

GammaSem 2010:

Working Group on true coincidence summation corrections

Elisabeth Strålberg and Trygve Bjerk

Background

- Outcome of GammaSem 2009:
 - Several key issues for follow-up were identified and working groups (WG) for addressing the identified problems were established.
 - The identified topics will form the basis for the agenda of the next seminar in 2010.
 - At GammaSem 2010 the different working groups will be invited to present their ideas/solutions to the relevant problems.

Working Groups

- Uncertainties and detection limits
- *True coincidence summation corrections*
- Monte Carlo simulations and efficiency transfer
- Absorption (density corrections and geometries)
- Mobile gamma spectrometry systems
- Nuclear forensics (on special samples and special parts of the spectra)

Working group on TCC

- Members of the group:
 - IFE Kjeller
 - NRPA (Østerås and Tromsø)
 - RISØ DTU
 - SIS
 - IRSA
 - Ringhals NPP
 - FOI
 - OKG AB
- No plan or major goal for the WG was established at last GammaSem

Mini-questionnaire to all TCC WG members

- Do you use TCC in your lab?
 - If yes:
 - What software do you use?
 - What method do you use?
 - What is your experience in using this software/method?
 - If no:
 - What is your reason for not using TCC?
- What is your reason for joining this working group?
- What should be the primary goal for this working group?
- Any additional comments?

Mini-questionnaire - responses

- From 6 out of 9 labs:
 - 2 labs: No TCC
 - 1 lab: TCC only for ^{134}Cs
 - Empirical correction
 - 3 labs: TCC implemented
 - Own developed software
 - Gamma 83
 - Gamma 10

Plan for the TCC WG

- No plan was set up at last GammaSem
- Plan established by e-mail communication:
 - Describe when TCC is needed
 - How large error is produced if TCC is not used
 - Produce guidelines on how to use TCC (for users of the major softwares Genie and GammaVision)

How to achieve these goals

- Write a short “guidance” on when TCC is needed
→ *labs already using TCC*
- Test the TCC calibration procedure presented by IRSA on GammaSem 2009
→ *labs using GammaVision*
- Test the TCC calibration for Genie
→ *labs using Genie*
- Intercomparison test, with and without TCC
→ *all labs in TCC working group*

Results

- Information on use of TCC has been compiled by IRSA
- Some tests on TCC in GammaVision has been done at IFE
- Little or no response from the WG participants during the last year
- Not much outcome from the TCC WG



