

Results of Proficiency Test
mixed-Xylenes
September 2011

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

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1 INTRODUCTION

Since 1995, the Institute for Interlaboratory Studies organized once every two years a proficiency test for Mixed-Xylenes. During the annual proficiency testing program 2010/2011, it was decided to organize again a round robin for the analysis of Mixed-Xylenes. In this interlaboratory study, 32 laboratories from 19 different countries have participated. See appendix 2 for the number of participants per country.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, The Netherlands, was the organiser of this proficiency test. Sample analyses for fit-for-use and homogeneity testing were subcontracted.

It was decided to send 2 samples of different composition (labelled #11072 and #11073). Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1 QUALITY SYSTEM

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, has implemented a quality system based on ISO guide 43, ILAC-G13:2007 AND ISO17043:2010. This ensures 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 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 different mixtures of Xylenes were prepared: one without Ethylbenzene and one with Ethylbenzene. The two samples were prepared from bulk material of high purity Xylenes and high purity Ethylbenzene, by mixing appropriate amounts (see table 1) to get approximately 10 litres (8.4-8.7 kg) of bulk mixtures.

	<i>Ethylbenzene in kg</i>	<i>p-Xylene in kg</i>	<i>m-Xylene in kg</i>	<i>o-Xylene in kg</i>
sample #11072	0.000	3.029	1.976	3.401
sample #11073	1.503	1.815	3.495	1.845

table 1: preparation table for subsamples #11072 and #11073

The 10 litre samples were each homogenised in a pre-cleaned can. Subsequently, of each 10 litre bulk sample, 41 (and 44) subsamples of approximately 220 mL were transferred to 250 mL brown glass bottles and labelled respectively #11072 and #11073. The homogeneities of the subsamples #11072 and #11073 were checked by determination of 4 components in accordance with the (obsolete) test method ASTM D2306:00 on 4 stratified randomly selected samples.

	<i>Ethylbenzene in %M/M</i>	<i>p-Xylene in %M/M</i>	<i>m-Xylene in %M/M</i>	<i>o-Xylene in %M/M</i>
sample #11072-1	<0.10	36.20	23.45	40.32
sample #11072-2	<0.10	36.21	23.45	40.31
sample #11072-3	<0.10	36.21	23.44	40.32
sample #11072-4	<0.10	36.20	23.44	40.33
sample #11073-1	17.49	21.10	40.43	20.97
sample #11073-2	17.48	21.09	40.40	21.03
sample #11073-3	17.54	21.12	40.37	20.97
sample #11073-4	17.47	21.08	40.42	21.03

table 2: homogeneity tests results for subsamples #11072 and #11073

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

	<i>Ethylbenzene in %M/M</i>	<i>p-Xylene in %M/M</i>	<i>m-Xylene in %M/M</i>	<i>o-Xylene in %M/M</i>
r (sample #11072)	---	0.016	0.016	0.023
r (sample #11073)	0.087	0.048	0.074	0.097
0.3xR _(D2306:00)	0.149	0.061 / 0.104	0.059 / 0.101	0.068 / 0.131

Table 3: repeatabilities of subsamples #11072 and #11073

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 2 bottles were sent (one bottle of 250 mL, labelled #11072 and one bottle of 250 mL, labelled #11073), on September 7, 2011.

2.5 STABILITY OF THE SAMPLES

The stability of the materials, packed in the brown glass bottles, was checked. The materials were found sufficiently stable for the period of the proficiency test.

2.6 ANALYSES

The participants were asked to determine on both samples: Benzene, Toluene, p-Xylene, m-Xylene, o-Xylene, Ethylbenzene, Cumene, C9 and higher aromatics and Nonaromatics.

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 received. The original reported results are tabulated per determination in appendix 1 of this report. The laboratories are presented by their code numbers.

Directly after deadline, a reminder fax was sent to those laboratories that had not yet reported any 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.

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.

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; nos.12 and 13).

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, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the spread of this interlaboratory study.

The target standard deviation was calculated from the target reproducibility (preferably taken from a standardized test method) by division with 2.8.

The z-scores were calculated in accordance with:

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

The $Z_{(\text{target})}$ scores are listed in the result tables in appendix 1.

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 the fit-for-useness of the reported test result.

Absolute values for $z < 2$ are very common and absolute values for $z > 3$ are very rare. The usual interpretation of z-scores is as follows:

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

4 EVALUATION

In this proficiency test some serious problems were encountered. The laboratories in Brazil, India and Saudi Arabia did not receive the samples in time due to problems with custom clearance. Five participants reported results after the final reporting date.

Finally, 29 laboratories did report 519 numerical results. Observed were 36 outlying results, which is 6.9%. 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 test. The methods, which are used by the various laboratories, are in the tables together with the original data. The abbreviations, used in these tables, are listed in appendix 3.

Regretfully, a standardized test method does not exist that covers all components evaluated in this study and a variety of test methods is required to have target reproducibilities of most components: ASTM D2360, ASTM D5917, ASTM D6563. The Horwitz equation were used for the components that were not mentioned in these standardized test methods.

Not all data sets proved to have a normal distribution. Non normal distributions were found with the following determinations on sample #11072: Benzene, toluene and m-xylene. And on sample #11073: Toluene, m-xylene, o-xylene and ethylbenzene. For these components the results of the statistical evaluation should be used with due care.

For many components only reproducibilities at one defined concentration were given in the literature standards. In order to calculate the z-scores estimated target reproducibilities derived from the literature standards were used.

Benzene: Regretfully, no standardized test method is available with precision data and therefore the Horwitz equation was used to estimate the target requirement. The benzene content of sample #11072 was near or below the limit of detection and too low to allow any significant conclusions. For sample #11073, the determination of this component was problematic. In total 4 statistical outliers were detected. The calculated reproducibility, after rejection of the statistical outliers, is not in agreement with the target requirement.

Toluene: The determination of this component may be problematic for a number of laboratories. In total two statistical outliers were detected. One laboratory reported false negative test results for both samples. The calculated

reproducibility for sample #11073, after rejection of the statistical outlier, is in good agreement with the requirements of ASTM D2360:11 and the calculated reproducibility for sample #11072, after rejection of the statistical outlier, is almost in good agreement.

p-Xylene: No analytical problems were observed for this component. In total six statistical outliers were detected. The calculated reproducibilities, after exclusion of the statistical outliers, are both in good agreement with the requirements of the test method ASTM D6563:11a, which appear to be identical to the requirements of the obsolete ASTM D2306:00.

m-Xylene: Some analytical problems were observed for this component. The calculated reproducibility for sample #11072, after rejection of the 5 (!) statistical outliers, is in good agreement with the requirements of ASTM D6563:11a. However, the calculated reproducibility for sample #11073, after rejection of the statistical outlier, is (only just) in agreement with the requirements of ASTM D6563:11a.

o-Xylene: Some analytical problems were observed for this component. The calculated reproducibility for sample #11072 is (only just) in agreement with the requirements of ASTM D6563:11a. However, the calculated reproducibility for sample #11073, after rejection of the statistical outlier, is not at all in agreement with the requirements of ASTM D6563:11a.

Sum m+p-Xylene: Some analytical problems were observed. Both calculated reproducibilities, after rejection of the statistical outliers, are not in agreement with the requirements of ASTM D6563:11a.

Ethylbenzene: Some analytical problems were observed for this component. In total three statistical outliers were detected and one false negative test result was reported for sample #11072. The calculated reproducibility for the low concentration of Ethylbenzene in sample #11072 is in good agreement with the requirements of the test method ASTM D6563:11a. However, the calculated reproducibility for the high concentration of Ethylbenzene in sample #11073 is, after exclusion of the statistical outlier, not at all in agreement with the requirements of the test method ASTM D6563:11a.

Cumene: Some analytical problems were observed for this component. Two statistical outliers were detected; one for each sample. Both calculated reproducibilities, after rejection of the statistical outliers, are not in agreement with the requirements of ASTM D2360:11.

Sum C9⁺ arom.: Major analytical problems were observed. In total four statistical outliers were detected. Also, both calculated reproducibilities, after rejection of the statistical outliers, are not at all in agreement with the requirements of ASTM D6563:11a.

Nonaromatics: Analytical problems were observed. Two statistical outliers were detected. However, both calculated reproducibilities, after rejection of the statistical outliers, are not in agreement with the requirements of ASTM D6563:11a.

General: In this round robin many different GC methods were used to determine the major components of the mixtures as well as the impurities. This was also the case in the previous rounds. Meanwhile method ASTM D6563:11a was issued, in which the reproducibilities for mixed-Xylenes are identical to the reproducibilities in the obsolete test method ASTM D2306. This is remarkable as the methods are not technically equivalent. Below is an overview of the test methods used and its quantification principles in order to enable judgement of the applicability:

D2306:00 - This test method determines the relative distribution of the individual C8 aromatic hydrocarbon isomers by normalization (major components only)

D2360:11 - This test method covers the determination of the total nonaromatic hydrocarbons, and trace monocyclic aromatic hydrocarbons (upto 1 %M/M)

D3797:05 - This test method covers the analysis of o-xylene

D4492:10 - This test method covers the determination of finished benzene

D5917:09 - This test method covers the determination of the total nonaromatic hydrocarbons and trace monocyclic aromatic hydrocarbons (upto 2.5 %M/M)

D6563:11 - This test method covers the determination of the total nonaromatic hydrocarbons, benzene, toluene, ethylbenzene, xylenes, and total C9 + aromatic hydrocarbons, and the relative distribution of the individual C8 aromatic hydrocarbon isomers (both impurities and major components)

D7504:09 - This test method covers the determination of the total nonaromatic hydrocarbons and trace monocyclic aromatic hydrocarbons (upto 2.5 %M/M)

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.

