

Call for applicants: Ph.D. Position

Designed many-body interactions in superlattices of 2D materials

Project description

Superlattices in crystalline solids can be used to implement custom many-body Hamiltonians and drive exotic electronic correlations. Such effects are especially prominent in 2-dimensional (2D) materials due to reduced screening of the Coulomb interaction. This has led to a recent surge of exciting discoveries, including unconventional superconductivity in magic-angle graphene and Hubbard model antiferromagnetism in twisted bilayer WSe_2 .

The current project seeks to develop novel non-destructive approaches to confine excitons in 2D semiconductors within periodic arrays of point traps and to study the quantum behavior of such synthetic superlattices. The main goals of the project are:

- To pioneer new substrate nanolithography and van der Waals fabrication techniques, exploiting proximity effects to confine electrons and excitons in a 2D superlattice, and;
- To study their quantum-optical properties and many-body physics using optical probes.

Work involved will be roughly half nanofabrication and half tabletop experimentation under cryogenic conditions, employing a variety of optical microspectroscopy techniques.

This project is funded by the Munich Center for Quantum Science and Technology and carried out at TUM at the Walter Schottky Institut under **Dr. Nathan Wilson** and **Prof. Dr. Jonathan Finley**.

Candidate profile

- We are seeking self-motivated, hard-working individuals with an inclination for mechanical and optical lab work.
- Applicants should hold a Master's certificate in Physics or a related discipline.
- Excellent verbal and written communication skills in English are essential.
- Proficiency in Matlab, prior experience with laser optics or optical spectroscopy, or experience with 2D materials will be strongly beneficial to the applicant.
- *Current/prospective Master's students are invited to inquire about research opportunities.*

Applications will be accepted until the position is filled. **Please send your CV and a short cover letter directly to Dr. Nathan Wilson at nathan.wilson@wsi.tum.de.**

Position/title: Ph.D. Position/*Designed many-body interactions in superlattices of 2D materials*

Employer: Technische Universität München

Location: Walter Schottky Institut

Salary: TVL-E13 75%

Fields: 2D materials, semiconductor physics, quantum optics, many-body physics, optical spectroscopy, nanofabrication

