Institute for
Interlaboratory Studies

Results of Proficiency Test
Refinery Gas
February 2023

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

Since 2022 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Refinery Gas based on the scope of the latest version of EN15984 every year. During the annual proficiency testing program 2022/2023 it was decided to continue the round robin for the analysis of Refinery Gas.

In this interlaboratory study 23 laboratories in 15 countries registered for participation, see appendix 3 for the number of participants per country. In this report the results of the Refinery Gas proficiency test are presented and discussed. This report is also electronically available through the iis website www.iisnl.com.

2 SET UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organizer of this proficiency test (PT). To optimize the costs for the participating laboratories it was decided to prepare one Refinery Gas mixture. The mixture was divided over a batch of 25 cylinders. The cylinder size is a cost-effective one-liter cylinder. Each cylinder was uniquely numbered and labelled #23015. The limited cylinder size is chosen to optimize transport and handling costs.
Sample analyzes for fit-for-use and homogeneity testing were subcontracted to an ISO/IEC17025 accredited laboratory.
The participants were requested to report rounded and unrounded test results. The unrounded test 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/IEC17043:2010. This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentiality of participant's data. Feedback from the participants on the reported data is encouraged and customer's satisfaction is measured on regular basis by sending out questionnaires.
EffecTech is accredited in conformance with ISO17025:2017 by UKAS (no. 0590).

2.2 PROTOCOL

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5). This protocol is electronically available through the iis website www.iisnl.com, from the FAQ page.

2.3 CONFIDENTIALITY STATEMENT

All data presented in this report must be regarded as confidential and for use by the participating companies only. Disclosure of the information in this report is only allowed by means of the entire report. Use of the contents of this report for third parties is only allowed by written permission of the Institute for Interlaboratory Studies. Disclosure of the identity of one or more of the participating companies will be done only after receipt of a written agreement of the companies involved.

2.4 SAMPLES

One batch of 25 one-liter cylinders with an artificial Refinery Gas mixture was prepared and tested for homogeneity by EffecTech (Uttoxeter, United Kingdom) in conformance with ISO Guide 35 and ISO/IEC17025 (job 22/1524, starting in January 2023). Each cylinder was uniquely numbered and labelled #23015. Every cylinder in the batch was analyzed using replicate measurements. The within bottle and between bottle variations were assessed in accordance with ISO Guide 35. This evaluation showed that all between bottle variations were small compared to the uncertainties on the reference values on each component.

The calculated repeatabilities were calculated per component and compared with 0.3 times the corresponding reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

Component	r (observed) in %mol/mol	0.3 * R (target) in %mol/mol	reference
Hydrogen	0.0989	1.0178	Horwitz
Oxygen/Argon	0.0006	0.0311	EN15984:22
Nitrogen	0.0090	0.1738	EN15984:22
Carbon Monoxide	0.0059	0.0691	EN15984:22
Carbon Dioxide	0.0030	0.0236	EN15984:22
Methane	0.0340	0.2733	EN15984:22
Ethane	0.0115	0.0945	EN15984:22
Ethene	0.0088	0.0374	EN15984:22
Propane	0.0223	0.0712	EN15984:22
Propene	0.0073	0.0286	EN15984:22
iso-Butane	0.0081	0.0343	EN15984:22
n-Butane	0.0066	0.0364	EN15984:22
trans-2-Butene	0.0007	0.0067	Horwitz
1-Butene	0.0007	0.0047	EN15984:22
2-Methyl-Propene	0.0005	0.0048	Horwitz
cis-2-Butene	0.0005	0.0048	Horwitz
iso-Pentane	0.0010	0.0035	EN15984:22
n-Pentane	0.0009	0.0087	EN15984:22

Table 1: evaluation of the repeatabilities of subsamples #23015

The calculated repeatabilities are in agreement with 0.3 times the corresponding reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed. For more details about choice of reference method see paragraph 4.1.

To each of the participating laboratories one 1 L cylinder labelled #23015 was sent on January 25, 2023. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

EffecTech (Uttoxeter, United Kingdom) declares that the prepared gas cylinders have a shelf life of at least 6 months. This is sufficient for the proficiency testing purposes.

2.6 ANALYZES

The participants were requested to determine: Hydrogen, Oxygen/Argon, Nitrogen, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Methane, Ethane, Ethene, Ethyne, Propane, Propene, Propyne, Propadiene, iso-Butane, n-Butane, trans-2-Butene, 1-Butene, 2-Methyl-Propene, cis-2-Butene, 1,3-Butadiene, iso-Pentane, n-Pentane, Other components with C5 or more C atoms (except iso-Pentane and n-Pentane), Carbon content and Lower Calorific Value.

It was explicitly requested to treat the sample as if it was a routine sample and to report the test results using the indicated units on the report form and not to round the test results, but report as much significant figures as possible. It was also requested not to report ‘less than’ test results, which are above the detection limit, because such test results cannot be used for meaningful statistical evaluations.

To get comparable test results a detailed report form and a letter of instructions are prepared. On the report form the reporting units are given as well as the reference test methods (when applicable) that will be used during the evaluation. The detailed report form and the letter of instructions are both made available on the data entry portal www.kpmd.co.uk/sgs-iis/. The participating laboratories are also requested to confirm the sample receipt on this data entry portal. The letter of instructions can also be downloaded from the iis website www.iisnl.com.

3 RESULTS

During five weeks after sample dispatch, the test results of the individual laboratories were gathered via the data entry portal www.kpmd.co.uk/sgs-iis/. The reported test results are tabulated per determination in appendices 1 and 2 of this report. The laboratories are presented by their code numbers.

Directly after the deadline, a reminder was sent to those laboratories that had not reported test results at that moment. Shortly after the deadline, the available test results were screened for suspect data. A test result was called suspect in case the Huber Elimination Rule (a robust outlier test) found it to be an outlier. The laboratories that produced these suspect data were asked to check the reported test results (no reanalyzes).

Additional or corrected test results are used for data analysis and original test results are placed under 'Remarks' in the result tables in appendices 1 and 2. Test results that came in after the deadline were not taken into account in this screening for suspect data and thus these participants were not requested for checks.

3.1 STATISTICS

The protocol followed in the organization of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' of June 2018 (iis-protocol, version 3.5).
For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded test results. Test results reported as '<…' or '>…' were not used in the statistical evaluation.

First, the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test, a variant of the Kolmogorov-Smirnov test and by the calculation of skewness and kurtosis. Evaluation of the three normality indicators in combination with the visual evaluation of the graphic Kernel density plot, lead to judgement of the normality being either 'unknown', 'OK', 'suspect' or 'not OK'. After removal of outliers, this check was repeated. If a data set does not have a normal distribution, the (results of the) statistical evaluation should be used with due care.

The assigned value is determined by consensus based on the test results of the group of participants after rejection of the statistical outliers and/or suspect data.

According to ISO13528 all (original received or corrected) results per determination were submitted to outlier tests. In the iis procedure for proficiency tests, outliers are detected prior to calculation of the mean, standard deviation and reproducibility. For small data sets, Dixon (up to 20 test results) or Grubbs (up to 40 test results) outlier tests can be used. For larger data sets (above 20 test results) Rosner's outlier test can be used. Outliers are marked by D(0.01) for the Dixon's test, by G(0.01) or DG(0.01) for the Grubbs' test and by R(0.01) for the Rosner's test. Stragglers are marked by D(0.05) for the Dixon's test, by G(0.05) or DG(0.05) for the Grubbs' test and by R(0.05) for the Rosner's test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value, the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. In this PT, the criterion of ISO13528, paragraph 9.2.1 was met for all evaluated tests, therefore, the uncertainty of all assigned values may be negligible and need not be included in the PT report.

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

3.2 GRAPHICS

In order to visualize the data against the reproducibilities from literature, Gauss plots were made, using the sorted data for one determination (see appendix 1). On the Y-axis the reported test results are plotted. The corresponding laboratory numbers are on the X-axis. The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected reference test method. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.

Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms. Also, a normal Gauss curve (dotted line) was projected over the Kernel Density Graph (smooth line) for reference. The Gauss curve is calculated from the consensus value and the corresponding standard deviation.

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 (derived from e.g. ISO or ASTM test methods), the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the variation of this interlaboratory study.

The target standard deviation was calculated from the literature reproducibility by division with 2.8. In case no literature reproducibility was available, other target values were used, like Horwitz or an estimated reproducibility based on former iis proficiency tests.

When a laboratory did use a test method with a reproducibility that is significantly different from the reproducibility of the reference test method used in this report, it is strongly advised to recalculate the z-score, while using the reproducibility of the actual test method used, this in order to evaluate whether the reported test result is fit-for-use.

The z-scores were calculated according to:

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

The $z_{(target)}$ scores are listed in the result tables of appendix 1.

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

	$\lvert z \rvert$	< 1	good
1 <	$\lvert z \rvert$	< 2	satisfactory
2 <	$\lvert z \rvert$	< 3	questionable
3 <	$\lvert z \rvert$		unsatisfactory

4 EVALUATION

In this proficiency test no problems were encountered with the dispatch of the samples. One participant reported test results after final reporting date and one other participant did not report any test results. Not all participants were able to report all tests requested.
In total 22 participants reported 420 numerical test results. Observed were 8 outlying test results, which is 1.9%. In proficiency studies outlier percentages of 3% - 7.5% are quite normal.

Not all data sets proved to have a normal Gaussian distribution. These are referred to as “not OK” or “suspect”. The statistical evaluation of these data sets should be used with due care, see also paragraph 3.1.

4.1 EVALUATION PER COMPONENT

In this section the reported test results are discussed per component. The test methods which were used by the various laboratories were taken into account for explaining the observed differences when possible and applicable. These test methods are also in the tables together with the original data in appendix 1. The abbreviations, used in these tables, are explained in appendix 4.

Test method EN15984 is used to evaluate the performance of the test results for Refinery Gas. The method version of 2017 describes only precision data for Carbon content and Lower Calorific Value. In February of 2022 a new version of this method was published. The precision data for the parameters Carbon content and Lower Calorific Value remained the same. Precision data for most of the components appeared to have been added to the test method in an informative annex. It was decided to use these published precision data for the evaluation of the components, except for Hydrogen. The mean of Hydrogen is far out of the application range mentioned in test method EN15984. For the components trans-2-Butene, 2-Methyl-Propene and cis-2-Butene no precision data was given in test method EN15984. Therefore, the estimated reproducibility calculated by the Horwitz equation was used for the evaluation of Hydrogen, trans-2-Butene, 2-Methyl-Propene and cis-2-Butene.

Total of the composition results: The total of the test results of the composition was calculated by iis. Since the composition is requested as normalized the total should be 100%. All laboratories had a total composition between 99 and 100%.

Hydrogen: The determination of this component was not problematic. One statistical outliers was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Oxygen/Argon: The determination of these components was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Nitrogen: The determination of this component was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN15984:22.

Carbon Monoxide: The determination of this component was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN15984:22.

Carbon Dioxide: The determination of this component was not problematic. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN15984:22.

Methane: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Ethane: The determination of this component was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of EN15984:22.

Ethene: The determination of this component was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN15984:22.

Propane: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Propene: The determination of this component was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN15984:22.

iso-Butane: The determination of this component was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of EN15984:22.

n-Butane: The determination of this component was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of EN15984:22.

trans-2-Butene: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated with the Horwitz equation.

1-Butene: The determination of this component was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement the requirements of EN15984:22.

2-Methyl-Propene: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated with the Horwitz equation.

cis-2-Butene: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the estimated reproducibility calculated with the Horwitz equation.

iso-Pentane: The determination of this component was problematic. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of EN15984:22.

n-Pentane: The determination of this component was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Carbon content: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility is in agreement with the requirements of EN15984:22.

Lower Calorific Value: This determination was not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is in agreement with the requirements of EN15984:22.

