LCSQA

Laboratoire Central de Surveillance de la Qualité de l'Air

European interlaboratory comparison for the analysis of PAH in ambient air

INERIS maîtriser le risque pour un développement durable

LNE Le progrès, une passion à partager

MINES Douai

"L'expertise au service de la qualité de l'air"

French reference laboratory for air quality monitoring

INERIS – French National Institute for Industrial Environment and Risks

EUROPEAN INTERLABORATORY COMPARISON FOR THE ANALYSIS OF PAH IN AMBIENT AIR

S.VERLHAC, A.ALBINET (INERIS)
J.CABILLIC, B.LALERE, C.FALLOT (LNE)

December 2015

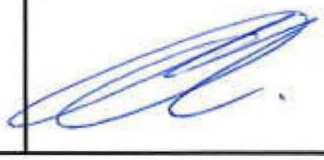
	Drafting	Checking	Approval
NOM	Stephane VERLHAC / Alexandre ALBINET	Caroline Marchand	Nicolas ALSAC
Quality	Coordinators of the interlaboratory comparison Chronic Risks Division	Head of the « Chemistry, Metrology, Test unit Chronic Risks Division	Head of Characterization of the Environment Departement Chronic Risks Division
Signature			

TABLE OF CONTENTS

FOREWORD

This report was drawn up on the basis of the information provided to INERIS and the objective (scientific or technical) data available and applicable regulations.
INERIS cannot be held liable if the information received was incomplete or erroneous.
Any findings, recommendations, suggestions or equivalent that are recorded by INERIS as part of the services it is contracted to perform may assist with decision making. Given the tasks entrusted to INERIS on the basis of the decree founding the organization, INERIS cannot be involved in the decision making process itself. INERIS cannot therefore take responsibility in lieu and place of the decision maker.
The addressee shall use the results comprised in this report in whole or at least in an objective manner. Using this information in the form of excerpts or summary memos may take place only under the full and complete responsibility of the addressee. The same applies to any modification made to this report.
INERIS declines any liability for any use of this report outside of the scope of the service provided

FRENCH VERSION OF THE ABSTRACT FOR THE REGIONAL AIR QUALITY MONITORING NETWORKS (AASQA)

Dans le cadre de la mise en œuvre des exigences qualité fixées par le ministère chargé de l'environnement, un essai de comparaison inter laboratoires (CIL) analytique a été organisé par le LCSQA (l'INERIS en collaboration avec le LNE) au premier semestre 2015, pour les laboratoires d'analyse sous-traitants des AASQA.

En raison d'une diminution du nombre de participants français et compte-tenu des résultats peu satisfaisants de la CIL organisée en 2014, les inscriptions ont été ouvertes en 2015 à des laboratoires européens appliquant les prescriptions des textes normatifs relatifs à l'analyse du Benzo[a]pyrène (B[a]P) et des autres HAP concernés par la Directive 2004/107/CE du 15 décembre 2004 ainsi que sur le phénanthrène, le fluoranthène et le benzo[g,h,i]pérylène.

Cet exercice comprenait des matrices de concentrations très différentes afin de prendre en compte les gammes de travail habituelles des laboratoires réalisant l'analyse de filtres issus de prélèvements haut débit ou bas débit. Chaque participant a donc reçu les matériaux suivants :

- un matériau solide de référence certifié (MRC) par le NIST (SRM 2787, fine particulate matter PM_{10}) ;

- trois matériaux solides (poinçons de filtre) contenus dans des boîtes de Pétri préparés par l'INERIS et issus de prélèvements réels pour deux d'entre eux, le troisième étant un blanc de laboratoire. Les prélèvements ont été effectués sur filtre en quartz à l'aide d'un préleveur grand volume de type Graseby-Andersen, équipé d'une tête PM_{10}, à un débit de 70 m^3/h. Chaque filtre était découpé avec un emporte-pièce en 16 morceaux de 47 mm de diamètre. Trois filtres notés filtre 1, filtre 2 et filtre 3 ont ainsi été envoyés aux participants ;

- trois matériaux liquides de référence certifiés (MRC) préparés par le LNE, constitués de trois solutions étalons notées : Etalon 1, Etalon 2 et Etalon 3, présentant des concentrations différentes.

18 laboratoires européens (dont 10 français) ont participé à cette CIL.

Deux laboratoires ont été exclus de l'analyse statistique pour le B[a]P pour le MRC solide et la solution 1 et un laboratoire pour la solution 3.

Le traitement statistique robuste des résultats a permis d'identifier une sous-estimation par les laboratoires pour l'analyse des MRC (pour le B[a]P, sous-estimation de 4 à 5 % pour les solutions et jusqu'à 36% pour le MRC solide du NIST).

La dégradation des performances des laboratoires constatée en 2014 pour l'analyse des filtres a également été confirmée.

Cette dégradation induit un dépassement des exigences de la Directive 2004/107/CE vis-à-vis de l'incertitude élargie pour la mesure du B[a]P (de 51 à 70 % contre < 50 % dans la Directive).

<u>Les AASQA sont donc invitées à porter une attention particulière aux performances de leur laboratoire d'analyse</u>.

Les résultats obtenus avec l'extraction QuEChERS (Quick Easy Cheap Rugged and Safe) étaient tout à fait satisfaisants montrant que cette technique d'extraction alternative pourrait être incluse dans la version révisée de la norme EN 155449 pour l'analyse des HAP dans l'air ambiant.

GLOSSARY

CRM	Certified reference material
ILC	An Interlaboratory Comparison is defined and implemented to allow laboratories to assess and demonstrate their performance in particular test, calibration or measuring sectors, NOTE: Three terms may be used: “interlaboratory tests” or “inter-comparison tests” or “aptitude tests,”
LoQ	Limit of quantification
Test material	Matrix of interest containing the targeted compounds by the interlaboratory comparison, potentially added using a spiking solution
B[a]A	Benzo[a]anthracene
B[a]P	Benzo[a]pyrene
B[b]F	Benzo[b]fluoranthene
B[g,h,i]P	Benzo[g,h,i]perylene
B[j]F	Benzo[j]fluoranthene
B[k]F	Benzo[k]fluoranthene
DB[a,h]A	Dibenzo[a,h]anthracene
Flt	Fluoranthene
Ind[1,2,3-cd]P	Indeno[1,2,3-cd]pyrene
Phen	Phenanthrene
Sum of BF	Sum of Benzo[b,j,k]fluoranthene

DEFINITIONS

CV_r	Standard deviation of x measurements divided by the average of those x measurements by % [(Standard deviation / average) by %],
CV_R	reproducibility variation coefficient equal to the standard deviation of the measurements averages divided by the average of the measurements averages by %,
CV_{rep}	mean repeatability variation coefficient, average of the the participants CV_r ,
Standard deviation	standard deviation of x measurements,
Population standard deviation	standard deviation of the measurement averages,
IC_R	reproducibility confidence interval,
IC_r	repeatability confidence interval,
Average	average of x measurements,
Population average	average of the measurement averages,
Number of decimals	number imposed in the instruction formula,
σ	robust standard deviation for assessing the aptitude (stipulated, perceived or s*: robust standard deviation for evaluating the aptitude obtained using the algorithm A of ISO 13528),
z score	performance criteria provided to each participant making it possible to measure its deviation relative to the assigned value. The assigned value is the robust average,
s*	robust standard deviation for assessing the aptitude obtained using the algorithm A of ISO 13528,
S_L	interlaboratory standard deviation,
S_R	reproducibility standard deviation,
S_r	repeatability standard deviation,
w*	robust standard deviation obtained using algorithm S of ISO 13528,
x*	robust average obtained using algorithm A of ISO 13528,
X_{MRC}	reference value resulting from the certificate for the certified reference material.

1. BACKGROUND

The monitoring of polycyclic aromatic hydrocarbons (PAH) in ambient air is mandatory and regulated according to the European Directive 2004/107/EC Article 9, from the French law of October 21st, 2010 related to the air quality monitoring and public information states that the participation to interlaboratory comparisons (ILC) is mandatory for the laboratories performing chemical analyses for the regional air quality monitoring associations networks (AASQA).

A new interlaboratory comparison was organized in 2015 by the French air quality monitoring reference laboratory (LCSQA).

ILC are organized either to check the ability of laboratories to deliver accurate testing results to their customers or to find out whether a certain analytical method performs well and is fit for its intended purposes. Furthermore, this exercise is useful to identify problems connected to the application of the standard procedure EN 15549 which has to be applied to the sampling and analysis of B[a]P in ambient air as well as of the technical specification CEN/TS 16445 for the measurement of the benz[a] anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene and benzo[g,h,i]perylene.

This test was first intended for the subcontractor laboratories performing analyses of PAH in ambient air for the AASQA and for other European laboratories performing this type of analyses.

2. PARTICIPANTS

According to ISO 5725-1 (§ 6.3.3), for each test material, a minimum number of p participants with n measurements such as $p \times n \geq 30$, allows to get a low level of uncertainty on the estimations of standard deviations of repeatability and reproducibility. A minimum of 10 participants is usually required and a maximum of 20 participants would have been ideal in this case (limitation due to the number of possible punches made on the field sample filter available).

18 participants have taking part into the ILC and are listed in the following Table 1. The instructions of ISO 5725-1 were followed.

Table 1 : Participants at the PAHs ILC organized in 2015

Laboratoire de Rouen	France
GIE LIC	France
Micropolluants Technologie	France
IANESCO	France
Laboratoire d'Hygiène de la Ville de Paris	France
Laboratoire National de Métrologie et d'essais	France
LCME	France
INERIS	France
Université de Strasbourg / CNRS UMR 7515, Institut de Chimie et Procédés pour l'Energie, l'Environnement et la santé	France
LD31	France
Český hydrometeorologický ústav	Czech Republic
VLAAMSE MILIEUMAATSCHAPPIJ	Belgium
LANUV Landesamt für Natur Umwelt und Verbraucher	Germany
LUBW Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg	Germany
Finnish Meteorological Institute / Atmospheric composition research / Air quality	Finland
National Physical Laboratory	Great Britain
TNO-ELSS AEC	Netherlands
Laboratorio regional agroalimentario y ambiental de Castilla - la mancha	Spain

The instrumentation used by the participants as well as the applied analytical procedures and the obtained results are presented anonymously in this report. A confidential code was assigned to each participant when they registered on-line for their participation to the ILC.

3. ORGANIZATION OF THE INTERLABORATORY COMPARISON

The interlaboratory comparison (ILC) was organized and implemented by the authorized personnel cited in the Table 2 below:

Table 2 : Authorized personnel who implemented the PAHs ILC

	First and Last Names	ILC Function
INERIS Parc Technologique Alata 60550 VERNEUIL-EN-HALATTE ☎ 0033 3.44.55.66.77 🗀 0033 3.44.55.66.99	Stephane VERLHAC	ILC coordinator
	Robin AUJAY	Test material assistant
	Florian Mathiot	Webmaster and designer of the statistical processing tool

The ILC was organized as follows:

2015 Week 7: Participants had to submit the registration form before February 9th, 2015.

2015 week 9: INERIS sent a confidential code, an identifier and a password to each participant.

March, 16th 2015: INERIS sent the different test materials to each participant. Opening of the website for on-line result submissions.

April, 17th 2015: Deadline for result submissions on the website.

June, 11th 2015: INERIS sent the preliminary report.

4. ANALYSES TO BE PERFORMED

Participants should have analyzed on each material the following substances:

Benzo[a]pyrene	Benzo[j]fluoranthene*
Benzo[a]anthracene	Benzo[k]fluoranthene*
Phenanthrene	Dibenzo[a,h]anthracene
Fluoranthene	Indeno[1,2,3-cd]pyrene
Benzo[b]fluoranthene*	Benzo[g,h,i]perylene

* *Results for the sum of B[b]F, B[k]F and B[j]F concentrations were accepted.*

Analyses should have been performed according to the methods specified in the standard procedure EN 15549 for the analysis of benzo[a]pyrene (B[a]P) and in the technical specification CEN/TS16445 for the measurement of benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, indeno[1,2,3-cd]pyrene and benzo[g,h,i]perylene.

The same operator or the same team should have performed all analyses for a given parameter, within a short time period.

5. DESCRIPTIONS OF THE TEST MATERIALS

All the test materials sent to the participants are presented Table 3 below:

Table 3 : Test materials sent to the participants

Test materials	Matrices	Quantity
CRM: Certified reference material	Solid powder	About 15 mg
F1: Field sample filter	Quartz	Filter punch of 47 mm ∅
F2: Field sample filter	Quartz	Filter punch of 47 mm ∅
F3: Laboratory blank filter	Quartz	Filter punch of 47 mm ∅
Standard sol 1: Certified standard solution	Acetonitrile	4 ml vial
Standard sol 2: Certified standard solution	Acetonitrile	4 ml vial
Standard sol 3: Certified standard solution	Acetonitrile	4 ml vial

5.1 Solid Certified Reference Materiel (CRM)

The NIST (National Institute of Standards and Technology) SRM 2787 (standard reference material, fine particulate matter, PM_{10}) was used in this ILC as solid CRM. Details on this CRM could be found in the certificate of analysis (Certificate issue date: 13 August 2013).

Certified mass fraction values for selected PAHs in NIST SRM 2787 are presented in the Table 4 below:

Table 4 : Certified mass fraction values for selected PAHs in NIST SRM 2787

Compound	Mass fraction on dry basis (mg kg^{-1}, k=2)	Uncertainty (mg kg^{-1}, k=2)
Benzo[a]anthracene	5	0.61
Benzo[a]pyrene	3.228	0.074
Benzo[b]fluoranthene	6.56	0.27
Benzo[g,h,i]perylene	4.99	0.14
Benzo[j]fluoranthene	3.77	0.25
Benzo[k]fluoranthene	2.94	0.11
Dibenzo[a,h]anthracene	0.53	0.11
Fluoranthene	12.28	0.21
Indeno[1,2,3-cd]pyrene	4.18	0.24
Phenanthrene	3.51	0.18

5.1 Field sample filter

Natural ambient air aerosol samples were collected using a PM_{10} high volume sampler (Graseby-Andersen working at 70 m^3 h^{-1}) in December 2014 at Verneuil-en-Halatte (France, sub-urban site). 18 equivalent punches of 47 mm diameter were performed in the quartz fibre filters (20.3 x 25.4 cm) to be sent to the participants.

5.2 Standard solutions (certified by LNE)

Three standard solutions (in acetonitrile) were prepared by LNE at different concentration levels defined on the basis of the standard thresholds, sampling flow rates and concentrations observed in ambient air.

For each compound/PAH, individual standard stock solutions were prepared gravimetrically by dissolution of the native compounds in 60 ml of acetonitrile:

- Standard solution 1 was prepared gravimetrically by mixing the individual stock standard solutions and dilution in acetonitrile (250 ml of standard solution 1).

Standard solutions 2 and 3 were obtained by gravimetrically dilution of standard solution 1 in acetonitrile:

- Standard solution 2: standard solution 1 diluted 15 times
- Standard solution 3: standard solution 1 diluted 35 times

Individual PAH concentrations of standard solution 1 was determined by using GC/MS. C_{13} labelled PAH were used for quantification (isotopic dilution). PAH concentrations were calculated considering the dilutions of standard solution 1. 4 ml of standard solutions were placed in amber vials and sent to the participants.

Standard solutions concentrations used in the ILC 2015 are presented in the Table 5 below:

Table 5 : Standard solutions concentrations

	Standard solution 1		Standard solution 2		Standard solution 3	
Coumpound	**ng ml^{-1}**	**Uncertainty U (ng ml^{-1}, k=2)**	**ng ml^{-1}**	**Uncertainty U (ng ml^{-1}, k=2)**	**ng ml^{-1}**	**Uncertainty U (ng ml^{-1}, k=2)**
Benzo[a]anthracene	274.1	5.5	19.54	0.39	8.12	0.24
Benzo[a]pyrene	408.3	8.2	29.11	0.58	8.20	0.25
Benzo[b]fluoranthene	553	11	39.41	0.79	16.37	0.33
Benzo[g,h,i]perylene	363.8	7.3	25.94	0.78	10.78	0.32
Benzo[j]fluoranthene	276.7	8.3	19.73	0.59	8.20	0.25
Benzo[k]fluoranthene	285.0	8.5	20.32	0.61	8.44	0.25
Dibenzo[a,h]anthracene	84.3	4.2	6.01	0.30	2.50	0.13
Fluoranthene	774	15	55.2	1.1	22.92	0.46
Indeno[1,2,3-cd]pyrene	735	15	52.4	1.0	21.77	0.87
Phenanthrene	1531	31	109.2	2.2	45.36	0.91

Uncertainty linked to the stability of the standard solution could considered as negligible. Uncertainties have been evaluated from the uncertainty of measurement and the homogeneity inter- and intra-vials.

6. HOMOGENEITY AND STABILITY OF THE AMBIENT AIR AEROSOL SAMPLES

6.1 Homogeneity of the filters

The homogeneity of the materials was checked before invoice. Analysis of samples was performed using the methodology described in the standard method ISO 13528.

The results fully complied with standard requirements, excepted for phenanthrene which showed a standard deviation of 13%.

6.2 Stability of the filters

The stability of filters was checked during all the ILC analytical period. Concurrent analyses were performed on two parallel ambient air filter samples. Punches from the same filter sample were analyzed once per week for the entire ILC period of four weeks. The stability of the materials was checked according to the methodology described in the standard method ISO 13528. The stability of B[a]P and Phenanthrene are presented in the figures below (error bars correspond to the analytical uncertainty):

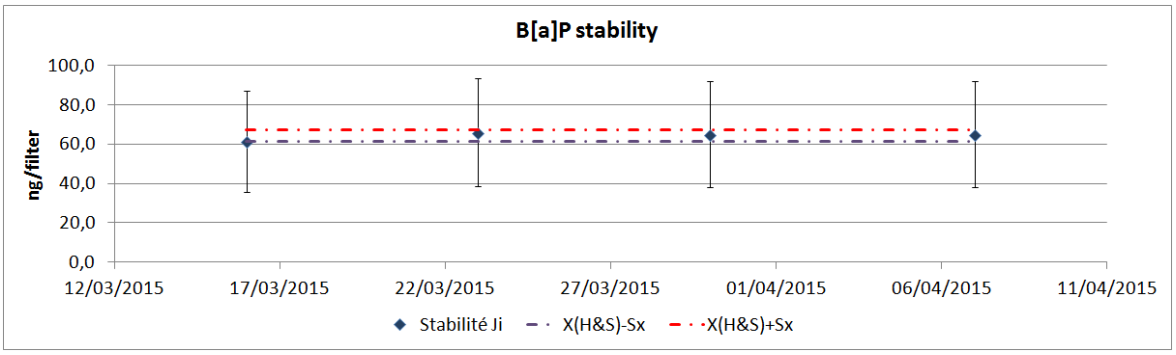


Figure 1 : B[a]P stability

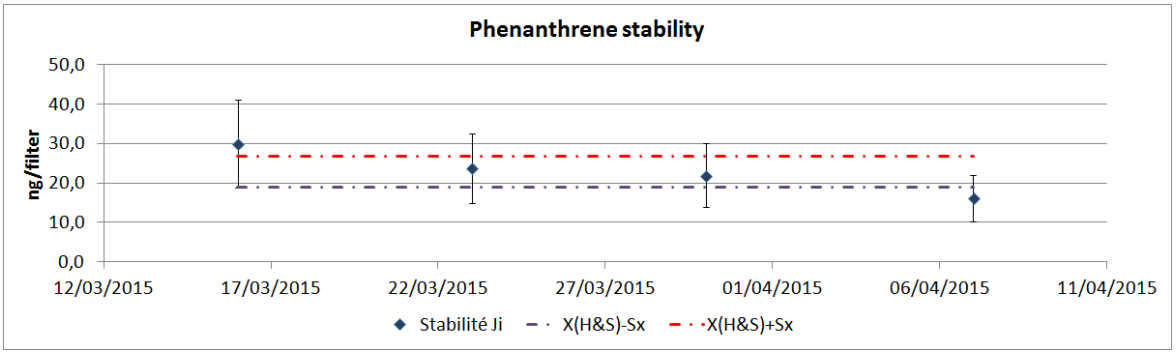


Figure 2 : Phenanthrene stability

Results obtained from the homogeneity and stability experiments showed that **the field sample filters could be considered as stable and homogeneous for the entire analytical period excepted for phenanthrene.**

7. DATA ANALYSIS

Statistical analysis of the results was performed according to the EN ISO/CEI 17043 standard procedure and the following requirements:

- Standard methods 1, 2 and 5 of the ISO 5725 series: “Accuracy (trueness and precision) of measurement methods and results”;
- ISO 13528 standard procedure: “Statistical methods for use in proficiency testing by interlaboratory comparison”;
- X06-050 standard procedure “Statistical application – Study of distribution normality.”

Determination of assigned values was done as follows:

- for the standard solutions and CRM: the value assigned to the average was taken to be equal to the certified value;
- for the field sample filter: the value assigned to the average was taken to be equal to the robust average of the results provided by the participants in the interlaboratory comparison;
- the reference value of the standard deviation for assessing the aptitude was taken to be equal to the robust standard deviation evaluated using the ISO 13528A algorithm.

Using the robust analysis, calculations of the reference values, confidence intervals and performance statistics are not affected by the analyst’s assessment data.

Evaluation of the performances of the participants was achieved using the Z-score calculations as described below:

Z score:

Certified value

$$z_i = \frac{\overline{x_i} - X_{CMR}}{\hat{\sigma}}$$

Robust average

$$z_i = \frac{\overline{x_i} - x^*}{\hat{\sigma}}$$

Zeta Score:

$$\zeta = \frac{x - X_{CMR}}{\sqrt{u_x^2 + u_{X_{CMR}}^2}}$$

8. RESULTS OF THE INTERLABORATORY COMPARISON

In the following sections, the results obtained before and after statistical analysis, averages, repeatability standard deviations and uncertainties are presented for each test materials. Performance of each laboratory (Z-score) is presented only for B[a]P. Results for the other substances are shown in the appendix. The statistical distribution graphs showing the average and standard deviation values obtained by each laboratory are provided here after.

