

2022/2023 Opportunities

NuSec Funded Research Projects Workshop, London, 11th October 2022

This workshop will provide an opportunity to hear and discuss the latest findings from NuSec Network funded research projects in detection methods and Nuclear Security technologies. It will be co-located at the IoP during the **NuFor: Nuclear Forensics Conference** so people can also attend both events.

Short NuSec presentations will be followed by Q&As with attendees.

A summary of proposed research topics can be viewed in the **Workshop Agenda**.

Workshop presentations will be recorded and available for viewing on the **NuSec website Events page**.

Personal Development Grants Applications

We are continuing to seek applications from Nuclear Science Early Career Researchers (ECRs) based either at a University, Research Establishment, or a Company within the UK to support the development of their research and innovation capacity. Personal Development Activities eligible for funding include attending Research Conference or Training Course or undertaking an Industrial Placement. We offer grants of up to £1,000 to Researchers based either at a University, Research Establishment, or a Company within the UK. 50% matched funding will normally be required, except for PhD students and ECRs. The closing date for all NuSec PDG Applications is now one month before the start date of the proposed personal development activity. Applicants will be informed of a decision usually within 1-2 weeks of each closing date. For an application form and further guidance, please visit the **funding pages of our NuSec Network website**.

A summary of previous awards can also be found **our NuSec website funding pages** too.

NuSec-NNSA collaboration Grants 2023 Applications

We are seeking applications to support collaboration between UK and US NNSA consortia researchers on nuclear security and non-proliferation technology topics. The closing dates for 2023 applications are 1st January, 1st April and 31st July.

Our PDRA support has now increased, up to £50,000 for projects of up to 6 months and costs can now include Overheads.

Collaboration Grants will be awarded up 80% of bid values and are available to UK researchers also for:

- Undergraduate student interns/summer research projects, up to £2,000
- Travel Grants up to £5,000 for collaboration research visits, or up to £2,000 for Conference or Training activities

Applications must include a letter of support from a NNSA consortia organisation (ETI, MTV & NSSC) and demonstrate a genuine UK-US collaborative research approach. All grant awards will be made at 80% of the total project cost up to the maximum values stated above. We welcome applications from UK researchers at universities and government laboratories. Please visit our **NuSec Website NNSA funding page** for details.

AWE Sigma Data Challenge

This Data Challenge will be formally launched at our **Technical Workshop 11th October 2022**.

It is a pilot project to trial access for academic researchers to large scale data sets from multi-site radiation detectors.

The datasets to be made available by AWE, were obtained during the Sigma London pilots of 2017/2018 where almost one billion gamma ray spectra were recorded by around one hundred distributed detectors located in central London. The data were collected on three occasions, each spanning weeks to months in duration. The middle pilot data will be released first. Further datasets will be released, and future challenges announced following feedback from researchers.

It is envisaged that this Challenge will require the use and development of Machine Learning or AI algorithms, to support analysis and conclusions about the distribution of radiation sources that were present in the field during the collection period. AWE is also keen to receive feedback from researchers on the quality of the data, the performance of their analysis algorithms, and recommendations on how the data could be improved in future trials.

To participate and to be granted access to the Sigma data, you will need to complete an application form and agree to the specified terms and conditions. Please visit our **NuSec Website Data Challenge page** for further details.



Welcome

Welcome to the 6th edition of our annual newsletter, aimed at Academic, Industrial and Government scientists and engineers working in Nuclear Security Science. In this edition, we summarise our 2021/22 Achievements in Nuclear Security Detection Research, Training and Collaboration and our 2022-23 NuSec Funding Opportunities.

Our Role

The NuSec Science Network promotes research and technology in Nuclear Security Science, with an emphasis on radiological detection techniques and systems.

