Results of Proficiency Test ortho- and para-Xylene September 2010

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-Xylene once per every two years. As part of the annual proficiency test program of 2010/2011, the Institute decided to continue this proficiency test on o- and p-Xylene. In this interlaboratory study, 27 laboratories from 17 different countries have participated. See appendix 2 for a list of participants in alphabetical country order. In this report, the results of the proficiency test are presented and discussed.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, The Netherlands, was the organiser of this proficiency test. It was decided to send one sample o-Xylene (1*250 mL bottle, labelled #1060) and one sample p-Xylene (1*500 mL bottle, labelled #1061). The participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1 ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO guide 43 and ILAC-G13:2007, (R007) since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This ensures 100% confidentially 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 January 2010 (iis-protocol, version 3.2).

2.3 CONFIDENTIALITY STATEMENT

All data present 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 samples were prepared: p-Xylene (500 mL) and o-Xylene (250 mL). The first batch, approx. 10 litre o-Xylene, purchased from a Dutch chemical supplier, was homogenised and subsequently divided over 47 brown glass bottles of 250 mL with inner and outer caps

(labelled #1060). The homogeneity of the subsamples was checked by determination of impurities p-Xylene and Styrene in accordance with ASTM D 3797:05 on 8 stratified randomly selected samples.

	Styrene in %M/M	p-Xylene in %M/M
sample #1060-1	0.014	0.647
sample #1060-2	0.014	0.665
sample #1060-3	0.014	0.682
sample #1060-4	0.014	0.649
sample #1060-5	0.013	0.656
sample #1060-6	0.014	0.677
sample #1060-7	0.014	0.672
sample #1060-8	0.014	0.656

Table 1: homogeneity tests of subsamples #1060 (o-Xylene)

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

	Styrene in %M/M	p-Xylene in %M/M
r (measured)	0.001	0.037
Reference method	ASTM D3797:05	ASTM D3797:05
0.3* R (reference method)	0.002	0.068

Table 2: repeatability of subsamples #1060

The second batch, approx. 20 litre of p-Xylene, also purchased from a Dutch chemical supplier, was homogenised and subsequently divided over 47 brown glass bottles of 500 mL with inner and outer caps (labelled #1061). The homogeneity of the subsamples #1061 was checked by determination of impurities o-Xylene and Ethylbenzene in accordance with ASTM D 3798:03 on 8 stratified randomly selected samples.

	o-Xylene in %M/M	Ethylbenzene in %M/M
sample #1061-1	0.064	0.123
sample #1061-2	0.064	0.122
sample #1061-3	0.067	0.126
sample #1061-4	0.067	0.130
sample #1061-5	0.063	0.124
sample #1061-6	0.064	0.125
sample #1061-7	0.066	0.127
sample #1061-8	0.065	0.126

Table 3: homogeneity tests of subsamples #1061 (p-Xylene)

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

	o-Xylene in %M/M	Ethylbenzene in %M/M
r (measured)	0.004	0.007
Reference method	ASTM D3798:03	ASTM D3798:03
0.3* R (reference method)	0.004	0.010

Table 4: repeatability of subsamples #1061

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

To each of the participating laboratories 1 bottle of 500 mL of p-Xylene (labelled #1061) and 1 bottle of 250 mL of o-Xylene (labelled #1060), were sent on September 8, 2010.

2.5 STABILITY OF THE SAMPLES

The stability of p-Xylene and of o-Xylene, packed in the brown glass bottles of 500 mL and 250 mL 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 #1060 (o-Xylene): Purity and Impurities (Nonaromatics, Toluene, Styrene, Ethylbenzene, m- and p-Xylene, Sum of Ethyltoluenes, n-Propylbenzene, iso-Propylbenzene (Cumene) and other Aromatics). On sample #1061 (p-Xylene) was requested to determine: Appearance, Colour Pt/Co, Density at 20ºC, Distillation (Initial Boiling Point (IBP), 50% Distillation Point and Dry Point (DP)), Organic Chloride, Sulphur, Purity and Impurities (Nonaromatics, Toluene, Styrene, Ethylbenzene, m- and o-Xylene).

To get comparable results a detailed report form, on which the units and the reference methods were printed, was sent together with each set of samples. Also, a letter of instructions and a SDS were added to the package.

3 RESULTS

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

Directly after the deadline, a reminder fax was sent to the laboratories that had not reported results at that moment. Shortly after the deadline, the available results were screened for suspect data. A result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the results. Additional or corrected results are used for data analysis and original results are placed under 'Remarks' in the result tables in appendix 1.

3.1 STATISTICS

Statistical calculations were performed as described in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of January 2010 (iis-protocol, version 3.2).

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. Results reported as '<…' or '>…' were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. After removal of outliers, this check was repeated. In case a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.
In accordance to ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test and by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test and by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of the averages and the standard deviations.

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

3.2 GRAPHICS

In order to visualise the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported analysis results are plotted. The corresponding laboratory numbers are under the X-axis.
The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.
Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density. Approximation to a set of data that avoids some problems associated with histograms (see appendix 3; no.12 and 13)

3.3 Z-SCORES

As it was decided to evaluate the performance of the participants against the literature requirements, e.g. ASTM reproducibilities, the z-scores were calculated using a target standard deviation. This target standard deviation was calculated from the literature reproducibility by division with 2.8. The z-scores were calculated according to:

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

To evaluate the performance of the participating laboratories the z-scores were calculated. Absolute values for z<2 are very common and absolute values for z>3 are very rare. Therefore, the usual interpretation of z-scores is as follows:

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

4 EVALUATION

In this proficiency test some problems were encountered with the despatch of the samples to Brazil, India and Kuwait. Due to custom clearance problems, several laboratories did receive the samples near or after the final reporting date.
Two participants did not report results and nine participants did report results after the final reporting date. Finally, 26 participants did report in total 471 numerical results. Observed were 41 outlying results, which is 8.7%. In proficiency studies, outlier percentages of 3% - 7.5% are quite normal.

4.1 EVALUATION PER TEST

In this section, the results are discussed per sample and per test.
Not all original data sets proved to have a normal distribution. Not normal distributions were found for the following determinations: Toluene, Ethylbenzene, m-Xylene and Other aromatics for sample #1060. On sample #1061, not normal distributions were found for the following determinations: Density @ 20°C, 50% Boiling Point and Dry Point.
Therefore, the statistical evaluation for these determinations should be used with care.

Sample #1060 o-Xylene:

Purity: No analytical problems were observed. No statistical outliers were observed. The calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

Nonaromatics: No analytical problems were observed. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

Toluene: Several analytical problems have been observed. Three statistical outliers were detected. However, the calculated reproducibility, after

rejection of the statistical outliers, is in good agreement with the requirements of ASTM D3797:05.

Styrene: Several analytical problems have been observed. Three statistical outliers were detected. However, the calculated reproducibility, after rejection of the statistical outliers, is in good agreement with the requirements of ASTM D3797:05.

Ethylbenzene: No analytical problems were observed. No statistical outliers were observed and the calculated reproducibility is in good agreement with the requirements of ASTM D3797:05.

m-Xylene: Several analytical problems have been observed. Two statistical outliers were detected. However, the calculated reproducibility, after rejection of the statistical outliers, is in good agreement with the requirements of ASTM D3797:05.

p-Xylene: No analytical problems were observed. Only one statistical outlier was observed. The calculated reproducibility, after rejection of the statistical outlier, is in good agreement with the requirements of ASTM D3797:05.

Sum of Ethyltoluenes: This determination may be problematic. No statistical outliers were observed. The observed reproducibility is almost in agreement with the requirements estimated from the Horwitz equation.

n-Propylbenzene: This determination may be problematic. No statistical outliers were observed. The observed reproducibility is almost in agreement with the requirements estimated from the Horwitz equation.

iso-Propylbenzene: No analytical problems were observed. Only one statistical outlier was observed. The calculated reproducibility, after rejection of the statistical outlier, is in good agreement with the requirements of ASTM D3797:05.

Other Aromatics: Several reasons may explain why the group of results is divided trimodally. The three participants of group 2 did not report any test results for ethyltoluenes and n-propylbenzene. When corrected for these two components, these three results for “Other Aromatics” may all be included in group 1. The two participants of group 3 have larger difficulties, as the correction of ethyltoluenes and n-propylbenzene does not explain the whole difference.

Sample #1061 p-Xylene:

Appearance: No analytical problems were observed. All participants agreed about the appearance of sample #1061, which is bright, clear and free of suspended matter. The uniformity of reporting can be improved.
A new standardized method is available for Appearance since 2009, being ASTM E2680. According this method the appearance should be reported as 'pass' (or 'fail').

Colour Pt/Co: The determination was problematic. Only one statistical outlier was observed. However, the calculated reproducibility, after rejection of the statistical outlier is not in agreement with the requirements of ASTM D1209:05e1. The rounding of the test results (in accordance with the test method) may explain for the large spread observed.

Density: No analytical problems were observed. Only one statistical outlier was observed and one test result was excluded because this result was determined at a deviating temperature. The calculated reproducibility, after rejection of the two test results, is in good agreement with the requirements of ASTM D 4052:02e1.

Distillation: The determination was problematic for several laboratories. In total eleven statistical outliers were observed (four for mid boiling point only!). However, the calculated reproducibilities of IBP, 50%BP and DP, after rejection of the statistical outliers are in agreement with the requirements of ASTM D850:08e1. This may be remarkable, as twelve (!) participants did obviously not correct for the theoretical mid boiling point of 138.3ºC (see ASTM D850. Note that ASTM D1078 does not mention a theoretical mid boiling point for p-Xylene).

Organic chloride: Due to the low organic chloride concentration no significant conclusions were drawn. All participants agreed that less than 1 mg/kg of organic chlorides was present.

Sulphur: Due to the low sulphur concentration no significant conclusions were drawn. All participants agreed that less than 1 mg/kg of sulphur was present.

Purity: Several analytical problems have been observed. Four statistical outliers were detected. However, the calculated reproducibility, after rejection of the statistical outliers, is in good agreement with the requirements of ASTM D3798:03.

Nonaromatics: No analytical problems were observed. Three statistical outliers were observed. However, the calculated reproducibility after rejection of the

statistical outliers is in good agreement with the requirements of ASTM D3798:03.

Toluene: 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 D3798:03.

Styrene: Due to the low styrene concentration no significant conclusions were drawn. All participants agreed that less than 0.01 %M/M of styrene was present, except for one that reported a false positive test result.

