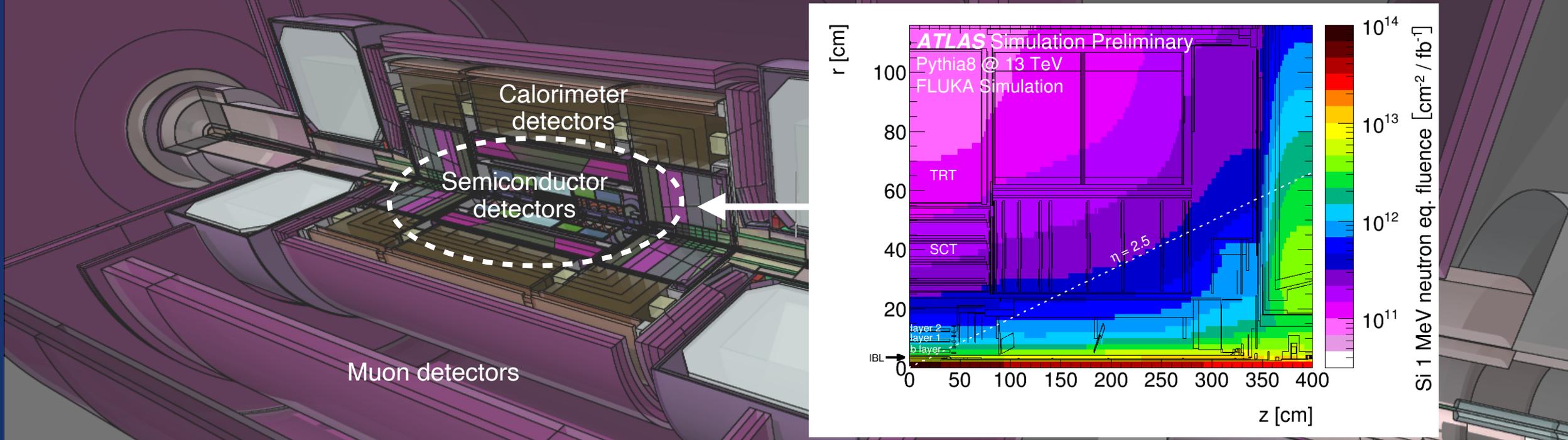


Working with industry?

1. My expertise.
2. Working with SMEs via “Innovate UK”.
3. The project - what did we do?
4. Outcome of the project?
5. Benefits?

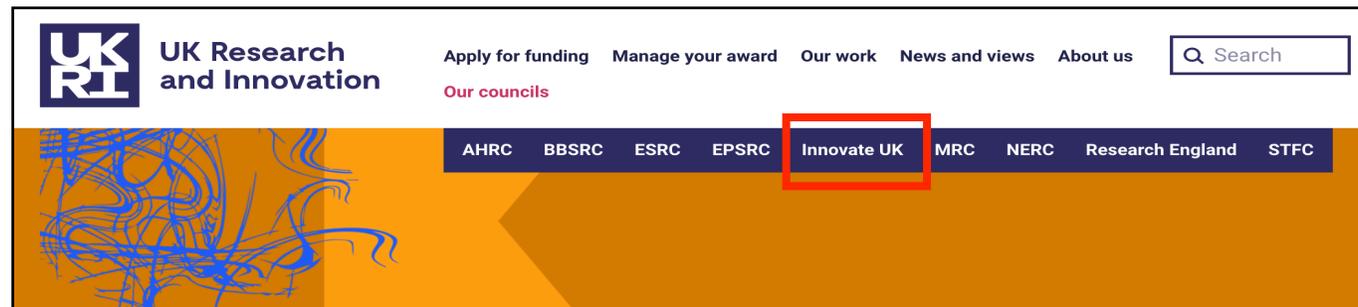
- My expertise? Particle physicist at Queen Mary. ATLAS ITk. Detector development.
- One of my roles is to simulate radiation backgrounds (FLUKA, Geant4) for evaluating the impact on detector systems. I coordinate this activity for the ATLAS experiment at CERN.



