Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The origin of the stripes observed in scanning single-electron transistor and in mesoscopic transport measurements of quantum Hall samples[1] CHENGGANG ZHOU, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, MONA BERCIU, Department of Physics and Astronomy, University of British Columbia — We analyze two seemingly unrelated types of experiments on quantum Hall samples. When the measured quantities (local compressibility and resistances) are plotted as a function of magnetic field(B) and electron density(n_e), both experiments exhibit stripes parallel to lines of integer filling factors on the B-n_e plane. Unlike the popular belief in Coulomb blockade physics, we explain this within the framework of non-interacting electron theory. Our numerical simulations and theoretical analysis demonstrate that new electronic states appear predominantly at the center of Landau levels, when the magnetic field increases. This leads to a certain "spectral ordering" of the localized states that is sufficient to explain the main features observed in the experiments.

[1]Part of this research was performed at the CNMS, sponsored at Oak Ridge National Laboratory by the Division of Scientific User Facilities, U.S. Department of Energy. MB acknowledges support from the Sloan Foundation, CIfAR Nanoelectronics and NSERC

Chenggang Zhou
Center for Nanophase Materials Sciences, Oak Ridge National Laboratory

Date submitted: 27 Nov 2007 Electronic form version 1.4