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## GammaRay X Proceedings: Webinar for users of gamma ray spectrometry

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## **Abstract**

A two-day webinar for users of gamma ray spectrometry was arranged in 20-21<sup>th</sup> October 2021. Around 90 participants from 11 countries were present in the webinar, which was one of the most popular NKS events ever. The total number of presentations was 29. Four internationally recognized experts were invited to give lectures. The GammaRay X activity also included intercomparison samples and intercomparison spectra. Positive feedback was received from the participant questionnaire.

## **Key words**

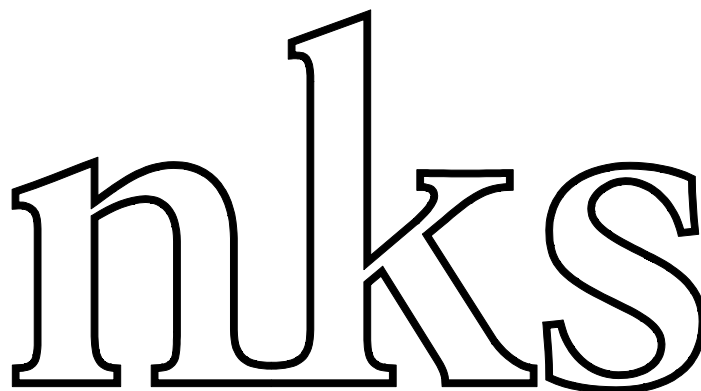
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# GammaRay X Proceedings

Webinar for users of gamma ray spectrometry

Helsinki, Finland,  
20-21 October 2021



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## Introduction

The GammaRay X activity addresses issues relevant to users of gamma ray spectrometry in the Nordic countries and includes a webinar on gamma spectrometry and intercomparison exercises. The scope of the activity was broad allowing a range of topics to be addressed. High-level internationally recognized experts were invited to give talks on selected topics and challenges in gamma-ray spectrometry.

The series of NKS-funded gamma ray seminars started at 2009. The Roman numeral X in the title of the present activity refers to the tenth event in the series of the seminars. The GammaRay X seminar was originally planned to be held at 2020, but because of the corona pandemia the main event was postponed to 2021. In addition, because of still ongoing restrictions, no on-site seminar could be organized. Instead, the GammaRay X webinar was arranged.

## GammaRay X

Around 90 participants from 11 countries were present in the webinar, see Appendix 1. This means that the activity was one of the most popular NKS events. The participants were from universities, research institutions, industry and authorities. The number of the presentations was 29, see Appendix 2. The presentations are available at the GammaWiki web site.

The intercomparison exercises included laboratory measurements of physical samples and their analysis as well as analyses of exercise spectra with associated information. Special attention in the webinar was given to the two NKS-financed events, i.e. the GammaRay activity and the RINFOR project in which a set of synthetic spectra of U and Pu materials were generated. Many projects closely linked with gamma-ray spectrometry have been NKS-financed during last years and their summaries were presented in the seminar.

According to the experience of the organizers and the participants there are notable differences between the traditional seminars and webinars. Social connections are limited in the case of a webinar, which is an evident drawback. However, webinars allow easy participation without travel costs, which may lead to the higher number of participants. From the point of view of the organizers special attention must be paid for viable technical issues such as web connections and workable software. In addition, it is important to follow the schedule of the program whereas seminars give more flexibility. Transfer of silent knowledge is one of the key issues, which makes seminars favourable compared to webinars.

At the end of the seminar, a panel discussion was arranged where invited lecturers discussed the following 3 themes (summary of the discussion is presented below each theme):

1. Gamma-ray spectrometry is a relatively mature technology used in many applications during the past decades. However, there is still room for improvement. In your opinion what are the main (technical) steps forward to be expected in the near future?

Summary of the discussion:

- Development towards specific applications and tailor-made solutions.
- Expanding from laboratory to on-site measurements and taking detectors outside.

- More use of Monte Carlo simulation tools.
  - Taking into account the sample chemical/elemental composition in analysis.
  - Implementation of list mode data acquisition and data processing.
2. Accreditation via ISO 17025 and other QA/QC activities are becoming more and more important in the future. Decision-makers need accurate and high-quality information. But are we qualified enough to perform analyses from challenging spectra e.g. in case of a nuclear incident or malicious use of radioactive material?

