Abstract Submitted
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Theory of edge currents in Sr_2RuO_4: effects of topology and gap anisotropy[1] SAMUEL LEDERER, SRINIVAS RAGHU, Stanford University — Substantial experimental evidence suggests that Sr_2RuO_4 is a chiral p-wave superconductor. Depending on bandstructure, such a system may exhibit topologically protected edge modes, and in general would exhibit intrinsic edge currents. The latter, however, have not been observed in sensitive scanning probe measurements. A possible resolution to this apparent contradiction has been offered by Raghu et al.[1]. They show that, in weak coupling, superconductivity is dominant not on the 2D γ band as commonly believed, but on the quasi-1D α and β bands, leading to a topologically trivial state, presumably with suppressed currents. They also show that the favored order parameter has sharp gap minima on the Fermi surface. We present calculations of edge currents incorporating these features using two different methods: self-consistent Bogoliubov-de Gennes equations, and Ginsburg-Landau theory. We find that, contrary to expectation, the existence and character of topological edge modes have no effect on edge currents. Multiband effects and gap anistropy yield quantitative reductions, but order 1 edge currents are a generic consequence of chiral p-wave superconductivity at low temperature in Sr_2RuO_4.
[1] S. Raghu, et al., PRL 105, 136401 (2010).

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