The following legend is used:

x*	Robust average obtained using the algorithm A of ISO 13528
σ	Standard deviation for assessing the aptitude obtained using the the algorithm A of ISO 13528
x	Participant's average
S_L	Interlaboratory standard deviation
S_R	Reproducibility standard deviation
S_r	Repeatability standard deviation
~~15,93~~	Value excluded by the expert
score z_i	Performance criteria available to each participant indicating the relative deviation to the assigned value.
NA	Not analyzed
UNS	Uncertainty not submitted
	$\|Z_i\| < 2$: Satisfactory score
	$2 \leq \|Z_i\| < 3$: Score requiring monitoring or preventive action
	$\|Z_i\| \geq 3$: Unsatisfactory score requiring corrective action (the analytical results are not acceptable)

8.1 NIST CRM

Results obtained for the analysis of CRM powder from NIST before and after statistical analysis are presented in the Table 6 below:

Table 6 : NIST CRM, raw data and robust analysis results

	Raw data						Robust analysis									
Substances (mg kg^{-1})	**Number of excluded laboratories**	**Certified value**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**$u_{X\ CRM}$**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2, %)**	**Mean recoveries**
B[a]A	2	5.0	10.8	19.1	178%	1%	4.2	0.7	0.7	0.3	0.7	0.7	0.1	33%	80% [1]	84%
B[a]P	2	3.2	5.4	9.7	179%	2%	2.0	0.6	0.6	0.0	0.6	0.6	0.0	**55%**	50% [2]	63%
B[b]F	3	6.6	10.6	18.4	173%	1%	5.9	0.8	0.8	0.1	0.8	0.8	0.1	29%	60% [1]	90%
B[g,h,i]P	3	5.0	13.0	20.6	158%	3%	3.9	1.3	1.3	0.1	1.3	1.3	0.1	65%	68% [1]	77%
B[j]F	6	3.8	6.2	10.9	175%	4%	3.3	1.0	1.0	0.1	1.0	1.0	0.1	60%	-	86%
B[k]F	4	2.9	4.8	8.4	175%	5%	2.7	0.7	0.7	0.1	0.7	0.7	0.1	51%	80% [1]	91%
DB[a,h]A	1	0.5	2.6	5.1	199%	5%	0.9	0.8	0.8	0.1	0.8	0.8	0.1	**180%**	106% [1]	172%
Flt	6	12.3	25.6	44.9	175%	6%	9.2	2.6	2.6	0.1	2.6	2.6	0.1	57%	-	75%
Ind[1,2,3-cd]P	3	4.2	9.8	17.7	181%	2%	4.0	0.6	0.6	0.1	0.6	0.6	0.1	32%	66% [1]	95%
Phen	7	3.5	14.0	22.0	157%	3%	3.0	1.2	1.2	0.1	1.2	1.2	0.1	84%	-	84%
Sum of BF	12	13.3	48.0	66.6	139%	2%	12.0	3.6	3.6	0.6	3.6	3.6	0.4	59%	84% [1]	91%

[1] CEN/TS 16645 : Ambient air — Method for the measurement of benz[a]anthracene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene and benzo[ghi]perylene

[2] 2004/107/EC European Directive

Table 7 : B[a]P participants' results on CRM analysis

	Benzo[a]pyrene			
Laboratory	**x (mg kg^{-1})**	**s_r (%)**	**Z-score**	**Zeta score**
15101	2.46	1.71%	-1.37	-0.08
15108	2.04	1.20%	-2.11	-0.08
15111	2.81	1.71%	-0.75	-1.01
15118	~~30.22~~	~~0.78%~~	~~47.83~~	~~2.70~~
15121	1.66	0.00%	-2.78	-0.10
15123	2.47	0.78%	-1.35	-0.05
15132	1.77	4.22%	-2.59	-0.10
15135	1.70	3.42%	-2.72	-0.08
15136	1.62	1.06%	-2.85	-0.11
15137	2.02	0.25%	-2.14	-0.22
15141	2.08	3.22%	-2.03	-0.21
15147	2.52	0.40%	-1.26	-0.03
15155	2.77	0.21%	-0.82	-0.05
15173	1.00	3.27%	-3.95	-0.89
15178	0.74	1.57%	-4.41	-0.17
15192	2.32	0.22%	-1.61	UNS
15198	~~33.46~~	~~2.31%~~	~~53.58~~	~~3.36~~
15199	2.11	2.28%	-1.99	-0.07

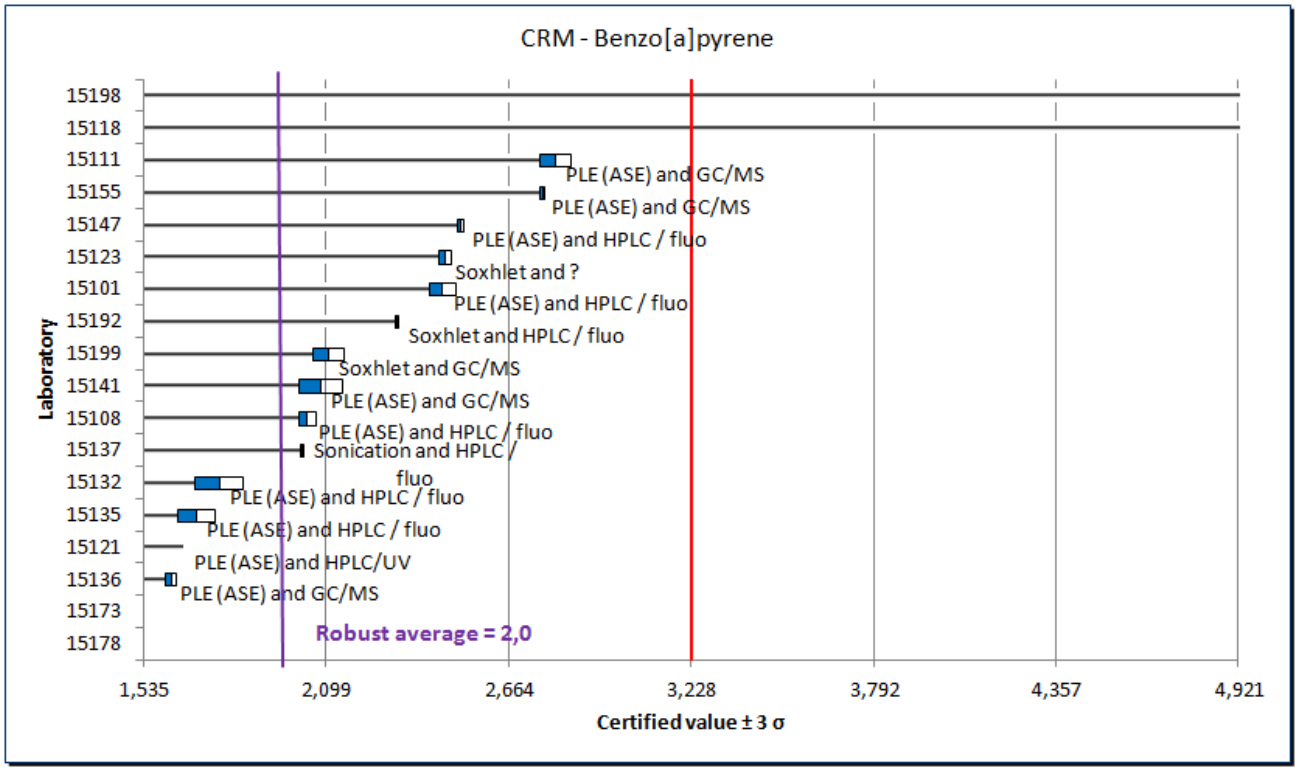


Figure 3 : B[a]P participants' dispersion on CRM analysis

Two laboratories (15118 and 15198) were excluded from the statistical analysis due to a retrievable error of a factor 10 in the submitted results.

Mean recoveries obtained were satisfactory (in the range of 0.8 to 1.2 as specified by the EN 15549 and XP/TS 16645) for all the PAH excepted for B[a]P and DB[a,h]A. **A significant underestimation of the B[a]P concentrations by all the participants of about 37% and an overestimation of DB[a,h]A concentrations of about 72% were observed**.

As an example, for B[a]P, a large dispersion of the results between the participants was observed. Reported concentration values ranged from 0.74 to 2.81 mg kg^{-1}. Z-score values obtained were of poor quality for this compound. 9 laboratories showed the requirement of monitoring or preventive actions and 2 laboratories, corrective actions. As a consequence, results obtained for the analysis of this CRM did not comply with the maximum uncertainty of 50 % allowed by the 2004/107/EC European directive for the measurement of B[a]P (U = 55 %, k =2). Moreover no link could be made between analytical procedure (extraction procedure and/or analysis by HPLC/fluorescence or GC/MS) and the large dispersion of the concentration values reported by the participants.

According to the SRM NIST certificate, the use of a least 30 mg of CRM for PAH quantification is advised. In order to lower the cost, only about 15 mg was sent to the participants. The NIST certification was performed using aliquots of 10 to 30 mg of CRM. The quantity provided to the participants could not explain the poor results observed for B[a]P and DB[a,h]A. No link could be made between analytical procedure (extraction procedure and/or analysis by HPLC/fluo or GC/MS) and the poor results obtained for both B[a]P and DB[a,h]A.

Improved results were obtained using Zeta score showing a good estimation of measurement uncertainties by the participants.

8.2 Field sample filters

Equivalent concentration ranges of the field sample filters provided to the participants are presented in the Table 8 below for high volume samplers (HVS) and low volume samplers (LVS).

Table 9 : Equivalent concentration ranges of filter 1 and 2

Test materials	Equivalent concentration ranges
Filter 1	HVS $\Rightarrow$ 0.17 ng m^{-3} / LVS $\Rightarrow$ 5.0 ng m^{-3}
Filter 2	HVS $\Rightarrow$ 0.10 ng m^{-3} / LVS $\Rightarrow$ 3.1 ng m^{-3}

Results obtained for the analysis of filter 1 and 2 before and after statistical analysis are presented in the Table 10 and Table 11below:

Table 10 : Filter 1, raw data and robust analysis results

Filter 1	Raw data					Robust analysis								
Substances (ng $filter^{-1}$)	**Number of excluded laboratories**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**u_{x*}**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2, %)**
B[a]A	0	109.6	35.6	33%	1%	114.6	26.8	26.8	7.9	26.8	26.8	1.6	47%	80%
B[a]P	0	118.9	40.4	34%	2%	125.0	31.7	31.7	9.3	31.7	31.7	1.7	**51%**	50%
B[b]F	2	189.1	70.7	37%	2%	192.0	40.7	40.7	12.7	40.7	41.0	5.1	43%	60%
B[g,h,i]P	2	119.5	53.4	45%	2%	129.7	37.9	37.9	11.8	37.9	37.9	1.8	58%	68%
B[j]F	6	105.1	51.6	49%	3%	117.9	35.4	37.7	12.8	35.4	35.6	3.6	60%	-
B[k]F	4	70.8	33.1	47%	2%	79.2	19.2	20.3	6.4	19.2	19.3	1.4	49%	80%
DB[a,h]A	2	27.9	26.6	95%	4%	24.6	17.4	17.4	5.4	17.4	17.5	1.1	**142%**	106%
Flt	3	109.8	53.7	49%	2%	108.5	51.8	54.5	16.7	51.8	51.9	2.2	96%	-
Ind[1,2,3-cd]P	0	122.8	44.6	36%	2%	124.9	45.5	45.5	13.4	45.5	45.6	3.3	73%	66%
Phen	4	57.3	34.8	61%	5%	54.5	32.2	33.9	10.7	32.2	32.2	1.8	118%	-
Sum of BF	10	372.1	139.9	38%	3%	372.1	158.7	173.5	70.1	158.6	158.9	10.4	**85%**	84%

Table 11 : Filter 2, raw data and robust analysis results

Filter 2	Raw data					Robust analysis								
Substances (ng filter^{-1})	**Number of excluded laboratories**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**u_{X*}**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2, %)**
B[a]A	2	53.8	19.6	36%	1%	56.5	14.2	14.2	4.4	14.2	14.2	1.0	50%	80%
B[a]P	0	73.6	27.3	37%	1%	73.8	25.7	25.7	7.6	25.7	25.8	1.5	**70%**	50%
B[b]F	4	143.8	44.8	31%	1%	154.8	24.7	26.1	8.3	24.7	24.8	2.7	32%	60%
B[g,h,i]P	2	118.0	26.6	23%	1%	120.1	26.1	26.1	8.1	26.0	26.1	2.3	44%	68%
B[j]F	6	86.7	32.1	37%	3%	93.5	21.6	23.0	7.8	21.6	21.8	3.2	47%	-
B[k]F	3	79.5	58.1	73%	2%	65.6	11.6	12.2	3.7	11.6	11.7	1.5	36%	80%
DB[a,h]A	2	25.7	42.0	164%	5%	16.8	9.9	9.9	3.1	9.9	9.9	0.8	**118%**	106%
Flt	3	63.0	30.0	48%	2%	60.6	21.2	22.3	6.8	21.2	21.2	1.3	70%	-
Ind[1,2,3-cd]P	2	106.9	33.7	32%	2%	114.3	22.9	22.9	7.2	22.9	23.0	2.1	40%	66%
Phen	5	40.7	44.7	110%	3%	32.3	13.9	14.7	4.8	13.9	14.0	0.9	86%	-
Sum of BF	10	302.5	71.8	24%	2%	302.5	81.5	89.1	36.0	81.4	81.6	6.5	54%	84%

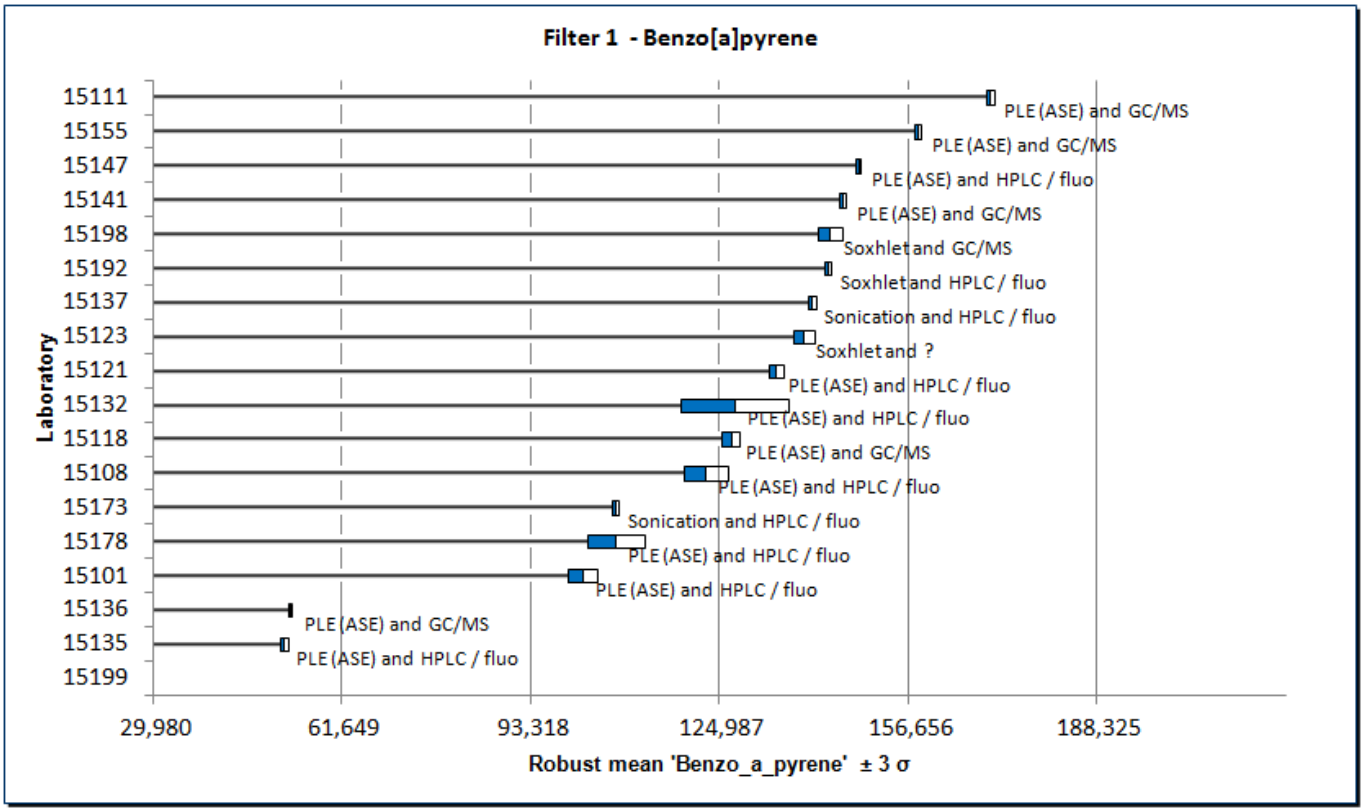


Figure 4 : B[a]P participants' dispersion on filter 1 analysis

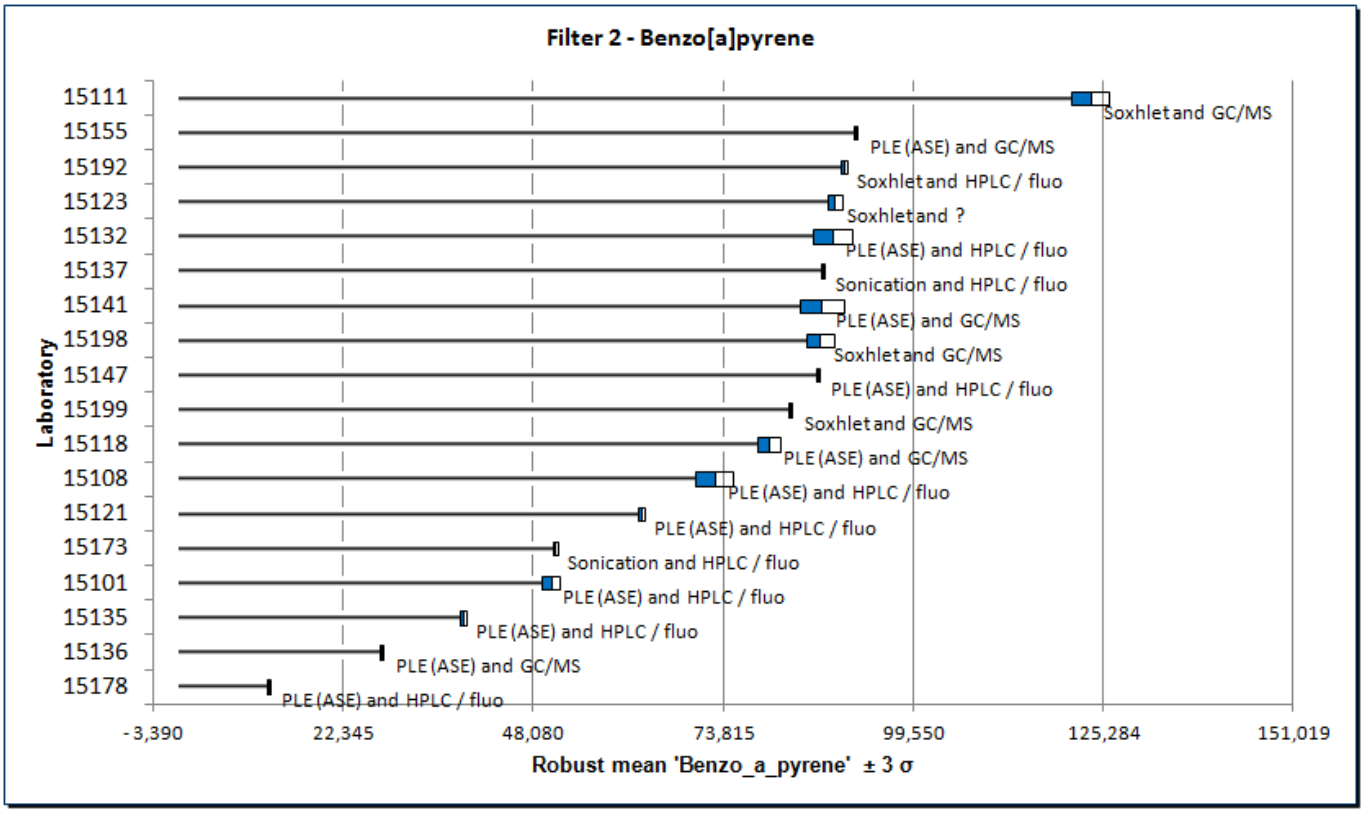


Figure 5 : B[a]P participants' dispersion on filter 2 analysis

Table 12 : B[a]P participants' results on filters analysis

Laboratory	Benzo[a]pyrene - Filter 1			Benzo[a]pyrene - Filter 2		
	x (ng filter^{-1})	s_r (%)	Z-score	x (ng filter^{-1})	s_r (%)	Z-score
15101	102.02	2.37%	-0.73	50.44	2.32%	-0.91
15108	122.58	3.02%	-0.08	72.62	3.54%	-0.05
15111	170.41	0.39%	1.43	123.52	2.11%	1.93
15118	126.89	1.23%	0.06	79.93	1.99%	0.24
15121	134.50	0.96%	0.3	62.75	0.80%	-0.43
15123	139.06	1.30%	0.44	88.87	1.12%	0.59
15132	127.50	7.01%	0.08	88.60	2.94%	0.57
15135	51.95	1.34%	-2.31	38.58	1.38%	-1.37
15136	52.88	0.52%	-2.28	27.53	0.96%	-1.8
15137	140.51	0.43%	0.49	87.29	0.29%	0.52
15141	145.65	0.43%	0.65	87.17	3.35%	0.52
15147	148.25	0.34%	0.73	86.70	0.23%	0.5
15155	158.22	0.37%	1.05	91.74	0.25%	0.7
15173	107.56	0.55%	-0.55	51.05	0.55%	-0.88
15178	107.54	4.45%	-0.55	12.23	1.78%	-2.39
15192	143.12	0.36%	0.57	90.26	0.50%	0.64
15198	143.52	1.41%	0.59	86.93	2.18%	0.51
15199	18.19	4.58%	-3.37	82.90	0.35%	0.35

Overall, Z-score results obtained for filters 1 and 2 were satisfactory for most of the participants and for all PAH. Only 1 laboratory had warning results and 2 laboratories had not acceptable results for most of the PAH (Appendix 2).

Note that, for filter 1, according to the Mandel k test, the laboratories 15132, 15178 showed intra-laboratory dispersion significantly higher than the rest of the population.

More specifically for B[a]P, Z-scores were satisfactory. Only 3 laboratories showed warning results and 1 laboratory got not acceptable results. However, the large dispersion of the concentration values obtained by the participants explained the good Z-score results observed. This highlighted that the Z-score statistical analysis should be used carefully. Primary conclusions could be distorted by the large dispersion of the reported concentrations values. No link could be made between analytical procedure (extraction procedure and/or analysis by HPLC/fluorescence or GC/MS) and the large dispersion of the concentration values reported by the participants.