The majority of the participants agreed on a concentration near or below the limit of detection for all other requested components mentioned in paragraph 2.5. Therefore, no z-scores are calculated for these components. The reported test results are given in appendix 2.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

A comparison has been made between the reproducibility as declared by the reference test method and the reproducibility as found for the group of participating laboratories. The number of significant test results, the average, the calculated reproducibility (2.8 * standard deviation) and the target reproducibility derived from reference methods are presented in the next table.

Component	unit	n	average	2.8 * sd	R(lit)
Hydrogen	%mol/mol	21	55.32	1.28	3.39
Oxygen/Argon	%mol/mol	20	0.120	0.058	0.108
Nitrogen	%mol/mol	21	2.534	0.301	0.580
Carbon Monoxide	%mol/mol	21	0.860	0.234	0.244
Carbon Dioxide	%mol/mol	20	0.498	0.056	0.103
Methane	%mol/mol	22	19.98	0.88	0.91
Ethane	%mol/mol	22	8.016	0.352	0.315
Ethene	%mol/mol	21	1.986	0.101	0.124
Propane	%mol/mol	22	5.041	0.258	0.237

Component	unit	n	average	2.8 * sd	R(lit)
Propene	%mol/mol	21	1.599	0.095	0.095
iso-Butane	%mol/mol	22	1.800	0.131	0.115
n-Butane	%mol/mol	22	1.408	0.135	0.122
trans-2-Butene	%mol/mol	21	0.149	0.017	0.022
1-Butene	%mol/mol	21	0.149	0.017	0.015
2-Methyl-Propene	%mol/mol	18	0.099	0.013	0.016
cis-2-Butene	%mol/mol	21	0.099	0.013	0.016
iso-Pentane	%mol/mol	22	0.179	0.021	0.011
n-Pentane	%mol/mol	22	0.158	0.016	0.028
Carbon content	g/100g	18	67.69	1.08	2.16
Lower Calorific Value	kJ/100g	14	4931	55	120

Table 2: reproducibilities of tests on sample #23015

Without further statistical calculations it can be concluded that for many components and the calculated parameters there is a good compliance of the group of participants with the reference test method. The problematic components have been discussed in paragraph 4.1.

4.3 COMPARISON OF THE PROFICIENCY TEST OF FEBRUARY 2023 WITH PREVIOUS PT

	February 2023	February 2022
Number of reporting laboratories	22	17
Number of test results	420	357
Number of statistical outliers	8	21
Percentage of statistical outliers	1.9%	5.9%

Table 3: 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 to the requirements of the reference methods. The conclusions are given the following table.

Component	February 2023	February 2022
Hydrogen	++	++
Oxygen/Argon	+	-
Nitrogen	+	+/-
Carbon Monoxide	+/-	+
Carbon Dioxide	+	+/-
Methane	+/-	+/-
Ethane	-	+
Ethene	+	+/-
Propane	+/-	-

Component	February 2023	February 2022
Propene	+/-	+
iso-Butane	-	-
n-Butane	-	+/-
trans-2-Butene	+	+/-
1-Butene	-	-
2-Methyl-Propene	+	+/-
cis-2-Butene	+	+/-
iso-Pentane	-	-
n-Pentane	+	+/-
Carbon content	++	++
Lower Calorific Value	++	+/-

Table 4: comparison of determinations to the reference method

The following performance categories were used:

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

5 DISCUSSION

The consensus values as determined in this PT are compared with the average values from the homogeneity testing by EffecTech (Uttoxeter, United Kingdom) in the following table. From this comparison it is clear that the average values as determined in this PT are very well in line with the values as determined during the preparation of the gas cylinders.

Component	EffecTech in %mol/mol	Average PT in %mol/mol	Differences in %mol/mol	z-score
Hydrogen	55.437	55.324	0.113	0.09
Oxygen/Argon	0.100	0.120	-0.020	-0.51
Nitrogen	2.501	2.534	-0.033	-0.16
Carbon Monoxide	0.802	0.860	-0.058	-0.67
Carbon Dioxide	0.499	0.498	0.001	0.02
Methane	19.950	19.977	-0.026	-0.08
Ethane	8.021	8.016	0.005	0.05
Ethene	1.992	1.986	0.006	0.13
Propane	5.062	5.041	0.020	0.24
Propene	1.602	1.599	0.004	0.10
iso-Butane	1.790	1.800	-0.009	-0.23
n-Butane	1.398	1.408	-0.009	-0.22
trans-2-Butene	0.150	0.149	0.001	0.16

Component	EffecTech in %mol/mol	Average PT in %mol/mol	Differences in %mol/mol	z-score
1-Butene	0.151	0.149	0.002	0.36
2-Methyl-Propene	0.099	0.099	0.001	0.09
cis-2-Butene	0.101	0.099	0.002	0.30
iso-Pentane	0.181	0.179	0.002	0.43
n-Pentane	0.161	0.158	0.003	0.29

Table 5: comparison of average values of this PT with values determined by EffecTech (Uttoxeter, United Kingdom)

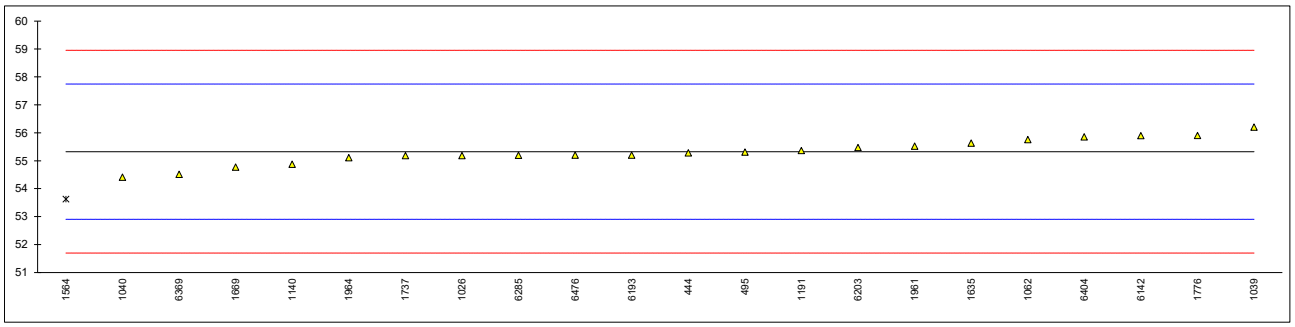
APPENDIX 1

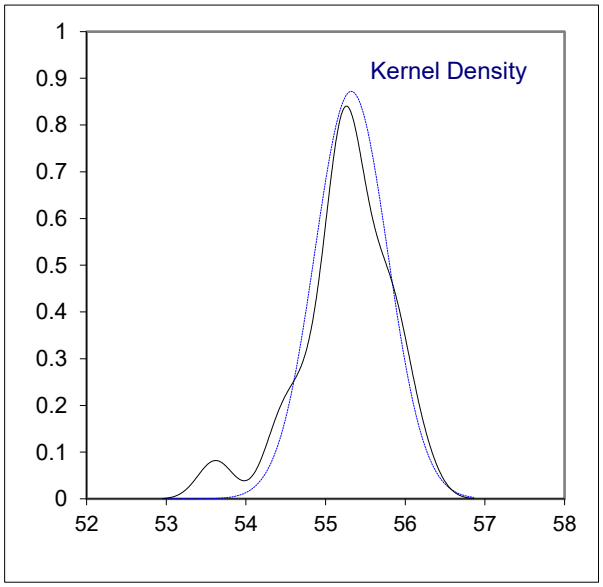
Total of reported (normalized) hydrocarbon composition test results; results in %mol/mol

lab	method	iis calculated	remarks
444	EN15984	100.002	
495	EN15984	100	
1026	EN15984	100	
1039	EN15984	100	
1040	EN15984	100.03	
1062	EN15984	99.9999	
1140	D7833	100	
1191	EN15984	99.902	
1564	EN15984	99.25	
1635	UOP539	99.9	
1669	EN15984	100.0849	
1737	In house	100	
1776	EN15984	99.525	
1961	EN15984	100.004	
1964	In house	99.9997	
6142	-----	99.903	
6193	EN15984	99.8	
6203	UOP539	99.997	
6285	-----	99.04	
6369	in house	100	
6404	EN15984	99.999	
6474	-----	-----	
6476	In house	100.24	

Determination of Hydrogen on sample #23015; results in %mol/mol

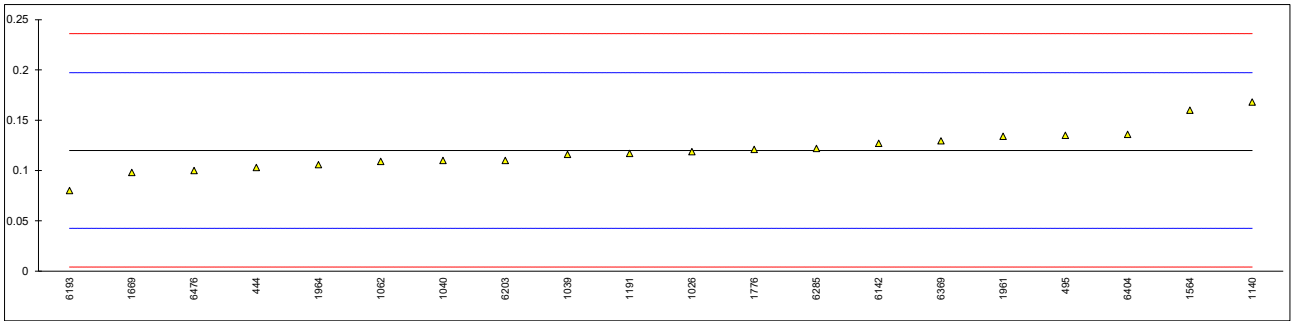
lab	method	value	mark	z(targ)	remarks
444	EN15984	55.281		-0.04	
495	EN15984	55.310		-0.01	
1026	EN15984	55.1844		-0.12	
1039	EN15984	56.198		0.72	
1040	EN15984	54.41		-0.76	
1062	EN15984	55.7529		0.35	
1140	D7833	54.872		-0.37	
1191	EN15984	55.362		0.03	
1564	EN15984	53.62	R(0.05)	-1.41	
1635	UOP539	55.63		0.25	
1669	EN15984	54.768		-0.46	
1737	In house	55.18		-0.12	
1776	EN15984	55.901		0.48	
1961	EN15984	55.521		0.16	
1964	In house	55.1085		-0.18	
6142		55.895		0.47	
6193	EN15984	55.20		-0.10	
6203	UOP539	55.470		0.12	
6285		55.195		-0.11	
6369	in house	54.5136		-0.67	
6404	EN15984	55.854		0.44	
6474		-----		-----	
6476	In house	55.197		-0.10	
	normality	OK			
	n	21			
	outliers	1			
	mean (n)	55.3240			
	st.dev. (n)	0.45746			
	R(calc.)	1.2809			
	st.dev.(Horwitz)	1.20959			
	R(Horwitz)	3.3869			
compare					
	R(EN15984:22)	1.5639			application range: 3.6 – 4.6

