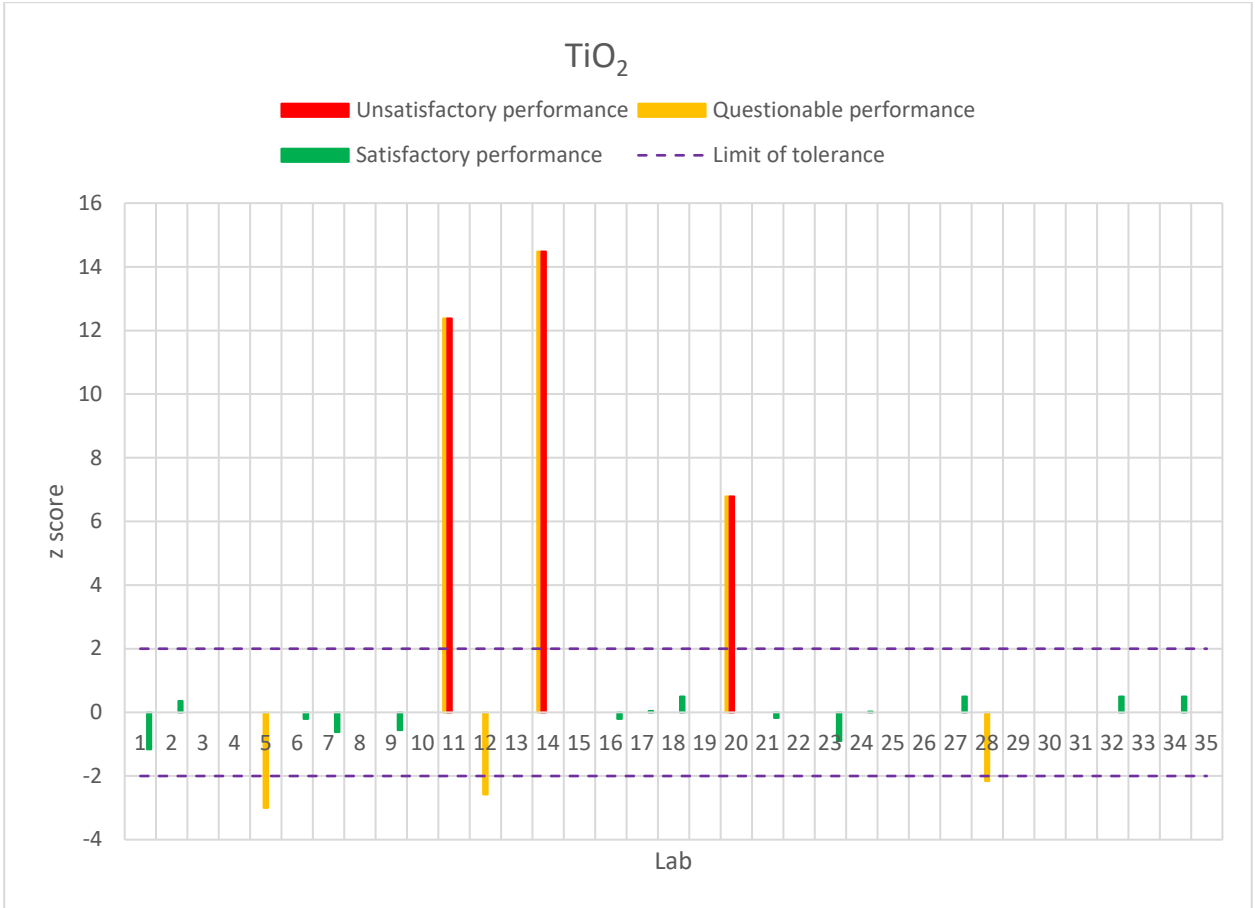
CHARTS SAMPLE C



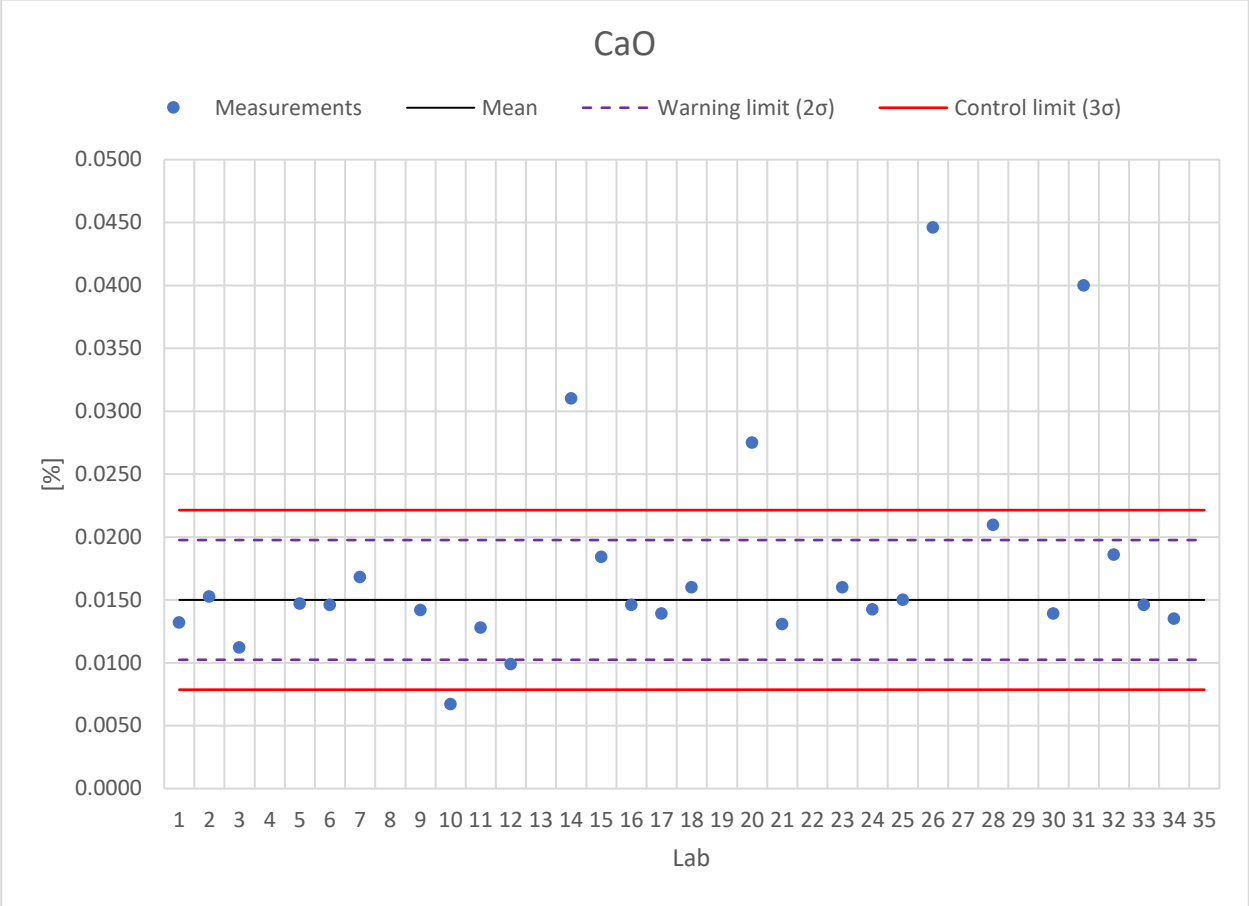


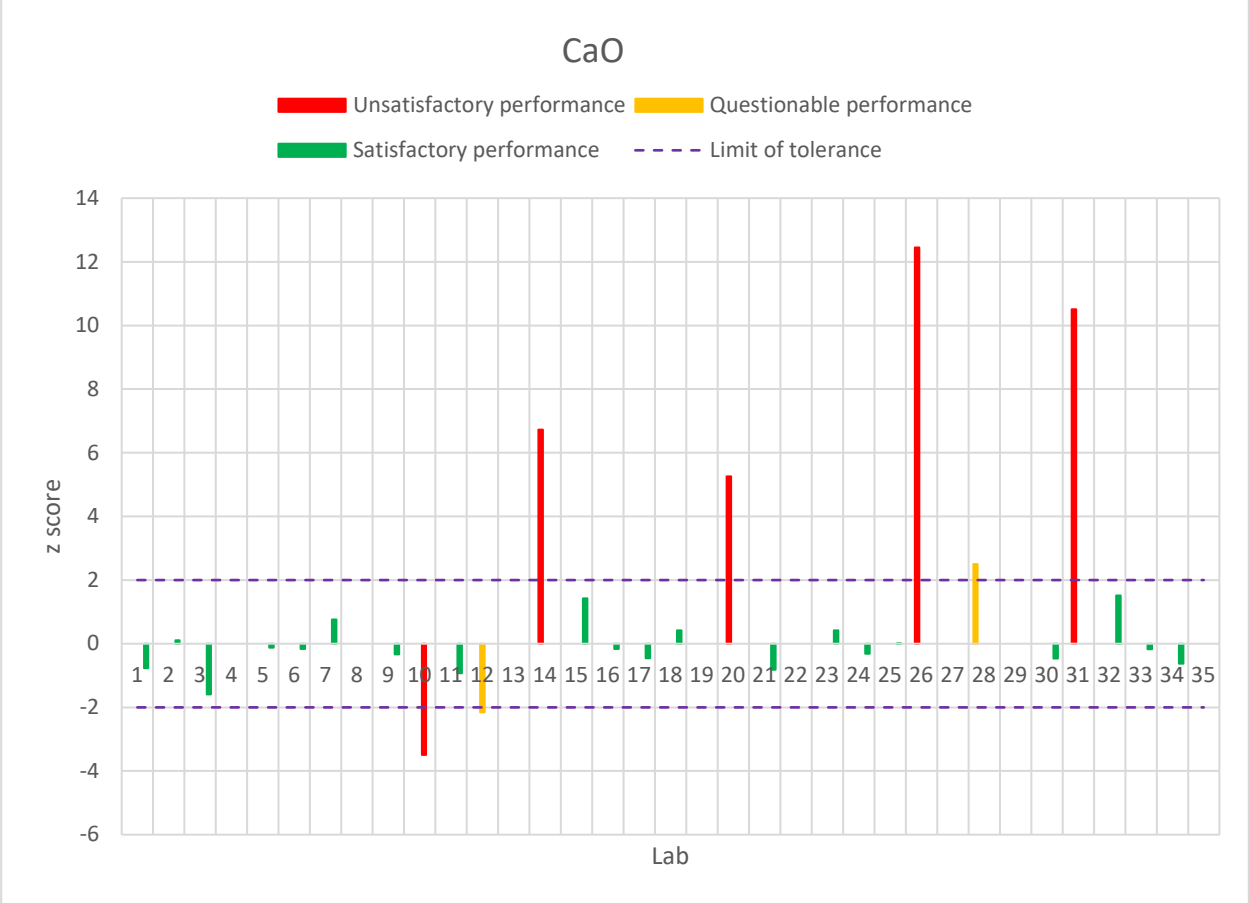
CHARTS SAMPLE C



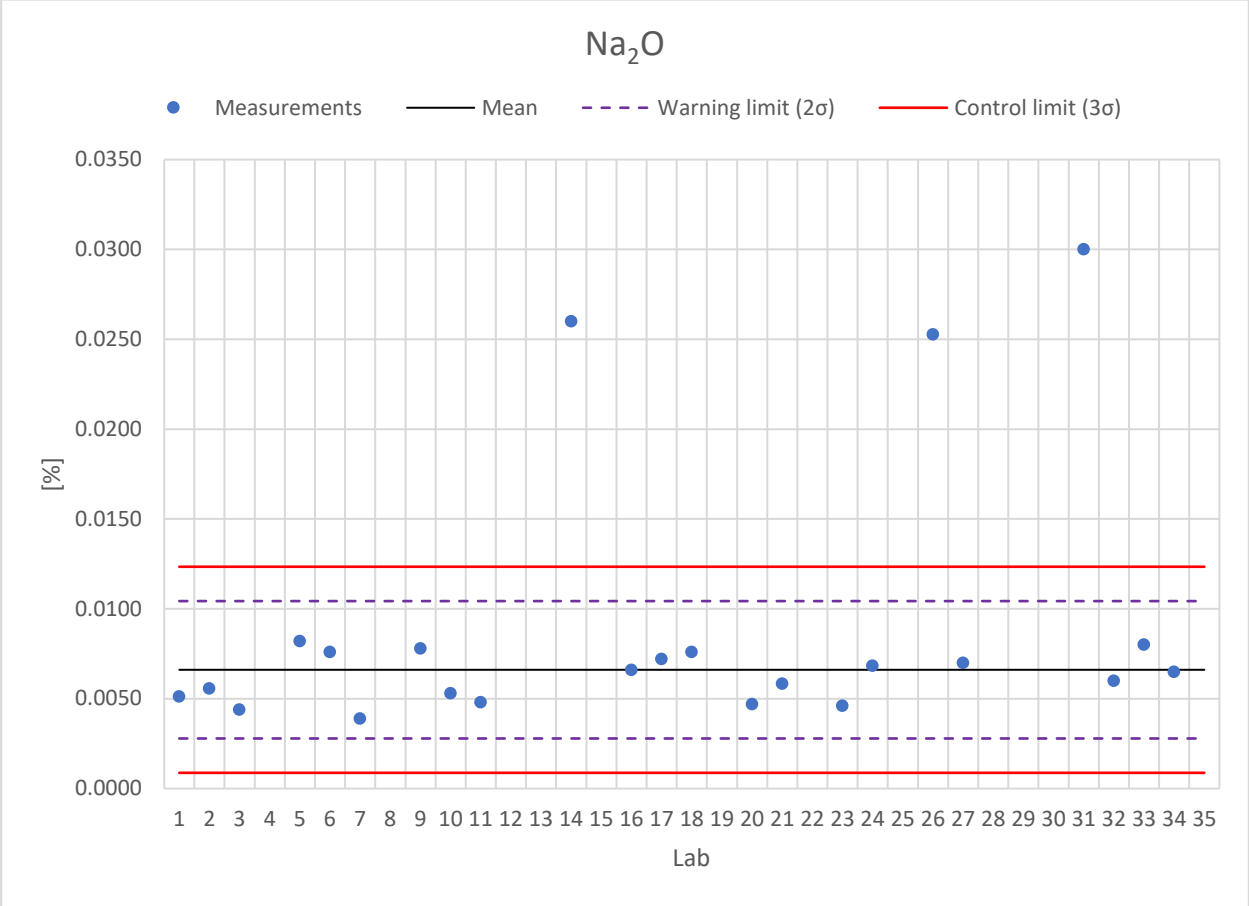


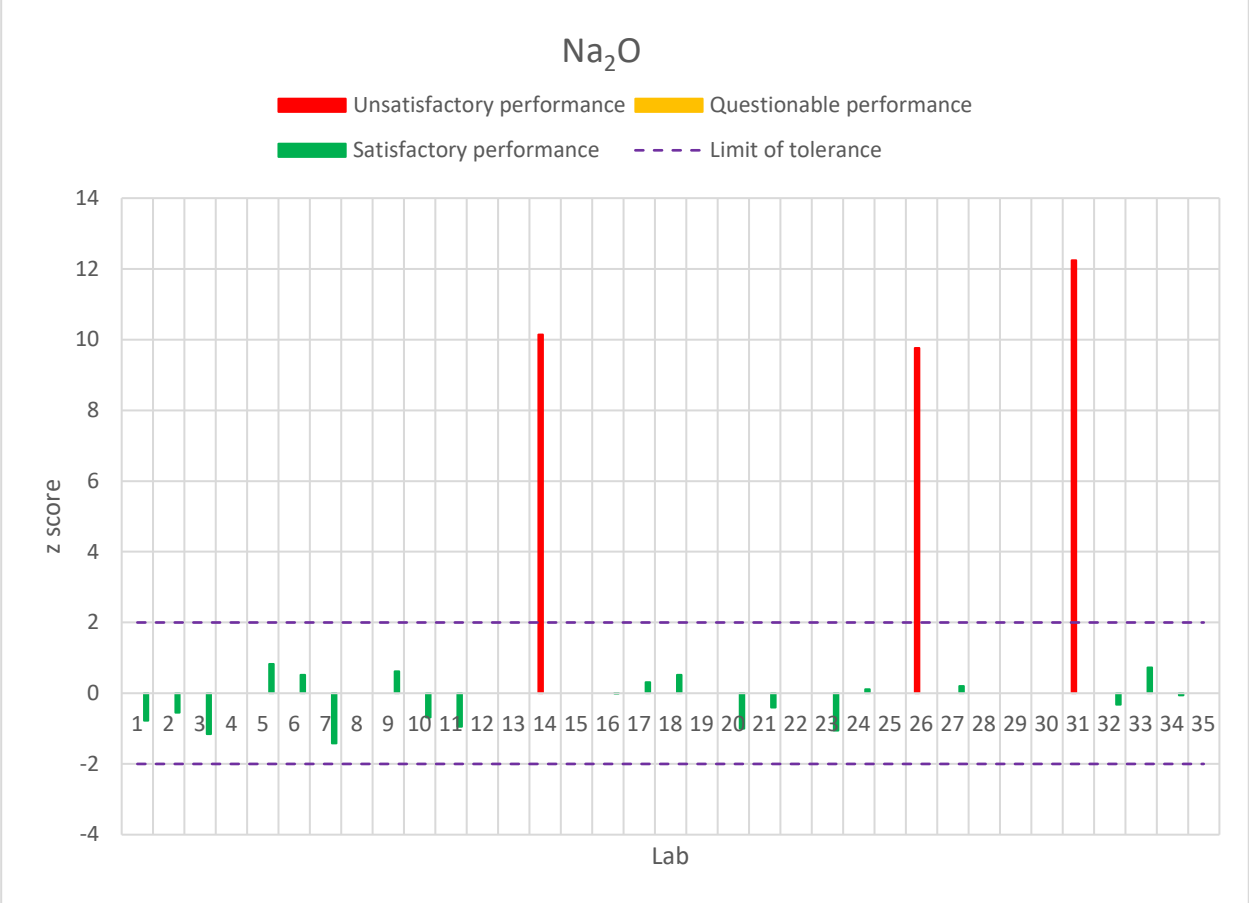
CHARTS SAMPLE C



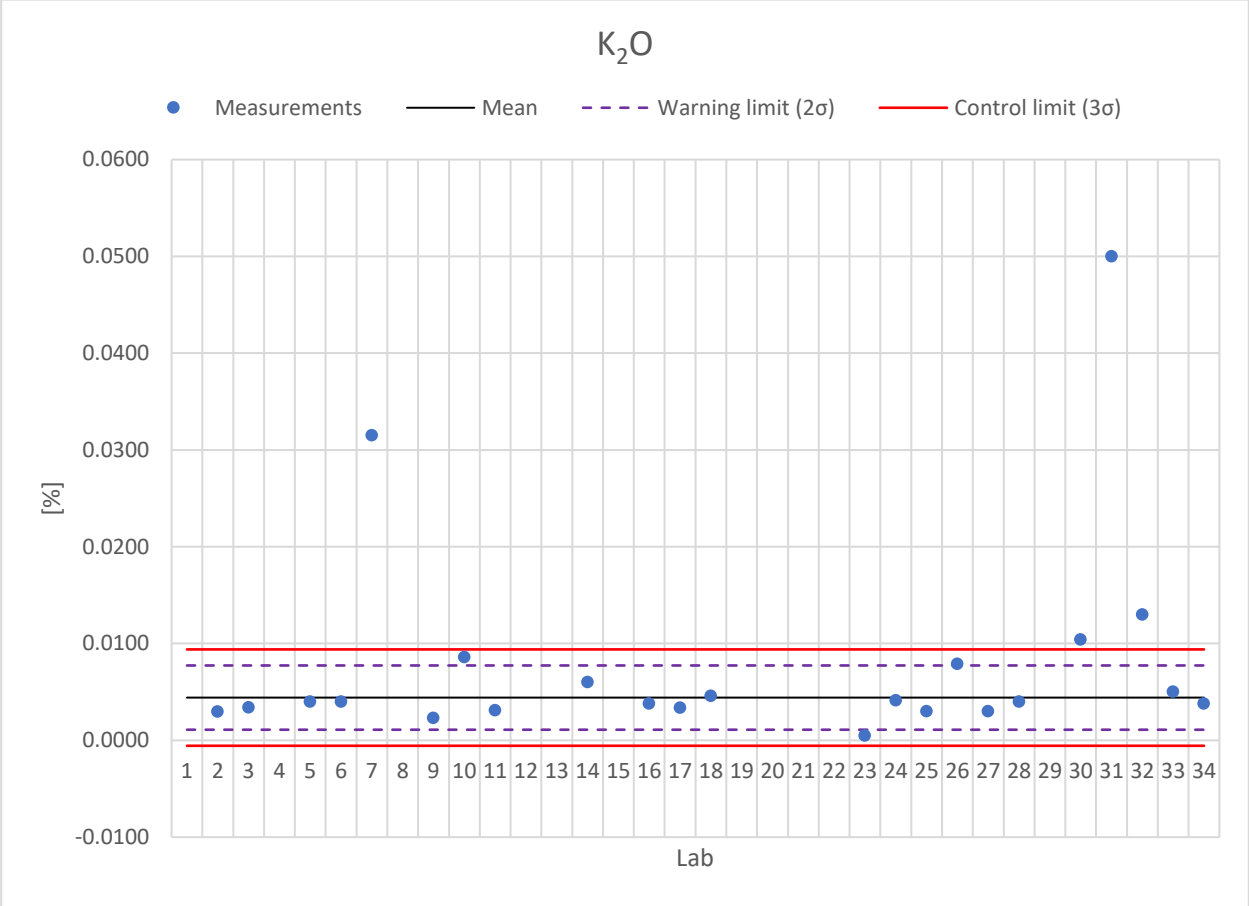


CHARTS SAMPLE C

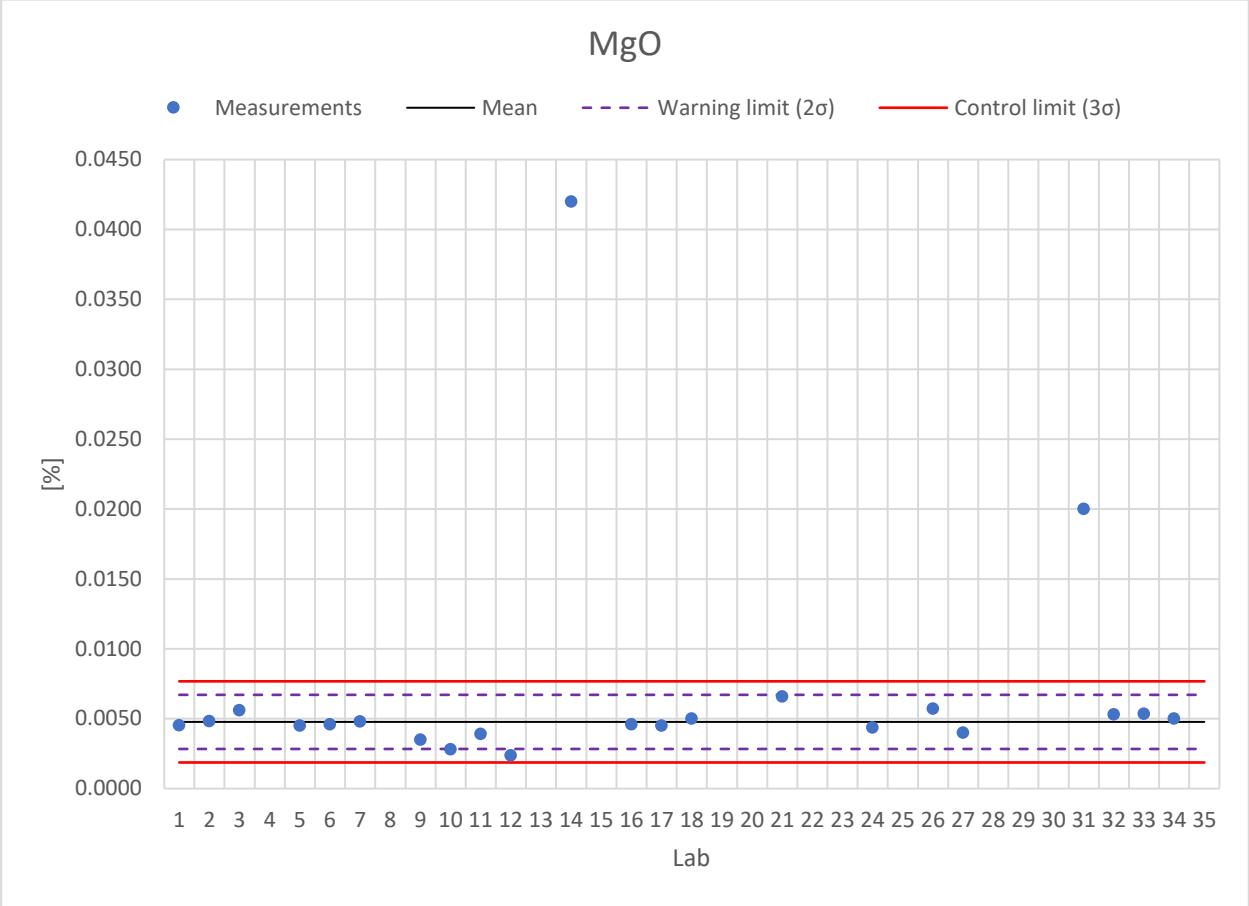


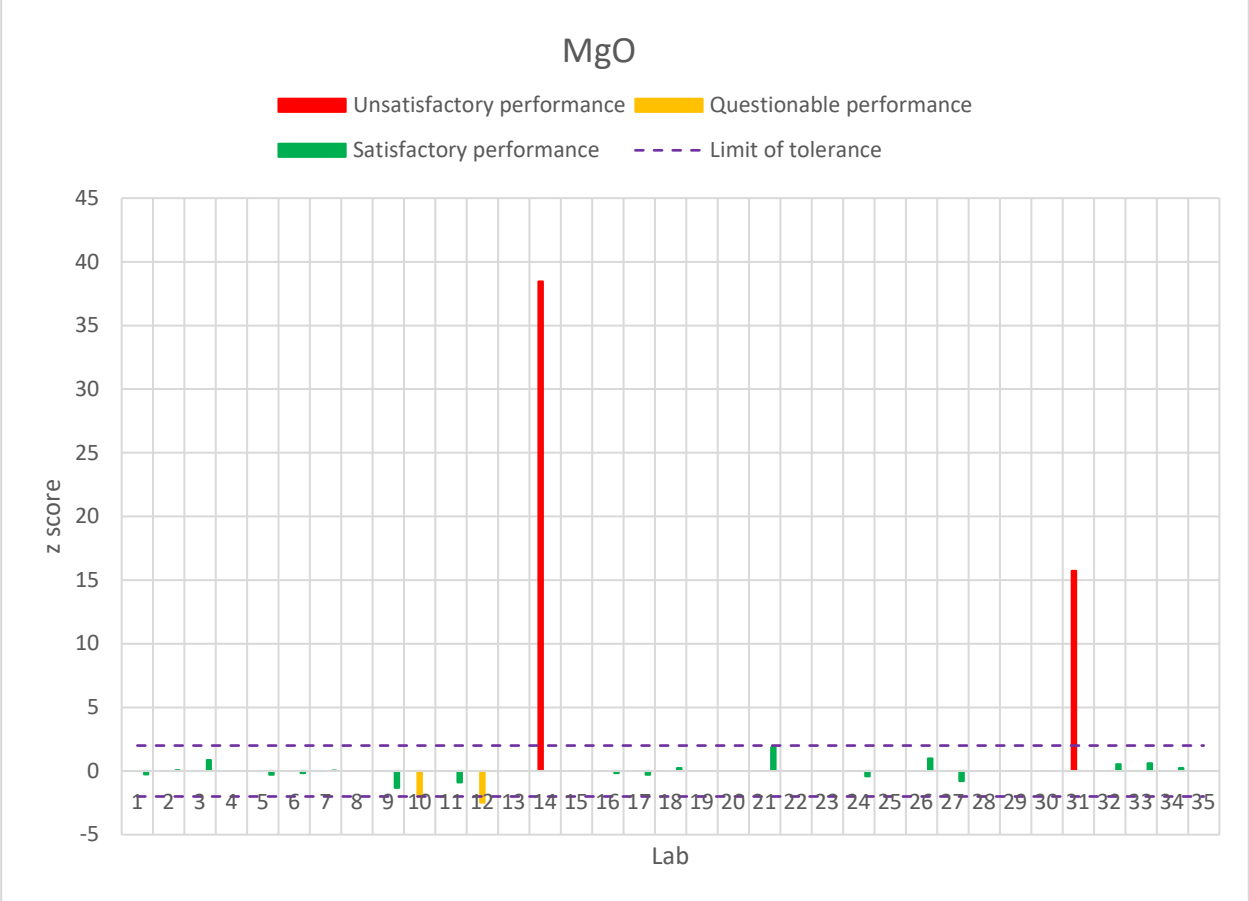


CHARTS SAMPLE C

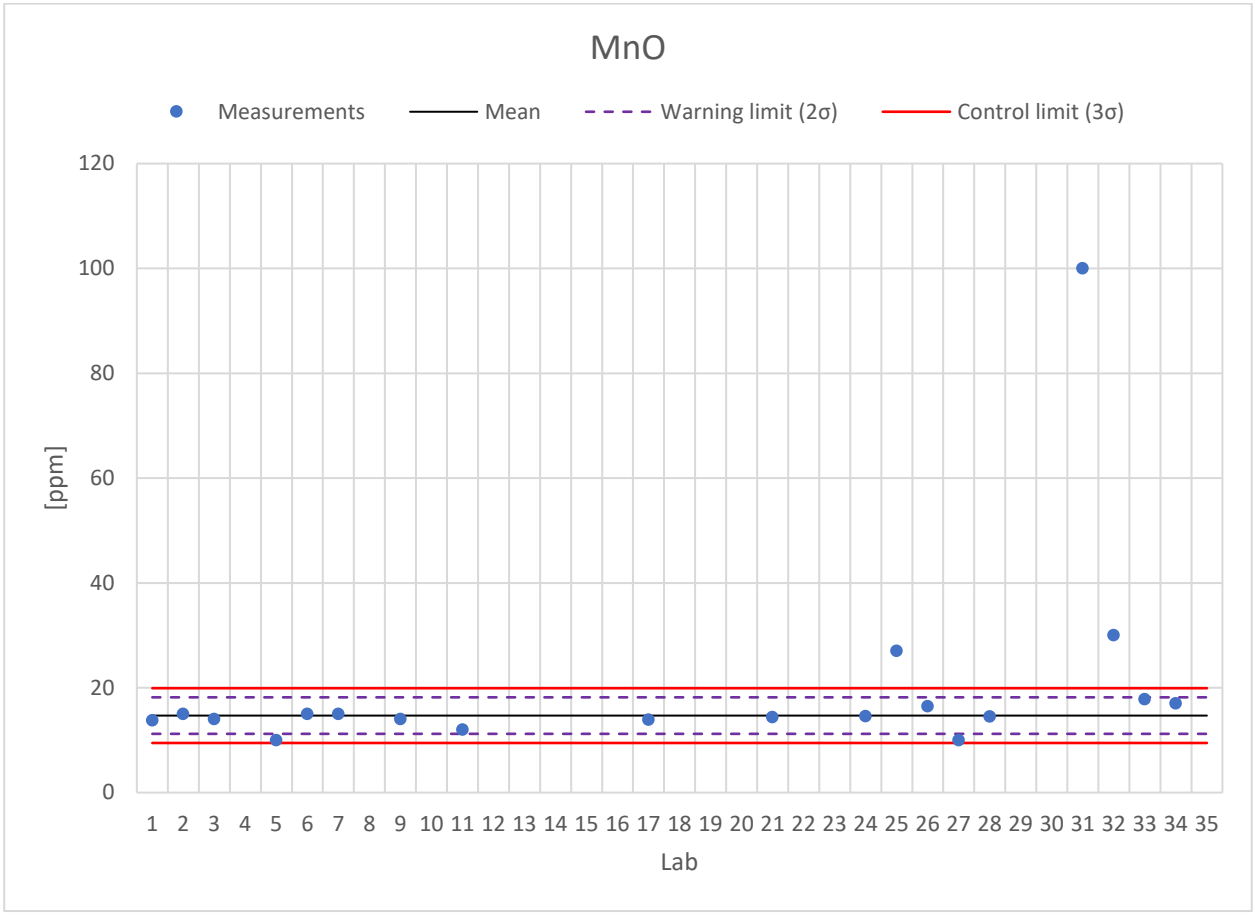


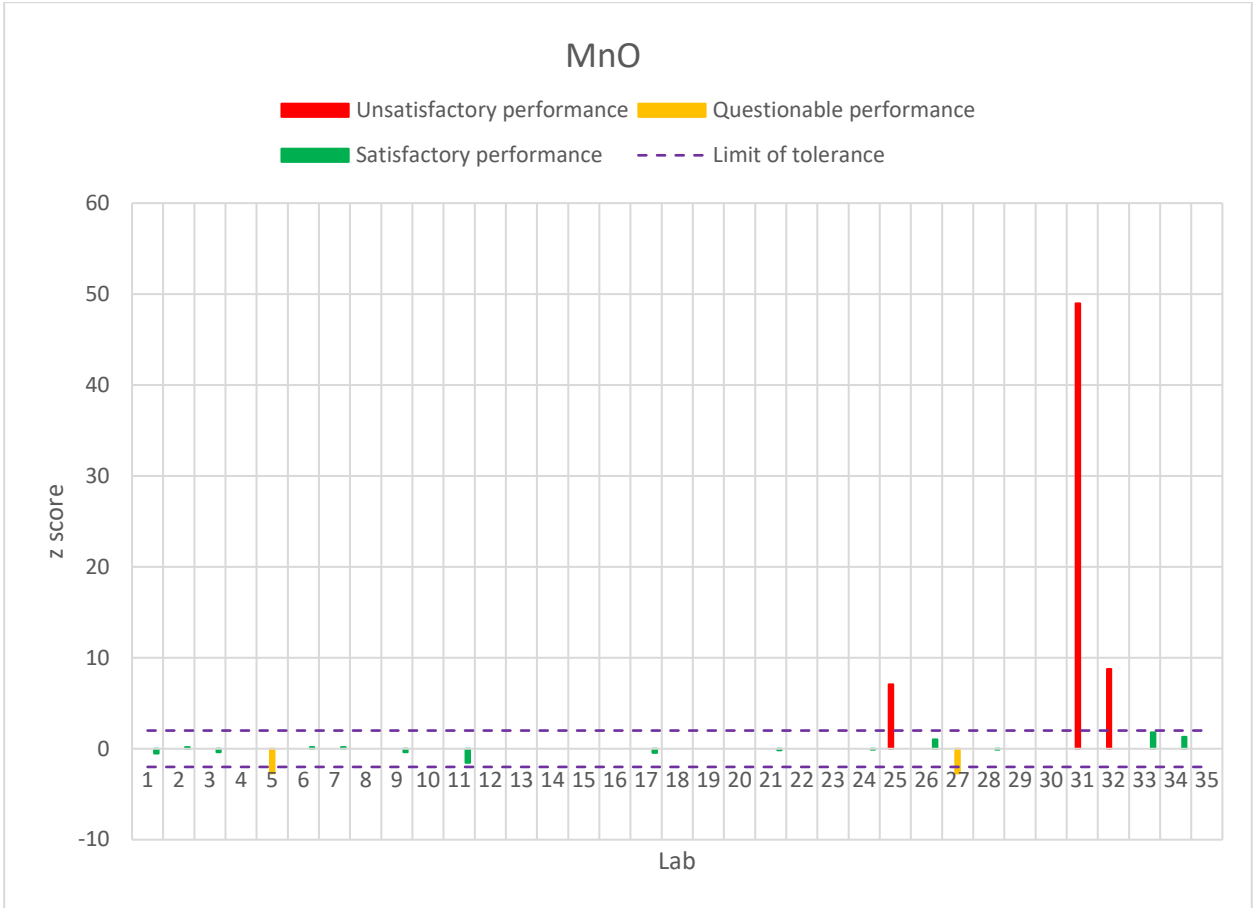
CHARTS SAMPLE C



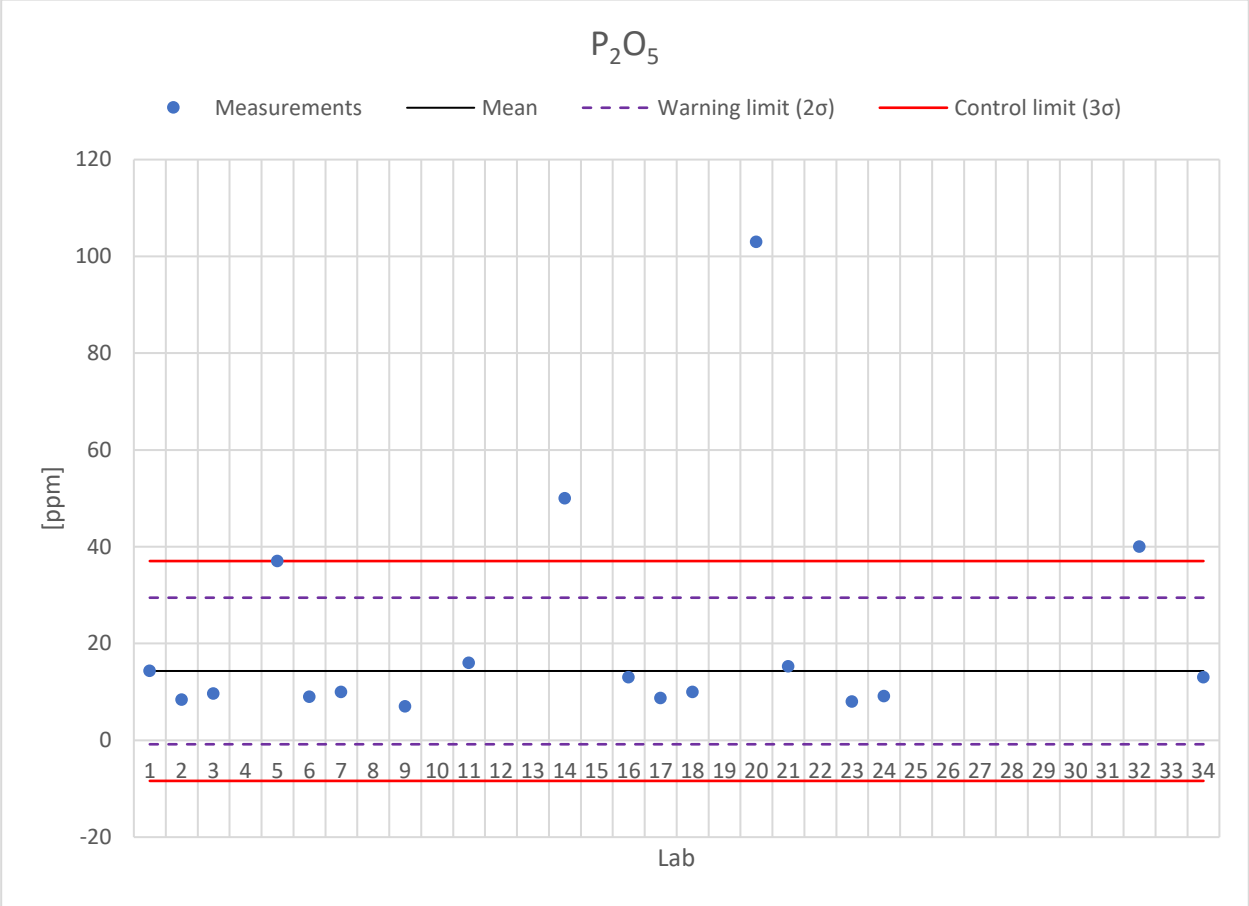


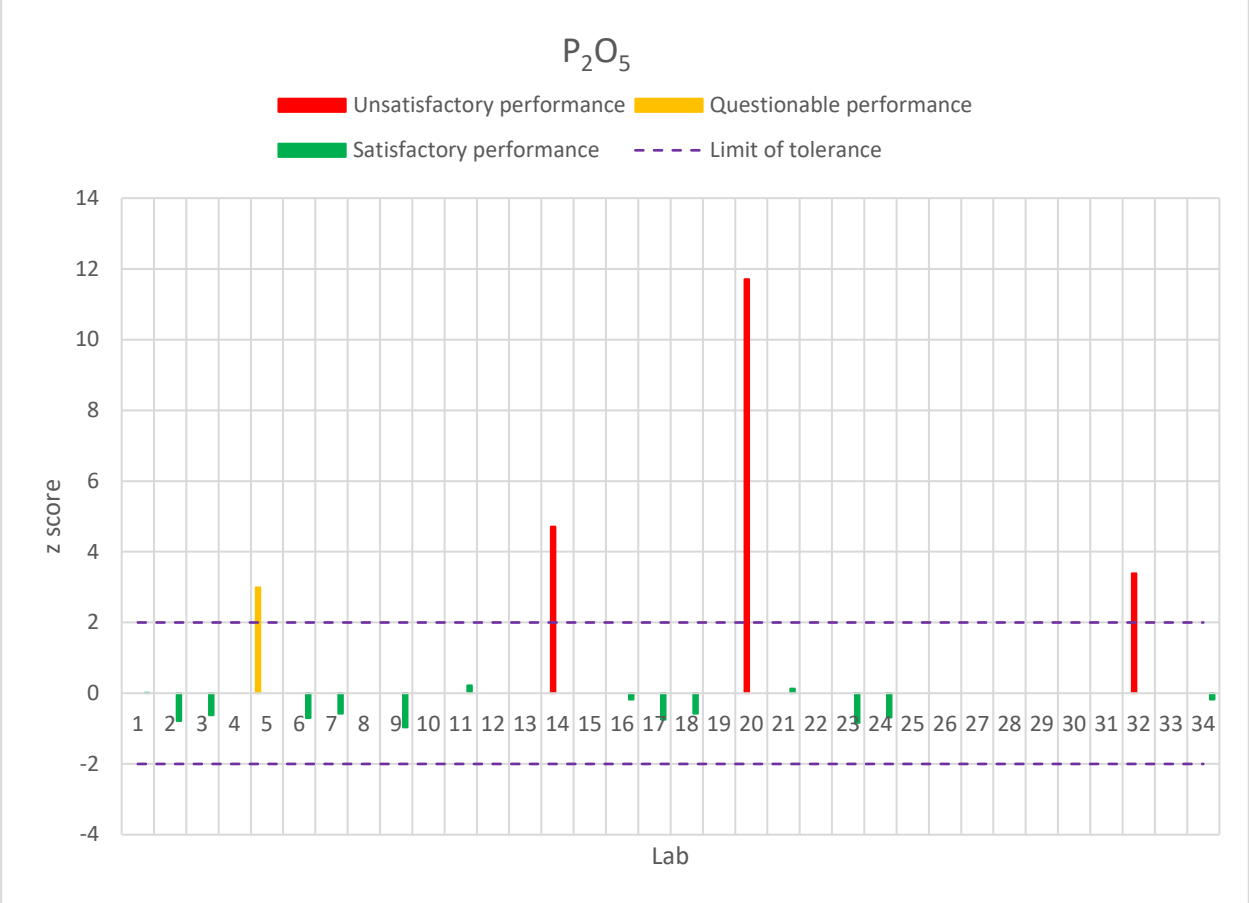
CHARTS SAMPLE C



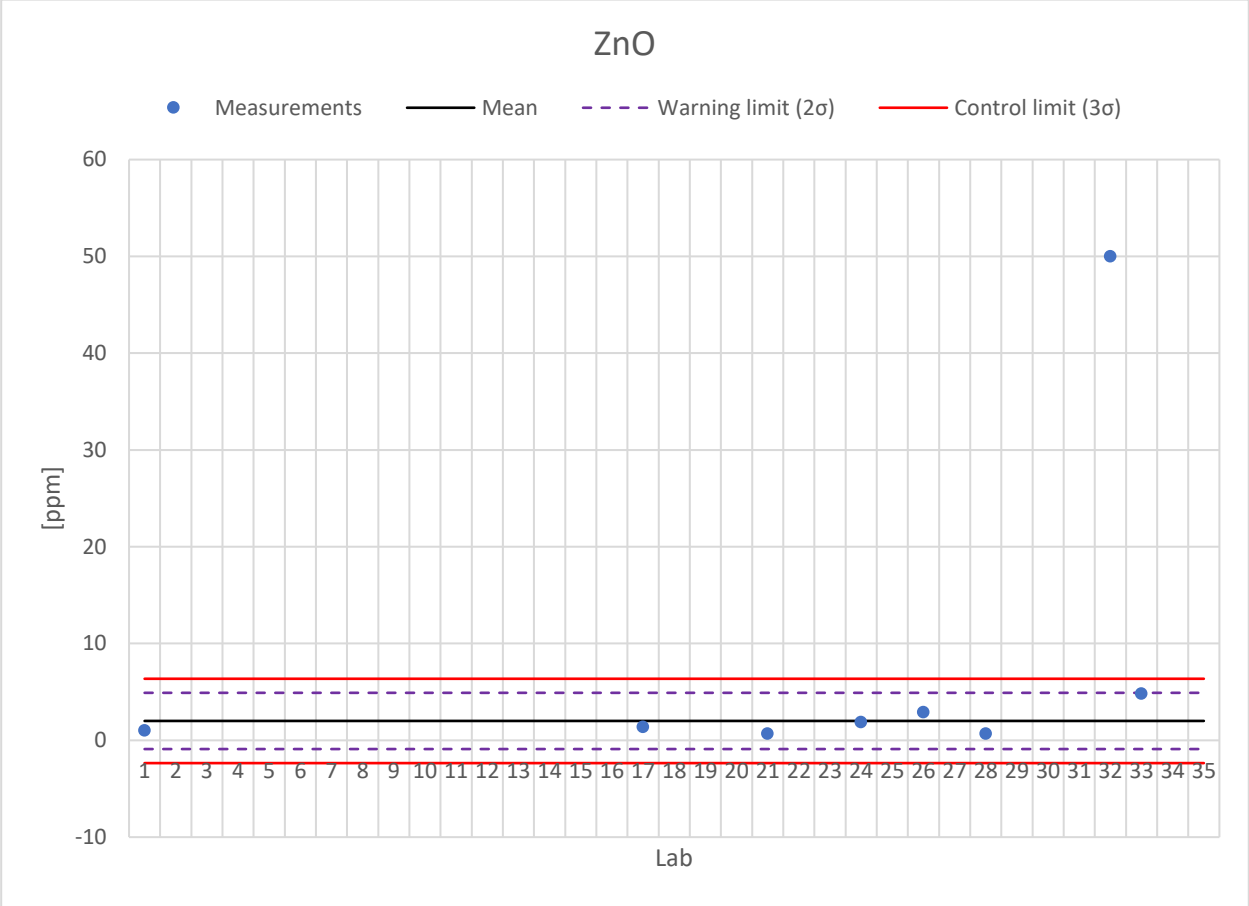


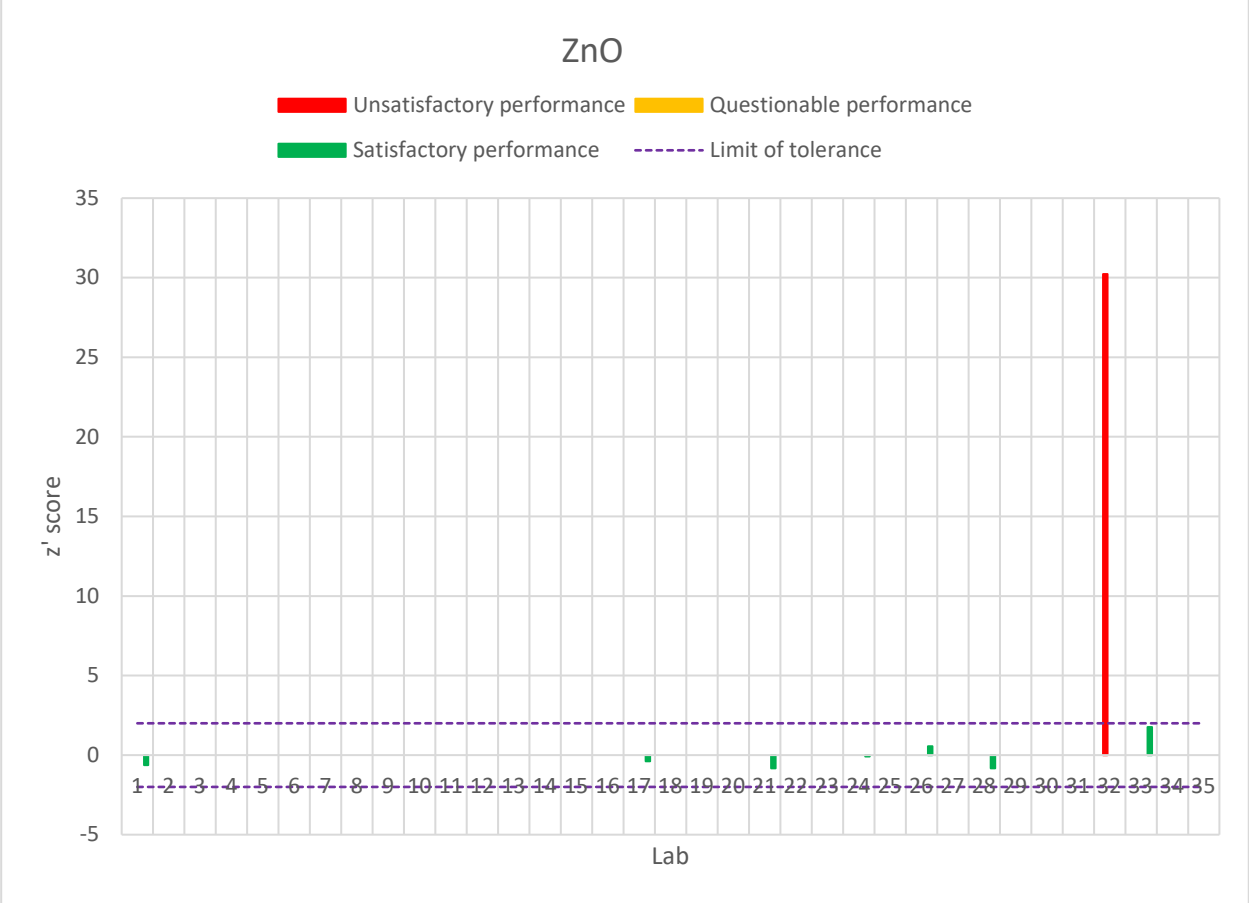
CHARTS SAMPLE C



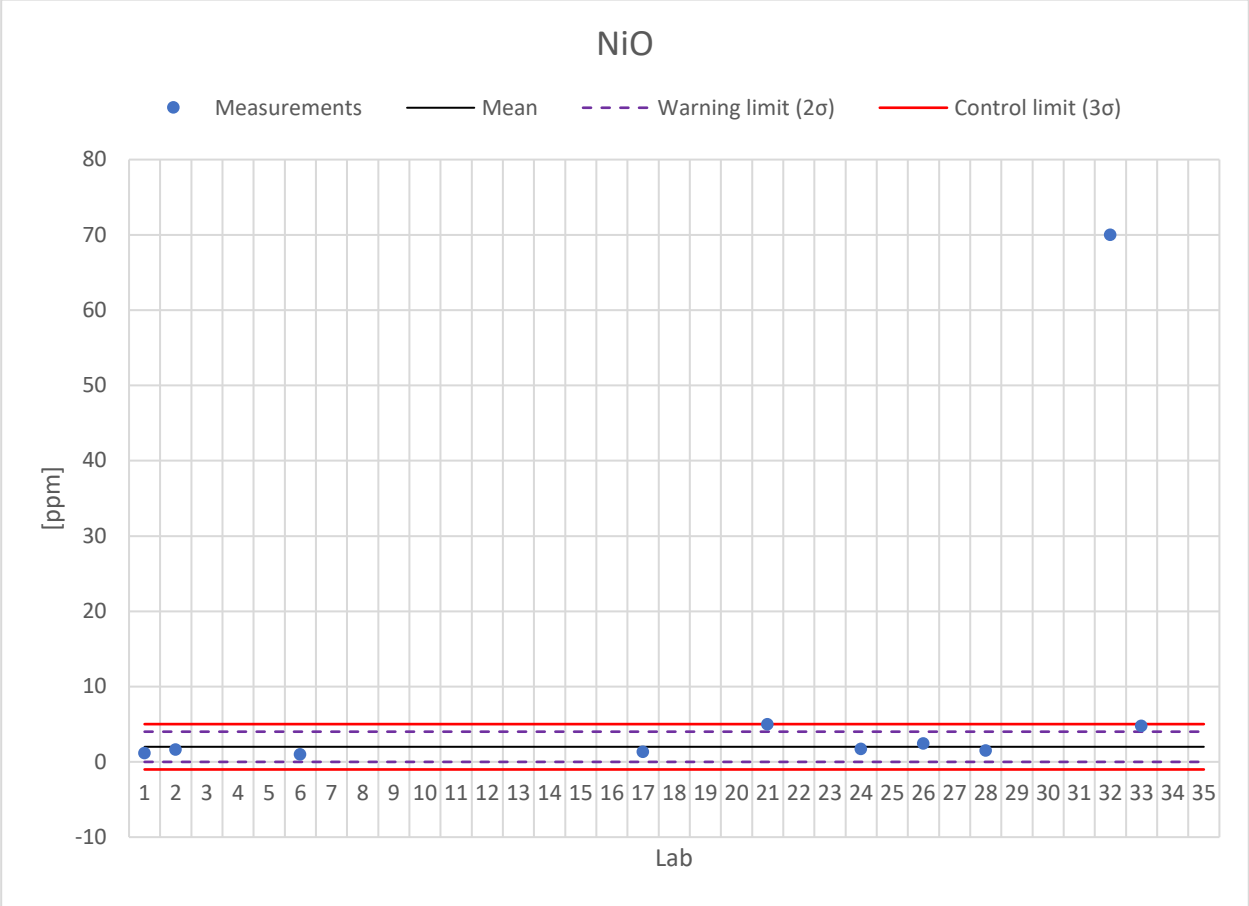


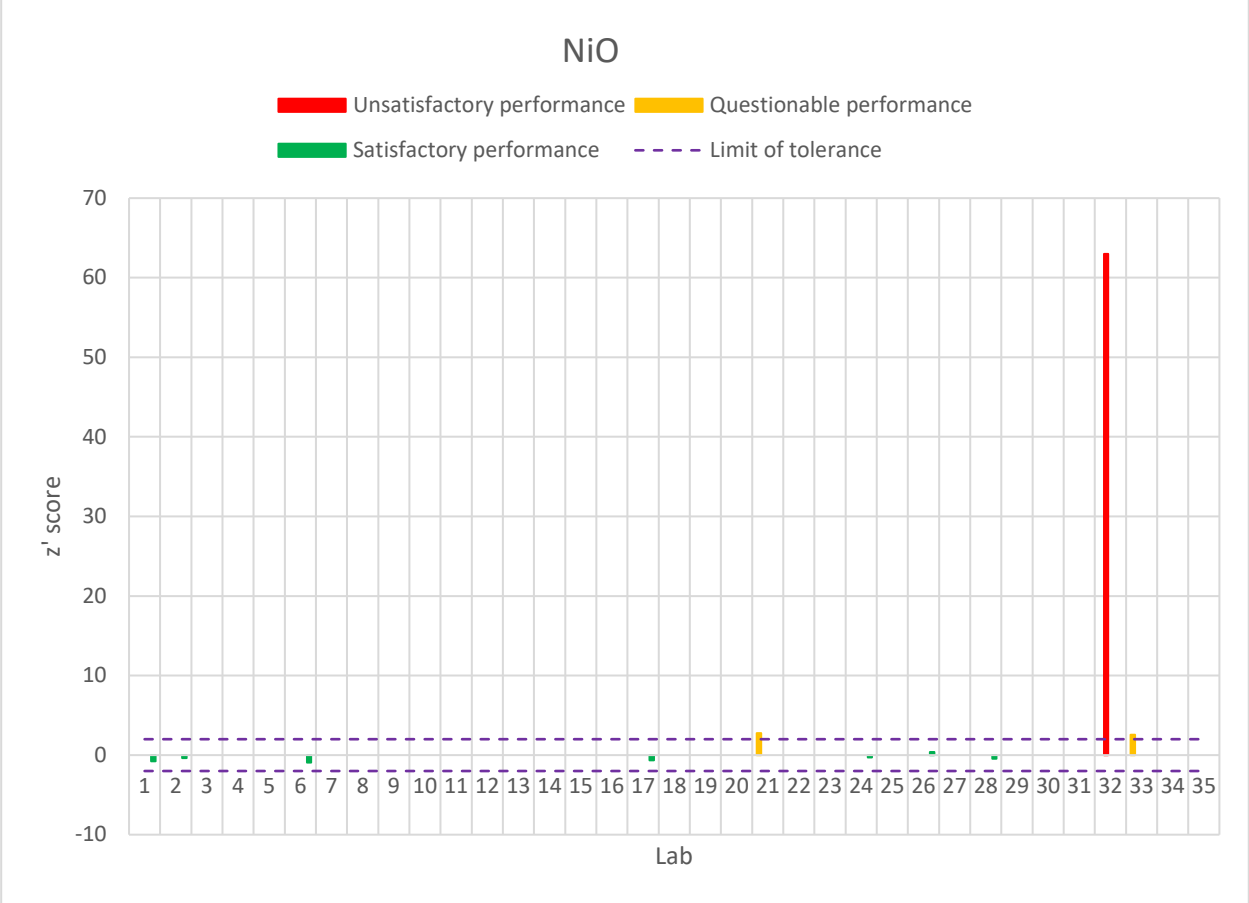
CHARTS SAMPLE C



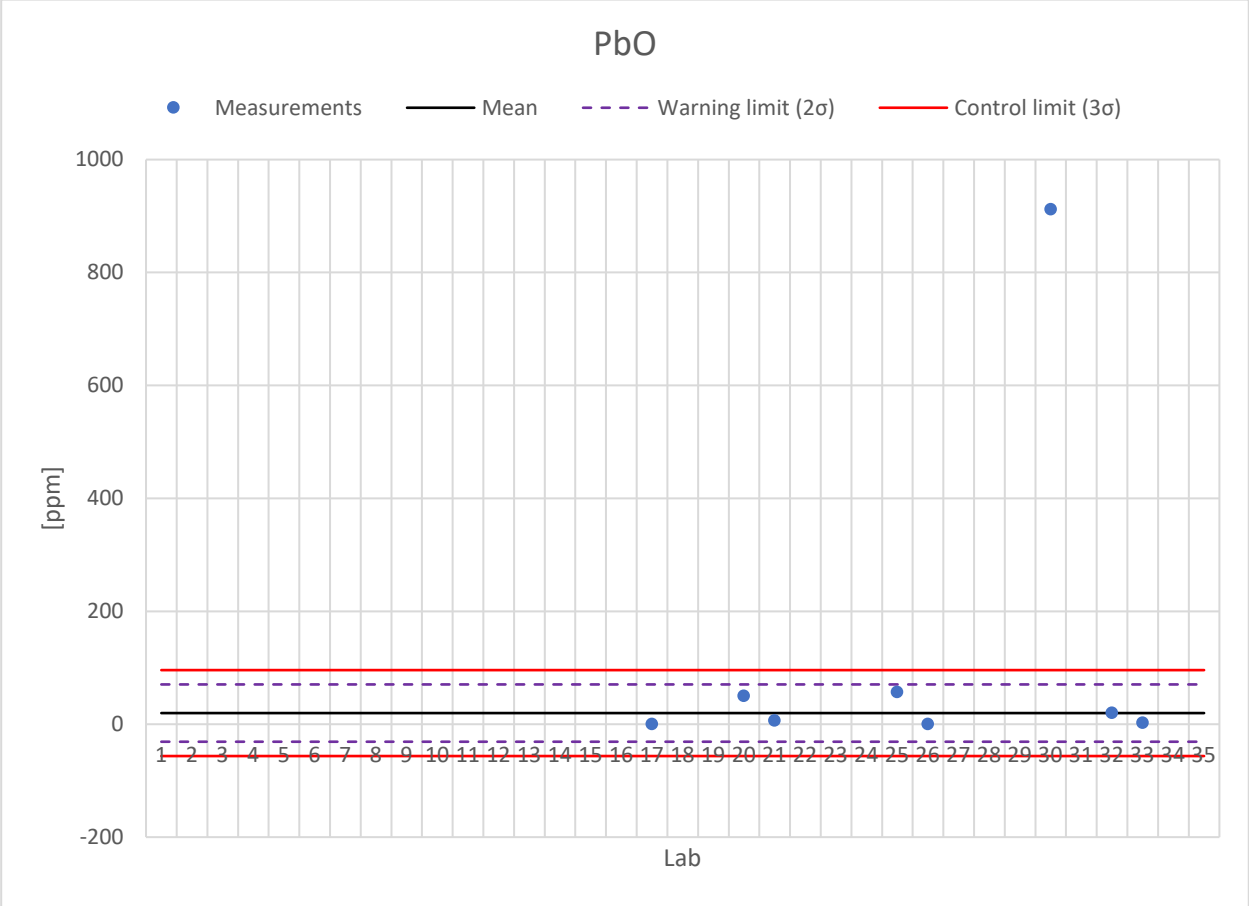


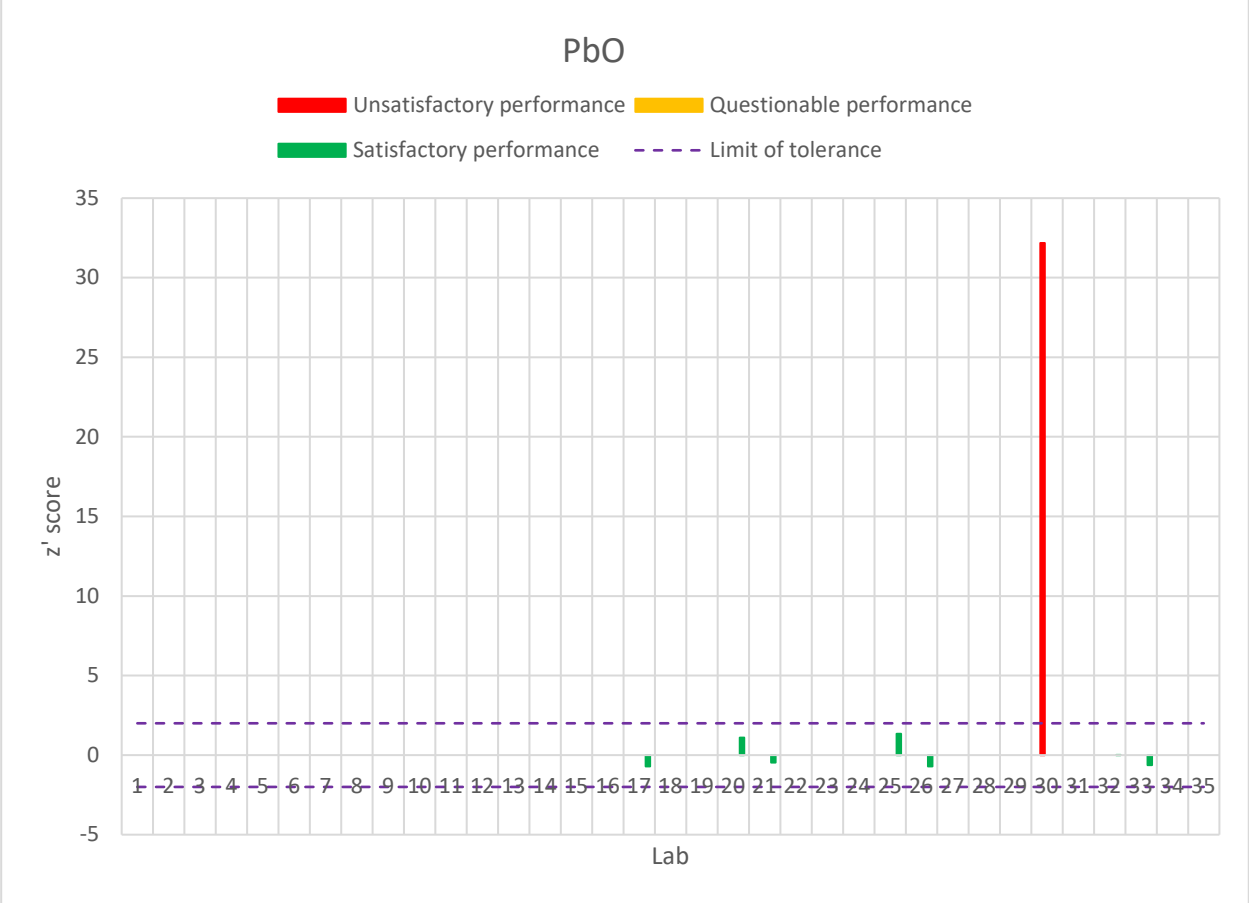
CHARTS SAMPLE C



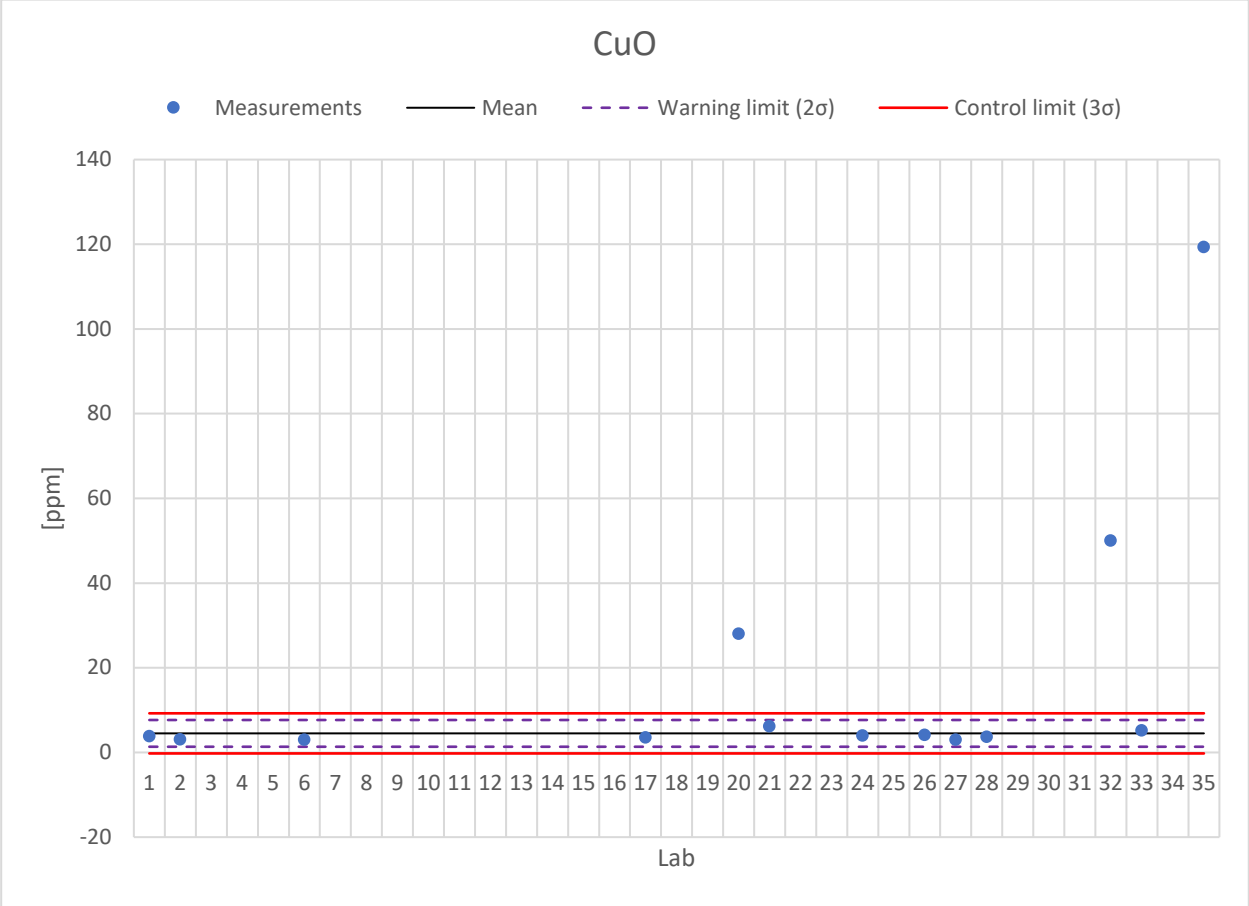


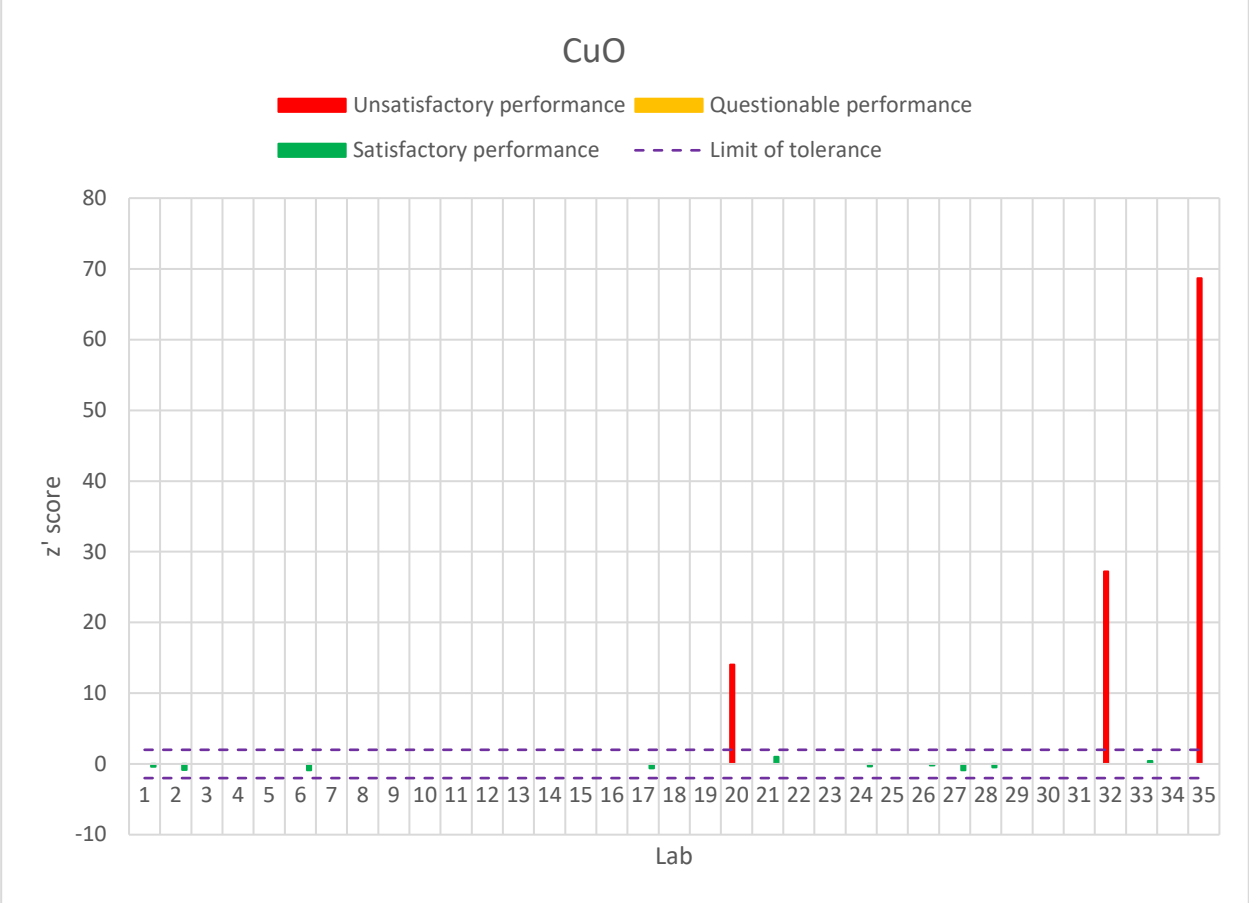
CHARTS SAMPLE C



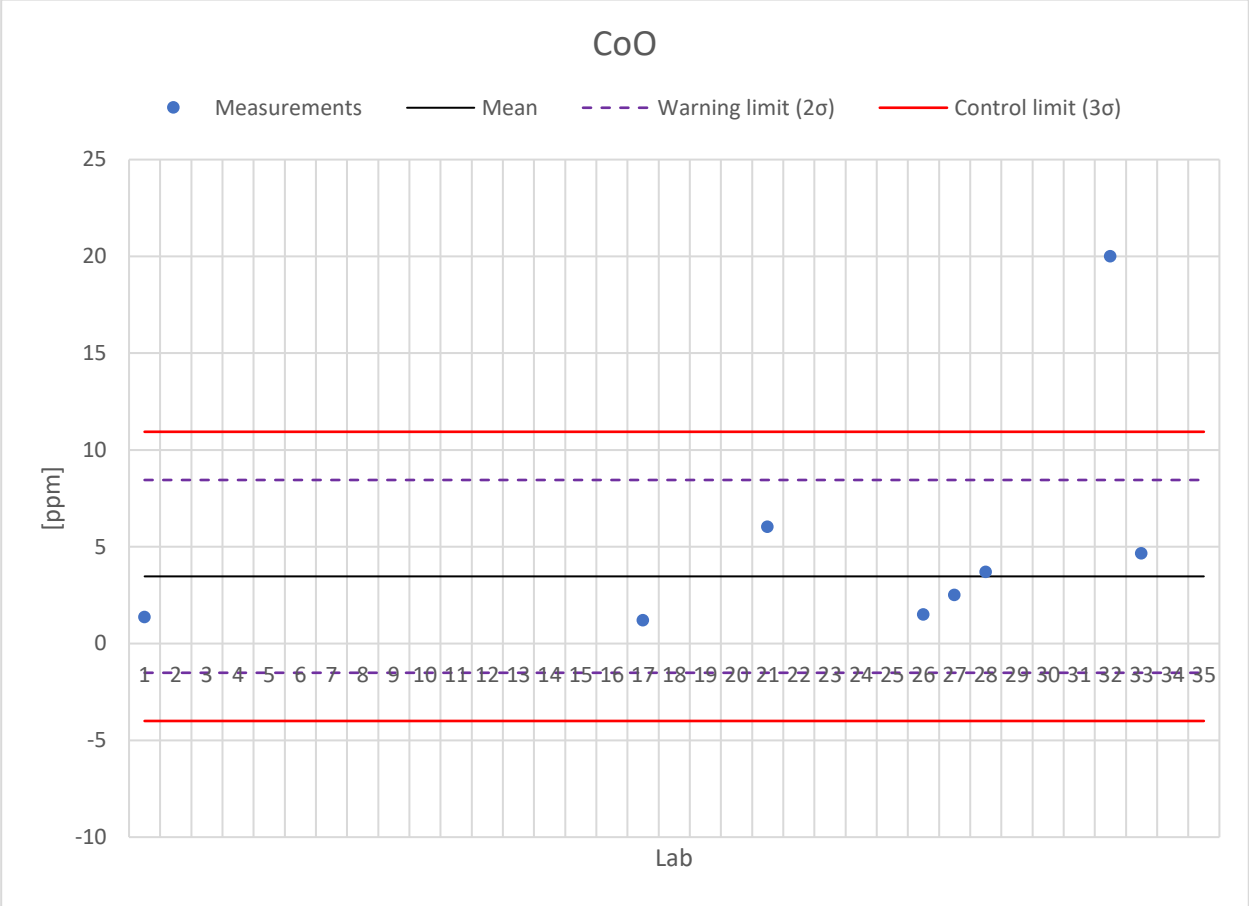


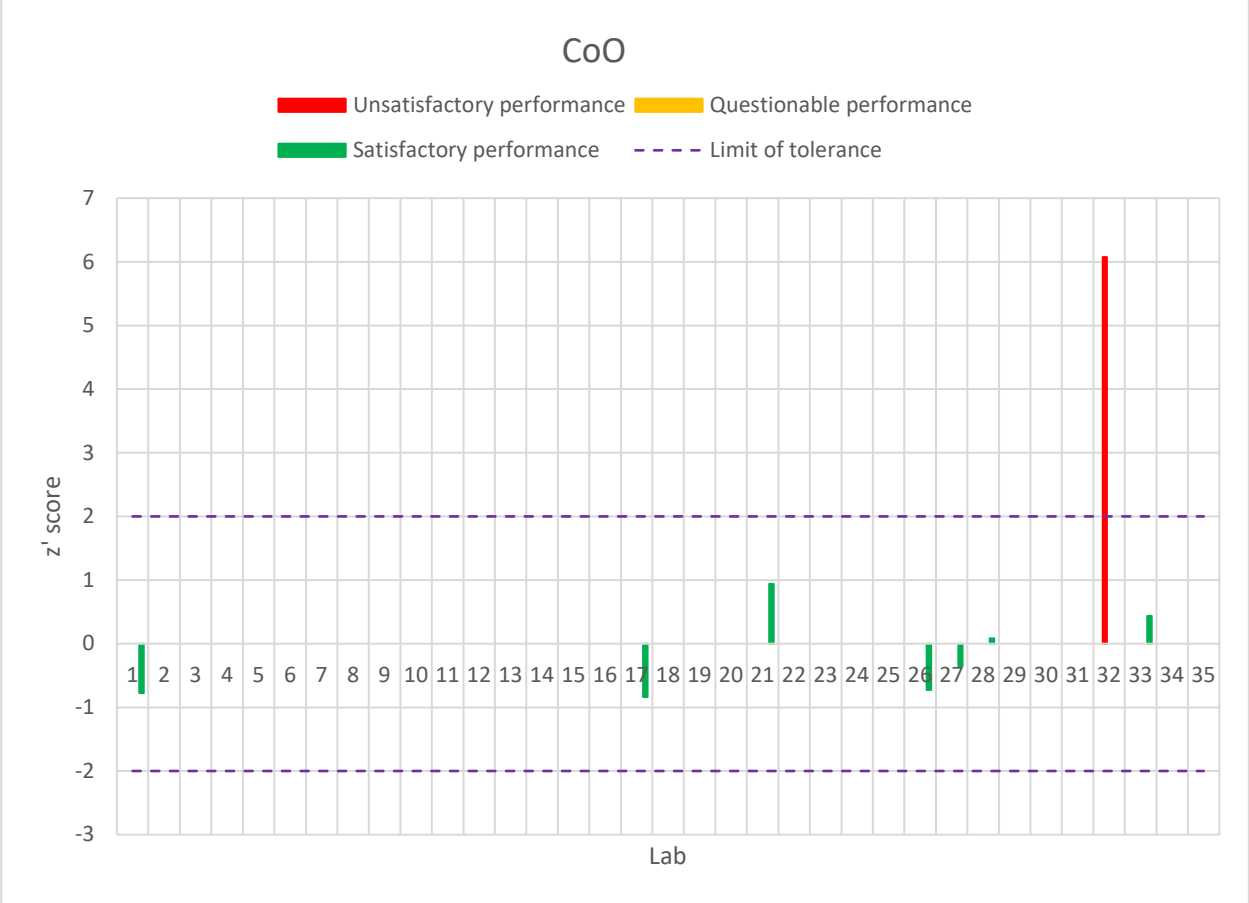
CHARTS SAMPLE C



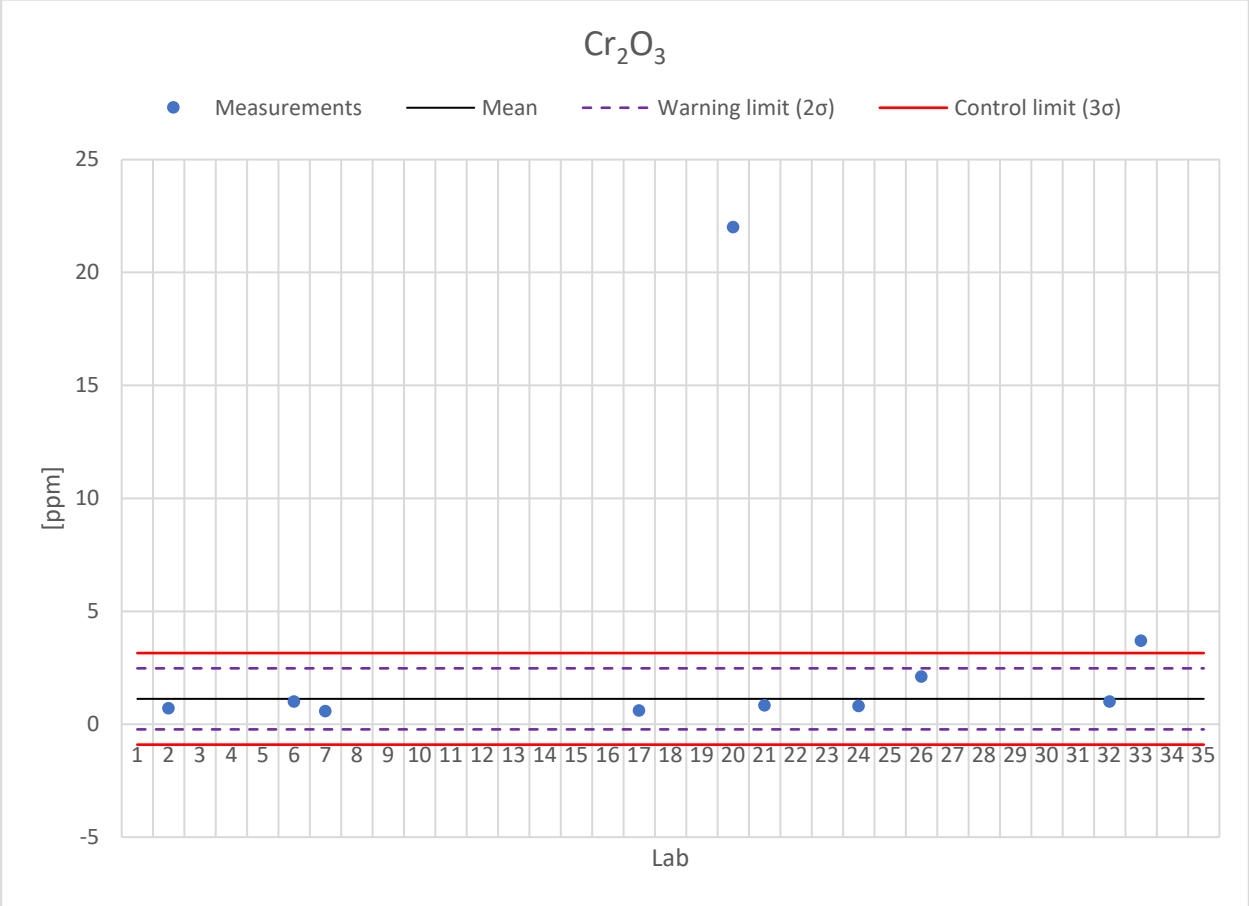


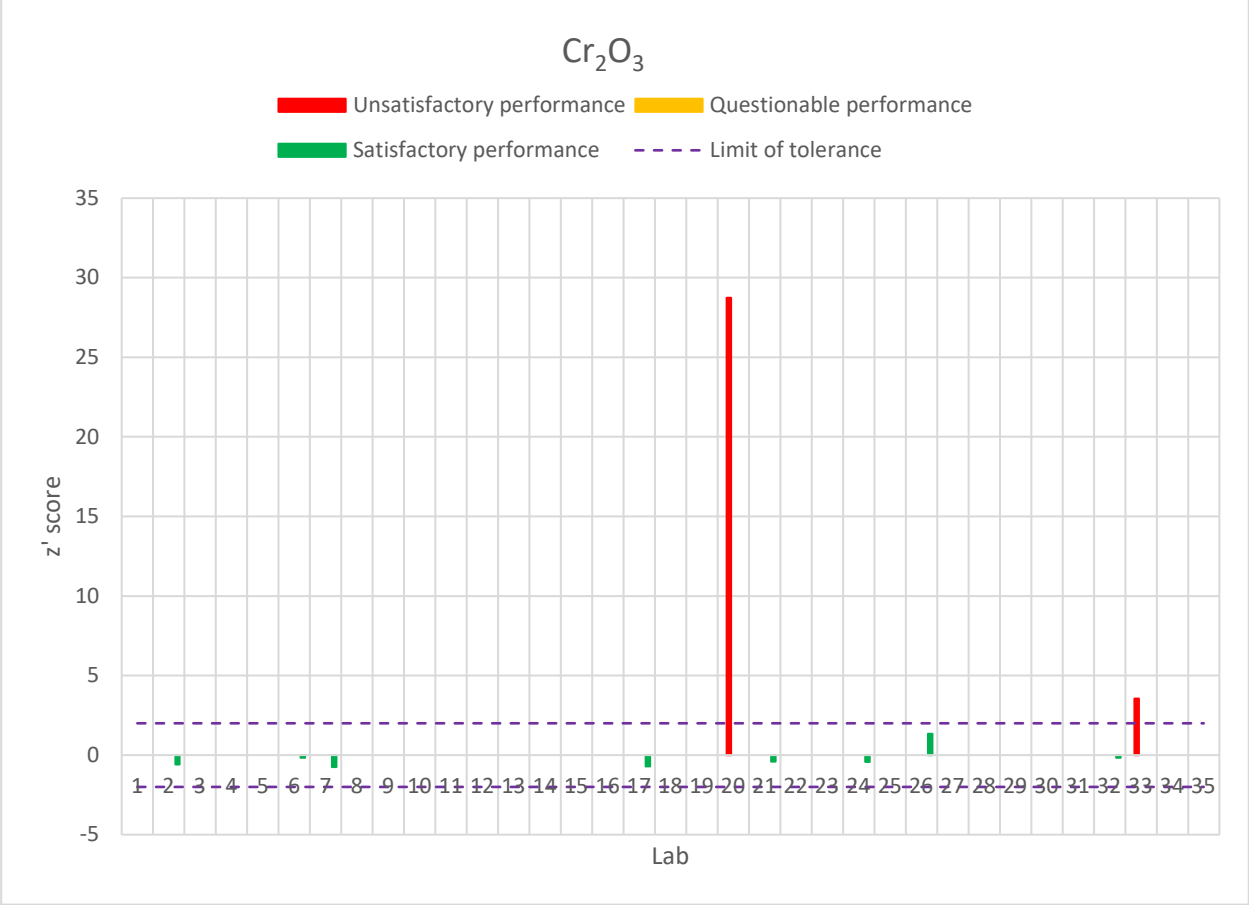
CHARTS SAMPLE C



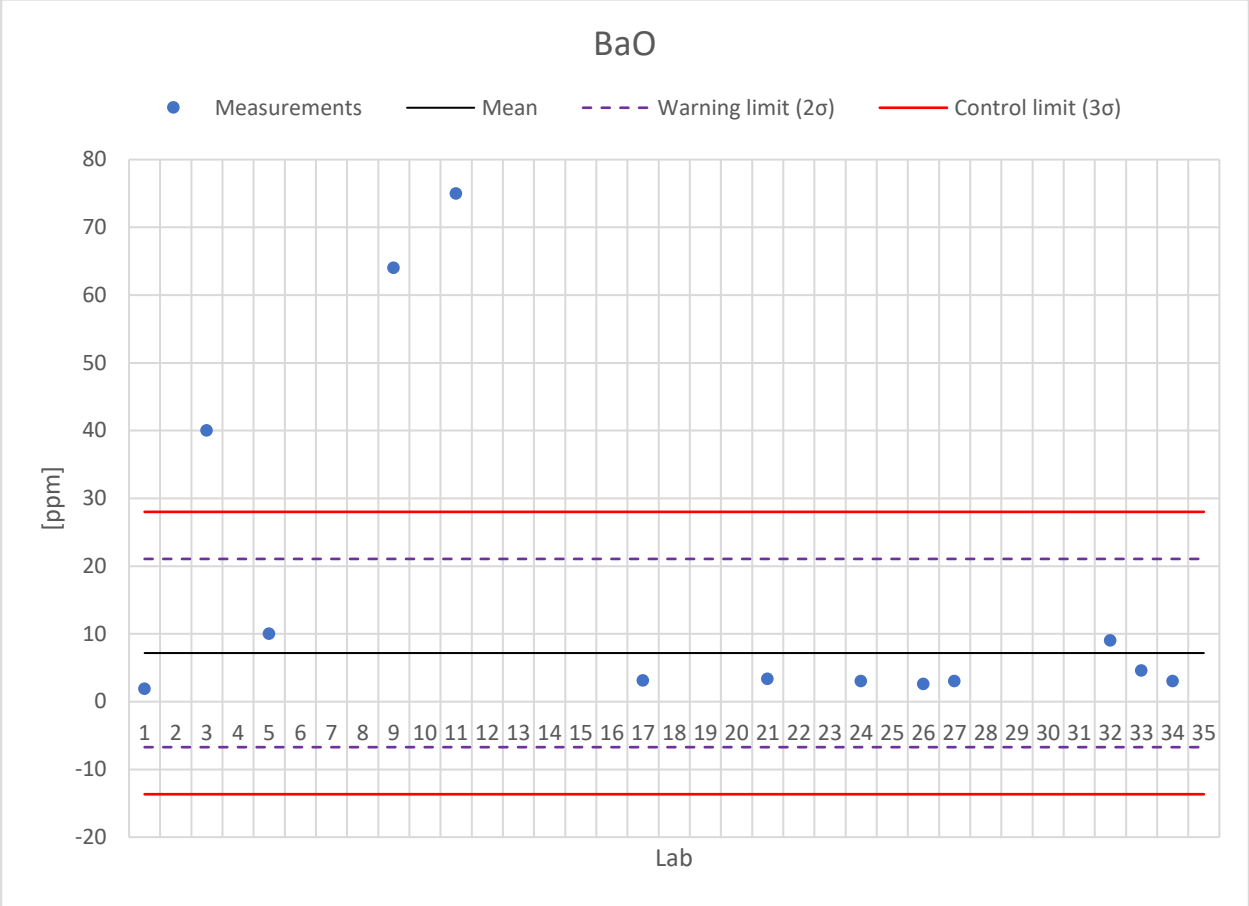


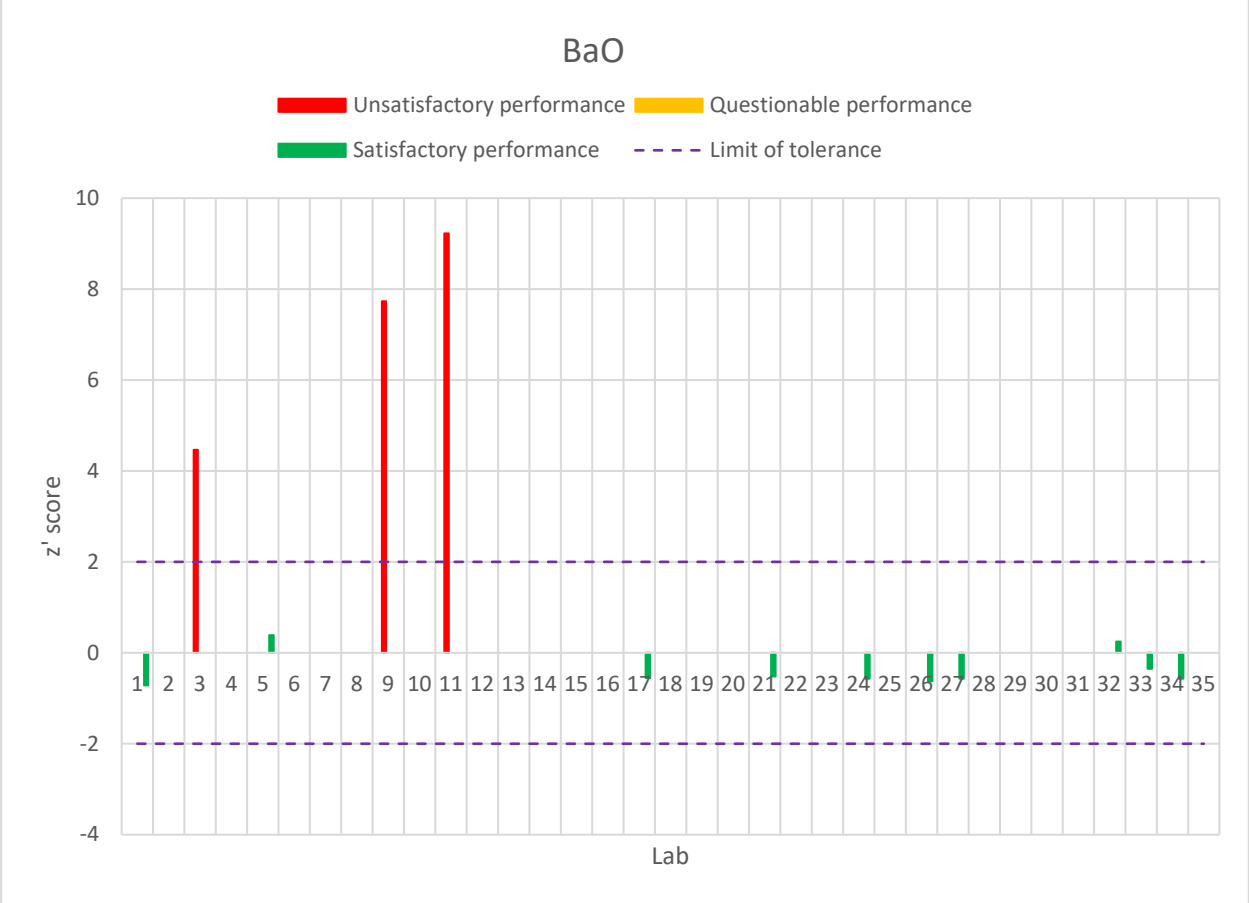
CHARTS SAMPLE C



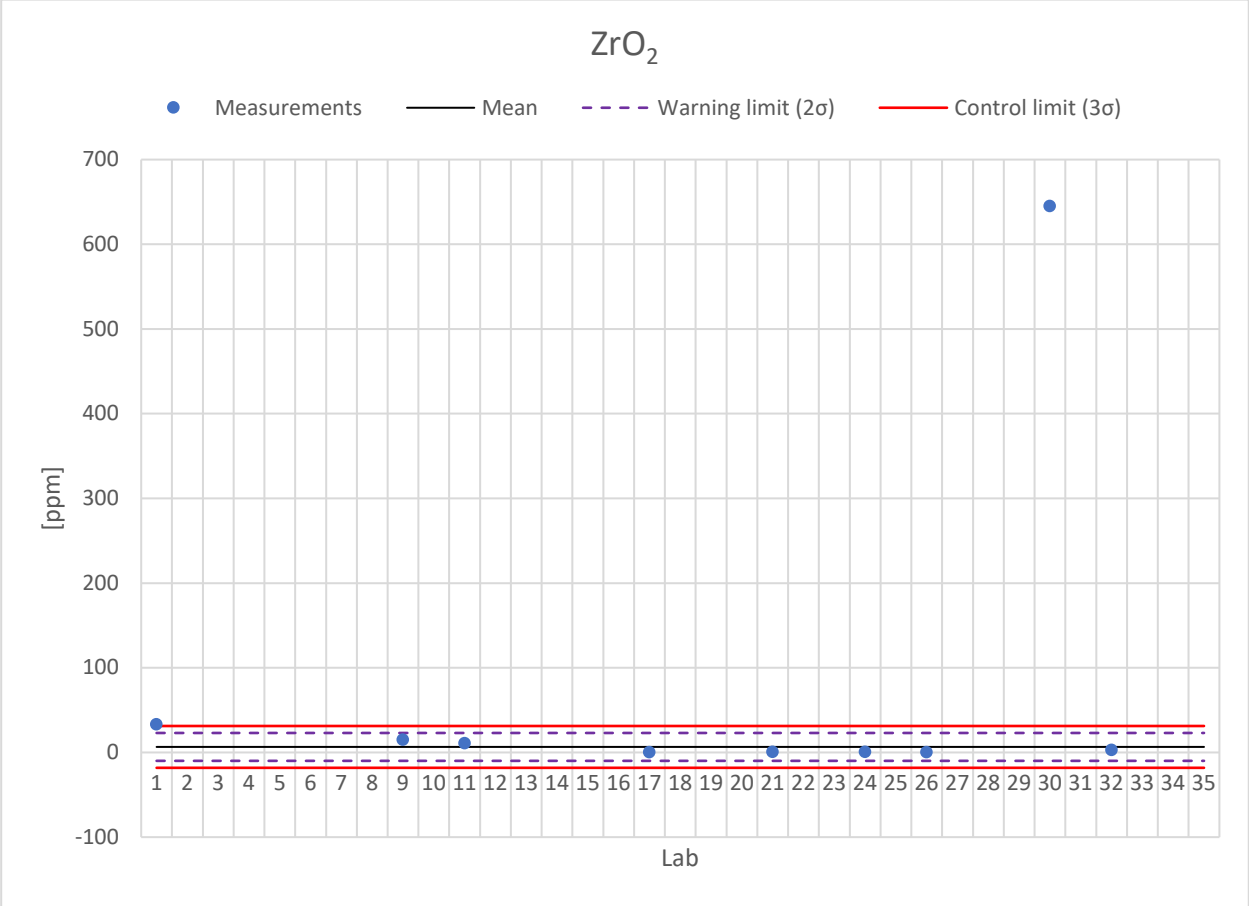


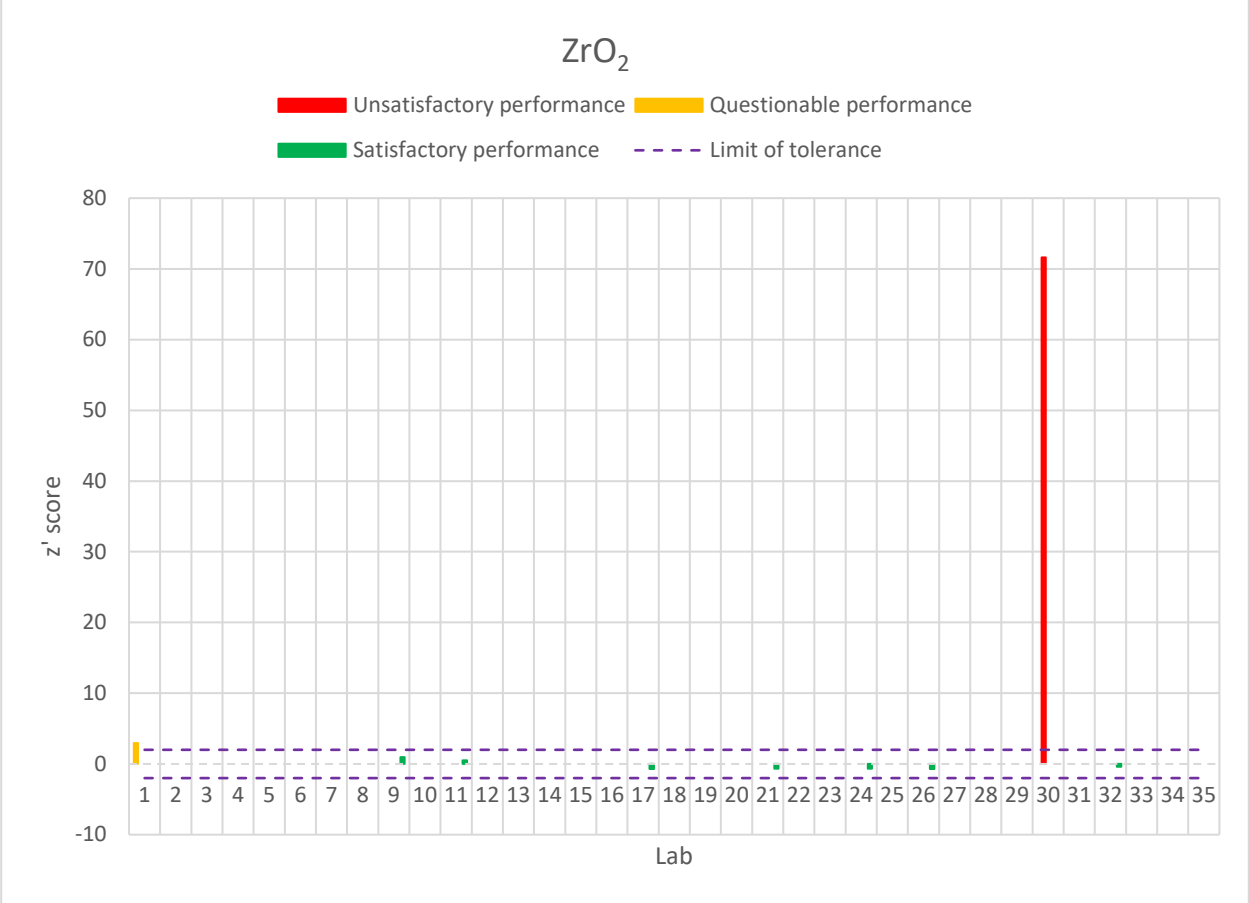
CHARTS SAMPLE C



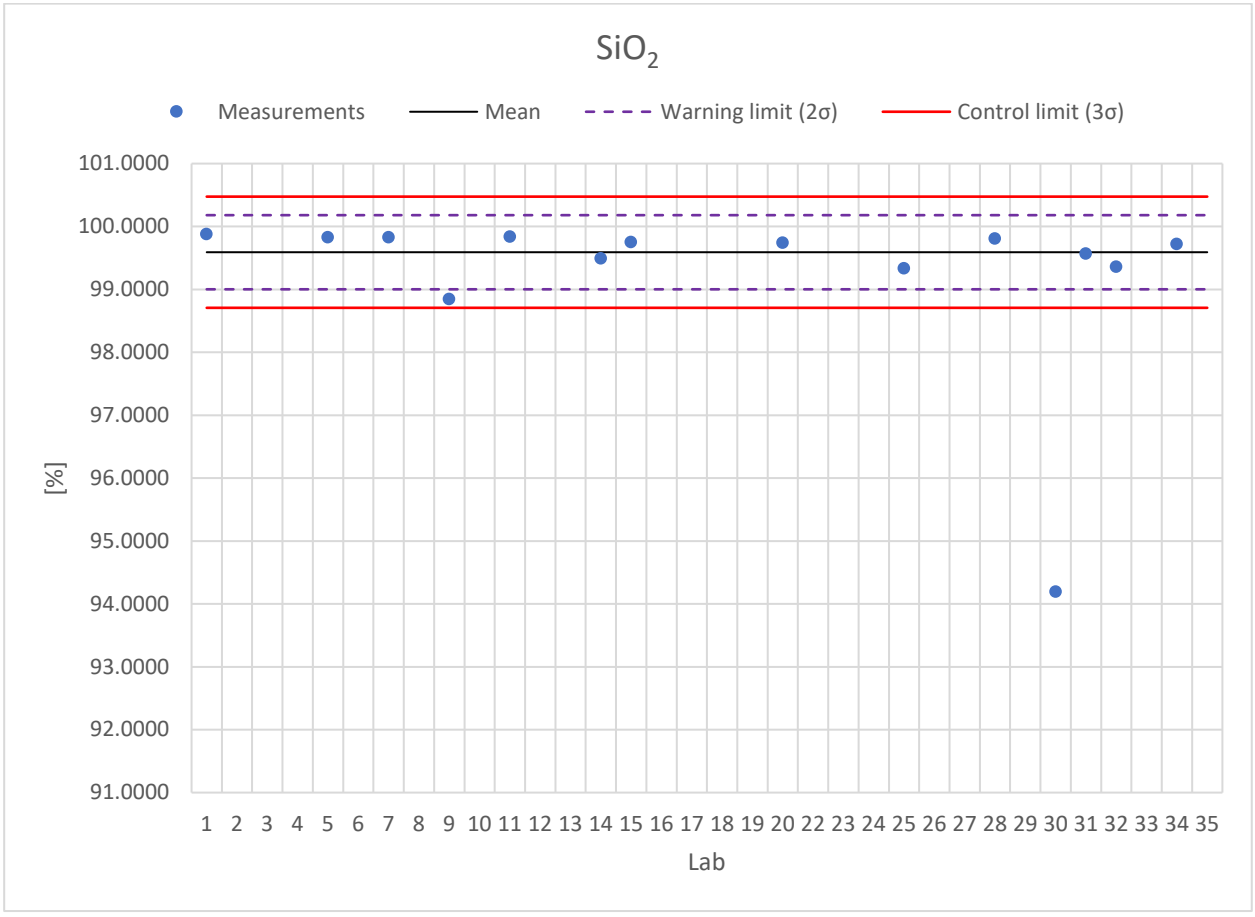


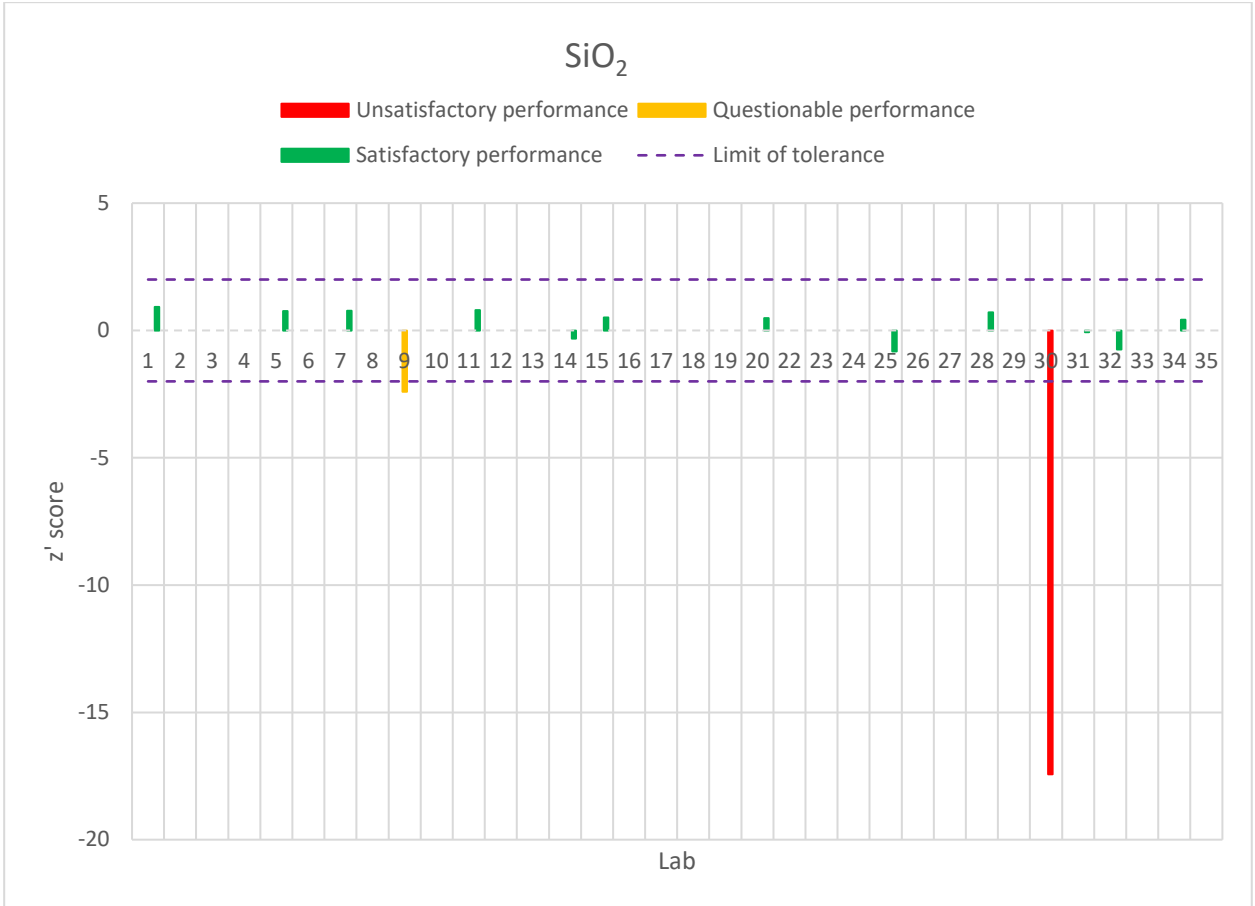
CHARTS SAMPLE C





CHARTS SAMPLE C





ANNEX 5.4. MEASUREMENTS SAMPLE D

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
x_{pt}	0.2263	0.0180	0.0019	0.0078	0.0043	0.0303	0.0042	3.12	140.44	4.03
σ_{pt}	0.0279	0.0040	0.0006	0.0028	0.0014	0.0045	0.0011	1.97	16.23	4.93
N	27	27	21	25	23	28	22	18	21	4

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
Lab 1	0.2037	0.0160	0.0015	0.0051	0.0020	0.0257	0.0038	1.4	139.9	<0.8
Lab 2	0.2424	0.0170	0.0020	0.0072	0.0037	0.0288	0.0042	1.7	154.5	
Lab 3	0.2113	0.0288		0.0051	0.0008	0.0280	0.0053	3.0	130.7	0.9
Lab 4										
Lab 5	0.2590	0.0220	0.0010	0.0077	0.0051	0.0310	0.0042	10.0	151.0	
Lab 6	0.2234	0.0154	0.0018	0.0102	0.0040	0.0329	0.0040	1.0	136.0	10.0
Lab 7	0.2300	0.0153	0.0015	0.0108	0.0039	0.0315	0.0039	3.0	132.0	
Lab 8										
Lab 9	0.1991	0.0233	0.0021	0.0066	0.0042	0.0273	0.0031	2.0	123.0	
Lab 10	0.2680		0.0023	0.0071	0.0009	0.0389	0.0013			
Lab 11	0.2121	0.0213	0.0044	0.0052	0.0004	0.0272	0.0034	3.0	142.0	
Lab 12	0.2062	0.0099	0.0014	0.0037			0.0016			
Lab 13										
Lab 14	0.2920	0.0310	0.0060	0.0260	0.0270	0.0330	0.0600		270.0	
Lab 15	0.1940	0.0230				0.0290			130.0	
Lab 16	0.2118	0.0189	0.0019	0.0070	0.0043	0.0319	0.0040		139.0	
