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Superconductivity deep inside the hidden-order phase of URu2Si2: a phenomenological model[1] JIAN KANG, RAFAEL FERNANDES, University of Minnesota — Recent magnetic torque and x-ray experiments have revealed that the tetragonal symmetry is broken in the hidden-order phase of URu_2Si_2. An important issue is how this symmetry breaking affects the superconducting state that develops deep inside the hidden-order state. Here we investigate this problem using a phenomenological model for both the "nematic" (i.e. tetragonal symmetry-broken) and superconducting phases. Based on recent field-angle-dependent heat capacity and thermal conductivity data, as well as Kerr effect measurements, we consider a chiral $d + id$ superconducting state that also breaks time-reversal symmetry. We find that in the presence of an orthorhombic/nematic order parameter, the system displays two sequential superconducting transitions: in the first, at T_c, the system enters a superconducting phase whereas in the second, at $T^* < T_c$, time-reversal symmetry is broken. Near the second transition, a "soft" but damped collective mode related to gap amplitude fluctuations emerges, which could be manifested in Raman scattering data. Between these two transitions, we find an unusual $\omega \log(\omega)$ dependence of the low-energy density of states, and show how it impacts the properties of several thermodynamic quantities in the $T^* < T < T_c$ regime.

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