Einladung zum

Physikalischen Kolloquium

Wintersemester 2022/2023

Physikzentrum der Technischen Universität Braunschweig

apl. Prof. Dr. Oliver Rader

(Helmholtz-Zentrum Berlin)

will give a talk on

November 22, 16:45, MS 3.1

Ferromagnetic topological insulators studied with synchrotron radiation

Magnetically doped topological insulators display the quantum anomalous Hall effect and are considered as materials for lossless interconnects, for a novel edge-state spintronics, for quantum metrology, and for topological qubits. Mn-doped Bi_2Se_3, Bi_2Te_3, and Sb_2Te_3 were initially believed to form substitutional dilute ferromagnetic topological insulators. Instead they form ferromagnetic heterostructures of stoichiometric $MnBi_2Te_4/Bi_2Te_3$ with a Curie temperature of 10 to 15 K [1]. This system allows the direct observation of the magnetic band gap at the Dirac point by angle-resolved photoemission which is importance since his band gap hosts the edge states of the quantum anomalous Hall effect [1]. Pure $MnBi_2Te_4$ is an antiferromagnet up to $T_N = 25$ K. It is shown that the replacement of Bi by Sb solves several problems at once [2]. In particular, the system becomes ferromagnetic with a high Curie temperature of 50 K and is a topological insulator with the magnetic gap at the Fermi energy [2,3]. The magnetic structure is complex and indicates the presence of a quantum critical point leading to spatiotemporal fluctuations [3].

[1] E. D. L. Rienks et al., Nature **576**, 423 (2019).
[2] S. Wimmer et al., Adv. Mater. **42**, 2102935 (2021).
[3] P. Küppers et al., arXiv:2202.11540 (2022).