Results of Proficiency Test
ortho- and para-Xylenes
October 2018

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Appendices:

1   INTRODUCTION

Since 1995, the Institute for Interlaboratory Studies organizes a proficiency test for the analyses of ortho- and para-Xylenes once every two years. As part of the annual proficiency test program of 2018/2019, it was decided to continue this proficiency test on o- and p-Xylenes analyses according to the scope of the latest version of ASTM D5471 for o-Xylene and ASTM D5136 for p-Xylene.

In this interlaboratory study, 24 laboratories from 15 different countries did register for participation. See appendix 2 for the number of participants per country. In this report, the results of the 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 organiser of this proficiency test (PT). Sample analyses for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC 17025 accredited laboratory. It was decided to send one 0.25 L bottle with o-Xylene (labelled #18195) and one 0.5 L bottle with p-Xylene (labelled #18196). The participants were requested to report rounded and unrounded test results. The unrounded test results were preferably used for statistical evaluation.

2.1   ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO/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' of June 2018 (iis-protocol, version 3.5). This protocol can be downloaded from 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

Two different samples were prepared; one for the analyses of o-Xylene and one for p-Xylene. A batch of approximately 10 litre of o-Xylene was purchased from a local supplier of chemicals. After homogenisation, 48 amber glass bottles were filled with approx. 0.25L o-Xylene and labelled #18195. The homogeneity of the subsamples of #18195 was checked by the determination of Density at 20°C in accordance with ASTM D4052 and by the determination of p-Xylene in accordance with ASTM D3797 on 8 stratified randomly selected samples.

	Density at 20°C in kg/L	p-Xylene in %M/Mt
sample #18195-1	0.87964	0.086
sample #18195-2	0.87966	0.087
sample #18195-3	0.87966	0.087
sample #18195-4	0.87966	0.086
sample #18195-5	0.87965	0.086
sample #18195-6	0.87966	0.088
sample #18195-7	0.87966	0.087
sample #18195-8	0.87965	0.088

Table 1: homogeneity test results of subsamples #18195 (o-Xylene)

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

	Density at 20°C in kg/L	p-Xylene in %M/M
r (observed)	0.00002	0.002
reference test method	ISO12185:96	ASTM D3797:05
0.3 * R (ref. test method)	0.00015	0.009

Table 2: repeatabilities on subsamples #18195

A batch of approximately 25 litre p-Xylene was purchased from a local supplier of chemicals. After homogenisation, 47 amber glass bottles were filled with approx. 0.5L p-Xylene and labelled #18196. The homogeneity of the subsamples was checked by the determination of Density at 20°C in accordance with ASTM D4052 and by the determination of o-Xylene in accordance with ASTM D3798 on 8 stratified randomly selected samples.

	Density at 20°C in kg/L	o-Xylene in %M/M
sample #18196-1	0.86098	0.042
sample #18196-2	0.86098	0.043
sample #18196-3	0.86097	0.043
sample #18196-4	0.86097	0.042
sample #18196-5	0.86097	0.042
sample #18196-6	0.86097	0.041
sample #18196-7	0.86098	0.042
sample #18196-8	0.86098	0.040

Table 3: homogeneity test results of subsamples #18196 (p-Xylene)

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

	Density at 20°C in kg/L	o-Xylene in %M/M
r (observed)	0.00001	0.003
reference test method	ISO12185:96	ASTM D5917:15e1
0.3 * R (ref. test method)	0.00015	0.016

Table 4: repeatabilities on subsamples #18196

All observed repeatabilities (see tables 2 and 4) were less than 0.3 times the corresponding reproducibilities of the reference test methods. Therefore, homogeneities of the subsamples #18195 and #18196 were assumed.

To each of the participating laboratories 1 bottle of 0.25 L with o-Xylene (labelled #18195) and 1 bottle of 0.5 L with p-Xylene (labelled #18196) were sent on September 19, 2018.

2.5   STABILITY OF THE SAMPLES

The stability of o-Xylene and p-Xylene, packed in the amber glass bottles of 0.25 L and 0.5 L was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6   ANALYSES

The participants were requested to determine on sample #18195 (o-Xylene); Purity and Impurities (m- and p-Xylene, Ethylbenzene, n-Propylbenzene, iso-Propylbenzene (Cumene), Styrene, Sum of Ethyltoluenes, Toluene, C9 and heavier aromatics and Nonaromatics.
On sample #18196 (p-Xylene) was requested to determine; Appearance, Organic Chloride, Color Pt/Co, Density at 20°C, Distillation (Initial Boiling Point (IBP), 50% Distillation Point, Dry Point (DP) and Distillation Range (DR)), Sulphur, Purity and Impurities (o- and m-Xylene, Ethylbenzene, Styrene, Toluene, Nonaromatics).

It was explicitly requested to treat the samples as if they were routine samples and to report the test results using the indicated units on the report form and not to round the test results, but report as much significant figures as possible. It was also requested not to report 'less than' results, which are above the detection limit, because such 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 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 reanalysis). Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the test 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.

According to ISO 5725 the original test results per determination were submitted to Dixon's, Grubbs' and/or Rosner's outlier tests. 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 was projected over the Kernel Density Graph for reference.

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 variation of this interlaboratory study. The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used. In some cases, a reproducibility based on former iis proficiency tests could be used.

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.
The usual interpretation of z-scores is as follows:

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

4   EVALUATION

In this proficiency test some problems were encountered with the dispatch of the samples to the laboratories. A number of laboratories received the samples late due to custom clearance problems. One participant received a bottle which was broken. A new one was sent.

One participant did not report any test results and two other participants did report test results after the final reporting date. Not all participants were able to report all requested parameters. Finally, 23 participants did report 375 numerical test results. Observed were 16 outlying test results, which is 4.3%. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

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.

4.1   EVALUATION PER SAMPLE AND PER TEST

In this section, the results are discussed per sample and per test.

The reference test methods for the analyses of o- and p-Xylenes were selected according to the scope of the latest version of ASTM D5471:18 for o-Xylene and ASTM D5136:17a for p-Xylene. Regretfully, the precision data mentioned in ASTM D7504 is very strict. It was therefore decided to use to precision data mentioned in ASTM D397:05, which was withdrawn. In case no precision data was mentioned, the calculated reproducibility was compared against the estimated requirements based on the Horwitz equation.

Sample #18195 o-Xylene:

Purity: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D3797:05.

m-Xylene: This determination was not problematic. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

p-Xylene: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in full agreement with the requirements of ASTM D3797:05.

Ethylbenzene: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D3797:05.

n-Propylbenzene: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the strict requirements estimated using the Horwitz equation.

iso-Propylbenzene: This determination was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D3797:05.

Styrene: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

Sum of Ethyltoluenes: This determination may be problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the strict requirements estimated using the Horwitz equation (based on 3 components).

Toluene: Almost all reporting participants reported a test result below 0.001. Therefore, no z-scores were calculated.

C9 and heavier aromatics: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D7504:18.

Nonaromatics: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

Sample #18196 p-Xylene:

Appearance: All participants agreed about the appearance of sample #18196. Participants who used the ASTM E2680 should report the Appearance as 'pass' (or 'fail'). Nine participants reported the appearance correctly as pass. The other laboratories used different kind of terms or abbreviations like: Clear, Clear and Bright or Clear and Free from Suspended Matter.

Organic chloride: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5808:18.

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 and ASTM D1209:05(2011).

Density: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ISO12185:96.

Distillation: This determination was not problematic. No statistical outliers were observed. The calculated reproducibilities of IBP, 50% rec, DP and distillation range are in agreement with the requirements of ASTM D850-A:18.

Sulphur: This determination was problematic depending on the test method used. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D7183:16, but is in agreement with the requirements of ASTM D5453:16e1.

Purity: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5917:15e1.

o-Xylene: This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5917:15e1.

m-Xylene: This determination was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of ASTM D5917:15e1.

Ethylbenzene: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5917:15e1.

<u>Styrene:</u>   All participants reported a test result below 0.001. Therefore, no z-scores were calculated.

<u>Toluene:</u>   This determination was not problematic. One statistical outlier was observed. However, the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5917:15e1.

<u>Nonaromatics:</u>   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 D5917:15e1.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the relevant reference test method and the reproducibility as found for the group of participating laboratories. The average results per sample, calculated reproducibilities and reproducibilities derived from reference test methods (in casu ASTM test methods), are compared in the next tables.

Parameter	unit	n	average	2.8 * sd	R (lit)
Purity (o-Xylene)	%M/M	16	98.967	0.151	0.423
m-Xylene	%M/M	16	0.386	0.031	0.094
p-Xylene	%M/M	15	0.087	0.008	0.030
Ethylbenzene	%M/M	11	0.0009	0.0003	0.0004
n-Propylbenzene	%M/M	9	0.026	0.003	0.005
i-Propylbenzene (Cumene)	%M/M	15	0.305	0.025	0.079
Styrene	%M/M	13	0.0062	0.0015	0.0025
Sum of Ethyltoluenes	%M/M	6	0.039	0.015	0.012
Toluene	%M/M	10	<0.001	n.a.	n.a.
C9 and heavier aromatics	%M/M	12	0.375	0.044	1.164
Non-aromatics	%M/M	17	0.181	0.051	0.134

Table 5: reproducibilities for sample #18195 (o-Xylene)

Parameter	unit	n	average	2.8 * sd	R(lit)
Appearance		18	Pass	n.a.	n.a.
Organic Chloride	mg/kg	12	0.73	0.60	1.3
Color Pt/Co		17	4.2	3.8	5.3
Density at 20°C	kg/L	16	0.8610	0.0001	0.0005
Initial Boiling Point	°C	14	137.8	0.6	1.0
50% Boiling Point	°C	15	138.3	0.3	0.4
Dry Point	°C	14	138.4	0.4	0.4
Distillation Range	°C	13	0.5	0.6	1.1
Sulphur	mg/kg	9	0.26	0.22	0.18
Purity (p-Xylene)	%M/M	21	99.705	0.074	0.042
o-Xylene	%M/M	20	0.044	0.007	0.056
m-Xylene	%M/M	20	0.153	0.055	0.050
Ethylbenzene	%M/M	19	0.077	0.013	0.016
Styrene	%M/M	8	<0.001	n.a.	n.a.
Toluene	%M/M	20	0.0058	0.0010	0.0026
Non-aromatics	%M/M	19	0.0107	0.0060	0.0244

Table 6: reproducibilities for sample #18196 (p-Xylene)

Without further statistical calculations, it can be concluded that for most tests there is a good compliance of the group of participating laboratories with the relevant reference test method. The problematic tests have been discussed in paragraph 4.1.

