Chez Pierre

Presents ...

Monday, November 21, 2016
12:00pm Noon
MIT Room 4-331

Chez Pierre Seminar

Dmitrii L. Maslov - University of Florida

"Fermi liquids with a (spin-orbit) twist"

We show that the combination of the effective spin-orbit (SO) magnetic field and Coulomb interaction gives rise to a new type of collective modes: spin-chiral waves, which are oscillations of magnetization. We construct a Fermi-liquid (FL) theory of these waves, both in the absence and presence of the external magnetic field, and both in the spatially uniform and non-uniform cases, taking into account damping both due due residual quasiparticle interaction and disorder. We show that the quantum kinetic equation for a FL can be mapped onto an effective 1D tight-binding model. In this mapping, the continuum of single-particle spin-flip excitations corresponds to the conduction band, while the collective modes appear as bound states due to both site and bond disorder, generated by FL interaction. Based on this theory, we develop a many-body picture of Electron Spin Resonance in FL with spin-orbit coupling and make specific predictions for the experiment, and explain the results of recent Raman measurements on magnetized 2D electron systems.

1. A. Ashrafi and D. L. Maslov, Chiral Spin Waves in Fermi Liquids with Spin-Orbit Coupling, PRL 109, 227201 (2012).
2. A. Ashrafi et al. E. I. Rashba, Theory of a chiral Fermi liquid: General formalism, PRB 88, 075115 (2013).
3. S. Maiti et al. Collective modes in two- and three-dimensional electron systems with Rashba spin-orbit coupling, PRB 91, 035106 (2015).
4. S. Maiti and D. L. Maslov, Intrinsic Damping of Collective Spin Modes in a Two-Dimensional Fermi Liquid with Spin-Orbit Coupling, PRL 114, 156803 (2015).
5. S. Maiti et al. Electron spin resonance in a two-dimensional Fermi liquid with spin-orbit coupling, PRB 93, 045134 (2016).