Institute for
Interlaboratory Studies

Results of Proficiency Test
Refinery Gas
February 2022

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

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1 INTRODUCTION

During the last years several participants requested iis to set up a proficiency test (PT) for Refinery Gas Analysis. In 2021 iis started an investigation for the feasibility of such a PT. Because iis has limited gas-handling facilities in place to prepare gas samples, EffecTech (Uttoxeter, United Kingdom) was contacted. This company is fully equipped and has a broad experience in the preparation of synthetic Refinery Gas samples for PT purposes. It was decided to organize a proficiency study for Refinery Gas in 2022 for the first time.

In this interlaboratory study 19 laboratories in 13 different 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 21 cylinders. The cylinder size is a cost-effective one-liter cylinder. Each cylinder was uniquely numbered and labelled #22015. 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 ISO/IEC17043:2010 by UKAS (no. 4719) and 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 also 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 21 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 21/0601). Each cylinder was uniquely numbered and labelled #22015. 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 method
Hydrogen	0.0989	1.0180	Horwitz
Oxygen/Argon	0.0003	0.0311	EN15984:22
Nitrogen	0.0094	0.1739	EN15984:22
Carbon Monoxide	0.0034	0.0696	EN15984:22
Carbon Dioxide	0.0028	0.0236	EN15984:22
Methane	0.0589	0.2729	EN15984:22
Ethane	0.0196	0.0942	EN15984:22
Ethene	0.0051	0.0374	EN15984:22
Propane	0.0739	0.0715	EN15984:22
Propene	0.0205	0.0287	EN15984:22
iso-Butane	0.0203	0.0345	EN15984:22
n-Butane	0.0169	0.0364	EN15984:22
trans-2-Butene	0.0018	0.0068	Horwitz
1-Butene	0.0021	0.0068	Horwitz
iso-Butene	0.0017	0.0048	Horwitz
cis-2-Butene	0.0017	0.0048	Horwitz
iso-Pentane	0.0024	0.0034	EN15984:22
n-Pentane	0.0024	0.0088	EN15984:22

Table 1: evaluation of the repeatabilities of subsamples #22015

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 1L cylinder labelled #22015 was sent on January 26, 2022. 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, Argon, Oxygen, Nitrogen, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Methane, Ethane, Ethene, Ethyne, Propane, Propene, Propyne, Propadiene, iso-Butane, n-Butane, trans-2-Butene, 1-Butene, iso-Butene, cis-2-Butene, 1,3-Butadiene, iso-Pentane, n-Pentane, Other components with C5 or more C atoms (except iso-Butane and 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 requirements 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. ASTM or EN 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:

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

4 EVALUATION

In this proficiency test some problems were encountered with the dispatch of the samples. Therefore, the reporting time on the data entry portal was extended with another week. One participant reported test results after the extended final reporting date and two other participants did not report any test results. Not all participants were able to report all tests requested.
In total 17 participants reported 357 numerical test results. Observed were 21 outlying test results, which is 5.9%. 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 components trans-2-Butene, iso-Butene 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 these three components and also for Hydrogen.

One laboratory reported deviating test results for many of the gas composition test results. In total 10 test results of the 17 reported test results were statistical outliers. As the test results are not obtained independently, it was decided not to use any of the reported results of this laboratory for the statistical evaluation. This means that the remaining reported test results were excluded.

Total of the composition results: The total of the test results of the composition per laboratory was calculated by iis. Since the composition is requested as normalized the total should be 100%. Two calculated results were found to be lower than 100%. Both laboratories did not report test results for all components.

Hydrogen: The determination of this component was not problematic. No statistical outliers were observed but one test result was excluded. The calculated

reproducibility after rejection of the suspect data is in agreement with the estimated reproducibility calculated with the Horwitz equation.

Oxygen/Argon: Test method EN15984:22 describes Argon and Oxygen combined as the second Refinery heating gas component. In this PT both components were requested separately. Many participants commented that these two gases co-elute and that the total of the two gases was submitted either as Argon or as Oxygen. Therefore, it was decided to evaluate these components as the sum of Oxygen and Argon.
The determination of the sum of both components was problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of EN15984:22.

Nitrogen: 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.

Carbon Monoxide: 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.

Carbon Dioxide: The determination of this component was not problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN15984:22.

Methane: The determination of this component was not problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN15984:22.

Ethane: The determination of this component was not problematic. One statistical outlier was observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN15984:22.

Ethene: The determination of this component was not problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN15984:22.

Propane: The determination of this component was problematic. No statistical outliers were observed but one test result was excluded. The calculated reproducibility after rejection of the suspect data is not 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. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outlier is not in agreement with the requirements of EN15984:22.

n-Butane: 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.

trans-2-Butene: 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 estimated reproducibility calculated with the Horwitz equation.

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

iso-Butene: 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 estimated reproducibility calculated with the Horwitz equation.

cis-2-Butene: 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 estimated reproducibility calculated with the Horwitz equation.

iso-Pentane: The determination of this component was problematic. Three statistical outliers were observed and one test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of EN15984:22.

n-Pentane: The determination of this component may be problematic for a number of laboratories. Four statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN15984:22.

Carbon content: 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.

Lower Calorific Value: This determination was not problematic. No statistical outliers were observed. The calculated reproducibility 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 were calculated. The reported test results of these components 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 literature reference test methods (in casu ASTM and EN standards) or estimated using the Horwitz equation are presented in the next table.

Component	unit	n	average	2.8 * sd	R(target)
Hydrogen	%mol/mol	16	55.58	1.68	3.40
Oxygen/Argon	%mol/mol	13	0.125	0.125	0.109
Nitrogen	%mol/mol	15	2.617	0.553	0.581
Carbon Monoxide	%mol/mol	15	0.820	0.180	0.235
Carbon Dioxide	%mol/mol	16	0.503	0.084	0.079
Methane	%mol/mol	16	19.85	0.90	0.91
Ethane	%mol/mol	15	7.913	0.267	0.311
Ethene	%mol/mol	15	1.985	0.116	0.124
Propane	%mol/mol	16	5.032	0.360	0.236
Propene	%mol/mol	15	1.601	0.089	0.095
iso-Butane	%mol/mol	15	1.752	0.133	0.112
n-Butane	%mol/mol	15	1.361	0.109	0.118
trans-2-Butene	%mol/mol	15	0.146	0.020	0.022
1-Butene	%mol/mol	15	0.146	0.021	0.015
iso-Butene	%mol/mol	13	0.098	0.015	0.016
cis-2-Butene	%mol/mol	14	0.097	0.015	0.015
iso-Pentane	%mol/mol	12	0.176	0.015	0.009
n-Pentane	%mol/mol	13	0.156	0.025	0.027
Carbon content	g/100g	11	67.61	0.97	2.16
Lower Calorific Value	kJ/100g	11	4929	118	120

Table 2: reproducibilities of tests of sample #22015

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 participating laboratories with the relevant reference test method. The problematic components have been discussed in paragraph 4.1.

4.3 OVERVIEW OF THE PROFICIENCY TEST OF FEBRUARY 2022

	February 2022
Number of reporting laboratories	17
Number of test results	357
Number of statistical outliers	21
Percentage of statistical outliers	5.9%

Table 3: overview of this proficiency test

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 reference methods. The conclusions are given the following table.

Component	February 2022
Hydrogen	++
Oxygen/Argon	-
Nitrogen	+/-
Carbon Monoxide	+
Carbon Dioxide	+/-
Methane	+/-
Ethane	+
Ethene	+/-
Propane	-
Propene	+
iso-Butane	-
n-Butane	+/-
trans-2-Butene	+/-
1-Butene	-
iso-Butene	+/-
cis-2-Butene	+/-
iso-Pentane	-
n-Pentane	+/-
Carbon content	++
Lower Calorific Value	+/-

Table 4: comparison determinations against 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	55.448	55.583	-0.135	-0.11
Oxygen/Argon	0.100	0.125	-0.025	-0.64
Nitrogen	2.510	2.617	-0.107	-0.52
Carbon Monoxide	0.808	0.820	-0.011	-0.14
Carbon Dioxide	0.499	0.503	-0.004	-0.14
Methane	19.907	19.846	0.061	0.19
Ethane	7.989	7.913	0.076	0.68
Ethene	1.997	1.985	0.011	0.25
Propane	5.087	5.032	0.055	0.65
Propene	1.612	1.601	0.011	0.32
iso-Butane	1.796	1.752	0.044	1.11
n-Butane	1.398	1.361	0.037	0.89
trans-2-Butene	0.152	0.146	0.006	0.73
1-Butene	0.152	0.146	0.006	1.15
iso-Butene	0.100	0.098	0.002	0.33
cis-2-Butene	0.102	0.097	0.004	0.81
iso-Pentane	0.180	0.175	0.005	1.37
n-Pentane	0.163	0.156	0.007	0.70

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

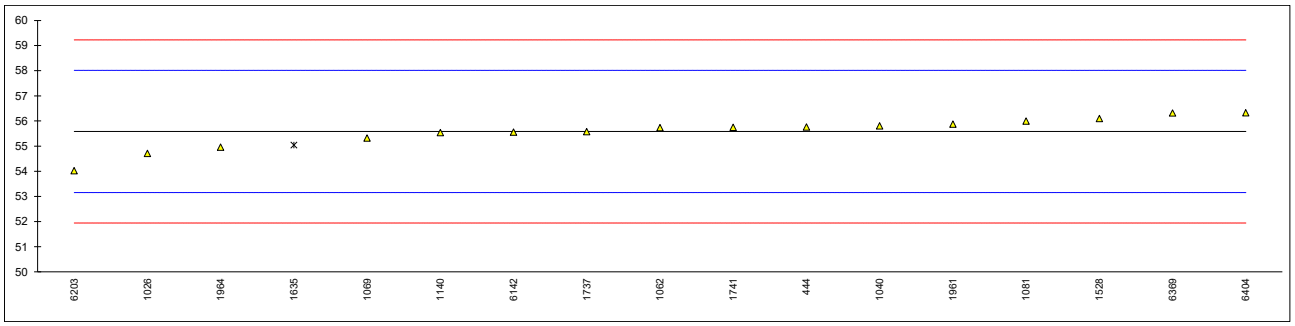
APPENDIX 1

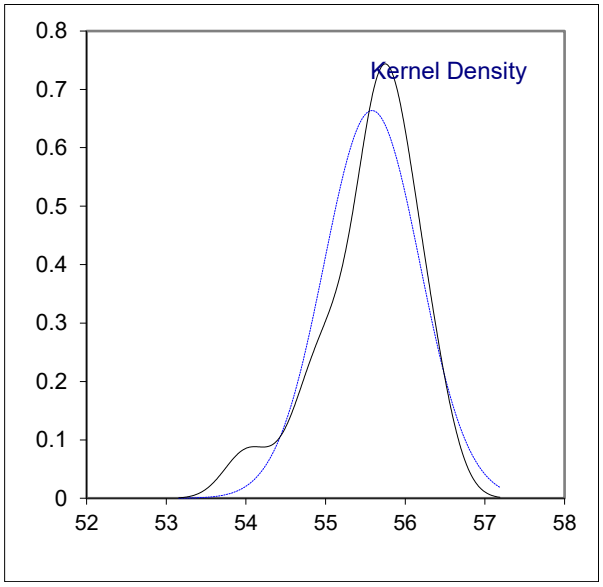
Total of reported (normalized) hydrocarbon composition test results; results in %mol/mol

lab	method	iis calculated	remarks
444	EN15984	100	
446		-----	
1026	EN15984	99.9871	
1040	EN15984	100.04	
1062	EN15984	99.9999	
1069	UOP539	99.9996	
1081		99.908	
1140	D7833	99.999	
1528	UOP539	99.981	
1635	UOP539	94.1	not 100%, reported zero for some components
1737	EN15984	100	
1741	UOP539	100	
1961	EN15984	100.001	
1964	In house	99.9953	did not report individual C4 compounds, only the sum of C4: 3.92%
6142	EN15984	96.3255	not 100%, did not report all components
6203	UOP539	100	
6369	ISO17025	100	
6404	EN15984	100.001	
9008		-----	