	unit	n	average	2.8 *sd _r	R(lit)
Benzene	%M/M	18	0.0024	0.0038	(0.0007)
Toluene	%M/M	20	0.0043	0.0015	0.0010
p-Xylene	%M/M	25	36.10	0.33	0.35
m-Xylene	%M/M	22	23.49	0.10	0.20
o-Xylene	%M/M	28	40.16	0.47	0.43
Sum m+p-Xylene	%M/M	27	59.62	0.45	0.40
Ethylbenzene	%M/M	25	0.0306	0.0065	0.0113
Cumene	%M/M	22	0.0368	0.0078	0.0048
Sum C9 ⁺ aromatics	%M/M	22	0.075	0.022	0.018
Nonaromatics	%M/M	24	0.133	0.057	0.042

table 4: reproducibilities of sample #11072

	unit	n	average	2.8 *sd _R	R (lit)
Benzene	%M/M	21	0.0088	0.0024	0.0020
Toluene	%M/M	20	0.0042	0.0011	0.0010
p-Xylene	%M/M	23	21.02	0.12	0.20
m-Xylene	%M/M	26	40.21	0.36	0.34
o-Xylene	%M/M	27	21.20	0.36	0.23
Sum m+p-Xylene	%M/M	25	61.26	0.30	0.39
Ethylbenzene	%M/M	26	17.40	0.23	0.15
Cumene	%M/M	22	0.0228	0.0048	0.0030
Sum C9 ⁺ aromatics	%M/M	24	0.054	0.039	0.013
Nonaromatics	%M/M	26	0.078	0.045	0.025

table 5: reproducibilities of sample #11073

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

4.3 COMPARISON OF THE SEPTEMBER 2011 PROFICIENCY TEST WITH PREVIOUS PTS

	<i>September 2011</i>	<i>September 2009</i>	<i>November 2007</i>	<i>November 2005</i>
Number of reporting labs	29	24	23	20
Number of results reported	519	430	434	329
Statistical outliers	36	26	30	30
Percentage outliers	6.9%	6.1%	6.9%	9.2%

table 6: 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:

	<i>September 2011</i>		<i>September 2009</i>		<i>November 2007</i>		<i>November 2005</i>	
Toluene	--	+/-	++	++	++	++	++	++
p-Xylene	++	++	++	++	++	++	++	++
m-Xylene	++	+/-	-	+/-	++	++	++	++
o-Xylene	+/-	--	+/-	--	++	+	++	+
Ethylbenzene	++	--	++	--	++	+	++	-
Cumene	--	--	+	-	--	+/-	-	+
C9 ⁺ aromatics	--	--	--	--	n.e.	n.e.	n.e.	n.e.
Nonaromatics	--	--	-	-	+	++	++	+/-

table 7: comparison of performances against the standard requirements over the last PTs

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

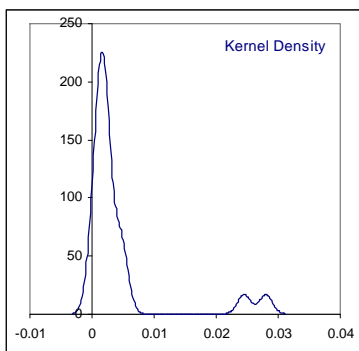
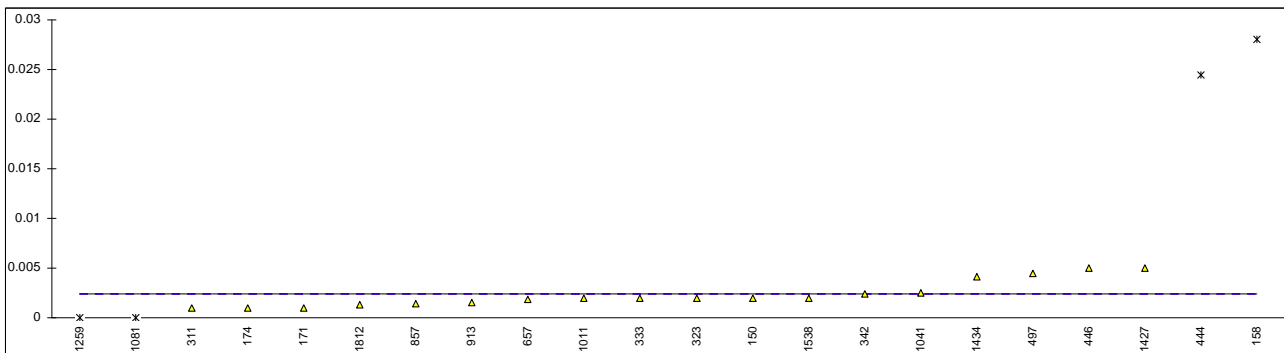
- ++: group performed much better than the standard
- + : group performed better than the standard
- +/-: group performance equals the standard
- : group performed worse than the standard
- : group performed much worse than the standard
- n.e.: not evaluated

APPENDIX 1

Determination of Benzene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	<0.01		----	
150	D2360	0.002		----	
158	D5917	0.028	G(0.01)	----	
171	D5917	0.001		----	
174	D2360	0.001		----	
311	D2360	0.001		----	
317	D6563	<0.01		----	
323	D2360	0.002		----	
333	D2360	0.002		----	
342	D2360	0.0024		----	
357	D6563	<0.01		----	
391		----		----	
444	D6563	0.0245	G(0.01)	----	
446	D6563	0.005		----	
497	INH-1460	0.0045		----	
557		----		----	
657	D2360	0.0018		----	
857	D2360	0.0014		----	
858	D2360	<0.001		----	
861	D2360	<0.001		----	
862	D2360	<0.001		----	
913	D2360	0.0015		----	
1011	D2306	0.0020		----	
1041	in house	0.0025		----	
1081	D6563	0.0	ex	----	test result excluded: zero is not a real value
1259	D6563	0.00	ex	----	test result excluded: zero is not a real value
1427	D5917	0.005		----	
1434	D4492	0.0041		----	
1538	D2360	0.002		----	
1653		----		----	
1812	D2360	0.0013		----	
1866		----		----	

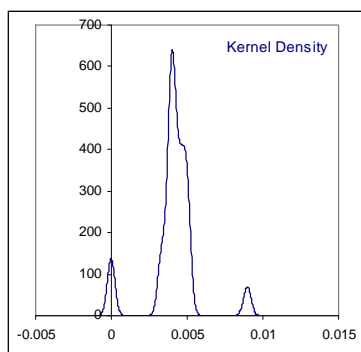
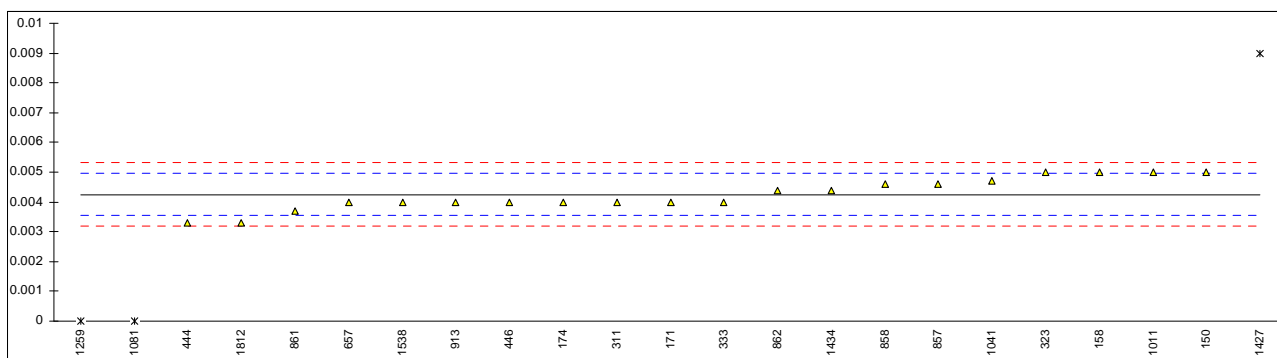
normality not OK
n 18
outliers 2
mean (n) 0.0024
st.dev. (n) 0.00135
R(calc.) 0.0038
R(Horwitz) (0.0007)



Determination of Toluene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	<0.01		-----	
150	D2360	0.005		2.10	
158	D5917	0.005		2.10	
171	D5917	0.004		-0.70	
174	D2360	0.004		-0.70	
311	D2360	0.004		-0.70	
317	D6563	<0.01		-----	
323	D2360	0.005		2.10	
333	D2360	0.004		-0.70	
342		-----		-----	
357	D6563	<0.01		-----	
391		-----		-----	
444	D6563	0.0033		-2.65	
446	D6563	0.004		-0.70	
497	INH-1460	<0.0010		<-9.08	
557		-----		-----	
657	D2360	0.0040		-0.70	
857	D2306	0.0046		0.98	
858	D2360	0.0046		0.98	
861	D2360	0.0037		-1.54	
862	D2360	0.0044		0.42	
913	D2360	0.0040		-0.70	
1011	D2306	0.0050		2.10	
1041	in house	0.0047		1.26	
1081	D6563	0.0	ex	-11.88	test result excluded: zero is not a real value
1259	D6563	0.00	ex	-11.88	test result excluded: zero is not a real value
1427	D5917	0.009	G(0.01)	13.27	
1434	D4492	0.0044		0.42	
1538	D2360	0.004		-0.70	
1653		-----		-----	
1812	D2360	0.0033		-2.65	
1866		-----		-----	

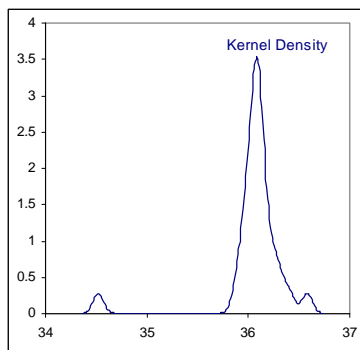
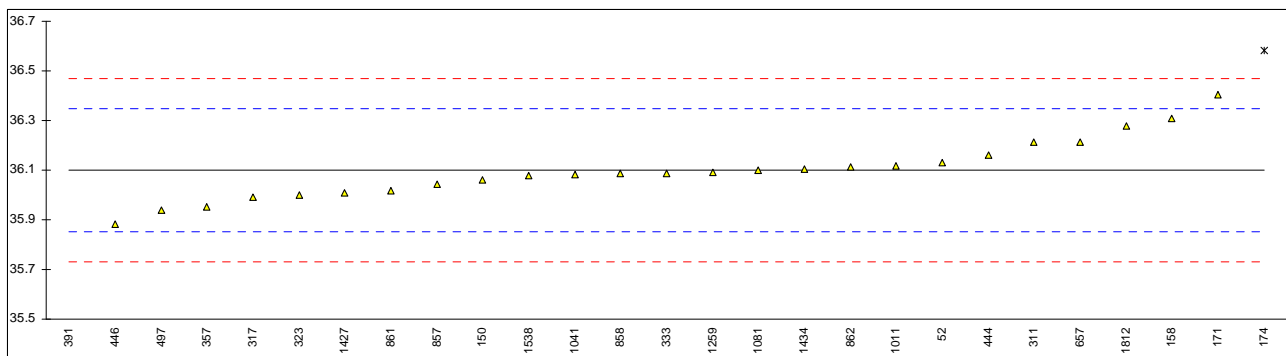
normality not OK
n 20
outliers 1
mean (n) 0.0043
st.dev. (n) 0.00053
R(calc.) 0.0015
R(D2360:11) 0.0010



