Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Discovery of competing 5/2 fractional quantum Hall states[1] XI LIN, HAILONG FU, PENGJIE WANG, PUJIA SHAN, LIN XIONG, Peking University, LOREN PFEIFFER, KEN WEST, Princeton University, MARC KASTNER, MIT Science Philanthropy Alliance — With an even denominator, \nu = 5/2 fractional quantum Hall state (FQH) is different from most of the other FQH states. Some of its proposed wave functions may exhibit novel non-Abelian statistics, which is related to topological quantum computation. We carried out tunneling measurements within a quantum point contact (QPC) at the 5/2 state and we were able to match the QPC's density to the two-dimensional electron gas bulk density. Such a density match guarantees the uniform filling factor inside and outside the QPC. The interaction parameter g and the effective charge e* can be extracted through the weak tunneling theory [1]. We found g and e* similar to what people believed to be the Abelian 331 state [2, 3]. By tuning the confinement, we observed another region where the experimental data agree well with the weak tunneling theory, which leads to e*=0.25 and g=0.52, implying non-Abelian wavefunctions such as anti-Pfaffian or U(1)SU2(2). Our discovery suggests that there are competing 5/2 fractional quantum Hall ground states depending on the confinement. [1] Science 320, 899 (2008). [2] Phys. Rev. B 85, 165321 (2012). [3] Phys. Rev. B 90, 075403 (2014).

[1]The work at PKU was funded by NSFC and NBRPC. The work at Princeton University was funded by the Gordon and Betty Moore Foundation through the EPiQS initiative Grant GBMF4420, and by the National Science Foundation MRSEC Grant DMR-1420541.

Xi Lin
Peking University

Date submitted: 26 Oct 2015 Electronic form version 1.4