4.3   COMPARISON OF THE OCTOBER 2018 PROFICIENCY TEST WITH PREVIOUS PT RESULTS

	October 2018	October 2016	October 2014	September 2012	October 2010
Number of reporting labs	23	26	29	27	26
Number of test results	375	498	529	471	471
Statistical outliers	16	16	29	27	41
Percentage outliers	4.3%	3.2%	5.5%	5.7%	8.7%

Table 7: comparison with previous proficiency tests

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

The performance of the determinations of the proficiency tests was compared against the requirements of the respective reference test methods. The conclusions are given the following table:

Parameter	October 2018	October 2016	October 2014	September 2012	October 2010
Purity (o-Xylene)	++	+	++	+	++
m-Xylene	++	+	++	++	++
p-Xylene	++	+/-	++	++	++
Ethylbenzene	+	+	++	++	++
n-Propylbenzene	+	-	+/-	++	-
i-Propylbenzene (Cumene)	++	-	+	++	++
Styrene	+	+	+	++	++
Sum of Ethyltoluenes	-	-	+	+/-	-
Toluene	n.e.	+/-	+/-	++	++
C9 and heavier aromatics	++	++	n.e.	n.e.	n.e.
Non-aromatics	++	+/-	++	++	++

Table 8: comparison determinations of sample #18195 (o-Xylene) against the reference test methods

Parameter	October 2018	October 2016	October 2014	September 2012	October 2010
Organic Chloride	++	++	++	n.e	n.e.
Color Pt/Co	+	-	++	+	--
Density at 20°C	++	++	++	++	++
Initial Boiling Point	+	+	++	+	++
50% Boiling Point	+	+	++	+/-	+/-
Dry Point	+/-	+/-	++	-	++
Distillation Range	++	++	n.e.	n.e	n.e.
Sulphur	-	-	+/-	n.e.	(--)
Purity (p-Xylene)	-	+/-	++	-	++
o-Xylene	++	++	++	++	++
m-Xylene	-	+	+	-	--
Ethylbenzene	+	+	++	++	++
Styrene	n.e.	+/-	++	-	n.e.
Toluene	++	+	++	++	++
Non-aromatics	++	++	++	++	++

Table 9: comparison determinations of sample #18196 (p-Xylene) against the reference test methods

NB   Marks between brackets should be used with care as the consensus value was outside the application range of the test method

The performance of the determinations against the requirements of the respective reference test methods is listed in the above table. 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 Purity of o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	98.9691		0.01	
150	D7504	98.8968		-0.47	
171		-----		-----	
311	D3797	98.92		-0.31	
323	D5917	99.05		0.55	
357	D7504	98.955		-0.08	
391	D2360	99.08		0.75	
551	D3797	98.926		-0.27	
558		-----		-----	
663	D7504	98.958		-0.06	
913		-----		-----	
963	D7504	99.3157	G(0.01)	2.31	
1041	In house	98.929		-0.25	
1067	In house	98.87		-0.64	
1081	D3797	99.0018		0.23	
1201	D3797	99.01		0.28	
1294		-----		-----	
1538	D7504	98.9587		-0.06	
1866	D3797	98.988		0.14	
1880		-----		-----	
6134		-----		-----	
6208	D3797	98.9746		0.05	
7009	D7504	98.990		0.15	
9008		-----		-----	

	normality	OK
	n	16
	outliers	1
	mean (n)	98.9673
	st.dev. (n)	0.05398
	R(calc.)	0.1512
	st.dev.(D3797:05)	0.15108
	R(D3797:05)	0.4230
Compare		
	R(D7504:18)	0.0553

Kernel Density
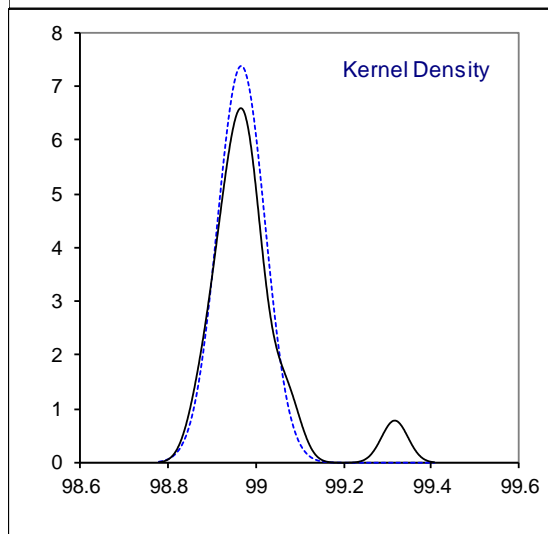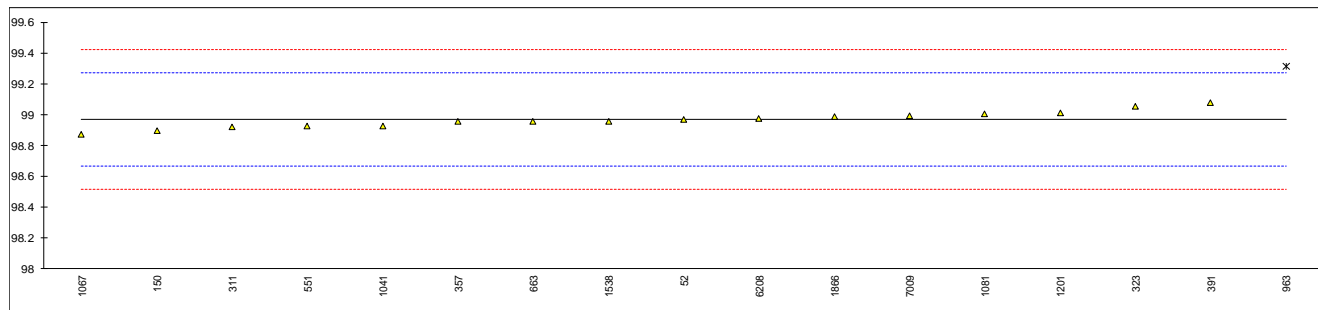
Determination of m-Xylene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.3827		-0.08	
150	D7504	0.3980		0.37	
171		-----		-----	
311	D3797	0.403		0.52	
323	D5917	0.365		-0.61	
357	D7504	0.3733		-0.36	
391		-----		-----	
551	D3797	0.4021		0.49	
558		-----		-----	
663	D7504	0.3832		-0.07	
913		-----		-----	
963	D7504	0.3832		-0.07	
1041	In house	0.389		0.10	
1067	In house	0.398		0.37	
1081	D3797	0.3764		-0.27	
1201	D3797	0.385		-0.02	
1294		-----		-----	
1538	D7504	0.3848		-0.02	
1866	D3797	0.3927		0.21	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.3739		-0.35	
7009	D7504	0.378		-0.22	
9008		-----		-----	

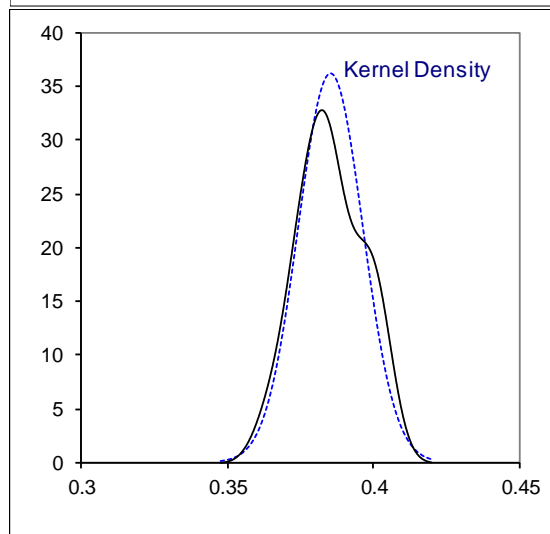|		
	normality	OK
	n	16
	outliers	0
	mean (n)	0.3855
	st.dev. (n)	0.01102
	R(calc.)	0.0308
	st.dev.(D3797:05)	0.03358
	R(D3797:05)	0.0940
Compare		
	R(D7504:18)	0.0151
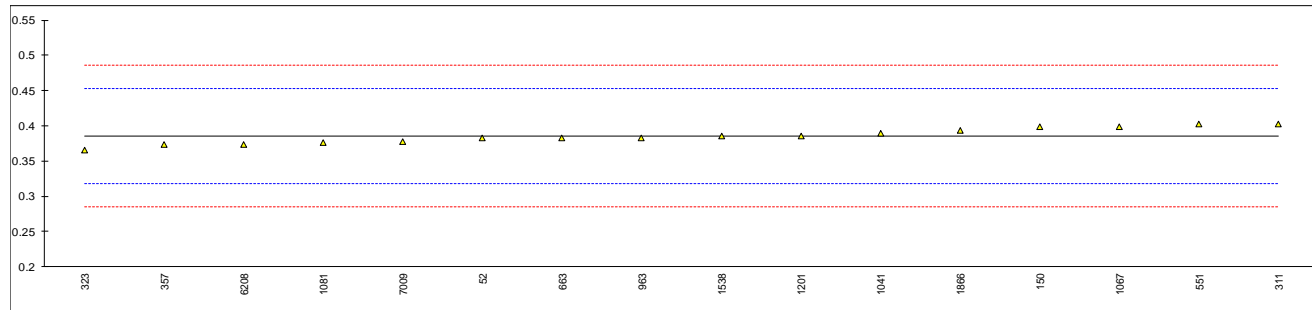
Determination of p-Xylene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0856		-0.10	
150	D7504	0.0906		0.37	
171		-----		-----	
311	D3797	0.088		0.12	
323	D5917	0.086		-0.06	
357	D7504	0.0838		-0.27	
391		-----		-----	
551	D3797	0.0901		0.32	
558		-----		-----	
663	D7504	0.0883		0.15	
913		-----		-----	
963	D7504	0.0881		0.13	
1041	In house	0.089		0.22	
1067	In house	0.087		0.03	
1081	D3797	0.0819		-0.45	
1201	D3797	0.073	G(0.01)	-1.29	
1294		-----		-----	
1538	D7504	0.0867		0.00	
1866	D3797	0.0886		0.18	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.0825		-0.39	
7009	D7504	0.084		-0.25	
9008		-----		-----	

	normality	OK
	n	15
	outliers	1
	mean (n)	0.0867
	st.dev. (n)	0.00267
	R(calc.)	0.0075
	st.dev.(D3797:05)	0.01064
	R(D3797:05)	0.0298
Compare		
	R(D7504:18)	0.0050
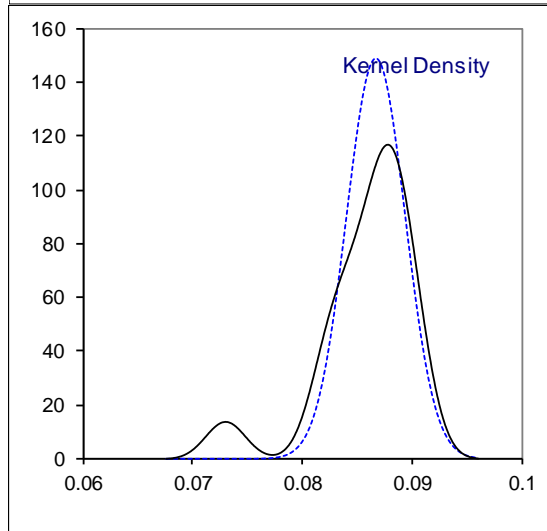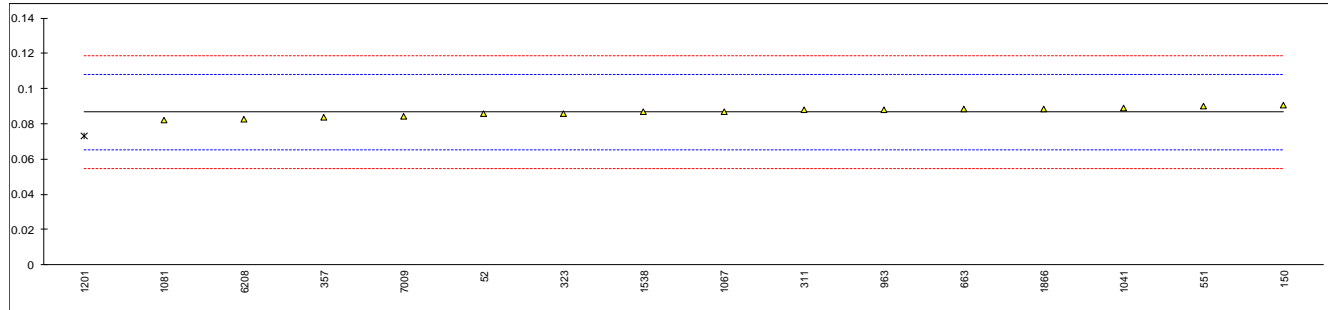
Determination of Ethylbenzene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0007		-1.37	
150	D7504	0.0009		0.00	
171		-----		-----	
311	D3797	<0.001		-----	
323	D5917	0.001		0.68	
357	D7504	0.0009		0.00	
391		-----		-----	
551	D3797	0.0008		-0.68	
558		-----		-----	
663	D7504	0.0009		0.00	
913		-----		-----	
963	D7504	0.0008		-0.68	
1041	In house	0.001		0.68	
1067	In house	0.001		0.68	
1081	D3797	0.0000	G(0.01)	-6.16	
1201	D3797	<0.001		-----	
1294		-----		-----	
1538	D7504	0.0013	G(0.05)	2.74	
1866	D3797	<0.001		-----	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.0009		0.00	
7009	D7504	0.001		0.68	
9008		-----		-----	

	normality	OK
	n	11
	outliers	2
	mean (n)	0.00090
	st.dev. (n)	0.000100
	R(calc.)	0.00028
	st.dev.(D3797:05)	0.000146
	R(D3797:05)	0.00041
Compare		
	R(D7504:18)	0.00030