Determination of p-Xylene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	36.13		0.25	
150	D6563	36.06		-0.32	
158	D5917	36.31		1.71	
171	D5917	36.406		2.49	
174	D2360	36.581	C,G(0.05)	3.91	first reported 37.480
311	D2306	36.212		0.92	
317	D6563	35.99		-0.88	
323	D6563	36.00		-0.80	
333	D3797	36.089		-0.08	
342		-----		-----	
357	D6563	35.953		-1.18	
391		34.52	G(0.01)	-12.79	
444	D6563	36.1624		0.51	
446	D6563	35.881		-1.77	
497	INH-1460	35.9402		-1.29	
557		-----		-----	
657	D6563	36.2137		0.93	
857	D6563	36.042		-0.46	
858	D6563	36.086		-0.10	
861	D6563	36.019		-0.65	
862	D6563	36.114		0.12	
913		-----		-----	
1011	D2306	36.1195		0.17	
1041	D6563	36.081		-0.15	
1081	D6563	36.1		0.01	
1259	D6563	36.09		-0.07	
1427	D5917	36.010		-0.72	
1434	D4492	36.1048		0.05	
1538	D2360	36.08		-0.15	
1653		-----		-----	
1812	D6563	36.280		1.47	
1866		-----		-----	

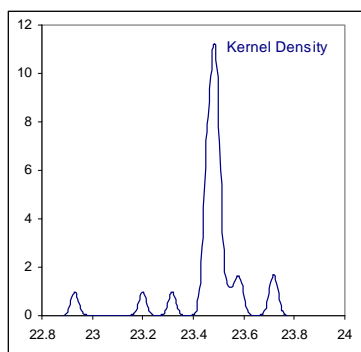
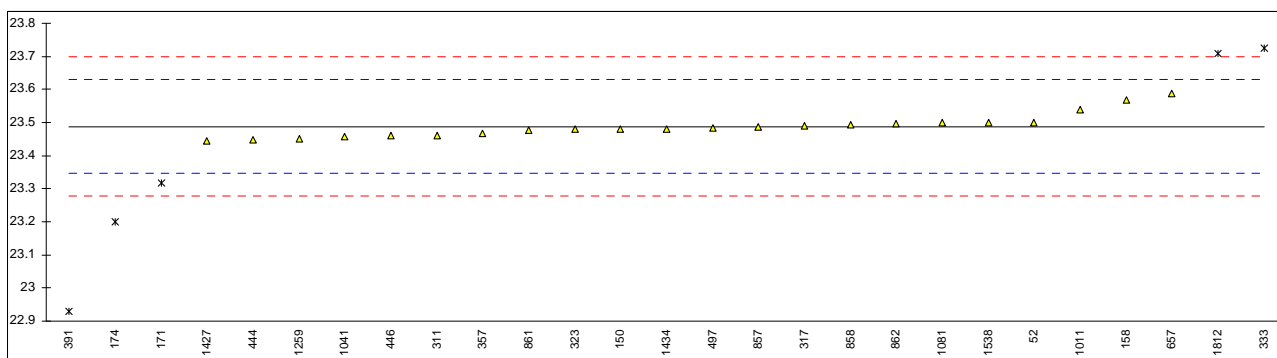
normality OK
n 25
outliers 2
mean (n) 36.0989
st.dev. (n) 0.11885
R(calc.) 0.3328
R(D6563:11a) 0.3456



Determination of m-Xylene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	23.50		0.16	
150	D6563	23.48		-0.12	
158	D5917	23.57		1.16	
171	D5917	23.316	G(0.01)	-2.46	
174	D2360	23.199	C,G(0.05)	-4.12	first reported 22.302
311	D2306	23.462		-0.38	
317	D6563	23.49		0.02	
323	D6563	23.48		-0.12	
333	D3797	23.726	DG(0.01)	3.38	
342		-----		-----	
357	D6563	23.466		-0.32	
391		22.93	G(0.01)	-7.96	
444	D6563	23.4490		-0.56	
446	D6563	23.462		-0.38	
497	INH-1460	23.4845		-0.06	
557		-----		-----	
657	D6563	23.5876		1.41	
857	D6563	23.486		-0.04	
858	D6563	23.492		0.05	
861	D6563	23.476		-0.18	
862	D6563	23.496		0.11	
913		-----		-----	
1011	D2306	23.5375		0.70	
1041	D6563	23.456		-0.46	
1081	D6563	23.5		0.16	
1259	D6563	23.45		-0.55	
1427	D5917	23.443		-0.65	
1434	D4492	23.4804		-0.12	
1538	D2360	23.50		0.16	
1653		-----		-----	
1812	D6563	23.710	DG(0.01)	3.15	
1866		-----		-----	

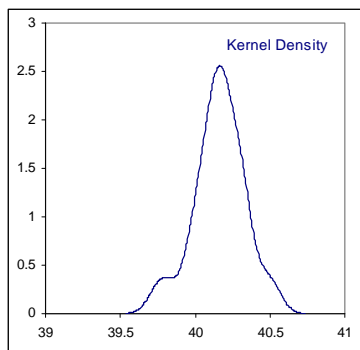
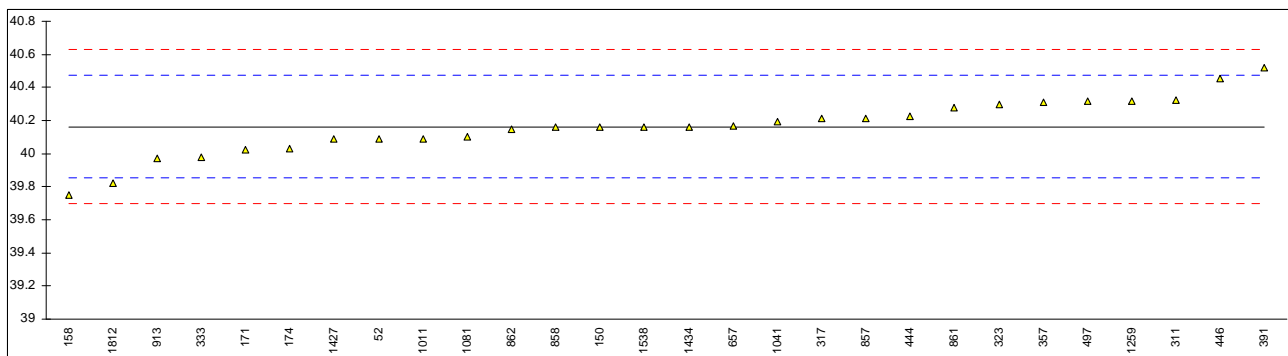
normality not OK
n 22
outliers 5
mean (n) 23.4885
st.dev. (n) 0.03638
R(calc.) 0.1019
R(D6563:11a) 0.1966



Determination of o-Xylene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	40.09		-0.47	
150	D6563	40.16		-0.02	
158	D5917	39.75		-2.66	
171	D5917	40.022		-0.91	
174	D2360	40.031		-0.85	
311	D2306	40.326		1.05	
317	D6563	40.21		0.30	
323	D6563	40.30		0.88	
333	D3797	39.977		-1.20	
342		-----		-----	
357	D6563	40.309		0.94	
391		40.52		2.30	
444	D6563	40.2253		0.40	
446	D6563	40.455		1.88	
497	INH-1460	40.3181		1.00	
557		-----		-----	
657	D6563	40.1665		0.02	
857	D6563	40.213		0.32	
858	D6563	40.159		-0.03	
861	D6563	40.279		0.75	
862	D6563	40.149		-0.09	
913	D2360	39.97		-1.24	
1011	D2306	40.0900		-0.47	
1041	D6563	40.191		0.18	
1081	D6563	40.1		-0.41	
1259	D6563	40.32		1.01	
1427	D5917	40.088		-0.48	
1434	D4492	40.1627		0.00	
1538	D2360	40.16		-0.02	
1653		-----		-----	
1812	D6563	39.820		-2.21	
1866		-----		-----	

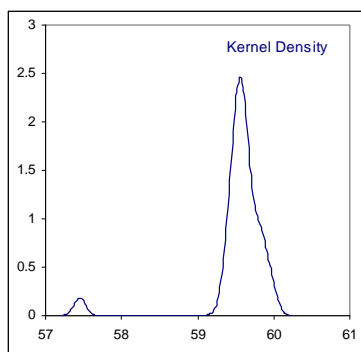
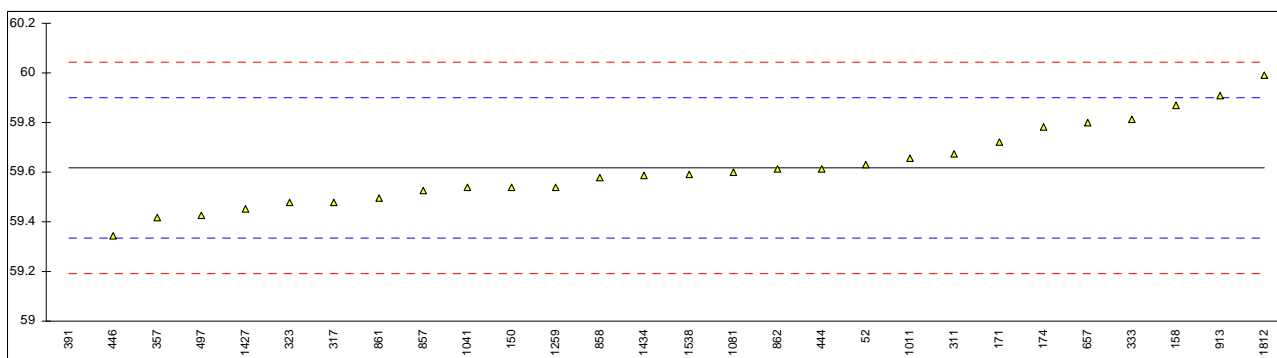
normality OK
n 28
outliers 0
mean (n) 40.1629
st.dev. (n) 0.16874
R(calc.) 0.4725
R(D6563:11a) 0.4347



