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Theory of quasiparticle vortex bound states in Fe-based superconductors: application to LiFeAs YAN WANG, PETER HIRSCHFELD, Department of Physics, University of Florida, Gainesville, Florida 32611, USA, ILYA VEKHTER, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, Louisiana 70803-4001, USA — Spectroscopy of vortex bound states can provide valuable information on the structure of the superconducting order parameter. Quasiparticle wavefunctions are expected to leak out in the directions of gap minima or nodes, if they exist, and scanning tunneling spectroscopy (STS) on these low-energy states should probe the momentum dependence of the gap. Anisotropy can also arise from band structure effects, however. We perform a quasiclassical calculation of the density of states of a single vortex in an anisotropic superconductor, and show that if the gap itself is not highly anisotropic, the Fermi surface anisotropy dominates, preventing direct observation of superconducting gap features. This serves as a cautionary message for the analysis of STS data on the vortex state on Fe-based superconductors, in particular LiFeAs, which we treat explicitly. YW and PJH were supported by the DOE under DE-FG02-05ER46236, and I. V. under DE-FG02-08ER46492.

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