Kernel Density
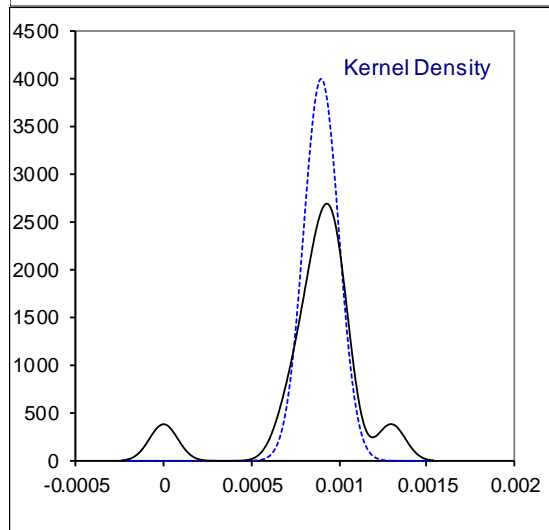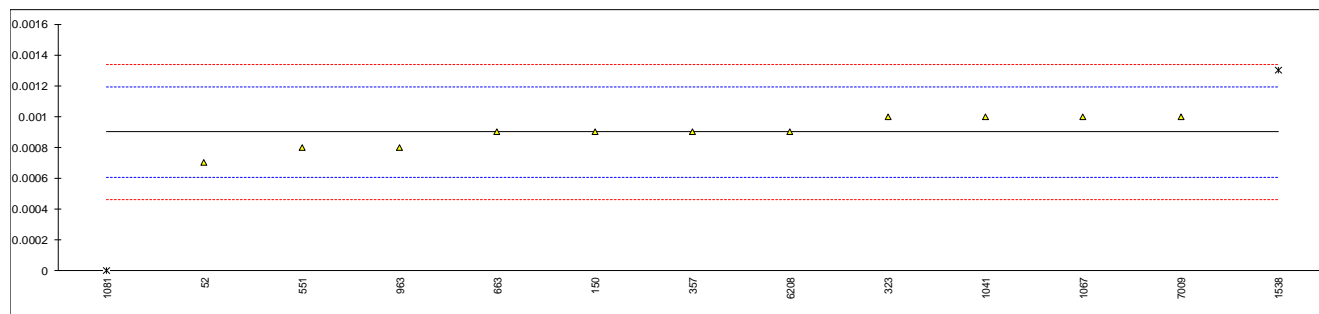
Determination of n-Propylbenzene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0254		-0.29	
150		-----		-----	
171		-----		-----	
311	D3797	0.026		0.04	
323	D5917	0.025		-0.51	
357	D7504	0.0311	G(0.05)	2.88	
391		-----		-----	
551	D3797	0.0269		0.54	
558		-----		-----	
663		-----		-----	
913		-----		-----	
963		-----		-----	
1041	In house	0.028		1.16	
1067	In house	0.026		0.04	
1081	D3797	0.0248		-0.62	
1201		-----		-----	
1294		-----		-----	
1538		-----		-----	
1866		0.0262		0.15	
1880		-----		-----	
6134		-----		-----	
6208		-----	W	-----	Test result withdrawn, reported 0
7009	D7504	0.025		-0.51	
9008		-----		-----	

normality	OK
n	9
outliers	1
mean (n)	0.0259
st.dev. (n)	0.00104
R(calc.)	0.0029
st.dev.(Horwitz)	0.00180
R(Horwitz)	0.0050

Kernel Density
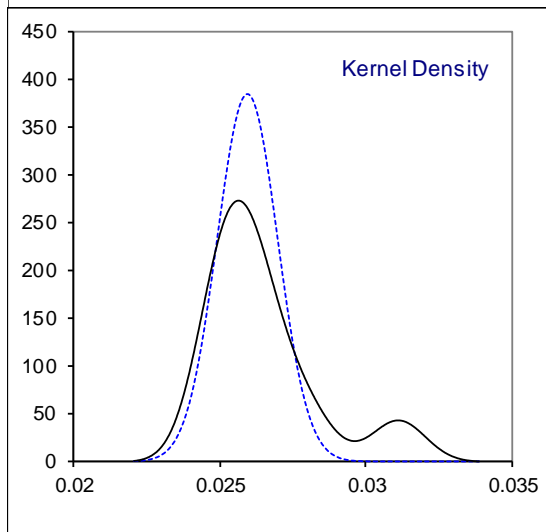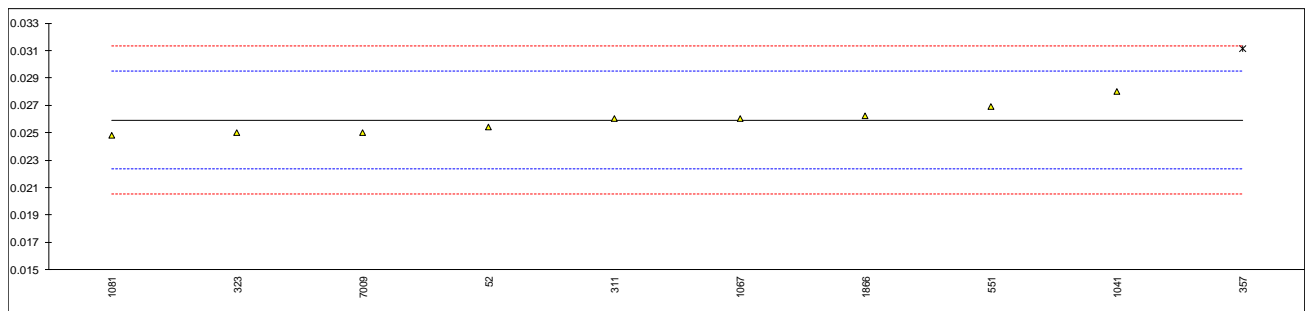
Determination of iso-Propylbenzene (Cumene) in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.3007		-0.16	
150	D7504	0.3159		0.38	
171		-----		-----	
311	D3797	0.308		0.10	
323	D5917	0.285		-0.72	
357	D7504	0.3176		0.44	
391	D2360	0.265	G(0.05)	-1.43	
551	D3797	0.3126		0.26	
558		-----		-----	
663	D7504	0.3012		-0.15	
913		-----		-----	
963	D7504	0.0256	G(0.01)	-9.95	
1041	In house	0.305		-0.01	
1067	In house	0.313		0.27	
1081	D3797	0.3030		-0.08	
1201	D3797	0.313		0.27	
1294		-----		-----	
1538	D7504	0.3044		-0.03	
1866	D3797	0.3087		0.12	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.2906		-0.52	
7009	D7504	0.301		-0.15	
9008		-----		-----	

normality	OK	
n	15	
outliers	2	
mean (n)	0.3053	
st.dev. (n)	0.00904	
R(calc.)	0.0253	
st.dev.(D3797:05)	0.02812	
R(D3797:05)	0.0787	
Compare		
R(D7504:18)	0.0140	
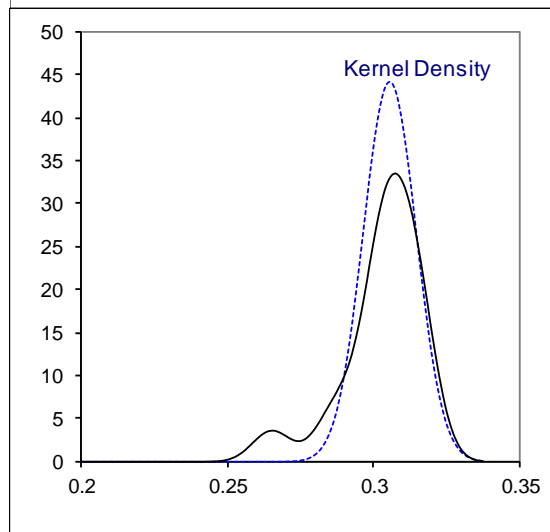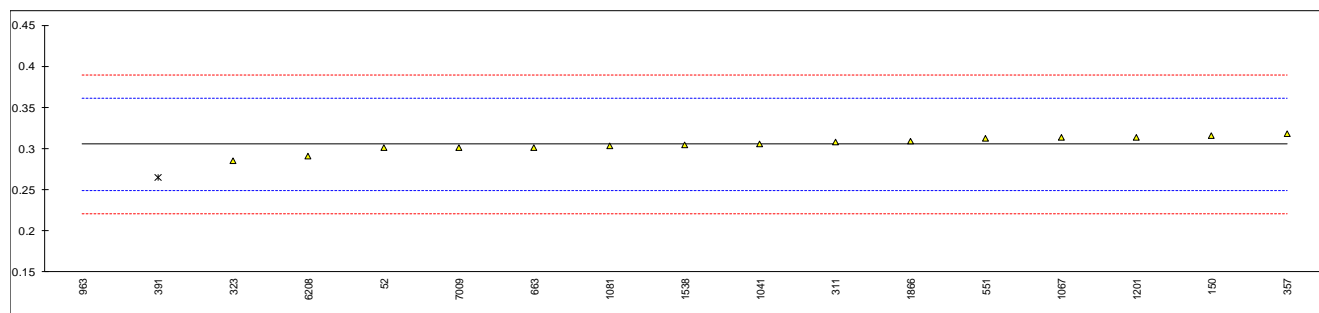
Determination of Styrene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0062		-0.02	
150	D7504	0.0068		0.66	
171		-----		-----	
311	D3797	0.007		0.88	
323	D5917	0.005		-1.37	
357	D7504	0.0059		-0.36	
391		-----		-----	
551	D3797	0.0068		0.66	
558		-----		-----	
663		-----		-----	
913		-----		-----	
963	D7504	0.0063		0.10	
1041	In house	0.006		-0.24	
1067	In house	0.006		-0.24	
1081		-----		-----	
1201	D3797	0.0060		-0.24	
1294		-----		-----	
1538	D7504	0.0060		-0.24	
1866	D3797	0.0068		0.66	
1880		-----		-----	
6134		-----		-----	
6208		-----	W	-----	Test result withdrawn, reported 0
7009	D7504	0.006		-0.24	
9008		-----		-----	

normality	OK	
n	13	
outliers	0	
mean (n)	0.00622	
st.dev. (n)	0.000537	
R(calc.)	0.00150	
st.dev.(D3797:05)	0.000888	
R(D3797:05)	0.00249	