Determination of Hydrogen on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	55.761	C	0.15	first reported: 55.658
446		-----		-----	
1026	EN15984	54.71	C	-0.72	first reported: 54.41833333
1040	EN15984	55.80		0.18	
1062	EN15984	55.7340		0.12	
1069	UOP539	55.32		-0.22	
1081		55.997		0.34	
1140	D7833	55.538	C	-0.04	first reported: 55.598
1528	UOP539	56.10	C	0.43	first reported: 56.429
1635	UOP539	55.04	ex	-0.45	test result excluded, see paragraph 4.1
1737		55.57		-0.01	
1741	UOP539	55.75		0.14	
1961	EN15984	55.875		0.24	
1964	In house	54.953		-0.52	
6142	EN15984	55.557		-0.02	
6203	UOP539	54.02		-1.29	
6369	ISO17025	56.3179		0.61	
6404	EN15984	56.325		0.61	
9008		-----		-----	
	normality	suspect			
	n	16			
	outliers	0 (+1ex)			
	mean (n)	55.5830			
	st.dev. (n)	0.60100			
	R(calc.)	1.6828			
	st.dev.(Horwitz)	1.21440			
	R(Horwitz)	3.4003			
compare					
	R(EN15984:22)	1.5684			application range: 3.60 - 4.60



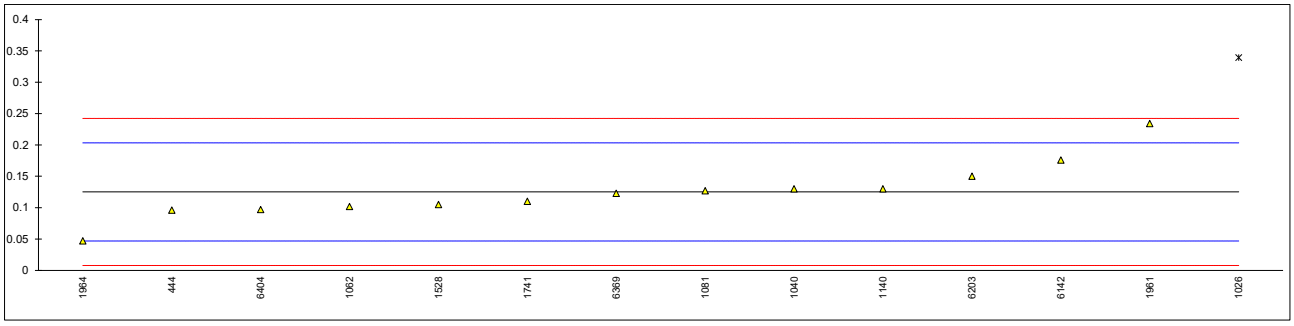


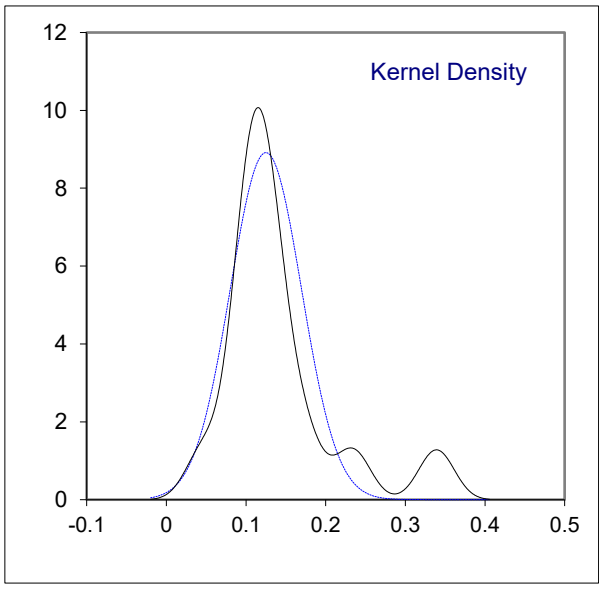
Determination of Oxygen/Argon on sample #22015; results in %mol/mol

lab	method	Ar	O_2	Ar+O_2	mark	z(targ)	remarks
444	EN15984	0.096	-----	0.096		-0.75	
446		-----	-----	-----		-----	
1026	EN15984	-----	0.3393	0.3393	G(0.01)	5.48	
1040	EN15984	0.13	0.00	0.13		0.12	
1062	EN15984	0.000	0.1017	0.1017		-0.60	
1069		-----	-----	-----		-----	
1081		-----	0.127	0.127		0.05	
1140	D7833	-----	0.130	0.13		0.12	
1528	UOP539	0.105	-----	0.105		-0.51	
1635		-----	-----	-----		-----	
1737		-----	-----	-----		-----	
1741	UOP539	-----	0.11	0.11		-0.39	
1961	EN15984	-----	0.234	0.234		2.79	
1964	In house	0.047	0	0.047		-2.00	
6142	EN15984	0.176	-----	0.176		1.30	
6203	UOP539	0	0.15	0.15		0.64	
6369	ISO17025	-----	0.1229	0.1229		-0.06	
6404	EN15984	-----	0.097	0.097		-0.72	
9008		-----	-----	-----		-----	

normality	not OK
n	13
outliers	1
mean (n)	0.1251
st.dev. (n)	0.04476
R(calc.)	0.1253
st.dev.(EN15984:22)	0.03909
R(EN15984:22)	0.1094

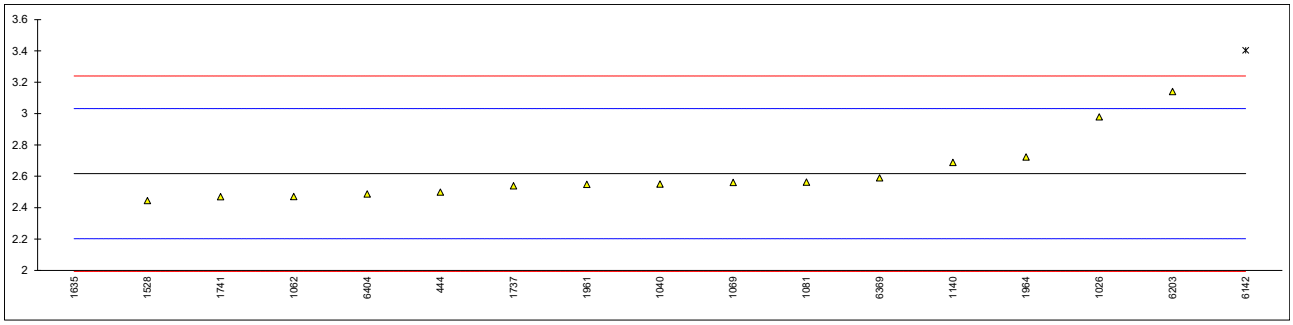
application range: 0.20 - 2.30

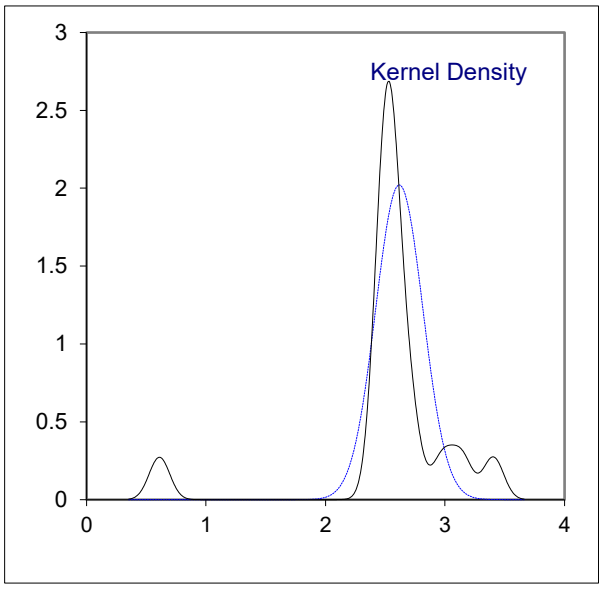




Determination of Nitrogen on sample #22015; results in %mol/mol

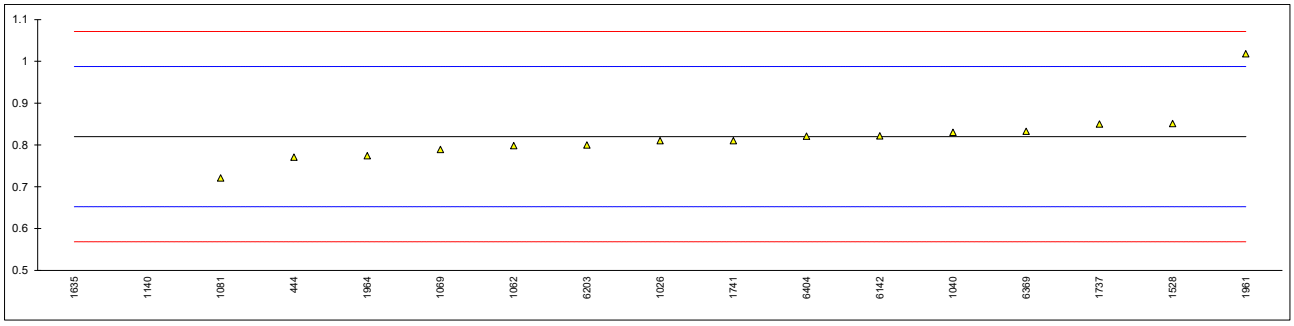
lab	method	value	mark	z(targ)	remarks
444	EN15984	2.499	C	-0.57	first reported: 2.495
446		-----		-----	
1026	EN15984	2.9783	C	1.74	first reported: 3.3039
1040	EN15984	2.55		-0.32	
1062	EN15984	2.4709		-0.70	
1069	UOP539	2.561		-0.27	
1081		2.563		-0.26	
1140	D7833	2.688	C	0.34	first reported: 2.675
1528	UOP539	2.445		-0.83	
1635	UOP539	0.61	G(0.01)	-9.66	
1737		2.54		-0.37	
1741	UOP539	2.47		-0.71	
1961	EN15984	2.548		-0.33	
1964	In house	2.723		0.51	
6142	EN15984	3.4035	G(0.05)	3.79	
6203	UOP539	3.14		2.52	
6369	ISO17025	2.5896		-0.13	
6404	EN15984	2.487		-0.63	
9008		-----		-----	
	normality	not OK			
	n	15			
	outliers	2			
	mean (n)	2.6169			
	st.dev. (n)	0.19743			
	R(calc.)	0.5528			
	st.dev.(EN15984:22)	0.20767			
	R(EN15984:22)	0.5815			application range: 5.00 - 57.00

