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**Institute for
Interlaboratory Studies**

Results of Proficiency Test
Styrene
October 2022

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Appendices:

1   INTRODUCTION

Since 1999 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Styrene in accordance with the latest version of ASTM D2827 every year. During the annual proficiency testing program 2022/2023 it was decided to continue the round robin for the analysis of Styrene.

In this interlaboratory study 34 laboratories in 17 countries registered for participation, see appendix 2 for the number of participants per country. In this report the results of the Styrene 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 Styrene in a 0.5 L glass bottle labelled #22180.
The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for the 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

A batch of approximately 35 liters of Styrene was obtained from a local supplier. This batch was spiked with Benzene and Toluene. After homogenization 70 amber glass bottles of 0.5 L were filled and labelled #22180.

The homogeneity of the subsamples was checked by determination of Density at 20 °C in accordance with ASTM D4052 on 8 stratified randomly selected subsamples.

	Density at 20 °C in kg/L
sample #22180-1	0.90622
sample #22180-2	0.90627
sample #22180-3	0.90622
sample #22180-4	0.90626
sample #22180-5	0.90624
sample #22180-6	0.90626
sample #22180-7	0.90623
sample #22180-8	0.90622

Table 1: homogeneity test results of subsamples #22180

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 20 °C in kg/L
r (observed)	0.00006
reference test method	ISO12185:96
0.3 x R (reference test method)	0.00015

Table 2: evaluation of the repeatability of subsamples #22180

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

To each of the participating laboratories one 0.5 L bottle of Styrene labelled #22180 was sent on September 07, 2022. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of Styrene packed in amber glass 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: Aldehydes as Benzaldehyde, Appearance, Organic Chlorides, Color Pt/Co, Density at 20 °C, Inhibitor as TBC, Peroxides as H_2O_2, Polymer, Total Sulfur, Water, Purity by GC, Benzene, Toluene, Ethylbenzene, sum of m- and p-Xylenes, iso-Propylbenzene (Cumene), o-Xylene, n-Propylbenzene, sum of m- and p-Ethyltoluenes, alpha-Methylstyrene, 1,2-Diethylbenzene, sum of alpha-Methylstyrene and 1,2-Diethylbenzene, Phenylacetylene, 3/4-Methylstyrenes, sum of Phenylacetylene and 3/4-Methylstyrenes, Benzaldehyde and Non-aromatics.
It was also requested to report some analytical details on the determination of Aldehydes as Benzaldehyde.

It was explicitly requested to treat the sample as if it was a routine sample 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 the original test results are placed under 'Remarks' in the result tables in appendix 1. Test results that came in 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 (derived from e.g. ISO or ASTM test methods), the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation in 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, 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

Some problems were encountered with the dispatch of the samples due to COVID-19 pandemic. One participant reported test results after the extended reporting date and eight other participants did not report any test results. Not all participants were able to report all tests requested.
In total 26 participants reported 334 numerical test results. Observed were 6 outlying test results, which is 1.8%. In proficiency studies 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 TEST

In this section the reported test results are discussed 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 in appendix 1. The abbreviations, used in these tables, are explained in appendix 3.

Unfortunately, a suitable reference test method, providing the precision data, is not available for all determinations. For these tests the calculated reproducibility was compared against the estimated reproducibility calculated with the Horwitz equation.

In the iis PT reports ASTM test methods are referred to with a number (e.g. D2121) and if appropriate an indication of sub test method (e.g. D2121-A) and an added designation for the year that the test method was adopted or revised (e.g. D2121-A:16).

Aldehydes as Benzaldehyde: This determination was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D7704:16.

Appearance: This determination was not problematic. All reporting participants agreed about the appearance of the sample as Pass (Clear & Bright).

Organic Chlorides: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

Color Pt/Co: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5386:16.

Density at 20 °C: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ISO12185:96.

Inhibitor as TBC: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D4590:18.

Peroxides as H_2O_2: This determination was very problematic. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the requirements of ASTM D2340:18.

Polymer: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D2121-A:16.

Total Sulfur: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

Water: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in full agreement with the requirements of ASTM E1064:16.

Purity by GC: This determination was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D5135:21.

Benzene: 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 D5135:21.

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

Ethylbenzene: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5135:21.

sum of m- and p-Xylenes: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

iso-Propylbenzene: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

o-Xylene: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

n-Propylbenzene: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

sum of m- and p-Ethyltoluenes: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

alpha-Methylstyrene: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of ASTM D5135:21.

1,2-Diethylbenzene: Only two participants reported a test result. No conclusions could be drawn.

sum of alpha-Methylstyrene and 1,2-Diethylbenzene: Only two participants reported a test result. No conclusions could be drawn.

Phenylacetylene: This determination was not problematic. The reporting participants agreed on a value near or below the application range. Therefore, no z-scores are calculated.

3/4-Methylstyrenes: Only six participants reported a test result. No conclusions could be drawn.

sum of Phenylacetylene and 3/4-Methylstyrenes: Only four participants reported a test result. No conclusions could be drawn.

Benzaldehyde: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in full agreement with the requirements of ASTM D5135:21.

Non-aromatics: This determination was very problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not at all in agreement with the requirements of ASTM D5135:21.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method 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 methods are presented in the next table.

Parameter	unit	n	average	2.8 * sd	R(lit)
Aldehydes as Benzaldehyde	mg/kg	19	128	126	106
Appearance		24	Pass	n.a.	n.a.
Organic Chlorides	mg/kg	14	<1	n.e.	n.e.
Color Pt/Co		26	9.1	5.3	6.0
Density at 20 °C	kg/L	23	0.9063	0.0002	0.0005
Inhibitor as TBC	mg/kg	25	4.3	1.9	2.7
Peroxides as H_2O_2	mg/kg	14	45.1	31.0	13
Polymer	mg/kg	24	4.9	3.8	5.7
Total Sulfur	mg/kg	19	<1	n.e.	n.e.

Parameter	unit	n	average	2.8 * sd	R(lit)
Water	mg/kg	26	121	40	44
Purity by GC	%M/M	22	99.941	0.038	0.030
Benzene	mg/kg	17	15.8	5.2	6.8
Toluene	mg/kg	14	17.4	4.0	5.1
Ethylbenzene	mg/kg	20	132.1	16.1	29.7
sum of m- and p-Xylenes	mg/kg	14	<10	n.e.	n.e.
iso-Propylbenzene (Cumene)	mg/kg	17	<10	n.e.	n.e.
o-Xylene	mg/kg	17	<10	n.e.	n.e.
n-Propylbenzene	mg/kg	12	<10	n.e.	n.e.
sum of m- and p-Ethyltoluenes	mg/kg	9	<10	n.e.	n.e.
alpha-Methylstyrene	mg/kg	18	203.5	29.5	37.4
1,2-Diethylbenzene	mg/kg	2	n.e.	n.e.	n.e.
sum of alpha-Methylstyrene and 1,2-Diethylbenzene	mg/kg	2	n.e.	n.e.	n.e.
Phenylacetylene	mg/kg	12	<10	n.e.	n.e.
3/4-Methylstyrenes	mg/kg	6	n.e.	n.e.	n.e.
sum of Phenylacetylene and 3/4-Methylstyrenes	mg/kg	4	n.e.	n.e.	n.e.
Benzaldehyde	mg/kg	11	136.0	47.5	51.0
Non-aromatics	mg/kg	10	44.4	107.0	51.8

Table 3: reproducibilities of tests on sample #22180

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 OCTOBER 2022 WITH PREVIOUS PTS

	October 2022	October 2021	October 2020	October 2019	October 2018
Number of reporting laboratories	26	28	37	29	39
Number of test results	334	345	498	468	649
Number of statistical outliers	6	16	9	10	25
Percentage of statistical outliers	1.8%	4.6%	1.8%	2.1%	3.9%

Table 4: 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.

