Electrical and magnetooptical measurements across the magnetic phase diagram of $MnBi_2Te_4$

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Magnetism in topological insulators yields a quantized anomalous Hall effect that hosts chiral edge states without a magnetic field. This state has been achieved in topological insulators alloyed with transition metals Cr and V to become ferromagnetic. [1] In contrast with this doping scheme, the recently discovered $MnBi_2Te_4$ is an intrinsic layered topological material that has an antiferromagnetic ground state and a rich magnetic phase diagram. In this talk, I will introduce the electronic and magnetic phase diagram of this material, with special focus on a canted magnetic phase that arises at intermediate magnetic field [2,3]. The talk will then discuss our recent findings that non-collinear magnetism in this phase yields an anomalous Hall effect that scales proportionally to the canting angle. Lastly, I will show preliminary infrared spectroscopy measurements that track the evolution of the optical gap of this material through its rich magnetic phase diagram. Overall, this talk will present the potential of $MnBi_2Te_4$ as a material that can achieve an interplay between topological electronic states and various magnetic phases, beyond ferromagnetism.

[1] Y. Tokura, K. Yasuda, A. Tsukazaki, *Nature Review Physics*, **2** 126 (2019).
[2] S. Bac, K. Koller et al. *npj Quantum Materials* accepted (2022). 10.1038/s41535-022-00455-5
[3] F. Lux et al. *Phys. Rev. Letter* **124** 096602 (2020).