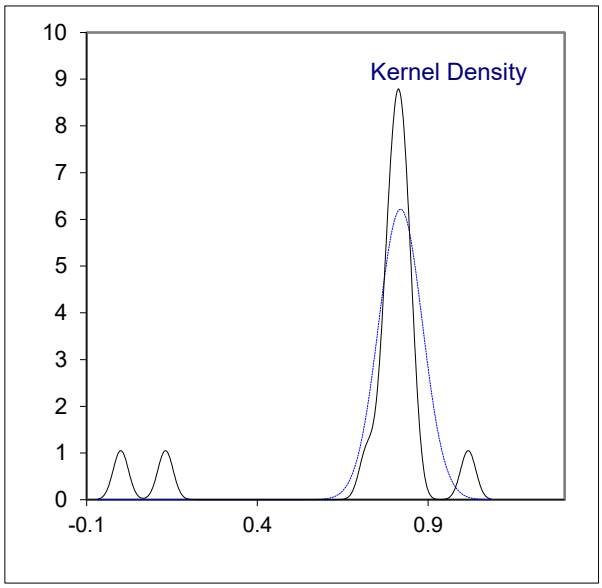




Determination of Carbon Monoxide on sample #22015; results in %mol/mol

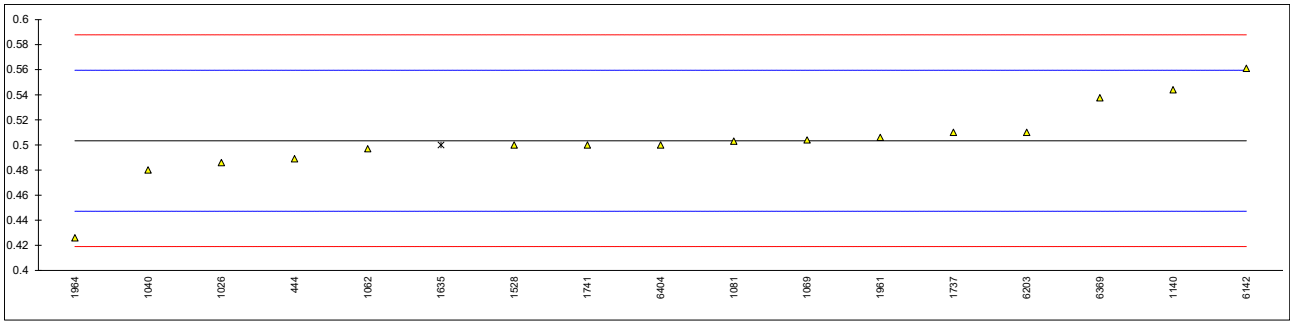
lab	method	value	mark	z(targ)	remarks
444	EN15984	0.771	C	-0.58	first reported: 0.770
446		-----		-----	
1026	EN15984	0.8099	C	-0.12	first reported; 0.787733333
1040	EN15984	0.83		0.12	
1062	EN15984	0.7984		-0.26	
1069	UOP539	0.789		-0.37	
1081		0.721		-1.18	
1140	D7833	0.131	C,G(0.01)	-8.22	first reported: 0.040
1528	UOP539	0.851		0.37	
1635	UOP539	0.0	G(0.05)	-9.79	
1737		0.85		0.36	
1741	UOP539	0.81		-0.12	
1961	EN15984	1.018		2.37	
1964	In house	0.774		-0.55	
6142	EN15984	0.8215		0.02	
6203	UOP539	0.80		-0.24	
6369	ISO17025	0.8324		0.15	
6404	EN15984	0.821		0.01	
9008		-----		-----	
	normality	not OK			
	n	15			
	outliers	2			
	mean (n)	0.8198			
	st.dev. (n)	0.06418			
	R(calc.)	0.1797			
	st.dev.(EN15984:22)	0.08376			
	R(EN15984:22)	0.2345			application range: 0.50 – 3.10

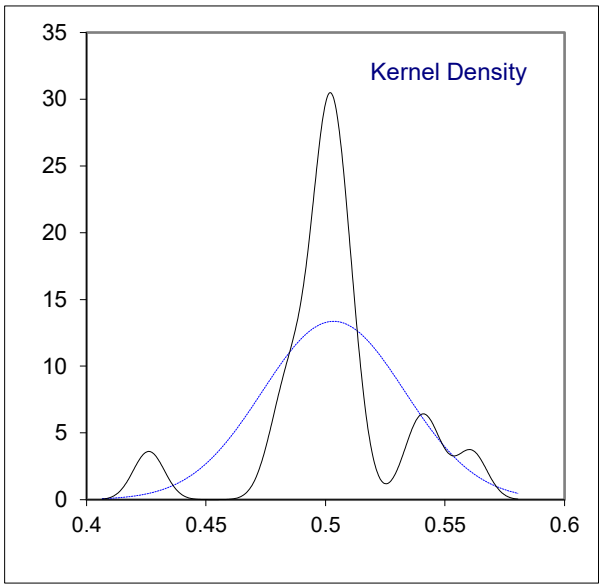




Determination of Carbon Dioxide on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.489	C	-0.51	first reported: 0.488
446		-----		-----	
1026	EN15984	0.4859	C	-0.62	first reported: 0.492233333
1040	EN15984	0.48		-0.83	
1062	EN15984	0.4969		-0.23	
1069	UOP539	0.504		0.02	
1081		0.503		-0.01	
1140	D7833	0.544		1.45	
1528	UOP539	0.500		-0.12	
1635	UOP539	0.5	ex	-0.12	test result excluded, see paragraph 4.1
1737		0.51		0.24	
1741	UOP539	0.50		-0.12	
1961	EN15984	0.506		0.09	
1964	In house	0.426		-2.75	
6142	EN15984	0.561		2.05	
6203	UOP539	0.51		0.24	
6369	ISO17025	0.5376		1.22	
6404	EN15984	0.500		-0.12	
9008		-----		-----	
	normality	not OK			
	n	16			
	outliers	0 (+1ex)			
	mean (n)	0.5033			
	st.dev. (n)	0.02984			
	R(calc.)	0.0836			
	st.dev.(EN15984:22)	0.02812			
	R(EN15984:22)	0.0787			application range: 0.40 – 10.00

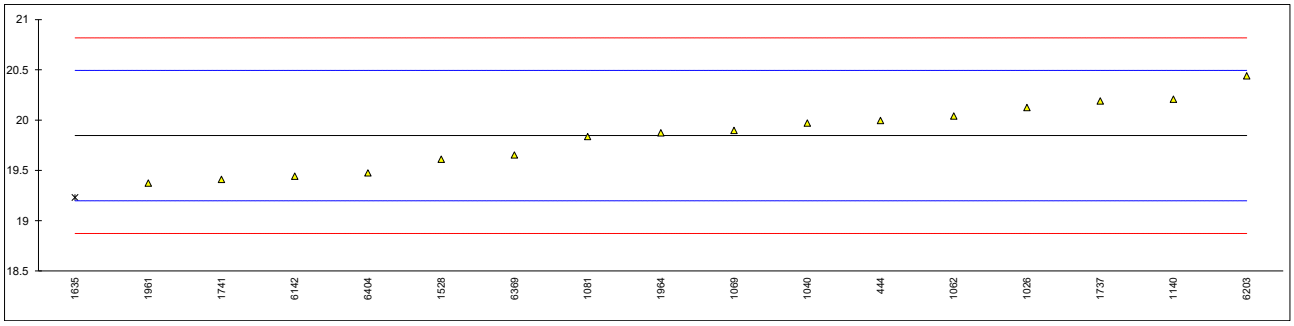


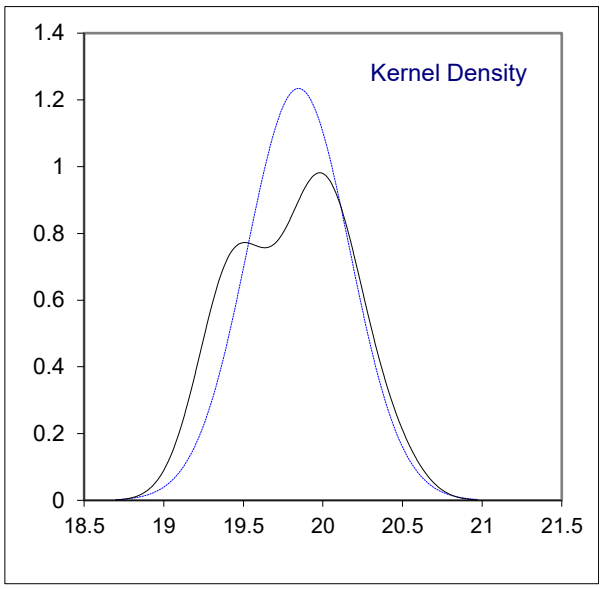


Determination of Methane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	19.996	C	0.46	first reported: 19.959
446		-----		-----	
1026	EN15984	20.1241	C	0.86	first reported: 20.04468333
1040	EN15984	19.97		0.38	
1062	EN15984	20.0396		0.60	
1069	UOP539	19.8982		0.16	
1081		19.836		-0.03	
1140	D7833	20.207	C	1.11	first reported: 20.229
1528	UOP539	19.61	C	-0.73	first reported: 20.097
1635	UOP539	19.23	ex	-1.90	test result excluded, see paragraph 4.1
1737		20.19		1.06	
1741	UOP539	19.41		-1.35	
1961	EN15984	19.373		-1.46	
1964	In house	19.8734		0.08	
6142	EN15984	19.441		-1.25	
6203	UOP539	20.44		1.83	
6369	ISO17025	19.6529		-0.60	
6404	EN15984	19.475		-1.14	
9008		-----		-----	

