

## NuSec Network Achievements 2016-2025

**Awarded** 22 UK-US Collaboration Grants and 4 UK Collaboration Grants to support PDRA, Research Visits and Travel between UK and US NNSA Consortia/ DTRA URA University researchers working on nuclear security and non-proliferation research. Total Project Value ~£868k

**Awarded** 6 PhD Studentships that will contribute towards the development of more accurate, cost effective and efficient nuclear security detection methods and technologies. Total Project Value ~£513k

**Hosted** 10 events for ~ 850 Academic, Industry and Government Researchers from the UK & US, giving >170 presenters the opportunity to highlight current nuclear detection challenges, propose research ideas, share and discuss findings from their own and NuSec funded research projects in person and online at our Technical Research Workshops, Lunch and afternoon seminars.

**Awarded** 28 Personal Development Grants (PDG) to ECRs and PDRAs to primarily support the presentation of their nuclear detection research at European, International Conferences. A small number of awards provided the opportunity to supervise or participate in small scale novel field research. Total Project Value ~£32.5K

**Funded** 42 Summer Pilot Projects to support development of early ideas, small proof of concept and feasibility studies in nuclear security science. Total Project Value ~£148K

**Funded** 3 Sigma Data Challenge Research Projects to explore and analyse large gamma ray spectra data sets using a variety of methods, including algorithms, machine learning, models to identify threatening radioactive material/isotopes, and to assess the distribution and quality of the short duration spectra data from mobile and fixed radiation sensors. Total Project Value ~£10.1K

**Awarded** 10 grants to 8 UK Universities to support 3–6-month PDRA research projects on a range of Nuclear Security Detection methods including Antineutrinos, Gamma Ray spectra analysis, Muon Tomography Algorithms, GAGG:Ce and HEXITEC. Total Project Value ~£152k

## 2024/2025 Opportunities and Beyond

### Personal Development Grant Applications

As we enter the final phase of formal funding for NuSec, we will continue to accept applications for Personal Development Grants. Any applications must be for funded activities which will be completed no later than 31 March 2025. The final date for acceptance of grant applications will be 31st January 2025.

Applications for Personal Development Grants are welcome 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 a Research Conference, UK Research, a Training Course,

or 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. Our normal grant award is up to 80% of a maximum of £1,000 FEC but exceptional requests of up to £2,000 of FEC project costs will be considered.

The closing date for all NuSec PDG Applications is 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 submission.

For an application form, further guidance, or a summary of our previous PDG awards, please visit the Funding page of our [NuSec Network website](#).

### NuSec Network Technical Workshop, Institute of Physics, London, 5th March 2025

Our next NuSec Technical Workshop will focus on current and future technical research challenges in nuclear security detection. It will also provide an in-person opportunity to hear and discuss the latest results from NuSec funded projects.

The technical scope of the workshop will cover all topics that have been supported by NuSec during the period of the network, including detector development, detection systems and instrumentation, data processing and AI/machine learning algorithms, as applied to nuclear security applications. The program will include

a mixture of invited talks from senior researchers, and presentations from PhD students and early career researchers.

The workshop will be run jointly with [NTR-Net](#), and will also include an update on their activities and future funding opportunities.

For further information, including Abstract submission, and registration information, please see the [Workshop Indico Page](#).



### Nuclear Threat Reduction Network NTR- Net

Supported by AWE, the Ministry of Defence and the Home Office, NTR-Net is a new initiative aiming to build a thriving, inclusive innovation and research network connecting academia, industry and government to enhance the activities of the UK's Nuclear Threat Reduction (NTR) Programme.

With the first cohort of students already underway, NTR-Net was **officially launched** at a high-profile event co-hosted by the Nuclear Institute (Southeast & London Branch) on 29th April 2024 at the Royal Academy of Engineering, featuring speakers from MoD, Home Office and DESNZ together with panel sessions addressing the future picture for nuclear energy and the nuclear skills gap in the UK.

This was followed by the inaugural 2024 NTR-Net Summer School hosted at the University of Bristol. In a week-long training programme, NTR-Net students received expert-led, interactive talks from members of academia, AWE and government, combined with both practical and communications training from industry experts.

As the second cohort of PhD projects begins, NTR-Net continues to grow from strength to strength, with funding calls for summer projects and PhD projects planned for next spring and summer respectively, together with a joint NuSec/NTR-Net Technical Workshop on Detection Science on 5th March 2025 at the IOP, London.

For further information on NTR-Net please visit <https://ntr-net.uk> or contact [info@ntr-net.uk](mailto:info@ntr-net.uk).