Determination of Sum m+p-Xylene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	59.63		0.09	
150	D6563	59.54		-0.54	
158	D5917	59.87	C	1.78	reported 29.87 which was an obvious typing error
171	D5917	59.722		0.74	
174	D2360	59.782		1.16	
311	D2306	59.674		0.40	
317	D6563	59.48		-0.97	
323	D6563	59.48		-0.97	
333	D3797	59.815		1.39	
342		-----		-----	
357		59.419		-1.40	
391		57.45	G(0.01)	-15.26	
444	D6563	59.6114		-0.04	
446	D6563	59.343	C	-1.93	first reported 76.336
497	INH-1460	59.4247		-1.36	
557		-----		-----	
657	D6563	59.8013		1.30	
857	D6563	59.528		-0.63	
858	D6563	59.578		-0.28	
861	D6563	59.495		-0.86	
862	D6563	59.611		-0.04	
913	D2360	59.91		2.06	
1011	D2306	59.6570		0.28	
1041	D6563	59.537		-0.57	
1081	D6563	59.6		-0.12	
1259	D6563	59.54		-0.54	
1427	D5917	59.453		-1.16	
1434	D4492	59.5852		-0.23	
1538	D2360	59.59		-0.19	
1653		-----		-----	
1812	D6563	59.990		2.62	
1866		-----		-----	

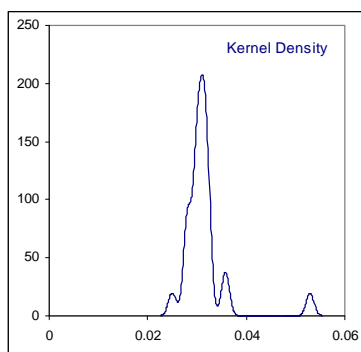
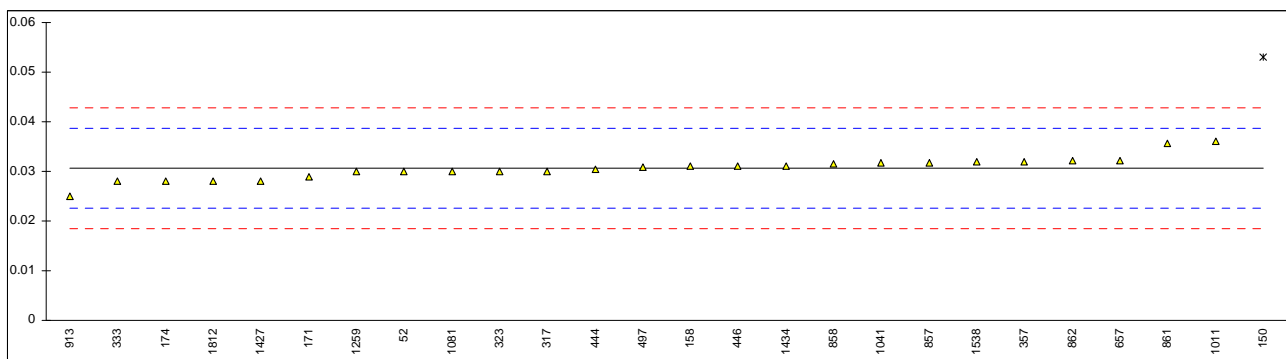
normality OK
n 27
outliers 1
mean (n) 59.6173
st.dev. (n) 0.16002
R(calc.) 0.4481
R(D6563:11a) 0.3976



Determination of Ethylbenzene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.03		-0.15	
150	D2360	0.053	C,G(0.01)	5.52	first reported 0.06
158	D5917	0.031		0.09	
171	D5917	0.029		-0.40	
174	D2360	0.028		-0.65	
311	D2306	<0.01		<-5.09	false negative test result?
317	D6563	0.03		-0.15	
323	D6563	0.03		-0.15	
333	D3797	0.028		-0.65	
342		----		----	
357	D6563	0.032		0.34	
391		----		----	
444	D6563	0.0304		-0.05	
446	D6563	0.031		0.09	
497	INH-1460	0.0309		0.07	
557		----		----	
657	D2360	0.0322		0.39	
857	D2360	0.0317		0.27	
858	D2360	0.0316		0.24	
861	D2360	0.0356		1.23	
862	D2360	0.0322		0.39	
913	D2360	0.0250		-1.39	
1011	D2306	0.0360		1.33	
1041	in house	0.0317		0.27	
1081	D6563	0.03		-0.15	
1259	D6563	0.03		-0.15	
1427	D5917	0.028		-0.65	
1434	D4492	0.0311		0.12	
1538	D2360	0.032		0.34	
1653		----		----	
1812	D6563	0.028		-0.65	
1866		----		----	

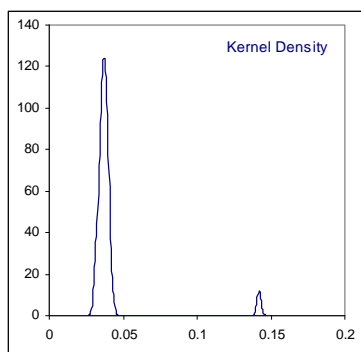
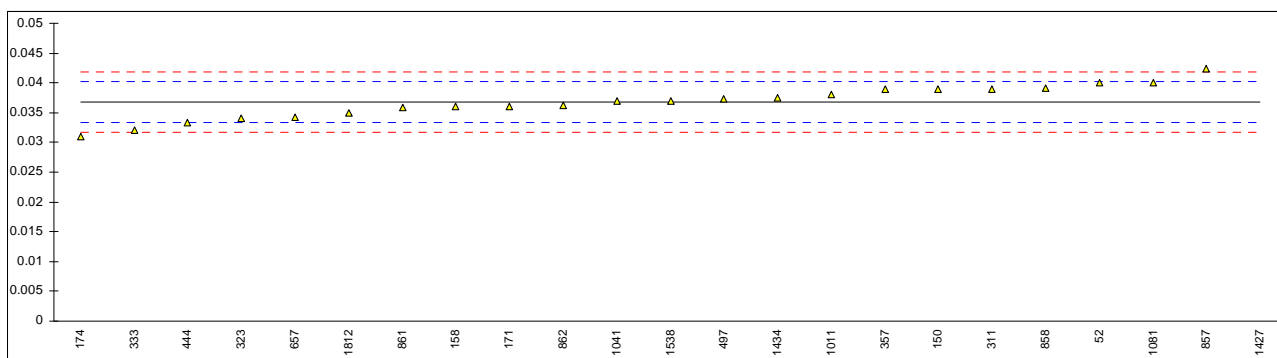
normality OK
n 25
outliers 1
mean (n) 0.0306
st.dev. (n) 0.00233
R(calc.) 0.0065
R(D6563:11a) 0.0113



Determination of Cumene on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.04		1.89	
150	D2360	0.039		1.30	
158	D5917	0.036		-0.45	
171	D5917	0.036		-0.45	
174	D2360	0.031		-3.38	
311	D2360	0.039		1.30	
317		----		----	
323	D2360	0.034		-1.62	
333	D2360	0.032		-2.80	
342		----		----	
357	D6563	0.039		1.30	
391		----		----	
444	D6563Mod.	0.0333		-2.03	
446		----		----	
497	INH-1460	0.0373		0.31	
557		----		----	
657	D2360	0.0343		-1.45	
857	D2360	0.0424		3.30	
858	D2360	0.0392		1.42	
861	D2360	0.0358		-0.57	
862	D2360	0.0363		-0.28	
913		----		----	
1011	D2306	0.0380		0.72	
1041	in house	0.0369		0.07	
1081	D6563	0.04		1.89	
1259		----		----	
1427	D5917	0.142	G(0.01)	61.63	
1434	D4492	0.0375		0.43	
1538	D2360	0.037		0.13	
1653		----		----	
1812	D6563	0.035		-1.04	
1866		----		----	

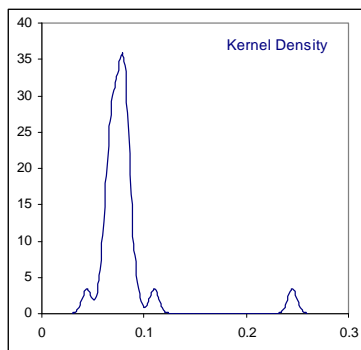
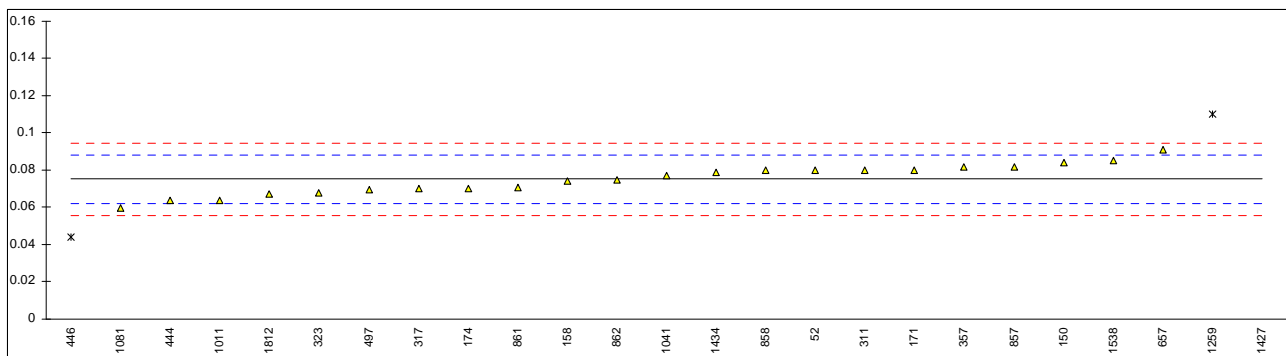
normality OK
n 22
outliers 1
mean (n) 0.0368
st.dev. (n) 0.00279
R(calc.) 0.0078
R(D2360:11) 0.0048



