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Study of non-Fermi liquid behavior from partial nesting in multi-orbital superconductors

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Partial nesting between two connected or disconnected regions of the Fermi surface leads to fractional powers of the Coulomb scattering lifetime as a function of temperature and frequency. This result is first demonstrated for a toy band structure where partial nesting occurs within a single band and between different regions of the Brillouin zone. A comparison is then made to a multiband scenario by studying the scattering rate of an effective two orbital model that was proposed in the context of multi-orbital superconductors. In the process, various model independent factors affecting the temperature exponent, n , are identified. The logarithmically divergent contributions of the lowest order vertex correction to the multi-orbital susceptibility, and the role played by nesting in suppressing these divergences is analysed. The relevance of these results is discussed keeping the recently observed anomalous resistivity in the Co doped Iron superconductor LiFeAs as a backdrop.

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Searching for ideal topological crystalline insulators and topological superconductors in the Pb-Sn-In-Te

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The discovery of 3D topological insulator materials and topological superconductor open up a new research field in the condensed matter physics. In order to search for the ideal topological insulator, topological crystalline insulator and topological superconductor, we have grown a large number of the single crystals of Pb-system (Pb-Sn-In-Te) topological crystalline insulator and their topological superconductor. We have measured the physical properties on these single crystals by various techniques. We have studied the effect of crystal growth condition, impurity and composition on the bulk electrical conductivity of these single crystals. We try to find out which composition and crystal growth condition is the best for the ideal topological insulator, topological crystalline insulator and topological superconductor. We have got the bulk topological superconductor with $T_c=5K$.

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