

Results of Proficiency Test  
Styrene  
September 2014

Organised by: Institute for Interlaboratory Studies (iis)  
Spijkenisse, the Netherlands

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## **1 INTRODUCTION**

Since 1995, the Institute for Interlaboratory Studies organizes a proficiency test for the analysis of Styrene. During the annual proficiency testing program 2014/2015, it was decided to organize again a round robin for the analysis of Styrene. In this interlaboratory study, 40 laboratories from 20 different countries have participated. See appendix 2 for the number of participants per country. In this report, the results of the 2014 Styrene proficiency test are presented and discussed. This report is also electronically available through the iis internet site [www.iisnl.com](http://www.iisnl.com).

## **2 SET UP**

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test. Sample analyses for fit-for-use and homogeneity testing were subcontracted. It was decided to send one 0.5 liter bottle with Styrene (labelled #14190). Participants were requested to report rounded and unrounded results. The unrounded 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/IEC 17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This proficiency test 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 organisation 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' (iis-protocol, version 3.3) of April 2014.

### **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

The necessary bulk material was obtained from a local Styrene producer. The approximately 36 litre was spiked with 86.5 mg Chloroform and 371.2 mg Dibenzothiophene. From the bulk sample, after homogenisation, 68 amber glass bottles of 0.5 L (labelled #14190) were filled. The homogeneity of the subsamples #14190 was checked by determination of Density at 20°C in accordance with ASTM D4052 and n-Propylbenzene in accordance with ASTM D5135 on 8 stratified randomly selected samples.

	<i>Density at 20°C in kg/L</i>	<i>n-Propylbenzene in mg/kg</i>
sample #14190-1	0.90500	147
sample #14190-2	0.90500	144
sample #14190-3	0.90500	147
sample #14190-4	0.90500	140
sample #14190-5	0.90500	146
sample #14190-6	0.90500	146
sample #14190-7	0.90500	147
sample #14190-8	0.90501	140

Table 1: homogeneity test results of subsamples #14190

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

	<i>Density at 20°C in kg/L</i>	<i>n-Propylbenzene in mg/kg</i>
r (sample #14190)	0.00001	8.5
Ref. method	ASTM D4052:02e1	ASTM D5135:14
0.3 x R (ref. method)	0.00015	10.2

Table 2: repeatabilities of subsamples #14190

Each calculated repeatability was less than 0.3 times the corresponding reproducibility of the reference method. Therefore homogeneity of the samples was assumed.

To each of the participating laboratories, 1 bottle of 0.5 L (labelled #14190) was sent on September 24, 2014.

## 2.5 STABILITY OF THE SAMPLES

The stability of Styrene, packed in a brown glass bottle, was checked. The material was found sufficiently stable for the period of the proficiency test.

## 2.6 ANALYSES

The participants were asked to determine on sample #14190: Aldehydes as benzaldehyde, Appearance, Colour Pt/Co, Inhibitor, Density at 20°C, Peroxide as H<sub>2</sub>O<sub>2</sub>, Polymer, Organic Chloride, Sulphur, Water, Purity and the Impurities: Benzene, Toluene, Ethylbenzene, m- & p-Xylenes, Cumene, o-Xylene, n-Propylbenzene, m- & p-Ethyltoluenes, alpha-Methylstyrene, 1,2-diethylbenzene, Phenylacetylene, 3,4-dimethylstyrenes, Benzaldehyde and Nonaromatics.

To get comparable results a detailed report form, on which the units were prescribed as well as the required standards and a letter of instructions were prepared and made available on the data entry portal [www.kpmd.co.uk/sgs-iis/](http://www.kpmd.co.uk/sgs-iis/). The detailed report form was also made available for download on the iis website [www.iisnl.com](http://www.iisnl.com).

A SDS and a form to confirm receipt of the samples were added to the sample package.

## 3 RESULTS

During four weeks after sample despatch the results of the individual laboratories were received. The original reported results were tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after deadline, a reminder fax was sent to those laboratories that had not yet reported results. Shortly after the deadline the available results were screened for suspect data. A 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 results. Additional or corrected results were used for data analysis and original results were placed under 'Remarks' in the result tables in appendix 1.

### 3.1 STATISTICS

Statistical calculations were performed as described in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' (iis-protocol, April 2014 version 3.3). For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. 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. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the results should be used with due care.

In accordance to ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon, Grubbs and Rosner outlier tests. Outliers are marked by D(0.01) for the Dixon test, by G(0.01) or DG(0.01) for the Grubbs test and by R(0.01) for the Rosner General ESD test (see appendix 3, no.15). Stragglers are marked by D(0.05) for the Dixon 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 the averages and the 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. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

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

### 3.2 GRAPHICS

In order to visualise 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 analysis results are plotted. The corresponding laboratory numbers are under 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 standard. 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 (see appendix 3; no.13 and 14). Also a normal Gauss curve was projected over the Kernel Density Graph.

### 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 reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the spread of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8.

The standard uncertainty ( $u_x$ ) was calculated from the (target) standard deviation in accordance with ISO13528, paragraph 5.6:

$$u_x = 1.23 * (\text{st.dev } (n)) / \sqrt{n}$$

In ISO13528 is stated that if  $u_x \geq 0.3 * \text{standard deviation}$  for proficiency testing, the uncertainty of the assigned value is not negligible and needs to be included in the interpretation of the results of the proficiency test. In the cases that the uncertainty is not negligible (see appendix 1) the z'-scores were calculated in stead of the usual z-scores.

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 in accordance with:

$$Z_{(\text{target})} = (\text{result} - \text{average of PT}) / \text{target standard deviation}$$

The  $Z'_{(\text{target})}$  were calculated in accordance with ISO13528 paragraph 7.6:

$$Z'_{(\text{target})} = (\text{result} - \text{mean of PT}) / \sqrt{((\text{target standard deviation})^2 + (u_x)^2)}$$

The  $Z_{(\text{target})}$  and  $Z'_{(\text{target})}$  scores are listed in the 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 maybe as follows:

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

## 4 EVALUATION

In this proficiency test some problems were encountered with the despatch of the samples to the laboratories in Brazil, Islamic Republic of Iran and Kuwait. These laboratories did receive the samples late. Six participants reported results after the final reporting date and four laboratories did not report results at all. Not all participants were able to report all requested parameters. Finally, 36 laboratories did report 510 numerical results. Observed were 33 outlying results, which is 6.5%. In proficiency studies outlier percentages of 3 - 7.5% are quite normal.

A number of participants mentioned to have large difficulties to analyze sample #14190 by GC. The large number and high concentrations of impurities present, which made this a low purity Styrene, made it very difficult to determine the requested impurities by GC and to report a suitable test result for each impurity.

### 4.1 EVALUATION PER TEST

In this section the results were discussed per test. The standard reproducibilities used for the evaluation of the GC impurities were extrapolated from the reproducibilities, as mentioned in ASTM D5135:14 (table 3) or calculated using the Horwitz equation when no precision data was mentioned in ASTM D5135:14.

In the iis PT reports, ASTM methods are referred to with a number (e.g. D2086) and an added designation for the year that the method was adopted or revised (e.g. D2086:08). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. D2086:08 (2013)).

In the results tables of Appendix 1 only the method number and year of adoption or revision will be used.

Not all original 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.

- Aldehydes as benzaldehyde: This determination was very problematic. One statistical outlier was observed and six results were excluded from the statistical calculation as the reported total aldehyde results were less than the test result for benzaldehyde by GC. The calculated reproducibility after rejection of the suspect data is not at all in agreement with the requirements of ASTM D2119:09. The large spread was also observed in previous years and two possible causes were found: CO<sub>2</sub>-absorption during the standing period of 1 hour may influence the result significantly and also the use of Thymol Blue in stead of the sodium salt of Thymol Blue (and the need of caustic to dissolve the Thymol blue) may be a cause.
- Appearance: A standardized method is available for Appearance since 2009, being ASTM E2680. However, not all participants did report according this method. All participants agreed about the appearance of sample #14190 to be CFFSM. Participants who used ASTM E2680 should report the Appearance as ‘pass’ (or ‘fail’). Twenty participants reported the appearance correctly as pass. The other laboratories used different kind of terms or abbreviations like: Clear, C&B, CFFSM and CLFSH. The explanations for the used abbreviations are given on page 15.
- Colour Pt/Co: This determination was not problematic. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D5386:10 and ASTM D1209:11.
- Density: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in good agreement with the requirements of ASTM D4052:02e1. The current version of this method ASTM D4052:11 only gives reproducibilities for the density range 0.71 g/ml to 0.88 g/ml, being valid for gasolines, distillates, basestocks and lubricating oils. Therefore this 2011 version may be not applicable for Styrene.
- Inhibitor: 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 D4590:13.
- Organic Chloride: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in full agreement with the requirements of ASTM D5808:09a. The average recovery of Organic Chloride (theoretical increment of 2.37 mg/kg) may be satisfactory: “less than 88%”. The actual blank concentration for Organic Chloride is unknown.



- Peroxides: This determination was very problematic. No statistical outliers were observed. However, the calculated reproducibility is not at all in agreement with the requirements of ASTM D2340:13.
- Polymers: This determination was very problematic. Five statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements estimated from the Horwitz equation.
- Sulphur: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D5453:12. The average recovery of Sulphur (theoretical increment of 1.99 mg/kg) may be satisfactory: "less than 126%" The actual blank concentration for Sulphur is unknown.
- Water: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility, after rejection of the statistical outlier is in good agreement with the requirement of ASTM E1064:12.
- Purity: As the consensus value found was below the application range of ASTM D5135 for this low purity Styrene, no significant conclusions were drawn. Four statistical outliers were observed.
- Benzene: 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 requirement estimated from the Horwitz' equation.
- Toluene: This determination was problematic at the high concentration of 5400 mg/kg. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements estimated using the Horwitz equation.
- Ethylbenzene: This determination was not problematic. Only one statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5135:14.
- m- & p-Xylenes: 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 estimated using the Horwitz equation. It must be noted that the observed reproducibility is not at all in agreement with the requirements estimated ASTM D5135:14. Remarkable is the significant difference between the Horwitz equation and reproducibility of the method. Therefore, it can be concluded that the reproducibility of the method probably can not be met in practice.