Ethylbenzene: 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 D3798:03

m-Xylene: This determination was very problematic. Two statistical outliers and one false negative test result were observed. The calculated reproducibility after rejection of the statistical outliers is not at all in agreement with the requirements of ASTM D3798:03

o-Xylene: Several analytical problems have been observed. Three statistical outliers were detected. However, the calculated reproducibility, after rejection of the statistical outliers, is in good agreement with the requirements of ASTM D3798:03

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

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

Parameter	unit	n	Average	2.8 *sd_R	R (lit)
o-Xylene	%M/M	19	98.8691	0.1102	0.4226
Nonaromatics	%M/M	19	0.3161	0.0473	0.2335
Toluene	%M/M	15	0.0030	0.0005	0.0008
Styrene	%M/M	14	0.0124	0.0031	0.0049
Ethylbenzene	%M/M	19	0.0114	0.0019	0.0052
m-Xylene	%M/M	17	0.0501	0.0089	0.0122
p-Xylene	%M/M	18	0.5544	0.0427	0.1906
Sum of Ethyltoluenes	%M/M	12	0.0565	0.0160	0.0138
n-Propylbenzene	%M/M	14	0.0267	0.0059	0.0052
i-Propylbenzene	%M/M	18	0.0850	0.0104	0.0219
Other Aromatics	%M/M	13	unknown	unknown	unknown

Table 5: reproducibilities of samples o-Xylene #1060

Parameter	unit	n	average	2.8 *sd_r	R(lit)
Appearance	---	25	pass	n.a.	n.a.
Colour Pt/Co	---	23	20.8	8.8	7.0
Density @ 20°C	kg/L	22	0.86098	0.00014	0.00050
Initial Boiling Point	°C	19	138.03	0.63	0.96
50% Boiling Point	°C	18	138.32	0.37	0.39
Dry Point	°C	19	138.41	0.38	1.04
Organic Chloride	mg/kg	5	0.22	n.a.	n.a.
Sulphur	mg/kg	9	0.220	0.329	(0.187)
p-Xylene	%M/M	21	99.686	0.060	0.093
Nonaromatics	%M/M	21	0.0129	0.0052	0.0249
Toluene	%M/M	23	0.0116	0.0033	0.0075
Styrene	%M/M	5	< 0.01	unknown	unknown
Ethylbenzene	%M/M	23	0.1169	0.0178	0.0308
m-Xylene	%M/M	21	0.1124	0.0434	0.0193
o-Xylene	%M/M	22	0.0619	0.0076	0.0124

Table 6: reproducibilities of sample p-Xylene #1061

* Results between brackets should be used with care as the consensus value is outside the application range of the test method

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

4.3 COMPARISON OF THE OCTOBER 2010 PROFICIENCY TEST WITH PREVIOUS PT RESULTS

	October 2010	November 2008	November 2006	November 2004
Number of reporting labs	26	26	21	17
Number of results reported	471	502	425	335
Statistical outliers	41	33	21	8
Percentage outliers	8.7%	6.6%	4.9%	2.4%

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 standards. The conclusions are given the following table:

Determination	October 2010	November 2008	November 2006	November 2004
o-Xylene	++	++	++	++
Nonaromatics	++	++	++	++
Toluene	++	++	++	++
Styrene	++	++	++	++
Ethylbenzene	++	++	++	++
m-Xylene	++	+/-	++	++
p-Xylene	++	++	++	++
Sum of Ethyltoluenes *)	-	++	++	++
n-Propylbenzene *)	-	+/-	++	++
i-Propylbenzene	++	-	++	++
Other Aromatics	n.e.	n.e.	n.e.	n.e.

Table 8: comparison determinations of sample #1060 (o-xylene) against the standard methods
*) against Horwitz

Determination	October 2010	November 2008	November 2006	November 2004
Colour Pt/Co	--	++	+	++
Density @ 20°C	++	++	++	n.e.
Initial Boiling Point	++	++	++	++
50% Boiling Point	+/-	n.e.	n.e.	n.e.
Dry Point	++	-	+	++
Organic Chloride	n.e.	n.e.	++	n.e.
Sulphur	(--)	n.e.	n.e.	n.e.
p-Xylene	++	++	++	++
Nonaromatics	++	++	++	++
Toluene	++	++	++	++
Styrene	n.e.	++	++	n.e.
Ethylbenzene	++	++	++	++
m-Xylene	--	+/-	--	++
o-Xylene	++	++	++	++

Table 9: comparison determinations of sample #1061 (p-xylene) against the standard methods

* 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 standards is listed in the above table. The following performance categories were used:

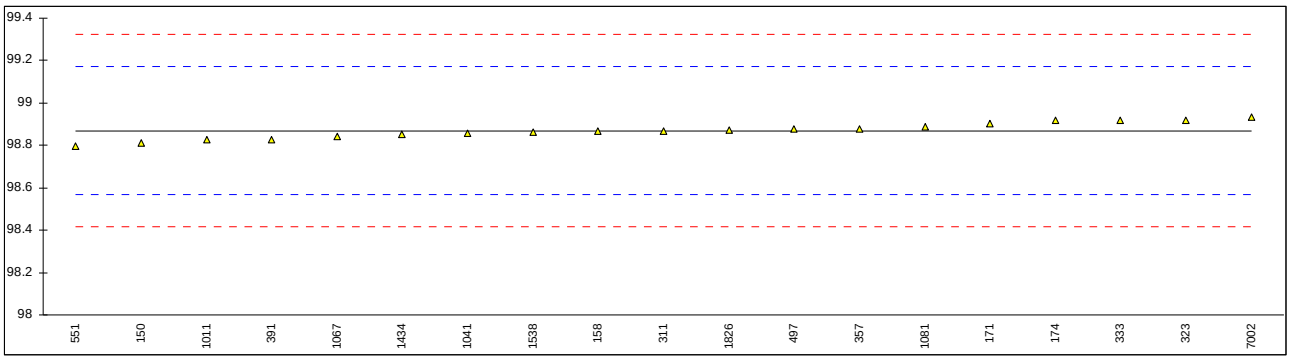
++:	group performed much better than the standard
+ :	group performed better than the standard
+/-:	group performance equals the standard
- :	group performed worse than the standard
-- :	group performed much worse than the standard
n.e.:	not evaluated

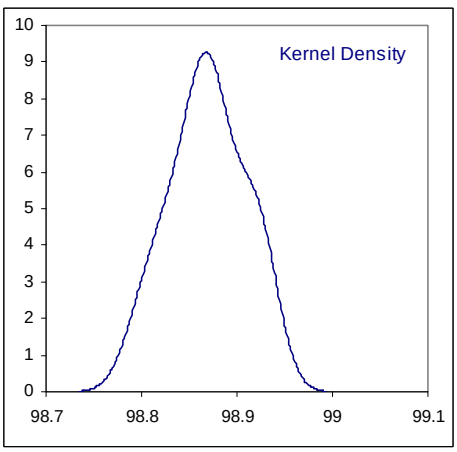
APPENDIX 1

Determination of Purity of o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	98.81	C	-0.39	First reported 99.81
158	D5917	98.868		-0.01	
171	D3797	98.901		0.21	
174	D3797	98.92		0.34	
311	D3797	98.869		0.00	
323	D3797	98.92		0.34	
333	D3797	98.92	C	0.34	First reported 98.42
357	D3797	98.88		0.07	
391	D2360	98.827		-0.28	
444		-----		-----	
497	D3797	98.877		0.05	
551	In house	98.794		-0.50	
663		-----		-----	
913		-----		-----	
1011	D3797	98.8247		-0.29	
1041	In house	98.8548		-0.09	
1067	GC	98.84		-0.19	
1081	D3797	98.89		0.14	
1291		-----		-----	
1294		-----		-----	
1434	D3797	98.854		-0.10	
1538	D3797	98.86		-0.06	
1657		-----		-----	
1826	D3797	98.87		0.01	
7002	D3798	98.934		0.43	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	19
outliers	0
mean (n)	98.8691
st.dev. (n)	0.03934
R(calc.)	0.1102
R(D3797:05)	0.4226

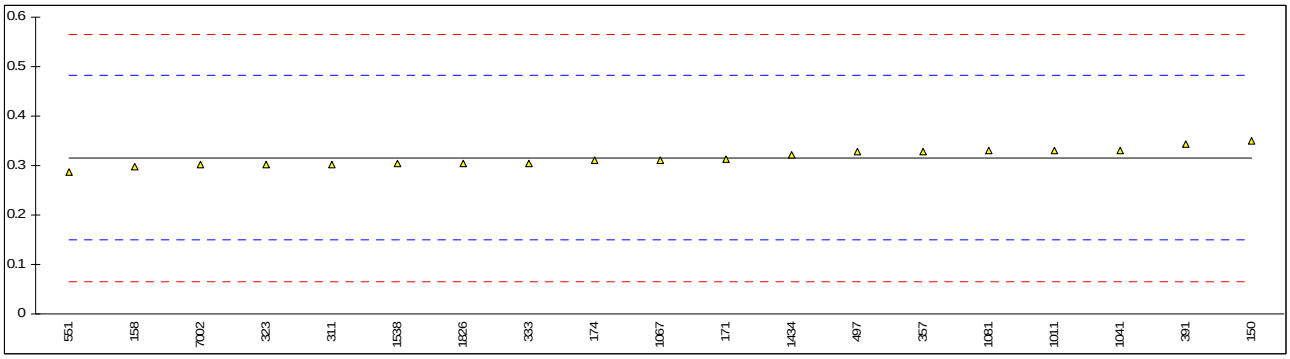


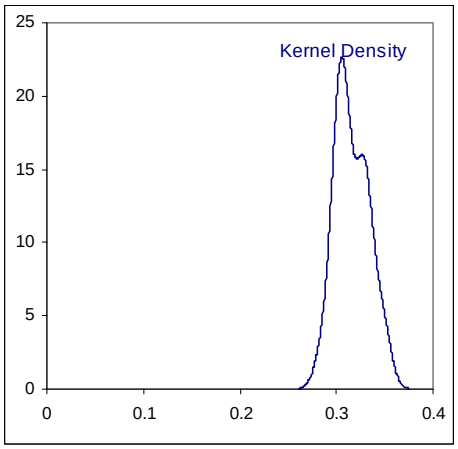


Determination of Nonaromatics in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.350		0.41	
158	D5917	0.298		-0.22	
171	D3797	0.313		-0.04	
174	D3797	0.310		-0.07	
311	D3797	0.303		-0.16	
323	D3797Mod.	0.303		-0.16	
333	D3797	0.305		-0.13	
357	D3797	0.329		0.16	
391	D2360	0.344		0.34	
444		-----		-----	
497	D3797	0.328		0.14	
551	In house	0.2859		-0.36	
663		-----		-----	
913		-----		-----	
1011	D3797	0.3303		0.17	
1041	In house	0.3313		0.18	
1067	GC	0.3114		-0.06	
1081	D3797	0.33		0.17	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.3223		0.07	
1538	D3797	0.304		-0.14	
1657		-----		-----	
1826	D3797	0.305		-0.13	
7002	D3798	0.302		-0.17	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	19
outliers	0
mean (n)	0.3161
st.dev. (n)	0.01690
R(calc.)	0.0473
R(D3797:05)	0.2335

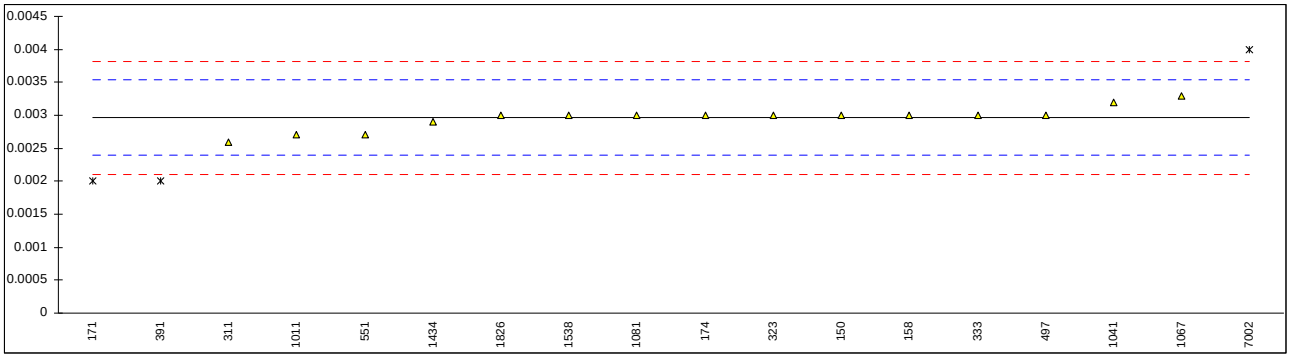


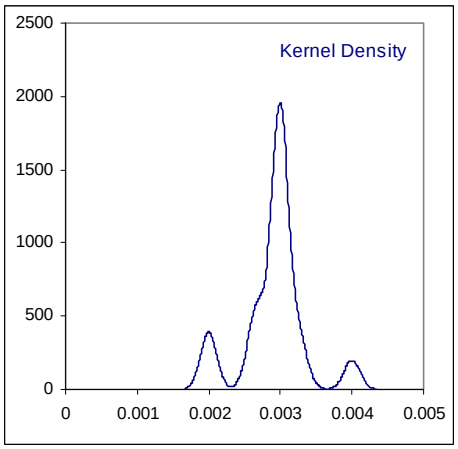


Determination of Toluene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.003		0.14	
158	D5917	0.003		0.14	
171	D3797	0.002	DG(0.01)	-3.37	
174	D3797	0.003		0.14	
311	D3797	0.0026		-1.26	
323	D3797Mod.	0.003		0.14	
333	D3797	0.003		0.14	
357	D3797	<0.010		-----	
391	D2360	0.002	DG(0.01)	-3.37	
444		-----		-----	
497	D3797	0.003		0.14	
551	In house	0.0027		-0.91	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0027		-0.91	
1041	In house	0.0032		0.84	
1067	GC	0.0033		1.19	
1081	D3797	0.003		0.14	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0029		-0.21	
1538	D3797	0.003		0.14	
1657		-----		-----	
1826	D3797	0.003		0.14	
7002	D3798	0.004	D(0.05)	3.65	
9005		-----		-----	
9008		-----		-----	

normality	not OK
n	15
outliers	3
mean (n)	0.0030
st.dev. (n)	0.00018
R(calc.)	0.0005
R(D3797:05)	0.0008