As a consequence, results obtained for the analysis of the field filter samples did not comply with the maximum uncertainty of 50 % allowed by the 2004/107/EC European directive for the measurement of B[a]P (U = 51 and 70% %, k =2).

Values observed for filter 3 (laboratory blank filter) are shown in appendix 4. Except for 2 laboratories (15132 and 13598, 0.373 and 0.113 ng filter^{-1}; respectively), all of the participants reported results lower than the quantification limits.

8.3 Standard solutions (provided and certified by LNE)

The equivalent concentration ranges of the certified solutions provided to the participants are presented in the Table 13 below for high volume samplers (HVS) and low volume samplers (LVS).

Table 13 : Equivalent concentration ranges of standard solutions

Test materials	Concentration ranges
Certified solution 1	Equivalent to 0.5 ng m^{-3} for B[a]P using HVS
Certified solution 2	Equivalent to 0.5 ng m^{-3} for B[a]P using LVS
Certified solution 3	HVS $\Rightarrow$ 0.15 ng m^{-3} / LVS $\Rightarrow$ 4 ng m^{-3} (for B[a]P)

Results obtained for the analysis of certified solutions 1 to 3 before and after statistical analysis are presented on the Table 14, Table 15 and Table 16 below.

Table 14 : Solution 1, raw data and robust analysis results

Solution 1	Raw data						Robust analysis								
Substances (ng ml^{-1})	**Number of excluded laboratories**	**Certified value**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**$u_{X\ CRM}$**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2)**
B[a]A	3	274.1	235.5	84.2	36%	3%	266.4	31.6	31.6	2.8	31.5	31.9	5.2	24%	80%
B[a]P	3	408.3	348.8	118.4	34%	3%	392.0	31.1	31.1	4.1	30.9	31.8	7.6	16%	50%
B[b]F	4	553.0	546.1	172.1	32%	3%	557.8	56.3	56.3	5.5	56.1	56.9	9.6	20%	60%
B[g,h,i]P	5	363.8	317.5	160.3	50%	3%	372.6	29.8	29.8	3.7	29.2	31.3	11.2	17%	68%
B[j]F	8	276.7	232.4	103.8	45%	2%	275.0	36.4	36.4	4.2	36.2	36.9	7.1	27%	-
B[k]F	6	285.0	247.6	96.4	39%	1%	286.0	14.7	14.7	4.3	14.5	15.4	5.2	11%	80%
DB[a,h]A	3	84.3	79.3	32.8	41%	3%	85.7	14.0	14.0	2.1	14.0	14.1	1.9	33%	106%
Flt	5	774.0	602.5	291.4	48%	2%	726.9	112.2	112.2	7.5	112.1	112.6	10.4	31%	-
Ind[1,2,3-cd]P	3	735.0	600.1	245.9	41%	2%	705.5	93.2	93.2	7.5	93.0	93.6	10.6	27%	66%
Phen	6	1531.0	1 294.8	513.4	40%	2%	1 496.0	188.7	188.7	15.5	188.4	189.6	21.2	25%	-
Sum of BF	12	1114.7	965.1	422.3	44%	1%	1 106.6	60.2	60.2	28.0	59.6	61.8	16.2	11%	84%

Table 15 : Solution 2, raw data and robust analysis results

Solution 2	Raw data						Robust analysis								
Substances (ng ml^{-1})	**Number of excluded laboratories**	**Certified value**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**$u_{X\ CRM}$**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2)**
B[a]A	1	19.5	19.8	6.6	33%	2%	18.8	2.7	2.7	0.2	2.7	2.7	0.3	29%	80%
B[a]P	1	29.1	28.9	6.4	22%	2%	27.7	2.6	2.6	0.3	2.6	2.7	0.8	20%	50%
B[b]F	3	39.4	42.0	12.6	30%	2%	39.3	3.7	3.7	0.4	3.7	3.8	1.0	19%	60%
B[g,h,i]P	3	25.9	24.1	7.0	29%	4%	25.7	3.2	3.2	0.4	3.2	3.3	0.7	25%	68%
B[j]F	7	19.7	17.1	5.8	34%	3%	18.6	2.6	2.6	0.3	2.6	2.7	0.7	29%	-
B[k]F	5	20.3	18.6	5.6	30%	2%	20.0	1.8	1.8	0.3	1.8	1.8	0.4	18%	80%
DB[a,h]A	3	6.0	8.4	7.7	92%	2%	6.0	1.0	1.0	0.2	0.9	1.0	0.2	32%	106%
Flt	3	55.2	49.4	14.3	29%	2%	51.9	6.6	6.6	0.6	6.6	6.7	1.0	26%	-
Ind[1,2,3-cd]P	1	52.4	48.3	8.4	17%	2%	49.4	5.9	5.9	0.5	5.9	6.0	1.2	24%	66%
Phen	4	109.2	108.4	14.2	13%	2%	106.6	10.7	10.7	1.1	10.6	11.0	2.7	21%	-
Sum of BF	11	79.5	73.1	9.6	13%	2%	73.1	10.9	10.9	2.0	10.9	11.0	1.7	30%	84%

Table 16 : Solution 3, raw data and robust analysis results

Solution 3	Raw data						Robust analysis								
Substances (ng ml^{-1})	**Number of excluded laboratories**	**Certified value**	**x**	**s**	**CV_R (%)**	**CV_{rep} (%)**	**x***	**s***	**σ**	**$u_{X\ CRM}$**	**S_L**	**S_R**	**S_r**	**U (k=2, %)**	**Maximum uncertainties allowed (k=2)**
B[a]A	2	8.1	22.9	56.3	246%	2%	7.9	1.3	1.3	0.1	1.3	1.3	0.2	32%	80%
B[a]P	2	12.1	32.7	79.9	244%	2%	11.6	1.1	1.1	0.1	1.0	1.1	0.4	19%	50%
B[b]F	3	16.4	17.7	5.9	34%	3%	16.4	1.8	1.8	0.2	1.8	1.8	0.5	22%	60%
B[g,h,i]P	3	10.8	34.5	89.5	259%	3%	10.8	1.9	1.9	0.2	1.9	1.9	0.4	36%	68%
B[j]F	9	8.2	7.8	4.6	59%	3%	7.7	0.9	0.9	0.1	0.9	1.0	0.4	25%	-
B[k]F	5	8.4	7.7	2.4	31%	2%	8.3	0.9	0.9	0.1	0.9	0.9	0.2	22%	80%
DB[a,h]A	6	2.5	9.5	20.4	215%	2%	2.5	0.4	0.4	0.1	0.4	0.4	0.1	35%	106%
Flt	5	22.9	70.8	195.2	276%	3%	21.8	2.9	2.9	0.2	2.8	2.9	0.6	27%	-
Ind[1,2,3-cd]P	3	21.8	54.6	146.1	268%	3%	20.7	2.9	2.9	0.4	2.9	2.9	0.7	28%	66%
Phen	5	45.4	133.5	332.1	249%	3%	43.7	6.1	6.1	0.5	6.1	6.2	1.1	28%	-
Sum of BF	13	33.0	146.8	291.5	199%	3%	30.4	5.5	5.5	0.9	5.4	5.6	1.2	37%	84%

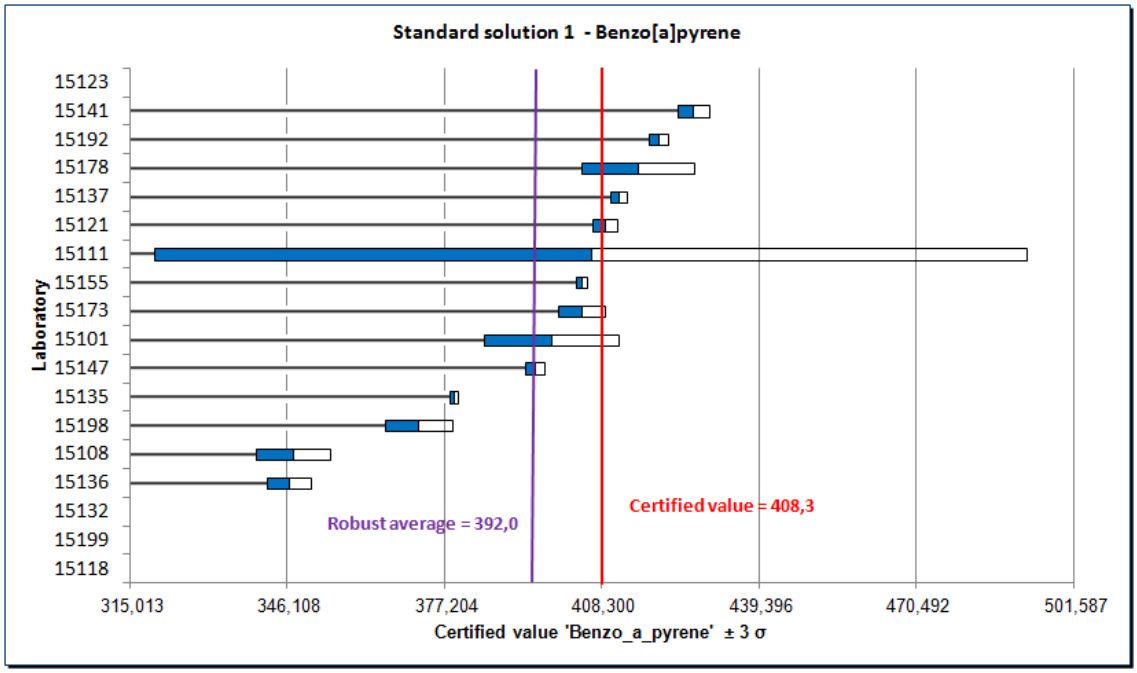


Figure 6 : B[a]P participants' dispersion on solution 1 analysis

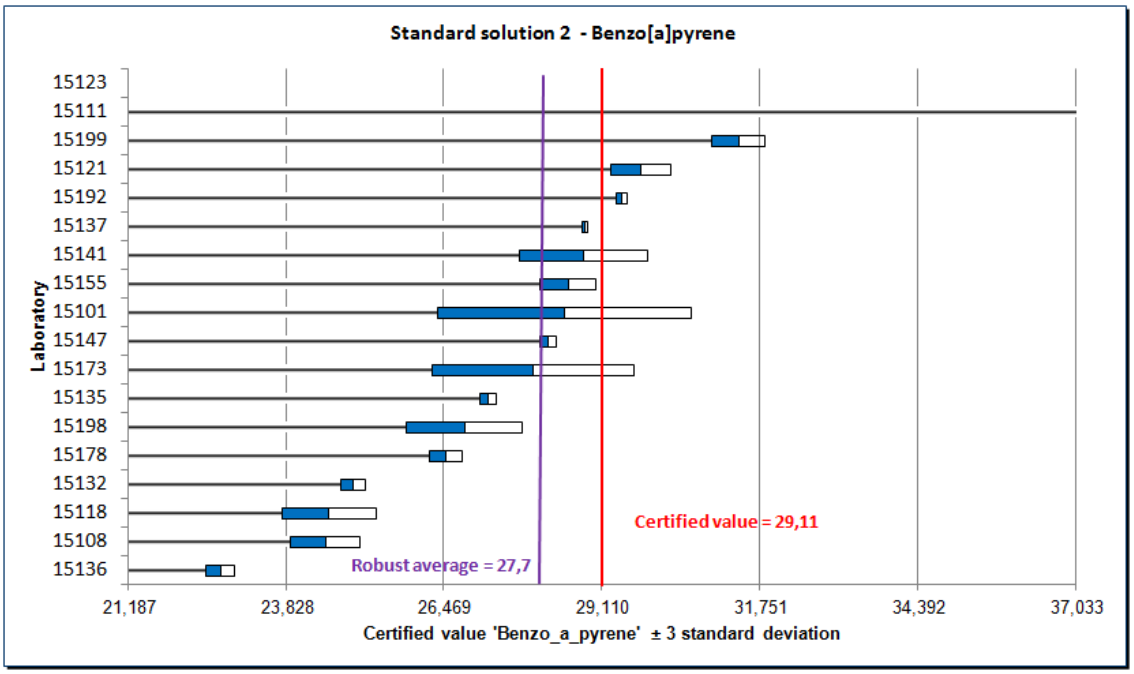


Figure 7 : B[a]P participants' dispersion on solution 2 analysis

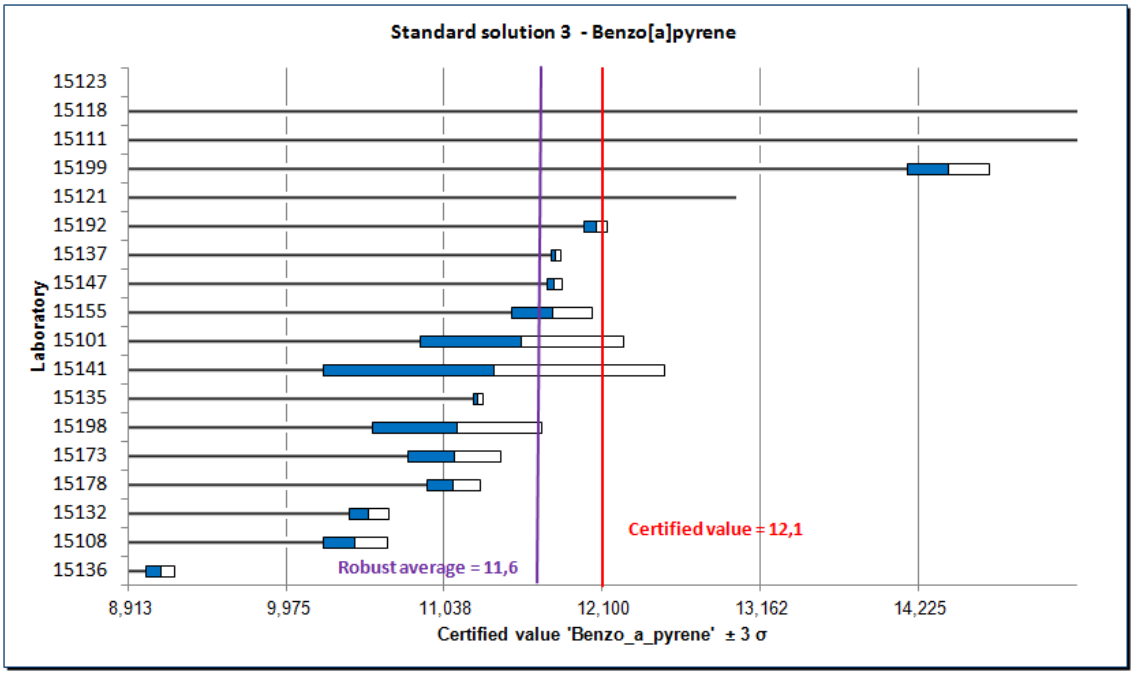


Figure 8 : B[a]P participants' dispersion on solution 3 analysis

Table 17 : B[a]P participants' results on standard solutions analysis

Laboratory	Benzo[a]pyrene - Solution 1				Benzo[a]pyrene - Solution 2				Benzo[a]pyrene - Solution 3			
	x (ng ml^{-1})	s_r (%)	Z-score	Zeta score	x (ng ml^{-1})	s_r (%)	Z-score	Zeta score	x (ng ml^{-1})	s_r (%)	Z-score	Zeta score
15101	398.350	3.33%	-0.32	-1.93	28.478	7.43%	-0.24	-0.06	11.555	5.90%	-0.51	-0.05
15108	347.133	2.12%	-1.97	-4.07	24.480	2.37%	-1.75	-0.31	10.437	2.06%	-1.57	-0.11
15111	406.025	21.23%	-0.07	-0.21	52.185	2.67%	8.74	14.21	36.775	2.57%	23.22	16.43
15118	~~10.428~~	~~3.49%~~	~~-12.80~~	-26.47	24.540	3.18%	-1.73	-0.45	~~341.663~~	~~1.64%~~	~~310.18~~	32.79
15121	409.000	0.60%	0.02	0.09	29.750	1.68%	0.24	0.08	13.000	0.00%	0.85	0.11
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	299.230	3.66%	-3.51	-16.58	24.938	0.82%	-1.58	-0.63	10.528	1.29%	-1.48	-0.24
15135	379.040	0.22%	-0.94	-1.95	27.200	0.48%	-0.72	-0.13	11.260	0.30%	-0.79	-0.06
15136	346.500	1.25%	-1.99	-4.11	22.725	1.04%	-2.42	-0.42	9.125	1.05%	-2.80	-0.20
15137	411.580	0.37%	0.11	3.07	28.818	0.17%	-0.11	-0.27	11.785	0.28%	-0.30	-0.29
15141	426.305	0.73%	0.58	3.22	28.803	3.71%	-0.12	-0.06	11.370	10.11%	-0.69	-0.13
15147	395.000	0.46%	-0.43	-0.64	28.200	0.50%	-0.34	-0.04	11.775	0.42%	-0.31	-0.02
15155	404.340	0.26%	-0.13	-1.77	28.535	1.63%	-0.22	-0.18	11.760	2.30%	-0.32	-0.07
15173	404.213	1.14%	-0.13	-1.52	27.958	6.06%	-0.44	-0.43	11.103	2.80%	-0.94	-0.37
15178	415.398	2.66%	0.23	0.47	26.493	1.06%	-0.99	-0.17	11.095	1.63%	-0.95	-0.07
15192	419.425	0.45%	0.36	UNS	29.438	0.32%	0.12	UNS	12.053	0.64%	-0.04	UNS
15198	371.965	1.79%	-1.17	-4.01	26.805	3.61%	-0.87	-0.25	11.123	5.12%	-0.92	-0.11
15199	~~86.098~~	~~1.10%~~	~~-10.36~~	UNS	31.390	1.41%	0.86	UNS	14.425	1.93%	2.19	UNS

Only results obtained for B[a]P are discussed below. Results obtained for all the other substances are presented in the appendices 5 to 7.

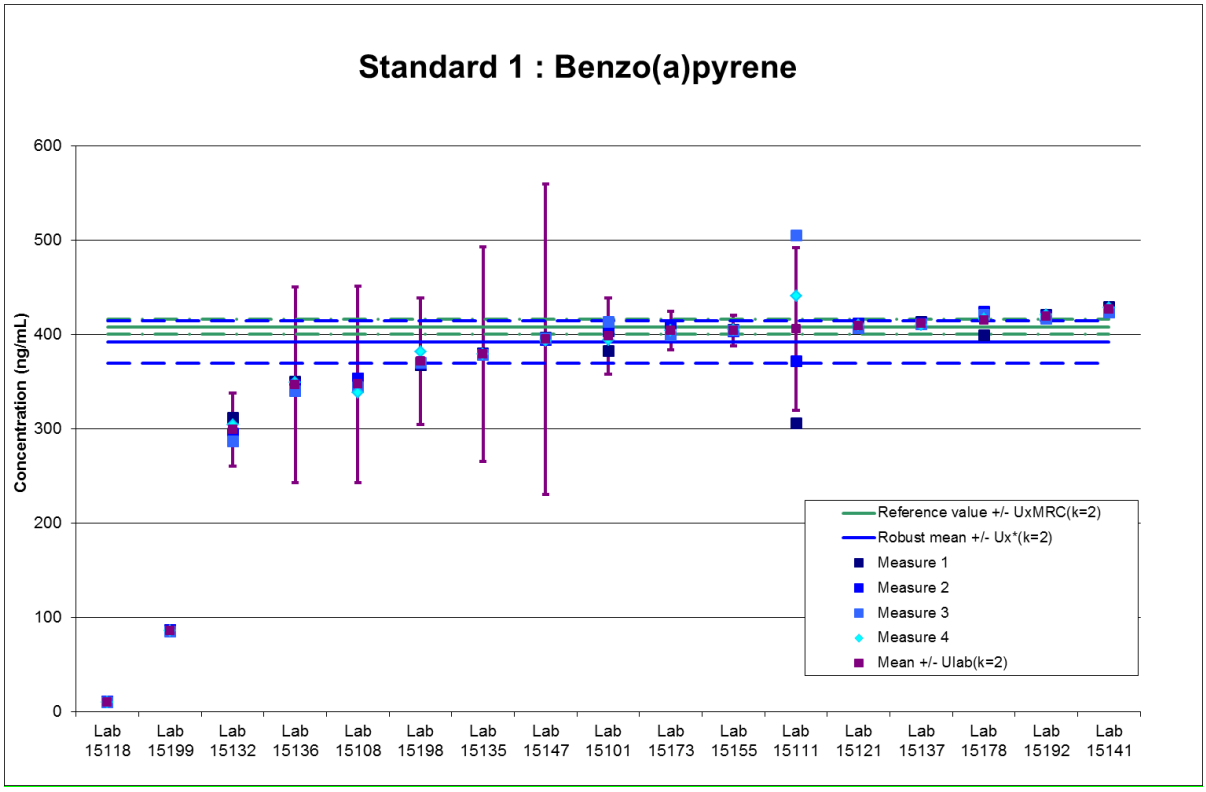
For the standard solution 1, two laboratories (15118 and 15199) have been excluded from the statistical analysis due to a retrievable error observed for the submitted results. As well, laboratory 15118 has been excluded for the statistical analysis of the solution 3. 2 laboratories did not provide their uncertainty values (15192 and 15199) and 1 laboratory (15123) did not provide any results.

Overall, Z-scores obtained were satisfactory. However, the standard deviations of repeatability obtained were slightly higher for the standard solutions than for the filters. This could partly explain the good Z-score values observed. Note that, laboratory 15111 showed a significant higher intra-laboratory dispersion (21.23%) than the rest of the population for solution 1, as well for the laboratories 15101 and 15173 for the solution 2.