Kernel Density
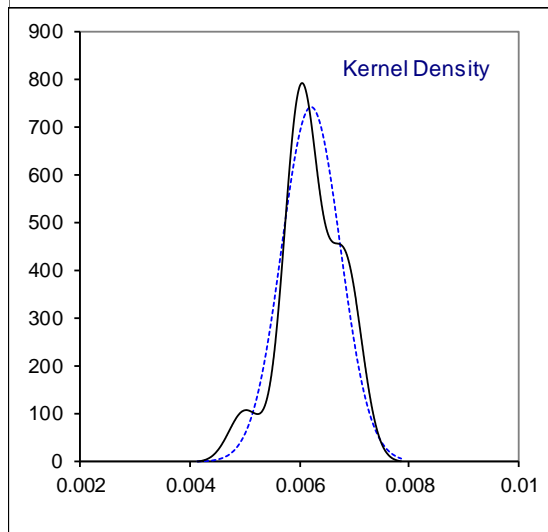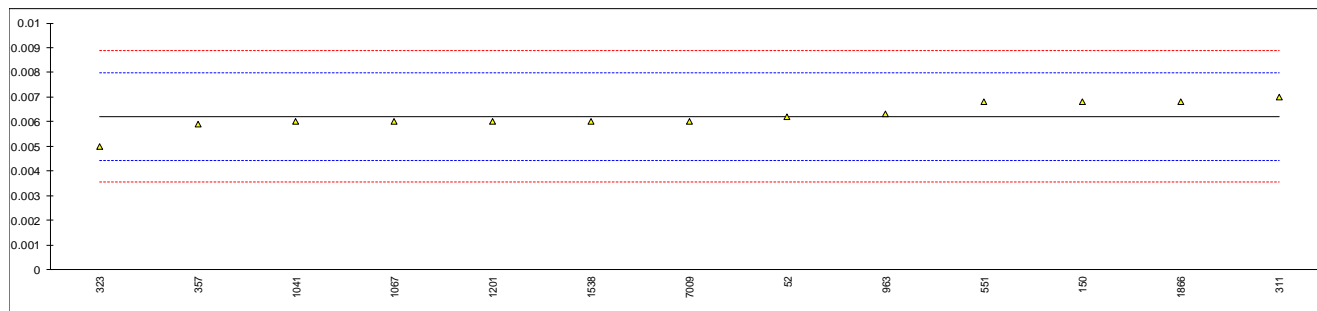
Determination of Sum of Ethyltoluenes in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0361		-0.62	
150		-----		-----	
171		-----		-----	
311	D3797	0.039		0.04	
323	D5917	0.033		-1.33	
357	D7504	0.0368		-0.46	
391		-----		-----	
551		-----		-----	
558		-----		-----	
663		-----		-----	
913		-----		-----	
963		-----		-----	
1041		-----		-----	
1067	In house	0.049		2.32	
1081		-----		-----	
1201		-----		-----	
1294		-----		-----	
1538		-----		-----	
1866		-----		-----	
1880		-----		-----	
6134		-----		-----	
6208		-----	W	-----	Test result withdrawn, reported 0
7009	D7504	0.039		0.04	
9008		-----		-----	

normality	unknown
n	6
outliers	0
mean (n)	0.0388
st.dev. (n)	0.00546
R(calc.)	0.0153
st.dev.(Horwitz n=3)	0.00439
R(Horwitz n=3)	0.0123
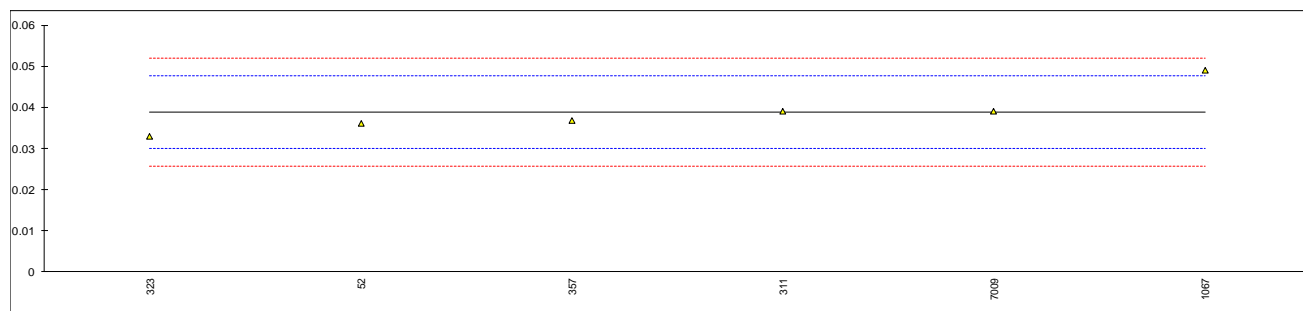
Determination of Toluene in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0000		-----	
150	D7504	0.0012	C	-----	First reported 0.0073
171		-----		-----	
311	D3797	<0.001		-----	
323	D5917	<0.001		-----	
357	D7504	< 0,0002		-----	
391		-----		-----	
551	D3797	<0.001		-----	
558		-----		-----	
663	D7504	0		-----	
913		-----		-----	
963		-----		-----	
1041	In house	0.002		-----	
1067	In house	<0.001		-----	
1081		-----		-----	
1201	D3797	<0.001		-----	
1294		-----		-----	
1538		-----		-----	
1866		-----		-----	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0		-----	
7009	D7504	0.001		-----	
9008		-----		-----	

normality	n.a.
n	10
outliers	n.a.
mean (n)	<0.001
st.dev. (n)	n.a.
R(calc.)	n.a.
st.dev.(lit)	n.a.
R(lit)	n.a.

Determination of C9 and heavier aromatics in o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.3665		-0.02	
150	D7504	0.3877		0.03	
171		-----		-----	
311	D3797	0.377		0.01	
323		-----		-----	
357	D7504	0.3855		0.03	
391		-----		-----	
551		-----		-----	
558		-----		-----	
663	D7504	0.3938		0.05	
913		-----		-----	
963		-----		-----	
1041	In house	0.383		0.02	
1067	In house	0.386		0.03	
1081	D3797	0.3748		0.00	
1201	D3797	0.364		-0.03	
1294		-----		-----	
1538	D7504	0.3774		0.01	
1866		0.3349		-0.10	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.0695	G(0.01)	-0.73	
7009	D7504	0.368		-0.02	
9008		-----		-----	

normality	not OK
n	12
outliers	1
mean (n)	0.3749
st.dev. (n)	0.01558
R(calc.)	0.0436
st.dev.(D7504:18)	0.41575
R(D7504:18)	1.1641

Kernel Density
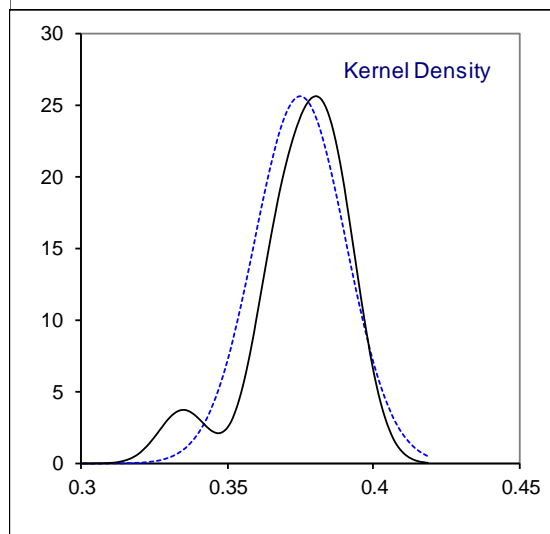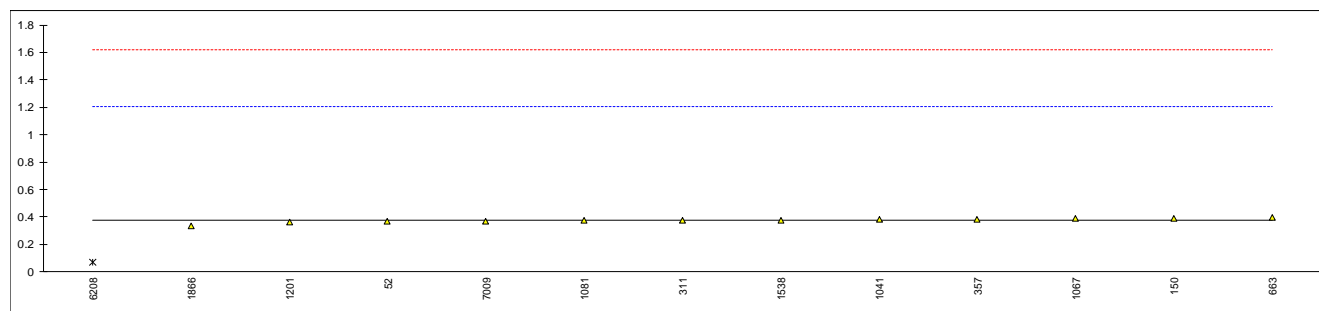
Determination of Non-aromatics oi o-Xylene sample #18195; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.1896		0.19	
150	D7504	0.2111		0.64	
171		-----		-----	
311	D3797	0.195		0.30	
323	D5917	0.157		-0.50	
357	D7504	0.1871		0.13	
391	D2360	0.15		-0.65	
551	D3797	0.1914		0.22	
558		-----		-----	
663	D7504	0.1754		-0.11	
913		-----		-----	
963	D7504	0.1758		-0.10	
1041	In house	0.200		0.40	
1067	In house	0.187		0.13	
1081	D3797	0.1651		-0.33	
1201	D3797	0.167		-0.29	
1294		-----		-----	
1538	D7504	0.1852		0.09	
1866	D3797	0.1551		-0.54	
1880		-----		-----	
6134		-----		-----	
6208	D3797	0.2081		0.57	
7009	D7504	0.173		-0.16	
9008		-----		-----	

normality	OK	
n	17	
outliers	0	
mean (n)	0.1808	
st.dev. (n)	0.01811	
R(calc.)	0.0507	
st.dev.(D3797:05)	0.04768	
R(D3797:05)	0.1335	
Compare		
R(D7504:18)	0.0209	

Kernel Density
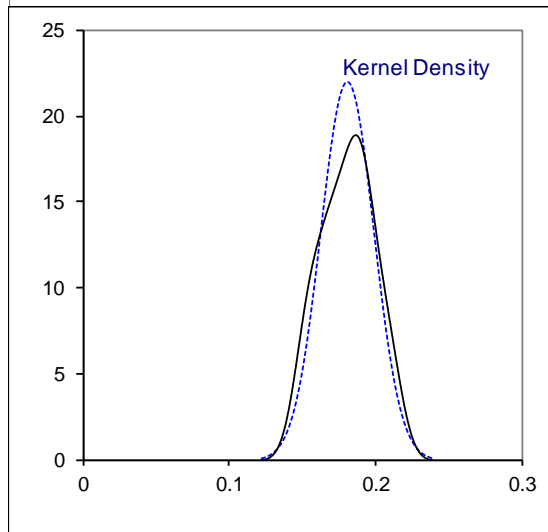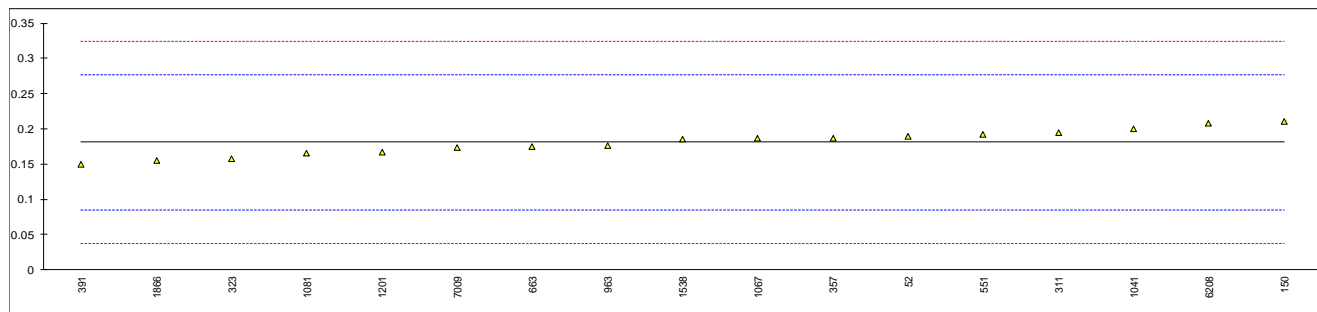
Determination of Appearance of p-Xylene sample #18196;

lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
150	D4176	Pass		-----	
171	E2680	pass		-----	
311	E2680	pass		-----	
323	D4176	pass		-----	
357	E2680	Pass		-----	
391		-----		-----	
551	E2680	PASS		-----	
558		-----		-----	
663	E2680	Pass, C&B		-----	
913	E2680	Pass		-----	
963	E2680	Pass		-----	
1041		-----		-----	
1067	Visual	B&C		-----	
1081	In house	B&C		-----	
1201	D4176	Br&Cl		-----	
1294	Visual	Clear		-----	
1538		-----		-----	
1866		-----		-----	
1880	D4176	Pass		-----	
6134	Visual	C&B		-----	
6208		-----		-----	
7009	Visual	pass		-----	
9008	Visual	Clear liquid		-----	

n	18
mean (n)	Pass, Bright &Clear

Determination of Organic Chloride in p-Xylene sample #18196; results in mg/kg.