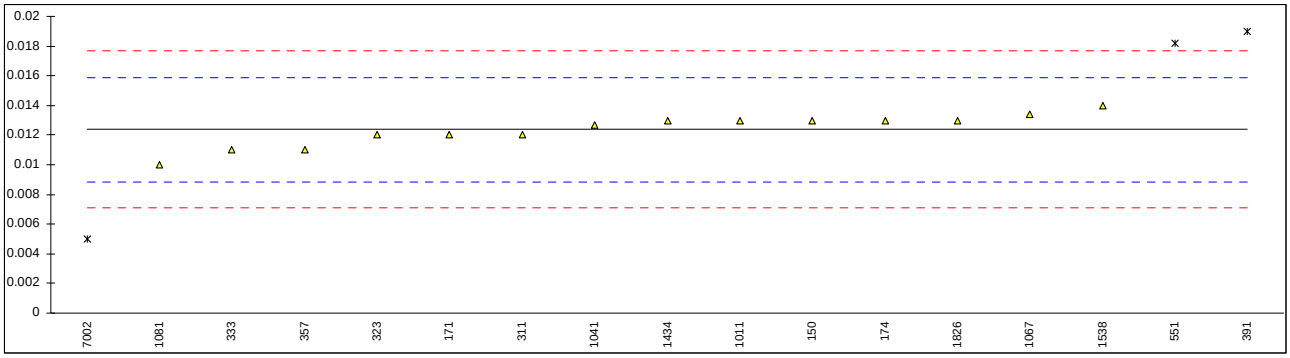


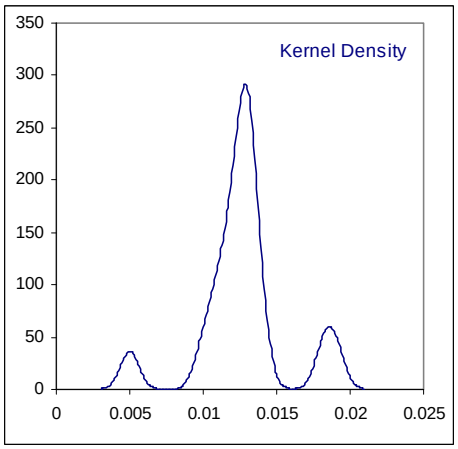


Determination of Styrene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.013	C	0.36	First reported 0.007
158		-----		-----	
171	D3797	0.012		-0.21	
174	D3797	0.013	C	0.36	First reported 0.030
311	D3797	0.012		-0.21	
323	D3797	0.012		-0.21	
333	D3797	0.011		-0.77	
357	D3797	0.011		-0.77	
391	D2360	0.019	DG(0.01)	3.76	
444		-----		-----	
497		-----		-----	
551	In house	0.0182	DG(0.01)	3.30	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0130		0.36	
1041	In house	0.0127		0.19	
1067	GC	0.0134		0.59	
1081	D3797	0.01		-1.34	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0130		0.36	
1538	D3797	0.014		0.93	
1657		-----		-----	
1826	D3797	0.013		0.36	
7002	D3798	0.005	D(0.01)	-4.17	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	14
outliers	3
mean (n)	0.0124
st.dev. (n)	0.00110
R(calc.)	0.0031
R(D3797:05)	0.0049

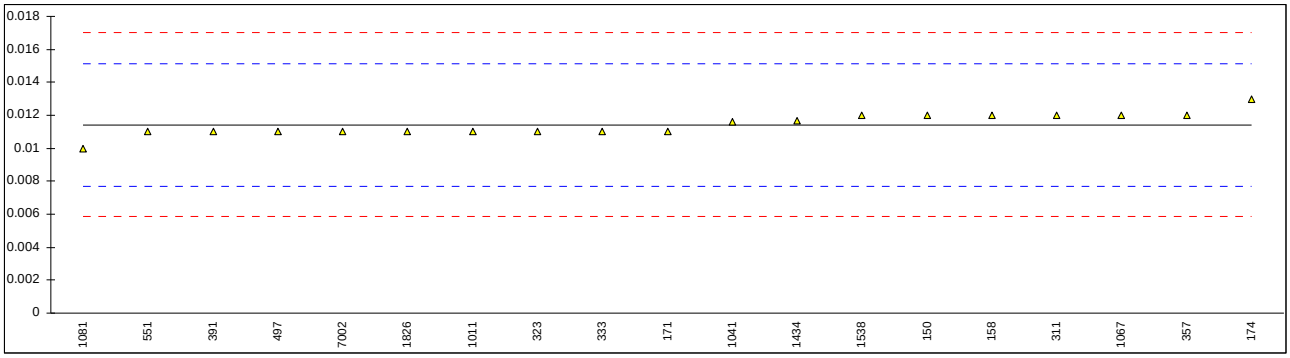


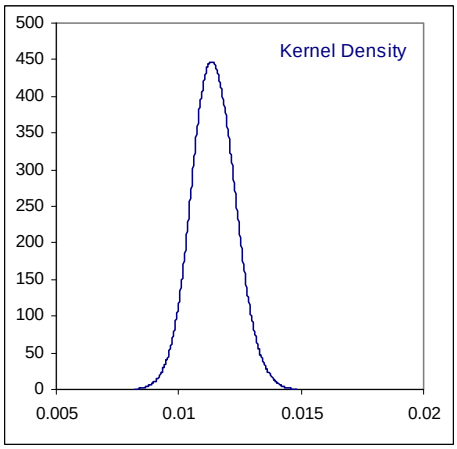


Determination of Ethylbenzene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.012		0.30	
158	D5917	0.012		0.30	
171	D3797	0.011		-0.24	
174	D3797	0.013		0.84	
311	D3797	0.012		0.30	
323	D3797	0.011		-0.24	
333	D3797	0.011		-0.24	
357	D3797	0.012		0.30	
391	D2360	0.011		-0.24	
444		-----		-----	
497	D3797	0.011		-0.24	
551	In house	0.0110		-0.24	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0110		-0.24	
1041	In house	0.0116		0.09	
1067	GC	0.0120		0.30	
1081	D3797	0.01		-0.77	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0117		0.14	
1538	D3797	0.012		0.30	
1657		-----		-----	
1826	D3797	0.011		-0.24	
7002	D3798	0.011		-0.24	
9005		-----		-----	
9008		-----		-----	

normality	not OK
n	19
outliers	0
mean (n)	0.0114
st.dev. (n)	0.00068
R(calc.)	0.0019
R(D3797:05)	0.0052

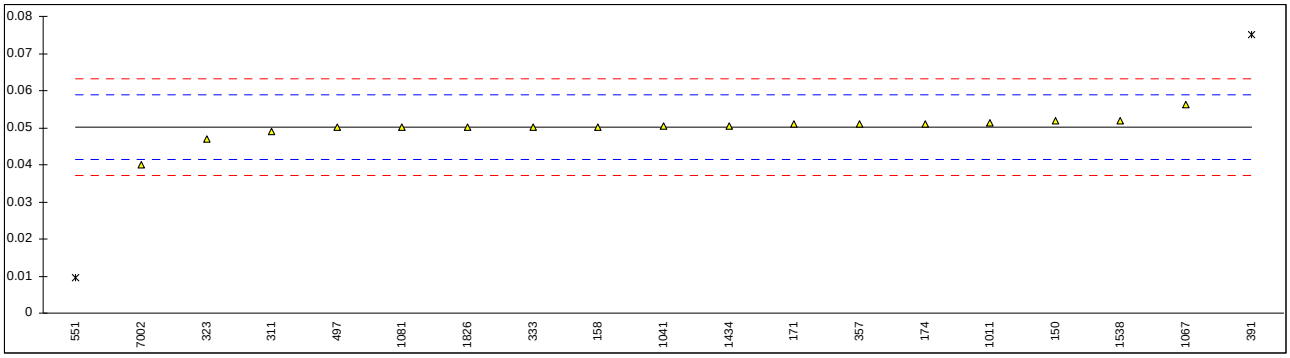


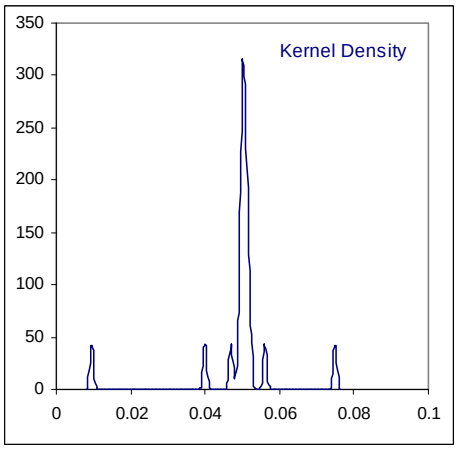


Determination of m-Xylene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.052	C	0.44	First reported 0.568
158	D5917	0.050		-0.02	
171	D3797	0.051		0.21	
174	D3797	0.051		0.21	
311	D3797	0.049		-0.25	
323	D3797	0.047		-0.70	
333	D3797	0.050		-0.02	
357	D3797	0.051		0.21	
391	D2360	0.075	G(0.01)	5.72	
444		-----		-----	
497	D3797	0.050		-0.02	
551	In house	0.0095	G(0.01)	-9.30	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0513		0.28	
1041	In house	0.0503		0.05	
1067	GC	0.0561		1.38	
1081	D3797	0.05		-0.02	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0505		0.10	
1538	D3797	0.052		0.44	
1657		-----		-----	
1826	D3797	0.05		-0.02	
7002	D3798	0.040		-2.31	
9005		-----		-----	
9008		-----		-----	

normality	not OK
n	17
outliers	2
mean (n)	0.0501
st.dev. (n)	0.00316
R(calc.)	0.0089
R(D3797:05)	0.0122

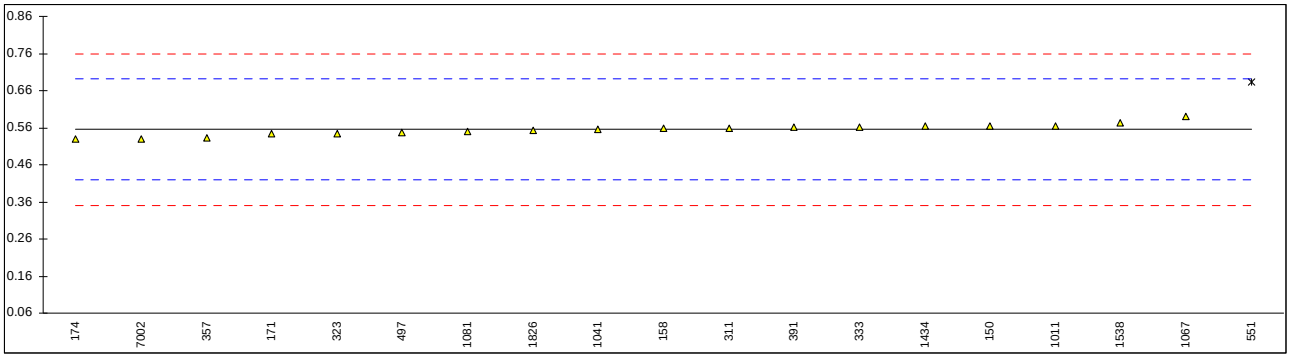


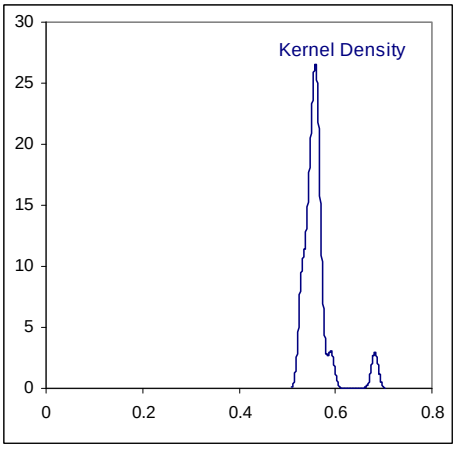


Determination of p-Xylene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.564	C	0.14	First reported 0.052
158	D5917	0.558		0.05	
171	D3797	0.544		-0.15	
174	D3797	0.530		-0.36	
311	D3797	0.559		0.07	
323	D3797	0.545		-0.14	
333	D3797	0.561		0.10	
357	D3797	0.533		-0.31	
391	D2360	0.560		0.08	
444		-----		-----	
497	D3797	0.547		-0.11	
551	In house	0.6820	G(0.01)	1.88	
663		-----		-----	
913		-----		-----	
1011	D3797	0.5643		0.15	
1041	In house	0.5556		0.02	
1067	GC	0.591		0.54	
1081	D3797	0.55		-0.06	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.5629		0.13	
1538	D3797	0.572		0.26	
1657		-----		-----	
1826	D3797	0.552		-0.03	
7002	D3798	0.530		-0.36	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	18
outliers	1
mean (n)	0.5544
st.dev. (n)	0.01524
R(calc.)	0.0427
R(D3797:05)	0.1906

