

Looking Ahead 2019/2020



Physics Lab Credit: University of Surrey

STFC funding for NuSec Network continues 2019-2022

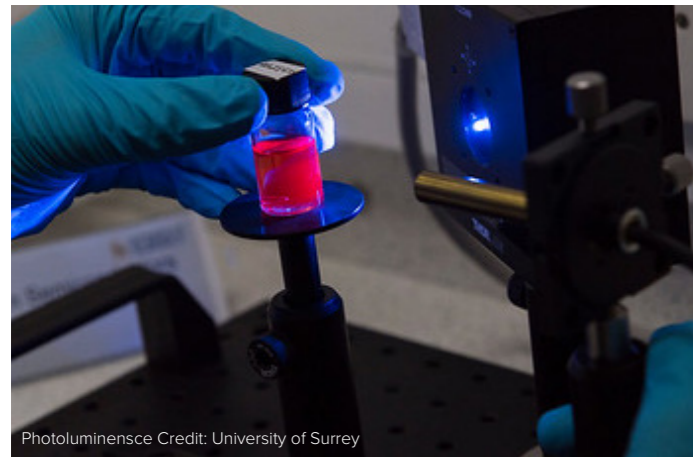
We are pleased to confirm that our application to continue the Nuclear Security Science network from 1st August 2019 – 31st July 2022 has been approved by the STFC. Key activities will include:-

- Awarding up to 50% funding for 6 PhD Studentships. A call will be issued in early Summer with an October 2019 closing date for applications.
- AWE funding for Summer Pilot Projects each year.
- Smaller focused technical

workshops.

- Continuation of our Personal Development Grant Scheme (PDG). Grant applications will be considered twice a year and funded up to £1,000.
- A showcase in 2022 of our Phase 2 Network activities and achievements.

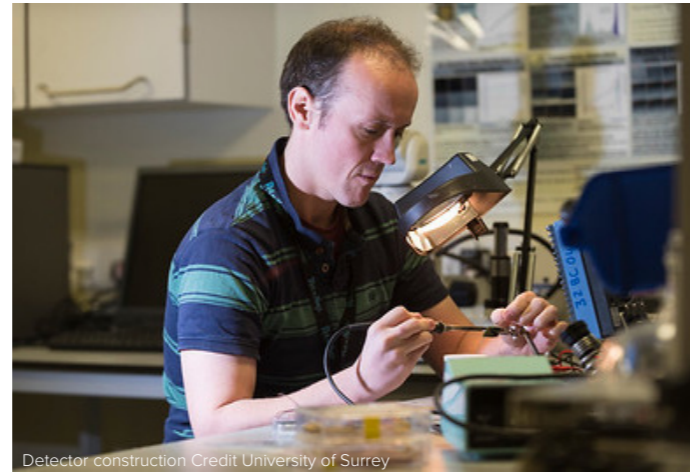
Further details will be announced over the coming months once our contractual arrangements with the STFC are in place.



Photoluminescence Credit: University of Surrey

Nuclear Security Summer Pilot Research Projects for 2019

The Network will shortly issue months and students will present their posters at a NuSec Summer 2019 Pilot Projects. Research will be undertaken during the summer 2020.



Detector construction Credit University of Surrey

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 £2,000 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. There is an open application deadline and applicants will be informed of a decision within 6 weeks of submission.

We have made 15 awards to date totalling more than £15,000. For details of previous awards, an Application Form and further Guidance, visit www.nusec.uk

We will accept applications up to 31st May 2019 and all activities must be complete by 31 July 2019.

New Guidance will be issued shortly for activities post 31 July 2019. NB Grants of up to £1,000 will be awarded twice a year.



Welcome

Welcome to the 3rd 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 2018/2019 achievements and highlight our future 2019 – 2022 Networking and Funding opportunities for Nuclear Security Research and Training.

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, GDS MoD, Department of Health, and academic leadership includes Universities of Bristol, Liverpool, Sheffield, Manchester, Glasgow and Cambridge. The network has now been running for more than 3 years and has over 350 registered network members of which 31% from Industry and funded Agencies, 57% from Academia and 12% are from Government Departments.