- Cumene: 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 requirement estimated from the Horwitz equation.
- o-Xylene: This determination was problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is not in agreement with the requirements estimated using the Horwitz equation. Remarkable is the significant difference between reproducibility of ASTM D5135 and the Horwitz equation. Therefore the conclusion can be drawn that the reproducibility of the method is probably not realistic.
- n-Prop.benzene: This determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5135:14.
- m- & p-Ethyltol.: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in agreement with the requirements of ASTM D5135:14.
- $\alpha$ -Methylstyrene: This determination was very problematic. No statistical outliers were observed. However, the calculated reproducibility is not at all in agreement with the requirements estimated using the Horwitz equation. The problem may be caused by the fact that the peak of this component is present on the long tail of the styrene peak, which may lead to integration differences between the various laboratories.
- 1,2-Diethylbenz.: Only five laboratories reported a numerical test result for this component. No significant conclusions were drawn.
- Phenylacetylene: This determination was very problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is not at all in agreement with the requirements estimated using the Horwitz equation. Four laboratories may have reported a false negative result.
- 3- & 4 -Me-Styrenes: Only three laboratories reported a numerical test result for these components. No significant conclusions were drawn.
- Benzaldehyde: This determination was very problematic. No statistical outliers were observed, but six results were excluded from the statistical calculation as the reported Benzaldehyde by GC test results were all larger than the reported test result for Total aldehyde by titration. The observed reproducibility after rejection of the excluded data is not at all in agreement with the requirement estimated from the Horwitz equation.

Nonaromatics: This determination may be very problematic. No statistical outliers were observed. The large spread may be caused by problems with the identification of the various peaks due to low purity. The calculated reproducibility is not in agreement with the requirements calculated using the Horwitz equation.

#### 4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant standard and the reproducibility as found for the group of participating laboratories. The results and the calculated reproducibilities and the reproducibilities, derived from literature standards (in casu ASTM standards) are compared in the next table.

Parameter	unit	n	average	2.8 *sd <sub>R</sub>	R (lit)
Aldehydes as benzaldehyde	mg/kg	21	141.8	84.1	56.7
Appearance		33	Pass	n.a.	n.a.
Colour		29	8.8	3.0	6.0
Density at 20°C	kg/L	30	0.9050	0.0002	0.0005
Inhibitor (p-TBC)	mg/kg	27	3.7	1.8	0.7
Organic Chlorides	mg/kg	15	2.1	1.2	1.3
Peroxides as H <sub>2</sub> O <sub>2</sub>	mg/kg	26	41.7	31.2	13.0
Polymers	mg/kg	26	4.6	2.4	1.6
Sulphur	mg/kg	23	2.5	1.1	1.2
Water	mg/kg	32	299	32	48
Purity	%M/M	21	98.48	0.14	(0.05)
Benzene	mg/kg	18	46.8	63.6	21.9
Toluene	mg/kg	18	5409	816	665
Ethylbenzene	mg/kg	25	412	89	118
m- & p-Xylenes	mg/kg	21	2453	378	480
Cumene	mg/kg	15	23.6	31.3	11.9
o-Xylene	mg/kg	22	1200	222	185
n-Propylbenzene	mg/kg	20	131	42	33
m- & p-Ethyltoluenes	mg/kg	14	361	100	129
α-Methylstyrene	mg/kg	23	271	161	52
1,2-diethylbenzene	mg/kg	5	47.1	68.5	(11.8)
Phenylacetylene	mg/kg	13	34.1	29.1	9.0
3- & 4-Methylstyrenes	mg/kg	3	43.3	n.a.	n.a.
Benzaldehyde	mg/kg	5	121	88	26
Nonaromatics	mg/kg	13	2564	2226	1114

Table 3: reproducibilities for sample #14190

Between brackets is near or below the detection limit of the test method

Without further statistical calculations it can be concluded that for only several components there is a good compliance of the group of participating laboratories with the relevant standards. The components that are problematic have been discussed in paragraph 4.1.

#### 4.3 COMPARISON OF THE PROFICIENCY TEST OF SEPTEMBER 2014 WITH PREVIOUS PTS

	<i>September 2014</i>	<i>September 2013</i>	<i>September 2012</i>	<i>October 2011</i>
Number of reporting labs	36	34	38	31
Number of Results reported	510	474	552	403
Statistical outliers	33	29	30	15
Percentage outliers	6.5%	6.1%	5.4%	3.7%

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 against the requirements of the respective standards. The conclusions are given in the following table:

Determination	<i>September 2014</i>	<i>September 2013</i>	<i>September 2012</i>	<i>October 2011</i>
Aldehydes	--	--	--	--
Colour	++	++	+	++
Density	++	++	++	++
Inhibitor	--	--	+	-
Organic chloride	+	+/-	++	n.e
Peroxides as H <sub>2</sub> O <sub>2</sub>	--	--	--	--
Polymer	--	--	--	+/-
Sulphur	+	++	+	n.e
Water	++	--	--	--
Purity	(--)	++	+/-	+
Benzene	--	--	--	n.e
Toluene	--	n.e.	n.e.	n.e.
Ethylbenzene	++	++	+/-	++
m+p-Xylenes	++	--	--	--
Cumene	--	n.e.	+	--
o-Xylene	--	++	++	++
n-Propylbenzene	--	+	n.e	-
m+p-Ethyltoluenes	++	n.e.	n.e	n.e
α-Methylstyrene	--	--	-	--
1,2-Diethylbenzene	(--)	n.e.	n.e	n.e
Phenylacetylene	--	--	(--)	--
3-&4-Methylstyrenes	n.e.	--	n.e	n.e
Benzaldehyde	--	--	--	--
Nonaromatics	--	n.e.	n.e.	--

Table 5: comparison of overall performance per parameter against the standard requirements

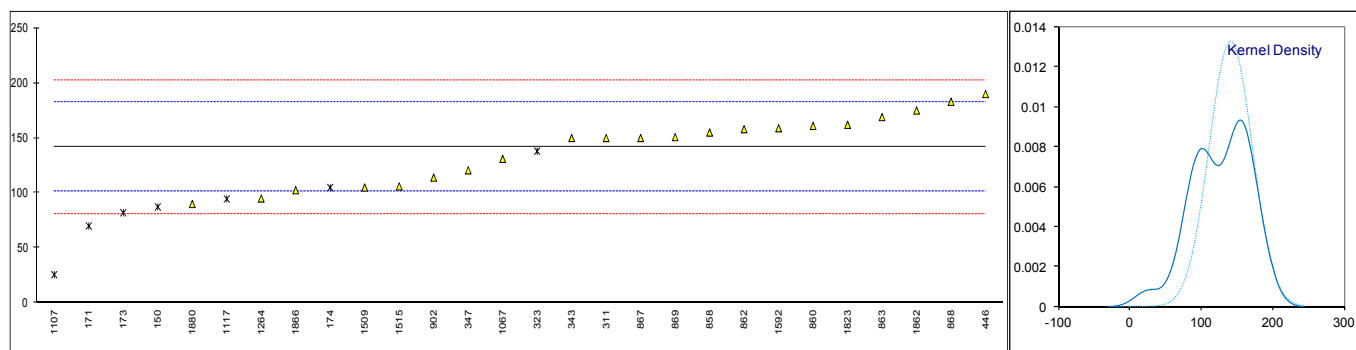
The performance of the determinations against the requirements of the respective standards is listed in the above table. The following performance categories were used:

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

**APPENDIX 1**

**Determination of Aldehydes as benzaldehyde on sample #14190; results in mg/kg**

lab	method	value	mark	z(targ)	Remarks
150	D2119	87.3	ex	-2.69	Result excluded, GC result > titration result
171	D2119	69.96699	ex	-3.54	Result excluded, GC result > titration result
173	D2119	82	ex	-2.95	Result excluded, GC result > titration result
174	D2119	104.9	ex	-1.82	Result excluded, GC result > titration result
273		----		----	
311	D2119	150		0.41	
323	D2119	138	ex	-0.19	Result excluded, GC result > titration result
333		----		----	
343	D2119	150		0.41	
347	D2119	120.64		-1.04	
446	D2119	190		2.38	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D2119	155		0.65	
860	D2119	161		0.95	
862	D2119	158		0.80	
863	D2119	169		1.35	
867	D2119	150		0.41	
868	D2119	183		2.04	
869	D2119	150.8		0.45	
902	D2119	114	C	-1.37	First reported 44
913		----		----	
1067	D2119	131		-0.53	
1107	D2119	25.7	R(0.05)	-5.73	
1117	D2119	94.6	ex	-2.33	Result excluded, GC result > titration result
1201		----		----	
1264	D2119	95		-2.31	
1429		----		----	
1509	D2119	105		-1.81	
1515	D2119	106		-1.77	
1592	D2119	158.9		0.85	
1823	D2119	162		1.00	
1862	D2119	175	C	1.64	First reported 17.5
1866	D2119	102.5		-1.94	
1880	D2119	90		-2.56	
7007		----		----	
7014		----		----	
9008		----		----	
normality	OK				
n	21				
outliers	1		+ 6 excl		
mean (n)	141.75				
st.dev. (n)	30.035				
R(calc.)	84.10				
R(D2119:09)	56.70				



## Determination of Appearance on sample #14190;

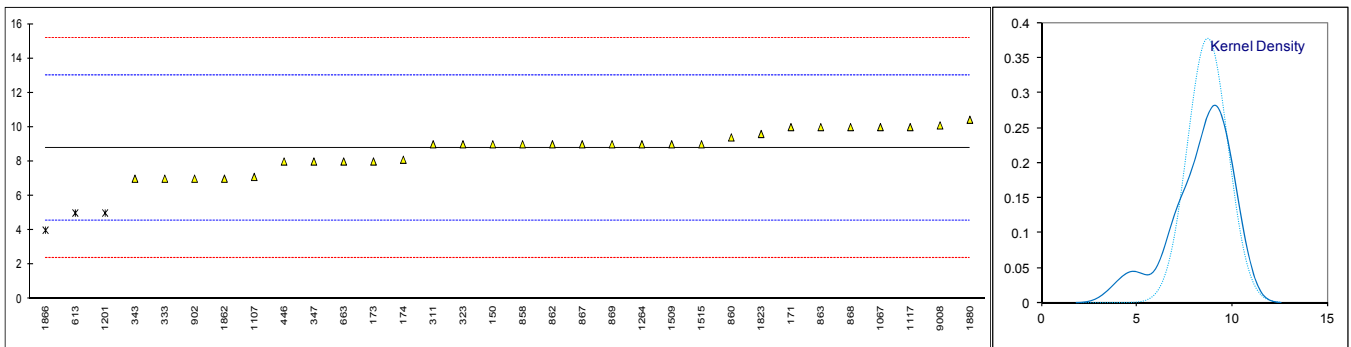
lab	method	value	mark	z(targ)	Remarks
150	E2680	Pass		----	
171	E2680	Pass		----	
173	D4176	Pass		----	
174	E2680	Pass		----	
273		----		----	
311	E2680	Pass		----	
323	E2680	CFFSM		----	
333	Visual	C&B		----	
343	E2680	Pass		----	
347	E2680	Pass		----	
446	E2680	Pass		----	
551		----		----	
557		----		----	
613	Visual	C&B		----	
663	E2680	Pass		----	
858	E2680	Pass		----	
860	E2680	Pass		----	
862	E2680	C&B		----	
863	E2680	C&B		----	
867	Visual	C&B		----	
868	E2680	Pass		----	
869	E2680	Pass		----	
902	E2680	Pass		----	
913		----		----	
1067	Visual	CLFSH		----	
1107	E2680	CFFSM		----	
1117	D4176	CFFSM		----	
1201	E2680	Pass		----	
1264	E2680	Clear		----	
1429		----		----	
1509	E2680	CFFSM		----	
1515	E2680	Pass		----	
1592		----		----	
1823	D4176	Pass		----	
1862	Visual	Pass		----	
1866	E2680	Clear		----	
1880	E2680	Pass		----	
7007		----		----	
7014	Inhouse	CFFSM		----	
9008	E2680	Pass		----	
	n	33			
	mean (n)	Pass			

