

CIPM CCRI(II) , 23-25 May 2007 Meeting, Presentation

**“Horia Hulubei” National Institute of Research and Development for Physics and
Nuclear Engineering, IFIN-HH, Bucharest, Romania,
Radionuclide Metrology Laboratory – Report: May 2005 - May 2007**

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1. Official Status of the Laboratory:

The IFIN-HH, Radionuclide Metrology Laboratory (RML) was reauthorized and attested for metrology activities by the Romanian Bureau of Legal Metrology (BRML) in December 2005. As a designated participant in CIPM MRA in the field of ionizing radiations, member of the CIPM CCRI(II), it is also represented in EUROMET, Technical Committee for Ionizing Radiations (IR-TC).

2. Infrastructure, equipment, progress:

2.1 Infrastructure

Situated in the Radioisotope Department (RD) building, it is now extended by a supplementary measurement room, assuring also the separation from the RD crossing activities. The RML improved its climatic regime and radiation background control.

2.2 Basic equipment

A research project, supported by the Romanian Scientific Research Authority, 2006-2008, assuring finance funds, allowed the designing and start of the purchase procedure for the following equipment

- Installations for absolute (direct) standardization:

(i) Construction of a new 4π PC- γ coincidence system, based on the existing detection blocks and new electronic modules, operated in a semi automatic regime. **Thanks are due to the BIPM, ENEA, and the LNHB, for their help in designing the new system.**

(ii) Automatic operation of the LSC-TDCR, replacement of the photomultipliers and construction of a new detection block, based on Channel Photomultipliers (CPM) use, **with the advise of LNHB;**

(iii) A photon-photon coincidence system, two thin NaI(Tl) detectors, was constructed and used for the standardization of ^{125}I

- Installations for relative (indirect) standardization:

(i) A new X and gamma-ray spectrometry system with Si(Li) and high efficiency HPGe detectors with improved shielding, and adequate software is also under construction.

(ii) The CENTRONIC IG12/20A system, was improved with a Keithley E6517A Electrometer, with the financial support of the IFIN-HH - EC-Center of Excellence, IDRANAP, and of the IAEA-CRP E 2.10.05

3. Personnel evolution:

Thanks are due to Dr. E.L.Grigorescu, who retired; a new physicist was employed: a total number of 6 staff members are presently working.

4. Main research areas:

4.1 Absolute standardization:

- Standardization of ^{55}Fe by the LSC-TDCR method, and participation at the CCRI(II) key comparison
- Common measurements at the LNHB, LSC-TDCR, by using the CPMs.
- Standardization of ^{125}I by the X-X, gamma coincidence method

4.2 Relative measurements:

- Transfer of the CENTRONIC IG12/20A calibration figure to the new electrometer; new calibration for ^{131}I

4.3 Participation at Nuclear Decay Data Projects

- Study of nuclear decay data for ^{188}W and ^{124}Sb .

4.4 Elaboration of the documentation for RML accreditation, according to EN ISO/IEC 17025:2005:

- All the quality documents were elaborated: Quality Manual; Organization, System, Work Procedures; Work Instructions

5. International affiliation and international activities

5.1 Affiliations

IFIN-HH is a member of ICRM, CIPM CCRI(II) , EUROMET

5.2 Participation at International Comparisons

- Key comparison: CCRI(II)-K2.Fe-55 /2006, LSC-TDCR method
- Key comparisons, SIR: [BIPM,RI(II)- K1.I-131; BIPM,RI(II)- K1.Ba-133] /2005; [BIPM,RI(II)- K1.Co-60]; [BIPM,RI(II)- K1.Cs-134] /2006. We propose to repeat the ^{131}I comparison in 2007;
- I-131, SSDL (SSRL) comparison/2006 : IAEA-CRP. E 2.10.05, accepted also as the Supplementary key comparison, code CCRI(II)-S6.I-131/2006
- IAEA-CU-2006-09-CCRI(II)-S4 Supplementary comparison on the determination of gamma emitting radionuclides: low level activity; re-measurement in a low background, underground laboratory, is proposed in 2007.

