Scanning susceptometry measurements - local measure of superfluid density
Susceptibility image - Ru rich Sr$_2$RuO$_4$ ac face

2.0K

1.5K

1.3K

0.5K

0.25K

edge of crystal

Ru inclusions

1150 $\phi_0$/Amp

100 $\mu$m
Histograms of susceptibility images
The graph shows the temperature dependence of the magnetic susceptibility ($\chi(\Phi_0/\text{Amp})$) for different crystal samples of $\text{Sr}_2\text{RuO}_4$. The graph includes two distinct regions:

- For $T < 0.5$ K, the susceptibility is shown for a Ru boule.
- For $T > 0.5$ K, the susceptibility is shown for a Ru rich $\text{Sr}_2\text{RuO}_4$ crystal.

The magnetic susceptibility decreases as the temperature increases, indicating a decrease in magnetic ordering or superconductivity. The graph highlights the transition temperatures at which these properties change.
Fasthenry calculations

\[ z = 4 \mu m \times 10 \mu m \times 10 \mu m \text{ hole} \]
Could this excess susceptibility come from $p_x \pm ip_y$ edge states?

\[ L = N_{\text{edge}} m^* VR = \rho_{2d} \pi R^2 \hbar / 2 \quad \rho_{2d} = k_F^2 / 2\pi \]

\[ N_{\text{edge}} = k_F R / 4 \]

\[ V = \hbar k_F / m^* \]

\[ I = \frac{N_{\text{edge}} eV}{2\pi R} \to \frac{N_{\text{edge}} e}{2\pi R} (V - e\vec{A}/m^*) \quad \vec{A} = B_a r \hat{\theta} \]

\[ \Delta I = \frac{k_F e^2 B_a R}{8\pi m^*} \]

$\Delta I$ - edge state currents induced by applied field

\[ \frac{\Delta \Phi}{\Phi_0 I_a} = \frac{\mu_0^2 k_F e^2}{32\pi m^* \Phi_0} \frac{R^3}{(R^2 + z^2)^{3/2}} \frac{R_s^2}{(R_s^2 + z^2)^{3/2}} A_{\text{eff}} \approx 10^{-3} / \text{Amp-layer} \]

\[ N_{\text{layers}} \approx \lambda_c / d \approx 3 \mu m / 1.3 nm = 2400 \]

\[ \frac{\Delta \Phi}{\Phi_0 I_a} \approx 3 \text{Amp}^{-1} \quad \text{compared with 100-200 Amp}^{-1} \text{ from experiment - probably not} \]