Abstract Submitted
for the NWS15 Meeting of
The American Physical Society

Vortex-Bound States in Chiral d-Wave Superconductors DARRICK LEE, University of British Columbia, ANDREAS SCHNYDER, Max Planck Institute for Solid State Research — Superconductors have a full energy gap in their bulk spectrum, but subgap bound states can occur at magnetic impurities, at the surface, or inside magnetic vortices. The latter are called vortex bound states. In this talk, we discuss how quasiparticle excitations in a superconductor with vortices can be modelled using a set of equations called the Bogoliubov de Gennes equations. In addition, we discuss how these equations are numerically and analytically solved for chiral d-wave superconductors to obtain the structure of their vortex bound states. This structure refers to a combination of two properties: the energy spectrum of the vortex bound states and the local density of states about the vortices. We find that in some cases, the vortex bound states form zero energy Majorana states, whereas in other cases, the bound states only occur at finite energies. In addition, we find that in all cases of chiral d-wave superconductors, the local density of states about the vortex is different than the local density of states about the antivortex. This difference remains present after temperature broadening of the local density of states, modeling a more realistic experimental environment, and can thus be used to characterize chiral d-wave superconductors.

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Date submitted: 10 Apr 2015 Electronic form version 1.4