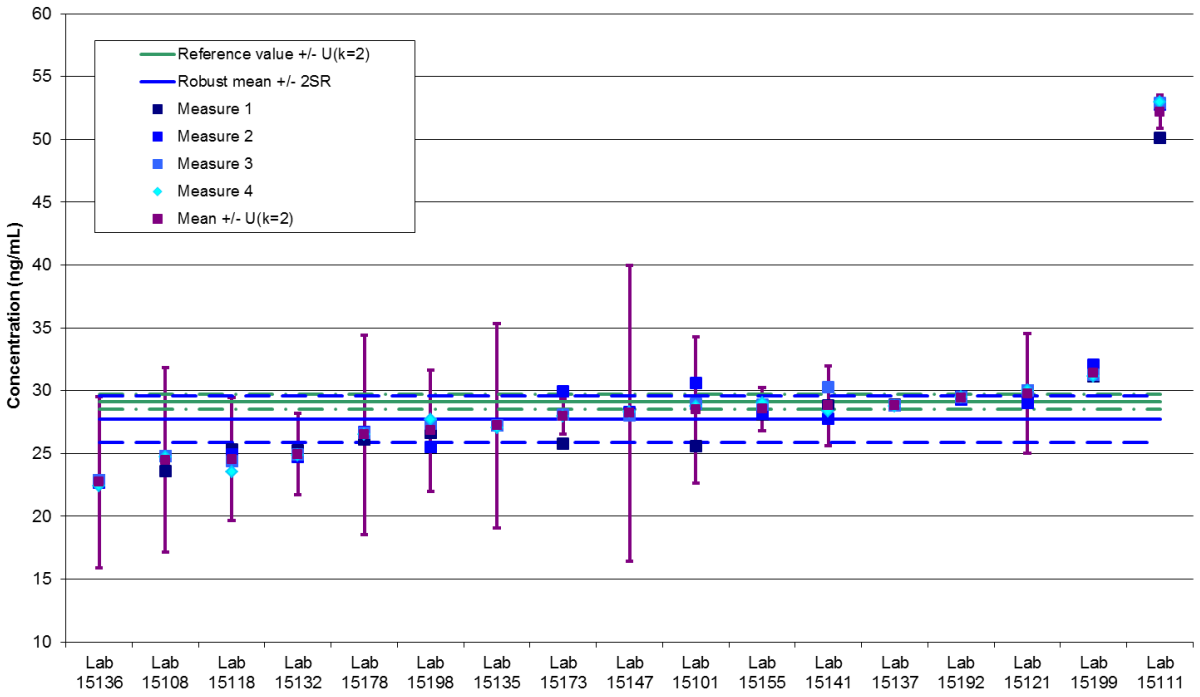
A systematic underestimation of the concentrations (about 4 to 5%) for the 3 certified solutions was observed.

Analytical uncertainties seemed poorly evaluated by the laboratories as shown by the Zeta scores obtained. Only the analytical step was perform for the analysis of such matrices and yet, results obtained were worse than the ones reported for CRM powder.

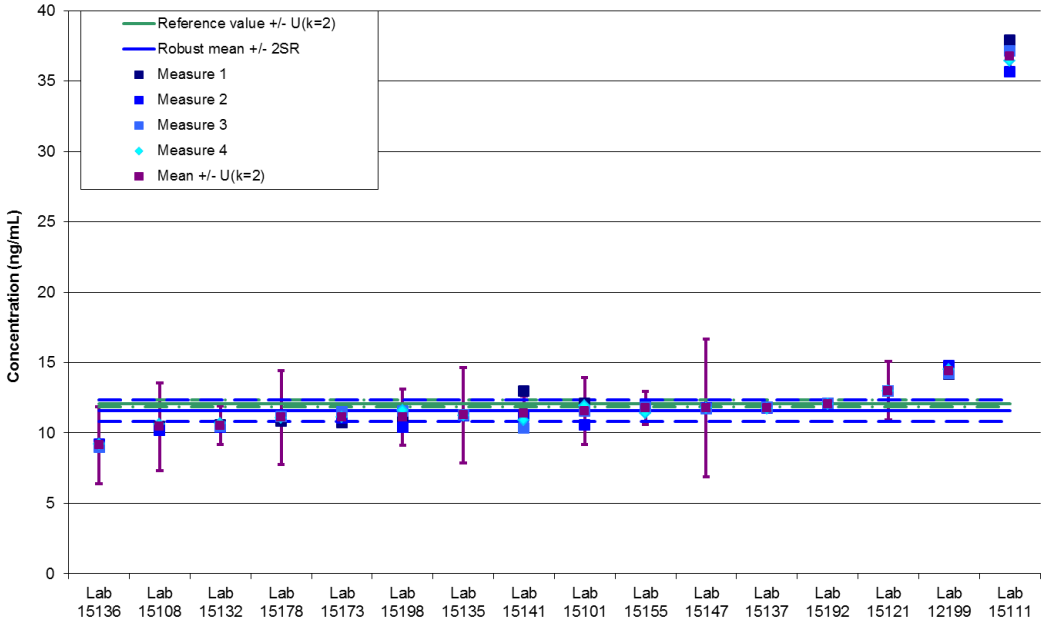
For the standard solution, a specific data analysis has been done by the LNE in order to compare to reference values to the results obtained by the participants. Figures below show results obtained for B[a]P for each participant with their associate uncertainty compared to the reference and the robust average values with their uncertainties. Laboratories reporting results <LQ are not shown on these figures.



Standard 2 : Benzo(a)pyrene



Standard 3 : Benzo(a)pyrene



The assigned value X_{CRM} is defined as equal to the certified reference material. The robust averages x* were compared to the certified reference values. If the difference between those two values is larger than twice the uncertainty of the difference (estimated according EN 13528), a bias is detected: |x*-Xmrc|>2 x u|x*-Xmrc|.

Substances	Solution 1	Solution 2	Solution 3
Benzo[a]anthracene	NTR	NTR	NTR
Benzo[a]pyrene	NTR	NTR	NTR
Benzo[b]fluoranthene	NTR	NTR	NTR
Benzo[g,h,i]perylene	NTR	NTR	NTR
Benzo[j]fluoranthene	NTR	NTR	NTR
Benzo[k]fluoranthene	NTR	NTR	NTR
Sum B[b+j+k]F	NTR	NTR	NTR
Dibenzo[a,h]anthracene	NTR	NTR	NTR
Fluoranthene	NTR	NTR	NTR
Indeno[[1,2,3-cd]pyrene	NTR	NTR	NTR
Phenanthrene	NTR	NTR	NTR

NTR : nothing to report

No bias has been detected between certified reference values and robust averages for all PAHs.

9. QuEChERS EXTRACTION

The reliability of QuEChERS (Quick Easy Cheap Rugged and Safe) extraction procedure described by Albinet et al. (2014)[3] for the analysis of PAH in ambient air particulate samples was evaluated by INERIS during this ILC.

MRC and filters samples were processed using this alternative and promising extraction procedure followed by ULPC-Fluorescence analysis.

For the 3 test materials, results obtained (presented in

Table 18) were in very good agreement with the CIL robust averages for all PAH except for fluoranthene for filters. As a consequence, Z-scores and Zeta-score were very satisfactory except for fluoranthene (see Appendix 8). Note that, uncertainties of measurement are very low using this extraction procedure.

These results showed that QuEChERS could be a good alternative extraction procedure to be included in the revised version of the standard procedure EN 15549 for the analysis of PAH in ambient air samples.

Table 18 : Results on filter 1, filter 2 and CRM analysis using QuEChERS extraction

	Filter 1 (ng filter^{-1})		Filter 2 (ng filter^{-1})		CRM (mg kg-^{1})		
Substances	**Robust average x**	**QuEChERS**	**Robust average x**	**QuEChERS**	**Certified value**	**Robust average x**	**QuEChERS**
B[a]A	112.718	85.825	55.256	37.250	5.000	4.117	3.033
B[a]P	125.388	122.500	74.375	80.650	3.228	2.056	2.120
B[b]F	193.104	203.500	155.359	162.000	6.560	5.935	6.110
B[g,h,i]P	130.247	133.500	120.250	118.250	4.990	3.723	3.413
B[j]F	119.052	130.250	94.375	104.500	3.770	3.360	3.040
B[k]F	79.040	75.050	65.064	60.500	2.940	2.696	2.160
DB[a,h]A	24.174	25.500	16.847	18.775	0.530	0.699	0.495
Flt	115.482	**223.750**	63.394	**148.750**	12.280	9.148	8.430
Ind[1,2,3-cd]P	126.759	155.500	115.358	130.000	4.180	3.964	3.873
Phen	54.132	50.550	31.557	27.200	3.510	2.909	2.485

[3] Albinet, A., Tomaz, S. and Lestremau, F.: A really quick easy cheap effective rugged and safe (QuEChERS) extraction procedure for the analysis of particle-bound PAHs in ambient air and emission samples, Science of The Total Environment, 450–451, 31–38, doi:10.1016/j.scitotenv.2013.01.068, 2013

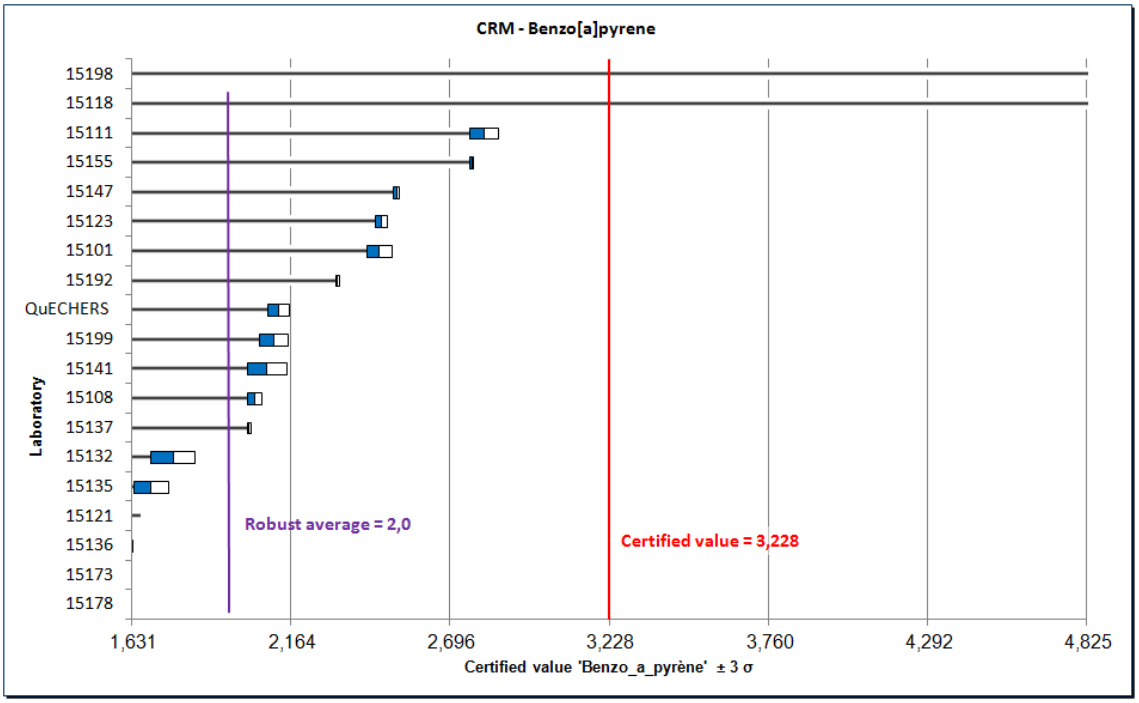


Figure 9 : QuEChERS results compare to B[a]P participants' dispersion on CRM analysis

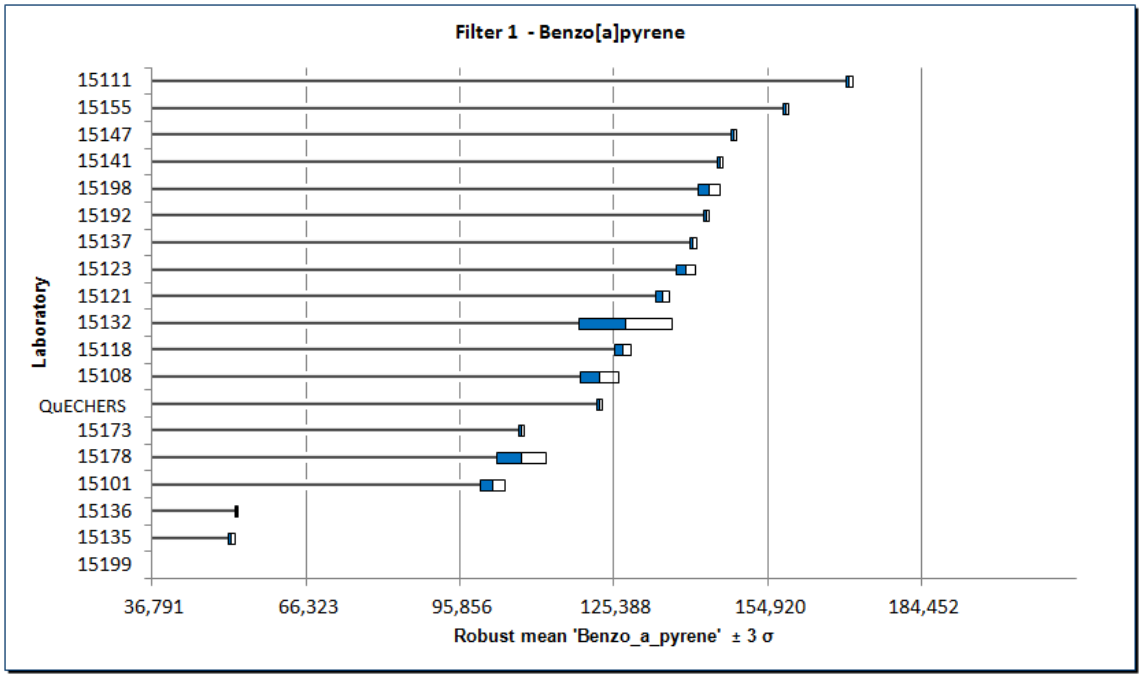


Figure 10 : QuEChERS results compare to B[a]P participants' dispersion on filter 1 analysis

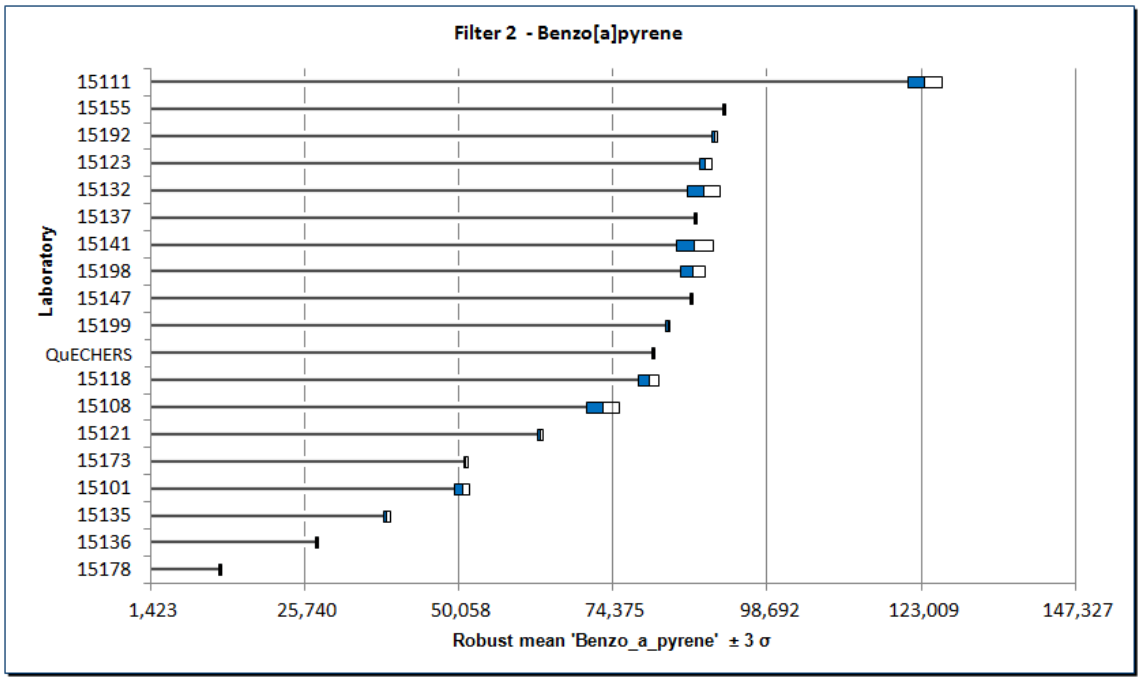


Figure 11 : QuEChERS results compare to B[a]P participants' dispersion on filter 2 analysis

10. CONCLUSIONS

A new ILC for the analysis of PHA in ambient air was organized in 2015. Several test materials were sent to the participants: three liquid certified standard solutions (certified by LNE), two PM_{10} field sample filters, one laboratory blank filter and a certified solid reference material (CRM NIST SRM 2787, fine particulate matter PM_{10}).

Eighteen European participants were involved in this ILC and submitted their results.

Two laboratories were excluded from the statistical analysis on B[a]P value on CRM and solution 1 and one laboratory on solution 3.

A significant dispersion of the results was observed for the analysis of standard solutions, sample filters (as in 2014) and CRM inducing distorted good Z-score evaluations. PAH concentrations (robust average) for the solutions and especially for B[a]P were underestimated about 4-5% by comparison to certified value. For CRM, an overall underestimation about 37% for B[a]P and an overestimation about 72% were observed.

As a consequence, results obtained did not comply with the maximum uncertainty of 50 % allowed by the 2004/107/EC European directive for the measurement of B[a]P (for filters, U = 51 and 70 %, k =2).

Results obtained using QuEChERS (Quick Easy Cheap Rugged and Safe) showed that this alternative extraction could be a good candidate procedure to be included in the revised version of the standard procedure EN 15549 for the analysis of PAH in ambient air samples.

APPENDICES

Appendix	Title	Number of pages
1	Detailed results on CRM	1
2	Detailed results on filter 1	1
3	Detailed results on filter 2	1
4	Detailed results on filter 3	1
5	Detailed results on solution 1	2
6	Detailed results on solution 2	2
7	Detailed results on solution 3	2
8	Detailed results on CRM, filters 1 and 2 using QuEChERS extraction	4

APPENDIX 1: DETAILED RESULTS ON CRM

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z
15101	4.328	0.083	1.91%	-0.97	2.458	0.042	1.71%	-1.37	6.610	0.175	2.64%	0.06	5.258	0.550	10.46%	0.21	3.520	0.293	8.32%	-0.26	2.873	0.115	4.01%	-0.10
15108	3.853	0.038	0.98%	-1.65	2.040	0.024	1.20%	-2.11	6.498	0.028	0.42%	-0.07	4.580	0.173	3.79%	-0.33	3.775	0.600	15.90%	0.01	2.688	0.015	0.56%	-0.38
15111	3.305	0.120	3.64%	-2.44	2.808	0.048	1.71%	-0.75	5.898	0.188	3.19%	-0.79	1.743	0.030	1.71%	-2.59	0.000	0.000	Pb. Moy.=0	-3.87	0.000	0.000	Pb. Moy.=0	-4.37
15118	~~51.025~~	~~0.127~~	~~0.25%~~	~~66.33~~	~~30.220~~	~~0.236~~	~~0.78%~~	~~47.83~~	NA	NA	NA	NA	~~60.245~~	~~0.811~~	~~1.35%~~	~~44.09~~	NA	NA	NA	NA	NA	NA	NA	NA
15121	3.940	0.040	1.02%	-1.53	1.660	0.000	0.00%	-2.78	5.370	0.040	0.74%	-1.41	3.678	0.072	1.97%	-1.05	3.810	0.131	3.44%	0.04	2.560	0.000	0.00%	-0.56
15123	5.828	0.022	0.38%	1.19	2.465	0.019	0.78%	-1.35	8.153	0.148	1.81%	1.89	4.485	0.037	0.82%	-0.40	4.143	0.104	2.51%	0.38	4.323	0.047	1.09%	2.05
15132	4.505	0.189	4.20%	-0.71	1.768	0.075	4.22%	-2.59	4.715	0.065	1.37%	-2.19	2.820	0.106	3.75%	-1.73	NA	NA	NA	NA	2.130	0.036	1.67%	-1.20
15135	3.098	0.073	2.35%	-2.74	1.695	0.058	3.42%	-2.72	5.630	0.044	0.78%	-1.10	3.423	0.040	1.18%	-1.25	3.575	0.035	0.98%	-0.20	2.033	0.059	2.88%	-1.35
15136	3.618	0.010	0.26%	-1.99	1.618	0.017	1.06%	-2.85	NA	NA	NA	NA	2.933	0.015	0.51%	-1.64	NA	NA	NA	NA	NA	NA	NA	NA
15137	4.328	0.033	0.76%	-0.97	2.023	0.005	0.25%	-2.14	5.240	0.022	0.41%	-1.57	NA	NA	NA	NA	2.620	0.112	4.26%	-1.18	2.455	0.017	0.71%	-0.72
15141	4.113	0.090	2.18%	-1.28	2.083	0.067	3.22%	-2.03	6.225	0.057	0.91%	-0.40	4.108	0.032	0.78%	-0.70	NA	NA	NA	NA	NA	NA	NA	NA
15147	3.958	0.015	0.38%	-1.50	2.515	0.010	0.40%	-1.26	6.718	0.010	0.14%	0.19	4.320	0.036	0.82%	-0.53	3.873	0.123	3.17%	0.11	2.518	0.005	0.20%	-0.63
15155	5.087	0.042	0.82%	0.12	2.767	0.006	0.21%	-0.82	6.507	0.065	1.00%	-0.06	4.933	0.029	0.59%	-0.05	4.387	0.061	1.39%	0.63	3.520	0.069	1.97%	0.86
15173	4.243	0.017	0.40%	-1.09	1.000	0.033	3.27%	-3.95	5.113	0.149	2.92%	-1.72	1.703	0.155	9.12%	-2.62	NA	NA	NA	NA	2.370	0.126	5.34%	-0.85
15178	5.730	0.080	1.40%	1.05	0.737	0.012	1.57%	-4.41	5.185	0.042	0.81%	-1.63	50.940	1.265	2.48%	36.66	2.217	0.015	0.69%	-1.59	3.590	1.671	46.56%	0.97
15192	4.200	0.022	0.51%	-1.15	2.318	0.005	0.22%	-1.61	6.600	0.024	0.37%	0.05	4.010	0.032	0.79%	-0.78	3.248	0.031	0.95%	-0.54	2.800	0.022	0.77%	-0.21
15198	~~73.143~~	~~0.561~~	~~0.77%~~	~~98.20~~	~~33.463~~	~~0.771~~	~~2.31%~~	~~53.58~~	~~79.428~~	~~2.744~~	~~3.45%~~	~~86.43~~	~~56.150~~	~~1.746~~	~~3.11%~~	~~40.82~~	~~42.148~~	~~2.734~~	~~6.49%~~	~~39.40~~	~~34.938~~	~~0.223~~	~~0.64%~~	~~47.53~~
15199	3.893	0.030	0.77%	-1.60	2.105	0.048	2.28%	-1.99	5.388	0.059	1.10%	-1.39	3.665	0.029	0.79%	-1.06	2.113	0.017	0.81%	-1.70	2.450	0.026	1.05%	-0.73

