Seminarankündigung

Dienstag, 11. Januar 2022
13:00 Uhr

ONLINE via ZOOM
https://tum-conf.zoom.us/j/63210679333
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“Optically probing many-body interactions in two-dimensional heterostructures”

The unique physical properties of two-dimensional materials, combined with the ability to stack unlimited combinations of atomic layers with arbitrary crystal angle, has unlocked a new paradigm in designer quantum materials. For example, when two different monolayers are brought into contact to form a heterobilayer, the electronic interaction between the two layers results in a spatially periodic potential-energy landscape: the moiré superlattice. The moiré superlattice can create flat bands and quench the kinetic energy of electrons, giving rise to strongly correlated electron systems. In atomically thin transition metal dichalcogenides (TMDs), the wide range of highly tunable many-body interactions can be probed optically: strongly bound excitons can probe their immediate dielectric environment, hybridize with other excitonic transitions, or be immersed in a Fermi sea to form Fermi-polarons affected by charge order and density. Here I will present results from magneto-optical spectroscopy on a range of TMD heterostructure devices, including homo-TMD devices (gated MoSe2 and WSe2 monolayers, bilayers, and trilayers) as well as MoSe2 / WSe2 moiré heterostructures with two, three, or four active TMD layers. The optical spectroscopy will be used to uncover details of the host TMD band structure, highly tunable hybridizations between different optical dipoles, and the emergence of strongly correlated electronic states (e.g. Wigner crystals and Mott insulating states) which can be further engineered by choice of material combination.

Prof. Brian Gerardot
Institute of Photonics and Quantum Sciences
Heriot-Watt University Edinburgh
United Kingdom