Abbreviations:

C&B: Clear and Bright  
CFFSM: Clear and Free from Matter in Suspension  
CLFSH: Clear Liquid Free from Sediment and Haze

Determination of Colour Pt/Co on sample #14190;

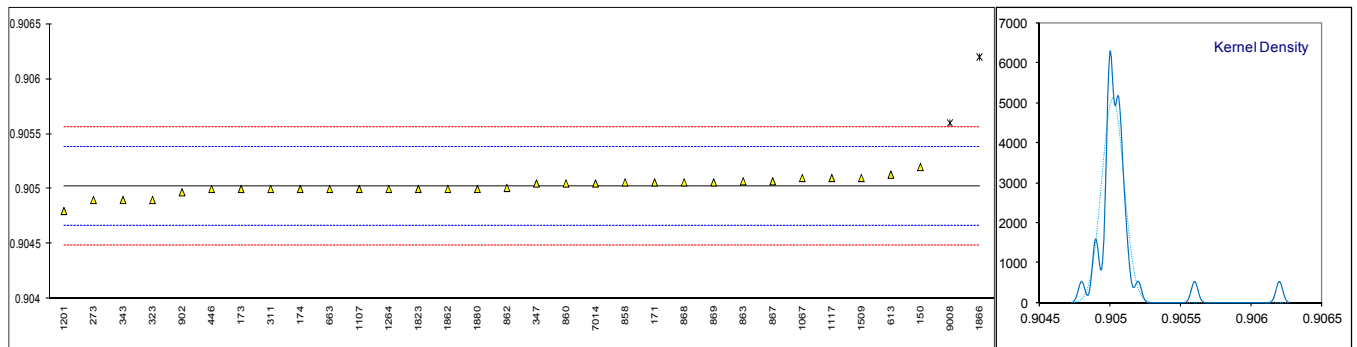
lab	method	value	mark	z(targ)	remarks
150	D5386	9		0.10	
171	D5386	10		0.57	
173	D5386	8		-0.37	
174	D5386	8.1		-0.32	
273		----		----	
311	D5386	9		0.10	
323	D5386	9		0.10	
333	D5386	7		-0.84	
343	D5386	7		-0.84	
347	D5386	8		-0.37	
446	D5386	8		-0.37	
551		----		----	
557		----		----	
613	D1209	5	C,R(0.05)	-1.78	First reported 4
663	D5386	8		-0.37	
858	D5386	9		0.10	
860	D5386	9.4		0.29	
862	D5386	9		0.10	
863	D1209	10		0.57	
867	D5386	9		0.10	
868	D1209	10		0.57	
869	D5386	9		0.10	
902	D5386	7	C	-0.84	First reported 2
913		----		----	
1067	D1209	10		0.57	
1107	D5386	7.1		-0.79	
1117	D1209	10		0.57	
1201	D1209	5	R(0.05)	-1.78	
1264	D1209	9		0.10	
1429		----		----	
1509	D5386	9		0.10	
1515	D5386	9		0.10	
1592		----		----	
1823	D5386	9.6		0.38	
1862	D1209	7		-0.84	
1866	D5386	4	R(0.05)	-2.25	
1880	D5386	10.43		0.77	
7007		----		----	
7014		----		----	
9008	D5386	10.1		0.62	
normality		OK			
n		29			
outliers		3			
mean (n)		8.78			
st.dev. (n)		1.066			
R(calc.)		2.99			
R(D5386:10)		5.96			
				Compare R(D1209) = 7.0	





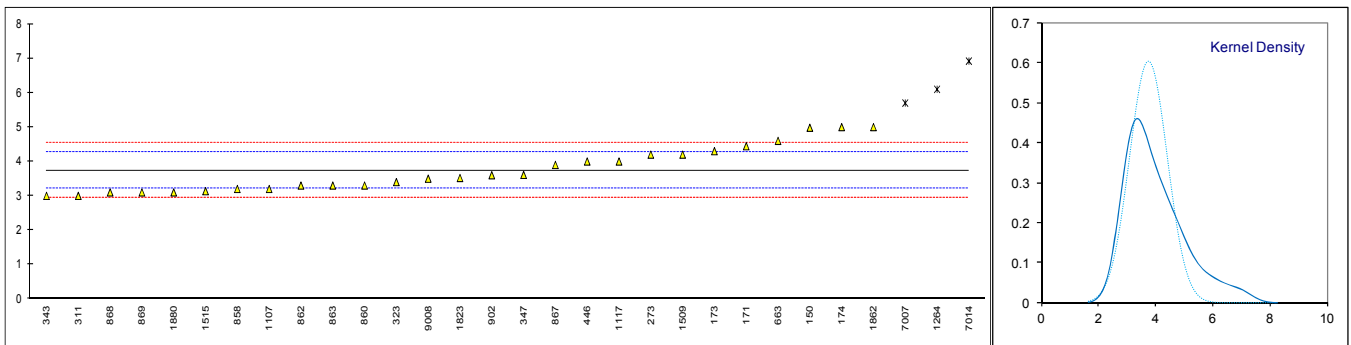
Determination of Density at 20°C on sample #14190; results in kg/L

lab	method	value	mark	z(targ)	remarks
150	D4052	0.9052		1.00	
171	D4052	0.90506		0.22	
173	D4052	0.9050		-0.12	
174	D4052	0.9050		-0.12	
273	D4052	0.9049		-0.68	
311	D4052	0.9050		-0.12	
323	D4052	0.9049		-0.68	
333		----		----	
343	D4052	0.9049		-0.68	
347	D4052	0.90505		0.16	
446	D4052	0.9050		-0.12	
551		----		----	
557		----		----	
613	D4052	0.90513		0.61	
663	D4052	0.9050		-0.12	
858	D4052	0.90506		0.22	
860	D4052	0.90505		0.16	
862	D4052	0.90501		-0.06	
863	D4052	0.90507		0.27	
867	D4052	0.90507		0.27	
868	D4052	0.90506		0.22	
869	D4052	0.90506		0.22	
902	D4052	0.90497		-0.29	
913		----		----	
1067	D4052	0.9051		0.44	
1107	D4052	0.9050		-0.12	
1117	D4052	0.9051		0.44	
1201	D4052	0.9048		-1.24	
1264	D4052	0.9050		-0.12	
1429		----		----	
1509	D4052	0.9051		0.44	
1515		----		----	
1592		----		----	
1823	D4052	0.9050		-0.12	
1862	D4052	0.90500		-0.12	
1866	D4052	0.9062	R(0.01)	6.60	
1880	D4052	0.90500		-0.12	
7007		----		----	
7014	D4052	0.90505		0.16	
9008	D4052	0.9056	R(0.01)	3.24	
normality		suspect			
n		30			
outliers		2			
mean (n)		0.90502			
st.dev. (n)		0.000078			
R(calc.)		0.00022			
R(D4052:02e1)		0.00050			



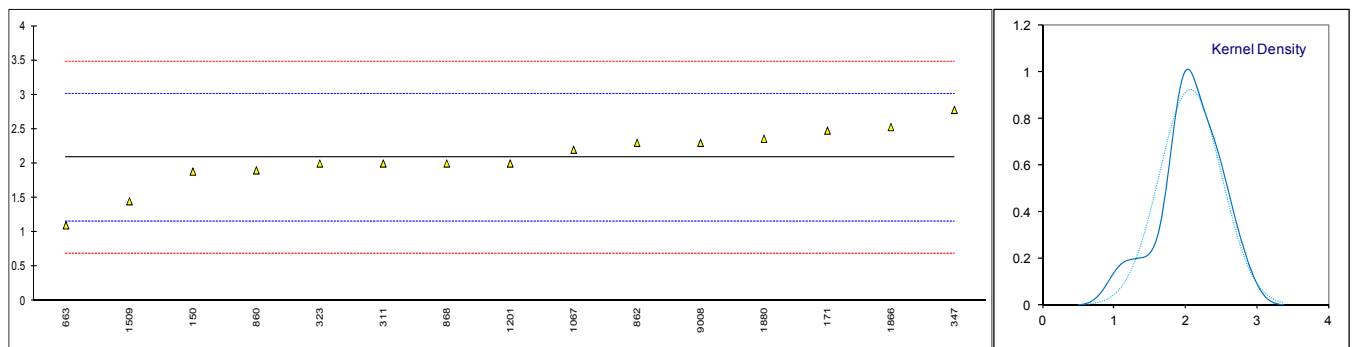
Determination of Inhibitor (pTBC) on sample #14190; results in mg/kg

lab	Method	value	mark	z(targ)	remarks
150	D4590	4.9824		4.65	
171	D4590	4.445		2.64	
173	D4590	4.3		2.09	
174	D4590	5.0		4.71	
273	D4590	4.2		1.72	
311	D4590	3		-2.77	
323	D4590	3.4		-1.27	
333		----		----	
343	D4590	3.0		-2.77	
347	D4590	3.61		-0.49	
446	D4590	4		0.97	
551		----		----	
557		----		----	
613		----		----	
663	D4590	4.6		3.22	
858	D4590	3.2		-2.02	
860	D4590	3.3		-1.65	
862	D4590	3.3		-1.65	
863	D4590	3.3		-1.65	
867	D4590	3.9		0.60	
868	D4590	3.1		-2.40	
869	D4590	3.1		-2.40	
902	D4590	3.6		-0.53	
913		----		----	
1067	D4590	< 0.1		----	False negative result?
1107	D4590	3.2		-2.02	
1117	D4590	4.0		0.97	
1201		----		----	
1264	D4590	6.1	R(0.05)	8.83	
1429		----		----	
1509	D4590	4.2		1.72	
1515	D4590	3.135		-2.27	
1592		----		----	
1823	D4590	3.52		-0.83	
1862	D4590	5.0	C	4.71	First reported 6
1866		----		----	
1880	D4590	3.1		-2.40	
7007	D4590	5.7	R(0.05)	7.33	
7014	D4590	6.92	R(0.05)	11.90	
9008	In house	3.5		-0.90	
	normality	OK			
	n	27			
	outliers	3			
	mean (n)	3.74			
	st.dev. (n)	0.649			
	R(calc.)	1.82			
	R(D4590:13)	0.75			