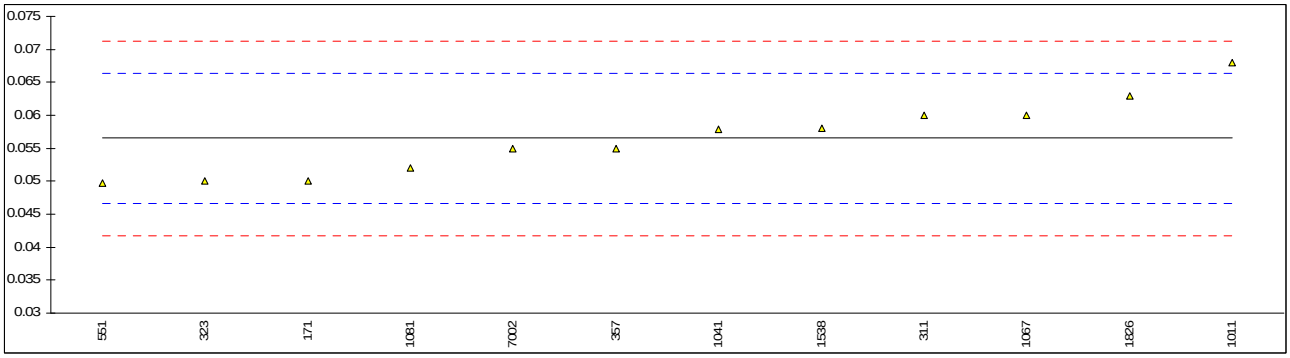


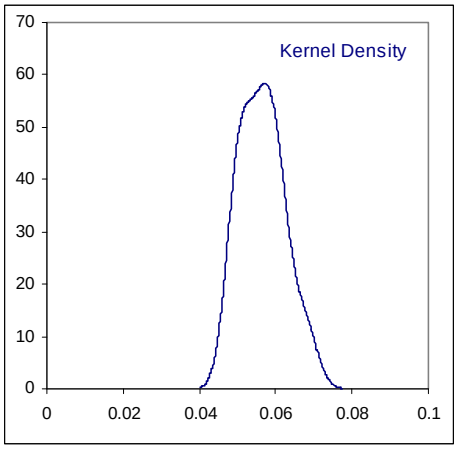


Determination of Sum of Ethyltoluenes in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150		-----		-----	
158		-----		-----	
171	D3797	0.050		-1.33	
174		-----		-----	
311	D3797	0.060		0.70	
323	D3797Mod.	0.050		-1.33	
333		-----		-----	
357	D3797	0.055		-0.31	
391		-----		-----	
444		-----		-----	
497		-----		-----	
551	In house	0.0497		-1.39	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0680		2.32	
1041	In house	0.0578		0.26	
1067	GC	0.0600		0.70	
1081	D3797	0.052		-0.92	
1291		-----		-----	
1294		-----		-----	
1434		-----		-----	
1538	D3797	0.058		0.30	
1657		-----		-----	
1826		0.063		1.31	
7002		0.055		-0.31	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	12
outliers	0
mean (n)	0.0565
st.dev. (n)	0.00571
R(calc.)	0.0160
R(Horwitz)	0.0138

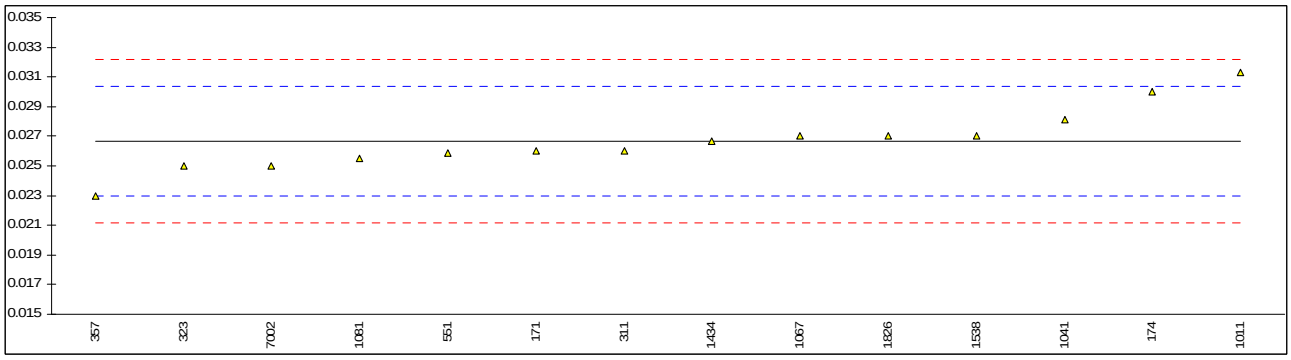


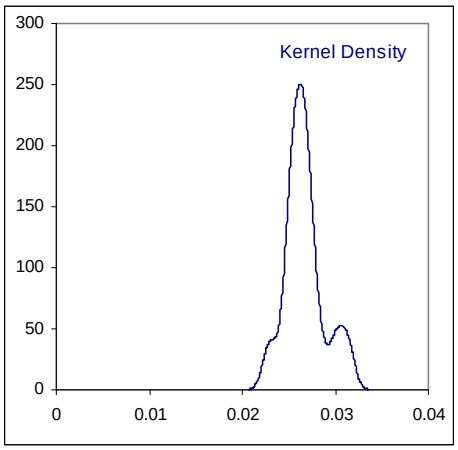


Determination of n-Propylbenzene in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150		-----		-----	
158		-----		-----	
171	D3797	0.026		-0.37	
174	D3797	0.030		1.80	
311	D3797	0.026		-0.37	
323	D3797Mod.	0.025		-0.91	
333		-----		-----	
357	D3797	0.023		-2.00	
391		-----		-----	
444		-----		-----	
497		-----		-----	
551	In house	0.0259		-0.42	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0313		2.51	
1041	In house	0.0281		0.77	
1067	GC	0.0270		0.17	
1081	D3797	0.0255		-0.64	
1291		-----		-----	
1294		-----		-----	
1434		0.0267		0.01	
1538	D3797	0.027		0.17	
1657		-----		-----	
1826		0.027		0.17	
7002		0.025		-0.91	
9005		-----		-----	
9008		-----		-----	

normality	OK
n	14
outliers	0
mean (n)	0.0267
st.dev. (n)	0.00209
R(calc.)	0.0059
R(Horwitz)	0.0052

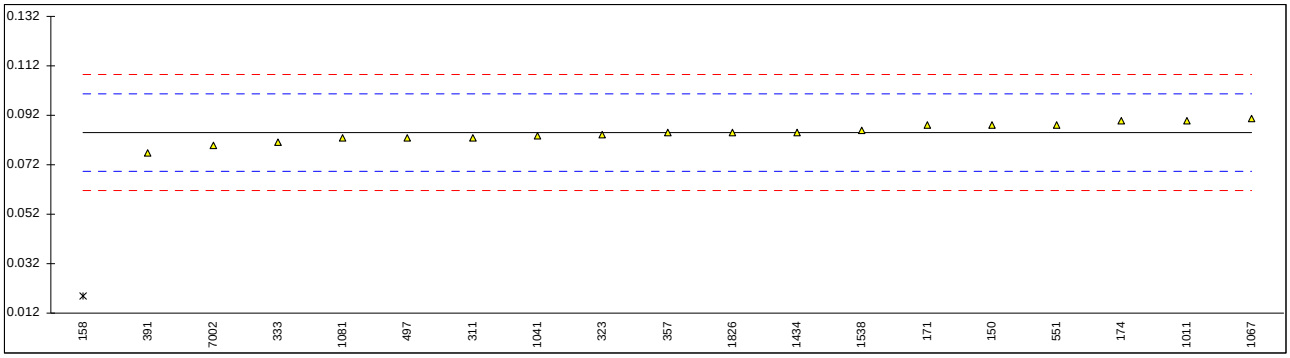


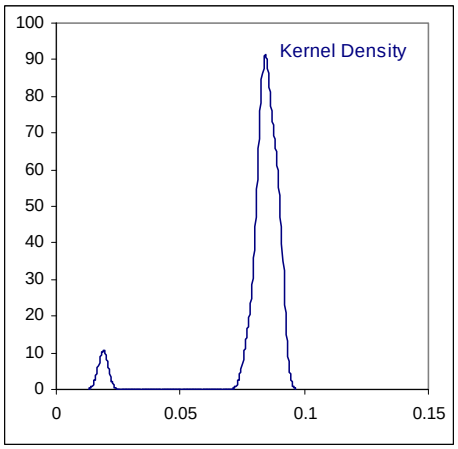


Determination of iso-Propylbenzene (cumene) in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3797	0.088		0.38	
158	D5917	0.019	G(0.01)	-8.43	
171	D3797	0.088		0.38	
174	D3797	0.090		0.64	
311	D3797	0.083		-0.26	
323	D3797Mod.	0.084		-0.13	
333	D3797	0.081		-0.51	
357	D3797	0.085		0.00	
391	D2360	0.077		-1.02	
444		-----		-----	
497	D3797	0.083		-0.26	
551	In house	0.0882		0.41	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0900		0.64	
1041	In house	0.0836		-0.18	
1067	GC	0.0907		0.72	
1081	D3797	0.0827		-0.30	
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0852		0.02	
1538	D3797	0.086		0.12	
1657		-----		-----	
1826	D3797	0.085		0.00	
7002	D3798	0.080		-0.64	
9005		-----		-----	
9008		-----		-----	

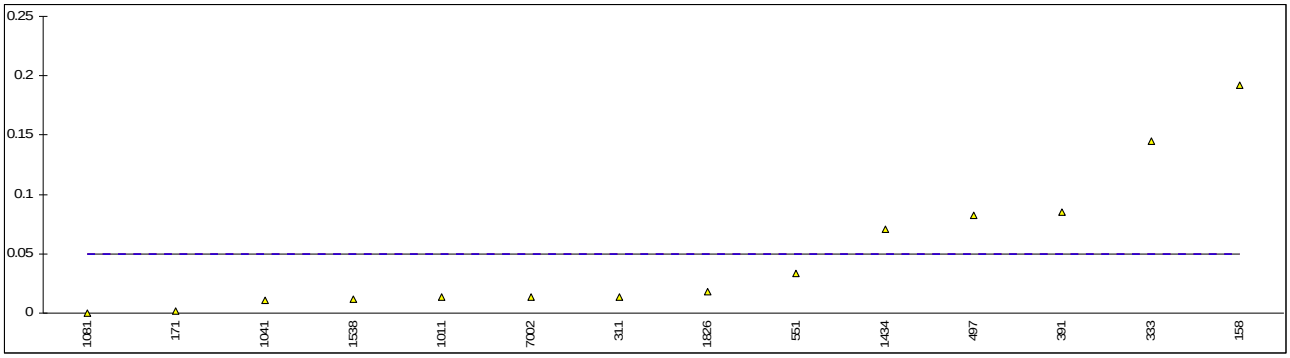
normality	OK
n	18
outliers	1
mean (n)	0.0850
st.dev. (n)	0.00370
R(calc.)	0.0104
R(D3797:05)	0.0219