Inadequate training, lack of proper reference materials and non-optimal hardware/software are possible examples of defective quality systems. Do you identify gaps in the present-day gamma-ray spectrometry and how to overcome them?

Summary of the discussion:

- Thinking out-of-the-box when dealing with non-routine samples.
  - Providing training material and courses for laboratory staff. These should also include difficult cases.
  - Some reference materials are not easily accessible.
  - Knowledge sharing among experts.
  - Standardization is needed (for example data formats).
3. [http://www.nks.org/en/this\\_is\\_nks/](http://www.nks.org/en/this_is_nks/): "The NKS-B program is focusing on nuclear and radiological emergency preparedness, radioecology and environmental assessments and measurement strategies, technologies and quality assurance."

You have been participating in previous seminars where the focus have mainly been in laboratory measurements. In the present webinar we decided to enlarge the topics. How would you develop gamma-spectrometry-related NKS-B-events to maximize "competence building, experience exchange and networking"?

Summary of the discussion:

- Continue joint research programs.
- Training exercises and field events.
- Deeper cooperation between experts.
- Face-to-face meetings.
- Meet in smaller groups and discuss challenging topics in more detail. More hands-on work.
- Access to experts outside Nordic Countries.

An anonymous feedback questionnaire was prepared in order to improve possible future seminars. The participants' comments together with the questions are presented in Appendix 3. The overall feedback was, as in the case of previous seminars, very positive.

**Appendix 1 – List of participants\* of the GammaRay X webinar, October 20–21, 2021. Contact details are only for those persons who have registered 15<sup>th</sup> October at the latest.**

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**Appendix 2 – Webinar Programme.**

| <b>Wednesday, 20 October 2021</b>                    |                  |                               |  |
|--|------------------|-------------------------------|--|
| <b>Start (UTC)</b>                                   | <b>End (UTC)</b> | <b>Speaker</b>                | <b>Title</b>   |
| <b>Opening session</b>                               |                  |                               |  |
| 7:00   | 7:10             | Roy Pöllänen, STUK            | Opening and general information  |
| 7:10   | 7:40             | Mark Dowdall, DSA             | <b>Invited lecture:</b> A Wide Spectrum: NKS Gamma Spectrometry Activities Over Two Decades      |
| 7:40   | 8:25             | Marie-Christine Lépy, CEA     | <b>Invited lecture:</b> Focus on measurements and corrective factors of low-energy X- and gamma- |
| 8:25   | 8:45             | -                             | Break  |
| <b>Detection limits &amp; coincidence correction</b> |                  |                               |  |
| 8:45   | 9:05             | Henrik Ramebäck, FOI          | Recent work on detection limits in gamma ray spectrometry  |
| 9:05   | 9:15             | Tim Vidmar, SCK CEN           | Validation of EFFTRAN for TCS corrections  |
| 9:15   | 9:35             | Henrik Ramebäck, FOI          | Interlaboratory comparison (ILC) on simulated air filter   |
| 9:35   | 10:30            | -                             | Lunch break  |
| <b>Uncertainties &amp; efficiencies</b>              |                  |                               |  |
| 10:30  | 11:15            | Alexander Muring, IFE         | <b>Invited lecture:</b> Estimating measurement uncertainties when the normal GUM approach fails  |
| 11:15  | 11:35            | Marc Breidenbach, AMETEK GmbH | Optimizing the detector model to improve the overall quality of efficiency transfer calculations |
| 11:35  | 11:50            | Roy Pöllänen, STUK            | Renewal of efficiency calibrations in STUK   |
| 11:50  | 12:10            | -                             | Break  |
| <b>Equipment &amp; development</b>                   |                  |                               |  |
| 12:10  | 12:30            | Riina Virta, HIP              | Passive Gamma Emission Tomography (PGET) for verifying spent nuclear fuel                        |
| 12:30  | 12:45            | Leen Verheyen, SCK CEN        | Automatic liquid nitrogen filling system in the gamma ray spectroscopy lab                       |
| 12:45  | 13:05            | Sakari Ihantola, STUK         | Novel Detector for Finnish Early Warning Network   |
| 13:05  | 13:20            | -                             | Break  |
| 13:20  | 13:30            | Jani Turunen, STUK            | Radical improvements to STUK's laboratory analysis capability                                    |
| 13:30  | 13:45            | Hussam Badran, STUK           | Non-destructive sample analysis using coincidence technique with the upgraded PANDA device       |
| 13:45  | 14:00            | Timo Hilden, STUK             | New multi-detector coincidence devices at STUK   |