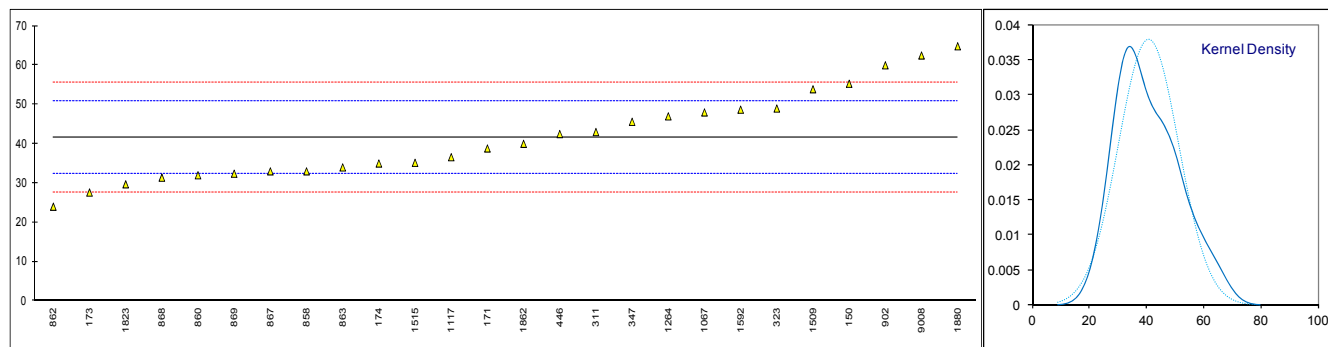
Determination of Organic Chloride on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5808	1.8825		-0.44	
171	D5808	2.478		0.85	
173		----		----	
174		----		----	
273		----		----	
311	D5808	2		-0.18	
323	D5808	2		-0.18	
333		----		----	
343		----		----	
347	D4929	2.78		1.50	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663	D5808	1.1		-2.12	
858		----		----	
860	D5808	1.9		-0.40	
862	D5808	2.3		0.46	
863		----		----	
867		----		----	
868	D5808	2.0		-0.18	
869		----		----	
902		----		----	
913		----		----	
1067	UOP779	2.2		0.25	
1107		----		----	
1117		----		----	
1201	UOP779	2		-0.18	
1264	D5808	<1		<-2.35	
1429		----		----	
1509	D5808	1.45		-1.37	
1515		----		----	
1592		----		----	
1823		----		----	
1862		----		----	
1866	D5808	2.53		0.96	
1880	D5808	2.36		0.59	
7007		----		----	
7014		----		----	
9008	D5808	2.3		0.46	
normality		suspect			
n		15			
outliers		0			
mean (n)		2.09	<u>Spike</u>		Recovery: <88%
st.dev. (n)		0.422	2.37		
R(calc.)		1.18			
R(D5808:09a)		1.30			



Determination of Peroxides as H<sub>2</sub>O<sub>2</sub> on sample #14190; results in mg/kg

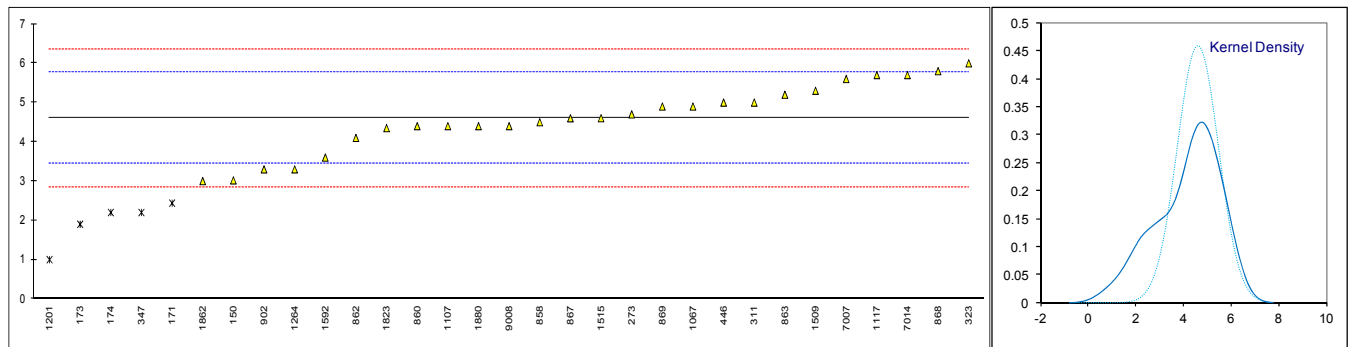
lab	method	value	mark	z(targ)	remarks
150	D2340	55.3		2.94	
171	D2340	38.821342		-0.61	
173	D2340	27.6		-3.03	
174	D2340	35.0		-1.43	
273		----		----	
311	D2340	43		0.29	
323	D2340	49		1.58	
333		----		----	
343		----		----	
347	D2340	45.61		0.85	
446	D2340	42.5		0.18	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D2340	33		-1.86	
860	D2340	32		-2.08	
862	D2340	24		-3.80	
863	D2340	34		-1.65	
867	D2340	33		-1.86	
868	D2340	31.4	C	-2.21	First reported 17.6
869	D2340	32.4		-1.99	
902	D2340	60		3.95	
913		----		----	
1067	D2340	48		1.37	
1107		----		----	
1117	D2340	36.6		-1.09	
1201		----		----	
1264	D2340	47		1.15	
1429		----		----	
1509	D2340	53.9		2.64	
1515	D2340	35.17		-1.40	
1592	D2340	48.7		1.52	
1823	D2340	29.7		-2.58	
1862	D2340	40.0		-0.36	
1866		----		----	
1880	D2340	64.84		4.99	
7007		----		----	
7014		----		----	
9008	D2340	62.5		4.49	
normality		OK			
n		26			
outliers		0			
mean (n)		41.66			
st.dev. (n)		11.140			
R(calc.)		31.19			
R(D2340:13)		13.00			



Determination of Polymers on sample #14190; results in mg/kg

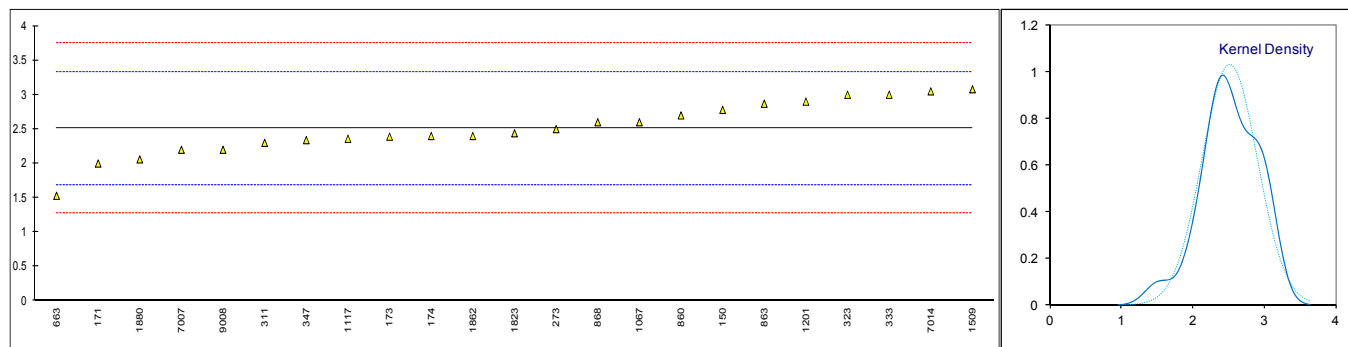
lab	method	value	mark	z(targ)	remarks
150	D2121	3.0187		-2.71	
171	D2121	2.4376		-3.70	
173	D2121	1.9	R(0.05)	-4.62	First reported 1.4
174	D2121	2.2	C,R(0.05)	-4.11	First reported 1.0
273	D2121	4.7		0.16	
311	D2121	5		0.67	
323	D2121	6		2.38	
333		----		----	
343		----		----	
347	INH-CM	2.2	R(0.05)	-4.11	
446	D2121	5		0.67	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D2121	4.5		-0.18	
860	D2121	4.4		-0.35	
862	D2121	4.1		-0.86	
863	D2121	5.2		1.01	
867	D2121	4.6		-0.01	
868	D2121	5.8		2.04	
869	D2121	4.9		0.50	
902	D2121	3.3		-2.23	
913		----		----	
1067	D2121	4.9		0.50	
1107	D2121	4.4		-0.35	
1117	D2121	5.7		1.87	
1201	D2121	1	R(0.05)	-6.16	
1264	D2121	3.3		-2.23	
1429		----		----	
1509	D2121	5.3		1.18	
1515	D2121	4.601		-0.01	
1592	D2121	3.6		-1.72	
1823	D2121	4.35		-0.44	
1862	D2121	3		-2.74	
1866		----		----	
1880	D2121	4.40		-0.35	
7007	D2121	5.6		1.70	
7014	D2121	5.7		1.87	
9008	D2121	4.4		-0.35	
normality		OK			
n		26			
outliers		5			
mean (n)		4.61			
st.dev. (n)		0.851			
R(calc.)		2.38			
R(Horwitz)		1.64			

Compare R(D2121:07) = 1.00



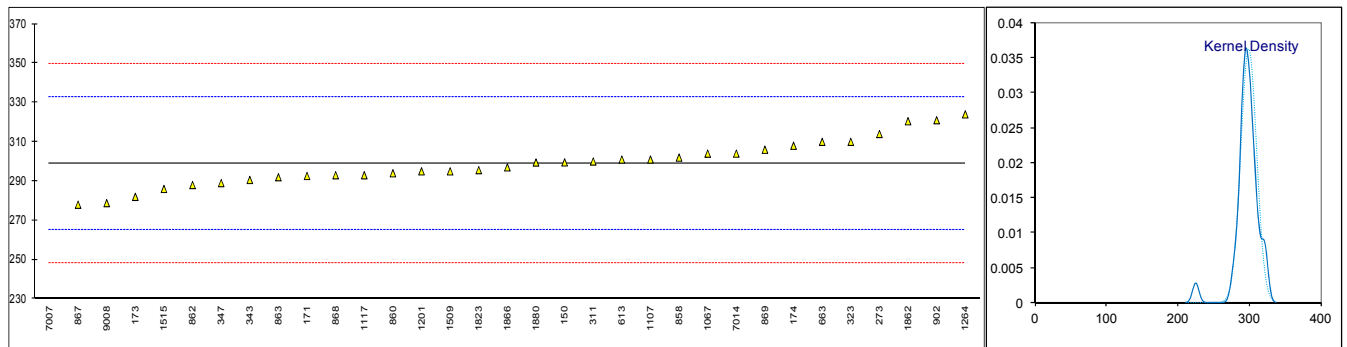
Determination of Sulphur on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5453	2.78		0.66	
171	D5453	2.00		-1.23	
173	D5453	2.39		-0.29	
174	D5453	2.4		-0.26	
273	D5453	2.5		-0.02	
311	D5453	2.3		-0.51	
323	D5453	3		1.19	
333	D5453	3.0		1.19	
343		----		----	
347	D5453	2.34		-0.41	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663	D5453	1.53		-2.37	
858		----		----	
860	D3120	2.7		0.46	
862		----		----	
863	D5453	2.87		0.88	
867		----		----	
868	D5453	2.6		0.22	
869		----		----	
902		----		----	
913		----		----	
1067	D5453	2.6		0.22	
1107		----		----	
1117	D5453	2.36		-0.36	
1201	D5453	2.9		0.95	
1264		----		----	
1429		----		----	
1509	D5453	3.08	C	1.38	First reported 3.87
1515		----		----	
1592		----		----	
1823	D5453	2.44		-0.17	
1862	ISO20846	2.4		-0.26	
1866		----		----	
1880	D5453	2.06		-1.09	
7007	D5453	2.2		-0.75	
7014	D5453	3.05		1.31	
9008	D5453	2.2		-0.75	
	normality	OK			
	n	23			
	outliers	0			
	mean (n)	2.509		<u>Spike</u>	Recovery: <126%
	st.dev. (n)	0.3848		1.99	
	R(calc.)	1.077			
	R(D5453:12)	1.156			



