Results of Proficiency Test
REN/Food Ethanol
November 2011

CONTENTS

Appendices:

1.   INTRODUCTION

Since 2007, a proficiency test for REN/Food Ethanol is organised every year by the Institute for Interlaboratory Studies. During the planning of the annual proficiency testing program 2011/2012, it was decided to continue the round robin for the analysis of REN/Food grade Ethanol.
In this interlaboratory study, 26 laboratories in 13 different countries have participated. See appendix 3 for the number of participants per country. In this report, the results of the proficiency test are presented and discussed.

2   SET-UP

The Institute for Interlaboratory Studies (iis) in Spijkenisse, the Netherlands, was the organiser of this proficiency test. Analysis for fit-for-use and homogeneity testing were subcontracted. It was decided to send one sample (1* 0.5 L of 95% REN/Food grade Ethanol, labelled #11122). Participants were requested to report rounded and unrounded results. The unrounded results were preferably used for statistical evaluation.

2.1   ACCREDITATION

The Institute for Interlaboratory Studies in Spijkenisse, the Netherlands, is accredited in agreement with ISO 17043:10, (R007) since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This ensures strict adherence to protocols for sample preparation and statistical evaluation and 100% confidentially of participant's data. Also customer's satisfaction is measured on regular basis by sending out questionnaires.

2.2   PROTOCOL

The protocol followed in the organisation of this proficiency test was the one as described for proficiency testing in the report 'iis Interlaboratory Studies: Protocol for the Organisation, Statistics and Evaluation' (iis-protocol, version 3.2) of January 2010.

2.3   CONFIDENTIALITY STATEMENT

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

2.4   SAMPLES

The necessary bulk material for sample #11122 was obtained from a local trader. The approximately 25 litre bulk sample was, after homogenisation in a precleaned can, divided over 48 amber glass bottles of 0.5 L and labelled #11122. The homogeneity of these subsamples was checked by determination of Density in accordance with ASTM D4052:11 and Water in accordance with ASTM D1364:07 on 8 stratified randomly selected samples.

Sample	Density @ 20ºC in kg/L	Water in %M/M
Sample #11122-1	0.80467	5.634
Sample #11122-2	0.80471	5.634
Sample #11122-3	0.80471	5.629
Sample #11122-4	0.80471	5.629
Sample #11122-5	0.80472	5.595
Sample #11122-6	0.80472	5.615
Sample #11122-7	0.80471	5.614
Sample #11122-8	0.80471	5.627

table 1: Homogeneity tests of subsamples #11122

From the test results of table 1, the repeatabilities were calculated and compared with 0.3 times the corresponding target reproducibility in agreement with the procedure of ISO 13528, Annex B2 in the next table:

	Density @ 20ºC in kg/L	Water in %M/M
r (Observed)	0.00004	0.037
reference method	ASTM D4052:11	ASTM D1364:07
0.3 * R (ref. method)	0.00015	0.043

table 2: Repeatability of subsamples #11122

The repeatabilities of the results from the homogeneity test were in agreement with the requirements of the respective standards. Therefore, homogeneity of all the prepared subsamples was assumed.

To each of the participating laboratories 1*0.5 L bottle of sample #11122 was sent on December 2, 2011.

2.5   ANALYSES

The participants were asked to determine on sample #11122: Density @ 20°C, Nonvolatile matter, Permanganate Time Test, Purity on dry basis, Water (titrimetric), Strength (in %V/V and %M/M) and UV transmittance at 300, 270, 240, 230 and 220nm. To get comparable results a detailed report form, on which the units were printed, was sent together with each sample. In addition, a letter of instructions and a SDS were added to the package.

3   RESULTS

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

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

3.1   STATISTICS

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

For the statistical evaluation the *unrounded* (when available) figures were used instead of the rounded results. Results reported as '<…' or '>…' were not used in the statistical evaluation. First the normality of the distribution of the various data sets per determination was checked by means of the Lilliefors-test. After removal of outliers, this check was repeated. Not all data sets proved to have a normal distribution, in which cases the statistical evaluation should be used with due care.

In accordance with ISO 5725 (1986 and 1994) the original results per determination were submitted subsequently to Dixon and Grubbs outlier tests. Outliers are marked by D(0.01) for the Dixon test, by G(0.01) or DG(0.01) for the Grubbs test. Stragglers are marked by D(0.05) for the Dixon test, by G(0.05) or DG(0.05) for the Grubbs test. Both outliers and stragglers were not included in the calculations of averages and standard deviations.

For each assigned value, the uncertainty was determined in accordance with ISO13528. Subsequently the calculated uncertainty was evaluated against the respective requirement based on the target reproducibility in accordance with ISO13528. When the uncertainty passed the evaluation, no remarks are made in the report. However, when the uncertainty failed the evaluation it is mentioned in the report and it will have consequences for the evaluation of the test results.

Finally, the reproducibilities were calculated from the standard deviations by multiplying 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 analysis results are plotted. The corresponding laboratory numbers are under the X-axis.
The straight horizontal line presents the consensus value (a trimmed mean). The four striped lines, parallel to the consensus value line, are the +3s, +2s, -2s and -3s target reproducibility limits of the selected standard. Outliers and other data, which were excluded from the calculations, are represented as a cross. Accepted data are represented as a triangle.
Furthermore, Kernel Density Graphs were made. This is a method for producing a smooth density approximation to a set of data that avoids some problems associated with histograms (see appendix 4, nr.13-14).

