

Achieving impact through industry collaborations



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Why engage with industry?

Engaging with industry is a key way to achieve research impact, defined as “the demonstrable contribution of research to changes that bring benefits to the economy, society, culture, public policy or services, health, the environment or quality of life”.

Engaging with the private, public or third sectors can help us:

- Achieve impact with our research;
- Provide additional income to fund the Department of Physics 's activities (e.g., conference attendance, outreach events, applied research projects);
- Lead to academic publications;
- Grow contacts and networks relevant to the department’s research.

Mechanisms for Collaborative R&D

- Collaborative research



- Contract research



- Consultancy



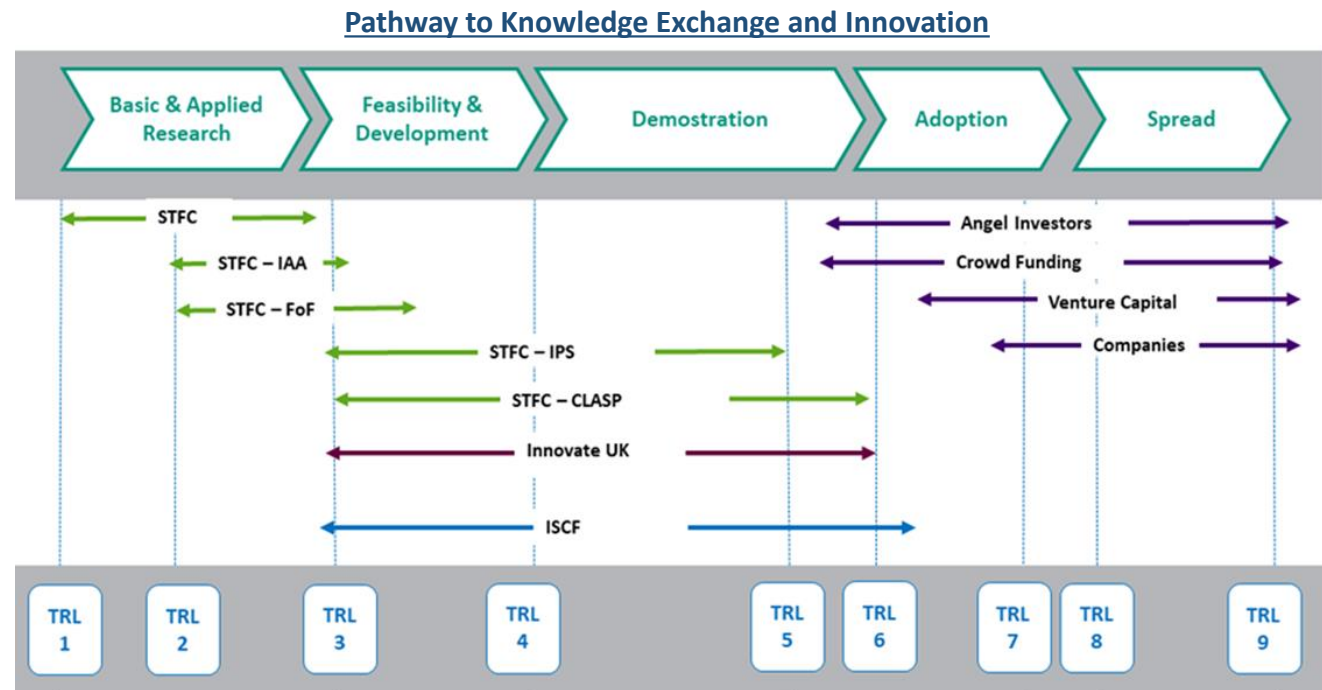
- Student projects



Impact Acceleration Account (IAA)

Implementation of the Department of Physics Research, Impact and Industry Strategy

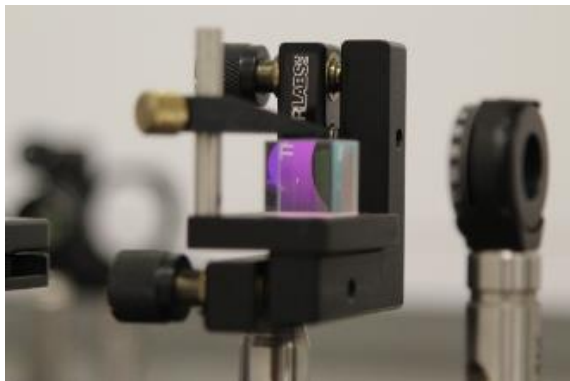
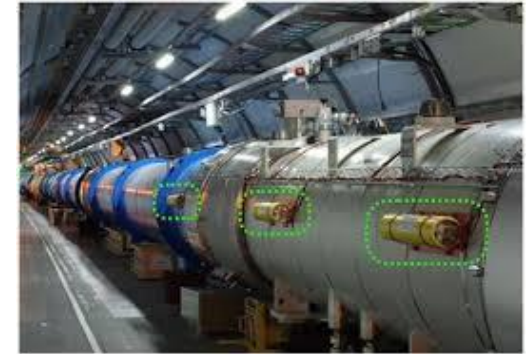
- Supports key areas of activities which will accelerate the impact with external organisations.
- Offers a unique opportunity to support novel ideas to further funding for R&D
- Issue two calls per year for Proof of Concept projects



Example of collaborative R&D – D-BEAM Ltd

Developed proof of concept projects in collaboration with D-BEAM Ltd

- Development of innovative non-invasive diagnostic technologies for particle accelerators via the applications of coherent radiation imaging and Digital Micro-mirror Devices (DMDs)
- Development of new techniques of measuring the absolute density profile of gas jets in use at particle accelerator facilities.