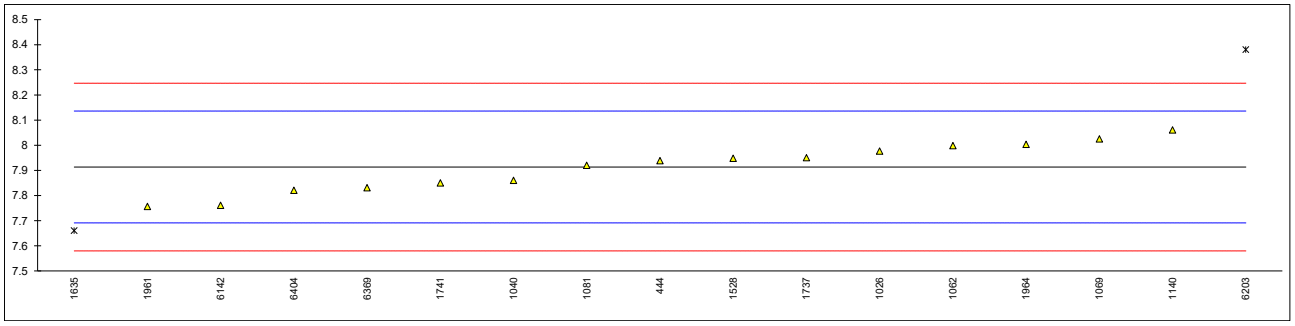
normality	OK	
n	16	
outliers	0 (+1ex)	
mean (n)	19.8460	
st.dev. (n)	0.32313	
R(calc.)	0.9048	
st.dev.(EN15984:22)	0.32413	
R(EN15984:22)	0.9076	application range: 4.00 – 20.00

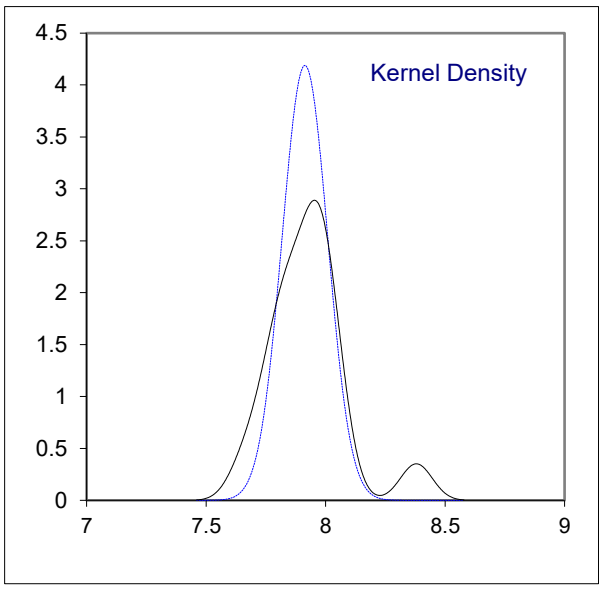




Determination of Ethane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	7.939	C	0.23	first reported: 7.927
446		-----		-----	
1026	EN15984	7.9766	C	0.57	first reported: 7.947816667
1040	EN15984	7.86		-0.48	
1062	EN15984	7.9983		0.76	
1069	UOP539	8.025		1.00	
1081		7.920		0.06	
1140	D7833	8.061	C	1.33	first reported:8.070
1528	UOP539	7.948		0.31	
1635	UOP539	7.66	ex	-2.28	test result excluded, see paragraph 4.1
1737		7.95		0.33	
1741	UOP539	7.85		-0.57	
1961	EN15984	7.756		-1.42	
1964	In house	8.0037		0.81	
6142	EN15984	7.761		-1.37	
6203	UOP539	8.38	G(0.05)	4.20	
6369	ISO17025	7.8311		-0.74	
6404	EN15984	7.821		-0.83	
9008		-----		-----	
	normality	OK			
	n	15			
	outliers	1 (+1ex)			
	mean (n)	7.9134			
	st.dev. (n)	0.09525			
	R(calc.)	0.2667			
	st.dev.(EN15984:22)	0.11115			
	R(EN15984:22)	0.3112			application range: 3.90 – 10.00

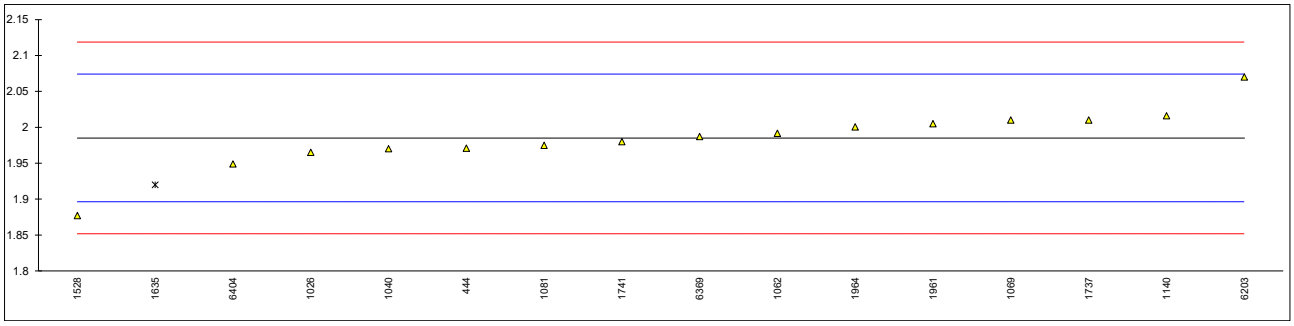


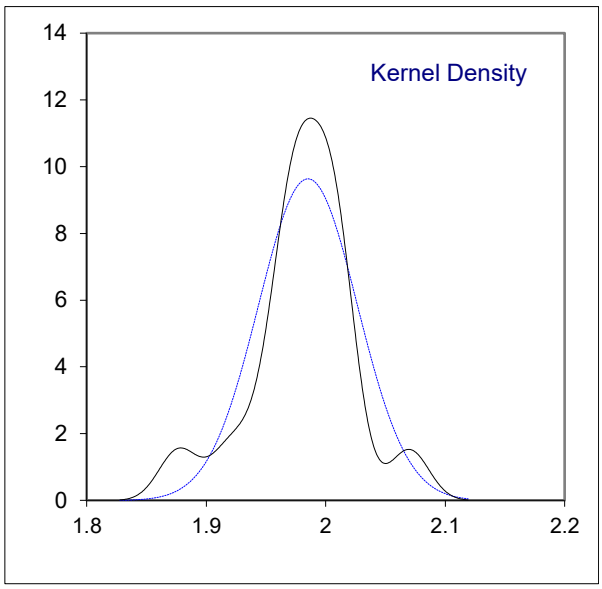


Determination of Ethene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.971	C	-0.32	first reported: 1.962
446		-----		-----	
1026	EN15984	1.965	C	-0.45	first reported: 1.96225
1040	EN15984	1.97		-0.34	
1062	EN15984	1.9917		0.15	
1069	UOP539	2.01		0.56	
1081		1.975		-0.23	
1140	D7833	2.016	C	0.69	first reported: 2.018
1528	UOP539	1.877		-2.43	
1635	UOP539	1.92	ex	-1.47	test result excluded, see paragraph 4.1
1737		2.01		0.56	
1741	UOP539	1.98		-0.12	
1961	EN15984	2.005		0.45	
1964	In house	2.0006		0.35	
6142		-----		-----	
6203	UOP539	2.07		1.91	
6369	ISO17025	1.9872		0.05	
6404	EN15984	1.949		-0.81	
9008		-----		-----	

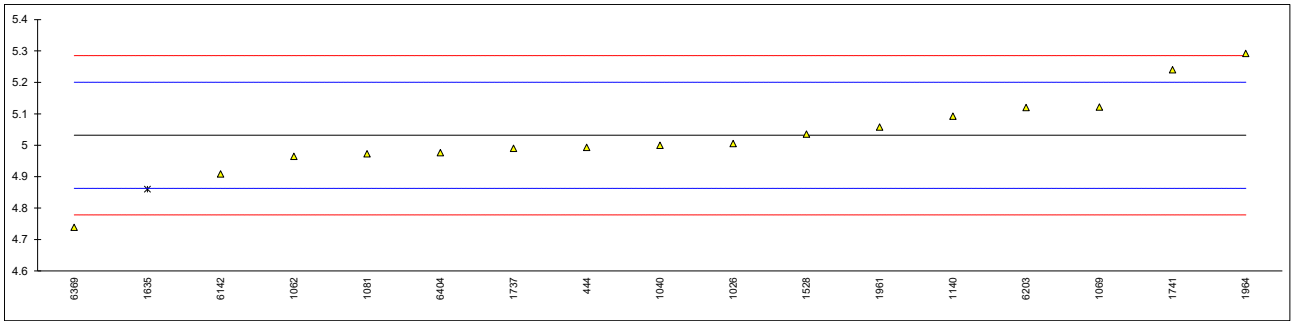
normality	not OK	
n	15	
outliers	0 (+1ex)	
mean (n)	1.9852	
st.dev. (n)	0.04143	
R(calc.)	0.1160	
st.dev.(EN15984:22)	0.04446	
R(EN15984:22)	0.1245	application range: 1.00 – 4.00

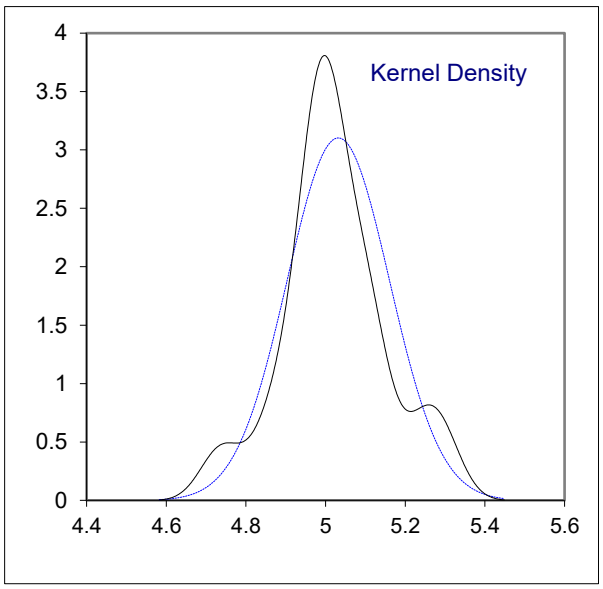




Determination of Propane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	4.993	C	-0.46	first reported: 4.984
446		-----		-----	
1026	EN15984	5.005	C	-0.32	first reported: 4.985583333
1040	EN15984	5.00		-0.38	
1062	EN15984	4.9646		-0.79	
1069	UOP539	5.121		1.06	
1081		4.973		-0.69	
1140	D7833	5.092	C	0.71	first reported: 5.098
1528	UOP539	5.035		0.04	
1635	UOP539	4.86	ex	-2.03	test result excluded, see paragraph 4.1
1737		4.99		-0.49	
1741	UOP539	5.24		2.47	
1961	EN15984	5.058		0.31	
1964	In house	5.2919		3.08	
6142	EN15984	4.9085		-1.46	
6203	UOP539	5.12		1.05	
6369	ISO17025	4.7388		-3.47	
6404	EN15984	4.976		-0.66	
9008		-----		-----	
	normality	suspect			
	n	16			
	outliers	0 (+1ex)			
	mean (n)	5.0317			
	st.dev. (n)	0.12863			
	R(calc.)	0.3602			
	st.dev.(EN15984:22)	0.08443			
	R(EN15984:22)	0.2364			application range 2.00 – 6.00