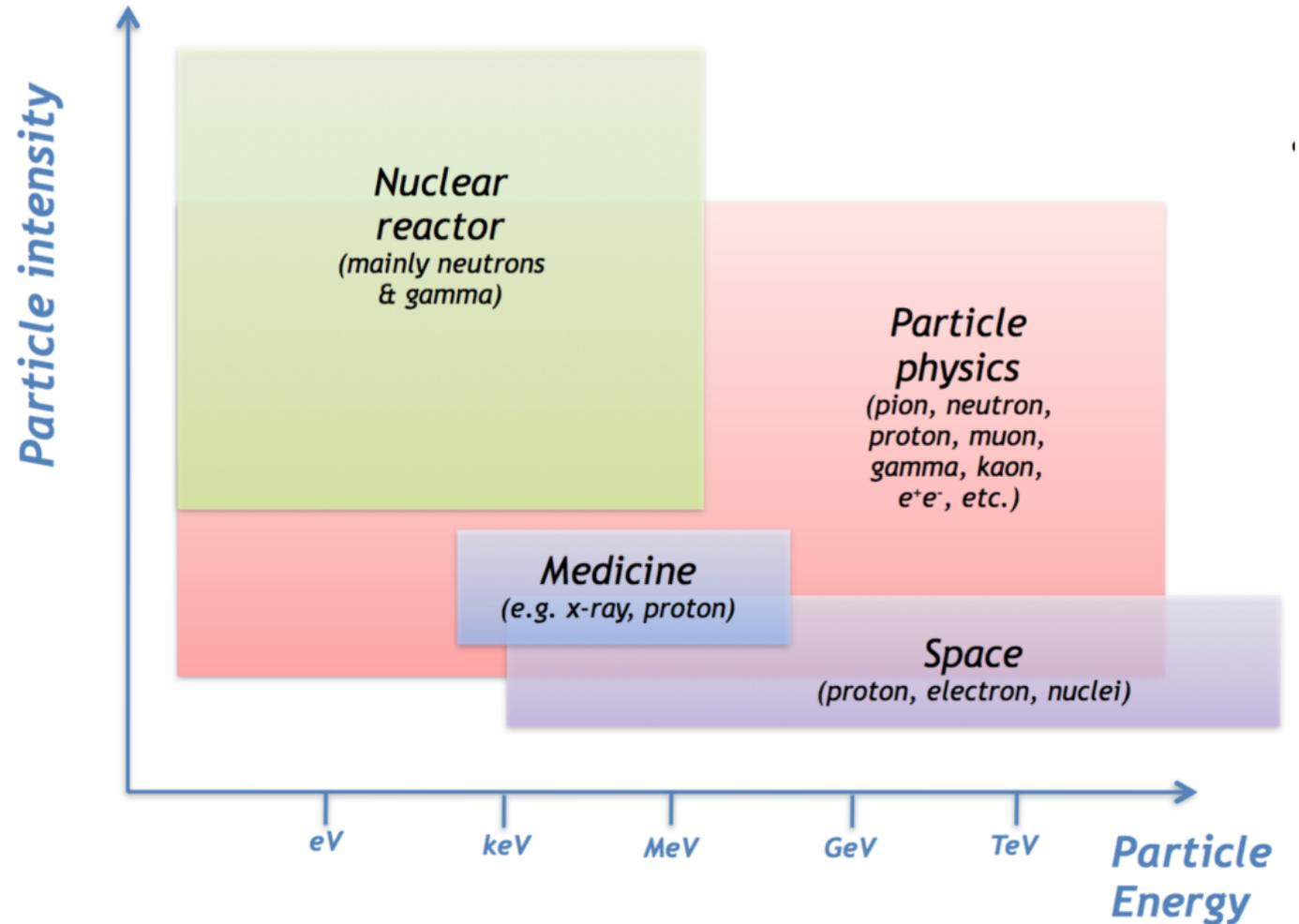
- From these simulations we can predict detector performance over its lifetime. Especially important for detector design. The work also involves testing at irradiation facilities and in-situ measurements and validation at the real world LHC.

