Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Controlled finite momentum pairing and spatially varying order parameter in proximitized HgTe quantum wells[1] SEAN HART, HECHEN REN, MICHAEL KOSOWSKY, GILAD BEN-SHACH, Harvard University, PHILIPP LEUBNER, CHRISTOPH BRUENE, HARTMUT BUHMANN, LAURENS MOLENKAMP, Universitaet Wuerzburg, BERTRAND HALPERIN, AMIR YACOBY, Harvard University — Conventional$s$-wave superconductivity arises from singlet pairing of electrons with opposite Fermi momenta, forming Cooper pairs with zero net momentum. Recent studies have focused on coupling$s$-wave superconductors to systems with an unusual configuration of electronic spin and momentum at the Fermi surface, where the nature of the paired state can be modified and the system may even undergo a topological phase transition. Here we present measurements on Josephson junctions based on HgTe quantum wells coupled to aluminum or niobium superconductors, and subject to a magnetic field in the plane of the quantum well. We observe that the in-plane magnetic field modulates the Fraunhofer interference pattern, and that this modulation depends both on electron density and on the direction of the in-plane field with respect to the junction. However, the orientation of the junction with respect to the underlying crystal lattice does not impact the measurements. These findings suggest that spin-orbit coupling plays a role in the observed behavior, and that measurements of Josephson junctions in the presence of an in-plane field can elucidate the Fermi surface properties of the weak link material.

[1]NSF DMR-1206016; STC Center for Integrated Quantum Materials under NSF Grant No. DMR-1231319; NSF GRFP under Grant DGE1144152, Microsoft Corporation Project Q.

Sean Hart
Harvard University

Date submitted: 11 Nov 2016 Electronic form version 1.4