Institute for
Interlaboratory Studies

Results of Proficiency Test
PCBs in Mineral Oil
November 2023

Organized by: Institute for Interlaboratory Studies
Spijkenisse, the Netherlands

Author: Mrs. G.A. Oosterlaken-Buijs, BSc
Correctors: Mr. R.J. Starink, BSc & Mr. M. Meijer, BSc
Approved by: Mr. R.J. Starink, BSc

Report: iis23L13

February 2024

CONTENTS

1 INTRODUCTION

Since 2001 the Institute for Interlaboratory Studies (iis) organizes a proficiency scheme for the analysis of Poly Chlorinated Biphenyls (PCBs) in Mineral Oil every year. During the annual proficiency testing program of 2023 it was decided to continue the round robin for the analysis of PCBs in Mineral Oil.

In this interlaboratory study 65 laboratories in 25 countries registered for participation, see appendix 2 for the number of participants per country. In this report the results of the PCBs in Mineral Oil 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). Sample analyzes for fit-for-use and homogeneity testing were subcontracted to a laboratory that has performed the tests in accordance with for ISO/IEC17043 relevant requirements of ISO/IEC17025.
It was decided to send one sample of Mineral Oil with a detectable level on PCBs in an 8 mL vial labelled #23243.
The participants were requested to report rounded and unrounded test results. The unrounded test 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/IEC17043:2010 (R007), since January 2000, by the Dutch Accreditation Council (Raad voor Accreditatie). This PT falls under the accredited scope. 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.

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

A batch of approximately 1 liter of Mineral Oil with a detectable level of PCBs was obtained from a third-party laboratory. After homogenization 85 amber glass vials of 8 mL were filled and labelled #23243.
The homogeneity of the subsamples was checked by determination of Total Organohalogenic Compounds (TOX) as Cl in accordance with UOP779 on 8 stratified randomly selected subsamples.

	TOX as Cl in mg/kg
sample #23243-1	28.8
sample #23243-2	28.9
sample #23243-3	28.6
sample #23243-4	29.2
sample #23243-5	28.2
sample #23243-6	28.9
sample #23243-7	28.3
sample #23243-8	28.3

Table 1: homogeneity test results of subsamples of #23243

From the above test results the repeatability was calculated and compared with 0.3 times the reproducibility of the reference test method in agreement with the procedure of ISO13528, Annex B2 in the next table.

	TOX as Cl in mg/kg
r (observed)	1.0
reference test method	UOP779:08
0.3 x R (reference test method)	1.5

Table 2: evaluation of the repeatability of subsamples #23243

The calculated repeatability is in agreement with 0.3 times the reproducibility of the reference test method. Therefore, homogeneity of the subsamples was assumed.

To each of the participating laboratories one 8 mL vial of PCBs in Mineral Oil labelled #23243 was sent on November 1, 2023. An SDS was added to the sample package.

2.5 STABILITY OF THE SAMPLES

The stability of PCBs in Mineral Oil packed in amber glass vials was checked. The material was found sufficiently stable for the period of the proficiency test.

2.6 ANALYZES

The participants were requested to determine: Total Organohalogenic Compounds (TOX) as Cl and Poly Chlorinated Biphenyls (via seven individual PCBs and/or via Aroclor standards). It was requested to determine 5 times the sum of 6 congeners. It was also requested to determine the sum of the seven congeners asked in this PT + all other congeners present in the sample. Further it was requested to determine the sum of all Aroclors.

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 appendix 1 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 the original test results are placed under 'Remarks' in the result tables in appendix 1. 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 them 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 in 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 test result tables in appendix 1.

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

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

4 EVALUATION

In this proficiency test no problems were encountered with the dispatch of the samples. Five participants reported test results after the 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 63 participants reported 341 numerical test results. Observed were 18 outlying test results, which is 5.3%. In proficiency tests 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 TEST

In this section the reported test results are discussed per test. 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 3.

In the iis PT reports ASTM test methods are referred to with a number (e.g. D4059) and an added designation for the year that the test method was adopted or revised (e.g. D4059:00). When a method has been reapproved an “R” will be added and the year of approval (e.g. D4059:00R18).

For the statistical evaluation of the individual PCBs the test method EN12766-1:00 was used, this test method is equal to IP462-1:01. In the test method EN61619:97 only the reproducibility of the total PCB content is mentioned while in EN12766-1:00 / IP462-1:01 the reproducibilities for individual congeners are mentioned.

Total Organohalogenic Compounds TOX as Cl: Only two participants reported test results. Therefore, no z-scores are calculated.

Poly Chlorinated Biphenyls as PCB no 28: The group of participants had difficulty to meet the target requirements. One statistical outlier was observed and two other test results were excluded. The calculated reproducibility after rejection of the suspect data is very large in comparison with the requirements of EN12766-1:00. Therefore, no z-scores are calculated.

Poly Chlorinated Biphenyls as PCB no 52: The group of participants had difficulty to meet the target requirements. Two statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of EN12766-1:00.

Poly Chlorinated Biphenyls as PCB no 101: The group of participants met the target requirements. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN12766-1:00.

Poly Chlorinated Biphenyls as PCB no 118: The group of participants had difficulty to meet the target requirements. 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 EN12766-1:00.

Poly Chlorinated Biphenyls as PCB no 138: The group of participants met the target requirements. Three statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN12766-1:00.

Poly Chlorinated Biphenyls as PCB no 153: The group of participants met the target requirements. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of EN12766-1:00.

Poly Chlorinated Biphenyls as PCB no 180: The group of participants met the target requirements. Two statistical outliers were observed and one other test result was excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN12766-1:00.

Poly Chlorinated Biphenyls as Aroclor 1242: The group of participants met the target requirements. 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 ASTM D4059:00R18.

Poly Chlorinated Biphenyls as Aroclor 1248: None of the participants reported a test result.

Poly Chlorinated Biphenyls as Aroclor 1254: The group of participants met the target requirements. Two statistical outliers were observed. The calculated reproducibility after rejection of the statistical outliers is in agreement with the requirements of ASTM D4059:00R18.

Poly Chlorinated Biphenyls as Aroclor 1260: The group of participants had difficulty to meet the target requirements. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D4059:00R18.

Total PCB, 5 times the sum of 6 PCB congeners: The group of participants met the target requirements. No statistical outliers were observed but six test results were excluded. The calculated reproducibility after rejection of the suspect data is not in agreement with the requirements of EN12766-2:01 method B.

Total PCB, sum of all congeners: It was requested to report the sum of **all** congeners: the sum of the seven congeners asked in this PT + all other congeners present in the sample. However, three participants reported the sum of the seven congeners asked in the PT only. Therefore, the test results of these three participants were excluded from the statistical analysis.
The group of participants met the target requirements. Three statistical outliers were observed and three other test results were excluded. The calculated reproducibility after rejection of the suspect data is in agreement with the requirements of EN61619:97 and EN12766-2:01 method A as this test method is identical to EN61619:97.

Total PCB, sum of all Aroclors: The group of participants had difficulty to meet the target requirements. No statistical outliers were observed. The calculated reproducibility is not in agreement with the requirements of ASTM D4059:00R18.

All participants agree that sample #23243 is positive on PCBs. Based on the two reported test results of Total Organohalogenic Compounds (TOX) as Cl an average concentration of 27.5 mg/kg was found in this PT. From this concentration, a total content of 48.8 mg PCB/kg is estimated using an average Cl content of 56.3%, assuming the presence of 6.2% Aroclor 1242 (42% Cl), 42.4% Aroclor 1254 (54% Cl) and 51.4% Aroclor 1260 (60% Cl). All values for total PCB are given in the next table.

	total PCB content in mg/kg
estimated by TOX as Cl	48.8
5 times the sum of 6 congeners	47.1
sum of all congeners	33.0
sum of all Aroclors	28.6

Table 3: comparison of estimations of total PCB content in sample #23243

The sum of all Aroclors is lower than the total PCB content based on the sum of all congeners. Furthermore, the two other estimates (from TOX as Cl and 5 times the sum of 6 congeners) are both much higher than the other two estimates.

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.

Parameter	unit	n	average	2.8 * sd	R(lit)
TOX as Cl	mg/kg	2	27.5	n.e.	n.e
PCB no. 28	mg/kg	26	0.11	0.12	(0.04)
PCB no. 52	mg/kg	30	0.65	0.42	0.30
PCB no. 101	mg/kg	32	1.68	0.88	0.82
PCB no. 118	mg/kg	23	0.97	0.64	0.46
PCB no. 138	mg/kg	31	2.51	0.89	1.24
PCB no. 153	mg/kg	32	2.46	1.17	1.21
PCB no. 180	mg/kg	31	1.88	0.76	0.92
Aroclor 1242	mg/kg	10	1.83	2.04	2.11
Aroclor 1248	mg/kg	0	n.e.	n.e.	n.e.
Aroclor 1254	mg/kg	12	12.64	6.32	8.98
Aroclor 1260	mg/kg	15	15.33	15.59	10.38
Total PCB, 5 x sum 6 congeners	mg/kg	23	47.1	16.1	21.1
Total PCB, sum of all congeners	mg/kg	23	33.0	11.2	10.2
Total PCB, sum of Aroclors	mg/kg	16	28.6	30.4	16.6

Table 4: reproducibilities of tests on sample #23243

For results between brackets no z-scores are calculated.