Working with SMEs via “Innovate UK”

- So one day I get a call asking “do I know anything about making things work in harsh radiation environments?”
- “Of course”, I said. “Let’s talk ... “
 - Several small companies (SMEs) wanted to investigate the “radiation resilience” of their products for application in the nuclear industry, and if necessary find ways to improve on their designs?
 - After several meetings we submitted two proposals through Innovate UKs “energy catalyst” call. I was the “academic partner”. Both were successful leading to grants of £993K and £252K.
- But not always so easy to become part of an industry consortium. Usually have to work harder! (Industry events, sandpits, cold-calling/emailing ...) Sign-up to get alerts from funding agencies.
 - But also important to find a good match to your area of expertise. And listen to their requirements!
- Important to engage early with university services (e.g. finance, research support) for help with costings, proposal guidance etc.



- You may ask, “What has particle physics got to do with the nuclear industry?”
- In terms of radiation simulation and testing there is good synergy between these industries.
- We use similar tools and methods to study impact of radiation on our designs. (E.g. Monte Carlo simulation tools. Irradiation test facilities.)
- Your expertise maybe more wide ranging than you realise!



The project - what did we do?

- The goal of the project was to develop radiation resilient ultrasound transducers (UT) for non destructive testing in nuclear applications.
- The industrial partners included:



SME researching piezopolymer (PVDF) ultrasound transducers for radioactive waste monitoring. Understanding gamma response crucial. PVDF sensor material of interest for high frequency/ resolution imaging applications.



SME researching piezoceramic based ultrasound transducers for monitoring extreme environment applications, such as inside nuclear reactors.

The Welding Institute. Large research and technology company, offering expertise in materials joining and engineering processes.



Lots of work packages!

WP1	DETERMINE, SPECIFY APPLICATION ENVIRONMENT T1.1 Determine Environmental Parameters; T1.2 In depth archival literature review; T1.3 Secure time for testing in irradiation facilities.	←	We led on this one, and contributed to all the others
WP2	PIEZO CERAMIC SENSORS/TRANSDUCERS T2.1 Materials & assembly method combinations selection; T2.2 Modelling - sensor packaging design optimisation; T2.3 Construction of sensor sample prototypes; T2.4 Testing of irradiated sensor samples.	←	PA
WP3	PIEZO POLYMER SENSORS/TRANSDUCERS T3.1 Materials & assembly method combinations selection; T3.2 Modelling - sensor packaging design optimisation; T3.3 Construction of sensor sample prototypes; T3.4 Testing of irradiated sensor samples.	←	Ionix
WP4	FIBRE OPTIC SENSOR T4.1 Pulsating Method Determination; T4.2 Select COTS - Fibre Optic probes to be tested; T4.3 Modelling - sensor packaging design optimisation; T4.4 Construction of sensor sample prototypes; T4.5 Testing of irradiated sensor samples.	←	PA
WP5	CABLE SIGNAL INTEGRITY T5.1 Determine & procure most suitable (best) cabling; T5.2 determine Test Parameters; T5.3 Perform cable signal integrity testing.	←	TWI
WP6	DISSEMINATION & EXPLOITATION T6.1 Develop/Maintain Web-Site; T6.2 Dissemination Activities; T6.3 Exploitation Business Plan.	←	TWI/AII
WP7	CONSORTIUM PROJECT MANAGEMENT T7.1 Consortium Project Management; T7.2 Progress Meetings and Reports.	←	PA

