

**ICRM GSWG**

## **Action report of the ICRM Gamma Spectrometry Working Group**

One of the objectives of the GSWG is to disseminate knowledge to end-users through various exercises that provide practical information that is regularly posted on a dedicated web page. Since the last ICRM general meeting, on-going action on Monte Carlo simulation continued and a new exercise dedicated to the detection limits has started. The contact between the participants was maintained (the information is distributed to an email list of 180 people), in particular through an intermediate meeting, which was held in late 2020.

More information is available at [http://www.lnhb.fr/icrm\\_gs\\_wg/](http://www.lnhb.fr/icrm_gs_wg/).

### **Intermediate meeting**

This first “virtual meeting” of the ICRM "Gamma Spectrometry" working group was held on October 29-30, 2020 and brought together more than 70 on-line participants.

The meeting was divided into two 3-hour sessions (from 13:00 to 16:00 CET) to allow colleagues from outside Europe to actively participate.

The agenda of meeting (see annex 1) included seven contributed talks, status on the on-going action (Benchmark for Monte Carlo simulation applied to coincidence summing corrective factors) and time dedicated to topics of interest (calculation of detection limits according to ISO11929 and self-attenuation in the low-energy range).

The last part of the meeting took the form of a general discussion in order to identify several topics of interest for future studies/exercises, and identify potential contributors. These topics are:

1. Angular correlations in coincidence summing,
2. Reference spectra
3. Self-attenuation
4. Detection limits

Thanks to the kind authorization of speakers, most of the presentations are made available on the ICRM/GSWG website: [http://www.lnhb.fr/icrm\\_gs\\_wg/](http://www.lnhb.fr/icrm_gs_wg/)



Participants in the intermediate meeting

## Benchmark for Monte Carlo simulation

This action was launched to provide a benchmark for several MC software used in gamma-ray spectrometry, for selected detector-source cases. The examples are based on simple geometries, two types of germanium detectors and four kinds of sources, to mimic eight typical measurement conditions. The action outputs (input files and efficiency calculation results, including practical recommendations for new users) should be made available for users.

The first part of the exercise was dedicated to the calculation of detection efficiency (full energy peak efficiency and the total efficiency). The summary of the results was presented during the ICRM2019 conference and has been published (Lépy et al., 2020). A full report including the exhaustive series of results and comparisons obtained during the study has been prepared. The publishing way is not yet defined (at least LNHb internal report, or better, ICRM special issue?)

The second part of the exercise concerns the calculation of coincidence summing correction, for the same geometrical conditions. Four radionuclides ( $^{22}\text{Na}$ ,  $^{60}\text{Co}$ ,  $^{133}\text{Ba}$ , and  $^{134}\text{Cs}$ ) are considered. A first set of results (22 data sets from 16 participating laboratories) have been obtained and presented during the October intermediate meeting. Another dedicated meeting (19 attendees) to specifically discuss about this exercise was held on December 7, 2020 and the minutes have been distributed to the

participants. Complementary calculations with harmonized simulation conditions are required to clarify the results and better understand some discrepancies. The next working meeting is expected to be held in the summer of 2021.

## Detection limits / ISO 11929

This new action was launched during the intermediate meeting. Several participants wishes to clarify the application of ISO 11929, in order to provide simple explanation for users when the need to report detection limits or decision thresholds.

The action is leaded by Milton VAN ROOY (NIMSA) and a first meeting was held on January 29, 2021. Test spectra prepared by Margarita HERRANTZ and Raquel IDOETA (Universidad del País Vasco) have been distributed to the participants on late April and first results will be discussed in a next meeting.

## ICRM GSWG web page ([http://www.lnhb.fr/icrm\\_gs\\_wg/](http://www.lnhb.fr/icrm_gs_wg/))

The ICRM GSWG web page is regularly updated with information on the recent activities of the group, report of the working meetings, as well as practical recommendations.



