Universität Regensburg

Institute for Theoretical Physics

Colloquium on condensed matter theory with GRK 2905 Ultrafast Nanoscopy

Thursday, 04.12.2025

Speaker: Assistant Professor Ipsita Mandal
Shiv Nadar Institution of Eminence (SNIoE), India

Title: Detectable signatures of topology of the band-structures in 3d semimetals

Time: 15.15

Room: PHY 5.0.21

Abstract:
We will elucidate the nature of the linear-response tensors in planar-Hall and planar-thermal-Hall set-ups, where we subject a 3d semimetal (harbouring nodal points of topological nature) to the combined influence of an electric field (and/or temperature gradient) and a weak (i.e., non-quantising) magnetic field. We will explain why it is essential to include the effects of the intrinsic orbital magnetic moment of the wavepackets in conjunction with the Berry curvature, in order to obtain a holistic picture of the effects of topology of the Brillouin zone in the linear-response tensors. Going beyond the well-studied example of Weyl semimetals, we will discuss the cases of their multifold cousins, harbouring higher Chern numbers. We will highlight how we can compute the exact solutions from the Boltzmann equations, which gets rid of the often-inaccurate results of the naive relaxation-time approximation. Finally, we will outline how to derive surface states, in the form of Fermi arcs, characterising generic nodal points.