

Overview of the NKS programs

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www.nks.org

NKS in short

NKS (Nordic Nuclear Safety Research) is a forum for Nordic cooperation, networking and competence maintenance/building in nuclear safety, including emergency preparedness.

NKS runs joint activities of interest to financing organisations and other end users producing seminars, exercises, scientific articles, technical reports and other types of reference material.

Two Programmes running activities: NKS-R (nuclear reactor safety, etc.) and NKS-B (nuclear/radiological emergency preparedness, etc.)

Financing and support comes from Nordic authorities, companies and other organisations. Annual call for proposals (mid-October)

Results should be practical and directly applicable for use by participating organisations in their decision making processes and information activities.

NKS financing organizations

Main financiers



Co-financiers



Requirements to receive NKS funding :

- Nordic collaboration, **R**: minimum of 2 Nordic countries involved;
B: minimum of 3 Nordic countries involved.
- Project costs, NKS funding maximum of 50 % of the total cost of the project - other 50 % from other sources.
- Maximum funding from NKS ~ 600 kDKK
- In the recent years **NKS-R** has funded 6 proposals/year and **NKS-B** has funded 7-8 proposals/year. Large variation between continued and new projects
- What do researches do in return of the NKS funding ?

REPORTS

The product of the NKS is information distributed free of charge

Big question:

- What kind of impact do the NKS reports get ?**

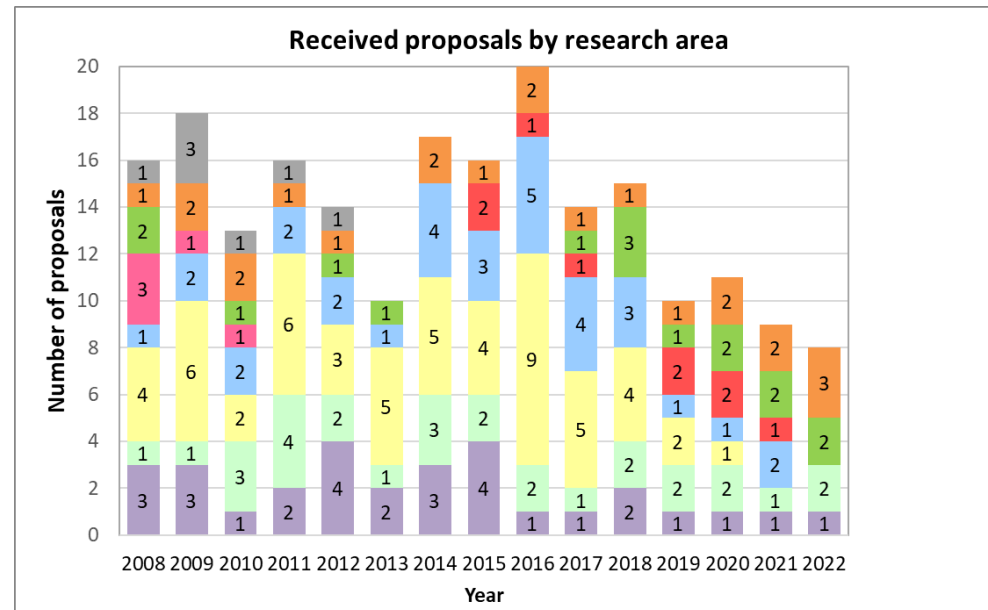
(Next slide shows the NKS-R projects and the reports that have been published after NKS 2019 seminar)

