

**ICRM Gamma-Ray Spectrometry Working Group  
Cape Town (South Africa) September 4<sup>th</sup>, 2007**

The Gamma Spectrometry Working Group meeting was held on Tuesday morning. About 50 participants attended the meeting; the list of participants is presented in Appendix 1. The proposed agenda was as follows:

- WG activity report (10')
- Short presentations (35')
- New proposals and discussion – AOB (10')

**1. WG activity report**

Following the 2005 ICRM conference, an interest enquiry about future ICRM actions got 13 replies as shown hereafter.

Interest	Monte Carlo	Web site Forum	Uncertainties	Coincidence summing	New detectors	Signal processing	Beta particle	X-Ray Spectrometry
High	9	6	7	10	1	2	0	4
Medium	1	6	3	3	6	7	8	6
Low	2	1	3	0	5	3	4	3

This result underlines the interest for the two projects that were proposed during ICRM 2005 WG meeting and are now standing.

**1.1 Comparison of Monte Carlo codes for efficiency calibration**

The Monte Carlo action, leaded by Tim Vidmar, started on January 2006. The participants were asked to run Monte Carlo codes to compute full energy peak and total efficiencies for three simple sample-germanium detector geometries, for a list of energies from 45 keV to 3 MeV. The dead line for the first series of results was June 30<sup>th</sup>, 2006.

Eighteen laboratories are participating (28 people involved) in the action and six different Monte Carlo codes are used: five generalist codes (MCNP, GEANT, PENELOPE, EGS, TRIPOLI) and one specific (GESPECOR); some participants used several codes.

A 2-days meeting of the working group with sixteen participants was held in Paris, on November 26-27<sup>th</sup>, 2006; the main goal of the meeting was to examine the results obtained during the first step of the Monte Carlo exercise and to discuss about further developments. Tim Vidmar presented the whole set of results, according to the codes used. Contrarily to what was expected, rather spread results were observed (except for geometry #1). However, relative results (example ratios from geometry 3 to geometry 2) show less discrepant results. These *a priori* not satisfactory results were discussed and some clues were given to try to explain the differences (cross sections, efficiency definitions, size of the bins used,). It was decided to perform further calculations for geometries 2 and 3 for a reduced list of energies, employing a well defined set of control parameters for each code and a precise definition of the full energy peak. It was also agreed that no variance reduction techniques should be applied in this second run of calculations.

The full report of this meeting is included in the ICRM GS Web page (see §1.2): [http://www.nucleide.org/ICRM\\_GSWG/GSWG\\_actions.htm](http://www.nucleide.org/ICRM_GSWG/GSWG_actions.htm)

Tim Vidmar had an oral presentation of these results during the Gamma Spectrometry session (paper O-5), entitled "An intercomparison of Monte Carlo codes used in gamma-ray spectrometry". The next step will compare the sets of cross sections used in the different codes to check whether this could explain the discrepancies.

## 1.2 GS WG Web site and forum

A web page dedicated to the Gamma Spectrometry WG is hosted by LNHB at the address: [http://www.nucleide.org/ICRM\\_GSWG.htm](http://www.nucleide.org/ICRM_GSWG.htm)

In parallel, a link on the ICRM main site hosted by NIST was also created

([http://physics.nist.gov/Divisions/Div846/ICRM/working\\_groups.html#GSWG](http://physics.nist.gov/Divisions/Div846/ICRM/working_groups.html#GSWG))

This should be the place to provide information about gamma-ray spectrometry technique. Up-to-now, the page includes the following items:

1. *Main Page*
  - Working Group purpose
  - Gamma-Ray Spectrometry Working Group Meeting
  - Gamma-Ray Spectrometry Forum
  - Disclaimer
2. *Members and areas of interest*
3. *Working group action (s)*
  - GSWG Report
  - Monte Carlo action
4. *Useful links*
  - Working Group Web Pages and ICRM information
  - Metrological and other related Institutions
5. *Miscellaneous information*
  - Forthcoming events
6. *Practical information*
  - Basic bibliography
  - Nuclear decay database
  - Gamma-ray spectra

Marie-Christine Lépy reminds that this GSWG Web page is the site of the participants of the WG: each one is welcomed to include any useful information, to make any comment.

Some suggestions are given to improve the information:

- Add some bibliography
- Add some practical tricks
- Give a list of available software
- Link to other sites

Moreover, as requested by some members of the working group, a forum has been created since May 2006, at the address: [http://laraweb.free.fr/GRS\\_forum/](http://laraweb.free.fr/GRS_forum/)

On September 2007, the forum had 44 registered members, but our members posted only 25 mails. Thus, the question is « How make it fruitful? »

This forum was created with the initial goals:

- Development of exchanges between members of the WG
- Proposal for new actions to improve metrological quality of the results obtained by gamma-ray spectrometry

Now, it could be extended to the gamma spectrometry community to provide responses to practical questions. It is suggested to try to forward the address to collaborators, students ...

## 2. Short presentations

Three short presentations were given:

***Reliability of the peak analysis results*** by M. Korun

***GEANT4 Electromagnetic Physics Intercomparison*** by S. Hurtado

***Germanium detector as a true activity meter*** by A. Švec

### **3. New proposals**

Some topics for new actions for the period 2007-2009 were briefly proposed:

#### ***3.1 Further studies about Monte Carlo applied to efficiency***

As above mentioned, the Monte Carlo action is in progress, and is coordinated by Tim Vidmar. Once examined the cross section database, the exercise could be extended to « real » cases

- Compare the simulated efficiency to experimental results
- Compare simulated spectra to real spectra

#### ***3.2 Comparison of efficiency curves fitting***

This action is proposed mainly to assess the reliability of uncertainties and importance of covariances in the efficiency calibration curves.

This rather simple exercise should include three steps:

Input: a set of experimental data (energy, efficiency, uncertainty, covariances)

Using a curve fitting procedure

Output: fitted efficiency, associated uncertainties ...

A coordinator is required for this action.

#### ***3.3 Coincidence summing corrections***

This topic is of major interest for ICRM GSWG members and should be started. Different methods (numerical computation, Monte Carlo simulation, empirical methods...) are used to compute the corrective factors, and the difficulty of the exercise is to provide a set of data as required by the different methods.

Marie-Christine Lépy proposes to coordinate this action, unless any volunteer wishes to do it.

#### ***3.4 Efficiency calibration in the low-energy range***

There is a requirement of measurements in the low-energy range (Nuclear decay data session). However, the accuracy of our efficiency calibration curves is rather poor in the 80-120 keV energy range mainly because of the change of the curvature in this region.

Moreover, few available radionuclides for calibration and relevant emission intensities with high uncertainty

More reflection should be necessary about this important topic is important. A coordinator is welcome for this action.

### **4. Discussion and AOB**

There were no more proposals, and, due to the lack of time, the discussion was rather short. However, new actions could be initiated within the next two years, according to the participant's requirements or the emergence of new specific topic of interest. Proposals should include a project and a coordinator.

## Appendix 1 : List of participants

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