Direct observation of spin-orbit coupling in iron-based superconductor

Sergey Borisenko

IFW-Dresden, Helmholtzstrasse 20, 01069 Dresden, Germany

E-mail: s.borisenko@ifw-dresden.de

Spin-orbit coupling (SOC) is a fundamental interaction in solids which can induce a broad spectrum of unusual physical properties from topologically non-trivial insulating states to unconventional pairing in superconductors. In iron-based superconductors its role has so far been considered insignificant with the models based on spin- or orbital fluctuations pairing being the most advanced in the field. Using angle-resolved photoemission spectroscopy we directly observe a sizeable spin-orbit splitting in a paradigm material LiFeAs (T_c~18K) and demonstrate its decisive impact on the low-energy electronic structure and details of the Fermi surface topology. Intriguingly, the largest pairing gap is supported exactly by SOC-induced three-dimensional Fermi surface.
I will also overview our recent results on many other iron-based superconductors.