The Network acts as a forum to support collaborations and capability amongst Academic, Industrial and Government stakeholders working in nuclear security and in other related areas. The network was initially a 3-year project led by the University of Surrey in partnership with AWE and funded by the Science and Technology Funding Council (STFC) 21st Century Global Challenge Networks Programme. Government sponsorship and oversight comes from the Home Office, BEIS, DfT, CPNI, MoD, Department of Health, Industrial oversight from the NNL and Knowledge Transfer Network, and Academic leadership from the Universities of Liverpool, Manchester, Surrey, and Sheffield.

In August 2019, the network received a further 4 years of funding from the STFC to support a NuSec Science Network+. Since then, we have continued our dialogue and collaborations with academic researchers within the STFC Academic Community, Industry and Government through the award of PhD Studentships, Personal Development Grants, Summer Student Pilot Projects. In 2020 the STFC and the US National Nuclear Security Administration (NNSA) also agreed to jointly fund our new UK-US Academic Network in Nuclear Skills from 2020-2023. The NuSec Network will formally end on 31st December 2023.

The NuSec Network has over 400 registered network members with 49% from Academia, 40% from Industry and 11% from Government Departments and funded Agencies.

If you would like to join the network membership and receive regular network updates on our funding and research opportunities, please contact info@nusec.co.uk



Achievements

The relaxation of Global and National Covid-19 travel restrictions have helped to increase the number of applications for NuSec funding particularly for those that require face to face interactions. We have continued with a hybrid format (in person and online) for our meetings and events and will continue to record live events where possible, to enable participation from those unable to travel.

Awarded 7 UK Collaboration Grant awards to support PDRA, Research Visit and Travel between UK and US NNSA University researchers working in the areas of nuclear security and non-proliferation. Total value of ~£67K

Awarded 3 Personal Development Grants (PDG) to 3 ECRs, to support attendance, at UK and US conferences and UK research visits. Total value of ~£3K

Funded 7 Summer Pilot Projects to support development of early ideas, small proof of concept and feasibility studies nuclear security science. Total value of ~£28K

Hosted 50 people at a Technical Research Workshop, London 2021, allowing 2 PhDs and 5 Pilot Project Students to share and discuss findings from their NuSec funded research projects with an in person and online audience.

Join Us

If you would like to receive regular network updates please contact info@nusec.co.uk
For more information about our Nuclear Security Science Events, Funding and Research Opportunities visit: www.nusec.uk



NETWORK ACTIVITIES IN 2021/2022

Summer 2022 Nuclear Security Pilot Projects

Following an external competition in Spring 2022, the NuSec Science Network made seven awards to universities for early-stage research on topics that could enhance the field of nuclear security. The value of each award was up to ~£4,500. Research was undertaken in the Summer 2022 by undergraduates and supervised by senior Academics.

University	Pilot Project Title
Bristol	The Inverse Collimator – Improving Signal Intensity for Source Localisation
Heriot Watt	Real-time radiation detection in virtual environments
Liverpool	Characterisation of CZT crystals for improved position resolution and defect correction
Loughborough	Gamma Ray Microcalorimeters using Superconducting Materials and Technologies
Queen Mary, London	Environmental stability of Polymer radiation detectors
Queen Mary, London	Identifying isotopes using Machine Learning
Sheffield	Causal Inference for Radiation Detection

Industry were also involved in some projects through expert advice, access to & loan of research facilities and equipment. These projects will build the foundations for further research & development and funding applications.

Posters summarising the research methodology, results and recommendations for each project will be presented at our [Technical Workshop 11th October 2022](#). They will also be available to view from our [NuSec website publications page](#).

NuSec PhD Studentships

To date we have awarded 6 NuSec PhD Studentships to the following Universities:

University	PhD Title	Project Duration	University	PhD Title	Project Duration
Bristol	Lawrence Livermore National Laboratory, California, USA (ETI consortia member)	October 2020 - June 2024	Glasgow	Development of compact neutron detectors using next-generation scintillator materials	October 2021 - June 2025
Sheffield	Development of mixed field radiation detection techniques for oil and gas well logging.	October 2020 - June 2024	Queen Mary London	Evaluating the suitability of Organic Semiconductor Detectors for Nuclear Security	October 2021 - June 2025
Bristol	Real time identification and tracking of radioactive materials carried by humans	October 2021 - June 2025	UCL	Larger area semiconductor detectors based on novel inorganic polycrystalline perovskite materials	October 2021 - June 2025

Personal Development Grant Awards

We have awarded 3 Personal Development Grants (PDG) to ECRs at two universities and a government funded laboratory. Our Grants have supported a research visit to a UK laboratory, presentations at Research conference in Canada, and to US National Research facilities.