Lab 17	0.2063	0.0152	0.0017	0.0055	0.0051	0.0273	0.0039	1.5	132.2	0.9
Lab 18	0.2290	0.0150	0.0020	0.0080	0.0060	0.0336	0.0040		130.0	
Lab 19										
Lab 20	0.2470	0.0212	0.0038	0.0154		0.0233		13.0	196.0	
Lab 21	0.2287	0.0157	0.0021	0.0050	0.0030	0.0262	0.0056	1.7	141.9	
Lab 22										
Lab 23	0.2600	0.0170	0.0014	0.0062	0.0051	0.0260			29.0	
Lab 24	0.2330	0.0155	0.0018	0.0067	0.0037	0.0316	0.0037	1.8	127.5	
Lab 25	0.2149	0.0040		0.0080		0.0306				
Lab 26	0.2979	0.0132		0.0380	0.0243	0.0420	0.0048	3.2		
Lab 27		0.0150	0.0020		0.0030	0.0310	0.0030	2.0		
Lab 28	0.1594	0.0163	0.0011	0.0122		0.0293			322.3	
Lab 29										
Lab 30		0.0361			0.1539	0.0313				
Lab 31	0.0500	0.1300		0.0400	0.0300	0.0500	0.0200	100.0		
Lab 32	0.2198	0.0290	0.0050	0.0100	0.0050	0.0180	0.0049	10.0	140.0	
Lab 33	0.2408	0.0182		0.0061	0.0045	0.0334	0.0048	4.2		4.3
Lab 34	0.2395	0.0160	0.0015	0.0075	0.0043	0.0045	0.0045	3.0	130.0	
Lab 35	0.2252					0.6646			10904	

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	1.14	0.40	1.48	23.36	1.41	1.47	0.83	1.39	174.02	6.75
σ_{pt}	0.63	0.15	1.63	11.43	1.32	1.24	0.57	0.54		6.95
N	7	4	7	12	9	7	4	13	1	14

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
Lab 1	0.9	<0.7	<0.5	15.5	0.6	0.5	0.4	0.8	<0.2	1.2
Lab 2		0.4	0.3		0.3			1.3		
Lab 3										38.0
Lab 4										
Lab 5										10.0
Lab 6								1.0		
Lab 7								1.0		
Lab 8										
Lab 9										65.0
Lab 10										
Lab 11										68.0
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	0.7	0.4	0.1	17.0	0.3	0.6		1.2		2.5
Lab 18										
Lab 19										
Lab 20				50.0	24.0			19.0		
Lab 21			3.7	23.1	2.6	5.1	0.5	1.3		2.5
Lab 22										
Lab 23										
Lab 24	0.8		0.8		0.6			1.4		2.4
Lab 25				63.0						
Lab 26	2.4	0.3	0.5	18.1	0.8	0.7		1.9	174.0	2.0
Lab 27				20.0		1.0		1.0		2.0
Lab 28	0.6			21.1						
Lab 29										
Lab 30				978.0				68.0		18366.0
Lab 31										
Lab 32	30.0	10.0	70.0	50.0	40.0	10.0	1.0	1.0		20.0
Lab 33	5.5		3.6	22.4	2.7	3.7	3.3	4.5		4.1
Lab 34				20.0						2.0
Lab 35										

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
x_{pt}	46.43	50.91	2.12	0.56	1319.00	7.13	321.99	18.60	10.00	5.08
σ_{pt}	15.67	31.17	2.75			8.10	427.85	21.17		7.89
N	2	4	3	1	1	9	3	5	1	2

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
Lab 1	36.7	27.6	1.5	0.6	<1.7	36.3				
Lab 2										
Lab 3										
Lab 4										
Lab 5		90.0								
Lab 6										
Lab 7										
Lab 8										
Lab 9		49.0				15.0				
Lab 10										
Lab 11						11.0				
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	56.2		0.1			0.9	0.1			
Lab 18										
Lab 19										
Lab 20		37.0								
Lab 21						1.2		17.6		
Lab 22										
Lab 23										
Lab 24						0.9				
Lab 25										
Lab 26						0.8		3.5		0.2
Lab 27								3.0		
Lab 28										
Lab 29										
Lab 30					1319.0	624.0	11022.0			