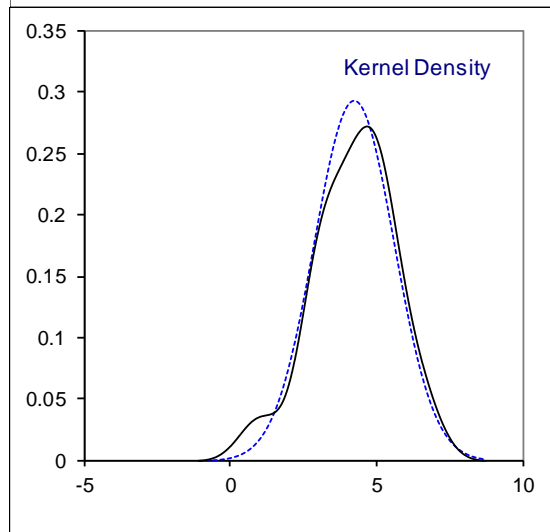| lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D7359	0.65		-0.16	
171	D5808	1		0.59	
311	D5808	<1		-----	
323	D5808	<1		-----	
357		-----		-----	
391		-----		-----	
551		-----		-----	
558		-----		-----	
663	D5808	0.82		0.20	
913		-----		-----	
963	D5808	0.5		-0.49	
1041		-----		-----	
1067	UOP779	< 1.0		-----	
1081	D5808	0.7		-0.06	
1201	D5808	0.4		-0.70	
1294	D7536	0.48		-0.53	
1538		-----		-----	
1866	D5808	1.10		0.81	
1880	D7359	0.8		0.16	
6134	D5808	0.935		0.45	
6208		-----		-----	
7009	D7536	0.63		-0.21	
9008	D5808	0.7		-0.06	

normality	OK	
n	12	
outliers	0	
mean (n)	0.726	
st.dev. (n)	0.2147	
R(calc.)	0.601	
st.dev.(D5808:18)	0.4643	
R(D5808:18)	1.3	

Kernel Density
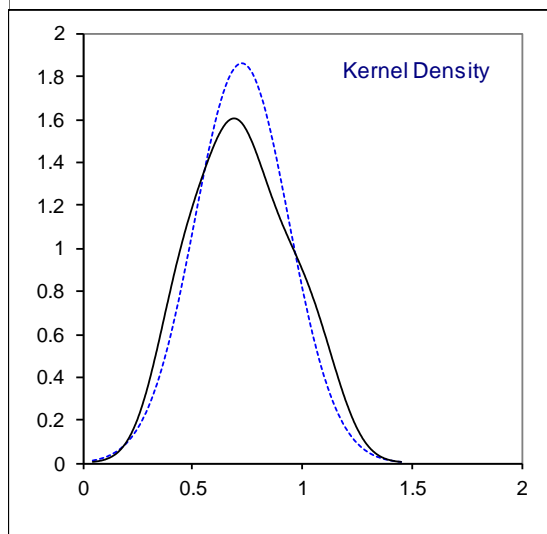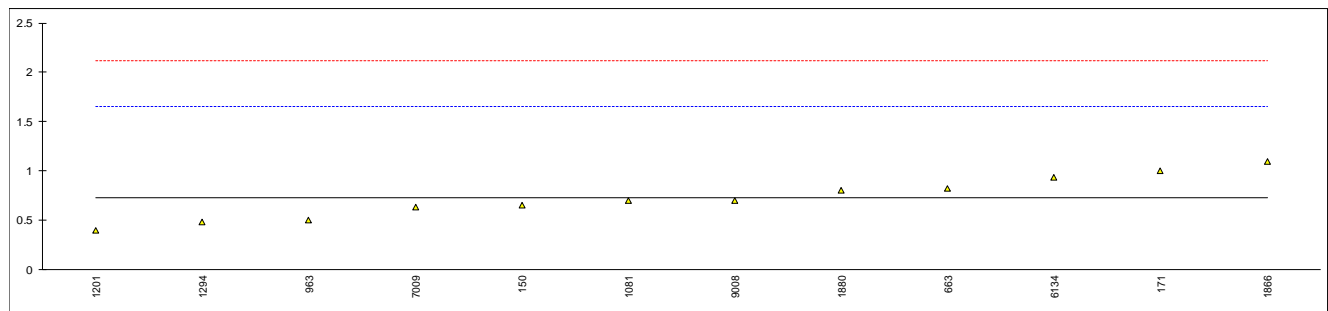
Determination of Color Pt/Co of p-Xylene sample #18196;

lab	method	value	mark	z(targ)	remarks
52	D5386	4.4		0.09	
150	D5386	4.0		-0.12	
171	D5386	5		0.41	
311	D5386	4		-0.12	
323	D5386	5		0.41	
357	D5386	3.8		-0.23	
391		-----		-----	
551	D5386	1		-1.72	
558		-----		-----	
663	D5386	3		-0.65	
913		-----		-----	
963	D5386	3		-0.65	
1041	ISO6271	5.1		0.46	
1067	D1209	< 5		-----	
1081	D5386	3		-0.65	
1201	D5386	6		0.94	
1294		-----		-----	
1538		-----		-----	
1866	D5386	3		-0.65	
1880	D5386	5.28		0.56	
6134	D1209	4.5		0.14	
6208		-----		-----	
7009	D1209	6.6		1.26	
9008	D5386	5.2		0.52	

	normality	OK
	n	17
	outliers	0
	mean (n)	4.23
	st.dev. (n)	1.360
	R(calc.)	3.81
	st.dev.(D5386:16)	1.876
	R(D5386:16)	5.25
Compare		
	R(d1209:05)	7
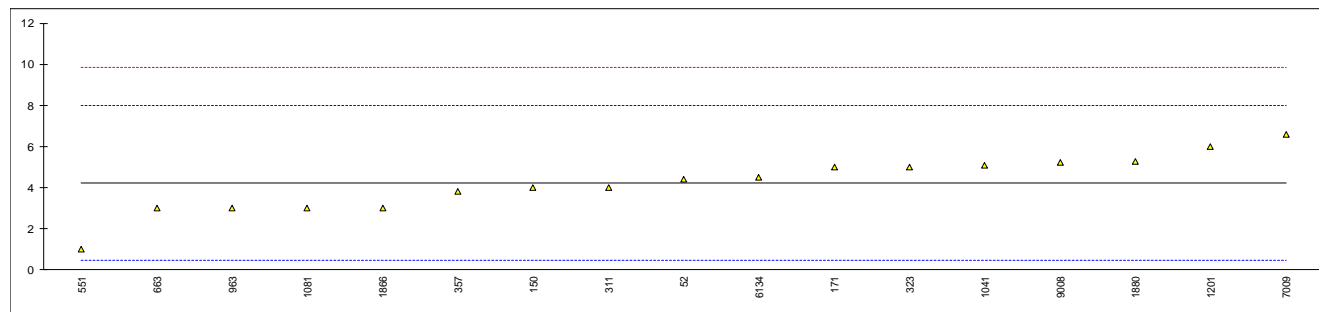
Determination of Density at 20°C of p-Xylene sample #18196; results in kg/L.

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8610		0.09	
150	D4052	0.8612	G(0.01)	1.21	
171	D4052	0.8610		0.09	
311	D4052	0.8610		0.09	
323	ISO12185	0.8609		-0.47	
357	D4052	0.86095		-0.19	
391		-----		-----	
551	D4052	0.86105		0.37	
558		-----		-----	
663	D4052	0.86097		-0.07	
913		-----		-----	
963	ISO12185	0.8610		0.09	
1041		-----		-----	
1067	D4052	0.8610		0.09	
1081		-----		-----	
1201	D4052	0.8610	C	0.09	First reported 861 kg/L
1294	D4052	0.8610		0.09	
1538		-----		-----	
1866	ISO1285	0.8610		0.09	
1880	D4052	0.8609		-0.47	
6134	D4052	0.86099		0.04	
6208		-----		-----	
7009	D4052	0.86097	C	-0.07	First reported 86097 kg/L
9008	D4052	0.8610		0.09	

normality	suspect
n	16
outliers	1
mean (n)	0.86098
st.dev. (n)	0.000039
R(calc.)	0.00011
st.dev.(ISO12185:96)	0.000179
R(ISO12185:96)	0.0005

Kernel Density
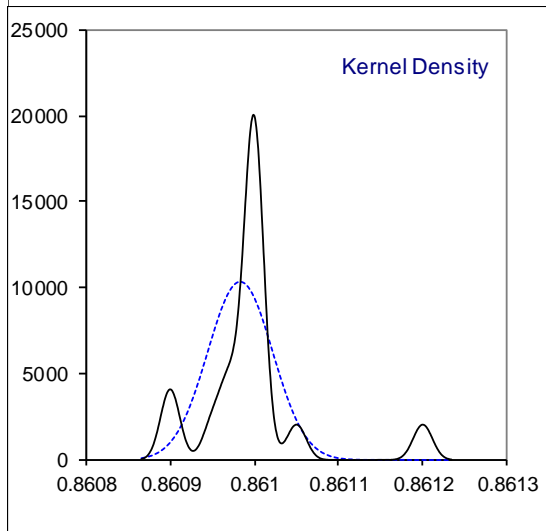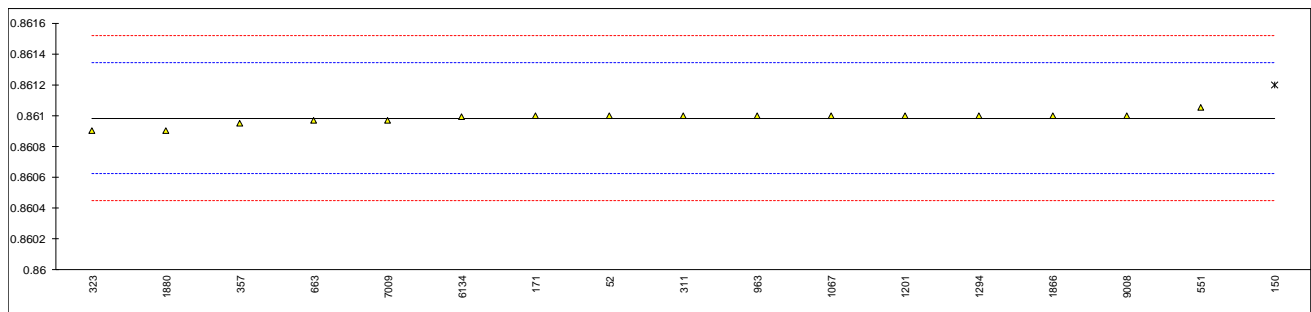
Determination of Distillation of p-Xylene sample #18196; results in °C

lab	method	IBP	mark	z(targ)	50%rec	mark	z(targ)	DP	mark	z(targ)
52	D850-automated	137.9		0.23	138.3		0.30	138.4		0.31
150	D850-automated	137.5		-0.93	138.3		0.30	138.4		0.31
171	D850-automated	138.0		0.52	138.1		-0.98	138.2		-1.13
311	D850-automated	137.6		-0.64	138.3		0.30	138.4		0.31
323	D850-manual	138.1		0.81	138.4		0.94	138.5		1.03
357	D850-automated	138.1		0.81	138.3		0.30	138.3		-0.41
391		-----		-----	-----		-----	-----		-----
551		-----		-----	-----		-----	-----		-----
558		-----		-----	-----		-----	-----		-----
663	D850-automated	138.0		0.52	138.3		0.30	138.3		-0.41
913		-----		-----	-----		-----	-----		-----
963	D850-automated	137.7		-0.35	138.1		-0.98	138.2		-1.13
1041		-----		-----	-----		-----	-----		-----
1067	D850-manual	138.0		0.52	138.3		0.30	138.5		1.03
1081		-----		-----	-----		-----	-----		-----
1201		-----		-----	138.3		0.30	138.5		1.03
1294	D850-automated	137.5		-0.93	138.1		-0.98	138.1		-1.85
1538		-----		-----	-----		-----	-----		-----
1866		137.80		-0.06	138.3		0.30	-----		-----
1880	D850-automated	137.9		0.23	138.4		0.94	138.5		1.03
6134	D850-manual	137.8		-0.06	138.2		-0.34	138.4		0.31
6208		-----		-----	-----		-----	-----		-----
7009	D850-automated	137.6		-0.64	138.1		-0.98	138.3		-0.41
9008		-----		-----	-----		-----	-----		-----

	normality	OK	OK	OK
	n	14	15	14
	outliers	0	0	0
	mean (n)	137.82	138.25	138.36
	st.dev. (n)	0.212	0.106	0.128
	R(calc.)	0.59	0.30	0.36
	st.dev.(D850-A:18)	0.344	0.157	0.139
	R(D850-A:18)	0.96	0.44	0.39

