Results of Proficiency Test ortho- and para-Xylenes October 2016

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 analyses of o- and p-Xylenes once every two years. As part of the annual proficiency test program of 2016/2017, 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, 30 laboratories from 17 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 #16201) and one 0.5 L bottle with p-Xylene (labelled #16202). 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 April 2014 (iis-protocol, version 3.3). 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 brown glass bottles with inner and outer caps were filled with 200 mL o-Xylene and labelled #16201. The homogeneity of the subsamples of #16201 was checked by determination of Density at 20°C in accordance with ASTM D4052 and p-Xylene in accordance with ASTM D3797 on 8 stratified randomly selected samples.

	Density at 20°C in kg/L	*p-Xylene in %M/M*
sample #16201-1	0.87997	0.0196
sample #16201-2	0.87995	0.0196
sample #16201-3	0.87996	0.0198
sample #16201-4	0.87996	0.0195
sample #16201-5	0.87996	0.0197
sample #16201-6	0.87995	0.0200
sample #16201-7	0.87997	0.0195
sample #16201-8	0.87999	0.0196

Table 1: homogeneity test results of subsamples #16201 (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)	0.00001	0.0005
reference test method	ISO12185:96	ASTM D3797:05
0.3 * R (ref. test method)	0.00015	0.0020

Table 2: repeatabilities on subsamples #16201

A batch of approximately 25 litre p-Xylene was purchased from a local supplier of chemicals. After homogenisation, 48 brown glass bottles with inner and outer caps were filled with 500 mL p-Xylene and labelled #16202. The homogeneity of the subsamples was checked by determination of Density at 20°C in accordance with ASTM D4052 and 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 #16202-1	0.86095	0.069
sample #16202-2	0.86096	0.075
sample #16202-3	0.86097	0.071
sample #16202-4	0.86098	0.072
sample #16202-5	0.86095	0.071
sample #16202-6	0.86095	0.067
sample #16202-7	0.86096	0.071
sample #16202-8	0.86097	0.070

Table 3: homogeneity test results of subsamples #16202 (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	0.0023
reference test method	ISO12185:96	ASTM D5917:15e1
0.3 * R (ref. test method)	0.00015	0.0027

Table 4: repeatabilities on subsamples #16202

All observed repeatabilities listed in tables 2 and 4 were less than 0.3 times the corresponding reproducibilities of the reference test methods. Therefore, homogeneities of the sub samples #16201 and #16202 were assumed.

To each of the participating laboratories 1 bottle of 0.25 L with o-Xylene (labelled #16201) and 1 bottle of 0.5 L with p-Xylene (labelled #16202) were sent on September 21, 2016.

2.5 STABILITY OF THE SAMPLES

The stability of o-Xylene and p-Xylene, packed in the brown 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 #16201 (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 Non aromatics.
And to determine on sample #16202 (p-Xylene); Appearance, Organic Chloride, Colour 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, Non-aromatics).

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.

To get comparable test results a detailed report form, on which the units were prescribed as well as the required reference test methods and a letter of instructions were prepared and made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The laboratories were also requested to confirm the sample receipt on the same data entry portal. A SDS was added to the sample.

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 April 2014 (iis-protocol, version 3.3).
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. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation of the test results 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. 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 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.
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 problems were encountered with the dispatch of the samples to laboratories in Brazil and Saudi Arabia. A number of laboratories received the samples late due to custom clearance problems.

Four participants did not report any test results and four other participants did report test results after the final reporting date. Not all participants were able to report all requested parameters. Finally, 26 participants did report 498 numerical test results. Observed were 16 outlying test results, which is 3.2%. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER SAMPLE AND PER TEST

In this section, the results are discussed per sample and per test.
In the iis PT reports, ASTM test methods are referred to with a number (e.g. D5136) and an added designation for the year that the test method was adopted or revised (e.g. D5136:09). If applicable, a designation in parentheses is added to designate the year of reapproval (e.g. d5136:09(2013)). In the tables of Appendix 1 only the test method number and year of adoption or revision will be used.

The reference test methods for the analyses of o- and p-Xylenes were selected according to the scope of the latest version of ASTM D5471:16 for o-Xylene and ASTM D5136:09(2013) for p-Xylene. In case no precision data was mentioned, the calculated reproducibility was compared against the estimated requirements based on the Horwitz equation.

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.

Sample #16201 o-Xylene:

Purity: 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.

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 may be problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the strict requirements estimated using the Horwitz equation.

iso-Propylbenzene: 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 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. 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 (based on 3 components).

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

C9 and heavier aromatics: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D7504:16.

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 #16202 p-Xylene:

Appearance: All participants agreed about the appearance of sample #16202. 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 at all. One statistical outlier was observed and the calculated reproducibility after rejection of the statistical outlier is in good agreement with the requirements of ASTM D5808:09a(2014).

Colour Pt/Co: This determination may be problematic dependently on the test method used. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D5386:10 but it is in agreement with the requirements of ASTM D1209:05(2011).

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

Distillation: This determination was not problematic. No statistical outliers were observed. In total eight test results (from two participants) were excluded as the reported distillation temperatures were much lower that the theoretical boiling point of p-Xylene (BP=138.3°C). The calculated reproducibilities of IBP, 50% rec, DP and distillation range after rejection of the suspect data are in agreement with the requirements of ASTM D850-A:16.

Sulphur: This determination was problematic. No statistical outliers were observed. However, the calculated reproducibility is not in agreement with the requirements of ASTM D7183:16.

Purity: This determination was problematic for a number of laboratories. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D5917:15e1.

o-Xylene: This determination was not problematic at all. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5917:15e1.

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

Ethylbenzene: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D5917:15e1.

Styrene: This determination may not be problematic. Two statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in good agreement with the requirements estimated from the Horwitz equation.

Toluene: 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.

Nonaromatics: This determination was not problematic at all. No statistical outliers were observed and the calculated reproducibility is in good 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	21	99.342	0.290	0.425
m-Xylene	%M/M	19	0.068	0.013	0.017
p-Xylene	%M/M	19	0.020	0.007	0.007
Ethylbenzene	%M/M	18	0.010	0.004	0.005
n-Propylbenzene	%M/M	10	0.003	0.002	0.001
i-Propylbenzene (Cumene)	%M/M	20	0.282	0.085	0.073
Styrene	%M/M	16	0.191	0.047	0.076
Sum of Ethyltoluenes	%M/M	9	0.004	0.003	0.002
Toluene	%M/M	18	0.002	0.001	0.001
C9 and heavier aromatics	%M/M	14	0.300	0.372	0.931
Non-aromatics	%M/M	19	0.083	0.059	0.061

Table 5: reproducibilities for sample #16201 (o-Xylene)

Parameter	unit	n	average	2.8 * sd	R(lit)
Appearance		22	Pass	n.a.	n.a.
Organic Chloride	mg/kg	11	0.34	0.50	1.30
Colour Pt/Co		20	6.4	7.4	5.6
Density at 20°C	kg/L	22	0.8610	0.0002	0.0005
Initial Boiling Point	°C	19	137.8	0.7	1.0
50% Boiling Point	°C	19	138.3	0.3	0.4
Dry Point	°C	19	138.4	0.4	0.4
Distillation Range	°C	18	0.6	0.6	1.1
Sulphur	mg/kg	21	0.64	0.47	0.28
Purity (p-Xylene)	%M/M	20	99.603	0.047	0.042
o-Xylene	%M/M	23	0.077	0.014	0.099
m-Xylene	%M/M	21	0.195	0.036	0.064
Ethylbenzene	%M/M	22	0.093	0.013	0.020
Styrene	%M/M	11	0.006	0.001	0.001
Toluene	%M/M	22	0.010	0.003	0.005
Non-aromatics	%M/M	21	0.014	0.012	0.032

Table 6: reproducibilities for sample #16202 (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 2016 PROFICIENCY TEST WITH PREVIOUS PT RESULTS

	October 2016	October 2014	September 2012	October 2010	November 2008
Number of reporting labs	26	29	27	26	26
Number of results reported	498	529	471	471	502
Statistical outliers	16	29	27	41	33
Percentage outliers	3.2%	5.5%	5.7%	8.7%	6.6%

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:

Determination	October 2016	October 2014	September 2012	October 2010	November 2008
Purity (o-Xylene)	+	++	+	++	++
m-Xylene	+	++	++	++	+/-
p-Xylene	+/-	++	++	++	++
Ethylbenzene	+	++	++	++	++
n-Propylbenzene	-	+/-	++	-	+/-
i-Propylbenzene (Cumene)	-	+	++	++	-
Styrene	+	+	++	++	++
Sum of Ethyltoluenes	-	+	+/-	-	++
Toluene	+/-	+/-	++	++	++
C9 and heavier aromatics	++	n.e.	n.e.	n.e.	n.e.
Non-aromatics	+/-	++	++	++	++

Table 8: comparison determinations of sample #16201 (o-Xylene) against the reference test methods

Determination	October 2016	October 2014	September 2012	October 2010	November 2008
Organic Chloride	++	++	n.e	n.e.	n.e.
Colour Pt/Co	-	++	+	--	++
Density at 20°C	++	++	++	++	++
Initial Boiling Point	+	++	+	++	++
50% Boiling Point	+	++	+/-	+/-	n.e.
Dry Point	+/-	++	-	++	-
Distillation Range	++	n.e.	n.e	n.e.	n.e.
Sulphur	-	+/-	n.e.	(--)	n.e.
Purity (p-Xylene)	+/-	++	-	++	++
o-Xylene	++	++	++	++	++
m-Xylene	+	+	-	--	+/-
Ethylbenzene	+	++	++	++	++
Styrene	+/-	++	-	n.e.	++
Toluene	+	++	++	++	++
Non-aromatics	++	++	++	++	++

Table 9: comparison determinations of sample #16202 (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

