Results of Proficiency Test
Engine Oil (used)
June 2021

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: E.R. Montenij-Bos
Correctors: ing. A.S. Noordman-de Neef & ing. R.J. Starink
Report: iis21L08

September 2021

CONTENTS

1 INTRODUCTION

Since 1997 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of used Engine Oil (Lubricating Oil) in accordance with the latest version of SAE specification and ASTM D4485 every year. During the annual proficiency testing program 2020/2021 it was decided to continue the round robin for the analysis of used Engine Oil.

In this interlaboratory study 75 laboratories from 48 different countries registered for participation for the Regular round and 73 laboratories from 45 different countries registered for participation for the Metals round. In total 80 participants from 49 different countries registered for participation for one or both proficiency tests. See appendix 2 for the number of participants per country. In this report the results of the used Engine Oil proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). Sample analyzes for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory.
It was decided to send one sample used Engine Oil in a 0.5 L bottle labelled #21076 and a 50 mL PE bottle labelled #21077 especially for wear metals analyzes.
The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/IEC17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This PT falls under the accredited scope. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

For the preparation of the sample for the regular analyses in used Engine Oil a batch of approximately 140 liters of used Engine Oil was obtained from a third-party laboratory. After homogenization 150 amber glass bottles of 0.5 L were filled and labelled #21076.
The homogeneity of the subsamples was checked by determination of Density at 15°C in accordance with ISO12185 on 8 stratified randomly selected subsamples.

	Density at 15°C in kg/L
Sample #21076-1	0.89385
Sample #21076-2	0.89384
Sample #21076-3	0.89383
Sample #21076-4	0.89384
Sample #21076-5	0.89385
Sample #21076-6	0.89384
Sample #21076-7	0.89384
Sample #21076-8	0.89384

Table 1: homogeneity test results of subsamples #21076

From the above test results the repeatability was calculated and compared with 0.3 times the reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

	Density at 15°C in kg/L
r (observed)	0.00002
reference test method	ISO12185:96
0.3 x R (reference test method)	0.00015

Table 2: evaluation of the repeatability of the subsamples #21076

The calculated repeatability is in agreement with 0.3 times the reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed for sample #21076.

For the preparation of the sample for the PT Metals in used Engine Oil a batch of approximately 7.5 L of used Engine Oil was obtained from a third-party laboratory. This batch was made positive with certain wear metals. After homogenization 108 PE bottles of 50 mL were filled and labelled #21077.

The homogeneity of the subsamples was checked by determination of Aluminum and Copper in accordance with ASTM D5185 on 8 stratified randomly selected subsamples.

	Aluminum in mg/kg	Copper in mg/kg
Sample #21077-1	10.9	8.9
Sample #21077-2	11.0	8.8
Sample #21077-3	11.1	9.0
Sample #21077-4	10.8	8.9
Sample #21077-5	11.0	8.9
Sample #21077-6	10.9	8.9
Sample #21077-7	11.2	8.9
Sample #21077-8	11.0	8.9

Table 3: homogeneity test results of subsamples #21077

From the above test results the repeatabilities were calculated and compared with 0.3 times the corresponding reproducibility of the reference test method in agreement with the procedure of ISO 13528, Annex B2 in the next table.

	Aluminum in mg/kg	Copper in mg/kg
r (observed)	0.35	0.15
reference test method	ASTM D5185:18	ASTM D5185:18
0.3 x R (reference test method)	2.13	0.64

Table 4: evaluation of repeatabilities of the subsamples #21077

The calculated repeatabilities are in agreement with 0.3 times the corresponding reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed for sample #21077.

Depending on the registration of the participant the appropriate set of PT samples was sent on May 12, 2021. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of Engine Oil packed in the amber glass bottles and PE bottles was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYZES

The participants were requested to determine on sample #21076: Total Acid Number, Base Number ($HClO_4$ and HCl titration), Density at 15°C, Flash Point PMcc (procedure A and B), Fuel Dilution, Kinematic Viscosity at 40°C and 100°C, Viscosity Index, Kinematic Viscosity Houillon at 40°C and 100°C and Water. Also, some extra questions were asked about the determination of Total Acid Number.

The participants were requested to determine 23 elements on sample #21077: Al, Ba, B, Cd, Cr, Cu, Fe, Pb, Li, Mg, Mn, Mo, Ni, K, Si, Ag, Na, Sn, Ti, V, Ca, P and Zn.

It was explicitly requested to treat the samples as if they were routine samples and to report the test results using the indicated units on the report form and not to round the test results, but report as much significant figures as possible. It was also requested not to report 'less than' test results, which are above the detection limit, because such test results cannot be used for meaningful statistical evaluations.

To get comparable test results a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods (when applicable) that will be used during the evaluation. The detailed report form and the letter of instructions are both made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The participating laboratories are also requested to confirm the sample receipt on this data entry portal. The letter of instructions can also be downloaded from the iis website www.iisnl.com.

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after the deadline a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalyzes). Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the result tables in appendix 1. Test results that came after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5).
For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<…' or '>…' were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test, a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either ‘unknown’, ‘OK’, ‘suspect’ or ‘not OK’. After removal of outliers, this check was repeated. If a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.

The assigned value is determined by consensus based on the test results of the group of participants after rejection of the statistical outliers and/or suspect data.

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner’s outlier test can be used. Outliers are marked by D(0.01) for the Dixon’s test, by G(0.01) or DG(0.01) for the Grubbs’ test and by R(0.01) for the Rosner’s test. Stragglers are marked by D(0.05) for the Dixon’s test, by G(0.05) or DG(0.05) for the Grubbs’ test and by R(0.05) for the Rosner’s test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. In this PT, the criterion of ISO13528, paragraph 9.2.1. was met for all evaluated tests, therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

Finally, the reproducibilities were calculated from the standard deviations by multiplying them with a factor of 2.8.

3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported test results are plotted. The corresponding laboratory numbers are on the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected reference test method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM or ISO reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation of this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used. In some cases, a reproducibility based on former iis proficiency tests could be used, like Horwitz or an estimated reproducibility based on former iis proficiency tests.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.
The z-scores were calculated according to:

$z_{(target)}$ = (test result - average of PT) / target standard deviation

The $z_{(target)}$ scores are listed in the test result tables in appendix 1.

Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore, the usual interpretation of z-scores is as follows:

	|z|	< 1	good
1 <	|z|	< 2	satisfactory
2 <	|z|	< 3	questionable
3 <	|z|		unsatisfactory

4 EVALUATION

In this proficiency test no problems were encountered with the dispatch of the samples. When considering both rounds one participant did not report any test results and eight other participants reported the test results after the reporting deadline. Not all participants were able to report all tests requested.
In total 80 participants reported 1737 numerical test results. Observed were 68 outlying test results, which is 3.9%. In proficiency tests outlier percentages of 3% - 7.5% are quite normal.

Not all data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care, see also paragraph 3.1.

4.1 EVALUATION PER SAMPLE AND PER TEST

In this section the reported test results are discussed per sample and per test. The test methods, which were used by the various laboratories, were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the original data. The abbreviations, used in these tables, are explained in appendix 3.

In the iis PT reports ASTM test methods are referred to with a number (e.g. D2270) and an added designation for the year that the test method was adopted or revised (e.g. D2270:10). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D2270:10(2016)). In the test results tables of appendix 1 only the method number (sub) and year of adoption or revision (e.g. D2270:10) will be used.

Unfortunately, a suitable reference test method, providing the precision data, is not available for all determinations. For the tests that have no available precision data, the calculated reproducibility was compared against the reproducibility estimated from the Horwitz equation.

Sample #21076

Total Acid Number: This determination may be problematic depending on the mode of the test method used. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D664-A:18e2, BEP pH=10 and 60 mL of titration solvent used, but not in agreement with the stricter requirements of the other modes.
When evaluated separately for the type of end point the calculated reproducibility of the group using BEP is in agreement with the requirements of ASTM D664-A:18e2 at 60 mL titration solvent. But not for BEP at 125 mL. The IP at both titration volumes is still not in agreement with the requirements of ASTM D664-A:18e2.
It is observed that four participants reported to have used pH 11 for BEP. Please note that in method ASTM D664-A version 2018e2 the Buffer End Point is pH 10. Furthermore, it is remarkable that IP has been used for a used oil. Test method ASTM D664-A advises to use BEP for used oils.

Base Number ($HClO_4$): This determination was problematic. Four statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D2896:15 procedure A forward titration.
When the forward titration test results of ASTM D2896 were evaluated separately for procedure A and B the calculated reproducibilities are not in agreement with the respective requirements of procedures A or B of the ASTM D2896:15 forward titration.

Base Number (HCl): This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D4739:17.

Density at 15°C: This determination was problematic for a number of laboratories. Eight statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ISO12185:96.

Flash Point PMcc Procedure A: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D93:20, procedure A.

Flash Point PMcc Procedure B: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D93:20, procedure B.

Fuel Dilution: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D3524:14.

Kinematic Viscosity at 40°C: This determination was problematic for a number of laboratories. Six statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D445:21.

Kinematic Viscosity at 100°C: This determination was problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements of ASTM D445:21.

Viscosity Index: This determination was problematic. One statistical outlier was observed and three other test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D2270:10(2016).

Kinematic Viscosity Houillon at 40°C: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D7279:20.

Kinematic Viscosity Houillon at 100°C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D7279:20.

Water: This determination was problematic. Three statistical outliers were observed. A new version of ASTM D6304 was published in 2020 with major changes. In the 2016 version one precision statement was mentioned for test results based on mass with a broad application range and one based on volume. In the 2020 version all precision statements are based on mass with three different procedures (A - direct injection, B - oven accessory and C - evaporation accessory) each with a different application range. In ASTM D6304:20 the reproducibility for all three procedures A, B and C is much stricter compared to ASTM D6304:16e1. Therefore, it was decided not to calculate z-scores due to a large variation in the test results compared with the stricter requirements.

Sample #21077

Two participants reported deviating test results for many of the elements. It was decided to use none of the reported test results of those laboratories because the test results of the elements are not independent. Therefore, the test results that were not already statistical outliers were excluded in the statistical evaluation.

Aluminum: This determination was not problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Barium: This determination was not problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5185:18.

Boron: This determination was not problematic. Four statistical outliers were observed and two other test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Cadmium: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the estimated reproducibility calculated with the Horwitz equation.

Chromium: This determination was not problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in full agreement with the requirements of ASTM D5185:18.

Copper: This determination was problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not agreement with the requirements of ASTM D5185:18.

Iron: This determination was not problematic. No statistical outliers were observed but two test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Lead: This determination was not problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Lithium: This determination was not problematic. The majority of the participants agreed on a concentration near or below the limit of detection. Therefore, no z-scores are calculated.

Magnesium: This determination was not problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of ASTM D5185:18.

Manganese: This determination was not problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the estimated reproducibility using the Horwitz equation but not in agreement with the strict requirements of ASTM D5185:18.

Molybdenum: This determination was problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D5185:18.

Nickel: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of ASTM D5185:18.

Potassium: This determination may not be problematic. The majority of the participants agreed on a concentration near or below the limit of detection. Therefore, no z-scores are calculated.

Silicon: This determination was not problematic. Five statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Silver: This determination was problematic. Two statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D5185:18.

Sodium: This determination was problematic. No statistical outliers were observed but two test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D5185:18.

Tin: This determination was not problematic. No statistical outliers were observed but four other test result was excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of ASTM D5185:18.

Titanium: This determination was not problematic. Two statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Vanadium: This determination was problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of ASTM D5185:18.

Calcium: This determination was not problematic. No statistical outliers were observed but two test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of ASTM D5185:18.

Phosphorus: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5185:18.

Zinc: This determination was not problematic. No statistical outliers were observed but two test results were excluded. The calculated reproducibility after rejection of the suspect data is in full agreement with the requirements of ASTM D5185:18.

As used Engine Oil is a complex matrix to analyze, strict adherence to the test methods with regards to sample preparation is advised. Improper sample preparation may be the cause of disagreement of the calculated reproducibility with the requirements of the reference test method. Also, one should be aware that for each element spectral interferences may occur, and differences may occur in uptake rates between test specimen and standard solutions through viscosity effects.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method or as declared by the estimated target reproducibility calculated with the Horwitz equation and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility (2.8 * standard deviation) and the target reproducibility derived from reference test methods (in casu ASTM, ISO test methods) or estimated using the Horwitz equation are presented in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Total Acid Number	mg KOH/g	44	3.49	2.01	1.88
Base Number ($HClO_4$)	mg KOH/g	45	9.24	0.82	0.65
Base Number (HCl)	mg KOH/g	16	7.62	1.06	3.97
Density at 15°C	kg/L	48	0.8939	0.0004	0.0005
Flash Point PMcc – procedure A	°C	33	208.2	8.8	14.8
Flash Point PMcc – procedure B	°C	16	198.1	19.4	10
Fuel Dilution	%M/M	14	0.9	1.3	1.6
Kinematic Viscosity at 40°C	mm^2/s	54	115.07	1.18	2.10
Kinematic Viscosity at 100°C	mm^2/s	52	13.445	0.210	0.151
Viscosity Index		50	113.6	2.7	2
Kin.Viscosity Houillon at 40°C	mm^2/s	18	115.31	1.10	3.46
Kin. Viscosity Houillon at 100°C	mm^2/s	18	13.554	0.322	0.759
Water	mg/kg	48	391	565	(134)

Table 5: reproducibilities of tests on sample #21076

Element	unit	n	average	2.8 * sd	R(lit)
Aluminum as Al	mg/kg	61	10.2	4.5	6.9
Barium as Ba	mg/kg	51	1.8	0.6	1.0
Boron as B	mg/kg	38	2.8	2.4	13.1
Cadmium as Cd	mg/kg	40	1.8	0.9	0.7
Chromium as Cr	mg/kg	62	8.2	2.6	2.9
Copper as Cu	mg/kg	65	8.6	2.8	2.1
Iron as Fe	mg/kg	62	7.8	2.3	2.7
Lead as Pb	mg/kg	65	15.1	5.3	8.0
Lithium as Li	mg/kg	24	<1	n.e.	n.e.
Magnesium as Mg	mg/kg	59	10.2	3.9	4.3
Manganese as Mn	mg/kg	49	2.2	0.8	0.9
Molybdenum as Mo	mg/kg	50	1.7	1.4	0.9
Nickel as Ni	mg/kg	65	14.6	4.3	5.7
Potassium as K	mg/kg	46	<40	n.e.	n.e.
Silicon as Si	mg/kg	55	11.1	3.5	7.4
Silver as Ag	mg/kg	49	1.8	1.2	0.6

Element	unit	n	average	2.8 * sd	R(lit)
Sodium as Na	mg/kg	43	4.0	3.5	2.9
Tin as Sn	mg/kg	44	2.8	3.9	4.0
Titanium as Ti	mg/kg	45	1.7	1.2	3.2
Vanadium as V	mg/kg	57	1.7	0.8	0.5
Calcium as Ca	mg/kg	60	3210	475	543
Phosphorus as P	mg/kg	61	1254	236	152
Zinc as Zn	mg/kg	64	1397	230	239

Table 6: reproducibilities of tests on sample #21077

Without further statistical calculations it can be concluded that for many tests there is a good compliance of the group of participants with the reference test methods. The problematic tests have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF JUNE 2021 WITH PREVIOUS PTS

	June 2021	June 2020	June 2019	June 2018	June 2017
Number of reporting laboratories	80	69	78	75	77
Number of test results	1737	1583	1545	1689	1679
Number of statistical outliers	68	46	89	63	72
Percentage of statistical outliers	3.9%	2.9%	5.8%	3.7%	4.3%

Table 7: comparison with previous proficiency tests

In proficiency tests outlier percentages of 3% - 7.5% are quite normal.

The performance of the determinations of the proficiency tests was compared to the requirements of the reference test methods. The conclusions are given in the following table.

Determination	June 2021	June 2020	June 2019	June 2018	June 2017
Total Acid Number	+/-	+/-	+/-	-	+/-
Base Number ($HClO_4$)	-	-	--	+/-	-
Base Number (HCl)	++	++	++	++	++
Density at 15°C	+	+/-	-	+/-	+/-
Flash Point PMcc – procedure A	+	-	-	+	+
Flash Point PMcc – procedure B	--	+/-	--	--	-
Fuel Dilution	+	+/-	-	-	-
Kinematic Viscosity at 40°C	+	+	+	+	+
Kinematic Viscosity at 100°C	-	-	-	-	-
Viscosity Index	-	-	-	-	+/-
Kin. Viscosity Houillon at 40°C	++	++	++	++	+
Kin. Viscosity Houillon at 100°C	++	++	++	++	++

Determination	June 2021	June 2020	June 2019	June 2018	June 2017
Water	(--)	+	+	+	+
Wear Metals	+	+	+	+	+

Table 8: comparison determinations against the reference test method

The results mentioned between brackets must be taken with due care.

The following performance categories were used:

++	:	group performed much better than the reference test method
+	:	group performed better than the reference test method
+/-	:	group performance equals the reference test method
-	:	group performed worse than the reference test method
--	:	group performed much worse than the reference test method
n.e.	:	not evaluated

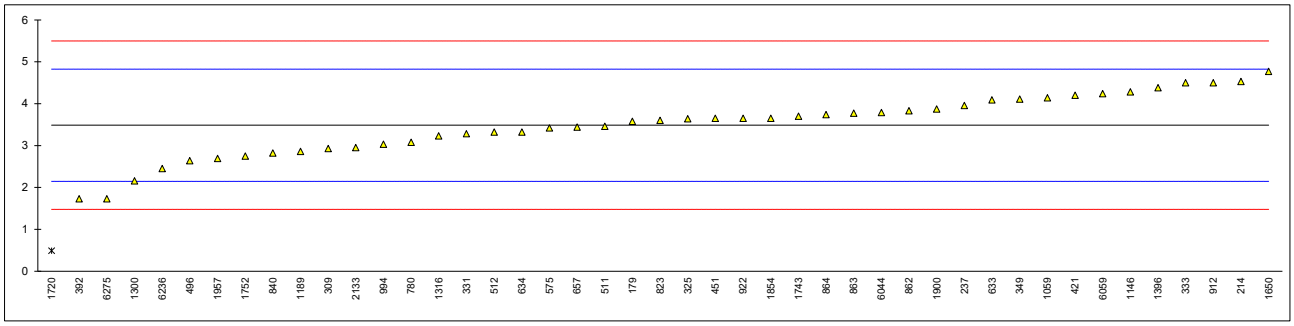
APPENDIX 1

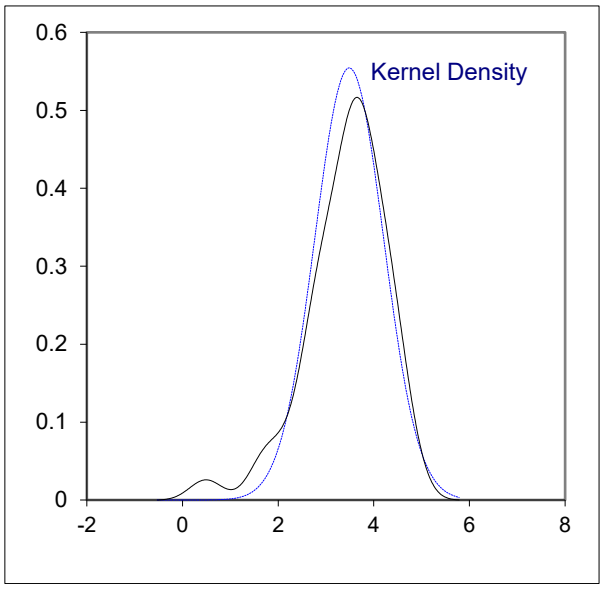
Determination of Total Acid Number on sample #21076; results in mg KOH/g

lab	method	value	mark	z(targ)	end point determination	titration volume	remarks
178		-----		-----	---	---	
179	D664-A	3.58		0.14	Inflection Point	60 mL	
211		-----		-----	---	---	
214		4.53		1.56	Inflection Point	125 mL	
225		-----		-----	---	---	
230		-----		-----	---	---	
237	D664-A	3.9547		0.70	Inflection Point	125 mL	
254		-----		-----	---	---	
257		-----		-----	---	---	
309	D664-A	2.93		-0.83	Buffer End Point (pH 10)	60 mL	
311		-----		-----	---	---	
325	D664-A	3.64		0.23	Buffer End Point (pH 11)	125 mL	
331	D664	3.28		-0.31	---	---	
333	D664-A	4.5		1.51	Buffer End Point (pH 10)	125 mL	
349	D664-A	4.11		0.93	Buffer End Point (pH 10)	60 mL	
392	INH-173	1.73		-2.62	---	---	
421	ISO6619	4.2		1.06	---	---	
451	D664-A	3.65		0.24	---	---	
496	D664-A	2.64		-1.27	Buffer End Point (pH 10)	60 mL	
511	D974	3.46		-0.04	Inflection Point	60 mL	
512	D974	3.32		-0.25	Inflection Point	60 mL	
542		-----		-----	---	---	
562		-----		-----	---	---	
575	D664-A	3.42		-0.10	Buffer End Point (pH 10)	60 mL	
614		-----		-----	---	---	
633	D664-A	4.09		0.90	---	---	
634	D664-A	3.32		-0.25	---	---	
657	D664-A	3.44		-0.07	Inflection Point	60 mL	
663		-----		-----	---	---	
780	D664-A	3.08		-0.61	Buffer End Point (pH 10)	60 mL	
823	D664-A	3.6		0.17	Inflection Point	125 mL	
840	D664-B	2.82		-1.00	Buffer End Point (pH 10)	60 mL	
862	D664-A	3.83		0.51	Inflection Point	60 mL	
863	D664-A	3.77		0.42	Inflection Point	60 mL	
864	D664-A	3.74		0.38	Inflection Point	60 mL	
875		-----		-----	---	---	
902		-----		-----	Inflection Point	60 mL	
912	D664-A	4.5		1.51	---	---	
913		-----		-----	---	---	
922	D664-A	3.65		0.24	Inflection Point	125 mL	
962		-----		-----	---	---	
963		-----		-----	---	---	
974		-----		-----	---	---	
994	D664-A	3.03		-0.68	Buffer End Point (pH 10)	125 mL	
1023		-----		-----	---	---	
1059	ISO6619	4.14		0.97	Buffer End Point (pH 11)	60 mL	
1146	D664-A	4.283		1.19	Buffer End Point (pH 10)	125 mL	
1169		-----		-----	---	---	
1173		-----		-----	---	---	
1189	D664-A	2.86		-0.94	---	---	
1213		-----		-----	---	60 mL	
1300	D664-A	2.157		-1.99	Inflection Point	60 mL	
1316	D664-A	3.23		-0.38	Buffer End Point (pH 10)	60 mL	
1396	D664-A	4.38		1.33	Inflection Point	60 mL	
1435		-----		-----	---	---	
1495		-----		-----	---	---	
1648		-----		-----	Buffer End Point (pH 10)	60 mL	
1650	D664-A	4.77		1.91	Inflection Point	125 mL	
1720	D664-A	0.49	R(0.01)	-4.48	---	---	
1743	D664-A	3.7		0.32	Buffer End Point (pH 11)	60 mL	
1752	D664-A	2.75		-1.10	Buffer End Point (pH 10)	125 mL	
1807		-----		-----	---	---	
1850		-----		-----	---	---	
1854	D664-B	3.65		0.24	Inflection Point	125 mL	
1900	D664-A	3.873		0.58	Inflection Point	---	
1957	D664-A	2.691		-1.19	Buffer End Point (pH 11)	125 mL	
1969		-----		-----	---	---	
2133	D664-A	2.95		-0.80	---	---	
6016		-----		-----	Inflection Point	60 mL	
6044	D664-A	3.789		0.45	Inflection Point	60 mL	

lab	method	value	mark	z(targ)	end point determination	titration volume	remarks
6059	D664-A	4.24		1.12	Inflection Point	125 mL	
6236	D8045	2.45		-1.55	Inflection Point	60 mL	
6275	D974	1.73		-2.62	---	---	
6307		-----		-----	---	---	
6402		-----		-----	---	---	

					BEP pH10 and pH11 only	Inflection Point only
	normality	OK			OK	suspect
	n	44			15	19
	outliers	1			1	1
	mean (n)	3.488			3.398	3.694
	st.dev. (n)	0.7195			0.6278	0.6216
	R(calc.)	2.014			1.758	1.741
	st.dev.(D664-A:18e2)	0.6698			0.6529	----
	R(D664-A:18e2)	1.875	BEP pH=10	60mL	1.828	----
Compare						
	R(D664-A:18e2)	1.175	BEP pH=10	125mL	1.143	----
	R(D664-A:18e2)	1.120	IP	60mL	----	1.174
	R(D664-A:18e2)	0.805	IP	125mL	----	0.855