Planned, 2007- international comparisons:

- EUROMET.RI(II)-S5.Sb-124, 907 Project: ^{124}Sb standardization and determination of photon emission intensities
- IAEA-CU-2007-06-CCRI(II)-S5 Supplementary comparison on the determination of Technically enhanced naturally occurring radionuclides (TENORM) in phosphogypsum.
- Ga-67 SSDL(SSRL) comparison : IAEA-CRP. E 2.10.05

5.3 IAEA, CRP, contracts:

- E.2.10.05 "Harmonization of quality practices for nuclear medicine radioactivity measurements", Contract no.12921/ROM
- F.4.20.06 "Updated decay data library for actinides", Contr. 13341/ROM

5.4 Bilateral collaboration:

- The collaboration accord with LNHB-France was renewed in 2006

5.5 Situation of CMCs and Implementation of the Quality System

- A number of 33 CMCs, for mononuclide solutions and standard sources, are under analysis at the IR –TC of EUROMET
- The Quality System of the IFIN- Ionizing Radiations Metrology Laboratory, according to the EN ISO/IEC 17025-2005, was recognized by the EUROMET TC-Q, as a basis for CMCs coverage.

6. National accreditation

6.1 Designations

The RML is designed as a calibration laboratory for the Romanian units operating in the nuclear field, through the Notification of the National Nuclear Authority (CNCAN) and is also attested as a calibration laboratory by the Romanian Bureau of Legal Metrology (BRML).

6.2 Accreditation by the national body, RENAR.

A pre-assessment evaluation of the accomplishment of the EN ISO/IEC 17025-2005 requirements in the laboratory was made by Michael J Woods, from the Ionizing Radiations Metrology Consultants (IRMC) Ltd., U.K., in April 2006. A detailed report, including the document "Pre-assessment comments on the Quality System and associated documentation of the Radionuclide Metrology Laboratory of the National Institute of R&D for Physics and Nuclear Engineering "Horia Hulubei", IFIN-HH" was elaborated. Following its observations, we revised the documents and the implementation aspects, and applied for accreditation at the Romanian Accreditation Body, RENAR. The evaluation is on way.

7. Radioactive standards and metrology services

7.1 Radioactive standards delivery

Standard sources and solutions were prepared and delivered to various users: environmental and food chain survey, Nuclear Power Plant, research laboratories: alpha spectrometry sources, large area beta, point beta and gamma, gamma volume sources (matrices water and ash equivalent, soil), radioactive solutions.

7.2 Calibration services

- A significant number of standard sources, produced by our laboratory, or imported from abroad, were standardized and certified for various users, including our counterpart laboratory from the National Institute of Metrology, the Nuclear Power Plant, etc.
- Three radioisotope calibrators were calibrated for I-131 and Re-188 (particularly, our calibration figure was in very good agreement with that found by B. Zimmerman for a calibrator type CRC 15, and was different from that established by the producer of the equipment)

7.3 Metrological checks

According to the Romanian Metrology Law, the Radioisotope Calibrators, must be verified every year. A significant number of calibrators were verified during the reported period. In some cases, a new calibration was performed.

7.4 National comparisons, proficiency tests

A preliminary comparison, on the measurement of I-131 was carried out during 2005. A large scale, I-131 comparison, regarding the measurements in nuclear medicine units, within the work program of the IAEA contract 12921, is under way.

8. Publications

8.1 The 2005-2006 published papers, such as presented on the Data Base of the CIPM-CCRI(II)

1. E.L.Grigorescu, A.C.Razdolescu, M.Sahagia, P.Cassette, "Calibration of tritium monitors using saturated vapour of tritiated water", Fusion Science and Technology, vol.48, nr.1 (2005)382 – 385
2. D.Stanga, I.Moreau, J.L.Piccolo, Ph. Cassette "A new tritium generator for activity measurements of the tritiated water by internal gas counting" Fusion Science and Technology, vol.48, nr.1 (2005)354-357
3. A.Stochioiu, M.Sahagia, I.Georgescu, F.Scarlat "Dysprosium doped CaSO₄ for high sensitivity X and gamma-rays detectors", Journal of Optoelectronics and Advanced Materials, 7,3 (2005)1657 -1663
4. Z.Szucs, D.Dudu, C.Campeanu, A.Luca, E.Duta, M.Sahagia, "Production and chemical separation of ⁴⁸V", J.Radioanalytical Nuclear Chemistry, Vol. 265. No.3 (2005)507 – 509
5. P.Cassette, M.Sahagia, L.Grigorescu, M.C.Lepy, J.L.Piccolo "Standardization of ²²²Rn by LSC and comparison with alpha and gamma spectrometry", Appl. Rad. Isot. 64, 10-11(2006) 1465-1470

