O 95: Overview Talk Kai Rossnagel

Time: Friday 9:30–10:15 Location: H24

Topical Talk O 95.1 Fri 9:30 H24

A quantum sandwich world and how we can explore it with soft x-rays — •Kai Rossnagel — Kiel University, Kiel, Germany — DESY, Hamburg, Germany

Without materials, there is nothing. Without quantum materials, there is nothing interesting.

Quantum materials express our desire to find and explain new states of matter and new physical phenomena induced by the quantum mechanical interactions of electrons. Paradigmatic examples are quantum material sandwiches made by stacking and twisting single layers of layered materials, which currently represent one of the richest and most tunable discovery and engineering platforms in all of condensed matter physics.

To see and understand how these and other quantum materials work, we need spectroscopic tools that can provide direct snapshots of electron behavior in energy-momentum space. The most powerful toolbox for this is soft x-ray spectroscopy. And the single most powerful tool is angle-resolved photoelectron spectroscopy (ARPES), which has recently been transformed into a true *in operando* technique using both nanofocused and ultrashort-pulsed soft x-ray beams to directly probe nonequilibrium electronic function in materials and devices on relevant nanometer length and femtosecond time scales, respectively.

Here, we give an overview of recent innovations in quantum material sandwiches, focusing on transition-metal dichalcogenides, and in nanoscopic and femtostroboscopic imaging of their electronic structures.