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Is Sr2RuO4 a chiral p-wave superconductor? Insights from edge currents and uniaxial strain

THOMAS SCAFFIDI, University of Oxford

The prevailing candidate for the superconducting order parameter in Sr2RuO4 is chiral p-wave and signatures of this phase have been looked for experimentally. In this work, we discuss two of these experiments at the light of theoretical results obtained from a weak coupling RG calculation. First, we show that the most favored chiral superconducting order parameter in Sr2RuO4 has Chern number —C—=7 in the weak coupling limit, owing to a dominant longer range pairing. Since it was shown that the edge currents of a —C—¿1 superconductor vanish exactly in the continuum limit, and can be strongly reduced on the lattice, this form of order parameter could help resolve the conflict between experimental observation of time-reversal symmetry breaking and yet the absence of observed edge currents in Sr2RuO4. Second, the p-wave order parameter obtained from the RG calculation exhibits a large Tc enhancement under uniaxial strain along 100. This enhancement is symmetric for tensile and compressive strain, and shows no measurable cusp at zero strain, in agreement with experiments. The absence of such a cusp is therefore not incompatible with a chiral p-wave state. Finally, we make predictions about the evolution of the superconducting state as a Van Hove singularity is crossed at larger strain.