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z	x (mg/kg)	s_r (mg/kg)	s_r en %	score z
15101	0.803	0.151	18.85%	0.33	10.260	0.473	4.61%	-0.77	4.245	0.117	2.76%	0.10	2.445	0.059	2.42%	-0.86	13.003	0.468	3.60%	-0.08
15108	0.395	0.017	4.38%	-0.16	10.335	0.091	0.89%	-0.74	4.080	0.066	1.61%	-0.16	~~32.400~~	~~0.000~~	~~0.00%~~	~~23.21~~	12.960	0.623	4.81%	-0.09
15111	2.033	0.035	1.72%	1.84	6.428	0.041	0.64%	-2.24	~~0.000~~	~~0.000~~	Pb. Moy.=0	~~-6.59~~	10.138	0.527	5.20%	5.32	NA	NA	NA	NA
15118	9.808	0.138	1.41%	11.33	~~122.720~~	~~2.095~~	~~1.71%~~	~~42.21~~	~~48.055~~	~~0.432~~	~~0.90%~~	~~69.20~~	~~64.350~~	~~0.892~~	~~1.39%~~	~~48.87~~	~~155.080~~	~~1.141~~	~~0.74%~~	~~39.81~~
15121	0.413	0.075	18.18%	-0.14	9.540	0.046	0.48%	-1.05	3.485	0.071	2.05%	-1.10	3.430	0.046	1.35%	-0.06	NA	NA	NA	NA
15123	2.078	0.121	5.82%	1.89	NA	NA	NA	NA	4.280	0.104	2.44%	0.16	NA	NA	NA	NA	16.620	0.220	1.32%	0.94
15132	0.215	0.013	6.00%	-0.38	6.735	0.058	0.86%	-2.12	1.923	0.051	2.67%	-3.56	2.748	0.087	3.18%	-0.61	NA	NA	NA	NA
15135	0.353	0.021	5.85%	-0.22	7.223	0.053	0.74%	-1.93	3.468	0.029	0.83%	-1.12	2.485	0.040	1.63%	-0.82	11.238	0.110	0.98%	-0.57
15136	0.700	0.022	3.09%	0.21	5.278	0.026	0.50%	-2.68	3.523	0.043	1.23%	-1.04	0.390	0.060	15.38%	-2.51	6.998	0.025	0.36%	-1.76
15137	0.353	0.005	1.42%	-0.22	NA	NA	NA	NA	3.968	0.010	0.24%	-0.34	NA	NA	NA	NA	NA	NA	NA	NA
15141	0.690	0.038	5.55%	0.20	9.318	0.036	0.39%	-1.13	4.373	0.163	3.73%	0.30	3.108	0.005	0.16%	-0.32	11.323	0.107	0.94%	-0.55
15147	0.573	0.010	1.67%	0.05	10.498	0.028	0.26%	-0.68	4.635	0.047	1.00%	0.72	3.093	0.015	0.49%	-0.34	NA	NA	NA	NA
15155	0.657	0.012	1.76%	0.15	12.127	0.107	0.88%	-0.06	4.717	0.059	1.24%	0.85	4.523	0.012	0.26%	0.81	NA	NA	NA	NA
15173	3.185	0.062	1.96%	3.24	~~0.080~~	~~0.060~~	~~75.00%~~	~~-4.66~~	4.605	0.065	1.40%	0.67	1.618	0.066	4.05%	-1.52	NA	NA	NA	NA
15178	0.197	0.012	5.87%	-0.41	12.688	0.212	1.67%	0.16	2.643	0.032	1.22%	-2.42	NA	NA	NA	NA	NA	NA	NA	NA
15192	0.508	0.013	2.48%	-0.03	NA	NA	NA	NA	3.803	0.038	0.99%	-0.60	NA	NA	NA	NA	NA	NA	NA	NA
15198	~~20.940~~	~~0.555~~	~~2.65%~~	~~24.94~~	~~147.458~~	~~4.714~~	~~3.20%~~	~~51.66~~	~~66.788~~	~~5.770~~	~~8.64%~~	~~98.75~~	~~60.268~~	~~1.163~~	~~1.93%~~	~~45.59~~	~~156.513~~	~~5.331~~	~~3.41%~~	~~40.21~~
15199	1.265	0.051	4.00%	0.90	9.945	0.059	0.59%	-0.89	4.240	0.057	1.35%	0.09	3.158	0.005	0.16%	-0.28	NA	NA	NA	NA

	Zeta score										
Id Lab.	Benzo_a_ anthracène	Benzo_a_ pyrène	Benzo_b_ fluoranthène	Benzo_g,h,i_ perylène	Benzo_j_ fluoranthène	Benzo_k_ fluoranthène	Dibenzo_a,h_ anthracène	Fluoranthène	Indeno_1,2,3_ c,d_pyrène	Phenanthrène	Sum_Benzo fluoranthène
15101	-0.11	-0.08	0.01	0.04	-0.02	-0.01	0.03	-0.40	0.01	-0.21	UNS
15108	-0.08	-0.08	0.00	-0.02	0.00	-0.02	0.00	-0.11	-0.01	1.03	UNS
15111	-0.65	-1.01	-0.25	-7.05	-30.16	-53.45	2.79	-22.74	-34.83	1.59	NA
15118	2.79	2.70	NA	2.30	NA	NA	0.71	13.80	1.83	2.59	14.90
15121	-0.07	-0.10	-0.08	-0.09	0.00	-0.03	-0.01	-0.18	-0.05	-0.01	NA
15123	0.06	-0.05	0.11	-0.03	0.02	0.09	0.10	NA	0.01	NA	0.22
15132	-0.06	-0.10	-0.14	-0.16	NA	-0.08	-0.03	-0.36	-0.17	-0.10	NA
15135	-0.11	-0.08	-0.05	-0.09	-0.01	-0.05	-0.01	-0.29	-0.04	-0.06	-0.12
15136	-0.06	-0.11	NA	-0.14	NA	NA	0.01	-0.47	-0.04	-0.16	-0.31
15137	-0.09	-0.22	-0.08	NA	-0.07	-0.06	-0.01	NA	-0.04	NA	NA
15141	-0.09	-0.21	-0.02	-0.10	NA	NA	0.01	-0.33	0.02	-0.04	-0.13
15147	-0.05	-0.03	0.01	-0.02	0.00	-0.02	0.00	-0.11	0.01	-0.02	NA
15155	0.02	-0.05	-0.01	-0.01	0.08	0.06	0.02	-0.03	0.07	0.20	NA
15173	-0.14	-0.89	-0.35	-0.66	NA	-0.10	0.35	-4.88	0.08	-0.38	NA
15178	0.05	-0.17	-0.14	2.63	-0.13	0.06	-0.04	0.03	-0.16	NA	NA
15192	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA	UNS	NA	NA
15198	7.57	3.36	9.11	6.82	4.80	4.27	3.71	19.31	8.35	6.68	17.86
15199	-0.07	-0.07	-0.07	-0.07	-0.19	-0.03	0.05	-0.13	0.00	-0.02	NA

APPENDIX 2: DETAILED RESULTS ON FILTER 1

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	100.810	5.967	5.92%	-0.51	102.015	2.415	2.37%	-0.73	202.480	8.116	4.01%	0.26	158.288	10.275	6.49%	0.76	118.468	3.333	2.81%	0.01	77.833	4.258	5.47%	-0.07
15108	129.308	3.489	2.70%	0.55	122.578	3.702	3.02%	-0.08	232.720	7.141	3.07%	1.00	209.195	19.205	9.18%	2.10	177.713	14.463	8.14%	1.59	99.493	1.675	1.68%	1.00
15111	128.100	0.476	0.37%	0.50	170.408	0.670	0.39%	1.43	357.960	6.273	1.75%	4.07	0.000	0.000	Pb. Moy.=0	-3.42	0.000	0.000	Pb. Moy.=0	-3.13	0.000	0.000	Pb. Moy.=0	-3.91
15118	106.918	0.597	0.56%	-0.29	126.885	1.556	1.23%	0.06	NA	NA	NA	NA	131.208	1.239	0.94%	0.04	NA	NA	NA	NA	NA	NA	NA	NA
15121	116.750	0.500	0.43%	0.08	134.500	1.291	0.96%	0.30	184.500	1.291	0.70%	-0.18	134.250	1.258	0.94%	0.12	132.000	3.559	2.70%	0.37	84.250	0.500	0.59%	0.25
15123	158.300	1.870	1.18%	1.63	139.060	1.804	1.30%	0.44	247.838	7.709	3.11%	1.37	148.345	0.718	0.48%	0.49	138.883	4.958	3.57%	0.56	121.358	1.813	1.49%	2.08
15132	143.755	4.078	2.84%	1.09	127.503	8.936	7.01%	0.08	170.538	9.776	5.73%	-0.53	153.660	7.891	5.14%	0.63	NA	NA	NA	NA	72.490	4.749	6.55%	-0.33
15135	41.420	0.608	1.47%	-2.73	51.945	0.698	1.34%	-2.31	84.028	0.590	0.70%	-2.65	61.800	0.574	0.93%	-1.79	70.198	0.525	0.75%	-1.27	30.853	0.364	1.18%	-2.38
15136	75.675	0.457	0.60%	-1.45	52.875	0.275	0.52%	-2.28	NA	NA	NA	NA	96.725	1.087	1.12%	-0.87	NA	NA	NA	NA	NA	NA	NA	NA
15137	122.510	0.945	0.77%	0.30	140.513	0.610	0.43%	0.49	174.703	0.353	0.20%	-0.42	NA	NA	NA	NA	96.750	3.912	4.04%	-0.56	80.558	0.311	0.39%	0.07
15141	120.898	3.901	3.23%	0.23	145.645	0.620	0.43%	0.65	208.650	2.349	1.13%	0.41	140.920	0.968	0.69%	0.30	NA	NA	NA	NA	NA	NA	NA	NA
15147	102.000	0.000	0.00%	-0.47	148.250	0.500	0.34%	0.73	207.500	1.291	0.62%	0.38	144.500	0.577	0.40%	0.39	136.750	1.500	1.10%	0.50	77.850	0.443	0.57%	-0.06
15155	131.795	1.201	0.91%	0.64	158.223	0.588	0.37%	1.05	221.205	3.621	1.64%	0.72	167.635	1.737	1.04%	1.00	148.158	2.896	1.95%	0.80	104.280	0.265	0.25%	1.24
15173	98.853	0.741	0.75%	-0.59	107.563	0.594	0.55%	-0.55	167.490	0.374	0.22%	-0.60	80.968	0.210	0.26%	-1.29	NA	NA	NA	NA	79.230	0.394	0.50%	0.00
15178	133.868	1.228	0.92%	0.72	107.538	4.784	4.45%	-0.55	177.075	2.443	1.38%	-0.37	124.178	1.582	1.27%	-0.15	127.175	1.077	0.85%	0.25	75.863	0.143	0.19%	-0.16
15192	112.290	0.921	0.82%	-0.09	143.123	0.511	0.36%	0.57	184.090	1.066	0.58%	-0.19	128.790	1.962	1.52%	-0.02	111.120	3.748	3.37%	-0.18	79.110	0.194	0.25%	0.00
15198	135.733	0.528	0.39%	0.79	143.518	2.024	1.41%	0.59	177.908	4.946	2.78%	-0.35	133.103	0.148	0.11%	0.09	99.823	1.798	1.80%	-0.48	68.690	3.035	4.42%	-0.52
15199	13.953	0.276	1.98%	-3.76	18.193	0.833	4.58%	-3.37	25.290	1.022	4.04%	-4.09	17.438	0.575	3.30%	-2.96	10.653	0.420	3.94%	-2.85	10.168	0.567	5.57%	-3.41

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	21.630	2.119	9.80%	-0.17	137.155	12.719	9.27%	0.53	136.958	5.962	4.35%	0.26	35.523	2.480	6.98%	-0.56	398.780	14.223	3.57%	0.15
15108	20.240	1.311	6.48%	-0.25	143.275	1.310	0.91%	0.64	168.758	7.662	4.54%	0.96	93.845	2.119	2.26%	1.16	608.088	68.995	11.35%	1.36
15111	67.733	2.914	4.30%	2.47	136.648	2.331	1.71%	0.52	59.108	4.385	7.42%	-1.45	142.183	46.047	32.39%	2.59	NA	NA	NA	NA
15118	23.223	0.168	0.72%	-0.08	113.195	1.270	1.12%	0.09	122.903	1.202	0.98%	-0.04	55.533	0.416	0.75%	0.03	316.500	4.124	1.30%	-0.32
15121	11.750	1.893	16.11%	-0.74	138.250	0.957	0.69%	0.55	132.250	4.272	3.23%	0.16	83.750	0.500	0.60%	0.86	NA	NA	NA	NA
15123	52.233	1.107	2.12%	1.58	NA	NA	NA	NA	147.428	0.755	0.51%	0.49	NA	NA	NA	NA	508.075	13.480	2.65%	0.78
15132	9.415	0.210	2.23%	-0.87	91.123	5.549	6.09%	-0.32	76.573	1.569	2.05%	-1.06	53.463	2.737	5.12%	-0.03	NA	NA	NA	NA
15135	7.403	0.497	6.71%	-0.99	43.985	0.665	1.51%	-1.19	62.133	0.670	1.08%	-1.38	20.660	0.815	3.95%	-1.00	185.078	0.558	0.30%	-1.08
15136	20.825	0.675	3.24%	-0.22	70.700	0.216	0.31%	-0.69	111.975	2.354	2.10%	-0.28	7.100	0.115	1.63%	-1.40	220.375	1.884	0.85%	-0.87
15137	13.443	0.264	1.96%	-0.64	NA	NA	NA	NA	153.158	0.567	0.37%	0.62	NA	NA	NA	NA	NA	NA	NA	NA
15141	23.903	0.232	0.97%	-0.04	114.385	0.603	0.53%	0.11	145.213	2.082	1.43%	0.45	56.145	0.909	1.62%	0.05	393.140	2.036	0.52%	0.12
15147	30.975	0.443	1.43%	0.36	225.250	1.708	0.76%	2.14	169.500	3.000	1.77%	0.98	58.425	0.206	0.35%	0.12	NA	NA	NA	NA
15155	20.588	0.317	1.54%	-0.23	151.350	1.604	1.06%	0.79	158.425	2.098	1.32%	0.74	66.180	3.173	4.79%	0.34	NA	NA	NA	NA
15173	108.140	0.950	0.88%	4.79	10.480	0.222	2.12%	-1.80	173.910	0.826	0.47%	1.08	50.403	0.363	0.72%	-0.12	NA	NA	NA	NA
15178	3.130	0.088	2.80%	-1.23	102.445	1.983	1.94%	-0.11	98.545	1.086	1.10%	-0.58	NA	NA	NA	NA	NA	NA	NA	NA
15192	NA	NA	NA	NA	NA	NA	NA	NA	109.583	2.593	2.37%	-0.34	NA	NA	NA	NA	NA	NA	NA	NA
15198	35.163	0.971	2.76%	0.60	131.468	7.220	5.49%	0.42	165.403	9.002	5.44%	0.89	65.693	0.248	0.38%	0.33	346.420	3.753	1.08%	-0.15
15199	5.000	0.000	0.00%	-1.13	37.030	0.861	2.33%	-1.31	18.873	0.613	3.25%	-2.33	13.543	0.266	1.96%	-1.21	NA	NA	NA	NA

APPENDIX 3: DETAILED RESULTS ON FILTER 2

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	48.708	1.580	3.24%	-0.55	50.443	1.172	2.32%	-0.91	170.370	5.420	3.18%	0.60	133.063	4.535	3.41%	0.50	98.860	3.394	3.43%	0.23	64.845	1.406	2.17%	-0.06
15108	57.730	1.929	3.34%	0.08	72.620	2.569	3.54%	-0.05	177.528	5.056	2.85%	0.87	154.108	4.507	2.92%	1.30	129.088	5.443	4.22%	1.54	74.228	2.582	3.48%	0.71
15111	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-3.99~~	123.518	2.605	2.11%	1.93	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-5.94~~	157.535	4.468	2.84%	1.44	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-4.06~~	283.848	3.796	1.34%	17.89
15118	51.905	0.554	1.07%	-0.33	79.925	1.594	1.99%	0.24	NA	NA	NA		124.190	0.863	0.70%	0.16	NA	NA	NA	NA	NA	NA	NA	NA
15121	45.500	0.577	1.27%	-0.78	62.750	0.500	0.80%	-0.43	125.750	1.708	1.36%	-1.12	94.250	1.500	1.59%	-0.99	76.500	3.697	4.83%	-0.74	54.000	0.000	0.00%	-0.95
15123	80.010	0.669	0.84%	1.66	88.873	0.994	1.12%	0.59	197.430	1.384	0.70%	1.64	131.600	0.478	0.36%	0.44	112.820	2.836	2.51%	0.84	97.720	1.747	1.79%	2.64
15132	89.653	1.630	1.82%	2.34	88.598	2.607	2.94%	0.57	160.303	3.273	2.04%	0.21	126.975	4.994	3.93%	0.26	NA	NA	NA	NA	67.388	1.743	2.59%	0.15
15135	29.113	0.422	1.45%	-1.94	38.575	0.534	1.38%	-1.37	103.605	0.775	0.75%	-1.97	73.253	0.560	0.76%	-1.80	85.180	0.505	0.59%	-0.36	36.960	0.809	2.19%	-2.34
15136	42.100	0.316	0.75%	-1.02	27.525	0.263	0.96%	-1.80	NA	NA	NA	NA	93.025	0.732	0.79%	-1.04	NA	NA	NA	NA	NA	NA	NA	NA
15137	61.638	0.287	0.47%	0.36	87.290	0.254	0.29%	0.52	140.490	0.379	0.27%	-0.55	NA	NA	NA	NA	82.453	4.600	5.58%	-0.48	64.483	0.101	0.16%	-0.09
15141	57.883	1.240	2.14%	0.09	87.170	2.923	3.35%	0.52	168.945	3.533	2.09%	0.54	124.388	1.691	1.36%	0.16	NA	NA	NA	NA	NA	NA	NA	NA
15147	45.150	0.100	0.22%	-0.80	86.700	0.200	0.23%	0.50	162.250	1.708	1.05%	0.29	124.500	0.577	0.46%	0.17	112.250	1.708	1.52%	0.81	60.125	0.206	0.34%	-0.45
15155	60.953	0.768	1.26%	0.31	91.735	0.233	0.25%	0.70	170.123	0.260	0.15%	0.59	142.310	0.393	0.28%	0.85	115.698	1.659	1.43%	0.96	78.413	1.668	2.13%	1.05
15173	73.613	0.424	0.58%	1.20	51.053	0.282	0.55%	-0.88	122.360	0.337	0.28%	-1.25	54.543	0.597	1.09%	-2.52	NA	NA	NA	NA	59.178	0.717	1.21%	-0.52
15178	~~62.720~~				12.227	0.217	1.78%	-2.39	~~136.040~~				~~121.190~~				83.357	1.306	1.57%	-0.44	59.143	0.546	0.92%	-0.53
15192	53.078	0.446	0.84%	-0.24	90.263	0.452	0.50%	0.64	148.365	0.643	0.43%	-0.25	118.410	0.615	0.52%	-0.07	86.010	2.119	2.46%	-0.33	65.490	0.263	0.40%	-0.01
15198	64.435	0.853	1.32%	0.56	86.933	1.895	2.18%	0.51	154.805	3.252	2.10%	0.00	116.828	1.327	1.14%	-0.13	79.295	2.777	3.50%	-0.62	57.400	1.648	2.87%	-0.67
15199	51.168	0.498	0.97%	-0.38	82.898	0.294	0.35%	0.35	156.385	1.877	1.20%	0.06	118.593	1.770	1.49%	-0.06	64.098	0.370	0.58%	-1.28	64.573	0.789	1.22%	-0.08

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	14.265	1.239	8.68%	-0.26	81.318	3.433	4.22%	0.93	120.690	0.734	0.61%	0.28	25.150	2.974	11.83%	-0.48	334.075	9.141	2.74%	0.35
15108	12.465	2.148	17.23%	-0.44	79.380	0.517	0.65%	0.84	131.918	4.221	3.20%	0.77	62.818	0.657	1.05%	2.07	380.843	12.898	3.39%	0.88
15111	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-1.70~~	78.603	0.577	0.73%	0.81	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-4.99~~	188.173	1.525	0.81%	10.57	NA	NA	NA	NA
15118	17.808	0.181	1.02%	0.10	58.090	0.956	1.64%	-0.11	100.835	1.124	1.11%	-0.59	36.850	0.358	0.97%	0.31	268.485	4.400	1.64%	-0.38
15121	7.000	1.633	23.33%	-0.99	59.500	0.577	0.97%	-0.05	83.000	2.000	2.41%	-1.37	40.500	0.577	1.43%	0.56	NA	NA	NA	NA
15123	42.588	0.360	0.85%	2.60	NA	NA	NA	NA	121.900	0.575	0.47%	0.33	NA	NA	NA	NA	407.973	3.560	0.87%	1.18
15132	6.153	0.326	5.29%	-1.07	55.755	1.277	2.29%	-0.22	87.473	3.108	3.55%	-1.17	29.725	0.948	3.19%	-0.17	NA	NA	NA	NA
15135	6.785	0.156	2.30%	-1.01	34.045	0.870	2.56%	-1.19	72.563	1.062	1.46%	-1.82	14.855	0.387	2.61%	-1.18	225.745	1.327	0.59%	-0.86
15136	17.300	0.374	2.16%	0.05	36.775	0.377	1.03%	-1.07	108.250	1.370	1.27%	-0.27	~~5.000~~	~~0.000~~	~~0.00%~~	~~-1.85~~	199.550	2.456	1.23%	-1.16
15137	9.903	0.102	1.03%	-0.70	NA	NA	NA	NA	121.233	1.221	1.01%	0.30	NA	NA	NA	NA	NA	NA	NA	NA
15141	17.423	0.172	0.98%	0.06	57.630	0.014	0.02%	-0.13	120.365	4.029	3.35%	0.26	30.698	0.209	0.68%	-0.11	311.810	1.793	0.57%	0.10
15147	20.075	0.150	0.75%	0.33	144.500	0.577	0.40%	3.77	134.500	0.577	0.43%	0.88	29.625	0.222	0.75%	-0.18	NA	NA	NA	NA
15155	14.115	0.212	1.50%	-0.27	72.568	0.927	1.28%	0.54	122.468	1.456	1.19%	0.35	24.258	0.447	1.84%	-0.55	NA	NA	NA	NA
15173	183.800	0.857	0.47%	16.84	8.453	0.295	3.49%	-2.34	147.183	0.664	0.45%	1.43	13.128	0.128	0.98%	-1.30	NA	NA	NA	NA
15178	8.530	0.306	3.59%	-0.83	44.010	1.383	3.14%	-0.74	~~86.140~~				NA	NA	NA	NA	NA	NA	NA	NA
15192	NA	NA	NA	NA	NA	NA	NA	NA	92.880	0.484	0.52%	-0.94	NA	NA	NA	NA	NA	NA	NA	NA
15198	30.783	1.488	4.83%	1.41	63.593	2.419	3.80%	0.14	136.470	5.128	3.76%	0.97	38.663	0.313	0.81%	0.43	291.500	6.403	2.20%	-0.12
15199	22.955	0.432	1.88%	0.62	65.928	1.916	2.91%	0.24	120.148	0.684	0.57%	0.25	30.028	2.456	8.18%	-0.15	NA	NA	NA	NA