Parameter	October 2022	October 2021	October 2020	October 2019	October 2018
Aldehydes as Benzaldehyde	-	++	++	++	--
Organic Chloride	n.e.	++	+	+/-	+
Color Pt/Co	+	+/-	+	+	+
Density at 20 °C	++	++	++	++	++
Inhibitor as TBC	+	+	+	+	+/-
Peroxides as H_2O_2	--	-	-	-	-
Polymer	+	++	+	++	++
Total Sulfur	n.e.	+/-	n.e.	-	+/-
Water	+/-	-	+	-	+
Purity by GC	-	+	+	-	--
Benzene	+	+	n.e.	+	+
Toluene	+	+	n.e.	+	+/-
Ethylbenzene	+	+/-	+/-	+	+
sum of m- and p-Xylenes	n.e.	n.e.	+	+/-	+
iso-Propylbenzene (Cumene)	n.e.	n.e.	n.e.	--	-
o-Xylene	n.e.	n.e.	n.e.	+	+
n-Propylbenzene	n.e.	n.e.	n.e.	--	-
sum of m- and p-Ethyltoluenes	n.e.	n.e.	n.e.	-	+
alpha-Methylstyrene	+	-	+/-	+	-
1,2-Diethylbenzene	n.e.	n.e.	n.e.	n.e.	n.e.
sum of alpha-Methylstyrene and 1,2-Diethylbenzene	n.e.	n.e.	-	n.e.	(--)
Phenylacetylene	n.e.	n.e.	n.e.	-	+/-
3/4-Methylstyrenes	n.e.	--	n.e.	n.e.	+/-
sum of Phenylacetylene and 3/4-Methylstyrenes	n.e.	+	n.e.	n.e.	(--)
Benzaldehyde	+/-	+	-	-	--
Non-aromatics	--	-	-	-	+/-

Table 5: comparison of the determinations to the reference test methods

For results between brackets no z-scores are calculated

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 Aldehydes as Benzaldehyde on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2119	130		0.06	
169	D2119	196		1.80	
171	D2119	133		0.14	
173	D2119	117		-0.28	
273		-----		-----	
315	D2119	160		0.85	
323	D2119	207		2.09	
333	D2119	90	C	-1.00	reported 0.009 mg/kg
347		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D2119	170		1.12	
902		-----		-----	
913		-----		-----	
1117	D7704	96.16		-0.83	
1135	D2119	68		-1.58	
1169		-----		-----	
1264		-----		-----	
1509	D2119	168.32		1.07	
1515		-----		-----	
1823		-----		-----	
1880	D7704	135		0.19	
6013		-----		-----	
6198		-----		-----	
6201	D2119	127		-0.02	
6202	D2119	174.77		1.24	
6262	D2119	95		-0.86	
6396	D2119	105		-0.60	
6406	D2119	98.6		-0.77	
6481	D2119	28		-2.63	
7014		-----		-----	
9008		-----		-----	
9014	D2119	128		0.01	

normality	OK	
n	19	
outliers	0	
mean (n)	127.729	
st.dev. (n)	44.8484	
R(calc.)	125.576	
st.dev.(D7704:16)	37.8571	
R(D7704:16)	106	
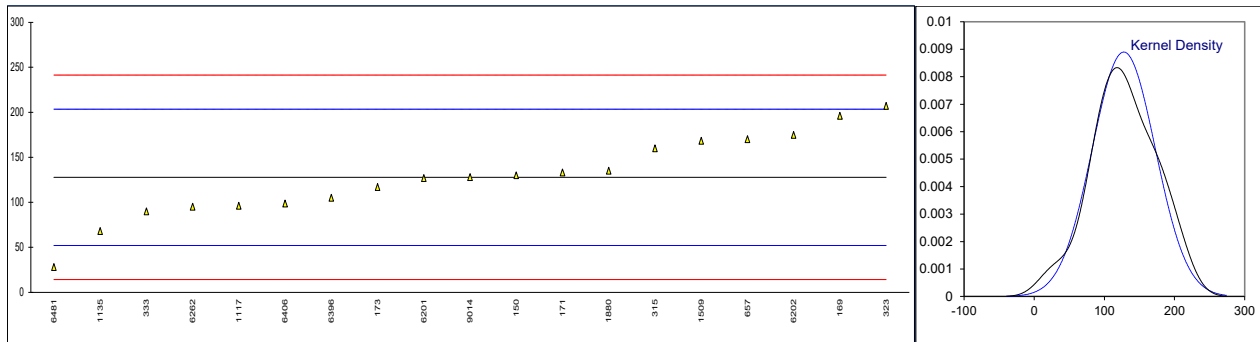
Determination of Appearance on sample #22180;

lab	method	value	mark	z(targ)	remarks
150	Visual	Clear and Bright		-----	
169	D4176	Pass		-----	
171	E2680	Pass		-----	
173	D4176	Pass		-----	
273	Visual	Bright & Clear		-----	
315	E2680	pass		-----	
323	Visual	C&B		-----	
333		-----		-----	
347	E2680	Pass		-----	
446	D4176	Pass		-----	
551		-----		-----	
557		-----		-----	
657	E2680	PASS		-----	
902		-----		-----	
913		-----		-----	
1117	D4176	PASS		-----	
1135	Visual	Clear & Bright		-----	
1169	D4176	Pass		-----	
1264		-----		-----	
1509	E2680	Clear & FFSM		-----	
1515	E2680	Pass		-----	
1823		-----		-----	
1880	Visual	Pass		-----	
6013	E2680	Pass		-----	
6198		-----		-----	
6201	Visual	Br/CL		-----	
6202	Visual	Clear		-----	
6262	Visual	clear and bright		-----	
6396	Visual	Clear and bright		-----	
6406	Visual	Clear and Bright		-----	
6481	D4176	C,B,F		-----	
7014		-----		-----	
9008		-----		-----	
9014	E2680	pass		-----	
	n	24			
	mean (n)	Pass			

Determination of Organic Chlorides on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150		-----		-----	
169		-----		-----	
171	D5808	<1.0		-----	
173		-----		-----	
273		-----		-----	
315	D5808	<0.7		-----	
323	UOP779	< 1		-----	
333	D5808	<0.2		-----	
347	D4929	<1		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5808	0.1884		-----	
902		-----		-----	
913		-----		-----	
1117	D7359	0.03		-----	
1135	UOP779	<0.3		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5808	<0.1		-----	
1515		-----		-----	
1823		-----		-----	
1880	D7359	<0.1		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5808	0.04		-----	
6202		-----		-----	
6262	UOP779	<1		-----	
6396	D7536	0.0		-----	
6406		-----		-----	
6481		-----		-----	
7014		-----		-----	
9008	D5194	<0.1		-----	
9014		-----		-----	
	n	14			
	mean (n)	<1			

