O 100: Overview Talk Marcel Reutzel

Time: Friday 9:30–10:15 Location: HE 101

Invited Talk O 100.1 Fri 9:30 HE 101

Momentum microscopy & 2D materials: Excitons in space and time — •Marcel Reutzel — I. Physikalisches Institut, Georg-August Universität Göttingen, Germany

The isolation of atomically thin van-der-Waals materials and their stacking to artificial heterostructures enables unprecedented possibilities for material control. Because of the 2D nature of the materials, surface science techniques have strongly contributed to the advancement of the field. Here, I will focus on the model system of semiconducting transition metal dichalcogendies (TMDs) and discuss how femtosecond momentum microscopy - a new variant of time- and angle-resolved photoemission spectroscopy - is capable of studying excitonics in space and time. I will show how the formation and thermalization dynamics of bright and dark electron-hole pairs (excitons) can be probed on the femtosecond time- and the nanometer length-scale.

First, I will provide an overview on how the momentum-resolved photoelectron detection scheme facilitates the direct access to the energy landscape and dynamics of bright and dark excitons in monolayer and twisted heterobilayer TMDs. Second, by combining momentum microscopy with dark-field imaging techniques, I will outline how distinct features of the photoemission spectral function can be imaged on the nanoscale, facilitating, e.g., access to the ultrafast exciton formation dynamics in laterally inhomogeneous TMD heterostructures.