



Research Centre

School of Physical Sciences

Post title

Postdoctoral Researcher

Electronic transport and valleytronics in two-dimensional heterostructures

Level on Framework

Level 1

Post duration

12 months fixed term contract

Dublin City University

Dublin City University (DCU) is a young, ambitious and vibrant university, with a mission ‘to transform lives and societies through education, research, innovation and engagement’. Known as Ireland’s ‘University of Enterprise’, DCU is a values-based institution, committed to the delivery of impact for the public good. DCU was named Sunday Times Irish University of the Year 2021.

DCU is based on three academic campuses in the Glasnevin-Drumcondra region of north Dublin. More than 18,000 students are enrolled across five faculties – Science and Health, DCU Business School, Computing and Engineering, Humanities and Social Sciences and DCU Institute of Education.

DCU is committed to excellence across all its activities. This is demonstrated by its world-class research initiatives, its cutting-edge approach to teaching and learning, its focus on delivering a transformative student experience, and its positive social and economic impact. The university continues to develop innovative programmes in collaboration with industry, such as the DCU Futures suite of degrees, which are designed to equip graduates with the skills and knowledge required in a rapidly evolving economy.

DCU’s pursuit of excellence has led to its current ranking among the top 2% of universities globally. It is also one of the world’s Top Young Universities (QS Top 100 Under 50, Times Higher Top 150 Under 100). In the Times Higher Education University Impact Rankings 2021, DCU ranked 23rd in the world for its approach to widening participation in higher education and its ongoing commitment to eradicating poverty, while it ranks 38th globally for its work in reducing inequality and 89th globally for gender equality.

The university is ranked 23rd in the world and first in Ireland for its graduate employment rate, according to the 2020 QS Graduate Employability Rankings. Over the past decade, DCU has been the leading Irish university in the area of technology transfer, as reflected by licensing of intellectual property.

As part of this role the researcher will be required to participate in the DCU Research Career Framework. This framework is designed to provide significant professional development opportunities to Researchers and offer the best opportunities in terms of a wider career path.

Background & Role

A 1-year postdoctoral position, supported by the Irish Research Council Laureate programme, is available in the School of Physical Sciences, Dublin City University, under the supervision of Dr Stephen Power. This theoretical / computational project will focus on electronic transport and valleytronics in two-dimensional heterostructures. In particular, we will examine substrate and interface-induced valley transport and valley Hall effects in graphene-based heterostructures, using a combination of large-scale tight-binding, quantum transport and effective Hamiltonian approaches.

Principal Duties and Responsibilities

Reporting to their Principal Investigator the successful individual will:

- Use the appropriate computational and theoretical methods, under the supervision and direction of the Principal Investigator, to model electronic and valleytronic effects in 2D heterostructures.
- Assist in identifying and developing future research and funding initiatives, at both a national and a European level.
- Disseminate the results of the research through both publications in peer-reviewed academic journals and presentations at conferences.
- Assist undergraduate and summer students with their research projects
- Engage in appropriate training and development opportunities as required by the Principal Investigator, the School or Research Centre, or the University
- Engage in teaching support as assigned by the Head of School
- Liaise with industry and academic collaborators as required.
- Carry out any administrative work associated with the programme of research.

Minimum Criteria

Applicants should have a PhD in theoretical/computational condensed matter physics or a closely related field. Previous experience modelling electronic transport in 2D materials is essential.

Highly Desirable:

- Familiarity with Dirac Hamiltonian techniques and/or valley phenomena

In addition, it is desirable that the candidate will have:

- a proven ability to carry out research projects with a degree of independence
- a strong publication record appropriate to their career stage
- excellent spoken and written English
- strong team-working skills

- strong programming skills, preferably Python or C.
- proficiency with high-performance computing and high-quality scientific graphics production

Candidates will be assessed on the following competencies:

Discipline knowledge and Research skills – Demonstrates knowledge of a research discipline and the ability to conduct a specific programme of research within that discipline

Understanding the Research Environment – Demonstrates an awareness of the research environment (for example funding bodies) and the ability to contribute to grant applications

Communicating Research – Demonstrates the ability to communicate their research with their peers and the wider research community (for example presenting at conferences and publishing research in relevant journals) and the potential to teach and tutor students

Managing & Leadership skills - Demonstrates the potential to manage a research project including the supervision of undergraduate students