## Welcome

Welcome to the 8th and final edition of our annual newsletter, aimed at Academic, Industrial and Government, scientists and engineers working in Nuclear Security Science. In this edition, we highlight our Achievements in Nuclear Security Detection in 2023-2024 and over the past 8 years our NuSec Funding, Research, Training, and Networking Opportunities in 2024/2025 and beyond.

### Our Role

The NuSec Science Network promotes research and technology in Nuclear Security Science, with an emphasis on radiological detection methods. 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 established in 2016, as 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, DSIT (formerly BEIS), DfT, CPNI, MoD, Department of Health, Industrial oversight from AWE, the NNL and Knowledge Transfer Network, and Academic leadership from the Universities of Liverpool, Manchester, Surrey, and Sheffield.

The Network has continued to receive additional funding from the STFC and AWE to support dialogue and research collaborations with academic researchers within the STFC Academic Community, Industry and Government through the award of grants for UK & US, Collaborative Research, A Sigma Data Challenge, PhD Studentships, Personal Development Grants and Summer Student Pilot Projects.

The NuSec Network currently has over 400 registered network members with 51% from Academia, 36% from Industry and 13% from Government Departments and funded Agencies.

The NuSec Network will formally end on 31st March 2025 and elements of the Network will continue to be delivered by the new [Nuclear Threat Reduction Network \(NTR-Net\)](#). A joint NuSec/NTR-Net Technical Workshop will take place on 5th March 2025, Institute of Physics, London. For further details please visit the [Workshop Indico Page](#).

In the meantime, if you would like to join the network membership and receive regular network updates on our funding and research opportunities, please contact [info@nusec.uk](mailto:info@nusec.uk).



### 2023/2024 Achievements

**Awarded** 9 Collaboration Grants to support PDRA, Research Visits and Travel between UK and US NNSA Consortia/ DTRA URA University researchers working on nuclear security and non-proliferation research. Total Project Value ~£454K

**Hosted** 100 Academic, Industry and Government Researchers from the UK & US at a Hybrid Technical Research Workshop, London 2023, providing 20 presenters with the opportunity to share and discuss results from their NuSec funded research projects.

**Awarded** 3 Personal Development Grants (PDG) to support the presentation of nuclear detection research at an International Conference and novel field research. Total Project Value ~£4.6K

**Provided** administrative and technical advice to support the development of the Nuclear Threat Reduction Network ([NTR-Net](#)) and [NuFor 2023](#) and [NuFor 2024](#).

### Join Us

If you would like to receive regular network updates please contact [info@nusec.uk](mailto:info@nusec.uk)

For more information about our Nuclear Security Science Events, Funding and Research Opportunities visit: [www.nusec.uk](http://www.nusec.uk)

# NETWORK ACTIVITIES IN 2023-2024

## UK-US Collaboration Grants Research 2024 Awards

Our nine Collaboration Grant Awards have supported partnerships between UK and NNSA Consortia/ DTRA URA Universities and Laboratories working on security and non-proliferation.

PDRA awards have enabled UK ECRs to undertake 3-12-month research projects within the UK and with members of the NNSA & DTRA URA consortia on range of potentially more accurate, compact, cost effective and efficient detection and non-proliferation methods and technologies.

NuSec awards have facilitated researcher visits to UK & US laboratories to undertake scientific experiments and training using novel detection equipment, to access world class facilities, utilise hardware, data collection and analytical methods.

Working collaboratively with other UK & US experts on similar detection challenges provides opportunities to understand and apply different perspectives and methodologies and also enable greater cohesion, flexibility, data sharing and cross-validation of results within a formalised research environment. Consequently, both UK & US researcher confidence in testing and utilising

alternative methods and results also improve. Researchers also have the opportunity to demonstrate, combine and refine new developing detection technologies and facilities to potential future end users in the US and UK.

Some neutron imaging and detection methods/technologies could also be applicable to other fields including reactor instrumentation, medical imaging, cancer proton beam monitoring, nuclear containment and disposal of nuclear materials.

Our travel awards have enabled UK researchers to visit the US to deliver face-to-face presentations of their research findings. Conferences and meetings with US researchers provide an opportunity to share experiences, discuss solutions to technical challenges and inform the next steps for future research.

Projects that have completed their research in 2024 will share their results at [NuFor 2024](#) and/or at our [NuSec-NTR Net Joint Technical Workshop, London, 5th March 2025](#).