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

4.3 COMPARISON OF THE PROFICIENCY TEST OF NOVEMBER 2023 WITH PREVIOUS PTS

	November 2023	November 2022	November 2021	November 2020	November 2019
Number of reporting laboratories	63	55	51	45	45
Number of test results	341	312	288	251	277
Number of statistical outliers	18	11	11	9	14
Percentage of statistical outliers	5.3%	3.5%	3.8%	3.6%	5.1%

Table 5: 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 test methods. The conclusions are given in the following table.

	November 2023	November 2022	November 2021	November 2020	November 2019
TOX as Cl	n.e.	-	--	n.e.	n.e.
PCB individual	+/-	-	-	-	+/-
Aroclor individual	+/-	-	-	-	-
Total PCB, 5 x the sum of 6 cong	+	+	-	+	+
Total PCB, sum of all congeners	+/-	--	-	-	+
Total PCB, sum of Aroclors	-	-	-	-	-

Table 6: comparison of determinations to the reference test methods

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

APPENDIX 1

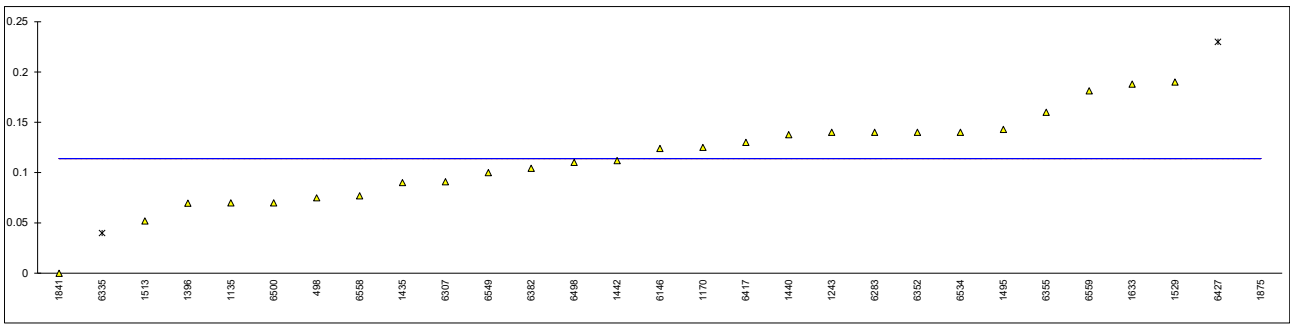
Determination of Total Organohalogenic Compounds (TOX) as Cl on sample #23243; results in mg/kg

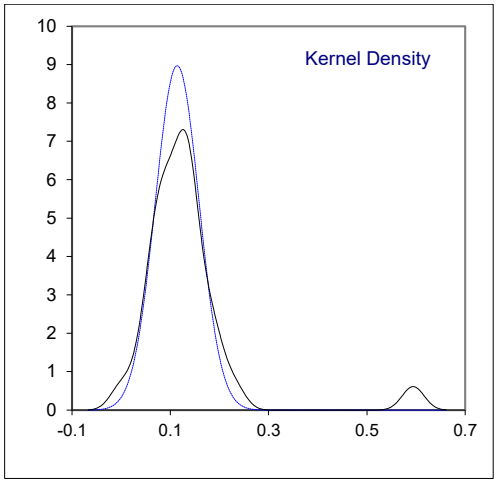
lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN14077	25.0		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		-----		-----	
1442		-----		-----	
1458		-----		-----	
1495		30		-----	
1505		-----		-----	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885		-----		-----	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275		-----		-----	
6278		-----		-----	
6283		-----		-----	
6307		-----		-----	
6334		-----		-----	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522		-----		-----	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559		-----		-----	
6566		-----		-----	
	n	2			
	mean (n)	27.5			

Determination of Poly Chlorinated Biphenyls as PCB no. 28 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	0.075		-----	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	<0.05		-----	
1135	IEC61619	0.07		-----	
1170	EN12766-1	0.125		-----	
1243	EN12766-1	0.14		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	0.0697171		-----	
1431		-----		-----	
1435	EN12766-1	0.09		-----	
1440	IEC61619	0.1377		-----	
1442	EN12766-1	0.112		-----	
1458		-----		-----	
1495	EN12766-1	0.143		-----	
1505		-----		-----	
1513	IEC61619	0.052		-----	
1529	In house	0.19		-----	
1633	EN61619	0.188		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		0.00		-----	
1875	EN12766-1	0.5943	R(0.01)	-----	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	<0.25		-----	
3132	IEC61619	<0.2		-----	
6067		-----		-----	
6146	EN12766-1	0.124		-----	
6254	EN12766-1	<0.5		-----	
6275		-----		-----	
6278		-----		-----	
6283		0.14		-----	
6307	IP462-1	0.091		-----	
6334		-----		-----	
6335		0.04	ex	-----	test result excluded as outliers in four related parameters
6352		0.14	C	-----	first reported 0.35
6355	EN12766-1	0.160		-----	
6382	EN12766-1	0.1044		-----	
6414		-----		-----	
6417	EN12766-1	0.13		-----	
6422		-----		-----	
6427		0.23	ex	-----	test result excluded as outliers in four related parameters
6491	EN12766-1	<0.7		-----	
6498	In house	0.1102		-----	
6500		0.070		-----	
6522		-----		-----	
6534		0.14		-----	
6549	EN12766-1	0.10		-----	
6558		0.077		-----	
6559	IEC61619	0.18129		-----	
6566		-----		-----	

normality	OK
n	26
outliers	1 + 2ex
mean (n)	0.1139
st.dev. (n)	0.04448
R(calc.)	0.1245
st.dev.(EN12766-1:00)	(0.01255)
R(EN12766-1:00)	(0.0351)

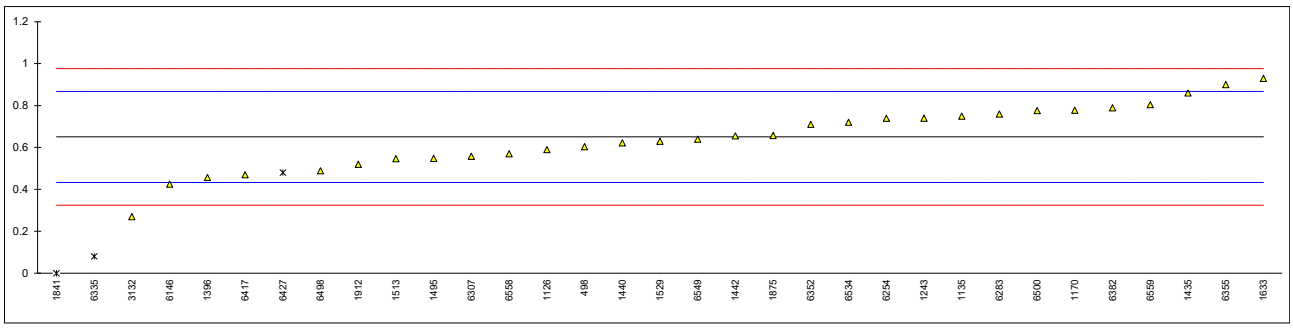

0.25
0.2
0.15
0.1
0.05
0
1841
6335
1513
1396
1135
6500
498
6558
1435
6307
6549
6382
6498
1442
6146
1170
6417
1440
1243
6283
6352
6534
1495
6355
6559
1633
1529
6427
1875

