The last submission was flagged for length, even though it was under 1200 characters.
for the MAR16 Meeting of
The American Physical Society

The extreme quantum limit in lightly-doped $SrTiO_3$[1] ANAND BHATTACHARYA, Materials Science Division and Nanoscience and Technology Division, Argonne National Laboratory, Lemont IL, BRIAN SKINNER, Materials Science Division, Argonne National Laboratory, Lemont IL, GURU KHALSA, CNST, National Institute of Standards and Technology, Gaithersburg MD, ALEXEY SUSLOV, National High Magnetic Field Laboratory, Tallahassee FL — When a three dimensional electron gas is placed in a sufficiently strong magnetic field, it is said to be in the quantum limit when the cyclotron energy $\hbar\omega_c > \varepsilon_F >>$kT, and all of the electrons occupy the lowest Landau level. Achieving this limit in a material requires a small Fermi energy relative to the applied magnetic field, and a weak disorder potential such that magnetic freeze-out is avoided. We present an experimental study of lightly-doped single crystals of $SrTiO_3$, which remain good bulk conductors in temperatures down to 25 mK and magnetic fields up to 45 T. Our measurements probe deep into the quantum limit, where $\hbar\omega_c >> \varepsilon_F$ and theory has long predicted that electron-electron interactions can drive the system into a charge density wave or Wigner crystal like state. A number of interesting features arise in electrical transport in this regime, including a striking re-entrant nonlinearity in the current-voltage characteristics. We discuss these features in the context of possible correlated electron states, and present a picture based on magnetic field induced puddling of electrons in a disorder potential landscape.

[1]U.S. DOE, BES contract No. DE-AC02-06CH11357; NIST CNST; US NSF Cooperative Agreement No. DMR-1157490; State of Florida.

Anand Bhattacharya
MSD and NST Division, Argonne National Laboratory

Date submitted: 30 Nov 2015 Electronic form version 1.4