ELECTRON SPIN RESONANCE IN A FERMI LIQUID WITH SPIN-ORBIT COUPLING.

M. Imran[1], S. Maiti[1,2] , and D. L. Maslov[1]

[1]Department of Physics, University of Florida, Gainesville, FL 32611, USA
[2]National High Magnetic Field Laboratory, Tallahassee, FL 32310, USA

Spin-orbit coupling (SOC) is the keystone physics element in the fields of spintronics and topological matter. In addition, SOC also changes our fundamental understanding of some of the basic properties of a Fermi-liquid[1]. Many body correlations in Fermi liquids with SOC give rise to a new kind of collective modes: the chiral-spin waves, which are oscillations of magnetization existing even in the absence of the magnetic field. In this talk, we review the theory and proposals for the experimental observation of the chiral-spin waves, compare various candidate materials[2], and present yet another way, via the Electron Spin Resonance (ESR) spectroscopy, as a viable probe for detecting the chiral-spin waves. We show that, in the presence of SOC, ESR becomes a probe of not only single-particle physics but also of many-body phenomena. The spectrum of chiral spin modes in the presence of the magnetic field have unique characteristics that can be traced in an ESR experiment. We also show that SOC induces a non-linear field dependence of the Larmor precession frequency and affects g-factor measurements.

[1] S. Maiti and D. L. Maslov, Phys. Rev. Lett. **114**, 156803 (2015).
[2] See S. Maiti, V. Zyuzin, D. L. Maslov, Phys. Rev. B **9**1, 035106 (2015) and refs therein.

Category: MR
Email: smaiti@magnet.fsu.edu