Determination of Water on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	E1064	299.55		0.04	
171	E1064	292.5965		-0.37	
173	D6304	282		-0.99	
174	E1064	308		0.54	
273	E1064	314		0.89	
311	E1064	300		0.07	
323	E1064	310		0.66	
333		----		----	
343	E1064	290.6		-0.49	
347	E1064	289		-0.58	
446		----		----	
551		----		----	
557		----		----	
613	E203	301		0.12	
663	E1064	310.0		0.66	
858	E1064	302		0.18	
860	E1064	294		-0.29	
862	E1064	288		-0.64	
863	E1064	292		-0.41	
867	E1064	278		-1.23	
868	E1064	293		-0.35	
869	E1064	306		0.42	
902	E1064	321		1.30	
913		----		----	
1067	E1064	304		0.30	
1107	E1064	301		0.12	
1117	D4672	293		-0.35	
1201	D6304	295		-0.23	
1264	E1064	324		1.48	
1429		----		----	
1509	E1064	295		-0.23	
1515	E1064	286		-0.76	
1592		----		----	
1823	E1064	295.6		-0.19	
1862	E1064	320.5		1.27	
1866	E1064	297		-0.11	
1880	E1064	299.5		0.04	
7007	UOP481	225.4	R(0.01)	-4.33	
7014	E1064	304.01		0.30	
9008	E1064	278.8		-1.18	
normality		OK			
n		32			
outliers		1			
mean (n)		298.88			
st.dev. (n)		11.458			
R(calc.)		32.08			
R(E1064:12)		47.52			

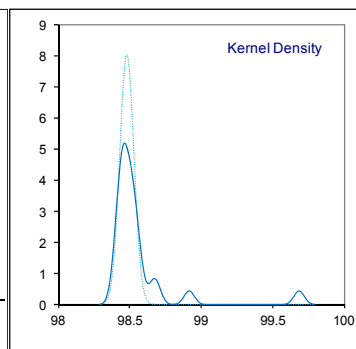
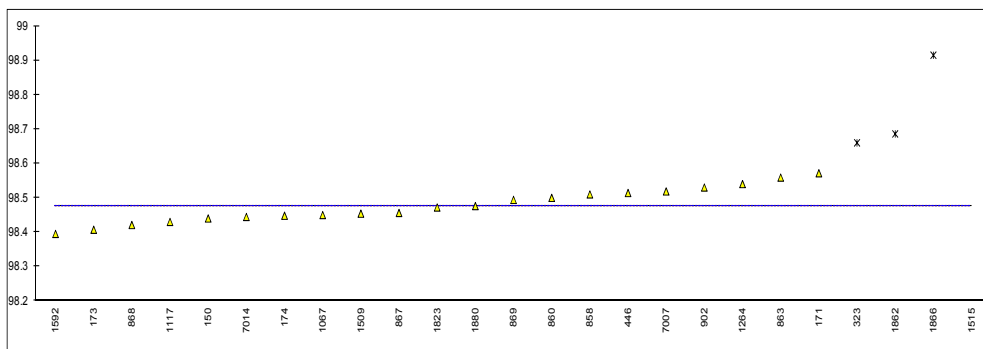


Determination of Purity on sample #14190; results in %M/M

lab	method	value	mark	z(targ)	remarks
150	D5135	98.44	C	----	First reported 99.44
171	D5135	98.5716		----	
173	D7504	98.4072		----	
174	D7504	98.448		----	
273		----		----	
311	D5135	<99.00		----	
323	D5135	98.66	R(0.05)	----	
333		----		----	
343		----		----	
347		----		----	
446	D5135	98.514	C	----	First reported 99.122
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D5135Mod.	98.51		----	
860	D5135Mod.	98.50		----	
862		----		----	
863	D5135Mod.	98.559		----	
867	D5135Mod.	98.456		----	
868	D5135	98.421		----	
869	D5135	98.494		----	
902	D5135	98.53	C	----	First reported 99.09
913		----		----	
1067	D5135	98.45		----	
1107		----		----	
1117	D5135	98.43		----	
1201		----	W	----	Result withdrawn reported 99.32
1264	D5135	98.54		----	
1429		----		----	
1509	D5135	98.454	C	----	First reported 98.775
1515	D5135	99.6848	R(0.01)	----	
1592	D5135	98.395	C	----	First reported 98.238
1823	D5135	98.472		----	
1862	D5135	98.686	R(0.05)	----	
1866	D5135	98.915	R(0.01)	----	
1880	D5135	98.476		----	
7007	D5135	98.5186		----	
7014	D5135	98.44437		----	
9008		----		----	

normality OK  
n 21  
outliers 4  
mean (n) 98.4777  
st.dev. (n) 0.04969  
R(calc.) 0.1391  
R(D5135:14) (0.0533)

Application range ASTM D5135: 99% or higher

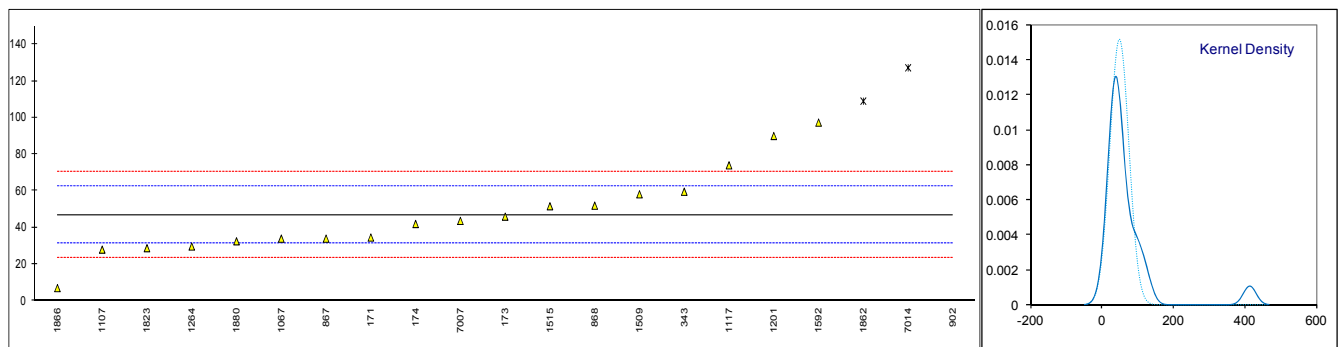




Determination of Benzene on sample #14190; results in mg/kg

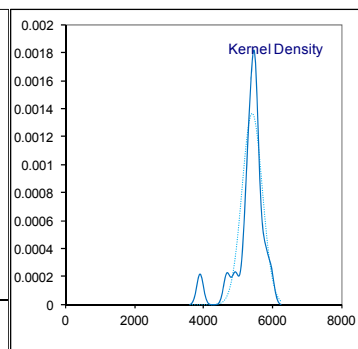
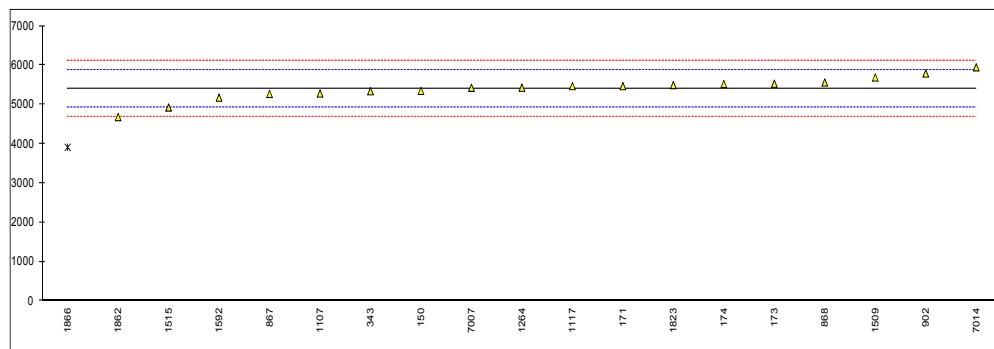
lab	method	value	mark	z'(targ)	Remarks
150		----		----	
171	D5135	34.61		-1.57	
173	D7504	46		-0.11	
174	D7504	42		-0.62	
273		----		----	
311		----		----	
323		----		----	
333		----		----	
343	INH-1456	59.6		1.63	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	34		-1.64	
868	D5135	52		0.66	
869		----		----	
902	INH-83	413	C,G(0.01)	46.89	First reported 329
913		----		----	
1067	D5135	34		-1.64	
1107	in house	28		-2.41	
1117	D5135	74		3.48	
1201	D5135	90		5.53	
1264	D6229	29.7		-2.19	
1429		----		----	
1509	INH-2922	58.18		1.45	
1515	D6229	51.68		0.62	
1592	D5135	97.3		6.46	
1823	D5135	28.8		-2.31	
1862	D5135	109.0	G(0.05)	7.96	
1866	D5135	7		-5.10	
1880	D4534	32.56		-1.83	
7007	D5135	43.67		-0.41	
7014	D5135	127.19	G(0.05)	10.29	
9008		----		----	
normality		OK			
n		18			
outliers		3			
mean (n)		46.84			
st.dev. (n)		22.709			
R(calc.)		63.59			
R'(Horwitz)		21.87			