Initial Boiling Point

50% recovered

Dry Point
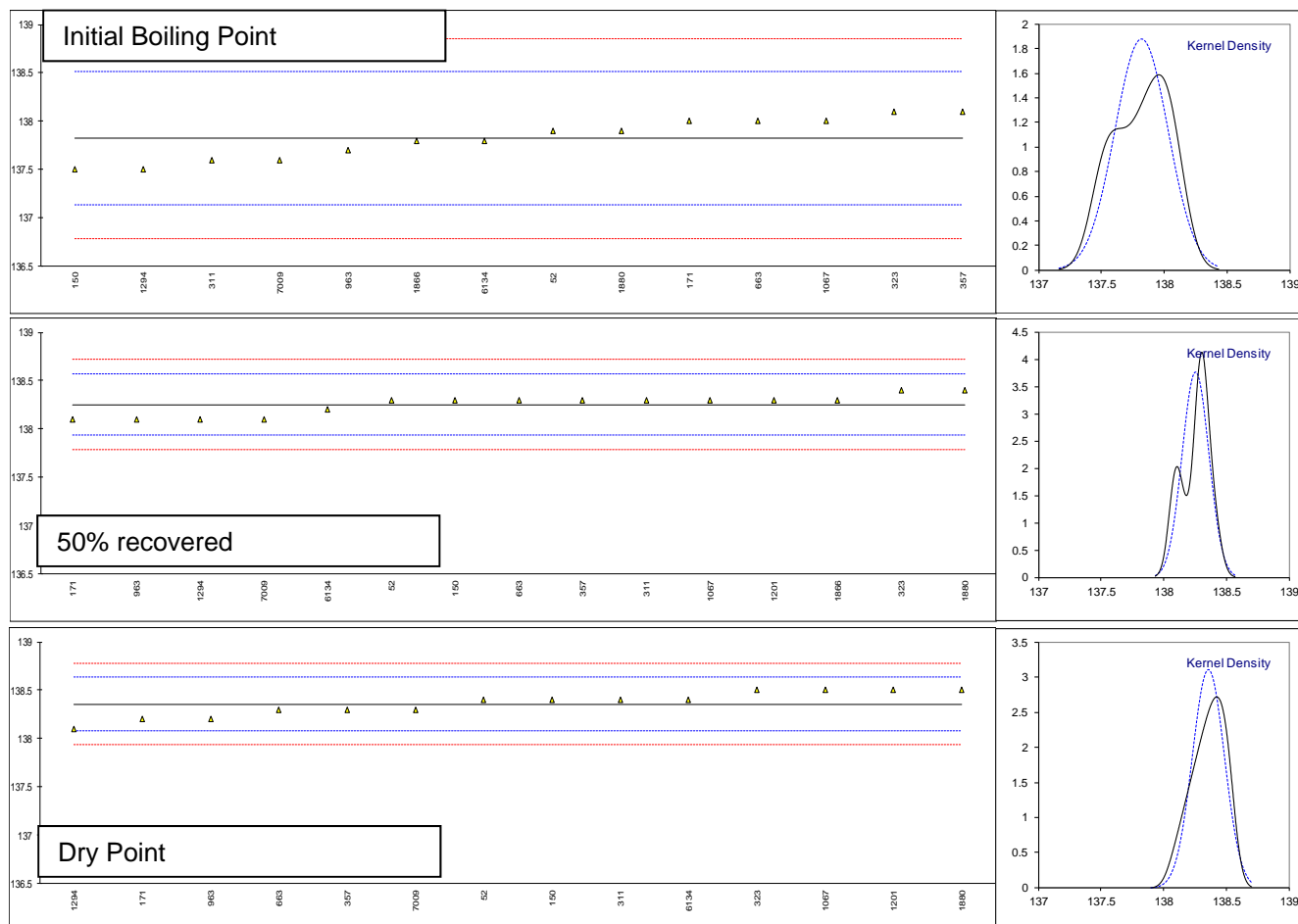
Determination of Distillation range of p-Xylene sample #18196; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
52	D850-automated	0.5		-0.06	
150	D850-automated	0.9		1.00	
171	D850-automated	0.2		-0.85	
311	D850-automated	0.8		0.73	
323	D850-manual	0.4		-0.33	
357	D850-automated	0.2		-0.85	
391		-----		-----	
551		-----		-----	
558		-----		-----	
663	D850-automated	0.3		-0.59	
913		-----		-----	
963	D850-automated	0.5		-0.06	
1041		-----		-----	
1067	D850-manual	0.5		-0.06	
1081		-----		-----	
1201		-----		-----	
1294	D850-automated	0.60		0.20	
1538		-----		-----	
1866		-----		-----	
1880	D850-automated	0.6		0.20	
6134	D850-manual	0.6		0.20	
6208		-----		-----	
7009	D850-automated	0.7		0.47	
9008		-----		-----	

normality	OK	
n	13	
outliers	0	
mean (n)	0.52	
st.dev. (n)	0.213	
R(calc.)	0.60	
st.dev.(D850-A:18)	0.378	
R(D850-A:18)	1.06	
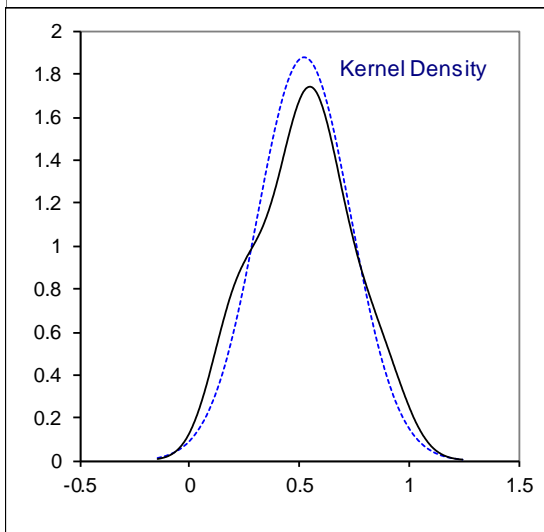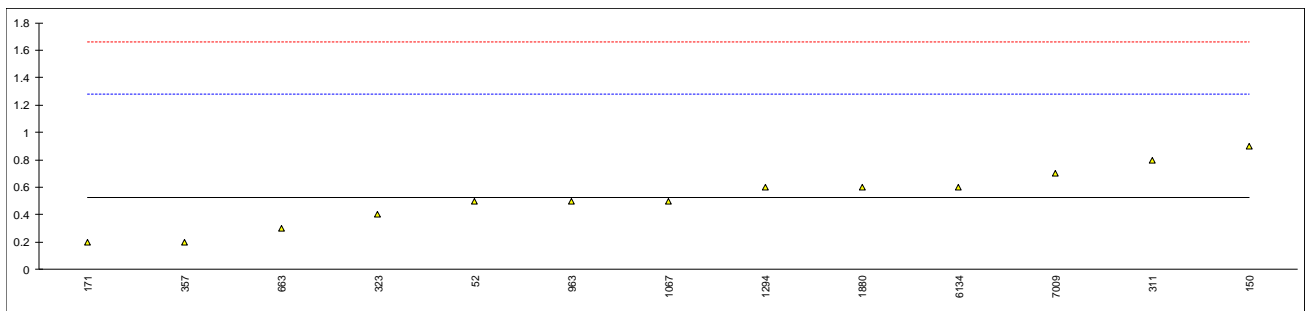
Determination of Sulphur in p-Xylene sample #18196; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
52	D7183	0.182		-1.25	
150	D7183	<0.50		-----	
171		-----		-----	
311	D7183	<0.5		-----	
323	D5453	<1		-----	
357	D7183	< 0,1		<-2.53	
391		-----		-----	
551	D5453	<1		-----	
558		-----		-----	
663	D5453	0.23		-0.50	
913		-----		-----	
963	D7183	0.3		0.59	
1041	D5453	0.21		-0.81	
1067	D5453	< 1.0		-----	
1081	D7183	0.26		-0.03	
1201		-----		-----	
1294	D4045	0.217		-0.70	
1538		-----		-----	
1866		-----		-----	
1880	D5453	0.2		-0.97	
6134	D5453	0.43		2.62	
6208		-----		-----	
7009	D5453	0.33		1.06	
9008	D5453	<0.1		<-2.53	

	normality	not OK
	n	9
	outliers	0
	mean (n)	0.262
	st.dev. (n)	0.0793
	R(calc.)	0.222
	st.dev.(D7183:18)	0.0640
	R(D7183:18)	0.179
Compare		
	R(D5453:16e1)	0.212
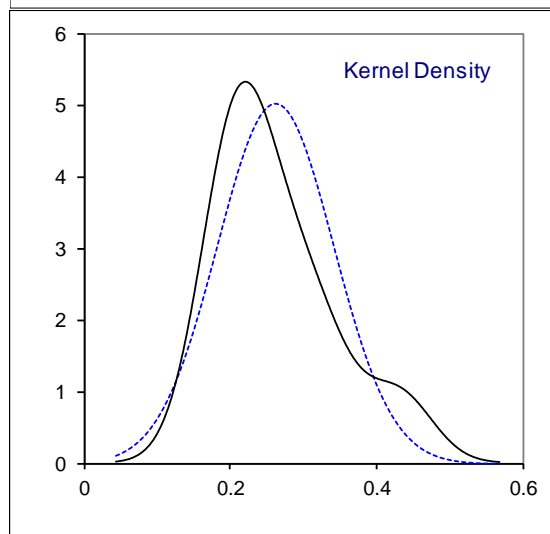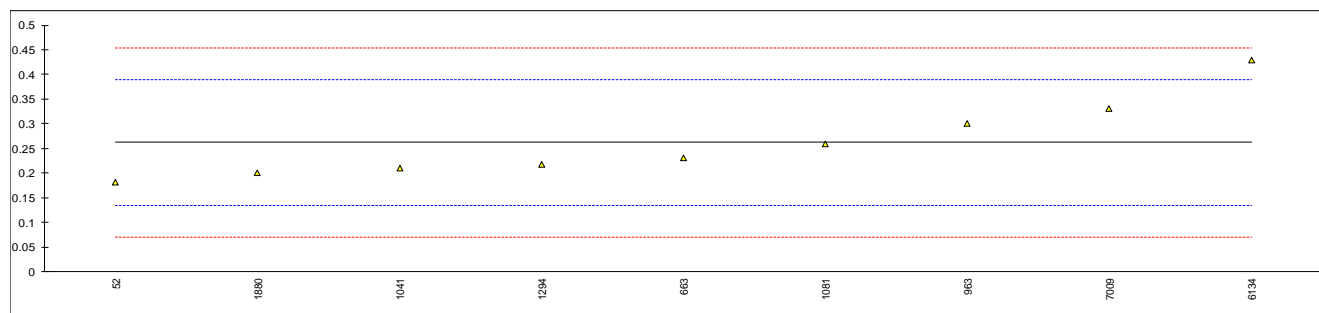
Determination of Purity in p-Xylene sample #18196; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D5917	99.7093		0.31	
150	D7504	99.64		-4.27	
171	D5917	99.82	R(0.01)	7.63	
311	D3798	99.75		3.00	
323	D5917	99.72		1.02	
357	D7504	99.660		-2.95	
391		-----		-----	
551	D5917	99.683		-1.43	
558		-----		-----	
663	D5917	99.700		-0.30	
913	D7504	99.71		0.36	
963	D7504	99.728		1.55	
1041	In house	99.692		-0.83	
1067	In house	99.69		-0.97	
1081	D3798	99.686		-1.23	
1201	D5917	99.76		3.66	
1294	D5917	99.70334		-0.08	
1538	D7504	99.7194		0.98	
1866	D5917	99.715		0.69	
1880	D3798	99.70		-0.30	
6134	UOP720	99.705		0.03	
6208	D5917	99.7051		0.03	
7009	D7504	99.721		1.08	
9008	UOP720	99.70		-0.30	

normality	suspect
n	21
outliers	1
mean (n)	99.7046
st.dev. (n)	0.02643
R(calc.)	0.0740
st.dev.(D5917:15e1)	0.01513
R(D5917:15e1)	0.0424
Compare	
R(D7504:18)	0.0173