JetDose – Developing a Proof of Concept project

- **In 2019 funded a PoC project with D-Beam: Proof of concept measurements for an online non-invasive simultaneous dose and profile monitor for therapy.**
Measurements were realised at the University of Birmingham cyclotron, using existing gas-jet technology within the department and expanding its use towards medical applications. Results fed directly into an STFC CLASP application.
- **The IAA funding proved to be the catalyst** for this next stage of work, enabling the development of an online, single shot, non-invasive monitor for gas jet profile measurements, and commercialisation of the technique with D-Beam Ltd.

The challenge/problem: Hadron beam therapy

Hadron beam therapy

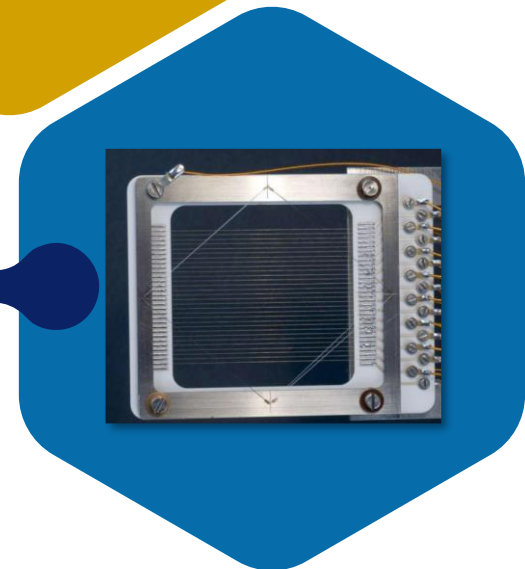
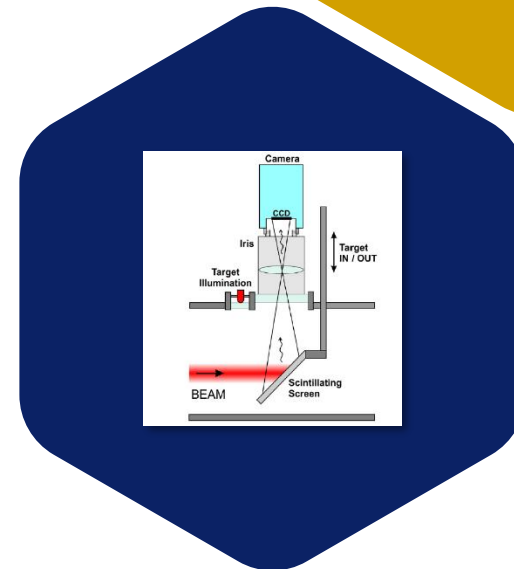
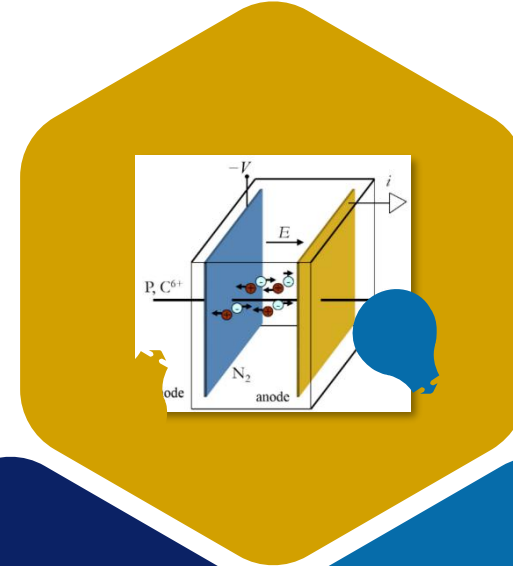


CNAO Synchrotron, image courtesy CNAO.

- Clear healthcare benefits for certain cancer types;
- Significant investment through NHS and private facilities in the UK;
- Optimization of Medical Accelerators (OMA) network identified key R&D challenges:
 - Significant time goes into Q&A
 - New technology solutions needed for novel treatment modalities such as FLASH
 - Desirable machine operation modes not currently possible due to lack of non-invasive (online) diagnostics

Existing diagnostics

- + High resolution
- + Reliability
- + Validity
- Interceptive
- Ongoing calibration
- Beam perturbation
- Limited live feedback



JetDose – Novel diagnostic solution

Non-invasive Gas Jet In-Vivo Profile Dosimetry for Particle Beam Therapy

1

Minimally invasive

- ✓ No beam perturbation
- ✓ Online monitoring
- ✓ Superior error detection

3

Novel treatments and improved operation

- ✓ Enabling technology for FLASH and Mini-Beam treatments
- ✓ Active machine regulation based on live feedback becomes feasible



2

Significantly reduced calibration time

- ✓ No mechanical parts interact with the beam
- ✓ All key parameters monitored remotely
- ✓ Significantly reduced maintenance

N. Kumar, C.P. Welsch, et. al, Physica Medica 73, p 173-178 (2020).

S. Jolly, C.P. Welsch, et al., "Technical challenges for FLASH proton therapy", Phys Med 2020 – Galileo Galilei Award, best paper in 2020

"Non-Invasive Gas Jet In-Vivo Dosimetry for Particle Beam Therapy", contributed talk at IPAC21

JetDose – Market size and route to market



JetDose - Summary

- *JetDose* will apply cutting edge STFC technology to a key healthcare challenge;
- Clearly identified clinical benefits – opening opportunities for novel cancer treatment modalities such as FLASH and improved ways to operate existing and future facilities;
- Project will be realized by consortium with long-standing collaborative links who are recognized leaders in their respective area;
- Exceptional international network for collaboration and dissemination established through OMA leadership.