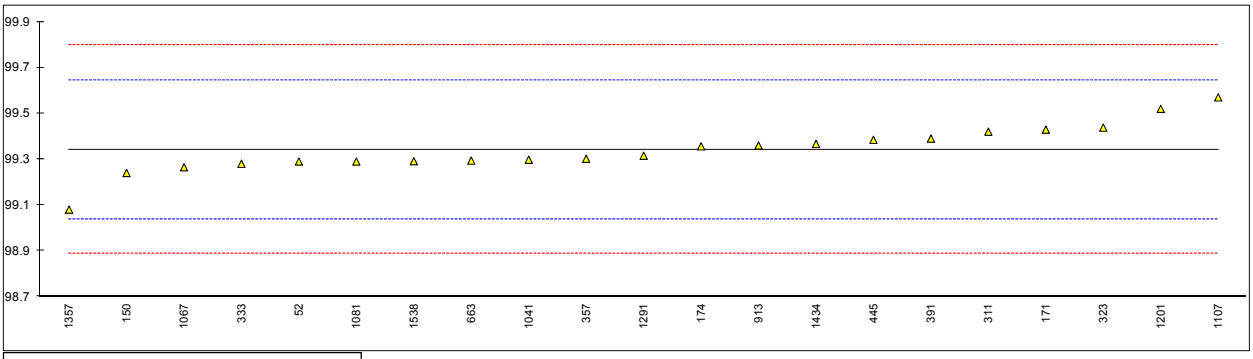
APPENDIX 1

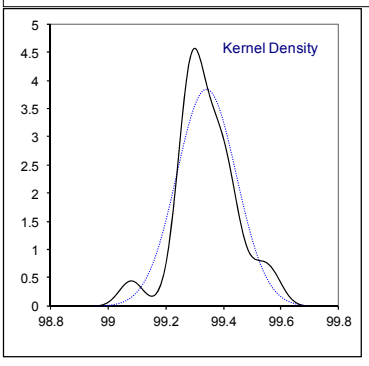
Determination of Purity on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	99.29	C	-0.34	first reported: 99.28
150	D3797	99.24		-0.67	
171	D3797	99.429		0.57	
174	D6563	99.356		0.09	
311	D3797	99.42		0.51	
323	D5917mod.	99.438		0.63	
333	D3797	99.28		-0.41	
338		-----		-----	
357	D7504	99.302		-0.26	
391	D2360	99.39		0.32	
445	D6563	99.3847		0.28	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	99.294	C	-0.32	first reported: 99.296
913	D3797	99.36		0.12	
963		-----		-----	
1041	In house	99.298		-0.29	
1067	D3797	99.265		-0.51	
1081		99.29		-0.34	
1107	D7504	99.570		1.50	
1201	D3797	99.52		1.17	
1291	D7504	99.3154		-0.17	
1294		-----		-----	
1357	In house	99.08		-1.73	
1434	D3797	99.3666		0.16	
1538	D7504	99.2914		-0.33	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

	normality	suspect
	n	21
	outliers	0
	mean (n)	99.3419
	st.dev. (n)	0.10371
	R(calc.)	0.2904
	R(D3797:05)	0.4246

compare R(D7504:16)=0.0552



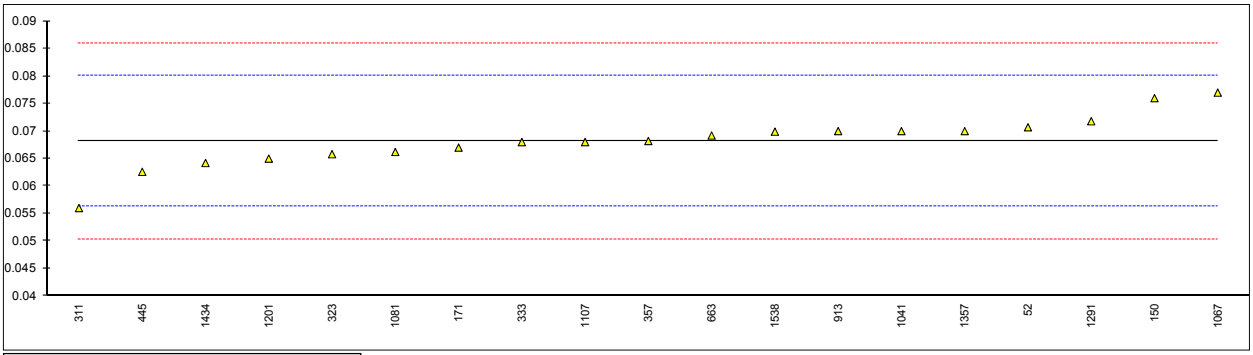


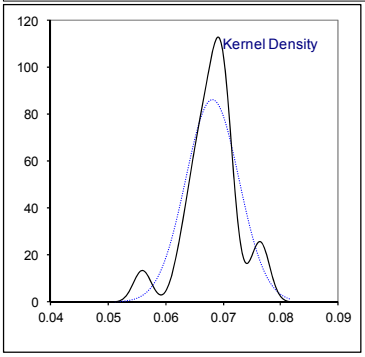
Determination of m-Xylene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0707		0.42	
150	D3797	0.076		1.31	
171	D3797	0.067		-0.20	
174	D6563	<0.01		<-9.80	possibly a false negative test result?
311	D3797	0.056		-2.05	
323	D5917mod.	0.0658		-0.40	
333	D3797	0.068		-0.03	
338		-----		-----	
357	D7504	0.0682		0.00	
391		-----		-----	
445	D6563	0.0626		-0.94	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0692		0.17	
913	D3797	0.0700		0.30	
963		-----		-----	
1041	In house	0.070		0.30	
1067	D3797	0.077		1.48	
1081		0.0662		-0.33	
1107	D7504	0.0680		-0.03	
1201	D3797	0.065		-0.54	
1291	D7504	0.0718		0.61	
1294		-----		-----	
1357	In house	0.07		0.30	
1434	D3797	0.0642		-0.67	
1538	D7504	0.0699		0.29	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	suspect
n	19
outliers	0
mean (n)	0.0682
st.dev. (n)	0.00465
R(calc.)	0.0130
R(D3797:05)	0.0166

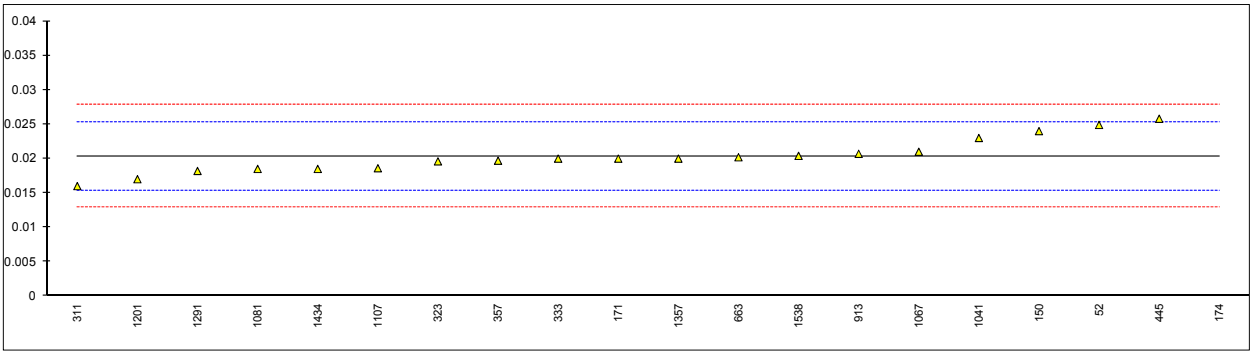
compare R(D7504:16)=0.0027

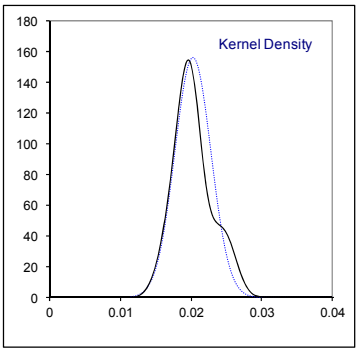




Determination of p-Xylene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0249	C	1.84	first reported: 0.0388
150	D3797	0.024		1.47	
171	D3797	0.020		-0.13	
174	D6563	0.0682	R(0.01)	19.19	
311	D3797	0.016		-1.73	
323	D5917mod.	0.0196		-0.29	
333	D3797	0.020		-0.13	
338		-----		-----	
357	D7504	0.0197		-0.25	
391		-----		-----	
445	D6563	0.0258		2.20	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0202		-0.05	
913	D3797	0.0207		0.15	
963		-----		-----	
1041	In house	0.023		1.07	
1067	D3797	0.021		0.27	
1081		0.0185		-0.73	
1107	D7504	0.0186		-0.69	
1201	D3797	0.017		-1.33	
1291	D7504	0.0182		-0.85	
1294		-----		-----	
1357	In house	0.02		-0.13	
1434	D3797	0.0185		-0.73	
1538	D7504	0.0204		0.03	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	
	normality	OK			
	n	19			
	outliers	1			
	mean (n)	0.0203			
	st.dev. (n)	0.00255			
	R(calc.)	0.0071			
	R(D3797:05)	0.0070			compare R(D7504:16)=0.0012

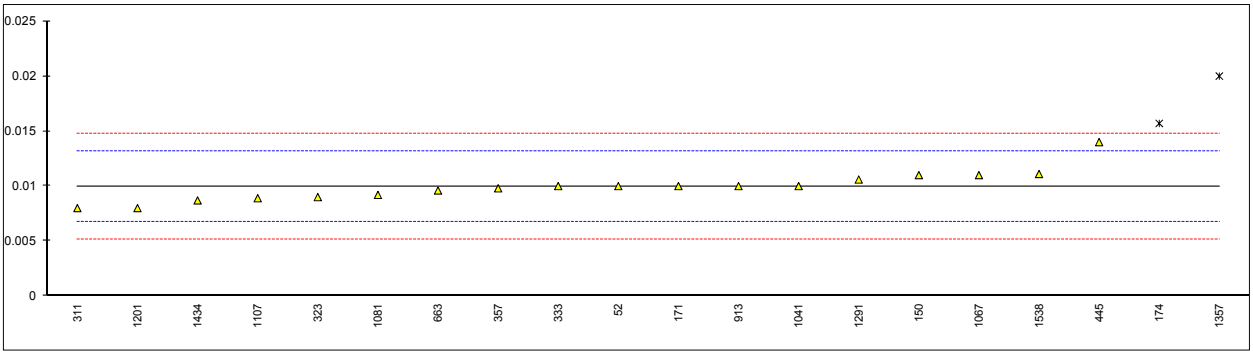


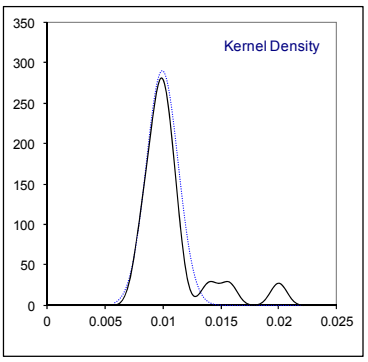


Determination of Ethylbenzene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0100		0.04	
150	D3797	0.011		0.66	
171	D3797	0.010		0.04	
174	D6563	0.0157	G(0.05)	3.57	
311	D3797	0.008		-1.20	
323	D5917mod.	0.0090		-0.58	
333	D3797	0.010		0.04	
338		-----		-----	
357	D7504	0.0098		-0.09	
391		-----		-----	
445	D6563	0.0140		2.52	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0096		-0.21	
913	D3797	0.0100		0.04	
963		-----		-----	
1041	In house	0.010		0.04	
1067	D3797	0.011		0.66	
1081		0.0092		-0.46	
1107	D7504	0.0089		-0.64	
1201	D3797	0.0080		-1.20	
1291	D7504	0.0106		0.41	
1294		-----		-----	
1357	In house	0.02	G(0.01)	6.24	
1434	D3797	0.0087		-0.77	
1538	D7504	0.0111		0.72	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	not OK	
n	18	
outliers	2	
mean (n)	0.0099	
st.dev. (n)	0.00138	
R(calc.)	0.0039	
R(D3797:05)	0.0047	compare R(D7504:16)=0.0033