Lab 31										
Lab 32			250.0			4.0		20.0	10.0	10.0
Lab 33								243.6		
Lab 34										
Lab 35							228.7			

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
x_{pt}	0.91	0.58	0.63	672.89	35.08	0.20	2598.00	8841.00	0.0052	0.5797	0.1924	99.4814
σ_{pt}	0.33			1071.46	56.01						0.0452	0.2729
N	7	1	1	2	2	1	1	1	1	1	7	15

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
Lab 1											0.1400	99.7715
Lab 2												
Lab 3												
Lab 4												
Lab 5												99.6540
Lab 6												
Lab 7												99.6900
Lab 8												
Lab 9												99.7090
Lab 10												
Lab 11											0.1500	99.7000
Lab 12												
Lab 13												
Lab 14											0.2000	98.8600
Lab 15											0.2200	99.5000
Lab 16												
Lab 17	0.7					0.2						
Lab 18												
Lab 19												
Lab 20									0.0052			99.5600
Lab 21	0.6											68.6934
Lab 22												
Lab 23												
Lab 24	0.7											
Lab 25	77.0										0.1900	99.3722
Lab 26		0.6	0.6	4.8	0.2							
Lab 27												
Lab 28	0.8											99.6800
Lab 29												
Lab 30				1341.0			2598.0	8841.0		0.5797		94.7301
Lab 31											0.1900	99.5700
Lab 32	1.0				70.0						0.4310	98.9900
Lab 33	1.3											
Lab 34												99.4100
Lab 35												

ANNEX 5.4.1. Z-SCORE SAMPLE D

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5
Lab 1	-0.8	-0.5	-0.7	-1.0	-1.6	-1.0	-0.3	-0.9	0.0
Lab 2	0.6	-0.3	0.2	-0.2	-0.4	-0.3	0.0	-0.7	0.9
Lab 3	-0.5	2.7		-1.0	-2.5	-0.5	1.0	-0.1	-0.6
Lab 4									
Lab 5	1.2	1.0	-1.6	-0.1	0.5	0.2	0.0	3.5	0.7
Lab 6	-0.1	-0.6	-0.2	0.8	-0.2	0.6	-0.2	-1.1	-0.3
Lab 7	0.1	-0.7	-0.6	1.0	-0.3	0.3	-0.3	-0.1	-0.5
Lab 8									
Lab 9	-1.0	1.3	0.3	-0.4	-0.1	-0.7	-1.0	-0.6	-1.1
Lab 10	1.5		0.7	-0.3	-2.4	1.9	-2.7		
Lab 11	-0.5	0.8	4.3	-0.9	-2.7	-0.7	-0.7	-0.1	0.1
Lab 12	-0.7	-2.0	-0.8	-1.5			-2.4		
Lab 13									
Lab 14	2.4	3.3	7.0	6.4	15.9	0.6	51.4		8.0
Lab 15	-1.2	1.3				-0.3			-0.6
Lab 16	-0.5	0.2	0.0	-0.3	0.0	0.4	-0.2		-0.1
Lab 17	-0.7	-0.7	-0.5	-0.8	0.5	-0.7	-0.3	-0.8	-0.5
Lab 18	0.1	-0.7	0.1	0.1	1.2	0.7	-0.2		-0.6
Lab 19									
Lab 20	0.7	0.8	3.2	2.7		-1.6		5.0	3.4
Lab 21	0.1	-0.6	0.3	-1.0	-0.9	-0.9	1.3	-0.7	0.1
Lab 22									
Lab 23	1.2	-0.2	-0.9	-0.6	0.5	-1.0			-6.9
Lab 24	0.2	-0.6	-0.1	-0.4	-0.4	0.3	-0.4	-0.7	-0.8
Lab 25	-0.4	-3.5		0.1		0.1			
Lab 26	2.6	-1.2		10.6	14.0	2.6	0.5	0.1	
Lab 27		-0.7	0.1		-0.9	0.2	-1.1	-0.6	
Lab 28	-2.4	-0.4	-1.4	1.5		-0.2			11.2
Lab 29									
Lab 30		4.6			104.7	0.2			
Lab 31	-6.3	28.2		11.3	18.0	4.4	14.6	49.1	
Lab 32	-0.2	2.8	5.3	0.8	0.5	-2.8	0.6	3.5	0.0
Lab 33	0.5	0.1		-0.6	0.2	0.7	0.5	0.5	
Lab 34	0.5	-0.5	-0.7	-0.1	0.0	-5.8	0.3	-0.1	-0.6
Lab 35	0.0					142.5			663.3

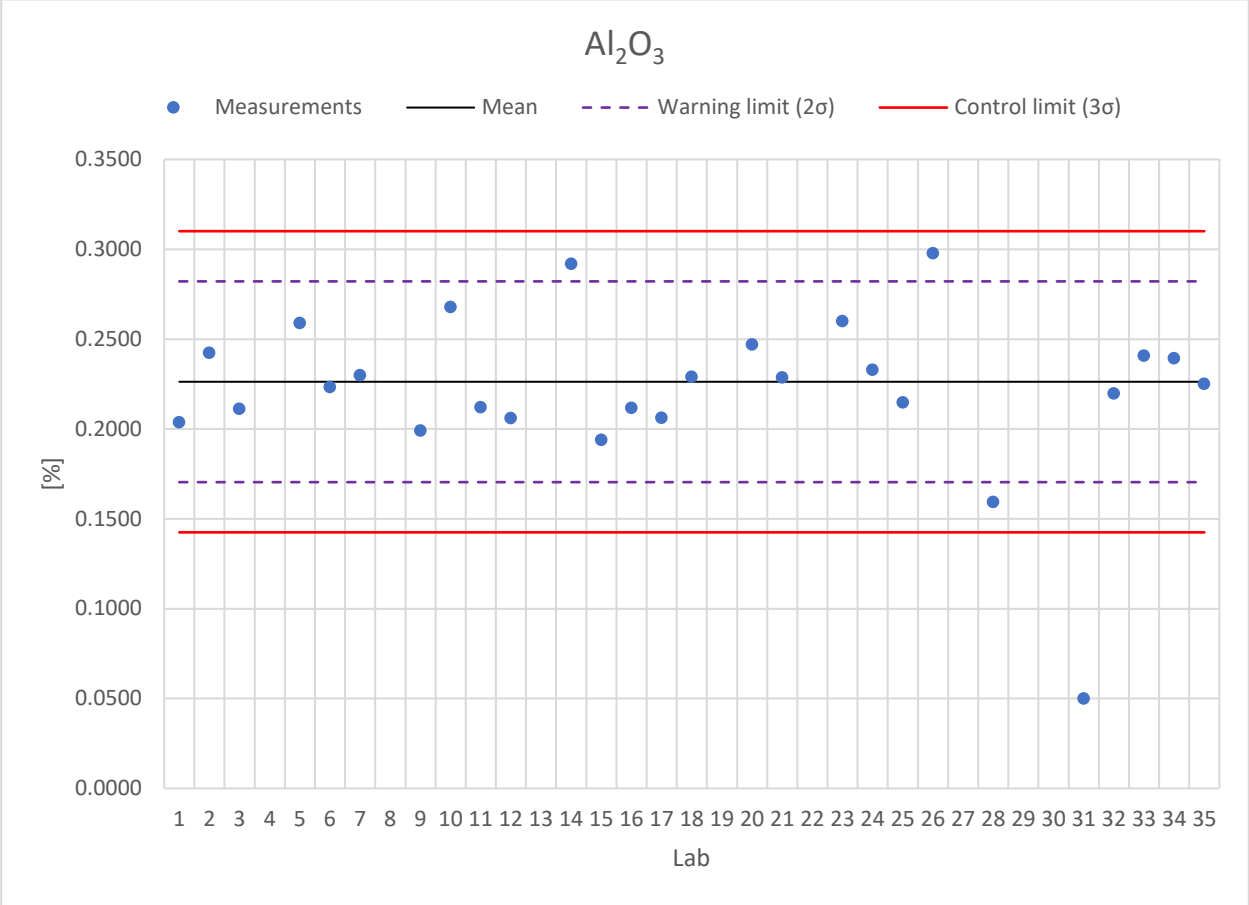
Satisfactory performance
Questionable performance
Unsatisfactory performance