The Gamma-Ray Spectrometry Working Group is devoted to the development of the metrological aspects of gamma-ray spectrometry and its applications. This includes, but is not restricted to: measurement techniques and equipment, determination of photon emission intensities, detector efficiency calibrations (including Monte Carlo methods), coincidence-summing corrections, uncertainties, correlations, new instrumentation, and X-ray spectrometry.



## Annex 1 : Intermediate meeting agenda

### Meeting of the ICRM Gamma Spectrometry Working Group

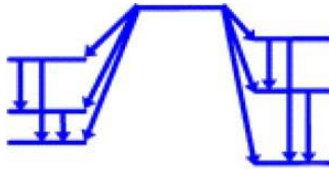
October 29-30, 2020 from 12:00 to 15:00 UTC (13:00 to 16:00 CET)

### FINAL AGENDA October 29<sup>th</sup>

(Time in CET – UTC +1)

#### October 29<sup>th</sup>:

- 12:30 - 13:00            *Tests for access to the webconference*
- 13:00 - 13:10            *Welcome and workshop objectives (Marie-Christine Lépy, LNHB)*
- 13:10 - 14:00    Contributed talks**
- 13:10 - 13:30            *General presentation of angular correlations in gamma-ray spectrometry (Octavian Sima, University of Bucharest & IFIN-HH Bucharest)*
- 13:30- 13:45            *New features of the peak fitting software COLEGRAM (Yves Ménesguen, LNHB)*
- 13:45 - 14:00            *New features of the radionuclide decay database LARA (Christophe Dulieu, LNHB)*
- 14:00 - 15:00    Discussion on detection limits – Application of ISO 11929**  
*(Moderator: Mikael Hult, EC-JRC)*
- 14:00 - 14:15            *Introduction presentation (Michael Bruggeman, SCK-CEN) – examples*
- 14:15 - 15:00            *General discussion (all participants)*
- 15:00 - 16: 00    Implementation of density corrections**
- 15:00 - 15:15            *Cutshall transmission method of the self-attenuation correction determination - a method outline and its Monte Carlo validation (Pawel Jodlowsky, University Krakow)*
- 15:15 - 16:00            *Share experience of participants*



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**FINAL AGENDA October 29<sup>th</sup>**  
(Time in CET – UTC +1)

**October 30<sup>th</sup>:**

12:45 - 13:00            *Tests for access to the webconference*

**13:00 - 14:10    Benchmark on coincidence summing**

13:00 – 13:10            Introduction/ presentation of the on-going exercise (*M.-C. Lépy*)

13:10 - 14:00            Presentation of results by code (5 minutes)

13:10 - 13:15                       EFFTRAN (*Tim Vidmar, SCK-CEN*)

13:15 – 13:20                       EGS (*Rapahel Galea, NRC*)

13:20 – 13:25                       GESPECOR (*Octavian Sima*)

13:25 - 13:30                       GEANT (*Cheick Thiam, LNHB*)

13:30 - 13:35                       PENELOPE (*Iason Mitsios, NTUA*)

13:35 - 13:40                       MCNP (*Thien-Thanh Tran, VNUHCM-University of Science*)

13:40 - 14:10            Summary and discussion – further step(s) (all participants)

14:10 – 14:20            *Short break*

**14:20 - 15:05    Contributed talks**

14:20 - 14:35            Modeling of inactive layers for p-type detectors (*Henrik Persson, Mirion technologies*)

14:35 - 14:50            Self-evaluation of coincidence summing factor of radionuclides using MCNP-CP and PENNUC codes (*Thien-Thanh Tran*)

14:50 - 15:05            Effect of the uncertainty of decay data parameters (*Octavian Sima*)

15:05 - 15:20            New <sup>166</sup>Ho gamma emission intensities by high-energy-resolution and well-calibrated HPGe detector  
(*Marco Capogni, ENEA*)

**15:20 - 16:00    Proposal of new actions - Discussion (all participants)**