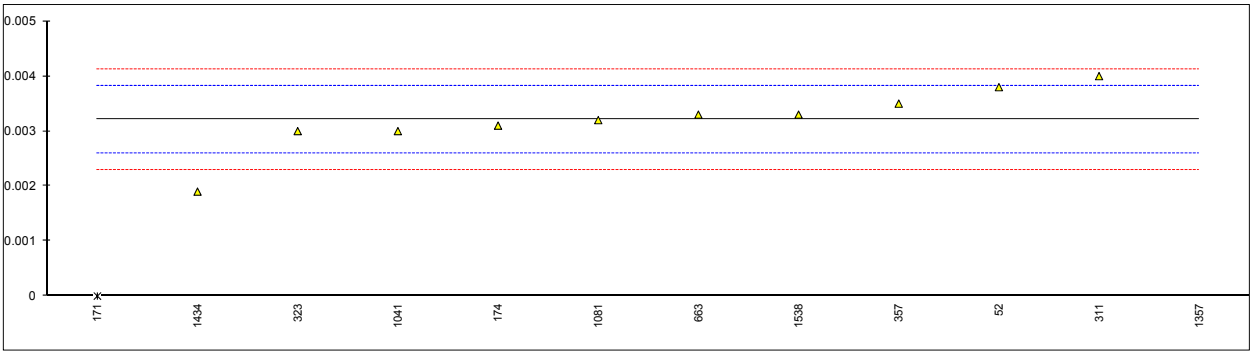


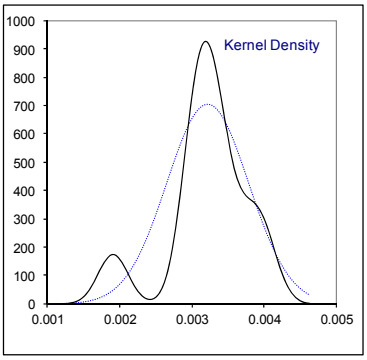


Determination of n-Propylbenzene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0038		1.94	
150		-----		-----	
171	D3797	0	ex	-10.53	test result excluded; zero is not a real value
174	D6563	0.0031		-0.36	
311	D3797	0.004		2.59	
323	D5917mod.	0.003	C	-0.69	first reported: <0.001
333		-----		-----	
338		-----		-----	
357	D7504	0.0035	C	0.95	first reported: 0.0065
391		-----		-----	
445		-----		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0033	C	0.30	first reported: <0.0002
913		-----		-----	
963		-----		-----	
1041	In house	0.003		-0.69	
1067		-----		-----	
1081		0.0032		-0.03	
1107		-----		-----	
1201		-----		-----	
1291		-----		-----	
1294		-----		-----	
1357		0.335	D(0.01)	1088.90	
1434	D3797	0.0019		-4.30	
1538	D7504	0.0033		0.30	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	not OK
n	10
outliers	1+1ex
mean (n)	0.0032
st.dev. (n)	0.00057
R(calc.)	0.0016
R(Horwitz)	0.0009



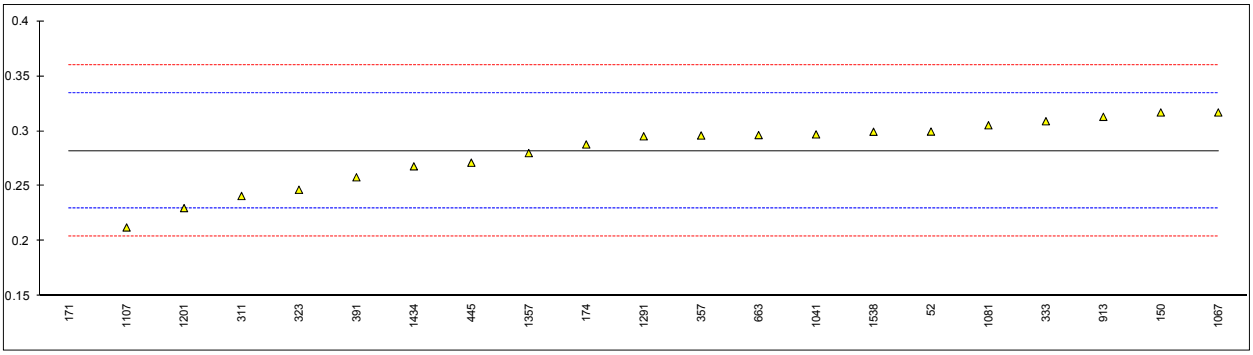


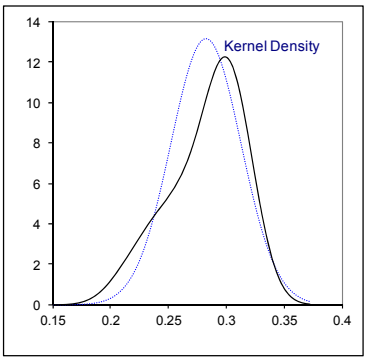
Determination of iso-Propylbenzene (Cumene) on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.2996		0.68	
150	D3797	0.317		1.35	
171	D3797	0.035	R(0.01)	-9.51	
174	D6563	0.2879		0.23	
311	D3797	0.241		-1.58	
323	D5917mod.	0.2467		-1.36	
333	D3797	0.309		1.04	
338		-----		-----	
357	D7504	0.2960		0.54	
391	D2360	0.258		-0.92	
445	D6563	0.2713		-0.41	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.2964		0.55	
913	D3797	0.3130		1.19	
963		-----		-----	
1041	In house	0.297		0.58	
1067	D3797	0.317		1.35	
1081		0.3053		0.90	
1107	D7504	0.2124		-2.68	
1201	D3797	0.23		-2.00	
1291	D7504	0.2953		0.51	
1294		-----		-----	
1357	In house	0.28		-0.08	
1434	D3797	0.2680		-0.54	
1538	D7504	0.2994		0.67	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	OK
n	20
outliers	1
mean (n)	0.2820
st.dev. (n)	0.03035
R(calc.)	0.0850
R(D3797:05)	0.0727

Compare R(D7504:16)=0.0002

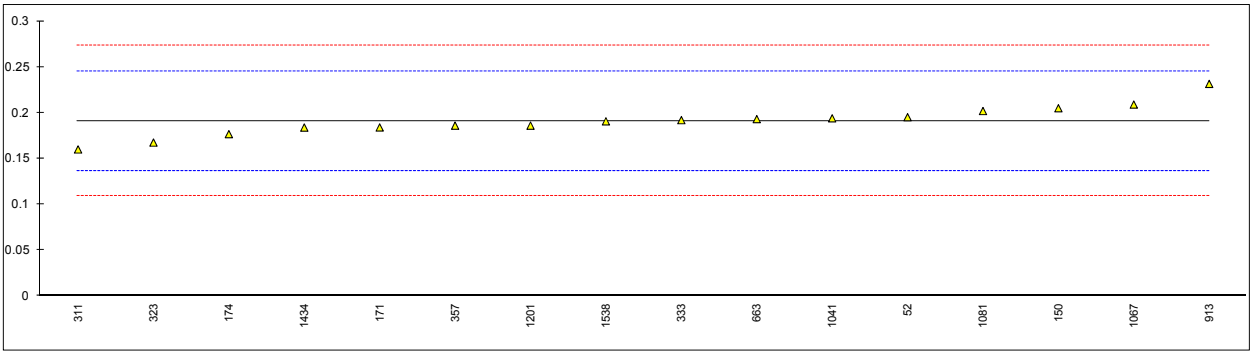


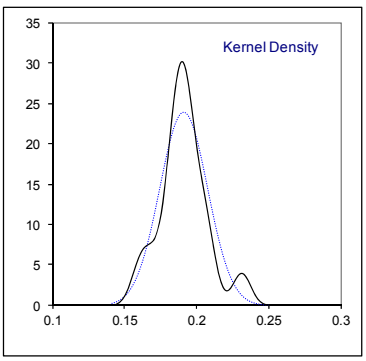


Determination of Styrene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.1952		0.15	
150	D3797	0.205		0.51	
171	D3797	0.184		-0.26	
174	D6563	0.1767		-0.53	
311	D3797	0.160		-1.14	
323	D5917mod.	0.1675		-0.86	
333	D3797	0.192		0.04	
338		-----		-----	
357	D7504	0.1860		-0.18	
391		-----		-----	
445		-----		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.1931		0.08	
913	D3797	0.2315		1.48	
963		-----		-----	
1041	In house	0.194		0.11	
1067	D3797	0.209		0.66	
1081		0.2019		0.40	
1107		-----		-----	
1201	D3797	0.186		-0.18	
1291		-----		-----	
1294		-----		-----	
1357		-----		-----	
1434	D3797	0.1839		-0.26	
1538	D7504	0.1907		-0.01	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	suspect
n	16
outliers	0
mean (n)	0.1910
st.dev. (n)	0.01669
R(calc.)	0.0467
R(D3797:05)	0.0764

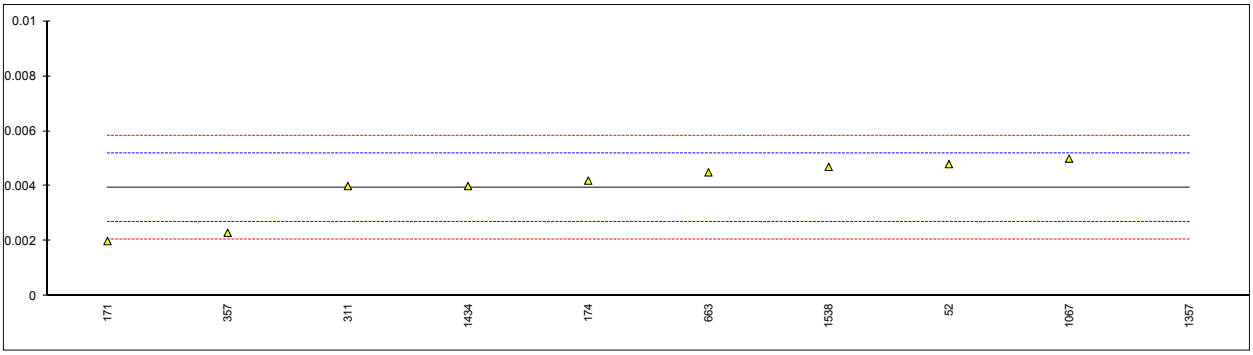


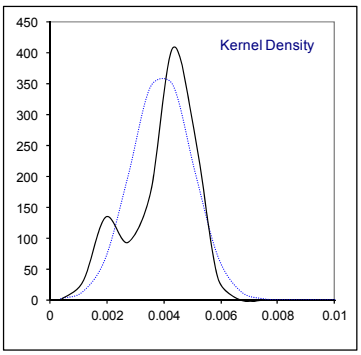


Determination of Sum of Ethyltoluenes on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0048		1.36	
150		-----		-----	
171	D3797	0.002		-3.09	
174	D6563	0.0042		0.41	
311	D3797	0.004		0.09	
323	D5917mod.	<0.010		-----	
333		-----		-----	
338		-----		-----	
357	D7504	0.0023		-2.62	
391		-----		-----	
445		-----		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0045		0.88	
913		-----		-----	
963		-----		-----	
1041		-----		-----	
1067	D3797	0.005		1.68	
1081		-----		-----	
1107		-----		-----	
1201		-----		-----	
1291		-----		-----	
1294		-----		-----	
1357	In house	0.20	D(0.01)	311.84	
1434	D3797	0.004	C	0.09	first reported: 99.4603
1538	D7504	0.0047		1.20	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	OK
n	9
outliers	1
mean (n)	0.0039
st.dev. (n)	0.00108
R(calc.)	0.0030
R(Horwitz 3 comp)	0.0018