Kernel Density
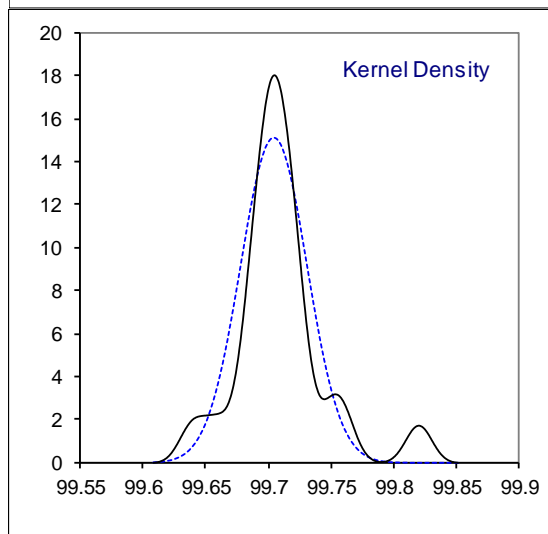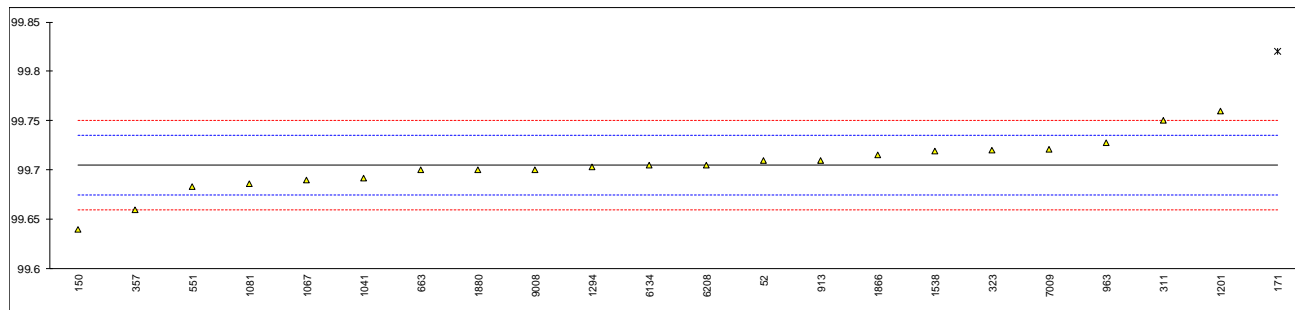
Determination of o-Xylene in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.0442		0.00	
150	D7504	0.1375	C,R(0.01)	4.64	First reported 0.1405
171	D5917	0.042		-0.11	
311	D3798	0.041		-0.16	
323	D5917	0.045		0.04	
357	D7504	0.0437		-0.02	
391		-----		-----	
551	D5917	0.045		0.04	
558		-----		-----	
663	D5917	0.0435		-0.03	
913		-----		-----	
963	D7504	0.0445		0.02	
1041	In house	0.046		0.09	
1067	In house	0.045		0.04	
1081	D3798	0.0442		0.00	
1201	D5917	0.039		-0.26	
1294	D5917	0.04482		0.03	
1538	D7504	0.0433		-0.04	
1866	D5917	0.0439		-0.01	
1880	D3798	0.0448		0.03	
6134	UOP720	0.0431		-0.05	
6208	D5917	0.0441		0.00	
7009	D7504	0.052		0.39	
9008	UOP720	0.0446		0.02	

normality	not OK
n	20
outliers	1
mean (n)	0.04419
st.dev. (n)	0.002428
R(calc.)	0.00680
st.dev.(D5917:15e1)	0.020125
R(D5917:15e1)	0.05635
Compare	
R(D7504:18)	0.00358

Kernel Density
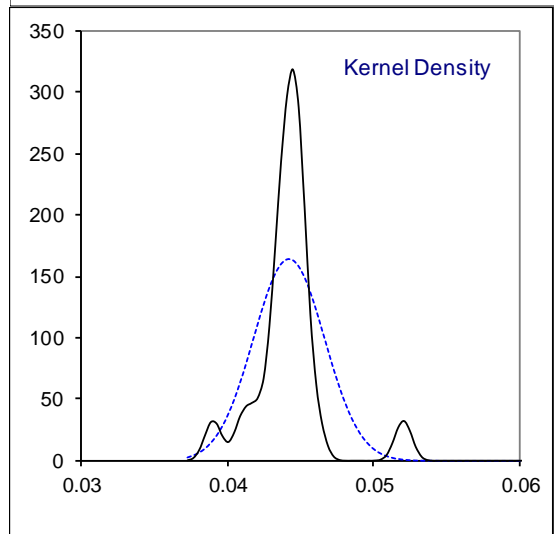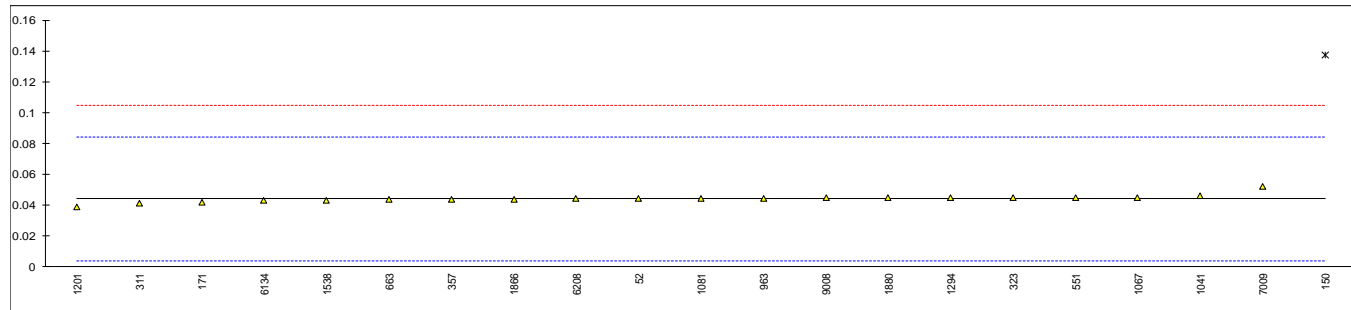
Determination of m-Xylene in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.1524		-0.03	
150	D7504	0.1203		-1.83	
171	D5917	0.058	R(0.01)	-5.32	
311	D3798	0.113		-2.24	
323	D5917	0.146		-0.39	
357	D7504	0.2018		2.74	
391		-----		-----	
551	D5917	0.172		1.07	
558		-----		-----	
663	D5917	0.1625		0.53	
913		-----		-----	
963	D7504	0.1534		0.02	
1041	In house	0.153		0.00	
1067	In house	0.160		0.39	
1081	D3798	0.1604		0.42	
1201	D5917	0.1157		-2.09	
1294	D5917	0.16044		0.42	
1538	D7504	0.1433		-0.54	
1866	D5917	0.1569		0.22	
1880	D3798	0.1602		0.40	
6134	UOP720	0.1565		0.20	
6208	D5917	0.1629		0.56	
7009	D7504	0.152		-0.06	
9008	UOP720	0.1569		0.22	

normality	suspect
n	20
outliers	1
mean (n)	0.1530
st.dev. (n)	0.01972
R(calc.)	0.0552
st.dev.(D5917:15e1)	0.01784
R(D5917:15e1)	0.0499
Compare	
R(D7504:18)	0.0203
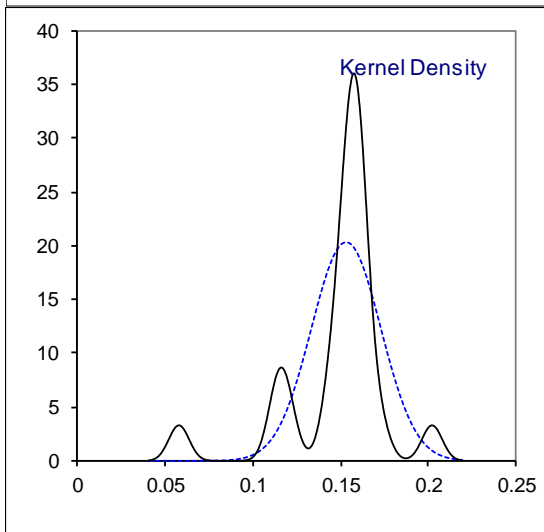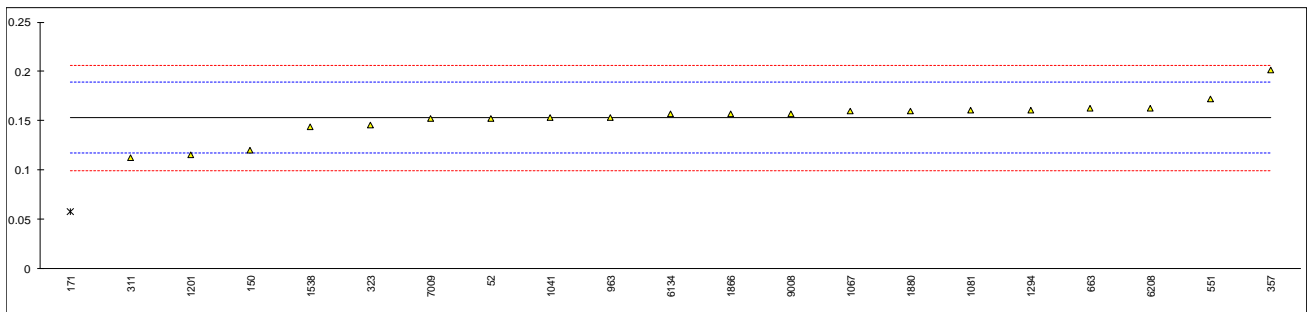
Determination of Ethylbenzene in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.0781		0.14	
150	D7504	0.0828		0.94	
171	D5917	0.065		-2.10	
311	D3798	0.079		0.29	
323	D5917	0.077		-0.05	
357	D7504	0.0784		0.19	
391		-----		-----	
551	D5917	0.082		0.80	
558		-----		-----	
663	D5917	0.0771		-0.04	
913		-----		-----	
963	D7504	0.0569	R(0.01)	-3.48	
1041	In house	0.081		0.63	
1067	In house	0.081		0.63	
1081	D3798	0.0779		0.10	
1201	D5917	0.066		-1.93	
1294	D5917	0.07731		0.00	
1538	D7504	0.0779		0.10	
1866	D5917	0.0778		0.08	
1880	D3798	0.0791		0.31	
6134	UOP720	0.0772		-0.02	
6208	D5917	0.0757		-0.27	
7009	D7504	0.056	R(0.01)	-3.63	
9008	UOP720	0.0785		0.20	

