

Non-Fermi Liquid behavior in Skyrmion crystals

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In crystals which lack inversion symmetry, spin orbit coupling leads to non-collinear magnetically ordered phases, which are collectively termed helimagnets. A particularly interesting helimagnetic order is the Skyrmion crystal, recently observed in MnSi and other B20 materials. Conduction electrons interact with the static magnetic texture giving rise to a topological Hall effect which was also observed. Here we study the interaction between conduction electrons and the collective modes of the Skyrmion lattice. We argue that a peculiar ‘topological’ coupling of the Skyrmion crystal modes to electrons, combined with an unusual phonon dispersion, makes this problem distinct from conventional systems of electrons coupled to phonons. In particular we argue that scattering of electrons off these Skyrmion lattice collective modes may lead to a non-Fermi liquid phase, and compare our results with the unusual $T^{3/2}$ scaling of temperature dependent resistivity seen in high pressure experiments on MnSi.