

Abstract Submitted  
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**Effect of impurities on the Josephson current through helical metals: Exploiting a neutrino paradigm** POUYAN GHAEMI, V. PARAMESWARAN NAIR, City College of City University of New York — In this talk we present our results on the effect of time-reversal symmetric impurities on the Josephson supercurrent through two dimensional helical metals such as on topological insulator surface state. We show that contrary to the usual superconducting-normal metal-superconducting junctions, the suppression of supercurrent in superconducting-helical metal-superconducting junction is mainly due to fluctuations of impurities in the junctions. Our results, which is a condensed matter realization of a part of the MSW effect for neutrinos, shows that the relationship between normal state conductance and critical current of Josephson junctions is significantly modified for Josephson junctions on the surface of topological insulators. We also study the temperature-dependence of supercurrent and present a two fluid model which can explain some of recent experimental results in Josephson junctions on the edge of topological insulators.

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