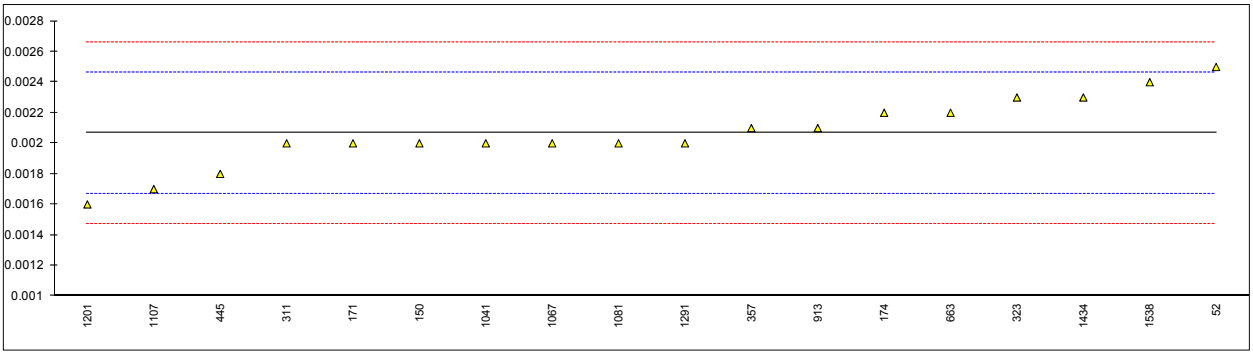


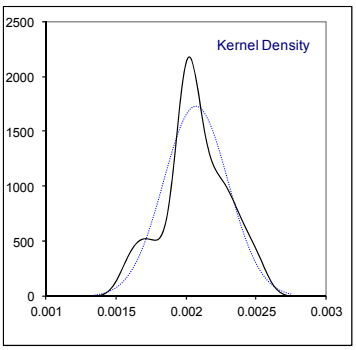
Determination of Toluene on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0025		2.18	
150	D3797	0.002		-0.33	
171	D3797	0.002		-0.33	
174	D6563	0.0022		0.67	
311	D3797	0.002		-0.33	
323	D5917mod.	0.0023		1.17	
333		-----		-----	
338		-----		-----	
357	D7504	0.0021		0.17	
391		-----		-----	
445	D6563	0.0018		-1.34	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0022		0.67	
913	D3797	0.0021		0.17	
963		-----		-----	
1041	In house	0.002		-0.33	
1067	D3797	0.002		-0.33	
1081		0.0020		-0.33	
1107	D7504	0.0017		-1.84	
1201	D3797	0.0016		-2.34	
1291	D7504	0.0020		-0.33	
1294		-----		-----	
1357		-----		-----	
1434	D3797	0.0023		1.17	
1538	D7504	0.0024		1.67	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

normality	OK
n	18
outliers	0
mean (n)	0.00207
st.dev. (n)	0.000230
R(calc.)	0.00056
R(D3797:05)	0.00064

compare R(D7504:16)=0.00568

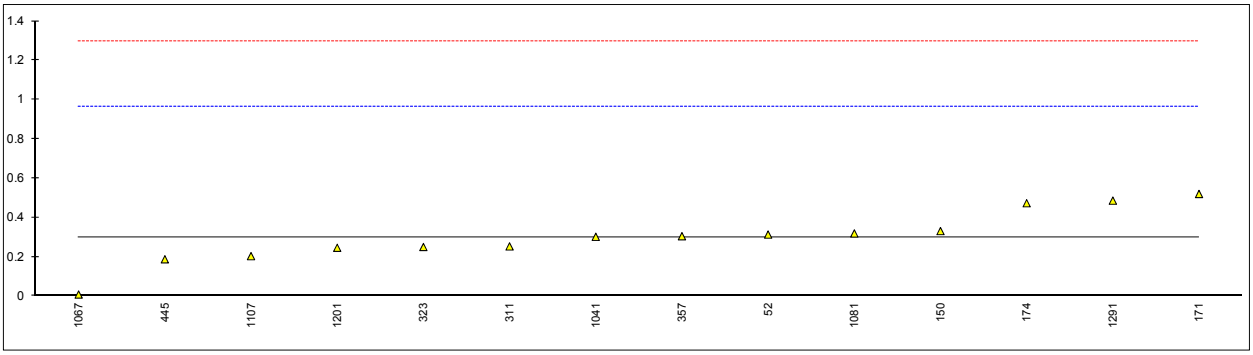


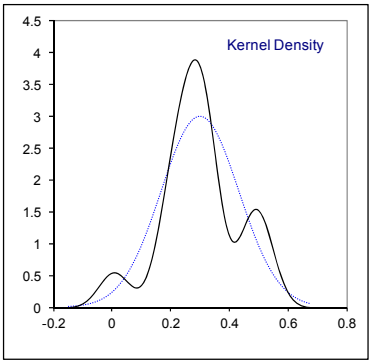


Determination of C9 and heavier aromatics on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.3134		0.04	
150	D3797	0.331	C	0.09	first reported: 0.014
171	D3797	0.520		0.66	
174	D6563	0.4728		0.52	
311	D3797	0.253		-0.14	
323	D5917mod.	0.250	C	-0.15	first reported: <0.010
333		-----		-----	
338		-----		-----	
357	D7504	0.3048		0.02	
391		-----		-----	
445	D6563	0.1874		-0.34	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663		-----		-----	
913		-----		-----	
963		-----		-----	
1041	In house	0.302		0.01	
1067	D3797	0.008		-0.88	
1081		0.319		0.06	
1107	D7504	0.2034		-0.29	
1201	D3797	0.246		-0.16	
1291	D7504	0.4860		0.56	
1294		-----		-----	
1357		-----		-----	
1434		-----		-----	
1538		-----		-----	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

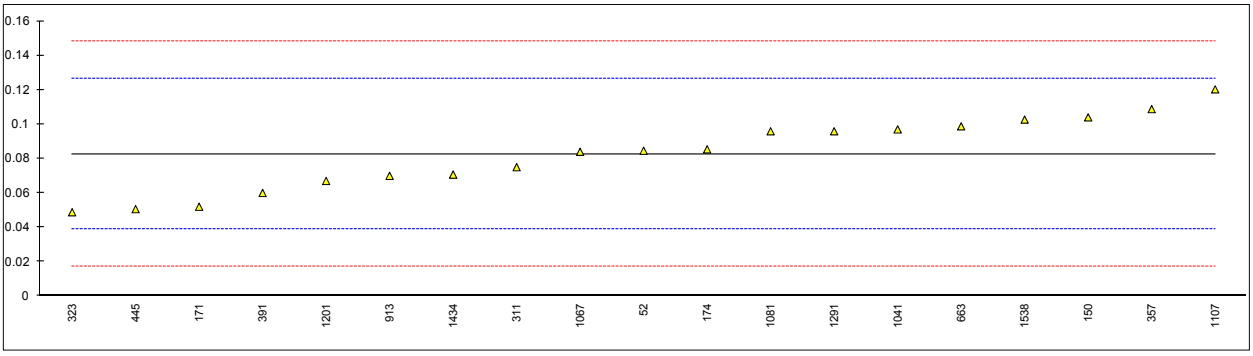
normality	OK
n	14
outliers	0
mean (n)	0.2998
st.dev. (n)	0.13280
R(calc.)	0.3719
R(D7504:16)	0.9309

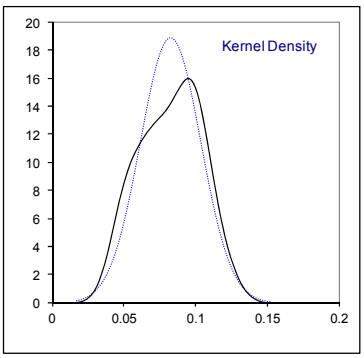




Determination of Non-aromatics on o-Xylene sample #16201; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D7504	0.0846		0.09	
150	D3797	0.104		0.98	
171	D3797	0.052		-1.41	
174	D6563	0.0854		0.12	
311	D3797	0.075		-0.35	
323	D5917mod.	0.0488		-1.55	
333		-----		-----	
338		-----		-----	
357	D7504	0.1088		1.20	
391	D2360	0.06		-1.04	
445	D6563	0.0506		-1.47	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D7504	0.0988		0.74	
913	D3797	0.0700		-0.58	
963		-----		-----	
1041	In house	0.097		0.65	
1067	D3797	0.084		0.06	
1081		0.0959		0.60	
1107	D7504	0.1203		1.72	
1201	D3797	0.067		-0.72	
1291	D7504	0.0959		0.60	
1294		-----		-----	
1357		-----		-----	
1434	D3797	0.0707		-0.55	
1538	D7504	0.1027		0.92	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	
	normality	OK			
	n	19			
	outliers	0			
	mean (n)	0.0827			
	st.dev. (n)	0.02111			
	R(calc.)	0.0591			
	R(D3797:05)	0.0611			compare R(D7504:16)=0.0096





Determination of Appearance on p-Xylene sample #16202;

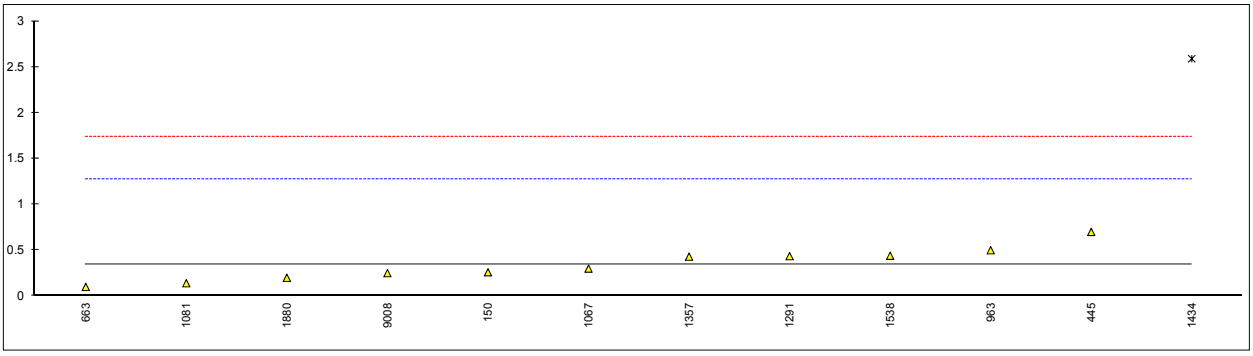
lab	method	value	mark	z(targ)	remarks
52	D4176	Pass		-----	
150	E2680	Pass		-----	
171	E2680	Pass		-----	
174	E2680	CFSM		-----	
311	E2680	pass		-----	
323	E2680	clear & bright		-----	
333		-----		-----	
338	Visual	Clear and Bright		-----	
357	E2680	Pass		-----	
391		-----		-----	
445	E2680	PASS		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	E2680	Pass		-----	
913	E2680	CFSM		-----	
963	E2680	Pass		-----	
1041		-----		-----	
1067	E2680	Pass		-----	
1081	Visual	b/c		-----	
1107	E2680	pass		-----	
1201		-----		-----	
1291	D5136	Clear Free of Sediments		-----	
1294	Visual	clear		-----	
1357	Visual	Clear & Bright		-----	
1434	E2680	clear liq		-----	
1538	Visual	C&B		-----	
1866		-----		-----	
1880	D4176	Pass		-----	
9008	E2680	Clear		-----	
	n	22			
	outliers	0			
	mean (n)	Pass			