Compare R(D6229:06) = 7.66, R(Horwitz) = 11.76



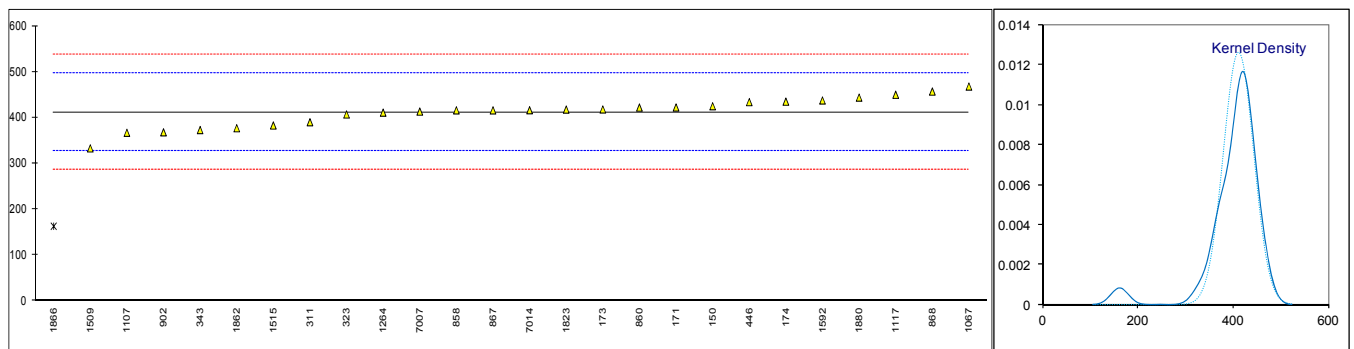
Determination of Toluene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
150	D5135	5348		-0.26	
171	D5135	5470		0.26	
173	D7504	5530		0.51	
174	D7504	5525		0.49	
273		----		----	
311		----		----	
323		----		----	
333		----		----	
343	D5135	5340		-0.29	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	5273		-0.57	
868	D5135	5563		0.65	
869		----		----	
902	D5135	5792	C	1.61	First reported 4573
913		----		----	
1067		----		----	
1107	in house	5283		-0.53	
1117	D5135	5469		0.25	
1201		----	W	----	Result withdrawn reported 8590
1264	D5135	5429		0.08	
1429		----		----	
1509	D5135	5690	C	1.18	First reported 4222
1515	D5135	4925		-2.04	
1592	D5135	5177.2	C	-0.98	First reported 6227.3
1823	D5135	5495.3		0.36	
1862	D5135	4682		-3.06	
1866	D5135	3911	G(0.01)	-6.31	
1880		----		----	
7007	D5135	5427.67		0.08	
7014	D5135	5949.02		2.27	
9008		----		----	
normality		suspect			
n		18			
outliers		1			
mean (n)		5409.3			
st.dev. (n)		291.44			
R(calc.)		816.0			
R(Horwitz)		664.6			



Determination of Ethylbenzene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	425		0.31	
171	D5135	422.26		0.24	
173	D7504	418		0.14	
174	D7504	435		0.55	
273		----		----	
311	D5135	390		-0.52	
323	D5135	407		-0.12	
333		----		----	
343	D5135	373		-0.93	
347		----		----	
446	D5135	434	C	0.52	First reported 244
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D5135Mod.	416		0.09	
860	D5135Mod.	422		0.24	
862		----		----	
863		----		----	
867	D5135Mod.	416		0.09	
868	D5135	457		1.07	
869		----		----	
902	D5135	368	C	-1.05	First reported 160
913		----		----	
1067	D5135	468		1.33	
1107	in house	367		-1.07	
1117	D5135	450		0.90	
1201		----	W	----	Result withdrawn reported 550
1264	D5135	411		-0.02	
1429		----		----	
1509	D5135	333		-1.88	
1515	D5135	383		-0.69	
1592	D5135	437.5	C	0.61	First reported 542.2
1823	D5135	417.7		0.13	
1862	D5135	377.0		-0.83	
1866	D5135	163	R(0.01)	-5.92	
1880	D5135	443.8		0.76	
7007	D5135	413.33		0.03	
7014	D5135	416.24		0.10	
9008		----		----	
normality		OK			
n		25			
outliers		1			
mean (n)		412.03			
st.dev. (n)		31.671			
R(calc.)		88.68			
R(D5135:14)		117.72			Compare R(Horwitz) = 74.58

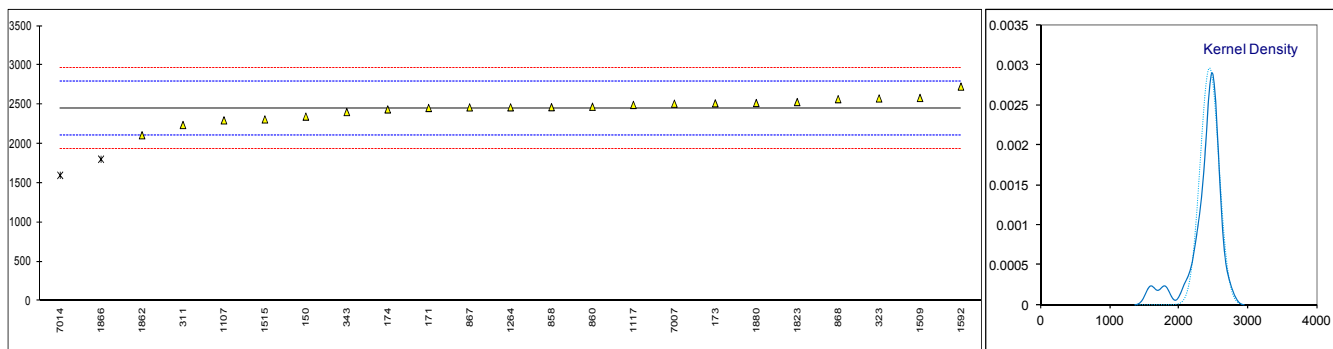


Determination of m- & p-Xylenes on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	2347		-0.62	
171	D5135	2456.32	C	0.02	First reported 1744.25
173	D7504	2516		0.37	
174	D7504	2438		-0.09	
273		----		----	
311	D5135	2240		-1.24	
323	D5135	2578		0.73	
333		----		----	
343	D5135	2405		-0.28	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D5135Mod.	2467		0.08	
860	D5135Mod.	2472		0.11	
862		----		----	
863		----		----	
867	D5135Mod.	2464		0.07	
868	D5135	2569		0.68	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107	in house	2299		-0.90	
1117	D5135	2496		0.25	
1201		----	W	----	Result withdrawn reported 3590
1264	D5135	2465		0.07	
1429		----		----	
1509	D5135	2584	C	0.77	First reported 1940
1515	D5135	2311		-0.83	
1592	D5135	2729.3		1.61	
1823	D5135	2532		0.46	
1862	D5135	2109		-2.01	
1866	D5135	1804	R(0.01)	-3.78	
1880	D5135	2519.7		0.39	
7007	D5135	2511		0.34	
7014	D5135	1599.39	R(0.01)	-4.98	
9008		----		----	

normality suspect  
n 21  
outliers 2  
mean (n) 2452.8  
st.dev. (n) 135.03  
R(calc.) 378.1  
R(Horwitz) 480.0

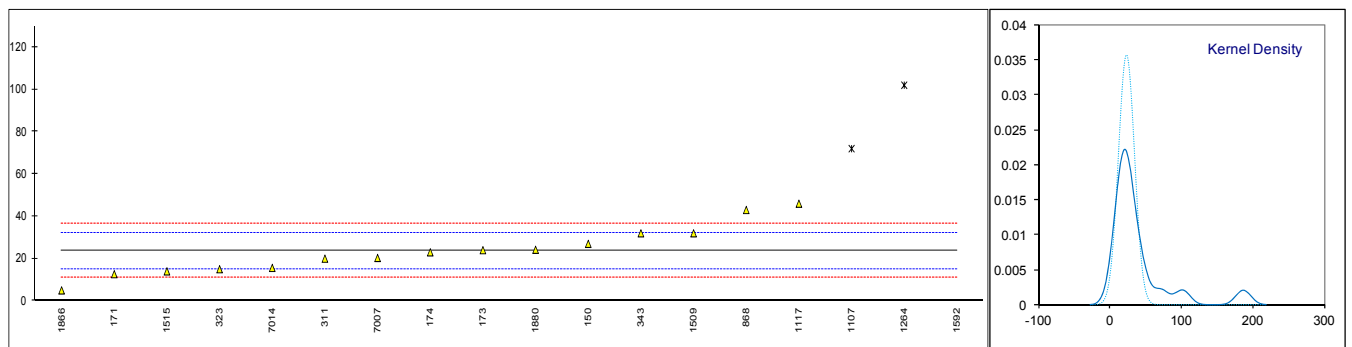
Compare R(D5135:14) = 137.4



Determination of Cumene on sample #14190; results in mg/kg

lab	method	value	mark	z'(targ)	Remarks
150	D5135	27		0.80	
171	D5135	12.65		-2.57	
173	D7504	24		0.10	
174	D7504	23		-0.14	
273		----		----	
311	D5135	20		-0.84	
323	D5135	15		-2.02	
333		----		----	
343	D5135	32		1.98	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867		----		----	
868	D5135	43		4.56	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107	in house	72	G(0.05)	11.37	
1117	D5135	46		5.27	
1201		----	W	----	Result withdrawn reported 130
1264	D5135	102	G(0.01)	18.42	
1429		----		----	
1509	D5135	32		1.98	
1515	D5135	14		-2.25	
1592	D5135	187.0	C,G(0.01)	38.40	First reported 244.2
1823		----		----	
1862	D5135	NA	C	----	First reported 134.0
1866	D5135	5		-4.37	
1880	D5135	24.2		0.14	
7007	D5135	20.33		-0.77	
7014	D5135	15.63		-1.87	
9008		----		----	
normality		OK			
n		15			
outliers		3			
mean (n)		23.59			
st.dev. (n)		11.183			
R(calc.)		31.31			
R'(Horwitz)		11.92			

Compare R(D5135:14) = 2.95, R(Horwitz) = 6.57

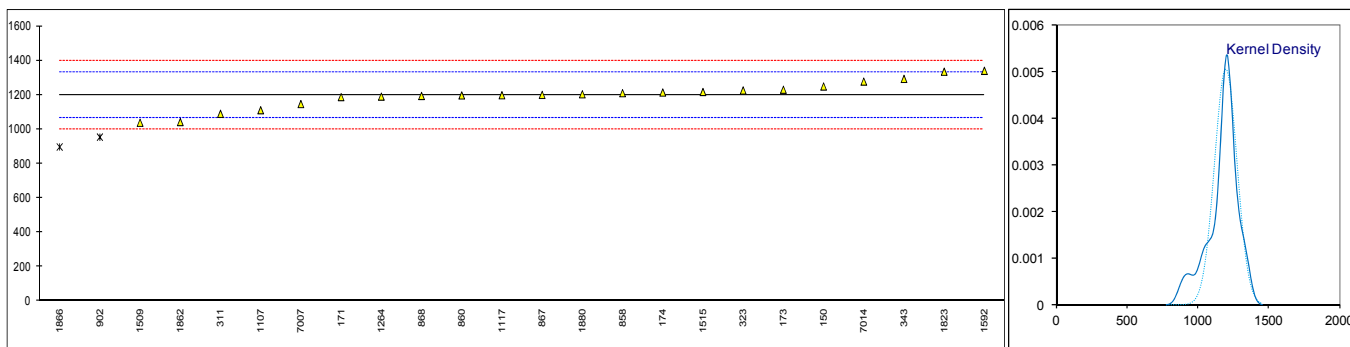


Determination of o-Xylene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
150	D5135	1249		0.75	
171	D5135	1187.18	C	-0.19	First reported 754.04
173	D7504	1230		0.46	
174	D7504	1214		0.22	
273		----		----	
311	D5135	1090		-1.66	
323	D5135	1226		0.40	
333		----		----	
343	D5135	1293		1.42	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858	D5135Mod.	1210		0.16	
860	D5135Mod.	1197		-0.04	
862		----		----	
863		----		----	
867	D5135Mod.	1200		0.01	
868	D5135	1194		-0.08	
869		----		----	
902	D5135	954	DG(0.05)	-3.72	
913		----		----	
1067		----		----	
1107	in house	1111		-1.34	
1117	D5135	1198		-0.02	
1201		----	W	----	Result withdrawn reported 1770
1264	D5135	1190		-0.14	
1429		----		----	
1509	D5135	1038		-2.45	
1515	D5135	1217		0.26	
1592	D5135	1340.3		2.13	
1823	D5135	1335.2		2.05	
1862	D5135	1042		-2.39	
1866	D5135	897	DG(0.05)	-4.58	
1880	D5135	1203.7		0.06	
7007	D5135	1146.66		-0.80	
7014	D5135	1277.63		1.18	
9008		----		----	

normality OK  
n 22  
outliers 2  
mean (n) 1199.5  
st.dev. (n) 79.16  
R(calc.) 221.7  
R(Horwitz) 184.9