3.3 Z-SCORES

To evaluate the performance of the participating laboratories the z-scores were calculated. As it was decided to evaluate the performance of the participants in this proficiency test (PT) against the literature requirements, e.g. ASTM reproducibilities, the z-scores were calculated using a target standard deviation. This results in an evaluation independent of the spread 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. In some cases, literature repeatability is available; in other cases, a reproducibility of a former iis proficiency test could be used and the Horwitz equation can be used to estimate target reproducibility.

The z-scores were calculated according to:

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

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

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

4.   EVALUATION

In this proficiency test, some problems were encountered with despatch of the samples. Four participants reported results after the final reporting date and three participants did not report any results at all. Not all laboratories were able to perform all analysis requested. Finally, the 23 reporting laboratories did send in 151 (numerical) results. Observed were 9 outlying results, which is 6.0%. In proficiency studies, outlier percentages of 3% - 7.5% are normal.

4.1   EVALUATION PER TEST

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

On the registration form the participants were asked to fill out the analytical details regarding the strenght determination and UV absorbance. Twenty laboratories answered the questions fully or partially (See Appendix 2). From the analytical details none of the participants did perform a distillation before the strength determination and all participants used the density meter for the strength determination.

A not normal distribution was found for the following determinations: Density, Purity and Strength. In this case the statistical evaluation should be used with due care.

Density: This determination was not problematic. One statistical outlier was observed and the calculated reproducibility is in good agreement with the requirements of ASTM D4052:11.

Nonvolatile matter: Almost all participants reported a "less then" result. Therefore no significant conclusions were drawn.

Water: This determination was not problematic. Two statistical outliers were observed. However, the calculated reproducibility, after rejection of the statistical outliers, is in agreement with the requirements of ASTM D1364:07.

Permanganate Test:Regretfully, no precision data are given in ASTM D1363:06 for Ethanol. Therefore, no conclusions were drawn. All participants reported a time larger then 20 minutes.

Purity on dry basis: Regretfully, no standard test method with precision data exists. Therefore no conclusions were drawn. No statistical outliers were observed. The calculated reproducibility is nearly equal to the

calculated reproducibility of the previous proficiency test (iis10C12b) of November 2010 (0.0111 vs 0.0124).

Strength (%V/V):   This determination is not problematic. One statistical outlier was observed. The calculated reproducibility after rejection of the statistical outliers is in good agreement with the reproducibility derived from the OIML table and ASTM D4052:11.

Strength(%M/M):   This determination may be not problematic. Regretfully, no standard test method with precision data exists.
The calculated reproducibility is small in comparison with the calculated reproducibility in the previous proficiency test (iis10C12b) of November 2010 (0.044 vs 0.095).

UV absorbance: Regretfully, no standard test method with precision data exists. Therefore no significant conclusions were drawn.
In total 5 statistical outliers were observed. The calculated reproducibilities are all large in comparison with the calculated reproducibilities in a previous proficiency test (iis10C12b) of November 2010.
From the analytical details, it is clear that all participants measured the UV absorbance against water and all used a 10 mm cuvette, except laboratories 312 and 1242. These participants used respectively a 5 mm and a 50 mm cuvette.

4.2 PERFORMANCE EVALUATION FOR THE GROUP OF LABORATORIES

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

	unit	n	average	2.8 *sd_R	R (lit)
Density @ 20°C	kg/L	22	0.80591	0.00014	0.00050
Nonvolatile matter	mg/100mL	4	0.131	n.a	n.a
Water	%M/M	11	5.594	0.142	0.168
Permanganate Time Test	min.	9	33.3	13.9	(8.4)
Purity on dry basis	%M/M	10	99.994	0.011	(0.012)
Strength	%V/V	22	96.373	0.038	0.100
Strength	%M/M	12	94.383	0.044	(0.095)
UV-absorbance 300 nm		6	0.0010	0.0050	(0.0016)
UV-absorbance 270 nm		7	0.0028	0.0079	(0.0065)
UV-absorbance 240 nm		12	0.0380	0.0177	(0.0093)
UV-absorbance 230 nm		14	0.0931	0.0354	(0.0284)
UV-absorbance 220 nm		13	0.1912	0.0592	(0.0344)

Table 3: Reproducibilities of sample #11122

Results between brackets are compared with the spread of the previous PT or estimated from a target reproducibility

4.3   COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2011 WITH PREVIOUS PT'S

	November 2011	*November 2010*	*December 2009*	*December 2008*
Number of reporting labs	23	28	31	22
Number of results reported	151	189	299	153
Number of statistical outliers	9	13	34	8
Percentage outliers	6.0%	6.9%	11.4%	5.2%

table 4: comparison with previous proficiency tests.

In proficiency tests, outlier percentages of 3% - 7.5% are quite normal.