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

We are pleased confirm that STFC will be continuing to support the Nuclear Security Science network for a further 3 years. We will continue our dialogue and research collaborations between academic researchers within the STFC community, and stakeholders in industry and government agencies through focused technical workshops, new PhD Studentships, Pilot Projects and Personal Development Grants awards.

NuSec Network 2018/2019 Achievements

Secured NuSec Science Network funding for a further 3 years 2019 – 2022.

Funded 10 Post-Doctorate Posts to undertake research in a range of nuclear security detection topics with total value ~ £158,000.

Organised a 2 day Nuclear Security Detection Workshop for over 100 delegates with 6 invited talks, 15 submitted talks and 28 poster presentations, also 2 industrial sessions lead by CBRN-UK and AWE.

Funded through the Home Office Detection Science programme 5 Nuclear Security Summer Pilot Projects with a total value of ~£22,000 covering topics such as a Neutron Energy Spectrometer, SoLiD detector, glass Cherenkov detector and Neutron- Gamma Telescope and Gd-doped plastic scintillators.

Awarded 4 Personal Development Grants totalling more than £4,000.

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

Well attended network meetings, with strong interest in the network from a full range of stakeholders.

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

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 2017/18

NuSec Post-Doctoral Support (PDRA) Support Grants

Following a competitive selection process, we have made 10 PDRA awards worth up to £24,000 each, to 8 Universities to support 3-9 month research projects in a range of Nuclear Security Detection topics.

University	PDRA Project Title
Liverpool	Antineutrino Measurement of Isotopes in Reactors (AMIR)
Coventry	Comparison of Gamma-ray spectra analysis using diverse machine learning methods
Sheffield	Comprehensive Testing and Benchmarking of Muon Tomography Algorithms
Surrey	Drone-deployable gamma detector for nuclear security mapping
York	Enhanced Resolution in Large Volume SrI2:Eu Detectors
Edinburgh	Hyperspectral sensing for autonomous nuclear element detection
Surrey	Investigating GAGG:Ce as a potential neutron detector
University College London	Neutron sensitivity of HEXITEC and capability in localisation of neutron radiation source
Bath	On-line tritiated water detection by in situ ATR-FTIR
York	Simulation of novel high-quality radiation sources for industrial use

Our PDRAs will present their findings as talks or posters at our [Nuclear Security Detection Workshop, University of Surrey 15-16 April 2019](#).

Update - Identifying Alternative Technologies for Radiation Sources in the Oil Industry

In January 2018, the NuSec network, AWE and the Institute for Manufacturing (IfM) organised a workshop in Cambridge with key stakeholders and subject matter experts from the UK & US energy industry, nuclear security, academia and Government agencies.

Road mapping was used to explore alternative technologies.

Including the technology developments required for their commercialisation, milestones and energy industry adjustments required for their adoption. Current and anticipated enablers were identified, as well as barriers that limit the worldwide adoption of each technology

A numbers of actions were defined to reduce and eventually eliminate the use of

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

Our Workshop will focus on current and future technical challenges in nuclear security detection and the program will include keynote invited speakers, submitted talks and poster presentations across the following topics:

- Nuclear Security detection systems
- Algorithms and Autonomous Decision Making
- Particle Detection for core monitoring
- UAV Monitoring and Environmental Measurements
- He-3 mitigation for neutron detectors.

The Workshop will include 6 invited talks from:-

- David Peterson (US Defense Threat Reduction Agency) *"DTRA Basic Research Support for Radiation Detection"*
- John Mattingly (North Carolina State University) *"Consortium for Non-proliferation Enabling Capabilities (CNEC): Mission and Accomplishments"*

- Rob Buckingham (UKAEA, RACE Robotics Centre) *"Relying on robotics: towards remotely operated inspection and maintenance in high hazard scenarios"*
- Tom Scott (University of Bristol) *"Survey techniques for environmental and disaster monitoring"*
- Robert Speller (UCL) *"Imaging and locating radioactive isotopes for security"*
- Lee Thompson (University of Sheffield) *"Monitoring nuclear reactor neutrinos with WATCHMAN/AIT"*.