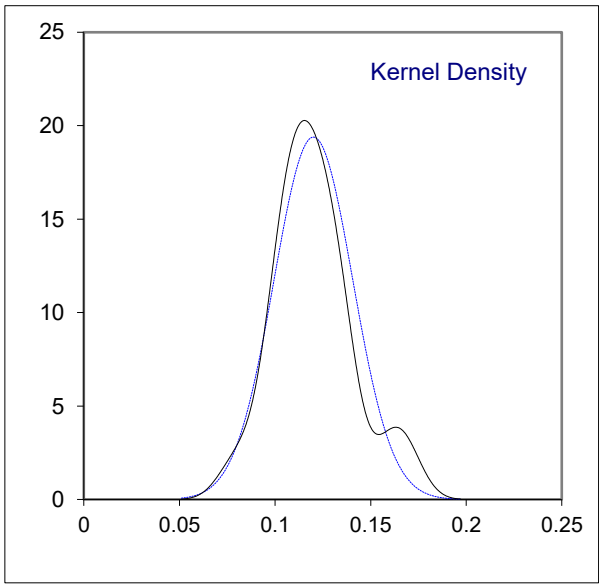




Determination of Oxygen/Argon on sample #23015; results in %mol/mol

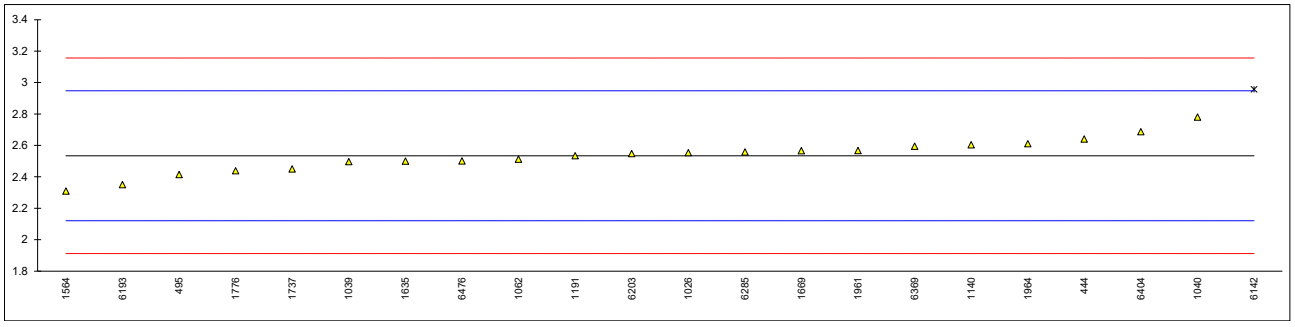
lab	method	value	mark	z(targ)	remarks
444	EN15984	0.103		-0.44	
495	EN15984	0.135		0.39	
1026	EN15984	0.1187		-0.03	
1039	EN15984	0.116		-0.10	
1040	EN15984	0.11		-0.26	
1062	EN15984	0.1091		-0.28	
1140	D7833	0.168		1.24	
1191	EN15984	0.117		-0.08	
1564	EN15984	0.16		1.03	
1635		-----		-----	
1669	EN15984	0.098		-0.57	
1737		-----		-----	
1776	EN15984	0.121		0.03	
1961	EN15984	0.134		0.36	
1964	In house	0.1058		-0.37	
6142		0.127		0.18	
6193	EN15984	0.08		-1.03	
6203	UOP539	0.110		-0.26	
6285		0.122	C	0.05	first reported: 0.334
6369	in house	0.1295		0.25	
6404	EN15984	0.136		0.41	
6474		-----		-----	
6476	In house	0.100		-0.52	
	normality	OK			
	n	20			
	outliers	0			
	mean (n)	0.1200			
	st.dev. (n)	0.02058			
	R(calc.)	0.0576			
	st.dev.(EN15984:22)	0.03867			
	R(EN15984:22)	0.1083			application range: 0.20 – 2.30

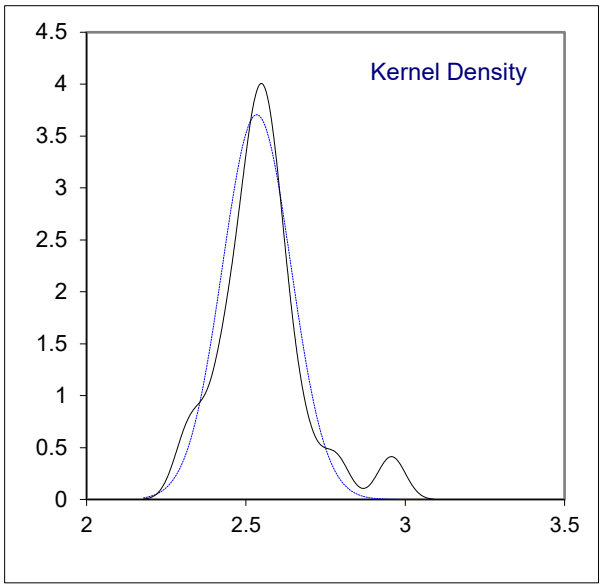




Determination of Nitrogen on sample #23015; results in %mol/mol

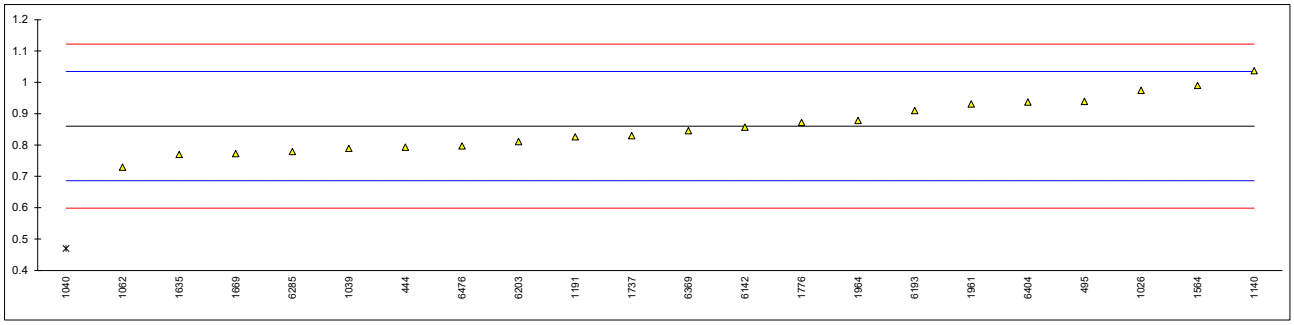
lab	method	value	mark	z(targ)	remarks
444	EN15984	2.640		0.51	
495	EN15984	2.414		-0.58	
1026	EN15984	2.5537		0.10	
1039	EN15984	2.496		-0.18	
1040	EN15984	2.78		1.19	
1062	EN15984	2.5115		-0.11	
1140	D7833	2.604		0.34	
1191	EN15984	2.534		0.00	
1564	EN15984	2.31	C	-1.08	first reported: 2.92
1635	UOP539	2.50		-0.16	
1669	EN15984	2.5658		0.15	
1737	In house	2.45		-0.41	
1776	EN15984	2.438		-0.46	
1961	EN15984	2.567		0.16	
1964	In house	2.6104		0.37	
6142		2.957	R(0.05)	2.04	
6193	EN15984	2.35		-0.89	
6203	UOP539	2.547		0.06	
6285		2.558	C	0.12	first reported: 3.303
6369	in house	2.5947		0.29	
6404	EN15984	2.687		0.74	
6474		-----		-----	
6476	In house	2.501		-0.16	
	normality	OK			
	n	21			
	outliers	1			
	mean (n)	2.5339			
	st.dev. (n)	0.10764			
	R(calc.)	0.3014			
	st.dev.(EN15984:22)	0.20715			
	R(EN15984:22)	0.5800			application range: 5.00 – 57.00

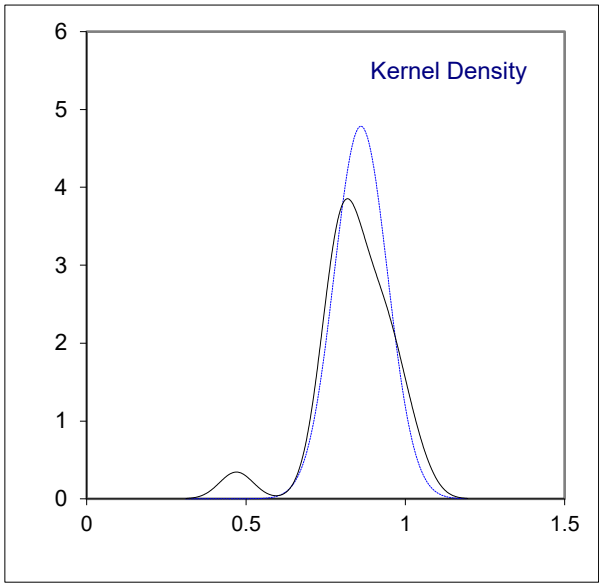




Determination of Carbon Monoxide on sample #23015; results in %mol/mol

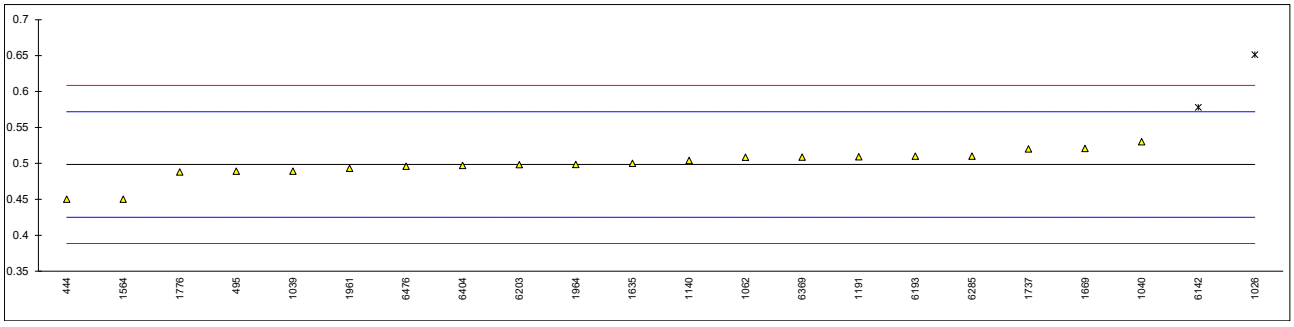
lab	method	value	mark	z(targ)	remarks
444	EN15984	0.793		-0.77	
495	EN15984	0.939		0.90	
1026	EN15984	0.9745		1.31	
1039	EN15984	0.789		-0.82	
1040	EN15984	0.47	R(0.01)	-4.48	
1062	EN15984	0.7291		-1.51	
1140	D7833	1.037		2.03	
1191	EN15984	0.826		-0.39	
1564	EN15984	0.99		1.49	
1635	UOP539	0.77		-1.04	
1669	EN15984	0.7727		-1.01	
1737	In house	0.83		-0.35	
1776	EN15984	0.872		0.13	
1961	EN15984	0.931		0.81	
1964	In house	0.8781		0.20	
6142		0.857		-0.04	
6193	EN15984	0.91		0.57	
6203	UOP539	0.811		-0.57	
6285		0.779		-0.93	
6369	in house	0.8459		-0.17	
6404	EN15984	0.937		0.88	
6474		-----		-----	
6476	In house	0.797		-0.73	
	normality	OK			
	n	21			
	outliers	1			
	mean (n)	0.8604			
	st.dev. (n)	0.08340			
	R(calc.)	0.2335			
	st.dev.(EN15984:22)	0.08718			
	R(EN15984:22)	0.2441			application range: 0.50 – 3.10