Determination of Sum of C9+ aromatics on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.08		0.76	
150	D6563	0.084		1.38	
158	D5917	0.074		-0.17	
171	D5917	0.080		0.76	
174	D6563	0.0702	C	-0.76	first reported 0.028
311	D2360	0.080		0.76	
317	D6563	0.07	C	-0.79	first reported 0.12
323	D2360	0.068		-1.10	
333		----		----	
342		----		----	
357	D6563	0.082		1.07	
391		----		----	
444	D6563	0.0637		-1.76	
446	D6563	0.044	G(0.05)	-4.81	
497	INH-1460	0.0695		-0.86	
557		----		----	
657	D6563	0.0910		2.47	
857	D6563	0.082		1.07	
858	D6563	0.0798		0.73	
861	D6563	0.071		-0.63	
862	D6563	0.0748		-0.04	
913		----		----	
1011	D2306	0.0640	C	-1.72	first reported 0.0260
1041	D6563	0.077		0.30	
1081	D6563	0.06		-2.34	
1259	D6563	0.11	G(0.05)	5.41	
1427	D5917	0.245	G(0.01)	26.33	
1434	D4492	0.0786		0.55	
1538	D2360	0.085		1.54	
1653		----		----	
1812	D6563	0.067		-1.25	
1866		----		----	

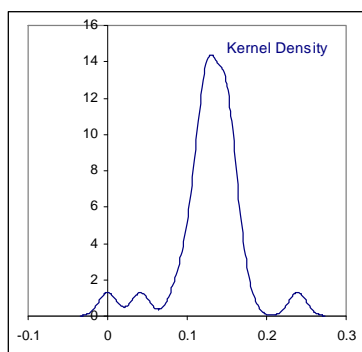
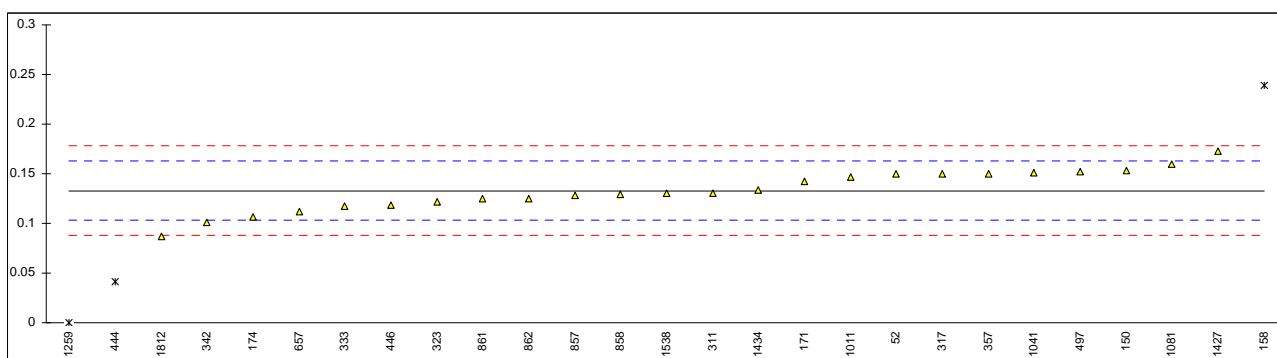
normality OK
n 22
outliers 3
mean (n) 0.0751
st.dev. (n) 0.00796
R(calc.) 0.0223
R(D6563:11a) 0.0181



Determination of Nonaromatics on sample #11072; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.15		1.11	
150	D2360	0.153		1.31	
158	D5917	0.239	G(0.05)	6.99	
171	D5917	0.142		0.59	
174	D2360	0.107		-1.72	
311	D2360	0.130		-0.21	
317	D6563	0.15		1.11	
323	D2360	0.122		-0.73	
333	D2360	0.117		-1.06	
342	D2360	0.1012		-2.11	
357	D6563	0.150		1.11	
391		----		----	
444	D6563	0.0415	G(0.01)	-6.05	
446	D6563	0.118		-1.00	
497	INH-1460	0.1524		1.27	
557		----		----	
657	D2360	0.1120		-1.39	
857	D2360	0.1281		-0.33	
858	D2360	0.129		-0.27	
861	D2360	0.125		-0.54	
862	D6563	0.1253		-0.52	
913		----		----	
1011	D2306	0.1470		0.92	
1041	in house	0.1516		1.22	
1081	D6563	0.16		1.78	
1259	D6563	0.00	ex	-8.79	test result excluded: zero is not a real value
1427	D5917	0.173		2.63	
1434	D4492	0.1342		0.07	
1538	D2360	0.130		-0.21	
1653		----		----	
1812	D6563	0.087		-3.05	
1866		----		----	

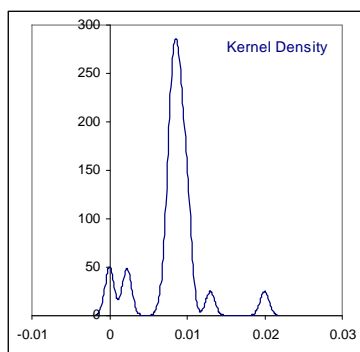
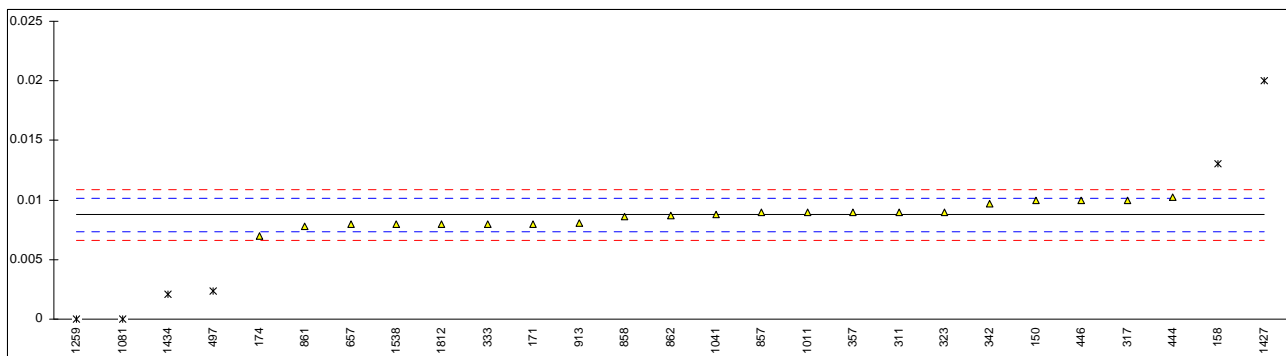
normality OK
n 24
outliers 2
mean (n) 0.1331
st.dev. (n) 0.02046
R(calc.) 0.0573
R(D2360:11) 0.0424



Determination of Benzene on sample #11073; results in %M/M

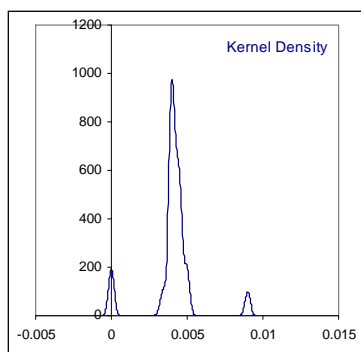
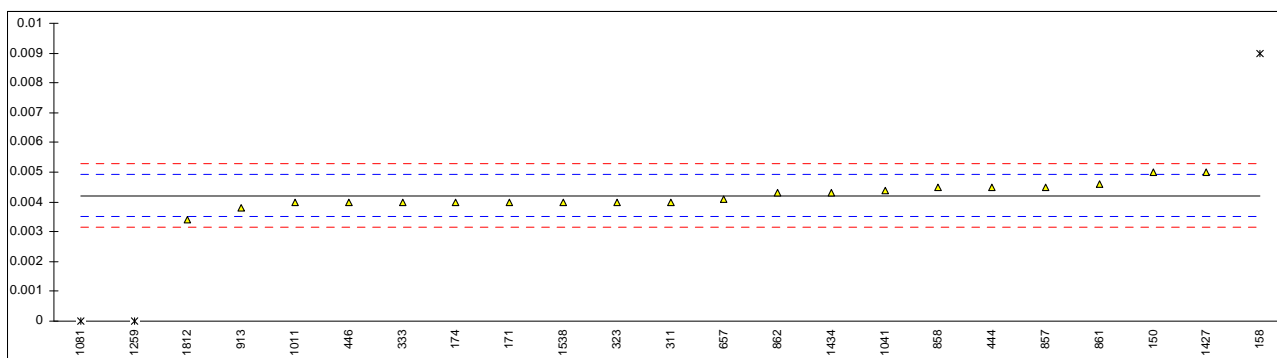
lab	method	value	mark	z(targ)	remarks
52	D7504	<0.01		-----	
150	D2360	0.010		1.74	
158	D5917	0.013	G(0.01)	5.94	
171	D5917	0.008		-1.06	
174	D2360	0.007		-2.46	
311	D2360	0.009		0.34	
317	D6563	0.01		1.74	
323	D2360	0.009		0.34	
333	D2360	0.008		-1.06	
342	D2360	0.0097		1.32	
357	D6563	0.009		0.34	
391		-----		-----	
444	D6563	0.0102		2.02	
446	D6563	0.010	C	1.74	first reported 0.004
497	INH-1460	0.0024	G(0.01)	-8.89	
557		-----		-----	
657	D2360	0.0080		-1.06	
857	D2360	0.0090		0.34	
858	D2360	0.0086		-0.22	
861	D2360	0.0078		-1.34	
862	D2360	0.0087		-0.08	
913	D2360	0.0081		-0.92	
1011	D2306	0.0090		0.34	
1041	in house	0.0088		0.06	
1081	D6563	0.0	ex	-12.25	test result excluded: zero is not a real value
1259	D6563	0.00	ex	-12.25	test result excluded: zero is not a real value
1427	D5917	0.020	G(0.01)	15.73	
1434	D4492	0.0021	G(0.05)	-9.31	
1538	D2360	0.008		-1.06	
1653		-----		-----	
1812	D2360	0.0080		-1.06	
1866		-----		-----	

normality OK
n 21
outliers 4
mean (n) 0.0088
st.dev. (n) 0.00087
R(calc.) 0.0024
R(Horwitz) 0.0020