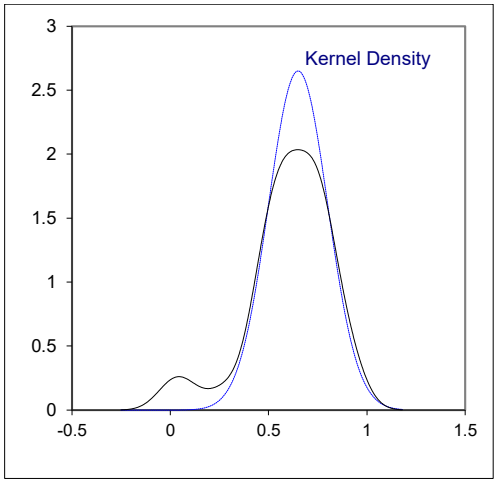

Kernel Density
10
9
8
7
6
5
4
3
2
1
0
-0.1
0.1
0.3
0.5
0.7

Determination of Poly Chlorinated Biphenyls as PCB no. 52 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	0.604		-0.43	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	0.59		-0.55	
1135	IEC61619	0.75		0.92	
1170	EN12766-1	0.778		1.17	
1243	EN12766-1	0.74		0.83	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	0.457331		-1.78	
1431		-----		-----	
1435	EN12766-1	0.86		1.93	
1440	IEC61619	0.6222		-0.26	
1442	EN12766-1	0.655	C	0.04	first reported 0.193
1458		-----		-----	
1495	EN12766-1	0.548		-0.94	
1505		-----		-----	
1513	IEC61619	0.5464	C	-0.96	first reported 0.011
1529	In house	0.63		-0.19	
1633	EN61619	0.930		2.57	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		0.00	R(0.05)	-5.98	
1875	EN12766-1	0.6577		0.07	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	0.52		-1.20	
3132	IEC61619	0.27		-3.50	
6067		-----		-----	
6146	EN12766-1	0.425		-2.07	
6254	EN12766-1	0.739		0.82	
6275		-----		-----	
6278		-----	W	-----	test result withdrawn, reported 1.6
6283		0.76		1.01	
6307	IP462-1	0.558		-0.85	
6334		-----		-----	
6335		0.08	R(0.05)	-5.25	
6352		0.71		0.55	
6355	EN12766-1	0.9		2.30	
6382	EN12766-1	0.789		1.28	
6414		-----		-----	
6417	EN12766-1	0.47		-1.66	
6422		-----		-----	
6427		0.48	ex	-1.57	test result excluded as outliers in four related parameters
6491	EN12766-1	<0.7		-----	
6498	In house	0.4889		-1.48	
6500		0.776		1.16	
6522		-----		-----	
6534		0.72		0.64	
6549	EN12766-1	0.64		-0.09	
6558		0.570		-0.74	
6559	IEC61619	0.80424		1.42	
6566		-----		-----	

normality	OK
n	30
outliers	2 + 1ex
mean (n)	0.6503
st.dev. (n)	0.15057
R(calc.)	0.4216
st.dev.(EN12766-1:00)	0.10871
R(EN12766-1:00)	0.3044

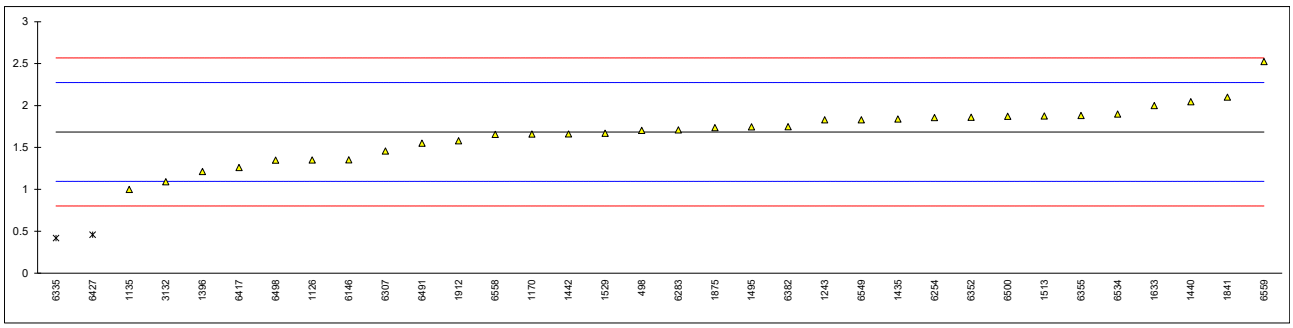

1.2
1
0.8
0.6
0.4
0.2
0
1841
6335
3132
6146
1396
6417
6427
6498
1912
1513
1495
6307
6558
1126
498
1440
1529
6549
1442
1875
6352
6534
6254
1243
1135
6283
6500
1170
6382
6559
1435
6355
1633

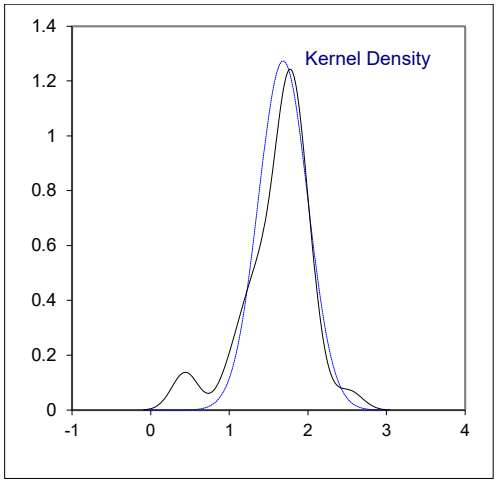

Kernel Density
3
2.5
2
1.5
1
0.5
0
-0.5
0
0.5
1
1.5

Determination of Poly Chlorinated Biphenyls as PCB no. 101 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	1.703		0.06	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	1.35		-1.14	
1135	IEC61619	1.00		-2.33	
1170	EN12766-1	1.660		-0.08	
1243	EN12766-1	1.83		0.49	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	1.21248		-1.61	
1431		-----		-----	
1435	EN12766-1	1.84		0.53	
1440	IEC61619	2.0451		1.22	
1442	EN12766-1	1.661	C	-0.08	first reported 0.448
1458		-----		-----	
1495	EN12766-1	1.746		0.21	
1505		-----		-----	
1513	IEC61619	1.877		0.65	
1529	In house	1.67		-0.05	
1633	EN61619	2.000		1.07	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		2.10		1.41	
1875	EN12766-1	1.7377		0.18	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	1.58		-0.36	
3132	IEC61619	1.091		-2.02	
6067		-----		-----	
6146	EN12766-1	1.352		-1.13	
6254	EN12766-1	1.856		0.58	
6275		-----		-----	
6278		-----	W	-----	test result withdrawn, reported 5.4
6283		1.71		0.09	
6307	IP462-1	1.459		-0.77	
6334		-----		-----	
6335		0.42	R(0.05)	-4.30	
6352		1.86		0.60	
6355	EN12766-1	1.882		0.67	
6382	EN12766-1	1.747		0.21	
6414		-----		-----	
6417	EN12766-1	1.26		-1.44	
6422		-----		-----	
6427		0.46	R(0.05)	-4.16	
6491	EN12766-1	1.552		-0.45	
6498	In house	1.3497		-1.14	
6500		1.872		0.64	
6522		-----		-----	
6534		1.90		0.73	
6549	EN12766-1	1.83		0.49	
6558		1.655		-0.10	
6559	IEC61619	2.52498		2.86	
6566		-----		-----	

normality	OK
n	32
outliers	2
mean (n)	1.6848
st.dev. (n)	0.31338
R(calc.)	0.8775
st.dev.(EN12766-1:00)	0.29414
R(EN12766-1:00)	0.8236

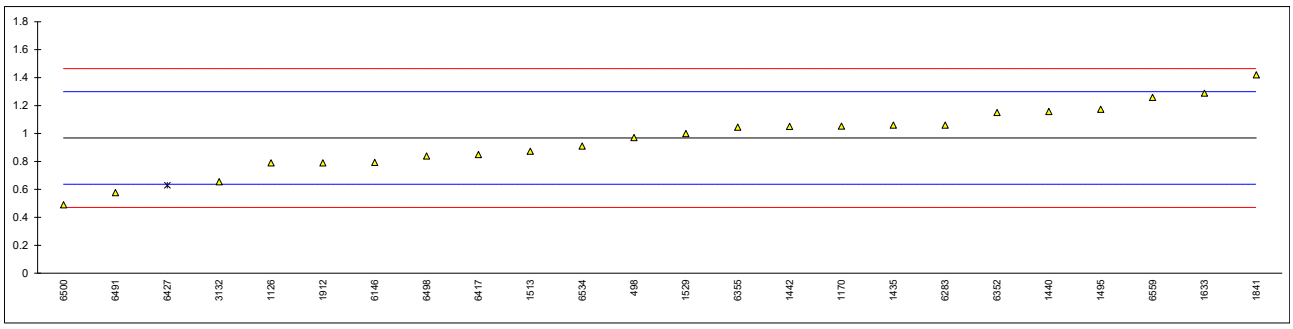

3
2.5
2
1.5
1
0.5
0
6335
6427
1135
3132
1396
6417
6498
1126
6146
6307
6491
1912
6558
1170
1442
1529
498
6283
1875
1495
6382
1243
6549
1435
6254
6352
6500
1513
6355
6534
1633
1440
1841
6559

