



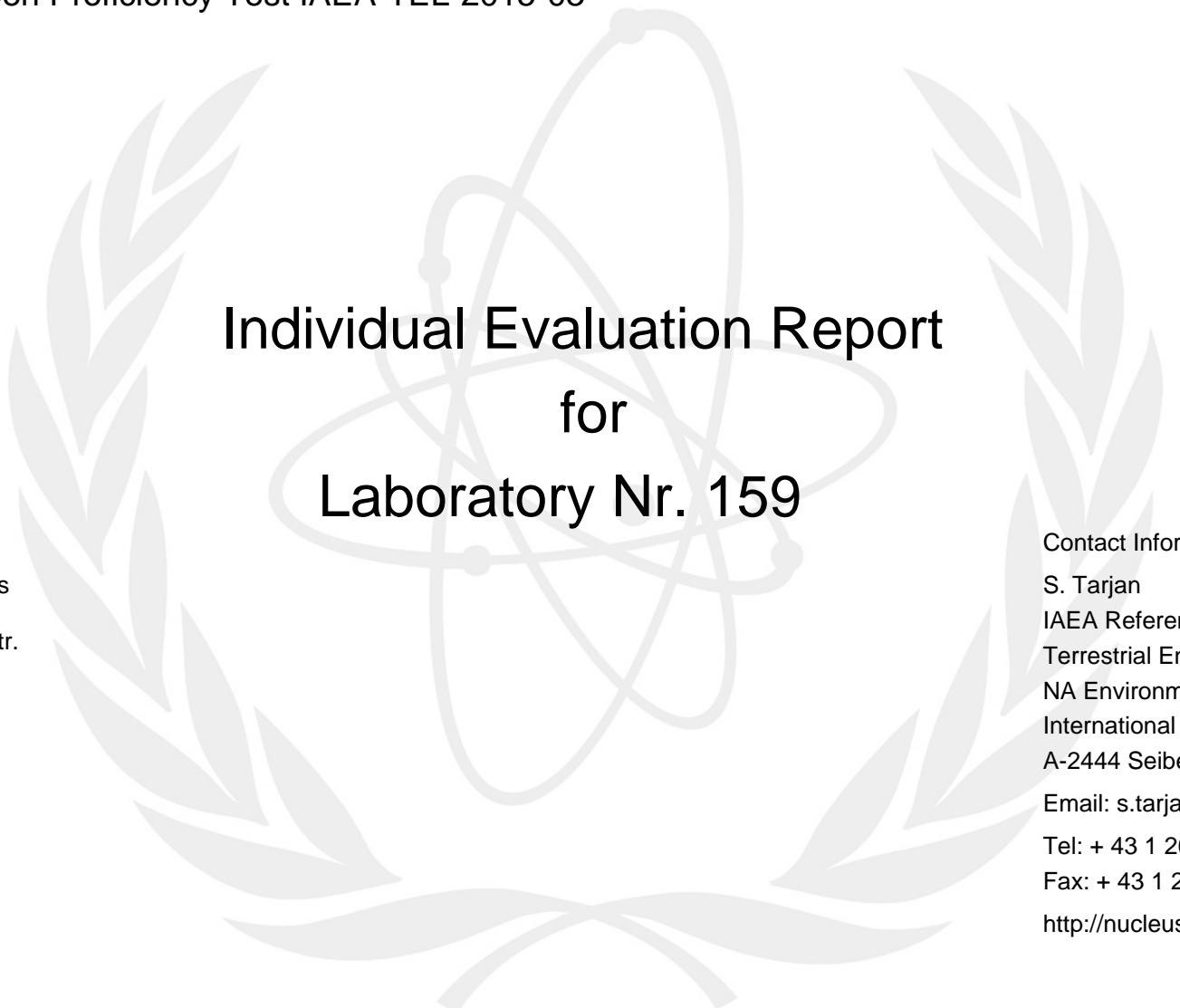
The IAEA-TEL-2015-03 world wide open proficiency test on the determination of anthropogenic and natural radionuclides in water, rice and soil

**Laboratory's Individual Evaluation Report
Laboratory Code: 159 (CuNo: 13949)
Total Pages (with cover): 7**



Individual Evaluation Report

for the World-Wide Open Proficiency Test IAEA-TEL-2015-03



Individual Evaluation Report for Laboratory Nr. 159

Participant Information:

Mr. Christos Maramathas
teleDOS Laboratories
102 Apostolou Paulou Str.
Corinth
GRE-20131

Contact Information:

S. Tarjan
IAEA Reference Materials Group
Terrestrial Environment Laboratory
NA Environment Laboratories NAEL
International Atomic Energy Agency
A-2444 Seibersdorf - Austria
Email: [s.tarjan\[at\]iaea.org](mailto:s.tarjan[at]iaea.org)
Tel: + 43 1 2600 28242
Fax: + 43 1 2600 28222
<http://nucleus.iaea.org/rpst/>

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Description of the 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:

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

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

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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Target Value Tables for the proficiency test parameters:

Table of Target Values and Evaluation Parameters (MARB) for Sample 1

Sample Code	Analyte	Target Value	Uncertainty	MARB
1	Sr-90	29.6	0.8	15 %
1	Cs-134	30	0.9	15 %
1	Cs-137	30.1	0.9	15 %

Table of Target Values and Evaluation Parameters (MARB) for Sample 2

Sample Code	Analyte	Target Value	Uncertainty	MARB
2	Na-22	65.1	1.5	15 %
2	Zn-65	177.3	5.7	15 %

Table of Target Values and Evaluation Parameters (MARB) for Sample 4

Sample Code	Analyte	Target Value	Uncertainty	MARB
4	K-40	72.1	3.5	25 %
4	Cs-134	12	0.4	15 %
4	Cs-137	38.6	0.9	15 %

Table of Target Values and Evaluation Parameters (MARB) for Sample 5

Sample Code	Analyte	Target Value	Uncertainty	MARB
5	Sr-90	36.2	2.7	20 %
5	Cs-137	715	30	15 %
5	U-234	46.2	2.3	20 %
5	U-238	46.4	2.5	20 %
5	Pu-239+240	2.7	0.4	25 %
5	Am-241	1.2	0.05	30 %

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Evaluation Tables for Labcode 159.

Evaluation Result Table for Sample 1

Sample Code	Analyte	Target Value	Target Unc.	MARB	Rep. Value	Rep. Unc	Rel. Bias	Robust SD	Z-Score	U-Test	Accuracy	P	Precision	Final Score
1	Cs-134	30	0.9	15 %	28.2	1.2	-6.00 %	1.8	-1.00	-1.20	A	5.21	A	A
1	Cs-137	30.1	0.9	15 %	32.2	2.9	6.98 %	1	2.10	0.69	A	9.49	A	A

Evaluation Result Table for Sample 2

Sample Code	Analyte	Target Value	Target Unc.	MARB	Rep. Value	Rep. Unc	Rel. Bias	Robust SD	Z-Score	U-Test	Accuracy	P	Precision	Final Score
2	Na-22	65.1	1.5	15 %	63.8	4.5	-2.00 %	4.5	-0.29	-0.27	A	7.42	A	A
2	Zn-65	177.3	5.7	15 %	159.8	9.8	-9.87 %	9	-1.94	-1.54	A	6.92	A	A

Evaluation Result Table for Sample 4

Sample Code	Analyte	Target Value	Target Unc.	MARB	Rep. Value	Rep. Unc	Rel. Bias	Robust SD	Z-Score	U-Test	Accuracy	P	Precision	Final Score
4	Cs-134	12	0.4	15 %	13.0	1.4	8.33 %	1.2	0.83	0.69	A	11.27	A	A
4	Cs-137	38.6	0.9	15 %	35.5	4.7	-8.03 %	2.5	-1.24	-0.65	A	13.44	A	A

Evaluation Result Table for Sample 5

Sample Code	Analyte	Target Value	Target Unc.	MARB	Rep. Value	Rep. Unc	Rel. Bias	Robust SD	Z-Score	U-Test	Accuracy	P	Precision	Final Score
5	Cs-137	715	30	15 %	720	28	0.70 %	37	0.14	0.12	A	5.72	A	A

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Intercomparison Parameter Evaluation:

Calculation of Evaluation Parameters

robust average: $x^* = \text{median of } x_i (i=1,2..p)$, robust standart deviation $s^* = 1.483 * \text{median of } |x_i - x^*|$, z-score: $z = (\text{Reported-Value} - \text{TargetValue}) / s^*$

z-score evaluation: $z < 2$: acceptable, $2 \leq z \leq 3$: warning, $z > 3$: not acceptable

Sample Code	Analyte	Robust Mean	Robust SD	Rep. Value	Rep. Unc	Z-Score	Z-Score Evaluation
5	Ac-228	49	4.4	64.1	9.1	3.43	N
5	Pb-212	49	5.2	58.0	8.0	1.73	A
5	Tl-208	17.4	1.9	17.9	1.7	0.26	A

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The analytes listed in the table below have been identified but are not present in the samples (false positive):

Sample Code	Analyte	Reported Value
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