Acronym	Project	Report #	Published	Downloads by May 12th, 2022
NorDec II	Challenges and opportunities for improving Nordic nuclear decommissioning	NKS-417	6.2.2019	547
BREDA-RPV	Barsebäck as a Research and Development Platform, Extraction and Analysis of Service-aged and Irradiated Reactor Pressure Vessel Material	NKS-418	6.2.2019	741
SITRON	Site risk analysis for nuclear installations	NKS-419	13.2.2019	1386
SYNTAGMA	Synthetic ground motions to support the Fennoscandian GMPEs	NKS-424	11.4.2019	820
FIREBAN	Determination of Fire Barriers reliability for fire risk assessment of Nuclear Power Plants.	NKS-426	1.6.2019	1247
WRANC	Warm Pre-Stressing – Validation of the relevance of the main mechanisms behind Warm Pre-Stressing in assessment of nuclear components	NKS-427	7.10.2019	717
SPARC	Scenarios and Phenomena Affecting Risk of Containment Failure and Release Characteristics	NKS-428	23.10.2019	693
BREDA-RPV	Barsebäck as a Research and Development Platform, Extraction and Analysis of Service-aged and Irradiated Reactor Pressure Vessel Material; Summary of 2019 activities	NKS-431	11.2.2020	771
PROSAFE	Prolonged Available Time and Safe States	NKS-432	27.2.2020	711
COCOS	Corrosion of copper in sulphide containing environment: the role and properties of sulphide	NKS-434	14.4.2020	537
TETRA	Main Outcomes of the TETRA Project on Tellurium Chemistry in a Severe Accident	NKS-438	4.6.2020	430
THEOS	Thermal Hydraulic Phenomena of the Suppression Pool	NKS-439	16.6.2020	1157
SPARC	Scenarios and Phenomena Affecting Risk of Containment Failure and Release Characteristics	NKS-440	7.6.2020	571
BREDA-RPV	Barsebäck as a Research and Development Platform, Extraction and Analysis of Service-aged and Irradiated Reactor Pressure Vessel Material	NKS-443	23.2.2021	378
PROSAFE-2020	Prolonged Available Time and Safe States	NKS-444	23.2.2021	4471
POMMI	Towards high-fidelity fuel pellet fracture modelling in current and new fuel designs	NKS-445	19.3.2021	293
WPS-MAF	Report on design and results from experimental test program for material characterization	NKS-446	28.4.2021	321
COCOS	Corrosion of copper in sulphide containing environment: the role and properties of sulphide films – Annual report 2020	NKS-447	28.4.2021	232
THEOS	Thermal Hydraulic Phenomena of the Suppression Pool - Summary of 2020 activities	NKS-450	1.9.2021	189
BREDA 2021	Barsebäck as a Research and Development Platform, Extraction and Analysis of Service-aged and Irradiated Reactor Pressure Vessel Material	NKS-455	28.2.2022	74

NKS-R Program: programme areas and funding

Seven program areas:

- Decommissioning and management of nuclear waste
- Severe Accidents
- Reactor Physics
- Plant life management and extension
- Organisational issues and Safety culture
- Thermal hydraulics
- Risk analysis and probabilistic methods



Average funding per year: in
the region of 3.0-3.1 MDKK

NKS-R Program: The current situation

Call for Proposals 2022 was completed in February. After evaluation 6 proposals were funded with a total amount of 2987 kDKK and are currently running.

	Acronym	Full name	Start - end year	Research area
Continued	BREDA-RPV	Barsebäck RPV trepan studies	2016-23	Plant life management and extension
	STATUS	Source term and timing uncertainty in severe accidents	2021-23	Severe accidents
	WPS-MAF	Study of the margin against fracture for reactor pressure vessels subjected to pressurized thermal shock transients utilizing the warm pre stressing effect: Development of general probabilistic model for cleavage fracture, numerical implementation and experimental validation	2020-22	Plant life management and extension
New	FEMMA	Dissimilar metal welds studies	2022-24	Plant life management and extension
	ORTEF	Organic Telluride formation During a Severe Nuclear accident	2022-22	Severe accidents
	POSEIDON	Position-sensitive detectors for nuclear fuel imaging	2022-24	Decommissioning

NKS-B Program: work areas and funding

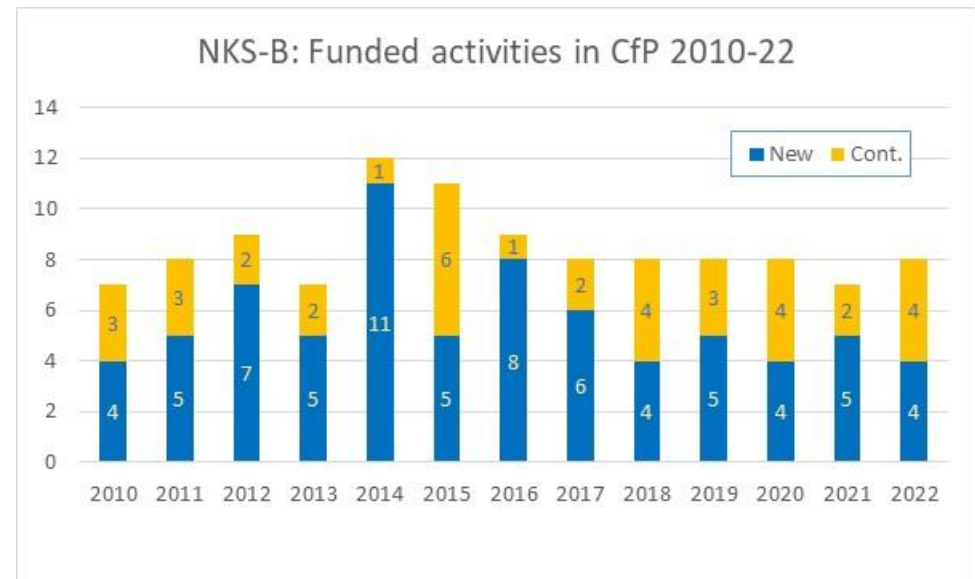
Three program areas:

