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Non-Local Quantum Transport Theory of Proximity Coupled Topological Systems BRIAN DELLABETTA, University of Illinois at Urbana-Champaign, MARTIN STEHNO, University of Twente, DALE VAN HARLINGEN, MATTHEW GILBERT, University of Illinois at Urbana-Champaign, DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING COLLABORATION, DEPARTMENT OF PHYSICS COLLABORATION — Previous work on the coupling of s-wave superconductors (SC) and time-reversal invariant topological insulators (TIs) has revealed that the broken spin-rotation symmetry inherent in the TI surface states results in a proximity-induced order that deviates from the conventional character of the parent SC.[1] Despite the plethora of interesting phenomena predicted to occur in this system, knowledge about the transport manifestations of this unusual SC order have yet to be studied. In this talk, we consider an SC-TI heterostructure and determine the quantum transport signatures of this unconventional superconductivity that emerges within the mean-field picture. By combining quantum transport experiments and non-equilibrium quantum transport theory, we discuss the unique signatures which appear in the non-local differential conductance due to the unconventional superconducting state present in our SC-TI coupled system.

[1]A. M. Black-Schaffer et al., *PRB* **87**, 220506 (2013).

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