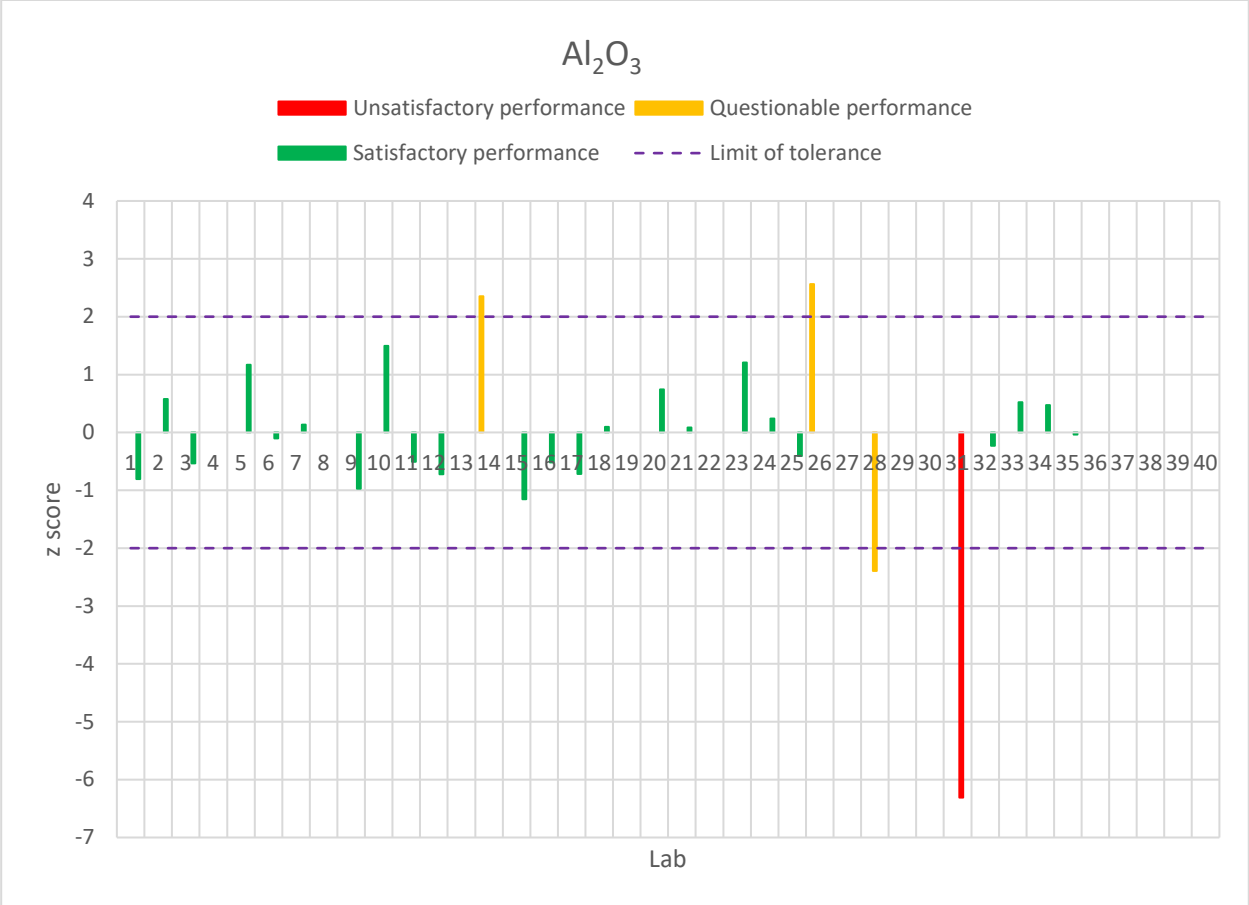
ANNEX 5.4.2. Z'-SCORE SAMPLE D

	PbO	CuO	CoO	Cr_2O_3	BaO	ZrO_2	SiO_2
Lab 1	-0.7	-0.6	-0.8	-1.2	-0.8	3.6	1.1
Lab 2		-0.8		-0.2			
Lab 3					4.5		
Lab 4							
Lab 5					0.5		0.6
Lab 6				-0.7			
Lab 7				-0.8			0.8
Lab 8							
Lab 9					8.4	1.0	0.8
Lab 10							
Lab 11					8.8	0.5	0.8
Lab 12							
Lab 13							
Lab 14							-2.3
Lab 15							0.1
Lab 16							
Lab 17	-0.6	-0.8	-0.7	-0.3	-0.6	-0.8	
Lab 18							
Lab 19							
Lab 20	2.3	17.1		32.7			0.3
Lab 21	0.0	0.9	2.9	-0.1	-0.6	-0.7	-112.8
Lab 22							
Lab 23							
Lab 24		-0.6		0.0	-0.6	-0.8	
Lab 25	3.5						-0.4
Lab 26	-0.5	-0.4	-0.6	1.0	-0.7	-0.8	
Lab 27	-0.3		-0.4	-0.7	-0.7		
Lab 28	-0.2						0.7
Lab 29							
Lab 30	83.5			123.8	2639.8	76.2	-17.4
Lab 31							0.3
Lab 32	2.3	29.2	6.9	-0.7	1.9	-0.4	-1.8
Lab 33	-0.1	1.0	1.8	5.8	-0.4		
Lab 34	-0.3				-0.7		-0.3
Lab 35							

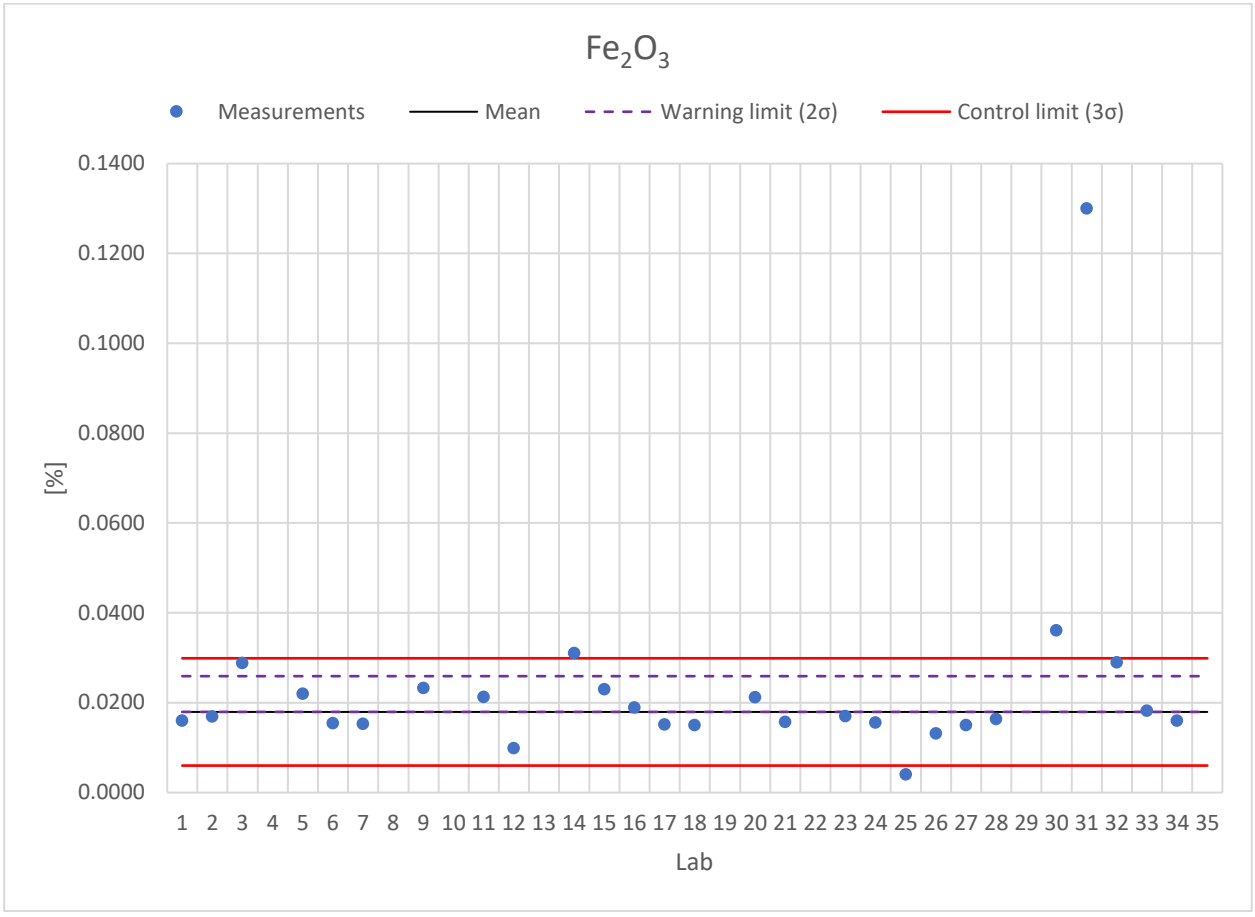
Satisfactory performance
Questionable performance
Unsatisfactory performance