E: Emergency Preparedness
(Radiological and Nuclear)

**M: Measurement Strategies,
Technologies and Quality
Assurance**

**R: Radioecology and
Environmental Assessments**

(often difficult to distinguish
from each other)



Average funding per year: in
the region of 3.3 MDKK

SLIM – *Source Localization by Inverse Methods* [DMI, NMI, DTU, SSM, DEMA, FMI, SMHI, STUK, PDC (2019-20)] – Jens Havskov Sørensen (DMI)

SOCHAOTIC - *Source Characterization Accounting for Meteorological Uncertainties* [DMI, NMI, DTU, SSM, DSA, DEMA, FMI, SMHI, STUK, PDC (2021-22)] – Jens Havskov Sørensen (DMI)

SHIELDMORC - *Detection distances and methods to locate orphan gamma radiation sources in shielded building geometries by mobile gamma spectrometry* [Lund U., SSM, DEMA, NGU, IRSA, STUK (2019-20)] – Christopher Rääf (Lund U.)

COMBMORC - *Combined analysis of primary and scattered components in mobile gamma spectrometric data for detection of materials out of regulatory control* – [Lund U., SSM, DEMA, DSA, NGU, IRSA, STUK (2019-20)] – Christopher Rääf (Lund U.)

NKS-B Program: activities 2019-21 (E)

CRESCENT – *Credible release scenarios for nuclear-powered vessels operating in Nordic waters* [DSA, SSM, DEMA, IRSA (2020)] – Øyvind Gjølme Selnæs (DSA)

NUCSEM - *Use of nuclear weapons towards a Nordic country: Scenarios, impact assessments and protective measures* [DSA, STUK, DEMA, IRSA (2020)] – Øyvind Gjølme Selnæs (DSA)

RNSARBOOK - *Nordic handbook for search and rescue in a maritime radiological/nuclear emergency* [DSA, JRCC-NN, IRSA, JRCC-DK, DEMA, FBG, NORD, ICG (2021)] – Øyvind Aas-Hansen (DSA)



Nuclear powered icebreakers at Murmansk (picture from RNSARBOOK handbook, 2021).

ECONORMS - *Radioecological transfer factors for Nordic subpopulations for assessment of internal committed dose from atmospheric fallout of radiocaesium* [Gothenb. U., Lund U., DSA, STUK (2019)] – Mats Isaksson (Gothenb. U.)

NANOD - *Natural radioactivity in the Nordic diet* [DSA, DTU, IRSA, Gothenburg U., STUK (2019)] – Mari Komperød (DSA)

ECOFOOD - *Adaptation of FDMT to the Nordic Conditions* [AF Consult, IRSA, STUK, DTU, DSA (2020)] – Rodolfo Avila (AF Consult)

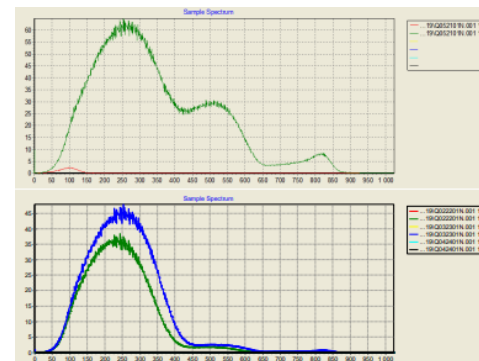
BIORAD - *Evaluation of the BIOaccumulation processes for a wide set of RADionuclides under accidental releases by biota* – [DSA, Frodsk. Føroya, VTT, Gothenb. U., IRSA (2021)] – Mikhail Iosjpe (DSA)

NKS-B Program: selected activities (M)

DTM-DECOM - *Intercomparison exercise in analysis of DTM in decommissioning waste* [VTT, Helsinki U., DTU, Cyclife, Fortum, IFE (2019-2021)] – Anumaija Leskinen (VTT)

OPTIMETHOD - *Optimization of analytical methods for simultaneous determination of important alpha emitting radionuclides in nuclear and environmental samples* [DTU, Forsmark, SKB, SSM, Chalmers U., Olkiluoto, Ringhals, Loviisa, Oskarsh., FOI, Cyclife, Helsinki U. (2019)] – Xiaolin Hou (DTU)

RAD-MERDE - *Radioanalytical Separation Method for Determining Pu, Am and Cm by alpha spectrometry - Method Expansion from Reactor water to Decommissioning and Environmental samples* [Helsinki U., DTU, Loviisa, STUK, SSM, IFE (2020)] – Susanna Salminen-Paatero (Helsinki U.)

