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Scenarios for half-integer fluxoid behavior of annular rings of Sr_2RuO_4 RAFFI BUDAKIAN, DAVID FERGUSON, PAUL M. GOLDBART, JOONHO JANG, University of Illinois at Urbana-Champaign, VICTOR VAKARYUK, Argonne National Laboratory — Recently, cantilever torque magnetometry experiments on annular rings of superconducting Sr_2RuO_4 have revealed half- height steps in the magnetization [1]. These features are suggestive of the existence, in these annular samples, of half- quantum fluxoid states (i.e., the coreless analogs of half- quantum vortices). We consider the existence and energetic stability (for various forms of triplet superconductivity) of half-quantum fluxoid states in annular samples. We also consider alternative scenarios that could give rise to magnetization steps. One particular scenario requires the presence, in the bulk of the sample, of thermodynamically stable "wall vortices" By analyzing the equilibrium state of the superconductor, as a function of the applied magnetic field, we conclude that any wall-vortex scenario consistent with the observations of Ref. [1] would require a (to date, unexplained) fine tuning of various material parameters.

[1] J. Jang, D. Ferguson, V. Vakaryuk, R. Budakian, S. Chung, P.Goldbart, and Y. Maeno, (2010 unpublished)

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