

Helmholtz Call for 2019 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Jülich GmbH – www.fz-juelich.de

Department/Institute: Ernst Ruska Centre (ER-C)
http://www.fz-juelich.de/er-c/EN/Home/home_node.html; [jsessionid=D5B169649F4A81B3C6322FF9B481040B](http://www.fz-juelich.de/er-c/EN/Home/home_node.html)

Supervising scientist: Dr. Knut Müller-Caspary, Prof. Dr. Rafal Dunin-Borkowski

University for Registration (for those looking for a dissertation): RWTH Aachen

Research Field: Solid State Physics/Materials Science

Position: PhD Student or Joint PhD Student

Research Area:

2D Materials such as MoS₂, WSe₂, h-BN, or Graphene have gained enormous attention in the field of fundamental physics and applied materials science. Due to their outstanding electronic, optical and mechanical properties, they are paradigm building blocks for, e.g., future information technology employing atomically thin flexible electronics or field effect transistors with charge carrier mobilities for THz communication devices. However, since 2D materials are only 1 atomic layer thick, atomic-scale defects such as vacancies, dopant atoms, edges or domain boundaries drastically affect their electronic performance. The successful candidate will work with the pioneers of momentum-resolved Scanning Transmission Electron Microscopy (STEM), and use this imaging mode to map the electric field and the electric charge density in the vicinity of defects in topical 2D materials at the subatomic scale. He/She will be trained to work autonomously at the outstanding aberration-corrected STEM infrastructure with ultrafast cameras, and to analyse the resulting 4D data sets. While initial work focuses on the fundamental understanding of the charge distribution at point and line defects by comparing 4D-STEM measurements in free-standing membranes with contemporary simulations, the second part targets the investigation of actual devices based on 2D materials under electrical bias in the microscope, so as to relate their macroscopic performance to atomic-scale physical properties.

Specific Requirements:

The candidate should have a M.Sc. degree in physics, with a preferred focus on solid-state physics, nanotechnology or materials science. Programming skills in any language (e.g. C, C++, Matlab, Python) will be beneficial. As a member of the moreSTEM group at ER-C, the candidate will be part of a team with a vivid mutual exchange of expertise and ideas, and enthusiasm to explore new scientific territory is expected. This PhD takes place in an international research environment at Forschungszentrum Jülich and the RWTH Aachen University, which makes excellent skills in English language mandatory (spoken and written). This project can either take place in cooperation with a Chinese partner group, in which case a stay of 24 months is foreseen. Extending the aforementioned work packages to include the characterisation of nanostructures from that group is highly welcome. Otherwise, a full PhD can be conducted in Jülich completely in cooperation with the RWTH Aachen University, for which a duration of 48 months is foreseen.

Duration of stay: 24 months (Joint PhD), 48 months (PhD)

Work Place: Forschungszentrum Jülich, Germany (near Cologne)

Earliest Start: September 2019

Language Requirement: Excellent command of English, spoken & written. A German language course will be offered parallel to the project

Name and Address of the Supervisor: Dr. Knut Müller-Caspary (Group leader) & Prof. Dr. Rafal Dunin-Borkowski, Forschungszentrum Jülich, 52425 Jülich, Germany
Email: k.mueller-caspary@fz-juelich.de

Helmholtz Call for 2019 CSC Fellowship Applicants

Helmholtz Centre: Forschungszentrum Juelich GmbH – www.fz-juelich.de

Department/Institute: Nuclear Physics Institute, Experimental Hadron Structure (IKP-1)
<http://www.fz-juelich.de/ikp/EN/Home/ExperimentelleHadronenstruktur.html>

Supervising scientist: Prof. Dr. James Ritman, Dr. Susan Schadmand

University for Registration (for those looking for a dissertation): Ruhr University Bochum

Research Field: Experimental Hadron Structure

Position: PhD Student **X** or Joint PhD Student **X**

Research Area:

Experiments and data analysis with the CLAS Detector at Jefferson Lab, USA. The scientific interest is focused on the decays of particles called hadrons, the basic building blocks of matter which interact via the strong force. Decay patterns and other observables help us learn about the structure and dynamics of hadrons. We are working on existing data from the completed CLAS g12 experiment where mesons were produced in photon-induced reactions on the proton. At the same time, we are involved in acquiring and analyzing incoming data from the upgraded CLAS12 detector. The thesis would concentrate on one eta' meson decay into pions and/or real and virtual photons. The corresponding physics topics are interactions of hadrons with the strong force and with electromagnetism.

Specific Requirements:

Ideally, the candidate should have had a course on experimental nuclear/hadron/particle physics.

In addition, the candidate should be capable of / have the potential for:

- work in a team within a large international collaboration
- good communication skills in, both, written and spoken English
- travel to the accelerator facility in the USA for experimental work
- presentations at collaboration meetings and conferences
- programming in C++ and java, use of the data analysis framework ROOT

Duration of stay: PhD 4 years
Joint PhD 2 years

Work Place: Forschungszentrum Juelich, with visits to Jefferson Lab, USA

Earliest Start: September 2019

Language Requirement: Very good knowledge of English language (written and spoken). A German language course will be offered parallel to the project.

Name and Address of the Supervisor: PhD habil. Susan Schadmand, Forschungszentrum Jülich, Nuclear Physics Institute (IKP-1), 52425 Jülich, Germany; s.schadmand@fz-juelich.de