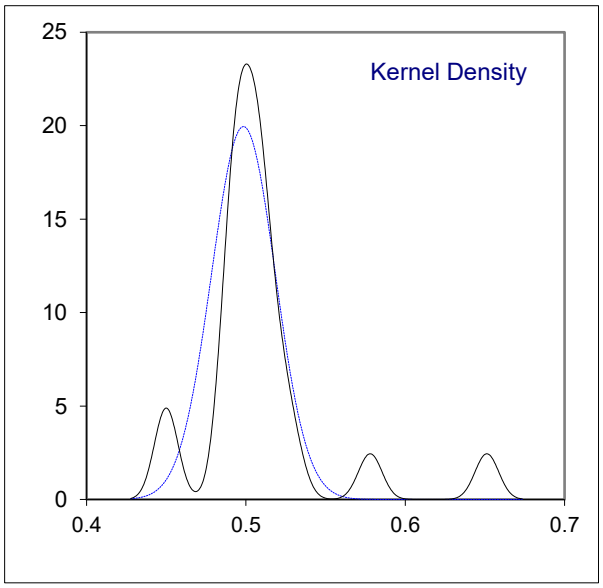




Determination of Carbon Dioxide on sample #23015; results in %mol/mol

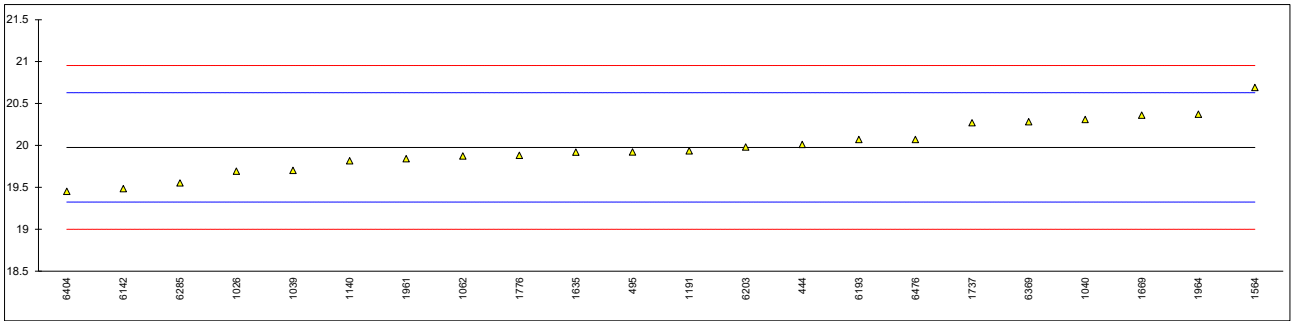
lab	method	value	mark	z(targ)	remarks
444	EN15984	0.450		-1.32	
495	EN15984	0.489		-0.26	
1026	EN15984	0.6512	R(0.01)	4.17	
1039	EN15984	0.489		-0.26	
1040	EN15984	0.53		0.86	
1062	EN15984	0.5085		0.27	
1140	D7833	0.504		0.15	
1191	EN15984	0.509		0.29	
1564	EN15984	0.45	C	-1.32	first reported: 0.60
1635	UOP539	0.50		0.04	
1669	EN15984	0.5207	C	0.61	first reported: 0.4355
1737	In house	0.52		0.59	
1776	EN15984	0.488		-0.29	
1961	EN15984	0.493		-0.15	
1964	In house	0.4985		0.00	
6142		0.578	R(0.05)	2.17	
6193	EN15984	0.51		0.31	
6203	UOP539	0.498		-0.01	
6285		0.510		0.31	
6369	in house	0.5087		0.28	
6404	EN15984	0.497		-0.04	
6474		-----		-----	
6476	In house	0.496		-0.07	
	normality	not OK			
	n	20			
	outliers	2			
	mean (n)	0.4985			
	st.dev. (n)	0.01999			
	R(calc.)	0.0560			
	st.dev.(EN15984:22)	0.03666			
	R(EN15984:22)	0.1027			application range: 0.40 – 10.00

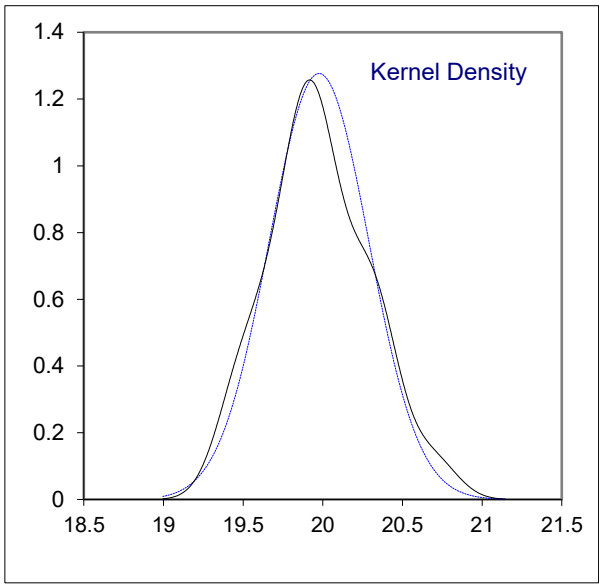




Determination of Methane on sample #23015; results in %mol/mol

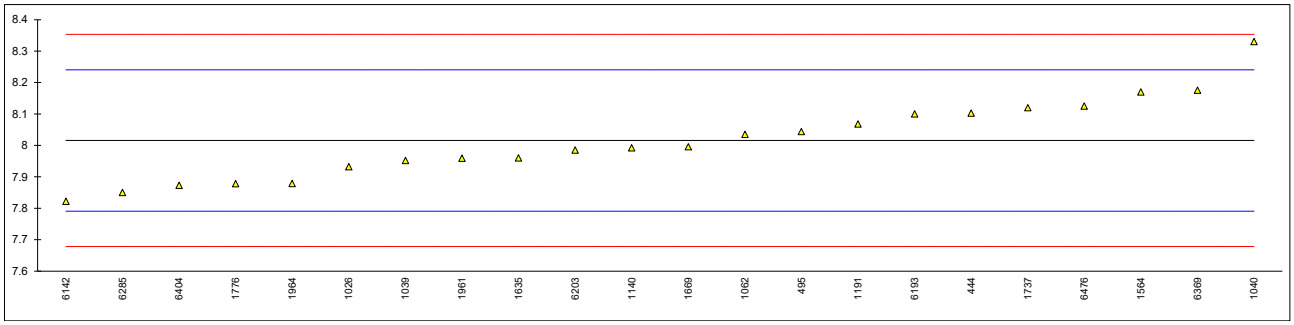
lab	method	value	mark	z(targ)	remarks
444	EN15984	20.011		0.11	
495	EN15984	19.922		-0.17	
1026	EN15984	19.6909		-0.88	
1039	EN15984	19.702		-0.84	
1040	EN15984	20.31		1.02	
1062	EN15984	19.8729		-0.32	
1140	D7833	19.817		-0.49	
1191	EN15984	19.934		-0.13	
1564	EN15984	20.69		2.19	
1635	UOP539	19.92		-0.17	
1669	EN15984	20.3611		1.18	
1737	In house	20.27		0.90	
1776	EN15984	19.882		-0.29	
1961	EN15984	19.841		-0.42	
1964	In house	20.3718		1.21	
6142		19.484		-1.51	
6193	EN15984	20.07		0.29	
6203	UOP539	19.979		0.01	
6285		19.551		-1.31	
6369	in house	20.2827		0.94	
6404	EN15984	19.451		-1.61	
6474		-----		-----	
6476	In house	20.071		0.29	
	normality	OK			
	n	22			
	outliers	0			
	mean (n)	19.9766			
	st.dev. (n)	0.31254			
	R(calc.)	0.8751			
	st.dev.(EN15984:22)	0.32567			
	R(EN15984:22)	0.9119			application range: 4.00 – 20.00

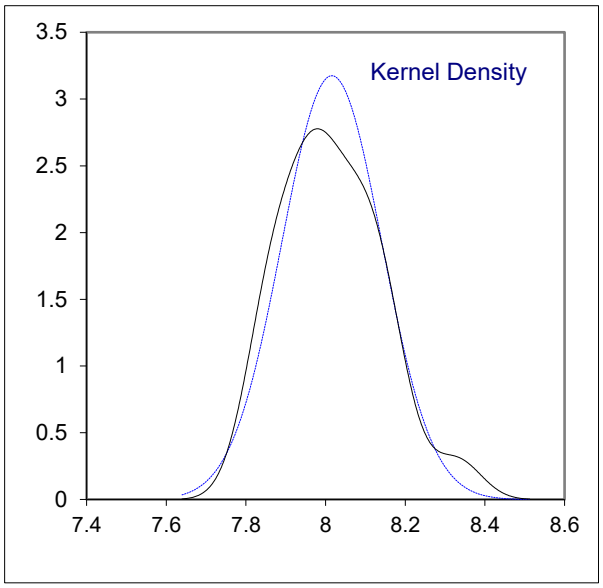




Determination of Ethane on sample #23015; results in %mol/mol

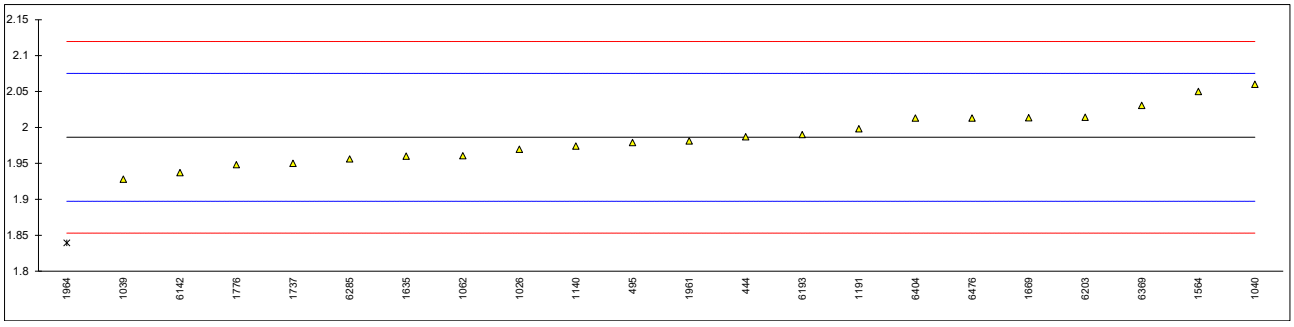
lab	method	value	mark	z(targ)	remarks
444	EN15984	8.103		0.78	
495	EN15984	8.044		0.25	
1026	EN15984	7.9321		-0.74	
1039	EN15984	7.952		-0.57	
1040	EN15984	8.33		2.79	
1062	EN15984	8.0351		0.17	
1140	D7833	7.992		-0.21	
1191	EN15984	8.068		0.46	
1564	EN15984	8.17		1.37	
1635	UOP539	7.96		-0.50	
1669	EN15984	7.9957		-0.18	
1737	In house	8.12		0.93	
1776	EN15984	7.878		-1.23	
1961	EN15984	7.959		-0.51	
1964	In house	7.8787		-1.22	
6142		7.822		-1.72	
6193	EN15984	8.10		0.75	
6203	UOP539	7.985		-0.27	
6285		7.850		-1.47	
6369	in house	8.1752		1.42	
6404	EN15984	7.873		-1.27	
6474		-----		-----	
6476	In house	8.125		0.97	
	normality	OK			
	n	22			
	outliers	0			
	mean (n)	8.0158			
	st.dev. (n)	0.12570			
	R(calc.)	0.3520			
	st.dev.(EN15984:22)	0.11247			
	R(EN15984:22)	0.3149			application range: 3.90 – 10.00