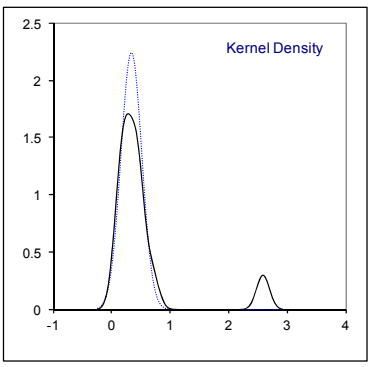
C&B = Clear and Bright
CFSM = Clear and Free From Suspended Matter

Determination of Organic Chloride on p-Xylene sample #16202; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
52	D5194	<1		-----	
150	D7359	0.26		-0.18	
171	D5808	<1		-----	
174		-----		-----	
311	D5808	<1		-----	
323	D5808	<1		-----	
333		-----		-----	
338		-----		-----	
357		-----		-----	
391		-----		-----	
445	IP510	0.7		0.77	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5808	0.1		-0.52	
913		-----		-----	
963	D5808	0.5		0.34	
1041	D5808	<1.0		-----	
1067	UOP779	0.3		-0.09	
1081	D5808	0.14		-0.43	
1107		-----		-----	
1201		-----		-----	
1291	D5808	0.4355		0.20	
1294		-----		-----	
1357	UOP779	0.43		0.19	
1434	D7536	2.59	D(0.01)	4.84	
1538	UOP779	0.44		0.21	
1866		-----		-----	
1880	D7359	0.2		-0.30	
9008	D5808	0.25		-0.20	

normality	OK
n	11
outliers	1
mean (n)	0.341
st.dev. (n)	0.1777
R(calc.)	0.498
R(D5808:09a)	1.300



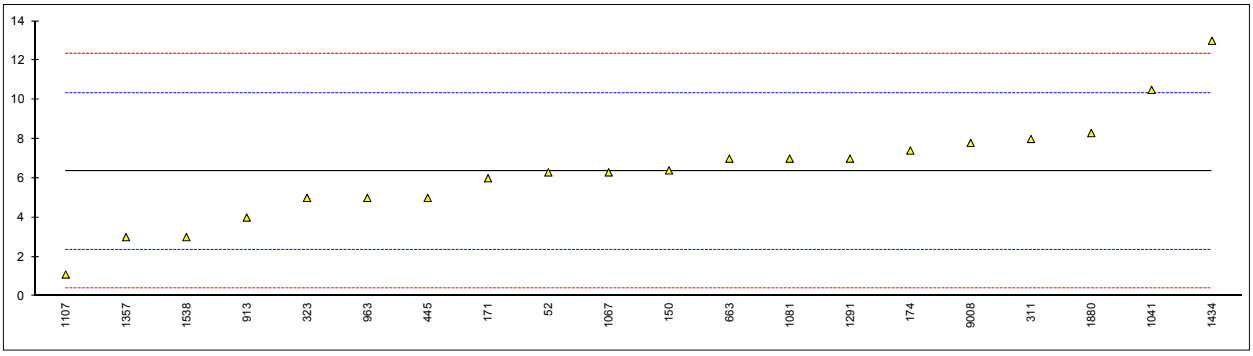


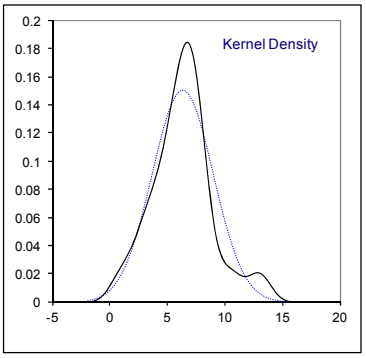
Determination of Colour Pt/Co on p-Xylene sample #16202;

lab	method	value	mark	z(targ)	remarks
52	D5386	6.3		-0.03	
150	D5386	6.4		0.02	
171	D5386	6		-0.18	
174	D5386	7.41		0.53	
311	D5386	8		0.82	
323	D1209	5		-0.68	
333		-----		-----	
338		-----		-----	
357	D1209	< 5		-----	
391		-----		-----	
445	D1209	5		-0.68	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5386	7		0.32	
913	D5386	4		-1.18	
963	D1209	5		-0.68	
1041	ISO6271	10.5		2.08	
1067	D5386	6.3		-0.03	
1081	D5386	7		0.32	
1107	D5386	1.1		-2.64	
1201		-----		-----	
1291	D1209	7		0.32	
1294		-----		-----	
1357	D1209	3		-1.68	
1434	D5386	13		3.33	
1538	D1209	3		-1.68	
1866		-----		-----	
1880	D5386	8.3		0.98	
9008	D5386	7.8		0.72	

	normality	suspect
	n	20
	outliers	0
	mean (n)	6.36
	st.dev. (n)	2.652
	R(calc.)	7.42
	R(D5386:10)	5.58

compare R(D1209:05)=7.00

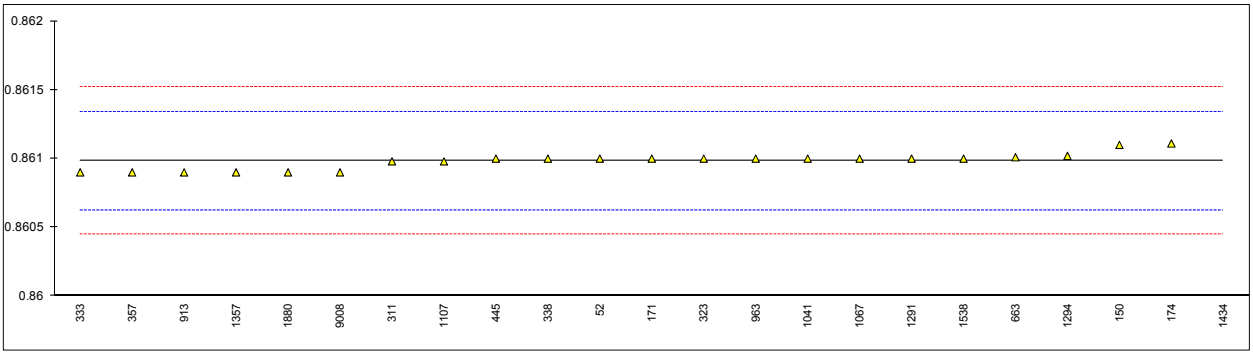


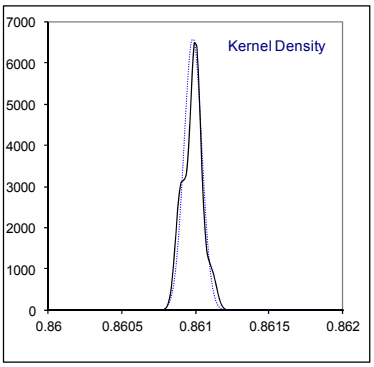


Determination of Density at 20°C on p-Xylene sample #16202; results in kg/L.

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8610		0.10	
150	D4052	0.8611		0.66	
171	D4052	0.8610		0.10	
174	D4052	0.86111		0.72	
311	D4052	0.86098		-0.01	
323	D4052	0.8610		0.10	
333	ISO12185	0.8609		-0.46	
338	ISO12185	0.8610		0.10	
357	D4052	0.86090		-0.46	
391		-----		-----	
445	D4052	0.8610		0.10	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D4052	0.86101		0.16	
913	D4052	0.8609		-0.46	
963	ISO12185	0.8610		0.10	
1041	ISO12185	0.8610		0.10	
1067	D4052	0.8610		0.10	
1081		-----		-----	
1107	D4052	0.86098		-0.01	
1201		-----		-----	
1291	D4052	0.8610		0.10	
1294	D4052	0.86102		0.21	
1357	D4052	0.8609		-0.46	
1434	D4052	0.86528	R(0.01)	24.07	
1538	D4052	0.861		0.10	
1866		-----		-----	
1880	D4052	0.8609		-0.46	
9008	D4052	0.8609		-0.46	

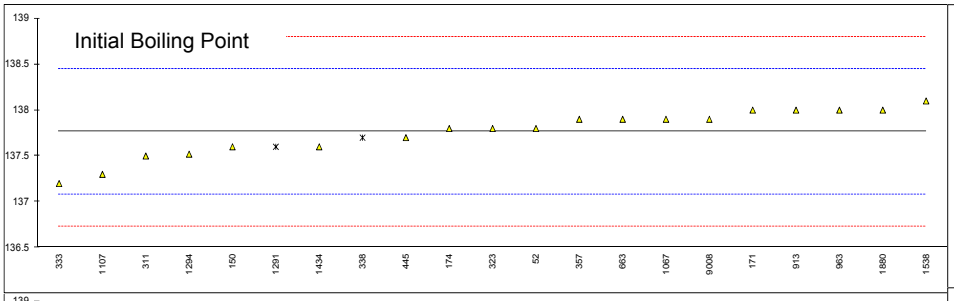
normality	OK
n	22
outliers	1
mean (n)	0.86098
st.dev. (n)	0.000060
R(calc.)	0.00017
R(ISO12185:96)	0.00050

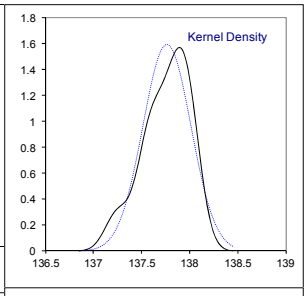


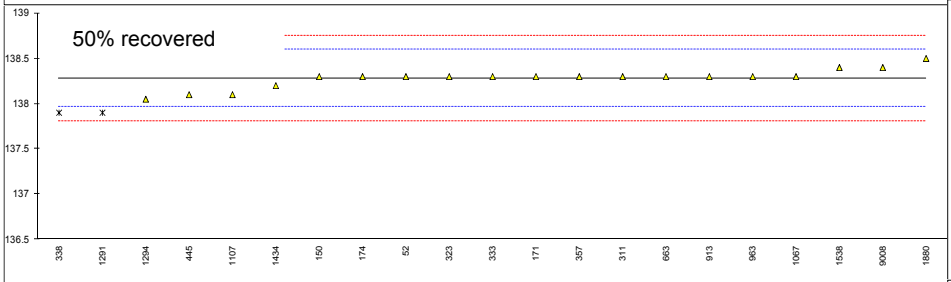


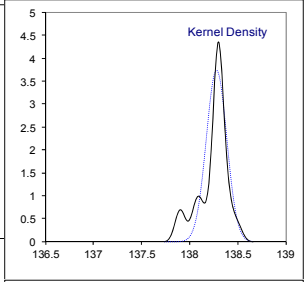
Determination of Distillation on p-Xylene sample #16202; results in °C

