Abstract Submitted
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Robustness of a topological insulator state probed by quantum Hall systems[1] XINQIANG CAI, Tsinghua University, VINICIO TARQUINI, TALBOT KNIGHTON, ZHE WU, JIAN HUANG, Wayne State University, LOREN PFEIFFER, KEN WEST, Princeton University — This study concerns the origin of the robustness of a topological insulator studied via dilute quantum Hall systems. Low carrier density is chosen to minimize the density gradient at the edge in order to examine how the edge-reconstruction is related to the protection mechanism of the topological order. An anti-Hall bar geometry is adopted to facilitate simultaneous probes to the edge (via the magnetoresistance and the Hall resistance) and bulk (via measurement between independent edges) states. The fully gapped bulk states are found only at exact integer filling factors down to a few percent accuracies. Fixing the magnetic filed at the fully gapped point, the breakdown is studied as a function of the external dc+ac voltage bias. A large breakdown threshold is far beyond the Landau level spacing. Moreover, extremely sharp discontinuous steps spaced at exactly the Landau level spacing appears following the threshold voltage, confirming a breakdown via a resonance-like edge-bulk tunneling, in contrast to the well-known QUILL theory. A model based on edge reconstruction will be discussed.

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