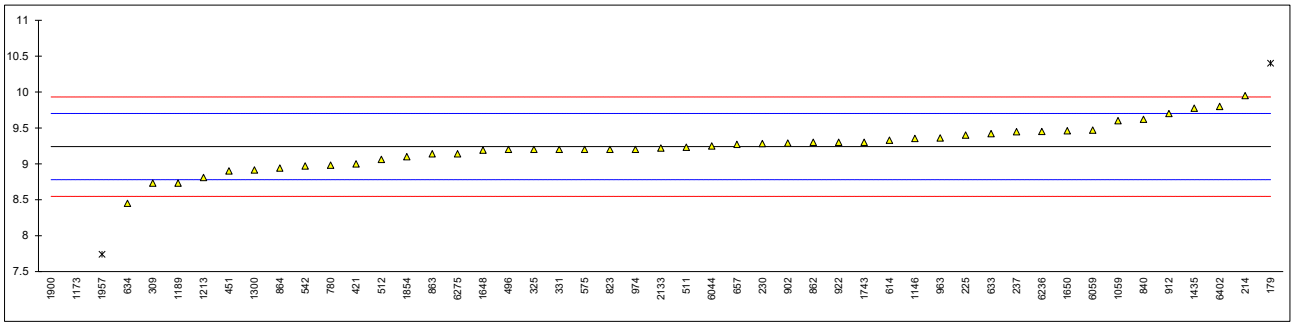


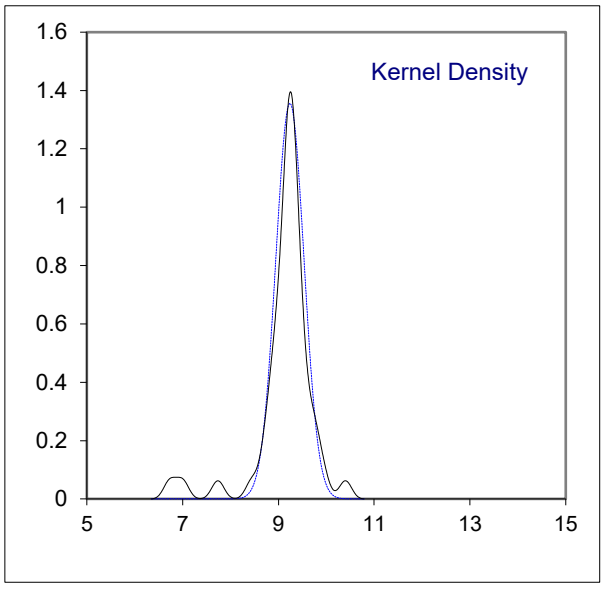
Determination of Base Number ($HClO_4$ titration) on sample #21076; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D2896-A forward	10.40	R(0.05)	5.02	
211		-----		-----	
214		9.95		3.07	
225	D2896-B back	9.4		0.69	
230	D2896-B forward	9.28		0.17	
237	D2896-A back	9.447		0.89	
254		-----		-----	
257		-----		-----	
309	D2896-A forward	8.73		-2.21	
311		-----		-----	
325	D2896-B forward	9.2		-0.18	
331	D2896	9.20		-0.18	
333		-----		-----	
349		-----		-----	
392		-----		-----	
421	ISO3771	9.0		-1.04	
451	D2896	8.9		-1.47	
496	D2896-B back	9.20		-0.18	
511		9.23		-0.05	
512		9.06		-0.78	
542	D2896-B forward	8.97		-1.17	
562		-----		-----	
575	D2896-B back	9.2		-0.18	
614	D2896-B forward	9.33		0.39	
633	D2896-A forward	9.42		0.78	
634	D2896-B forward	8.45		-3.42	
657	D2896-B back	9.27		0.13	
663		-----		-----	
780	D2896-B forward	8.98		-1.13	
823	D2896-A back	9.2		-0.18	
840	D2896-B forward	9.62		1.64	
862	D2896-B forward	9.3		0.26	
863	D2896-B	9.14		-0.44	
864	D2896-A	8.94		-1.30	
875		-----		-----	
902	D2896-B forward	9.29		0.21	
912	D2896	9.7		1.99	
913		-----		-----	
922	D2896-B forward	9.3		0.26	
962		-----		-----	
963	D2896-A forward	9.36		0.52	
974	D2896-A back	9.2		-0.18	
994		-----		-----	
1023		-----		-----	
1059	ISO3771	9.6		1.56	
1146	D2896-A back	9.354		0.49	
1169		-----		-----	
1173	In house	7.0	R(0.01)	-9.70	
1189	D2896-B forward	8.73		-2.21	
1213	D2896-B forward	8.81		-1.86	
1300	D2896-B back	8.914		-1.41	
1316		-----		-----	
1396		-----		-----	
1435	D2896-A forward	9.774		2.31	
1495		-----		-----	
1648	D2896-A back	9.19		-0.22	
1650	D2896-A forward	9.46		0.95	
1720		-----		-----	
1743	D2896-B forward	9.3		0.26	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854	D2896-A back	9.1		-0.61	
1900	In house	6.736	R(0.01)	-10.84	
1957	D2896-A back	7.738	R(0.01)	-6.50	
1969		-----		-----	
2133	D2896-B forward	9.22		-0.09	
6016		-----		-----	
6044	D2896-B forward	9.25		0.04	

lab	method	value	mark	z(targ)	remarks
6059	D2896-A forward	9.47		0.99	
6236	D2896-B forward	9.45		0.91	
6275	D2896-B forward	9.14		-0.44	
6307		-----		-----	
6402	D4739	9.8		2.42	

			Only procedure A forward	Only procedure B forward
	normality	OK	not OK	suspect
	n	45	6	17
	outliers	4	1	0
	mean (n)	9.241	9.369	9.154
	st.dev. (n)	0.2943	0.3445	0.2859
	R(calc.)	0.824	0.965	0.801
	st.dev.(D2896-A:15 forward)	0.2310	0.2342	----
	R(D2896-A:15 forward)	0.647	0.656	----
Compare				
	R(D2896-A:15) back	2.957	----	----
	R(D2896-B:15) forward	0.647	----	0.641



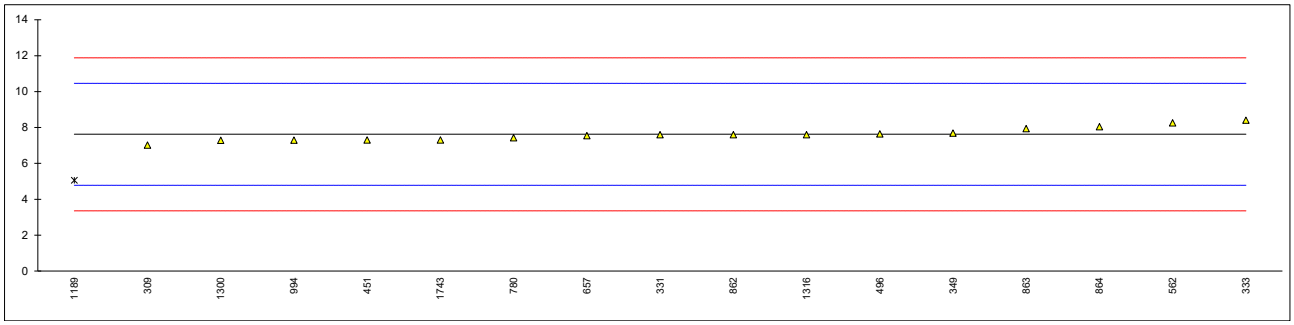


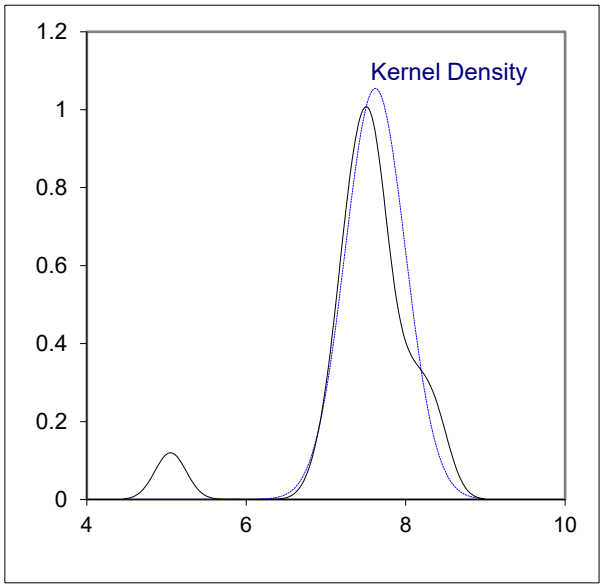
Determination of Base Number (HCl titration) on sample #21076; results in mg KOH/g

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309	D4739	7.01		-0.43	
311		-----		-----	
325		-----		-----	
331	D4739	7.60		-0.01	
333	D4739	8.4		0.55	
349	D4739	7.68		0.04	
392		-----		-----	
421		-----		-----	
451	D4739	7.3		-0.23	
496	D4739	7.64		0.01	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562	D4739	8.26144		0.45	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634		-----		-----	
657	D4739	7.54		-0.06	
663		-----		-----	
780	D4739	7.43		-0.13	
823		-----		-----	
840		-----		-----	
862	D4739	7.6		-0.01	
863	D4739	7.94		0.23	
864	D4739	8.04		0.30	
875		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963		-----		-----	
974		-----		-----	
994	D4739	7.29		-0.23	
1023		-----		-----	
1059		-----		-----	
1146		-----		-----	
1169		-----		-----	
1173		-----		-----	
1189	D4739	5.05	G(0.01)	-1.81	
1213		-----		-----	
1300	D4739	7.282		-0.24	
1316	D4739	7.6		-0.01	
1396		-----		-----	
1435		-----		-----	
1495		-----		-----	
1648		-----		-----	
1650		-----		-----	
1720		-----		-----	
1743	D4739	7.3		-0.23	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900		-----		-----	
1957		-----		-----	
1969		-----		-----	
2133		-----		-----	
6016		-----		-----	
6044		-----		-----	

lab	method	value	mark	z(targ)	remarks
6059		-----		-----	
6236		-----		-----	
6275		-----		-----	
6307		-----		-----	
6402		-----		-----	

normality	OK
n	16
outliers	1
mean (n)	7.620
st.dev. (n)	0.3783
R(calc.)	1.059
st.dev.(D4739:17)	1.4192
R(D4739:17)	3.974



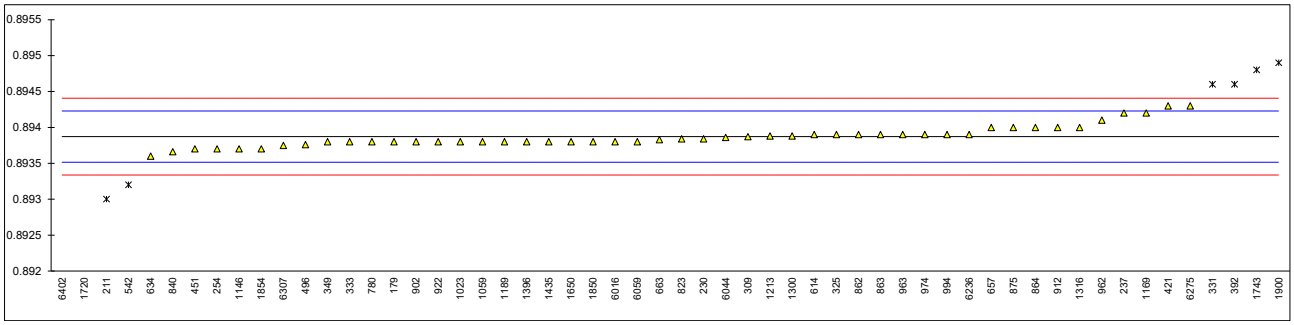


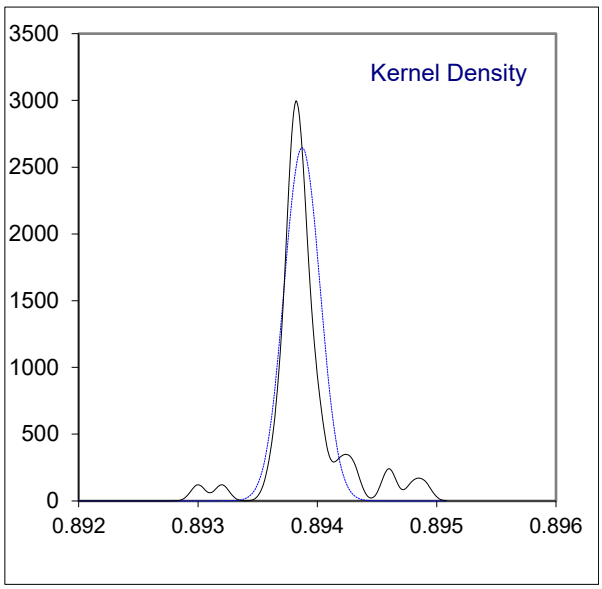
Determination of Density at 15°C on sample #21076; results in kg/L

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D4052	0.8938		-0.41	
211	D4052	0.8930	C,R(0.01)	-4.89	first reported 893.3 kg/m3
214		-----		-----	
225		-----		-----	
230	ISO12185	0.89384		-0.18	
237	D4052	0.8942		1.83	
254	D4052	0.8937		-0.97	
257		-----		-----	
309	D4052	0.89387		-0.01	
311		-----		-----	
325	D4052	0.8939		0.15	
331	ISO12185	0.89460	R(0.01)	4.07	
333	D4052	0.8938		-0.41	
349	D4052	0.8938		-0.41	
392	INH-166	0.8946	R(0.01)	4.07	
421	ISO12185	0.8943		2.39	
451	D4052	0.8937		-0.97	
496	ISO12185	0.89376		-0.63	
511		-----		-----	
512		-----		-----	
542	D4052	0.8932	R(0.01)	-3.77	
562		-----		-----	
575		-----		-----	
614	D4052	0.8939		0.15	
633		-----		-----	
634	D4052	0.8936		-1.53	
657	D4052	0.8940		0.71	
663	D4052	0.89383		-0.24	
780	ISO12185	0.8938		-0.41	
823	ISO12185	0.89384		-0.18	
840	D4052	0.89366		-1.19	
862	D4052	0.8939		0.15	
863	D4052	0.8939		0.15	
864	ISO12185	0.8940	C	0.71	reported 894.0 kg/L
875	D4052	0.8940		0.71	
902	D4052	0.8938		-0.41	
912	ISO12185	0.8940		0.71	
913		-----		-----	
922	D4052	0.8938		-0.41	
962	ISO12185	0.8941		1.27	
963	D4052	0.8939		0.15	
974	D4052	0.8939		0.15	
994	ISO12185	0.8939		0.15	
1023	D4052	0.8938		-0.41	
1059	ISO12185	0.8938		-0.41	
1146	D4052	0.8937		-0.97	
1169	D4052	0.8942		1.83	
1173		-----		-----	
1189	D4052	0.8938		-0.41	
1213	D4052	0.89388		0.04	
1300	ISO12185	0.89388		0.04	
1316	D4052	0.8940		0.71	
1396	IP365	0.8938		-0.41	
1435	D4052	0.8938		-0.41	
1495		-----		-----	
1648		-----	W	-----	test result withdrawn, first reported 878.00 kg/m3
1650	ISO12185	0.8938		-0.41	
1720	D4052	0.8892	R(0.01)	-26.17	
1743	ISO12185	0.8948	C,R(0.01)	5.19	first reported 895.0 kg/m3
1752		-----		-----	
1807		-----		-----	
1850	D4052	0.8938		-0.41	
1854	ISO12185	0.8937	C	-0.97	reported 893.7 kg/m3
1900	D4052	0.8949	R(0.01)	5.75	
1957		-----		-----	
1969		-----		-----	
2133		-----		-----	
6016	D4052	0.8938		-0.41	
6044	D4052	0.89386		-0.07	

lab	method	value	mark	z(targ)	remarks
6059	D4052	0.8938		-0.41	
6236	D4052	0.8939		0.15	
6275	D1298	0.8943		2.39	
6307	IP365	0.89375		-0.69	
6402	D5002	0.86075	R(0.01)	-185.49	

normality	not OK
n	48
outliers	8
mean (n)	0.89387
st.dev. (n)	0.000151
R(calc.)	0.00042
st.dev.(ISO12185:96)	0.000179
R(ISO12185:96)	0.0005



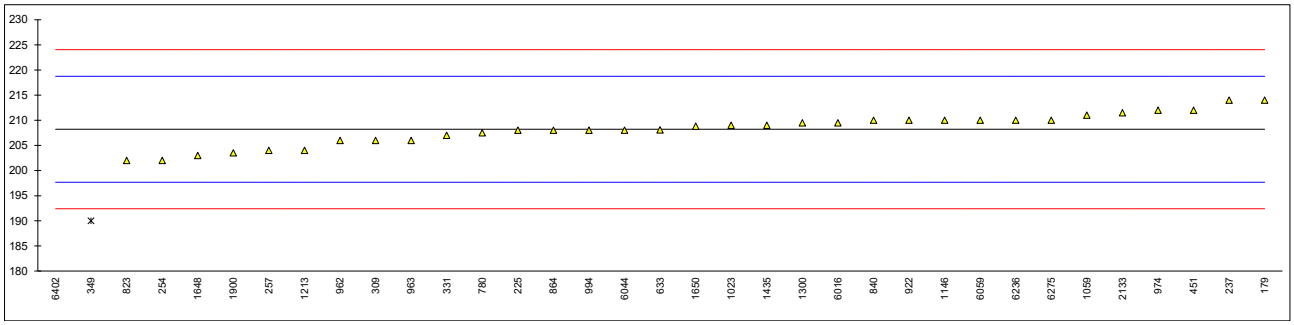


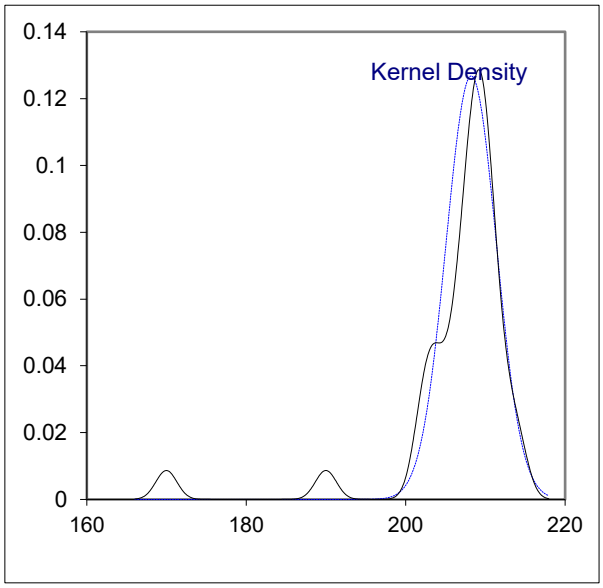
Determination of Flash Point PMcc procedure A on sample #21076; results in °C

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D93-A	214		1.09	
211		-----		-----	
214		-----		-----	
225	D93-A	208.0		-0.04	
230		-----		-----	
237	D93-A	214.0		1.09	
254	D93-A	202.0		-1.18	
257	D93-A	204		-0.80	
309	D93-A	206.0		-0.42	
311		-----		-----	
325		-----		-----	
331	D93-A	207.00		-0.23	
333		-----		-----	
349	D93-A	190	C,R(0.01)	-3.45	first reported 195
392		-----		-----	
421		-----		-----	
451	D93-A	212		0.72	
496		-----		-----	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633	D93-A	208.08		-0.03	
634		-----		-----	
657		-----		-----	
663		-----		-----	
780	D93-A	207.5		-0.14	
823	ISO2719-A	202		-1.18	
840	D3828	210.0		0.34	
862		-----		-----	
863		-----		-----	
864	D93-A	208.0		-0.04	
875		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
922	D93-A	210		0.34	
962	D93-A	206.0		-0.42	
963	D93-A	206.0		-0.42	
974	D93-A	212		0.72	
994	D93-A	208.0		-0.04	
1023	D93-A	209.0		0.15	
1059	ISO2719-A	211.0		0.53	
1146	D93-A	210.0		0.34	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1213	D93-A	204		-0.80	
1300	D93-A	209.5		0.24	
1316		-----		-----	
1396		-----		-----	
1435	D93-A	209.0		0.15	
1495		-----		-----	
1648	D93-A	203.0		-0.99	
1650	D93-A	208.8		0.11	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900	D7094	203.5		-0.89	
1957		-----		-----	
1969		-----		-----	
2133	D93-A	211.5		0.62	
6016	D93-A	209.5		0.24	
6044	D93-A	208		-0.04	

lab	method	value	mark	z(targ)	remarks
6059	D93-A	210		0.34	
6236	D93-A	210		0.34	
6275	D93-A	210		0.34	
6307		-----		-----	
6402	D93-A	170	R(0.01)	-7.24	

normality	OK
n	33
outliers	2
mean (n)	208.224
st.dev. (n)	3.1486
R(calc.)	8.816
st.dev.(D93-A:20)	5.2800
R(D93-A:20)	14.784



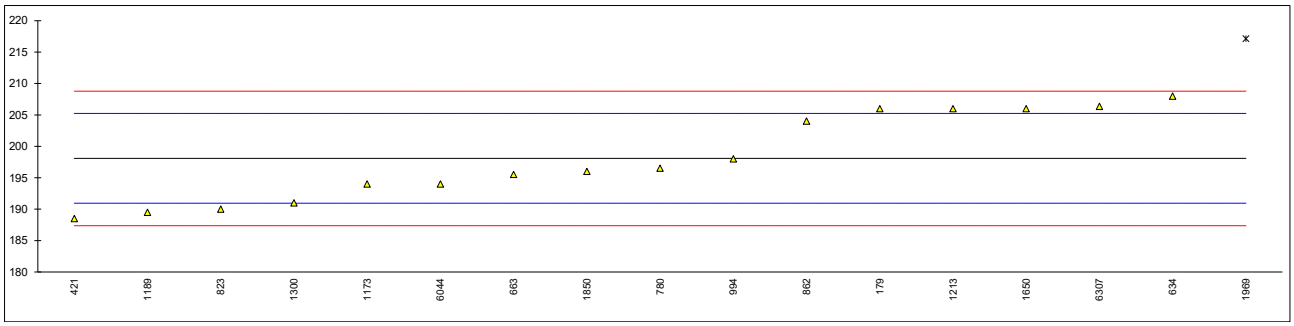


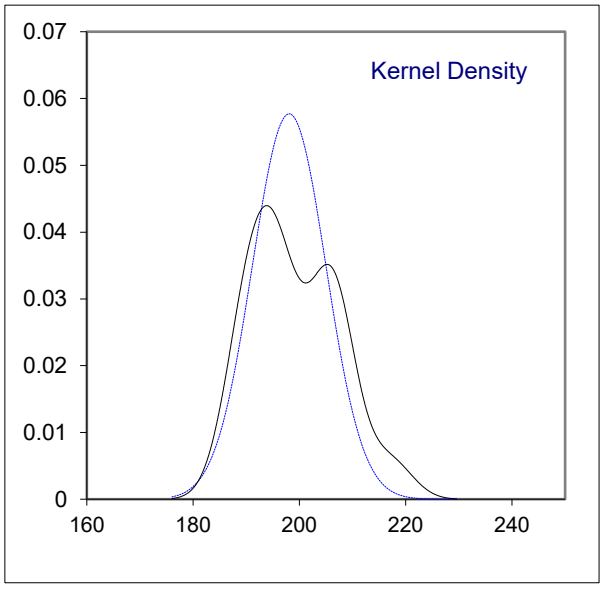
Determination of Flash Point PMcc procedure B on sample #21076; results in °C

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D93-B	206		2.22	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309		-----		-----	
311		-----		-----	
325		-----		-----	
331		-----		-----	
333		-----		-----	
349		-----		-----	
392		-----		-----	
421	ISO2719-B	188.5		-2.68	
451		-----		-----	
496		-----		-----	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634	D93-B	208.0		2.78	
657		-----		-----	
663	D93-B	195.525		-0.72	
780	D93-B	196.5		-0.44	
823	ISO2719-B	190		-2.26	
840		-----		-----	
862	D93-B	204		1.66	
863		-----		-----	
864		-----		-----	
875		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963		-----		-----	
974		-----		-----	
994	D93-B	198.0		-0.02	
1023		-----		-----	
1059		-----		-----	
1146		-----		-----	
1169		-----		-----	
1173	D93-B	194.0		-1.14	
1189	D93-B	189.5		-2.40	
1213	D93-B	206		2.22	
1300	D93-B	191		-1.98	
1316		-----		-----	
1396		-----		-----	
1435		-----		-----	
1495		-----		-----	
1648		-----		-----	
1650	D93-B	206.0		2.22	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1807		-----		-----	
1850	ISO2719-B	196		-0.58	
1854		-----		-----	
1900		-----		-----	
1957		-----		-----	
1969	ISO2719-B	217.125	G(0.05)	5.33	
2133		-----		-----	
6016		-----		-----	
6044	D93-B	194		-1.14	

lab	method	value	mark	z(targ)	remarks
6059		-----		-----	
6236		-----		-----	
6275		-----		-----	
6307	IP523-B	206.35		2.31	
6402		-----		-----	

normality	OK
n	16
outliers	1
mean (n)	198.086
st.dev. (n)	6.9161
R(calc.)	19.365
st.dev.(D93-B:20)	3.5714
R(D93-B:20)	10



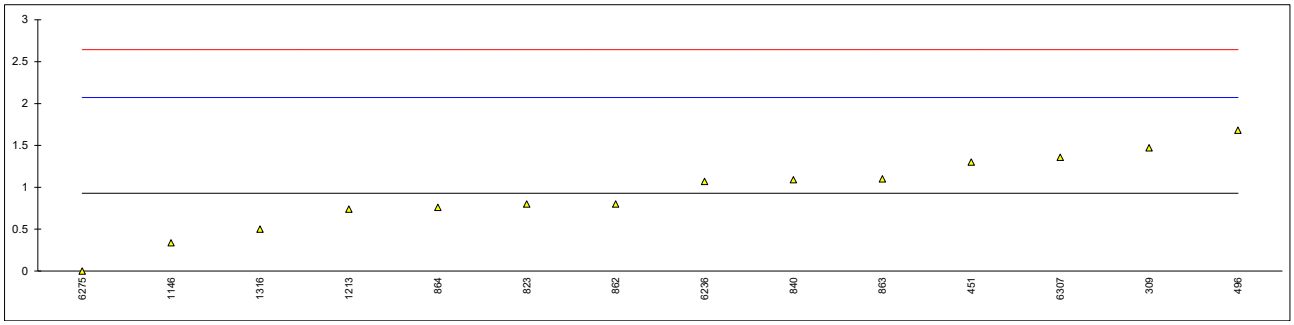


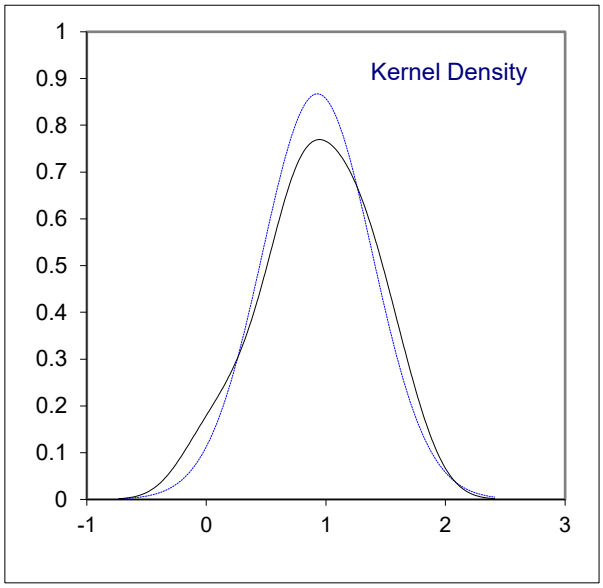
Determination of Fuel Dilution on sample #21076; results in %M/M