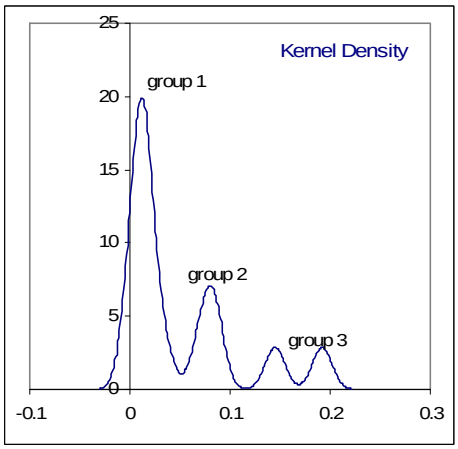




Determination of Other Aromatics in o-Xylene sample #1060; results in %M/M.

lab	method	value	mark	z(targ)	remarks (see paragraph 4.1)
52		-----		-----	
150		-----		-----	
158	D5917	0.192	DG(0.05)	-----	Ethyltol. + n-Propbenz + Styr. may be included, deviating Iso-propbenz
171	D3797	0.002		-----	
174		-----		-----	
311	D3797	0.014		-----	
323		-----		-----	
333	D3797	0.145	DG(0.05)	-----	Ethyltol. + n-Propylbenz.may be included
357		-----		-----	
391	D2360	0.085		-----	Ethyltol. + n-Propylbenz.may be included
444		-----		-----	
497	D3797	0.082		-----	Ethyltol. + n-Propylbenz.may be included
551	In house	0.0332		-----	
663		-----		-----	
913		-----		-----	
1011	D3797	0.0133		-----	
1041	In house	0.0113		-----	
1067		-----		-----	
1081	D3797	0	ex	-----	excluded, zero is not a real result
1291		-----		-----	
1294		-----		-----	
1434	D3797	0.0703		-----	Ethyltol. may be included
1538	D3797	0.012		-----	
1657		-----		-----	
1826	D3797	0.018		-----	
7002	D3798	0.014		-----	
9005		-----		-----	
9008		-----		-----	
		Group 1	Group 2	Group 3	
	normality	OK	n.a.	n.a.	
	n	8	3	2	
	outliers	0	0	0	
	mean (n)	0.0147	0.0791	0.1685	
	st.dev. (n)	0.00875	0.00777	n.a.	
	R(calc.)	0.0245	0.0217	n.a.	
	R(lit)	unknown	unknown	unknown	





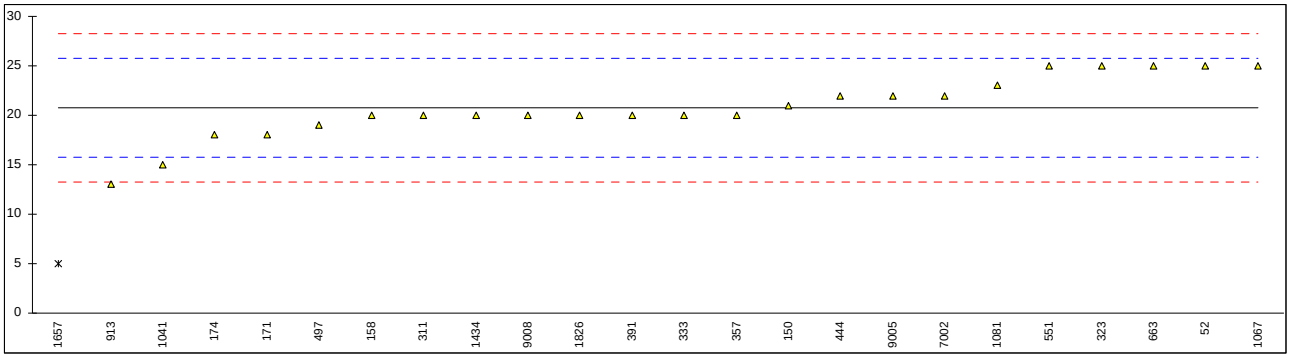
Determination of Appearance on p-Xylene sample #1061;

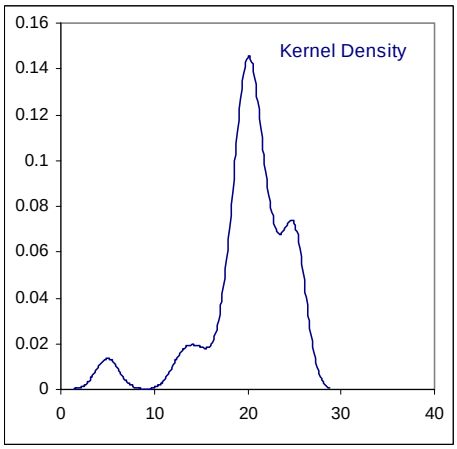
lab	method	value	mark	z(targ)	remarks
52	D4176	PASS		-----	
150	E2680	PASS		-----	
158	E2680	PASS		-----	
171	E2680	C&F		-----	
174	E2680	C&F		-----	
311	E2680	PASS		-----	
323	INH-001	CFFMS		-----	
333	E2680	B&C		-----	
357	E2680	PASS		-----	
391	E2680	PASS		-----	
444	E2680	PASS		-----	
497	VISUAL	B&C		-----	
551	E2680	B&C		-----	
663	E2680	B&C		-----	
913	E2680	CFFMS		-----	
1011	VISUAL	CLEAR		-----	
1041	VISUAL	CFFMS		-----	
1067	E2680	PASS		-----	
1081	E2680	B&C		-----	
1291		-----		-----	
1294		-----		-----	
1434	E2680	CLEAR		-----	
1538	VISUAL	B&C		-----	
1657		-----		-----	
1826	E2680	B&C		-----	
7002	E2680	CLEAR		-----	
9005	E2680	PASS		-----	
9008	D4176	CLEAR		-----	

B&C = Bright and Clear
C&F = Clear and Free
CLFSM = Clear Liquid Free of Suspended Matter
CFFSM = Clear Free From Suspended Matter
CLWP = Clear Liquid Without Particles
CFSM = Clear and Free of Suspended Matter
CLFS = Clear Liquid Free of Solids

Determination of Colour Pt/Co on p-Xylene sample #1061;

lab	method	value	mark	z(targ)	remarks
52	D1209	25		1.69	
150	D5386	21	C	0.09	First reported 0
158	D1209	20		-0.31	
171	D1209	18		-1.11	
174	D1209	18		-1.11	
311	D1209	20		-0.31	
323	D1209	25		1.69	
333	D1209	20		-0.31	
357	D1209	20		-0.31	
391	D1209	20		-0.31	
444	D5386	22		0.49	
497	D1209	19		-0.71	
551	D1209	25		1.69	
663	D1209	25		1.69	
913	D5386	13.0		-3.11	
1011		-----		-----	
1041	ISO6271	15		-2.31	
1067	D1209	25		1.69	
1081	D5386	23		0.89	
1291		-----		-----	
1294		-----		-----	
1434	D1209	20		-0.31	
1538		-----		-----	
1657	D1209	5	G(0.01)	-6.31	
1826	D1209	20		-0.31	
7002	D1209	22		0.49	
9005	D5386	22		0.49	
9008	D5386	20		-0.31	
	normality	OK			
	n	23			
	outliers	1			
	mean (n)	20.8			
	st.dev. (n)	3.13			
	R(calc.)	8.8			
	R(D1209:05)	7.0			

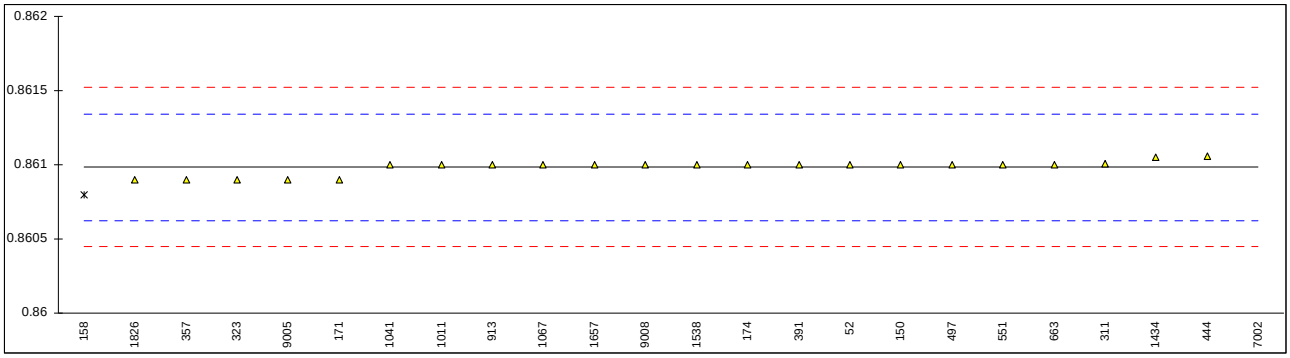


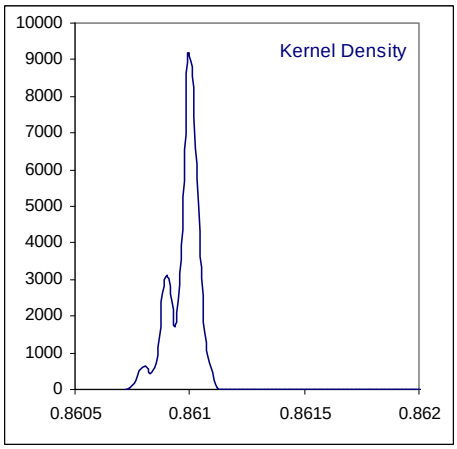


Determination of Density @ 20°C on p-Xylene sample #1061; results in kg/L.

lab	method	value	mark	z(targ)	remarks
52	D4052	0.8610		0.10	
150	D4052	0.8610		0.10	
158	D4052	0.8608	G(0.05)	-1.02	
171	D4052	0.8609		-0.46	
174	D4052	0.8610		0.10	
311	D4052	0.86101		0.15	
323	D4052	0.8609		-0.46	
333		-----		-----	
357	D4052	0.8609		-0.46	
391	D4052	0.8610		0.10	
444	D4052	0.86106		0.43	
497	D4052	0.8610		0.10	
551	D4052	0.8610		0.10	
663	D4052	0.8610		0.10	
913	D4052	0.8610		0.10	
1011	D4052	0.8610		0.10	
1041	D4052	0.86100		0.10	
1067	D4052	0.8610		0.10	
1081		-----		-----	
1291		-----		-----	
1294		-----		-----	
1434	D4052	0.86105		0.38	
1538	D4052	0.8610		0.10	
1657	D4052	0.8610	C	0.10	First reported 0.8659
1826	D4052	0.8609		-0.46	
7002	D4052	0.8653	ex	24.18	Result excluded, measured at deviating temperature (15˚C)
9005	D4052	0.8609		-0.46	
9008	D4052	0.8610		0.10	

normality	not OK
n	22
outliers	1
mean (n)	0.86098
st.dev. (n)	0.000049
R(calc.)	0.00014
R(D4052:02e1)	0.00050