6. M.Sahagia “Standardization of ^{99m}Tc ” Appl. Radiat. Isot, 64, 10-11 (2006)1234-1237
7. A.C.Razdolescu, R.Broda, P. Cassette, B.R.S.Simpson, W.M.Van Wyngaardt” The IFIN-HH triple coincidence liquid scintillation counter”, Appl. Radiat. Isot. 64, 10-11(2006)1510-1514
8. D.Stanga, I.Moreau, P.Cassette “Standardization of tritiated water by two improved methods” Appl. Radiat.Isot 64,10-11(2006)1203-1206
9. M.Sahagia, A.C.Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan, V.Lungu, “The standardization of ^{177}Lu and its use in nuclear medicine”, EUR Report EN 22136, Luxembourg, EC, 2005, pp. 181-184 , Ed. EC-JRC-IRMM
10. E.Neacsu, A.Luca, V.Stefan, A.Zorliu “Romanian experience on wet storage spent nuclear fuel at VVR-S research reactor of IFIN”Horia Hulubei”, EUR Report EN 22136, Luxembourg, EC, 2005, pp.173-176 , Ed. EC-JRC-IRMM
11. Z.Szucs, D.Dudu, C.Campeanu, A.Luca, E.Duta, M.Sahagia “Production and chemical separation of ^{68}Ge ” Ann. Rep.of Inst. Nucl. Res. of Hungarian Academy, Debrecen, 2005.
12. C.Ivan, M.Sahagia, A.Luca, E.L.Grigorescu ”The experience of the Radioisotope Department of IFIN-HH, Romania , in production, testing, delivery, transport and evidence of radioactive sources” IAEA, Vienna, International Conference on the Safety and Security of Radioactive Sources: Control of Sources through their Life Cycle, Bordeaux, France,27 june-1July,2005, IAEA-CN-134, pp164-168, Ed. IAEA
13. Commissariat a l’Energie Atomique, France, Rapport CEA-R-6081, M.M. Bé.....A.Luca, M.Sahagia, A-M. Razdolescu, L. Grigorescu.....
”Activity measurements and gamma emission intensities determination in the decay of ^{65}Zn ”
14. International Atomic Energy Agency (IAEA)-Vienna, Austria - Technical Report Series 454 (TRS 454), 2006 , « Quality Assurance for Radioactivity Measurements in Nuclear Medicine” p.1-96, Contributors to drafting and review: M.Dondi, C.P.Herbst, A.Iwahara, M.Morengo, S. Mather, J.P. Norenberg, V.Olsovcova, P.Oropesa Verdicia, P.Otiz-Lopez, L.Joseph, M.Ghafoori, J.A.Onto, N. Ramamoorthy, M.Sahagia, K.R. Shortt, S.Tastan, P.Vincze, M.J.Woods, B.E.Zimmerman
15. M.Sahagia, A.C.Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan”Results Obtained by the Radionuclide Metrology Laboratory of IFIN-HH in International Comparisons, during the Period 2002-2004’, Rom.J.Phys Vol 51, Nos.1-2(2006)21-26.
16. A.C.Razdolescu, M.Sahagia, E.L.Grigorescu, “ Comparative measurements of Ni-63, Cs-137, Am-241” , Rom. J. Pys. Vol 50, Nos 9-10(2005)957-962
17. M.Sahagia, A.C.Razdolescu, E.L.Grigorescu, A.Luca, C.Ivan “Measurement of the activity of the radiopharmaceuticals used in therapy” Conference IRPA EUROPE, Paris, 2006 paper P 113, pp 1-6, <http://www.irpa2006europe.com>
18. M.Sahagia, A.C. Razdolescu, A. Luca, C. Ivan “Importance of the Primary Radioactivity Standard Laboratory and Implementation of its Quality Management” 6- th Balkanian Union Conf. Istanbul, Turkey, 2006, accepted for publication, American Institute of Physics (AIP)
19. A.Stochioiu, M. Sahagia, F. Mihai, I. Tudor, H. Lupescu “Application of the Thermoluminescent Dosimeters for the Measurement of Low Level Background” Balkanian Union Conf. Istanbul, Turkey, 2006, accepted , AIP

8.2 Papers sent for publication and proposed for presentation at International Conferences

- A paper was sent to the Applied Radiation and Isotopes, ARI-D-07-00101; a paper was sent to the Romanian Reports in Physics
- The ICRM 2007 Conference, a number of 3 abstracts were transmitted and accepted for presentation
- The IRPA Regional Congress for Central and Eastern Europe, IRPA2007, Brasov, Romania, a number of 3 abstracts were transmitted
- The International Proficiency Testing Conference, Sinaia, Romania, 1 paper was transmitted and accepted