

The objective of the project is to experimentally establish a basic understanding of the dynamics of Dirac carriers in TI materials. Because spin and momentum of Dirac quasiparticles in topological insulators are directly linked to one another, they should possess common relaxation dynamics. However, this fundamental question has not been experimentally addressed so far. It is a challenging task to separate the contribution of the topological surface states from the bulk carriers with high time resolution. To this end, we plan to optimize and fabricate HgTe based heterostructure samples both for the 2D and 3D TI case with semi-transparent gate electrodes to be able to tune the energetic position of the electro-chemical potential. The spin-momentum dynamics will be probed by means of time-resolved THz pump-probe polarimetry. The prime advantage of this approach is the ability to address the energy and spin relaxation independently by following the spectral and polarization time evolution simultaneously.