October 10th, 14:30 pm

Seminar Room IV, CFEL (Bldg. 99, 01.111)

CFEL SCIENCE

Max Planck Research Department for Structural Dynamics

SEMINAR

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Strongly spin-orbit coupled systems investigated by Dichroic and Time-Resolved ARPES

The recent discoveries of materials hosting large spin splitting unlock the gate for groundbreaking experiments and theory in the perspective of exploiting the spin polarized channel in spintronics devices.

Topological insulators (TIs) and bulk Rashba systems, such as the BiTeX (X = I, Br, Cl) family, are two classes of materials of paramount interest. TIs are semiconductors hosting a topologically protected spin helical metallic surface state, while BiTeX are non centro-symmetric material displaying both spin split surface states along with spin split bulk states. The texture of the spin polarization at the Fermi level is clearly a fundamental issue of both these systems, although the bulk Rashba systems have been poorly studied with respect to the TIs.

Here we tackle the problem of deepening our present knowledge on BiTeX (X = I, Br, Cl) Rashba family by exploiting dichroic ARPES. Our results show that the recent models for interpreting the dichroic signal, in term of the spin and orbital degrees of freedom, are inadequate to interpret the experimental data and further theoretical work is needed.

At the same time, the absence of backscattering in these spin-split systems makes mandatory a detailed investigation of the electron-phonon scattering mechanisms. We are addressing this question by measuring the relaxation and scattering mechanisms for both in TIs and in bulk-Rashba systems by means of Time-Resolved ARPES and the most recent results will be presented.

Host: Andrea Cavalleri, MPSD-CFEL