Determination of Color Pt/Co on sample #22180;

lab	method	value	mark	z(targ)	remarks
150	D5386	8		-0.52	
169	D5386	10		0.41	
171	D5386	8.6		-0.24	
173	D5386	8.71		-0.19	
273	D1209	5		-1.92	
315	D5386	11		0.88	
323	D5386	10		0.41	
333	D5386	9		-0.06	
347	D5386	7		-0.99	
446	D5386	4		-2.39	
551		-----		-----	
557		-----		-----	
657	D5386	10		0.41	
902		-----		-----	
913		-----		-----	
1117	D1209	11		0.88	
1135	D5386	12		1.34	
1169	D5386	9.6		0.22	
1264		-----		-----	
1509	D1209	9.5		0.18	
1515	D1209	11		0.88	
1823		-----		-----	
1880	D5386	11.2		0.97	
6013	D5386	9		-0.06	
6198		-----		-----	
6201	D5386	8		-0.52	
6202	D1209	6.45		-1.24	
6262	D5386	8.7		-0.20	
6396	D5386	10.4		0.60	
6406	D5386	8.9		-0.10	
6481	D5386	9	C	-0.06	first reported 0
7014		-----		-----	
9008	D5386	11		0.88	
9014	D5386	10.1		0.46	

normality	suspect
n	26
outliers	0
mean (n)	9.12
st.dev. (n)	1.898
R(calc.)	5.32
st.dev.(D5386:16)	2.146
R(D5386:16)	6.01
Compare	
R(D1209:05)	7
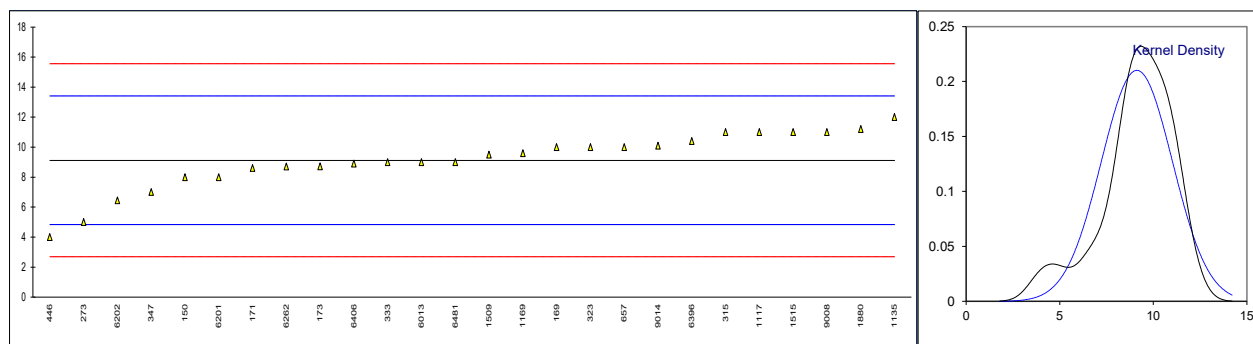
Determination of Density at 20 °C on sample #22180; results in kg/L

lab	method	value	mark	z(targ)	remarks
150	D4052	0.9063		-0.14	
169	D4052	0.9063		-0.14	
171	D4052	0.9063		-0.14	
173	D4052	0.9062		-0.70	
273	D4052	0.9063		-0.14	
315	D4052	0.9063		-0.14	
323	D4052	0.9063		-0.14	
333		-----		-----	
347	D4052	0.9063		-0.14	
446	D4052	0.9063		-0.14	
551		-----		-----	
557		-----		-----	
657	D4052	0.9064		0.42	
902		-----		-----	
913		-----		-----	
1117	D4052	0.9063	C	-0.14	first reported 906.3 kg/L
1135	ISO12185	0.9064		0.42	
1169	D4052	0.9064		0.42	
1264		-----		-----	
1509	D4052	0.90632		-0.03	
1515		-----		-----	
1823		-----		-----	
1880	D4052	0.9063		-0.14	
6013	ISO12185	0.9063		-0.14	
6198		-----		-----	
6201	ISO12185	0.90629		-0.20	
6202		-----		-----	
6262	D4052	0.9063		-0.14	
6396	D4052	0.90647		0.81	
6406	ISO12185	0.9064		0.42	
6481	D4052	0.9063		-0.14	
7014		-----		-----	
9008	D4052	0.9062		-0.70	
9014	D4052	0.90650		0.98	

normality	OK
n	23
outliers	0
mean (n)	0.90632
st.dev. (n)	0.000072
R(calc.)	0.00020
st.dev.(ISO12185:96)	0.000179
R(ISO12185:96)	0.0005
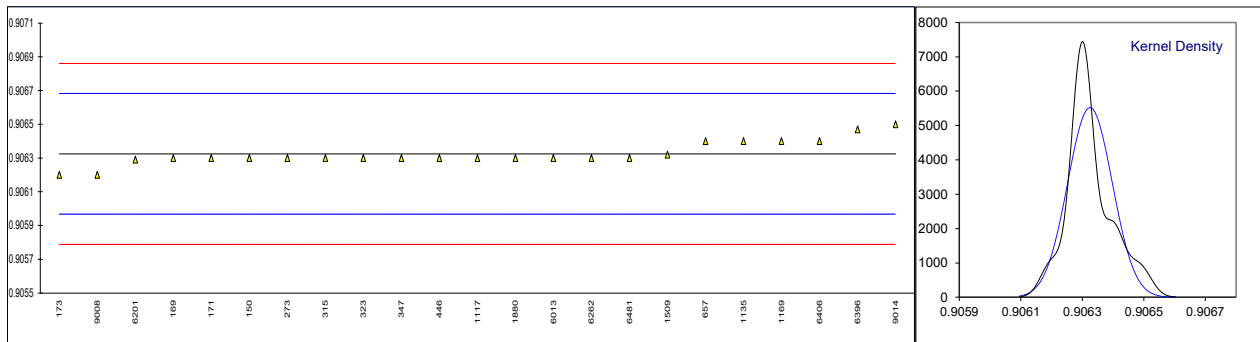
Determination of Inhibitor as TBC on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D4590	4		-0.28	
169	D4590	4.0		-0.28	
171	D4590	4.5		0.25	
173		-----		-----	
273	D4590	5.5		1.30	
315	D4590	4.9		0.67	
323	D4590	5		0.77	
333	D4590	3.5		-0.80	
347	D4590	4		-0.28	
446	D4590	5.4		1.20	
551		-----		-----	
557		-----		-----	
657	D4590	4.9		0.67	
902		-----		-----	
913		-----		-----	
1117	D4590	4.85		0.62	
1135	D4590	3		-1.33	
1169	D4590	4.2		-0.07	
1264		-----		-----	
1509	D4590	4.483		0.23	
1515	D4590	4.4587		0.20	
1823		-----		-----	
1880	D4590	3.2		-1.12	
6013	D4590	4.7		0.46	
6198		-----		-----	
6201	D4590	3.8		-0.49	
6202	D4590	4.80		0.56	
6262	D4590	3.1		-1.22	
6396	D4590	4.36		0.10	
6406	D4590	4.4		0.14	
6481	D4590	3.79		-0.50	
7014		-----		-----	
9008	D4590	3.4		-0.91	
9014	D4590	4.36		0.10	