University	Project	Award	Collaboration NNSA Consortia/ DTRA URA/ UK	US or UK Collaborator
Bristol	Advanced UAV-based radiation and dosimetry determinations using solid-state LiDAR combined with gamma spectrometry	PDRA & Travel Grant	NSSC	Florida International University, The University of Nevada & DoE Airbourne Radiometric
Edinburgh	Non-Proliferation with Advanced Neutrino Detection [NAND]	Research Visit & Conference	MTV	Brookhaven Laboratory
Glasgow	Low Power compact dual mode detectors for NuSec applications	Research Visit	ETI	Lawrence Livermore National Laboratory
Imperial	Neutron Capture in a Plasma Environment	Research Visit	NSSC	Massachusetts Institute of Technology (MIT) & LLNL National Ignition facility
Lancaster & Liverpool	Apply compact gamma ray detectors on robotic platforms to locate radionuclides in confined spaces	PDRA & Research Visit	DTRA URA	H3D
Liverpool	Develop Intelligent Object Detection and Semantic Segmentation for Maximum Likelihood Estimation in Complex Radioactive Environments	PDRA	NSSC	University of Berkeley California
Manchester	Neutron detection using in house 3D printed plastic scintillators and a fast Timepix3 optical camera	PDRA	MTV	Brookhaven National Laboratory
Sheffield Hallam	PRtSEL: Proton Recoil Tracking for Source Energy & Location	PDRA & Research Visit	NSSC	Texas A&M University & University of Birmingham
Surrey	Radiation Hardness of Perovskite Scintillators	PDRA	IIRM	Applied Radiation Laboratory at Penn State University

## Technical Research Workshop, October, London 2023

Our workshop was attended by 100 people in person and online from the UK & US. Presentations from Academic and Government researchers were given on Detection Methods, Instrumentation, Algorithms, Machine Learning, NuSec Sigma Data Challenge and the [Nuclear Threat Reduction Network \(NTR-Net\)](#).

The event was held at the same venue as [NuFor 2023](#) so attendees could attend both consecutive events and network with the Academic, Industry and Government research communities. All workshop presentations including posters can be viewed on the [Nusec website events page](#).

## Personal Development Grant Awards

We have awarded four Personal Development Grants (PDG) to four ECRs at two universities, for a research project involving the supervision of a PDRA and also to present nuclear detection research at National and International Conferences.

Awardees	PDG Award	PDG Activity
Strathclyde	Hyperspectral Imaging (HIS) Project	Field Research
Surrey	IEEE Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC) and Room Temperature Semiconductor Detector (RTSD), Tampa, Florida, 2024	Presentations
Surrey	NuFor 2024 Manchester	Presentation

Our NuSec PDG to the ECR at Strathclyde gave them the opportunity to supervise a PDRA to explore the use of Hyperspectral Imaging on unleaded glass. It also allowed them to develop their project leadership and management skills and improve their confidence to manage future larger scale projects.

The project also resulted in a better understanding on the effect of leaded glass on hyperspectral data, and provided a number of novel ideas for the future deployment of hyperspectral technology in the nuclear sector.

Two further PDGs will enable Surrey ECRs to jointly deliver four oral and poster presentations at IEEE NSS, MIC, RTSD, Florida 2024, on topics including *Neural Network Isotope Identifiers*, *Principle Component Analysis, the Influence of Temperature Effect on Detector Responses* and *Formamidinium Hybrid Perovskite (FAPbBr3) Crystals*. Our fourth PDG will support an MPhys student to present SIGMA date research *Emulating moving gamma-ray sources within a laboratory environment* at NuFor 2024. It is hoped that these three PDGs will help to support discussions between European and International researchers who can provide helpful insights on results or methods and from other relevant research fields that can support future research development.



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## PhD Studentships

Our six NuSec funded PhD studentships support research in detection systems and related technologies for nuclear security applications. In partnership with Industrial collaborators, we have each funded 21 months of research costs.

2024 is the final/penultimate year of research for our PhD studentships. Each PhD student is on course to receive their PhD and seek employment in the nuclear detection as academic or industrial researcher. It is hoped their PhDs will be used to inform future research and advance the new detector technologies.

NuSec funded PhD Students will present their research results at [NuFor 2024](#) and/or at [NuSec-NTR Net Joint Technical Workshop, London, 5th March 2025](#).

University	PhD Title	Project Duration
Bristol	Developing the next-generation shipping container scanning system	October 2020 - June 2024
Sheffield	Development of mixed field radiation detection techniques for oil and gas well logging	October 2020 - June 2024
UCL	Larger area semiconductor detectors based on novel inorganic polycrystalline perovskite materials	October 2021 - June 2025
Glasgow	Development of compact neutron detectors using next-generation scintillator materials	October 2021 - June 2025
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 - Sept 2025



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