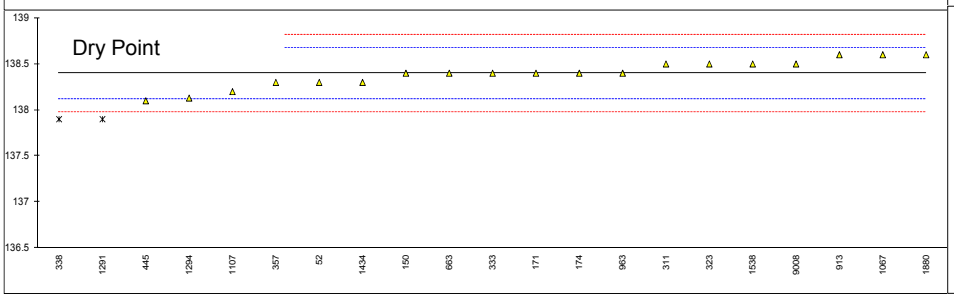
lab	method	mode	IBP	mark	z(targ)	50%rec	mark	z(targ)	DP	mark	z(targ)
52	D850	Automated	137.8		0.10	138.3		0.12	138.3		-0.69
150	D850	Automated	137.6		-0.48	138.3		0.12	138.4		0.03
171	D850	Automated	138.0		0.68	138.3		0.12	138.4		0.03
174	D1078	Automated	137.8		0.10	138.3		0.12	138.4		0.03
311	D850	Automated	137.5		-0.77	138.3		0.12	138.5		0.74
323	D850	Manual	137.8		0.10	138.3		0.12	138.5		0.74
333	D850	Automated	137.2		-1.64	138.3		0.12	138.4		0.03
338	D850	Automated	137.7	ex	-0.19	137.9	ex	-2.43	137.9	ex	-3.56
357	D850	Automated	137.9		0.39	138.3		0.12	138.3		-0.69
391			-----		-----	-----		-----	-----		-----
445	D850	Manual	137.7		-0.19	138.1		-1.16	138.1		-2.13
551			-----		-----	-----		-----	-----		-----
555			-----		-----	-----		-----	-----		-----
558			-----		-----	-----		-----	-----		-----
663	D850	Automated	137.9		0.39	138.3		0.12	138.4		0.03
913	D850	Manual	138.0		0.68	138.3		0.12	138.6		1.46
963	D850	Automated	138.0		0.68	138.3		0.12	138.4		0.03
1041			-----		-----	-----		-----	-----		-----
1067	D850	Manual	137.9		0.39	138.3		0.12	138.6		1.46
1081			-----		-----	-----		-----	-----		-----
1107	D850	Automated	137.3		-1.35	138.1		-1.16	138.2		-1.41
1201			-----		-----	-----		-----	-----		-----
1291	D850	Automated	137.6	ex	-0.48	137.9	ex	-2.43	137.9	ex	-3.56
1294	D850	Automated	137.52		-0.71	138.05		-1.48	138.13		-1.91
1357		Automated	-----		-----	-----		-----	-----		-----
1434	D850	Automated	137.6		-0.48	138.2		-0.52	138.3		-0.69
1538	D850	Automated	138.1		0.98	138.4		0.76	138.5		0.74
1866			-----		-----	-----		-----	-----		-----
1880	D850	Automated	138.0		0.68	138.5		1.39	138.6		1.46
9008	D850	Automated	137.9		0.39	138.4		0.76	138.5		0.74
	normality		OK			OK			OK		
	n		19			19			19		
	outliers		0+2ex			0+2ex			0+2ex		
	mean (n)		137.76			138.28			138.40		
	st.dev. (n)		0.251			0.107			0.148		
	R(calc.)		0.70			0.30			0.41		
	R(D850-A:16)		0.96			0.44			0.39		

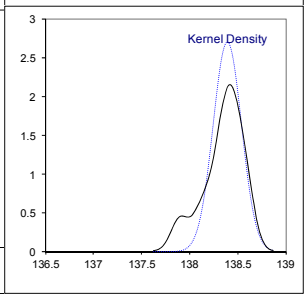








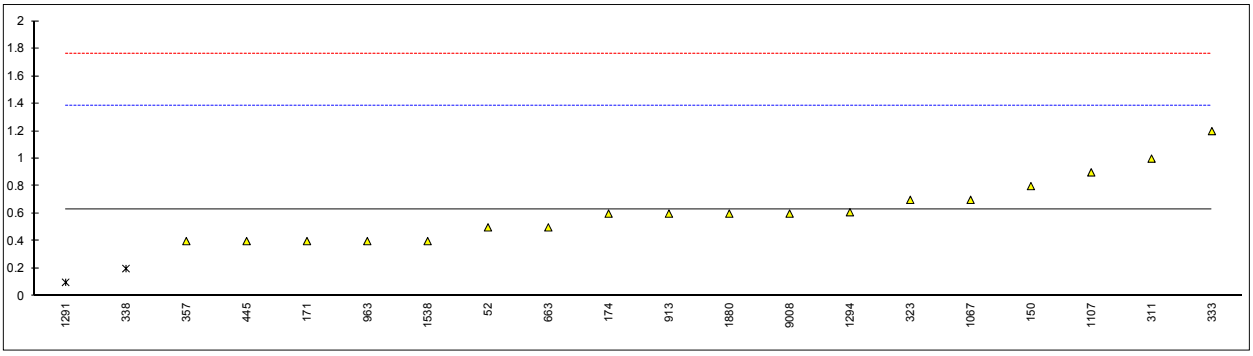


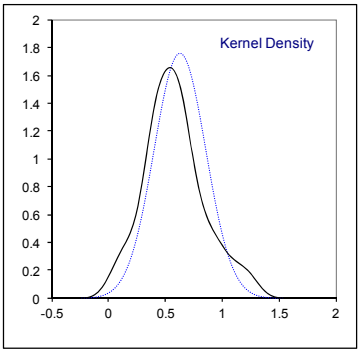


Determination of Distillation range on p-Xylene sample #16202; results in °C

lab	method	value	mark	z(targ)	remarks
52	D850	0.5		-0.34	
150	D850	0.8		0.45	
171	D850	0.4		-0.60	
174	D1075	0.6		-0.07	
311	D850	1.0		0.98	
323	D850	0.7		0.19	
333	D850	1.2		1.51	
338	D850	0.2	ex	-1.13	excluded; see §4.1
357	D850	0.4		-0.60	
391		-----		-----	
445	D850	0.4		-0.60	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D850	0.5		-0.34	
913	D850	0.6		-0.07	
963	D850	0.4		-0.60	
1041		-----		-----	
1067	D850	0.7		0.19	
1081		-----		-----	
1107	D850	0.9		0.72	
1201		-----		-----	
1291	D850	0.1	ex	-1.40	excluded; see §4.1
1294	D850	0.61		-0.05	
1357		-----		-----	
1434		-----		-----	
1538	D850	0.4		-0.60	
1866		-----		-----	
1880	D850	0.6		-0.07	
9008	D850	0.6		-0.07	

normality	OK
n	18
outliers	0+2ex
mean (n)	0.63
st.dev. (n)	0.227
R(calc.)	0.64
R(D850-A:16)	1.06

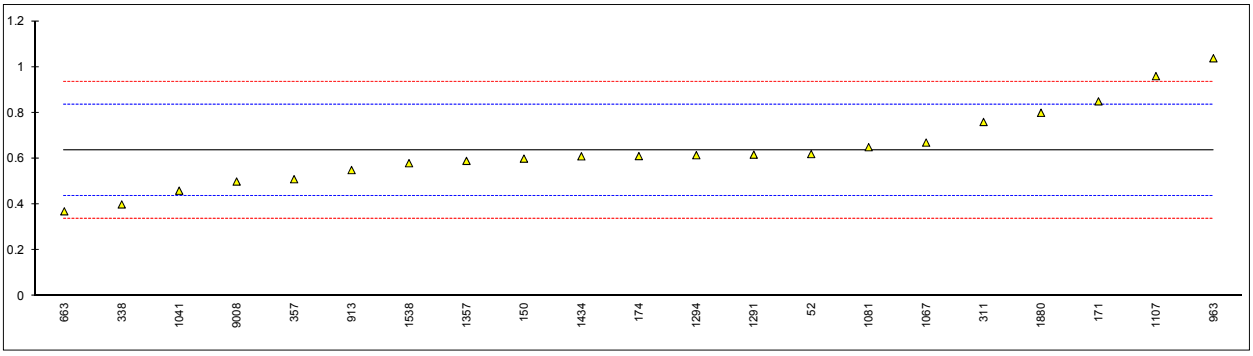


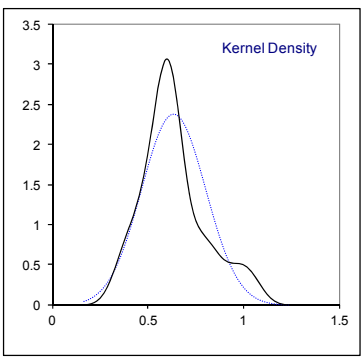


Determination of Sulphur on p-Xylene sample #16202; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
52	D7183	0.62		-0.16	
150	D5453	0.6		-0.37	
171	D7183	0.85		2.16	
174	D5453	0.611		-0.26	
311	D7183	0.76		1.25	
323	D5453	<1		-----	
333		-----		-----	
338	ISO20846	0.4		-2.39	
357	D7183	0.51		-1.28	
391		-----		-----	
445	D5453	<1		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5453	0.37		-2.69	
913	D5453	0.55		-0.87	
963	D7183	1.038	C	4.06	first reported: 1.38
1041	D5453	0.46		-1.78	
1067	D5453	0.67		0.34	
1081	D7183	0.65		0.14	
1107	D5453	0.96		3.27	
1201		-----		-----	
1291	D5453	0.6174		-0.19	
1294	D5453	0.615		-0.21	
1357	D5453	0.59		-0.47	
1434	D7183	0.61		-0.27	
1538	D7183	0.58		-0.57	
1866		-----		-----	
1880	D5453	0.8		1.65	
9008	D5453	0.50		-1.38	

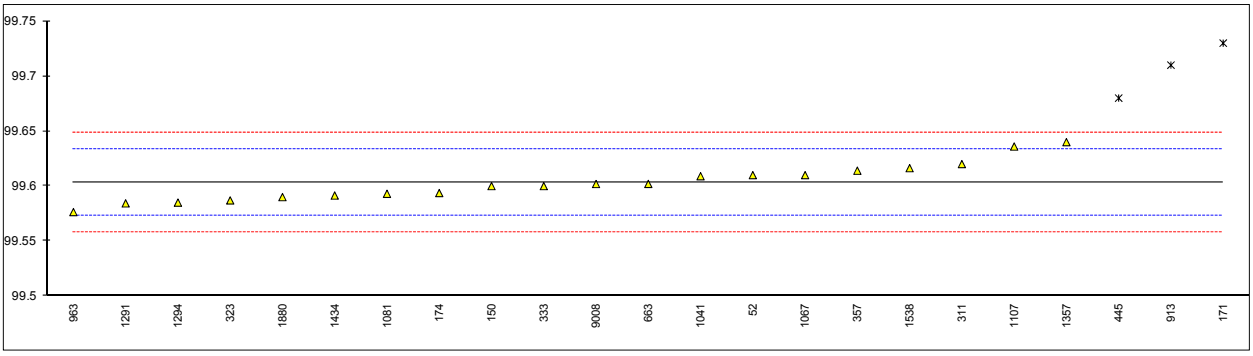
normality	OK
n	21
outliers	0
mean (n)	0.636
st.dev. (n)	0.1679
R(calc.)	0.470
R(D7183:16)	0.277

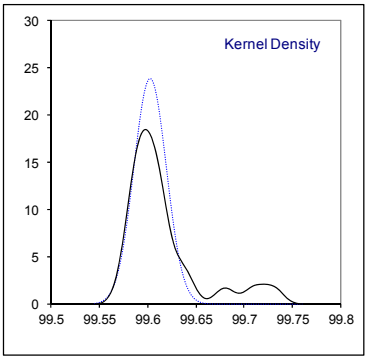




Determination of Purity on p-Xylene sample #16202; results in %M/M.