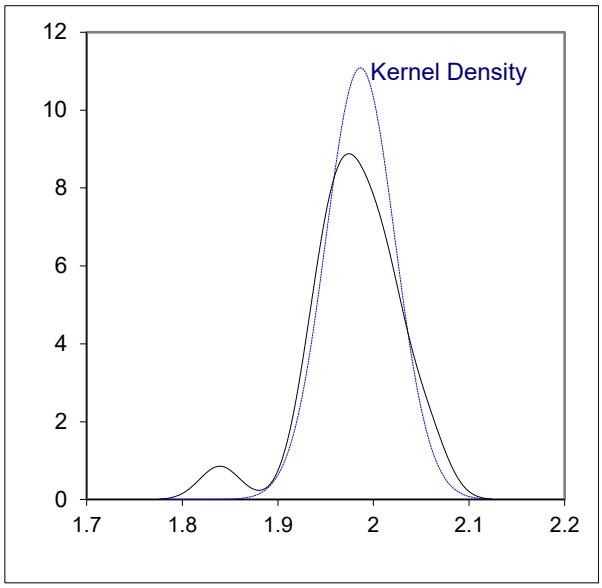




Determination of Ethene on sample #23015; results in %mol/mol

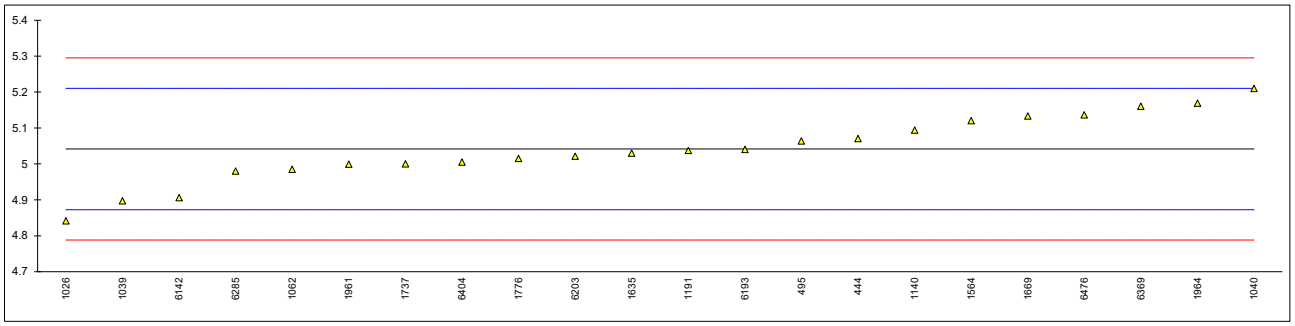
lab	method	value	mark	z(targ)	remarks
444	EN15984	1.987		0.02	
495	EN15984	1.979		-0.16	
1026	EN15984	1.9697		-0.37	
1039	EN15984	1.928		-1.31	
1040	EN15984	2.06		1.66	
1062	EN15984	1.9606		-0.58	
1140	D7833	1.974		-0.28	
1191	EN15984	1.998		0.26	
1564	EN15984	2.05		1.43	
1635	UOP539	1.96		-0.59	
1669	EN15984	2.0134		0.61	
1737	In house	1.95		-0.82	
1776	EN15984	1.948		-0.86	
1961	EN15984	1.981		-0.12	
1964	In house	1.8393	R(0.05)	-3.31	
6142		1.937		-1.11	
6193	EN15984	1.99		0.08	
6203	UOP539	2.014		0.62	
6285		1.956		-0.68	
6369	in house	2.0305		0.99	
6404	EN15984	2.013		0.60	
6474		-----		-----	
6476	In house	2.013		0.60	
	normality	OK			
	n	21			
	outliers	1			
	mean (n)	1.9863			
	st.dev. (n)	0.03600			
	R(calc.)	0.1008			
	st.dev.(EN15984:22)	0.04446			
	R(EN15984:22)	0.1245			application range: 1.00 – 4.00

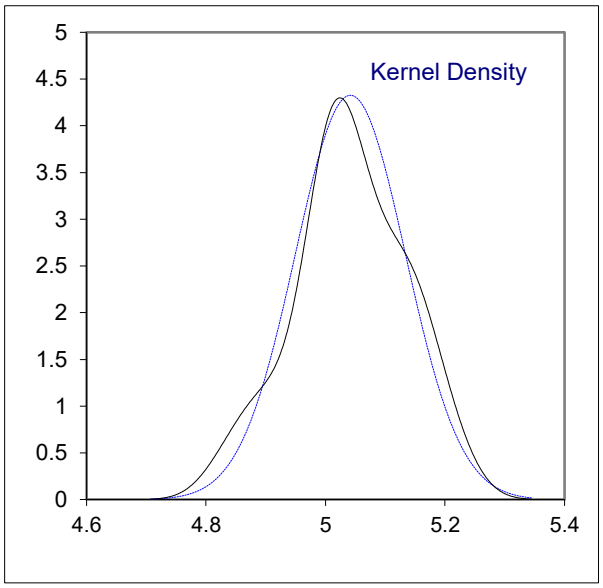




Determination of Propane on sample #23015; results in %mol/mol

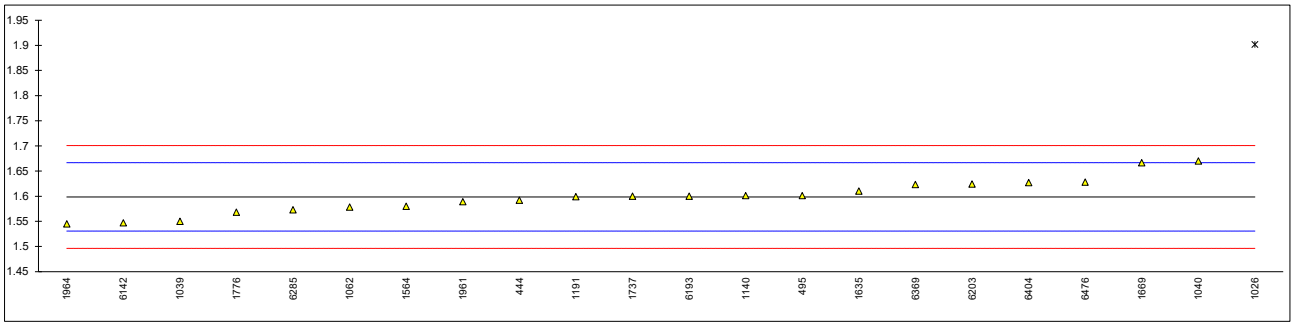
lab	method	value	mark	z(targ)	remarks
444	EN15984	5.070		0.34	
495	EN15984	5.064		0.27	
1026	EN15984	4.8412		-2.37	
1039	EN15984	4.897		-1.71	
1040	EN15984	5.21		1.99	
1062	EN15984	4.9845		-0.67	
1140	D7833	5.094		0.62	
1191	EN15984	5.037		-0.05	
1564	EN15984	5.12		0.93	
1635	UOP539	5.03		-0.14	
1669	EN15984	5.1331		1.08	
1737	In house	5.00		-0.49	
1776	EN15984	5.015		-0.31	
1961	EN15984	4.999		-0.50	
1964	In house	5.1687		1.51	
6142		4.906		-1.60	
6193	EN15984	5.04		-0.02	
6203	UOP539	5.021		-0.24	
6285		4.980		-0.73	
6369	in house	5.1601		1.40	
6404	EN15984	5.005		-0.43	
6474		-----		-----	
6476	In house	5.136		1.12	
	normality	OK			
	n	22			
	outliers	0			
	mean (n)	5.0414			
	st.dev. (n)	0.09225			
	R(calc.)	0.2583			
	st.dev.(EN15984:22)	0.08456			
	R(EN15984:22)	0.2368			application range: 2.00 – 6.00

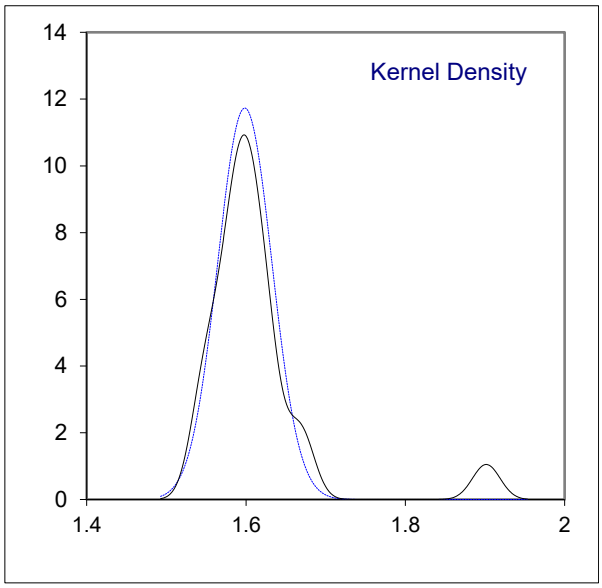




Determination of Propene on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.592		-0.20	
495	EN15984	1.601		0.07	
1026	EN15984	1.9017	R(0.01)	8.90	
1039	EN15984	1.550		-1.43	
1040	EN15984	1.67		2.10	
1062	EN15984	1.5783		-0.60	
1140	D7833	1.601		0.07	
1191	EN15984	1.599		0.01	
1564	EN15984	1.58		-0.55	
1635	UOP539	1.61		0.33	
1669	EN15984	1.6663		1.99	
1737	In house	1.60		0.04	
1776	EN15984	1.568		-0.90	
1961	EN15984	1.589		-0.28	
1964	In house	1.5448		-1.58	
6142		1.547		-1.52	
6193	EN15984	1.60		0.04	
6203	UOP539	1.624		0.74	
6285		1.573		-0.75	
6369	in house	1.6232		0.72	
6404	EN15984	1.627		0.83	
6474		-----		-----	
6476	In house	1.628		0.86	
	normality	OK			
	n	21			
	outliers	1			
	mean (n)	1.5986			
	st.dev. (n)	0.03402			
	R(calc.)	0.0953			
	st.dev.(EN15984:22)	0.03403			
	R(EN15984:22)	0.0953			application range: 0.50 – 6.00

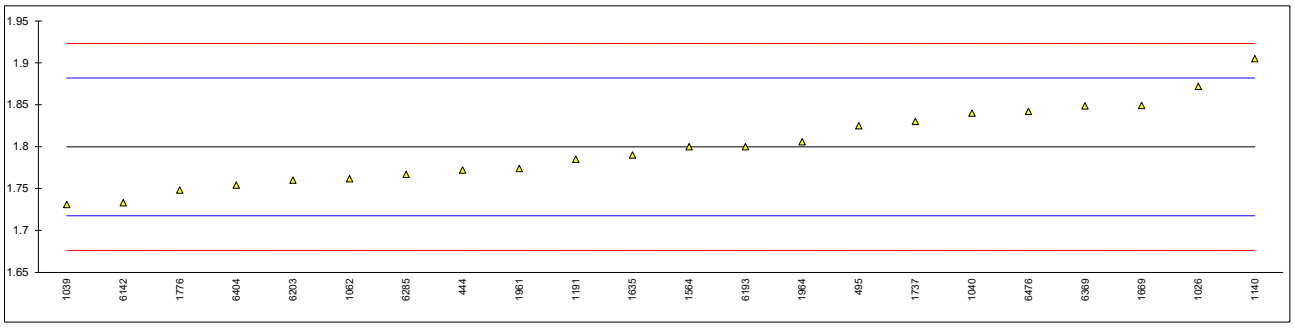


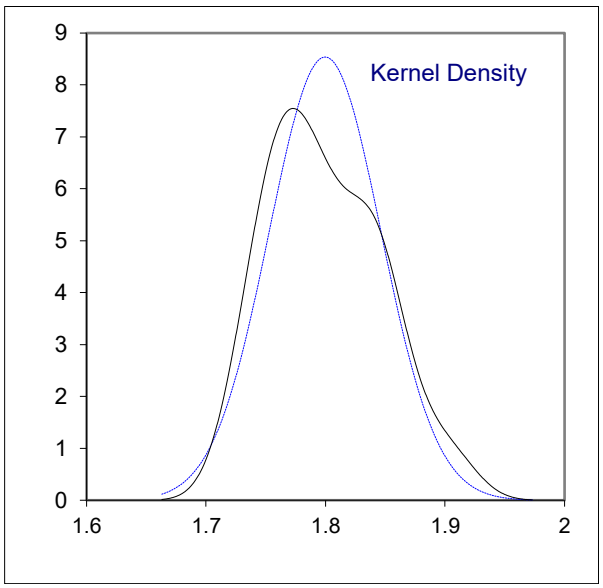


Determination of iso-Butane on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.772		-0.67	
495	EN15984	1.825		0.62	
1026	EN15984	1.8719		1.76	
1039	EN15984	1.731		-1.67	
1040	EN15984	1.84		0.98	
1062	EN15984	1.7616		-0.93	
1140	D7833	1.905		2.56	
1191	EN15984	1.785		-0.36	
1564	EN15984	1.80		0.01	
1635	UOP539	1.79		-0.24	
1669	EN15984	1.849		1.20	
1737	In house	1.83		0.74	
1776	EN15984	1.748		-1.26	
1961	EN15984	1.774		-0.62	
1964	In house	1.8058		0.15	
6142		1.733		-1.62	
6193	EN15984	1.80		0.01	
6203	UOP539	1.760		-0.97	
6285		1.767		-0.79	
6369	in house	1.8485		1.19	
6404	EN15984	1.754		-1.11	
6474		-----		-----	
6476	In house	1.842		1.03	

normality	OK	
n	22	
outliers	0	
mean (n)	1.7997	
st.dev. (n)	0.04674	
R(calc.)	0.1309	
st.dev.(EN15984:22)	0.04111	
R(EN15984:22)	0.1151	application range: 1.00 – 2.50

