SFB1242

SFB 1242 Nichtgleichgewichtsdynamik kondensierter Materie in der Zeitdomäne

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

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Campus Duisburg

Enhanced Nonlinear Response by Manipulating the Dirac Point in (111) Interfaces

Prof. Dr. Yoram Dagan

Tel Aviv University

Tunable spin-orbit interaction (SOI) is an important feature for future spin-based devices. In the presence of a magnetic field, SOI induces an asymmetry in the energy bands, which can produce nonlinear transport effects ($V \sim I^2$). Here, we focus on such effects to study the role of SOI in the (111) $LaTiO_3/SrTiO_3$ interface. This system is a convenient platform for understanding the role of SOI since it exhibits a single-band Hall response through the entire gate-voltage range studied. We report a pronounced rise in the nonlinear longitudinal resistance at a critical in-plane field $H_{\rm cr}$. This rise disappears when a small out-of-plane field component is present. We explain these results by considering the location of the Dirac point formed at the crossing of the spin-split energy bands. An in-plane magnetic field pushes this point outside of the Fermi contour, and consequently changes the symmetry of the Fermi contours and intensifies the nonlinear transport. An out-of-plane magnetic field opens a gap at the Dirac point, thereby significantly diminishing the nonlinear effects. We propose that magnetoresistance effects previously reported in interfaces with SOI could be comprehended within our suggested scenario.

Finally, I will discuss data on various surfaces of $KTaO_3$ where the SOI is expected to be much stronger.

[1] G. Tuvia, A. Burshtein, I. Silber, A. Aharony, O. Entin-Wohlman, M. Goldstein, and Y. Dagan, Phys. Rev. Lett. **132**, 146301 (2024).

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

Contact: Prof. Dr. Björn Sothmann, Faculty of Physics
Phone: +49 (203) 37-93330 / Mail: bjoerns@thp.uni-due.de