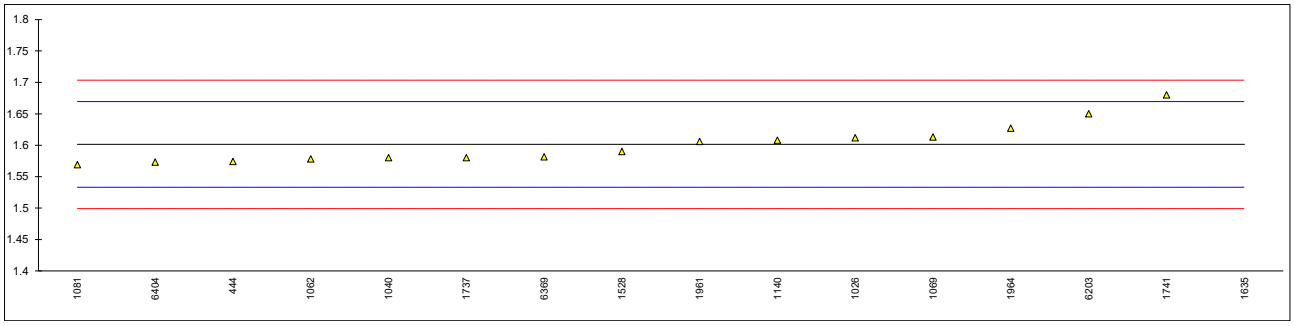


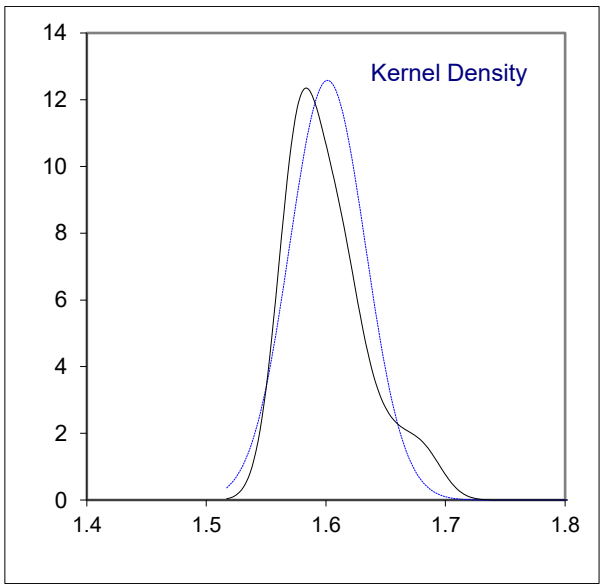


Determination of Propene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.574	C	-0.80	first reported: 1.639
446		-----		-----	
1026	EN15984	1.6118	C	0.30	first reported: 1.603533333
1040	EN15984	1.58		-0.63	
1062	EN15984	1.5781		-0.68	
1069	UOP539	1.613		0.34	
1081		1.569		-0.95	
1140	D7833	1.608	C	0.19	first reported: 1.610
1528	UOP539	1.59	C	-0.34	first reported: 1.337
1635	UOP539	2.30	G(0.01)	20.50	
1737		1.58		-0.63	
1741	UOP539	1.68		2.31	
1961	EN15984	1.606		0.13	
1964	In house	1.6269		0.75	
6142		-----		-----	
6203	UOP539	1.65		1.43	
6369	ISO17025	1.5816		-0.58	
6404	EN15984	1.573		-0.83	
9008		-----		-----	

normality	not OK	
n	15	
outliers	1	
mean (n)	1.6014	
st.dev. (n)	0.03172	
R(calc.)	0.0888	
st.dev.(EN15984:22)	0.03407	
R(EN15984:22)	0.0954	application range: 0.50 – 6.00

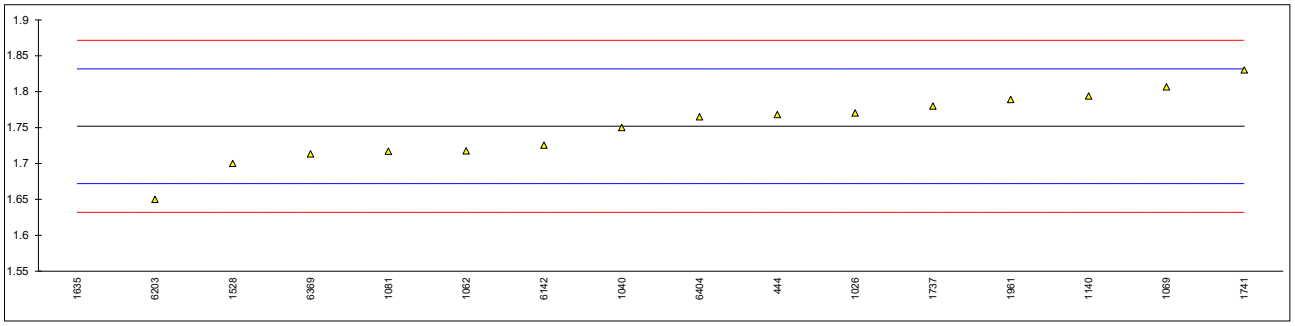


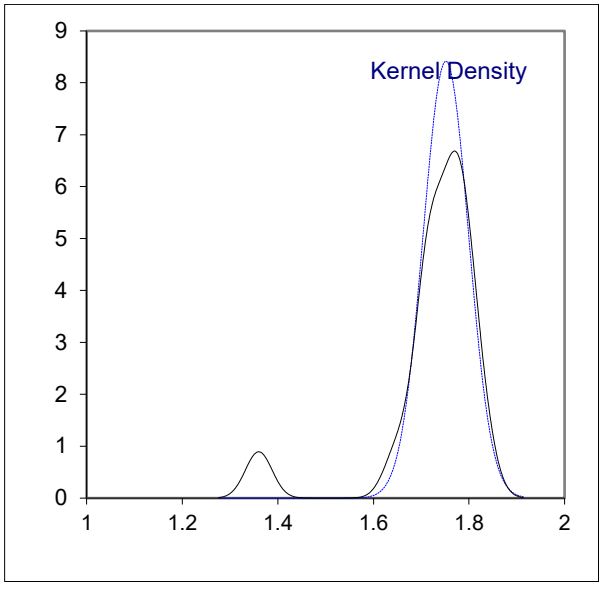


Determination of iso-Butane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.768	C	0.41	first reported: 1.764
446		-----		-----	
1026	EN15984	1.7703	C	0.46	first reported: 1.7641
1040	EN15984	1.75		-0.04	
1062	EN15984	1.7175		-0.86	
1069	UOP539	1.8066		1.37	
1081		1.717		-0.87	
1140	D7833	1.794	C	1.06	first reported: 1.796
1528	UOP539	1.70	C	-1.30	first reported: 1.498
1635	UOP539	1.36	G(0.01)	-9.82	
1737		1.78		0.71	
1741	UOP539	1.83		1.96	
1961	EN15984	1.789		0.93	
1964		-----		-----	
6142	EN15984	1.7255		-0.66	
6203	UOP539	1.65		-2.55	
6369	ISO17025	1.7134		-0.96	
6404	EN15984	1.765		0.33	
9008		-----		-----	

normality	OK	
n	15	
outliers	1	
mean (n)	1.7518	
st.dev. (n)	0.04740	
R(calc.)	0.1327	
st.dev.(EN15984:22)	0.03991	
R(EN15984:22)	0.1118	application range: 1.00 – 2.50

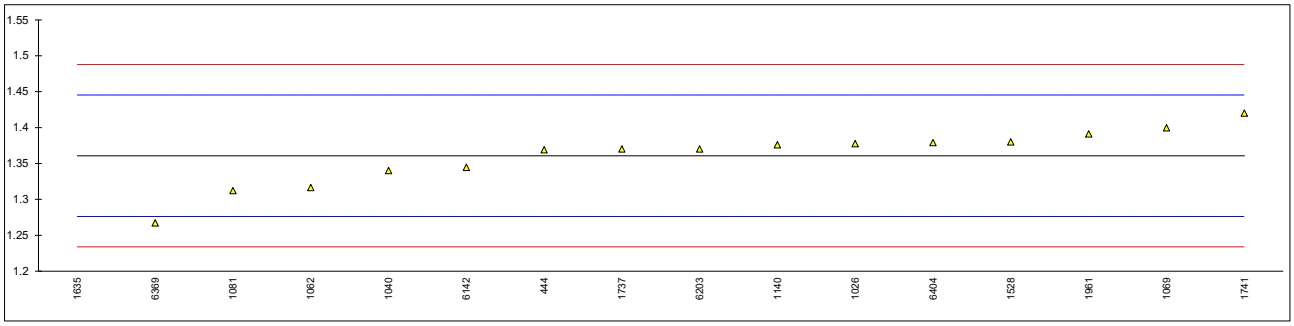


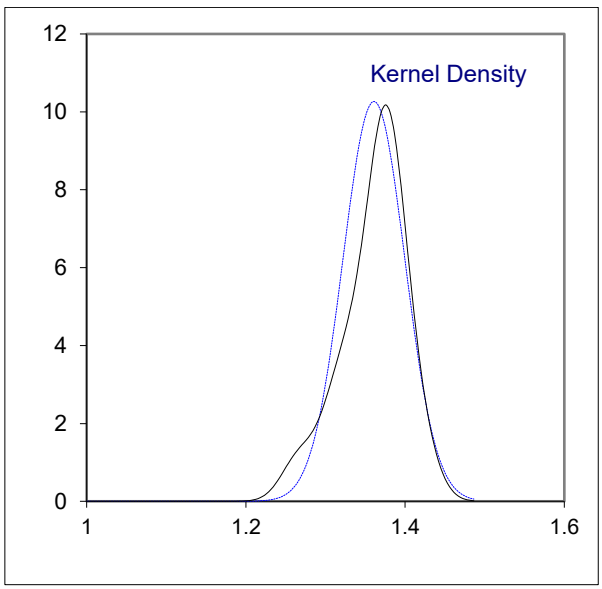


Determination of n-Butane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	1.369	C	0.19	first reported: 1.366
446		-----		-----	
1026	EN15984	1.3775	C	0.39	first reported: 1.374
1040	EN15984	1.34		-0.49	
1062	EN15984	1.3166		-1.05	
1069	UOP539	1.3995		0.91	
1081		1.312		-1.15	
1140	D7833	1.376	C	0.36	first reported: 1.378
1528	UOP539	1.38	C	0.45	first reported: 1.216
1635	UOP539	0.14	G(0.01)	-28.86	
1737		1.37		0.22	
1741	UOP539	1.42		1.40	
1961	EN15984	1.391		0.71	
1964		-----		-----	
6142	EN15984	1.3445		-0.39	
6203	UOP539	1.37		0.22	
6369	ISO17025	1.2673		-2.21	
6404	EN15984	1.379		0.43	
9008		-----		-----	

normality	suspect	
n	15	
outliers	1	
mean (n)	1.3608	
st.dev. (n)	0.03886	
R(calc.)	0.1088	
st.dev.(EN15984:22)	0.04231	
R(EN15984:22)	0.1185	application range 1.00 – 4.00