normality	OK	
n	25	
outliers	0	
mean (n)	4.264	
st.dev. (n)	0.6842	
R(calc.)	1.916	
st.dev.(D4590:18)	0.9503	
R(D4590:18)	2.661	
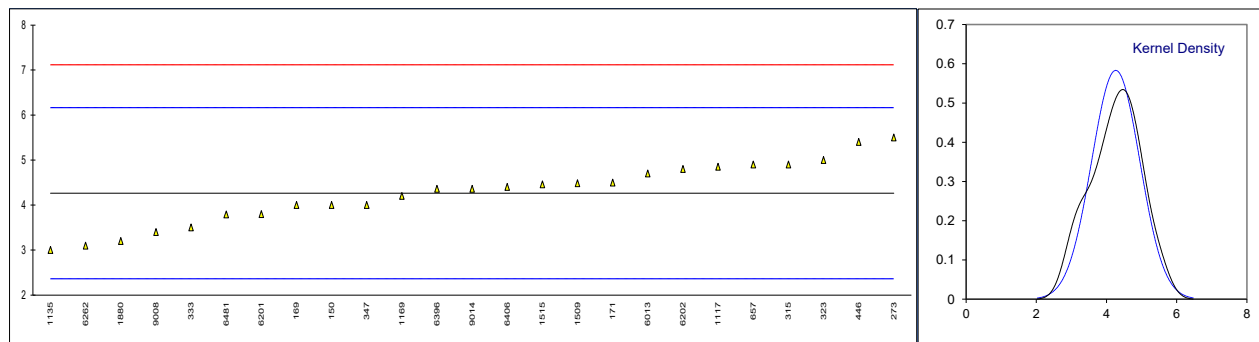
Determination of Peroxides as H_2O_2 on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2340	45		-0.03	
169	D2340	40		-1.11	
171	D2340	12	G(0.05)	-7.14	
173		-----		-----	
273		-----		-----	
315	D2340	33		-2.61	
323		-----		-----	
333	D2340	45		-0.03	
347		-----		-----	
446	D2340	44		-0.24	
551		-----		-----	
557		-----		-----	
657	D2340	>60		>3.20	possibly a false positive test result?
902		-----		-----	
913		-----		-----	
1117	D2340	37		-1.75	
1135	D2340	30		-3.26	
1169		-----		-----	
1264		-----		-----	
1509	D2340	28.06		-3.68	
1515		-----		-----	
1823		-----		-----	
1880	D2340	60		3.20	
6013	D2340	46		0.19	
6198		-----		-----	
6201	D2340	14	G(0.05)	-6.71	
6202	D2340	57.07		2.57	
6262	D2340	47		0.40	
6396	D2340	88.66	G(0.05)	9.38	
6406		-----		-----	
6481	D2340	56		2.34	
7014		-----		-----	
9008	D2340	63.7		4.00	
9014		-----		-----	

	normality	OK	
	n	14	
	outliers	3	
	mean (n)	45.131	
	st.dev. (n)	11.0666	
	R(calc.)	30.986	
	st.dev.(D2340:18)	4.6429	
	R(D2340:18)	13	
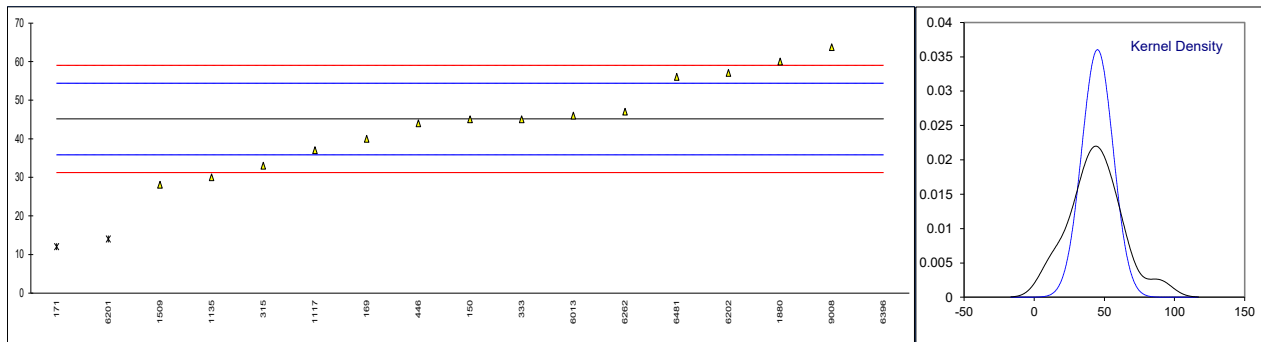
Determination of Polymer on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D2121-A	<1		-----	
169	D2121-A	4.8		-0.04	
171	D2121-A	4		-0.43	
173		-----		-----	
273	D2121-A	3.5		-0.68	
315	D2121-A	5		0.06	
323	D2121-A	4		-0.43	
333	D2121-A	7		1.04	
347	INH-3007	2		-1.42	
446	D2121-A	4.6		-0.14	
551		-----		-----	
557		-----		-----	
657	D2121-A	5		0.06	
902		-----		-----	
913		-----		-----	
1117	D2121-A	7.7		1.38	
1135	D2121-A	6		0.55	
1169	D2121-A	5.0		0.06	
1264		-----		-----	
1509	D2121-A	6.158		0.63	
1515	D2121-A	6.92990		1.01	
1823		-----		-----	
1880	D2121-A	3.9		-0.48	
6013	D2121-A	5		0.06	
6198		-----		-----	
6201	D2121-A	2.75		-1.05	
6202	D2121-A	4.64		-0.12	
6262	D2121-A	5		0.06	
6396	D2121-A	6.44		0.76	
6406	D2121-A	5.4		0.25	
6481	D2121-A	3.69		-0.59	
7014		-----		-----	
9008	In house	3.8		-0.53	
9014	D2121-A	4.914		0.01	

normality	OK	
n	24	
outliers	0	
mean (n)	4.884	
st.dev. (n)	1.3559	
R(calc.)	3.796	
st.dev.(D2121-A:16)	2.0344	
R(D2121-A:16)	5.696	
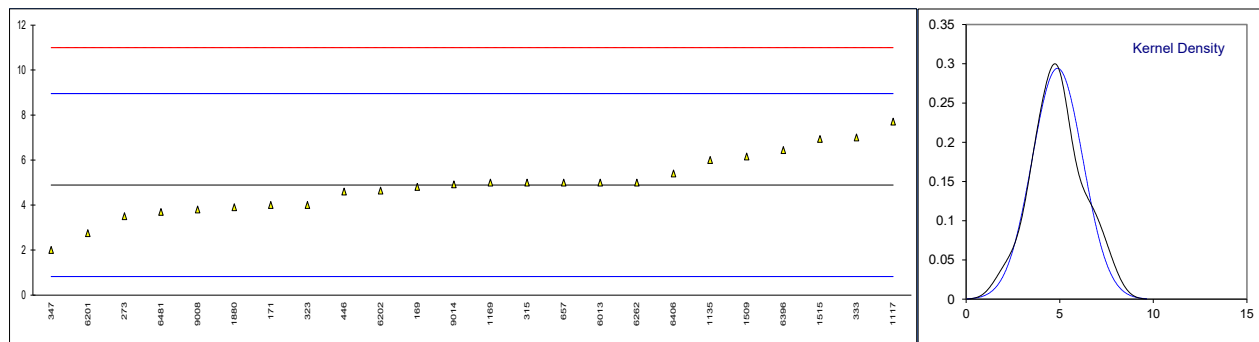
Determination of Total Sulfur on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5453	<1.0		-----	
169	D5453	<1.0		-----	
171	D5453	<1.0		-----	
173		-----		-----	
273		-----		-----	
315	D7183	<0.10		-----	
323	D5453	< 1		-----	
333	D5453	<0.5		-----	
347	D5453	<1		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5453	<1		-----	
902		-----		-----	
913		-----		-----	
1117	D5453	0.038		-----	
1135	D5453	<1.0		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5453	0.08		-----	
1515		-----		-----	
1823		-----		-----	
1880	D5453	<0.1		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5453	0.58		-----	
6202	D5453	<0.09		-----	
6262	D5453	<1		-----	
6396	D5453	0.10		-----	
6406	D5453	<0.1		-----	
6481	D5453	0.10		-----	
7014		-----		-----	
9008	D5453	<0.1		-----	
9014		-----		-----	
	n	19			
	mean (n)	<1			

