Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Spatially resolved breakdown in reentrant quantum Hall states OLEKSANDR ROSSOKHATY, JOSHUA FOLK, University of British Columbia, YUVAL BAUM, ADY STERN, Weizmann Institute of Science, JOHN WATSON, GEOFFREY GARDNER, MICHAEL MANFRA, Purdue University — Electrons in a two dimensional electron gas in the fractional quantum Hall regime may rearrange into a quasi-crystalline structure that gives rise to a reentrant Integer Quantum Hall (RIQH) effect in transport. As bias current increases, longitudinal and Hall resistivities measured for these states show multiple sharp breakdown transitions, a signature that is unique to RIQH states and has previously been ascribed to pinning-depinning transitions or to the development of bias-induced anisotropy. We present an alternate interpretation of the characteristic features of RIQH breakdown at high bias, based on spatially-resolved measurements that indicate a phase boundary between broken-down and unbroken regions propagating chirally from source and drain contacts as a function of bias current. As the phase boundary passes various contacts, its spreading generates multi-stage breakdown signatures like those reported elsewhere. Confirming numerical simulations, the chiral sense of the spreading is set not by the chirality of the edge state itself, but instead depends on electron- or hole-like character of the RIQH state.

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Date submitted: 06 Nov 2015 Electronic form version 1.4