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309	D3524	1.47		0.95	
311		-----		-----	
325	D3524	<0.1		-----	
331	INH	<0.4		-----	
333		-----		-----	
349	D3524	<0,1		-----	
392		-----		-----	
421		-----		-----	
451	D3524	1.3		0.65	
496	DIN51454	1.68		1.31	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634		-----		-----	
657		-----		-----	
663		-----		-----	
780		-----		-----	
823	D3524	0.8		-0.23	
840	D3524	1.09		0.28	
862	D3524	0.8		-0.23	
863	D3524	1.1		0.30	
864	D3524	0.76		-0.30	
875		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963		-----		-----	
974		-----		-----	
994		-----		-----	
1023		-----		-----	
1059		-----		-----	
1146	D3524	0.3362		-1.04	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1213	D3524	0.74		-0.33	
1300		-----		-----	
1316	D3524	0.5		-0.75	
1396		-----		-----	
1435		-----		-----	
1495		-----		-----	
1648		-----		-----	
1650		-----		-----	
1720		-----		-----	
1743		-----		-----	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900		-----		-----	
1957		-----		-----	
1969		-----		-----	
2133		-----		-----	
6016		-----		-----	
6044		-----		-----	

lab	method	value	mark	z(targ)	remarks
6059		-----		-----	
6236	D7593	1.07		0.25	
6275	D322	0		-1.63	
6307	D7593	1.358		0.75	
6402		-----		-----	

normality	OK
n	14
outliers	0
mean (n)	0.929
st.dev. (n)	0.4599
R(calc.)	1.288
st.dev.(D3524:14)	0.5714
R(D3524:14)	1.6



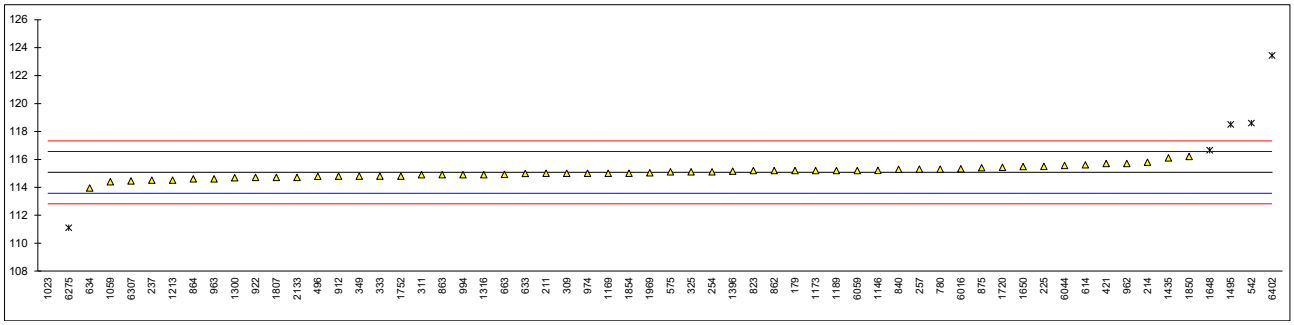


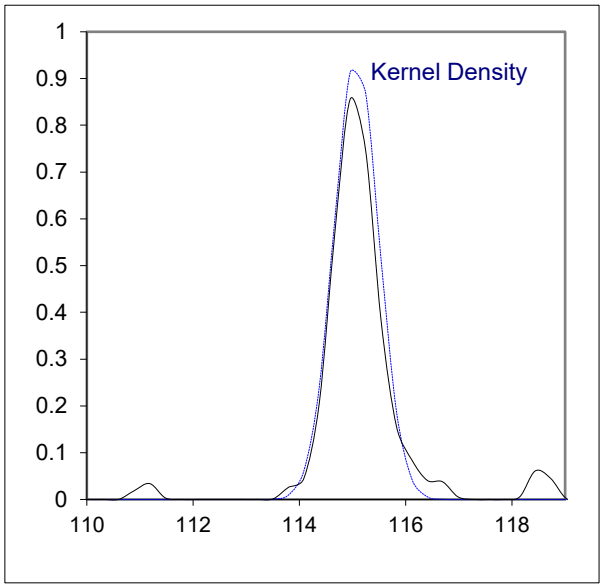
Determination of Kinematic Viscosity at 40°C on sample #21076; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D445	115.20		0.17	
211	D445	115.0		-0.09	
214	D7042	115.79		0.96	
225	D445	115.5		0.57	
230		-----		-----	
237	D445	114.5	C	-0.76	first reported 113.1
254	D445	115.1		0.04	
257	D7279 corrected to D445	115.3		0.30	
309	D445	115.0		-0.09	
311	D445	114.9		-0.23	
325	D445	115.1		0.04	
331		-----		-----	
333	D445	114.8		-0.36	
349	D445	114.8		-0.36	
392		-----		-----	
421	ISO3104	115.7		0.84	
451		-----		-----	
496	D445	114.79		-0.37	
511		-----		-----	
512		-----		-----	
542	D7042	118.60	R(0.01)	4.70	
562		-----		-----	
575	D445	115.1		0.04	
614	D7042	115.6		0.70	
633	D445	114.99		-0.11	
634	D445	113.95		-1.49	
657		-----		-----	
663	D445	114.92		-0.20	
780	D445	115.3		0.30	
823	D445	115.2		0.17	
840	D7042	115.29		0.29	
862	D445	115.2		0.17	
863	D445	114.9		-0.23	
864	D445	114.6		-0.63	
875	D445	115.4		0.44	
902		-----		-----	
912	D445	114.8		-0.36	
913		-----		-----	
922	D445	114.7		-0.49	
962	D445	115.7		0.84	
963	D445	114.6		-0.63	
974	D445	115.0		-0.09	
994	D445	114.9		-0.23	
1023	D445	50.5	R(0.01)	-85.99	
1059	ISO3104	114.4		-0.89	
1146	D445	115.21		0.18	
1169	D445	115.0		-0.09	
1173	D445	115.2		0.17	
1189	D445	115.2		0.17	
1213	D445	114.5		-0.76	
1300	D445	114.68		-0.52	
1316	ISO3104	114.9		-0.23	
1396	IP71	115.14945		0.10	
1435	D7042	116.1		1.37	
1495	ISO3104	118.5	R(0.01)	4.57	
1648	D445	116.65	R(0.05)	2.10	
1650	D445	115.484		0.55	
1720	D445	115.43		0.48	
1743		-----		-----	
1752	D7279 corrected to D445	114.8		-0.36	
1807	D445	114.7		-0.49	
1850	ISO3104	116.2		1.50	
1854	ISO3104	115.0		-0.09	
1900		-----		-----	
1957		-----		-----	
1969	ISO3104	115.0379		-0.04	
2133	D445	114.70	C	-0.49	first reported as KV 100°C
6016	D7042	115.320		0.33	
6044	D7042	115.56		0.65	

lab	method	value	mark	z(targ)	remarks
6059	D445	115.20		0.17	
6236		-----		-----	
6275	D445	111.1	C,R(0.01)	-5.29	first reported 112.1
6307	IP71	114.45		-0.83	
6402	D445	123.4333	R(0.01)	11.14	

normality	OK
n	54
outliers	6
mean (n)	115.071
st.dev. (n)	0.4210
R(calc.)	1.179
st.dev.(D445:21)	0.7510
R(D445:21)	2.103



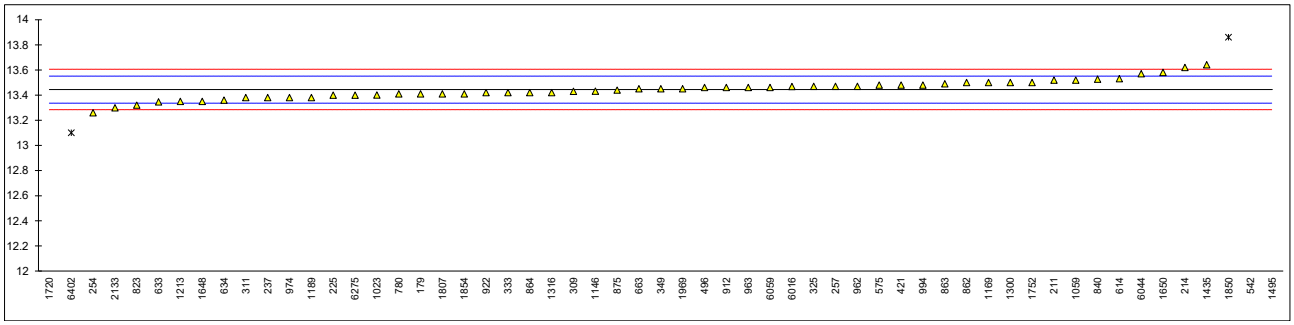


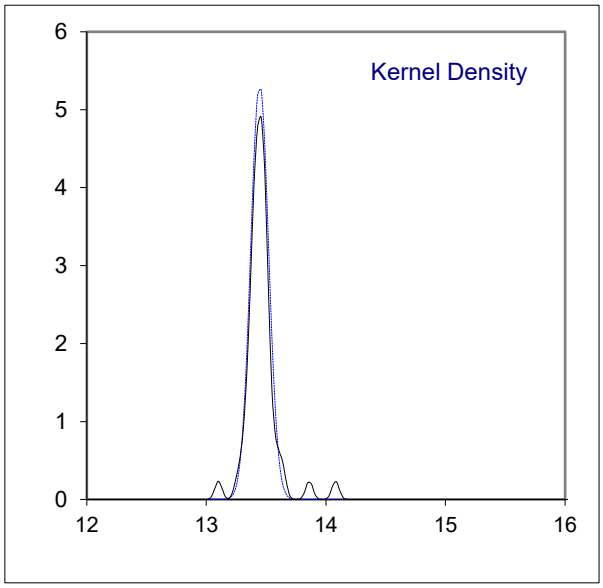
Determination of Kinematic Viscosity at 100°C on sample #21076; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D445	13.41		-0.65	
211	D445	13.52		1.40	
214	D7042	13.62		3.25	
225	D445	13.40		-0.83	
230		-----		-----	
237	D445	13.38		-1.21	
254	D445	13.26		-3.44	
257	D7279 corrected to D445	13.47		0.47	
309	D445	13.43		-0.28	
311	D445	13.38		-1.21	
325	D445	13.47		0.47	
331		-----		-----	
333	D445	13.42		-0.46	
349	D445	13.45		0.09	
392		-----		-----	
421	ISO3104	13.48		0.65	
451		-----		-----	
496	D445	13.460		0.28	
511		-----		-----	
512		-----		-----	
542	D7042	14.079	R(0.01)	11.79	
562		-----		-----	
575	D445	13.48		0.65	
614	D7042	13.53		1.58	
633	D445	13.346		-1.84	
634	D445	13.36	C	-1.58	first reported 13.095
657		-----		-----	
663	D445	13.450		0.09	
780	D445	13.41		-0.65	
823	ISO3104	13.32		-2.32	
840	D7042	13.527		1.53	
862	D445	13.50		1.02	
863	D445	13.49		0.84	
864	D445	13.42		-0.46	
875	D445	13.44		-0.09	
902		-----		-----	
912	D445	13.46		0.28	
913		-----		-----	
922	D445	13.42		-0.46	
962	D445	13.47	C	0.47	first reported 13.8
963	D445	13.46		0.28	
974	D445	13.38		-1.21	
994	D445	13.48		0.65	
1023	D445	13.401		-0.82	
1059	ISO3104	13.52		1.40	
1146	D445	13.431		-0.26	
1169	D445	13.5		1.02	
1173		-----		-----	
1189	D445	13.38		-1.21	
1213	D445	13.35		-1.76	
1300	D445	13.50		1.02	
1316	ISO3104	13.42		-0.46	
1396		-----		-----	
1435	D7042	13.641		3.65	
1495	ISO3104	19	R(0.01)	103.27	
1648	D445	13.350		-1.76	
1650	D445	13.5795		2.50	
1720	D445	11.54	R(0.01)	-35.41	
1743		-----		-----	
1752	D7279 corrected to D445	13.5		1.02	
1807	D445	13.41		-0.65	
1850	ISO3104	13.86	R(0.01)	7.72	
1854	ISO3104	13.41		-0.65	
1900		-----		-----	
1957		-----		-----	
1969	ISO3104	13.4504		0.10	
2133	D445	13.30	C	-2.69	first reported as KV 40°C
6016	D7042	13.469		0.45	
6044	D7042	13.57		2.33	

lab	method	value	mark	z(targ)	remarks
6059	D445	13.46		0.28	
6236		-----		-----	
6275	D445	13.40		-0.83	
6307		-----		-----	
6402	D445	13.1	R(0.01)	-6.41	

normality	OK
n	52
outliers	5
mean (n)	13.445
st.dev. (n)	0.0749
R(calc.)	0.210
st.dev.(D445:21)	0.0538
R(D445:21)	0.151



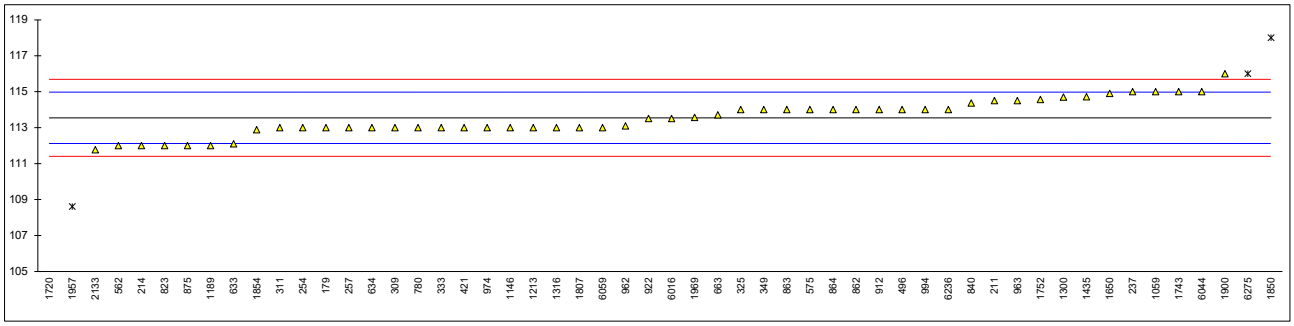


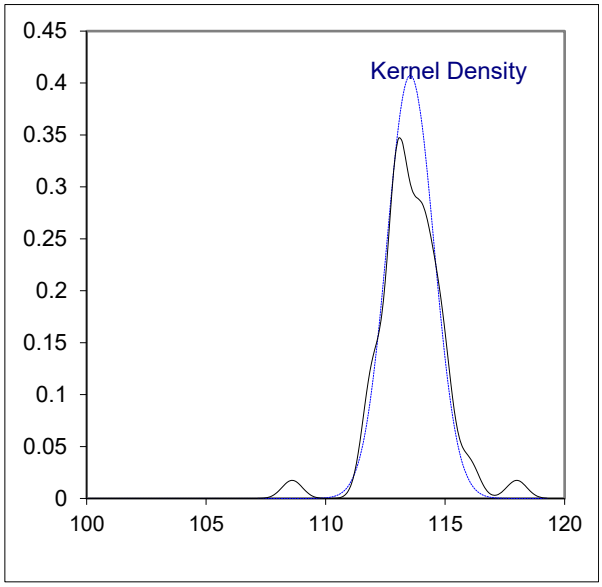
Determination of Viscosity Index on sample #21076

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D2270	113		-0.77	
211	D2270	114.5		1.33	
214		112	E	-2.17	calculated difference, iis calculated 115.11
225		-----		-----	
230		-----		-----	
237	D2270	115	E	2.03	calculated difference, iis calculated 113.17
254	D2270	113	C,E	-0.77	first reported 111, calculated difference, iis calculated 110.71
257	D2270	113		-0.77	
309	D2270	113		-0.77	
311	D2270	113		-0.77	
325	D2270	114		0.63	
331		-----		-----	
333	D2270	113		-0.77	
349	D2270	114		0.63	
392		-----		-----	
421	ISO2909	113		-0.77	
451		-----		-----	
496	D2270	114.0		0.63	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562	D2270	112		-2.17	
575	D2270	114		0.63	
614		-----		-----	
633	D2270	112.10		-2.03	
634	D2270	113	C	-0.77	first reported 110
657		-----		-----	
663	D2270	113.71		0.23	
780	D2270	113		-0.77	
823	D2270	112	C	-2.17	first reported 111
840	D2270	114.37		1.15	
862	D2270	114		0.63	
863	D2270	114		0.63	
864	D2270	114		0.63	
875	D2270	112	E	-2.17	calculated difference, iis calculated 112.99
902		-----		-----	
912	D2270	114		0.63	
913		-----		-----	
922	D2270	113.5		-0.07	
962	D2270	113.1	C	-0.63	first reported 117.8
963	D2270	114.5		1.33	
974	D2270	113		-0.77	
994	D2270	114		0.63	
1023		-----		-----	
1059	ISO2909	115		2.03	
1146	D2270	113		-0.77	
1169		-----		-----	
1173		-----		-----	
1189	D2270	112		-2.17	
1213	D2270	113		-0.77	
1300	D2270	114.7		1.61	
1316	D2270	113		-0.77	
1396		-----		-----	
1435	D2270	114.71		1.63	
1495		-----		-----	
1648		-----	W	-----	test result withdrawn, reported 110.18
1650	D2270	114.9		1.89	
1720	D2270	84.53	ex	-40.62	excluded, outlier at KV 100
1743	ISO2909	115		2.03	
1752	D2270	114.562		1.42	
1807	D2270	113		-0.77	
1850	ISO2909	118	ex	6.23	excluded, outlier at KV 100
1854	D2270	112.88		-0.93	
1900	D7279	116		3.43	
1957	D2270	108.6	R(0.01)	-6.93	
1969	ISO2909	113.56		0.02	
2133	D2270	111.766		-2.49	
6016	D2270	113.5		-0.07	
6044	D2270	115		2.03	

lab	method	value	Mark	z(targ)	remarks
6059	D2270	113		-0.77	
6236	D2270	114		0.63	
6275	D2270	116	ex, E	3.43	excluded, outlier at KV 40. Calculated diff., iis calculated 117.62
6307		-----		-----	
6402		-----		-----	

normality	OK
n	50
outliers	1 (+3ex)
mean (n)	113.55
st.dev. (n)	0.979
R(calc.)	2.74
st.dev.(D2270:10)	0.714
R(D2270:10)	2



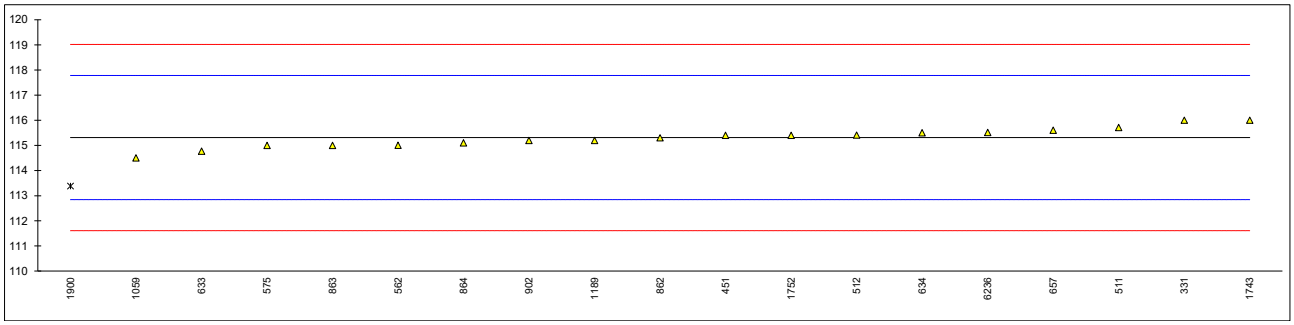


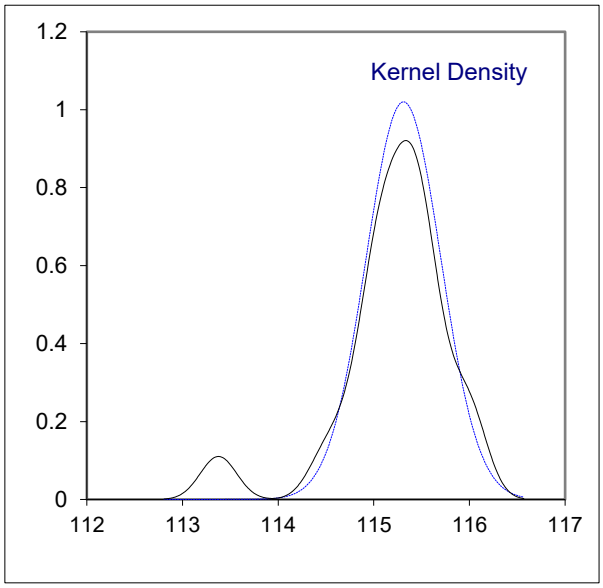
Determination of Kinematic Viscosity Houillon at 40°C on sample #21076; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309		-----		-----	
311		-----		-----	
325		-----		-----	
331	D7279	116.00		0.56	
333		-----		-----	
349		-----		-----	
392		-----		-----	
421		-----		-----	
451	D7279	115.4		0.07	
496		-----		-----	
511	D7279	115.71		0.32	
512	D7279	115.41		0.08	
542		-----		-----	
562	D7279	115.0036		-0.25	
575	D7279	115.0		-0.25	
614		-----		-----	
633	D7279	114.77		-0.44	
634	D7279	115.5		0.15	
657	D7279	115.6		0.23	
663		-----		-----	
780		-----		-----	
823		-----		-----	
840		-----		-----	
862	D7279	115.3		-0.01	
863	D7279	115.0		-0.25	
864	D7279	115.1		-0.17	
875		-----		-----	
902	D7279	115.2		-0.09	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963		-----		-----	
974		-----		-----	
994		-----		-----	
1023		-----		-----	
1059	D7279	114.5		-0.66	
1146		-----		-----	
1169		-----		-----	
1173		-----		-----	
1189	D7279	115.2		-0.09	
1213		-----		-----	
1300		-----		-----	
1316		-----		-----	
1396		-----		-----	
1435		-----		-----	
1495		-----		-----	
1648		-----		-----	
1650		-----		-----	
1720		-----		-----	
1743	D7279	116.0		0.56	
1752	D7279	115.4		0.07	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900	D7279	113.377	C,G(0.01)	-1.57	first reported 133.377
1957		-----		-----	
1969		-----		-----	
2133		-----		-----	
6016		-----		-----	
6044		-----		-----	

lab	method	value	mark	z(targ)	remarks
6059		-----		-----	
6236	D7279	115.51		0.16	
6275		-----		-----	
6307		-----		-----	
6402		-----		-----	

normality	OK
n	18
outliers	1
mean (n)	115.311
st.dev. (n)	0.3911
R(calc.)	1.095
st.dev.(D7279:20)	1.2355
R(D7279:20)	3.459



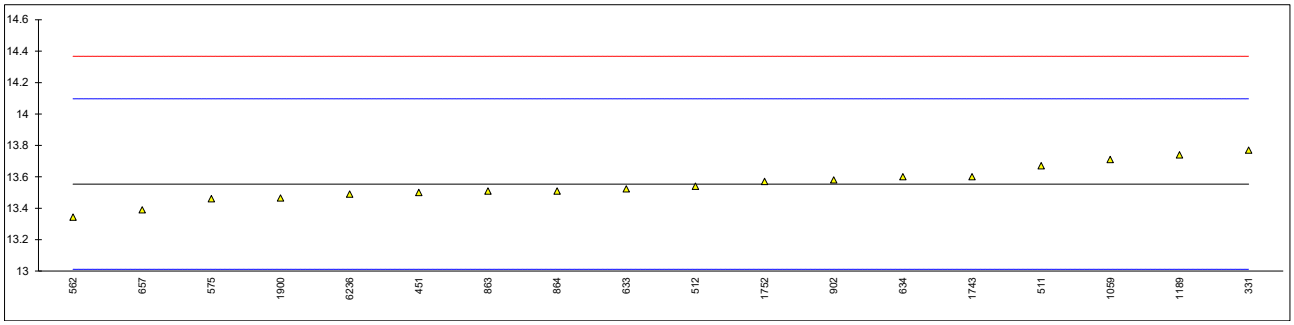


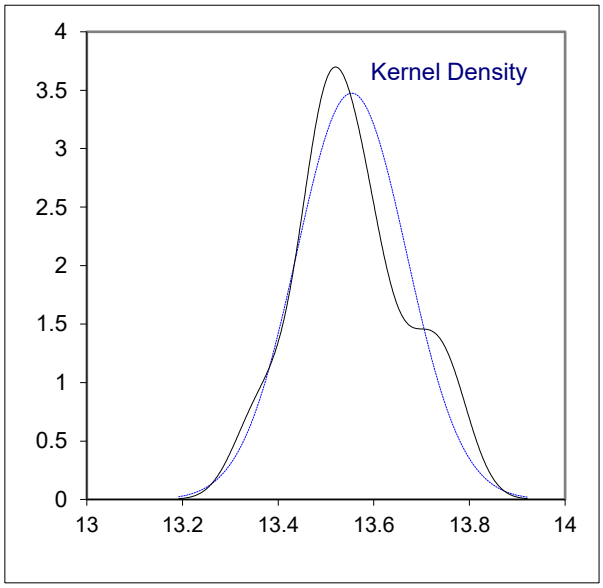
Determination of Kinematic Viscosity Houillon at 100°C on sample #21076; results in mm^2/s

