Magnetism of Multi-Orbital Edge States in Sr_2RuO_4

Y. Imai[a, b], K. Wakabayashi[c], and M. Sigrist[a]

[a]Institute for Theoretical Physics, ETH Zürich, Zürich, Switzerland
[b]Department of Physics, Saitama University, Saitama, Japan
[c]International Center for Materials Nanoarchitectonics (MANA), NIMS, Tsukuba, Japan

Motivated by the multi-band spin-triplet superconductor Sr_2RuO_4, we investigate the superconducting and magnetic properties of a two-band system. The two bands correspond to the α-β bands of Sr_2RuO_4 coupled via inter-band hybridization and spin-orbit coupling. Considering chiral p-wave pairing we analyze the multi-orbital edge states which possess a gapless quasiparticle spectrum but are not topologically protected. We find that the edge states carry both charge and spin current giving rise to anomalous and spin Hall effect. Including electron-electron correlation the edge states develop instability towards an incommensurate magnetic order concentrated at the surface. We analyze the interplay between magnetism and superconductivity in this context and discuss experimental consequences of the edge states and their magnetic order.