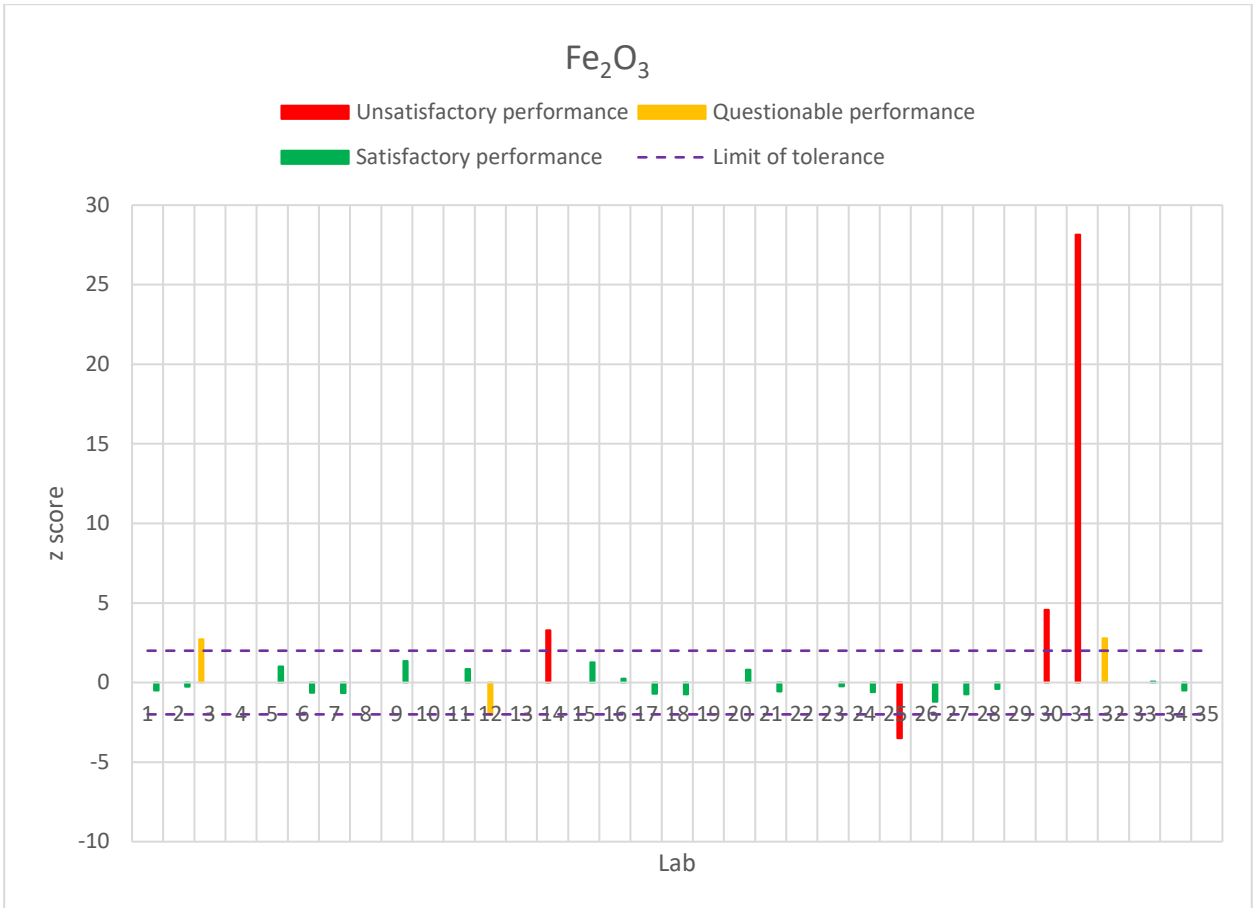
ANNEX 5.4.3. CHARTS SAMPLE D



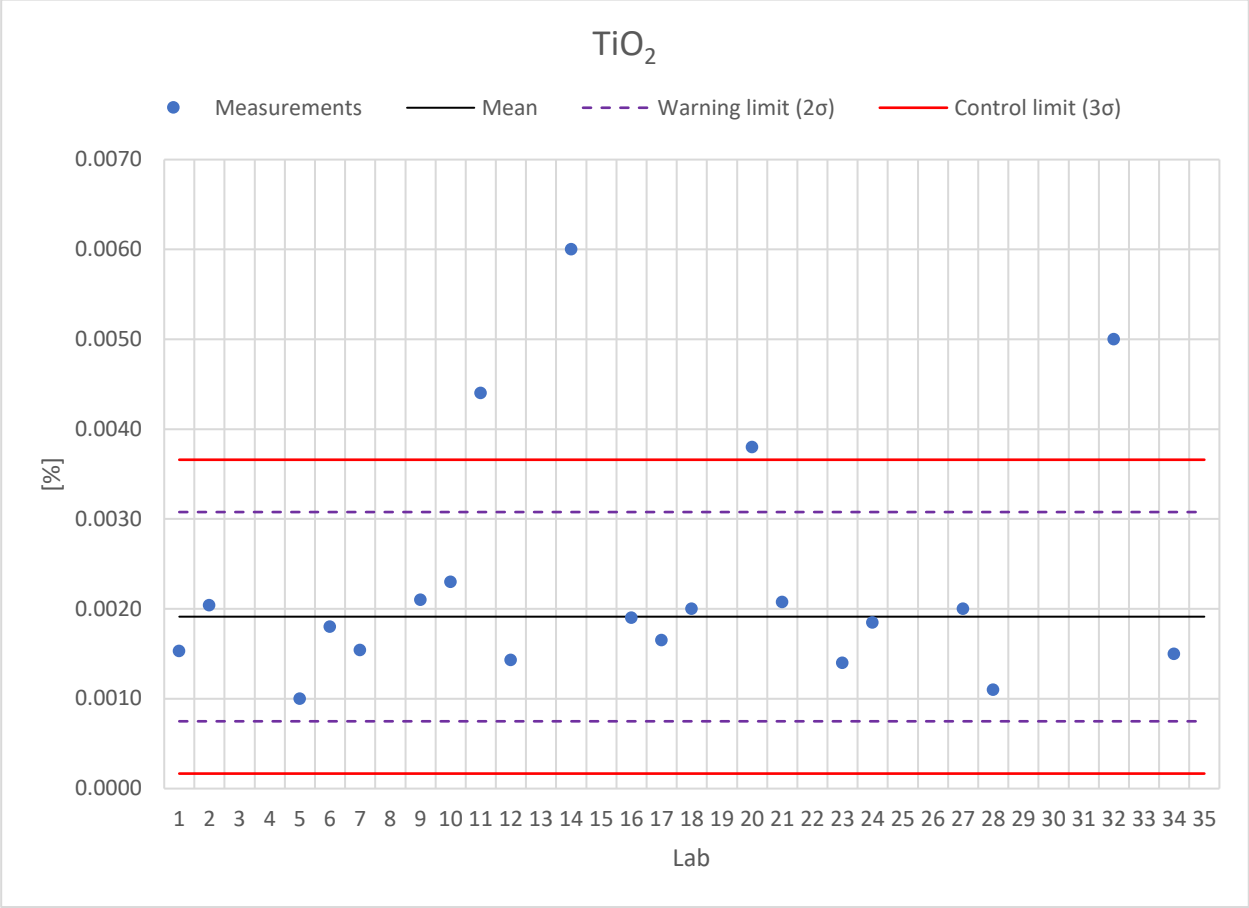


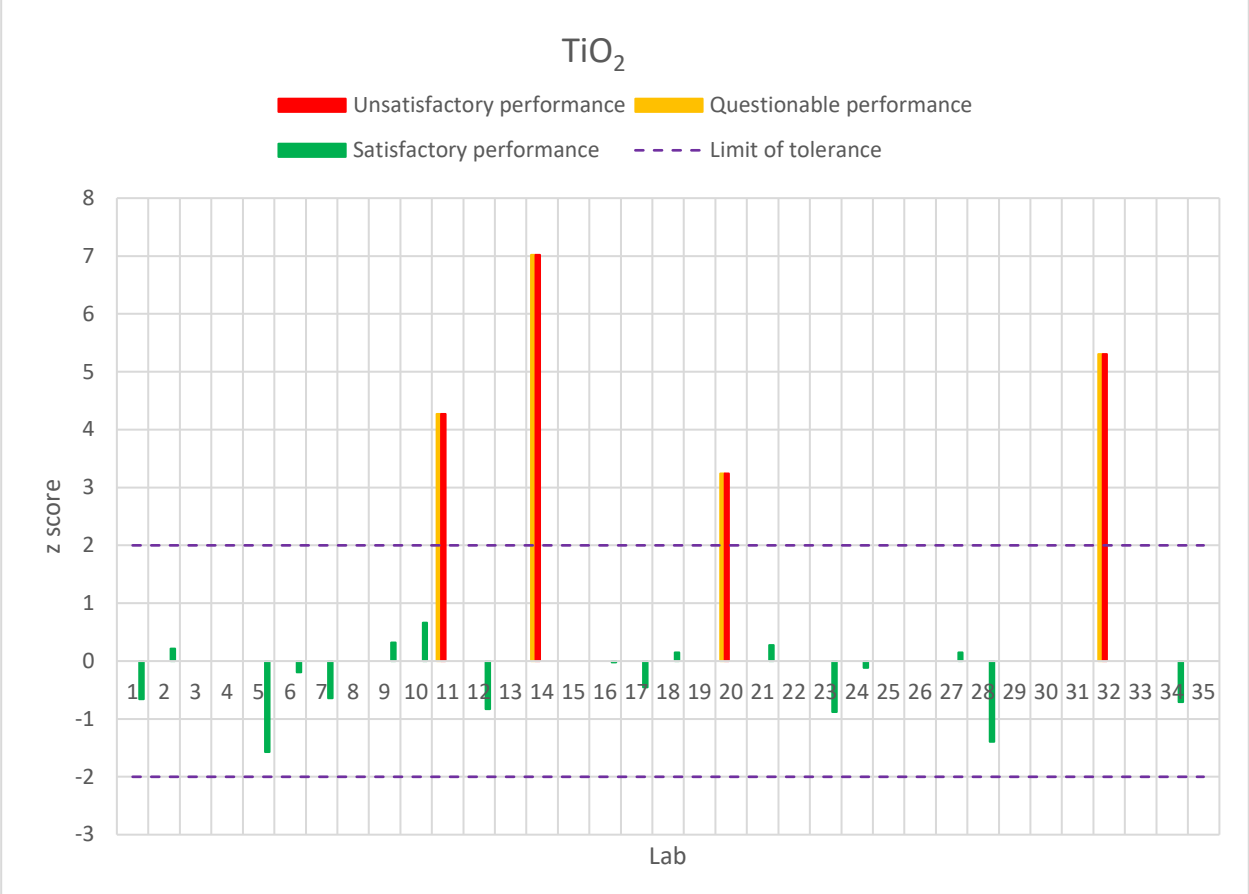
CHARTS SAMPLE D



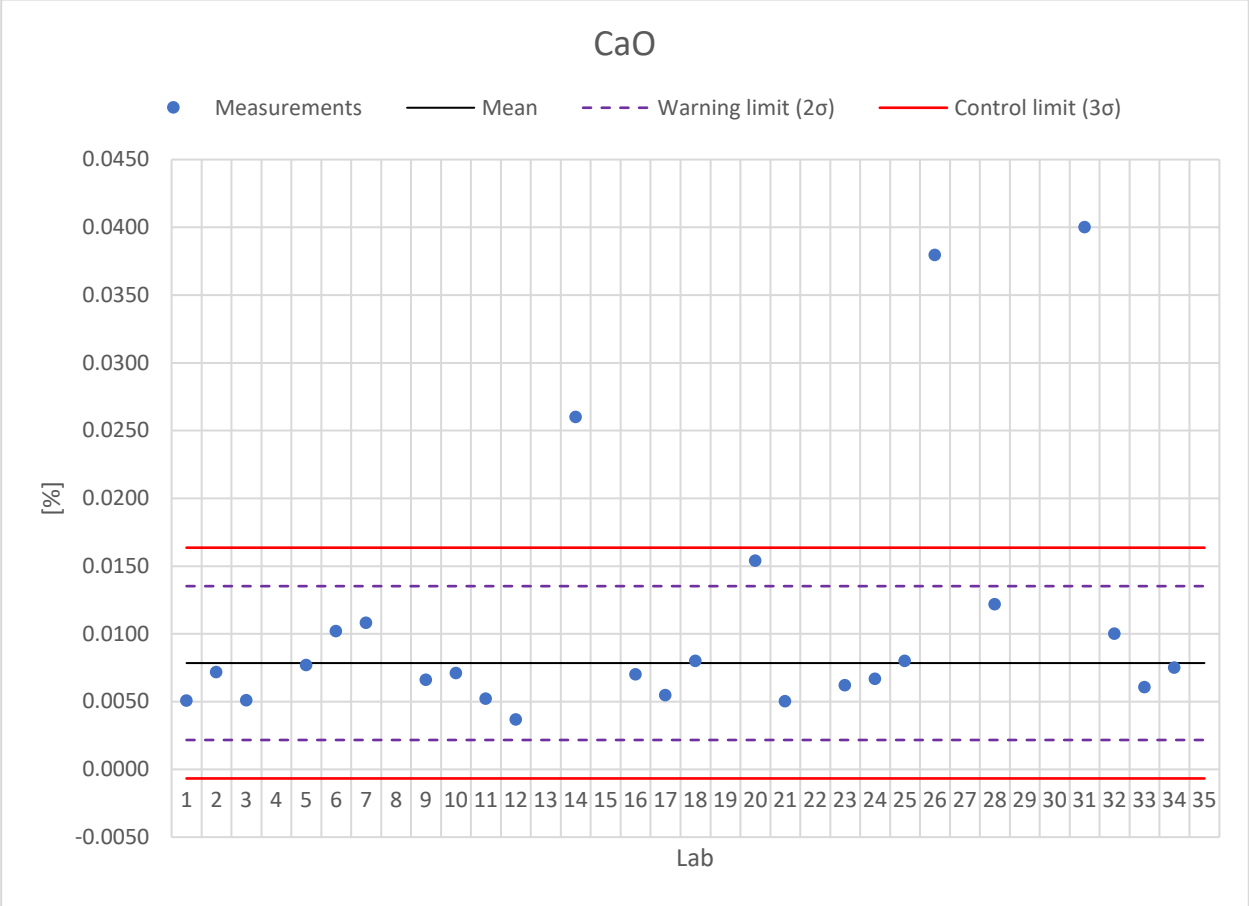


CHARTS SAMPLE D

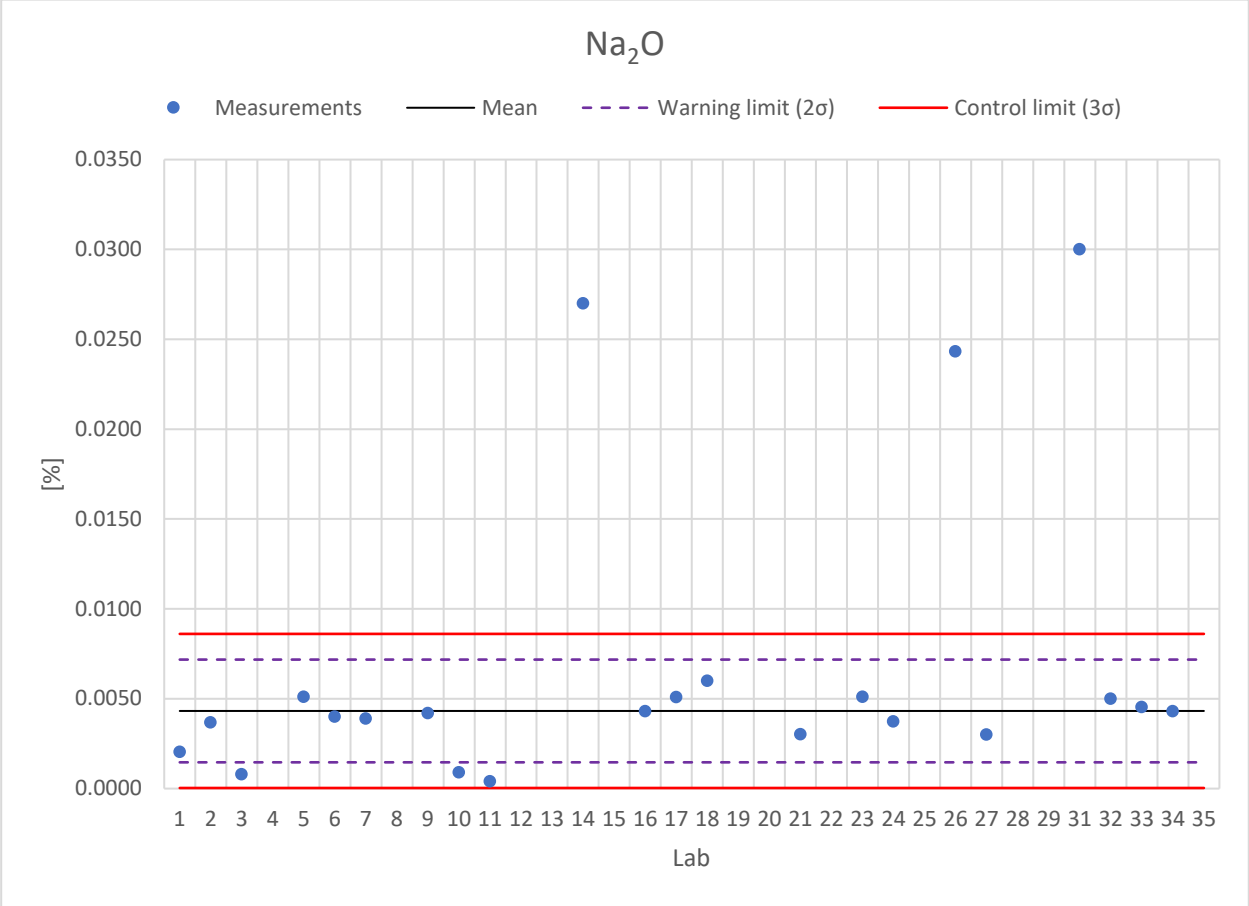


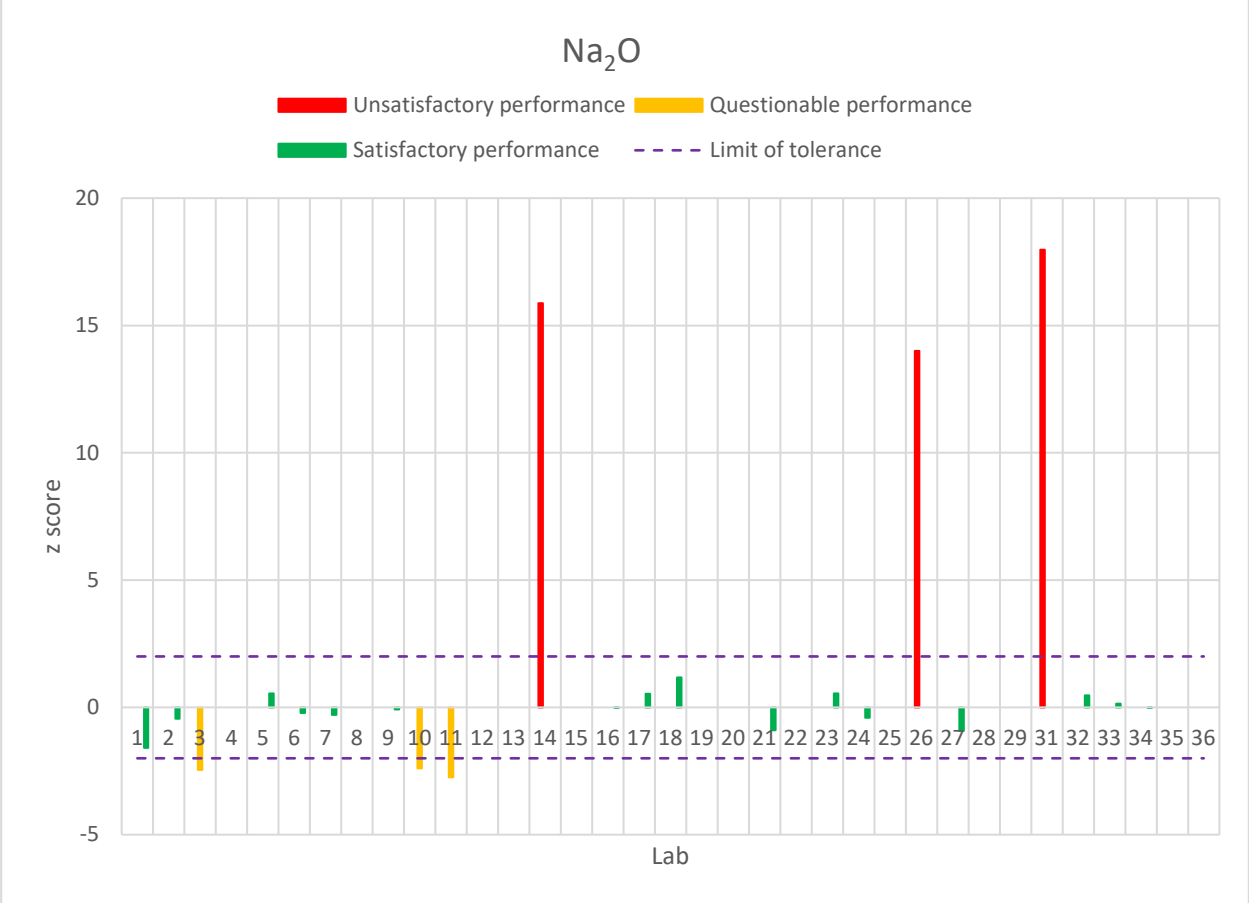


CHARTS SAMPLE D

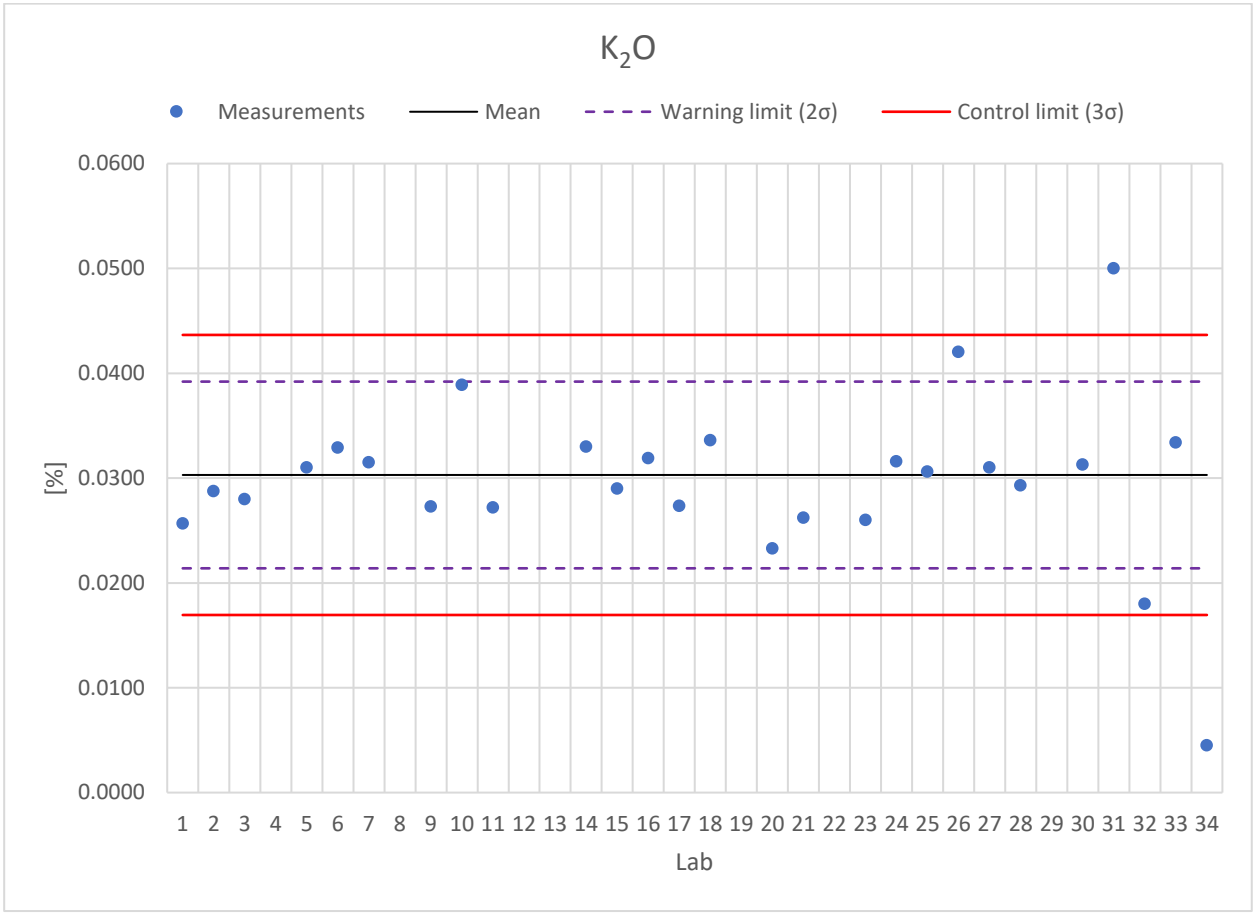


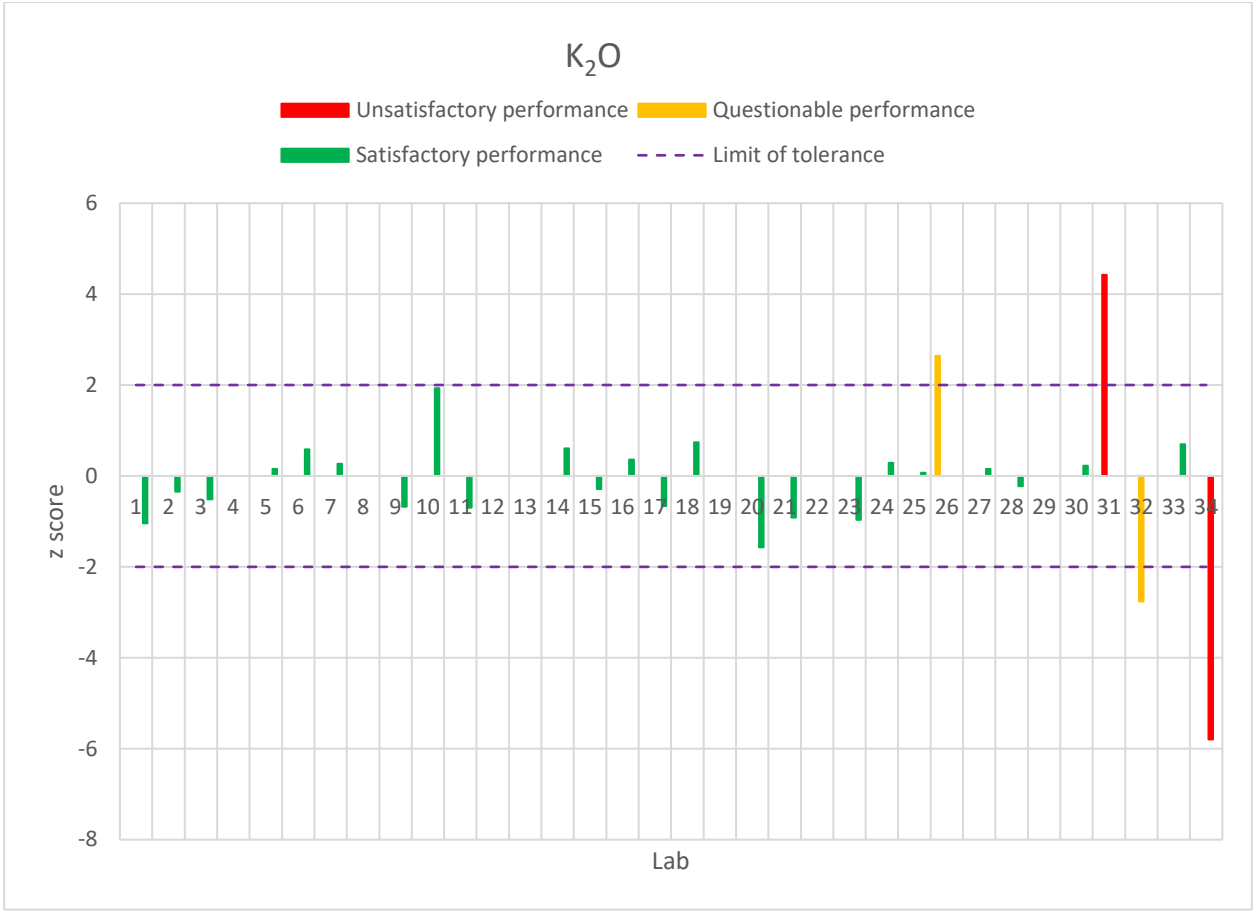
CHARTS SAMPLE D



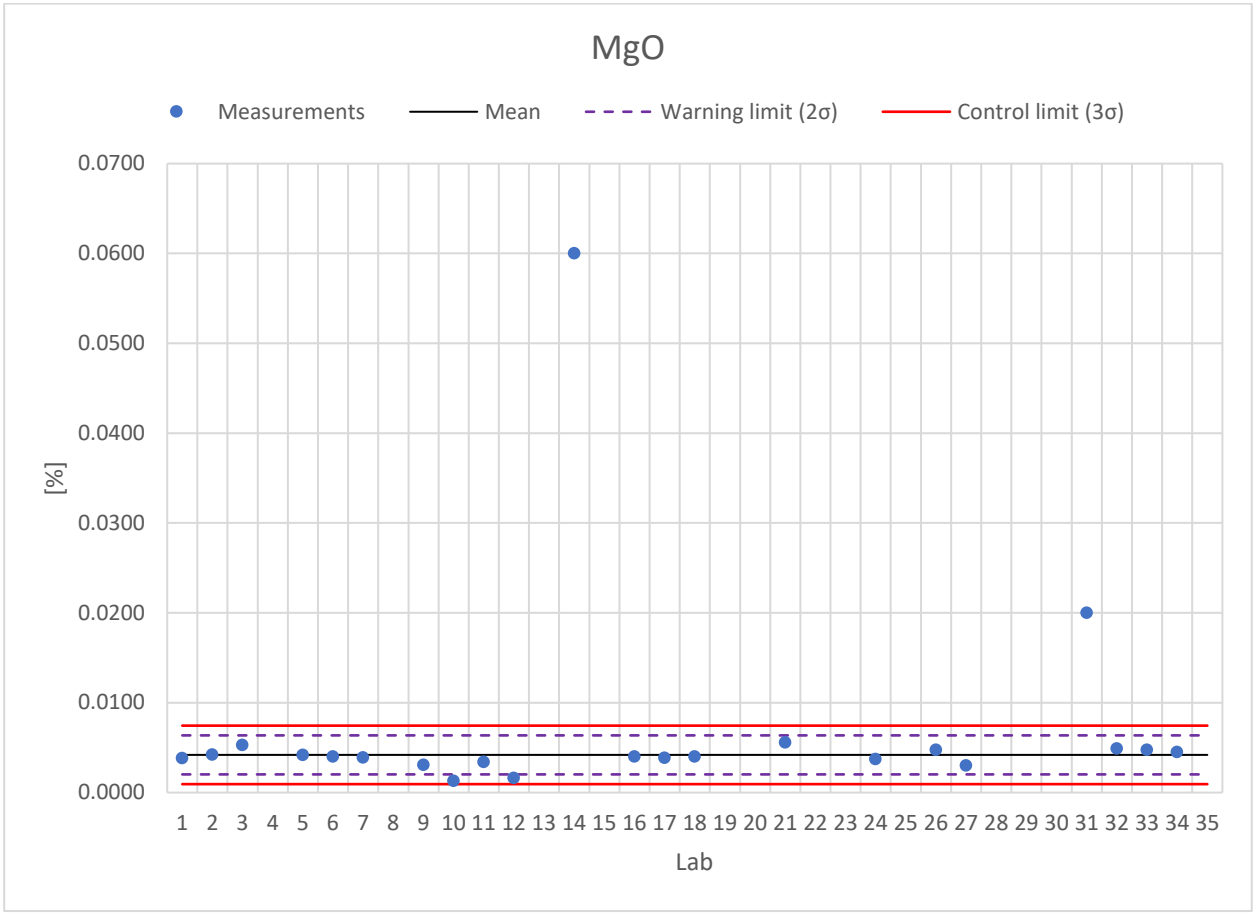


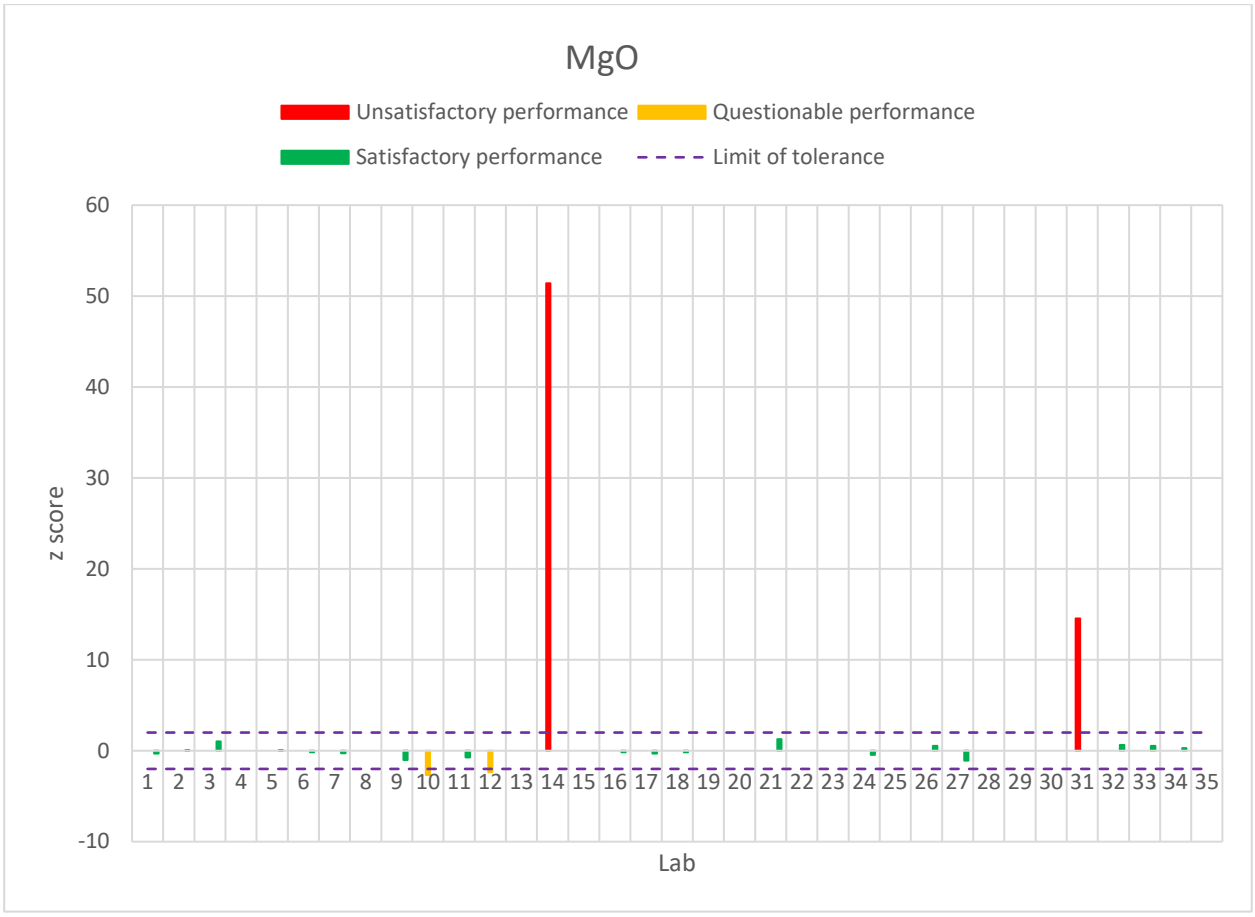
CHARTS SAMPLE D



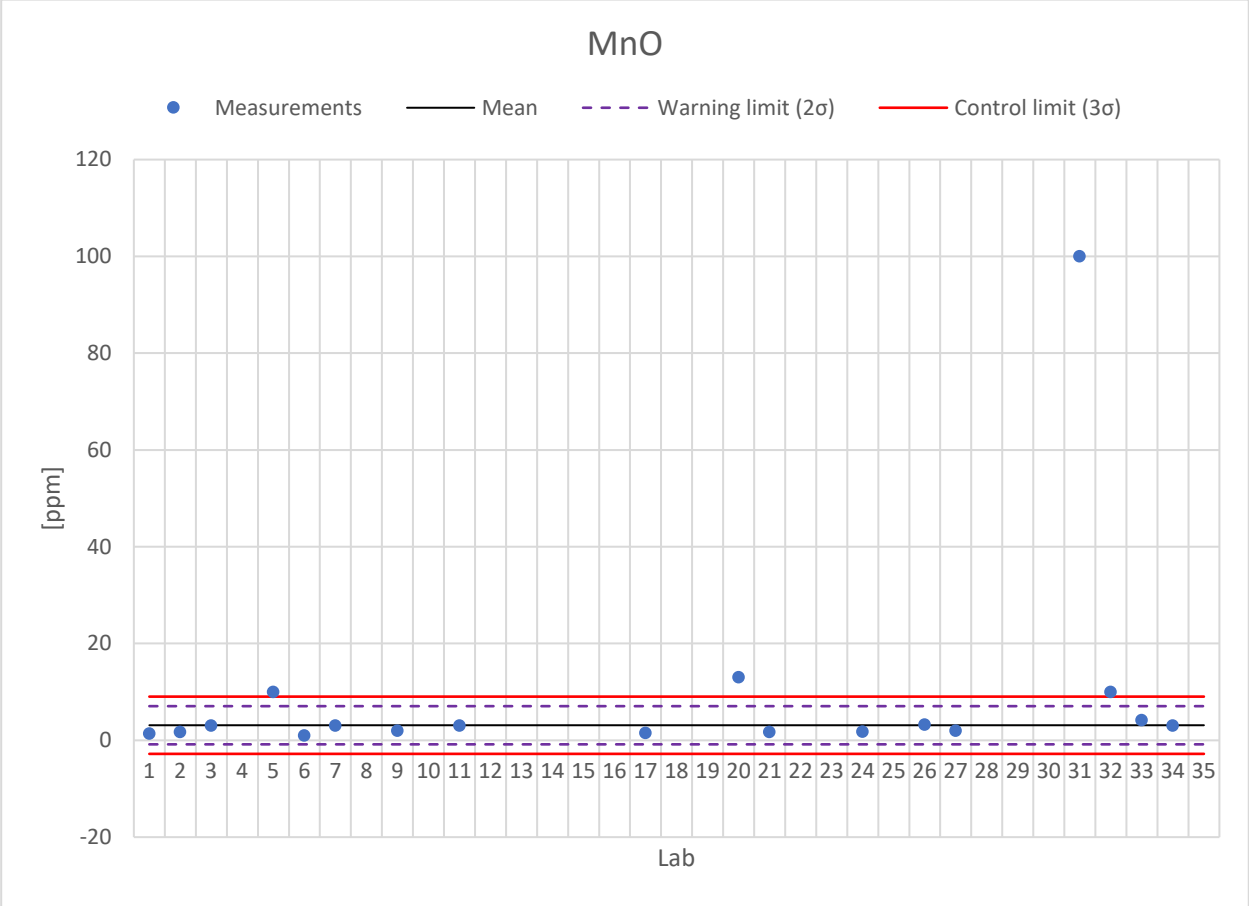


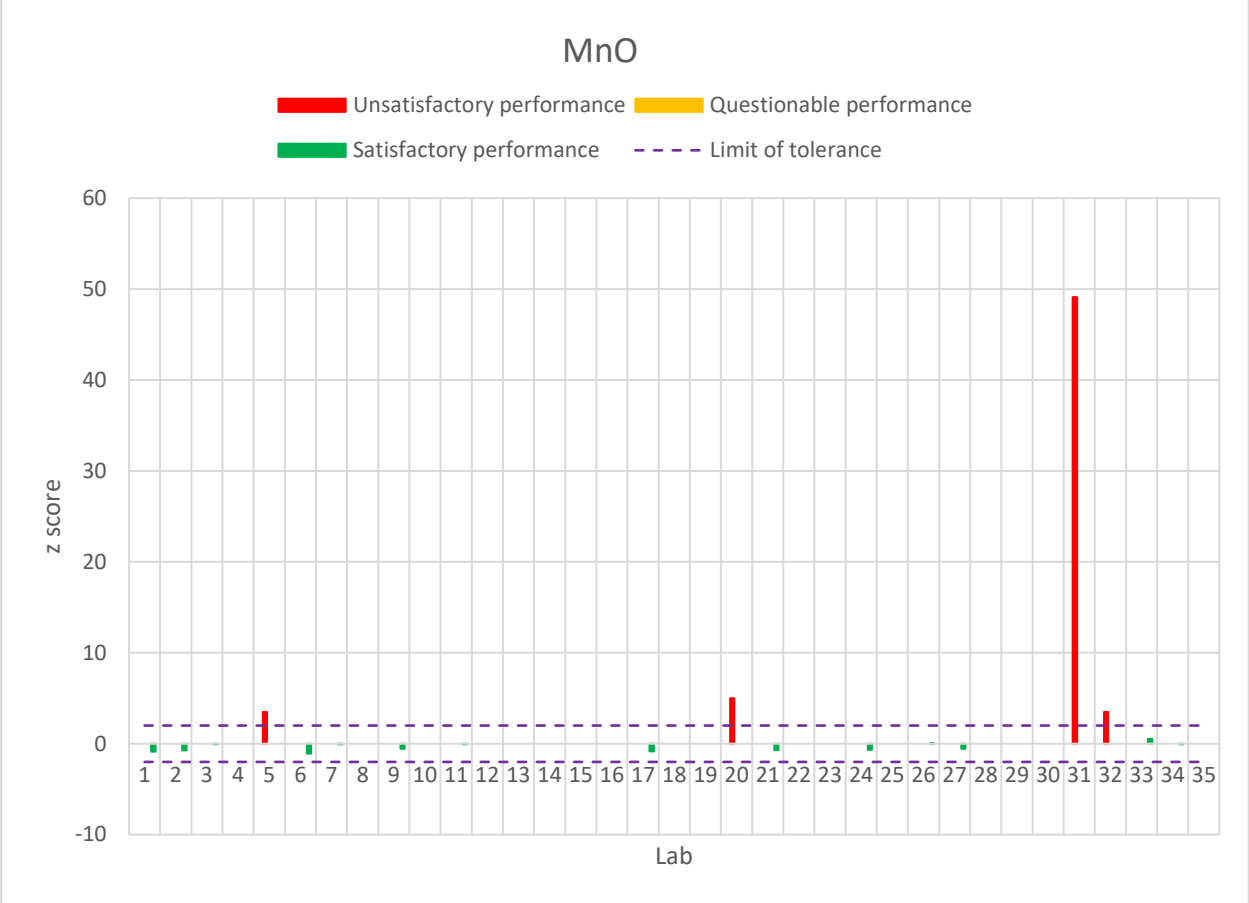
CHARTS SAMPLE D



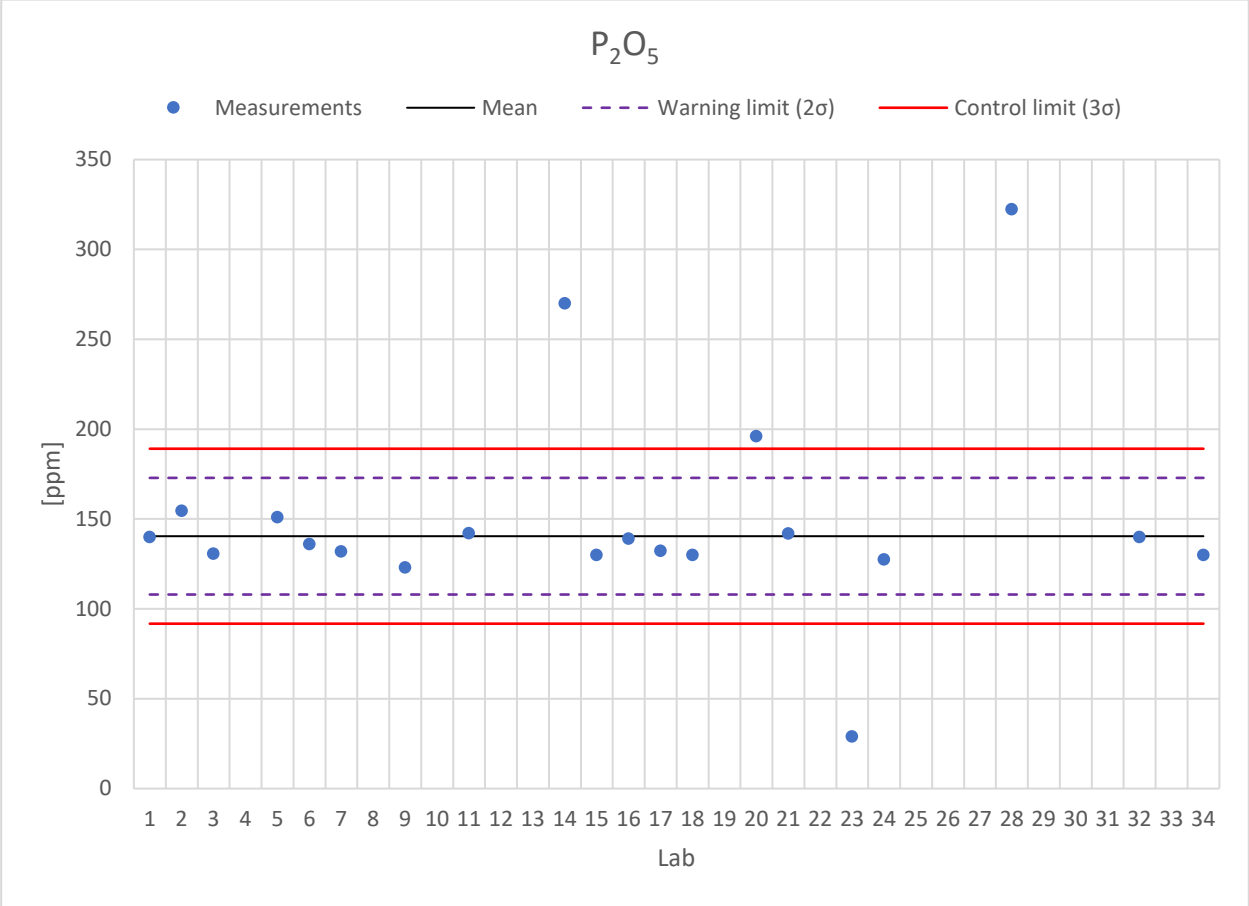


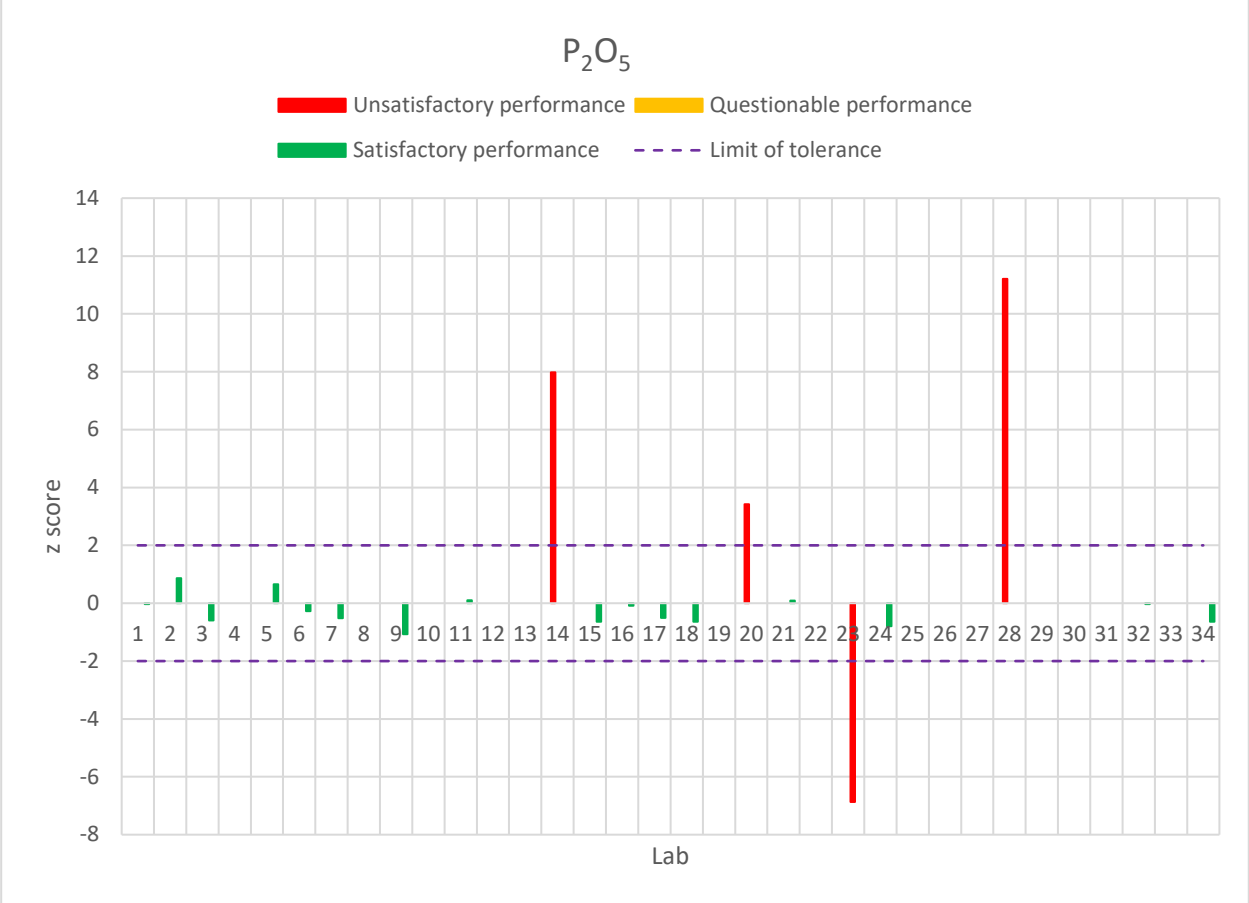
CHARTS SAMPLE D



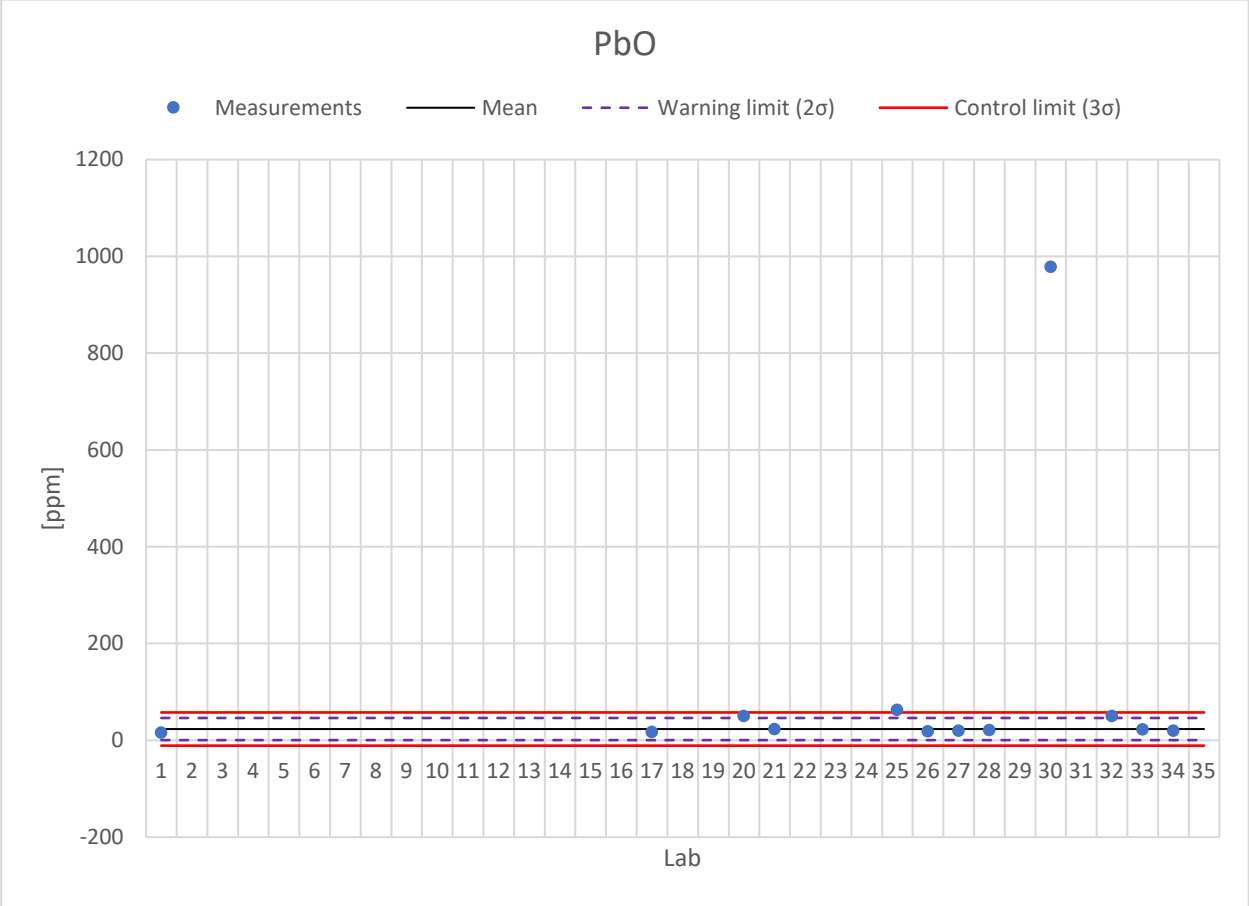


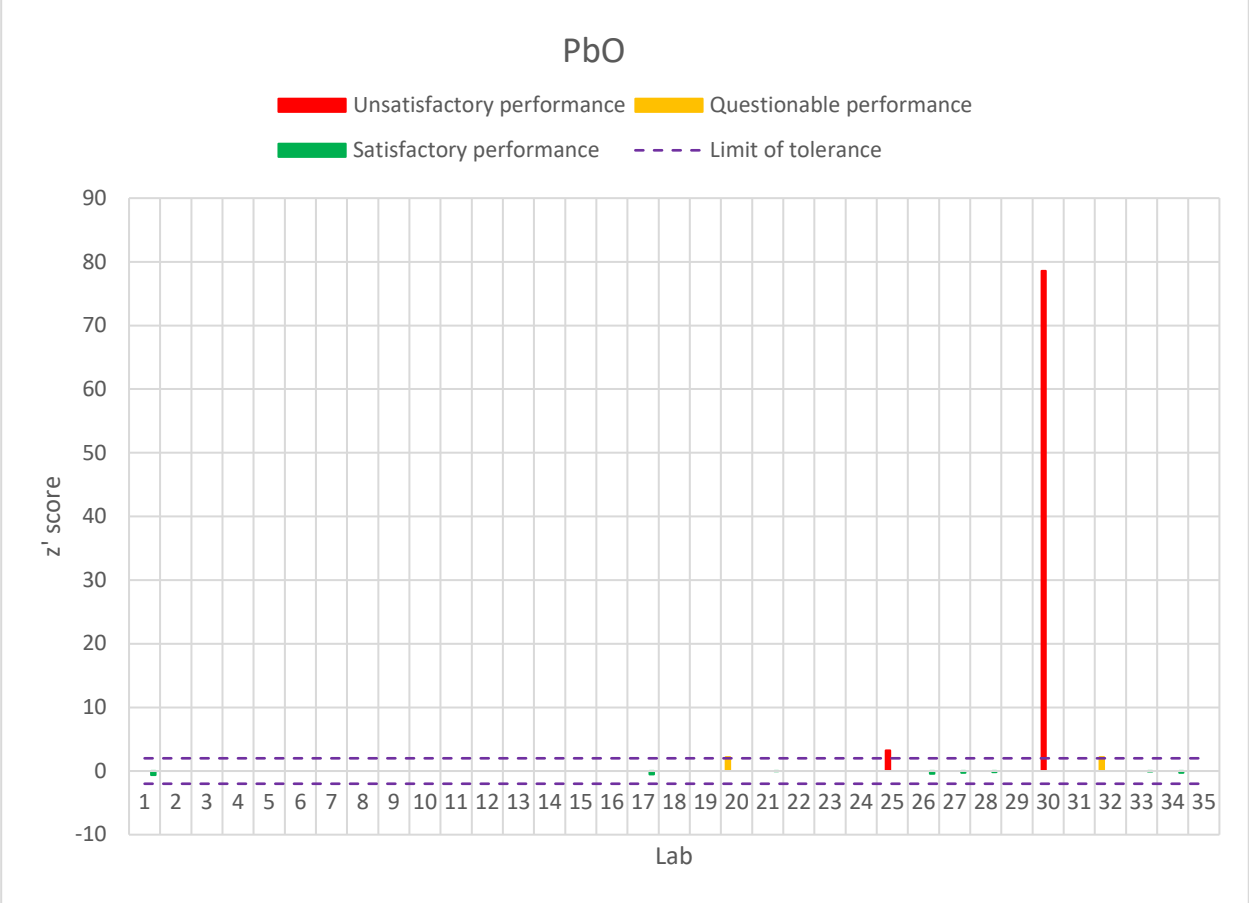
CHARTS SAMPLE D



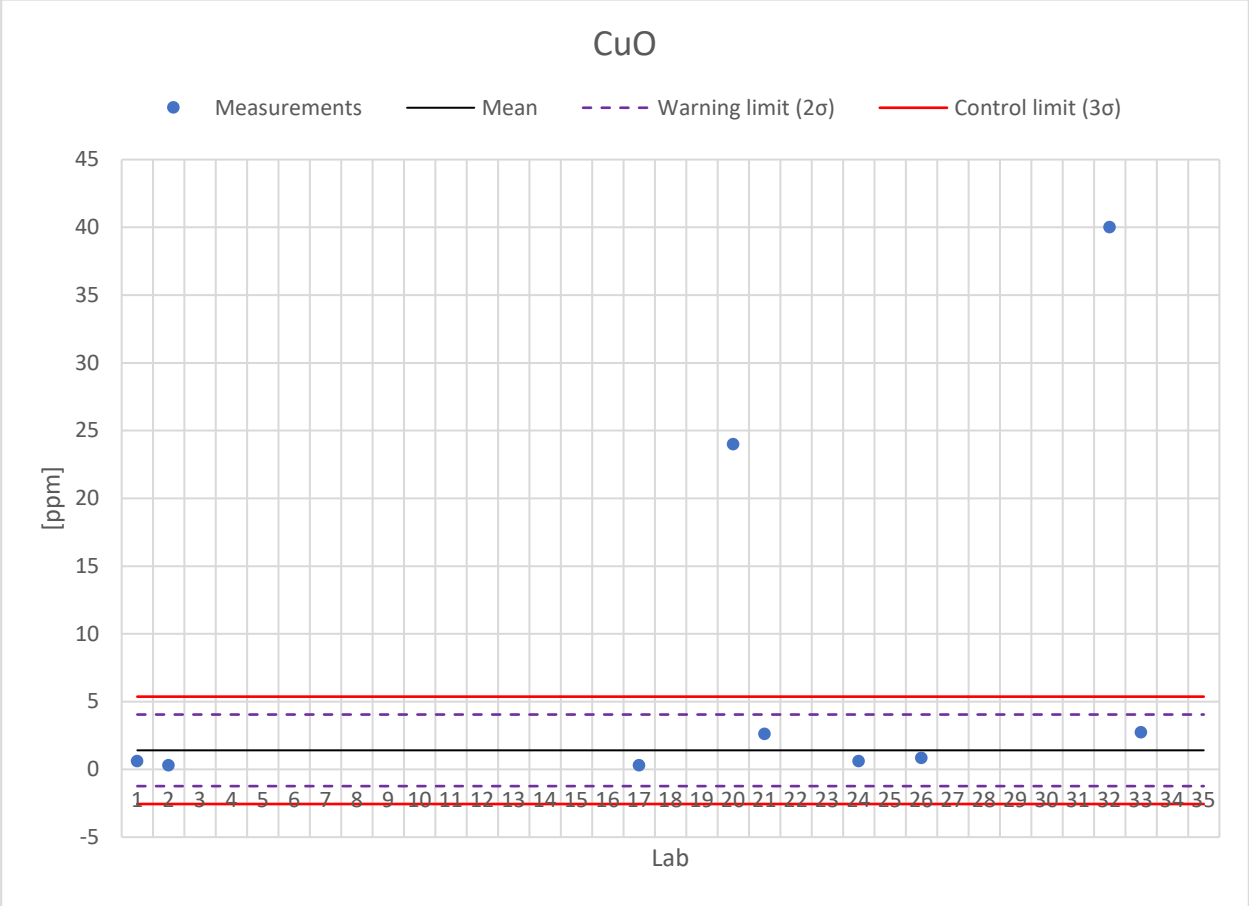


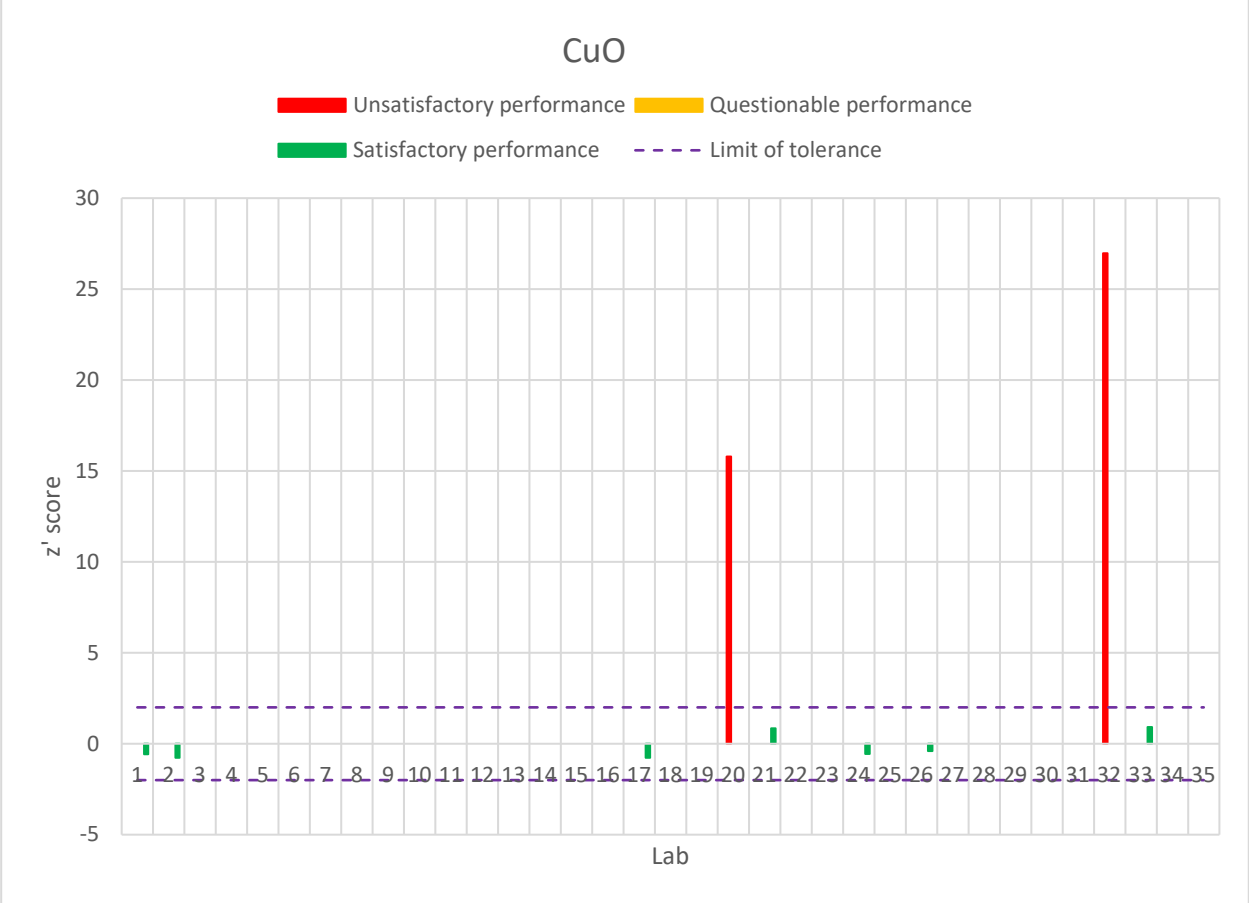
CHARTS SAMPLE D



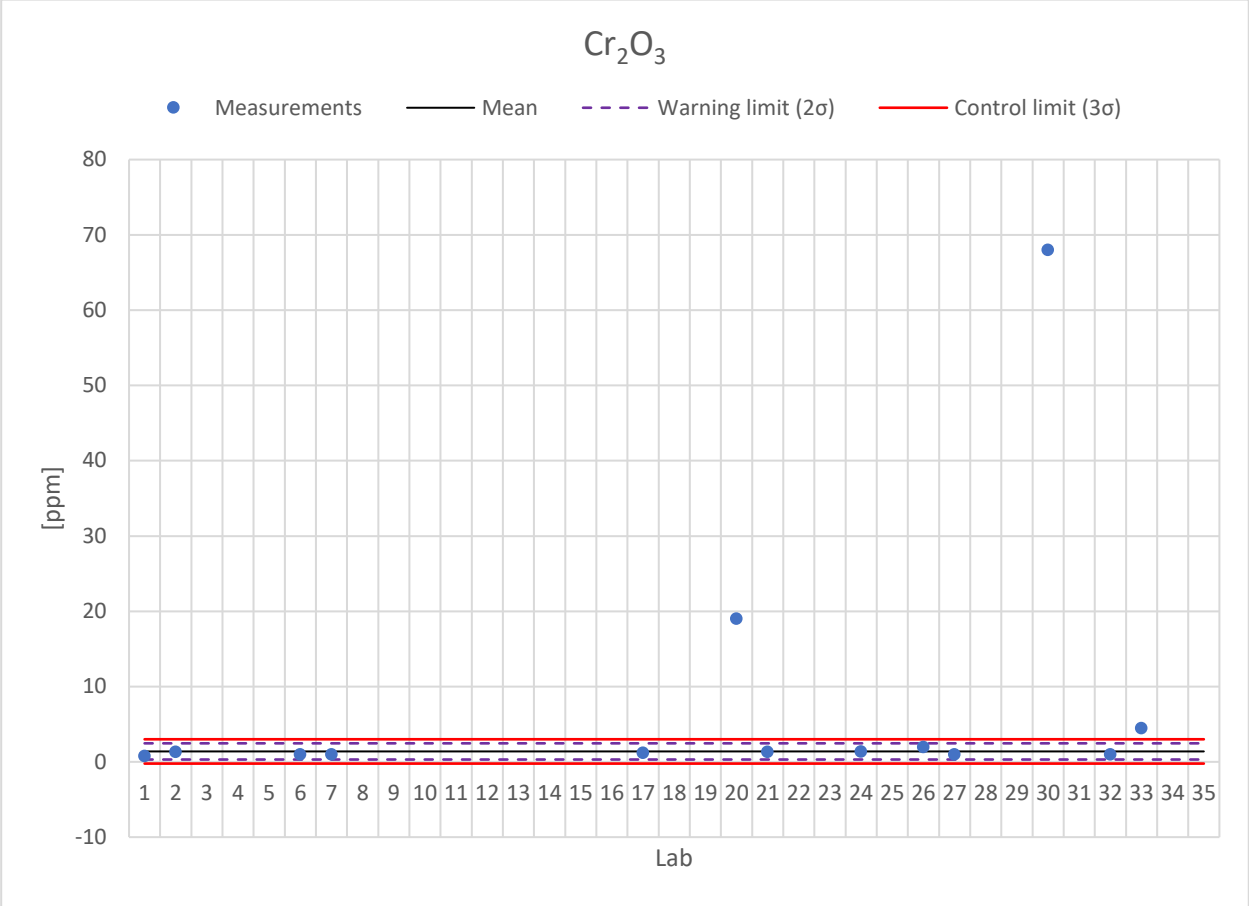


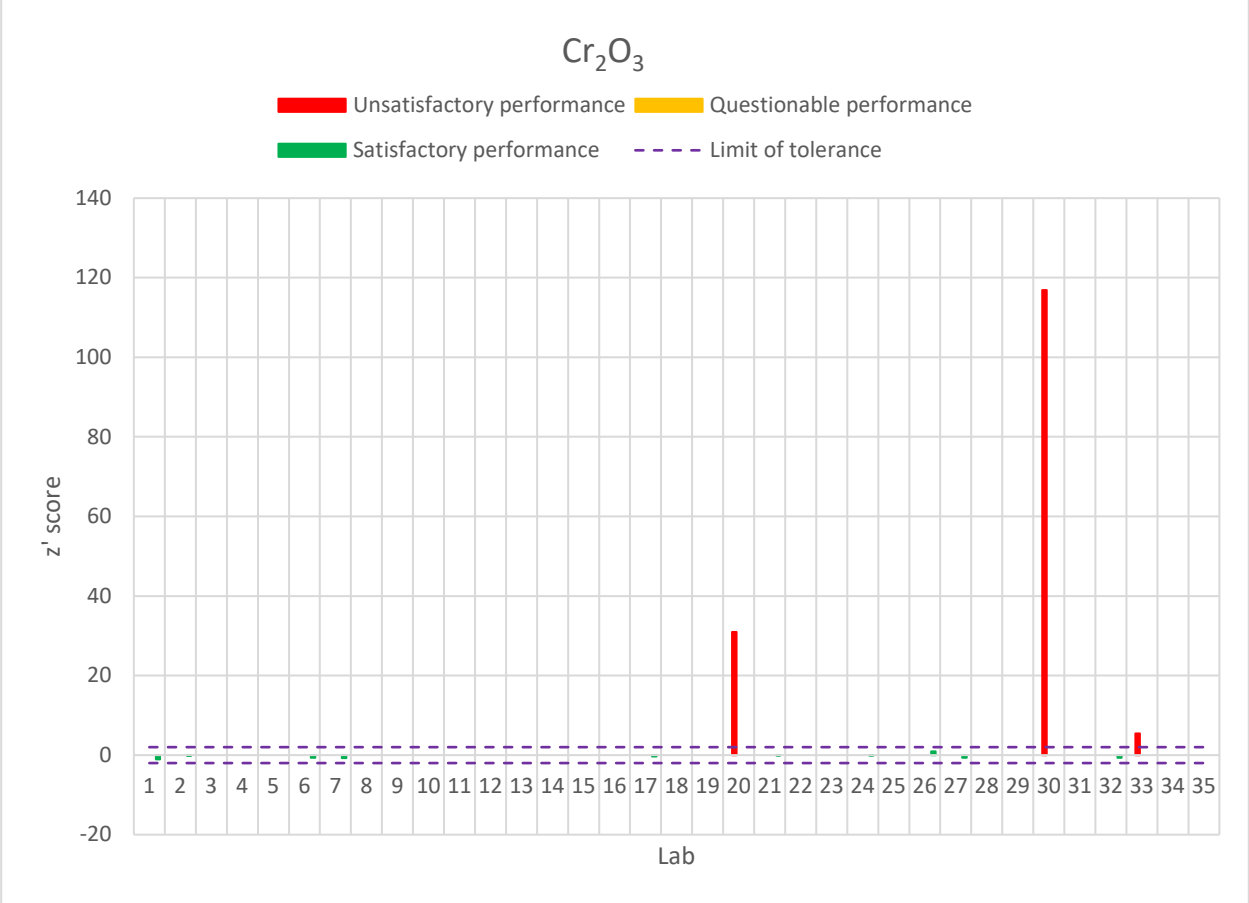
CHARTS SAMPLE D



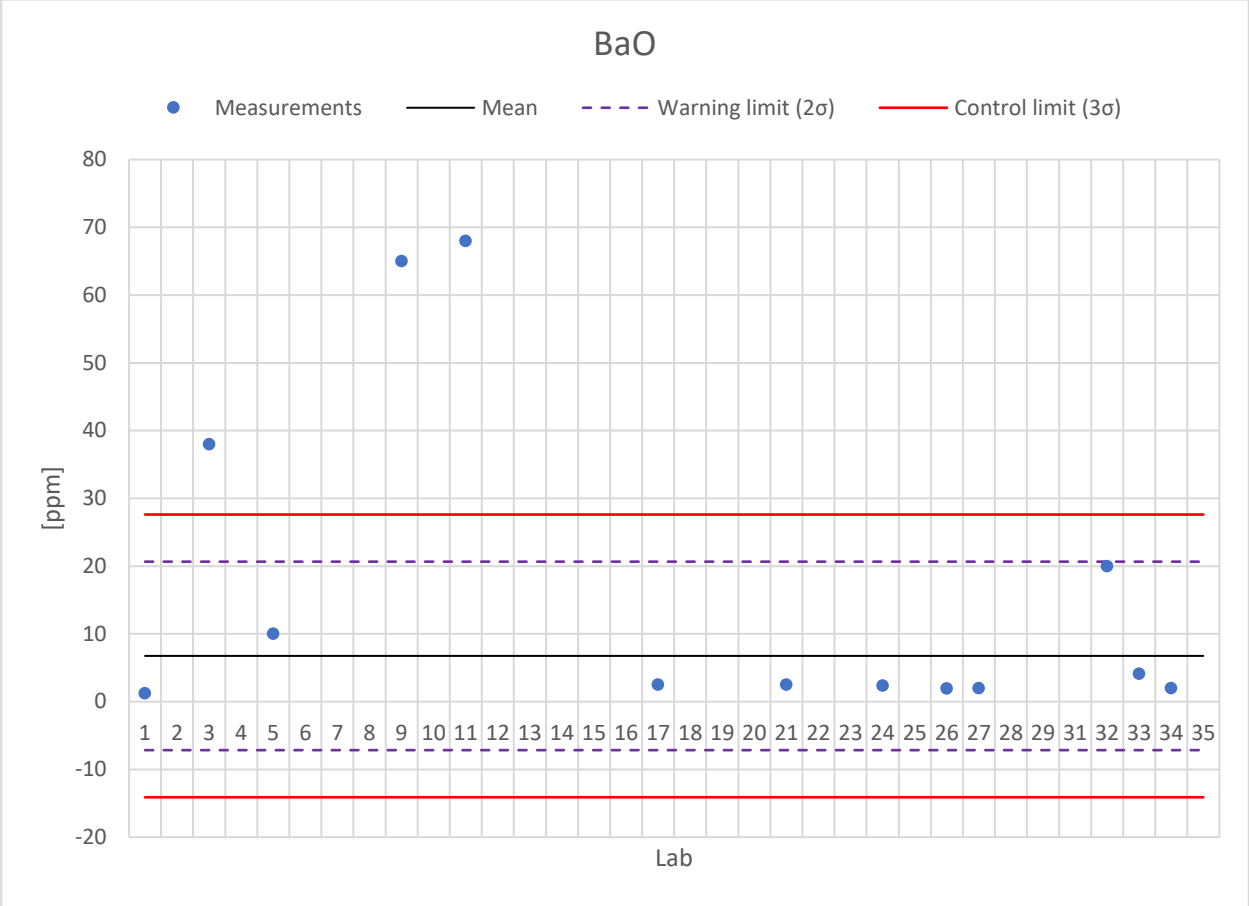


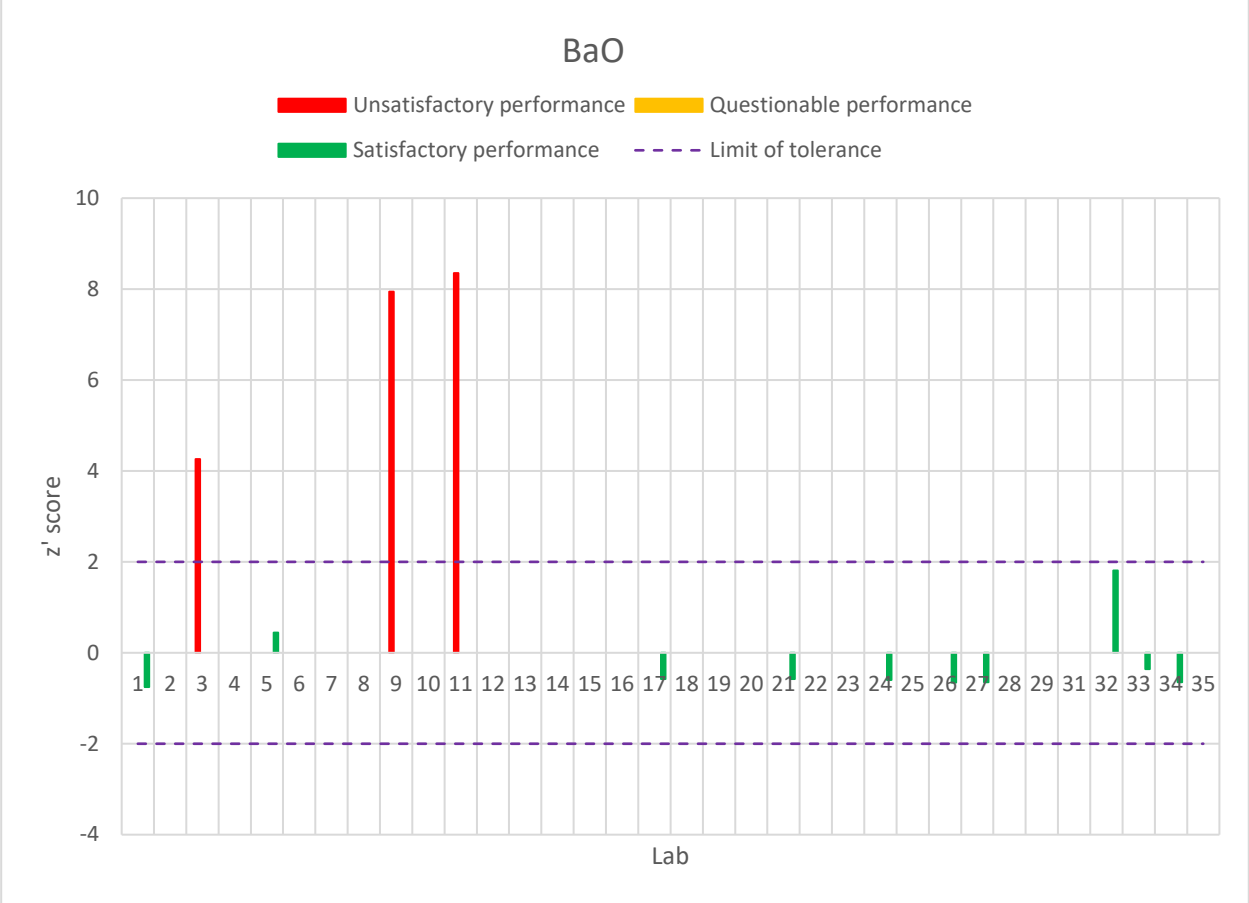
CHARTS SAMPLE D



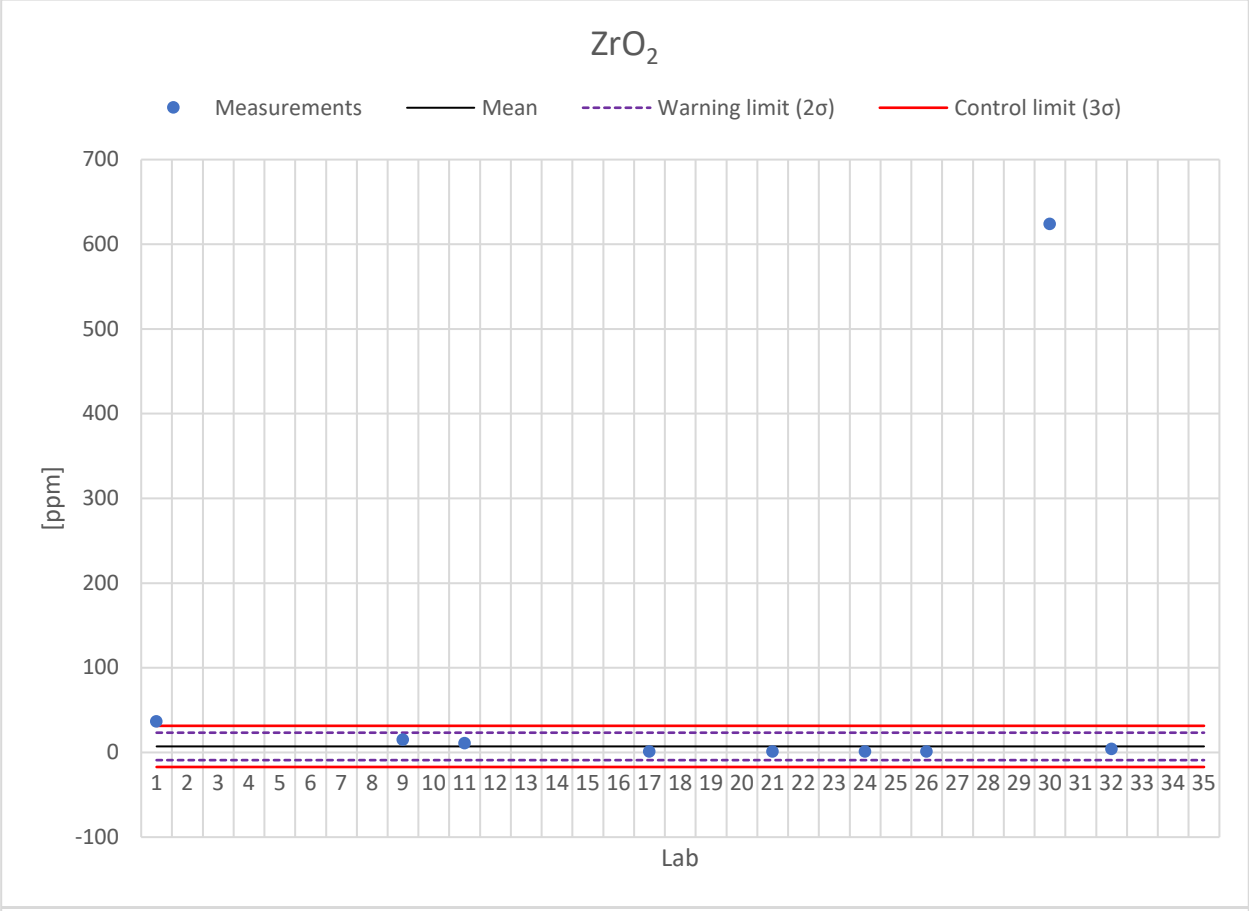


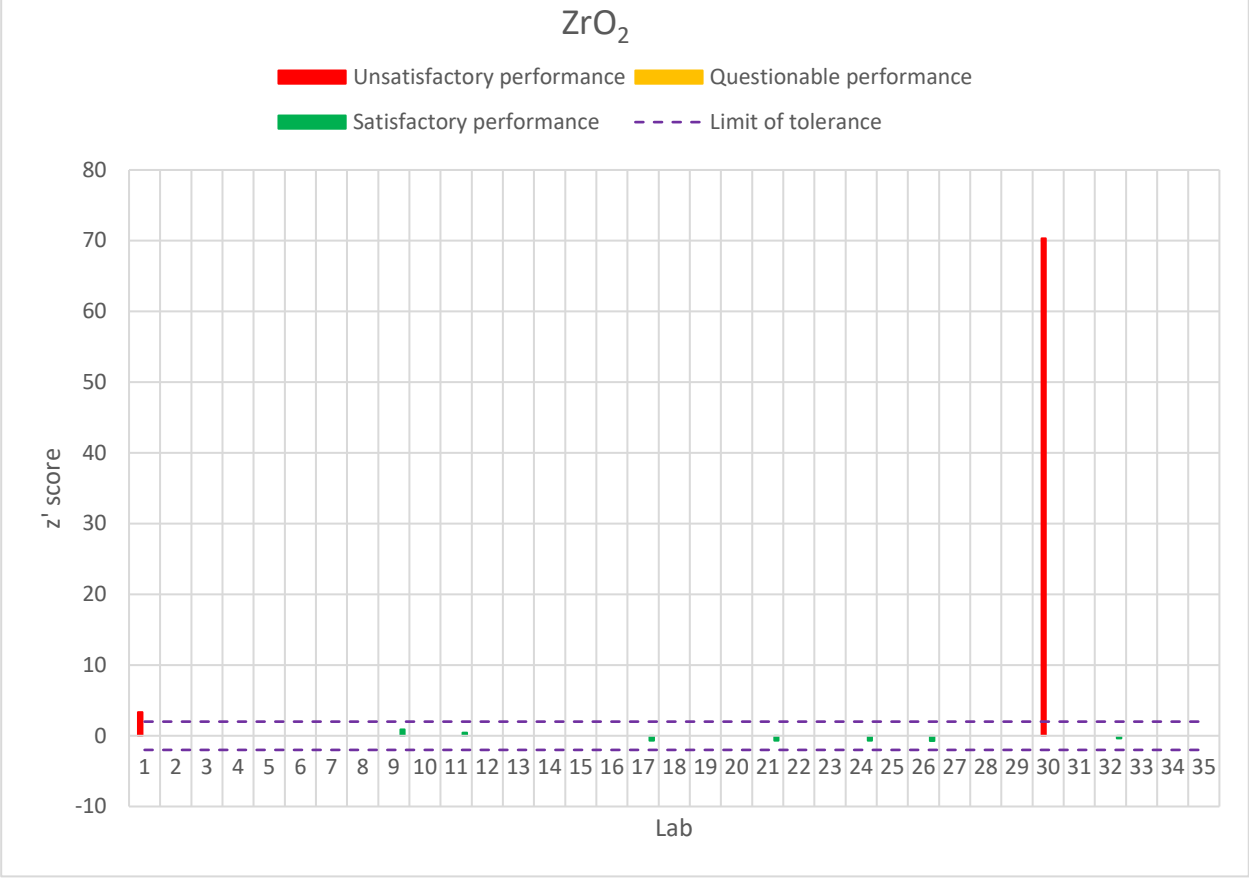
CHARTS SAMPLE D



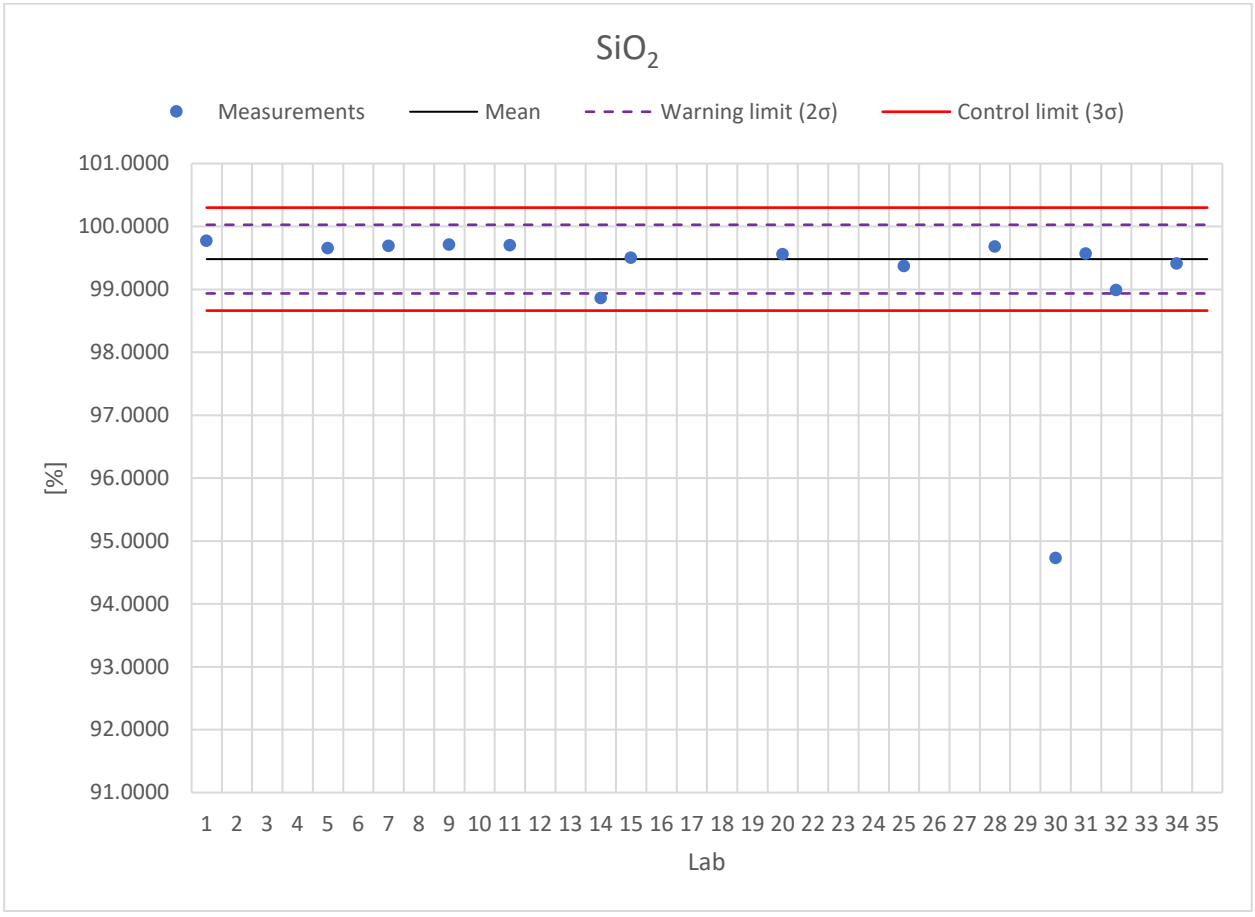


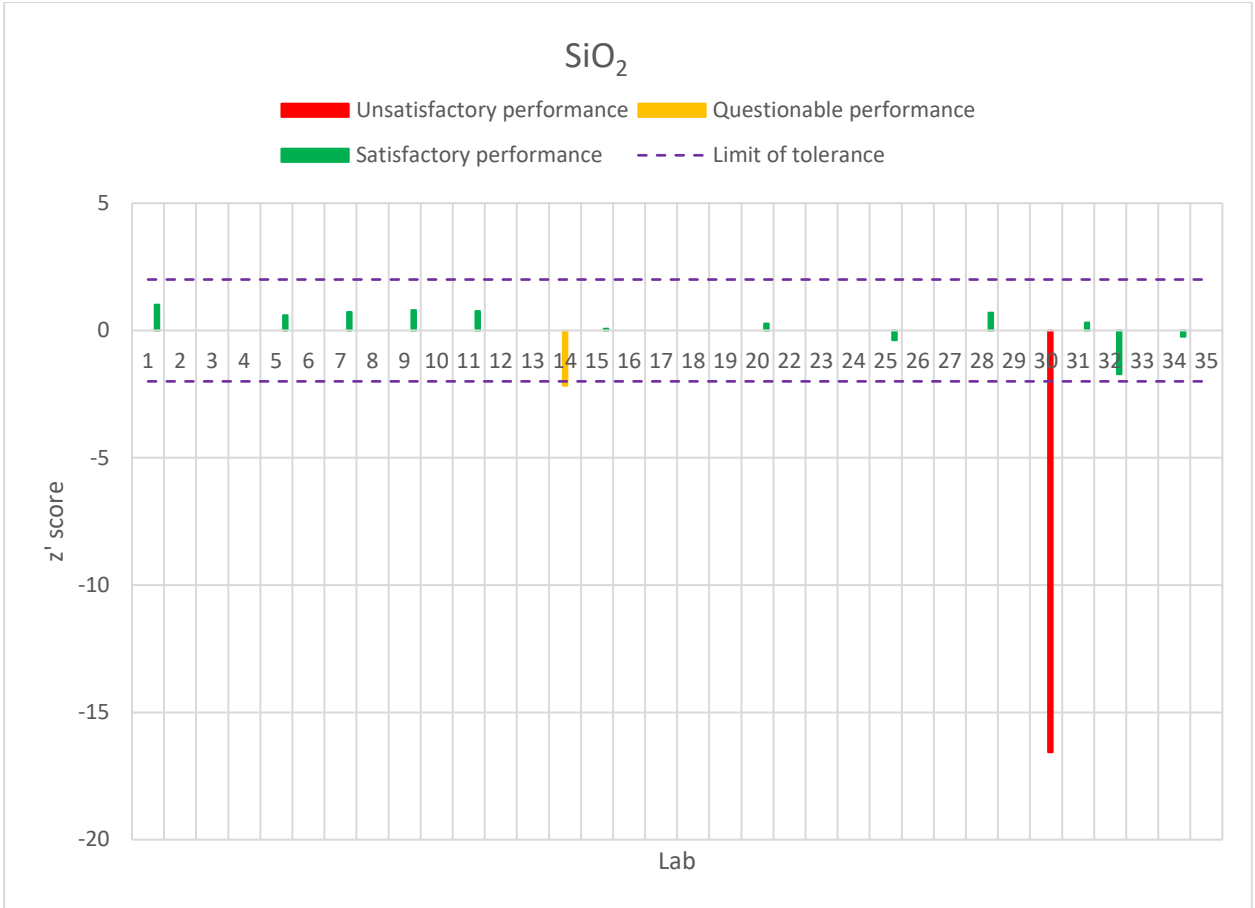
CHARTS SAMPLE D



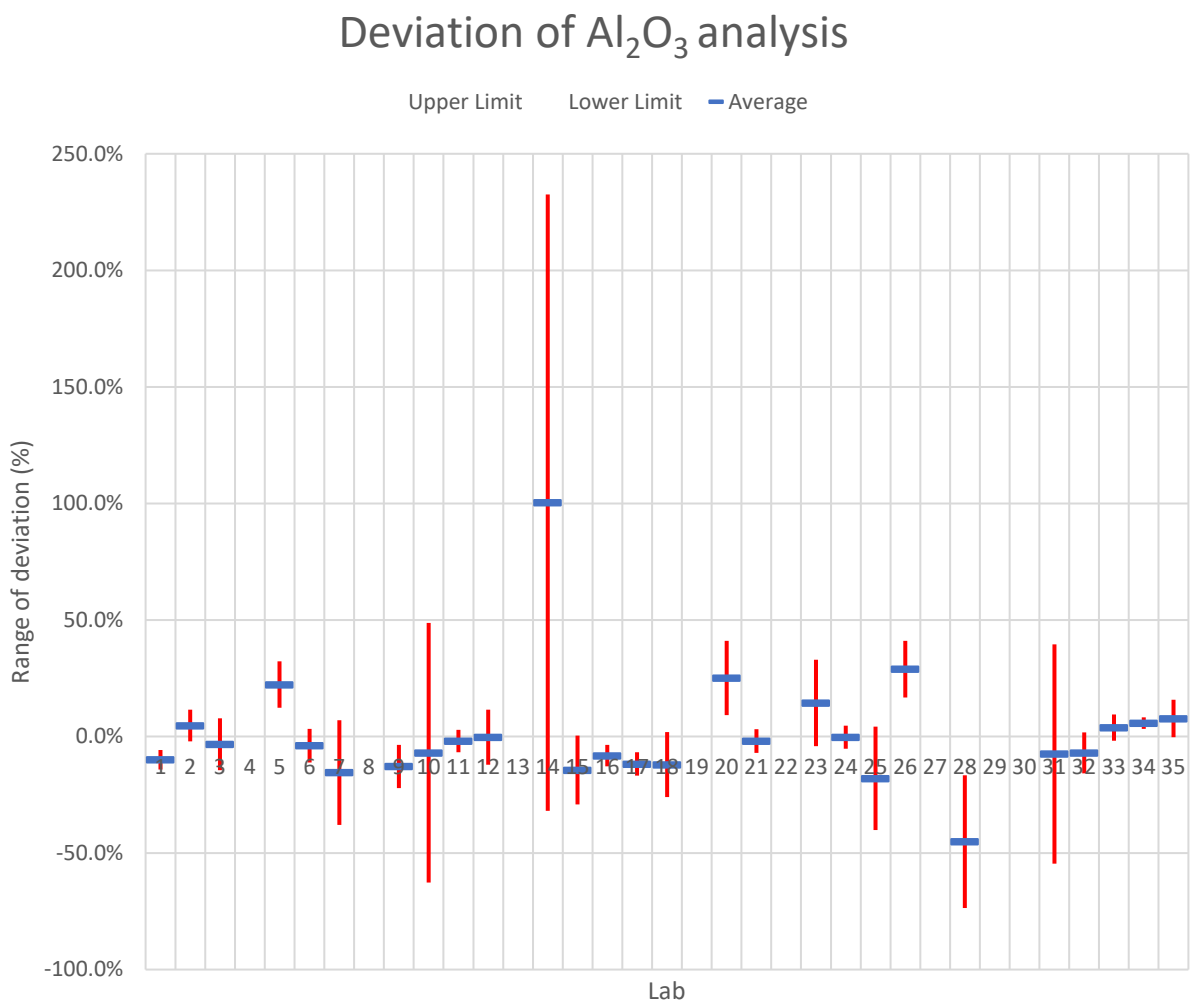


CHARTS SAMPLE D





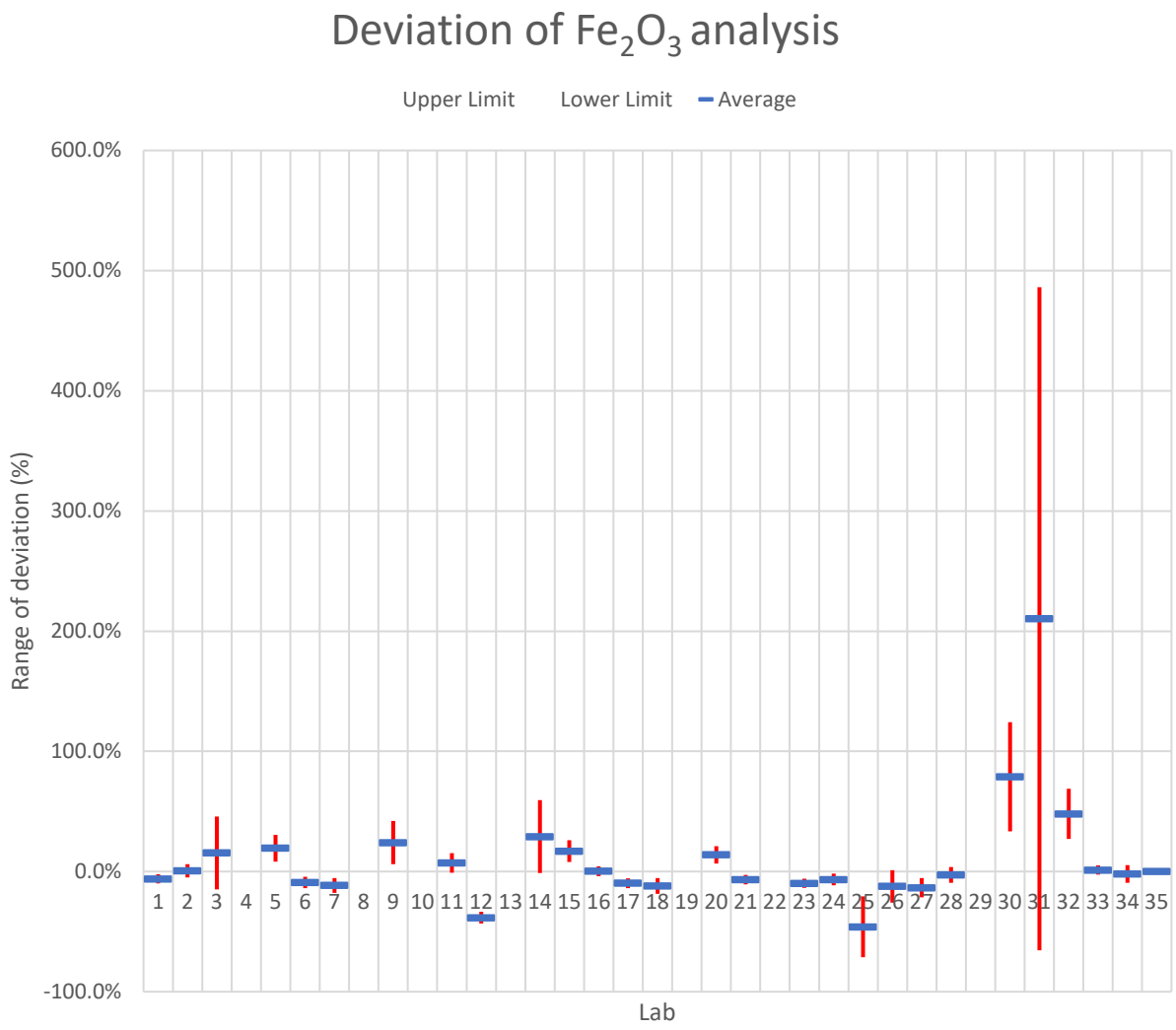
ANNEX 6. INTERSAMPLE AVERAGE