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309		-----		-----	
311		-----		-----	
325		-----		-----	
331	D7279	13.77		0.80	
333		-----		-----	
349		-----		-----	
392		-----		-----	
421		-----		-----	
451	D7279	13.50		-0.20	
496		-----		-----	
511	D7279	13.67		0.43	
512	D7279	13.54		-0.05	
542		-----		-----	
562	D7279	13.3436		-0.78	
575	D7279	13.46		-0.35	
614		-----		-----	
633	D7279	13.523		-0.11	
634	D7279	13.60		0.17	
657	D7279	13.39		-0.60	
663		-----		-----	
780		-----		-----	
823		-----		-----	
840		-----		-----	
862		-----		-----	
863	D7279	13.51		-0.16	
864	D7279	13.51		-0.16	
875		-----		-----	
902	D7279	13.58		0.10	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963		-----		-----	
974		-----		-----	
994		-----		-----	
1023		-----		-----	
1059	D7279	13.71		0.58	
1146		-----		-----	
1169		-----		-----	
1173		-----		-----	
1189	D7279	13.74		0.69	
1213		-----		-----	
1300		-----		-----	
1316		-----		-----	
1396		-----		-----	
1435		-----		-----	
1495		-----		-----	
1648		-----		-----	
1650		-----		-----	
1720		-----		-----	
1743	D7279	13.60		0.17	
1752	D7279	13.57		0.06	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900	D7279	13.4649		-0.33	
1957		-----		-----	
1969		-----		-----	
2133		-----		-----	
6016		-----		-----	
6044		-----		-----	

lab	method	value	mark	z(targ)	remarks
6059		-----		-----	
6236	D7279	13.49		-0.24	
6275		-----		-----	
6307		-----		-----	
6402		-----		-----	

normality	OK
n	18
outliers	0
mean (n)	13.5540
st.dev. (n)	0.11484
R(calc.)	0.3215
st.dev.(D7279:20)	0.27108
R(D7279:20)	0.7590

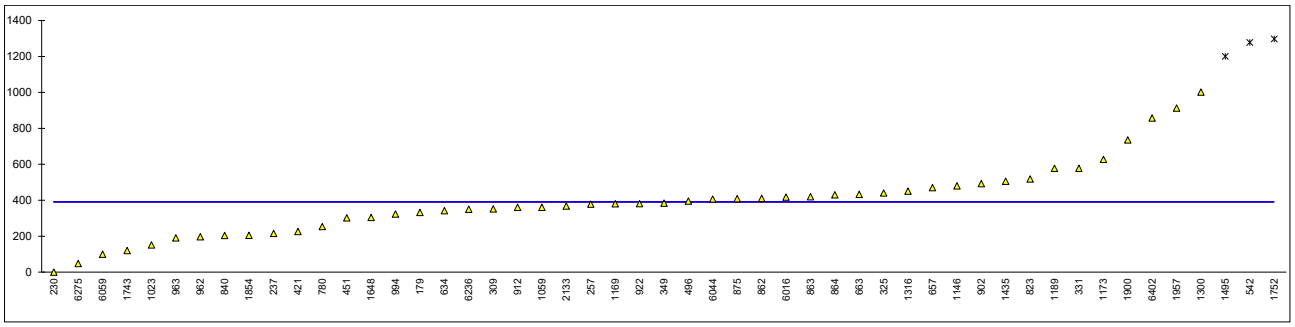


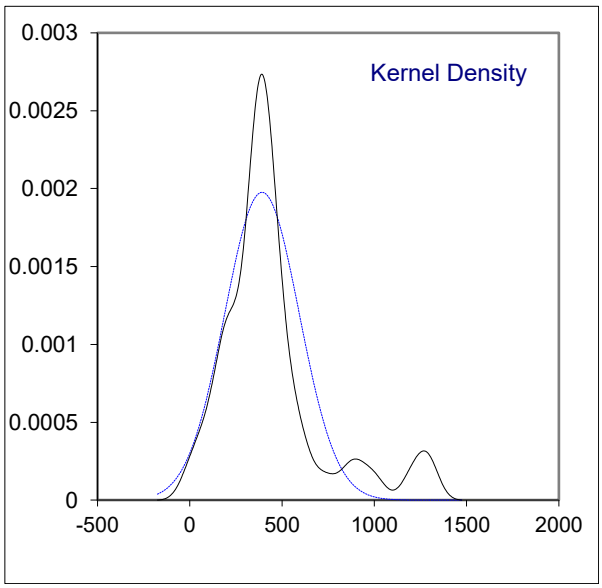


Determination of Water on sample #21076; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179	D6304-C	332		-----	
211		-----		-----	
214		-----		-----	
225		-----		-----	
230	INH-13	0.00		-----	
237	D6304-C	215		-----	
254		-----		-----	
257	D6304-A	378		-----	
309	D6304-C	351		-----	
311		-----		-----	
325	D6304-C	440		-----	
331	INH	578.00		-----	
333		-----		-----	
349	D6304-C	383		-----	
392		-----		-----	
421	D6304-C	226		-----	
451	D6304-B	301		-----	
496	D6304-C	395		-----	
511		-----		-----	
512		-----		-----	
542	D6304-A	1277.3	R(0.05)	-----	
562		-----		-----	
575		-----		-----	
614		-----		-----	
633		-----		-----	
634	D6304-A	342		-----	
657	D6304-C	469.5		-----	
663	D6304-B	432.6		-----	
780	D6304-B	253		-----	
823	D6304-C	518		-----	
840	D6304-B	204.2		-----	
862	D6304-B	410		-----	
863	D6304-B	419		-----	
864	D6304-B	429.8		-----	
875	D6304	409		-----	
902	D6304-C	492.5		-----	
912	D6304	360		-----	
913		-----		-----	
922	D6304-A	381		-----	
962	D6304-C	196		-----	
963	D6304-C	190		-----	
974		-----		-----	
994	D6304-C	323		-----	
1023	D6304-A	151.2		-----	
1059	D6304-B	360		-----	
1146	D6304-C	480		-----	
1169	D6304-A	380		-----	
1173	D5984 Mod	626.8		-----	
1189	D6304-C	577		-----	
1213		-----		-----	
1300	D6304-A	1001.4		-----	
1316	D6304-B	450		-----	
1396	IP74	<500		-----	
1435	D6304-A	505		-----	
1495	E203	1200	R(0.05)	-----	
1648	D6304-C	303.7		-----	
1650		-----		-----	
1720		-----		-----	
1743	in house	120		-----	
1752	D6304-A	1297.6	R(0.05)	-----	
1807		-----		-----	
1850		-----		-----	
1854	D6304-C	205		-----	
1900	D6304-C	735		-----	
1957	D6304-C	911.9		-----	
1969		-----		-----	
2133	D6304-B	367		-----	
6016	D6304-A	417		-----	
6044	D6304-C	406		-----	

lab	method	value	mark	z(targ)	remarks
6059	D6304-A	100		-----	
6236	D6304-A	349.0		-----	
6275	D6304-A	47		-----	
6307		-----		-----	
6402	D1533	857.2		-----	
	normality	suspect			
	n	48			
	outliers	3			
	mean (n)	391.22			
	st.dev. (n)	201.818			
	R(calc.)	565.09			
	st.dev.(D6304-C:20)	(47.86)			
	R(D6304-C:20)	(134.01)			range 20 - 360 mg/kg
Compare					
	R(D6304-A:20)	(157.57)			range 20 - 25000 mg/kg
	R(D6304-B:20)	(271.96)			range 30 - 2100 mg/kg
	R(D6304:16e1)	(606.92)			

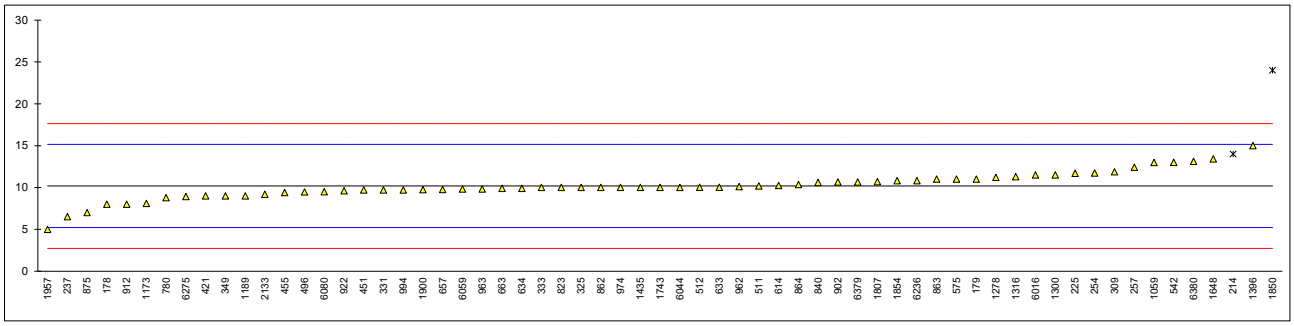


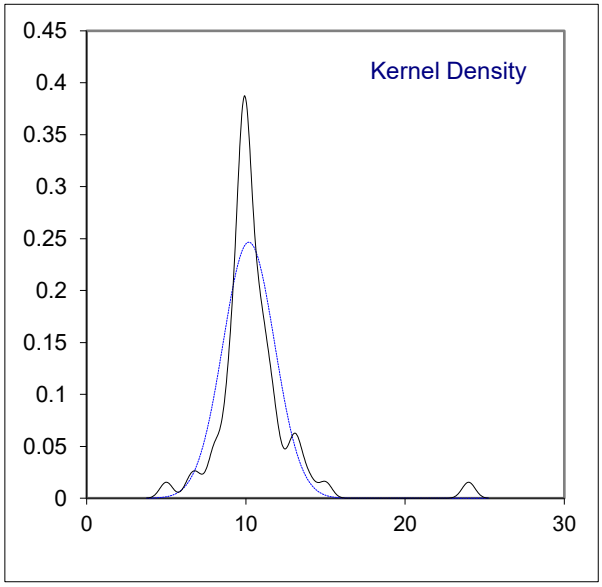


Determination of Aluminum as Al on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	8		-0.88	
179	D5185	11		0.33	
214	D5185	14	ex	1.54	test result excluded, see § 4.1
225	D6595	11.7		0.61	
230		-----		-----	
237	D5185	6.512		-1.48	
254	D5185	11.725		0.62	
257	D6595	12.42		0.90	
309	D5185	11.88		0.68	
311		-----		-----	
325	D5185	10		-0.08	
331	D5185	9.7		-0.20	
333	D5185	10		-0.08	
349		9		-0.48	
392		-----		-----	
421	D5185	9.0		-0.48	
451	D5185	9.7		-0.20	
455	D5185	9.383		-0.32	
496	D5185	9.466		-0.29	
511	D5185	10.18		0.00	
512	D5185	10.02		-0.07	
542	D6595	13.01		1.14	
562		-----		-----	
575	D6595	11		0.33	
614	D5185	10.24		0.02	
633	D6595	10.02		-0.07	
634	D6595	9.9		-0.12	
657	D5185	9.76		-0.17	
663	D5185	9.8925		-0.12	
780	D5185	8.8		-0.56	
823	D5185	10		-0.08	
840	D5185	10.6		0.17	
862	D5185	10		-0.08	
863	D5185	11.0		0.33	
864	D5185	10.35		0.07	
875	D5185	6.99		-1.29	
902	D5185	10.66		0.19	
912	D5185	8		-0.88	
913		-----		-----	
922	D5185	9.6		-0.24	
962	D5185	10.1		-0.03	
963	D5185	9.83		-0.14	
974	D5185	10		-0.08	
994	D5185	9.7		-0.20	
1059	In house	13		1.13	
1146	D5185	<2		<3.30	Possibly a false negative test result?
1169		-----		-----	
1173	In house	8.11		-0.84	
1189	D5185	9		-0.48	
1278	D5185	11.2		0.41	
1300	D5185	11.5		0.53	
1316	D5185	11.3		0.45	
1396	In house	15		1.94	
1435	D5185	10		-0.08	
1495		-----		-----	
1648	D5185	13.41		1.30	
1743	D5185	10		-0.08	
1752		-----		-----	
1807	D5185	10.7		0.21	
1850	In house	24	R(0.01)	5.57	
1854	D5185	10.8		0.25	
1900	D5185	9.736		-0.18	
1957	D5185	5		-2.09	
2133	D5185	9.186		-0.40	
6016	D6595	11.493		0.53	
6044	D5185	10		-0.08	
6059	D5185	9.8		-0.16	
6080	D5185	9.5		-0.28	
6236	D5185	10.8		0.25	
6275	D5185	8.92		-0.51	

lab	method	value	mark	z(targ)	remarks
6379	D5185	10.66		0.19	
6380	D5185	13.119		1.18	
	normality	not OK			
	n	61			
	outliers	1 (+1ex)			
	mean (n)	10.186			
	st.dev. (n)	1.6177			
	R(calc.)	4.530			
	st.dev.(D5185:18)	2.4815			
	R(D5185:18)	6.948			application range: 6 – 40 mg/kg





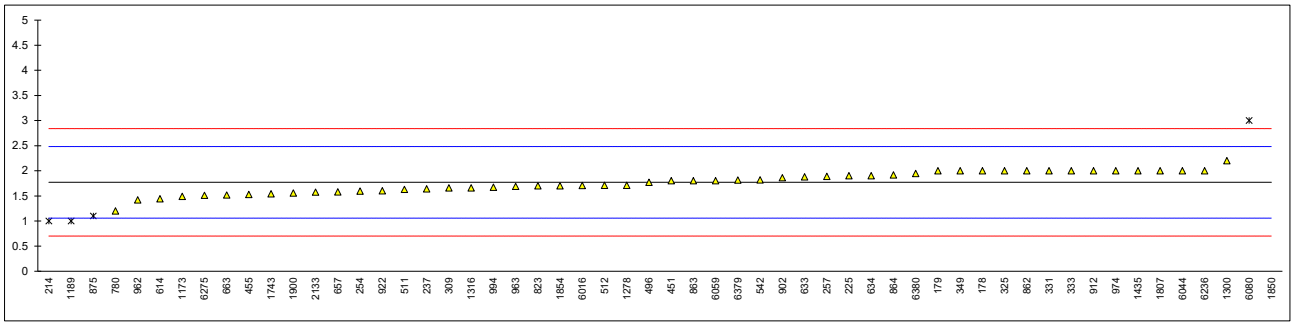
Determination of Barium as Ba on sample #21077; results in mg/kg

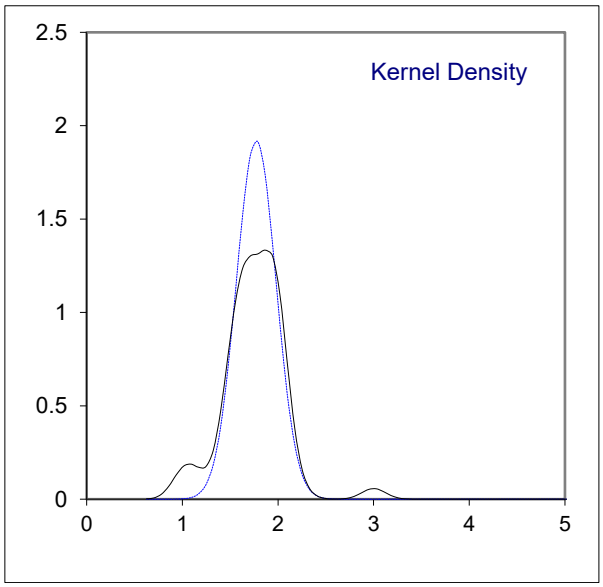
lab	method	value	mark	z(targ)	remarks
178	D5185	2		0.64	
179	D5185	2		0.64	
214	D5185	1	R(0.01)	-2.16	
225	D6595	1.9		0.36	
230		-----		-----	
237	D5185	1.640		-0.37	
254	D5185	1.595		-0.49	
257	D6595	1.89		0.33	
309	D5185	1.66		-0.31	
311		-----		-----	
325	D5185	2		0.64	
331	D5185	2.0		0.64	
333	D5185	2		0.64	
349		2		0.64	
392		-----		-----	
421	D5185	<1,0		-----	
451	D5185	1.8		0.08	
455	D5185	1.53		-0.68	
496	D5185	1.77		0.00	
511	D5185	1.63		-0.40	
512	D5185	1.71		-0.17	
542	D6595	1.82		0.14	
562		-----		-----	
575		-----		-----	
614	D5185	1.44		-0.93	
633	D6595	1.88		0.31	
634	D6595	1.9	C	0.36	first reported 0
657	D5185	1.58		-0.54	
663	D5185	1.5175		-0.71	
780	D5185	1.2		-1.60	
823	D5185	1.7		-0.20	
840		-----		-----	
862	D5185	2		0.64	
863	D5185	1.8		0.08	
864	D5185	1.915		0.40	
875	D5185	1.1	R(0.01)	-1.88	
902	D5185	1.86		0.25	
912	D5185	2		0.64	
913		-----		-----	
922	D5185	1.6		-0.48	
962	D5185	1.42		-0.98	
963	D5185	1.69		-0.23	
974	D5185	2		0.64	
994	D5185	1.67		-0.28	
1059		-----		-----	
1146	D5185	<5		-----	
1169		-----		-----	
1173	In house	1.49		-0.79	
1189	D5185	1	R(0.01)	-2.16	
1278	D5185	1.710		-0.17	
1300	D5185	2.2		1.20	
1316	D5185	1.66		-0.31	
1396		-----		-----	
1435	D5185	2		0.64	
1495		-----		-----	
1648		-----		-----	
1743	D5185	1.54		-0.65	
1752		-----		-----	
1807	D5185	2.0	C	0.64	first reported 0
1850	In house	20	R(0.01)	51.13	
1854	D5185	1.7		-0.20	
1900	D5185	1.556		-0.60	
1957	D5185	<1	C	-----	first reported 4
2133	D5185	1.573		-0.56	
6016	D6595	1.707		-0.18	
6044	D5185	2		0.64	
6059	D5185	1.8		0.08	
6080	D5185	3.0	R(0.01)	3.45	
6236	D5185	2.0		0.64	
6275	D5185	1.51		-0.73	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1.815		0.12	
6380	D5185	1.947		0.49	

normality	OK
n	51
outliers	5
mean (n)	1.771
st.dev. (n)	0.2076
R(calc.)	0.581
st.dev.(D5185:18)	0.3565
R(D5185:18)	0.998

application range: 0.5 – 4 mg/kg

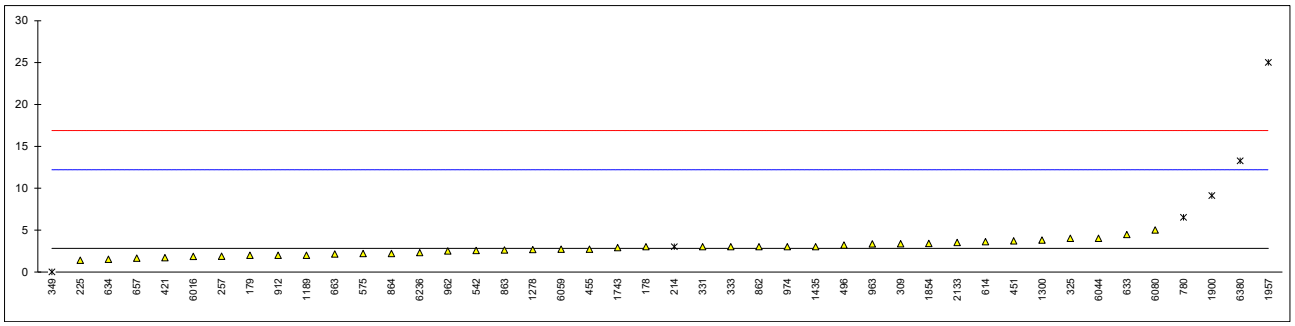


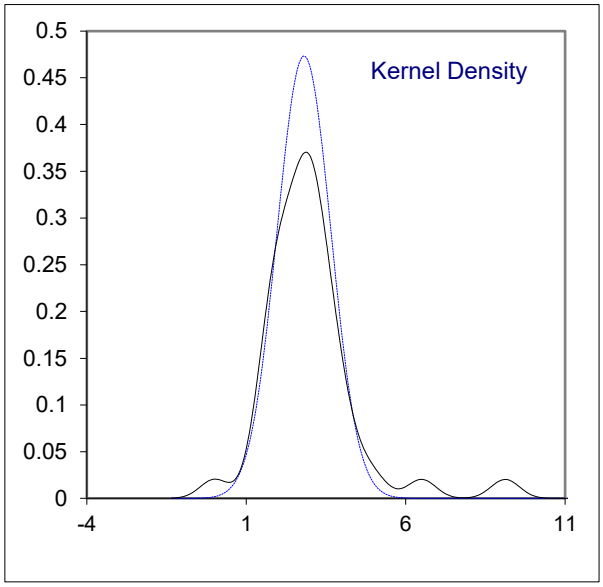


Determination of Boron as B on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	3		0.04	
179	D5185	2		-0.17	
214	D5185	3	ex	0.04	test result excluded, see § 4.1
225	D6595	1.4		-0.30	
230		-----		-----	
237	D5185	<1		-----	
254		-----		-----	
257	D6595	1.87		-0.20	
309	D5185	3.35		0.11	
311		-----		-----	
325	D5185	4		0.25	
331	D5185	3.0		0.04	
333	D5185	3		0.04	
349		0	ex	-0.60	test result excluded, 0 is not a real value
392		-----		-----	
421	D5185	1.7		-0.24	
451	D5185	3.7		0.19	
455	D5185	2.726		-0.02	
496	D5185	3.20		0.08	
511	D5185	<4		-----	
512	D5185	<4		-----	
542	D6595	2.56		-0.05	
562		-----		-----	
575	D6595	2.2		-0.13	
614	D5185	3.6	C	0.17	first reported 4
633	D6595	4.45		0.35	
634	D6595	1.5		-0.28	
657	D5185	1.64		-0.25	
663	D5185	2.1450		-0.14	
780	D5185	6.5	R(0.01)	0.79	
823	D5185	<6		-----	
840		-----		-----	
862	D5185	3		0.04	
863	D5185	2.6		-0.04	
864	D5185	2.2		-0.13	
875		-----		-----	
902	D5185	<4		-----	
912	D5185	2		-0.17	
913		-----		-----	
922		-----		-----	
962	D5185	2.5		-0.07	
963	D5185	3.33		0.11	
974	D5185	3		0.04	
994		-----		-----	
1059		-----		-----	
1146		-----		-----	
1169		-----		-----	
1173		-----		-----	
1189	D5185	2		-0.17	
1278	D5185	2.67		-0.03	
1300	D5185	3.8		0.21	
1316	D5185	<30		-----	
1396		-----		-----	
1435	D5185	3		0.04	
1495		-----		-----	
1648		-----		-----	
1743	D5185	2.9		0.02	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854	D5185	3.4		0.13	
1900	D5185	9.123	R(0.01)	1.35	
1957	D5185	25	R(0.01)	4.73	
2133	D5185	3.516		0.15	
6016	D6595	1.842		-0.21	
6044	D5185	4		0.25	
6059	D5185	2.719		-0.02	
6080	D5185	5.0		0.47	
6236	D5185	2.3		-0.11	
6275		-----		-----	

lab	method	value	mark	z(targ)	remarks
6379		-----		-----	
6380	D5185	13.258	R(0.01)	2.23	
	normality	OK			
	n	38			
	outliers	4 (+2ex)			
	mean (n)	2.811			
	st.dev. (n)	0.8427			
	R(calc.)	2.360			
	st.dev.(D5185:18)	4.6911			
	R(D5185:18)	13.135			application range: 4 – 30 mg/kg