Quarterly meetings

Q1 progress meeting

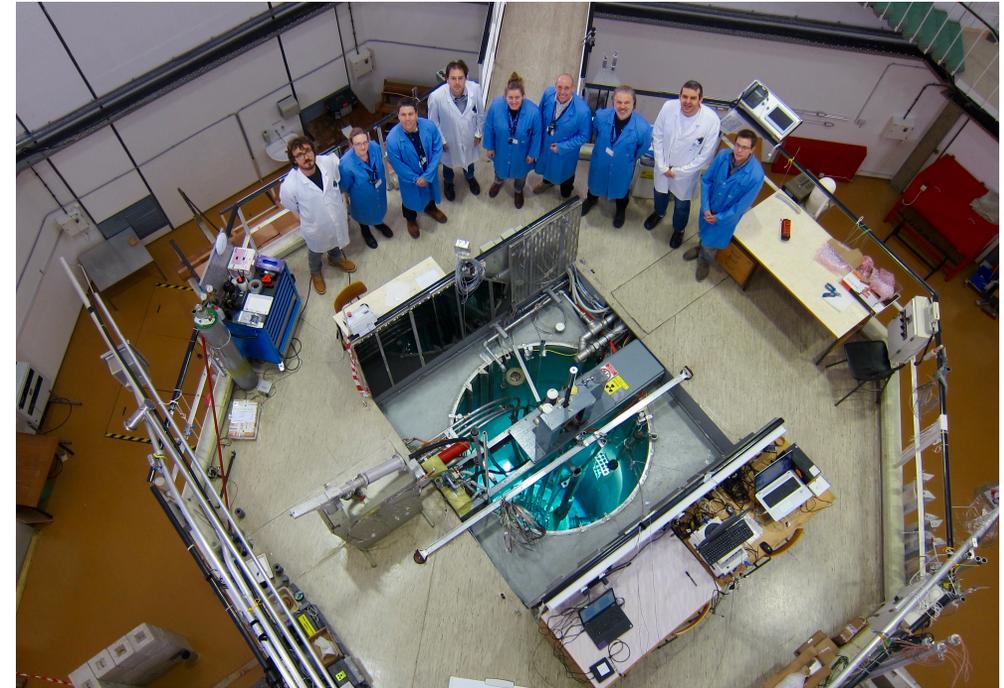
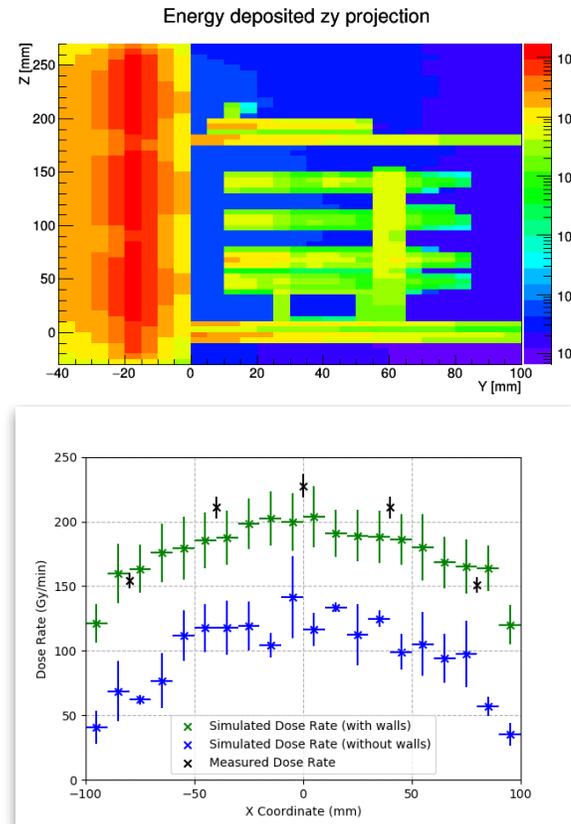
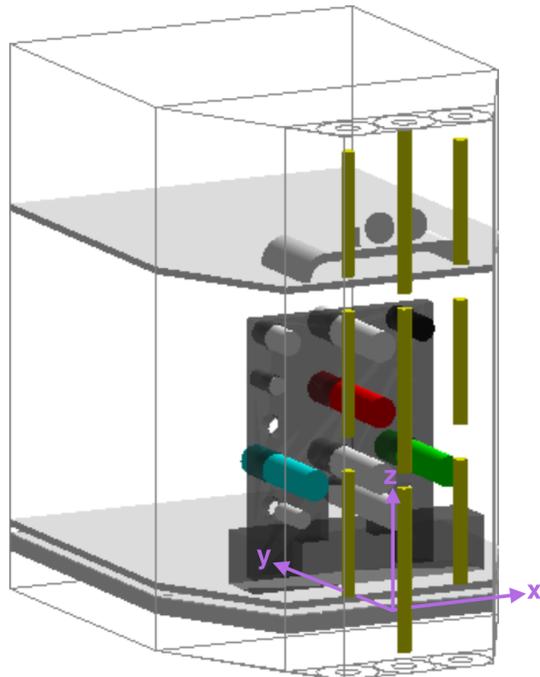
AGENDA

