Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Detecting Perfect Transmission in Josephson Junctions on the Surface of Three Dimensional Topological Insulators JENS H. BARDARSON, Max Planck Institute for the Physics of Complex Systems, Dresden, RONI ILAN, University of California, Berkeley, H.-S. SIM, Korea Advanced Institute of Science and Technology, JOEL E. MOORE, University of California, Berkeley —
We consider Josephson junctions on surfaces of three dimensional topological insulator nanowires. We find that in the presence of a parallel magnetic field, short junctions on nanowires show signatures of a perfectly transmitted mode capable of supporting Majorana fermions. Such signatures appear in the current-phase relation in the presence or absence of the fermion parity anomaly, and are most striking when considering the critical current as a function of flux Φ, which exhibits a peak around $\Phi = h/2e$. The peak sharpens in the presence of disorder at low but finite chemical potentials, and can be easily disentangled from weak-antilocalization effects. The peak also survives at small but finite temperatures, and represents a realistic and robust hallmark for perfect transmission and the emergence of Majorana physics inside the wire.

Jens H Bardarson
Max Planck Institute for the Physics of Complex Systems, Dresden

Date submitted: 15 Nov 2013 Electronic form version 1.4