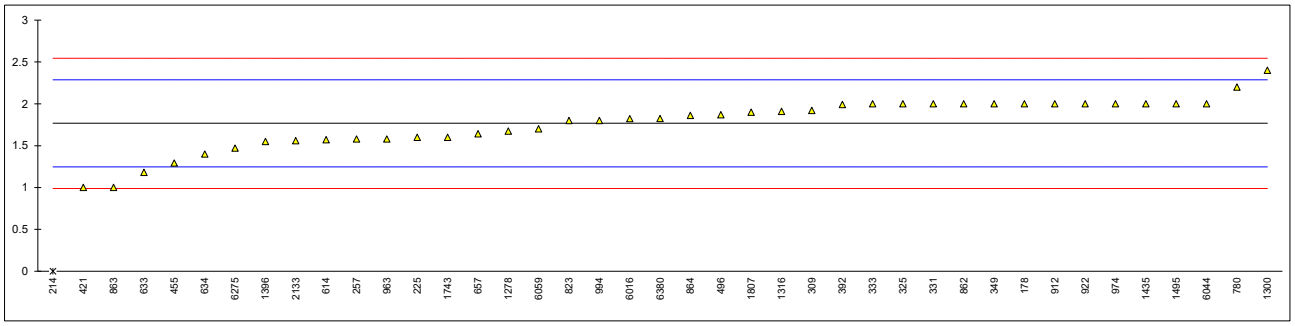


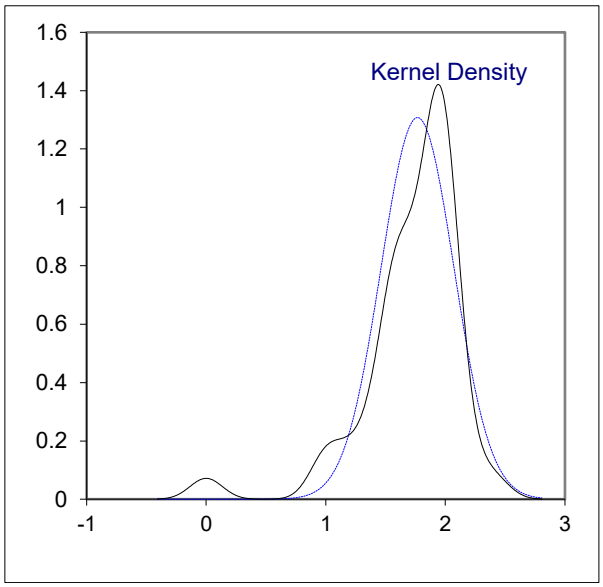
Determination of Cadmium as Cd on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	2		0.90	
179	D5185	-----		-----	
214	D5185	0	R(0.01)	-6.81	
225	D6595	1.6		-0.64	
230		-----		-----	
237	D5185	-----		-----	
254	D5185	-----		-----	
257	D6595	1.58		-0.72	
309	D5185	1.92		0.59	
311		-----		-----	
325	D5185	2		0.90	
331	D5185	2.0		0.90	
333	D5185	2		0.90	
349		2		0.90	
392	D5185	1.99		0.86	
421	D5185	1.0		-2.96	
451	D5185	-----		-----	
455	D5185	1.293		-1.83	
496	D5185	1.87		0.40	
511	D5185	-----		-----	
512	D5185	-----		-----	
542	D6595	-----		-----	
562		-----		-----	
575	D6595	-----		-----	
614	D5185	1.57		-0.76	
633	D6595	1.18		-2.26	
634	D6595	1.4		-1.42	
657	D5185	1.64		-0.49	
663	D5185	-----		-----	
780	D5185	2.2		1.67	
823	D5185	1.8		0.13	
840	D5185	-----		-----	
862	D5185	2		0.90	
863	D5185	1.0		-2.96	
864	D5185	1.862		0.36	
875	D5185	-----		-----	
902	D5185	-----		-----	
912	D5185	2		0.90	
913		-----		-----	
922	D5185	2.0		0.90	
962	D5185	-----		-----	
963	D5185	1.58		-0.72	
974	D5185	2		0.90	
994	D5185	1.8		0.13	
1059	In house	-----		-----	
1146	D5185	-----		-----	
1169		-----		-----	
1173	In house	-----		-----	
1189	D5185	-----		-----	
1278	D5185	1.673		-0.36	
1300	D5185	2.4		2.44	
1316	D5185	1.91		0.55	
1396	In house	1.55		-0.84	
1435	D5185	2		0.90	
1495	IP PM ED	2		0.90	
1648	D5185	-----		-----	
1743	D5185	1.6		-0.64	
1752	In house	-----		-----	
1807	D5185	1.9	C	0.51	first reported 0
1850	In house	<5		-----	
1854	D5185	-----		-----	
1900	D5185	-----		-----	
1957	D5185	<1		-----	
2133	D5185	1.559		-0.80	
6016	D6595	1.822		0.21	
6044	D5185	2		0.90	
6059	D5185	1.7		-0.26	
6080	D5185	<1		-----	
6236	D5185	-----		-----	
6275	D5185	1.47		-1.15	

lab	method	value	mark	z(targ)	remarks
6379	D5185	-----		-----	
6380	D5185	1.824		0.22	

normality	OK
n	40
outliers	1
mean (n)	1.767
st.dev. (n)	0.3052
R(calc.)	0.854
st.dev.(Horwitz)	0.2595
R(Horwitz)	0.727

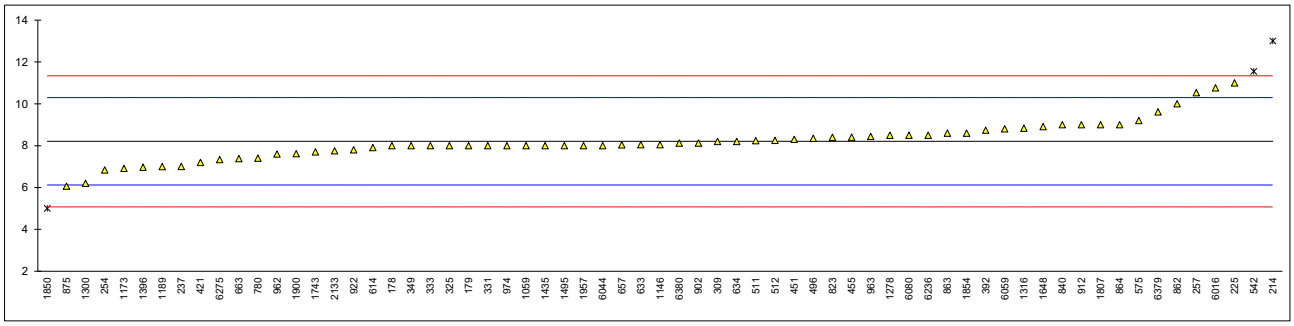


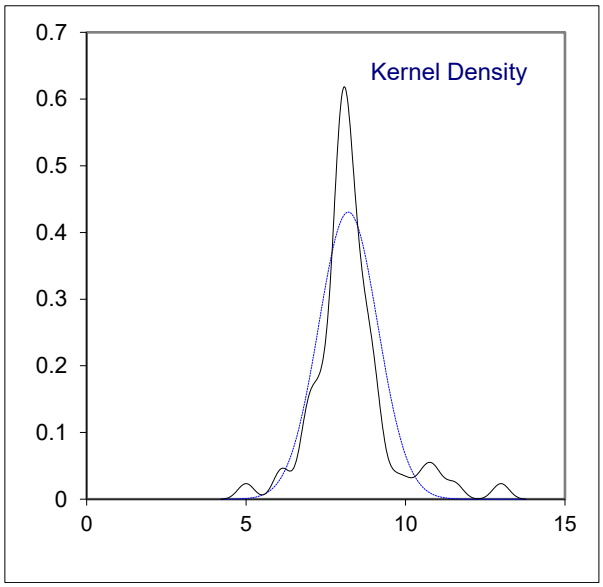


Determination of Chromium as Cr on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
178	D5185	8		-0.20	
179	D5185	8		-0.20	
214	D5185	13	R(0.01)	4.59	
225	D6595	11		2.67	
230		-----		-----	
237	D5185	7.001		-1.16	
254	D5185	6.840		-1.31	
257	D6595	10.53		2.22	
309	D5185	8.20		-0.01	
311		-----		-----	
325	D5185	8		-0.20	
331	D5185	8.0		-0.20	
333	D5185	8		-0.20	
349		8		-0.20	
392	D5185	8.74		0.51	
421	D5185	7.2		-0.97	
451	D5185	8.3		0.09	
455	D5185	8.405		0.19	
496	D5185	8.35		0.14	
511	D5185	8.24		0.03	
512	D5185	8.25		0.04	
542	D6595	11.55	R(0.05)	3.20	
562		-----		-----	
575	D6595	9.2		0.95	
614	D5185	7.91		-0.29	
633	D6595	8.05		-0.15	
634	D6595	8.2	C	-0.01	first reported 11.5
657	D5185	8.04		-0.16	
663	D5185	7.3780		-0.79	
780	D5185	7.4		-0.77	
823	D5185	8.4		0.18	
840	D5185	9.0		0.76	
862	D5185	10		1.71	
863	D5185	8.6		0.37	
864	D5185	9.001		0.76	
875	D5185	6.06		-2.06	
902	D5185	8.12		-0.08	
912	D5185	9		0.76	
913		-----		-----	
922	D5185	7.8		-0.39	
962	D5185	7.6		-0.58	
963	D5185	8.44		0.22	
974	D5185	8		-0.20	
994		-----		-----	
1059	In house	8		-0.20	
1146	D5185	8.05		-0.15	
1169		-----		-----	
1173	In house	6.91		-1.24	
1189	D5185	7		-1.16	
1278	D5185	8.50		0.28	
1300	D5185	6.2		-1.92	
1316	D5185	8.83		0.59	
1396	In house	6.97		-1.19	
1435	D5185	8		-0.20	
1495	IP PM ED	8		-0.20	
1648	D5185	8.91		0.67	
1743	D5185	7.7		-0.49	
1752		-----		-----	
1807	D5185	9.0		0.76	
1850	In house	5	R(0.05)	-3.07	
1854	D5185	8.6		0.37	
1900	D5185	7.614		-0.57	
1957	D5185	8		-0.20	
2133	D5185	7.753		-0.44	
6016	D6595	10.763		2.45	
6044	D5185	8		-0.20	
6059	D5185	8.8		0.57	
6080	D5185	8.5		0.28	
6236	D5185	8.5		0.28	
6275	D5185	7.34		-0.83	

lab	method	value	mark	z(targ)	remarks
6379	D5185	9.612		1.34	
6380	D5185	8.119		-0.09	
	normality	suspect			
	n	62			
	outliers	3			
	mean (n)	8.208			
	st.dev. (n)	0.9273			
	R(calc.)	2.596			
	st.dev.(D5185:18)	1.0448			
	R(D5185:18)	2.925			application range: 1 – 40 mg/kg

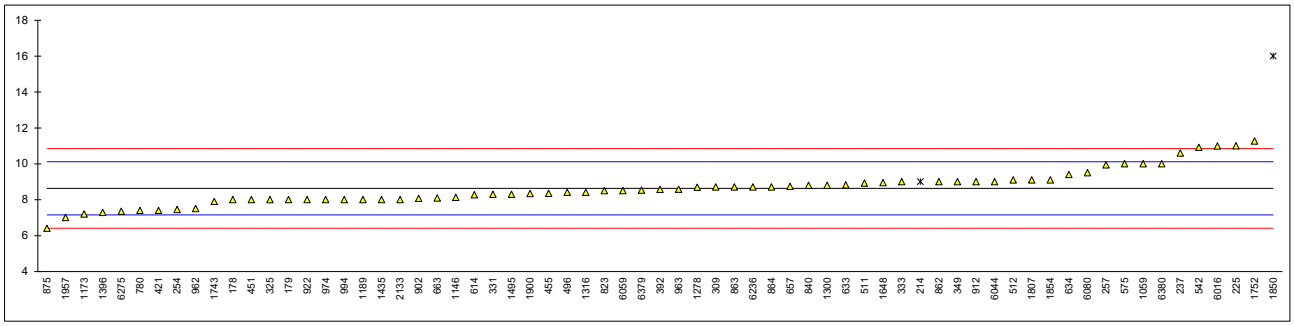


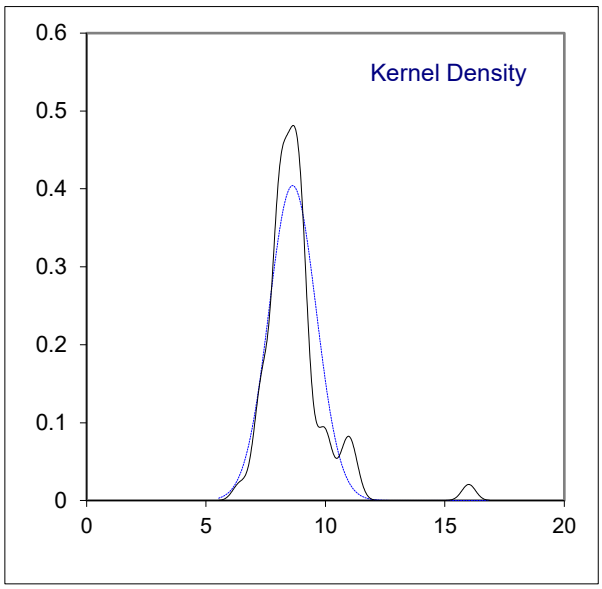


Determination of Copper as Cu on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	8		-0.85	
179	D5185	8		-0.85	
214	D5185	9	ex	0.51	test result excluded, see § 4.1
225	D6595	11		3.21	
230		-----		-----	
237	D5185	10.60		2.67	
254	D5185	7.455		-1.58	
257	D6595	9.94		1.78	
309	D5185	8.70		0.10	
311		-----		-----	
325	D5185	8		-0.85	
331	D5185	8.3		-0.44	
333	D5185	9		0.51	
349		9		0.51	
392	D5185	8.57		-0.08	
421	D5185	7.4		-1.66	
451	D5185	8.0		-0.85	
455	D5185	8.346		-0.38	
496	D5185	8.41		-0.29	
511	D5185	8.92		0.40	
512	D5185	9.1		0.64	
542	D6595	10.91		3.09	
562		-----		-----	
575	D6595	10		1.86	
614	D5185	8.27		-0.48	
633	D6595	8.82		0.26	
634	D6595	9.4		1.05	
657	D5185	8.74		0.15	
663	D5185	8.0960		-0.72	
780	D5185	7.4		-1.66	
823	D5185	8.5		-0.17	
840	D5185	8.8		0.24	
862	D5185	9		0.51	
863	D5185	8.7		0.10	
864	D5185	8.701		0.10	
875	D5185	6.4		-3.01	
902	D5185	8.07		-0.75	
912	D5185	9		0.51	
913		-----		-----	
922	D5185	8.0		-0.85	
962	D5185	7.5		-1.52	
963	D5185	8.58		-0.06	
974	D5185	8		-0.85	
994	D5185	8.0		-0.85	
1059	In house	10	C	1.86	first reported 13
1146	D5185	8.13		-0.67	
1169		-----		-----	
1173	In house	7.20		-1.93	
1189	D5185	8		-0.85	
1278	D5185	8.69		0.09	
1300	D5185	8.8		0.24	
1316	D5185	8.41		-0.29	
1396	In house	7.29		-1.81	
1435	D5185	8		-0.85	
1495	IP PM ED	8.3		-0.44	
1648	D5185	8.95		0.44	
1743	D5185	7.9		-0.98	
1752	In house	11.27		3.58	
1807	D5185	9.1		0.64	
1850	In house	16	R(0.01)	9.97	
1854	D5185	9.1		0.64	
1900	D5185	8.337		-0.39	
1957	D5185	7		-2.20	
2133	D5185	8.004		-0.84	
6016	D6595	10.987		3.19	
6044	D5185	9		0.51	
6059	D5185	8.5		-0.17	
6080	D5185	9.5		1.18	
6236	D5185	8.7		0.10	
6275	D5185	7.35		-1.73	

lab	method	value	mark	z(targ)	remarks
6379	D5185	8.53		-0.13	
6380	D5185	10.001		1.86	
	normality	OK			
	n	65			
	outliers	1 (+1ex)			
	mean (n)	8.626			
	st.dev. (n)	0.9873			
	R(calc.)	2.764			
	st.dev.(D5185:18)	0.7394			
	R(D5185:18)	2.070			application range: 2 – 160 mg/kg





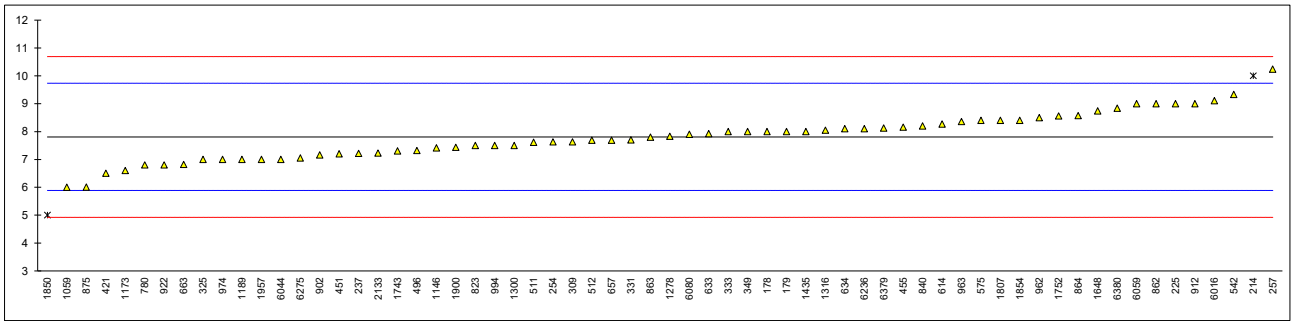
Determination of Iron as Fe on sample #21077; results in mg/kg

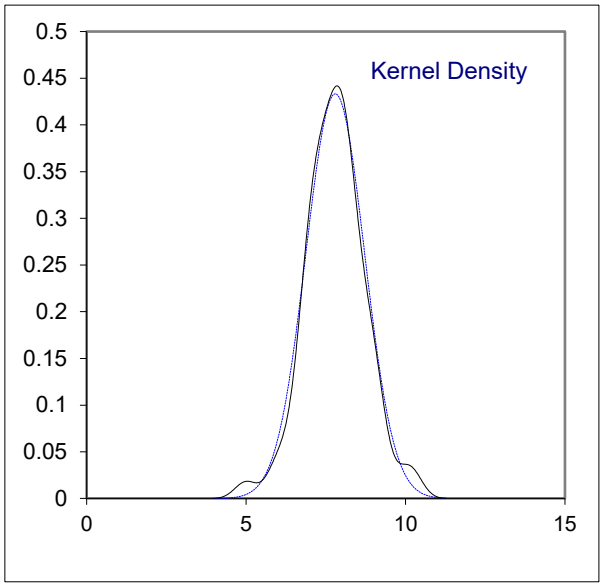
lab	method	value	mark	z(targ)	remarks
178	D5185	8		0.20	
179	D5185	8		0.20	
214	D5185	10	ex	2.28	test result excluded, see § 4.1
225	D6595	9.0		1.24	
230		-----		-----	
237	D5185	7.213		-0.62	
254	D5185	7.630		-0.19	
257	D6595	10.24		2.53	
309	D5185	7.63		-0.19	
311		-----		-----	
325	D5185	7		-0.84	
331	D5185	7.7		-0.11	
333	D5185	8		0.20	
349		8		0.20	
392		-----		-----	
421	D5185	6.5		-1.36	
451	D5185	7.2		-0.63	
455	D5185	8.154		0.36	
496	D5185	7.32		-0.51	
511	D5185	7.61		-0.21	
512	D5185	7.69		-0.12	
542	D6595	9.33		1.58	
562		-----		-----	
575	D6595	8.4		0.61	
614	D5185	8.27		0.48	
633	D6595	7.92		0.12	
634	D6595	8.1		0.30	
657	D5185	7.69		-0.12	
663	D5185	6.8190		-1.03	
780	D5185	6.8		-1.05	
823	D5185	7.5		-0.32	
840	D5185	8.2		0.41	
862	D5185	9		1.24	
863	D5185	7.8		-0.01	
864	D5185	8.571		0.79	
875	D5185	6.01		-1.87	
902	D5185	7.16		-0.68	
912	D5185	9		1.24	
913		-----		-----	
922	D5185	6.8		-1.05	
962	D5185	8.5		0.72	
963	D5185	8.36		0.57	
974	D5185	7		-0.84	
994	D5185	7.5		-0.32	
1059	In house	6	C	-1.88	first reported 5
1146	D5185	7.41		-0.42	
1169		-----		-----	
1173	In house	6.60		-1.26	
1189	D5185	7		-0.84	
1278	D5185	7.83		0.02	
1300	D5185	7.5		-0.32	
1316	D5185	8.05		0.25	
1396	In house	<5		-----	
1435	D5185	8		0.20	
1495		-----		-----	
1648	D5185	8.74		0.97	
1743	D5185	7.3		-0.53	
1752	In house	8.56		0.78	
1807	D5185	8.4		0.61	
1850	In house	5	ex	-2.92	test result excluded, see § 4.1
1854	D5185	8.4		0.61	
1900	D5185	7.435		-0.39	
1957	D5185	7		-0.84	
2133	D5185	7.225		-0.61	
6016	D6595	9.107		1.35	
6044	D5185	7		-0.84	
6059	D5185	8.999		1.24	
6080	D5185	7.9		0.09	
6236	D5185	8.1		0.30	
6275	D5185	7.05		-0.79	

lab	method	value	mark	z(targ)	remarks
6379	D5185	8.122		0.33	
6380	D5185	8.838		1.07	

normality	OK
n	62
outliers	0 (+2ex)
mean (n)	7.809
st.dev. (n)	0.8174
R(calc.)	2.289
st.dev.(D5185:18)	0.9615
R(D5185:18)	2.692

application range: 2 – 140 mg/kg

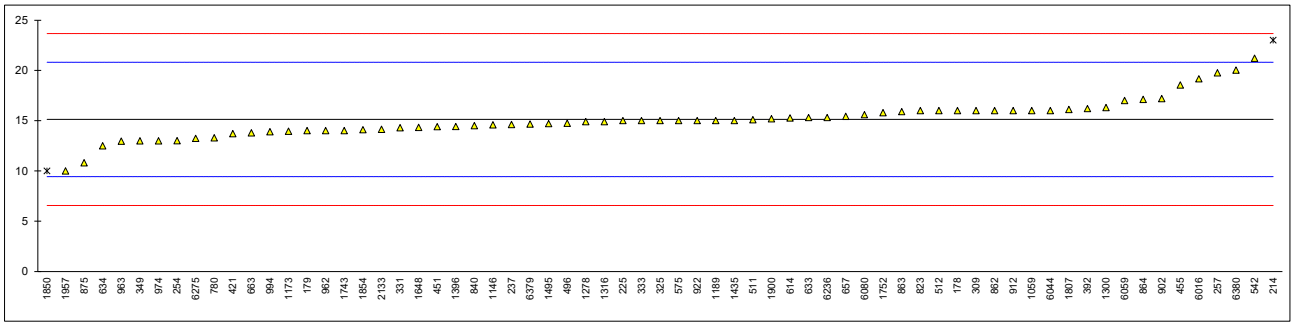


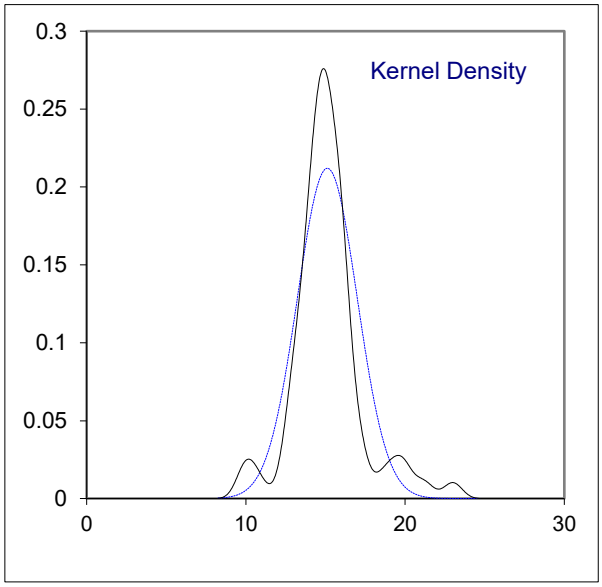


Determination of Lead as Pb on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	16		0.31	
179	D5185	14		-0.39	
214	D5185	23	R(0.05)	2.77	
225	D6595	15.0		-0.04	
230		-----		-----	
237	D5185	14.61		-0.18	
254	D5185	13.015		-0.74	
257	D6595	19.75		1.63	
309	D5185	16.00		0.31	
311		-----		-----	
325	D5185	15		-0.04	
331	D5185	14.3		-0.29	
333	D5185	15		-0.04	
349		13		-0.74	
392	D5185	16.20		0.38	
421	D5185	13.7		-0.50	
451	D5185	14.4		-0.25	
455	D5185	18.54		1.20	
496	D5185	14.75		-0.13	
511	D5185	15.1		-0.01	
512	D5185	16		0.31	
542	D6595	21.20		2.13	
562		-----		-----	
575	D6595	15		-0.04	
614	D5185	15.26		0.05	
633	D6595	15.30		0.06	
634	D6595	12.5		-0.92	
657	D5185	15.42		0.10	
663	D5185	13.7790		-0.47	
780	D5185	13.3		-0.64	
823	D5185	16		0.31	
840	D5185	14.5		-0.22	
862	D5185	16		0.31	
863	D5185	15.9		0.27	
864	D5185	17.12		0.70	
875	D5185	10.8		-1.52	
902	D5185	17.2		0.73	
912	D5185	16		0.31	
913		-----		-----	
922	D5185	15.0		-0.04	
962	D5185	14.0		-0.39	
963	D5185	12.96		-0.76	
974	D5185	13		-0.74	
994	D5185	13.9		-0.43	
1059	In house	16	C	0.31	first reported 8
1146	D5185	14.58		-0.19	
1169		-----		-----	
1173	In house	13.95		-0.41	
1189	D5185	15		-0.04	
1278	D5185	14.9		-0.08	
1300	D5185	16.3		0.41	
1316	D5185	14.9		-0.08	
1396	In house	14.42		-0.25	
1435	D5185	15		-0.04	
1495	IP PM ED	14.7		-0.15	
1648	D5185	14.33		-0.28	
1743	D5185	14		-0.39	
1752	In house	15.79		0.23	
1807	D5185	16.1		0.34	
1850	In house	10	ex	-1.80	test result excluded, see § 4.1
1854	D5185	14.1		-0.36	
1900	D5185	15.184		0.02	
1957	D5185	10		-1.80	
2133	D5185	14.145		-0.34	
6016	D6595	19.163		1.42	
6044	D5185	16		0.31	
6059	D5185	17		0.66	
6080	D5185	15.6		0.17	
6236	D5185	15.3		0.06	
6275	D5185	13.23		-0.66	

lab	method	value	mark	z(targ)	remarks
6379	D5185	14.65		-0.17	
6380	D5185	20.014		1.72	
	normality	not OK			
	n	65			
	outliers	1 (+1ex)			
	mean (n)	15.121			
	st.dev. (n)	1.8814			
	R(calc.)	5.268			
	st.dev.(D5185:18)	2.8485			
	R(D5185:18)	7.976			application range: 10 – 160 mg/kg