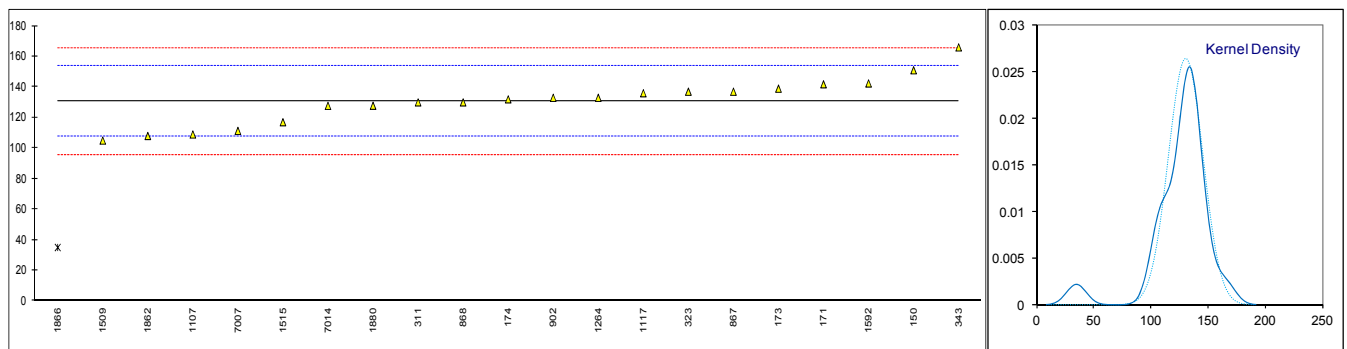
Compare R(D5135:14) = 1679.3



Determination of n-Propylbenzene on sample #14190; results in mg/kg

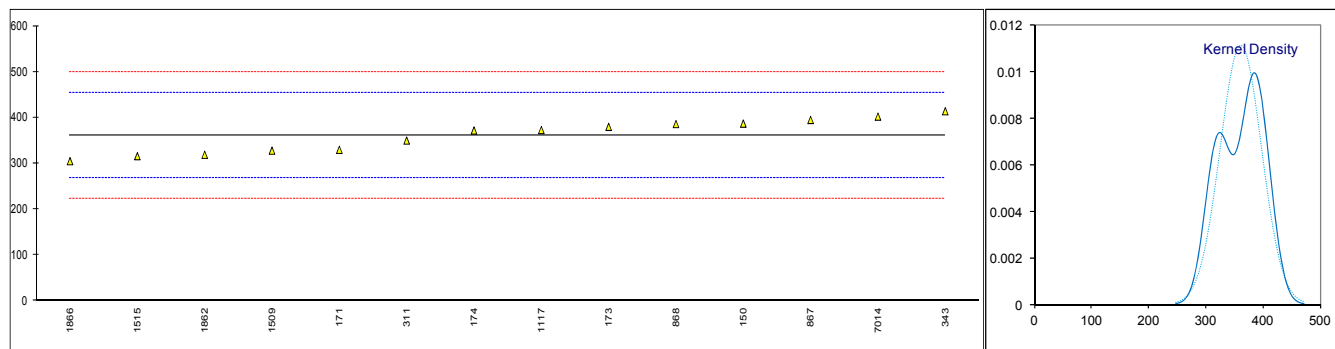
lab	method	value	mark	z(targ)	Remarks
150	D5135	151		1.74	
171	D5135	141.861		0.96	
173	D7504	139		0.71	
174	D7504	132		0.11	
273		----		----	
311	D5135	130		-0.06	
323	D5135	137		0.54	
333		----		----	
343	D5135	166		3.02	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	137		0.54	
868	D5135	130		-0.06	
869		----		----	
902	D5135	133	C	0.20	First reported 102
913		----		----	
1067		----		----	
1107	in house	109		-1.86	
1117	D5135	136		0.45	
1201		----	W	----	Result withdrawn reported 170
1264	D5135	133		0.20	
1429		----		----	
1509	D5135	105		-2.20	
1515	D5135	117		-1.17	
1592	D5135	142.4	C	1.00	First reported 186.1
1823		----		----	
1862	D5135	108.0		-1.95	
1866	D5135	35	R(0.01)	-8.20	
1880	D5135	127.8		-0.25	
7007	D5135	111.33		-1.66	
7014	D5135	127.74		-0.25	
9008		----		----	
normality		OK			
n		20			
outliers		1			
mean (n)		130.71			
st.dev. (n)		15.107			
R(calc.)		42.30			
R(D5135:14)		32.68			

Compare R(Horwitz) = 28.12



Determination of m- & p-Ethyltoluenes on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	Remarks
150	D5135	387		0.56	
171	D5135	329.85		-0.68	
173	D7504	380		0.41	
174	D7504	372		0.23	
273		----		----	
311	D5135	350		-0.24	
323		----		----	
333		----		----	
343	D5135	414		1.15	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	395		0.73	
868	D5135	386		0.54	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107		----		----	
1117	D5135	373		0.26	
1201		----	W	----	Result withdrawn reported 540
1264		----		----	
1429		----		----	
1509	D5135	328		-0.72	
1515	D5135	316		-0.98	
1592		----		----	
1823		----		----	
1862	D5135	319.0		-0.92	
1866	D5135	305		-1.22	
1880		----		----	
7007		----		----	
7014	D5135	402.35		0.89	
9008		----		----	
normality		OK			
n		14			
outliers		0			
mean (n)		361.23			
st.dev. (n)		35.848			
R(calc.)		100.38			
R(D5135:14)		129.01			
				Compare R(Horwitz) = 94.32	



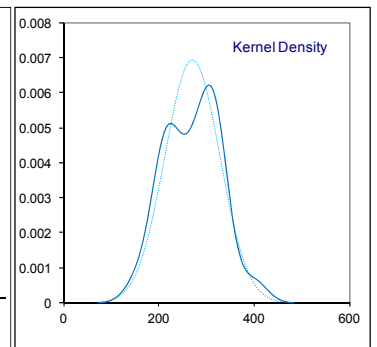
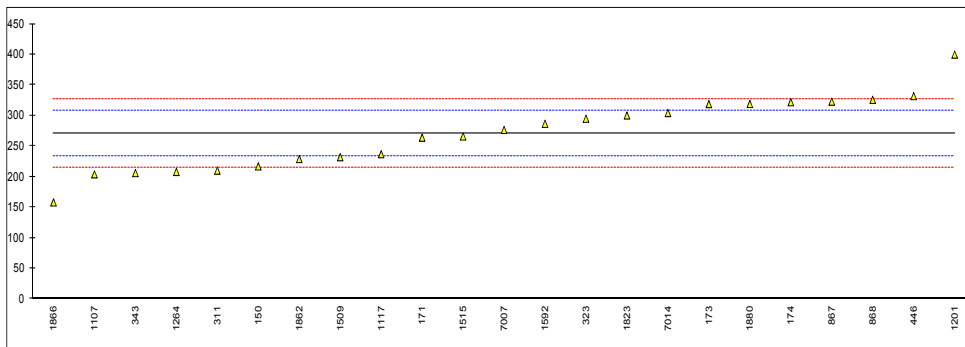


Determination of alpha-Methylstyrene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	217		-2.90	
171	D5135	264.06		-0.38	
173	D7504	319		2.57	
174	D7504	322		2.73	
273		----		----	
311	D5135	210		-3.27	
323	D5135	295		1.28	
333		----		----	
343	D5135	206		-3.49	
347		----		----	
446	D5135	332	C	3.26	First reported 187
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	323		2.78	
868	D5135	326		2.94	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107	in house	204		-3.59	
1117	D5135	237		-1.83	
1201	D5135	400		6.91	
1264	D5135	208		-3.38	
1429		----		----	
1509	D5135	232		-2.09	
1515	D5135	266		-0.27	
1592	D5135	286.7		0.84	
1823	D5135	300.4		1.57	
1862	D5135	229.0		-2.26	
1866	D5135	158		-6.06	
1880	D5135	319.1		2.57	
7007	D5135	276.66		0.30	
7014	D5135	304.39		1.78	
9008		----		----	

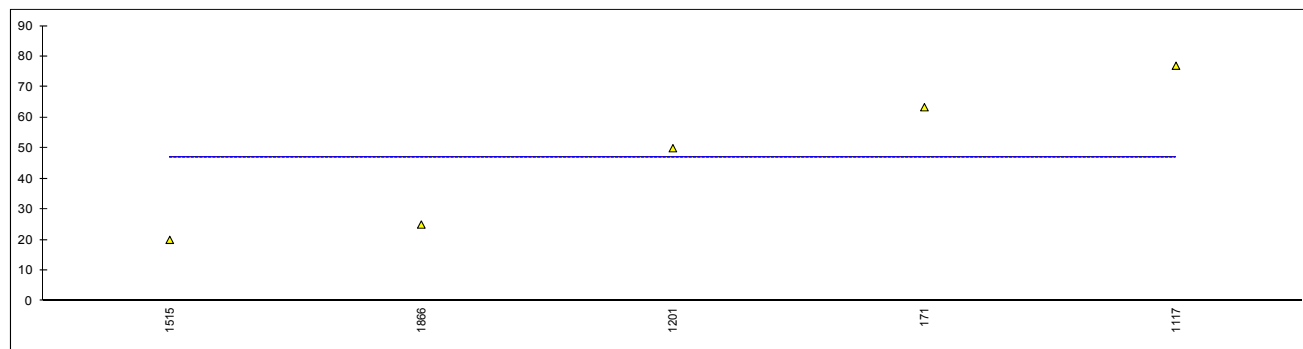
normality OK  
n 23  
outliers 0  
mean (n) 271.10  
st.dev. (n) 57.503  
R(calc.) 161.01  
R(Horwitz) 52.26

