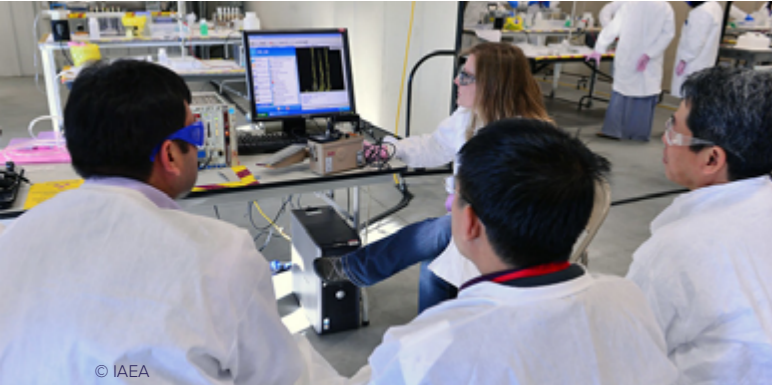


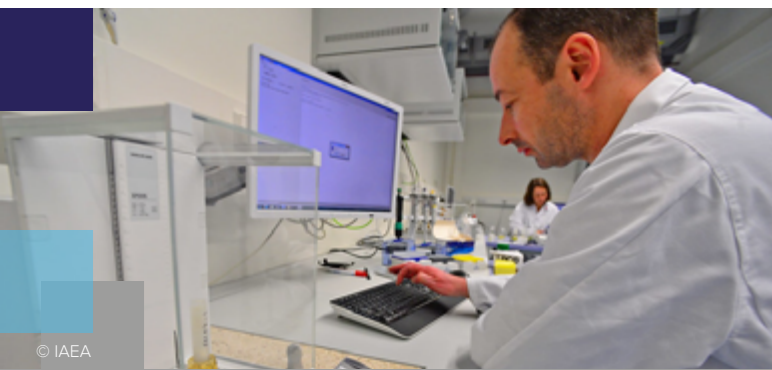
# Looking Ahead 2020/2021



## UK-US Academic Network in Nuclear Skills

Starting in 2021, the NuSec Network is pleased to announce a new UK-US Academic Network in Nuclear Skills which is funded jointly by the STFC and the US National Nuclear Security Administration (NNSA). Funding will be available over the next 3 years to support collaborations between UK researchers working in nuclear security and members of the NNSA ETI and MTV Consortia (ETI - Enabling Technologies and Innovation, [eti.gatech.edu](http://eti.gatech.edu) and MTV - Monitoring Technology and Verification, [mtv.engin.umich.edu](http://mtv.engin.umich.edu)). Grants will be offered to support collaborative research pilot studies, student training and staff mobility, which will connect UK researchers with NNSA partner universities and national laboratories.

The scope of the academic network will cover research topics that will include *Machine Learning and Big Data Challenges; Advanced Detection Methods for Nuclear Fuel Cycle Monitoring; Advanced materials for Radiation Detection; Sensor Development for Radioactive Materials Monitoring; Novel imaging Techniques; Radionuclide Source Measurement and Identification*. Further research topics will be developed for this program where there is a clear connection to the scope and objectives of the NNSA consortia. We will be launching this new program in April 2021 with an online workshop at which keynote presentations will be given by leading UK and US researchers. Further information about the workshop, including registration details, will be available in early 2021.



## PhD Studentship Awards

Following a call in Autumn 2020, we are intending to award up to 50% funding for a further three PhD Studentships with a maximum value of £42,750 each.

Research proposals will:

- Support the aims of the NuSec Science Network, to deliver research activities which have clear objectives in Nuclear Security Science.
- Be primarily focused on research that is within the remit of the STFC, particularly for multidisciplinary projects.
- Include an industrial or academic collaborator who will make a direct financial and in kind contributions to project costs.

The closing date for applications has now passed and an announcement of the successful recipients will be made in January 2021.

Our award will cover 21 months of funding, for the period **1st October 2021 - 30th June 2023**.

The host university will then fund the studentship up to **31st March 2025**.

Further details can be found on our [NuSec Network website](http://NuSec Network website).



## Personal Development Grants Applications Required

We are continuing to seek applications from Early Career Researchers based either at a University, Research Establishment or a Company within the UK to support the development of their nuclear science 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 Early Career Researchers.

Applications will be considered twice a year. The closing date for applications will be 31st August and 28th February each calendar year. Applicants will be informed of a decision usually within 2-4 weeks of submission. For further details, please visit the funding pages of our [NuSec Network Website](http://NuSec Network Website).



# Welcome

Welcome to the 4th 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 2019/2020 achievements and highlight our 2020/2021 funding opportunities for Nuclear Security Detection Research, Events and Training. Despite the disruptions due to Covid-19 restrictions, the network remains active and focused on delivering its programme of activities.

## 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 collaboration and capability amongst Academic, Industrial and Government stakeholders and engineers 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, and academic leadership from the Universities of Cambridge, Liverpool, Manchester and Sheffield. The network has over 350 registered network members with 33% from Industry and funded Agencies, 55% from Academia and 12% from Government Departments. 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](mailto:info@nusec.co.uk).