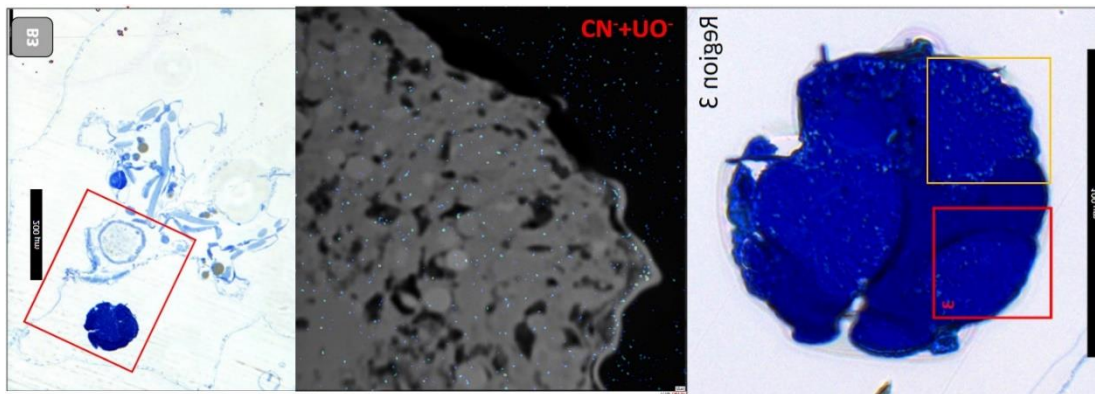


LSC spectra from DTM-DECOM report

NKS-B Program: selected activities (M)

ICP-BIODEC - *Application of Inductively Coupled Plasma Mass Spectrometry to Long-lived Actinides Measurements in Biological and Nuclear Decommissioning Samples* [DTI, FOI, Helsinki U., VTT, NMBU (2019)] – Jixin Qiao (DTU)

NORDICNANO - *Implementing NanoSIMS as an analytical technique within nuclear sciences in Nordic countries* [Chalmers U., Gothenb. U., FOI, Helsinki U., DTU, NMBU (2021)] – Per Malmberg (Chalmers U.)



(left) light microscopy image of a consecutive Daphnia section to the section analyzed by NanoSIMS. Red square show a Daphnia egg that was analyzed by NanoSIMS. (middle) NanoSIMS image at 30x30 μm field of view of the Daphnia egg showing an overlay between CN- in grey scale and UO- in color. (right) light microscopy close up of the Daphnia egg showing with a yellow square the area used for NanoSIMS imaging demonstrating the strategy of analyzing consecutive sections (from NORDICNANO report).

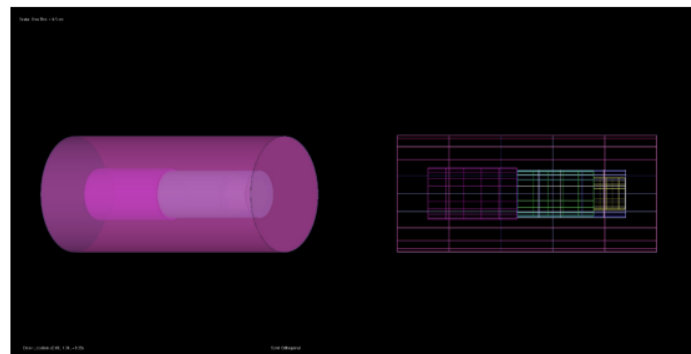
NKS-B Program: selected activities (M)

GAMMARAY X - *Seminar for users of gamma-ray spectrometry* [STUK, FOI, IFE, IRSA, DTU (2020)] – Roy Pöllänen (STUK)

RINFOR - *Development of a Resource for the Improvement of National Nuclear Forensics Gamma Spectrometric Core Capabilities* [DSA, STUK, SSM, DTU, FOI, IRSA (2019)] – Mark Dowdall (DSA)

PERLAD - *Analysis of the Performance of LaBr₃ Detectors for Fresh Fallout Response* [DSA, STUK, DEMA, IRSA, SSM (2021)] – Mark Dowdall (DSA)

GEANT4 simulation
model of a LaBr₃
detector and housing
(from PERLAD
report).