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-6%	12%	8%		32%	3%	7%		-4%	49%	3%	11%		233%	0%
UL	-14%	-2%	-14%		12%	-11%	-38%		-22%	-63%	-7%	-12%		-23%	-29%
Avg	-10%	5%	-3%		22%	-4%	-15%		-13%	-7%	-2%	0%		105%	-14%
SD	4%	7%	11%		10%	7%	22%		9%	56%	5%	12%		128%	15%

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	-4%	-7%	2%		41%	3%		33%	5%	4%	41%		-17%		
UL	-13%	-17%	-26%		9%	-7%		-4%	-5%	-40%	17%		-74%		
Avg	-8%	-12%	-12%		25%	-2%		14%	0%	-18%	29%		-45%		
SD	5%	5%	14%		16%	5%		19%	5%	22%	12%		28%		

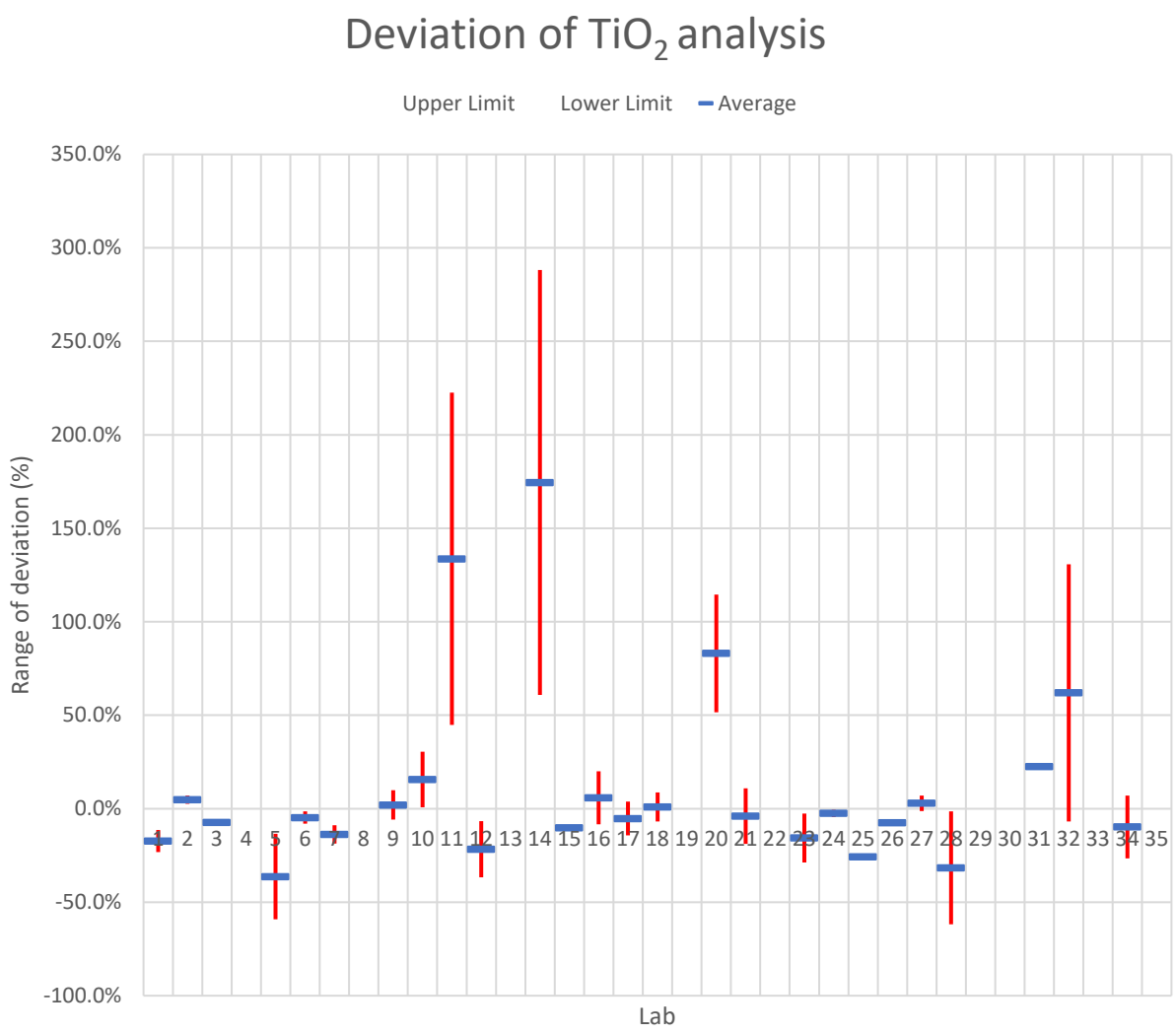
	31	32	33	34	35
UL	40%	2%	9%	8%	16%
UL	-55%	-16%	-2%	3%	0%
Avg	-8%	-7%	4%	6%	8%
SD	47%	9%	6%	3%	8%



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-2%	6%	46%		31%	-4%	-5%		42%		15%	-33%		59%	26%
UL	-10%	-5%	-15%		8%	-14%	-18%		6%		-1%	-43%		-1%	8%
Avg	-6%	1%	16%		19%	-9%	-12%		24%		7%	-38%		29%	17%
SD	4%	6%	30%		11%	5%	6%		18%		8%	5%		30%	9%

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	4%	-6%	-5%		21%	-3%		-6%	-2%	-21%	1%	-6%	4%		124%
UL	-4%	-14%	-18%		7%	-11%		-14%	-12%	-71%	-26%	-22%	-9%		33%
Avg	0%	-10%	-12%		14%	-7%		-10%	-7%	-46%	-12%	-14%	-3%		79%
SD	4%	4%	7%		7%	4%		4%	5%	25%	14%	8%	7%		46%

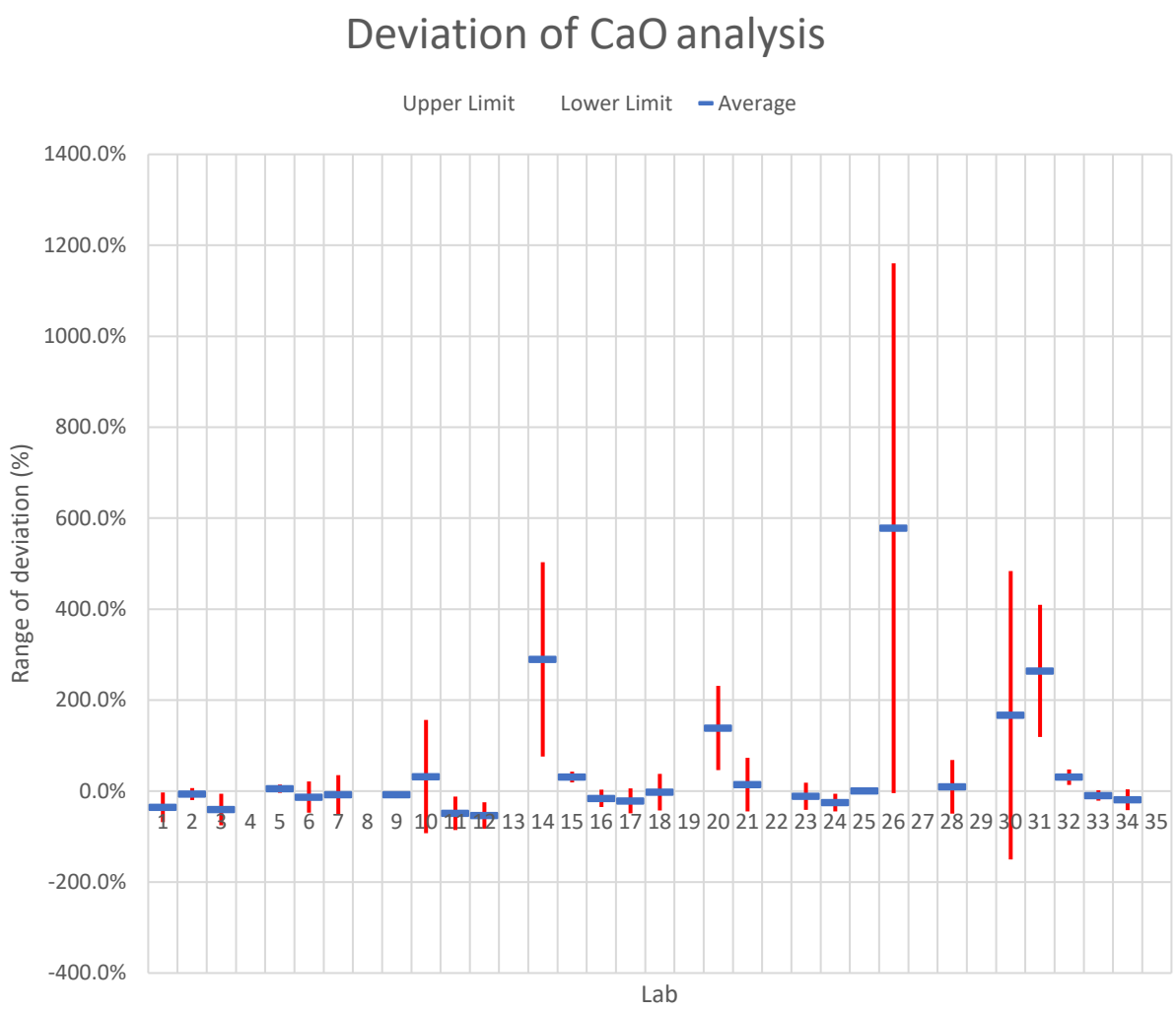
	31	32	33	34	35
UL	486%	69%	5%	5%	
UL	-66%	27%	-3%	-9%	
Avg	210%	48%	1%	-2%	
SD	276%	21%	4%	7%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-11%	8%			-13%	-1%	-8%		10%	47%	222%	-6%		288%	
UL	-23%	3%			-59%	-8%	-19%		-6%	-64%	46%	-37%		62%	
Avg	-17%	5%	-6%		-36%	-4%	-14%		2%	-8%	134%	-21%		175%	-9%
SD	6%	2%			23%	4%	5%		8%	56%	88%	15%		113%	