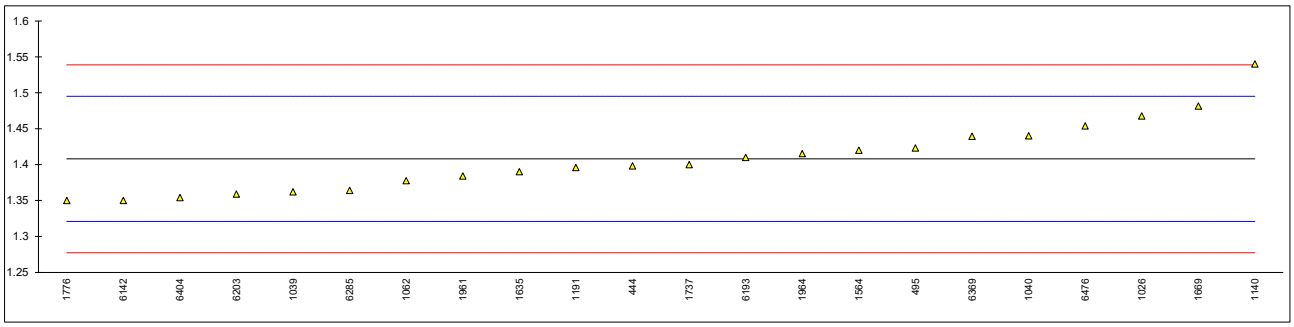


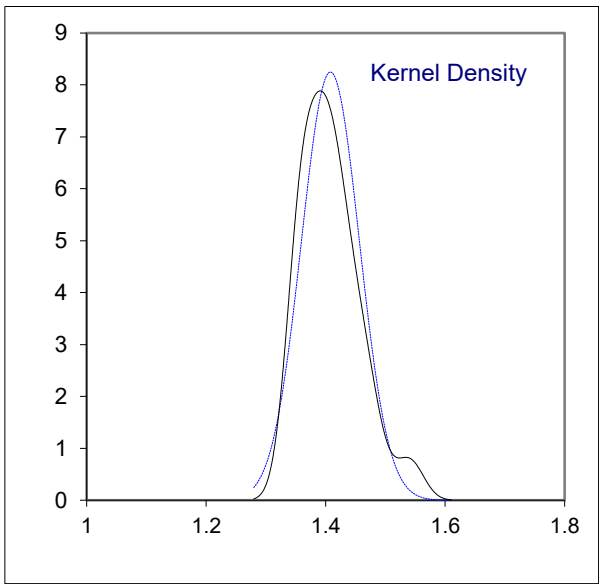


Determination of n-Butane on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.398		-0.23	
495	EN15984	1.423		0.35	
1026	EN15984	1.4677		1.37	
1039	EN15984	1.362		-1.05	
1040	EN15984	1.44		0.74	
1062	EN15984	1.3775		-0.70	
1140	D7833	1.540		3.03	
1191	EN15984	1.396		-0.27	
1564	EN15984	1.42		0.28	
1635	UOP539	1.39		-0.41	
1669	EN15984	1.4814		1.69	
1737	In house	1.40		-0.18	
1776	EN15984	1.350		-1.33	
1961	EN15984	1.384		-0.55	
1964	In house	1.4152		0.17	
6142		1.350		-1.33	
6193	EN15984	1.41		0.05	
6203	UOP539	1.359		-1.12	
6285		1.364		-1.01	
6369	in house	1.4393		0.72	
6404	EN15984	1.354		-1.24	
6474		-----		-----	
6476	In house	1.454		1.06	

normality	not OK	
n	22	
outliers	0	
mean (n)	1.4080	
st.dev. (n)	0.04838	
R(calc.)	0.1355	
st.dev.(EN15984:22)	0.04358	
R(EN15984:22)	0.1220	application range: 1.00 – 4.00

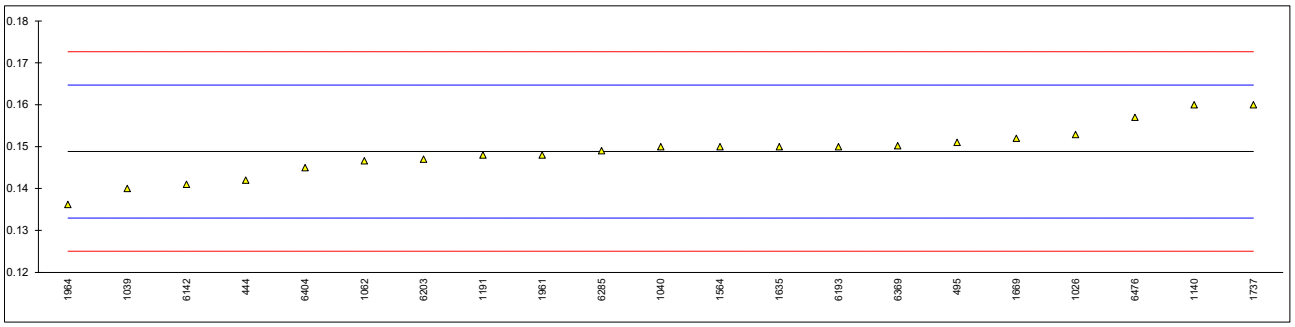


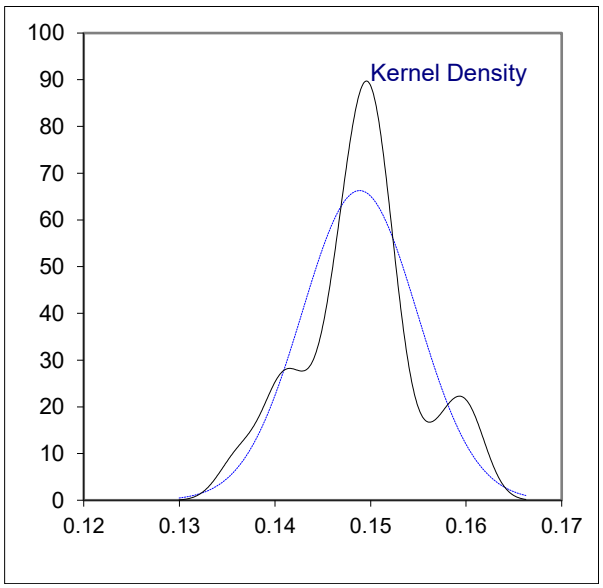


Determination of trans-2-Butene on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.142		-0.86	
495	EN15984	0.151		0.27	
1026	EN15984	0.1529		0.51	
1039	EN15984	0.140		-1.12	
1040	EN15984	0.15		0.14	
1062	EN15984	0.1466		-0.28	
1140	D7833	0.160		1.41	
1191	EN15984	0.148		-0.11	
1564	EN15984	0.15		0.14	
1635	UOP539	0.15		0.14	
1669	EN15984	0.152		0.40	
1737	In house	0.16		1.41	
1776		-----		-----	
1961	EN15984	0.148		-0.11	
1964	In house	0.1362		-1.60	
6142		0.141		-0.99	
6193	EN15984	0.15		0.14	
6203	UOP539	0.147		-0.23	
6285		0.149		0.02	
6369	in house	0.1502		0.17	
6404	EN15984	0.145		-0.49	
6474		-----		-----	
6476	In house	0.157		1.03	

normality	OK
n	21
outliers	0
mean (n)	0.1489
st.dev. (n)	0.00602
R(calc.)	0.0169
st.dev.(Horwitz)	0.00793
R(Horwitz)	0.0222



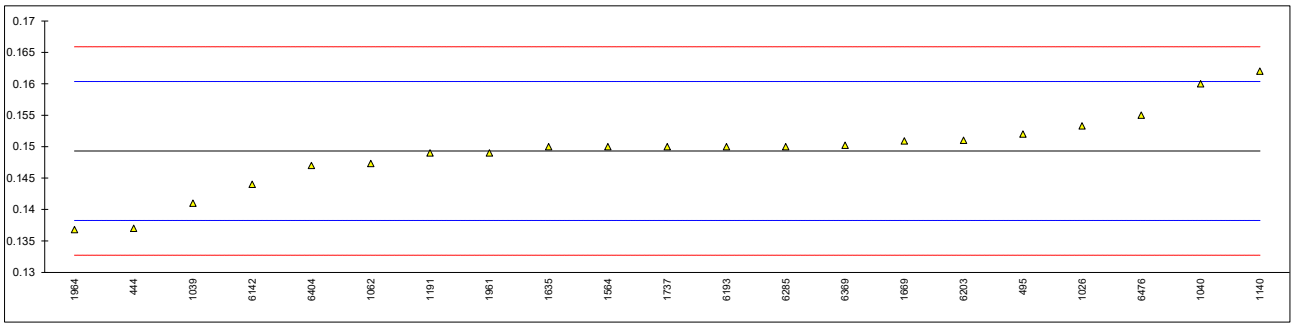


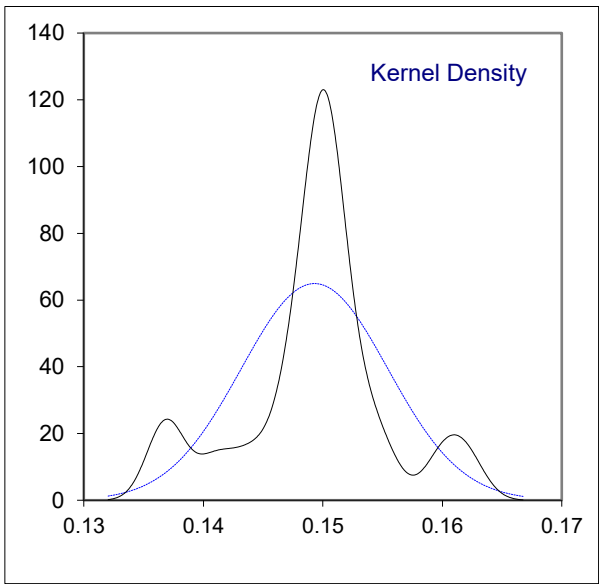
Determination of 1-Butene on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.137		-2.23	
495	EN15984	0.152		0.49	
1026	EN15984	0.1533		0.72	
1039	EN15984	0.141		-1.50	
1040	EN15984	0.16		1.94	
1062	EN15984	0.1473		-0.36	
1140	D7833	0.162		2.30	
1191	EN15984	0.149		-0.06	
1564	EN15984	0.15		0.13	
1635	UOP539	0.15		0.13	
1669	EN15984	0.1509		0.29	
1737	In house	0.15		0.13	
1776		-----		-----	
1961	EN15984	0.149		-0.06	
1964	In house	0.1368		-2.26	
6142		0.144		-0.96	
6193	EN15984	0.15		0.13	
6203	UOP539	0.151		0.31	
6285		0.150		0.13	
6369	in house	0.1502		0.16	
6404	EN15984	0.147		-0.42	
6474		-----		-----	
6476	In house	0.155		1.03	

normality	OK
n	21
outliers	0
mean (n)	0.1493
st.dev. (n)	0.00614
R(calc.)	0.0172
st.dev.(EN15984:22)	0.00552
R(EN15984:22)	0.0155