|		
	normality	not OK
	n	19
	outliers	2
	mean (n)	0.0773
	st.dev. (n)	0.00454
	R(calc.)	0.0127
	st.dev.(D5917:15e1)	0.00587
	R(D5917:15e1)	0.0164
Compare		
	R(D7504:18)	0.0092
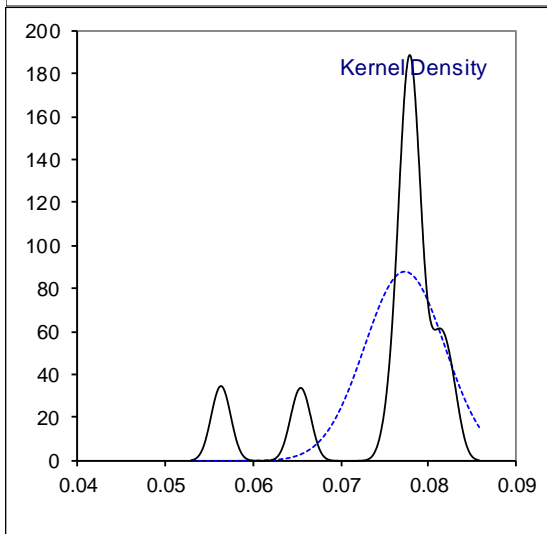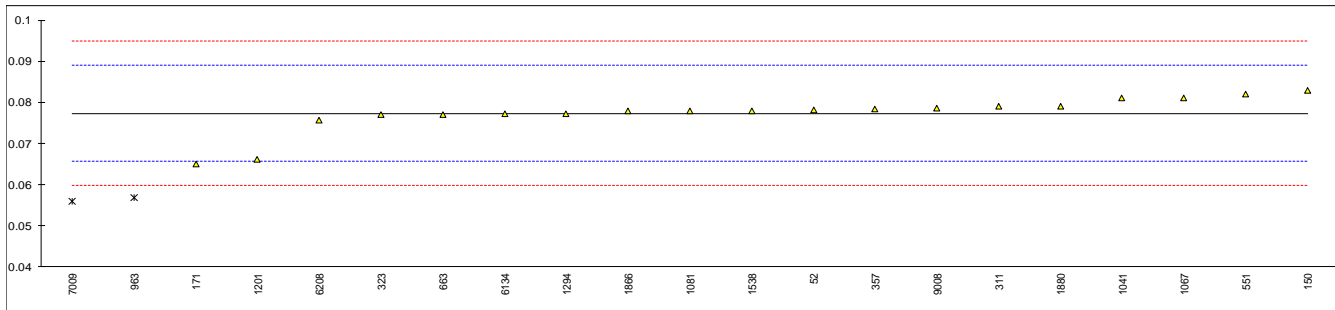
Determination of Styrene in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150		-----		-----	
171	D5917	<0.001		-----	
311	D3798	<0.001		-----	
323	D5917	<0.001		-----	
357	D7504	< 0,0002		-----	
391		-----		-----	
551	D5917	<0.01		-----	
558		-----		-----	
663		-----		-----	
913		-----		-----	
963	D7504	<0.0002		-----	
1041		-----		-----	
1067	In house	< 0.001		-----	
1081		-----		-----	
1201	D5917	<0.001		-----	
1294		-----		-----	
1538		-----		-----	
1866		-----		-----	
1880		-----		-----	
6134		-----		-----	
6208	D5917	0		-----	
7009		-----		-----	
9008		-----		-----	
	n	8			
	mean (n)	<0.001			

Determination of Toluene in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.0056		-0.22	
150	D7504	0.0061		0.32	
171	D5917	0.005		-0.86	
311	D3798	0.006		0.21	
323	D5917	0.006		0.21	
357	D7504	0.0054		-0.43	
391		-----		-----	
551	D5917	0.0061		0.32	
558		-----		-----	
663	D5917	0.0061		0.32	
913		-----		-----	
963	D7504	0.0056		-0.22	
1041	In house	0.006		0.21	
1067	In house	0.006		0.21	
1081	D3798	0.0057		-0.11	
1201	D5917	0.0044	R(0.05)	-1.49	
1294	D5917	0.00596		0.17	
1538	D7504	0.0059		0.10	
1866	D5917	0.0061		0.32	
1880	D3798	0.0058		0.00	
6134	UOP720	0.0057		-0.11	
6208	D5917	0.0062		0.42	
7009	D7504	0.005	C	-0.86	First reported 0.009
9008	UOP720	0.0058		0.00	

	normality	suspect
	n	20
	outliers	1
	mean (n)	0.00580
	st.dev. (n)	0.000345
	R(calc.)	0.00096
	st.dev.(D5917:15e1)	0.000938
	R(D5917:15e1)	0.00263
Compare		
	R(D7504:18)	0.00049

Kernel Density
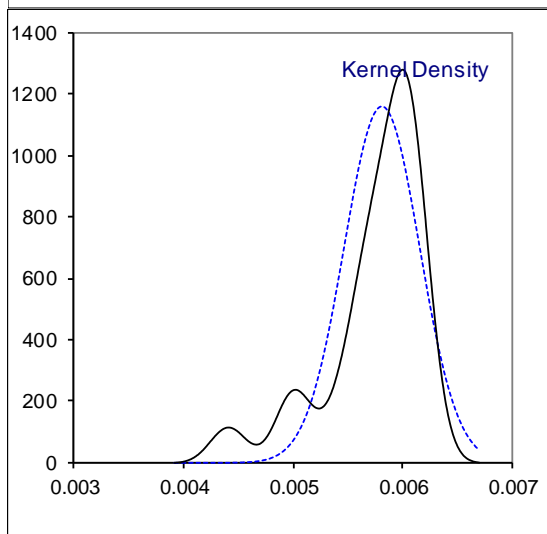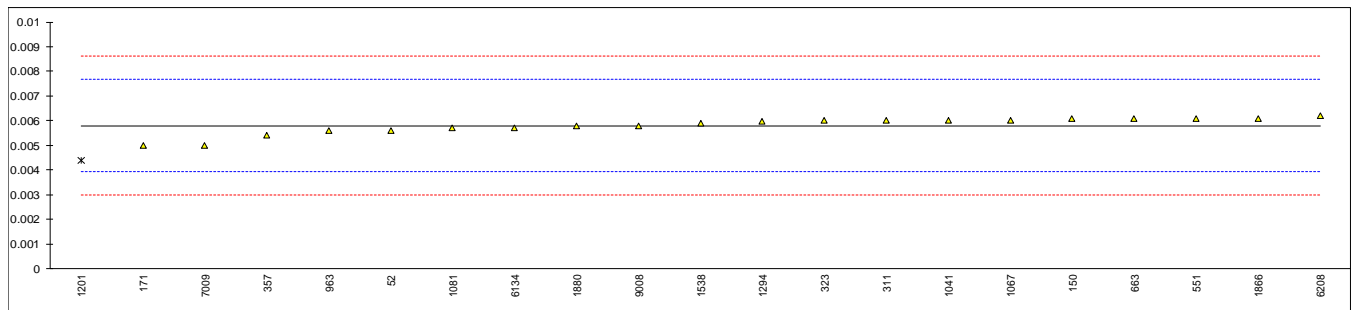
Determination of Non-aromatics in p-Xylene sample #18196; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.0104		-0.04	
150	D7504	0.0147		0.46	
171	D5917	0.010		-0.08	
311	D3798	0.014		0.38	
323	D5917	0.010		-0.08	
357	D7504	0.0103		-0.05	
391		-----		-----	
551	D5917	0.0100		-0.08	
558		-----		-----	
663	D5917	0.0115		0.09	
913		-----		-----	
963	D7504	0.0110		0.03	
1041	In house	0.012		0.15	
1067	In house	0.013		0.26	
1081	D3798	0.0263	R(0.01)	1.79	
1201	D5917	0.0080		-0.31	
1294	D5917	0.00813		-0.30	
1538	D7504	0.0103		-0.05	
1866		-----		-----	
1880	D3798	0.0107		0.00	
6134	UOP720	0.0125		0.21	
6208	D5917	0.0055		-0.60	
7009	D7504	0.010		-0.08	
9008	UOP720	0.0114		0.08	

normality	suspect
n	19
outliers	1
mean (n)	0.01071
st.dev. (n)	0.002130
R(calc.)	0.00596
st.dev.(D5917:15e1)	0.008723
R(D5917:15e1)	0.02442
Compare	
R(D7504:18)	0.01705

Kernel Density
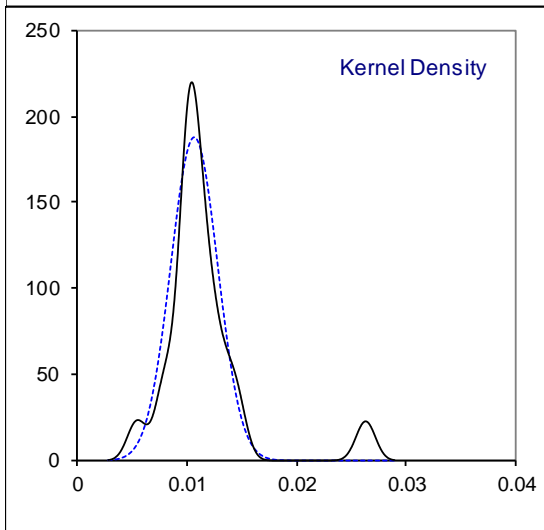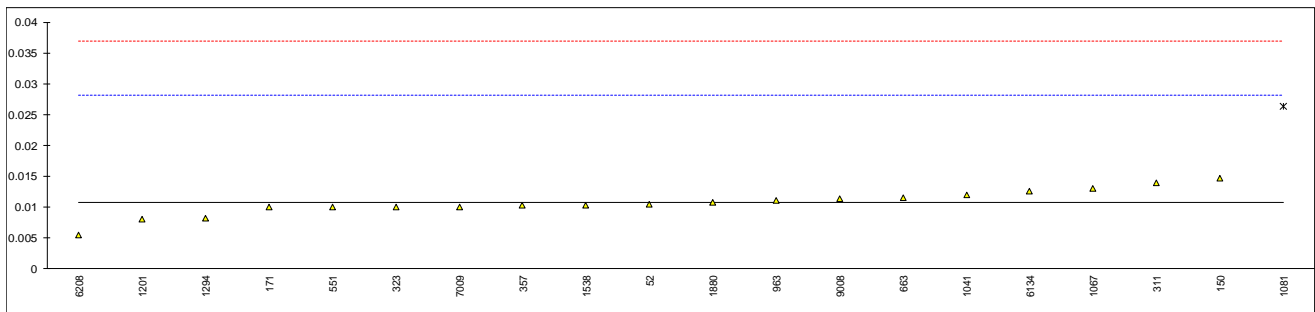
APPENDIX 2

List of number of participants per country

   1 lab in BELGIUM
2 labs in BRAZIL
   1 lab in CANADA
   1 lab in FINLAND
   1 lab in GERMANY
2 labs in INDIA
   1 lab in IRAN, Islamic Republic of
   1 lab in ITALY
2 labs in KUWAIT
4 labs in NETHERLANDS
   1 lab in POLAND
3 labs in SAUDI ARABIA
   1 lab in SOUTH KOREA
   1 lab in THAILAND
2 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	= probably an error in calculations
U	= test result probably reported in a different unit
W	= test result withdrawn on request of participant
ex	= test result excluded from statistical evaluations
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
SDS	= Safety Data Sheet

Literature:

1   iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018

2   ASTM E178:02

3   ASTM E1301:03

4   ISO 5725:86

5   ISO 5725, parts 1-6, 1994

6   M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)

7   W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)

8   IP 367:84

9   DIN 38402 T41/42

10   P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)

11   J.N. Miller, Analyst, 118, 455, (1993)

12   Analytical Methods Committee Technical brief, No 4 January 2001.

13   P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364 (2002)

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

15   Horwitz, R. Albert, J. AOAC Int. 79-3, 589 (1996)