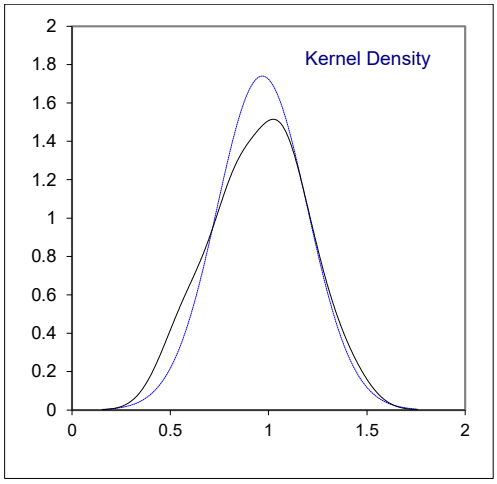

Kernel Density
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-1
0
1
2
3
4

Determination of Poly Chlorinated Biphenyls as PCB no. 118 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	0.971		0.02	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	0.79		-1.07	
1135		-----		-----	
1170	EN12766-1	1.053		0.52	
1243		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396		-----		-----	
1431		-----		-----	
1435	EN12766-1	1.06		0.56	
1440	IEC61619	1.1578		1.15	
1442	EN12766-1	1.051		0.50	
1458		-----		-----	
1495	EN12766-1	1.173		1.24	
1505		-----		-----	
1513	IEC61619	0.873		-0.57	
1529	In house	1.00		0.20	
1633	EN61619	1.289		1.94	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		1.42		2.73	
1875		-----		-----	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	0.79		-1.07	
3132	IEC61619	0.655		-1.89	
6067		-----		-----	
6146	EN12766-1	0.793		-1.05	
6254		-----		-----	
6275		-----		-----	
6278		-----		-----	
6283		1.06		0.56	
6307		-----		-----	
6334		-----		-----	
6335		-----		-----	
6352		1.15		1.10	
6355	EN12766-1	1.045		0.47	
6382		-----		-----	
6414		-----		-----	
6417	EN12766-1	0.85		-0.71	
6422		-----		-----	
6427		0.63	ex	-2.04	test result excluded as outliers in four related parameters
6491	EN12766-1	0.577		-2.36	
6498	In house	0.8391		-0.78	
6500		0.490		-2.88	
6522		-----		-----	
6534		0.91		-0.35	
6549		-----		-----	
6558		-----		-----	
6559	IEC61619	1.25852		1.76	
6566		-----		-----	

normality	OK
n	23
outliers	0 + 1ex
mean (n)	0.9676
st.dev. (n)	0.22934
R(calc.)	0.6422
st.dev.(EN12766-1:00)	0.16559
R(EN12766-1:00)	0.4637

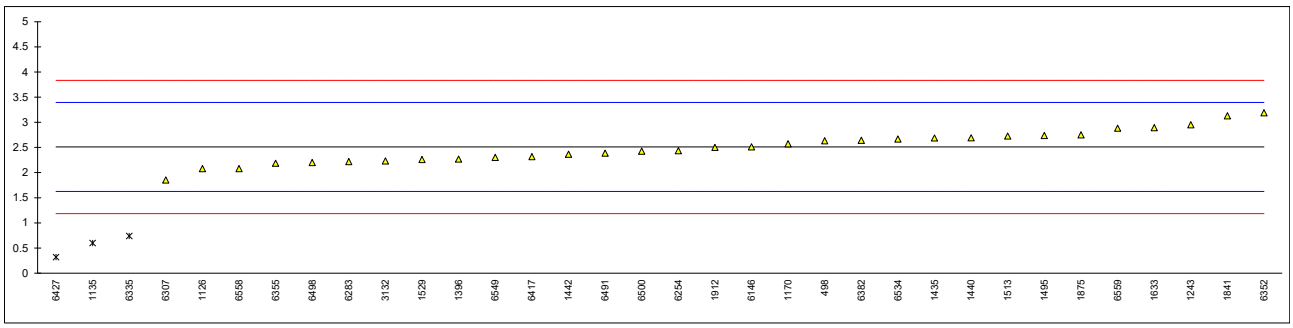

1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
6500
6491
6427
3132
1126
1912
6146
6498
6417
1513
6534
498
1529
6355
1442
1170
1435
6283
6352
1440
1495
6559
1633
1841

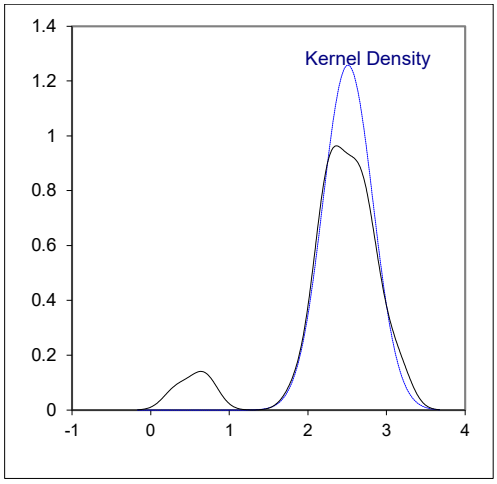

Kernel Density
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2

Determination of Poly Chlorinated Biphenyls as PCB no. 138 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	2.632		0.28	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	2.08		-0.97	
1135	IEC61619	0.60	C,R(0.01)	-4.32	first reported 0.42
1170	EN12766-1	2.571		0.14	
1243	EN12766-1	2.95		1.00	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	2.26765		-0.55	
1431		-----		-----	
1435	EN12766-1	2.69		0.41	
1440	IEC61619	2.6929		0.41	
1442	EN12766-1	2.367		-0.32	
1458		-----		-----	
1495	EN12766-1	2.739		0.52	
1505		-----		-----	
1513	IEC61619	2.728		0.49	
1529	In house	2.26		-0.56	
1633	EN61619	2.894		0.87	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		3.13		1.40	
1875	EN12766-1	2.7503		0.54	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	2.50		-0.02	
3132	IEC61619	2.234		-0.62	
6067		-----		-----	
6146	EN12766-1	2.512		0.01	
6254	EN12766-1	2.435		-0.17	
6275		-----		-----	
6278		-----	W	-----	test result withdrawn, reported 7.6
6283		2.22		-0.66	
6307	IP462-1	1.855		-1.48	
6334		-----		-----	
6335		0.74	R(0.01)	-4.00	
6352		3.19		1.54	
6355	EN12766-1	2.186		-0.73	
6382	EN12766-1	2.643		0.30	
6414		-----		-----	
6417	EN12766-1	2.32		-0.43	
6422		-----		-----	
6427		0.32	R(0.01)	-4.95	
6491	EN12766-1	2.385		-0.28	
6498	In house	2.2014		-0.70	
6500		2.427		-0.19	
6522		-----		-----	
6534		2.67		0.36	
6549	EN12766-1	2.30		-0.47	
6558		2.082		-0.97	
6559	IEC61619	2.88226		0.84	
6566		-----		-----	

normality	OK
n	31
outliers	3
mean (n)	2.5095
st.dev. (n)	0.31726
R(calc.)	0.8883
st.dev.(EN12766-1:00)	0.44197
R(EN12766-1:00)	1.2375

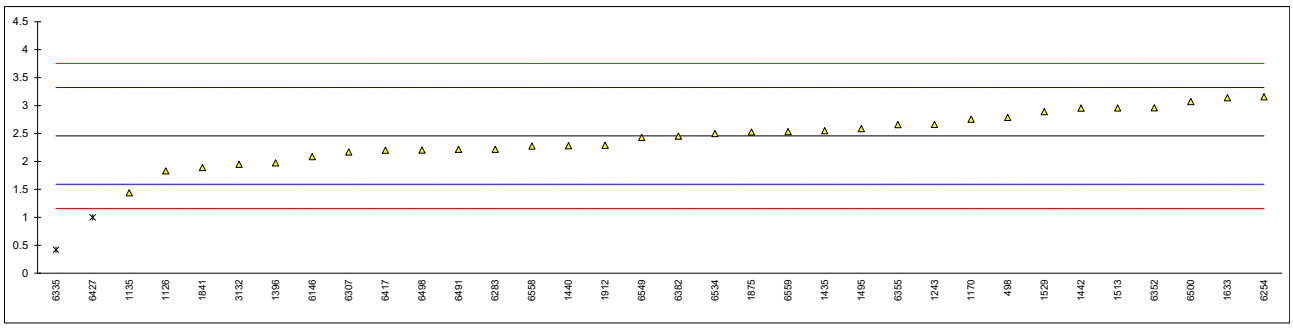

5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
6427
1135
6335
6307
1126
6558
6355
6498
6283
3132
1529
1396
6549
6417
1442
6491
6500
6254
1912
6146
1170
498
6382
6534
1435
1440
1513
1495
1875
6559
1633
1243
1841
6352