Determination of Toluene on sample #11073; results in %M/M

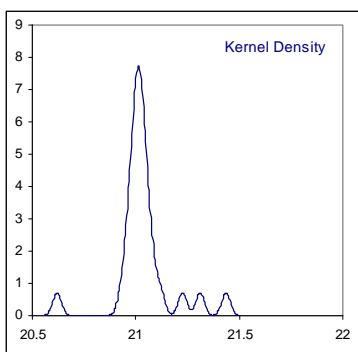
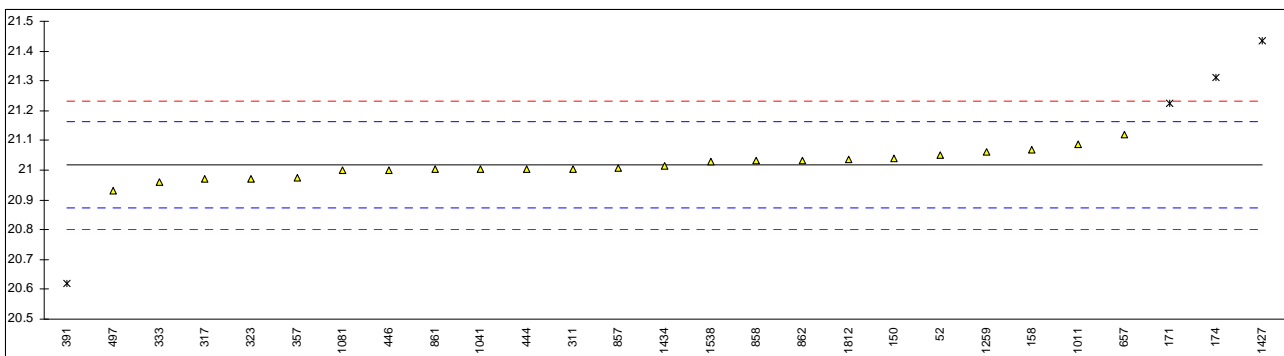
lab	method	value	mark	z(targ)	remarks
52	D7504	<0.01		-----	
150	D2360	0.005		2.19	
158	D5917	0.009	G(0.01)	13.45	
171	D5917	0.004		-0.62	
174	D2360	0.004	C	-0.62	first reported 0.003
311	D2360	0.004		-0.62	
317	D6563	<0.01		-----	
323	D2360	0.004		-0.62	
333	D2360	0.004		-0.62	
342		-----		-----	
357	D6563	<0.01		-----	
391		-----		-----	
444	D6563	0.0045		0.79	
446	D6563	0.004	C	-0.62	first reported 0.008
497	INH-1460	<0.0010		<-9.06	
557		-----		-----	
657	D2360	0.0041		-0.34	
857	D2360	0.00451		0.81	
858	D2360	0.0045		0.79	
861	D2360	0.0046		1.07	
862	D2360	0.0043		0.22	
913	D2360	0.0038		-1.18	
1011	D2306	0.0040		-0.62	
1041	in house	0.0044		0.51	
1081	D6563	0.0	ex	-11.88	test result excluded: zero is not a real value
1259	D6563	0.00	ex	-11.88	test result excluded: zero is not a real value
1427	D5917	0.005		2.19	
1434	D4492	0.0043		0.22	
1538	D2360	0.004		-0.62	
1653		-----		-----	
1812	D2360	0.0034		-2.31	
1866		-----		-----	
normality		not OK			
n		20			
outliers		1			
mean (n)		0.0042			
st.dev. (n)		0.00039			
R(calc.)		0.0011			
R(D2360:11)		0.0010			



Determination of p-Xylene on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	21.05		0.45	
150	D6563	21.04		0.31	
158	D5917	21.07		0.73	
171	D5917	21.226	G(0.01)	2.90	
174	D2360	21.311	C,G(0.01)	4.08	first reported 22.704
311	D2306	21.004		-0.19	
317	D6563	20.97		-0.66	
323	D6563	20.97		-0.66	
333	D3797	20.961		-0.79	
342		-----		-----	
357	D6563	20.973		-0.62	
391		20.62	G(0.05)	-5.53	
444	D6563	21.0031		-0.20	
446	D6563	21.001	C	-0.23	first reported 30.101
497	INH-1460	20.9324		-1.18	
557		-----		-----	
657	D6563	21.1203		1.43	
857	D6563	21.008		-0.13	
858	D6563	21.032		0.20	
861	D6563	21.003		-0.20	
862	D6563	21.034		0.23	
913		-----		-----	
1011	D2306	21.0865		0.96	
1041	D6563	21.003		-0.20	
1081	D6563	21.0		-0.24	
1259	D6563	21.06		0.59	
1427	D5917	21.436	G(0.05)	5.82	
1434	D4492	21.016		-0.02	
1538	D2360	21.03		0.17	
1653		-----		-----	
1812	D6563	21.036		0.26	
1866		-----		-----	

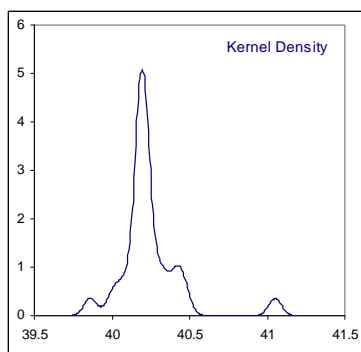
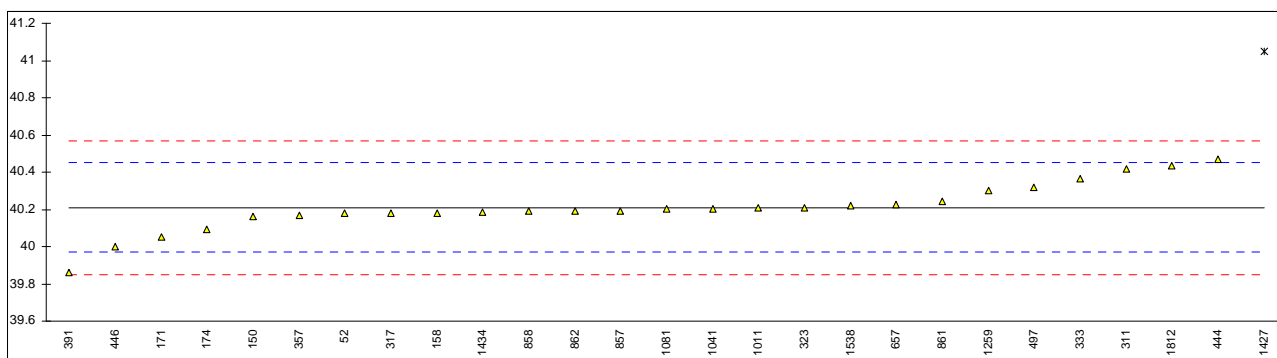
normality OK
n 23
outliers 4
mean (n) 21.0175
st.dev. (n) 0.04309
R(calc.) 0.1206
R(D6563:11a) 0.2012



Determination of m-Xylene on sample #11073; results in %M/M

lab	method	value	mark	z(target)	remarks
52	D7504	40.18		-0.25	
150	D6563	40.16		-0.41	
158	D5917	40.18		-0.25	
171	D5917	40.051		-1.32	
174	D2360	40.095	C	-0.95	first reported 38.702
311	D2306	40.417		1.73	
317	D6563	40.18		-0.25	
323	D6563	40.21		0.00	
333	D3797	40.365		1.29	
342		-----		-----	
357	D6563	40.168		-0.35	
391		39.86		-2.91	
444	D6563	40.4708		2.17	
446	D6563	39.998	C	-1.76	first reported 24.173
497	INH-1460	40.3189		0.91	
557		-----		-----	
657	D6563	40.2260		0.14	
857	D6563	40.192		-0.15	
858	D6563	40.189		-0.17	
861	D6563	40.245		0.29	
862	D6563	40.192		-0.15	
913		-----		-----	
1011	D2306	40.2060		-0.03	
1041	D6563	40.204		-0.05	
1081	D6563	40.2		-0.08	
1259	D6563	40.30		0.75	
1427	D5917	41.051	G(0.01)	7.00	
1434	D4492	40.1874		-0.18	
1538	D2360	40.22		0.09	
1653		-----		-----	
1812	D6563	40.435		1.88	
1866		-----		-----	

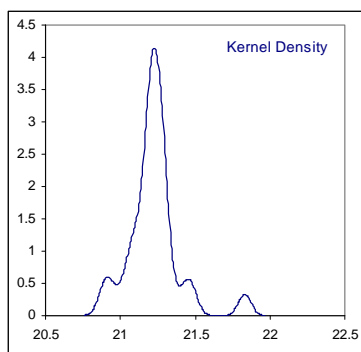
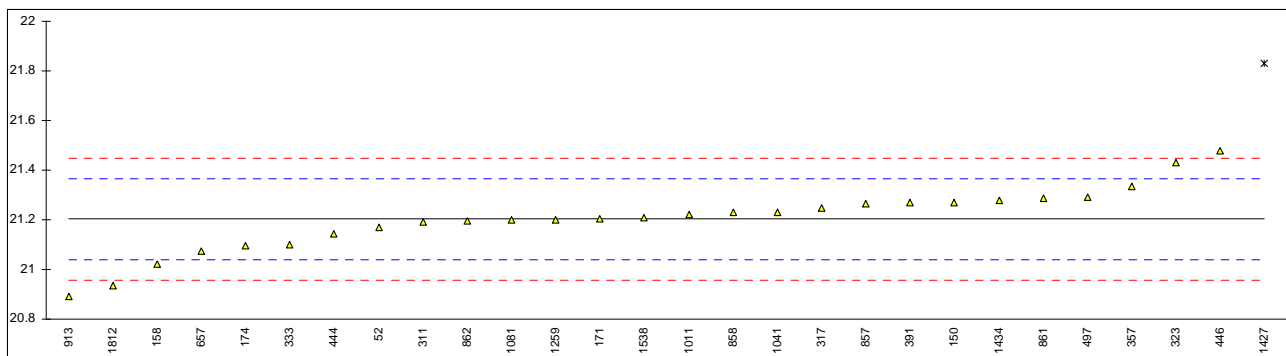
normality not OK
n 26
outliers 1
mean (n) 40.2096
st.dev. (n) 0.12988
R(calc.) 0.3637
R(D6563:11a) 0.3365