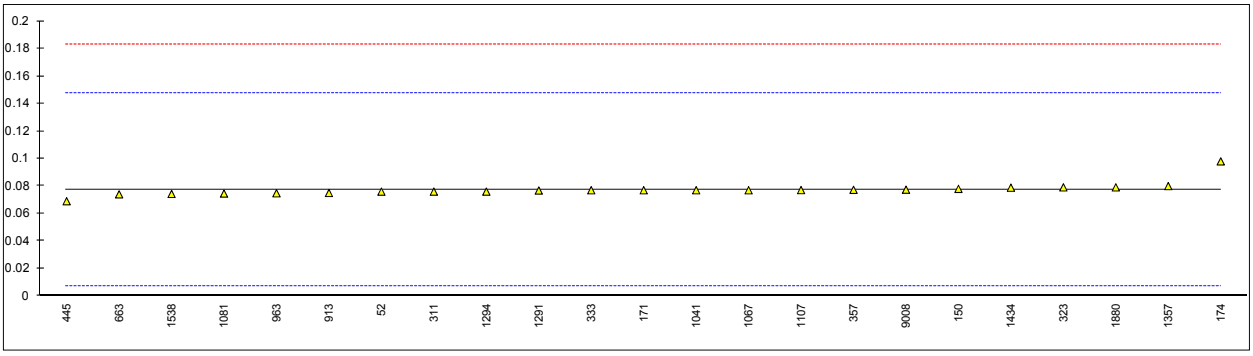
lab	method	value	mark	z(targ)	remarks
52	D5917	99.61		0.46	
150	D3798	99.60		-0.20	
171	D5917	99.73	R(0.01)	8.40	
174	D6563	99.5937		-0.62	
311	D3798	99.62		1.12	
323	D5917	99.587		-1.06	
333	D5917	99.60		-0.20	
338		-----		-----	
357	D7504	99.614		0.73	
391		-----		-----	
445	D6563/D2360	99.68	R(0.01)	5.09	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	99.602		-0.07	
913	D5917	99.71	R(0.01)	7.08	
963	D7504	99.5764		-1.76	
1041	In house	99.609		0.40	
1067	In house	99.61		0.46	
1081		99.593		-0.66	
1107	D7504	99.636		2.18	
1201		-----		-----	
1291	D7504	99.5843		-1.24	
1294	D5917	99.585		-1.19	
1357	In house	99.64		2.45	
1434	D3798	99.59142		-0.77	
1538	D3798	99.6163		0.88	
1866		-----		-----	
1880	D3798	99.590		-0.86	
9008	UOP720	99.6019		-0.07	
	normality	OK			
	n	20			
	outliers	3			
	mean (n)	99.6030			
	st.dev. (n)	0.01674			
	R(calc.)	0.0469			
	R(D5917:15e1)	0.0423			compare R(D7504:16)=0.0173

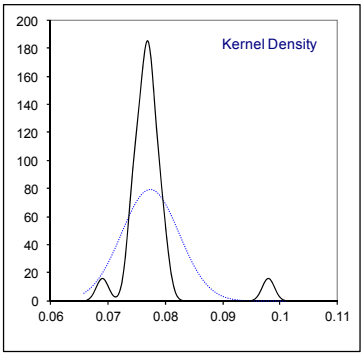




Determination of o-Xylene on p-Xylene sample #16202; results in %M/M.

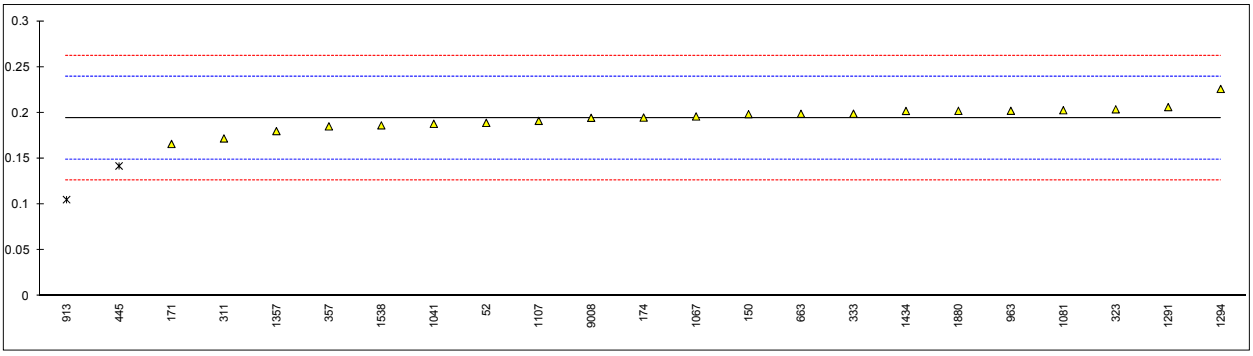
lab	method	value	mark	z(targ)	remarks
52	D5917	0.076		-0.04	
150	D3798	0.078		0.02	
171	D5917	0.077		-0.01	
174	D6563	0.0980		0.59	
311	D3798	0.076		-0.04	
323	D5917	0.0791		0.05	
333	D5917	0.077		-0.01	
338		-----		-----	
357	D7504	0.0773		0.00	
391		-----		-----	
445	D6563/D2360	0.069		-0.24	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	0.0740		-0.10	
913	D5917	0.0750		-0.07	
963	D7504	0.0748		-0.07	
1041	In house	0.077		-0.01	
1067	In house	0.077		-0.01	
1081		0.0746		-0.08	
1107	D7504	0.0771		-0.01	
1201		-----		-----	
1291	D7504	0.0768		-0.02	
1294	D5917	0.076		-0.04	
1357	In house	0.08		0.07	
1434	D3798	0.07886		0.04	
1538	D7504	0.0743		-0.09	
1866		-----		-----	
1880	D3798	0.0791		0.05	
9008	UOP720	0.0774		0.00	
	normality	not OK			
	n	23			
	outliers	0			
	mean (n)	0.0774			
	st.dev. (n)	0.00504			
	R(calc.)	0.0141			
	R(D5917:15e1)	0.0987			compare R(D7504:16)=0.0063

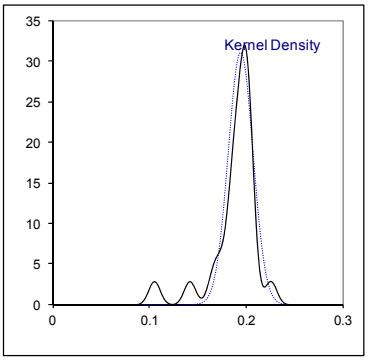




Determination of m-Xylene on p-Xylene sample #16202; results in %M/M.

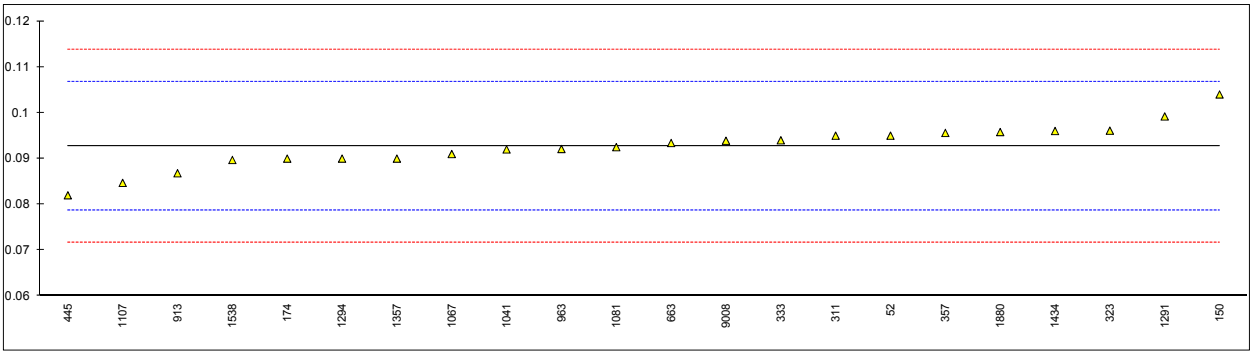
lab	method	value	mark	z(targ)	remarks
52	D5917	0.189		-0.24	
150	D3798	0.1985		0.18	
171	D5917	0.166		-1.26	
174	D6563	0.1948		0.01	
311	D3798	0.172		-0.99	
323	D5917	0.2038		0.41	
333	D5917	0.199		0.20	
338		-----		-----	
357	D7504	0.1852		-0.41	
391		-----		-----	
445	D6563/D2360	0.142	R(0.05)	-2.31	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	0.1989		0.19	
913	D5917	0.1052	R(0.01)	-3.94	
963	D7504	0.2022		0.34	
1041	In house	0.188		-0.29	
1067	In house	0.196		0.07	
1081		0.2028		0.37	
1107	D7504	0.1912		-0.15	
1201		-----		-----	
1291	D7504	0.2062		0.52	
1294	D5917	0.226		1.39	
1357	In house	0.18		-0.64	
1434	D3798	0.2020		0.33	
1538	D7504	0.1863		-0.36	
1866		-----		-----	
1880	D3798	0.2021		0.34	
9008	UOP720	0.1945		0.00	
	normality	suspect			
	n	21			
	outliers	2			
	mean (n)	0.1945			
	st.dev. (n)	0.01281			
	R(calc.)	0.0359			
	R(D5917:15e1)	0.0635			compare R(D7504:16)=0.0258

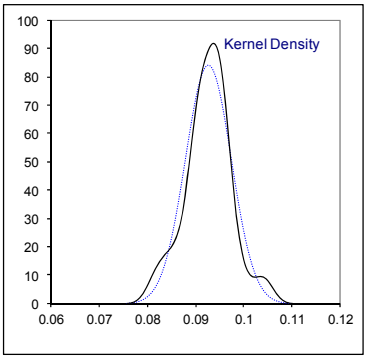




Determination of Ethylbenzene on p-Xylene sample #16202; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.095		0.33	
150	D3798	0.104		1.61	
171	D5917	<0.001		<-13.03	possibly a false negative test result?
174	D6563	0.0900		-0.38	
311	D3798	0.095		0.33	
323	D5917	0.0961		0.49	
333	D5917	0.094		0.19	
338		-----		-----	
357	D7504	0.0956		0.42	
391		-----		-----	
445	D6563/D2360	0.082		-1.52	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	0.0934		0.10	
913	D5917	0.0868		-0.84	
963	D7504	0.0921		-0.08	
1041	In house	0.092		-0.10	
1067	In house	0.091		-0.24	
1081		0.0925		-0.02	
1107	D7504	0.0847	C	-1.13	first reported: 0.0647
1201		-----		-----	
1291	D7504	0.0992		0.93	
1294	D5917	0.09		-0.38	
1357	In house	0.09		-0.38	
1434	D3798	0.09602		0.48	
1538	D7504	0.0897		-0.42	
1866		-----		-----	
1880	D3798	0.0958		0.44	
9008	UOP720	0.0939		0.17	
	normality	suspect			
	n	22			
	outliers	0			
	mean (n)	0.0927			
	st.dev. (n)	0.00474			
	R(calc.)	0.0133			
	R(D5917:15e1)	0.0197			compare R(D7504:16)=0.0110