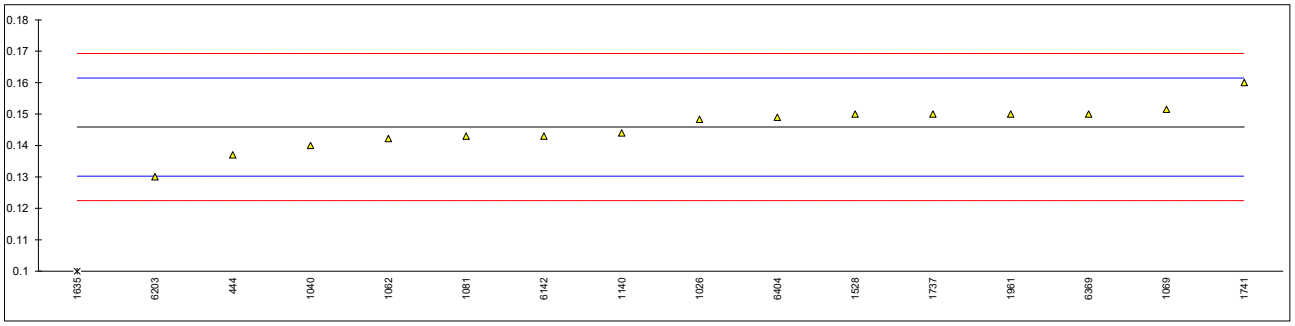


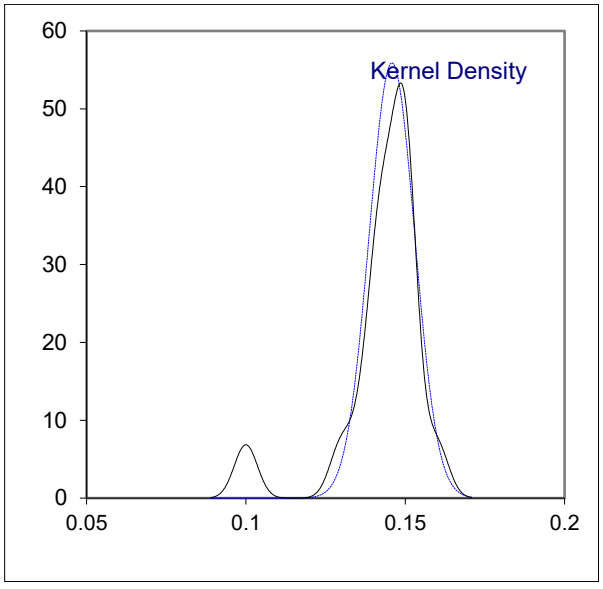


Determination of trans-2-Butene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	Remarks
444	EN15984	0.137	C	-1.14	first reported: 0.178
446		-----		-----	
1026	EN15984	0.1483	C	0.31	first reported: 0.14795
1040	EN15984	0.14		-0.75	
1062	EN15984	0.1422		-0.47	
1069	UOP539	0.1515		0.72	
1081		0.143		-0.37	
1140	D7833	0.144		-0.24	
1528	UOP539	0.15	C	0.53	first reported: 0.114
1635	UOP539	0.10	G(0.01)	-5.88	
1737		0.15		0.53	
1741	UOP539	0.16		1.81	
1961	EN15984	0.150		0.53	
1964		-----		-----	
6142	EN15984	0.143		-0.37	
6203	UOP539	0.13		-2.04	
6369	ISO17025	0.1500		0.53	
6404	EN15984	0.149		0.40	
9008		-----		-----	

normality	suspect
n	15
outliers	1
mean (n)	0.1459
st.dev. (n)	0.00714
R(calc.)	0.0200
st.dev.(Horwitz)	0.00780
R(Horwitz)	0.0218

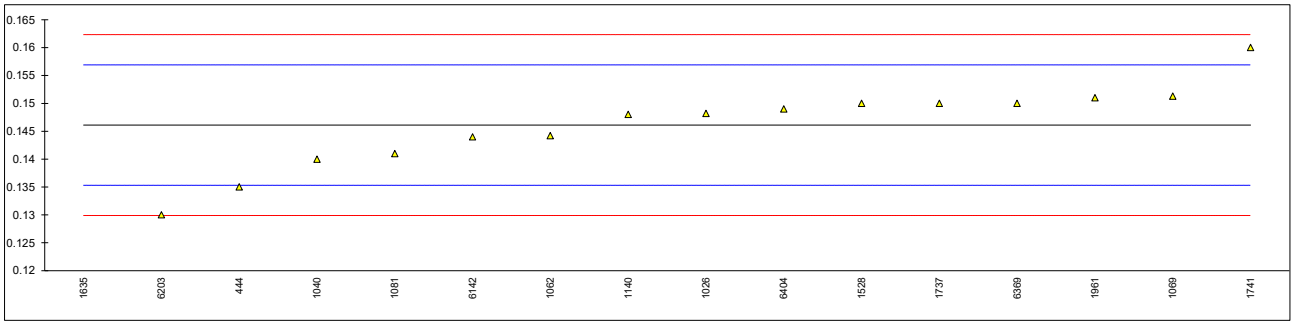


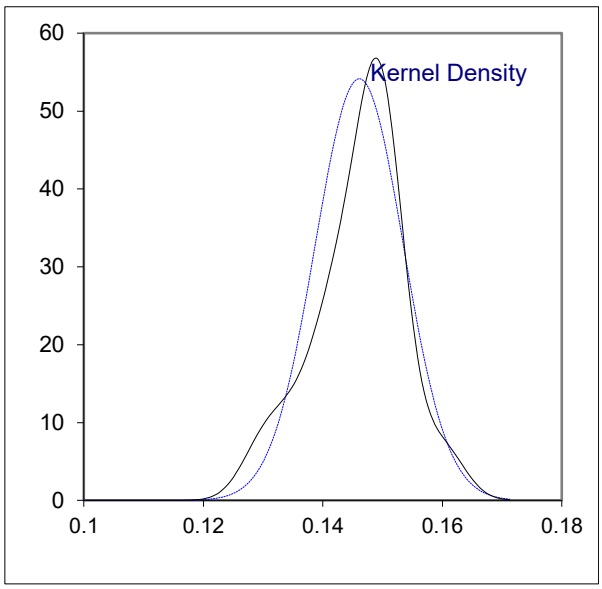


Determination of 1-Butene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.135	C	-2.06	first reported: 0.167
446		-----		-----	
1026	EN15984	0.1482	C	0.39	first reported: 0.148333333
1040	EN15984	0.14		-1.13	
1062	EN15984	0.1442		-0.35	
1069	UOP539	0.1513		0.96	
1081		0.141		-0.95	
1140	D7833	0.148		0.35	
1528	UOP539	0.15	C	0.72	first reported: 0.119
1635	UOP539	0	G(0.01)	-27.05	
1737		0.15		0.72	
1741	UOP539	0.16		2.57	
1961	EN15984	0.151		0.90	
1964		-----		-----	
6142	EN15984	0.144		-0.39	
6203	UOP539	0.13		-2.98	
6369	ISO17025	0.1500		0.72	
6404	EN15984	0.149		0.53	
9008		-----		-----	

normality	OK	
n	15	
outliers	1	
mean (n)	0.1461	
st.dev. (n)	0.00737	
R(calc.)	0.0206	
st.dev.(EN15984:22)	0.00540	
R(EN15984:22)	0.0151	application range: 0.50-2.00

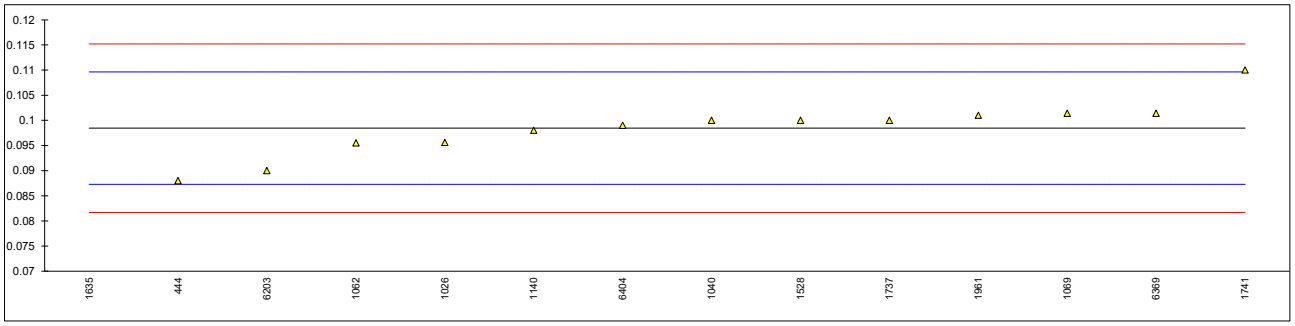


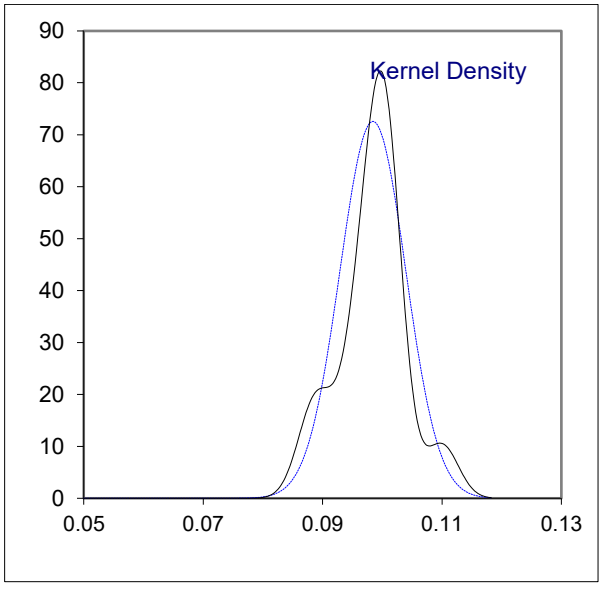


Determination of iso-Butene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.088	C	-1.87	first reported: 0.109
446		-----		-----	
1026	EN15984	0.0956	C	-0.51	first reported: 0.097
1040	EN15984	0.10		0.28	
1062	EN15984	0.0955		-0.53	
1069	UOP539	0.1014		0.53	
1081		-----		-----	
1140	D7833	0.098	C	-0.08	first reported: 0.099
1528	UOP539	0.10	C	0.28	first reported: 0.082
1635	UOP539	0	G(0.01)	-17.64	
1737		0.10		0.28	
1741	UOP539	0.11		2.07	
1961	EN15984	0.101		0.46	
1964		-----		-----	
6142		-----		-----	
6203	UOP539	0.09		-1.51	
6369	ISO17025	0.1014		0.53	
6404	EN15984	0.099		0.10	
9008		-----		-----	

normality	suspect
n	13
outliers	1
mean (n)	0.0985
st.dev. (n)	0.00550
R(calc.)	0.0154
st.dev.(Horwitz)	0.00558
R(Horwitz)	0.0156