The performance of the determinations of the proficiency tests was compared against the requirements of the respective standards. The conclusions are given the following table:

	November 2011	*November 2010*	*December 2009*	*December 2008*
Density @ 20°C	++	++	++	++
Nonvolatile matter	n.e	++	n.e.	n.e.
Water	+/-	++	--	--
Permanganate Time Test	(--)	(--)	--	--
Purity on dry basis	(+)	(--)	(++)	(+/-)
Strength %V/V	++	++	-	(++)
Strength %M/M	++	(--)	(++)	(--)
UV-absorbance 300 nm	(--)	(++)	(++)	(++)
UV-absorbance 270 nm	(-)	(++)	(++)	(++)
UV-absorbance 240 nm	(-)	(++)	(++)	(++)
UV-absorbance 230 nm	(-)	(+)	(++)	(++)
UV-absorbance 220 nm	(-)	(-)	(++)	(++)

Table 5: comparison determinations of sample #11122 against the standard

results between brackets are compared with the spread of the previous round robin

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

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

APPENDIX 1

Determination of Density @ $20^{o}C$ on sample #11122; results in kg/L

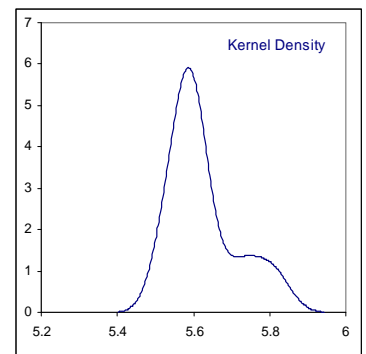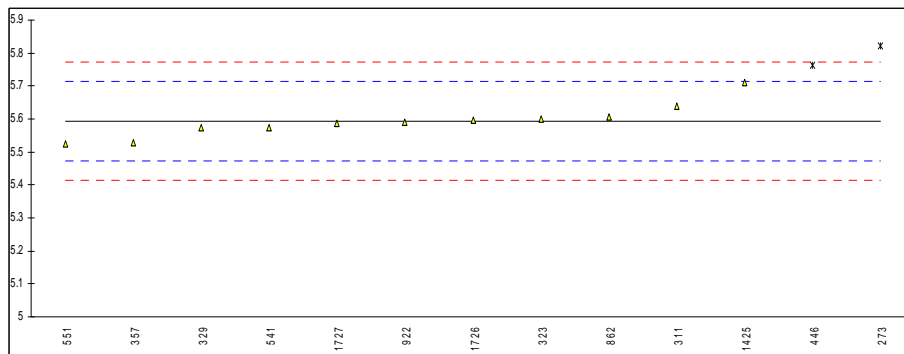| lab	method	value	mark	z(targ)	remarks
273	D4052	0.8060		0.53	
311	D4052	0.8059		-0.03	
312	D4052	0.8059		-0.03	
323	D4052	0.8058		-0.59	
329	D4052	0.8058		-0.59	
357	D4052	0.80588		-0.14	
446	D4052	0.8059		-0.03	
522		-----		-----	
541	D4052	0.8059		-0.03	
551	D4052	0.8059		-0.03	
556		-----		-----	
559		-----		-----	
862	D4052	0.80600		0.53	
922	D4052	0.8059		-0.03	
1126	D4052	0.805907		0.01	
1205	in house	0.80590		-0.03	
1241	D4052	0.805903		-0.02	
1242	D4052	0.805990		0.47	
1247	INH-4500	0.80594		0.19	
1253	D4052	0.80610	G(0.05)	1.09	
1425		-----		-----	
1605	D4052	0.80594		0.19	
1627	INH-79528	0.80588		-0.14	
1726	D4052	0.80591		0.02	
1727	D4052	0.80588		-0.14	
1835	D4052	0.80588		-0.14	
4247	INH-4500	0.80592		0.08	
	normality	not OK			
	n	22			
	outliers	1			
	mean (n)	0.80591			
	st.dev. (n)	0.000501			
	R(calc.)	0.00014			
	R(D4052:11)	0.00050			
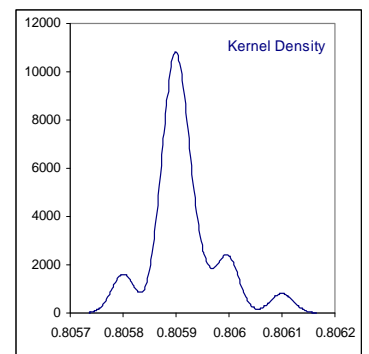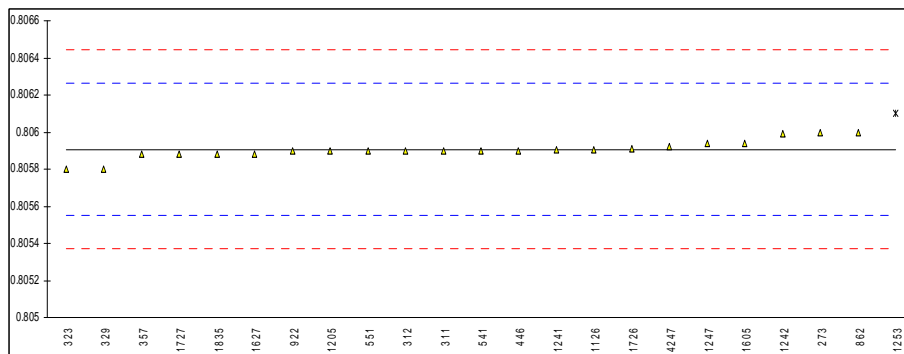
Determination of Nonvolatile matter on sample #11122; results in mg/100mL