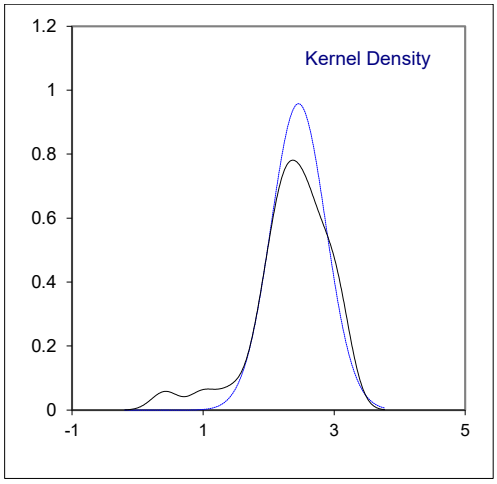

Kernel Density
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-1
0
1
2
3
4

Determination of Poly Chlorinated Biphenyls as PCB no. 153 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	2.788		0.77	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	1.83		-1.45	
1135	IEC61619	1.44		-2.35	
1170	EN12766-1	2.755		0.69	
1243	EN12766-1	2.66		0.47	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	1.97650		-1.11	
1431		-----		-----	
1435	EN12766-1	2.55		0.22	
1440	IEC61619	2.2798		-0.41	
1442	EN12766-1	2.955		1.15	
1458		-----		-----	
1495	EN12766-1	2.586		0.30	
1505		-----		-----	
1513	IEC61619	2.956		1.16	
1529	In house	2.89		1.00	
1633	EN61619	3.140		1.58	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		1.89		-1.31	
1875	EN12766-1	2.5258		0.16	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	2.29		-0.38	
3132	IEC61619	1.95		-1.17	
6067		-----		-----	
6146	EN12766-1	2.088		-0.85	
6254	EN12766-1	3.158		1.62	
6275		-----		-----	
6278		-----		-----	
6283		2.22		-0.55	
6307	IP462-1	2.168		-0.67	
6334		-----		-----	
6335		0.42	R(0.01)	-4.71	
6352		2.96		1.16	
6355	EN12766-1	2.659		0.47	
6382	EN12766-1	2.453		-0.01	
6414		-----		-----	
6417	EN12766-1	2.20		-0.59	
6422		-----		-----	
6427		1.00	R(0.05)	-3.37	
6491	EN12766-1	2.219		-0.55	
6498	In house	2.2046		-0.58	
6500		3.070		1.42	
6522		-----		-----	
6534		2.50		0.10	
6549	EN12766-1	2.43		-0.06	
6558		2.275		-0.42	
6559	IEC61619	2.53274		0.18	
6566		-----		-----	

normality	OK
n	32
outliers	2
mean (n)	2.4562
st.dev. (n)	0.41664
R(calc.)	1.1666
st.dev.(EN12766-1:00)	0.43242
R(EN12766-1:00)	1.2108

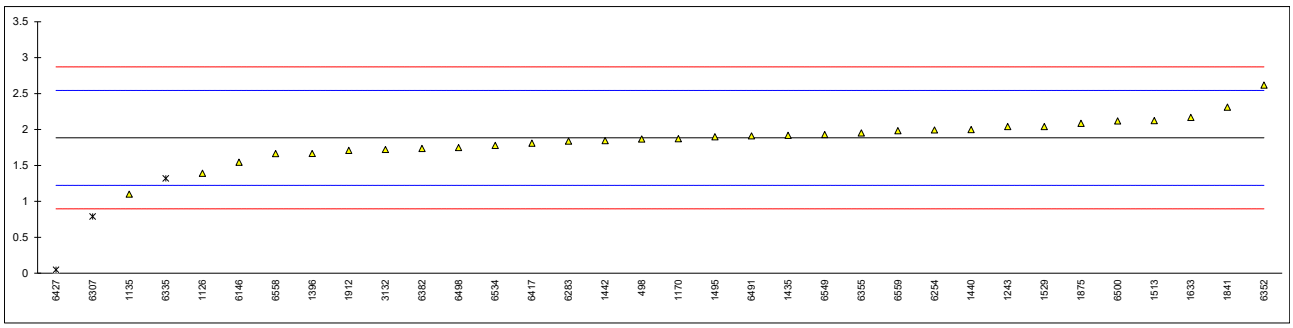

4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
6335
6427
1135
1126
1841
3132
1396
6146
6307
6417
6498
6491
6283
6558
1440
1912
6549
6382
6534
1875
6559
1435
1495
6355
1243
1170
498
1529
1442
1513
6352
6500
1633
6254

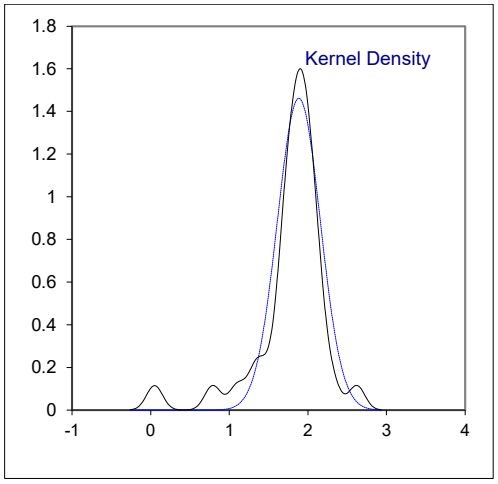

Kernel Density
1.2
1
0.8
0.6
0.4
0.2
0
-1
1
3
5

Determination of Poly Chlorinated Biphenyls as PCB no. 180 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-1	1.867		-0.05	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126	EN12766-1	1.39		-1.50	
1135	IEC61619	1.10		-2.38	
1170	EN12766-1	1.872		-0.04	
1243	EN12766-1	2.04		0.47	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-1	1.66622		-0.66	
1431		-----		-----	
1435	EN12766-1	1.92		0.11	
1440	IEC61619	1.9993		0.35	
1442	EN12766-1	1.846		-0.11	
1458		-----		-----	
1495	EN12766-1	1.898		0.04	
1505		-----		-----	
1513	IEC61619	2.123		0.73	
1529	In house	2.04		0.47	
1633	EN61619	2.168		0.86	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		2.31		1.29	
1875	EN12766-1	2.0870		0.62	
1885		-----		-----	
1888		-----		-----	
1912	EN12766-1	1.71		-0.53	
3132	IEC61619	1.722		-0.49	
6067		-----		-----	
6146	EN12766-1	1.545		-1.03	
6254	EN12766-1	1.994		0.33	
6275		-----		-----	
6278		-----	W	-----	test result withdrawn, reported 2.8
6283		1.84		-0.13	
6307	IP462-1	0.79	C,R(0.05)	-3.32	first reported 0.463
6334		-----		-----	
6335		1.32	ex	-1.71	test result excluded as outliers in four related parameters
6352		2.62		2.23	
6355	EN12766-1	1.953		0.21	
6382	EN12766-1	1.737		-0.44	
6414		-----		-----	
6417	EN12766-1	1.81		-0.22	
6422		-----		-----	
6427		0.05	R(0.01)	-5.56	
6491	EN12766-1	1.912		0.09	
6498	In house	1.7480		-0.41	
6500		2.118		0.71	
6522		-----		-----	
6534		1.78		-0.31	
6549	EN12766-1	1.93		0.14	
6558		1.664		-0.67	
6559	IEC61619	1.98288		0.30	
6566		-----		-----	

normality	not OK
n	31
outliers	2 + 1ex
mean (n)	1.8836
st.dev. (n)	0.27301
R(calc.)	0.7644
st.dev.(EN12766-1:00)	0.32978
R(EN12766-1:00)	0.9234

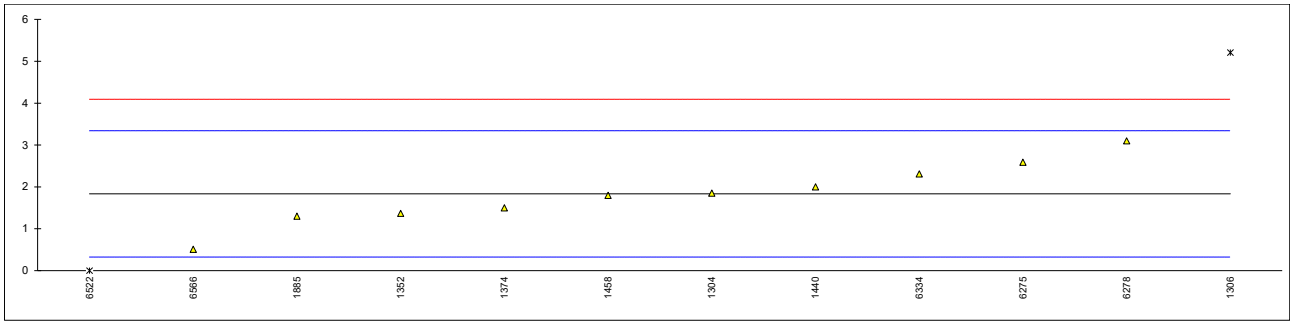

3.5
3
2.5
2
1.5
1
0.5
0
6427
6307
1135
6335
1126
6146
6558
1396
1912
3132
6382
6498
6534
6417
6283
1442
498
1170
1495
6491
1435
6549
6355
6559
6254
1440
1243
1529
1875
6500
1513
1633
1841
6352