Determination of IBP, 50% rec. and DP @ 760 mmHg on sample #1061; results in °C

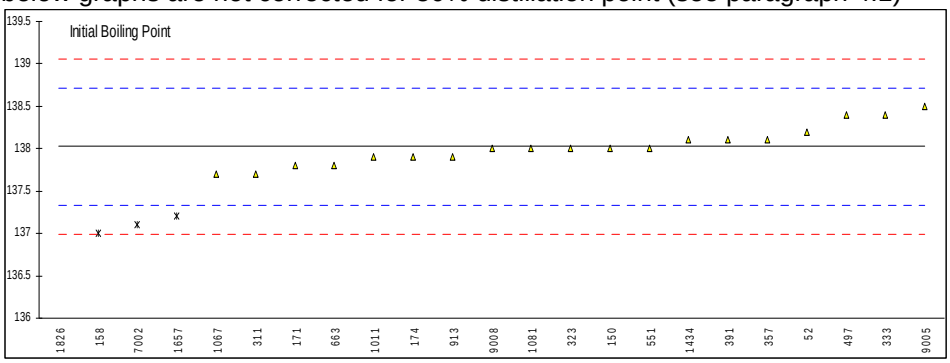
lab	method	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
52	D850-A	138.2		0.50	138.3		-0.16	138.4		-0.03	
150	D850-A	138.0		-0.08	138.3		-0.16	138.3		-0.30	
158	D850-A	137.0	G(0.05)	-2.98	137.5	DG(0.05)	-5.90	137.5	G(0.05)	-2.45	
171	D850-A	137.8		-0.66	138.3		-0.16	138.3		-0.30	
174	D850-A	137.9		-0.37	138.3		-0.16	138.3		-0.30	
311	D850-A	137.7		-0.95	138.3		-0.16	138.3		-0.30	
323	D850-M	138.0		-0.08	138.1		-1.60	138.3		-0.30	
333	D850-A	138.4		1.09	138.5		1.28	138.6		0.51	
357	D850-A	138.1		0.21	138.3		-0.16	138.3		-0.30	
391	D850-M	138.1		0.21	138.3		-0.16	138.5		0.24	
444		-----		-----	-----		-----	-----		-----	
497	D850-A	138.4		1.09	139.0	G(0.01)	4.87	-----		-----	
551	D850-A	138.0		-0.08	138.5		1.28	138.6		0.51	
663	D850-A	137.8		-0.66	138.1		-1.60	138.1		-0.84	
913	D850-M	137.9		-0.37	138.3		-0.16	138.5		0.24	
1011	D850-A	137.9		-0.37	138.3		-0.16	138.4		-0.03	
1041		-----		-----	-----		-----	-----		-----	
1067	D850-M	137.7		-0.95	138.3		-0.16	138.5		0.24	
1081	D850-A	138.0		-0.08	-----		-----	138.5		0.24	
1291		-----		-----	-----		-----	-----		-----	
1294		-----		-----	-----		-----	-----		-----	
1434	D850-A	138.1		0.21	138.5		1.28	138.5		0.24	
1538		-----		-----	-----		-----	-----		-----	
1657	D850-A	137.2	CG(0.05)	-2.40	137.8	CDG(0.05)	-3.75	137.7	G(0.01)	-1.91	
1826	D850-M	135.8	G(0.01)	-6.47	136.5	G(0.01)	-13.08	136.7	G(0.01)	-4.61	
7002	D850-A	137.1	G(0.05)	-2.69	138.2		-0.88	138.3		-0.30	
9005	D850-A	138.5		1.38	138.6		1.99	138.6		0.51	
9008	D850-A	138.0		-0.08	138.3		-0.16	138.5		0.24	
	normality	OK			not OK			not OK			
	N	19			18			19			
	outliers	4			4			3			
	mean (n)	138.03			138.32			138.41			
	st.dev. (n)	0.226			0.131			0.137			
	R(calc.)	0.63			0.37			0.38			
	R(D850:08e1-A)	0.96			0.39			1.04			

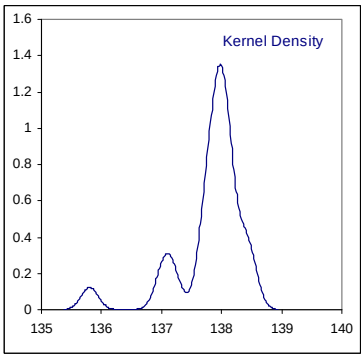
Lab 1657: first reported IBP = 137.1; 50% BP = 137.6

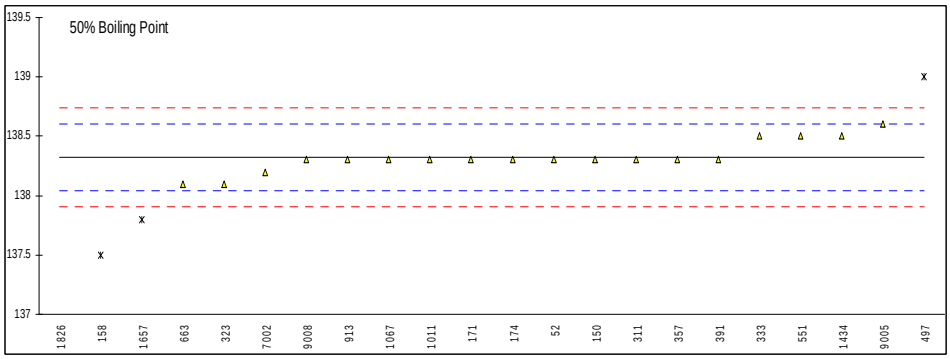
After manual correction to Mid Boiling Point (138.3 ºC)

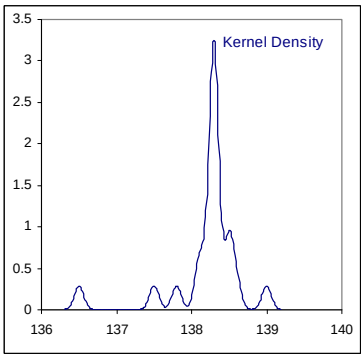
lab	Method	IBP	mark	z(targ)	50%	mark	z(targ)	DP	mark	z(targ)	remarks
158	D850-A	137.8		-0.37	138.3		0.00	138.3		-0.24	
323	D850-M	138.2		0.79	138.3		0.00	138.5		0.30	
333	D850-A	138.2		0.79	138.3		0.00	138.4		0.03	
497	D850-A	137.7		-0.66	138.3		0.00	-----		-----	
551	D850-A	137.8		-0.37	138.3		0.00	138.4		0.03	
663	D850-A	138		0.21	138.3		0.00	138.3		-0.24	
1434	D850-A	137.9		-0.08	138.3		0.00	138.3		-0.24	
1657	D850-A	137.7	C	-0.66	138.3	C	0.00	138.2		-0.51	
1826	D850-M	137.6		-0.95	138.3		0.00	138.5		0.30	
7002	D850-A	137.2	G(0.05)	-2.11	138.3		0.00	138.4		0.03	
9005	D850-A	138.2		0.79	138.3		0.00	138.3		-0.24	
	normality	OK			not OK			not OK			
	n	22			22			22			
	outliers	1			0			0			
	mean (n)	137.9273			138.30			138.39			
	st.dev. (n)	0.188179			0.000			0.088			
	R(calc.)	0.5269			0.00			0.25			
	R(D850:08e1-A)	0.964			0.39			1.04			

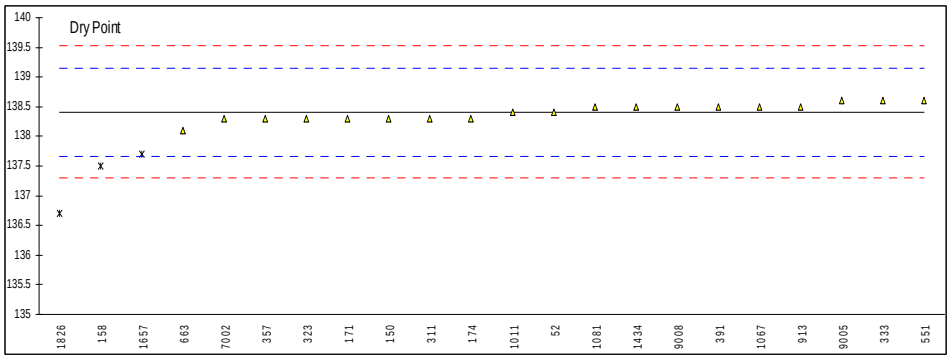
below graphs are not corrected for 50% distillation point (see paragraph 4.1)

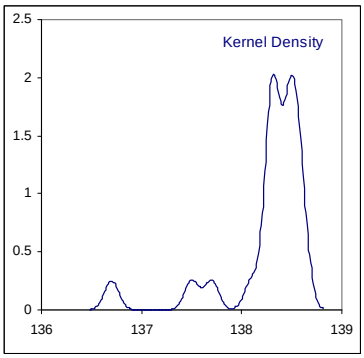










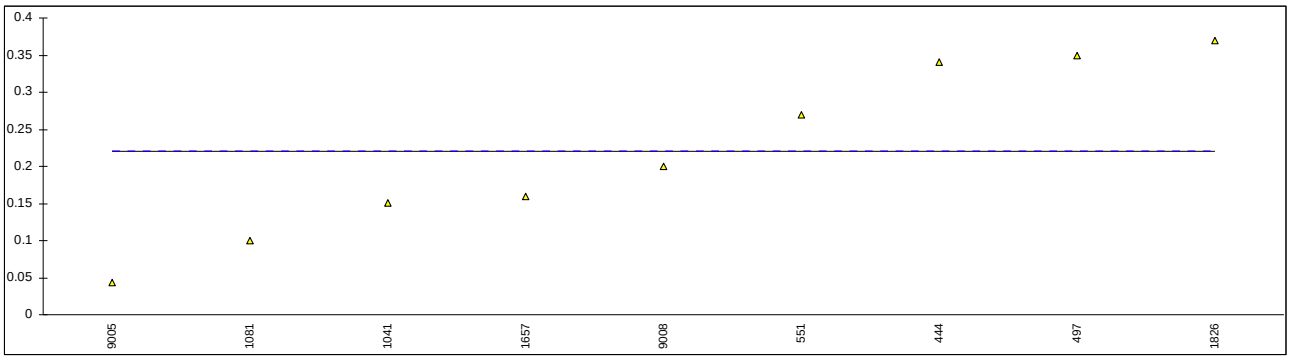


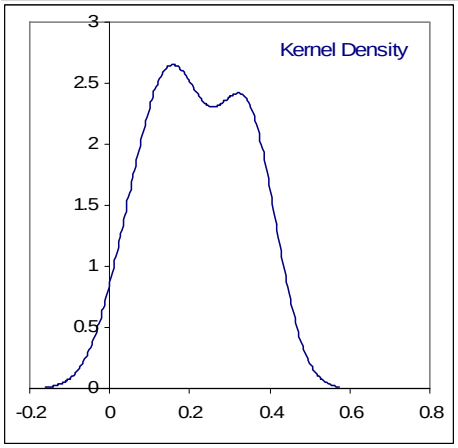
Determination of Organic Chloride in p-Xylene sample #1061; results in mg/kg.

lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D7359	<0.5		-----	
158	UOP779	<1.0		-----	
171		-----		-----	
174		-----		-----	
311	UOP779	<1		-----	
323	UOP779	<1		-----	
333		-----		-----	
357	UOP779	<1		-----	
391		-----		-----	
444		-----		-----	
497	UOP779	0.37		-----	
551	D4929b	0.19		-----	
663		-----		-----	
913		-----		-----	
1011		-----		-----	
1041		-----		-----	
1067	UOP779	<0.3		-----	
1081	D5808	<0.5		-----	
1291		-----		-----	
1294		-----		-----	
1434	D7536	<0.5		-----	
1538		-----		-----	
1657		-----		-----	
1826	UOP779	0.1		-----	
7002		-----		-----	
9005	D5808	0.269		-----	
9008	D5808	0.16		-----	
	normality	n.a.			
	n	5			
	outliers	0			
	mean (n)	0.22			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(UOP779:08)	n.a.			Application range: 0.3 – 1000 mg/kg

Determination of Sulphur in p-Xylene sample #1061; results in mg/kg.

