Multipolar current phases in correlated systems

Wojciech Brzezicki[1]

[1] *Institute of Theoretical Physics, Jagiellonian University, Łojasiewicza 11, PL-30348 Kraków, Poland*

We unveil signatures of multipolar current phases in kagome $CsTi_3Bi_5$ and layered perovskite Sr_2RuO_4 [1,2]. This is done using circularly polarized, spin-selective, angular-resolved photoelectron spectroscopy, which shows intriguing asymmetry between spin-up and spin-down signals. In both cases a multipolar, spin-orbital current phases are postulated, and verified for stability, to account for this effect, as more conventional types of order must be excluded as incoherent with experiments. In both cases we develop description of the spin-dichroic signal by means of a tight-binding model with a special form of a time-reversal symmetry.

References:

[1] F. Mazzola, W. Brzezicki,..., M. Cuoco, Anomalous spin-optical helical effect in Ti-based kagome metal, arXiv:2502.19589

[2] F. Mazzola, W. Brzezicki, M.T. Mercaldo, A. Guarino, C. Bigi, J.A. Miwa, D. De Fazio, A. Crepaldi, J. Fujii, G. Rossi, P. Orgiani, S. K. Chaluvadi, S. P. Chalil, G. Panaccione, A. Jana, V. Polewczyk, I. Vobornik, C. Kim, F. Miletto-Granozio, R. Fittipaldi, C. Ortix, M. Cuoco, A. Vecchione, Signatures of a surface spin–orbital chiral metal , Nature 626, 752 (2024).

I acknowledge support from the National Science Centre (NCN, Poland) under Project No. 2021/43/B/ST3/02166