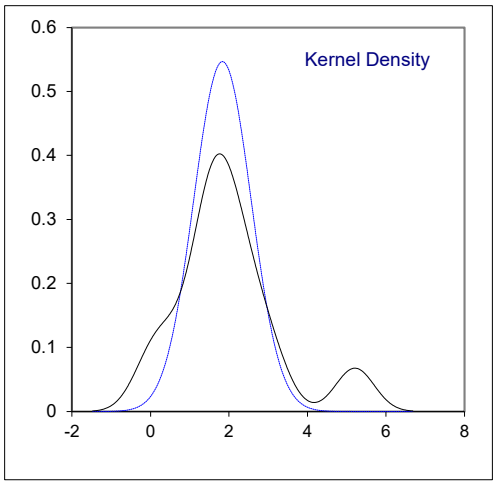

Kernel Density
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-1
0
1
2
3
4

Determination of Poly Chlorinated Biphenyls as Aroclor 1242 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511		-----		-----	
614	D4059	<2		-----	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		1.85		0.02	
1306	EPA600	5.21	G(0.05)	4.48	
1352	In house	1.368		-0.62	
1374	D4059	1.50		-0.44	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		2.0		0.22	
1442		-----		-----	
1458	D4059	1.8		-0.04	
1495		-----		-----	
1505		-----		-----	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885	D4059	1.3		-0.71	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275	D4059	2.59		1.00	
6278	EPA8082A	3.1		1.68	
6283		-----		-----	
6307		-----		-----	
6334	IEC61619Mod.	2.31		0.63	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522	D4059	0	ex	-2.43	test result excluded as zero is not a real value
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559		-----		-----	
6566		0.510		-1.75	

normality	OK
n	10
outliers	1 + 1ex
mean (n)	1.8328
st.dev. (n)	0.73004
R(calc.)	2.0441
st.dev.(D4059:00R18 (silicone))	0.75385
R(D4059:00R18 (silicone))	2.1108


6
5
4
3
2
1
0
6522
6566
1885
1352
1374
1458
1304
1440
6334
6275
6278
1306


Kernel Density
0.6
0.5
0.4
0.3
0.2
0.1
0
-2
0
2
4
6
8

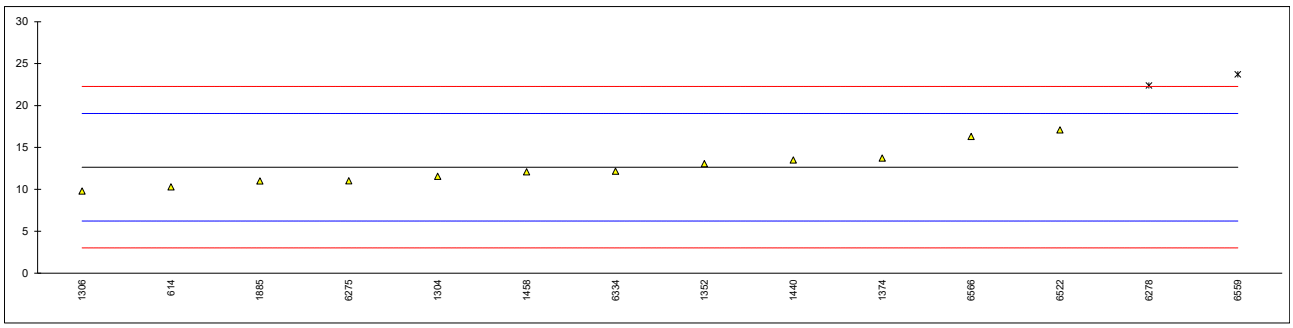
Determination of Poly Chlorinated Biphenyls as Aroclor 1248 on sample #23243; results in mg/kg

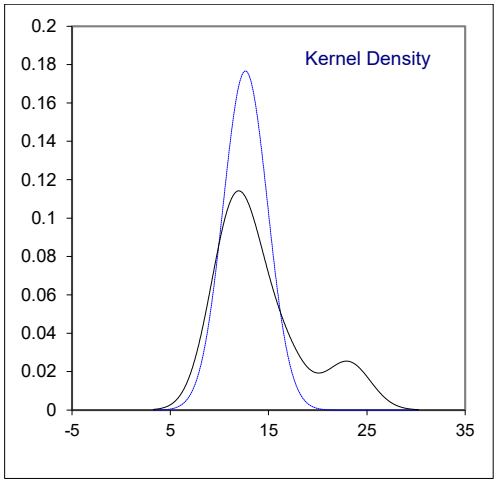
lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		-----		-----	
1442		-----		-----	
1458		-----		-----	
1495		-----		-----	
1505		-----		-----	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885		-----		-----	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275		-----		-----	
6278		-----		-----	
6283		-----		-----	
6307		-----		-----	
6334		-----		-----	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522		-----		-----	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559		-----		-----	
6566		-----		-----	

Determination of Poly Chlorinated Biphenyls as Aroclor 1254 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511		-----		-----	
614	D4059	10.3		-0.73	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		11.56		-0.34	
1306	EPA600	9.81		-0.88	
1352	In house	13.064		0.13	
1374	D4059	13.73		0.34	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		13.5		0.27	
1442		-----		-----	
1458	D4059	12.1		-0.17	
1495		-----		-----	
1505		-----		-----	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885	D4059	11		-0.51	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275	D4059	11.02		-0.51	
6278	EPA8082A	22.4	DG(0.05)	3.04	
6283		-----		-----	
6307		-----		-----	
6334	IEC61619Mod.	12.17		-0.15	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522	D4059	17.11		1.39	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559	D4059	23.7158	DG(0.05)	3.45	
6566		16.318		1.15	

normality	OK
n	12
outliers	2
mean (n)	12.6402
st.dev. (n)	2.25819
R(calc.)	6.3229
st.dev.(D4059:00R18 (silicone))	3.20820
R(D4059:00R18 (silicone))	8.9830

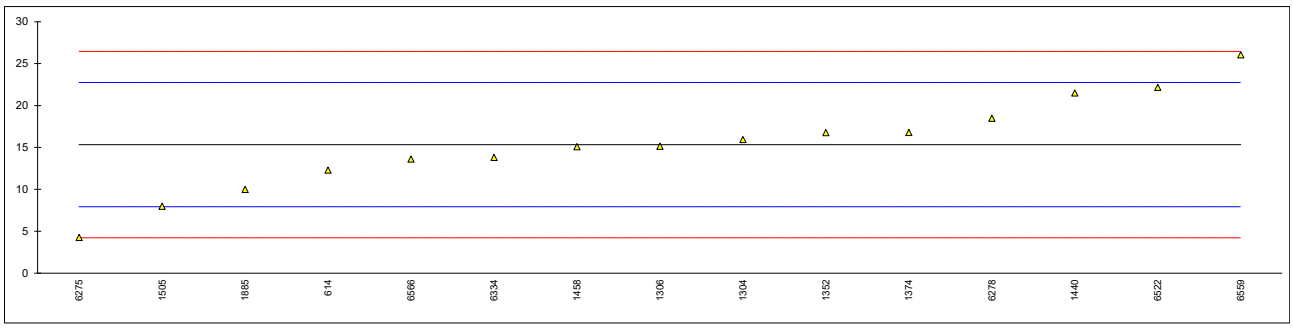

30
25
20
15
10
5
0
1306
614
1885
6275
1304
1458
6334
1352
1440
1374
6566
6522
6278
6559

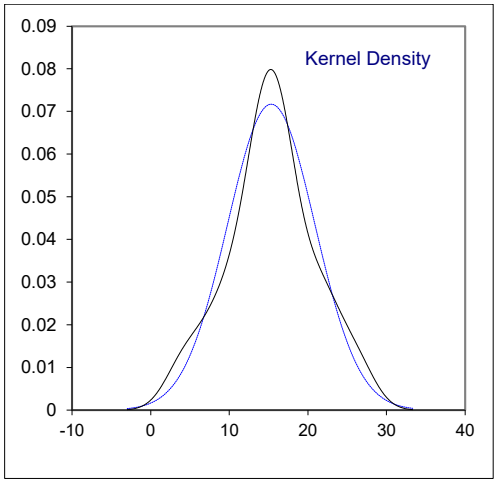

Kernel Density
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-5
5
15
25
35

Determination of Poly Chlorinated Biphenyls as Aroclor 1260 on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511		-----		-----	
614	D4059	12.3		-0.82	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		15.94		0.16	
1306	EPA600	15.15		-0.05	
1352	In house	16.772		0.39	
1374	D4059	16.79		0.39	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		21.5		1.66	
1442		-----		-----	
1458	D4059	15.1		-0.06	
1495		-----		-----	
1505	D4059	7.98		-1.98	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885	D4059	10		-1.44	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275	D4059	4.27		-2.98	
6278	EPA8082A	18.5		0.86	
6283		-----		-----	
6307		-----		-----	
6334	IEC61619Mod.	13.80		-0.41	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522	D4059	22.17		1.85	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559	D4059	26.0516		2.89	
6566		13.615		-0.46	

normality	OK
n	15
outliers	0
mean (n)	15.3292
st.dev. (n)	5.56611
R(calc.)	15.5851
st.dev.(D4059:00R18 (silicone))	3.70755
R(D4059:00R18 (silicone))	10.3811

