The IAEA-TEL-2012-03 world wide open proficiency test on the determination of radionuclides in water, hay and soil

Laboratory's Individual Evaluation Report
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Evaluation Report

for

Laboratory No. 5

(revised April 2014)

Your personal customer number: 13949

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IAEA

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Evaluation Criterias

The data is evaluated according to the following steps:

The relative bias between the reported and the target value (the best estimation of the true value) is expressed by the following equation:

$$Bias_{relative} = \frac{Value_{reported} - Value_{target}}{Value_{target}} \times 100\%$$

The relative bias will be compared to the Maximum Acceptable Relative Bias (**MARB**) which has been determined for each measurand, considering the physical background of radioanalytical methods, including the level of the radioactivity and the complexity of the task.

If the **Bias**$_{relative}$ ≤ **MARB** value the result will be "Accepted" for accuracy.

Based on fit for purpose and the good laboratory practice principles the expanded relative combined uncertainty should cover the relative bias:

$$P = \sqrt[2]{\left(\frac{u_{target}}{A_{target}}\right)^2 + \left(\frac{u_{reported}}{A_{reported}}\right)^2} \times 100$$

$$Bias_{relative} \leq k * P$$

where k is the coverage factor, for the 95% confidential level **k** is 2.56. If the reported result is between the ± **MARB** values, but it is not overlapping with the target value within their uncertainties, this equation helps to decide whether they are significantly different or not.

The **P** value will be compared to the **MARB** also. If both the **P** ≤ **MARB** and **Bias**$_{relative}$ ≤ **k*P** are fulfilled the reported result will be "Accepted" for the precision. If one of them is insufficient the result will be assigned the "Not accepted" status for precision.

The final score according to the above detailed evaluation:
    "**Accepted**" when both accuracy and precision achieved "Accepted" status,
    "**Not Accepted**" when the accuracy is "Not accepted" and
    "**Warning**" when accuracy is "Accepted", but the precision is "Not accepted".

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Acceptance Limits

Please find below in the tables the acceptance limits for MARB (%) in relation to the matrix and the analyte that have been used for the evaluation.

Parameter Table 1 for Sample 1, Spiked Water

Analyte	MARB(%)
Am-241	n.a.
Ce-139	n.a.
Co-57	n.a.
Co-60	n.a.
Cr-51	n.a.
Cs-134	15
Cs-137	n.a.
Eu-152	15
Sr-85	n.a.
Zn-65	n.a.

Parameter Table 2 for Sample 2, Spiked Water

Analyte	MARB(%)
Am-241	20
Ce-139	n.a.
Co-57	n.a.
Co-60	n.a.
Cr-51	n.a.
Cs-134	n.a.
Cs-137	15
Eu-152	n.a.
Sr-85	n.a.
Zn-65	n.a.

Parameter Table 3 for Sample 4, Hay

Analyte	MARB(%)
Cs-134	20
Cs-137	15

Parameter Table 4 for Sample 5, Soil

Analyte	MARB(%)
Ac-228	20
Am-241	25
Cs-137	20
K-40	20
Pb-210	20
Pb-212	20
Po-210	20
Pu-239+240	20
Sr-90	25
Tl-208	20
U-238	20

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Laboratory No. 5, Results submitted on 2013-05-13

Evaluation on Sample 1, Spiked Water

Reference Date: 01-01-2012

Analyte	IAEA Value [Bq/kg]	IAEA Unc [Bq/kg]	Lab Value [Bq/kg]	Lab Unc [Bq/kg]	Lab Unc %	Rel. Bias %	u-Test	Ratio Lab/IAEA	Accuracy	P(%)	Precision	**Final Score**
Am-241	not pres.	n.a.	1.25									A
Ce-139	not pres.	n.a.	5.92									A
Co-57	not pres.	n.a.	1.72									A
Co-60	not pres.	n.a.	1.02									A
Cr-51	not pres.	n.a.	152000									A
Cs-134	82.6	0.71	68.78	6.44	9.36	-16.73	-2.13	0.83	N	9.40	A	N
Cs-137	not pres.	n.a.	1.27									A
Eu-152	118.6	1.0	109.1	4.6	4.22	-8.01	-2.02	0.92	A	4.30	A	A
Sr-85	not pres.	n.a.	78.3									A
Zn-65	not pres.	n.a.	15.7									A

Evaluation on Sample 2, Spiked Water

Reference Date: 01-01-2012

Analyte	IAEA Value [Bq/kg]	IAEA Unc [Bq/kg]	Lab Value [Bq/kg]	Lab Unc [Bq/kg]	Lab Unc %	Rel. Bias %	u-Test	Ratio Lab/IAEA	Accuracy	P(%)	Precision	**Final Score**
Am-241	120.9	0.74	125.6	4.6	3.66	3.89	1.01	1.04	A	3.71	A	A
Ce-139	not pres.	n.a.	2.52									A
Co-57	not pres.	n.a.	0.684									A
Co-60	not pres.	n.a.	0.493									A
Cr-51	not pres.	n.a.	68100									A
Cs-134	not pres.	n.a.	0.638									A
Cs-137	102.5	0.75	100.6	3.2	3.18	-1.85	-0.58	0.98	A	3.26	A	A
Eu-152	not pres.	n.a.	4.22									A
Sr-85	not pres.	n.a.	37.3									A
Zn-65	not pres.	n.a.	4.83									A

The IAEA-TEL-2012-03 worldwide open proficiency test

Laboratory No. 5, Results submitted on 2013-05-13

Evaluation on Sample 4, Hay   Reference Date: 01-01-2012

Analyte	IAEA Value [Bq/kg d.m.]	IAEA Unc [Bq/kg d.m.]	Lab Value [Bq/kg d.m.]	Lab Unc [Bq/kg d.m.]	Lab Unc %	Rel. Bias %	u-Test	Ratio Lab/IAEA	Accuracy	P(%)	Precision	**Final Score**
Cs-134	316	20	246.0	22.8	9.27	-22.15	-2.31	0.78	N	11.22	A	N
Cs-137	815	24	731.9	22.5	3.07	-10.20	-2.53	0.90	A	4.26	A	A

Evaluation on Sample 5, Soil   Reference Date: 01-01-2012

Analyte	IAEA Value [Bq/kg d.m.]	IAEA Unc [Bq/kg d.m.]	Lab Value [Bq/kg d.m.]	Lab Unc [Bq/kg d.m.]	Lab Unc %	Rel. Bias %	u-Test	Ratio Lab/IAEA	Accuracy	P(%)	Precision	**Final Score**
Ac-228	32.4	1.6	28.75	1.50	5.22	-11.27	-1.66	0.89	A	7.18	A	A
Am-241	1.78	0.1	1.587	0.283	17.83	-10.84	-0.64	0.89	A	18.70	A	A
Cs-137	118.6	2.9	97.83	3.13	3.20	-17.51	-4.87	0.82	A	4.03	N	W
K-40	207.7	8.3	187.2	10.8	5.77	-9.87	-1.51	0.90	A	7.02	A	A
Pb-210	595	19	521.9	18.0	3.45	-12.29	-2.79	0.88	A	4.70	N	W
Pb-212	31.0	1.2	27.11	1.19	4.39	-12.55	-2.30	0.87	A	5.85	A	A
Po-210	573	25										
Pu-239+240	4.74	0.1										
Sr-90	25.4	1.9										
Tl-208	11.5	0.6	9.402	0.500	5.32	-18.24	-2.69	0.82	A	7.45	A	A
U-238	23.6	0.7	20.16	2.19	10.86	-14.58	-1.50	0.85	A	11.26	A	A