lab	method	value	mark	z(targ)	remarks
273		-----		-----	
311	D1353	<1		-----	
312		-----		-----	
323	D1353	<1		-----	
329	D1353	<1		-----	
357	D1353	<1		-----	
446	INH-4524	<10		-----	
522		-----		-----	
541	D1353	<0.1		-----	
551	D1353	0.0		-----	
556		-----		-----	
559		-----		-----	
862	D1353	<0.1		-----	
922	D1353	0.19		-----	
1126		-----		-----	
1205		-----		-----	
1241		-----		-----	
1242		-----		-----	
1247		-----		-----	
1253		-----		-----	
1425		-----		-----	
1605		-----		-----	
1627	INH-79529	0.035		-----	
1726	D1353	<10		-----	
1727	D1353	0.3		-----	
1835	EN15691	<10		-----	
4247		-----		-----	

normality	unknown	
n	4	
outliers	n.a	
mean (n)	0.131	
st.dev. (n)	n.a	
R(calc.)	n.a	
R(D1353:09)	n.a	

Determination of Water (Titrimetric) on sample #11122; results in %M/M

lab	method	value	mark	z(targ)	remarks
273	E203	5.821	C,DG(0.05)	3.79	first reported: 6.21
311	D1364	5.64		0.77	
312		-----		-----	
323	D1364	5.600		0.10	
329	E203	5.573		-0.35	
357	E203	5.529		-1.08	
446	E203	5.7632	DG(0.05)	2.83	
522		-----		-----	
541	E1064	5.575		-0.31	
551	D1364	5.525		-1.15	
556		-----		-----	
559		-----		-----	
862	D1364	5.606		0.21	
922	E203	5.59		-0.06	
1126		-----		-----	
1205		-----		-----	
1241		-----		-----	
1242		-----		-----	
1247		-----		-----	
1253		-----		-----	
1425	in house	5.71		1.94	
1605		-----		-----	
1627		-----		-----	
1726	D1364	5.5965		0.05	
1727	D1364	5.5863		-0.12	
1835		-----		-----	
4247		-----		-----	

normality	OK
n	11
outliers	2
mean (n)	5.5937
st.dev. (n)	0.05062
R(calc.)	0.1417
R(D1364:07)	0.1678

Determination of Permanganate Time Test @ 15 °C on sample #11122; results in minutes

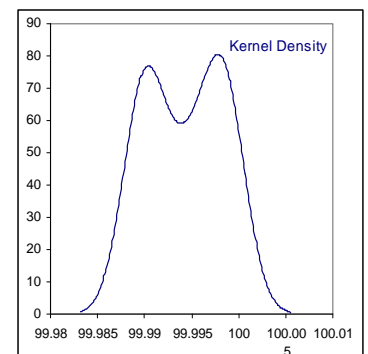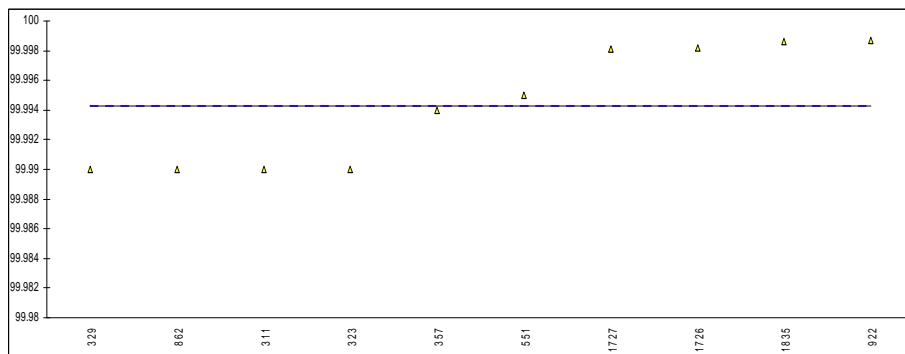| lab	method	value	mark	z(targ)	remarks
273		-----		-----	
311	D1363	40		-----	
312		-----		-----	
323	D1363Mod.	40		-----	
329	D1363	>20		-----	
357	D1363	35		-----	
446		-----		-----	
522		-----		-----	
541	D1363	36		-----	
551	D1363	25		-----	
556		-----		-----	
559		-----		-----	
862	D1363	33		-----	
922	D1363	30		-----	
1126		-----		-----	
1205		-----		-----	
1241		-----		-----	
1242		-----		-----	
1247		-----		-----	
1253		-----		-----	
1425		-----		-----	
1605		-----		-----	
1627		-----		-----	
1726	D1363	30		-----	
1727		-----		-----	
1835	D1363	31		-----	
4247		-----		-----	
				-----	
	normality	OK			
	n	9			
	outliers	0			
	mean (n)	33.3			
	st.dev. (n)	4.95			
	R(calc.)	13.9			
	R(D1363:06)	(8.4)			
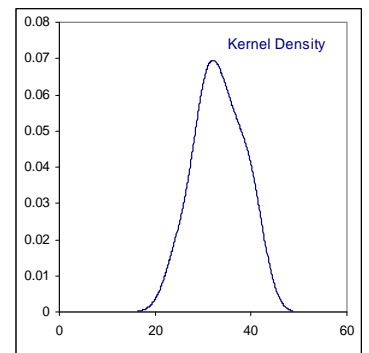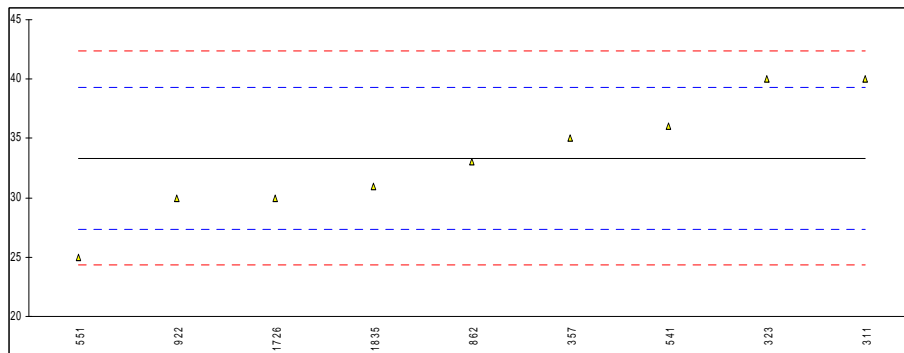
Determination of Purity on dry basis on sample #11122; results in %M/M