In August 2019, we were awarded a further four years funding from the STFC to support our core NuSec Science Network+ up to July 2023. 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 and Summer Student Pilot Projects. The STFC and the US National Nuclear Security Administration (NNSA) will also jointly fund our new UK-US Academic Network in Nuclear Skills from 2021-2024.



## NuSec Network 2019/2020 Achievements

**Secured** STFC 21st Century Global Challenge Network funding for a further 4 years 2019-2023.

**Funded** 5 NuSec Network PDRA 3-month post extensions, to support the continuation of research in a range of nuclear security detection topics at a total cost of ~£45,000.

**Funded** through the Home Office Detection Science programme 5 Nuclear Security Summer Pilot Projects with a total value of ~£20,000.

**Awarded** 10 Personal Development Grants totalling more than £10,000.

**Secured** further funding from the STFC to support an engagement program for UK academics and graduate students with the US NNSA nuclear security consortia and affiliated national laboratories.

**Generated** a wide range of collaborations between Academics, Industry and a broad range of Government Agencies.

**Good scientific outcomes** delivered by our 5 Summer Pilot Projects, Personal Development Grants and PDRAs which will continue to be taken forward by our Network partners.

## Join Us

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



## Summer Pilot Projects

Unfortunately, due to COVID 19 mobility constraints this grants scheme was unable to run in Summer 2020. We can now confirm that we are planning to run our Pilot Projects Grant scheme for Summer 2021. Further details will be announced in January 2021.

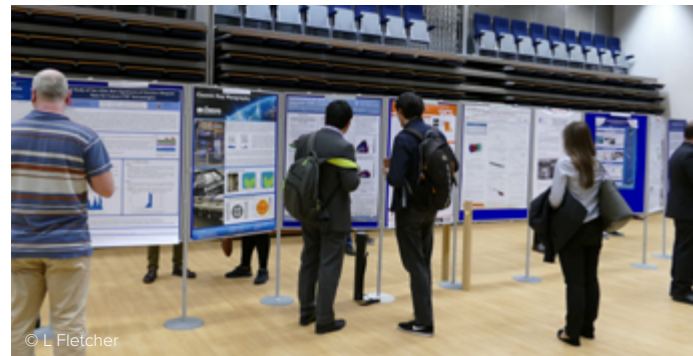
# NETWORK ACTIVITIES IN 2019/20

## NuSec Network Post-Doctoral Support (PDRA) Support Grants Extensions

Following a competitive selection process, we extended our NuSec Network PDRA posts for up to three months each to continue their Nuclear Security Detection research:

University	PDRA Project Title
Bath	On-line tritiated water detection by in situ ATR-FTIR
Coventry	Comparison of Gamma-ray spectra analysis using diverse machine learning methods
Edinburgh	Hyperspectral sensing for autonomous nuclear element detection
Liverpool	Antineutrino Measurement of Isotopes in Reactors (AMIR)
Sheffield	Comprehensive Testing and Benchmarking of Muon Tomography Algorithms

All the Early Career Researchers (ECRs) presented their research at our **NuSec Network Detection Conference April 2019**. Each university is continuing to explore other funding opportunities to continue their research.



## PhD Studentships

Following an external competition, we have awarded up to 50% funding for three PhD studentships starting in October 2020 at the following universities:

Organisation	PhD Title
Bristol	Developing the next-generation shipping container scanning system
Sheffield	Development of mixed field radiation detection techniques for oil and gas well logging.
University College London <sup>1</sup>	Larger area semiconductor detectors based on novel inorganic polycrystalline perovskite materials

<sup>1</sup>Due to recruitment difficulties this studentship will now start in October 2021.

## Nuclear Security Detection Workshop, University of Surrey, 15-16 April 2019

Our Workshop focused on the current and future technical challenges in nuclear security detection.

31 invited speakers, 31 poster presenters and 113 participants from UK & US Academia, Industry and Government contributed to an informative and productive event.

Submitted talks and poster presentations covered following topics:

- Nuclear Security detection systems
- Algorithms and Autonomous Decision Making
- Particle Detection for core monitoring
- UAV Monitoring and Environmental Measurements
- Helium – Alternative Technologies
- US Defence Threat Reduction Agency ( DTRA) Support for Radiation Detection Research
- Consortium for Non-proliferation Enabling Capabilities (CNEC) - Mission & Accomplishments
- Overview of CBRN UK
- Challenges of Working in a Nuclear Environment
- Industrial Challenges for suppliers and customers

Many academic researchers had been funded by our NuSec Network PDRA and Pilot Projects grants.

Prizes were awarded to Diego Cimadom (University of Sheffield) for the best undergraduate poster on the **Investigation of neutron and gamma sensitivity i Gadolinium- doped plastic scintillator**, to Anthony Turner (University of Birmingham) **Generalized gamma spectrometry simulator for forward and reverse problems in nuclide identification** and Xiaoqi Lui (Queen Mary College, University of London) **Solution processable organic bulk heterojunction diodes as direct radiation detectors** for the best PhD posters.