Determination of Water on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	E1064	150		1.88	
169	E1064	120		-0.04	
171	E1064	136		0.99	
173	E203	95		-1.64	
273	E203	159		2.46	
315	E1064	110		-0.68	
323	E1064	108		-0.81	
333	D1364	119		-0.10	
347	E1064	120		-0.04	
446	E1064	109		-0.74	
551		-----		-----	
557		-----		-----	
657	E1064	120		-0.04	
902		-----		-----	
913		-----		-----	
1117		123		0.15	
1135	E1064	126		0.35	
1169	E1064	130.7		0.65	
1264		-----		-----	
1509	E1064	114.35		-0.40	
1515	E1064	124.5		0.25	
1823		-----		-----	
1880	E1064	113		-0.49	
6013	E1064	113		-0.49	
6198		-----		-----	
6201	E1064	111	C	-0.62	first reported 0.0111 mg/kg
6202	D6304	118.0	C	-0.17	first reported 162.7
6262	E1064	110		-0.68	
6396	E1064	105.4		-0.97	
6406	ISO12937	129		0.54	
6481	E1064	108		-0.81	
7014		-----		-----	
9008	D6304	124		0.22	
9014	E203	140		1.24	

normality	suspect
n	26
outliers	0
mean (n)	120.61
st.dev. (n)	14.152
R(calc.)	39.63
st.dev.(E1064:16)	15.610
R(E1064:16)	43.71
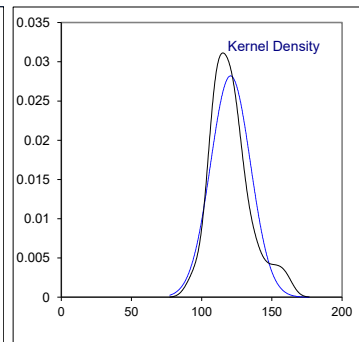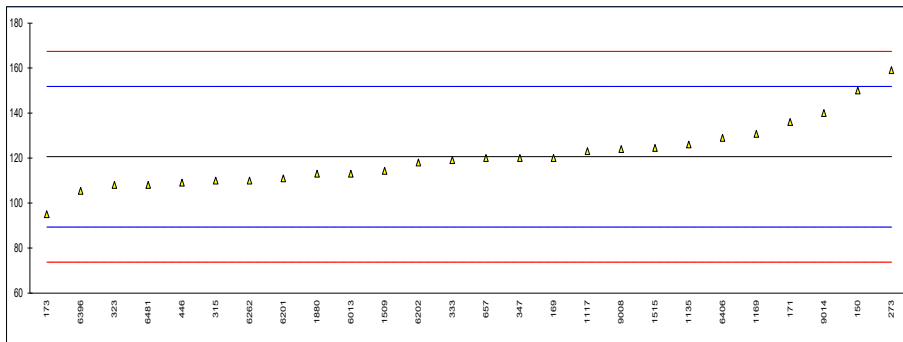
Determination of Purity by GC on sample #22180; results in %M/M

lab	method	value	mark	z(targ)	remarks
150	D5135	99.93		-1.05	
169	D5135	99.94		-0.11	
171	D5135	99.92		-1.98	
173		-----		-----	
273	D5135	99.95		0.83	
315	D5135	99.94		-0.11	
323	D5135	99.93		-1.05	
333	D5135	99.96		1.77	
347	D5135	99.93		-1.05	
446	D5135	99.95		0.83	
551		-----		-----	
557		-----		-----	
657	D5135	99.94		-0.11	
902		-----		-----	
913		-----		-----	
1117	D5135	99.93		-1.05	
1135		-----		-----	
1169	D5135	99.96		1.77	
1264		-----		-----	
1509	D5135	99.944		0.27	
1515	D5135	99.94821		0.66	
1823		-----		-----	
1880	D7504	99.927		-1.33	
6013		-----		-----	
6198		-----		-----	
6201	D5135	99.938		-0.30	
6202	D5135	99.9421	C	0.09	first reported 99.9394
6262	D5135	99.92	C	-1.98	first reported 99.86
6396	D5135	99.96		1.77	
6406	D5135	99.9475		0.60	
6481	D7504	99.9685		2.56	
7014		-----		-----	
9008	D7504	99.93		-1.05	
9014		-----		-----	

normality	OK	
n	22	
outliers	0	
mean (n)	99.9412	
st.dev. (n)	0.01345	
R(calc.)	0.0377	
st.dev.(D5135:21)	0.01066	
R(D5135:21)	0.0299	
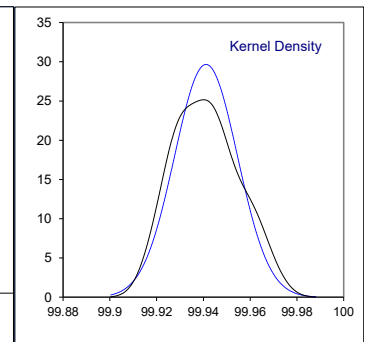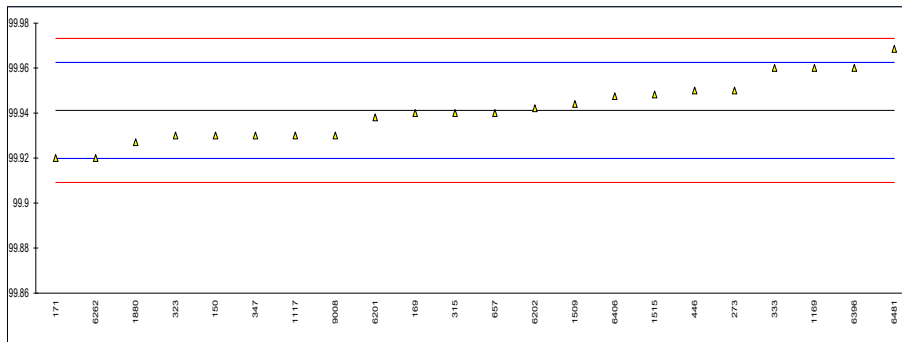
Determination of Benzene on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	14		-0.76	
169	D5135	14.6		-0.51	
171	D6229	14		-0.76	
173		-----		-----	
273		-----		-----	
315	D6229	17.0		0.48	
323	INH-189	17		0.48	
333	D5135	14		-0.76	
347		-----		-----	
446	D5135	16		0.06	
551		-----		-----	
557		-----		-----	
657	D5135	17.6939		0.76	
902		-----		-----	
913		-----		-----	
1117		18.28		1.00	
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	In house	14.45		-0.58	
1515	D5135	13.5		-0.97	
1823		-----		-----	
1880	D4534	14.7		-0.47	
6013		-----		-----	
6198		-----		-----	
6201	D6229	20		1.71	
6202	D5135	15.16		-0.28	
6262	D6229	16		0.06	
6396	D5135	<3		<-5.30	possibly a false negative test result?
6406	D5135	18		0.89	
6481	D7504	3	G(0.01)	-5.30	
7014		-----		-----	
9008	D6229	15		-0.35	
9014		-----		-----	