Determination of o-Xylene on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	21.17		-0.40	
150	D6563	21.27		0.82	
158	D5917	21.02		-2.23	
171	D5917	21.206		0.04	
174	D2360	21.095		-1.31	
311	D2306	21.193		-0.12	
317	D6563	21.25		0.58	
323	D6563	21.43		2.78	
333	D3797	21.102		-1.23	
342		-----		-----	
357	D6563	21.333		1.59	
391		21.27		0.82	
444	D6563	21.1450		-0.70	
446	D6563	21.4795	C	3.38	first reported 31.462
497	INH-1460	21.2913		1.08	
557		-----		-----	
657	D6563	21.0732		-1.58	
857	D6563	21.265		0.77	
858	D6563	21.229		0.32	
861	D6563	21.285		1.01	
862	D6563	21.194		-0.10	
913	D2360	20.89		-3.81	
1011	D2306	21.2220		0.24	
1041	D6563	21.232		0.36	
1081	D6563	21.2		-0.03	
1259	D6563	21.20		-0.03	
1427	D5917	21.832	G(0.01)	7.68	
1434	D4492	21.279		0.93	
1538	D2360	21.21		0.09	
1653		-----		-----	
1812	D6563	20.933		-3.29	
1866		-----		-----	

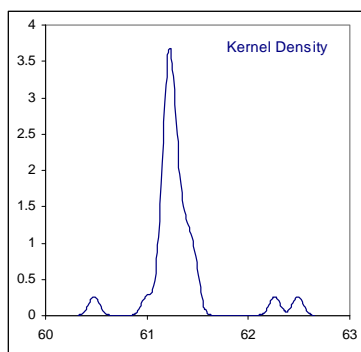
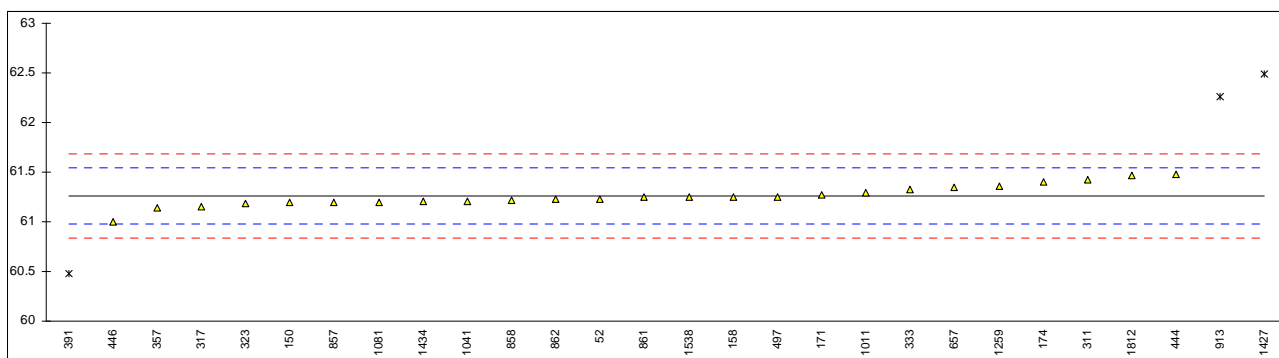
normality not OK
n 27
outliers 1
mean (n) 21.2025
st.dev. (n) 0.12859
R(calc.) 0.3600
R(D6563:11a) 0.2295



Determination of Sum m+p-Xylene on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	61.23		-0.22	
150	D6563	61.20		-0.44	
158	D5917	61.25		-0.08	
171	D5917	61.277		0.11	
174	D2360	61.406		1.03	
311	D2306	61.421		1.14	
317	D6563	61.15		-0.79	
323	D6563	61.18		-0.58	
333	D3797	61.326		0.46	
342		-----		-----	
357	D6563	61.141		-0.86	
391		60.48	G(0.05)	-5.58	
444	D6563	61.4739		1.52	
446	D6563	60.999	C	-1.87	first reported 61.563
497	INH-1460	61.2513		-0.07	
557		-----		-----	
657	D6563	61.3463		0.61	
857	D6563	61.200		-0.44	
858	D6563	61.221		-0.29	
861	D6563	61.248		-0.09	
862	D6563	61.226		-0.25	
913	D2360	62.26	G(0.01)	7.13	
1011	D2306	61.2925		0.22	
1041	D6563	61.207		-0.39	
1081	D6563	61.2		-0.44	
1259	D6563	61.36		0.71	
1427	D5917	62.487	G(0.01)	8.75	
1434	D4492	61.2034		-0.41	
1538	D2360	61.25		-0.08	
1653		-----		-----	
1812	D6563	61.471		1.50	
1866		-----		-----	

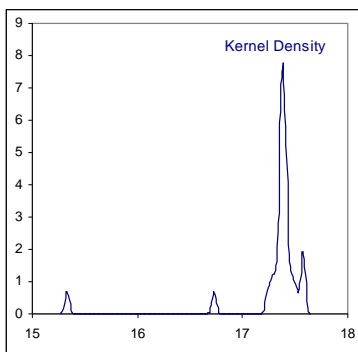
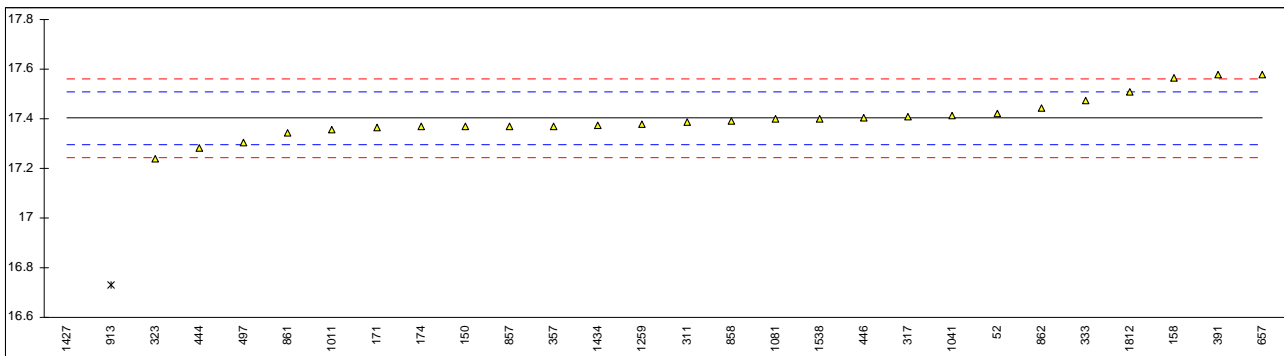
normality OK
n 25
outliers 3
mean (n) 61.2612
st.dev. (n) 0.10844
R(calc.) 0.3036
R(D6563:11a) 0.3921



Determination of Ethylbenzene on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	17.42		0.30	
150	D2360	17.37		-0.64	
158	D5917	17.565		3.04	
171	D5917	17.366		-0.71	
174	D2360	17.369		-0.66	
311	D2306	17.387		-0.32	
317	D6563	17.41		0.12	
323	D6563	17.24		-3.09	
333	D3797	17.473		1.30	
342		-----		-----	
357	D6563	17.371		-0.62	
391		17.58		3.32	
444	D6563	17.2809		-2.32	
446	D6563	17.4056	C	0.03	first reported 14.087
497	INH-1460	17.3042		-1.88	
557		-----		-----	
657	D6563	17.5804		3.33	
857	D6563	17.37		-0.64	
858	D6563	17.391		-0.24	
861	D6563	17.343		-1.15	
862	D6563	17.442		0.72	
913	D2360	16.73	G(0.01)	-12.71	
1011	D2306	17.3555		-0.91	
1041	D6563	17.415		0.21	
1081	D6563	17.4		-0.07	
1259	D6563	17.38		-0.45	
1427	D5917	15.330	G(0.01)	-39.10	
1434	D4492	17.375		-0.54	
1538	D2360	17.40		-0.07	
1653		-----		-----	
1812	D6563	17.507		1.94	
1866		-----		-----	

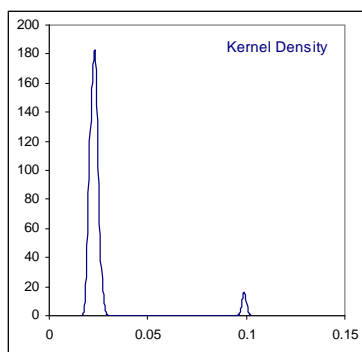
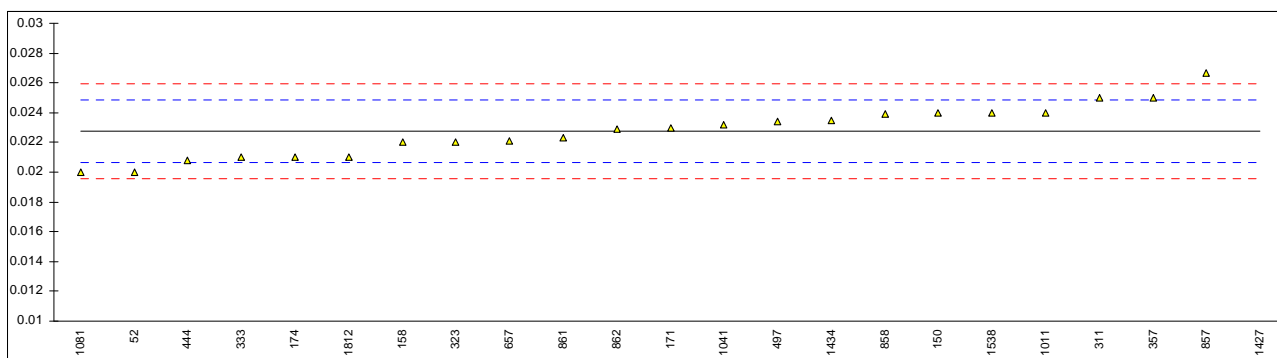
normality not OK
n 26
outliers 2
mean (n) 17.4039
st.dev. (n) 0.08278
R(calc.) 0.2318
R(D6563:11a) 0.1485