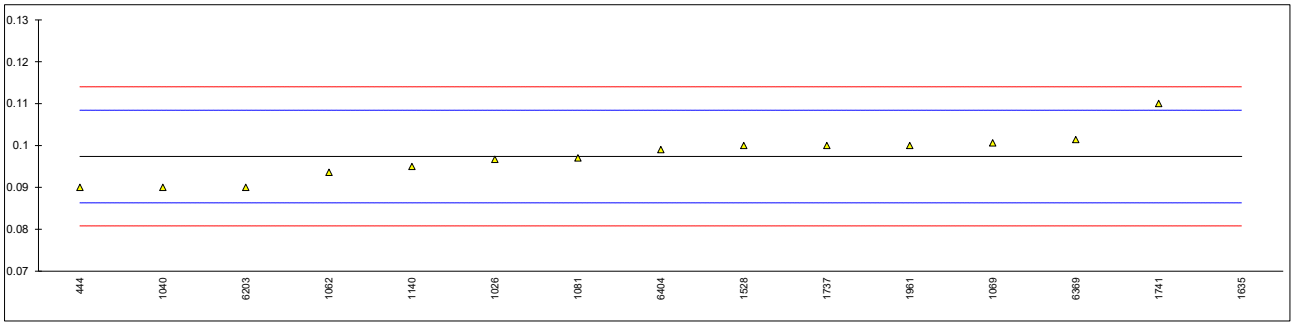


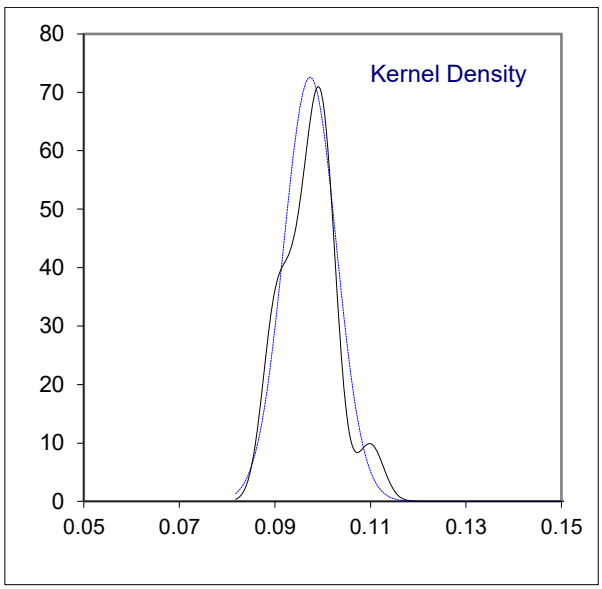


Determination of cis-2-Butene on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.09	C	-1.33	first reported: 0.119
446		-----		-----	
1026	EN15984	0.0967	C	-0.12	first reported: 0.09795
1040	EN15984	0.09		-1.33	
1062	EN15984	0.0936		-0.68	
1069	UOP539	0.1006		0.58	
1081		0.097		-0.07	
1140	D7833	0.095	C	-0.43	first reported: 0.096
1528	UOP539	0.10	C	0.47	first reported: 0.076
1635	UOP539	0.22	G(0.01)	22.17	
1737		0.10		0.47	
1741	UOP539	0.11		2.28	
1961	EN15984	0.100		0.47	
1964		-----		-----	
6142		-----		-----	
6203	UOP539	0.09		-1.33	
6369	ISO17025	0.1014		0.73	
6404	EN15984	0.099		0.29	
9008		-----		-----	

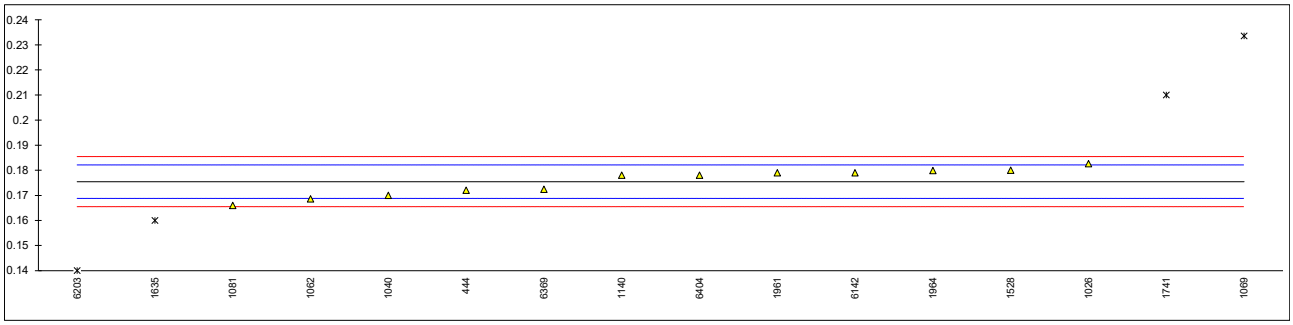
normality	OK
n	14
outliers	1
mean (n)	0.0974
st.dev. (n)	0.00550
R(calc.)	0.0154
st.dev.(Horwitz)	0.00553
R(Horwitz)	0.0155

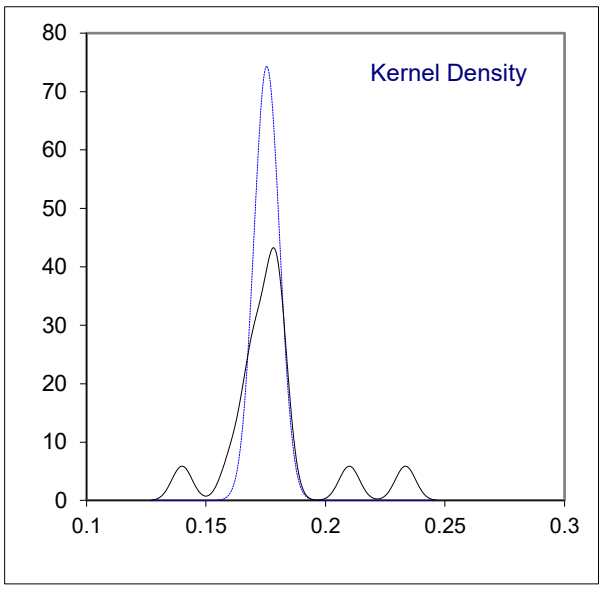




Determination of iso-Pentane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.172		-1.04	
446		-----		-----	
1026	EN15984	0.1826	C	2.15	first reported: 0.18385
1040	EN15984	0.17		-1.64	
1062	EN15984	0.1686		-2.07	
1069	UOP539	0.2335	G(0.01)	17.48	
1081		0.166		-2.85	
1140	D7833	0.178		0.77	
1528	UOP539	0.18	C	1.37	first reported: 0.140
1635	UOP539	0.16	ex	-4.66	test result excluded, see paragraph 4.1
1737		-----		-----	
1741	UOP539	0.21	G(0.01)	10.40	
1961	EN15984	0.179		1.07	
1964	In house	0.1799		1.34	
6142	EN15984	0.179		1.07	
6203	UOP539	0.14	G(0.01)	-10.68	
6369	ISO17025	0.1724		-0.92	
6404	EN15984	0.178		0.77	
9008		-----		-----	
	normality	OK			
	n	12			
	outliers	3 (+1ex)			
	mean (n)	0.1755			
	st.dev. (n)	0.00537			
	R(calc.)	0.0150			
	st.dev.(EN15984:22)	0.00332			
	R(EN15984:22)	0.0093			application range: 0.20-2.10



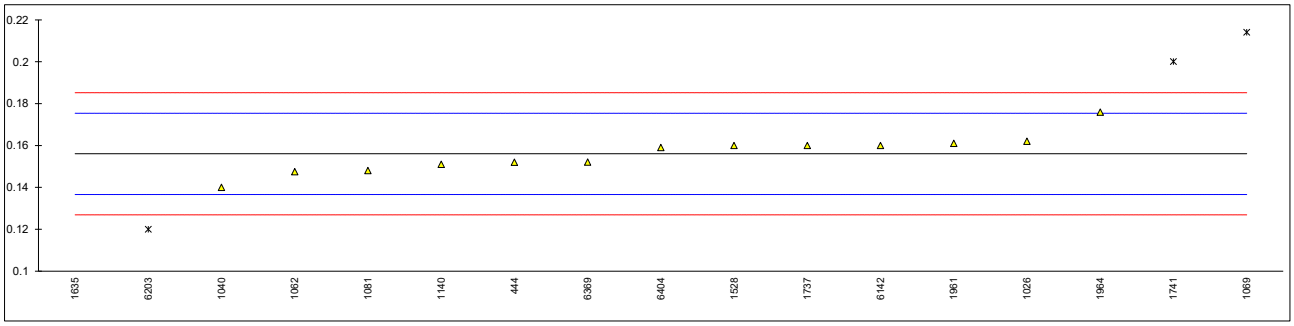


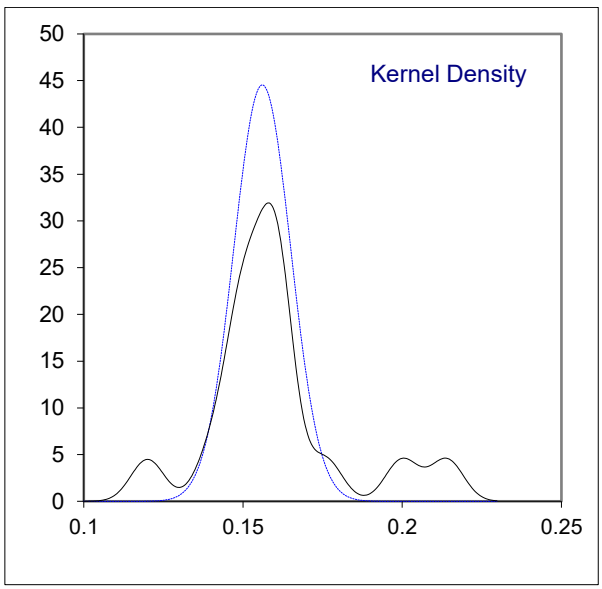
Determination of n-Pentane on sample #22015; results in %mol/mol