application range: 0.50 – 2.00

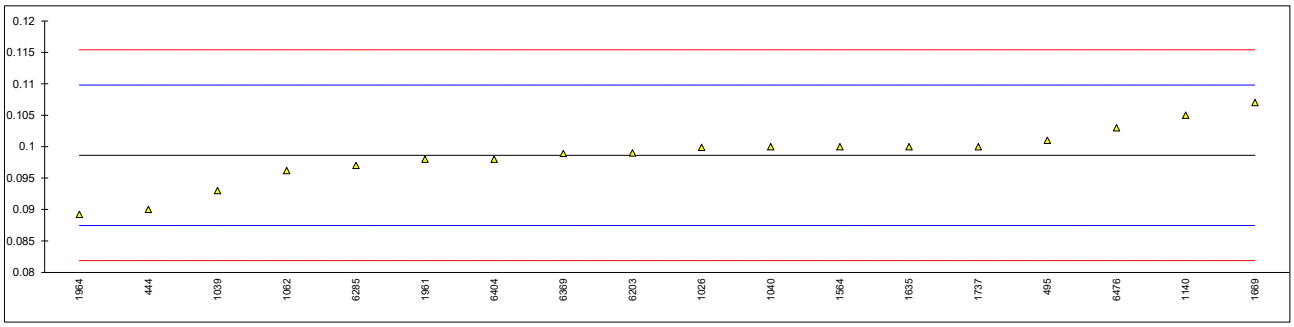


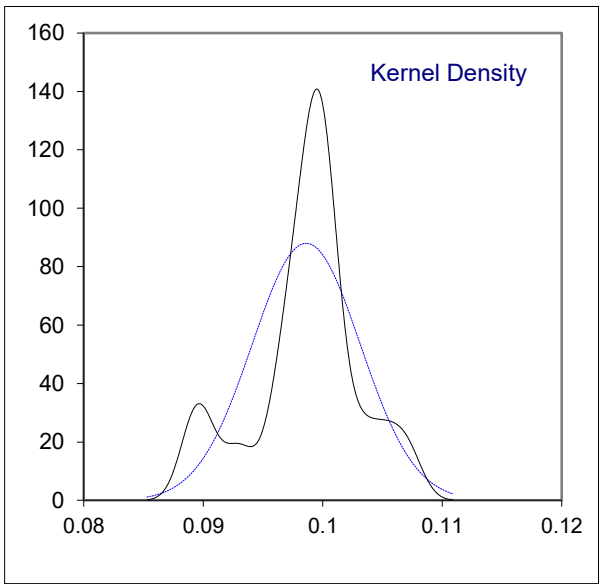


Determination of 2-Methyl-Propene on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.090		-1.54	
495	EN15984	0.101		0.43	
1026	EN15984	0.0999		0.23	
1039	EN15984	0.093		-1.01	
1040	EN15984	0.10		0.25	
1062	EN15984	0.0962		-0.43	
1140	D7833	0.105		1.14	
1191		-----		-----	
1564	EN15984	0.10		0.25	
1635	UOP539	0.10		0.25	
1669	EN15984	0.107		1.50	
1737	In house	0.10		0.25	
1776		-----		-----	
1961	EN15984	0.098		-0.11	
1964	In house	0.0892		-1.69	
6142		-----		-----	
6193		-----		-----	
6203	UOP539	0.099		0.07	
6285		0.097		-0.29	
6369	in house	0.0989		0.05	
6404	EN15984	0.098		-0.11	
6474		-----		-----	
6476	In house	0.103		0.78	

normality	OK
n	18
outliers	0
mean (n)	0.0986
st.dev. (n)	0.00453
R(calc.)	0.0127
st.dev.(Horwitz)	0.00559
R(Horwitz)	0.0157

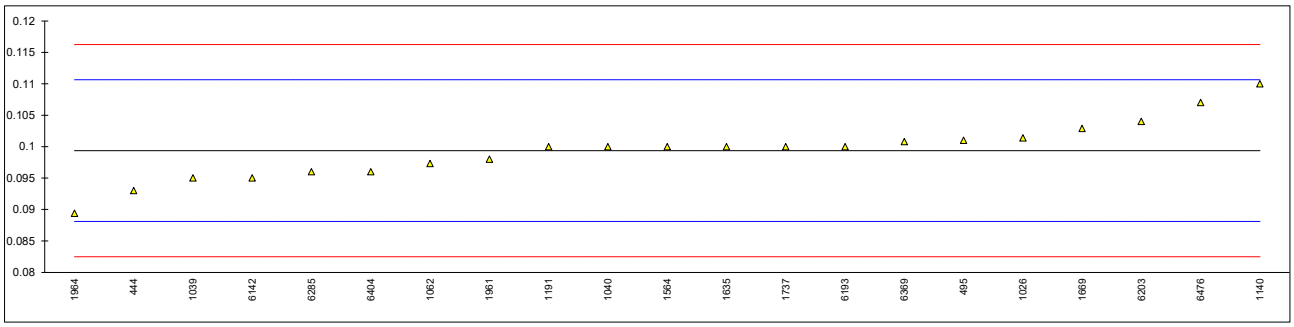


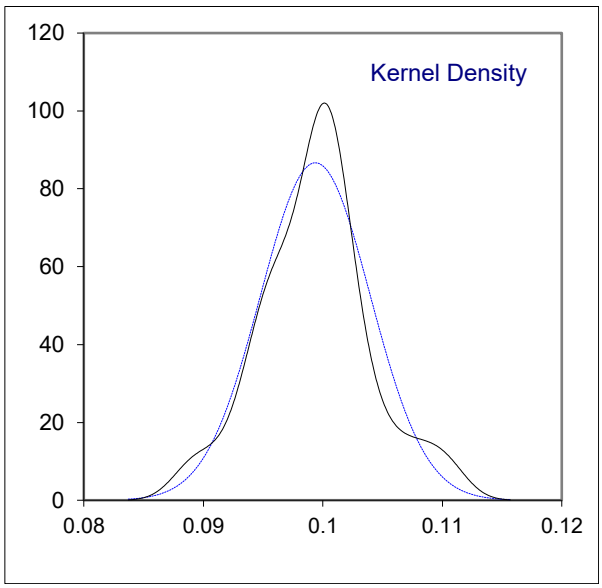


Determination of cis-2-Butene on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.093		-1.13	
495	EN15984	0.101		0.29	
1026	EN15984	0.1014		0.36	
1039	EN15984	0.095		-0.78	
1040	EN15984	0.10		0.11	
1062	EN15984	0.0973		-0.37	
1140	D7833	0.110		1.89	
1191	EN15984	0.10		0.11	
1564	EN15984	0.10		0.11	
1635	UOP539	0.10		0.11	
1669	EN15984	0.1029		0.63	
1737	In house	0.10		0.11	
1776		-----		-----	
1961	EN15984	0.098		-0.24	
1964	In house	0.0894		-1.77	
6142		0.095		-0.78	
6193	EN15984	0.1		0.11	
6203	UOP539	0.104		0.82	
6285		0.096		-0.60	
6369	in house	0.1008		0.25	
6404	EN15984	0.096		-0.60	
6474		-----		-----	
6476	In house	0.107		1.36	

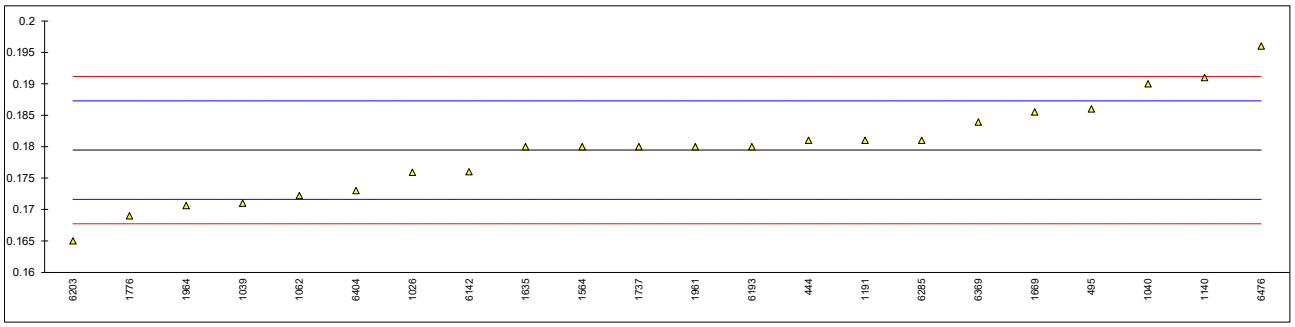
normality	OK
n	21
outliers	0
mean (n)	0.0994
st.dev. (n)	0.00460
R(calc.)	0.0129
st.dev.(Horwitz)	0.00563
R(Horwitz)	0.0158

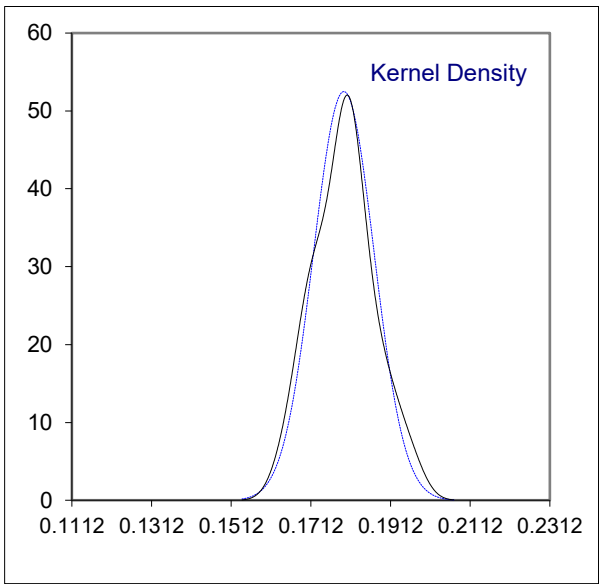




Determination of iso-Pentane on sample #23015; results in %mol/mol

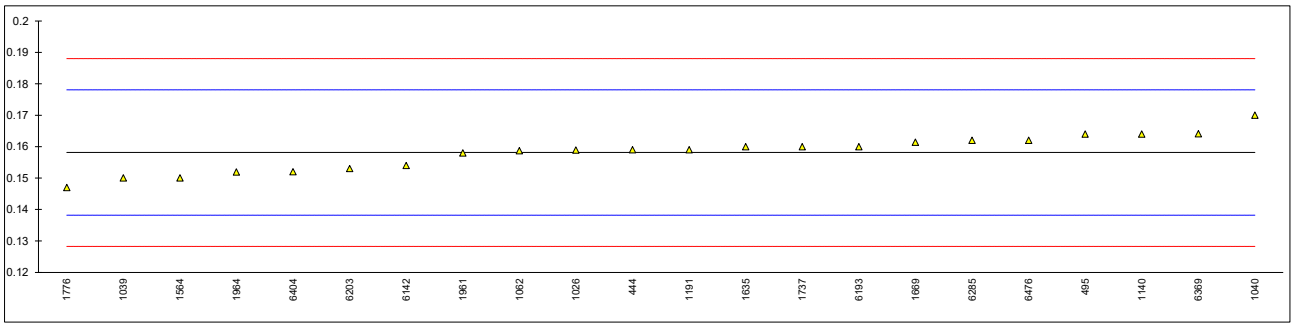
lab	method	value	mark	z(targ)	remarks
444	EN15984	0.181		0.39	
495	EN15984	0.186		1.67	
1026	EN15984	0.1759		-0.91	
1039	EN15984	0.171		-2.16	
1040	EN15984	0.19		2.70	
1062	EN15984	0.1722		-1.86	
1140	D7833	0.191		2.95	
1191	EN15984	0.181		0.39	
1564	EN15984	0.18		0.14	
1635	UOP539	0.18		0.14	
1669	EN15984	0.1855		1.54	
1737	In house	0.18		0.14	
1776	EN15984	0.169		-2.67	
1961	EN15984	0.180		0.14	
1964	In house	0.1706		-2.27	
6142		0.176		-0.88	
6193	EN15984	0.18		0.14	
6203	UOP539	0.165		-3.70	
6285		0.181		0.39	
6369	in house	0.1839		1.14	
6404	EN15984	0.173		-1.65	
6474		-----		-----	
6476	In house	0.196		4.23	
	normality	OK			
	n	22			
	outliers	0			
	mean (n)	0.1795			
	st.dev. (n)	0.00760			
	R(calc.)	0.0213			
	st.dev.(EN15984:22)	0.00391			
	R(EN15984:22)	0.0110			application range: 0.20 – 2.10