APPENDIX 4: DETAILED RESULTS ON FILTER 3

Id Lab.	Benzo_a_anthracene			Benzo_a_pyrene			Benzo_b_fluoranthene			Benzo_g,h,i_perylene			Benzo_j_fluoranthene			Benzo_k_fluoranthene		
	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %
15101	<2,8	-	-	<1,5	-	-	<7	-	-	<7	-	-	<27	-	0.00%	<7	-	-
15108	<0,82	-	-	<2,25	-	-	<0,54	-	-	<2,22	-	-	<8,4	-	0.00%	<0,24	-	-
15111	<0	-	-	0.000	-	-	0.000	-	-	0.000	-	-	0.000	-	Pb. Moy.=0	0.000	-	-
15118	<1	-	-	<1,1	-	-	NA	NA	NA	<0,55	-	-	NA	NA	NA	NA	NA	NA
15121	<2	-	-	<1	-	-	<2	-	-	<2	-	-	<2	-	0.00%	<2	-	-
15123	<16,21	-	-	<13,33	-	-	<10,63	-	-	<8,65	-	-	<12,02	-	0.00%	<12,9	-	-
15132	0.945	0.081	8.58%	0.373	0.015	4.03%	1.958	0.177	9.03%	1.438	0.116	8.10%	NA	NA	NA	1.740	0.058	3.32%
15135	<1	-	-	<1	-	-	<1	-	-	<1	-	-	1.000	-	0.00%	<1	-	-
15136	<5	-	-	<5	-	-	NA	NA	NA	<5	-	-	NA	NA	NA	NA	NA	NA
15137	0.000	-	-	0.000	-	-	0.000	-	-	NA	NA	NA	0.000	0.000	Pb. Moy.=0	0.000	-	-
15141	<0,6	-	-	<0,7	-	-	<0,6	-	-	<0,6	-	-	NA	NA	NA	NA	NA	NA
15147	<2	-	-	<1	-	-	<1	-	-	<1	-	-	<1	-	0.00%	<1	-	-
15155	<4	-	-	<8	-	-	<8	-	-	<9	-	-	<8	-	0.00%	<8	-	-
15173	<1	-	-	<1	-	-	<1	-	-	<1	-	-	NA	NA	NA	<1	-	-
15178	<0,08	-	-	<0,04	-	-	<0,09	-	-	<0,02	-	-	<0,18	-	0.00%	<0,03	-	-
15192	<4	-	-	<4	-	-	<4	-	-	<4	-	-	<4	-	0.00%	<4	-	-
15198	0.213	0.015	7.06%	0.113	0.043	37.97%	0.220	0.016	7.42%	0.195	0.034	17.52%	0.075	0.006	7.70%	0.115	0.006	5.02%
15199	<2,5	-	-	<5	-	-	<5	-	-	<5	-	-	<5	-	0.00%	<5	-	-

Id Lab.	Dibenzo_a,h_anthracene			Fluoranthene			Indeno_1,2,3_c,d_pyrene			Phenanthrene			Sum_Benzofluoranthene		
	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %	x (ng/filter)	s_r (ng/filter)	s_r en %
15101	<7	-	-	<14	-	-	<7	-	-	<14	-	-	<41	-	-
15108	<0,45	-	-	<23,8	-	-	<0,5	-	-	<97,1	-	-	<9,18	-	-
15111	0.000	-	-	0.000	-	-	0.000	-	-	0.000	-	-	NA	NA	NA
15118	<0,55	-	-	2.768	0.109	3.93%	<0,55	-	-	7.878	0.057	0.73%	1.828	0.113	6.18%
15121	<2	-	-	<2	-	-	<2	-	-	<3	-	-	NA	NA	NA
15123	<11,6	-	-	NA	NA	NA	<9,58	-	-	NA	NA	NA	NA	NA	NA
15132	0.135	0.010	7.41%	1.050	0.076	7.25%	1.145	0.066	5.73%	2.785	0.107	3.83%	NA	NA	NA
15135	<1	-	-	<1	-	-	<1	-	-	<1	-	-	<3	-	-
15136	<5	-	-	<5	-	-	<5	-	-	<5	-	-	<5	-	-
15137	0.000	-	-	NA	NA	NA	0.000	-	-	NA	NA	NA	NA	NA	NA
15141	<0,7	-	-	<0,5	-	-	<0,75	0.058	7.70%	<0,5	-	-	<0,6	-	-
15147	<1	-	-	<1	-	-	<1	-	-	<1	-	-	NA	NA	NA
15155	<9	-	-	<4	-	-	<10	-	-	<8	-	-	NA	NA	NA
15173	<1	-	-	<1	-	-	<1	-	-	<1	-	-	NA	NA	NA
15178	<0,05	-	-	<0,07	-	-	<0,06	-	-	NA	NA	NA	NA	NA	NA
15192	NA	NA	NA	NA	NA	NA	<4	-	-	NA	NA	NA	NA	NA	NA
15198	0.173	0.091	52.57%	<1,2175	0.043	3.51%	0.238	0.064	26.93%	7.003	0.046	0.66%	0.410	0.014	3.45%
15199	<5	-	-	2.500	-	-	<5	-	-	<2,5	-	-			

APPENDIX 5: DETAILED RESULTS ON SOLUTION 1

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	275.755	4.349	1.58%	0.05	398.350	13.265	3.33%	-0.32	546.930	11.518	2.11%	-0.11	382.590	14.295	3.74%	0.63	307.658	8.723	2.84%	0.85	285.425	6.418	2.25%	0.03
15108	317.610	3.146	0.99%	1.38	347.133	7.348	2.12%	-1.97	632.745	7.528	1.19%	1.42	414.725	8.658	2.09%	1.71	321.650	10.407	3.24%	1.24	334.180	2.705	0.81%	3.34
15111	288.078	55.505	19.27%	0.44	406.025	86.183	21.23%	-0.07	981.833	208.457	21.23%	7.61	0.000	0.000	Pb. Moy.=0	-12.22	0.000	0.000	Pb. Moy.=0	-7.61	0.000	0.000	Pb. Moy.=0	-19.37
15118	7.533	0.068	0.90%	-8.44	10.428	0.363	3.49%	-12.80	NA	NA	NA	NA	10.213	1.503	14.72%	-11.88	NA	NA	NA	NA	NA	NA	NA	NA
15121	285.000	2.160	0.76%	0.35	409.000	2.449	0.60%	0.02	576.250	3.775	0.66%	0.41	380.000	14.720	3.87%	0.54	287.750	0.500	0.17%	0.30	300.750	1.708	0.57%	1.07
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	184.633	8.382	4.54%	-2.83	299.230	10.953	3.66%	-3.51	398.828	13.277	3.33%	-2.74	271.278	12.954	4.78%	-3.11	NA	NA	NA	NA	212.045	6.862	3.24%	-4.96
15135	262.663	0.445	0.17%	-0.36	379.040	0.837	0.22%	-0.94	544.400	0.482	0.09%	-0.15	353.103	0.877	0.25%	-0.36	244.425	0.217	0.09%	-0.89	269.340	0.541	0.20%	-1.06
15136	226.375	2.878	1.27%	-1.51	346.500	4.318	1.25%	-1.99	NA	NA	NA	NA	376.575	11.896	3.16%	0.43	NA	NA	NA	NA	NA	NA	NA	NA
15137	280.660	0.703	0.25%	0.21	411.580	1.520	0.37%	0.11	556.650	0.915	0.16%	0.06	NA	NA	NA	NA	275.938	6.908	2.50%	-0.02	289.573	1.003	0.35%	0.31
15141	297.593	1.907	0.64%	0.74	426.305	3.099	0.73%	0.58	608.448	12.114	1.99%	0.98	382.638	1.596	0.42%	0.63	NA	NA	NA	NA	NA	NA	NA	NA
15147	268.500	1.291	0.48%	-0.18	395.000	1.826	0.46%	-0.43	528.250	2.217	0.42%	-0.44	353.250	2.062	0.58%	-0.35	264.250	1.258	0.48%	-0.34	276.750	0.957	0.35%	-0.56
15155	273.025	0.452	0.17%	-0.03	404.340	1.041	0.26%	-0.13	552.133	1.620	0.29%	-0.02	369.558	0.846	0.23%	0.19	276.775	5.835	2.11%	0.00	287.368	7.592	2.64%	0.16
15173	192.900	6.614	3.43%	-2.57	404.213	4.611	1.14%	-0.13	586.408	6.302	1.07%	0.59	622.813	28.346	4.55%	8.70	NA	NA	NA	NA	292.330	2.415	0.83%	0.50
15178	261.813	4.869	1.86%	-0.39	415.398	11.057	2.66%	0.23	511.865	3.692	0.72%	-0.73	357.753	9.584	2.68%	-0.20	220.253	8.954	4.07%	-1.55	295.355	7.189	2.43%	0.70
15192	274.825	2.623	0.95%	0.02	419.425	1.895	0.45%	0.36	562.700	7.848	1.39%	0.17	387.425	9.666	2.49%	0.79	245.225	8.235	3.36%	-0.87	289.325	0.797	0.28%	0.29
15198	249.420	13.303	5.33%	-0.78	371.965	6.648	1.79%	-1.17	486.315	13.397	2.75%	-1.18	340.515	3.688	1.08%	-0.78	305.513	2.491	0.82%	0.79	274.015	7.130	2.60%	-0.75
15199	57.280	0.359	0.63%	-6.86	86.098	0.950	1.10%	-10.36	117.785	1.184	1.01%	-7.73	78.250	0.705	0.90%	-9.60	39.875	0.306	0.77%	-6.51	60.498	0.480	0.79%	-15.26

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	85.883	2.936	3.42%	0.11	765.225	9.855	1.29%	-0.08	700.318	12.450	1.78%	-0.37	1 491.073	33.061	2.22%	-0.21	1 140.013	16.507	1.45%	0.42
15108	104.105	1.165	1.12%	1.41	875.853	7.556	0.86%	0.91	850.175	10.538	1.24%	1.24	1 783.135	15.837	0.89%	1.34	1 288.573	19.809	1.54%	2.89
15111	153.333	14.728	9.61%	4.92	696.038	106.140	15.25%	-0.69	370.285	73.087	19.74%	-3.92	1 349.860	150.870	11.18%	-0.96	NA	NA	NA	NA
15118	2.405	0.091	3.79%	-5.84	21.420	0.561	2.62%	-6.71	18.320	0.151	0.82%	-7.69	41.900	0.351	0.84%	-7.89	24.335	0.400	1.65%	-18.12
15121	88.000	0.816	0.93%	0.26	768.750	7.411	0.96%	-0.05	738.500	3.416	0.46%	0.04	1 440.000	14.142	0.98%	-0.48	NA	NA	NA	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	63.718	1.886	2.96%	-1.47	497.480	3.193	0.64%	-2.46	497.860	11.354	2.28%	-2.55	1 051.645	18.913	1.80%	-2.54	NA	NA	NA	NA
15135	84.953	0.440	0.52%	0.05	772.893	0.318	0.04%	-0.01	721.953	1.992	0.28%	-0.14	1 553.515	2.150	0.14%	0.12	1 058.163	0.787	0.07%	-0.94
15136	77.775	1.300	1.67%	-0.47	593.325	6.997	1.18%	-1.61	746.750	11.472	1.54%	0.13	1 759.000	70.979	4.04%	1.21	1 079.000	11.045	1.02%	-0.59
15137	89.460	0.355	0.40%	0.37	NA	NA	NA	NA	749.283	1.479	0.20%	0.15	NA	NA	NA	NA	NA	NA	NA	NA
15141	86.328	1.767	2.05%	0.14	824.235	3.543	0.43%	0.45	801.668	15.588	1.94%	0.72	1 612.233	2.187	0.14%	0.43	1 099.665	6.415	0.58%	-0.25
15147	84.350	0.569	0.67%	0.00	755.750	4.717	0.62%	-0.16	699.750	1.258	0.18%	-0.38	1 467.500	5.196	0.35%	-0.34	NA	NA	NA	NA
15155	83.150	1.359	1.63%	-0.08	771.563	1.372	0.18%	-0.02	726.270	3.619	0.50%	-0.09	1 541.608	2.728	0.18%	0.06	NA	NA	NA	NA
15173	60.993	1.844	3.02%	-1.66	35.878	2.507	6.99%	-6.58	262.565	5.126	1.95%	-5.07	1 386.813	9.207	0.66%	-0.76	NA	NA	NA	NA
15178	82.715	0.721	0.87%	-0.11	773.000	16.560	2.14%	-0.01	720.648	1.195	0.17%	-0.15	NA	NA	NA	NA	NA	NA	NA	NA
15192	78.575	0.585	0.74%	-0.41	NA	NA	NA	NA	741.575	7.372	0.99%	0.07	NA	NA	NA	NA	NA	NA	NA	NA
15198	103.650	9.367	9.04%	1.38	735.648	21.461	2.92%	-0.34	693.563	14.508	2.09%	-0.44	1 358.240	4.308	0.32%	-0.92	1 065.843	21.963	2.06%	-0.81
15199	18.348	0.302	1.64%	-4.70	150.285	1.692	1.13%	-5.56	162.180	1.678	1.03%	-6.15	290.048	2.942	1.01%	-6.58	NA	NA	NA	NA

	Zeta - Score										
Id Lab.	Benzo_a_ anthracène	Benzo_a_ pyrène	Benzo_b_ fluoranthène	Benzo_g,h,i_ perylène	Benzo_j_ fluoranthène	Benzo_k_ fluoranthène	Dibenzo_a,h_ anthracène	Fluoranthène	Indeno_1,2,3_ c,d_pyrène	Phenanthrène	Sum_Benzo fluoranthène
15101	0.28	-1.93	-1.33	4.45	1.89	0.10	0.34	-1.72	-9.92	-7.83	UNS
15108	3.10	-4.07	5.49	2.82	1.69	3.16	0.70	5.98	6.22	9.00	UNS
15111	1.44	-0.21	40.22	-363.80	-184.47	-190.00	12.74	-10.14	-36.76	-31.90	NA
15118	-11.58	-26.47	NA	-14.13	NA	NA	-4.06	-37.58	-23.88	-33.08	-71.82
15121	1.35	0.09	2.43	1.89	1.21	1.64	0.36	-0.65	0.39	-9.53	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	-12.65	-16.58	-25.35	-9.21	NA	-13.98	-2.60	-27.51	-33.54	-78.81	NA
15135	-0.76	-1.95	-0.57	-0.71	-2.14	-1.04	0.04	-0.07	-0.87	1.50	-3.72
15136	-1.91	-4.11	NA	0.85	NA	NA	-0.37	-12.02	0.78	11.39	-1.77
15137	6.26	3.07	2.69	NA	-0.21	2.98	1.89	NA	8.97	NA	NA
15141	5.70	3.22	6.12	5.18	NA	NA	0.23	7.10	16.17	22.32	-1.62
15147	-0.27	-0.64	-0.85	-0.32	-0.51	-0.30	0.00	-1.09	-0.99	-3.43	NA
15155	-0.48	-1.77	-0.39	2.57	0.02	0.71	-0.24	-1.09	-3.90	4.74	NA
15173	-14.79	-1.52	7.83	50.80	NA	1.30	-2.95	-274.13	-92.65	-28.28	NA
15178	-0.88	0.47	-4.09	-0.35	-4.67	0.89	-0.16	-0.07	-1.50	NA	NA
15192	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA	UNS	NA	NA
15198	-2.73	-4.01	-8.27	-3.08	3.54	-1.44	3.20	-5.42	-5.48	-20.19	-5.86
15199	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA

APPENDIX 6: DETAILED RESULTS ON SOLUTION 2

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	19.593	0.295	1.51%	0.02	28.478	2.115	7.43%	-0.24	37.860	0.848	2.24%	-0.42	24.800	0.455	1.83%	-0.36	20.988	1.083	5.16%	0.48	20.105	0.440	2.19%	-0.12
15108	21.700	0.213	0.98%	0.79	24.480	0.581	2.37%	-1.75	43.200	0.829	1.92%	1.02	29.170	1.160	3.98%	1.01	22.348	0.305	1.36%	1.01	23.058	0.439	1.90%	1.53
15111	43.268	2.627	6.07%	8.72	52.185	1.392	2.67%	8.74	86.258	3.845	4.46%	12.58	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-8.08~~	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-7.60~~	~~0.000~~	~~0.000~~	~~Pb. Moy.=0~~	~~-11.37~~
15118	17.308	0.095	0.55%	-0.82	24.540	0.780	3.18%	-1.73	NA	NA	NA	NA	25.025	2.875	11.49%	-0.29	NA	NA	NA	NA	NA	NA	NA	NA
15121	20.750	0.500	2.41%	0.44	29.750	0.500	1.68%	0.24	42.500	1.000	2.35%	0.83	27.750	0.500	1.80%	0.56	19.250	0.957	4.97%	-0.18	21.750	0.500	2.30%	0.80
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	15.675	0.179	1.14%	-1.42	24.938	0.205	0.82%	-1.58	33.178	0.102	0.31%	-1.67	21.418	0.225	1.05%	-1.41	NA	NA	NA	NA	17.620	0.078	0.44%	-1.51
15135	18.865	0.051	0.27%	-0.25	27.200	0.131	0.48%	-0.72	36.458	0.327	0.90%	-0.79	24.658	0.098	0.40%	-0.40	16.813	0.482	2.87%	-1.12	19.260	0.036	0.18%	-0.59
15136	14.850	0.129	0.87%	-1.72	22.725	0.236	1.04%	-2.42	NA	NA	NA	NA	20.825	0.206	0.99%	-1.59	NA	NA	NA	NA	NA	NA	NA	NA
15137	19.773	0.059	0.30%	0.09	28.818	0.048	0.17%	-0.11	38.958	0.028	0.07%	-0.12	NA	NA	NA	NA	20.583	0.690	3.35%	0.33	20.460	0.045	0.22%	0.08
15141	21.013	0.200	0.95%	0.54	28.803	1.070	3.71%	-0.12	42.123	0.815	1.94%	0.73	26.693	0.494	1.85%	0.23	NA	NA	NA	NA	NA	NA	NA	NA
15147	19.050	0.129	0.68%	-0.18	28.200	0.141	0.50%	-0.34	37.825	0.275	0.73%	-0.43	24.950	0.173	0.69%	-0.31	19.975	0.330	1.65%	0.09	19.800	0.141	0.71%	-0.29
15155	19.390	0.122	0.63%	-0.06	28.535	0.465	1.63%	-0.22	39.195	0.645	1.64%	-0.06	27.630	0.313	1.13%	0.53	19.228	1.512	7.87%	-0.19	20.285	0.682	3.36%	-0.02
15173	11.690	1.201	10.27%	-2.88	27.958	1.694	6.06%	-0.44	39.530	2.301	5.82%	0.03	30.468	8.545	28.05%	1.41	NA	NA	NA	NA	19.580	0.507	2.59%	-0.41
15178	16.930	0.094	0.56%	-0.96	26.493	0.280	1.06%	-0.99	33.183	0.240	0.72%	-1.67	22.640	0.235	1.04%	-1.03	15.153	0.175	1.15%	-1.76	18.683	0.284	1.52%	-0.92
15192	19.040	0.164	0.86%	-0.18	29.438	0.095	0.32%	0.12	38.970	0.564	1.45%	-0.12	27.543	0.283	1.03%	0.50	17.618	0.627	3.56%	-0.81	20.010	0.288	1.44%	-0.17
15198	16.958	0.074	0.44%	-0.95	26.805	0.968	3.61%	-0.87	38.153	2.001	5.24%	-0.34	23.775	0.942	3.96%	-0.67	17.180	0.300	1.75%	-0.98	17.498	0.562	3.21%	-1.58
15199	21.070	0.262	1.24%	0.56	31.390	0.443	1.41%	0.86	42.468	0.364	0.86%	0.82	28.495	0.401	1.41%	0.80	15.773	0.193	1.22%	-1.52	22.203	0.153	0.69%	1.05