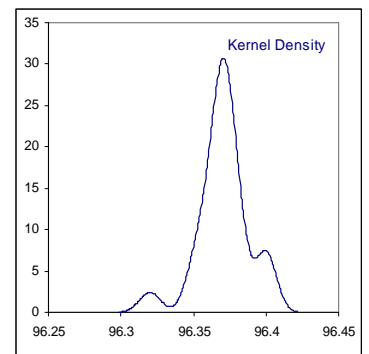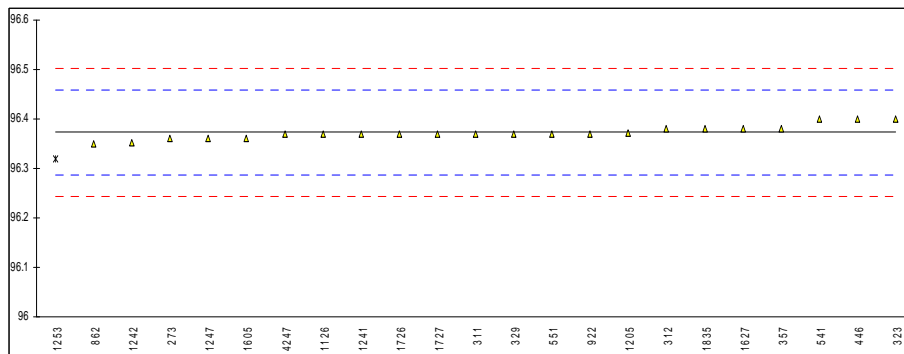| lab	method	value	mark	z(targ)	remarks
273		-----		-----	
311		99.99		-----	
312		-----		-----	
323	INH-001	99.99		-----	
329		99.99		-----	
357	EN15721	99.994		-----	
446	INH-CM	>99.99		-----	
522		-----		-----	
541		-----		-----	
551	INH-1313	99.995		-----	
556		-----		-----	
559		-----		-----	
862	INH-0001	99.99		-----	
922	INH-0001	99.9987		-----	
1126		-----		-----	
1205		-----		-----	
1241		-----		-----	
1242		-----		-----	
1247		-----		-----	
1253		-----		-----	
1425		-----		-----	
1605		-----		-----	
1627		-----		-----	
1726	in house	99.9982		-----	
1727		99.9981		-----	
1835	in house	99.9986		-----	
4247		-----		-----	
	normality	not OK			
	n	10			
	outliers	0			
	mean (n)	99.994			
	st.dev. (n)	0.0040			
	R(calc.)	0.011			
	R(Lit)	unknown		Compare R(iis10C12b)=0.0124	

Determination of Strength on sample #11122; results in %V/V

lab	method	value	mark	z(targ)	remarks
273	OIML	96.36		-0.36	
311	OIML	96.37		-0.08	
312	OIML	96.38		0.20	
323	D4052	96.4		0.76	
329	OIML	96.37		-0.08	
357	OIML	96.38		0.20	
446	OIML	96.4		0.76	
522		-----		-----	
541	Dens.Det.	96.4		0.76	
551	D4052	96.37		-0.08	
556		-----		-----	
559		-----		-----	
862	Table	96.35		-0.64	
922	OIML	96.37		-0.08	
1126		96.37		-0.08	
1205	in house	96.372		-0.03	
1241		96.37		-0.08	
1242		96.352		-0.59	
1247	in house	96.36		-0.36	
1253		96.32	G(0.05)	-1.48	
1425		-----		-----	
1605		96.36		-0.36	
1627	INH-79528	96.38		0.20	
1726	OIML	96.37		-0.08	
1727		96.37		-0.08	
1835	OIML	96.38		0.20	
4247	in house	96.37		-0.08	

normality	not OK		
n	22		
outliers	1		
mean (n)	96.373		
st.dev. (n)	0.0137		
R(calc.)	0.038		
R(see $4.1)	0.100	Compare R(iis10C12b)=0.095	