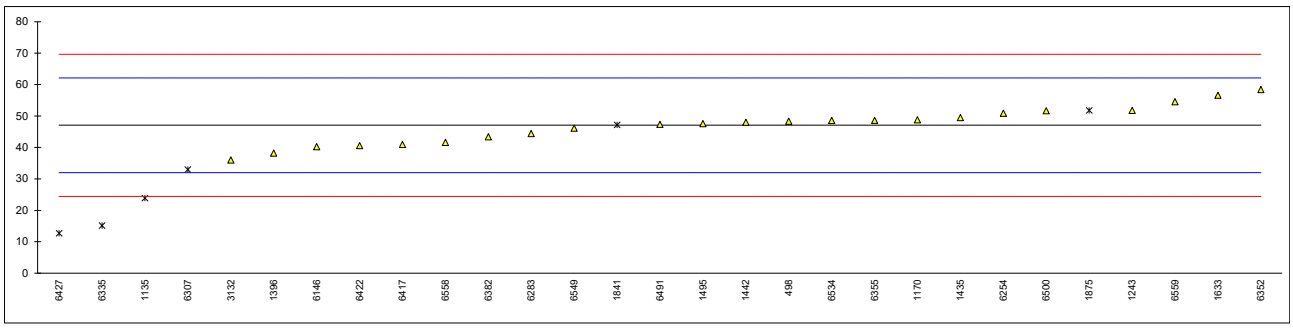

30
25
20
15
10
5
0
6275
1505
1885
614
6566
6334
1458
1306
1304
1352
1374
6278
1440
6522
6559

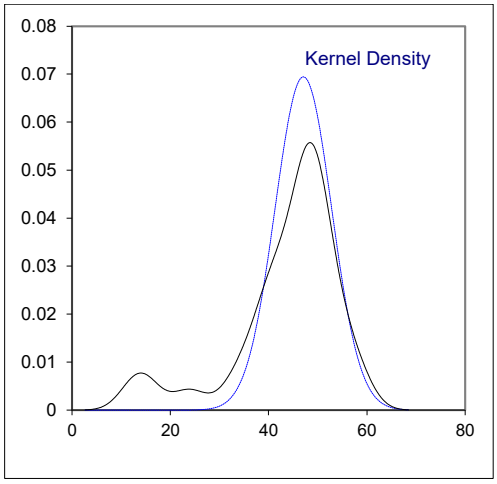

Kernel Density
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-10
0
10
20
30
40

Determination of Total PCB, 5 times the sum of 6 congeners on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498	EN12766-2-B	48.349		0.17	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126		-----		-----	
1135	IEC61619	23.90	ex, E	-3.08	excl. as outlier in related parameter, calc. diff: iis calc. 24.80
1170	D4059	48.79	C	0.23	first reported 95.20
1243	EN12766-2-B	51.8		0.63	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-2	38.2495	C	-1.17	first reported 56.04650
1431		-----		-----	
1435	EN12766-2-B	49.50	E	0.32	calculation difference, iis calculated 48.3
1440		-----		-----	
1442	EN12766-2-B	47.99	C	0.12	first reported 39.61
1458		-----		-----	
1495	EN12766-2-B	47.6		0.07	
1505		-----		-----	
1513		-----		-----	
1529		-----		-----	
1633	EN61619	56.599		1.27	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841	EN12766-2-B	47.15	ex	0.01	test result excluded as statistical outlier in related parameter
1875	EN12766-2-B	51.7642	ex	0.63	test result excluded as statistical outlier in related parameter
1885		-----		-----	
1888		-----		-----	
1912		-----		-----	
3132	EN12766-2-B	36		-1.47	
6067		-----		-----	
6146	EN12766-2-B	40.23		-0.91	
6254	EN12766-2-B	50.900		0.51	
6275		-----		-----	
6278		-----		-----	
6283	EN12766-2-B	44.45		-0.35	
6307	IP462-2	32.97	ex, E	-1.87	excl. as outlier in related parameter, calc. diff: iis calc. 34.61
6334		-----		-----	
6335	EN12766-2-B	15.152	ex	-4.24	test result excluded as statistical outlier in related parameter
6352		58.40		1.51	
6355	EN12766-2-B	48.616		0.21	
6382	EN12766-2-B	43.422	E	-0.48	calculation difference, iis calculated 47.367
6414		-----		-----	
6417	EN12766-2-B	40.94		-0.81	
6422	IEC61619	40.6		-0.86	
6427	EN12766-2-B	12.7	ex	-4.56	test result excluded as statistical outlier in related parameter
6491	EN12766-2-B	47.338		0.04	
6498		-----		-----	
6500	EN12766-2-B	51.662		0.61	
6522		-----		-----	
6534	EN12766-2-B	48.56		0.20	
6549	EN12766-2-B	46.11		-0.13	
6558	EN12766-2-B	41.61		-0.72	
6559	EN12766-2-B	54.54192		0.99	
6566		-----		-----	

normality	OK
n	23
outliers	0 + 6ex
mean (n)	47.0547
st.dev. (n)	5.74815
R(calc.)	16.0948
st.dev.(EN12766-2B:01)	7.52860
R(EN12766-2B:01)	21.0801

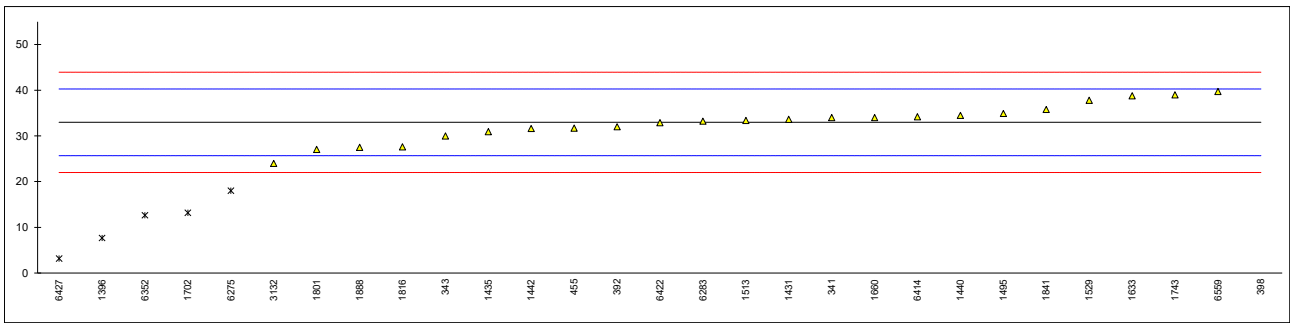

80
70
60
50
40
30
20
10
0
6427
6335
1135
6307
3132
1396
6146
6422
6417
6558
6382
6283
6549
1841
6491
1495
1442
498
6534
6355
1170
1435
6254
6500
1875
1243
6559
1633
6352