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	24.800	0.455	1.83%	19.74	51.313	2.697	5.26%	-0.59	49.445	1.275	2.58%	-0.50	97.830	5.927	6.06%	-1.06	78.953	1.905	2.41%	-0.05
15108	6.958	0.125	1.80%	1.00	59.600	0.091	0.15%	0.67	58.260	1.600	2.75%	0.99	118.753	0.567	0.48%	0.89	88.603	1.550	1.75%	0.84
15111	31.473	0.270	0.86%	26.75	65.678	1.516	2.31%	1.58	42.965	1.599	3.72%	-1.59	121.328	3.137	2.59%	1.13	NA	NA	NA	NA
15118	5.460	0.178	3.26%	-0.58	51.733	1.238	2.39%	-0.52	45.098	0.682	1.51%	-1.23	101.085	3.132	3.10%	-0.76	58.798	0.630	1.07%	-1.89
15121	7.000	0.000	0.00%	1.04	56.500	1.000	1.77%	0.20	53.750	1.258	2.34%	0.23	109.000	1.414	1.30%	-0.02	NA	NA	NA	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	5.055	0.057	1.12%	-1.00	43.335	0.332	0.77%	-1.79	41.280	0.474	1.15%	-1.87	96.773	0.404	0.42%	-1.16	NA	NA	NA	NA
15135	5.943	0.045	0.76%	-0.07	51.900	0.342	0.66%	-0.50	48.285	0.316	0.66%	-0.69	104.410	0.230	0.22%	-0.45	72.530	0.766	1.06%	-0.64
15136	5.000	0.000	0.00%	-1.06	40.950	0.208	0.51%	-2.15	48.050	0.656	1.36%	-0.73	148.725	5.450	3.66%	3.69	64.725	0.403	0.62%	-1.35
15137	6.188	0.039	0.62%	0.19	NA	NA	NA	NA	51.520	0.320	0.62%	-0.15	NA	NA	NA	NA	NA	NA	NA	NA
15141	5.275	0.279	5.28%	-0.77	52.995	0.636	1.20%	-0.33	54.425	1.745	3.21%	0.34	105.370	0.633	0.60%	-0.36	75.425	1.230	1.63%	-0.37
15147	5.950	0.062	1.05%	-0.06	53.850	0.191	0.36%	-0.20	49.200	0.141	0.29%	-0.54	104.250	0.500	0.48%	-0.46	NA	NA	NA	NA
15155	5.653	0.050	0.88%	-0.38	56.128	0.297	0.53%	0.14	52.213	3.232	6.19%	-0.03	113.700	0.300	0.26%	0.42	NA	NA	NA	NA
15173	~~1.000~~	~~0.000~~	~~0.00%~~	~~-5.26~~	2.243	0.075	3.36%	-8.01	21.193	0.534	2.52%	-5.25	102.038	8.744	8.57%	-0.67	NA	NA	NA	NA
15178	5.200	0.077	1.49%	-0.85	52.890	0.497	0.94%	-0.35	45.523	0.347	0.76%	-1.16	NA	NA	NA	NA	NA	NA	NA	NA
15192	5.318	0.100	1.88%	-0.73	NA	NA	NA	NA	52.155	0.304	0.58%	-0.04	NA	NA	NA	NA	NA	NA	NA	NA
15198	5.885	0.296	5.02%	-0.13	51.588	1.795	3.48%	-0.55	49.665	1.785	3.59%	-0.46	103.480	1.195	1.16%	-0.53	72.830	2.761	3.79%	-0.61
15199	~~10.000~~	~~0.000~~	~~0.00%~~	4.19	50.423	0.756	1.50%	-0.72	58.015	0.734	1.27%	0.94	91.183	1.259	1.38%	-1.68	NA	NA	NA	NA

	Zeta - Score										
Id Lab.	Benzo_a_ anthracène	Benzo_a_ pyrène	Benzo_b_ fluoranthène	Benzo_g,h,i_ perylène	Benzo_j_ fluoranthène	Benzo_k_ fluoranthène	Dibenzo_a,h_ anthracène	Fluoranthène	Indeno_1,2,3_ c,d_pyrène	Phenanthrène	Sum_Benzo fluoranthène
15101	0.01	-0.06	-0.16	-0.16	0.08	-0.03	2.09	-0.76	-0.85	-2.23	UNS
15108	0.15	-0.31	0.26	0.18	0.10	0.18	0.03	0.26	0.32	0.34	UNS
15111	7.41	14.21	19.17	-17.29	-13.15	-13.55	10.04	6.86	-4.47	7.41	NA
15118	-0.14	-0.45	NA	-0.04	NA	NA	-0.04	-0.43	-0.30	-0.35	-2.11
15121	0.15	0.08	0.38	0.21	-0.05	0.18	0.10	0.16	0.15	-0.02	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	-0.55	-0.63	-1.02	-0.45	NA	-0.52	-0.12	-1.18	-1.57	-2.04	NA
15135	-0.04	-0.13	-0.20	-0.09	-0.19	-0.07	0.00	-0.22	-0.27	-0.32	-0.46
15136	-0.19	-0.42	NA	-0.34	NA	NA	-0.06	-0.95	-0.29	1.97	-0.73
15137	0.22	-0.27	-0.33	NA	0.24	0.09	0.07	NA	-0.55	NA	NA
15141	0.36	-0.06	0.30	0.20	NA	NA	-0.08	-0.31	0.49	-1.05	-0.43
15147	-0.02	-0.04	-0.05	-0.03	0.01	-0.02	0.00	-0.08	-0.09	-0.27	NA
15155	-0.05	-0.18	-0.07	0.50	-0.10	-0.01	-0.08	0.41	-0.06	1.24	NA
15173	-1.43	-0.43	0.03	0.87	NA	-0.13	-0.63	-19.67	-6.12	-1.40	NA
15178	-0.19	-0.17	-0.62	-0.19	-0.38	-0.14	-0.08	-0.17	-0.72	NA	NA
15192	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA	UNS	NA	NA
15198	-0.29	-0.25	-0.16	-0.28	-0.31	-0.37	-0.02	-0.51	-0.36	-0.67	-0.80
15199	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA

APPENDIX 7 : DETAILED RESULTS ON SOLUTION 3

Id Lab.	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	8.235	0.354	4.30%	0.09	11.555	0.682	5.90%	-0.51	15.865	0.622	3.92%	-0.29	9.585	0.954	9.95%	-0.63	20.000	0.000	0.00%	-12.88	8.390	0.344	4.10%	-0.06
15108	8.830	0.118	1.34%	0.56	10.437	0.215	2.06%	-1.57	17.870	0.231	1.29%	0.85	11.250	0.193	1.72%	0.25	9.230	0.926	10.03%	1.12	9.560	0.106	1.11%	1.24
15111	28.988	0.786	2.71%	16.55	36.775	0.945	2.57%	23.22	38.593	2.975	7.71%	12.55	28.650	1.346	4.70%	9.37	0.000	0.000	Pb. Moy.=0	-8.95	0.000	0.000	Pb. Moy.=0	-9.36
15118	240.310	2.961	1.23%	184.14	341.663	5.605	1.64%	310.18	NA	NA	NA	NA	369.143	5.568	1.51%	187.97	NA	NA	NA	NA	NA	NA	NA	NA
15121	9.000	0.000	0.00%	0.70	13.000	0.000	0.00%	0.85	18.000	0.000	0.00%	0.92	11.750	0.500	4.26%	0.51	8.000	0.000	0.00%	-0.22	9.000	0.000	0.00%	0.62
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	6.593	0.128	1.94%	-1.21	10.528	0.135	1.29%	-1.48	14.563	0.213	1.46%	-1.02	8.938	0.089	0.99%	-0.97	NA	NA	NA	NA	7.520	0.086	1.14%	-1.02
15135	7.715	0.026	0.34%	-0.32	11.260	0.034	0.30%	-0.79	15.268	0.166	1.09%	-0.62	10.280	0.202	1.97%	-0.26	6.675	0.247	3.70%	-1.66	7.988	0.022	0.28%	-0.50
15136	6.225	0.050	0.80%	-1.50	9.125	0.096	1.05%	-2.80	NA	NA	NA	NA	7.625	0.096	1.26%	-1.65	NA	NA	NA	NA	NA	NA	NA	NA
15137	8.085	0.034	0.42%	-0.03	11.785	0.033	0.28%	-0.30	15.995	0.147	0.92%	-0.21	NA	NA	NA	NA	4.270	0.000	0.00%	-4.29	8.423	0.050	0.59%	-0.02
15141	9.093	0.337	3.71%	0.77	11.370	1.149	10.11%	-0.69	18.065	0.874	4.84%	0.96	10.590	0.358	3.38%	-0.10	NA	NA	NA	NA	NA	NA	NA	NA
15147	7.945	0.034	0.43%	-0.14	11.775	0.050	0.42%	-0.31	15.975	0.050	0.31%	-0.22	10.400	0.082	0.79%	-0.20	7.248	0.403	5.56%	-1.04	8.298	0.038	0.45%	-0.16
15155	8.058	0.074	0.91%	-0.05	11.760	0.270	2.30%	-0.32	16.275	0.184	1.13%	-0.05	11.323	0.220	1.94%	0.28	8.200	0.286	3.48%	0.00	8.340	0.283	3.40%	-0.11
15173	6.013	0.207	3.45%	-1.67	11.103	0.311	2.80%	-0.94	15.320	0.576	3.76%	-0.59	13.838	0.488	3.53%	1.60	NA	NA	NA	NA	8.125	0.307	3.78%	-0.35
15178	6.870	0.077	1.11%	-0.99	11.095	0.181	1.63%	-0.95	13.788	0.136	0.99%	-1.46	9.298	0.131	1.41%	-0.78	6.370	0.029	0.46%	-2.00	7.775	0.139	1.79%	-0.74
15192	7.315	0.082	1.12%	-0.64	12.053	0.077	0.64%	-0.04	15.603	0.202	1.30%	-0.43	10.928	0.168	1.53%	0.08	7.945	0.072	0.90%	-0.28	7.385	0.138	1.86%	-1.17
15198	7.050	0.133	1.89%	-0.85	11.123	0.569	5.12%	-0.92	15.480	1.778	11.49%	-0.50	9.795	0.520	5.31%	-0.52	7.790	0.731	9.39%	-0.45	6.833	0.750	10.97%	-1.78
15199	9.008	0.139	1.54%	0.70	14.425	0.279	1.93%	2.19	18.620	0.235	1.26%	1.27	12.993	0.564	4.34%	1.16	7.735	0.066	0.85%	-0.51	10.015	0.171	1.71%	1.75

Id Lab.	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z	x (ng/ml)	s_r (ng/ml)	s_r en %	score z
15101	5.000	0.000	0.00%	6.01	19.285	3.030	15.71%	-1.27	19.203	1.393	7.26%	-0.89	35.935	5.281	14.69%	-1.54	44.255	0.934	2.11%	2.05
15108	2.850	0.018	0.64%	0.84	24.860	0.102	0.41%	0.68	24.695	0.217	0.88%	1.01	49.833	0.208	0.42%	0.73	36.660	1.256	3.43%	0.67
15111	30.138	0.932	3.09%	66.48	29.465	0.968	3.29%	2.29	0.000	0.000	Pb. Moy.=0	-7.52	48.890	3.795	7.76%	0.58	NA	NA	NA	NA
15118	84.295	3.303	3.92%	196.77	776.160	18.368	2.37%	263.18	620.958	14.547	2.34%	207.11	1 287.195	29.488	2.29%	202.81	803.763	19.953	2.48%	140.66
15121	3.000	0.000	0.00%	1.20	24.000	0.000	0.00%	0.38	22.250	0.500	2.25%	0.17	45.750	0.500	1.09%	0.06	NA	NA	NA	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	2.148	0.036	1.67%	-0.85	18.563	0.236	1.27%	-1.52	17.845	0.175	0.98%	-1.36	41.100	0.498	1.21%	-0.70	NA	NA	NA	NA
15135	2.380	0.074	3.11%	-0.29	21.523	0.468	2.17%	-0.49	20.973	0.498	2.38%	-0.28	43.338	0.205	0.47%	-0.33	29.933	0.377	1.26%	-0.56
15136	5.000	0.000	0.00%	6.01	15.800	0.141	0.90%	-2.49	17.500	0.606	3.46%	-1.48	66.350	5.870	8.85%	3.43	23.275	0.096	0.41%	-1.78
15137	2.523	0.022	0.88%	0.05	NA	NA	NA	NA	20.263	0.056	0.27%	-0.52	NA	NA	NA	NA	NA	NA	NA	NA
15141	2.180	0.236	10.82%	-0.77	22.233	0.472	2.12%	-0.24	22.528	0.758	3.36%	0.26	44.763	0.340	0.76%	-0.10	32.173	0.835	2.59%	-0.15
15147	2.525	0.024	0.94%	0.06	22.675	0.275	1.21%	-0.09	20.275	0.171	0.84%	-0.52	43.950	0.443	1.01%	-0.23	NA	NA	NA	NA
15155	2.350	0.014	0.60%	-0.36	23.530	0.008	0.03%	0.21	23.473	0.944	4.02%	0.59	47.385	0.174	0.37%	0.33	NA	NA	NA	NA
15173	1.000	0.000	0.00%	-3.61	1.000	0.000	0.00%	-7.66	11.923	0.342	2.87%	-3.40	37.330	1.527	4.09%	-1.31	NA	NA	NA	NA
15178	2.168	0.095	4.40%	-0.80	19.835	0.369	1.86%	-1.08	18.988	0.133	0.70%	-0.96	NA	NA	NA	NA	NA	NA	NA	NA
15192	1.860	0.047	2.52%	-1.54	NA	NA	NA	NA	20.933	0.228	1.09%	-0.29	NA	NA	NA	NA	NA	NA	NA	NA
15198	2.425	0.218	8.97%	-0.18	22.010	1.709	7.76%	-0.32	20.555	0.685	3.33%	-0.42	41.953	0.238	0.57%	-0.56	30.103	1.825	6.06%	-0.53
15199	10.000	0.000	0.00%	18.04	21.000	0.275	1.31%	-0.67	25.508	1.249	4.90%	1.29	35.290	0.458	1.30%	-1.64	NA	NA	NA	NA

	Zeta - Score										
Id Lab.	Benzo_a_ anthracène	Benzo_a_ pyrène	Benzo_b_ fluoranthène	Benzo_g,h,i_ perylène	Benzo_j_ fluoranthène	Benzo_k_ fluoranthène	Dibenzo_a,h_ anthracène	Fluoranthène	Indeno_1,2,3_ c,d_pyrène	Phenanthrène	Sum_Benzo fluoranthène
15101	0.02	-0.05	-0.05	-0.16	0.72	-0.01	0.28	-0.71	-0.29	-1.85	UNS
15108	0.05	-0.11	0.10	0.03	0.04	0.07	0.01	0.11	0.16	0.16	UNS
15111	10.86	16.43	6.34	8.58	-5.47	-5.63	9.57	1.85	-10.89	0.96	NA
15118	14.01	32.79	NA	14.90	NA	NA	6.18	93.43	24.88	52.80	78.76
15121	0.11	0.11	0.20	0.11	-0.02	0.07	0.05	0.13	0.05	0.05	NA
15123	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
15132	-0.21	-0.24	-0.30	-0.18	NA	-0.18	-0.04	-0.43	-0.54	-0.70	NA
15135	-0.02	-0.06	-0.07	-0.03	-0.09	-0.03	-0.01	-0.09	-0.05	-0.13	-0.20
15136	-0.08	-0.20	NA	-0.21	NA	NA	0.14	-0.47	-0.28	1.05	-0.48
15137	-0.02	-0.29	-0.28	NA	-1.09	-0.01	0.01	NA	-0.64	NA	NA
15141	0.23	-0.13	0.19	-0.05	NA	NA	-0.04	-0.10	0.17	-0.16	-0.09
15147	-0.01	-0.02	-0.01	-0.01	-0.04	-0.01	0.00	-0.01	-0.04	-0.08	NA
15155	-0.01	-0.07	-0.02	0.10	0.00	-0.02	-0.02	0.23	0.42	0.56	NA
15173	-0.38	-0.37	-0.25	0.59	NA	-0.06	-0.19	-8.14	-1.83	-1.57	NA
15178	-0.09	-0.07	-0.26	-0.08	-0.15	-0.06	-0.03	-0.23	-0.29	NA	NA
15192	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA	UNS	NA	NA
15198	-0.12	-0.11	-0.11	-0.13	-0.05	-0.21	-0.01	-0.13	-0.16	-0.40	-0.35
15199	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA

APPENDIX 8: DETAILED RESULTS WITH QUECHERS

CRM

	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	4.328	0.083	1.91%	-0.89	2.458	0.042	1.71%	-1.45	6.610	0.175	2.64%	0.06	5.258	0.550	10.46%	0.25	3.520	0.293	8.32%	-0.30	2.873	0.115	4.01%	-0.11
15108	3.853	0.038	0.98%	-1.52	2.040	0.024	1.20%	-2.23	6.498	0.028	0.42%	-0.08	4.580	0.173	3.79%	-0.38	3.775	0.600	15.90%	0.01	2.688	0.015	0.56%	-0.42
15111	3.305	0.120	3.64%	-2.25	2.808	0.048	1.71%	-0.79	5.898	0.188	3.19%	-0.82	~~1.743~~	~~0.030~~	~~1.71%~~	-3.03	~~0.000~~	~~0.000~~	Pb. Moy.=0	-4.54	~~0.000~~	~~0.000~~	Pb. Moy.=0	-4.89
15118	51.025	0.127	0.25%	61.14	30.220	0.236	0.78%	50.72	NA	NA	NA		60.245	0.811	1.35%	51.47	NA	NA	NA		NA	NA	NA	
15121	3.940	0.040	1.02%	-1.41	1.660	0.000	0.00%	-2.95	5.370	0.040	0.74%	-1.47	3.678	0.072	1.97%	-1.22	3.810	0.131	3.44%	0.05	2.560	0.000	0.00%	-0.63
15123	5.828	0.022	0.38%	1.10	2.465	0.019	0.78%	-1.43	8.153	0.148	1.81%	1.96	4.485	0.037	0.82%	-0.47	4.143	0.104	2.51%	0.45	4.323	0.047	1.09%	2.30
15132	4.505	0.189	4.20%	-0.66	1.768	0.075	4.22%	-2.74	4.715	0.065	1.37%	-2.28	2.820	0.106	3.75%	-2.02	NA	NA	NA		2.130	0.036	1.67%	-1.35
15135	3.098	0.073	2.35%	-2.53	1.695	0.058	3.42%	-2.88	5.630	0.044	0.78%	-1.15	3.423	0.040	1.18%	-1.46	3.575	0.035	0.98%	-0.23	2.033	0.059	2.88%	-1.51
15136	3.618	0.010	0.26%	-1.84	1.618	0.017	1.06%	-3.03	NA	NA	NA		2.933	0.015	0.51%	-1.92	NA	NA	NA		NA	NA	NA	
15137	4.328	0.033	0.76%	-0.89	2.023	0.005	0.25%	-2.27	5.240	0.022	0.41%	-1.63	NA	NA	NA		2.620	0.112	4.26%	-1.39	2.455	0.017	0.71%	-0.81
15141	4.113	0.090	2.18%	-1.18	2.083	0.067	3.22%	-2.15	6.225	0.057	0.91%	-0.41	4.108	0.032	0.78%	-0.82	NA	NA	NA		NA	NA	NA	
15147	3.958	0.015	0.38%	-1.38	2.515	0.010	0.40%	-1.34	6.718	0.010	0.14%	0.19	4.320	0.036	0.82%	-0.62	3.873	0.123	3.17%	0.12	2.518	0.005	0.20%	-0.70
15155	5.087	0.042	0.82%	0.12	2.767	0.006	0.21%	-0.87	6.507	0.065	1.00%	-0.07	4.933	0.029	0.59%	-0.05	4.387	0.061	1.39%	0.74	3.520	0.069	1.97%	0.96
15173	4.243	0.017	0.40%	-1.01	1.000	0.033	3.27%	-4.19	5.113	0.149	2.92%	-1.79	1.703	0.155	9.12%	-3.06	NA	NA	NA		2.370	0.126	5.34%	-0.95
15178	5.730	0.080	1.40%	0.97	0.737	0.012	1.57%	-4.68	5.185	0.042	0.81%	-1.70	50.940	1.265	2.48%	42.80	2.217	0.015	0.69%	-1.87	3.590	1.671	46.56%	1.08
15192	4.200	0.022	0.51%	-1.06	2.318	0.005	0.22%	-1.71	6.600	0.024	0.37%	0.05	4.010	0.032	0.79%	-0.91	3.248	0.031	0.95%	-0.63	2.800	0.022	0.77%	-0.23
15198	73.143	0.561	0.77%	90.52	33.463	0.771	2.31%	56.81	79.428	2.744	3.45%	89.89	56.150	1.746	3.11%	47.66	42.148	2.734	6.49%	46.23	34.938	0.223	0.64%	53.22
15199	3.893	0.030	0.77%	-1.47	2.105	0.048	2.28%	-2.11	5.388	0.059	1.10%	-1.45	3.665	0.029	0.79%	-1.23	2.113	0.017	0.81%	-2.00	2.450	0.026	1.05%	-0.81
QuECHERS	3.033	0.036	1.19%	-2.61	2.120	0.036	1.68%	-2.08	6.110	0.071	1.16%	-0.56	3.413	0.025	0.73%	-1.47	3.040	0.187	6.15%	-0.88	2.160	0.014	0.65%	-1.30

	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	0.803	0.151	18.85%	0.56	10.260	0.473	4.61%	-0.81	4.245	0.117	2.76%	0.11	2.445	0.059	2.42%	-0.93	13.003	0.468	3.60%	-0.08
15108	0.395	0.017	4.38%	-0.28	10.335	0.091	0.89%	-0.78	4.080	0.066	1.61%	-0.17	32.400	0.000	0.00%	25.32	12.960	0.623	4.81%	-0.09
15111	2.033	0.035	1.72%	3.11	6.428	0.041	0.64%	-2.34	0.000	0.000	Pb. Moy.=0	-6.99	10.138	0.527	5.20%	5.81	NA	NA	NA	NA
15118	9.808	0.138	1.41%	19.23	122.720	2.095	1.71%	44.24	48.055	0.432	0.90%	73.33	64.350	0.892	1.39%	53.32	155.080	1.141	0.74%	39.81
15121	0.413	0.075	18.18%	-0.24	9.540	0.046	0.48%	-1.10	3.485	0.071	2.05%	-1.16	3.430	0.046	1.35%	-0.07	NA	NA	NA	NA
15123	2.078	0.121	5.82%	3.21	NA	NA	NA		4.280	0.104	2.44%	0.17	NA	NA	NA		16.620	0.220	1.32%	0.94
15132	0.215	0.013	6.00%	-0.65	6.735	0.058	0.86%	-2.22	1.923	0.051	2.67%	-3.77	2.748	0.087	3.18%	-0.67	NA	NA	NA	NA
15135	0.353	0.021	5.85%	-0.37	7.223	0.053	0.74%	-2.03	3.468	0.029	0.83%	-1.19	2.485	0.040	1.63%	-0.90	11.238	0.110	0.98%	-0.57
15136	0.700	0.022	3.09%	0.35	5.278	0.026	0.50%	-2.81	3.523	0.043	1.23%	-1.10	0.390	0.060	15.38%	-2.73	6.998	0.025	0.36%	-1.76
15137	0.353	0.005	1.42%	-0.37	NA	NA	NA		3.968	0.010	0.24%	-0.36	NA	NA	NA		NA	NA	NA	NA
15141	0.690	0.038	5.55%	0.33	9.318	0.036	0.39%	-1.19	4.373	0.163	3.73%	0.32	3.108	0.005	0.16%	-0.35	11.323	0.107	0.94%	-0.55
15147	0.573	0.010	1.67%	0.09	10.498	0.028	0.26%	-0.71	4.635	0.047	1.00%	0.76	3.093	0.015	0.49%	-0.37	NA	NA	NA	NA
15155	0.657	0.012	1.76%	0.26	12.127	0.107	0.88%	-0.06	4.717	0.059	1.24%	0.90	4.523	0.012	0.26%	0.89	NA	NA	NA	NA
15173	3.185	0.062	1.96%	5.50	0.080	0.060	75.00%	-4.89	4.605	0.065	1.40%	0.71	1.618	0.066	4.05%	-1.66	NA	NA	NA	NA
15178	0.197	0.012	5.87%	-0.69	12.688	0.212	1.67%	0.16	2.643	0.032	1.22%	-2.57	NA	NA	NA		NA	NA	NA	NA
15192	0.508	0.013	2.48%	-0.05	NA	NA	NA		3.803	0.038	0.99%	-0.63	NA	NA	NA		NA	NA	NA	NA
15198	20.940	0.555	2.65%	42.31	147.458	4.714	3.20%	54.15	66.788	5.770	8.64%	104.64	60.268	1.163	1.93%	49.74	156.513	5.331	3.41%	40.21
15199	~~1.265~~	~~0.051~~	~~4.00%~~	~~1.52~~	9.945	0.059	0.59%	-0.94	4.240	0.057	1.35%	0.10	3.158	0.005	0.16%	-0.31	NA	NA	NA	NA
QuECHERS	0.495	0.021	4.21%	-0.07	8.430	0.022	0.26%	-1.54	3.873	0.071	1.84%	-0.51	2.485	0.038	1.52%	-0.90	NA	NA	NA	NA

