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Spin susceptibility function of helical metal and RKKY interacton[1] CHUNXIAO LIU, BITAN ROY, JAY SAU, university of maryland, CMTC AND JQI TEAM — Topological insulator is a peculiar material, which is insulating in the bulk, while conducting on the surface due to the topology in momentum space . Here, we study the surface of 3D topological insulator, which is also called helical metal. The Hamiltonian of the surface electrons is $H = k \times \sigma$, which has spin-momentum locking and Dirac dispersion. The property that we are interested in is the spin susceptibility function of the helical metal. It describes how the system respond to the external magnetic field in the linear response regime. However, because the dispersion of helical metal is linear in momentum k, the spin susceptibility is easily divergent in terms of UV momentum cutoff. The talk we will present is focusing on how we renormalize the spin susceptibility function in the particular renormalization scheme we choose. In the second part of the talk, we will make use of the renormalized spin susceptibility to show how external magnetic impurities on the surface would interact with each other, with the interaction mediated by electrons of helical metal. This interaction is also called RKKY interaction. Treating impurities as classical spins, we show the pattern of ground state with numerical simulations.

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