Universität Regensburg
Fakultät für Physik

Seminar on special topics

Announcement of Scientific Presentation

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Date: Thursday, 03/12/2026, 12:30 Uhr, RUN 0.34

Title: **"Optical discrimination of the enantiomers of CoSi: symmetry constraints and strong-field simulations"**

Abstract: CoSi (B20 structure, space group $P2_13$) is a chiral topological semimetal with multifold band crossings at Γ and R. The signs of their topological charges, and with them the winding of the surface Fermi arcs, are fixed by the structural handedness, which is commonly determined by x-ray diffraction. We examine whether the handedness can also be obtained from the nonlinear optical response to intense mid-infrared pulses, combining a symmetry analysis with simulations of the semiconductor Bloch equations for a four-band tight-binding model on the full three-dimensional Brillouin zone. Within the electric-dipole approximation, reflection at normal incidence cannot distinguish the enantiomers: the field reflected by one enantiomer equals that of the other rotated by 180° about the surface normal, for any field strength, polarization and pulse shape. High-harmonic intensities, Kerr rotation, ellipticity and circular dichroism therefore do not reveal the handedness. The same analysis identifies two observables that do: a rectified current along the surface normal and, at oblique incidence, a rectified in-plane current perpendicular to the plane of incidence. Both reverse sign between the enantiomers. For the (110) surface we present the computed signs and magnitudes of these currents in the non-perturbative regime and discuss their detection.

Host: Prof. Dr. Ferdinand Evers