

# The IAEA-CU-2006-11 Proficiency test on the determination of gamma emitting radionuclides in air filters

## Reporting Form (F-01)

**\*Filter number: Same as  
Greek Atomic Energy Commission**

**Please include name and address of responsible analyst (if other than given or wrong).**

### Responsible Analyst:

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Signature: .....  
Date: ..... 03.08.2006  
Collaborators: ..... Mr. JOHN SARRIS

\*Customer Number **13949**

### Please send back to:

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\* For trackability, kindly fill as in the hard copy sent with the sample



# The IAEA-CU-2006-11 Proficiency test on the determination of gamma emitting radionuclides in air filters

## Results and Uncertainties Reporting Form (F-02)

### BLANK AIR FILTER

\*Filter number: Same as  
Greek Atomic Energy Commission

Nuclide	Unit	Individual Determinations						Your Estimates		Date of measurement
		Value 1	Unc.1*	Value 2	Unc.2*	Value 3	Unc.3*	Average Value	Total Unc.* at 1σ level	(yyyy-mm-dd)
<sup>241</sup> Am	Bq/filter	< 0.01 = LLD	--	< 0.01 = LLD	--	< 0.01 = LLD	--	< 0.01 = LLD	--	2006-07-17
<sup>57</sup> Co	Bq/filter	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	2006-07-17
<sup>134</sup> Cs	Bq/filter	2.609E-03	1.637E-03	3.169E-03	1.404E-03	2.943E-03	1.320E-03	2.936E-03	8.29E-04	2006-07-17
<sup>137</sup> Cs	Bq/filter	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	2006-07-17
<sup>54</sup> Mn	Bq/filter	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	2006-07-17
<sup>65</sup> Zn	Bq/filter	< 0.02 = LLD	--	< 0.02 = LLD	--	< 0.02 = LLD	--	< 0.02 = LLD	--	2006-07-17
<sup>60</sup> Co	Bq/filter	2.117E-03	2.028E-03	2.274E-03	2.147E-03	2.303E-03	2.180E-03	2.226E-03	1.221E-03	2006-07-17
<sup>90</sup> Sr	Bq/filter	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	0 (=LLD)	--	2006-07-17
<sup>239+240</sup> Pu	Bq/filter	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2006-07-17
<sup>234</sup> U	Bq/filter	9.302E+00	3.720E+00	9.107E+00	3.579E+00	9.174E+00	3.670E+00	9.192E+00	2.110E+00	2006-07-17
<sup>238</sup> U	Bq/filter	1.832E+00	2.13E-01	1.827E+00	2.13E-01	1.842E+00	2.19E-01	1.834E+00	1.24E-01	2006-07-17

\* Standard uncertainty of individual determination expressed in (Bq/filter) (see uncertainty quantification sheet)

\*\* Detection limit should be reported in the same units as results (Bq/filter)

\*\*\* All data should decay correct to 1<sup>st</sup> January, 2006.