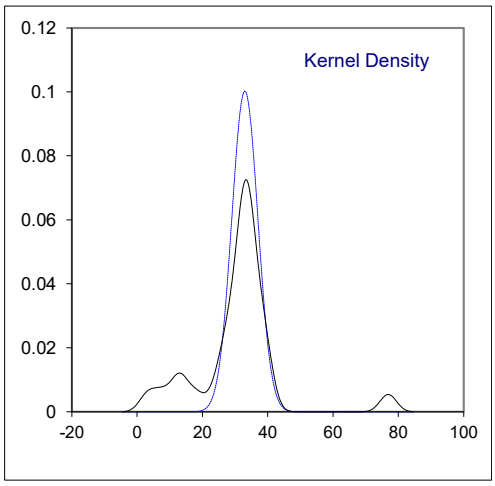

Kernel Density
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
20
40
60
80

Determination of Total PCB, sum of all congeners on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341	EN61619	34		0.28	
343	EN61619	30		-0.81	
392	EN12766-2A	32		-0.27	
398	EN12766-2B	76.9	G(0.01)	12.01	
455	EN61619	31.7268		-0.34	
498		-----		-----	
511		-----		-----	
614		-----		-----	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264		-----		-----	
1304		-----		-----	
1306		-----		-----	
1352		-----		-----	
1374		-----		-----	
1396	IP462-2	7.64990	ex,C	-6.92	ex. as reported sum 7 congeners and not sum of all, f.r. 11.20930
1431	IEC61619	33.63		0.18	
1435	EN12766-2A	30.95		-0.55	
1440	IEC61619	34.5		0.42	
1442	IEC61619	31.62		-0.37	
1458		-----		-----	
1495	EN12766-2A	34.9		0.53	
1505		-----		-----	
1513	IEC61619	33.4		0.12	
1529	In house	37.8		1.32	
1633	EN61619	38.788		1.59	
1660	IEC61619	34		0.28	
1702	IEC61619	13.18	G(0.05)	-5.41	
1743	IEC61619	39		1.65	
1801	EN61619	27.06		-1.62	
1816	EN61619	27.6		-1.47	
1841	IEC61619	35.79		0.77	
1875		-----		-----	
1885		-----		-----	
1888	EN61619	27.5		-1.50	
1912		-----		-----	
3132	EN61619	24		-2.45	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275	EN61619	18.00	G(0.05)	-4.09	
6278		-----		-----	
6283	IEC61619	33.23		0.07	
6307		-----		-----	
6334		-----		-----	
6335		-----		-----	
6352		12.63	ex,C	-5.56	excl. as reported sum 7 congeners and not sum of all, f.r. 12.84
6355		-----		-----	
6382		-----		-----	
6414	IEC61619	34.2		0.34	
6417		-----		-----	
6422	IEC61619	32.9		-0.02	
6427	EN12766-2A	3.17	ex	-8.15	ex. reported sum 7 cong. and not sum of all+outlier in related parameter
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522		-----		-----	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559	EN61619	39.727		1.85	
6566		-----		-----	

normality	OK
n	23
outliers	3 + 3ex
mean (n)	32.9705
st.dev. (n)	3.98234
R(calc.)	11.1506
st.dev.(EN61619:97)	3.65808
R(EN61619:97)	10.2426

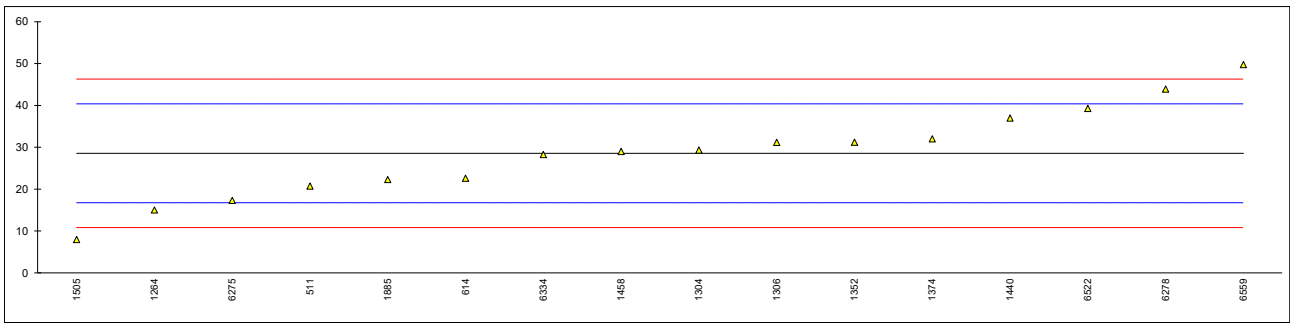

50
40
30
20
10
0
6427
1396
6352
1702
6275
3132
1801
1888
1816
343
1435
1442
455
392
6422
6283
1513
1431
341
1660
6414
1440
1495
1841
1529
1633
1743
6559
398

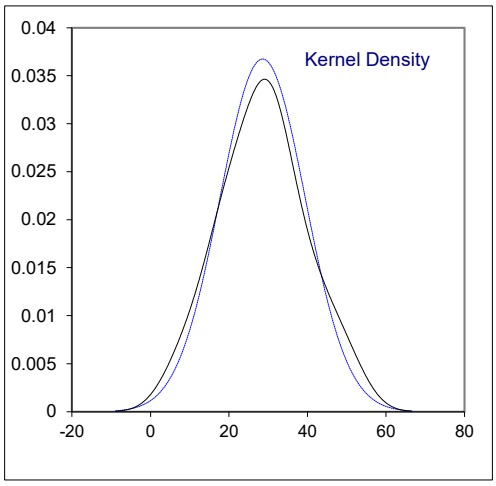

Kernel Density
0.12
0.1
0.08
0.06
0.04
0.02
0
-20
0
20
40
60
80
100

Determination of Total PCB, sum of all Aroclors on sample #23243; results in mg/kg

lab	method	value	mark	z(targ)	remarks
341		-----		-----	
343		-----		-----	
392		-----		-----	
398		-----		-----	
455		-----		-----	
498		-----		-----	
511	D4059	20.73		-1.32	
614	D4059	22.6		-1.01	
1059		-----		-----	
1126		-----		-----	
1135		-----		-----	
1170		-----		-----	
1243		-----		-----	
1264	D4059	15.01		-2.29	
1304	In house	29.35		0.13	
1306		31.17	E	0.44	calculation difference, iis calculated 30.17
1352	In house	31.205		0.45	
1374	D4059	32.02		0.59	
1396		-----		-----	
1431		-----		-----	
1435		-----		-----	
1440		37.0		1.43	
1442		-----		-----	
1458	D4059	29.0		0.08	
1495		-----		-----	
1505	D4059	7.98		-3.48	
1513		-----		-----	
1529		-----		-----	
1633		-----		-----	
1660		-----		-----	
1702		-----		-----	
1743		-----		-----	
1801		-----		-----	
1816		-----		-----	
1841		-----		-----	
1875		-----		-----	
1885	D4059	22.3		-1.06	
1888		-----		-----	
1912		-----		-----	
3132		-----		-----	
6067		-----		-----	
6146		-----		-----	
6254		-----		-----	
6275	D4059	17.31	E	-1.90	calculation difference, iis calculated 17.88
6278	EPA8082A	43.9		2.60	
6283		-----		-----	
6307		-----		-----	
6334	IEC61619Mod.	28.28		-0.05	
6335		-----		-----	
6352		-----		-----	
6355		-----		-----	
6382		-----		-----	
6414		-----		-----	
6417		-----		-----	
6422		-----		-----	
6427		-----		-----	
6491		-----		-----	
6498		-----		-----	
6500		-----		-----	
6522	D4059	39.28		1.81	
6534		-----		-----	
6549		-----		-----	
6558		-----		-----	
6559	D4059	49.7674		3.59	
6566		-----		-----	

normality	OK
n	16
outliers	0
mean (n)	28.5564
st.dev. (n)	10.85546
R(calc.)	30.3953
st.dev.(D4059:00R18 (silicone))	5.91186
R(D4059:00R18 (silicone))	16.5532


60
50
40
30
20
10
0
1505
1264
6275
511
1885
614
6334
1458
1304
1306
1352
1374
1440
6522
6278
6559


Kernel Density
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-20
0
20
40
60
80

APPENDIX 2

Number of participants per country

6 labs in	AUSTRALIA
1 lab in	AUSTRIA
2 labs in	BELGIUM
1 lab in	CZECH REPUBLIC
1 lab in	ESTONIA
3 labs in	FRANCE
8 labs in	GERMANY
3 labs in	GREECE
1 lab in	INDONESIA
1 lab in	IRELAND
6 labs in	ITALY
1 lab in	LUXEMBOURG
1 lab in	MALAYSIA
2 labs in	MOROCCO
3 labs in	NETHERLANDS
2 labs in	NORWAY
1 lab in	PERU
1 lab in	PHILIPPINES
5 labs in	PORTUGAL
1 lab in	QATAR
1 lab in	SAUDI ARABIA
1 lab in	SLOVENIA
2 labs in	SOUTH AFRICA
7 labs in	SPAIN
4 labs in	UNITED KINGDOM

APPENDIX 3

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 statistical evaluation
n.a.	= not applicable
n.e.	= not evaluated
n.d.	= not detected
fr.	= first reported
f+?	= possibly a false positive test result?
f-?	= possibly a false negative test result?
SDS	= Safety Data Sheet

Literature

1 iis Interlaboratory Studies, Protocol for the Organisation, Statistics & Evaluation, June 2018
2 ISO5725:86
3 ISO5725 parts 1-6:94
4 ISO13528:05
5 M. Thompson and R. Wood, J. AOAC Int, 76, 926, (1993)
6 W.J. Youden and E.H. Steiner, Statistical Manual of the AOAC, (1975)
7 P.L. Davies, Fr. Z. Anal. Chem, 331, 513, (1988)
8 J.N. Miller, Analyst, 118, 455, (1993)
9 Analytical Methods Committee, Technical Brief, No 4, January 2001
10 P.J. Lowthian and M. Thompson, The Royal Society of Chemistry, Analyst, 127, 1359-1364, (2002)
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)

Address: Malledijk 18, P.O. Box 200, 3200 AE Spijkenisse, The Netherlands
Telephone number: +31 (0)88 214 45 41
Email address: nl.iis@sgs.com
Website: www.iisnl.com