Determination of Strength on sample #11122; results in %M/M

lab	method	value	mark	z(targ)	remarks
273		-----		-----	
311	OIML	94.38		-----	
312	OIML	94.39		-----	
323	D4052	94.4		-----	
329		94.40		-----	
357	OIML	94.39		-----	
446		-----		-----	
522		-----		-----	
541	Dens.Det.	94.4		-----	
551	D4052	94.37		-----	
556		-----		-----	
559		-----		-----	
862	Table	94.35		-----	
922	OIML	94.37		-----	
1126		-----		-----	
1205		-----		-----	
1241		-----		-----	
1242		-----		-----	
1247		-----		-----	
1253		-----		-----	
1425		-----		-----	
1605		-----		-----	
1627		-----		-----	
1726	OIML	94.37		-----	
1727		94.39		-----	
1835	OIML	94.39		-----	
4247		-----		-----	

normality	not OK
n	12
outliers	0
mean (n)	94.383
st.dev. (n)	0.0156
R(calc.)	0.044
R(Lit)	unknown

Compare R(iis10C12b)=0.095
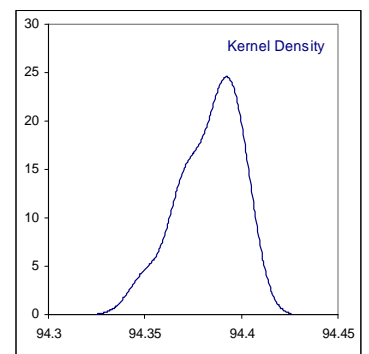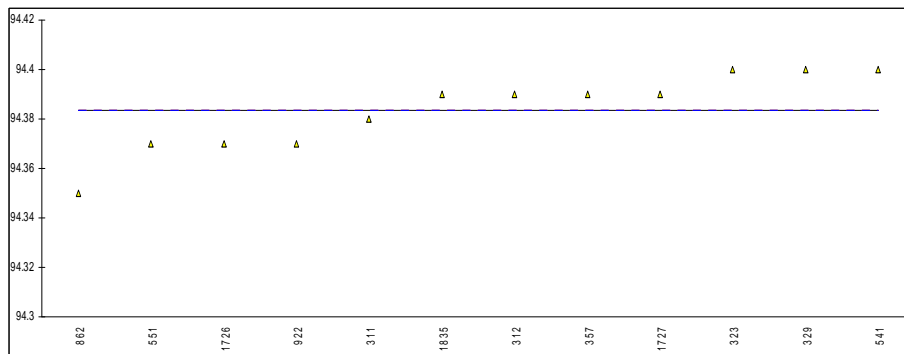
Determination of UV absorbance on sample #11122;

lab	method	300nm	mark	270nm	mark	240nm	mark	230nm	mark	220nm	mark
273	IMPCA004	<0.01		<0.01		0.037		0.086		0.169	
311		<0.005		<0.005		0.047		0.107		0.214	
312	INH-094	<0.005		<0.005	C	0.042	C	0.099	C	0.201	C
323	INH-CM	<0.001		<0.001		0.030		0.083		0.176	
329		<0.001		0.002		0.040		0.093		0.192	
357		-----		-----		-----		-----		-----	
446	INH-CM	<0.01		<0.01		0.039		0.099		0.211	
522		-----		-----		-----		-----		-----	
541		-----		-----		-----		-----		-----	
551	INH-1519	0.0022		0.0066		0.04235		0.09185		0.1792	
556		-----		-----		-----		-----		-----	
559		-----		-----		-----		-----		-----	
862	IMPCA004	0.004		0.006		0.045		0.100		0.193	
922		0.0000		0.0000		0.0352		0.0867		0.1788	
1126		-----		-----		-----		-----		-----	
1205		-----		-----		-----		-----		-----	
1241		-----		-----		-----		-----		-----	
1242		-0.0008		-0.0009		0.027		0.070		0.099	C,G(0.05)
1247		-----		-----		-----		-----		-----	
1253		-----		-----		-----		-----		-----	
1425		-----		-----		-----		-----		-----	
1605		<0.05		<0.05		0.030		0.079		0.181	
1627		-----		-----		-----		-----		-----	
1726		0.000315	C	0.002457	C	0.065565	DG(0.05)	0.094381	C	0.24082	
1727		0.01356	G(0.01)	0.02037	G(0.01)	0.06644	DG(0.05)	0.122		0.164	
1835		0.000325		0.003516		0.041456		0.092277		0.18537	
4247		-----		-----		-----		-----		-----	
	normality	OK		OK		OK		OK		OK	
	n	6		7		12		14		13	
	outliers	1		1		2		0		1	
	mean (n)	0.00101		0.00281		0.0380		0.0931		0.1912	
	st.dev. (n)	0.001767		0.002813		0.00632		0.01264		0.02116	
	R(calc.)	0.00495		0.00788		0.0177		0.0354		0.0592	
	R(Lit)	unknown		unknown		unknown		unknown		unknown	
	R(iis10C12b)	0.00163		0.00651		0.0093		0.0284		0.0344	