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	20%	5%	8%		114%	11%		-2%	0%			7%	-1%		
UL	-8%	-14%	-6%		53%	-19%		-29%	-4%			0%	-62%		
Avg	6%	-5%	1%		83%	-4%		-15%	-2%	-25%	-6%	3%	-31%		
SD	14%	9%	7%		31%	15%		14%	2%			4%	31%		

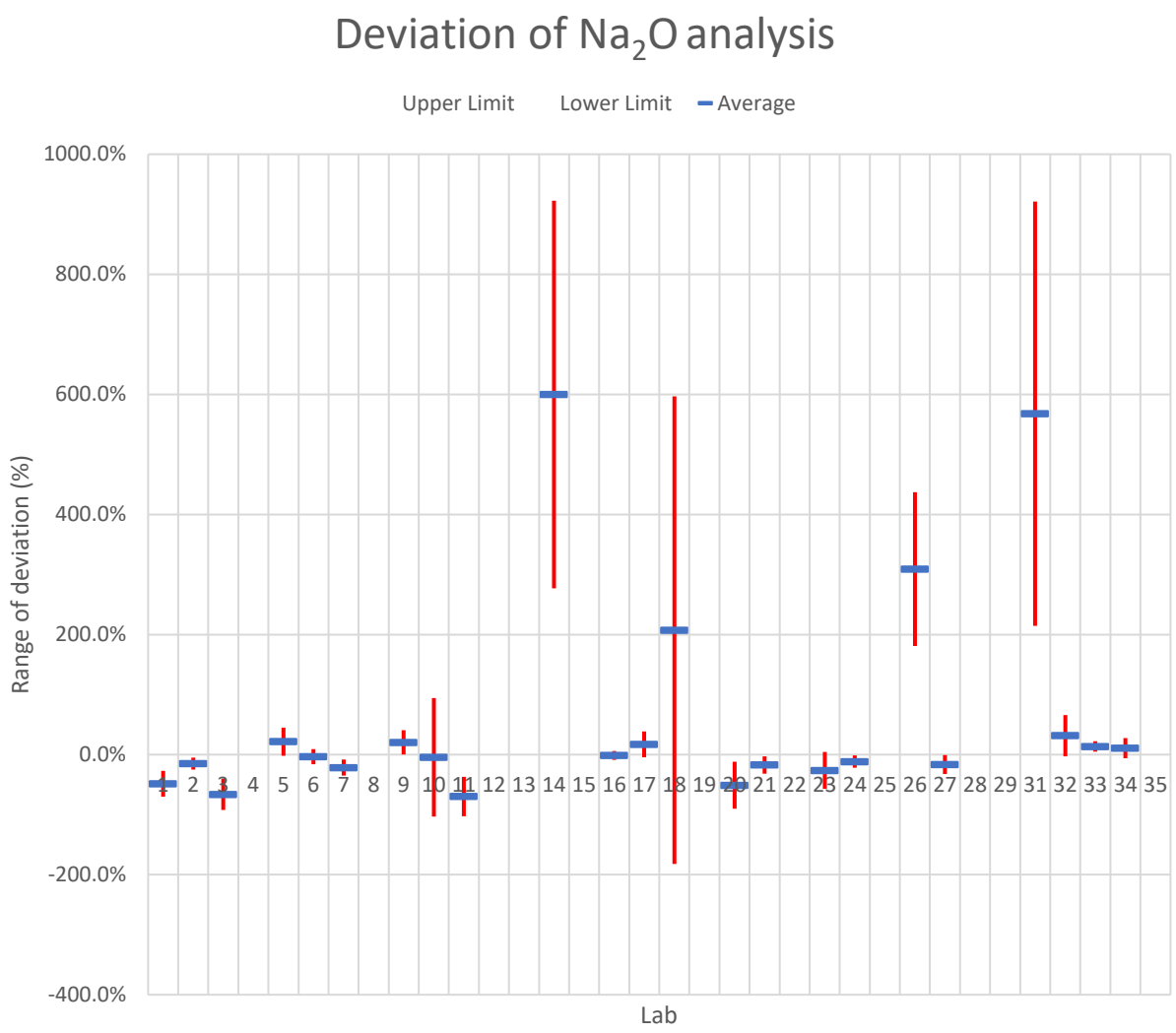
	31	32	33	34	35
UL		131%		7%	
UL		-6%		-26%	
Avg	24%	62%		-10%	
SD		68%		17%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-3%	7%	-6%		14%	21%	35%		-1%	156%	-12%	-24%		503%	43%
UL	-68%	-20%	-75%		-4%	-48%	-51%		-15%	-93%	-86%	-83%		76%	19%
Avg	-36%	-6%	-41%		5%	-13%	-8%		-8%	32%	-49%	-54%		289%	31%
SD	33%	13%	35%		9%	35%	43%		7%	125%	37%	29%		213%	12%

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	3%	6%	38%		231%	73%		19%	-6%	2%	1160%		68%		484%
UL	-35%	-49%	-42%		46%	-45%		-41%	-44%	-1%	-4%		-50%		-150%
Avg	-16%	-21%	-2%		138%	14%		-11%	-25%	1%	578%		9%		167%
SD	19%	28%	40%		93%	59%		30%	19%	1%	582%		59%		317%

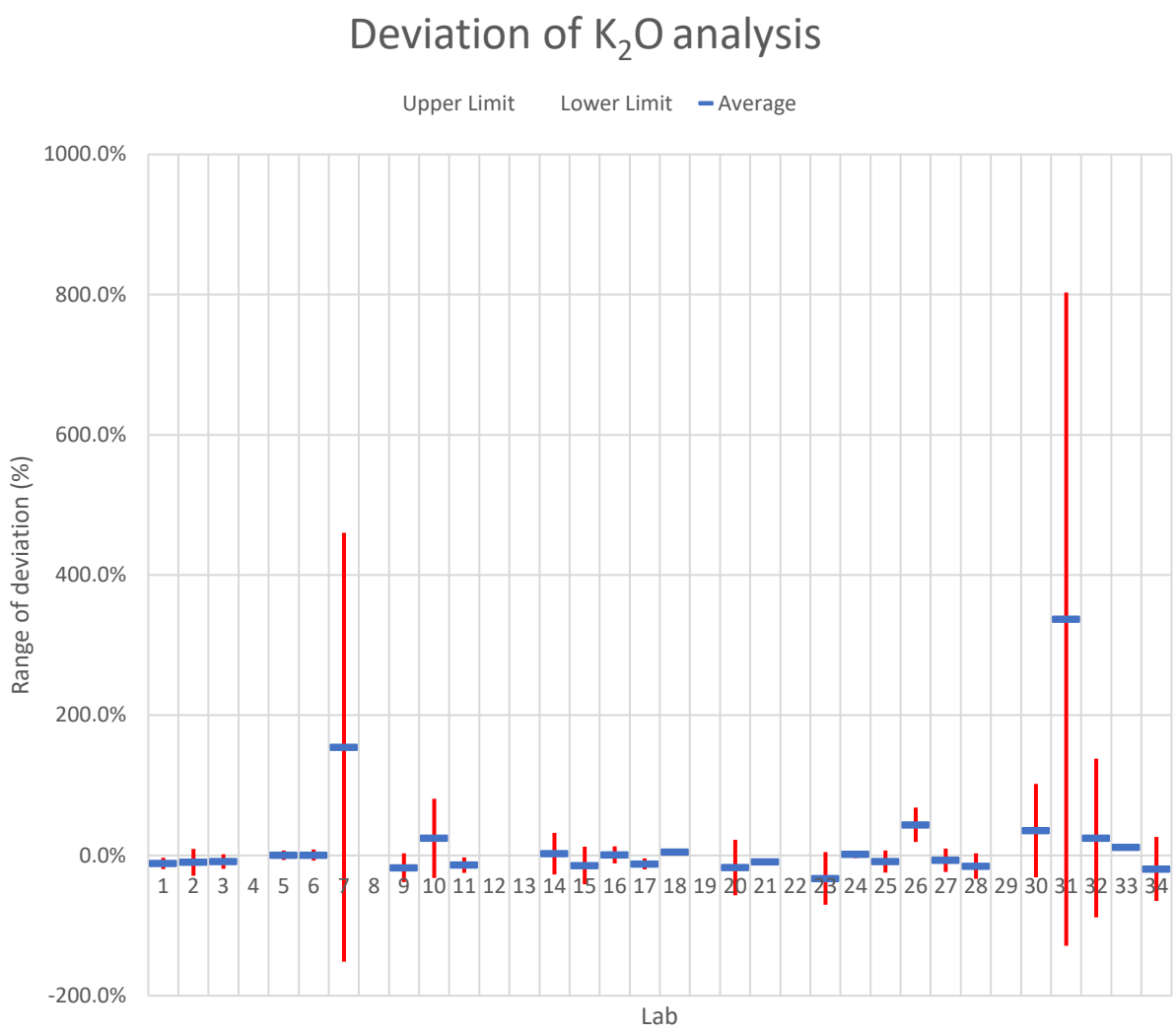
	31	32	33	34	35
UL	409%	48%	2%	4%	
UL	119%	14%	-21%	-42%	
Avg	264%	31%	-10%	-19%	
SD	145%	17%	11%	23%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-27%	-5%	-40%		45%	9%	-8%		40%	94%	-37%			923%	
UL	-70%	-25%	-92%		-2%	-16%	-35%		0%	-103%	-103%			277%	
Avg	-49%	-15%	-66%		22%	-3%	-22%		20%	-4%	-70%			600%	
SD	22%	10%	26%		23%	12%	13%		20%	99%	33%			323%	

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	6%	39%	597%		-12%	-3%		4%	-1%		437%	-1%			
UL	-9%	-4%	-182%		-90%	-32%		-57%	-22%		181%	-32%			
Avg	-1%	17%	207%		-51%	-17%		-26%	-12%		309%	-17%			3462%
SD	7%	21%	389%		39%	14%		31%	10%		128%	16%			

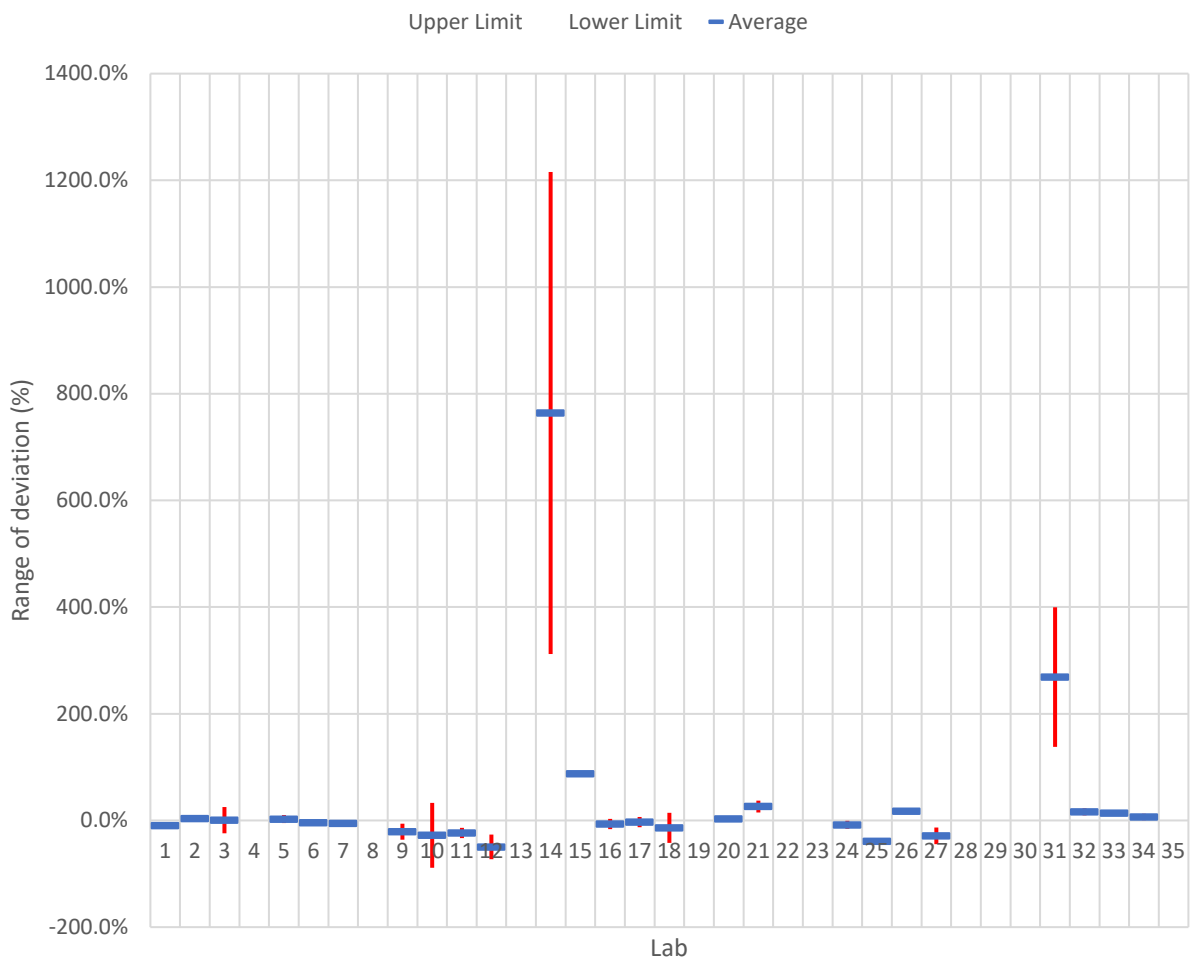
	31	32	33	34	35
UL	921%	66%	22%	28%	
UL	215%	-3%	5%	-6%	
Avg	568%	32%	14%	11%	
SD	353%	35%	9%	17%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-3%	9%	2%		7%	8%	460%		3%	81%	-3%			32%	12%
UL	-19%	-29%	-19%		-6%	-7%	-151%		-38%	-32%	-25%			-27%	-41%
Avg	-11%	-10%	-9%		0%	0%	154%		-17%	25%	-14%			3%	-14%
SD	8%	19%	10%		7%	8%	306%		20%	56%	11%			30%	27%

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	13%	-4%	9%		22%	-5%		5%	7%	7%	68%	10%	3%		102%
UL	-11%	-20%	1%		-57%	-13%		-70%	-4%	-25%	19%	-24%	-34%		-31%
Avg	1%	-12%	5%		-17%	-9%		-33%	2%	-9%	44%	-7%	-15%		35%
SD	12%	8%	4%		40%	4%		37%	5%	16%	25%	17%	18%		67%

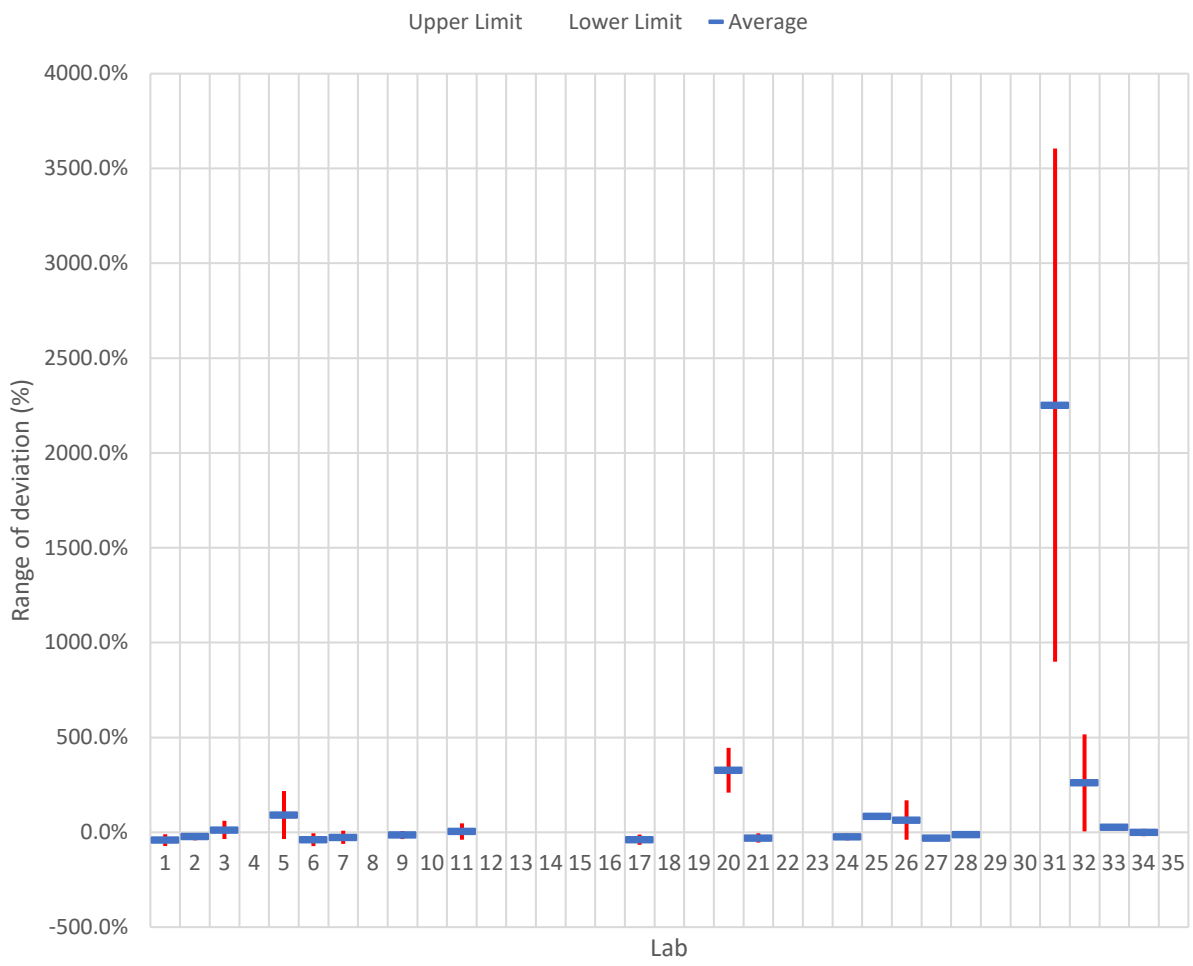
	31	32	33	34	35
UL	803%	138%	14%	26%	11577%
UL	-129%	-88%	8%	-65%	-1456%
Avg	337%	25%	11%	-19%	5060%
SD	466%	113%	3%	46%	6517%



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-6%	9%	25%		10%	-2%	0%		-6%	33%	-14%	-27%		1216%	
UL	-14%	-2%	-24%		-5%	-7%	-11%		-36%	-89%	-33%	-73%		312%	
Avg	-10%	4%	1%		3%	-4%	-6%		-21%	-28%	-24%	-50%		764%	87%
SD	4%	6%	25%		7%	3%	5%		15%	61%	10%	23%		452%	

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	3%	7%	14%			37%			-1%		20%	-13%			
UL	-16%	-13%	-42%			15%			-16%		15%	-44%			
Avg	-7%	-3%	-14%		3%	26%			-8%	-39%	18%	-29%			
SD	10%	10%	28%			11%			8%		3%	16%			

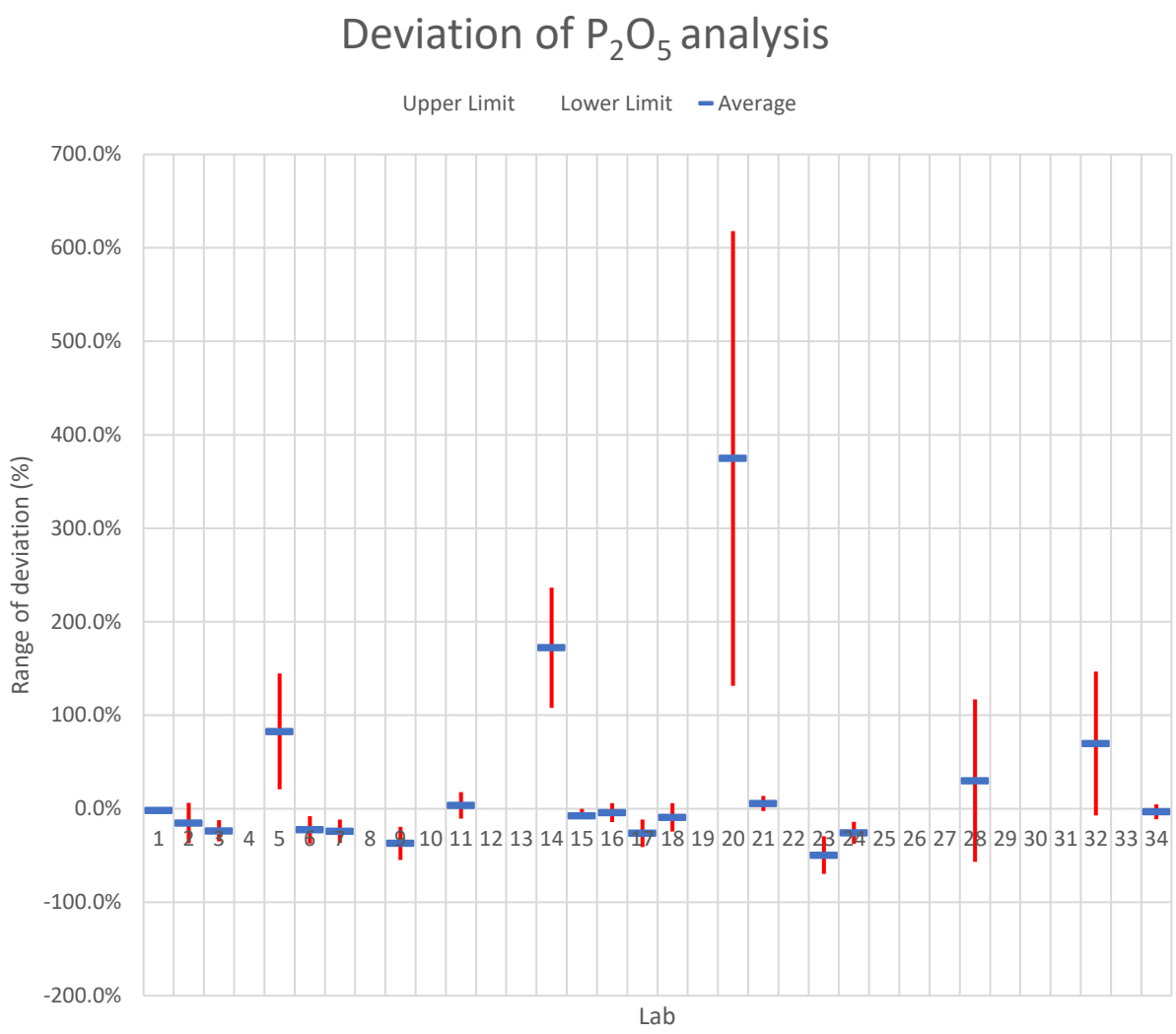
	31	32	33	34	35
UL	399%	23%	16%	13%	
UL	138%	10%	11%	1%	
Avg	269%	16%	14%	7%	
SD	131%	6%	3%	6%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-9%	-3%	61%		218%	-6%	8%		7%		47%				
UL	-72%	-42%	-36%		-35%	-72%	-62%		-35%		-38%				
Avg	-41%	-23%	12%		91%	-39%	-27%		-14%		5%				
SD	31%	20%	48%		126%	33%	35%		21%		43%				

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-12%			445%	-5%			-6%		168%	-23%	3%		
UL		-65%			210%	-55%			-42%		-38%	-37%	-29%		
Avg		-38%			327%	-30%			-24%	84%	65%	-30%	-13%		
SD		27%			118%	25%			18%		103%	7%	16%		

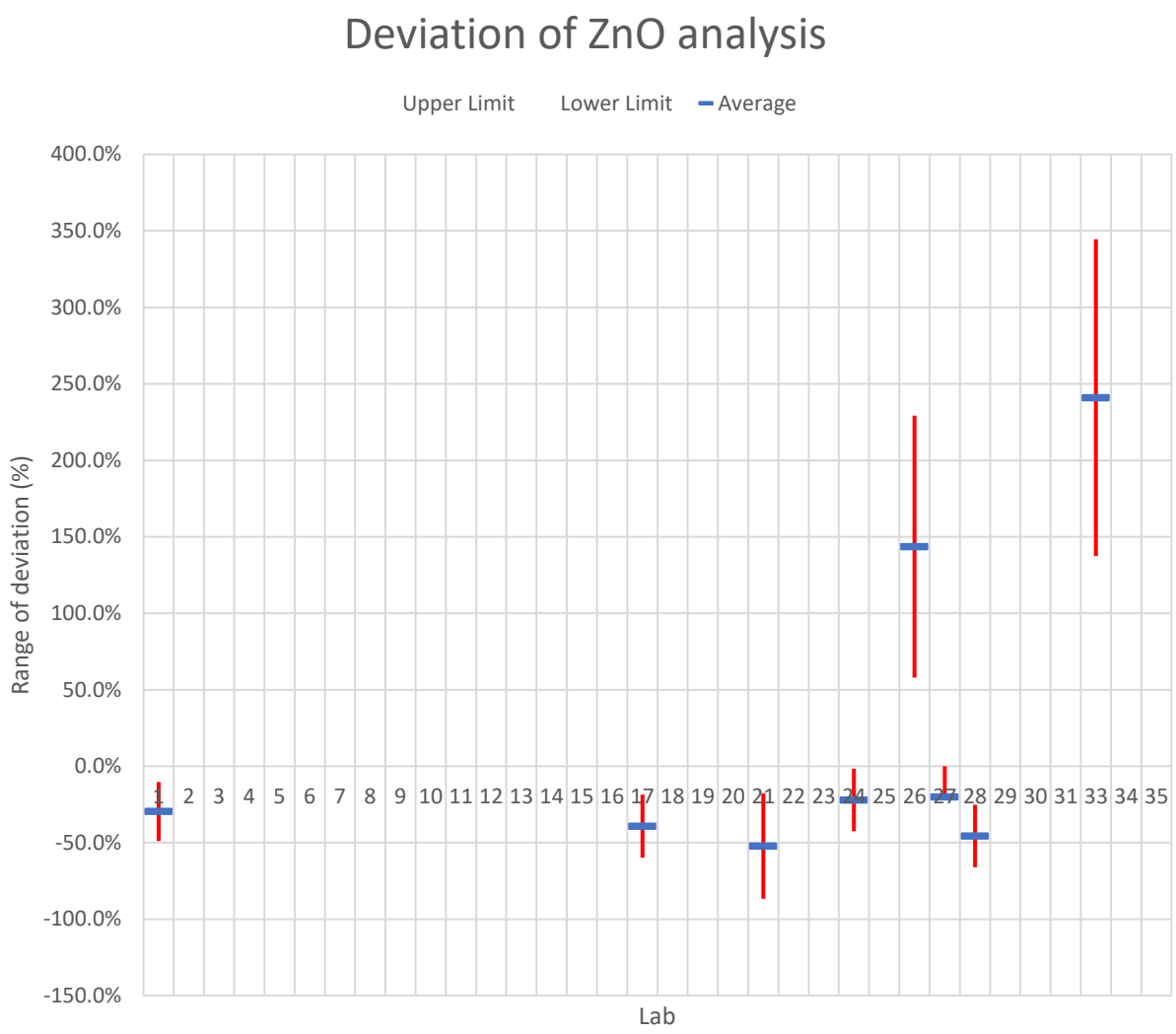
	31	32	33	34	35
UL	3605%	516%	35%	18%	
UL	899%	6%	18%	-20%	
Avg	2252%	261%	27%	-1%	
SD	1353%	255%	8%	19%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	1%	6%	-12%		145%	-8%	-12%		-19%		18%			237%	
UL	-5%	-37%	-35%		21%	-37%	-36%		-55%		-11%			108%	
Avg	-2%	-15%	-24%		83%	-23%	-24%		-37%		4%			172%	-7%
SD	3%	22%	11%		62%	15%	12%		18%		14%			64%	

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL	6%	-12%	6%		618%	14%		-30%	-14%				117%		
UL	-14%	-41%	-25%		132%	-3%		-70%	-38%				-57%		
Avg	-4%	-26%	-9%		375%	6%		-50%	-26%				30%		
SD	10%	15%	15%		243%	8%		20%	12%				87%		

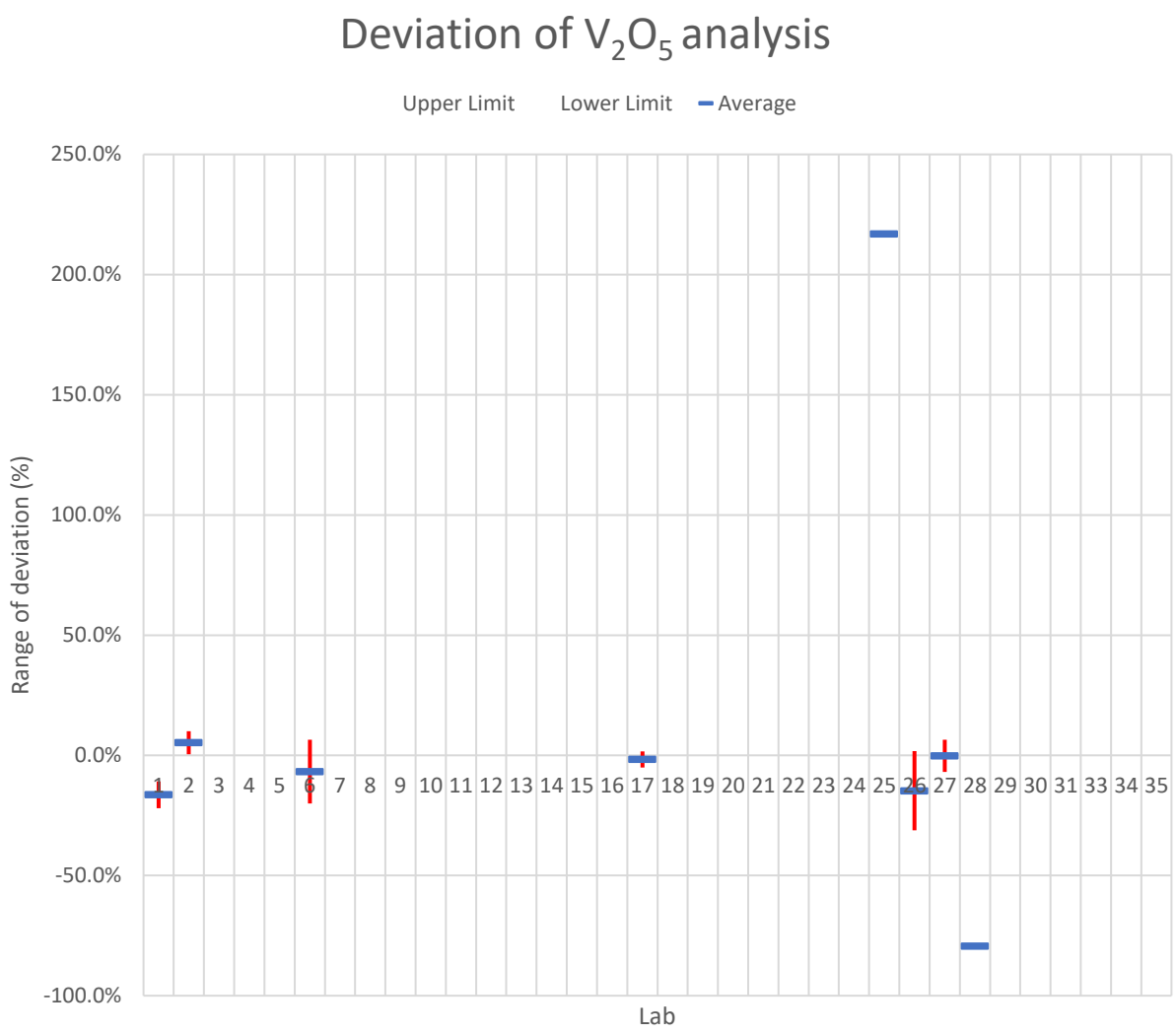
	31	32	33	34	35
UL		147%		5%	76187%
UL		-7%		-11%	18744%
Avg		70%		-3%	47465%
SD		77%		8%	28721%



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-10%														
UL	-49%														
Avg	-30%														
SD	19%														

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-19%				-18%			-2%		229%		-25%		
UL		-60%				-87%			-42%		58%		-66%		
Avg		-39%				-52%			-22%		144%	-20%	-46%		
SD		21%				34%			20%		86%		20%		

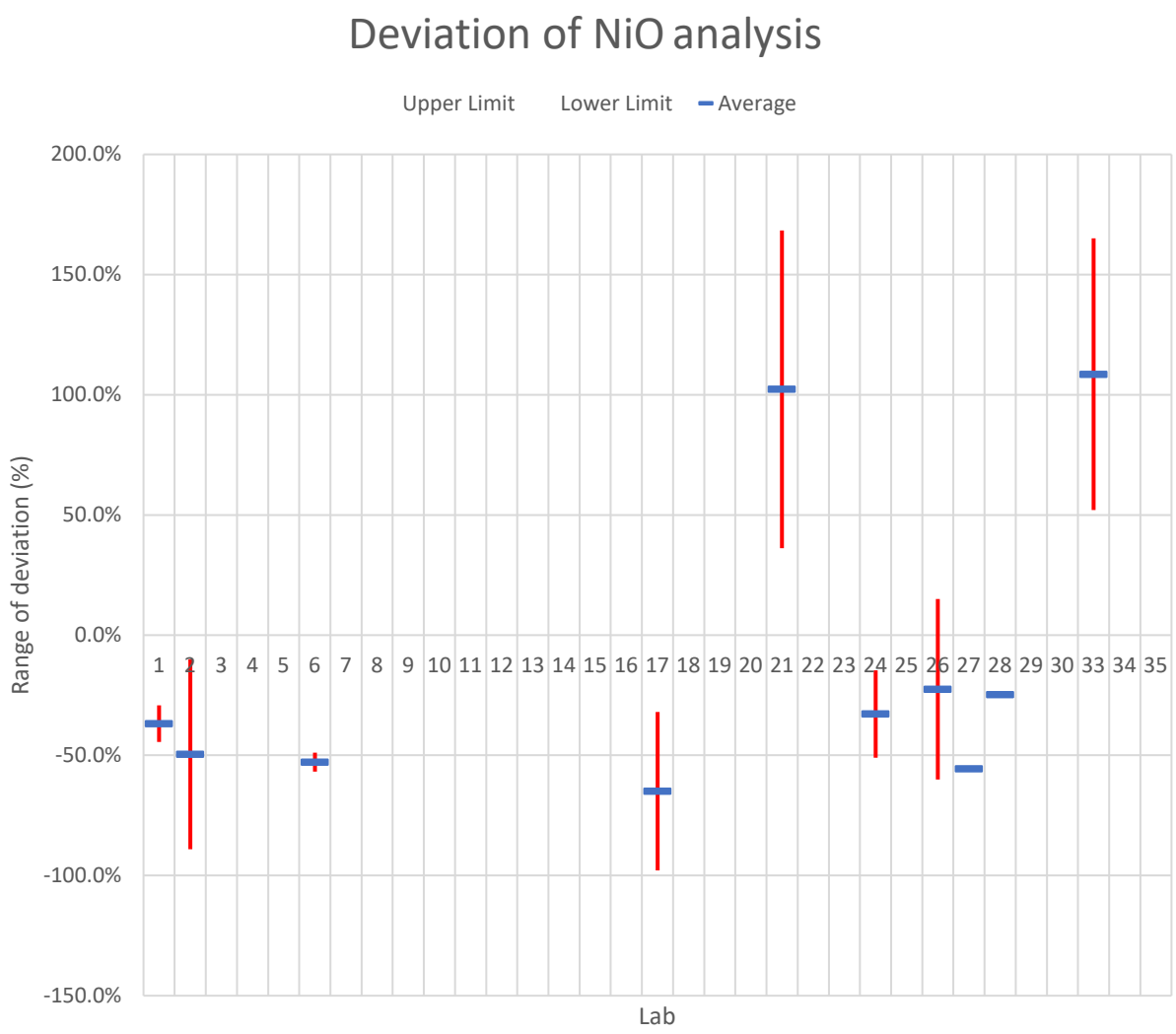
	31	32	33	34	35
UL		3641%	344%		
UL		2278%	137%		
Avg		2960%	241%		
SD		682%	104%		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-11%	10%				6%									
UL	-22%	0%				-20%									
Avg	-16%	5%				-7%									
SD	6%	5%				13%									

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		2%									2%	6%			
UL		-5%									-31%	-7%			
Avg		-2%								217%	-15%	0%	-79%		
SD		3%									16%	7%			

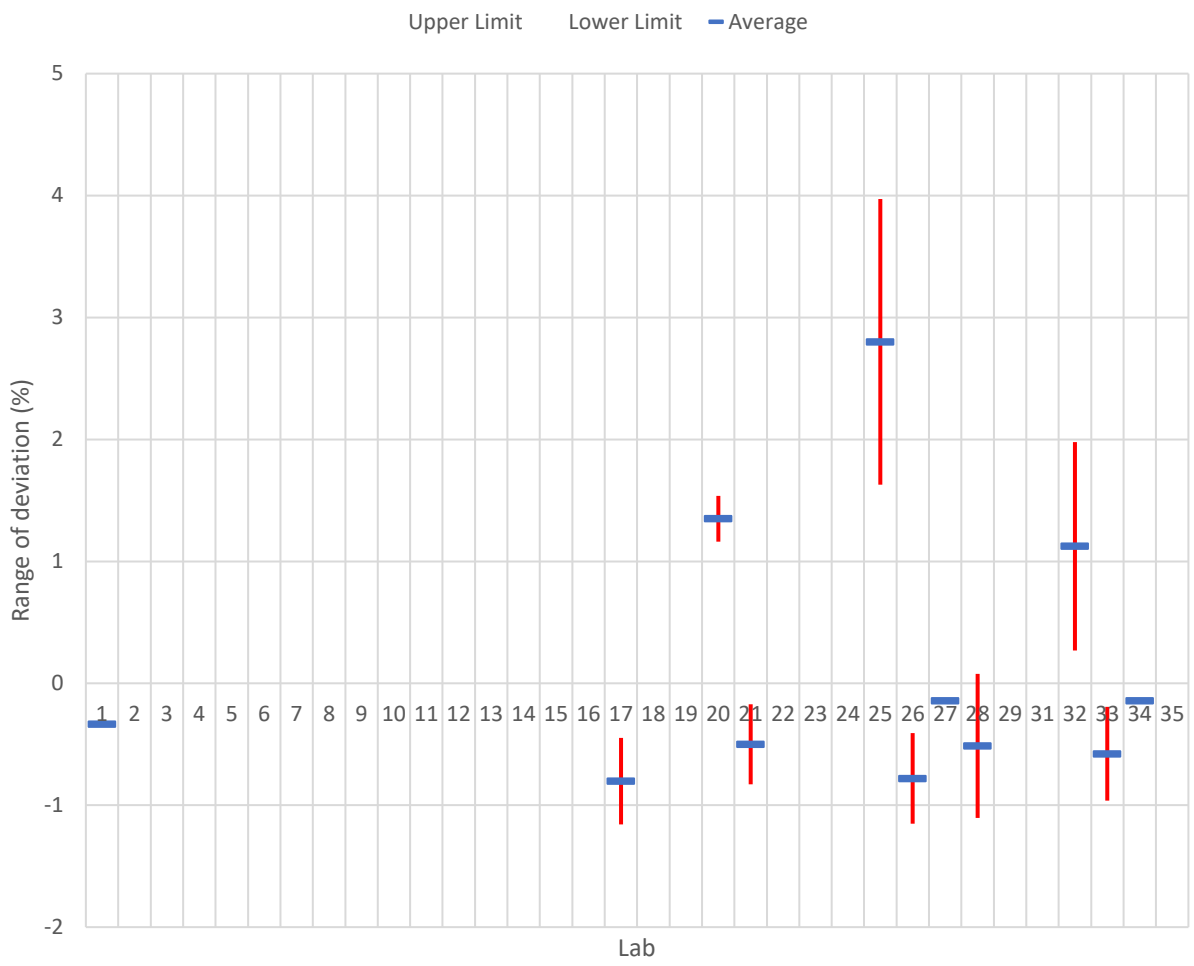
	31	32	33	34	35
UL		2357%			
UL		-127%			
Avg		1115%			
SD		1242%			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-29%	-10%				-49%									
UL	-44%	-89%				-57%									
Avg	-37%	-50%				-53%									
SD	8%	39%				4%									

