Project title: Laser-driven high-repetition rate particle and photon sources for energy-transfer applications

Academic supervisor: Prof. Gianluca Sarri, Queen's University Belfast
Industry supervisor: Dr. Robert Deas, DSTL

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How to apply: applications must be submitted via the QUB Applications portal by the 13th of February 2026.

Before you apply: We strongly recommend that you contact the supervisor(s) for this PhD project before you apply.

Eligibility: PhD Candidates must hold a minimum of an upper Second-Class UK Honours degree or international equivalent in a relevant science or engineering discipline. Candidates must be UK Nationals and be willing to apply for and able to obtain Baseline Personnel Security Standard (BPSS) clearance.

Key Details:

- Host Institution: Queen's University Belfast, UK
- Industry Partner: DSTL
- PhD Duration: 4 years
- Start Date: 1st October 2026
- Enhanced stipend of £24,780/year
- Additional funds of £7,000 a year for travel, conferences and research equipment.

About the PhD Project: Are you passionate about developing novel research and keen to shape the future of energy transfer technologies in areas such as, laser interactions, plasma physics, RF technologies, materials science and engineering? We are recruiting a motivated PhD candidate to undertake an exciting project within the EPSRC Energy Transfer Technologies Doctoral Training Hub. As a student of the Hub, you will receive an **enhanced stipend of £24,780 per year**, plus additional funds of £7,000 a year for travel, conferences and research equipment. This project is co- funded by DSTL.

The Hub: The Doctoral Hub specialises in developing research and training the next generation of leaders in energy transfer technologies for defence and related sectors. The successful candidate will be based at Queen's University Belfast and throughout their PhD will benefit from the support and expertise of our diverse academic community, a community of students working towards similar goals, as well as our specialist industrial network.

Why Join Us?

- Industrial Collaboration: Each PhD student within the Hub is partnered with an industry collaborator, providing placement opportunities to work and train alongside industry experts

- Comprehensive Training: The Hub offers a blend of academic and industrial training, preparing you for diverse career pathways in research or industry
- Cohort Experience: Build your research network through inclusion in a vibrant cohort of PhD students that conduct research with academic leaders across leading UK institutions. Engage in online and face-to-face activities, including cohort-building events and collaborative learning exercises
- Funding: A generous fully funded studentship (no fees and a monthly personal payment) with additional support for conferences, travel, training, consumables and extended placement with industry collaborators.

Research project description: Laser-driven particle accelerators can drive a wide range of secondary radiation and particle beams with spatiotemporal properties (typically in the micron and femtosecond scales) that are effectively unmatched by any other technology. Their extreme versatility not only enables a precise control and fine-tuning of the beam parameters but also permits to select, by simply varying the interaction conditions, the type of particle or radiation (i.e., x-rays, gamma-rays, electrons, positrons, ions, and neutrons). This unique feature can thus also enable multi-modal imaging, a unique feature of laser-driven systems.

These sources have the potential to provide a paradigm shift in a wide range of industrial and applied domains. For example, they can deliver high-resolution radiography and tomography of electronic components and sensitive materials, enable precision manipulation of advanced materials, and provide a platform for testing the resilience of instruments and detectors under extreme environments, including space-weather conditions. To unlock these applications, however, one must achieve high average fluxes and thus have access to high repetition rate and high-power laser systems.

Current high power (multi-TW to PW) laser systems in the UK can only operate at limited repetition rates of the order of 1 Hz. To fill this gap in technological capability, we are building at Queen's University Belfast a user facility that will host the first high-power (10TW) and high repetition rate (100 Hz) laser in the UK, which will offer a host of high-flux particle and photon sources for applications. The facility is co-funded by the EPSRC and is planned to be operational in January 2027.

The successful candidate will join a multi-disciplinary team at QUB under the supervision of Prof. Gianluca Sarri to develop, optimise, and apply laser-driven particle and photon sources at 100 Hz repetition rates. The student will develop specific frameworks for the self-optimisation of these sources for specific applications, including resilience testing of instruments and detectors under extreme environments and high-resolution radiography of electronic components and high-Z materials. The main aim of the project is to establish and utilise specific operational models of laser-driven sources (e.g., x-rays, gamma-rays, electrons, and positrons) for specific applications of direct interest to DSTL.