

Scholarship Title	Searches for Quantum Entanglement in High Energy Particle Collisions at CERN
Reference number	WD_2025_09_SPONS
Supervisor(s)	Dr Deirdre Kilbane (SETU), Prof. Ronan McNulty (UCD), Dr Barry Dillon (UU)
Research Group/Centre	Walton Institute SETU
Department /School/Faculty	Department of Computing and Mathematics / Department of Science
Duration	4 Years (48 months for PhD by research)
Status: Full-time / part-time	Full-time
Funding information	Walton Institute Funded
Value of the scholarship per year for four years	Stipend: €25,000 per annum Fees: €5,750 per annum (covered by scholarship) Research Costs: €3,000 per annum
Closing date and time	Thursday, 30 April 2026 at 4pm Irish time
Interview date	TBC
PhD commencement date	Immediately
P Code	TBC
Post summary	<p>Applications are invited for a PhD Studentship in Walton Institute, South East Technological University, Ireland. The candidate is expected to be highly self-motivated, and willing will work with future emerging topics in High Energy Particle Physics and Quantum Physics. The aim of the research is to develop the underlying theory, simulations and Artificial Intelligence (AI) for quantum entanglement and tomography in particle decays and measure these using data from the Large Hadron Collider (LHC) at CERN. Quantum tomography aims to reconstruct the full density matrix of proton collisions an event, which includes all accessible information on polarisations and correlations. data from the LHC provided by UCD and CERN. This requires advances in theory and simulation in collaboration with Ulster University utilising AI and high-performance computing facilities in Walton Institute SETU, thus that will reconstruct and interpret the full event, providing a route to interpretable and explainable AI tools for the LHC and future colliders. Access to data will be provided through the LHCb collaboration, of which the PhD candidate will become a member, with the opportunity to spend some time at CERN. the CERN Collaboration and develop theory, simulations, and AI tools for application to data from the LHC and future colliders.</p> <p><a href="https://doi.org/10.1051/epjconf/201919901022">https://doi.org/10.1051/epjconf/201919901022</a> - Central exclusive production at LHCb</p> <p><a href="https://arxiv.org/pdf/2507.13447">https://arxiv.org/pdf/2507.13447</a> - Theory-Informed Neural Networks for Particle Physics.</p>

## Knowledge & Experience

### Essential

- Background in high energy particle physics and/or advanced quantum mechanics
- Experience with programming, simulation, or Artificial Intelligence
- Excellent analytical and organizational skills

### Desirable

- Knowledge of quantum theory
- Demonstrated capability in the delivery of research projects at undergraduate or postgraduate level

## Skills & Competencies

### Essential

- Applicants whose first language is not English must submit evidence of competency in English, please see [SETU's English Language Requirements](#) for details.
- Highly motivated student, demonstrating initiative and the ability to work within multi-disciplinary team to achieve results.
- Strong interpersonal and communication skills.
- Excellent academic record and good writing skills.

### Desirable

- Prior experience in scientific paper and report writing.
- Willing to spend some time at CERN.

## Further information

For any informal queries, please contact Deirdre Kilbane by email [deirdre.kilbane@waltoninstitute.ie](mailto:deirdre.kilbane@waltoninstitute.ie)

## Application procedure

Complete the online application form from the [SETU website](#) quoting the advert reference code WD\_2025\_09\_SPONS

Please ensure that you upload all supporting documents as part of your submission.

For queries relating to the application and admission process please contact the Postgraduate Admissions Office via email [researchadmissions@setu.ie](mailto:researchadmissions@setu.ie) or telephone +353 (0)51 302883.

University Website: <https://www.setu.ie>

Please note that paper submissions will not be accepted.

The University may decide to interview only those applicants who appear from the information available, to be the most suitable, in terms of experience, qualifications and other requirements of the scholarship.

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