There will also be 15 submitted talks and 28 poster presentations. Many researchers will have been funded by NuSec Network PDRA and Pilot Projects grants.

There will also be Academic-Industrial collaboration sessions led by CBRN-UK and on He-3 mitigation for neutron detectors, led by AWE.

Nuclear Security Summer Pilot Projects funded in 2018

Following an external competition, the NuSec Science Network made five awards to 4 Universities for early stage research, on topics that could enhance the field of nuclear security. The value of each award was around ~£4,400.

Research was undertaken in the summer by undergraduates and supervised by senior Academics. Industry were also

involved in some of the projects through the loan of research facilities and equipment.

Results from these recent Pilot Projects will be presented as posters at our April 2019 NuSec Workshop. Aspects of these projects will also be taken forward by AWE as part of their ongoing relationships with the project teams and inform new Phd research projects.

Organisation	Pilot Project
University of Sheffield	An investigation of Glass Cherenkov detectors in a pulsed neutron interrogation system
Sheffield Hallam University and the University of Birmingham	NESSY – A prototype Neutron Energy Spectrometer for Security
University of Surrey	Develop a prototype "telescope"-style detector with a neutron detection capability for deployment as a portable neutron scanner
University of Bristol	Develop a SoLiD detector to measure anti-neutrino flux inside nuclear reactors.
University of Sheffield & Lab Logig	Investigation of neutron and gamma sensitivity in Gd-doped plastic scintillator



X ray chambers Credit: University of surrey

NUSEC Network Personal Development Grants awarded in 2018/2019

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 15 awards to PhD students at UK Universities totalling more than £15,000 to support attendance and collaborations at Nuclear Security Science events and courses in Europe, the USA and Australia.

In 2018 the NuSec network made 3 PDG awards to ECRs totalling around £4,000, to enable them to attend and present at the *IEEE Nuclear Science Symposium and Medical Imaging Conference, Sydney 10-17 November, Australia 2019*.

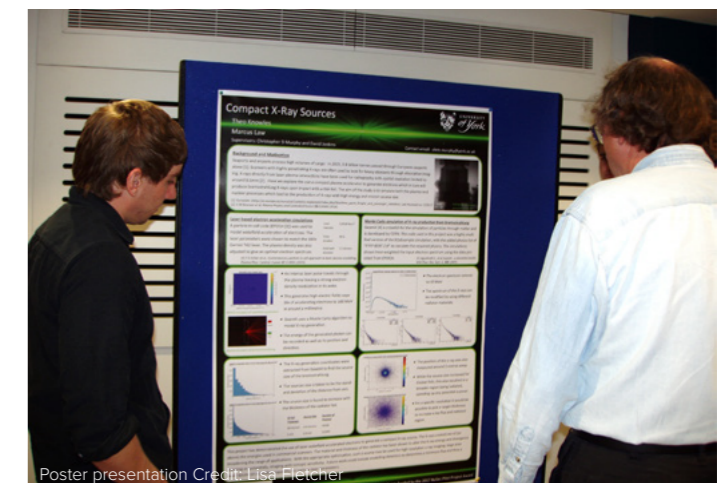
The ECRs from UCL, Liverpool and Sheffield Universities gave oral presentations on a range of topics including *3D Printed Radiation Detectors, Pulse Shape Analysis of Planar Semiconductor Detectors in a Triple-Layered Compton Camera System and Pulse Shape Discrimination (PSD) performance of the EJ299-*

33 organic scintillator in a V1751 Digitiser.

They attended one-day technical courses on topics including *Integrated Circuits and Detector Signal Processing and GATE GEANT 4 Based Simulation Toolkit*.

They also attended talks on *novel neutron detectors, instrumentation, mobile and compact gamma-ray imaging cameras, machine learning in image reconstruction, novel plastic scintillators, homeland nuclear security, scintillation detectors and women in engineering*.

Other impacts of our PDGs, include enabling ECRs to build new collaborations with other academic and industrial researchers working on similar topics. Discussions and networking with other researchers and developed specialists also helped each ECR to overcome some of their technical research challenges and will help influence the future direction of their current PhD research.



Poster presentation Credit: Lisa Fletcher