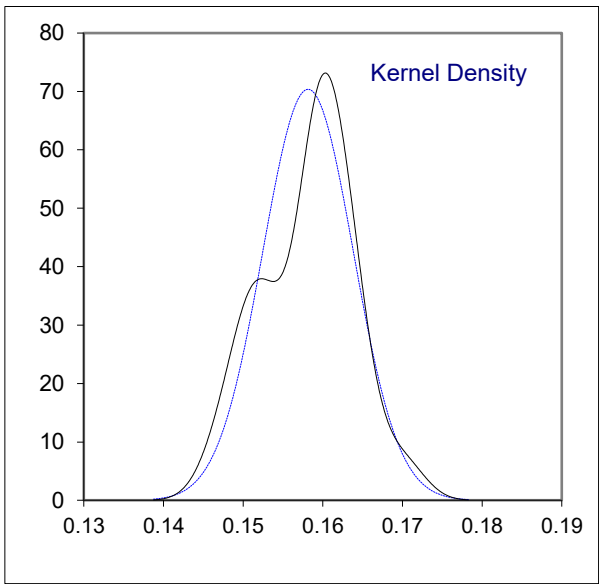




Determination of n-Pentane on sample #23015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.159		0.09	
495	EN15984	0.164		0.59	
1026	EN15984	0.1589		0.08	
1039	EN15984	0.150		-0.82	
1040	EN15984	0.17	C	1.19	first reported: 0.12
1062	EN15984	0.1587		0.06	
1140	D7833	0.164		0.59	
1191	EN15984	0.159		0.09	
1564	EN15984	0.15		-0.82	
1635	UOP539	0.16		0.19	
1669	EN15984	0.1614		0.33	
1737	In house	0.16		0.19	
1776	EN15984	0.147		-1.12	
1961	EN15984	0.158		-0.01	
1964	In house	0.1519		-0.63	
6142		0.154		-0.42	
6193	EN15984	0.16		0.19	
6203	UOP539	0.153		-0.52	
6285		0.162		0.39	
6369	in house	0.1641		0.60	
6404	EN15984	0.152		-0.62	
6474		-----		-----	
6476	In house	0.162		0.39	
	normality	OK			
	n	22			
	outliers	0			
	mean (n)	0.1581			
	st.dev. (n)	0.00567			
	R(calc.)	0.0159			
	st.dev.(EN15984:22)	0.00996			
	R(EN15984:22)	0.0279			application range: 0.10 – 0.35

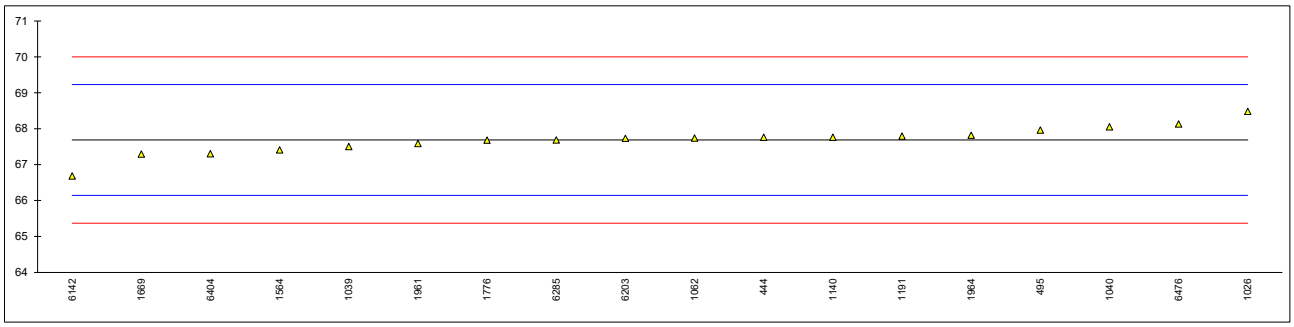


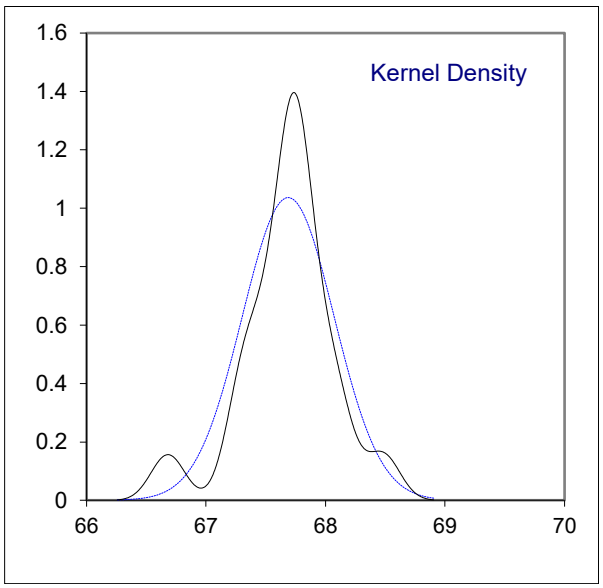


Determination of Carbon content on sample #23015; results in g/100 g

lab	method	value	mark	z(targ)	remarks
444	EN15984	67.76		0.10	
495	EN15984	67.96		0.36	
1026	EN15984	68.48		1.03	
1039	EN15984	67.501		-0.24	
1040	EN15984	68.05		0.47	
1062	EN15984	67.74		0.07	
1140	EN15984	67.76		0.10	
1191	EN15984	67.78892		0.13	
1564	EN15984	67.41		-0.36	
1635		-----		-----	
1669	EN15984	67.29		-0.51	
1737		-----		-----	
1776	EN15984	67.68		-0.01	
1961	EN15984	67.586		-0.13	
1964	In house	67.818		0.17	
6142	EN15984	66.68		-1.30	
6193		-----		-----	
6203	ISO6976	67.73		0.06	
6285		67.686	C	0.00	first reported: 66.27
6369		-----		-----	
6404	EN15984	67.30		-0.50	
6474		-----		-----	
6476	EN15984	68.13		0.58	

normality	not OK
n	18
outliers	0
mean (n)	67.686
st.dev. (n)	0.3848
R(calc.)	1.077
st.dev.(EN15984:22)	0.7714
R(EN15984:22)	2.16

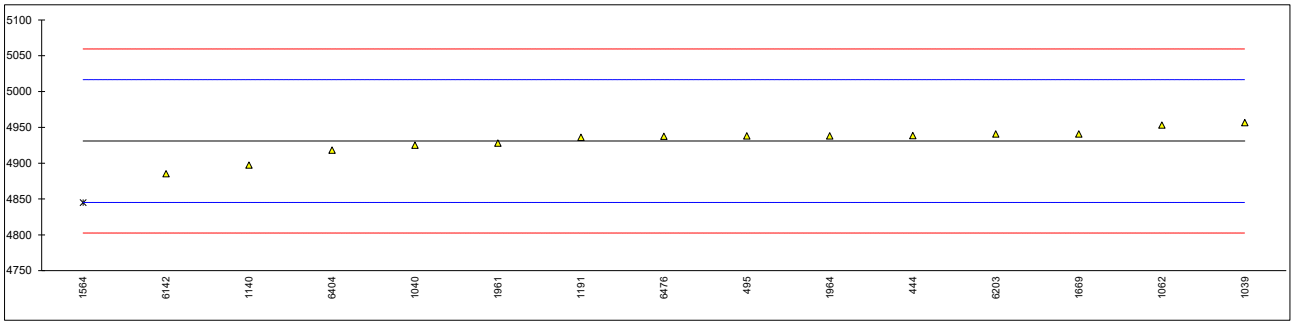


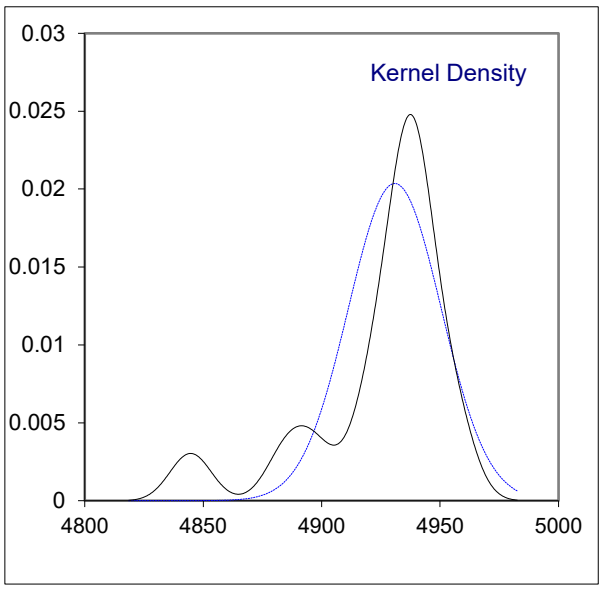


Determination of Lower Calorific Value on sample #23015; results in kJ/100 g

lab	method	value	mark	z(targ)	remarks
444	EN15984	4938.47		0.18	
495	EN15984	4938.05		0.17	
1026		-----		-----	
1039	EN15984	4956.372		0.60	
1040	EN15984	4925		-0.14	
1062	EN15984	4953.0638		0.52	
1140	EN15984	4897.2		-0.79	
1191	EN15984	4935.85		0.12	
1564	EN15984	4844.67	G(0.05)	-2.01	
1635		-----		-----	
1669	EN15984	4940.63		0.23	
1737		-----		-----	
1776		-----		-----	
1961	EN15984	4927.959		-0.07	
1964	In house	4938.114		0.17	
6142	EN15984	4885.11		-1.07	
6193		-----		-----	
6203	ISO6976	4940.62		0.23	
6285		-----		-----	
6369		-----		-----	
6404	EN15984	4918.24		-0.29	
6474		-----		-----	
6476	EN15984	4937.42		0.15	

normality	suspect
n	14
outliers	1
mean (n)	4930.864
st.dev. (n)	19.5975
R(calc.)	54.873
st.dev.(EN15984:22)	42.821
R(EN15984:22)	119.9





APPENDIX 2

Other reported test results

lab	Hydrogen sulfide	Ethyne	Propyne	Propadiene	1,3-Butadiene	Other *)
444	0	0	0	0	0	0
495	<0,1	<0,01	<0,01	<0,01	<0,01	<0,01
1026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1039	-----	-----	-----	-----	-----	-----
1040	0.00	0.00	-----	0.00	0.00	-----
1062	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1140	0.0	0.0	0.0	0.0	0.0	0.0
1191	0	-----	-----	-----	0.00	0.00
1564	0	0	0	0	0	0.06
1635	0	0	-----	-----	0	-----
1669	-----	0	-----	0	0	0
1737	-----	<0.01	<0.01	<0.01	<0.01	<0.01
1776	-----	-----	-----	-----	-----	-----
1961	-----	-----	-----	-----	-----	-----
1964	-----	-----	-----	-----	-----	-----
6142	-----	0	-----	0	0	0
6193	-----	-----	-----	0	0	-----
6203	0.0	0.0	0.0	0.0	0.0	0.0
6285	-----	-----	-----	-----	-----	-----
6369	0	0	0	0	0	-----
6404	0	0	0	0	0	0
6474	-----	-----	-----	-----	-----	-----
6476	0.000	0.000	0.000	0.000	0.000	0.000

*) Other components with 5 or more carbon atoms, excluding iso- and n-Pentanes (C5+)

APPENDIX 3

Number of participants per country

1 lab in AUSTRIA
2 labs in BELGIUM
1 lab in CROATIA
1 lab in DENMARK
1 lab in FINLAND
1 lab in FRANCE
2 labs in GERMANY
1 lab in IRELAND
2 labs in NETHERLANDS
1 lab in POLAND
1 lab in ROMANIA
1 lab in SAUDI ARABIA
2 labs in SPAIN
2 labs in SWEDEN
4 labs in UNITED KINGDOM

APPENDIX 4

Abbreviations

C	= final test result after checking of first reported suspect test result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
R(0.01)	= outlier in Rosner's outlier test
R(0.05)	= straggler in Rosner's outlier test
E	= calculation difference between reported test result and result calculated by iis
W	= test result withdrawn on request of participant
ex	= test result excluded from the statistical evaluation
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
SDS	= Material Safety Data Sheet

Literature

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018
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5 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
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7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
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12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)