| <b>Thursday, 21 October 2021</b>                              |                  |   |   |
|---|------------------|---|---|
| <b>Start (UTC)</b>  | <b>End (UTC)</b> | <b>Speaker</b>  | <b>Title</b>  |
| <b>Laboratory measurement and development</b>                 |                  |   |   |
| 7:00  | 7:15             | Sven Poul Nielsen, DTU                                | Update on gamma spectrometry at DTU Risø  |
| 7:15  | 7:25             | Satu Rautio, Loviisa NPP                              | Gamma measurements at Loviisa Power Plant   |
| 7:25  | 7:35             | Eric Dorval, VTT Technical Research Centre of Finland | An overview of gamma-spectrometry activities at VTT   |
| 7:35  | 7:55             | Nicola Markovic<br>Barsebäck Kraft AB                 | Source homogeneity assumption in object gamma spectrometry  |
| 7:55  | 8:05             | Julia Puputti, University of Oulu                     | Callio Lab – multidisciplinary underground research centre  |
| 8:05  | 8:20             | -   | Break   |
| <b>Field measurements, nuclear forensics and applications</b> |                  |   |   |
| 8:20  | 8:50             | Harri Toivonen, HT Nuclear                            | <b>Invited lecture:</b> Simulation of radiation in-field operations for training, exercises, and capability testing           |
| 8:50  | 9:20             | Mark Dowdall, DSA                                     | NKS RINFOR: Improvement of National Nuclear Forensics Gamma Spectrometric Core Capabilities                                   |
| 9:20  | 9:40             | Dieter Pauwels, Mirion                                | AEGIS Field Measurement   |
| 9:40  | 10:30            | -   | Lunch break   |
| <b>Applications, software</b>                                 |                  |   |   |
| 10:30   | 10:50            | Matti Kalliokoski<br>University of Helsinki           | Gamma-ray imaging with a GeGI device  |
| 10:50   | 11:10            | Joonas Tikkanen, STUK                                 | Fluence spectrum of an X-ray irradiator: How to obtain fluence from a measured spectrum with MC data                          |
| 11:10   | 11:20            | Mats Eriksson<br>University of Linköping              | On the use of principal component analysis, PCA, in gamma spectrometry  |
| 11:20   | 11:30            | Sigurður Emil Pálsson,<br>University of Iceland       | Using first responder gamma spectrometric software for teaching and emergency response  |
| 11:30   | 11:50            | -   | Break   |
| <b>NORM, nuclear fuel &amp; waste</b>                         |                  |   |   |
| 11:50   | 12:20            | Antti Kallio, STUK                                    | <b>Invited lecture:</b> Measurements supporting NORM-regulation in Finland  |
| 12:20   | 12:40            | Aleksandr Jermolajev, Ignalina NPP                    | Radiological characterization of radioactive waste and clearance of radioactive waste from regulatory control at Ignalina NPP |
| 12:40   | 12:50            | Thomas Bandur Aleksandersen & Anna Banel, IFE         | How IFE contributes to handle challenges associated with LSA waste and contamination?   |
| 12:50   | 13:10            | -   | Break   |
| <b>Webinar round up</b>                                       |                  |   |   |
| 13:10   | 13:40            | Invited lecturers<br>Facilitator Roy Pöllänen         | Panel discussion  |
| 13:40   | 13:50            | Roy Pöllänen, STUK                                    | Summary, webinar reporting, future gamma spectrometry meetings/seminars/webinars  |

### Appendix 3 – Participant feedback.

Average values of the answers are given for questions 2 – 4. In total 17 participants answered the questions.

## GammaRay X webinar 20.-21.10.2021 feedback

Participant anonymous feedback. Please answer following questions in order to improve future seminars.  
Item 1: you can insert free text and send it several times during the seminar. You will find the Send -button at the bottom of questionnaire.