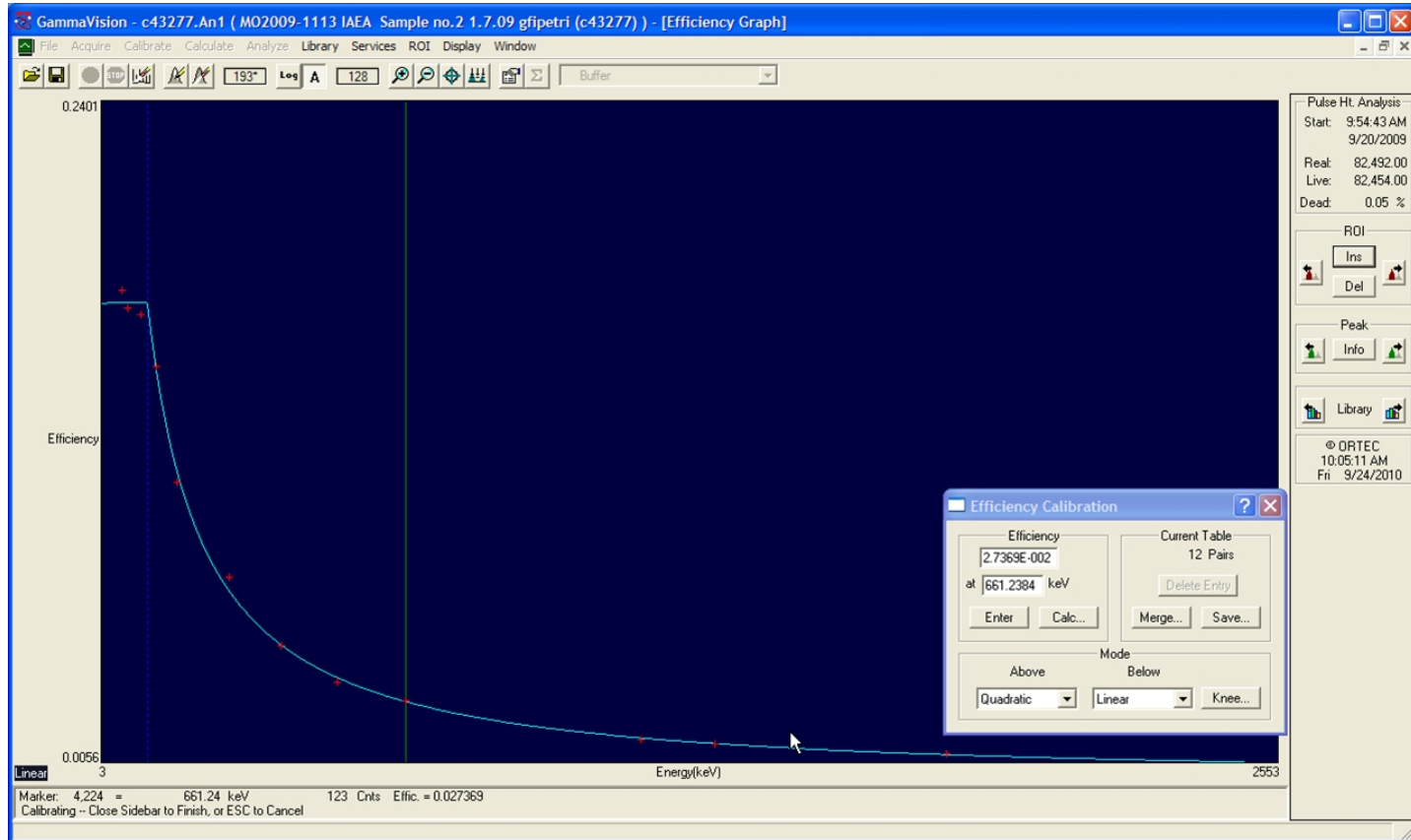
Input from IRSA

- Test use of GammaVision for TCC analysis of gamma spectra
- Ortec's recommended method for calibration used (although some problems identified).
- Using procedure in 2 NPL international intercomparison exercises with good results (100% score)
- Results presented at last GammaSem seminar
- An efficient platform for sharing experience missing