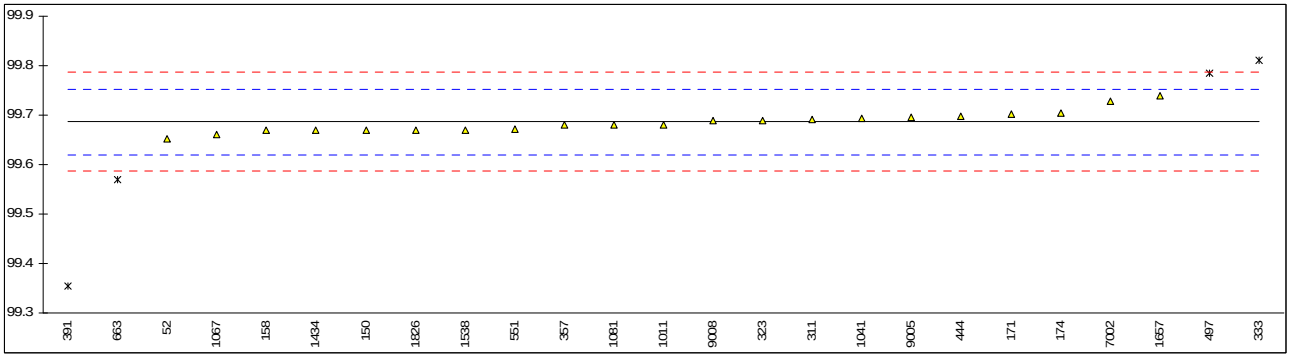
lab	method	value	mark	z(targ)	remarks
52	D7183	<0.5		-----	
150	D5453	<1.0		-----	
158		-----		-----	
171	D5453	<1		-----	
174		-----		-----	
311	D3961	<0.5		-----	
323	D5453	<0.1		-----	
333	D5453	<1		-----	
357	D7183	<0.5		-----	
391		-----		-----	
444	D7183	0.34		-----	
497	D5453	0.35		-----	
551	D3120	0.27		-----	
663		-----		-----	
913		-----		-----	
1011	D3798	<0.40		-----	
1041	D5403	0.15		-----	
1067		-----		-----	
1081	D6212	0.1		-----	
1291		-----		-----	
1294		-----		-----	
1434	D5453	<0.25		-----	
1538		-----		-----	
1657	D5453	0.16		-----	
1826	D5453	0.37		-----	
7002	D5453	<1		-----	
9005	D5453	0.044		-----	
9008	D5453	0.20		-----	
	normality	OK			
	n	9			
	outliers	0			
	mean (n)	0.220			
	st.dev. (n)	0.1176			
	R(calc.)	0.329			
	R(D5453:09)	(0.187)			Application range: 1 – 8000 mg/kg

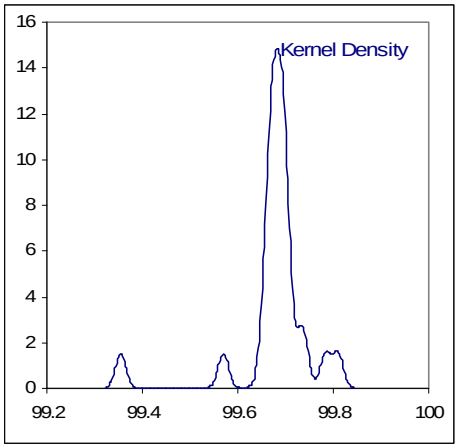




Determination of Purity of p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	99.653		-1.00	
150	D3798	99.67		-0.49	
158	D5917	99.669	C	-0.52	First reported 0.000 (mixed up with m-Xylene)
171	D3798	99.702		0.47	
174	D3798	99.705		0.56	
311	D3798	99.692		0.17	
323	D5917	99.69		0.11	
333	D3798	99.81	DG(0.05)	3.72	
357	D3798	99.68		-0.19	
391	D2360	99.355	G(0.01)	-9.95	
444	D5917	99.6988		0.38	
497	D3798	99.784	DG(0.05)	2.94	
551	In house	99.6725		-0.41	
663	D3798	99.57	CG(0.01)	-3.49	
913		-----		-----	
1011	D3798	99.6805		-0.17	
1041	In house	99.6945		0.25	
1067	D3798	99.66		-0.79	
1081	D3798	99.68		-0.19	
1291		-----		-----	
1294		-----		-----	
1434	D7504	99.66918		-0.51	
1538	D3798	99.67		-0.49	
1657	D3798	99.74		1.62	
1826	D3798	99.67		-0.49	
7002	D3798	99.729		1.29	
9005	D3798	99.696		0.29	
9008	UOP720	99.6888		0.08	
	normality	OK			
	n	21			
	outliers	4			
	mean (n)	99.6862			
	st.dev. (n)	0.02141			
	R(calc.)	0.0599			
	R(D3798:03)	0.0932			

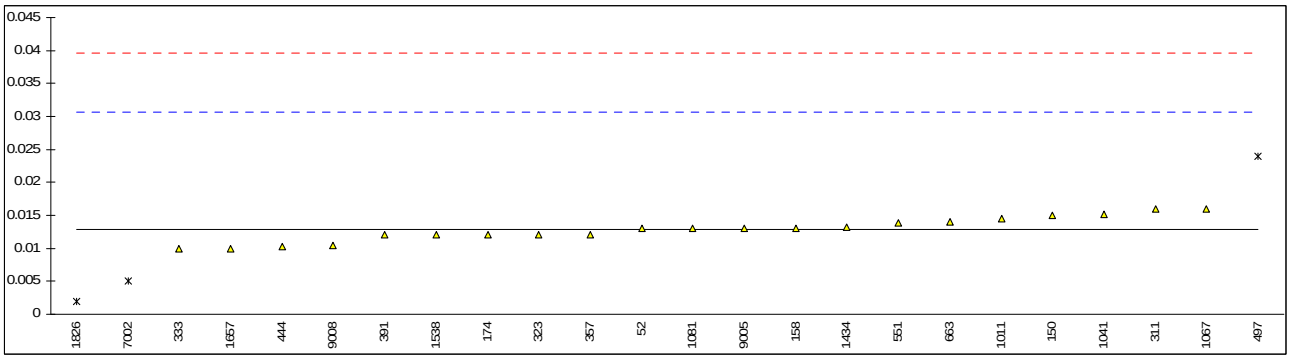


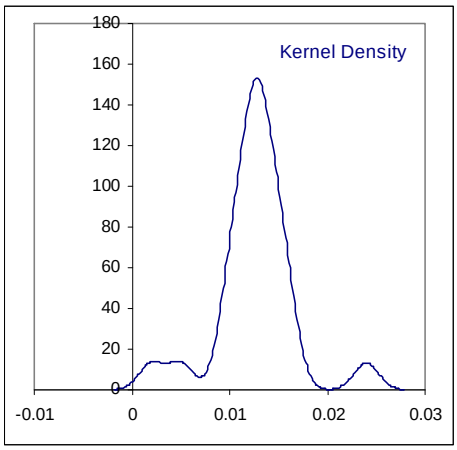


Determination of Nonaromatics in p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.013		0.01	
150	D3798	0.015		0.24	
158	D5917	0.013		0.01	
171		-----		-----	
174	D3798	0.012		-0.10	
311	D3798	0.016		0.35	
323	D5917	0.012		-0.10	
333	D3798	0.01		-0.32	
357	D3798	0.012		-0.10	
391	D2360	0.012		-0.10	
444	D5917	0.0103		-0.29	
497	D3798	0.024	G(0.05)	1.25	
551	In house	0.01389		0.11	
663	D3798	0.014	C	0.13	First reported 0.012
913		-----		-----	
1011	D3798	0.0145		0.18	
1041	In house	0.0152		0.26	
1067	D3798	0.016		0.35	
1081	D3798	0.013		0.01	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.0132		0.04	
1538	D3798	0.012		-0.10	
1657	D3798	0.01		-0.32	
1826	D3798	0.002	G(0.01)	-1.22	
7002	D3798	0.005	G(0.05)	-0.89	
9005	D3798	0.013		0.01	
9008	UOP720	0.0104		-0.28	

normality	OK
n	21
outliers	3
mean (n)	0.0129
st.dev. (n)	0.00184
R(calc.)	0.0052
R(D3798:03)	0.0249

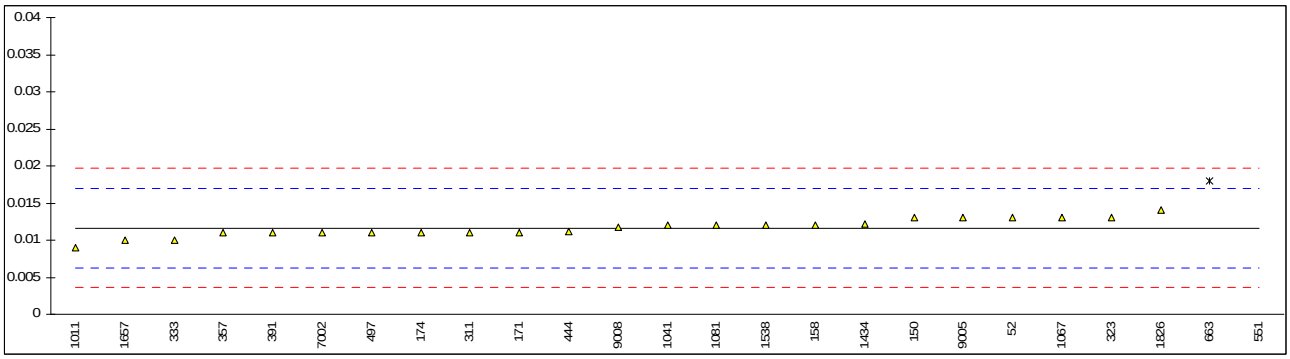


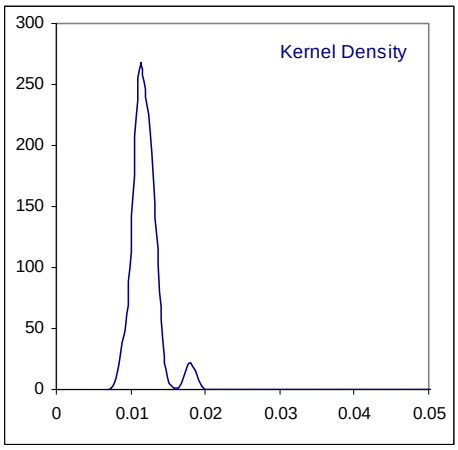


Determination of Toluene in p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.013		0.51	
150	D3798	0.013		0.51	
158	D5917	0.012		0.13	
171	D3798	0.011		-0.24	
174	D3798	0.011		-0.24	
311	D3798	0.011		-0.24	
323	D5917	0.013		0.51	
333	D3798	0.01		-0.62	
357	D3798	0.011		-0.24	
391	D2360	0.011		-0.24	
444	D5917	0.0111		-0.21	
497	D3798	0.011		-0.24	
551	In house	0.1198	G(0.01)	40.44	
663	D3798	0.018	C,G(0.01)	2.38	First reported 0.016
913		-----		-----	
1011	D3798	0.009		-0.99	
1041	In house	0.0120		0.13	
1067	D3798	0.013		0.51	
1081	D3798	0.012		0.13	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.01211		0.17	
1538	D3798	0.012		0.13	
1657	D3798	0.01		-0.62	
1826	D3798	0.014		0.88	
7002	D3798	0.011		-0.24	
9005	D3798	0.013		0.51	
9008	UOP720	0.0117		0.02	

normality	OK
n	23
outliers	2
mean (n)	0.0116
st.dev. (n)	0.00119
R(calc.)	0.0033
R(D3798:03)	0.0075





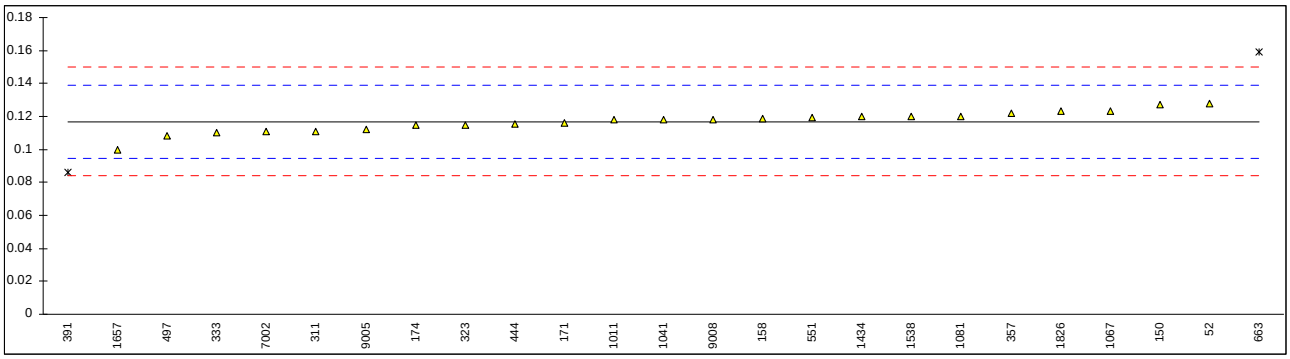
Determination of Styrene in p-Xylene sample #1061; results in %M/M.

