Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electrical manipulation of Majorana Fermions in an interdigitated superconductor-ferromagnet device[1] SHU-PING LEE, California Institute of Technology, JASON ALICEA, University of California, Irvine, GIL REFAEL, California Institute of Technology — We show that a topological phase supporting Majorana fermions can form in a 2DEG adjacent to an interdigitated superconductor-ferromagnet structure. An advantage of this setup is that the 2DEG can inherit the required Zeeman splitting and superconductivity from a single interface, allowing one to utilize a wide class of 2DEG's including the surface states of bulk InAs. We demonstrate that the interdigitated device supports a robust topological phase when the finger spacing λ is smaller than the Fermi wavelength λ_F. In this regime the electrons effectively see a "smeared" Zeeman splitting and pairing field despite the interdigitation. The topological phase survives even in the opposite limit $\lambda < \lambda_F$, though with a reduced bulk gap. We also describe how to electrically generate a vortex in this setup to trap a Majorana mode, which can be detected through edge tunneling spectroscopy.

[1]National Science Foundation grant DMR-1055522, and IQIM

Shu-Ping Lee
California Institute of Technology

Date submitted: 11 Nov 2011 Electronic form version 1.4