normality	OK
n	17
outliers	1
mean (n)	15.846
st.dev. (n)	1.8654
R(calc.)	5.223
st.dev.(D5135:21)	2.4254
R(D5135:21)	6.791
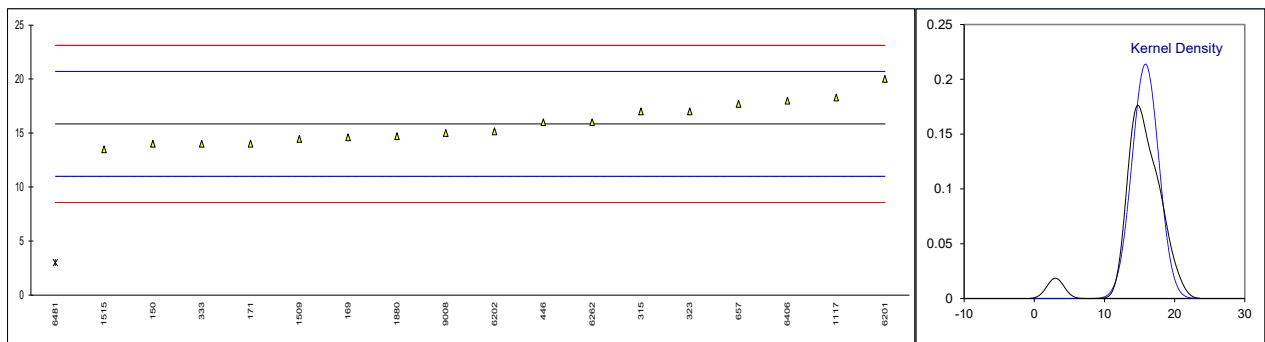
Determination of Toluene on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	19		0.90	
169		-----		-----	
171	D5135	77	G(0.01)	32.98	
173		-----		-----	
273		-----		-----	
315	D5135	17		-0.20	
323	INH-189	18		0.35	
333		-----		-----	
347		-----		-----	
446	D5135	17		-0.20	
551		-----		-----	
557		-----		-----	
657	D5135	17.7701	C	0.22	first reported <10
902		-----		-----	
913		-----		-----	
1117	D5135	18.56		0.66	
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5135	15.12		-1.24	
1515	D5135	15.2		-1.20	
1823		-----		-----	
1880		-----		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	17		-0.20	
6202	D5135	16.50		-0.48	
6262	D5135	20		1.46	
6396	D5135	<3		<-7.42	possibly a false negative test result?
6406	D5135	19		0.90	
6481	D7504	17	C	-0.20	first reported 0
7014		-----		-----	
9008	D6229	16		-0.76	
9014		-----		-----	

normality	OK
n	14
outliers	1
mean (n)	17.368
st.dev. (n)	1.4453
R(calc.)	4.047
st.dev.(Horwitz)	1.8083
R(Horwitz)	5.063
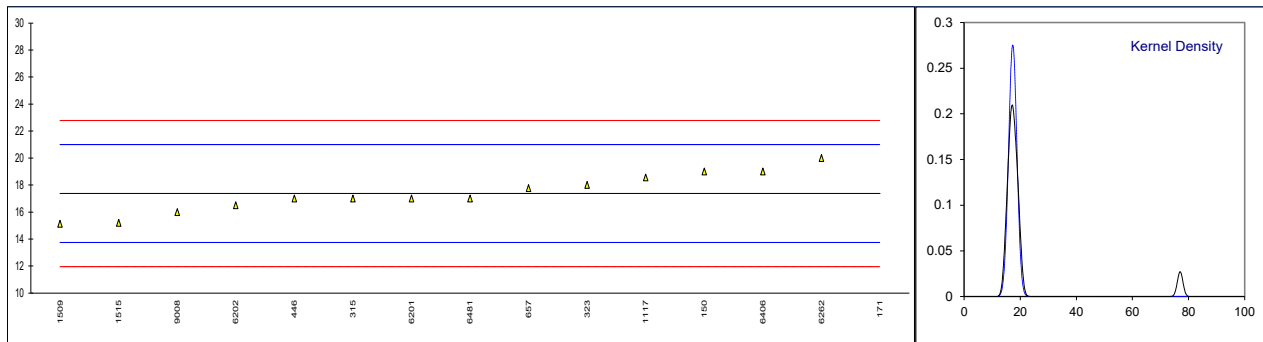
Determination of Ethylbenzene on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	135		0.28	
169	D5135	131.2		-0.08	
171	D5135	141		0.84	
173		-----		-----	
273		-----		-----	
315	D5135	138		0.56	
323	D5135	129		-0.29	
333	D5135	140		0.75	
347	D5135	120		-1.14	
446	D5135	134		0.18	
551		-----		-----	
557		-----		-----	
657	D5135	129.5958		-0.23	
902		-----		-----	
913		-----		-----	
1117	D5135	133.5		0.13	
1135		-----		-----	
1169	D5135	131		-0.10	
1264		-----		-----	
1509	D5135	134.31		0.21	
1515	D5135	120.6		-1.08	
1823		-----		-----	
1880	D7504	130		-0.20	
6013		-----		-----	
6198		-----		-----	
6201	D5135	134		0.18	
6202	D5135	122.32		-0.92	
6262	D5135	134	C	0.18	first reported 160
6396	D5135	<3		<-12.17	possibly a false negative test result?
6406	D5135	132		-0.01	
6481	D7504	137	C	0.46	first reported 5
7014		-----		-----	
9008	D7504	135		0.28	
9014		-----		-----	

normality	OK
n	20
outliers	0
mean (n)	132.076
st.dev. (n)	5.7654
R(calc.)	16.143
st.dev.(D5135:21)	10.6021
R(D5135:21)	29.686
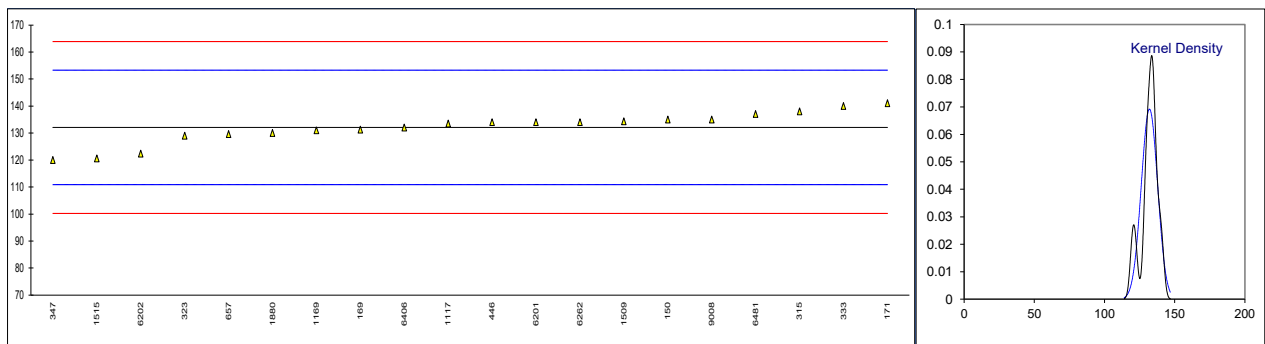
Determination of sum of m- and p-Xylenes on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	<10		-----	
169		-----		-----	
171	D5135	<10		-----	
173		-----		-----	
273		-----		-----	
315		-----		-----	
323	D5135	< 10		-----	
333	D5135	<10		-----	
347		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5135	<10		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	0		-----	
1135		-----		-----	
1169	D5135	<1		-----	
1264		-----		-----	
1509	D5135	1.15		-----	
1515	D5135	22		-----	
1823		-----		-----	
1880	D7504	<10		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	0		-----	
6202	D5135	<4		-----	
6262	D5135	15		-----	
6396	D5135	2.9752	C	-----	first reported 0.00029752 mg/kg
6406		-----		-----	
6481	D7504	0		-----	
7014		-----		-----	
9008	D7504	<10		-----	
9014		-----		-----	
	n	14			
	mean (n)	<10			

Determination of iso-Propylbenzene (Cumene) on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	<10		-----	
169		-----		-----	
171	D5135	<10		-----	
173		-----		-----	
273		-----		-----	
315	D5135	<10		-----	
323	D5135	< 10		-----	
333	D5135	<10		-----	
347		-----		-----	
446	D5135	<3		-----	
551		-----		-----	
557		-----		-----	
657	D5135	<10		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	0		-----	
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5135	0		-----	
1515	D5135	0		-----	
1823		-----		-----	
1880	D7504	<10		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	0		-----	
6202	D5135	<2		-----	
6262	D5135	7		-----	
6396	D5135	<3		-----	
6406		-----		-----	
6481	D7504	0	C	-----	first reported 116
7014		-----		-----	
9008	D7504	<10		-----	
9014		-----		-----	
	n	17			
	mean (n)	<10			

