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Topologically Protected Quantum State Transfer in a Chiral Spin Liquid NORMAN YAO, CHRIS LAUMANN, Harvard University, ALEXEY GORSHKOV, California Institute of Technology, HENDRIK WEIMER, Harvard University, LIANG JIANG, California Institute of Technology, J. IGNACIO CIRAC, Max Planck Institute for Quantum Optics, PETER ZOLLER, University of Innsbruck, MIKHAIL LUKIN, Harvard University — Topology plays a central role in ensuring the robustness of a variety of physical phenomena. Notable examples range from the robust current carrying edge states associated with the quantum Hall and the quantum spin Hall effects to proposals involving topologically protected quantum memory and quantum logic operations. In this talk, I will describe a topologically protected channel for the transfer of quantum states between remote spin-based quantum registers. In our approach, state transfer is mediated by the edge-mode of a chiral spin liquid. I will demonstrate that the proposed method is intrinsically robust to realistic imperfections associated with disorder and decoherence. Possible experimental implementations and applications to the detection and characterization of spin liquid phases will be discussed.

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