Determination of Lithium as Li on sample #21077; results in mg/kg

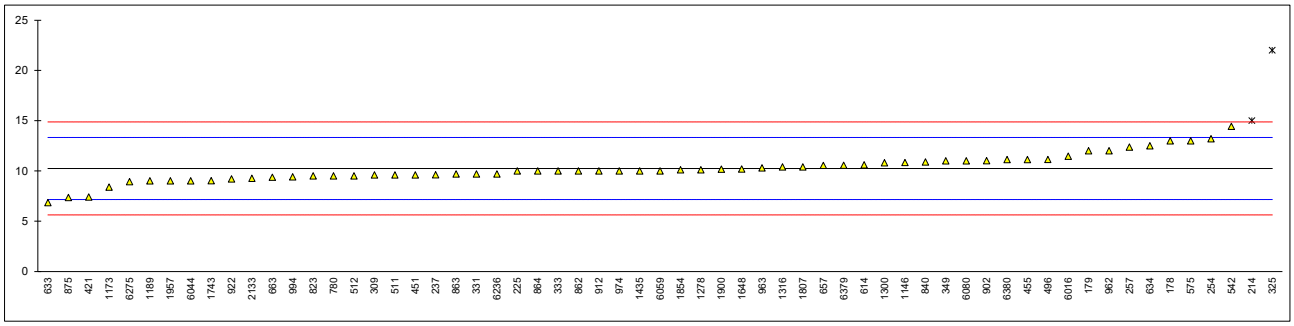
lab	method	value	mark	z(targ)	remarks
178		-----		-----	
179		-----		-----	
214	D5185	0		-----	
225		-----		-----	
230		-----		-----	
237		-----		-----	
254		-----		-----	
257		-----		-----	
309	D5185	0		-----	
311		-----		-----	
325	D5185	<1		-----	
331	D5185	<2.0		-----	
333		-----		-----	
349		0		-----	
392		-----		-----	
421		-----		-----	
451		-----		-----	
455	D5185	0.092		-----	
496	D5185	0.18		-----	
511		-----		-----	
512		-----		-----	
542		-----		-----	
562		-----		-----	
575		-----		-----	
614	D5185	0.8		-----	
633	D6595	0.03		-----	
634		-----		-----	
657	D5185	<1		-----	
663		-----		-----	
780		-----		-----	
823	D5185	<1		-----	
840		-----		-----	
862	D5185	<1		-----	
863	D5185	<1		-----	
864	D5185	0.139		-----	
875		-----		-----	
902		-----		-----	
912		-----		-----	
913		-----		-----	
922		-----		-----	
962		-----		-----	
963	D5185	<1		-----	
974	D5185	<1		-----	
994		-----		-----	
1059		-----		-----	
1146	D5185	<1		-----	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1278		-----		-----	
1300	D5185	<1		-----	
1316		-----		-----	
1396		-----		-----	
1435	D5185	<1		-----	
1495		-----		-----	
1648		-----		-----	
1743	D5185	0		-----	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854	D5185	<1		-----	
1900		-----		-----	
1957	D5185	<1		-----	
2133		-----		-----	
6016	D6595	0.093		-----	
6044	D5185	0		-----	
6059		-----		-----	
6080		-----		-----	
6236	D5185	0.3		-----	
6275		-----		-----	

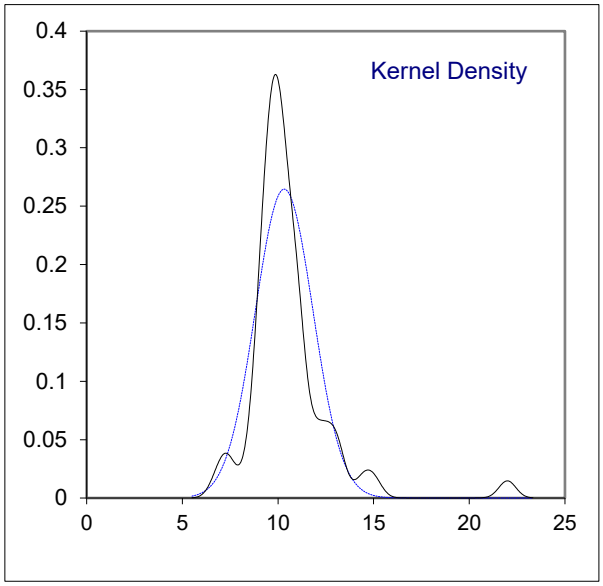
lab	method	value	mark	z(targ)	remarks
6379	D5185	<4		-----	
6380		-----		-----	
	n	24			
	mean (n)	<1			

Determination of Magnesium as Mg on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	13		1.79	
179	D5185	12		1.14	
214	D5185	15	ex	3.08	test result excluded, see § 4.1
225	D6595	10.0		-0.16	
230		-----		-----	
237	D5185	9.611		-0.41	
254	D5185	13.195		1.91	
257	D6595	12.37		1.38	
309	D5185	9.59		-0.42	
311		-----		-----	
325	D5185	22	R(0.01)	7.62	
331	D5185	9.7		-0.35	
333	D5185	10		-0.16	
349		11		0.49	
392		-----		-----	
421	D5185	7.4		-1.84	
451	D5185	9.6		-0.42	
455	D5185	11.12		0.57	
496	D5185	11.13		0.57	
511	D5185	9.6		-0.42	
512	D5185	9.5		-0.48	
542	D6595	14.43		2.71	
562		-----		-----	
575	D6595	13		1.79	
614	D5185	10.6		0.23	
633	D6595	6.84		-2.21	
634	D6595	12.5		1.46	
657	D5185	10.54		0.19	
663	D5185	9.3735		-0.56	
780	D5185	9.5		-0.48	
823	D5185	9.5		-0.48	
840	D5185	10.9		0.42	
862	D5185	10		-0.16	
863	D5185	9.7		-0.35	
864	D5185	10.0		-0.16	
875	D5185	7.36		-1.87	
902	D5185	11.02		0.50	
912	D5185	10		-0.16	
913		-----		-----	
922	D5185	9.2		-0.68	
962	D5185	12.0		1.14	
963	D5185	10.30		0.04	
974	D5185	10		-0.16	
994	D5185	9.41		-0.54	
1059		-----		-----	
1146	D5185	10.83		0.38	
1169		-----		-----	
1173	In house	8.38		-1.21	
1189	D5185	9		-0.81	
1278	D5185	10.11		-0.09	
1300	D5185	10.8		0.36	
1316	D5185	10.4		0.10	
1396		-----		-----	
1435	D5185	10		-0.16	
1495		-----		-----	
1648	D5185	10.19		-0.04	
1743	D5185	9.02		-0.79	
1752		-----		-----	
1807	D5185	10.4		0.10	
1850		-----		-----	
1854	D5185	10.1		-0.09	
1900	D5185	10.17		-0.05	
1957	D5185	9		-0.81	
2133	D5185	9.258		-0.64	
6016	D6595	11.475		0.80	
6044	D5185	9		-0.81	
6059	D5185	10		-0.16	
6080	D5185	11.0		0.49	
6236	D5185	9.7		-0.35	
6275	D5185	8.93		-0.85	

lab	method	value	mark	z(targ)	remarks
6379	D5185	10.56		0.20	
6380	D5185	11.114		0.56	
	normality	suspect			
	n	59			
	outliers	1 (+1ex)			
	mean (n)	10.245			
	st.dev. (n)	1.3884			
	R(calc.)	3.887			
	st.dev.(D5185:18)	1.5426			
	R(D5185:18)	4.319			application range: 5 – 1700 mg/kg





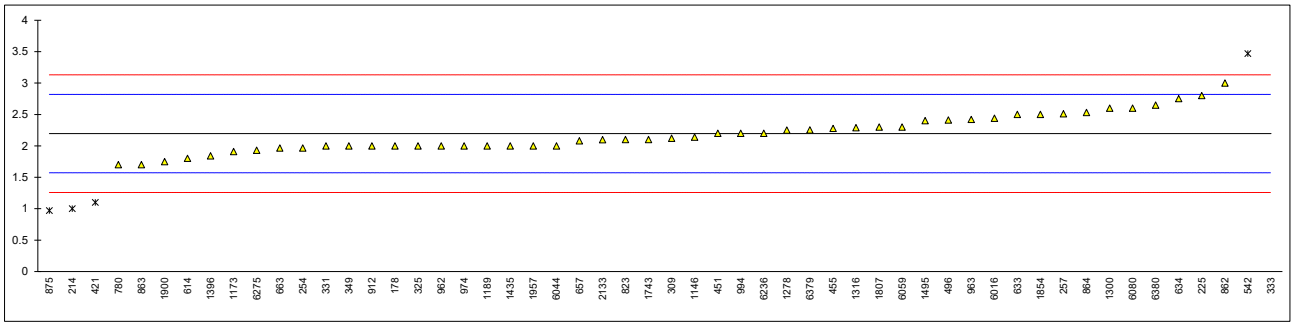
Determination of Manganese as Mn on sample #21077; results in mg/kg

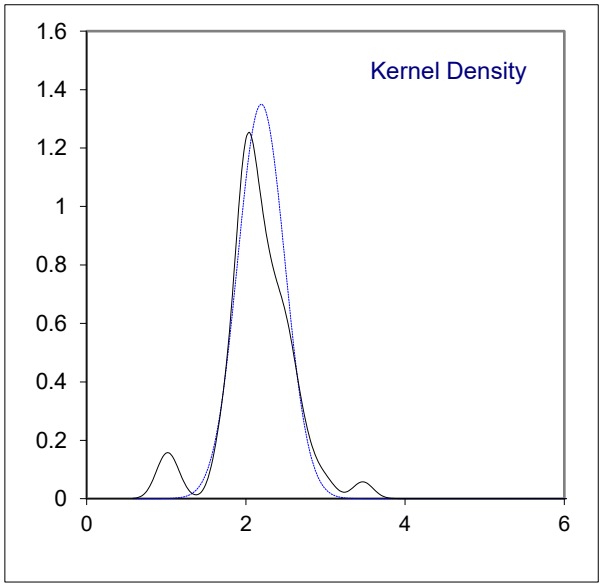
lab	method	value	mark	z(targ)	remarks
178	D5185	2		-0.63	
179		-----		-----	
214	D5185	1	R(0.01)	-3.83	
225	D6595	2.8		1.94	
230		-----		-----	
237		-----		-----	
254	D5185	1.965		-0.74	
257	D6595	2.51		1.01	
309	D5185	2.12		-0.24	
311		-----		-----	
325	D5185	2		-0.63	
331	D5185	2.0		-0.63	
333	D5185	10	R(0.01)	25.01	
349		2		-0.63	
392		-----		-----	
421	D5185	1.1	R(0.01)	-3.51	
451	D5185	2.2		0.01	
455	D5185	2.278		0.26	
496	D5185	2.41		0.69	
511	D5185	<5	C	-----	first reported 0
512	D5185	<5	C	-----	first reported 0
542	D6595	3.47	R(0.01)	4.08	
562		-----		-----	
575		-----		-----	
614	D5185	1.8		-1.27	
633	D6595	2.50		0.98	
634	D6595	2.75		1.78	
657	D5185	2.08		-0.37	
663	D5185	1.9650		-0.74	
780	D5185	1.7		-1.59	
823	D5185	2.1		-0.31	
840	D5185	<5		-----	
862	D5185	3		2.58	
863	D5185	1.7		-1.59	
864	D5185	2.53		1.07	
875	D5185	0.97	R(0.01)	-3.93	
902	D5185	<5		-----	
912	D5185	2		-0.63	
913		-----		-----	
922	D5185	<5.0		-----	
962	D5185	2		-0.63	
963	D5185	2.42		0.72	
974	D5185	2		-0.63	
994	D5185	2.2		0.01	
1059		-----		-----	
1146	D5185	2.14		-0.18	
1169		-----		-----	
1173	In house	1.91		-0.91	
1189	D5185	2		-0.63	
1278	D5185	2.25		0.18	
1300	D5185	2.6		1.30	
1316	D5185	2.29		0.30	
1396	In house	1.84		-1.14	
1435	D5185	2		-0.63	
1495	IP PM ED	2.4		0.66	
1648		-----		-----	
1743	D5185	2.1		-0.31	
1752		-----		-----	
1807	D5185	2.3	C	0.34	first reported 0
1850	In house	<3		-----	
1854	D5185	2.5		0.98	
1900	D5185	1.747		-1.44	
1957	D5185	2	C	-0.63	first reported <1
2133	D5185	2.098		-0.31	
6016	D6595	2.440		0.78	
6044	D5185	2		-0.63	
6059	D5185	2.3		0.34	
6080	D5185	2.6		1.30	
6236	D5185	2.2		0.01	
6275	D5185	1.93		-0.85	

lab	method	value	mark	z(targ)	remarks
6379	D5185	2.254		0.19	
6380	D5185	2.646		1.44	

	normality	OK
	n	49
	outliers	5
	mean (n)	2.195
	st.dev. (n)	0.2955
	R(calc.)	0.827
	st.dev.(Horwitz)	0.3121
	R(Horwitz)	0.874
Compare		
	R(D5185:18)	0.334

Application range :5-700 mg/kg

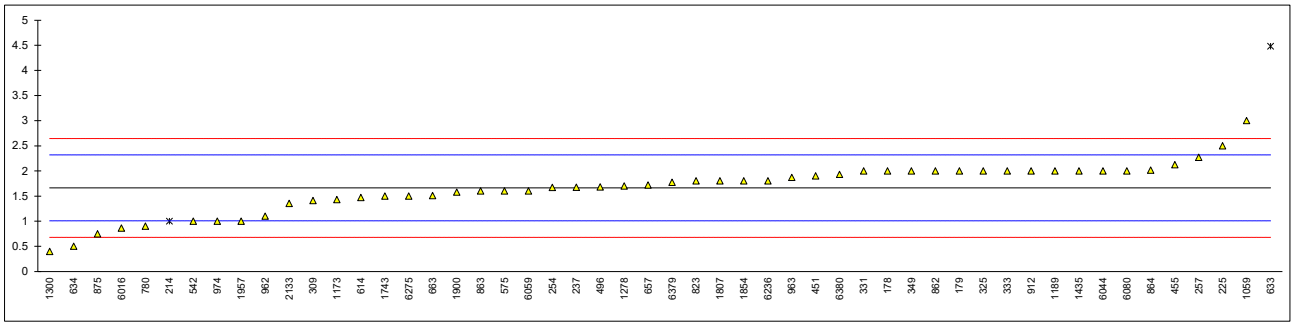


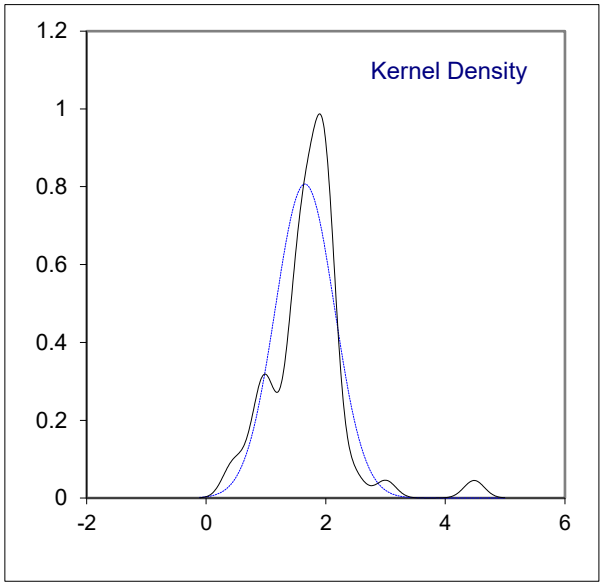


Determination of Molybdenum as Mo on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	2		1.03	
179	D5185	2		1.03	
214	D5185	1	ex	-2.02	test result excluded, see § 4.1
225	D6595	2.5		2.56	
230		-----		-----	
237	D5185	1.673		0.03	
254	D5185	1.670		0.03	
257	D6595	2.27		1.86	
309	D5185	1.41		-0.77	
311		-----		-----	
325	D5185	2		1.03	
331	D5185	2.0		1.03	
333	D5185	2		1.03	
349		2		1.03	
392		-----		-----	
421	D5185	<1,0		-----	
451	D5185	1.9		0.73	
455	D5185	2.123		1.41	
496	D5185	1.68		0.06	
511	D5185	<5	C	-----	first reported 0
512	D5185	<5	C	-----	first reported 0
542	D6595	1.00		-2.02	
562		-----		-----	
575	D6595	1.6		-0.19	
614	D5185	1.47		-0.58	
633	D6595	4.48	R(0.01)	8.60	
634	D6595	0.5		-3.54	
657	D5185	1.72		0.18	
663	D5185	1.5080		-0.47	
780	D5185	0.9		-2.32	
823	D5185	1.8		0.42	
840	D5185	<5		-----	
862	D5185	2		1.03	
863	D5185	1.6		-0.19	
864	D5185	2.014		1.07	
875	D5185	0.748		-2.79	
902	D5185	<5		-----	
912	D5185	2		1.03	
913		-----		-----	
922	D5185	<5.0		-----	
962	D5185	1.1		-1.71	
963	D5185	1.87		0.64	
974	D5185	1		-2.02	
994	D5185	<5		-----	
1059	In house	3	C	4.08	first reported 4
1146		-----		-----	
1169		-----		-----	
1173	In house	1.43		-0.71	
1189	D5185	2		1.03	
1278	D5185	1.70		0.12	
1300	D5185	0.4		-3.85	
1316	D5185	<3		-----	
1396		-----		-----	
1435	D5185	2		1.03	
1495		-----		-----	
1648		-----		-----	
1743	D5185	1.5		-0.49	
1752		-----		-----	
1807	D5185	1.8	C	0.42	first reported 0
1850	In house	<21		-----	
1854	D5185	1.8		0.42	
1900	D5185	1.576		-0.26	
1957	D5185	1		-2.02	
2133	D5185	1.353		-0.94	
6016	D6595	0.865		-2.43	
6044	D5185	2		1.03	
6059	D5185	1.6		-0.19	
6080	D5185	2.0		1.03	
6236	D5185	1.8		0.42	
6275	D5185	1.50		-0.49	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1.775		0.35	
6380	D5185	1.931		0.82	
	normality	suspect			
	n	50			
	outliers	1 (+1ex)			
	mean (n)	1.662			
	st.dev. (n)	0.4908			
	R(calc.)	1.374			
	st.dev.(D5185:18)	0.3278			
	R(D5185:18)	0.918			application range: 5 – 200 mg/kg

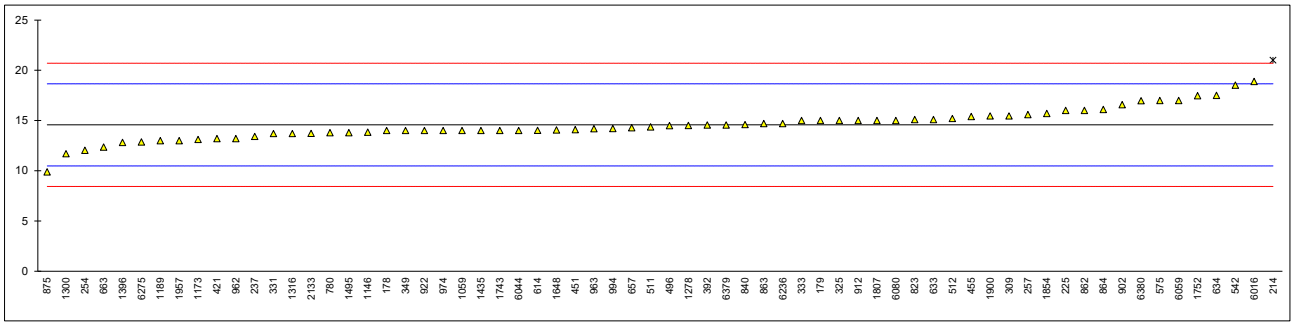


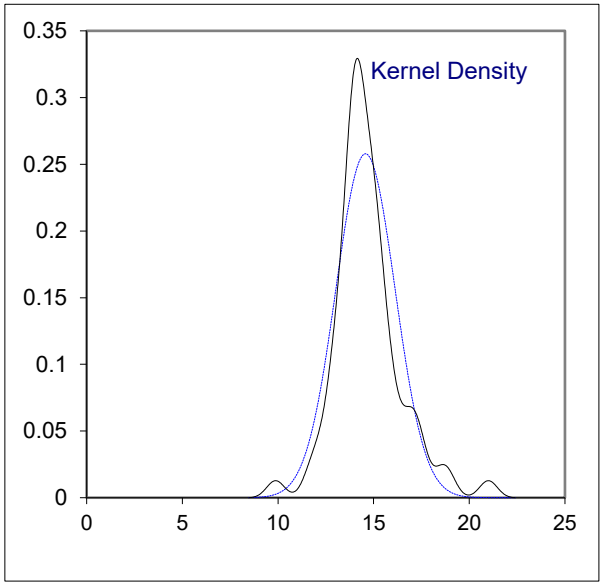


Determination of Nickel as Ni on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	14		-0.28	
179	D5185	15		0.21	
214	D5185	21	R(0.01)	3.14	
225	D6595	16.0		0.70	
230		-----		-----	
237	D5185	13.41		-0.57	
254	D5185	12.045		-1.24	
257	D6595	15.60		0.50	
309	D5185	15.46		0.43	
311		-----		-----	
325	D5185	15		0.21	
331	D5185	13.7		-0.43	
333	D5185	15		0.21	
349		14		-0.28	
392	D5185	14.55		-0.01	
421	D5185	13.2		-0.67	
451	D5185	14.1		-0.23	
455	D5185	15.4		0.40	
496	D5185	14.486		-0.04	
511	D5185	14.37		-0.10	
512	D5185	15.2		0.30	
542	D6595	18.52		1.93	
562		-----		-----	
575	D6595	17		1.18	
614	D5185	14.02		-0.27	
633	D6595	15.1		0.26	
634	D6595	17.5		1.43	
657	D5185	14.28		-0.15	
663	D5185	12.3550		-1.09	
780	D5185	13.8		-0.38	
823	D5185	15.1		0.26	
840	D5185	14.6		0.01	
862	D5185	16		0.70	
863	D5185	14.7		0.06	
864	D5185	16.11		0.75	
875	D5185	9.88		-2.30	
902	D5185	16.57		0.97	
912	D5185	15		0.21	
913		-----		-----	
922	D5185	14.0		-0.28	
962	D5185	13.2		-0.67	
963	D5185	14.19		-0.19	
974	D5185	14		-0.28	
994	D5185	14.2		-0.18	
1059	In house	14		-0.28	
1146	D5185	13.84		-0.36	
1169		-----		-----	
1173	In house	13.12		-0.71	
1189	D5185	13		-0.77	
1278	D5185	14.5		-0.04	
1300	D5185	11.7		-1.41	
1316	D5185	13.7		-0.43	
1396	In house	12.81		-0.86	
1435	D5185	14		-0.28	
1495	IP PM ED	13.8		-0.38	
1648	D5185	14.07		-0.25	
1743	D5185	14		-0.28	
1752	In house	17.46		1.41	
1807	D5185	15.0		0.21	
1850	In house	<5		<-4.68	Possibly a false negative test result?
1854	D5185	15.7		0.55	
1900	D5185	15.453		0.43	
1957	D5185	13		-0.77	
2133	D5185	13.725		-0.42	
6016	D6595	18.887		2.11	
6044	D5185	14		-0.28	
6059	D5185	17		1.18	
6080	D5185	15.0		0.21	
6236	D5185	14.7		0.06	
6275	D5185	12.88		-0.83	

lab	method	value	mark	z(targ)	remarks
6379	D5185	14.55		-0.01	
6380	D5185	16.965		1.17	
	normality	suspect			
	n	65			
	outliers	1			
	mean (n)	14.577			
	st.dev. (n)	1.5473			
	R(calc.)	4.332			
	st.dev.(D5185:18)	2.0453			
	R(D5185:18)	5.727			application range: 5 – 40 mg/kg





Determination of Potassium as K on sample #21077; results in mg/kg

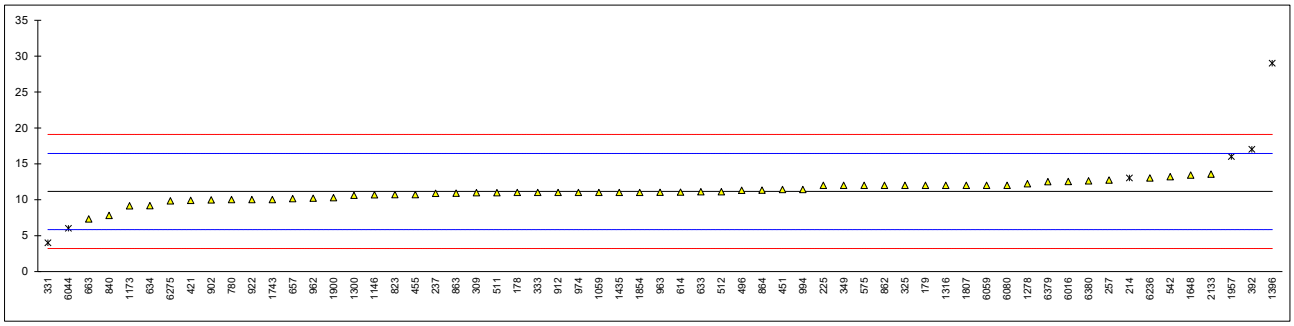
lab	method	value	mark	z(targ)	remarks
178	D5185	2		-----	
179		-----		-----	
214	D5185	1		-----	
225	D6595	1.4		-----	
230		-----		-----	
237	D5185	0.9307		-----	
254		-----		-----	
257	D6595	1.28		-----	
309	D5185	1.22		-----	
311		-----		-----	
325	D5185	<2		-----	
331	D5185	<2.0		-----	
333	D5185	1		-----	
349		0		-----	
392		-----		-----	
421	D5185	1.0		-----	
451	D5185	1.0		-----	
455	D5185	1.29		-----	
496	D5185	1.71		-----	
511	D5185	<40		-----	
512	D5185	<40		-----	
542	D6595	1.28		-----	
562		-----		-----	
575		-----		-----	
614	D5185	3.0		-----	
633	D6595	1.35		-----	
634	D6595	1.75		-----	
657	D5185	<1		-----	
663		-----		-----	
780	D5185	<1		-----	
823	D5185	<3		-----	
840		-----		-----	
862	D5185	<1		-----	
863	D5185	1.3		-----	
864	D5185	1.012		-----	
875		-----		-----	
902	D5185	<40		-----	
912		-----		-----	
913		-----		-----	
922	D5185	<5.0		-----	
962	D5185	0.55		-----	
963	D5185	<0.10		-----	
974	D5185	<1		-----	
994	D5185	1.95		-----	
1059		-----		-----	
1146		-----		-----	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1278	D5185	1.52		-----	
1300	D5185	<40		-----	
1316	D5185	<15		-----	
1396	In house	<1		-----	
1435	D5185	1		-----	
1495		-----		-----	
1648		-----		-----	
1743	D5185	0		-----	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854		-----		-----	
1900	D5185	1.093		-----	
1957	D5185	<1		-----	
2133		-----		-----	
6016	D6595	1.377		-----	
6044	D5185	0		-----	
6059	D5185	2		-----	
6080	D5185	1.0		-----	
6236	D5185	1.0		-----	
6275		-----		-----	

