This work is unique, as it opens the field to look for less conventional states, such as Majorana and para-fermions, which carry fractional thermal conductance.

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Observation of quantum limit of anyonic Heat Flow MITALI BANERJEE, MOTY HEIBLUM, AMIR ROSENBLATT, YUVAL OREG, Braun Center for Sub-Micron Research, Dept. of Condensed Matter Physics, Weizmann Institute of Science, Rehovot, Israel 76100, DIMA FELDMAN, Department of physics, Brown University, Providence, Rhode Island 02912, USA, ADY STERN, VLADIMIR UMANSKY, Braun Center for Sub-Micron Research, Dept. of Condensed Matter Physics, Weizmann Institute of Science, Rehovot, Israel 76100 — Quantum mechanics sets a bound on information flow, and thus also a bound on heat flow. Indeed, the heat conductance of a ballistic one-dimensional channel was predicted to be a universal quantity (depending only on universal constants), called the 'quantum limit of heat conductance'; namely, $(\pi^2 k_B^2 T)/3h$ [1]. Note that this constant does not depend on the charge, the statistics, or the interaction strength of the heat-carrying particles. This had been verified experimentally for weakly interacting phonons [2], photons [3] and electronic Fermi-liquids [4]. Here, we report the first observation of quantized heat flow in a strongly interacting system of 2D electrons in the fractional quantum Hall regime. We observed such quantization in the particle-like 1/3 state and in several hole-like states with fillings between 1/2 and 1. Since the heat in these fractional states is carried by fractionally charged and neutral quasiparticles, the observed quantization is relevant for both, independent on their anyonic statistics [5]. [1] J. B. Pendry, J. Phys. A 16, 2161 (1983) [2] K. Schwab et al., Nature 404, 974 (2000). [3] M. Meschke et al., Nature 444, 187 (2006). [4] S. Jezouin et al., Science 342, 601(2013). [5] C. L. Kane et al., Phys. Rev. B 55, 15852 (1997).

Mitali Banerjee
Weizmann Institute of Science

Date submitted: 16 Nov 2016 Electronic form version 1.4