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POS-F55 – Toward an understanding of the interplay between quantum magnetism and electron transport in magnetic topological insulators

Wednesday 9 June 2021 14:13 (2 minutes)

Motivated by magnetotransport experiments on magnetic topological insulators, a theoretical study of Dirac cone electrons coupled to magnetic moments has been done [1]. That work showed that the electronic response is determined by the magnetic configuration - the electronic spectrum is gapped in a region of the ferromagnetically ordered moments, but the gap vanishes at domain walls. This vanishing gap gives rise to one-dimensional channels of conductance. Taking the interplay between Dirac electrons and magnetic moments further, we wish to study a coupled system where the magnetic moments are treated quantum mechanically. A quantum-mechanical treatment may provide a more complete understanding of the role that the domain-wall bound states play in the behavior of the magnetoconductance in magnetic topological insulators and in heterostructure. For example, domain walls may be delocalized due to quantum fluctuations while still coupling to the Dirac fermions. The generalization of the classical model to the quantum regime could help in the development of spintronics applications and sensors of magnetic excitations.

[1] K. L. Tiwari, W.A. Coish, and T. Pereg-Barnea Phys. Rev. B. **96**, 235120 (2017).

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