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-32%				168%			-15%		15%		-24%		
UL		-98%				36%			-51%		-60%		-25%		
Avg		-65%				102%			-33%		-22%	-56%	-25%		
SD		33%				66%			18%		38%		0%		

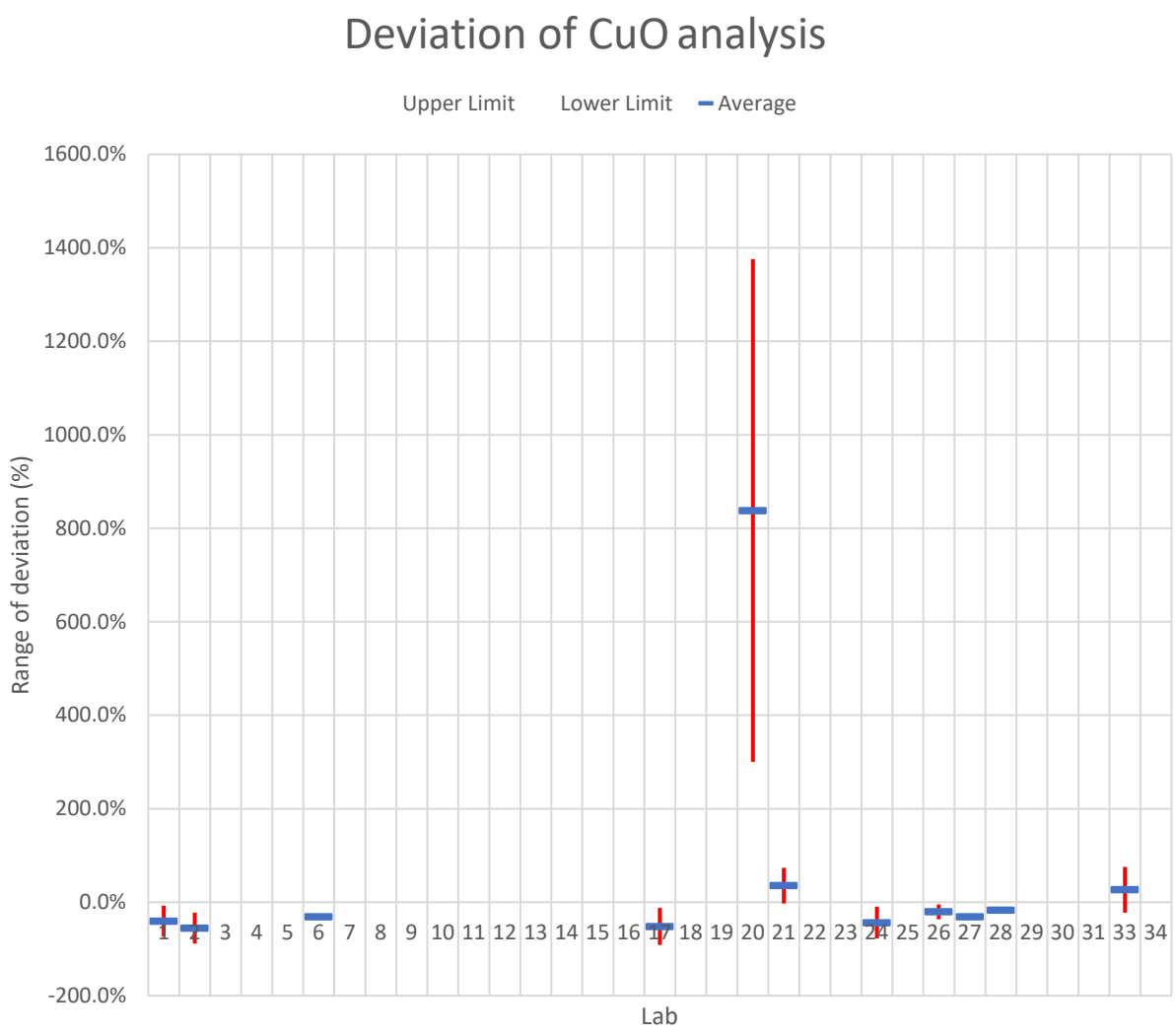
	31	32	33	34	35
UL	4599%	4365%	165%		
UL	2827%	2052%	52%		
Avg	3713%	3209%	109%		
SD	886%	1156%	56%		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL															
UL															
Avg	-34%														
SD															

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-45%			154%	-17%				397%	-41%		8%		5588%
UL		-116%			116%	-83%				163%	-115%		-110%		4107%
Avg		-80%			135%	-50%				280%	-78%	-14%	-51%		4847%
SD		35%			19%	33%				117%	37%		59%		740%

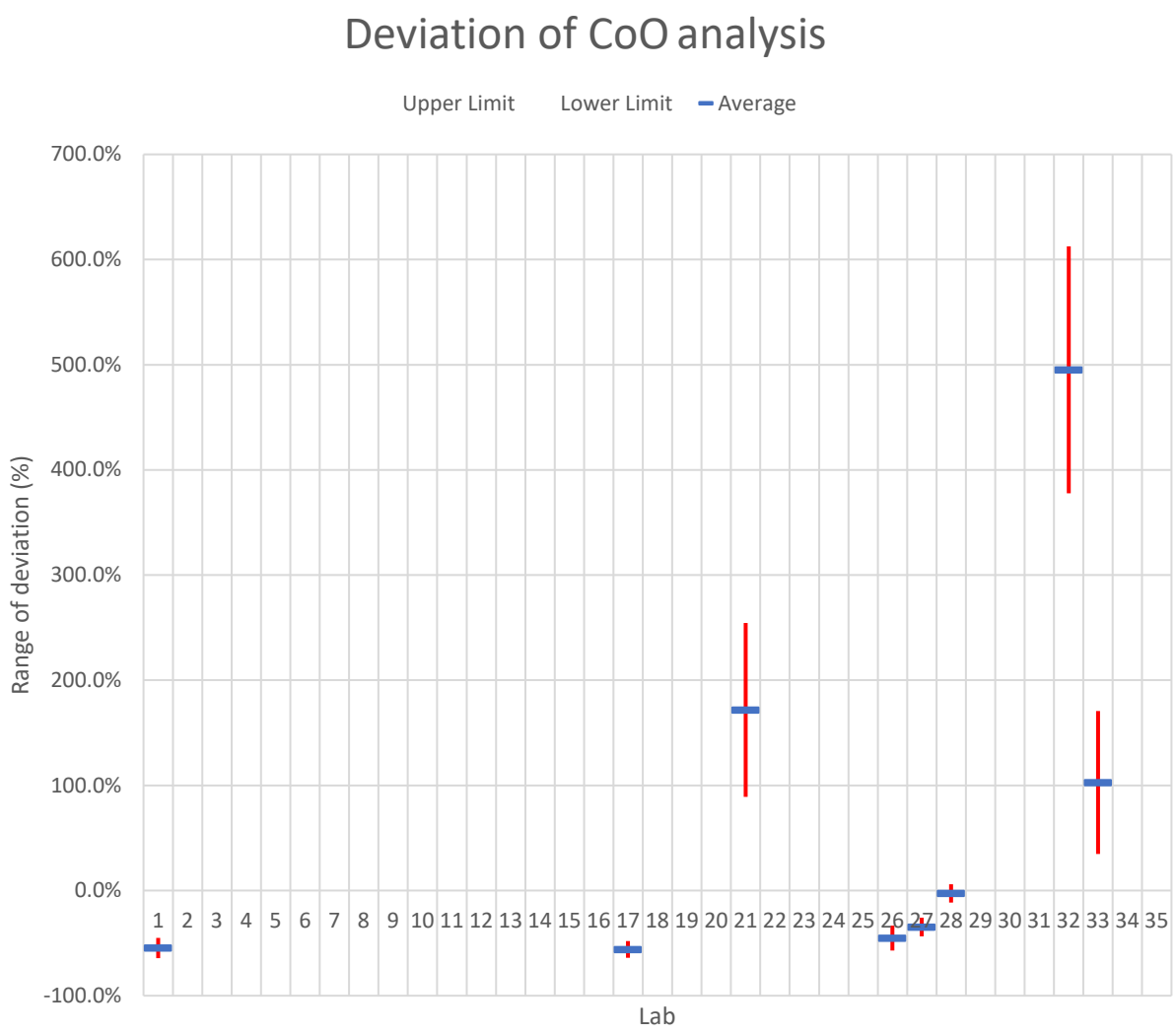
	31	32	33	34	35
UL		198%	-19%		
UL		27%	-96%		
Avg		112%	-58%	-14%	
SD		86%	38%		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-7%	-22%				-27%									
UL	-74%	-88%				-34%									
Avg	-41%	-55%				-31%									
SD	33%	33%				4%									

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-12%			1376%	74%			-10%		-5%	-27%	-16%		
UL		-91%			300%	-2%			-78%		-36%	-34%	-18%		
Avg		-52%			838%	36%			-44%		-21%	-31%	-17%		
SD		39%			538%	38%			34%		16%	4%	1%		

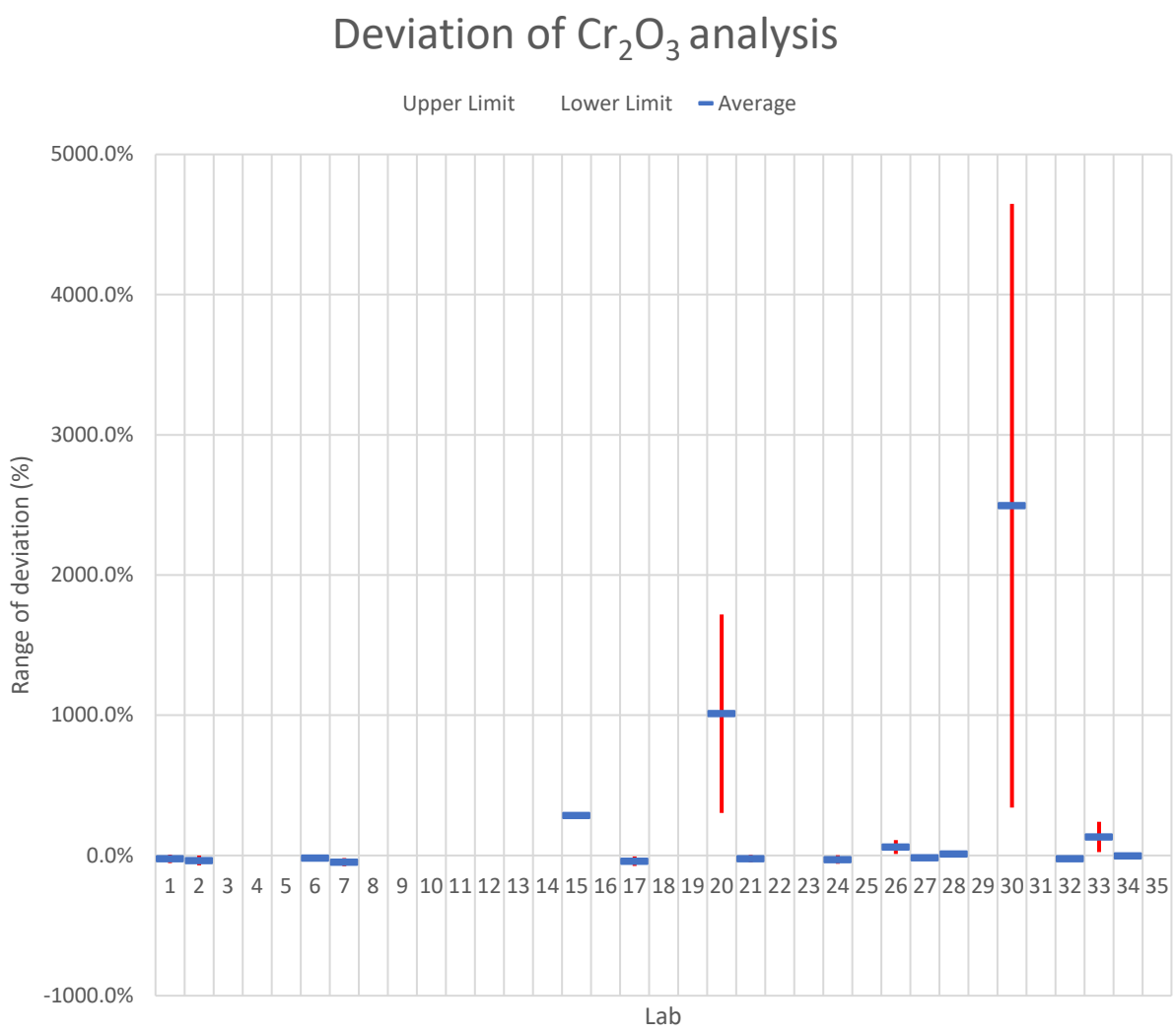
	31	32	33	34	35
UL		2613%	76%		2523%
UL		1100%	-22%		2069%
Avg		1856%	27%		2296%
SD		757%	49%		227%



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	-45%														
UL	-64%														
Avg	-55%														
SD	10%														

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-48%				254%					-33%	-26%	6%		
UL		-64%				89%					-57%	-43%	-11%		
Avg		-56%				172%					-45%	-35%	-3%		
SD		8%				83%					12%	9%	9%		

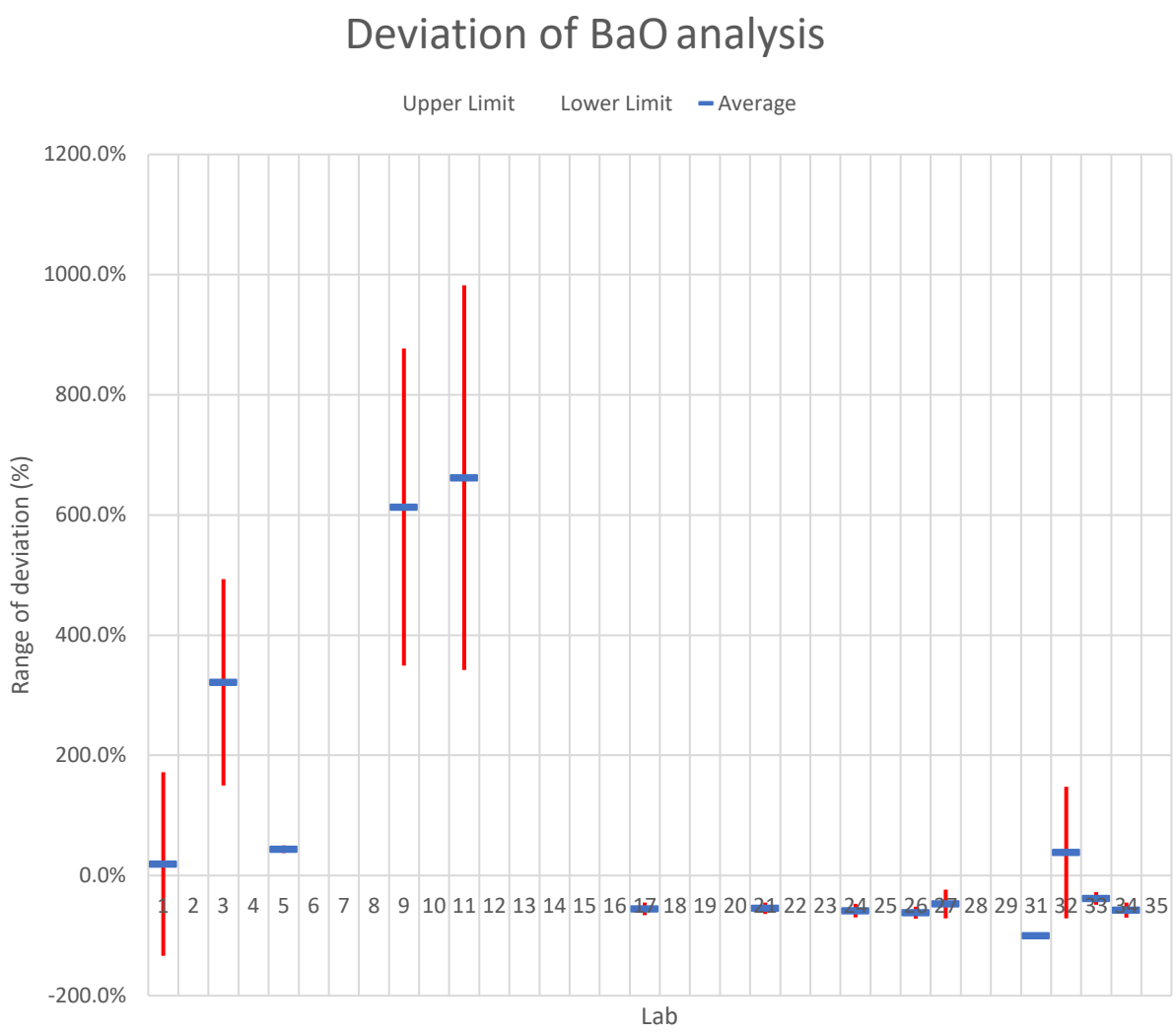
	31	32	33	34	35
UL		613%	171%		
UL		378%	35%		
Avg		495%	103%		
SD		117%	68%		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	6%	-1%				-8%	-18%								
UL	-54%	-69%				-27%	-76%								
Avg	-24%	-35%				-17%	-47%								286%
SD	30%	34%				9%	29%								

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-6%			1720%	3%			2%		110%	2%			4647%
UL		-75%			303%	-51%			-59%		11%	-33%			342%
Avg		-41%			1011%	-24%			-29%		61%	-16%	10%		2494%
SD		34%			708%	27%			30%		50%	17%			2153%

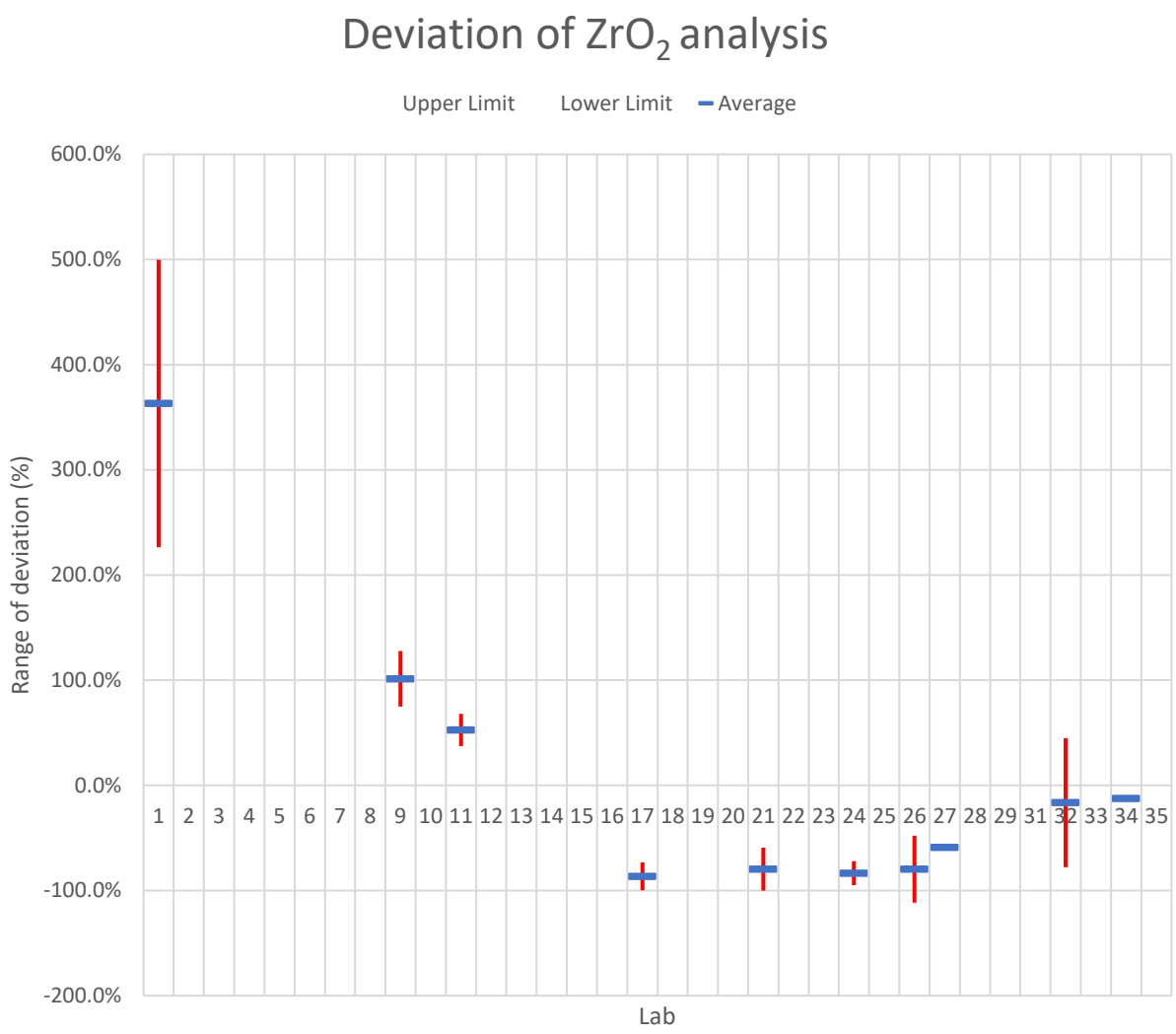
	31	32	33	34	35
UL		-9%	241%		
UL		-38%	24%		
Avg		-23%	133%	-3%	
SD		15%	108%		



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	172%		493%		50%				877%		982%				
UL	-134%		150%		38%				349%		342%				
Avg	19%		321%		44%				613%		662%				
SD	153%		172%		6%				264%		320%				

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-45%				-45%			-47%		-52%	-23%			262381%
UL		-66%				-64%			-70%		-72%	-71%			94831%
Avg		-55%				-54%			-58%		-62%	-47%			178606%
SD		10%				10%			11%		10%	24%			83775%

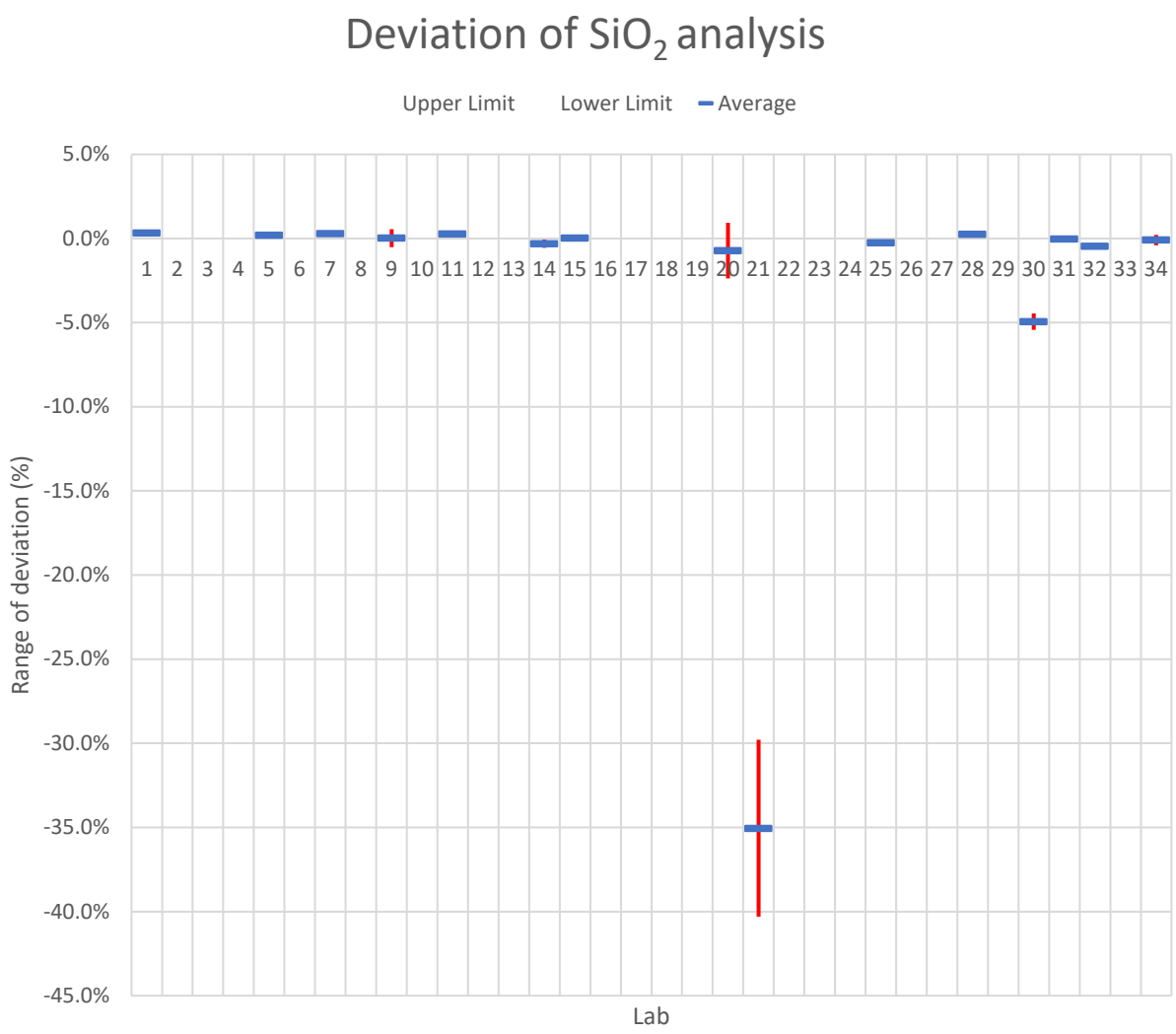
	31	32	33	34	35
UL		148%	-28%	-45%	
UL		-71%	-49%	-70%	
Avg	-100%	38%	-38%	-58%	
SD		109%	10%	13%	



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	500%								128%		68%				
UL	227%								75%		37%				
Avg	363%								101%		53%				
SD	137%								26%		15%				

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL		-73%				-59%			-72%		-48%				9711%
UL		-100%				-100%			-95%		-112%				8582%
Avg		-87%				-80%			-84%		-80%	-59%			9146%
SD		13%				20%			11%		32%				564%

	31	32	33	34	35
UL		45%			
UL		-78%			
Avg		-16%		-12%	
SD		61%			



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
UL	0%				0%		0%		1%		0%			0%	0%
UL	0%				0%		0%		-1%		0%			-1%	0%
Avg	0%				0%		0%		0%		0%			0%	0%
SD	0%				0%		0%		1%		0%			0%	0%

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
UL					1%	-30%				0%			0%		-4%
UL					-2%	-40%				0%			0%		-5%
Avg					-1%	-35%				0%			0%		-5%
SD					2%	5%				0%			0%		0%

	31	32	33	34	35
UL	0%	0%		0%	
UL	0%	-1%		0%	
Avg	0%	0%		0%	
SD	0%	0%		0%	

ANNEX 7. ANALYTICAL METHODS

	Al_2O_3	Fe_2O_3	TiO_2	CaO	Na_2O	K_2O	MgO	MnO	P_2O_5	B_2O_3
	%	%	%	%	%	%	%	ppm	ppm	ppm
Lab 1	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 2	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 3	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
Lab 4										
Lab 5	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
Lab 6	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 7	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	
Lab 8										
Lab 9	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
Lab 10	XRF		XRF	XRF	XRF	XRF	XRF			
Lab 11	XRF	XRF	XRF	XRF	XRF	XRF	XRF		XRF	
Lab 12	XRF	XRF	XRF	XRF			XRF			
Lab 13										
Lab 14	XRF	XRF	XRF	XRF	XRF	XRF	XRF		XRF	
Lab 15	XRF	XRF	XRF	XRF		XRF	XRF		XRF	
Lab 16	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES	
Lab 17	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 18	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES	
Lab 19										
Lab 20	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	
Lab 21	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 22	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	
Lab 23										
Lab 24	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	
Lab 25	XRF	XRF	XRF	XRF	XRF	XRF	XRF		XRF	
Lab 26	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS		
Lab 27		ICP-OES	ICP-OES		ICP-OES	ICP-OES	ICP-OES	ICP-OES		
Lab 28	XRF	XRF	XRF	XRF		XRF		XRF	XRF	
Lab 29										
Lab 30		XRF		XRF	XRF	XRF				
Lab 31	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 32	ICP-OES	ICP-OES	ICP-OES	XRF	ICP-OES	XRF	ICP-OES	ICP-OES	ICP-OES	
Lab 33	ICP-OES	ICP-OES		ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 34	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 35	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	

	ZnO	V_2O_5	NiO	PbO	CuO	CoO	CdO	Cr_2O_3	Sc_2O_3	BaO
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Lab 1	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 2		ICP-OES	ICP-OES		ICP-OES			ICP-OES		
Lab 3										XRF
Lab 4										
Lab 5										XRF
Lab 6		ICP-OES	ICP-OES		ICP-OES			ICP-OES		
Lab 7								ICP-OES		
Lab 8										
Lab 9										
Lab 10										
Lab 11	XRF	XRF		XRF						XRF
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES		ICP-OES
Lab 18										
Lab 19										
Lab 20				XRF	XRF			XRF		
Lab 21	ICP-OES		ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 22	ICP-OES		ICP-OES		ICP-OES			ICP-OES		ICP-OES
Lab 23										
Lab 24	ICP-OES		ICP-OES		ICP-OES			ICP-OES		ICP-OES
Lab 25	XRF	XRF	XRF	XRF	XRF			XRF		XRF
Lab 26	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS	ICP-MS
Lab 27	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 28	XRF	XRF	XRF	XRF	XRF	XRF		XRF		
Lab 29										
Lab 30				XRF				XRF		
Lab 31	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 32	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	XRF	ICP-OES	ICP-OES		ICP-OES
Lab 33	ICP-OES		ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 34	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES
Lab 35	ICP-OES				ICP-OES	ICP-OES	ICP-OES	ICP-OES		ICP-OES

	LiO_2	SO_3	MoO_3	HfO_2	Nb_2O_5	ZrO_2	As_2O_3	Bi_2O_3	Sb_2O_3	SnO_2
	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
Lab 1	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES				
Lab 2										
Lab 3										
Lab 4										
Lab 5		XRF								
Lab 6										
Lab 7										
Lab 8										
Lab 9						XRF				
Lab 10										
Lab 11										
Lab 12										
Lab 13										
Lab 14										
Lab 15										
Lab 16										
Lab 17	ICP-OES		ICP-OES			ICP-OES	ICP-OES			
Lab 18										
Lab 19										
Lab 20		XRF								
Lab 21						ICP-OES		ICP-OES		
Lab 22						ICP-OES				
Lab 23										
Lab 24						ICP-OES				
Lab 25						XRF				
Lab 26			ICP-MS	ICP-MS			ICP-MS	ICP-MS	ICP-MS	ICP-MS
Lab 27			ICP-OES			ICP-OES	ICP-OES	ICP-OES	ICP-OES	ICP-OES
Lab 28							XRF			
Lab 29										
Lab 30					XRF	XRF	XRF			
Lab 31			ICP-OES				ICP-OES		ICP-OES	
Lab 32			XRF			ICP-OES		ICP-OES	ICP-OES	ICP-OES
Lab 33								ICP-OES		
Lab 34	ICP-OES		ICP-OES			ICP-OES		ICP-OES		ICP-OES
Lab 35							ICP-OES			

	SrO	Ga_2O_3	GeO_2	Rb_2O	La_2O_3	Y_2O_3	ThO_2	Cs_2O	Cl	I	LOI	SiO_2
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%
Lab 1											Other	Difference
Lab 2												
Lab 3												
Lab 4												
Lab 5												XRF
Lab 6												
Lab 7												Difference
Lab 8												
Lab 9												XRF
Lab 10												
Lab 11												XRF
Lab 12												
Lab 13												
Lab 14											Other	Other
Lab 15											TGA	XRF
Lab 16												
Lab 17	ICP-OES					ICP-OES						
Lab 18												
Lab 19												
Lab 20									XRF			XRF
Lab 21	ICP-OES											ICP-OES
Lab 22	ICP-OES											
Lab 23												
Lab 24												
Lab 25	XRF										Other	XRF
Lab 26	ICP-MS	ICP-MS	ICP-MS	ICP-MS								
Lab 27	ICP-OES											
Lab 28												XRF
Lab 29												
Lab 30				XRF			XRF	XRF		XRF		XRF
Lab 31	ICP-OES										TGA	ICP-OES
Lab 32	ICP-OES				XRF						Other	XRF
Lab 33	ICP-OES											Gravimetric
Lab 34	ICP-OES											
Lab 35												

ANNEX 8. CERTIFIED VALUES

SAMPLE A

Elem.	Unit	Certified value	±	Uncertainty	Analytical method
Al_2O_3	%	0.986783153	±	0.042690576	ICP-OES, ICP-MS, XRF
Fe_2O_3	%	0.039229348	±	0.003321403	ICP-OES, ICP-MS, XRF
TiO_2	%	0.024213135	±	0.001098602	ICP-OES, ICP-MS, XRF
CaO	%	0.009329958	±	0.001166392	ICP-OES, ICP-MS, XRF
Na_2O	%	0.005436705	±	0.001044131	ICP-OES, ICP-MS, XRF
K_2O	%	0.084724013	±	0.003816425	ICP-OES, ICP-MS, XRF
MgO	%	0.022405715	±	0.002678337	ICP-OES, ICP-MS, XRF
MnO	%	0.000538622	±	0.000087810	ICP-OES, ICP-MS, XRF
P_2O_5	%	0.002124535	±	0.000411699	ICP-OES, XRF
ZnO	%	0.000224794	±	0.000047157	ICP-OES, ICP-MS, XRF
V_2O_5	%	0.000725695	±	0.000089984	ICP-OES, ICP-MS, XRF
NiO	%	0.000225270	±	0.000079336	ICP-OES, ICP-MS, XRF
PbO	%	0.001614452	±	0.001533890	ICP-OES, ICP-MS, XRF
CuO	%	0.000559059	±	0.000099299	ICP-OES, ICP-MS, XRF
CoO	%	0.000145544	±	0.000074028	ICP-OES, ICP-MS, XRF
Cr_2O_3	%	0.001036068	±	0.000123022	ICP-OES, ICP-MS, XRF
BaO	%	0.000183300	±	0.000105677	ICP-OES, ICP-MS, XRF
ZrO_2	%	0.001140966	±	0.000624324	ICP-OES, XRF
SiO_2	%	98.415438989	±	0.356535311	XRF, Difference

SAMPLE B

Elem.	Unit	Certified value	±	Uncertainty	Analytical method
Al_2O_3	%	0.090616035	±	0.005469503	ICP-OES, ICP-MS, XRF
Fe_2O_3	%	0.035957276	±	0.001526028	ICP-OES, ICP-MS, XRF
TiO_2	%	0.001969574	±	0.000286783	ICP-OES, ICP-MS, XRF
CaO	%	0.002148337	±	0.000793214	ICP-OES, ICP-MS, XRF
Na_2O	%	0.002596323	±	0.000776293	ICP-OES, ICP-MS, XRF
K_2O	%	0.025511741	±	0.001419010	ICP-OES, ICP-MS, XRF
MgO	%	0.005000361	±	0.000518100	ICP-OES, ICP-MS, XRF
MnO	%	0.000272745	±	0.000115770	ICP-OES, ICP-MS, XRF
P_2O_5	%	0.001883857	±	0.000320391	ICP-OES, XRF
NiO	%	0.000313829	±	0.000246816	ICP-OES, ICP-MS, XRF
PbO	%	0.001781590	±	0.001836994	ICP-OES, ICP-MS, XRF
CuO	%	0.000265256	±	0.000176475	ICP-OES, ICP-MS, XRF
CoO	%	0.000229153	±	0.000121036	ICP-OES, ICP-MS, XRF
Cr_2O_3	%	0.000228650	±	0.000176475	ICP-OES, ICP-MS, XRF
BaO	%	0.000646092	±	0.000236052	ICP-OES, ICP-MS, XRF
ZrO_2	%	0.000702546	±	0.000656333	ICP-OES, ICP-MS, XRF
SiO_2	%	99.657842231	±	0.133673999	XRF, Difference

SAMPLE C

Elem.	Unit	Certified value	±	Uncertainty	Analytical method
Al_2O_3	%	0.042796298	±	0.004207747	ICP-OES, ICP-MS, XRF
Fe_2O_3	%	0.075589514	±	0.002561053	ICP-OES, ICP-MS, XRF
TiO_2	%	0.001858133	±	0.000130206	ICP-OES, ICP-MS, XRF
CaO	%	0.014998121	±	0.000941043	ICP-OES, ICP-MS, XRF
Na_2O	%	0.006610767	±	0.000826461	ICP-OES, ICP-MS, XRF
K_2O	%	0.004416769	±	0.000700686	ICP-OES, ICP-MS, XRF
MgO	%	0.004771644	±	0.000429181	ICP-OES, ICP-MS, XRF
MnO	%	0.001469237	±	0.000083946	ICP-OES, ICP-MS, XRF
P_2O_5	%	0.001433394	±	0.000364907	ICP-OES, XRF
ZnO	%	0.000127114	±	0.000029754	ICP-OES, ICP-MS, XRF
NiO	%	0.000200115	±	0.000071803	ICP-OES, ICP-MS, XRF
PbO	%	0.001972312	±	0.002120794	ICP-OES, ICP-MS, XRF
CuO	%	0.000450518	±	0.000095448	ICP-OES, ICP-MS, XRF
CoO	%	0.000450518	±	0.000208146	ICP-OES, ICP-MS, XRF
Cr_2O_3	%	0.000112279	±	0.000048335	ICP-OES, ICP-MS, XRF
BaO	%	0.000717072	±	0.000419736	ICP-OES, ICP-MS, XRF
ZrO_2	%	0.000654040	±	0.000632590	ICP-OES, XRF
SiO_2	%	99.590957402	±	0.163156766	XRF, Difference

SAMPLE D

Elem.	Unit	Certified value	±	Uncertainty	Analytical method
Al_2O_3	%	0.226277422	±	0.011048465	ICP-OES, ICP-MS, XRF
Fe_2O_3	%	0.017954062	±	0.001574347	ICP-OES, ICP-MS, XRF
TiO_2	%	0.001913326	±	0.000264974	ICP-OES, ICP-MS, XRF
CaO	%	0.007846073	±	0.001171528	ICP-OES, ICP-MS, XRF
Na_2O	%	0.004320267	±	0.000617993	ICP-OES, ICP-MS, XRF
K_2O	%	0.030299427	±	0.001726460	ICP-OES, ICP-MS, XRF
MgO	%	0.004196157	±	0.000481178	ICP-OES, ICP-MS, XRF
MnO	%	0.000312076	±	0.000098056	ICP-OES, ICP-MS, XRF
P_2O_5	%	0.014043787	±	0.000738612	ICP-OES, XRF
PbO	%	0.002336140	±	0.000726273	ICP-OES, ICP-MS, XRF
CuO	%	0.000140635	±	0.000101509	ICP-OES, ICP-MS, XRF
Cr_2O_3	%	0.000138614	±	0.000032528	ICP-OES, ICP-MS, XRF
BaO	%	0.000675043	±	0.000401564	ICP-OES, ICP-MS, XRF
ZrO_2	%	0.000712838	±	0.000622503	ICP-OES, XRF
SiO_2	%	99.481361026	±	0.151122525	XRF, Difference