	Zeta score										
Id Lab.	Benzo_a_anthracène	Benzo_a_pyrène	Benzo_b_fluoranthène	Benzo_g,h,i_perylène	Benzo_j_fluoranthène	Benzo_k_fluoranthène	Dibenzo_a,h_anthracène	Fluoranthène	Indéno_1,2,3_c,d_pyrène	Phénanthrène	Somme_Benzofluoranthène
15101	-0.11	-0.08	0.01	0.04	-0.02	-0.01	0.03	-0.40	0.01	-0.21	UNS
15108	-0.08	-0.08	0.00	-0.02	0.00	-0.02	0.00	-0.11	-0.01	1.03	UNS
15111	-0.65	-1.01	-0.25	-7.05	-30.16	-53.45	2.79	-22.74	-34.83	1.59	NA
15118	2.79	2.70	NA	2.30	NA	NA	0.71	13.80	1.83	2.59	14.90
15121	-0.07	-0.10	-0.08	-0.09	0.00	-0.03	-0.01	-0.18	-0.05	-0.01	NA
15123	0.06	-0.05	0.11	-0.03	0.02	0.09	0.10	NA	0.01	NA	0.22
15132	-0.06	-0.10	-0.14	-0.16	NA	-0.08	-0.03	-0.36	-0.17	-0.10	NA
15135	-0.11	-0.08	-0.05	-0.09	-0.01	-0.05	-0.01	-0.29	-0.04	-0.06	-0.12
15136	-0.06	-0.11	NA	-0.14	NA	NA	0.01	-0.47	-0.04	-0.16	-0.31
15137	-0.09	-0.22	-0.08	NA	-0.07	-0.06	-0.01	NA	-0.04	NA	NA
15141	-0.09	-0.21	-0.02	-0.10	NA	NA	0.01	-0.33	0.02	-0.04	-0.13
15147	-0.05	-0.03	0.01	-0.02	0.00	-0.02	0.00	-0.11	0.01	-0.02	NA
15155	0.02	-0.05	-0.01	-0.01	0.08	0.06	0.02	-0.03	0.07	0.20	NA
15173	-0.14	-0.89	-0.35	-0.66	NA	-0.10	0.35	-4.88	0.08	-0.38	NA
15178	0.05	-0.17	-0.14	2.63	-0.13	0.06	-0.04	0.03	-0.16	NA	NA
15192	UNS	UNS	UNS	UNS	UNS	UNS	UNS	NA	UNS	NA	NA
15198	7.57	3.36	9.11	6.82	4.80	4.27	3.71	19.31	8.35	6.68	17.86
15199	-0.07	-0.07	-0.07	-0.07	-0.19	-0.03	0.05	-0.13	0.00	-0.02	NA
QuECHERS	-0.47	-0.38	-0.12	-0.38	UNS	-0.31	-0.01	-2.33	-0.15	-0.60	NA

Filter 1

	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	100.810	5.967	5.92%	-0.43	102.015	2.415	2.37%	-0.79	202.480	8.116	4.01%	0.25	158.288	10.275	6.49%	0.80	118.468	3.333	2.81%	-0.02	77.833	4.258	5.47%	-0.07
15108	129.308	3.489	2.70%	0.60	122.578	3.702	3.02%	-0.10	232.720	7.141	3.07%	1.05	209.195	19.205	9.18%	2.25	177.713	14.463	8.14%	1.68	99.493	1.675	1.68%	1.11
15111	128.100	0.476	0.37%	0.55	170.408	0.670	0.39%	1.52	357.960	6.273	1.75%	4.36	0.000	0.000	Pb. Moy.=0	-3.71	0.000	0.000	Pb. Moy.=0	-3.42	0.000	0.000	Pb. Moy.=0	-4.30
15118	106.918	0.597	0.56%	-0.21	126.885	1.556	1.23%	0.05	NA	NA	NA		131.208	1.239	0.94%	0.03	NA	NA	NA		NA	NA	NA	
15121	116.750	0.500	0.43%	0.15	134.500	1.291	0.96%	0.31	184.500	1.291	0.70%	-0.23	134.250	1.258	0.94%	0.11	132.000	3.559	2.70%	0.37	84.250	0.500	0.59%	0.28
15123	158.300	1.870	1.18%	1.64	139.060	1.804	1.30%	0.46	247.838	7.709	3.11%	1.45	148.345	0.718	0.48%	0.52	138.883	4.958	3.57%	0.57	121.358	1.813	1.49%	2.30
15132	143.755	4.078	2.84%	1.12	127.503	8.936	7.01%	0.07	170.538	9.776	5.73%	-0.60	153.660	7.891	5.14%	0.67	NA	NA	NA		72.490	4.749	6.55%	-0.36
15135	41.420	0.608	1.47%	-2.57	51.945	0.698	1.34%	-2.49	84.028	0.590	0.70%	-2.88	61.800	0.574	0.93%	-1.95	70.198	0.525	0.75%	-1.40	30.853	0.364	1.18%	-2.62
15136	75.675	0.457	0.60%	-1.34	52.875	0.275	0.52%	-2.46	NA	NA	NA		96.725	1.087	1.12%	-0.96	NA	NA	NA		NA	NA	NA	
15137	122.510	0.945	0.77%	0.35	140.513	0.610	0.43%	0.51	174.703	0.353	0.20%	-0.49	NA	NA	NA		96.750	3.912	4.04%	-0.64	80.558	0.311	0.39%	0.08
15141	120.898	3.901	3.23%	0.29	145.645	0.620	0.43%	0.69	208.650	2.349	1.13%	0.41	140.920	0.968	0.69%	0.30	NA	NA	NA		NA	NA	NA	
15147	102.000	0.000	0.00%	-0.39	148.250	0.500	0.34%	0.77	207.500	1.291	0.62%	0.38	144.500	0.577	0.40%	0.41	136.750	1.500	1.10%	0.51	77.850	0.443	0.57%	-0.06
15155	131.795	1.201	0.91%	0.69	158.223	0.588	0.37%	1.11	221.205	3.621	1.64%	0.74	167.635	1.737	1.04%	1.07	148.158	2.896	1.95%	0.84	104.280	0.265	0.25%	1.37
15173	98.853	0.741	0.75%	-0.50	107.563	0.594	0.55%	-0.60	167.490	0.374	0.22%	-0.68	80.968	0.210	0.26%	-1.40	NA	NA	NA		79.230	0.394	0.50%	0.01
15178	133.868	1.228	0.92%	0.76	107.538	4.784	4.45%	-0.60	177.075	2.443	1.38%	-0.42	124.178	1.582	1.27%	-0.17	127.175	1.077	0.85%	0.23	75.863	0.143	0.19%	-0.17
15192	112.290	0.921	0.82%	-0.02	143.123	0.511	0.36%	0.60	184.090	1.066	0.58%	-0.24	128.790	1.962	1.52%	-0.04	111.120	3.748	3.37%	-0.23	79.110	0.194	0.25%	0.00
15198	135.733	0.528	0.39%	0.83	143.518	2.024	1.41%	0.61	177.908	4.946	2.78%	-0.40	133.103	0.148	0.11%	0.08	99.823	1.798	1.80%	-0.55	68.690	3.035	4.42%	-0.56
15199	13.953	0.276	1.98%	-3.56	18.193	0.833	4.58%	-3.63	25.290	1.022	4.04%	-4.44	17.438	0.575	3.30%	-3.22	10.653	0.420	3.94%	-3.11	10.168	0.567	5.57%	-3.75
QuECHERS	85.825	0.171	0.20%	-0.97	122.500	0.577	0.47%	-0.10	203.500	0.577	0.28%	0.27	133.500	0.577	0.43%	0.09	130.250	2.217	1.70%	0.32	75.050	0.058	0.08%	-0.22

	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	21.630	2.119	9.80%	-0.16	137.155	12.719	9.27%	0.36	136.958	5.962	4.35%	0.23	35.523	2.480	6.98%	-0.58	398.780	14.223	3.57%	0.15
15108	20.240	1.311	6.48%	-0.25	143.275	1.310	0.91%	0.46	168.758	7.662	4.54%	0.95	93.845	2.119	2.26%	1.24	608.088	68.995	11.35%	1.36
15111	67.733	2.914	4.30%	2.75	136.648	2.331	1.71%	0.35	59.108	4.385	7.42%	-1.52	142.183	46.047	32.39%	2.76	NA	NA	NA	NA
15118	23.223	0.168	0.72%	-0.06	113.195	1.270	1.12%	-0.04	122.903	1.202	0.98%	-0.09	55.533	0.416	0.75%	0.04	316.500	4.124	1.30%	-0.32
15121	11.750	1.893	16.11%	-0.78	138.250	0.957	0.69%	0.38	132.250	4.272	3.23%	0.12	83.750	0.500	0.60%	0.93	NA	NA	NA	NA
15123	52.233	1.107	2.12%	1.77	NA	NA	NA		147.428	0.755	0.51%	0.47	NA	NA	NA		508.075	13.480	2.65%	0.78
15132	9.415	0.210	2.23%	-0.93	91.123	5.549	6.09%	-0.40	76.573	1.569	2.05%	-1.13	53.463	2.737	5.12%	-0.02	NA	NA	NA	NA
15135	7.403	0.497	6.71%	-1.06	43.985	0.665	1.51%	-1.19	62.133	0.670	1.08%	-1.45	20.660	0.815	3.95%	-1.05	185.078	0.558	0.30%	-1.08
15136	20.825	0.675	3.24%	-0.21	70.700	0.216	0.31%	-0.74	111.975	2.354	2.10%	-0.33	7.100	0.115	1.63%	-1.47	220.375	1.884	0.85%	-0.87
15137	13.443	0.264	1.96%	-0.68	NA	NA	NA		153.158	0.567	0.37%	0.59	NA	NA	NA		NA	NA	NA	NA
15141	23.903	0.232	0.97%	-0.02	114.385	0.603	0.53%	-0.02	145.213	2.082	1.43%	0.42	56.145	0.909	1.62%	0.06	393.140	2.036	0.52%	0.12
15147	30.975	0.443	1.43%	0.43	225.250	1.708	0.76%	1.82	169.500	3.000	1.77%	0.96	58.425	0.206	0.35%	0.13	NA	NA	NA	NA
15155	20.588	0.317	1.54%	-0.23	151.350	1.604	1.06%	0.60	158.425	2.098	1.32%	0.71	66.180	3.173	4.79%	0.38	NA	NA	NA	NA
15173	108.140	0.950	0.88%	5.30	10.480	0.222	2.12%	-1.75	173.910	0.826	0.47%	1.06	50.403	0.363	0.72%	-0.12	NA	NA	NA	NA
15178	3.130	0.088	2.80%	-1.33	102.445	1.983	1.94%	-0.22	98.545	1.086	1.10%	-0.63	NA	NA	NA		NA	NA	NA	NA
15192	NA	NA	NA		NA	NA	NA		109.583	2.593	2.37%	-0.39	NA	NA	NA		NA	NA	NA	NA
15198	35.163	0.971	2.76%	0.69	131.468	7.220	5.49%	0.27	165.403	9.002	5.44%	0.87	65.693	0.248	0.38%	0.36	346.420	3.753	1.08%	-0.15
15199	5.000	0.000	0.00%	-1.21	37.030	0.861	2.33%	-1.30	18.873	0.613	3.25%	-2.43	13.543	0.266	1.96%	-1.27	NA	NA	NA	NA
QuECHERS	25.500	0.082	0.32%	0.08	223.750	0.500	0.22%	1.80	155.500	1.000	0.64%	0.65	50.550	0.252	0.50%	-0.11	NA	NA	NA	NA

Filter 2

	Benzo_a_anthracene				Benzo_a_pyrene				Benzo_b_fluoranthene				Benzo_g,h,i_perylene				Benzo_j_fluoranthene				Benzo_k_fluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	48.708	1.580	3.24%	-0.44	50.443	1.172	2.32%	-0.98	170.370	5.420	3.18%	0.61	133.063	4.535	3.41%	0.52	98.860	3.394	3.43%	0.20	64.845	1.406	2.17%	-0.02
15108	57.730	1.929	3.34%	0.17	72.620	2.569	3.54%	-0.07	177.528	5.056	2.85%	0.90	154.108	4.507	2.92%	1.37	129.088	5.443	4.22%	1.56	74.228	2.582	3.48%	0.86
15111	0.000	0.000	Pb. Moy.=0	-3.69	123.518	2.605	2.11%	2.02	0.000	0.000	Pb. Moy.=0	-6.34	~~157.535~~	~~4.468~~	~~2.84%~~	~~1.51~~	~~0.000~~	~~0.000~~	Pb. Moy.=0	-4.25	~~283.848~~	~~3.796~~	~~1.34%~~	20.42
15118	51.905	0.554	1.07%	-0.22	79.925	1.594	1.99%	0.23	NA	NA	NA		124.190	0.863	0.70%	0.16	NA	NA	NA		NA	NA	NA	
15121	45.500	0.577	1.27%	-0.65	62.750	0.500	0.80%	-0.48	125.750	1.708	1.36%	-1.21	94.250	1.500	1.59%	-1.05	76.500	3.697	4.83%	-0.80	54.000	0.000	0.00%	-1.03
15123	80.010	0.669	0.84%	1.65	88.873	0.994	1.12%	0.60	197.430	1.384	0.70%	1.72	131.600	0.478	0.36%	0.46	112.820	2.836	2.51%	0.83	97.720	1.747	1.79%	3.05
15132	89.653	1.630	1.82%	2.30	88.598	2.607	2.94%	0.58	160.303	3.273	2.04%	0.20	126.975	4.994	3.93%	0.27	NA	NA	NA		67.388	1.743	2.59%	0.22
15135	29.113	0.422	1.45%	-1.75	38.575	0.534	1.38%	-1.47	103.605	0.775	0.75%	-2.11	73.253	0.560	0.76%	-1.91	85.180	0.505	0.59%	-0.41	36.960	0.809	2.19%	-2.62
15136	42.100	0.316	0.75%	-0.88	27.525	0.263	0.96%	-1.93	NA	NA	NA		93.025	0.732	0.79%	-1.10	NA	NA	NA		NA	NA	NA	
15137	61.638	0.287	0.47%	0.43	87.290	0.254	0.29%	0.53	140.490	0.379	0.27%	-0.61	NA	NA	NA		82.453	4.600	5.58%	-0.54	64.483	0.101	0.16%	-0.05
15141	57.883	1.240	2.14%	0.18	87.170	2.923	3.35%	0.53	168.945	3.533	2.09%	0.55	124.388	1.691	1.36%	0.17	NA	NA	NA		NA	NA	NA	
15147	45.150	0.100	0.22%	-0.67	86.700	0.200	0.23%	0.51	162.250	1.708	1.05%	0.28	124.500	0.577	0.46%	0.17	112.250	1.708	1.52%	0.80	60.125	0.206	0.34%	-0.46
15155	60.953	0.768	1.26%	0.38	91.735	0.233	0.25%	0.71	170.123	0.260	0.15%	0.60	142.310	0.393	0.28%	0.89	115.698	1.659	1.43%	0.96	78.413	1.668	2.13%	1.25
15173	73.613	0.424	0.58%	1.23	51.053	0.282	0.55%	-0.96	122.360	0.337	0.28%	-1.35	54.543	0.597	1.09%	-2.66	NA	NA	NA		59.178	0.717	1.21%	-0.55
15178	62.720				12.227	0.217	1.78%	-2.56	136.040				121.190				83.357	1.306	1.57%	-0.50	59.143	0.546	0.92%	-0.55
15192	53.078	0.446	0.84%	-0.15	90.263	0.452	0.50%	0.65	148.365	0.643	0.43%	-0.29	118.410	0.615	0.52%	-0.07	86.010	2.119	2.46%	-0.38	65.490	0.263	0.40%	0.04
15198	64.435	0.853	1.32%	0.61	86.933	1.895	2.18%	0.52	154.805	3.252	2.10%	-0.02	116.828	1.327	1.14%	-0.14	79.295	2.777	3.50%	-0.68	57.400	1.648	2.87%	-0.72
15199	51.168	0.498	0.97%	-0.27	82.898	0.294	0.35%	0.35	156.385	1.877	1.20%	0.04	118.593	1.770	1.49%	-0.07	64.098	0.370	0.58%	-1.36	64.573	0.789	1.22%	-0.05
QuECHERS	37.250	0.311	0.83%	-1.20	80.650	0.300	0.37%	0.26	162.000	0.000	0.00%	0.27	118.250	0.500	0.42%	-0.08	104.500	1.000	0.96%	0.46	60.500	0.141	0.23%	-0.43

	Dibenzo_a,h_anthracene				Fluoranthene				Indeno_1,2,3_c,d_pyrene				Phenanthrene				Sum_Benzofluoranthene			
Laboratory	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z	x (ng/filter)	s_r (ng/filter)	s_r en %	score z
15101	14.265	1.239	8.68%	-0.27	81.318	3.433	4.22%	0.73	120.690	0.734	0.61%	0.24	25.150	2.974	11.83%	-0.48	334.075	9.141	2.74%	0.35
15108	12.465	2.148	17.23%	-0.46	79.380	0.517	0.65%	0.65	131.918	4.221	3.20%	0.74	62.818	0.657	1.05%	2.34	380.843	12.898	3.39%	0.88
15111	0.000	0.000	Pb. Moy.=0	-1.78	78.603	0.577	0.73%	0.62	0.000	0.000	Pb. Moy.=0	-5.15	188.173	1.525	0.81%	11.72	NA	NA	NA	NA
15118	17.808	0.181	1.02%	0.10	58.090	0.956	1.64%	-0.22	100.835	1.124	1.11%	-0.65	36.850	0.358	0.97%	0.40	268.485	4.400	1.64%	-0.38
15121	7.000	1.633	23.33%	-1.04	59.500	0.577	0.97%	-0.16	83.000	2.000	2.41%	-1.45	40.500	0.577	1.43%	0.67	NA	NA	NA	NA
15123	42.588	0.360	0.85%	2.72	NA	NA	NA		121.900	0.575	0.47%	0.29	NA	NA	NA		407.973	3.560	0.87%	1.18
15132	6.153	0.326	5.29%	-1.13	55.755	1.277	2.29%	-0.31	87.473	3.108	3.55%	-1.25	29.725	0.948	3.19%	-0.14	NA	NA	NA	NA
15135	6.785	0.156	2.30%	-1.06	34.045	0.870	2.56%	-1.19	72.563	1.062	1.46%	-1.91	14.855	0.387	2.61%	-1.25	225.745	1.327	0.59%	-0.86
15136	17.300	0.374	2.16%	0.05	36.775	0.377	1.03%	-1.08	108.250	1.370	1.27%	-0.32	5.000	0.000	0.00%	-1.99	199.550	2.456	1.23%	-1.16
15137	9.903	0.102	1.03%	-0.73	NA	NA	NA		121.233	1.221	1.01%	0.26	NA	NA	NA		NA	NA	NA	NA
15141	17.423	0.172	0.98%	0.06	57.630	0.014	0.02%	-0.23	120.365	4.029	3.35%	0.22	30.698	0.209	0.68%	-0.06	311.810	1.793	0.57%	0.10
15147	20.075	0.150	0.75%	0.34	144.500	0.577	0.40%	3.29	134.500	0.577	0.43%	0.85	29.625	0.222	0.75%	-0.14	NA	NA	NA	NA
15155	14.115	0.212	1.50%	-0.29	72.568	0.927	1.28%	0.37	122.468	1.456	1.19%	0.32	24.258	0.447	1.84%	-0.55	NA	NA	NA	NA
15173	183.800	0.857	0.47%	17.65	8.453	0.295	3.49%	-2.23	147.183	0.664	0.45%	1.42	13.128	0.128	0.98%	-1.38	NA	NA	NA	NA
15178	8.530	0.306	3.59%	-0.88	44.010	1.383	3.14%	-0.79	86.140				NA	NA	NA		NA	NA	NA	NA
15192	NA	NA	NA		NA	NA	NA		92.880	0.484	0.52%	-1.00	NA	NA	NA		NA	NA	NA	NA
15198	30.783	1.488	4.83%	1.47	63.593	2.419	3.80%	0.01	136.470	5.128	3.76%	0.94	38.663	0.313	0.81%	0.53	291.500	6.403	2.20%	-0.12
15199	22.955	0.432	1.88%	0.65	65.928	1.916	2.91%	0.10	120.148	0.684	0.57%	0.21	30.028	2.456	8.18%	-0.11	NA	NA	NA	NA
QuECHERS	18.775	0.189	1.01%	0.20	148.750	1.258	0.85%	3.47	130.000	0.816	0.63%	0.65	27.200	0.082	0.30%	-0.33	NA	NA	NA	NA

direction et secrétariat du LCSQA
INERIS - parc technologique Alata - BP 2 - F60550 Verneuil-en-Halatte
tél. 03 44 55 64 04 - www.lcsqa.org