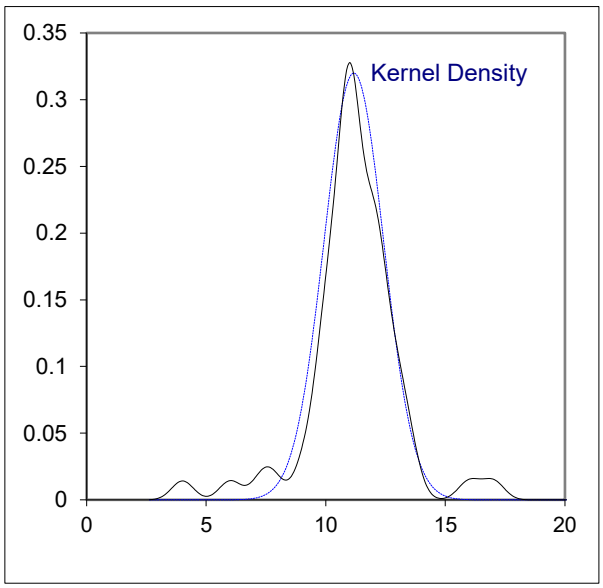
lab	method	value	mark	z(targ)	remarks
6379	D5185	1.528		-----	
6380		-----		-----	
	n	46			
	mean (n)	<40			application range: 40 – 1200 mg/kg

Determination of Silicon as Si on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	11		-0.05	
179	D5185	12		0.33	
214	D5185	13	ex	0.70	test result excluded, see § 4.1
225	D6595	12		0.33	
230		-----		-----	
237	D5185	10.88		-0.10	
254		-----		-----	
257	D6595	12.74		0.61	
309	D5185	10.95		-0.07	
311		-----		-----	
325	D5185	12		0.33	
331	D5185	4.0	R(0.01)	-2.69	
333	D5185	11		-0.05	
349		12		0.33	
392	D5185	17.00	R(0.05)	2.21	
421	D5185	9.9		-0.47	
451	D5185	11.4		0.10	
455	D5185	10.7		-0.16	
496	D5185	11.29		0.06	
511	D5185	10.96		-0.07	
512	D5185	11.11		-0.01	
542	D6595	13.19		0.77	
562		-----		-----	
575	D6595	12		0.33	
614	D5185	11.03		-0.04	
633	D6595	11.1		-0.01	
634	D6595	9.15		-0.75	
657	D5185	10.14		-0.38	
663	D5185	7.3105		-1.44	
780	D5185	10.0		-0.43	
823	D5185	10.7		-0.16	
840	D5185	7.8		-1.26	
862	D5185	12		0.33	
863	D5185	10.9		-0.09	
864	D5185	11.31		0.07	
875		-----		-----	
902	D5185	9.96		-0.44	
912	D5185	11		-0.05	
913		-----		-----	
922	D5185	10.0		-0.43	
962	D5185	10.2		-0.35	
963	D5185	11.02		-0.04	
974	D5185	11		-0.05	
994	D5185	11.4		0.10	
1059	In house	11		-0.05	
1146	D5185	10.68		-0.17	
1169		-----		-----	
1173	In house	9.13		-0.76	
1189		-----		-----	
1278	D5185	12.2		0.40	
1300	D5185	10.6		-0.20	
1316	D5185	12.0		0.33	
1396	In house	29.0	R(0.01)	6.74	
1435	D5185	11		-0.05	
1495		-----		-----	
1648	D5185	13.42		0.86	
1743	D5185	10		-0.43	
1752		-----		-----	
1807	D5185	12.0		0.33	
1850		-----		-----	
1854	D5185	11.0		-0.05	
1900	D5185	10.278		-0.32	
1957	D5185	16	C,R(0.05)	1.83	first reported <1
2133	D5185	13.563		0.92	
6016	D6595	12.517		0.52	
6044	D5185	6	R(0.05)	-1.94	
6059	D5185	12		0.33	
6080	D5185	12.0		0.33	
6236	D5185	13.0		0.70	
6275	D5185	9.84		-0.49	

lab	method	value	mark	z(targ)	remarks
6379	D5185	12.505		0.52	
6380	D5185	12.601		0.55	
	normality	suspect			
	n	55			
	outliers	5 (+1ex)			
	mean (n)	11.136			
	st.dev. (n)	1.2331			
	R(calc.)	3.453			
	st.dev.(D5185:18)	2.6513			
	R(D5185:18)	7.422			application range: 8 – 50 mg/kg

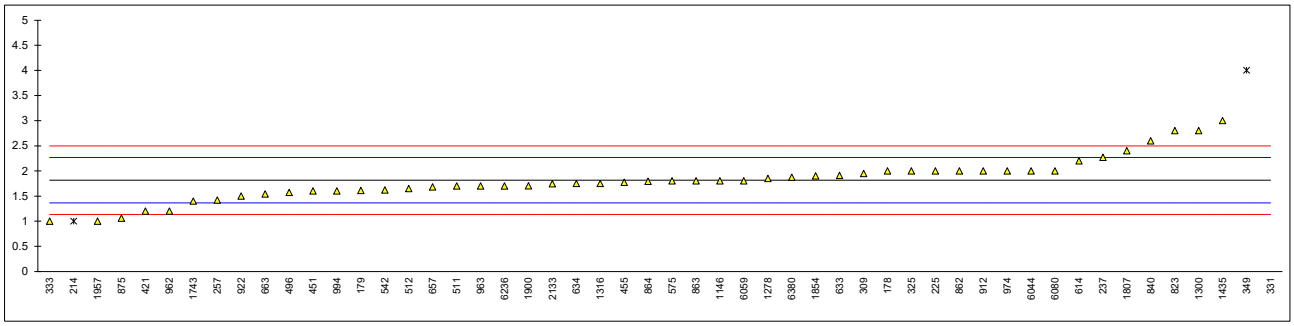


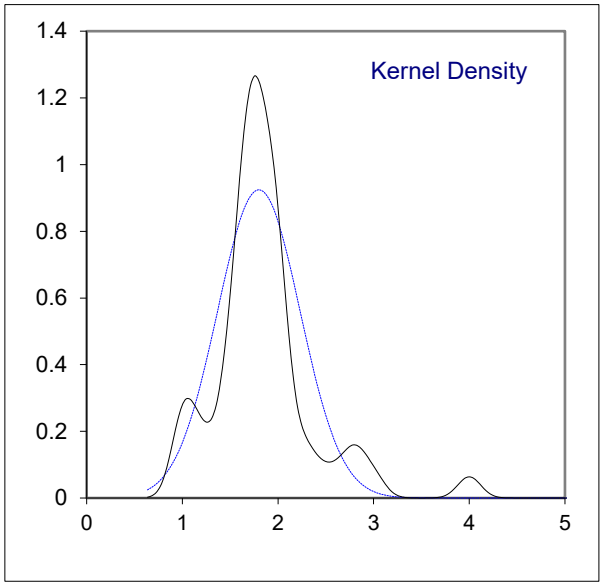


Determination of Silver as Ag on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	2		0.81	
179	D5185	1.61		-0.91	
214	D5185	1	ex	-3.60	test result excluded, see § 4.1
225	D6595	2.0		0.81	
230		-----		-----	
237	D5185	2.269		1.99	
254		-----		-----	
257	D6595	1.42		-1.75	
309	D5185	1.95		0.59	
311		-----		-----	
325	D5185	2		0.81	
331	D5185	11.7	R(0.01)	43.52	
333	D5185	1		-3.60	
349		4	R(0.01)	9.62	
392		-----		-----	
421	D5185	1.2		-2.72	
451	D5185	1.6		-0.95	
455	D5185	1.774		-0.19	
496	D5185	1.57		-1.09	
511	D5185	1.7		-0.51	
512	D5185	1.65		-0.73	
542	D6595	1.62		-0.87	
562		-----		-----	
575	D6595	1.8		-0.07	
614	D5185	2.2		1.69	
633	D6595	1.91		0.41	
634	D6595	1.75		-0.29	
657	D5185	1.68		-0.60	
663	D5185	1.5395		-1.22	
780	D5185	<1		<-3.60	Possibly a false negative test result?
823	D5185	2.8		4.33	
840	D5185	2.6		3.45	
862	D5185	2		0.81	
863	D5185	1.8		-0.07	
864	D5185	1.792		-0.11	
875	D5185	1.06		-3.33	
902		-----		-----	
912	D5185	2		0.81	
913		-----		-----	
922	D5185	1.5		-1.39	
962	D5185	1.2		-2.72	
963	D5185	1.70		-0.51	
974	D5185	2		0.81	
994	D5185	1.6		-0.95	
1059		-----		-----	
1146	D5185	1.80		-0.07	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1278	D5185	1.85		0.15	
1300	D5185	2.8		4.33	
1316	D5185	1.75		-0.29	
1396		-----		-----	
1435	D5185	3		5.21	
1495		-----		-----	
1648		-----		-----	
1743	D5185	1.4		-1.83	
1752		-----		-----	
1807	D5185	2.4	C	2.57	first reported 3.4
1850		-----		-----	
1854	D5185	1.9		0.37	
1900	D5185	1.704		-0.50	
1957	D5185	1		-3.60	
2133	D5185	1.744		-0.32	
6016		-----		-----	
6044	D5185	2		0.81	
6059	D5185	1.8		-0.07	
6080	D5185	2.0		0.81	
6236	D5185	1.7		-0.51	
6275		-----		-----	

lab	method	value	mark	z(targ)	remarks
6379		-----	W	-----	test result withdrawn, reported 3447
6380	D5185	1.872		0.24	
	normality	suspect			
	n	49			
	outliers	2 (+1ex)			
	mean (n)	1.817			
	st.dev. (n)	0.4202			
	R(calc.)	1.177			
	st.dev.(D5185:18)	0.2271			
	R(D5185:18)	0.636			application range: 0.5 – 50 mg/kg





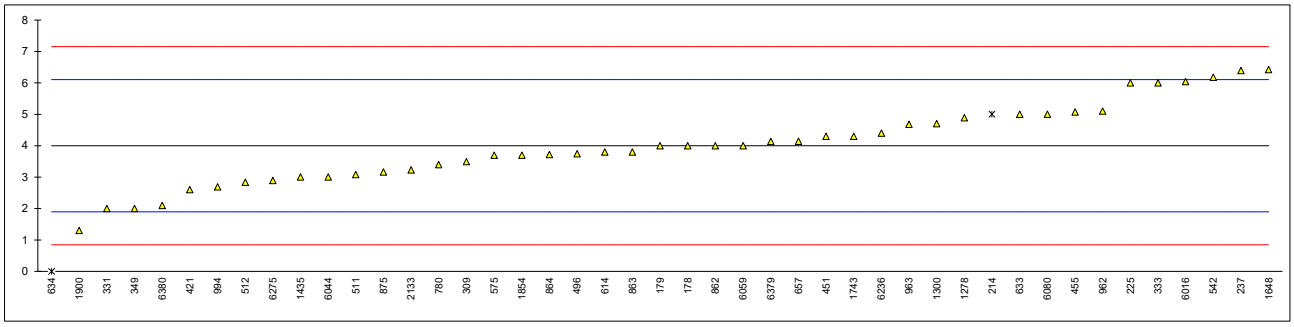
Determination of Sodium as Na on sample #21077; results in mg/kg

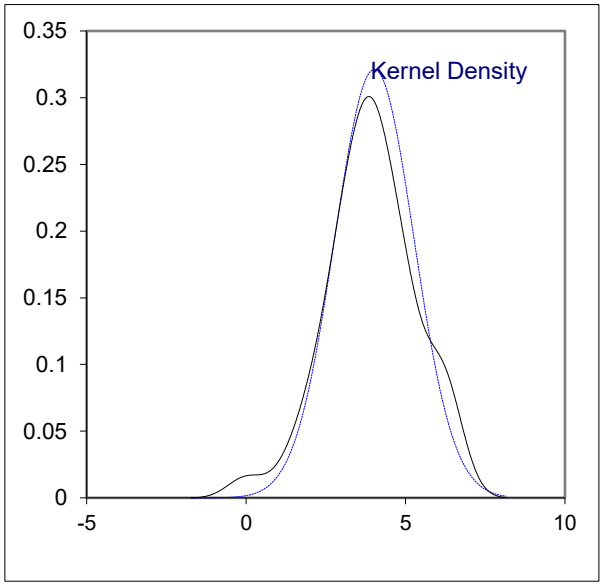
lab	method	value	mark	z(targ)	remarks
178	D5185	4		0.00	
179	D5185	4		0.00	
214	D5185	5	ex	0.95	test result excluded, see § 4.1
225	D6595	6.0		1.90	
230		-----		-----	
237	D5185	6.392		2.28	
254		-----		-----	
257		-----		-----	
309	D5185	3.49		-0.48	
311		-----		-----	
325	D5185	<2		-----	
331	D5185	2.0		-1.90	
333	D5185	6		1.90	
349		2		-1.90	
392		-----		-----	
421	D5185	2.6		-1.33	
451	D5185	4.3		0.29	
455	D5185	5.072		1.02	
496	D5185	3.74		-0.25	
511	D5185	3.08		-0.87	
512	D5185	2.84		-1.10	
542	D6595	6.18		2.07	
562		-----		-----	
575	D6595	3.7		-0.28	
614	D5185	3.8		-0.19	
633	D6595	5.0		0.95	
634	D6595	0	ex	-3.80	test result excluded, 0 is not a real value
657	D5185	4.14		0.13	
663		-----		-----	
780	D5185	3.4		-0.57	
823	D5185	<6		-----	
840		-----		-----	
862	D5185	4		0.00	
863	D5185	3.8		-0.19	
864	D5185	3.717		-0.27	
875	D5185	3.16		-0.80	
902	D5185	<7		-----	
912		-----		-----	
913		-----		-----	
922	D5185	<7.0		-----	
962	D5185	5.1		1.05	
963	D5185	4.68		0.65	
974		-----		-----	
994	D5185	2.69		-1.25	
1059		-----		-----	
1146	D5185	<4		-----	
1169		-----		-----	
1173		-----		-----	
1189		-----		-----	
1278	D5185	4.89		0.85	
1300	D5185	4.7		0.67	
1316	D5185	<3		-----	
1396		-----		-----	
1435	D5185	3		-0.95	
1495		-----		-----	
1648	D5185	6.42		2.30	
1743	D5185	4.3		0.29	
1752		-----		-----	
1807		-----		-----	
1850		-----		-----	
1854	D5185	3.7		-0.28	
1900	D5185	1.3		-2.57	
1957	D5185	<1		-----	
2133	D5185	3.230		-0.73	
6016	D6595	6.039		1.94	
6044	D5185	3		-0.95	
6059	D5185	4		0.00	
6080	D5185	5.0		0.95	
6236	D5185	4.4		0.38	
6275	D5185	2.89		-1.06	

lab	method	value	mark	z(targ)	remarks
6379	D5185	4.133		0.13	
6380	D5185	2.097		-1.81	

normality	OK
n	43
outliers	0 (+2ex)
mean (n)	4.000
st.dev. (n)	1.2470
R(calc.)	3.492
st.dev.(D5185:18)	1.0511
R(D5185:18)	2.943

application range: 7 – 70 mg/kg





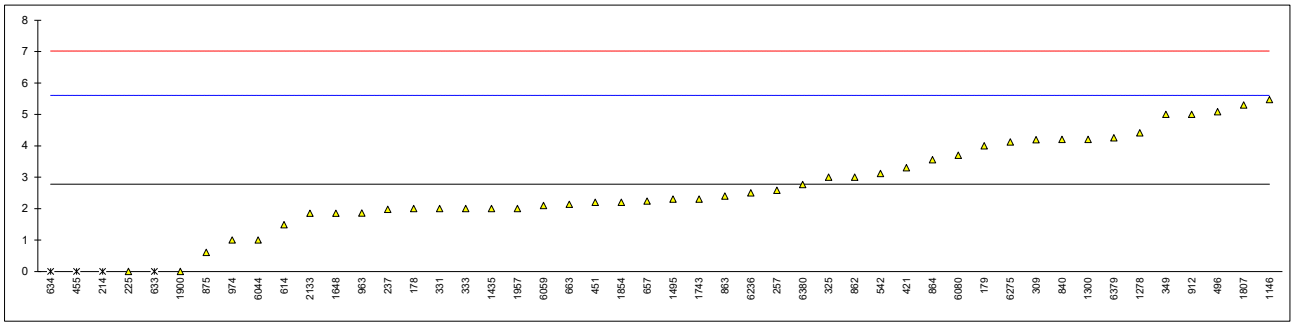
Determination of Tin as Sn on sample #21077; results in mg/kg

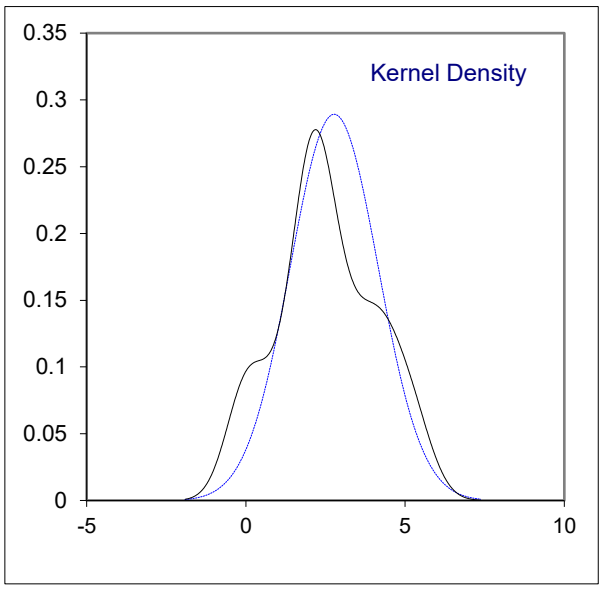
lab	method	value	mark	z(targ)	remarks
178	D5185	2		-0.55	
179	D5185	4		0.86	
214	D5185	0	ex	-1.97	test result excluded, see § 4.1
225	D6595	0.0		-1.97	
230		-----		-----	
237	D5185	1.976		-0.57	
254		-----		-----	
257	D6595	2.58		-0.14	
309	D5185	4.19		1.00	
311		-----		-----	
325	D5185	3		0.16	
331	D5185	2.0		-0.55	
333	D5185	2		-0.55	
349		5		1.57	
392		-----		-----	
421	D5185	3.3		0.37	
451	D5185	2.2		-0.41	
455	D5185	0	ex	-1.97	test result excluded, 0 is not a real value
496	D5185	5.08		1.63	
511	D5185	<10		-----	
512	D5185	<10		-----	
542	D6595	3.12		0.24	
562		-----		-----	
575		-----		-----	
614	D5185	1.49		-0.91	
633	D6595	0	ex	-1.97	test result excluded, 0 is not a real value
634	D6595	0	ex	-1.97	test result excluded, 0 is not a real value
657	D5185	2.24		-0.38	
663	D5185	2.1355		-0.45	
780	D5185	<1		-----	
823	D5185	<3		-----	
840	D5185	4.2		1.01	
862	D5185	3		0.16	
863	D5185	2.4		-0.27	
864	D5185	3.553		0.55	
875	D5185	0.602		-1.54	
902	D5185	<10		-----	
912	D5185	5		1.57	
913		-----		-----	
922	D5185	<10.0		-----	
962	D5185	<1		-----	
963	D5185	1.86		-0.65	
974	D5185	1		-1.26	
994	D5185	<10		-----	
1059	In house	<8		-----	
1146	D5185	5.47		1.90	
1169		-----		-----	
1173		-----		-----	
1189	D5185	<1		-----	
1278	D5185	4.41		1.15	
1300	D5185	4.2		1.01	
1316	D5185	<6		-----	
1396		-----		-----	
1435	D5185	2		-0.55	
1495	IP PM ED	2.3		-0.34	
1648	D5185	1.85		-0.66	
1743	D5185	2.3		-0.34	
1752		-----		-----	
1807	D5185	5.3		1.78	
1850	In house	<3		-----	
1854	D5185	2.2		-0.41	
1900	D5185	0	C	-1.97	first reported -1.143
1957	D5185	2		-0.55	
2133	D5185	1.849		-0.66	
6016	D6595	<1		-----	
6044	D5185	1		-1.26	
6059	D5185	2.1		-0.48	
6080	D5185	3.7		0.65	
6236	D5185	2.5		-0.20	
6275	D5185	4.12		0.95	

lab	method	value	mark	z(targ)	remarks
6379	D5185	4.253		1.04	
6380	D5185	2.764		-0.01	

normality	OK
n	44
outliers	0 (+4ex)
mean (n)	2.778
st.dev. (n)	1.3795
R(calc.)	3.862
st.dev.(D5185:18)	1.4132
R(D5185:18)	3.957

application range: 10 – 40 mg/kg

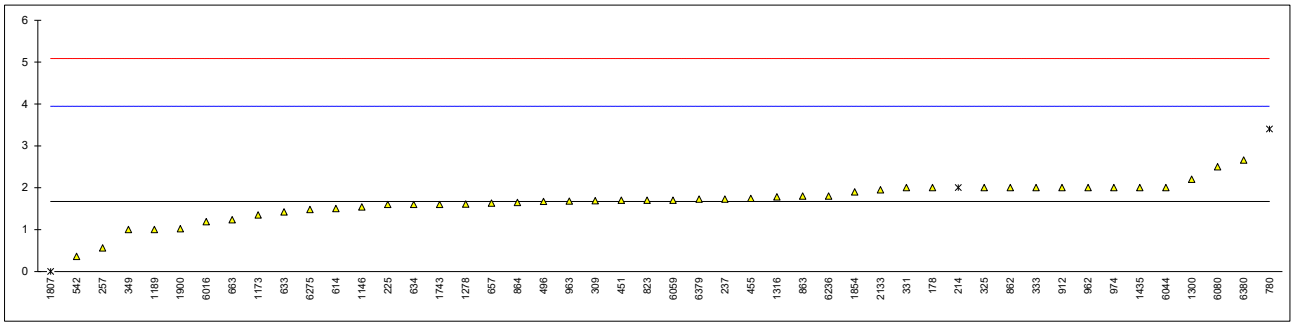


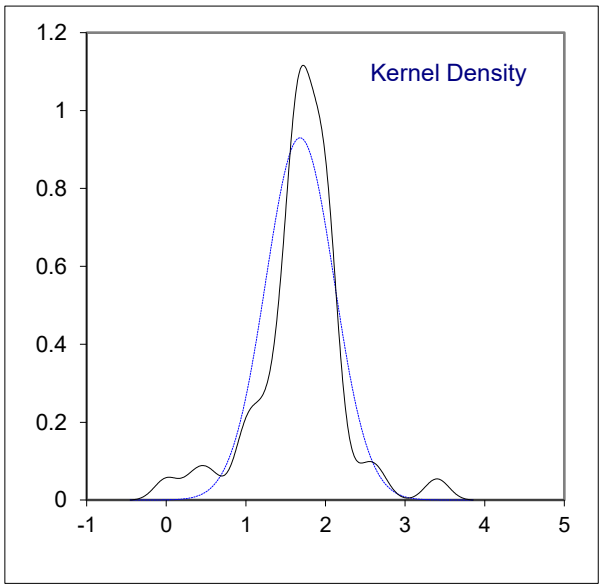


Determination of Titanium as Ti on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	2		0.29	
179		-----		-----	
214	D5185	2	ex	0.29	test result excluded, see § 4.1
225	D6595	1.6		-0.06	
230		-----		-----	
237	D5185	1.726		0.05	
254		-----		-----	
257	D6595	0.56		-0.98	
309	D5185	1.69		0.02	
311		-----		-----	
325	D5185	2		0.29	
331	D5185	2.0		0.29	
333	D5185	2		0.29	
349		1		-0.59	
392		-----		-----	
421	D5185	<1,0		-----	
451	D5185	1.7		0.02	
455	D5185	1.745		0.06	
496	D5185	1.67		0.00	
511	D5185	<5		-----	
512	D5185	<5		-----	
542	D6595	0.36		-1.15	
562		-----		-----	
575		-----		-----	
614	D5185	1.5		-0.15	
633	D6595	1.42		-0.22	
634	D6595	1.6		-0.06	
657	D5185	1.63		-0.04	
663	D5185	1.2335		-0.39	
780	D5185	3.4	R(0.05)	1.52	
823	D5185	1.7		0.02	
840	D5185	<5		-----	
862	D5185	2		0.29	
863	D5185	1.8		0.11	
864	D5185	1.646		-0.02	
875		-----		-----	
902	D5185	<5		-----	
912	D5185	2		0.29	
913		-----		-----	
922	D5185	<5.0		-----	
962	D5185	2		0.29	
963	D5185	1.68		0.01	
974	D5185	2		0.29	
994	D5185	<5		-----	
1059		-----		-----	
1146	D5185	1.54		-0.12	
1169		-----		-----	
1173	In house	1.35		-0.28	
1189	D5185	1		-0.59	
1278	D5185	1.61		-0.05	
1300	D5185	2.2		0.46	
1316	D5185	1.78		0.09	
1396		-----		-----	
1435	D5185	2		0.29	
1495		-----		-----	
1648		-----		-----	
1743	D5185	1.6		-0.06	
1752		-----		-----	
1807	D5185	0	R(0.05)	-1.47	
1850		-----		-----	
1854	D5185	1.9		0.20	
1900	D5185	1.019		-0.57	
1957	D5185	<1		-----	
2133	D5185	1.948		0.24	
6016	D6595	1.190		-0.42	
6044	D5185	2		0.29	
6059	D5185	1.7		0.02	
6080	D5185	2.5		0.73	
6236	D5185	1.8		0.11	
6275	D5185	1.48		-0.17	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1.725		0.05	
6380	D5185	2.657		0.87	
	normality	suspect			
	n	45			
	outliers	2 (+1ex)			
	mean (n)	1.672			
	st.dev. (n)	0.4312			
	R(calc.)	1.207			
	st.dev.(D5185:18)	1.1370			
	R(D5185:18)	3.184			application range: 5 – 40 mg/kg