Determination of o-Xylene on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	<10		-----	
169		-----		-----	
171	D5135	<10		-----	
173		-----		-----	
273		-----		-----	
315	D5135	<10		-----	
323	D5135	< 10		-----	
333		-----		-----	
347		-----		-----	
446	D5135	<3		-----	
551		-----		-----	
557		-----		-----	
657	D5135	<10		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	1.6		-----	
1135		-----		-----	
1169	D5135	<1		-----	
1264		-----		-----	
1509	D5135	0.99		-----	
1515	D5135	0		-----	
1823		-----		-----	
1880	D7504	<10		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	0		-----	
6202	D5135	<2		-----	
6262	D5135	3		-----	
6396	D5135	<3		-----	
6406		-----		-----	
6481	D7504	0	C	-----	first reported 107
7014		-----		-----	
9008	D7504	<10		-----	
9014		-----		-----	
	n	17			
	mean (n)	<10			

Determination of n-Propylbenzene on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	<10		-----	
169		-----		-----	
171	D5135	<10		-----	
173		-----		-----	
273		-----		-----	
315	D5135	<10		-----	
323	D5135	< 10		-----	
333		-----		-----	
347		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5135	<10		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	0		-----	
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5135	0		-----	
1515	D5135	0		-----	
1823		-----		-----	
1880	D7504	<10		-----	
6013		-----		-----	
6198		-----		-----	
6201		-----		-----	
6202	D5135	<2		-----	
6262		-----		-----	
6396	D5135	<3		-----	
6406		-----		-----	
6481		-----		-----	
7014		-----		-----	
9008	D7504	<10		-----	
9014		-----		-----	
	n	12			
	mean (n)	<10			

Determination of sum of m- and p-Ethyltoluenes on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	<10		-----	
169		-----		-----	
171		-----		-----	
173		-----		-----	
273		-----		-----	
315	D5135	<10		-----	
323	D5135	< 10		-----	
333		-----		-----	
347		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5135	<10		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	32		-----	possibly a false positive test result?
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5135	1.13		-----	
1515	D5135	0		-----	
1823		-----		-----	
1880	D7504	<10		-----	
6013		-----		-----	
6198		-----		-----	
6201		-----		-----	
6202	D5135	<4		-----	
6262		-----		-----	
6396		-----		-----	
6406		-----		-----	
6481		-----		-----	
7014		-----		-----	
9008	D7504	<10		-----	
9014		-----		-----	
	n	9			
	mean (n)	<10			

Determination of alpha-Methylstyrene, 1,2-Diethylbenzene and sum of alpha-Methylstyrene + 1,2-Diethylbenzene on sample #22180; results in mg/kg

lab	method	alpha-MS	mark	z(targ)	1,2-DeB	mark	z(targ)	sum	mark	z(targ)
150	D5135	205		0.11	-----		-----	-----		-----
169	D5135	203.2		-0.02	-----		-----	-----		-----
171	D5135	214		0.79	-----		-----	-----		-----
173		-----		-----	-----		-----	-----		-----
273		-----		-----	-----		-----	-----		-----
315	D5135	211		0.56	-----		-----	-----		-----
323	D5135	208		0.34	-----		-----	-----		-----
333	D5135	198		-0.41	-----		-----	-----		-----
347		-----		-----	-----		-----	-----		-----
446	D5135	203		-0.04	-----		-----	-----		-----
551		-----		-----	-----		-----	-----		-----
557		-----		-----	-----		-----	-----		-----
657	D5135	196.4502		-0.53	-----		-----	-----		-----
902		-----		-----	-----		-----	-----		-----
913		-----		-----	-----		-----	-----		-----
1117	D5135	203.8		0.02	-----		-----	-----		-----
1135		-----		-----	-----		-----	-----		-----
1169	D5135	187		-1.24	-----		-----	-----		-----
1264		-----		-----	-----		-----	-----		-----
1509	D5135	202.67		-0.06	-----		-----	-----		-----
1515	D5135	181.3		-1.66	-----		-----	-----		-----
1823		-----		-----	-----		-----	-----		-----
1880	D7504	206		0.19	-----		-----	-----		-----
6013		-----		-----	-----		-----	-----		-----
6198		-----		-----	-----		-----	-----		-----
6201		-----		-----	-----		-----	-----		-----
6202	D5135	189.62		-1.04	<2		-----	<2	E	-----
6262	D5135	206		0.19	<3		-----	206		-----
6396	D5135	<3	f-?	<-14.24	-----		-----	-----		-----
6406	D5135	226		1.69	-----		-----	-----		-----
6481	D7504	215	C	0.86	-----		-----	-----		-----
7014		-----		-----	-----		-----	-----		-----
9008	D7504	207		0.26	-----		-----	-----		-----
9014		-----		-----	-----		-----	-----		-----

normality	OK
n	18
outliers	0
mean (n)	203.502
st.dev. (n)	10.5470
R(calc.)	29.532
st.dev.(D5135:21)	13.3438
R(D5135:21)	37.363

lab 6481 first reported 105
lab 6396 possibly a false negative test result?
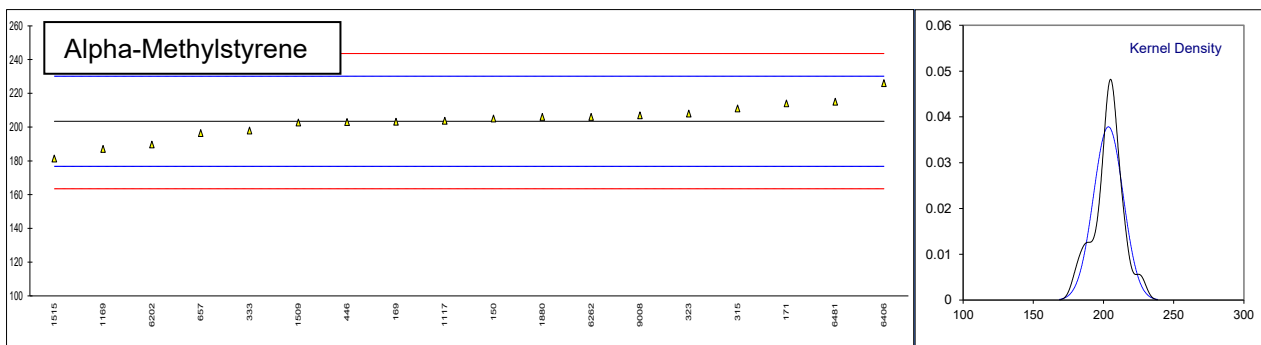
Determination of Phenylacetylene, 3/4-Methylstyrenes and sum of Phenylacetylene + 3/4-Methylstyrenes on sample #22180; results in mg/kg