C = Corrected

first reported test results:

lab 312,270 nm:0.007
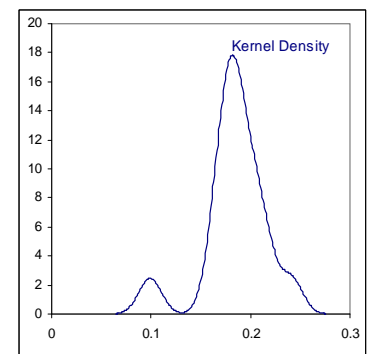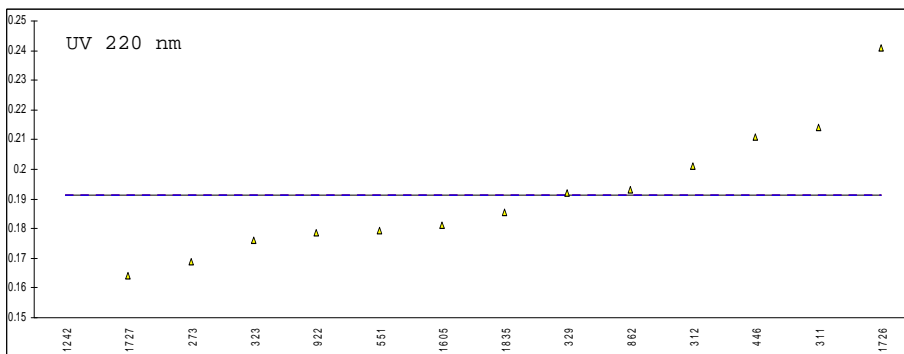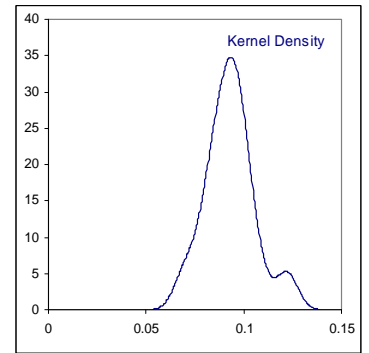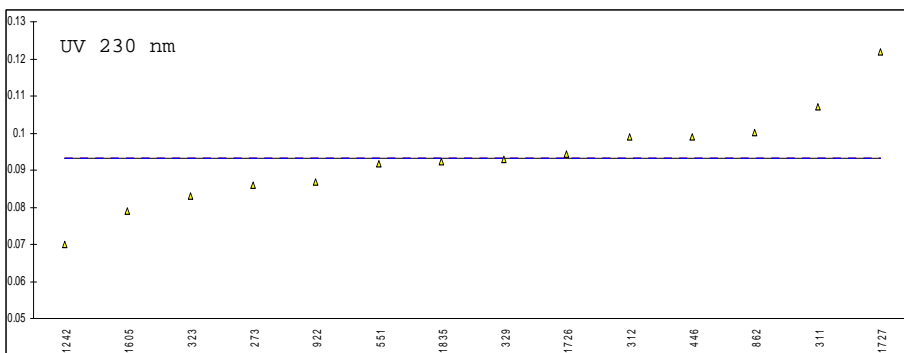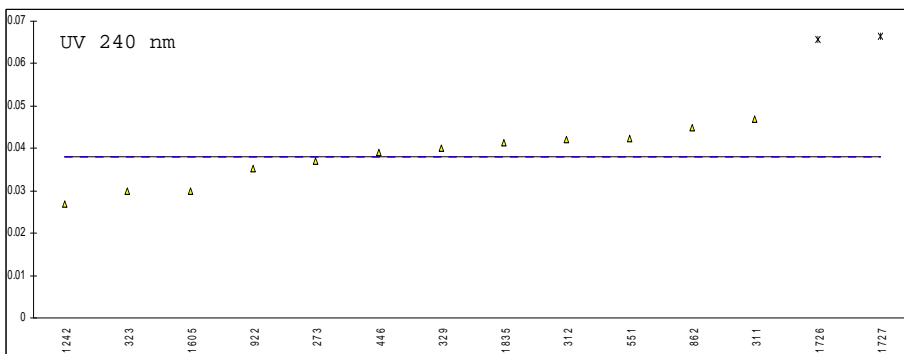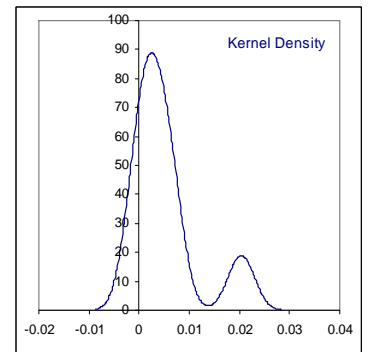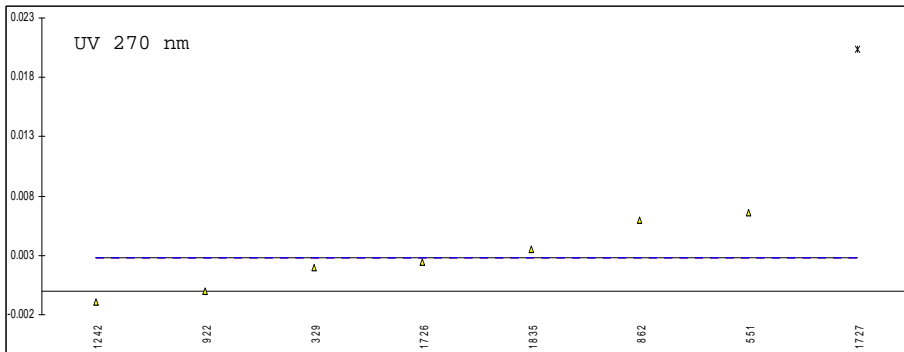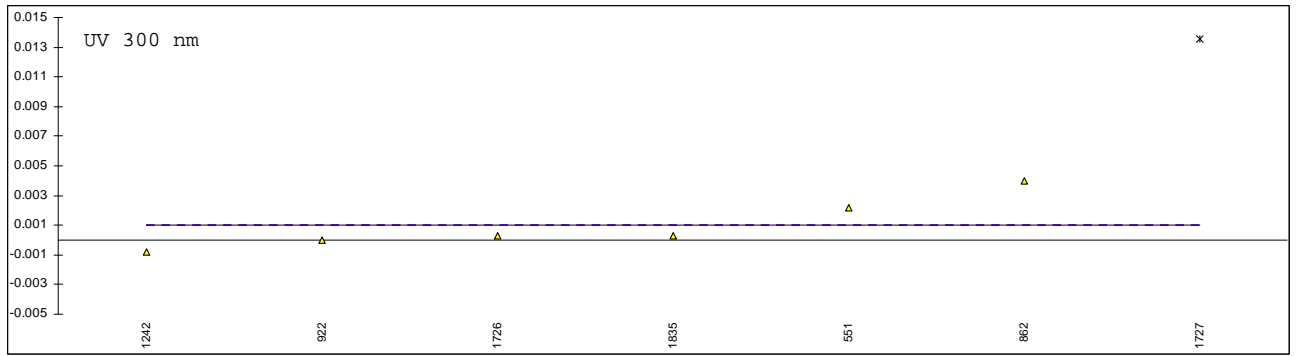lab 312,240 nm:0.209
lab 312,230 nm:0.497
lab 312,220 nm:1.005
lab 1242, 220 nm:0.124
lab 1726, 300 nm: 0.024105
lab 1726, 270 nm:0.027316
lab 1726, 230 nm:0.13518
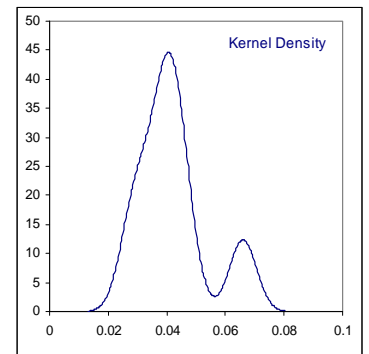
APPENDIX 2

