Poster-1-19

Hall effect and magneto transport in a quasi-1D conductor at low densities

Giacomo Morpurgo, Christophe Berthod, and Thierry Giamarchi

DQMP, University of Geneva, Switzerland

Among the various 2D magnetic semiconductors that have been recently discovered and investigated, CrSBr has shown unexpected transport properties under field-effect doping. In particular, the absence of Hall effect and a large anisotropy of the conductivity indicate quasi-1D behavior and possibly strong disorder [1]. Here, we study the field- and temperature-dependent longitudinal and transverse conductivities in a 2D anisotropic tight-binding model ($t_\perp \ll t_\parallel$), where the dissipation is described by a local (i.e., momentum-independent) self-energy Σ. Using the Kubo formalism, we calculate numerically the conductivity tensor up to second order in the field. This model allows one to describe the crossover from a regime of coherent anisotropic transport when $\Sigma < t_\perp$ to a quasi-1D regime with incoherent transport along one direction when $t_\perp < \Sigma < t_\parallel$. Furthermore, it allows us to explore a low-density regime that has not been much studied so far, where the chemical potential lies below the band and, when $k_B T < \Sigma$, the metallicity stems from spectral-weight broadening due to the self-energy rather than thermal excitation of carriers.

[1] W. Fan *et al.*, Adv. Mater. 2022, 2109759 (2022).