Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Odd-parity superconductors with two-component order parameters: nematic and chiral, gapped and nodal JRN W F VENDERBOS, VLADYSLAV KOZII, LIANG FU, Massachusetts Institute of Technology — Motivated by growing experimental evidence that superconductivity in the doped topological insulator CuxBi2Se3 has an odd-parity pairing with broken rotational symmetry, we study the general class of odd-parity superconductors with two-component order parameters. We address the energetics and physical properties of different superconducting phases, with special emphasis on the role of spin-orbit coupling, which is generally strong in topological insulator and related materials. We show that within the weak-coupling BCS theory, in the absence of spin-orbit coupling, isotropic superconductors are favored, which are analogs of the A- or B-phase of ^{3}He. In the presence of spin-orbit coupling, however, we find that a nematic superconducting phase, which spontaneously breaks rotational symmetry are favored. We determine the superconducting gap structures and find, in addition to fully gapped odd-parity superconductors, nodal superconductors with Dirac and Weyl quasiparticles, which are markedly different from superfluid phases of ^{3}He.

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Date submitted: 06 Nov 2015 Electronic form version 1.4