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Reversal of specific heat oscillations with planar magnetic field in 2D d-wave superconductors: Doppler shift beyond the nodal approximation. G.R. BOYD, P.J. HIRSCHFELD, University of Florida, ILYA VEKHTER, Louisiana State University — Experiments on several novel superconducting compounds found oscillations of the specific heat when an applied magnetic field is rotated with respect to the crystal axes. The results are commonly interpreted as arising from the nodes of an unconventional order parameter, but the identifications of nodal directions are sometimes controversial. While the semiclassical method predicted the minima for the field aligned with the nodes in the low-energy range, inclusion of vortex scattering was shown to lead to an inversion of the oscillation pattern at finite energy. Here we show with a simple model calculation that even within semiclassical approach with no scattering on the vortices, either minima or maxima can occur in thermodynamic quantities depending on the the temperature and the magnetic field scale. Using a d-wave BCS model and approximating the quasiparticle excitations semiclassically, we find a sign reversal of the field angle oscillations as temperature is increased. Absence of this effect in earlier work within the same approach is attributed to the use of the nodal approximation, which breaks down at higher energies. The result indicates that the inversion of oscillations is an intrinsic feature of unconventional superconductors.

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