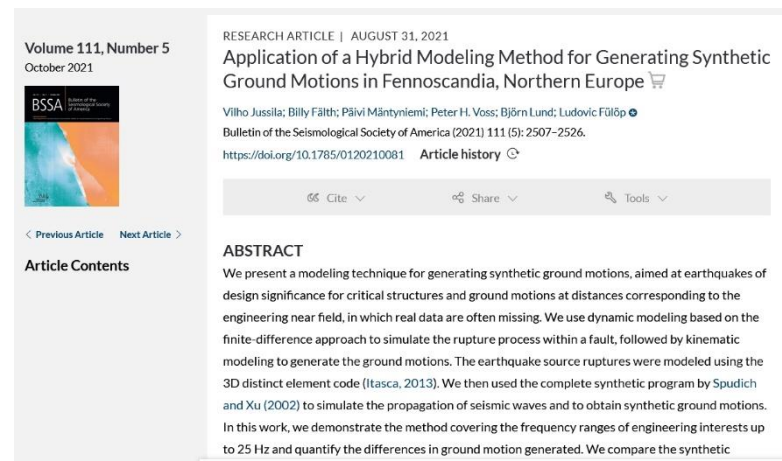


Publishing in a peer-reviewed journals

- **Highly recommended !**

E.g. article made from the results of the NKS-R Syntagma Project (top), and from the results of the NKS-B DTM-Decom Project (bottom)

Acknowledgement of the funding source is naturally required.



Journal of Radioanalytical and Nuclear Chemistry (2020) 324:1303–1316
<https://doi.org/10.1007/s10967-020-07181-x>



Intercomparison exercise on difficult to measure radionuclides in activated steel: statistical analysis of radioanalytical results and activation calculations

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Abstract

This paper reports the results obtained during an intercomparison exercise for the determination of difficult to measure radionuclides in activated reactor pressure vessel (RPV) steel samples. In total, eight laboratories participated analysing ¹⁴C, ⁵⁹Fe and ⁶³Ni activity concentrations in RPV steel. In addition, some laboratories also analysed ⁶⁰Co activity concentrations. Corresponding activity concentrations were also determined using activation calculations. Robust statistical techniques were utilised for the analysis of the results according to ISO 13528 standard. The results showed good agreement for ⁵⁹Fe and ⁶³Ni results whereas ¹⁴C results had significant differences. ⁶⁰Co results were in quite good agreement.

Upcoming Workshop in June 2022

NKS-B NORDICNANO ToF-SIMS in nuclear sciences Workshop

7-9 June 2022, Chalmers University of Technology, Gothenburg, Sweden

Seminar Venue:

The workshop takes place at Chalmers Johanneberg campus – located in Gothenburg on the west coast in Sweden.

The workshop consists of a theoretical part focusing on ToF-SIMS principles and lectures from specialists on correlated techniques like gamma and X-ray spectroscopy and electron microscopy. This is followed by a second practical part focusing on TOF-SIMS hands-on training with data acquisition from standards and environmental samples. There will be a second part focusing on data mining and data interpretations of in particular isotopic imaging of radionuclides. The aim of the workshop is to give the user a introduction to the use of ToF-SIMS and a rudimentary understanding of how to design an experiment and conduct an analysis.

Seminar Organizers:

Chalmers University of Technology/Göteborg University
Norwegian University of Life Sciences
Technical University of Denmark
University of Helsinki

Registration:

Please send an email to Per Malmberg malmper@chalmers.se

Registration deadline 30th of May November 2022. The registration is free. Light refreshments will be provided. Participants are expected to cover their own travel and subsistence costs.

Contact Person:

Per Malmberg (malmper@chalmers.se), +4631-7728321.

Don't forget to visit the (oral) poster stands !



*Ari Leppänen – NKS-R
Kasper G. Andersson – NKS-B*

*Joint NKS-R and NKS-B seminar
Stockholm, 24-25 May 2022*

Remember!

Call for proposals for NKS-B 2023

NKS warmly welcomes proposals from **you** for new R&D activities

Call announced: 1st of September 2022

- Deadline: 14th of October 2022
- Foreseen project start: January 2023
- NKS funding total 3 MDKK for each programme (NKS-R and NKS-B)
- Information on www.nks.org

Thank you for your attention!