Date: 6th March 2018

Location: Precision Acoustics, Hampton Farm Business Park, Dorchester, DT2 8QH

Item	Time		
	10:00-10:15	Arrival, welcome, coffee	
1	10:15-10:30	Review of minutes from Kick-off meeting	PA
2	10:30-10:45	Progress report, review of deliverables, milestones and SLPP.	PA
3	10:45-11:30	Summary of Q1 Finances	PA
	11:30-12:15	Partners presentations	All partners
6	12:15-12:30	Review of risk register	All partners
7	12:30-12:45	Dissemination and exploitation	All partners
8	12:45-13:00	Comment from Monitoring officer	MO
		Lunch	
11	13:30-14:30	Technical discussion	All partners
12	14:30-14:45	AOB	All partners
13		Date and location of next meeting	All partners
	15:00	Close of meeting	

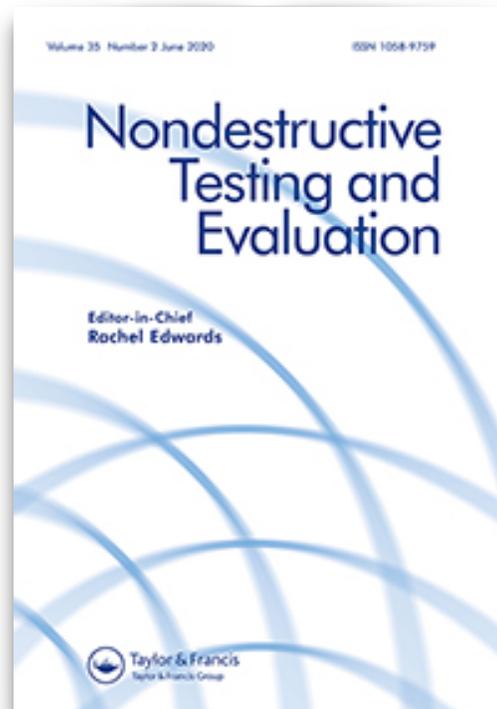
The project - what did we do? (Some examples.)



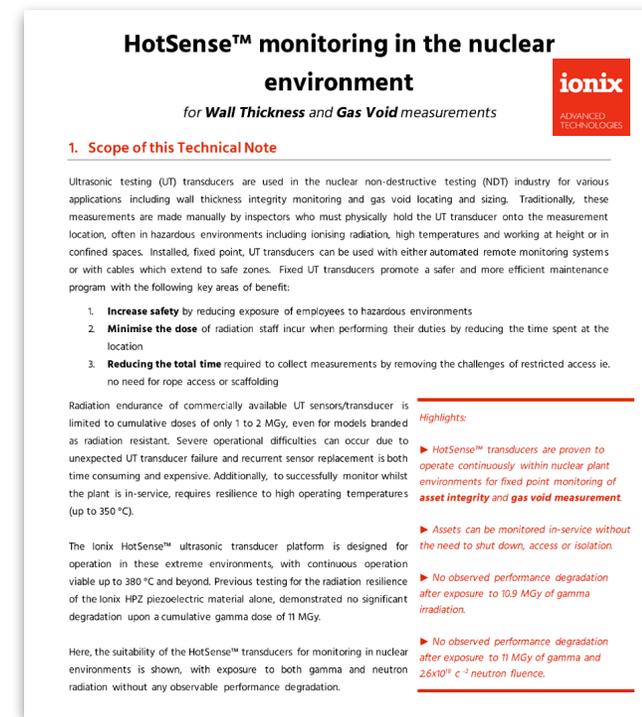
Irradiation testing at nuclear research reactor for neutron and gammas damage studies.

Radiation modelling of gamma irradiation facility to properly understand device dosimetry.

Outcome of project?



Publication (Vol 35, Issue 2, 2020) and presentation at Advanced GEANT4 workshop.



Companies now advertising their radiation resilient products. Any lessons learned? SMEs have much to offer the aerospace and nuclear industries, but need expert support to navigate radiation hardness assurance and test facility usage.

Benefits of working with industry

(Personal perspective as an academic researcher)

- **Improved employment or promotion prospects.**
- **Meet interesting new people outside of academia. All my experiences so far been positive, and a lot of fun!**
- **New professional contacts can lead to consultancy work.**
- **Learn new skills (e.g. project/people management)**
- **Solving real world problems outside academia.**
- **Understand better how business/corporate world works!**
- **Passing on knowledge/expertise to next generation**
 - **E.g. my last postdoc/ECR quickly found a nice career in the nuclear industry soon after the project completion**

Thank you!