Workshop presentations and posters are available to view and download from our Cern INDICO **Nuclear Security Detection Workshop Website**.

Each Phd has secured match funding from an industrial partner. The host University and Industrial partner will also provide further support through the loan of specialist equipment, access to laboratories & testing sites, scientific knowledge, research supervision, advice on product commercialisation and R&D project management.

These PhDs will contribute towards the development of more accurate, cost effective and efficient nuclear security

detection systems and alternative technologies for industrial use of non radiation sources. They will also involve collaborations across a range of disciplines including Electronics, Medical Physics, Material Science, Nanotechnology, Computing, Geophysics, Environmental and Particle Physics.

We will invite applications for up to a further three NuSec Network funded Studentships later in 2020.

## Summer 2019 Nuclear Security Summer Pilot Projects

Organisation	Pilot Project
Imperial College London	Increasing the statistics of sparse detector data using GANs
Queen Mary College University of London	Organic Field Effect Transistor Radiation Detector Development
University College London	Prototype Radical Detector for Nuclear Security
University of Bristol	Developing the next-generation shipping container scanning system
University of Surrey	A Novel Compact Thermal Neutron Detector

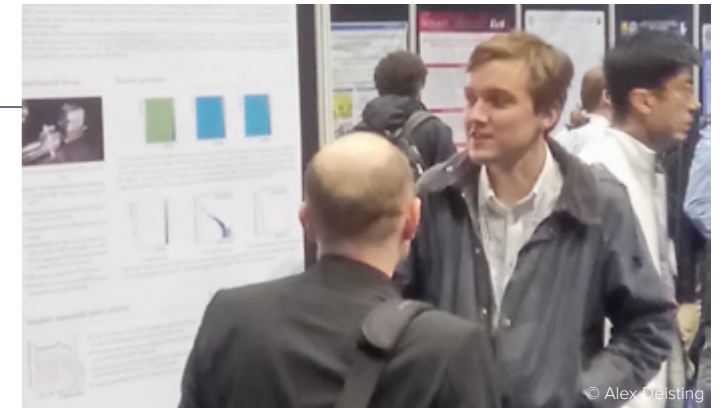
Following an external competition in Spring 2019, the NuSec Science Network made five awards to Universities for early stage research on topics that could enhance the field of nuclear security.

The value of each award was around ~£4,000. Research was undertaken in the summer 2019 by undergraduates and supervised by senior Academics.

Industry were also involved in some of the projects through the loan of research facilities and equipment. Posters summarising the research methodology, results and

recommendations for each project are now available to view and download from our **NuSec Network website**

Aspects of all these projects will continue to be taken forward by AWE as part of their ongoing relationships with the project teams and through new MSC and Phd research projects. The NuSec Science Network and AWE have also agreed to fund a PhD Studentship at the University of Bristol to develop the Next Generation Shipping Container Scanning System starting in October 2020.



## NUSEC Network Personal Development Grants awarded in 2019

Our Personal Development Grants (PDGs) are aimed at strengthening the research and innovation capacity of Nuclear Security researchers and at developing new collaboration between researchers and partner organisations. To date, we have made 23 awards to PhD students at UK Universities totalling more than £23,000 to support attendance and collaborations at Nuclear Security Science events and courses in Europe, the USA and Australia.

In 2019 the NuSec network made 9 PDG awards to ECRs totalling around £10,000 to enable them to attend and present at the *IEEE Medical Imaging 2019 Conference (MIC), Manchester*.

ECRs from 7 UK Universities (Bristol, Sheffield, Surrey, Manchester, Imperial, Royal Holloway, York), gave talks and poster presentations on a range of topics including *Detection with Prior Knowledge of Source Activity; Neutron/Gamma-Ray Phoswich Scintillation Detector; Pulse Shape Discrimination; A Muon Tomography Detector: Time Protection Chamber Prototype; Lead assay with CMOS and Detector Development for High Energy Particle Physics*.

They also attended talks on range of technical topics

including *Computing & Software perspectives; Analogue and digital electronics; DAQ; High Energy Nuclear Physics; Field Programmable Gate Arrays; Neutron Detectors; Novel materials; Data Analysis Techniques; Neutrino Interactions and Cross Sections*.

We also funded an ECR to attend the International conference on *Advancements in Nuclear Instrumentation Measurement Methods and their Applications (ANIMMA), Portorož, Slovenia, 17-21 June 2019*. The ECR gave a contributed talk on *Investigating GAGG as a potential neutron detector*.

These conferences have provided ECRs with opportunities to present and discuss their work with other academic and industrial researchers working in similar or subfields from the UK, Europe, US, Canada and Japan. Discussions can help ECRs overcome technical challenges in their research and lead to the application of their research in new areas and new product developments. ECRs also had the opportunity to practise their presenting skills and better understand the skills required of Nuclear Detection scientists.