Research Topics include the measuring the origins of nuclear materials, advanced nuclear reactors design and development and scintillator materials.

Awardees	PDG Award	PDG Activity
Surrey	Presentation	Scintillator materials presentation, Defence Threat Reduction Agency (DTRA) Penn State University 9-13th July 2022 and at Oak Ridge National Laboratory 15th July 2022
National Physical Laboratory	Research	Enhanced measurement capability for traceable determination of the origins of nuclear materials 1st July - 30th September 2022
King's College London	Conference attendance	Attend Generation 4 and Small Reactors International Conference 3rd - 6th October 2022

NuSec Network Technical Workshop, Nov 3rd November 2021

The workshop was attended by 50 people in person and online. It included presentations from our NuSec-funded PhD students and undergraduates researchers who worked on the shorter Summer 2021 pilot projects. It provided an opportunity to hear updates on their research, for attendees to ask questions and participate in discussions.

Presentations can be viewed on [our events page](#) and 2021 Pilot Projects posters can be viewed on [our publications page](#).

UK-US NNSA Collaboration Grant 2022 Awards

Our 2022 Collaboration Grant Awards have supported partnerships between seven UK and NNSA US University/Laboratories working in the areas of nuclear security and non-proliferation.

University	Award	Project	NNSA Consortia	US Collaborator
Bristol	PDRA	Machine Learning Integrated Quadrant Gamma Detectors for Enhanced Safeguards, Security, and Inspection	NSSC	University of Berkeley California
Cambridge	Research Visit	Pulsed Neutron-Gamma Die Away Experiments for C1-35 Nuclear Data Validation	NSSC	University of California Berkeley (UCB) and Lawrence Livermore National Laboratory (LLNL)
Glasgow	PDRA and Research Visit	Develop a Geant 4 simulation framework to optimize a multimodal detector for tomographic imaging of used nuclear fuel casks	ETI	Colorado School of Mines
Kings College London	Travel	Water-based quantum dots detector for near-field nuclear fission reactor monitoring detector	MTV	University of Michigan
Manchester	PDRA, Research Visit and Travel Grants	Novel imaging technique for thermal and slow neutrons using a single photon fast optical camera	MTV	Brookhaven National Laboratory
Surrey	PDRA and Research Visit	Development of Perovskite Scintillators for Nuclear Security Inspection	ETI	Georgia Tech
York	PDRA and Research Visit	Neutron and X-ray imaging in extreme environments	MTV	University of Michigan

Our PDRA awards have enabled UK ECRs to undertake up to 3-month research projects with members of the NNSA consortia on new detector and non-proliferation technologies. They have facilitated visits to US laboratories to undertake novel scientific research, obtain a first-hand in-sight of US detection hardware and understand US data collection & management methods. They have also provided an opportunity to demonstrate new developing technologies to potential future end users in the US.

Our travel awards have assisted UK researchers to travel to the US and deliver a face-to-face presentation of their research findings. They provide an opportunity to share experiences, discuss solutions to technical challenges and agree future collaborative actions for research projects.

NuSec NNSA Collaboration PDRA awardees will share their results at our [Technical Workshop 11th October 2022](#).

These awards are intended to develop collaborations between UK and US researchers, and to lead to the development of further funding applications to other funding bodies.



Our studentships support research in detection systems and related technologies for nuclear security applications.

NuSec funding for studentships covers the first 21 months of research, match funding from industrial partners then provides financial support for the remaining 21 months.

PhD Students will provide a progress update on their research at our [Technical Workshop 11th October 2022](#).