Compare R(D5135:14) = 38.73



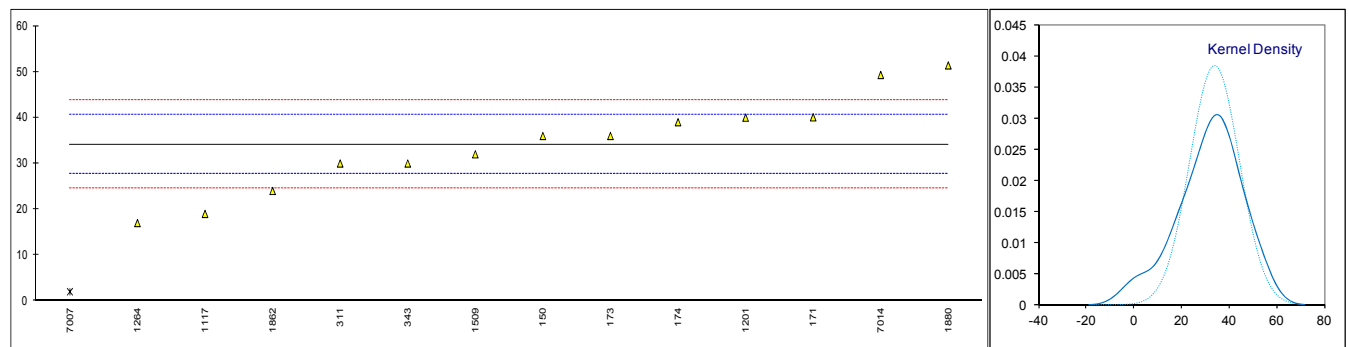
Determination of 1,2-Diethylbenzene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150		----		----	
171	D5135	63.41		----	
173		----		----	
174		----		----	
273		----		----	
311		----		----	
323		----		----	
333		----		----	
343		----		----	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867		----		----	
868		----		----	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107		----		----	
1117	D5135	77		----	
1201	D5135	50		----	
1264		----		----	
1429		----		----	
1509		----		----	
1515	D5135	20		----	
1592		----		----	
1823		----		----	
1862		----		----	
1866	D5135	25		----	
1880		----		----	
7007		----		----	
7014		----		----	
9008		----		----	
normality		unknown			
n		5			
outliers		0			
mean (n)		47.08			
st.dev. (n)		24.450			
R(calc.)		68.46			
R(Horwitz)		(11.81)			



Determination of Phenylacetylene on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	36		0.58	
171	D5135	40.07		1.85	
173	D7504	36		0.58	
174	D7504	39		1.51	
273		----		----	
311	D5135	30		-1.29	
323	D5135	<10		<-7.52	False negative result?
333		----		----	
343	D5135	30		-1.29	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867		----		----	
868		----		----	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107	in house	<10		<-7.52	False negative result?
1117	D5135	19		-4.71	
1201	D5135	40		1.83	
1264	D5135	17		-5.34	
1429		----		----	
1509	D5135	32		-0.67	
1515	D5135	<3		<-9.70	False negative result?
1592		----		----	
1823		----		----	
1862	D5135	24.0		-3.16	
1866	D5135	<10		<-7.52	False negative result?
1880	D5135	51.4		5.38	
7007	D5135	2	G(0.05)	-10.01	
7014	D5135	49.32		4.73	
9008		----		----	
normality		OK			
n		13			
outliers		1			
mean (n)		34.14			
st.dev. (n)		10.381			
R(calc.)		29.07			
R(Horwitz)		8.99			

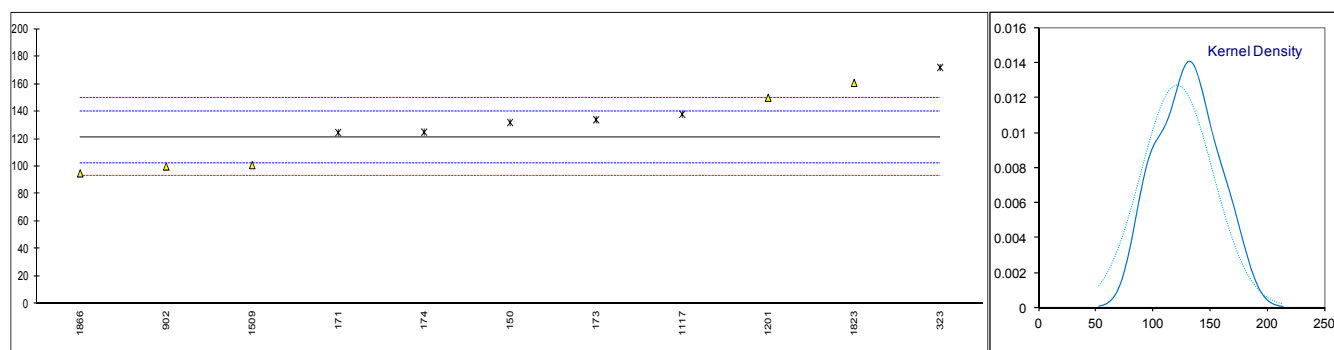


Determination of 3- & 4-Methylstyrenes on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150		----		----	
171		----		----	
173		----		----	
174		----		----	
273		----		----	
311		----		----	
323		----		----	
333		----		----	
343		----		----	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867		----		----	
868		----		----	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107		----		----	
1117	D5135	37		----	
1201		----		----	
1264		----		----	
1429		----		----	
1509		----		----	
1515	D5135	71		----	
1592		----		----	
1823		----		----	
1862		----		----	
1866	D5135	22		----	
1880		----		----	
7007		----		----	
7014		----		----	
9008		----		----	
	normality	n.a.			
	n	3			
	outliers	0			
	mean (n)	43.33			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(lit.)	unknown			

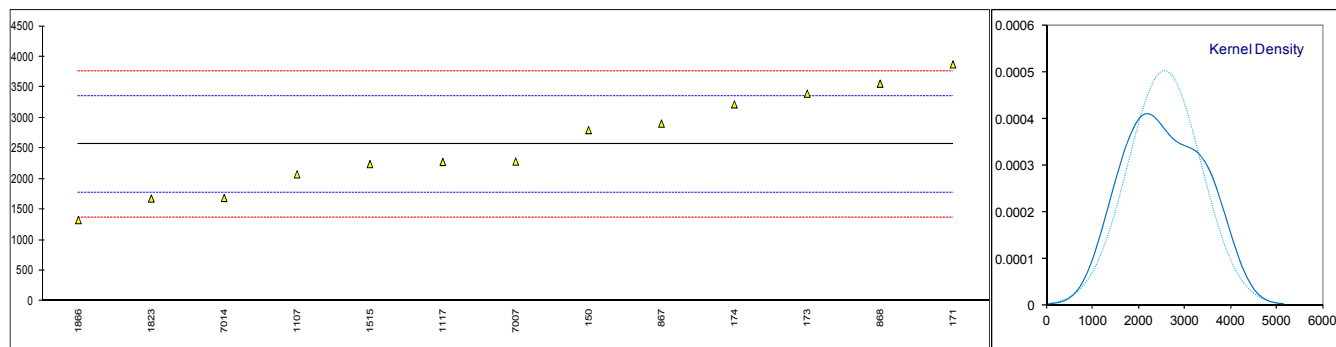
Determination of Benzaldehyde on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	132	ex	1.13	Result excluded, GC result > titration result
171	D5135	124.60	ex	0.34	Result excluded, GC result > titration result
173	D7504	134	ex	1.34	Result excluded, GC result > titration result
174	D7504	125	ex	0.39	Result excluded, GC result > titration result
273		----		----	
311		----		----	
323	D5135	172	ex	5.37	Result excluded, GC result > titration result
333		----		----	
343		----		----	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867		----		----	
868		----		----	
869		----		----	
902	D5135	100		-2.27	
913		----		----	
1067		----		----	
1107		----		----	
1117	D5135	138	ex	1.76	Result excluded, GC result > titration result
1201	D5135	150		3.04	
1264		----		----	
1429		----		----	
1509	D5135	101		-2.16	
1515		----		----	
1592		----		----	
1823	D5135	160.8		4.18	
1862		----		----	
1866	D5135	95		-2.80	
1880		----		----	
7007		----		----	
7014		----		----	
9008		----		----	
normality		OK			
n		5			
outliers		0	+ 6 excl		
mean (n)		121.36			
st.dev. (n)		31.390			
R(calc.)		87.89			
R(Horwitz)		26.40			



Determination of Nonaromatics on sample #14190; results in mg/kg

lab	method	value	mark	z(targ)	remarks
150	D5135	2800		0.59	
171	D5135	3874.74		3.29	
173	D7504	3396		2.09	
174	D7504	3221		1.65	
273		----		----	
311		----		----	
323		----		----	
333		----		----	
343		----		----	
347		----		----	
446		----		----	
551		----		----	
557		----		----	
613		----		----	
663		----		----	
858		----		----	
860		----		----	
862		----		----	
863		----		----	
867	D5135Mod.	2906		0.86	
868	D5135	3560		2.50	
869		----		----	
902		----		----	
913		----		----	
1067		----		----	
1107	in house	2075		-1.23	
1117	D5135	2279		-0.72	
1201		----		----	
1264		----		----	
1429		----		----	
1509		----		----	
1515	D5135	2243		-0.81	
1592		----		----	
1823	D5135	1679.5		-2.22	
1862		----		----	
1866	D5135	1327		-3.11	
1880		----		----	
7007	D5135	2285		-0.70	
7014	D5135	1688.81		-2.20	
9008		----		----	
normality		OK			
n		13			
outliers		0			
mean (n)		2564.2			
st.dev. (n)		795.10			
R(calc.)		2226.3			
R(Horwitz)		1114.6			



## APPENDIX 2

### Number of participants per country

1 lab in AUSTRALIA  
2 labs in BELGIUM  
2 labs in BRAZIL  
1 lab in CANADA  
1 lab in FRANCE  
1 lab in INDIA  
2 labs in IRAN, Islamic Republic of  
2 labs in KUWAIT  
9 labs in P.R. of CHINA  
1 lab in RUSSIA  
1 lab in SAUDI ARABIA  
1 lab in SINGAPORE  
1 lab in SOUTH AFRICA  
2 labs in SPAIN  
1 lab in THAILAND  
4 labs in THE NETHERLANDS  
1 lab in TURKEY  
1 lab in U.A.E.  
4 labs in U.S.A.  
2 labs in UNITED KINGDOM

### APPENDIX 3

#### Abbreviations:

C	= final result after checking of first reported suspect 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 outlier test
R(0.05)	= straggler in Rosner outlier test
E	= error in calculations
U	= reported wrong unit
W	= result withdrawn on request of participant
ex	= excluded from calculations
n.a.	= not applicable
n.d.	= not detected
n.e.	= not evaluated

#### Literature:

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- 15 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, *Technometrics*, 25(2), pp. 165-172, (1983)