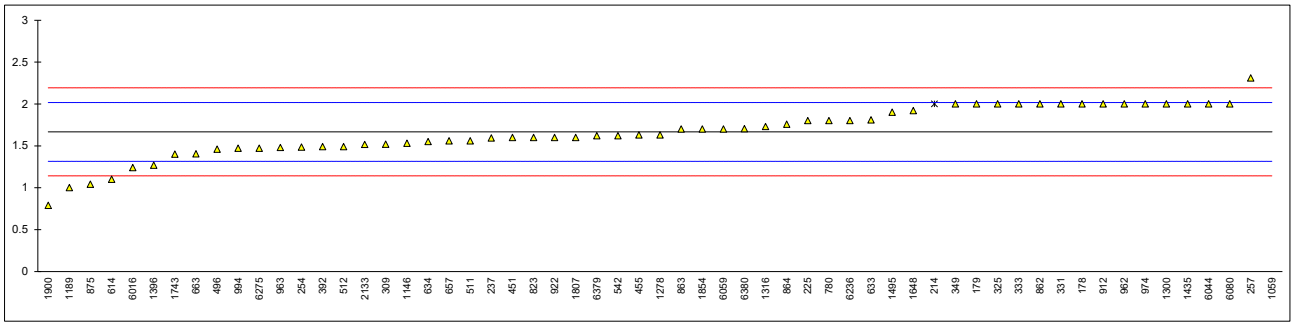
Determination of Vanadium as V on sample #21077; results in mg/kg

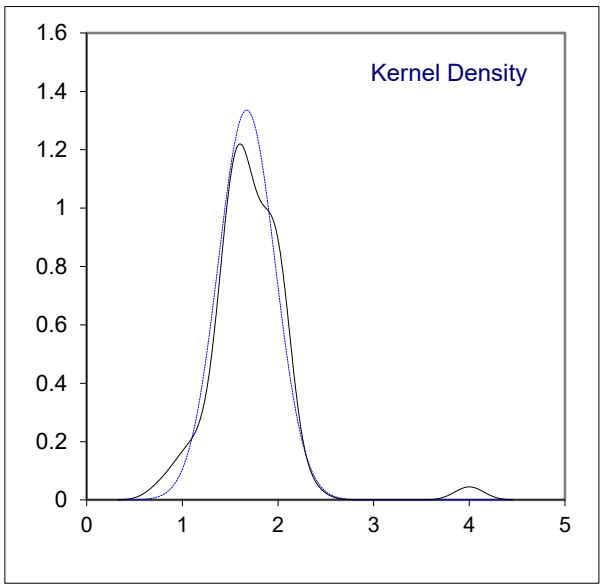
lab	method	value	mark	z(targ)	remarks
178	D5185	2		1.91	
179	D5185	2		1.91	
214	D5185	2	ex	1.91	test result excluded, see § 4.1
225	D6595	1.8		0.77	
230		-----		-----	
237	D5185	1.593		-0.41	
254	D5185	1.485		-1.03	
257	D6595	2.31		3.68	
309	D5185	1.52		-0.83	
311		-----		-----	
325	D5185	2		1.91	
331	D5185	2.0		1.91	
333	D5185	2		1.91	
349		2		1.91	
392	D5185	1.49		-1.00	
421	D5185	<1,0		<-3.80	Possibly a false negative test result?
451	D5185	1.6		-0.37	
455	D5185	1.63		-0.20	
496	D5185	1.46		-1.17	
511	D5185	1.56		-0.60	
512	D5185	1.49		-1.00	
542	D6595	1.62		-0.26	
562		-----		-----	
575		-----		-----	
614	D5185	1.1		-3.23	
633	D6595	1.81		0.82	
634	D6595	1.55		-0.66	
657	D5185	1.56		-0.60	
663	D5185	1.4035		-1.50	
780	D5185	1.8		0.77	
823	D5185	1.6		-0.37	
840	D5185	<5		-----	
862	D5185	2		1.91	
863	D5185	1.7		0.20	
864	D5185	1.757		0.52	
875	D5185	1.04		-3.57	
902	D5185	<1		<-3.80	Possibly a false negative test result?
912	D5185	2		1.91	
913		-----		-----	
922	D5185	1.6		-0.37	
962	D5185	2		1.91	
963	D5185	1.48		-1.06	
974	D5185	2		1.91	
994	D5185	1.47		-1.12	
1059	In house	4	C,R(0.01)	13.32	first reported 6
1146	D5185	1.53		-0.77	
1169		-----		-----	
1173		-----		-----	
1189	D5185	1		-3.80	
1278	D5185	1.63		-0.20	
1300	D5185	2.0		1.91	
1316	D5185	1.73		0.37	
1396	In house	1.27		-2.26	
1435	D5185	2		1.91	
1495	IP PM ED	1.9		1.34	
1648	D5185	1.92		1.45	
1743	D5185	1.4		-1.52	
1752		-----		-----	
1807	D5185	1.6	C	-0.37	first reported 0
1850	In house	<3		-----	
1854	D5185	1.7		0.20	
1900	D5185	0.788		-5.01	
1957	D5185	<1		<-3.80	Possibly a false negative test result?
2133	D5185	1.515		-0.86	
6016	D6595	1.240		-2.43	
6044	D5185	2		1.91	
6059	D5185	1.7		0.20	
6080	D5185	2.0		1.91	
6236	D5185	1.8		0.77	
6275	D5185	1.47		-1.12	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1.619		-0.27	
6380	D5185	1.704		0.22	

normality	OK
n	57
outliers	1 (+1ex)
mean (n)	1.666
st.dev. (n)	0.2979
R(calc.)	0.834
st.dev.(D5185:18)	0.1753
R(D5185:18)	0.491

application range: 1 – 50 mg/kg





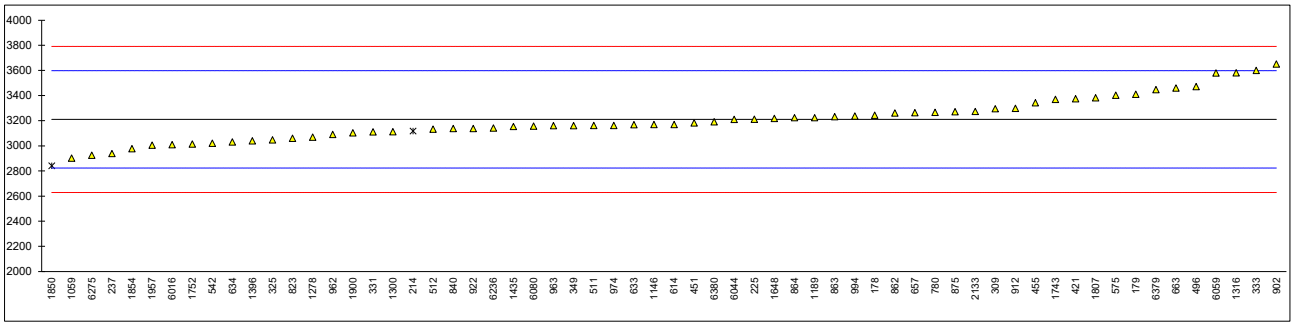
Determination of Calcium as Ca on sample #21077; results in mg/kg

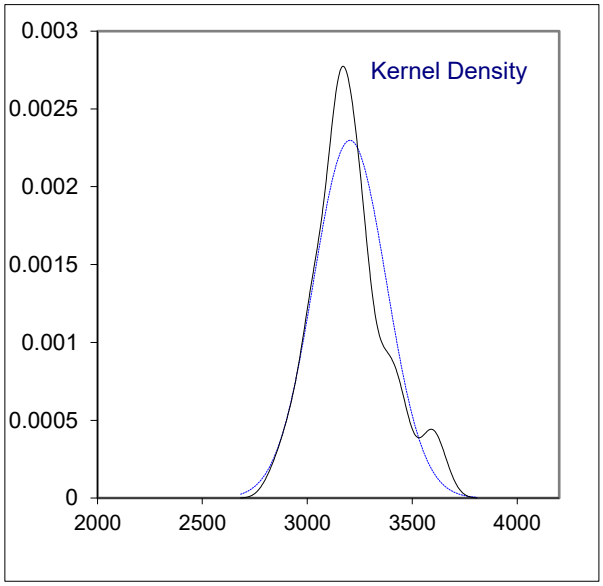
lab	method	value	mark	z(targ)	remarks
178	D5185	3243		0.17	
179	D5185	3410		1.03	
214	D5185	3117	ex	-0.48	test result excluded, see § 4.1
225	D6595	3211		0.00	
230		-----		-----	
237	D5185	2938		-1.40	
254		-----		-----	
257		-----		-----	
309	D5185	3295		0.44	
311		-----		-----	
325	D5185	3047		-0.84	
331	D5185	3110.7		-0.51	
333	D5185	3599		2.01	
349		3161		-0.25	
392		-----		-----	
421	D5185	3374		0.84	
451	D5185	3182		-0.15	
455	D5185	3342		0.68	
496	D5185	3470.6		1.34	
511	D5185	3162		-0.25	
512	D5185	3132		-0.40	
542	D6595	3020		-0.98	
562		-----		-----	
575	D6595	3402		0.99	
614	D5185	3169		-0.21	
633	D6595	3168		-0.22	
634	D6595	3030		-0.93	
657	D5185	3263		0.27	
663	D5185	3459.4420		1.29	
780	D5185	3265		0.28	
823	D5185	3060		-0.78	
840	D5185	3137		-0.38	
862	D5185	3261		0.26	
863	D5185	3232		0.11	
864	D5185	3223		0.07	
875	D5185	3270		0.31	
902	D5185	3650		2.27	
912	D5185	3298		0.45	
913		-----		-----	
922	D5185	3137		-0.38	
962	D5185	3090		-0.62	
963	D5185	3160.19		-0.26	
974	D5185	3162		-0.25	
994	D5185	3236		0.13	
1059	In house	2902		-1.59	
1146	D5185	3168.55		-0.22	
1169		-----		-----	
1173		-----		-----	
1189	D5185	3223		0.07	
1278	D5185	3068		-0.73	
1300	D5185	3112.2		-0.51	
1316	D5185	3580		1.91	
1396	In house	3040		-0.88	
1435	D5185	3153		-0.30	
1495		-----		-----	
1648	D5185	3217.3		0.04	
1743	D5185	3370		0.82	
1752	In house	3014		-1.01	
1807	D5185	3382		0.89	
1850	In house	2840	ex	-1.91	test result excluded, see § 4.1
1854	D5185	2977		-1.20	
1900	D5185	3102.33		-0.56	
1957	D5185	3005		-1.06	
2133	D5185	3272.490		0.32	
6016	D6595	3008.3		-1.04	
6044	D5185	3210		0.00	
6059	D5185	3579.14		1.90	
6080	D5185	3157		-0.27	
6236	D5185	3141.3		-0.36	
6275	D5185	2925		-1.47	

lab	method	value	mark	z(targ)	remarks
6379	D5185	3447		1.22	
6380	D5185	3190.18		-0.10	

normality	OK
n	60
outliers	0 (+2ex)
mean (n)	3210.245
st.dev. (n)	169.5052
R(calc.)	474.615
st.dev.(D5185:18)	193.8353
R(D5185:18)	542.739

application range: 40 – 9000 mg/kg

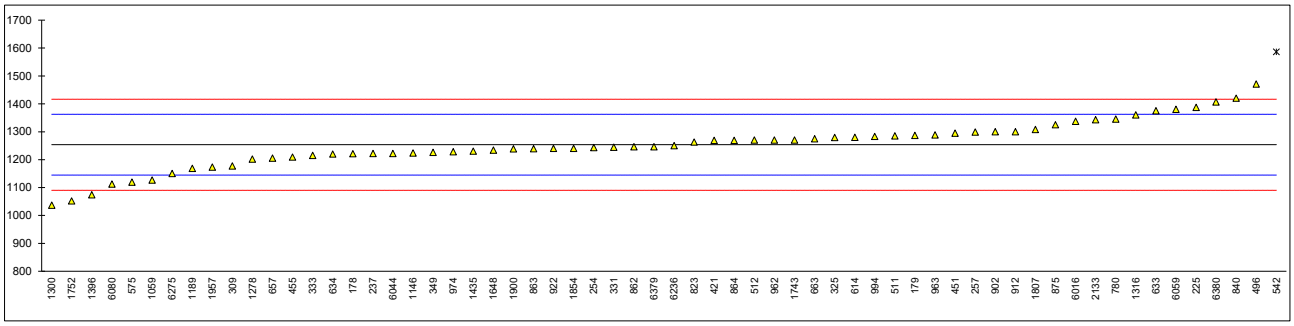


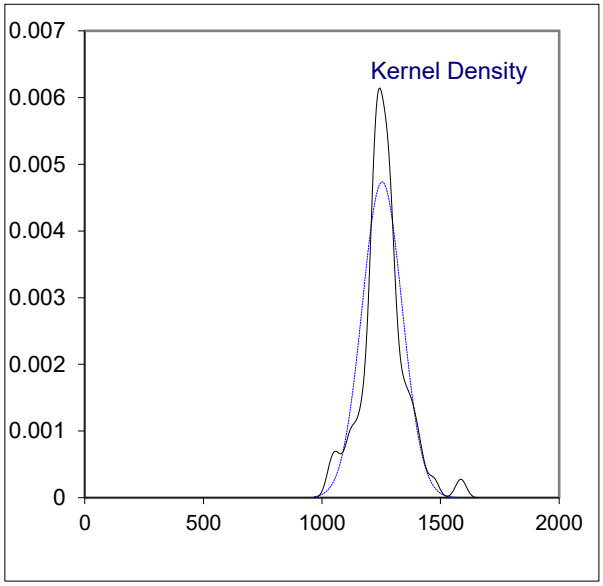


Determination of Phosphorus as P on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	1221		-0.60	
179	D5185	1287		0.61	
214		-----		-----	
225	D6595	1387		2.45	
230		-----		-----	
237	D5185	1222	C	-0.58	first reported 1571
254	D5185	1243.325		-0.19	
257	D6595	1299		0.83	
309	D5185	1177		-1.41	
311		-----		-----	
325	D5185	1279		0.47	
331	D5185	1244.3		-0.17	
333	D5185	1215		-0.71	
349		1226		-0.51	
392		-----		-----	
421	D5185	1269		0.28	
451	D5185	1295		0.76	
455	D5185	1209		-0.82	
496	D5185	1470.6		3.99	
511	D5185	1285		0.58	
512	D5185	1269.86		0.30	
542	D6595	1586	R(0.05)	6.11	
562		-----		-----	
575	D6595	1119		-2.48	
614	D5185	1280		0.48	
633	D6595	1375		2.23	
634	D6595	1220		-0.62	
657	D5185	1205		-0.89	
663	D5185	1274.8080		0.39	
780	D5185	1345		1.68	
823	D5185	1263		0.17	
840	D5185	1420		3.06	
862	D5185	1246		-0.14	
863	D5185	1239		-0.27	
864	D5185	1269		0.28	
875	D5185	1325		1.31	
902	D5185	1300		0.85	
912	D5185	1300		0.85	
913		-----		-----	
922	D5185	1240		-0.25	
962	D5185	1270		0.30	
963	D5185	1288.26		0.64	
974	D5185	1228		-0.47	
994	D5185	1283		0.54	
1059	In house	1127		-2.33	
1146	D5185	1223.71		-0.55	
1169		-----		-----	
1173		-----		-----	
1189	D5185	1169		-1.56	
1278	D5185	1202		-0.95	
1300	D5185	1036.5		-3.99	
1316	D5185	1360		1.96	
1396	In house	1074		-3.30	
1435	D5185	1230		-0.44	
1495		-----		-----	
1648	D5185	1234.1		-0.36	
1743	D5185	1270		0.30	
1752	In house	1052		-3.71	
1807	D5185	1308		1.00	
1850		-----		-----	
1854	D5185	1240		-0.25	
1900	D5185	1238.545		-0.28	
1957	D5185	1173		-1.48	
2133	D5185	1342.690		1.64	
6016	D6595	1337.3		1.54	
6044	D5185	1222		-0.58	
6059	D5185	1380.14		2.33	
6080	D5185	1112		-2.61	
6236	D5185	1249.6		-0.07	
6275	D5185	1150		-1.91	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1246		-0.14	
6380	D5185	1406.45		2.81	
	normality	OK			
	n	61			
	outliers	1			
	mean (n)	1253.659			
	st.dev. (n)	84.293			
	R(calc.)	236.021			
	st.dev.(D5185:18)	54.3751			
	R(D5185:18)	152.250			application range: 10 – 1000 mg/kg

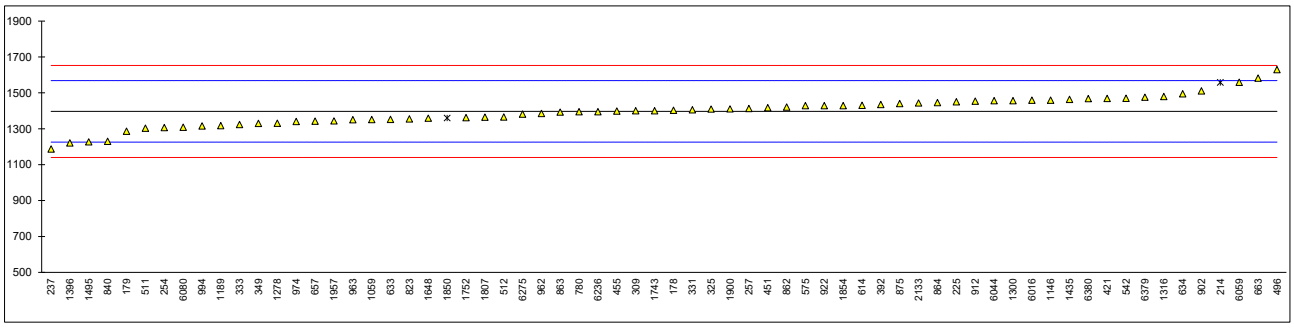


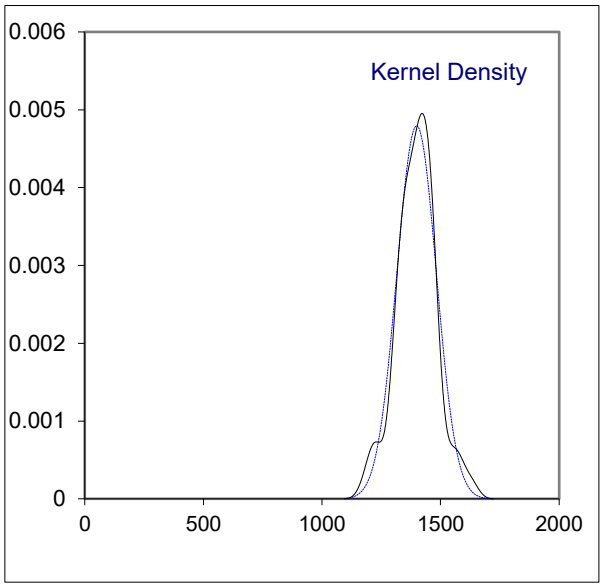


Determination of Zinc as Zn on sample #21077; results in mg/kg

lab	method	value	mark	z(targ)	remarks
178	D5185	1403		0.07	
179	D5185	1286		-1.30	
214	D5185	1558	ex	1.88	test result excluded, see § 4.1
225	D6595	1450		0.62	
230		-----		-----	
237	D5185	1187		-2.46	
254	D5185	1306.29		-1.06	
257	D6595	1413		0.18	
309	D5185	1400		0.03	
311		-----		-----	
325	D5185	1410		0.15	
331	D5185	1405.7		0.10	
333	D5185	1323		-0.87	
349		1330		-0.79	
392	D5185	1435.00		0.44	
421	D5185	1469		0.84	
451	D5185	1417		0.23	
455	D5185	1399		0.02	
496	D5185	1629.7		2.72	
511	D5185	1303		-1.10	
512	D5185	1366		-0.37	
542	D6595	1470		0.85	
562		-----		-----	
575	D6595	1429		0.37	
614	D5185	1431		0.40	
633	D6595	1352		-0.53	
634	D6595	1495		1.14	
657	D5185	1342		-0.65	
663	D5185	1582.5765		2.17	
780	D5185	1395		-0.03	
823	D5185	1355		-0.49	
840	D5185	1230		-1.96	
862	D5185	1421		0.28	
863	D5185	1393		-0.05	
864	D5185	1446		0.57	
875	D5185	1440		0.50	
902	D5185	1511		1.33	
912	D5185	1454		0.66	
913		-----		-----	
922	D5185	1429		0.37	
962	D5185	1385		-0.14	
963	D5185	1350.20		-0.55	
974	D5185	1340		-0.67	
994	D5185	1316		-0.95	
1059	In house	1351		-0.54	
1146	D5185	1458.96		0.72	
1169		-----		-----	
1173		-----		-----	
1189	D5185	1317		-0.94	
1278	D5185	1331		-0.77	
1300	D5185	1456.2		0.69	
1316	D5185	1480		0.97	
1396	In house	1221.11		-2.06	
1435	D5185	1464		0.78	
1495	IP PM ED	1226.9		-1.99	
1648	D5185	1359.2		-0.44	
1743	D5185	1400		0.03	
1752	In house	1362		-0.41	
1807	D5185	1365		-0.38	
1850	In house	1360	ex	-0.44	test result excluded, see § 4.1
1854	D5185	1429		0.37	
1900	D5185	1410.38		0.15	
1957	D5185	1344		-0.62	
2133	D5185	1443.620		0.54	
6016	D6595	1458.3		0.72	
6044	D5185	1456		0.69	
6059	D5185	1558.71		1.89	
6080	D5185	1308		-1.04	
6236	D5185	1395.3		-0.02	
6275	D5185	1382		-0.18	

lab	method	value	mark	z(targ)	remarks
6379	D5185	1476		0.92	
6380	D5185	1467.79		0.83	
	normality	OK			
	n	64			
	outliers	0 (+2ex)			
	mean (n)	1397.202			
	st.dev. (n)	81.9975			
	R(calc.)	229.593			
	st.dev.(D5185:18)	85.4487			
	R(D5185:18)	239.256			application range: 60 – 1600 mg/kg





APPENDIX 2

Number of participants per country

1 lab in	ALGERIA
1 lab in	ARGENTINA
1 lab in	AUSTRALIA
1 lab in	AZERBAIJAN
3 labs in	BELGIUM
1 lab in	BOTSWANA
1 lab in	CHILE
3 labs in	CHINA, People's Republic
1 lab in	COLOMBIA
1 lab in	COTE D'IVOIRE
1 lab in	CROATIA
1 lab in	CZECH REPUBLIC
1 lab in	DENMARK
1 lab in	ESTONIA
1 lab in	FINLAND
3 labs in	FRANCE
1 lab in	GERMANY
3 labs in	GREECE
2 labs in	INDIA
1 lab in	INDONESIA
1 lab in	ITALY
1 lab in	KAZAKHSTAN
1 lab in	KENYA
1 lab in	MACEDONIA
3 labs in	MALAYSIA
1 lab in	MAURITIUS
2 labs in	MOROCCO
4 labs in	NETHERLANDS
1 lab in	NIGERIA
2 labs in	NORWAY
1 lab in	PAKISTAN
2 labs in	PERU
2 labs in	PHILIPPINES
1 lab in	POLAND
2 labs in	RUSSIAN FEDERATION
2 labs in	SAUDI ARABIA
1 lab in	SINGAPORE
1 lab in	SLOVENIA
1 lab in	SOUTH KOREA
4 labs in	SPAIN
1 lab in	SUDAN
1 lab in	SWEDEN
1 lab in	TANZANIA
1 lab in	THAILAND
1 lab in	TURKEY
2 labs in	UNITED ARAB EMIRATES
5 labs in	UNITED KINGDOM
3 labs in	UNITED STATES OF AMERICA
2 labs in	VIETNAM

APPENDIX 3

Abbreviations

C	= final test result after checking of first reported suspect test result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
E	= calculation difference between reported test result and result calculated by iis
W	= test result withdrawn on request of participant
ex	= test result excluded from statistical evaluation
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
f+?	= possibly a false positive test result?
f-?	= possibly a false negative test result?
SDS	= Safety Data Sheet

Literature

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018
2 ISO5725:86
3 ISO5725 parts 1-6:94
4 ISO13528:05
5 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
6 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
8 J.N. Miller, Analyst, 118, 455, (1993)
9 Analytical Methods Committee, Technical Brief, No 4, January 2001
10 P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364, (2002)
11 W. Horwitz and R. Albert, J. AOAC Int, 79.3, 589-621, (1996)
12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)