lab	method	Phenylacetylene	mark	z(targ)	3/4M.styrenes	mark	z(targ)	sum	mark	z(targ)
150	D5135	18		-----	-----		-----	-----		-----
169	D5135	16		-----	-----		-----	-----		-----
171	D5135	<10		-----	-----		-----	-----		-----
173		-----		-----	-----		-----	-----		-----
273		-----		-----	-----		-----	-----		-----
315	D5135	<10		-----	-----		-----	-----		-----
323	D5135	< 10		-----	-----		-----	-----		-----
333	D5135	<10		-----	-----		-----	-----		-----
347		-----		-----	-----		-----	-----		-----
446	D5135	13		-----	-----		-----	-----		-----
551		-----		-----	-----		-----	-----		-----
557		-----		-----	-----		-----	-----		-----
657	D5135	<10		-----	17.9194		-----	24.8441		-----
902		-----		-----	-----		-----	-----		-----
913		-----		-----	-----		-----	-----		-----
1117	D5135	20.1		-----	0		-----	20		-----
1135		-----		-----	-----		-----	-----		-----
1169	D5135	<1		-----	-----		-----	-----		-----
1264		-----		-----	-----		-----	-----		-----
1509	D5135	7.03		-----	0		-----	-----		-----
1515	D5135	0		-----	19.4		-----	19.4		-----
1823		-----		-----	-----		-----	-----		-----
1880	D7504	<10		-----	-----		-----	-----		-----
6013		-----		-----	-----		-----	-----		-----
6198		-----		-----	-----		-----	-----		-----
6201	D5135	18		-----	202	f+?	-----	220		-----
6202	D5135	<2		-----	15.40		-----	-----		-----
6262	D5135	18		-----	-----		-----	-----		-----
6396	D5135	5.1161	C	-----	-----		-----	-----		-----
6406	D5135	15		-----	-----		-----	-----		-----
6481	D7504	6		-----	-----		-----	-----		-----
7014		-----		-----	-----		-----	-----		-----
9008	D7504	17		-----	-----		-----	-----		-----
9014		-----		-----	-----		-----	-----		-----
	n	12								
	mean (n)	<10								

lab 6396 first reported 0.00051161 mg/kg
lab 1509 reported only 4-methylstyrene
lab 6201 possibly a false positive test result?

## Determination of Benzaldehyde on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	123		-0.72	
169		-----		-----	
171	D5135	147		0.60	
173		-----		-----	
273		-----		-----	
315	D5135	113		-1.26	
323	D5135	134		-0.11	
333		-----		-----	
347		-----		-----	
446		-----		-----	
551		-----		-----	
557		-----		-----	
657	D5135Mod.	131.0046		-0.28	
902		-----		-----	
913		-----		-----	
1117	D5135	138		0.11	
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509	D5135	140.02		0.22	
1515		-----		-----	
1823		-----		-----	
1880		-----		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	114		-1.21	
6202	D5135	163.5	C	1.51	first reported 190.94
6262	D5135	130		-0.33	
6396	D5135	<3		<-6.69	possibly a false negative test result?
6406		-----		-----	
6481		-----		-----	
7014		-----		-----	
9008	D7504	163		1.48	
9014		-----		-----	

normality	OK	
n	11	
outliers	0	
mean (n)	136.048	
st.dev. (n)	16.9509	
R(calc.)	47.463	
st.dev.(D5135:21)	18.2207	
R(D5135:21)	51.018	
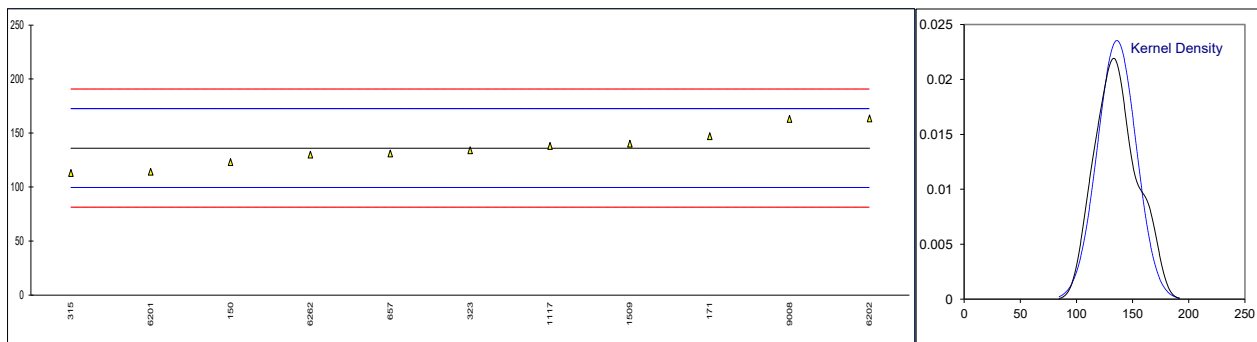
Determination of Non-aromatics on sample #22180; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	50		0.30	
169		-----		-----	
171	D5135	49		0.25	
173		-----		-----	
273		-----		-----	
315	D5135	60		0.84	
323	D5135	37		-0.40	
333		-----		-----	
347		-----		-----	
446	D5135	86		2.25	
551		-----		-----	
557		-----		-----	
657		-----		-----	
902		-----		-----	
913		-----		-----	
1117	D5135	590	C,G(0.01)	29.49	first reported 170
1135		-----		-----	
1169		-----		-----	
1264		-----		-----	
1509		-----		-----	
1515	D5135	3.1		-2.23	
1823		-----		-----	
1880		-----		-----	
6013		-----		-----	
6198		-----		-----	
6201	D5135	16		-1.54	
6202	D5135	20.97		-1.27	
6262	D5135	122		4.19	
6396	D5135	<3		-----	
6406		-----		-----	
6481	D7504	0		-2.40	
7014		-----		-----	
9008		-----		-----	
9014		-----		-----	

normality	OK
n	10
outliers	1
mean (n)	44.407
st.dev. (n)	38.2034
R(calc.)	106.970
st.dev.(D5135:21)	18.5029
R(D5135:21)	51.808
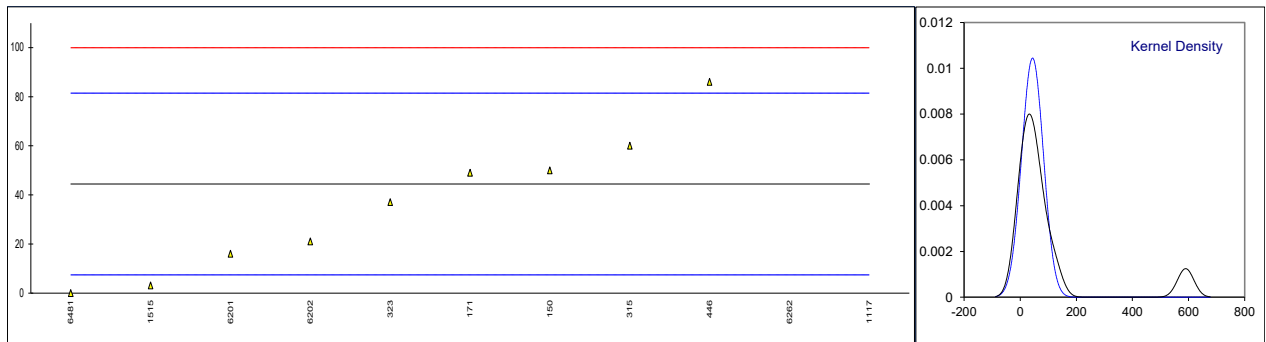
APPENDIX 2

Number of participants per country

      3 labs in BELGIUM

      2 labs in BRAZIL

       1 lab in CANADA

      2 labs in CHINA, People's Republic

       1 lab in FRANCE

       1 lab in INDIA

       1 lab in INDONESIA

       1 lab in IRAN, Islamic Republic of

      2 labs in KUWAIT

      4 labs in NETHERLANDS

       1 lab in SAUDI ARABIA

      2 labs in SINGAPORE

       1 lab in SOUTH AFRICA

       1 lab in SPAIN

      3 labs in TURKEY

       1 lab in UNITED KINGDOM

      7 labs in UNITED STATES OF AMERICA

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

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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)