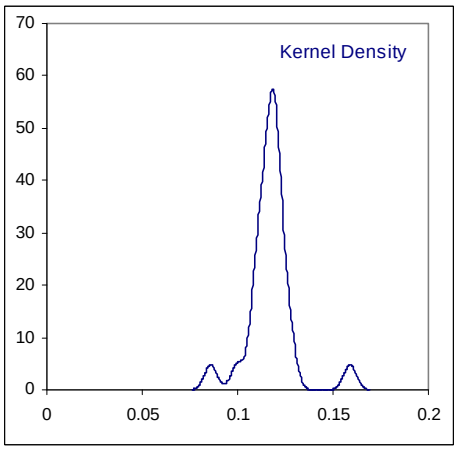
lab	method	value	mark	z(targ)	remarks
52		-----		-----	
150	D3798	<0.001		-----	
158		-----		-----	
171	D3798	<0.01		-----	
174	D3798	<0.01		-----	
311	D3798	<0.001		-----	
323	D5917	<0.001		-----	
333		<0.01		-----	
357	D3798	<0.010		-----	
391	D2360	0.001		-----	
444		-----		-----	
497		-----		-----	
551	In house	<0.01		-----	
663		-----		-----	
913		-----		-----	
1011	D3798	<0.001		-----	
1041	In house	<0.01		-----	
1067	D3798	<0.0005		-----	
1081	D3798	0.0		-----	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.0000		-----	
1538		-----		-----	
1657		-----		-----	
1826		-----		-----	
7002		0.001		-----	
9005		-----		-----	
9008	INHOUSE	2.1		-----	False positive?
	normality	n.a.			
	n	5			
	outliers	0			
	mean (n)	n.a.			
	st.dev. (n)	n.a.			
	R(calc.)	n.a.			
	R(lit)	n.a.			

Determination of Ethylbenzene in p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.128		1.01	
150	D3798	0.127		0.92	
158	D5917	0.119		0.19	
171	D3798	0.116		-0.08	
174	D3798	0.115		-0.17	
311	D3798	0.111		-0.54	
323	D5917	0.115		-0.17	
333		0.11		-0.63	
357	D3798	0.122		0.46	
391	D2360	0.086	G(0.01)	-2.81	
444	D5917	0.1153		-0.15	
497	D3798	0.108		-0.81	
551	In house	0.1191		0.20	
663	D3798	0.159	CG(0.01)	3.82	First reported 0.173
913		-----		-----	
1011	D3798	0.118		0.10	
1041	In house	0.1182		0.12	
1067	D3798	0.123		0.55	
1081	D3798	0.120		0.28	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.11987		0.27	
1538	D3798	0.120		0.28	
1657	D3798	0.10		-1.54	
1826	D3798	0.123		0.55	
7002	D3798	0.111		-0.54	
9005	D3798	0.112		-0.45	
9008	UOP720	0.1183		0.13	

normality	OK
n	23
outliers	2
mean (n)	0.1169
st.dev. (n)	0.00634
R(calc.)	0.0178
R(D3798:03)	0.0308

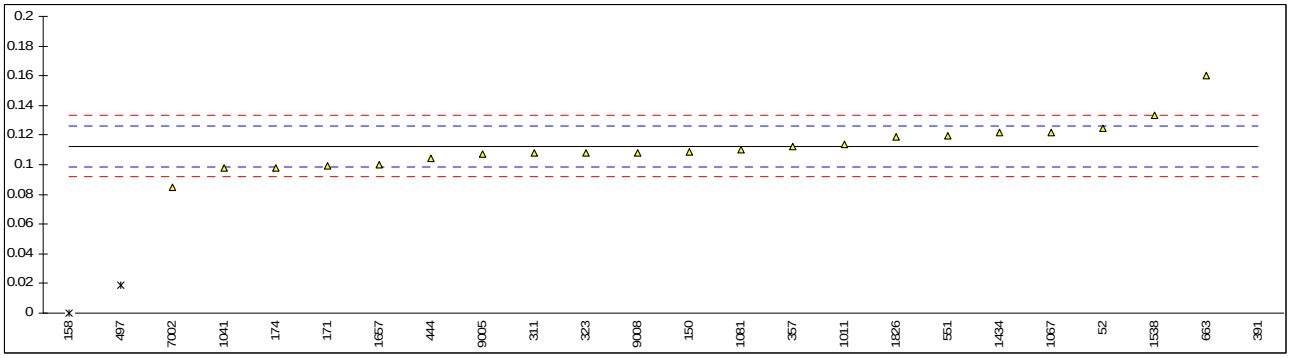


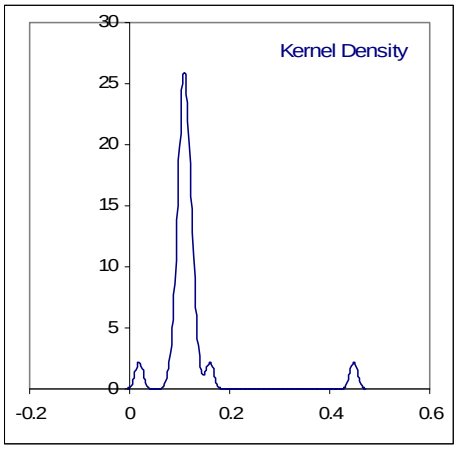


Determination of m-Xylene in p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.125		1.82	
150	D3798	0.109		-0.49	
158	D5917	0.000	C, ex	-16.28	First reported 99.669 (mixed up with p-Xylene), zero not real result
171	D3798	0.099		-1.94	
174	D3798	0.098		-2.09	
311	D3798	0.108		-0.64	
323	D5917	0.108		-0.64	
333		<0.01		<-14.83	False negative?
357	D3798	0.112		-0.06	
391	D2360	0.448	G(0.01)	48.60	
444	D5917	0.1044		-1.16	
497	D3798	0.019	G(0.01)	-13.53	
551	In house	0.1195		1.03	
663	D3798	0.160	C	6.89	First reported 0.174
913		-----		-----	
1011	D3798	0.114		0.23	
1041	In house	0.0976		-2.14	
1067	D3798	0.122		1.39	
1081	D3798	0.11		-0.35	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.12194		1.38	
1538	D3798	0.133		2.98	
1657	D3798	0.10		-1.80	
1826	D3798	0.119		0.95	
7002	D3798	0.085		-3.97	
9005	D3798	0.107		-0.78	
9008	UOP720	0.1082		-0.61	

normality	OK
n	21
outliers	2
mean (n)	0.1124
st.dev. (n)	0.01550
R(calc.)	0.0434
R(D3798:03)	0.0193

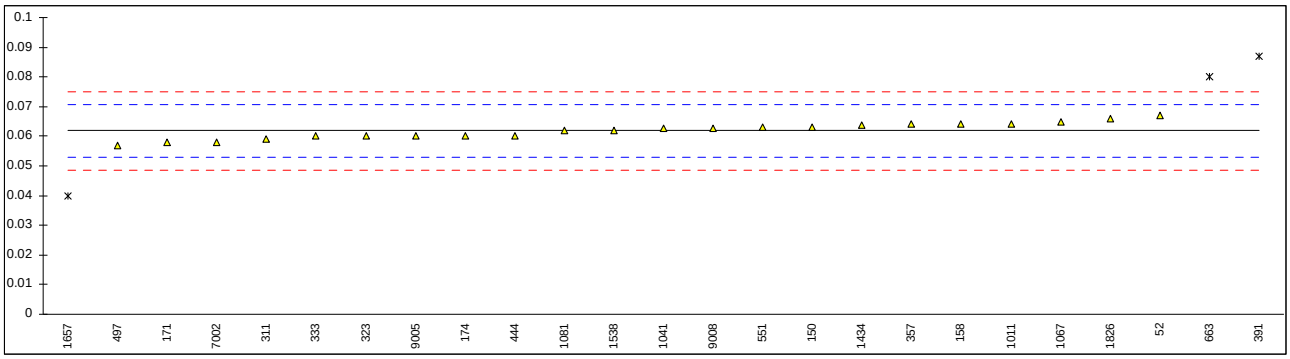


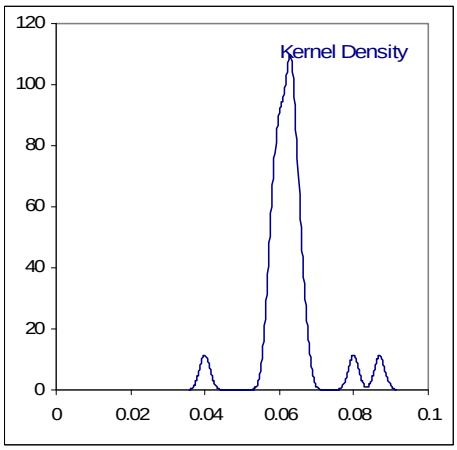


Determination of o-Xylene in p-Xylene sample #1061; results in %M/M.

lab	method	value	mark	z(targ)	remarks
52	D5917	0.067		1.16	
150	D3798	0.063		0.26	
158	D5917	0.064		0.49	
171	D3798	0.058		-0.87	
174	D3798	0.060		-0.42	
311	D3798	0.059		-0.65	
323	D5917	0.060		-0.42	
333		0.06		-0.42	
357	D3798	0.064		0.49	
391	D2360	0.087	G(0.05)	5.69	
444	D5917	0.0601		-0.40	
497	D3798	0.057		-1.10	
551	In house	0.0630		0.26	
663	D3798	0.080	CG(0.05)	4.11	
913		-----		-----	
1011	D3798	0.064		0.49	
1041	In house	0.0625		0.15	
1067	D3798	0.065		0.71	
1081	D3798	0.062		0.03	
1291		-----		-----	
1294		-----		-----	
1434	D7504	0.0637		0.42	
1538	D3798	0.062		0.03	
1657	D3798	0.04	G(0.01)	-4.95	
1826	D3798	0.066		0.94	
7002	D3798	0.058		-0.87	
9005	D3798	0.06		-0.42	
9008	UOP720	0.0625		0.15	

normality	OK
n	22
outliers	3
mean (n)	0.0619
st.dev. (n)	0.00270
R(calc.)	0.0076
R(D3798:03)	0.0124





APPENDIX 2

List of number of participants per country

1 laboratory in	BELGIUM
2 laboratories in	BRAZIL
1 laboratory in	CANADA
1 laboratory in	FINLAND
1 laboratory in	FRANCE
2 laboratories in	GERMANY
1 laboratory in	INDIA
1 laboratory in	IRAN
1 laboratory in	ISRAEL
1 laboratory in	ITALY
2 laboratories in	KUWAIT
1 laboratory in	MALAYSIA
1 laboratory in	POLAND
1 laboratory in	PORTUGAL
1 laboratory in	SAUDI ARABIA
1 laboratory in	THAILAND
4 laboratories in	THE NETHERLANDS
4 laboratories in	U.S.A.
1 laboratory in	UNITED KINGDOM

APPENDIX 3

Abbreviations:

C	= final result after checking of first reported suspect result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
E	= error in calculations
ex	= excluded from calculations
n.a.	= not applicable
SDS	= Safety Data Sheet

Literature:

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, January 2010
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6 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
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11 J.N. Miller, Analyst, 118, 455, (1993)
12 Analytical Methods Committee Technical brief, No4 January 2001.
13 The Royal Society of Chemistry 2002, Analyst 2002, 127 page 1359-1364, P.J. Lowthian and M. Thompson (see http://www.rsc.org/suppdata/an/b2/b205600n/).