Analytical details regarding Strength determination and UV absorbance.

Lab			Strength		UV absorbance		Other details
	Distillation	Equipment	used sample in ml	how much distillate was obtained in ml	cuvette(mm)	measured aginst:	
273	no	Density meter			10	H_2O	
311	no				10	H_2O	
312	no	Density meter			50	H_2O	
323					10	H_2O	
329	no				10	H_2O	
357	no						
446					10	H_2O	
541	no						
551	no				10	H_2O	
862	no	Density meter & alcohol table			10	H_2O	
922					10	H_2O	
1126	no	Dichtheidsmeting*					* is used for evaluation
	yes	GC	10	50			
1205	no						
1241	no	Density meter					
1242	no				5	H_2O	
1247	no						
1605	no	Density meter			10	H_2O	
1726	no	Density meter			10	H_2O	
1727					10	H_2O	
1835					10	H2O	

APPENDIX 3

Number of participants per country

1 lab in ARGENTINA
4 labs in BELGIUM
3 labs in BRAZIL
1 lab in FINLAND
1 lab in HONG KONG
1 lab in MEXICO
1 lab in P.R. of CHINA
1 lab in PAKISTAN
1 lab in POLAND
1 lab in SOUTH AFRICA
3 labs in SPAIN
7 labs in THE NETHERLANDS
1 lab in UNITED KINGDOM

APPENDIX 4

Abbreviations:

C	= final result after checking of first reported suspect result
D(0.01)	= outlier in Dixon's outlier test
D(0.05)	= straggler in Dixon's outlier test
G(0.01)	= outlier in Grubbs' outlier test
G(0.05)	= straggler in Grubbs' outlier test
DG(0.01)	= outlier in Double Grubbs' outlier test
DG(0.05)	= straggler in Double Grubbs' outlier test
E	= error in calculations
ex	= excluded from calculations
n.a.	= not applicable
OILM	= International Organization of Legal Metrology
U	= unit error
SDS	= safety data sheet

Literature:

1   i.i.s. Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, January 2010

2   W. Horwitz and R. Albert, J. AOAC Int., Vol. 79, 3, p. 589, (1996)

3   ASTM E178-02

4   ASTM E1301-03

5   ISO13528-05

5   ISO 5725-86

6   ISO 5725, parts 1-6, 1994

7   M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)

8   W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)

9   IP 367/84

10   DIN 38402 T41/42

11   P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)

12   J.N. Miller, Analyst, 118, 455, (1993)

13   Analytical Methods Committee Technical brief, No 4.January 2001

14   The Royal Society of Chemistry 2002, Analyst, 2002, 127, page 1359-1364, P.J. Lowthian and
        M. Thompson. (see http://www.rsc.org/suppdata/an/b2/b205600n/)