

CIPM-CCRI(II) , 23-25 May 2005 Meeting, Presentation

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Radionuclide Metrology Laboratory**

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1. Short History:

IFIN-HH was founded, under the name of “Institute for Atomic Physics”, in 1949, by the physicist Horia Hulubei, early X-ray researcher, former collaborator, in France, of Yvette Cauchois, Irene et Frederic Jolliot Curie. The name IFIN was given in 1977, what became IFIN-HH in 1996

The Radionuclide Metrology Laboratory (RML) was created as early as 1960.

2. Official Status of the Laboratory:

The RML is authorized for metrology activities by the Romanian Bureau of Legal Metrology. IFIN is designated as participant in CIPM-MRA in the field of ionizing radiations and it is member of the CIPM- CCRI(II). After the admission of Romania in EUROMET, IFIN was appointed as its representative in the Technical Committee for Ionizing Radiations (IR-TC). A Collaboration Protocol was signed with the National Metrology Institute; it establishes the responsibility of IFIN, as the owner of the Primary Standard of Activity Unit (Becquerel) and derived units, on national as well as international level.

3. Infrastructure, equipment and personnel:

3.1 Infrastructure

At present the Laboratory is a part of the IFIN Radioisotope Department. It disposes of the adequate facilities for safe operation of sealed and open radioactive sources, consisting from a radiochemistry laboratory, a balance room, two measurement laboratories. It has access to a very good library, the computing and communication network of IFIN.

3.2 Basic equipment.

- Installations for absolute (direct) standardization:

- ◆ A 4π PC- γ coincidence installation, containing a home made PC, flow type, working with pure methane and a NaI(Tl) detector. The electronics is NIM modular of types NE and Canberra.
- ◆ A liquid scintillation counter, LSC-TDCR, realized with the contribution of the LNHB-France and RC-Poland.
- ◆ A gamma-gamma coincidence detection block, provided with two thin NaI(Tl) detectors for the standardization of radionuclides, such as ^{125}I , is under construction

- **Installations for relative (indirect) standardization:**
 - ◆ A well-type ionization chamber, CENTRONIC IG12/20A, calibrated for gamma emitters;
 - ◆ A large area multiwire, sealed proportional counter for surface alpha and beta sources calibration;
 - ◆ Two gamma spectrometry systems with HPGe and GeLi detectors
- **A Mettler M5 microanalytical and an analytical balances, equipment for preparation of VYNS golded films, and sealed sources.**

3.3 Personnel:

5 permanent and 2 associate members. 4 PhD, 1 PhD student, 1 Scientific researcher, 1 technician

4. Main research areas:

4.1 In the preparation of sources:

- ◆ Preparation of radioactive solutions;
- ◆ Preparation of point and large area beta sources for the calibration of contaminometers;
- ◆ Preparation of point and volume gamma solid standard sources, with matrices: water equivalent, soil, zeolite;
- ◆ Preparation of sources for absolute standardization.

4.2 In the absolute standardization:

- ◆ The development of the $4\pi\text{PC}-\gamma$ coincidence method was concentrated in the following directions:(i) Corrections for the dead time and coincidence resolution time;(ii) Measurement of beta-gamma and electron capture-gamma, with no transitions to the ground level, by the efficiency extrapolation, with the accomplishment of linearity conditions;(iii) Use of the efficiency tracer for the pure beta emitters and efficiency extrapolation for emitters with high probability transition to the ground level (triangular decay scheme).
- ◆ The LSC-TDCR method was used for the measurement of nuclides such as: H-3, C-14, P-32, Ni-63, Sr-89, Tl-204, Am-241, Cs-137.

4.3 In the relative measurements:

- ◆ In gamma spectrometry:(i) Use of the coincidence and Compton suppression anticoincidence for the low level activity measurements;(ii) Study of the decay scheme for the nuclide Zn-65;(iii) Studies on the shape of the background in the total absorption peaks.
- ◆ Calibration of the equipment used for relative measurements

4.4 In the assurance of traceability: Organization of national comparisons for the measurement of environmental samples and for radiopharmaceuticals activity measurement

The list of the 6- year recent papers is presented on the Data Base of CIPM-CCRI(II).

5. International affiliation and international activities

5.1 Affiliations

- ◆ Member of ICRM since 1980, member of the CIPM-CCRI(II) since 2004, member of EUROMET since 2004.
- ◆ Member of the EC-Center of Excellence InterDisciplinary Research and Applications Based on Nuclear and Atomic Physics (IDRANAP), IFIN-HH, WP7, Radionuclide Metrology, 2001-2004

5.2 Bilateral collaboration:

- ◆ With LNHB-France, since 1993
- ◆ Common calibration of the CENTRONIC Ionization Chamber at PTB-Germany, in 2001

5.3 International Comparisons

- ◆ Participation in CIPM, SIR, EUROMET, key comparisons, since 1962; at present IFIN is presented on the CIPM-MRA Data Base, Annex B, with 19 results.
- ◆ Participation in comparisons of low level activity measurements, organized by IAEA, (2000 and 2001), and NPL-UK (1995 and 2004)
- ◆ Participation at 7 comparisons of standard solutions between East European countries, 1978-1989
- ◆ Bilateral comparisons with LNHB-France.

5.4 Situation of CMCs and implementation of the Quality System

- ◆ A number of 21 CMCs, for mononuclide solutions and standard sources, prepared from radionuclides verified in key or bilateral comparisons, were elaborated and sent to the (IR –TC) of EUROMET
- ◆ The Quality System of the IFIN- Ionizing Radiations Metrology Laboratory, including also the QS of RML, according to the ISO/IEC 17025-2000, was presented at the EUROMET QS-Forum 12, Bucharest, Romania, 14-16 February, 2005

5.5 Presentation of papers at International Conferences

- ◆ The ICRM Conferences, starting with the 1972 Summer School: 23 papers; ICRM, Low Level Measurement Symposia: 3 papers
- ◆ Other Conferences: IRPA 9 Congress, Vienna, 1996, 2 papers; EC-IDRANAP-HIPAN-2 Conf. Neptun, Romania, 2002: 6 papers; “Tritium Science and Technology” Conference Baden- Baden, Germany, 2004: 1paper, EC-JRC-IRMM, NEMEA-2, Conf., Bucharest, 2004: 1paper, Regional, Balkan Conferences: 6 papers