



International Committee for Radionuclide Metrology (ICRM)
Gamma-Ray Spectrometry Working Group (GSWG)

Recent gamma-ray spectrometry measurements at IFIN-HH / Radionuclide Metrology Laboratory

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IFIN-HH/ Radionuclide Metrology Laboratory (LMR)

- Primary laboratory for activity standardization
- Attested National Standard for the unit of measurement of the quantity Activity (of a radionuclide) - Bq
- Accredited metrology services for customers, according to ISO 17025:2005: preparation and calibration of radioactive sources, calibration of the equipment used for activity measurements, testing of radioactive materials by high resolution gamma-ray spectrometry (especially NORM)
- IFIN-HH: Associated member (Designated Institute) at EURAMET (TC-IR), Designated Institute for IR metrology by the CIPM-MRA, member of CIPM – CCRI(II) – Radionuclide Measurements, member of the ICRM and DDEP; Bilateral cooperation with CEA/LNE-LNHB (Laboratoire National Henri Becquerel), Saclay, Franta (Protocole for the period 2015-2020)

Gamma-ray spectrometry equipment

- **One coaxial HPGe detector** (relative efficiency 29%; FWHM: 1.72 keV at 1332 keV and 0.84 keV at 122 keV; peak-to-Compton ratio: 62:1) with a γ -ray digital analyzer, graded shielding made of lead (10 cm thick), tin and copper (1 mm thick each), computer with specific software for gamma-ray spectrometry.
- **One NaI(Tl) detector** which is used mainly for relative standardization of radioactive sources
- **One Si(Li) detector used for X-ray spectrometry and also for low energy gamma-ray spectrometry**



Supplementary international comparison CCRI(II)-S13: Measurement of an activity per unit mass of Cs-134 and Cs-137 in wheat flour

- Pilot institute: NMIJ & National Food Research Institute (Japan)
- Wheat harvested in 2011, just after the accident of Fukushima Daiichi nuclear power plant.
- Total activity (Cs-134 and Cs-137) of about 10 Bq / sample
- IFIN-HH/Radionuclide Metrology Laboratory (LMR) received 3 similar samples (about 81 g wet mass each) in early May 2018 and will report the activity per dry mass for each radionuclide and the relative humidity (%)

- One sample was measured in the underground laboratory Micro Bq, situated in a salt mine from Slanic-Prahova, Romania (dr. Romulus Margineanu)
- The participation is important to assure the traceability of the national activity measurements for food products, done within the network of sanitary-veterinary and food safety laboratories. The samples will be used for local comparisons with other laboratories.

IFA Romania – CEA France joint research project no. C5-09/2016

- CEA/LNE-LNHB (France) and IFIN-HH/DRMR/LMR (Romania) are participating in the project IFA-CEA no. C5-09/2016 (3 years period):

“Metrology research for the standardization of some pharmaceutical and public health interest radionuclides, to ensure radioprotection in hospitals, homes and working places”

In 2018:

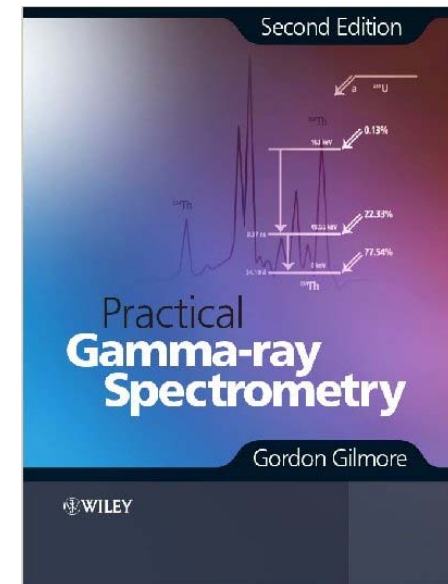
LNHB is performing the experimental study of **Ra-223** (α -particle emitter, 11.43(3) days half-life): activity standardization (absolute) and measurement of nuclear decay data, such as half-life and emission intensities for gamma- and X-rays, impurities determination by gamma-ray spectrometry;

LMR will undertake a similar study for **Zr-89** (PET diagnostic radionuclide, 78.42(13) hours half-life);

A common Workshop is foreseen at LNHB, early November 2018.

BOOKS for young gamma-ray spectrometrists

- K. Debertin and R.G. Helmer, “**Gamma- and X-ray spectrometry with semiconductor detectors**”, Elsevier Science Publishers B.V., Amsterdam, 1988.
- G. Gilmore and J. Hemingway, “**Practical gamma-ray spectrometry**”, John Wiley & Sons Ltd., Chichester, England, 1995.
- **G. Gilmore, “Practical gamma-ray spectrometry”, 2nd Edition, John Wiley & Sons Ltd., 2008**
<http://www.gammaspectrometry.co.uk/>
- Klenn F. Knoll, “**Radiation detection and measurement**”, 4th Ed., John Wiley & Sons Inc., USA, 2010.



- **We are open to new collaborations, especially in the frame of European and international research projects (EURAMET-EMPIR, IAEA, Horizon 2020 etc.)**

<http://www.nipne.ro/>

<http://www.eli-np.ro/>



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Thank you for your attention!
Merci beaucoup!