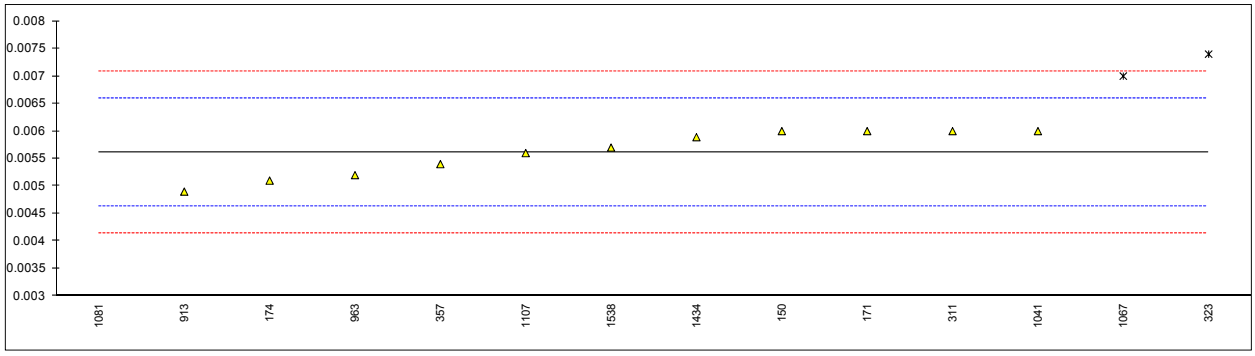


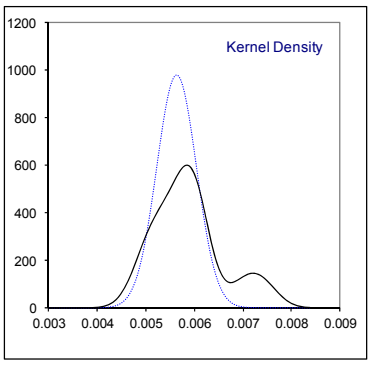


Determination of Styrene on p-Xylene sample #16202; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3798	0.006		0.78	
171	D5917	0.006		0.78	
174	D6563	0.0051		-1.06	
311	D3798	0.006		0.78	
323	D5917	0.0074	DG(0.05)	3.64	
333		-----		-----	
338		-----		-----	
357	D7504	0.0054		-0.44	
391		-----		-----	
445		-----		-----	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	<0.001		<-9.42	possibly a false negative test result?
913	D5917	0.0049		-1.46	
963	D7504	0.0052		-0.85	
1041	In house	0.006		0.78	
1067	In house	0.007	DG(0.05)	2.82	
1081		0	ex	-11.46	test result excluded; zero is not a real value
1107	D7504	0.0056		-0.04	
1201		-----		-----	
1291		-----		-----	
1294		-----		-----	
1357		-----		-----	
1434	D3798	0.00589		0.56	
1538	D7504	0.0057		0.17	
1866		-----		-----	
1880		-----		-----	
9008		-----		-----	

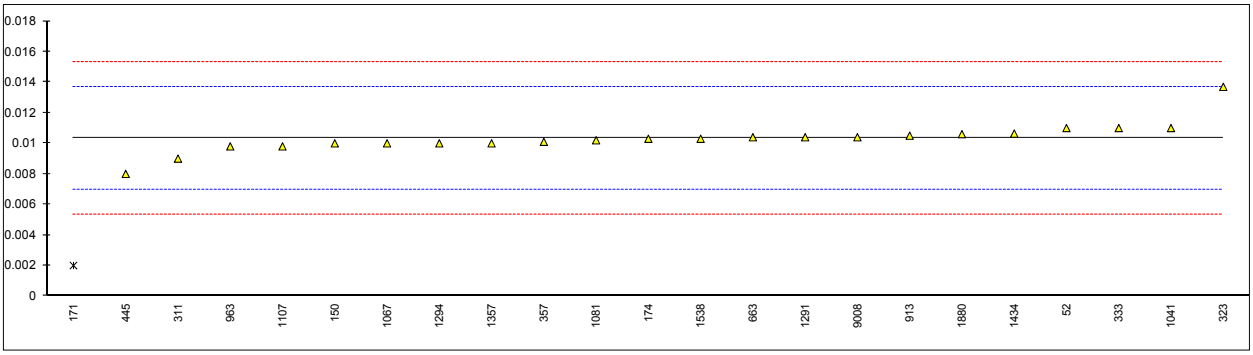
normality	OK
n	11
outliers	2+1ex
mean (n)	0.0056
st.dev. (n)	0.00041
R(calc.)	0.0011
R(Horwitz)	0.0014

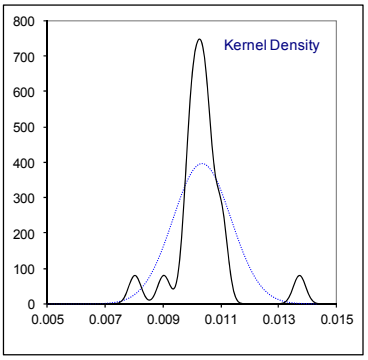




Determination of Toluene on p-Xylene sample #16202; results in %M/M.

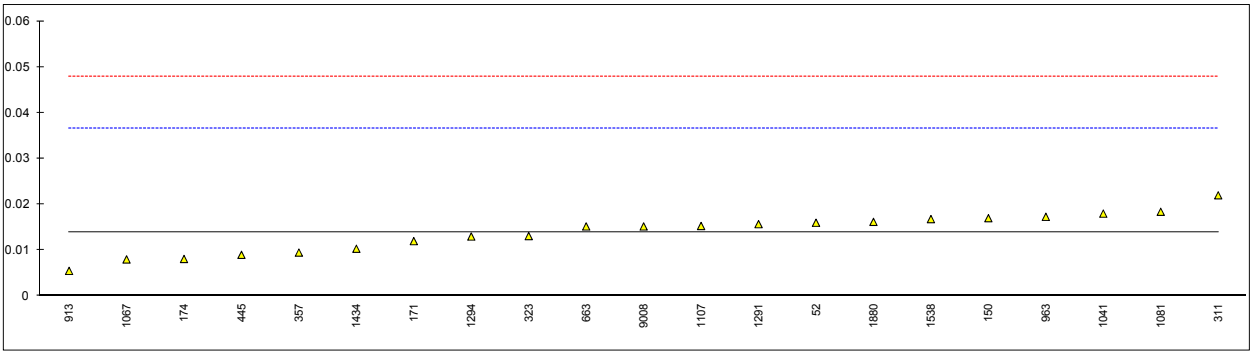
lab	method	value	mark	z(targ)	remarks
52	D5917	0.011		0.40	
150	D3798	0.010		-0.19	
171	D5917	0.002	R(0.01)	-4.99	
174	D6563	0.0103		-0.01	
311	D3798	0.009		-0.79	
323	D5917	0.0137		2.02	
333	D5917	0.011		0.40	
338		-----		-----	
357	D7504	0.0101		-0.13	
391		-----		-----	
445	D6563/D2360	0.008		-1.39	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	0.0104		0.05	
913	D5917	0.0105		0.11	
963	D7504	0.0098	C	-0.31	first reported: 0.032
1041	In house	0.011		0.40	
1067	In house	0.010		-0.19	
1081		0.0102		-0.07	
1107	D7504	0.0098		-0.31	
1201		-----		-----	
1291	D7504	0.0104		0.05	
1294	D5917	0.01		-0.19	
1357	In house	0.01		-0.19	
1434	D3798	0.01064		0.19	
1538	D7504	0.0103		-0.01	
1866		-----		-----	
1880	D3798	0.0106		0.16	
9008	UOP720	0.0104		0.05	
	normality	not OK			
	n	22			
	outliers	1			
	mean (n)	0.0103			
	st.dev. (n)	0.00100			
	R(calc.)	0.0028			
	R(D5917:15e1)	0.0047			compare R(D7504:16)=0.0009

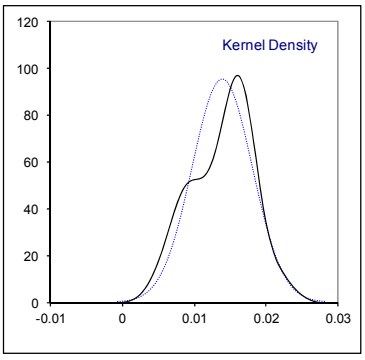




Determination of Non-aromatics on p-Xylene sample #16202; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.016		0.19	
150	D3798	0.017		0.28	
171	D5917	0.012		-0.17	
174	D6563	0.0081		-0.51	
311	D3798	0.022		0.72	
323	D5917	0.0131		-0.07	
333		-----		-----	
338		-----		-----	
357	D7504	0.0095		-0.39	
391		-----		-----	
445	D6563/D2360	0.009		-0.43	
551		-----		-----	
555		-----		-----	
558		-----		-----	
663	D5917	0.0152		0.12	
913	D5917	0.0055		-0.74	
963	D7504	0.0173		0.30	
1041	In house	0.018		0.36	
1067	In house	0.008		-0.52	
1081		0.0184		0.40	
1107	D7504	0.0153		0.12	
1201		-----		-----	
1291	D7504	0.0157		0.16	
1294	D5917	0.013		-0.08	
1357		-----		-----	
1434	D3798	0.01033		-0.31	
1538	D7504	0.0168		0.26	
1866		-----		-----	
1880	D3798	0.0162		0.20	
9008	UOP720	0.0152		0.12	
	normality	OK			
	n	21			
	outliers	0			
	mean (n)	0.0139			
	st.dev. (n)	0.00419			
	R(calc.)	0.0117			
	R(D5917:15e1)	0.0317			compare R(D7504:16)=0.0221





APPENDIX 2

List of number of participants per country

2 labs in BELGIUM
4 labs in BRAZIL
1 lab in CANADA
1 lab in FINLAND
2 labs in FRANCE
1 lab in GERMANY
1 lab in INDIA
1 lab in ISRAEL
1 lab in ITALY
2 labs in KUWAIT
4 labs in NETHERLANDS
1 lab in OMAN
1 lab in POLAND
3 labs in SAUDI ARABIA
1 lab in THAILAND
1 lab in UNITED KINGDOM
3 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 calculations
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, April 2014
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9 DIN 38402 T41/42
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12 Analytical Methods Committee Technical brief, No 4 January 2001.
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15 Horwitz, R. Albert, J. AOAC Int. 79-3, 589 (1996)