Determination of Cumene on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.02		-2.61	
150	D2360	0.024		1.17	
158	D5917	0.022		-0.72	
171	D5917	0.023		0.22	
174	D2360	0.021		-1.67	
311	D2360	0.025		2.12	
317		-----		-----	
323	D2360	0.022		-0.72	
333	D2360	0.021		-1.67	
342		-----		-----	
357	D6563	0.025		2.12	
391		-----		-----	
444	D6563Mod.	0.0208		-1.86	
446		-----		-----	
497	INH-1460	0.0234		0.60	
557		-----		-----	
657	D2360	0.0221		-0.63	
857	D2360	0.0267		3.72	
858	D2360	0.0239		1.08	
861	D2360	0.0223		-0.44	
862	D2360	0.0229		0.13	
913		-----		-----	
1011	D2306	0.0240		1.17	
1041	in house	0.0232		0.41	
1081	D6563	0.02		-2.61	
1259		-----		-----	
1427	D5917	0.099	G(0.01)	72.13	
1434	D4492	0.0235		0.70	
1538	D2360	0.024		1.17	
1653		-----		-----	
1812	D6563	0.021		-1.67	
1866		-----		-----	

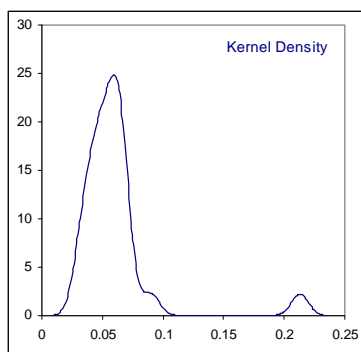
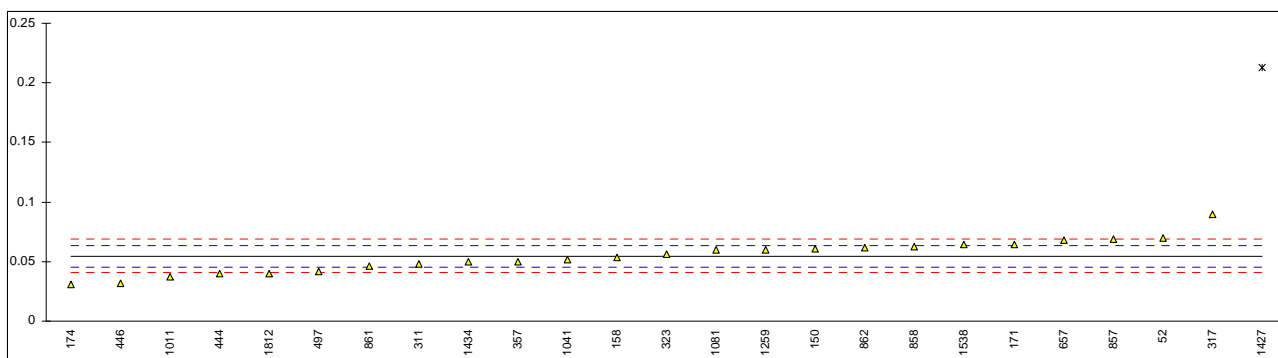
normality OK
n 22
outliers 1
mean (n) 0.0228
st.dev. (n) 0.00173
R(calc.) 0.0048
R(D2360:11) 0.0030



Determination of Sum of C9+ aromatics on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.07		3.33	
150	D6563	0.061		1.41	
158	D5917	0.053		-0.30	
171	D5917	0.064		2.05	
174	D6563	0.031		-5.01	
311	D2360	0.048		-1.37	
317	D6563	0.09		7.60	
323	D2360	0.056		0.34	
333		----		----	
342		----		----	
357	D6563	0.050		-0.95	
391		----		----	
444	D6563	0.0400		-3.08	
446	D6563	0.032	C	-4.79	first reported 0.070
497	INH-1460	0.0415		-2.76	
557		----		----	
657	D6563	0.0680		2.90	
857	D6563	0.069		3.11	
858	D6563	0.06273		1.77	
861	D6563	0.046		-1.80	
862	D6563	0.0617		1.55	
913		----		----	
1011	D2306	0.0370	C	-3.72	first reported 0.0130 (excl. cumene)
1041	D6563	0.0517		-0.58	
1081	D6563	0.06		1.19	
1259	D6563	0.06		1.19	
1427	D5917	0.213	G(0.01)	33.89	
1434	D4492	0.0496		-1.03	
1538	D2360	0.064		2.05	
1653		----		----	
1812	D6563	0.040		-3.08	
1866		----		----	

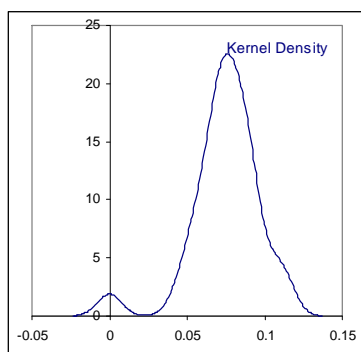
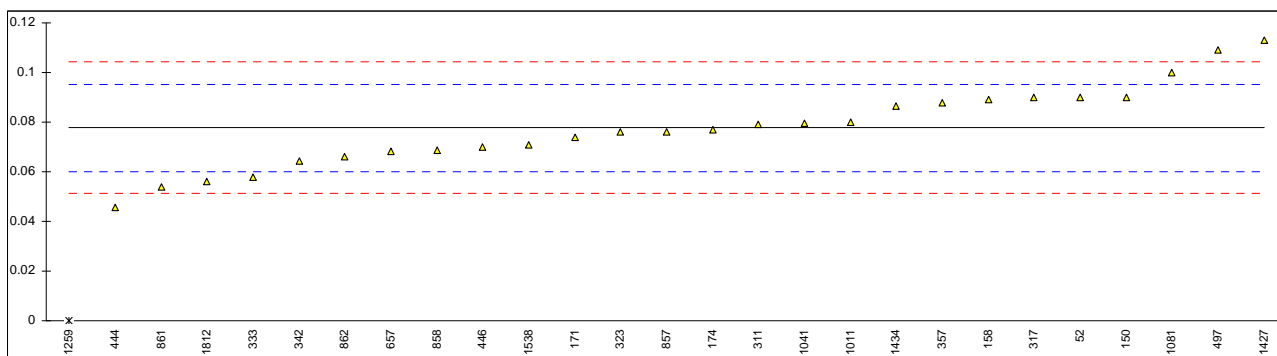
normality OK
n 24
outliers 1
mean (n) 0.0544
st.dev. (n) 0.01386
R(calc.) 0.0388
R(D6563:11a) 0.0131



Determination of Nonaromatics on sample #11073; results in %M/M

lab	method	value	mark	z(targ)	remarks
52	D7504	0.09		1.40	
150	D2360	0.090		1.40	
158	D5917	0.089		1.28	
171	D5917	0.074		-0.41	
174	D2360	0.077		-0.07	
311	D2360	0.079		0.15	
317	D6563	0.09		1.40	
323	D2360	0.076		-0.19	
333	D2360	0.058		-2.23	
342	D2360	0.0643		-1.51	
357	D6563	0.088		1.17	
391		-----		-----	
444	D6563	0.0457		-3.62	
446	D6563	0.070	C	-0.87	first reported 0.095
497	INH-1460	0.1092		3.57	
557		-----		-----	
657	D2360	0.0681		-1.08	
857	D2360	0.0761		-0.18	
858	D2360	0.0686		-1.03	
861	D2360	0.054		-2.68	
862	D6563	0.0663		-1.29	
913		-----		-----	
1011	D2306	0.0800		0.26	
1041	in house	0.0795		0.21	
1081	D6563	0.1		2.53	
1259	D6563	0.00	ex	-8.79	test result excluded: zero is not a real value
1427	D5917	0.113		4.00	
1434	D4492	0.0864		0.99	
1538	D2360	0.071		-0.75	
1653		-----		-----	
1812	D6563	0.056		-2.45	
1866		-----		-----	

normality OK
n 26
outliers 0
mean (n) 0.0777
st.dev. (n) 0.01620
R(calc.) 0.0454
R(D2360:11) 0.0247



APPENDIX 2

Number of participants per country

1 lab in BELGIUM
2 labs in BRAZIL
1 lab in CANADA
1 lab in CROATIA
1 lab in FINLAND
1 lab in FRANCE
3 labs in GERMANY
1 lab in INDIA
1 lab in ISRAEL
1 lab in ITALY
4 labs in P.R. of CHINA
1 lab in POLAND
2 labs in PORTUGAL
1 lab in SAUDI ARABIA
1 lab in SINGAPORE
1 lab in SPAIN
3 labs in THE NETHERLANDS
4 labs in U.S.A.
2 labs in UNITED KINGDOM

APPENDIX 3

Abbreviations:

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

Literature:

- 1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, January 2010
- 2 ASTM E178-89
- 3 ASTM E1301-89
- 4 ISO 5725-86
- 5 ISO 5725, parts 1-6, 1994
- 6 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
- 7 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
- 8 IP 367/84
- 9 DIN 38402 T41/42
- 10 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
- 11 J.N. Miller, Analyst, 118, 455, (1993)
- 12 Analytical Methods Committee Technical brief, 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/>).