1. Free text (for example: comments of the present webinar, suggestion of the future seminar topics/themes, etc.)

Kirjoita vastaus

2. Content of the webinar program (on a scale 1-5, 1=poor and 5=excellent)

1  
 2  
 3  
 4  
 5

Average value of the answers: 4.3

3. Presentations should be more practical/theoretical (on a scale 1-5, 1=practical and 5=theoretical)

1  
 2  
 3  
 4  
 5

Average value of the answers: 3.1

4. Was the webinar useful (on a scale 1-5, 1=not at all and 5=very useful)

1

2

3

4

5

Average value of the answers: 4.4

5. If you did not participated the ILC, what was the reason?

Kirjoita vastaus

6. What kind of exercises/events would you like to see next time?

Kirjoita vastaus

Following free-text comments were given by the participants for question 1:

- Feedback concerning invited lecturer X.X [name removed]: I think this presentation was first one today that had since in it. Ig it was more clear with pictures, examples and good talking. A bit too fast for my taste. Would be pleasure to hear him lecturing more with time.
- I really enjoyed the seminar. A nice spread of topics. I understand the difficulties in filling up seminars with speakers when the topic is narrow but some specific seminars on a topic like Monte Carlo or whatever could be nice.
- As a first-first time participant, I was very positively surprised by the quality of the works presented. The topics of the seminar were just adequate for somebody who has been working on gamma spectroscopy "in isolation". I think there was a good balance between theory and practice/implementation.
- Everything was good - only too little time sometimes for discussions.
- Webseminar is very well organized, thanks to technical organization personnel!
- Thanks for a good seminar. Many very interesting topics discussed. But why was there no discussion about the exercise spectra?
- Very nice seminar in total!
- "This was my fourth gamma seminar, first in webinar form. Although generally quality of lectures was very high, personal interaction part was really missing

compared to the previous live seminars. But I would say it was a success, very well organised. Thank you!"

- "Another excellent NKS-B seminar on gamma spectrometry. It might have been better and enjoyable by meeting face to face but then the number of participants would probably have been much smaller. The topics were broad but all interesting and relevant. The two types of exercises were interesting and challenging and should certainly be continued at future gamma seminars. Important that the seminars appear attractive to newcomers in gamma spectrometry."
- It was a very nice and interesting webinar, off course in our institute I have a gamma lab under controlled conditions and other people do the in-situ measurements. I think for them this would be even more interesting. So, it depends a bit on the main subjects of the seminar.

Following free-text comments were given by the participants for question 5:

- My colleagues do. It is not my responsibility.
- My colleagues do so...
- We did not have time.
- Hard to answer. Probably do not have time and freedom to do at work what I would like to (as for example participate in ILC).
- I/we did participate in both exercises

Following free-text comments were given by the participants for question 6:

- Everything relevant upto organizers.
- Complex spectra exercises simply for the challenge
- As with the RINFOR exercise, I like to get unusual (fresh fallout etc) or complicated spectra (eg NORM in disequilibrium) etc as exercises!
- Continue with the same format but live (+ lab visit).
- Both kinds of exercises, measuring real samples and analyzing synthetic spectra are useful and valuable. Perhaps consider including more simple exercises suitable for those with little prior experience in the field, in order to serve as training exercises for newcomers.
- "I thought this exercise was already very interesting, I will look next week into detail why I didn't reported the Eu-155 and other radionuclides, because I saw already that I could see them, and all data for them were okay. It seems I was focused on the 4 main radionuclides, but I don't remember why... sometimes PT's need to be done between other work, so maybe that was the reason, but still strange. For the future I have no specific requests at the moment."
- Something like what Alexander Mauring suggested in the panel discussion, i.e. a group exercise on an analysis problem.

**Bibliographic Data Sheet****NKS-452**

|                                  |   |
|----------------------------------|---|
| Title                            | GammaRay X Proceedings: Webinar for users of gamma ray spectrometry   |
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| No. of references                | -   |
| Abstract<br>max. 2000 characters | A two-day webinar for users of gamma ray spectrometry was arranged in 20-21 <sup>th</sup> October 2021. Around 90 participants from 11 countries were present in the webinar, which was one of the most popular NKS events ever. The total number of presentations was 29. Four internationally recognized experts were invited to give lectures. The GammaRay X activity also included intercomparison samples and intercomparison spectra. Positive feedback was received from the participant questionnaire. |
| Key words                        | Gamma ray spectrometry  |