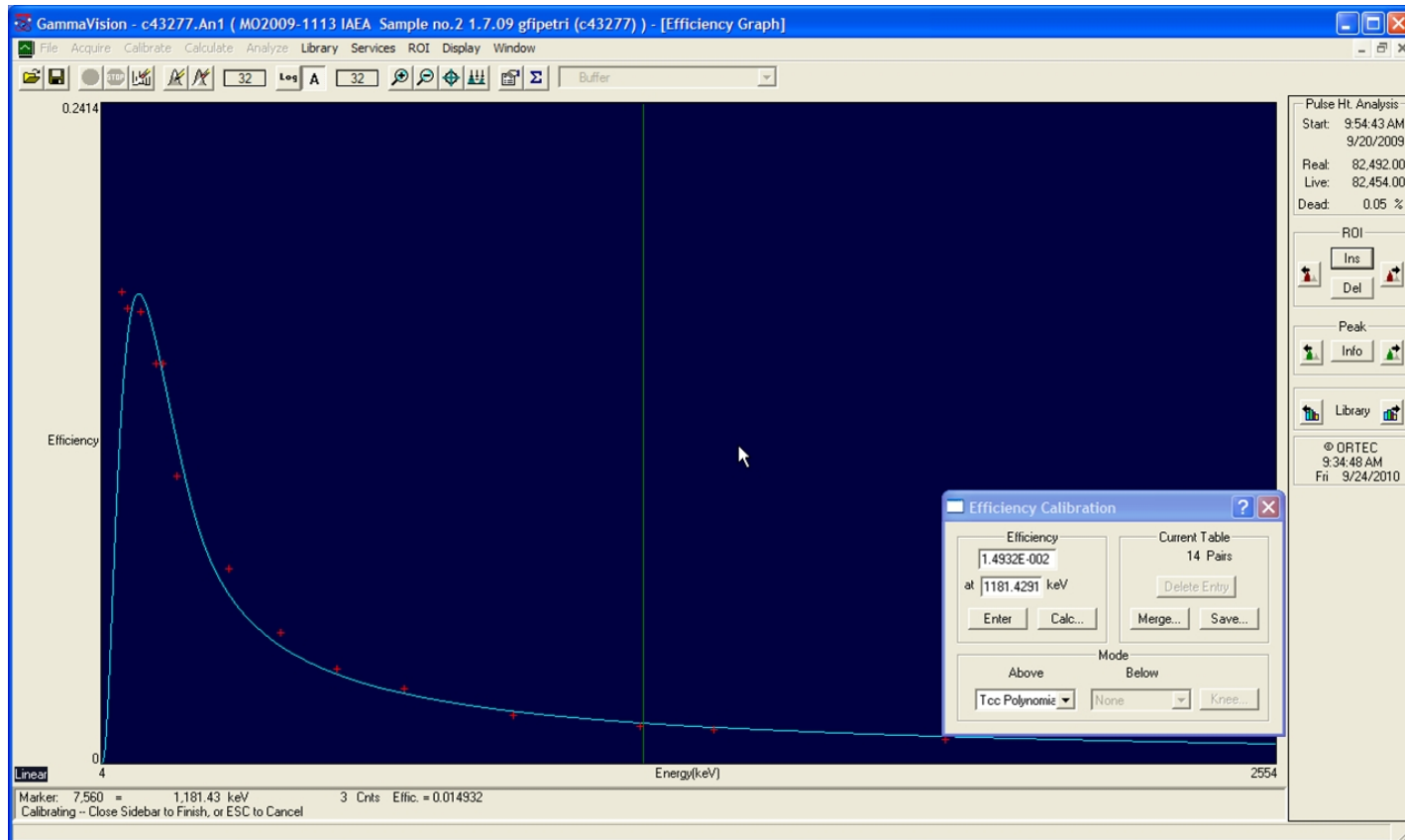
Input from IFE

- TCC calibration with GammaVision
- Used this to re-analyse ALMERA filter samples from 2009
- Comparison of results with and without TCC

Efficiency calibration without TCC



TCC efficiency calibration



TCC Calibration Wizard

- From GammaVision user manual:

“When the TCC calibration is performed, it includes recalculating the efficiency function, therefore, **the efficiency curve might not appear to be a good fit** to the experimental points. This is because the total efficiency function is the combination of all the different functions.”

- How can we know if the efficiency calibration is ok?

Results ^{57}Co , Bq/sample

	Without TCC (relative bias)	With TCC (relative bias)	Target value, IAEA
Sample 01	22,58 (24,07 %)	20,46 (12,42 %)	18,200
Sample 02	1,98 (22,96 %)	1,80 (11,56 %)	1,610
Sample 03	22,19 (21,92 %)	20,11 (10,47 %)	18,200

Results ^{134}Cs , Bq/sample

	Without TCC (relative bias)	With TCC (relative bias)	Target value, IAEA
Sample 01	16,74 (-8,68 %)	19,63 (7,08 %)	18,327
Sample 02	0,51 (2,02 %)	0,62 (24,63 %)	0,499
Sample 03	16,53 (-9,82 %)	19,50 (6,41 %)	18,327

Results ^{137}Cs , Bq/sample

	Without TCC (relative bias)	With TCC (relative bias)	Target value, IAEA
Sample 01	52,47 (9,29 %)	55,69 (15,99 %)	48,010
Sample 02	0,57 (14,23 %)	0,58 (16,21 %)	0,499
Sample 03	52,49 (9,33 %)	55,71 (16,04 %)	48,010

Results ^{152}Eu , Bq/sample

	Without TCC (relative bias)	With TCC (relative bias)	Target value, IAEA
Sample 01	40,28 (0,03 %)	48,357 (20,08 %)	40,269
Sample 02	1,14 (7,2 %)	1,40 (31,67 %)	1,060
Sample 03	40,05 (-0,56 %)	47,74 (18,56 %)	40,269

Analysis of ^{152}Eu

- GammaVision insisted of using the 40,12 keV line when calculating the activity
- Not possible to exclude this or other low energy lines from the library
- Solution: Set energy range for analysis to > 50 keV.

Results ^{241}Am , Bq/sample

	Without TCC (relative bias)	With TCC (relative bias)	Target value, IAEA
Sample 01	61,0 (17,53 %)	65,9 (27,05 %)	51,900
Sample 02	1,92 (21,60 %)	2,08 (31,52 %)	1,579
Sample 03	60,1 (15,80 %)	64,9 (25,14 %)	51,900

TCC and libraries

- Problem: 1-2 years ago we spent a lot of time updating our library and chose <http://laraweb.free.fr/> (available from *Laboratoire National Henri Becquerel*) as our source.
- Using the TCC calibration in GammaVision forces us to use the *NuclideNavigator III* to create libraries.
- Can data from other sources be imported into this format to ensure traceability to the same source??

Courses

- IFE participated at the ALMERA workshop on coincidence summing and geometry correction in gamma ray spectrometry
- Report from the workshop presented yesterday

Courses ...

- Our plan was to attend an Ortec course on TCC in USA
 - Too few participants → course cancelled
 - → No input from the course on GammaSem
- This is the only advanced course that includes TCC offered by Ortec. Why so little response?
- **What about arranging a course in Scandinavia?**

Problems with the WG concept

- No plan for the WG was set up at GammaSem 2009
- Confusion on what the WG should achieve
- Most members signed up because they wanted to learn more about TCC
- No funding available for the WG → all results to be achieved by communication by e-mail only

Lessons learned

- A *plan* or at least the *primary goal* for the WG should have been established at GammaSem 2009
- The WG should have applied for *funding* from the NKS to accomplish the goals
- The funding could have been used for arranging at least one *project meeting / workshop / seminar ...*



Thank you for your attention!