lab	method	value	mark	z(targ)	remarks
444	EN15984	0.152	C	-0.42	first reported: 0.151
446		-----		-----	
1026	EN15984	0.162	C	0.61	first reported: 0.163566667
1040	EN15984	0.14		-1.65	
1062	EN15984	0.1475		-0.88	
1069	UOP539	0.2140	DG(0.05)	5.97	
1081		0.148		-0.83	
1140	D7833	0.151		-0.52	
1528	UOP539	0.16	C	0.41	first reported: 0.130
1635	UOP539	0	G(0.01)	-16.08	
1737		0.16		0.41	
1741	UOP539	0.20	DG(0.05)	4.53	
1961	EN15984	0.161		0.51	
1964	In house	0.1759		2.05	
6142	EN15984	0.160		0.41	
6203	UOP539	0.12	G(0.05)	-3.71	
6369	ISO17025	0.1521		-0.41	
6404	EN15984	0.159		0.31	
9008		-----		-----	

	normality	suspect
	n	13
	outliers	4
	mean (n)	0.1560
	st.dev. (n)	0.00896
	R(calc.)	0.0251
	st.dev.(EN15984:22)	0.00970
	R(EN15984:22)	0.0272

application range: 0.10 – 0.35

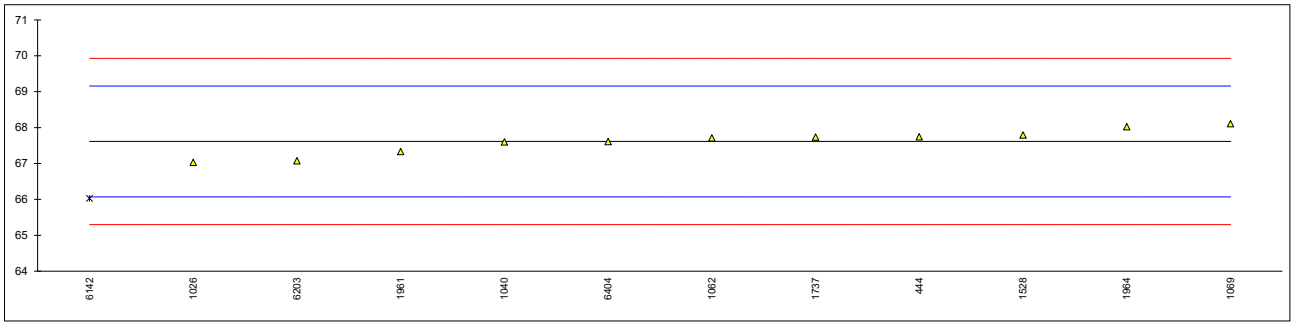


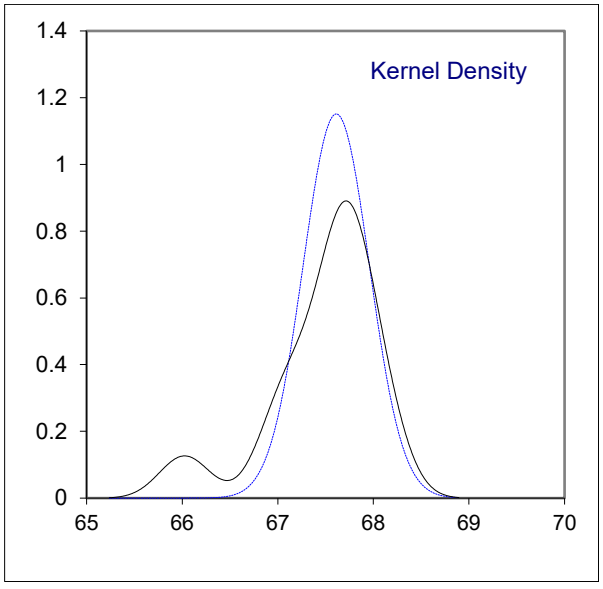


Determination of Carbon content on sample #22015; results in g/100g

lab	method	value	mark	z(targ)	remarks
444	EN15984	67.74	C	0.16	first reported: 67.86
446		-----		-----	
1026	EN15984	67.03		-0.76	
1040	EN15984	67.6		-0.02	
1062	EN15984	67.71		0.13	
1069	EN15984	68.11		0.64	
1081		-----		-----	
1140		-----		-----	
1528	UOP539	67.79	C	0.23	first reported: 67.732
1635		-----		-----	
1737	EN15984	67.73		0.15	
1741		-----		-----	
1961	EN15984	67.33		-0.37	
1964	In house	68.024		0.53	
6142	EN15984	66.025	G(0.05)	-2.06	
6203	EN15984	67.07		-0.70	
6369		-----		-----	
6404	EN15984	67.61		0.00	
9008		-----		-----	

normality	OK
n	11
outliers	1
mean (n)	67.613
st.dev. (n)	0.3466
R(calc.)	0.971
st.dev.(EN15984:22)	0.7714
R(EN15984:22)	2.16

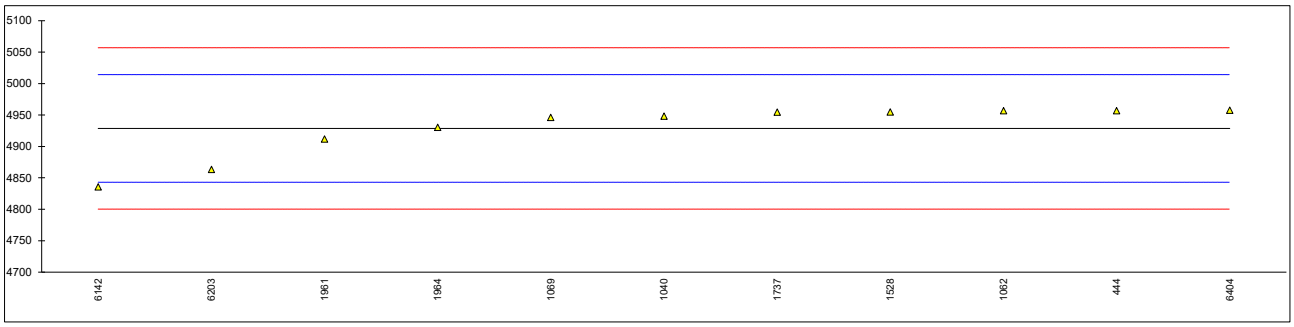


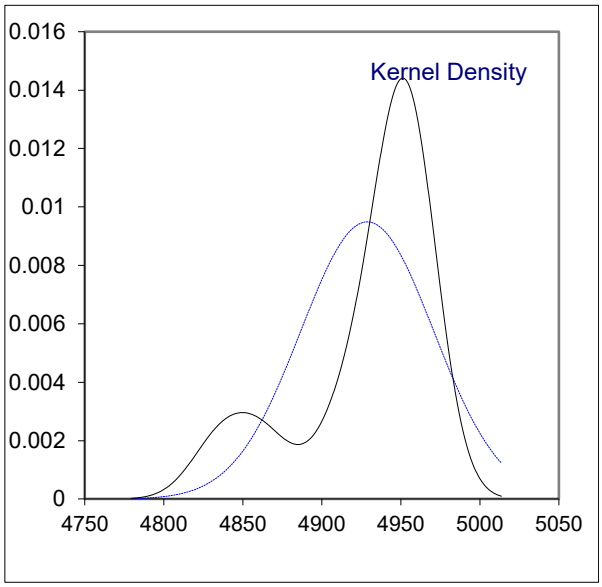


Determination of Lower Calorific Value on sample #22015; results in kJ/100g

lab	method	value	mark	z(targ)	remarks
444	EN15984	4956.84	C	0.66	first reported: 4953.85
446		-----		-----	
1026		-----		-----	
1040	EN15984	4948.0	C	0.45	first reported: 494.8
1062	EN15984	4956.69		0.65	
1069	EN15984	4946	C	0.40	first reported: 494600
1081		-----		-----	
1140		-----		-----	
1528	ISO6976	4954.9	C	0.61	first reported: 49.73
1635		-----		-----	
1737	EN15984	4954.60		0.60	
1741		-----		-----	
1961	EN15984	4911.80		-0.39	
1964	In house	4930.507		0.04	
6142	EN15984	4835.58		-2.17	
6203	ISO6976	4863.31		-1.53	
6369		-----		-----	
6404	EN15984	4957.54		0.67	
9008		-----		-----	

normality	suspect
n	11
outliers	0
mean (n)	4928.706
st.dev. (n)	42.0382
R(calc.)	117.707
st.dev.(EN15984:22)	42.8214
R(EN15984:22)	119.90





APPENDIX 2

Other reported test results

lab	Hydrogen sulfide	Ethyne	Propyne	Propadiene	1,3-Butadiene	Other *)
444	0	0	0	0	0	0
446	-----	-----	-----	-----	-----	-----
1026	0	-----	-----	-----	-----	0
1040	0.00	0.00	0.00	0.00	0.00	0.00
1062	0.000	0.000	0.000	0.000	0.000	0.0000
1069	-----	0.00	0.00	0.00	0.00	0.00
1081	-----	0 C	0 C	-----	-----	-----
1140	-----	0.000	-----	0.000	0.000	0.000
1528	-----	-----	-----	-----	-----	-----
1635	0	0	-----	-----	0	-----
1737	-----	<0,01	<0,01	<0,01	<0,01	-----
1741	-----	-----	-----	-----	-----	-----
1961	0.000	0.000	-----	0.000	0.000	0.000
1964	-----	-----	-----	-----	-----	-----
6142	-----	-----	-----	-----	-----	-----
6203	0	0	0	0	0	0
6369	-----	-----	-----	-----	-----	-----
6404	0.000	0.000	0.000	0.000	0.000	0.000
9008	-----	-----	-----	-----	-----	-----

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

Lab 1081 first reported for Ethyne: 1.975, for Propyne: 1.569

APPENDIX 3

Number of participants per country

1 lab in AUSTRIA
2 labs in BELGIUM
1 lab in CROATIA
1 lab in FINLAND
1 lab in FRANCE
1 lab in GERMANY
1 lab in IRELAND
1 lab in KUWAIT
2 labs in NETHERLANDS
2 labs in ROMANIA
1 lab in SERBIA
1 lab 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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7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
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11 W. Horwitz and R. Albert, J. AOAC Int, 79.3, 589-621, (1996)
12 Bernard Rosner, Percentage Points for a Generalized ESD Many-Outlier Procedure, Technometrics, 25(2), 165-172, (1983)