# The IAEA-CU-2006-11 Proficiency test on the determination of gamma emitting radionuclides in air filters

## Results and Uncertainties Reporting Form (F-02)

### SAMPLE AIR FILTER

\*Filter number: Same as  
Greek Atomic Energy Commission

Nuclide	Unit	Individual Determinations						Your Estimates		Date of measurement
		Value 1	Unc.1*	Value 2	Unc.2*	Value 3	Unc.3*	Average Value	Total Unc.* at 1 $\sigma$ level	(yyyy-mm-dd)
<sup>241</sup> Am	Bq/filter	1.913E-01	2.86E-02	1.872E-01	3.00E-02	1.875E-01	3.04E-02	<b>1.888E-01</b>	<b>1.71E-02</b>	<b>2006-07-25</b>
<sup>57</sup> Co	Bq/filter	3.662E+00	3.23E-01	3.665E+00	3.24E-01	3.699E+00	3.70E-01	<b>3.673E+00</b>	<b>1.95E-01</b>	<b>2006-07-25</b>
<sup>134</sup> Cs	Bq/filter	2.524E+00	1.85E-01	2.525E+00	1.85E-01	2.375E+00	2.40E-01	<b>2.490E+00</b>	<b>1.15E-01</b>	<b>2006-07-25</b>
<sup>137</sup> Cs	Bq/filter	3.180E+00	2.45E-01	3.178E+00	2.45E-01	2.957E+00	2.58E-01	<b>3.110E+00</b>	<b>1.44E-01</b>	<b>2006-07-25</b>
<sup>54</sup> Mn	Bq/filter	3.097E+00	2.38E-01	3.094E+00	2.38E-01	3.099E+00	3.15E-01	<b>3.096E+00</b>	<b>1.48E-01</b>	<b>2006-07-25</b>
<sup>65</sup> Zn	Bq/filter	3.090E+00	2.42E-01	3.086E+00	2.41E-01	3.183E+00	3.20E-01	<b>3.109E+00</b>	<b>1.51E-01</b>	<b>2006-07-25</b>
<sup>60</sup> Co	Bq/filter	2.704E+00	2.00E-01	2.705E+00	2.00E-01	2.737E+00	2.18E-01	<b>2.714E+00</b>	<b>1.19E-01</b>	<b>2006-07-25</b>
<sup>90</sup> Sr	Bq/filter	0 (= LLD)	--	0 (= LLD)	--	0 (= LLD)	--	<b>0 (= LLD)</b>	--	<b>2006-07-25</b>
<sup>239+240</sup> Pu	Bq/filter	N/A	N/A	N/A	N/A	N/A	N/A	<b>N/A</b>	<b>N/A</b>	<b>2006-07-25</b>
<sup>234</sup> U	Bq/filter	0 (or < 5.07 = LLD)	--	0 (or < 5.18 = LLD)	--	0 (or < 5.23 = LLD)	--	<b>0 (or &lt; 5.16 = LLD)</b>	--	<b>2006-07-25</b>
<sup>238</sup> U	Bq/filter	2.870E-01	8.76E-02	2.775E-01	8.71E-02	2.823E-01	1.280E-01	<b>2.822E-01</b>	<b>5.56E-02</b>	<b>2006-07-25</b>

\* Standard uncertainty of individual determination expressed in (Bq/filter) (see uncertainty quantification sheet)

\*\* Detection limit should be reported in the same units as results (Bq/filter)

\*\*\* All data should decay correct to 1<sup>st</sup> January, 2006.



## **The IAEA-CU-2006-11- Proficiency test on the determination of gamma emitting radionuclides in air filters**

### **Method Validation and Combined Uncertainty Estimation Form (F-03)**

*Name of analyst(s): Mr. CHRISTOS ATH. MARAMATHAS*

*Laboratory name: NUCLEAR TECHNOLOGY & ENVIRONMENTAL LABORATORY - teleDOS LTD*

**Please provide us with the following information related to method validation:**

**1- Did you perform method validation?**

**2- If yes, kindly submit the obtained validation parameters such as: Minimum detection limit, Repeatability limit, Reproducibility limit...**

**3- Please describe your approach for evaluation of uncertainty components and give the formula used for calculation of the expanded uncertainty.**

**4- You are kindly asked to list the sources of uncertainties included in the estimation of the combined uncertainty.**

**5- Did your laboratory obtain a formal accreditation? Do you apply a QAS?**

## 6- How many samples your laboratory analyze per year?

### Remark:

In practice, there are many possible sources of uncertainty in a measurement, both, of random nature or manifested as bias, including:

- 1) reproducibility of measurement;
- 2) bias or drift of measurement;
- 3) uncertainty in calibration process; of blank; in instrument readings (e.g. peak integration)
- 4) uncertainties of calibration sources; in sample preparation (mass, dilution, etc.).

These sources of uncertainty are not necessarily independent and some may be combined in 1). Of course, these possible sources of uncertainty are not an exhaustive list. Individual standard uncertainties may be estimated from repeated observations (any valid statistical method for treating data) or by using all relevant information which may include previous measurement data, experience with or general knowledge of the behaviour and properties of relevant materials and instruments, manufacturers specifications, data provided in calibration and other certificates, and uncertainties assigned to reference data taken from handbooks.



## **The IAEA-CU-2006-11 Proficiency test on the determination of gamma emitting radionuclides in air filters**

*Name of analyst(s): Mr. CHRISTOS ATH. MARAMATHAS*

*Laboratory name: NUCLEAR TECHNOLOGY & ENVIRONMENTAL LABORATORY - teleDOS LTD*

### **Method and Quality Control Procedure Description Form (F-04)**

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#### **1. DESCRIPTION OF SAMPLE PREPARATION AND DIGESTION METHOD (if applicable)**

Describe how the sample was prepared and presented to the apparatus (digestion method).

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#### **2. DESCRIPTION OF MEASUREMENT TECHNIQUE AND CALIBRATION METHOD**

Describe the efficiency and energy calibration procedure, what sources were used.

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#### **3. DESCRIPTION OF QUALITY CONTROL PROCEDURE**

Use of blank, CRM, Control samples, duplicate, replicate, spike sample and control charts. Kindly report quality control data.