Novel understanding for the transitions in the ultra-quantum limit of graphite

ZENGWEI ZHU, ROSS MCDONALD, ARKADY SHEKHTER, BRAD RAMSHAW, KIMBERLY MODIC, FEDOR BALAKIREV, NEIL HARRISON, MS-E536, NHMFL, Los Alamos National Laboratory, Los Alamos, New Mexico 87545 — A fascinating transition was documented in the ultra-quantum limit of graphite between 22T and 53T. Recently, another unexpected high-field transition was observed around 75T. The relative simple band structure, though the complicated phase transitions, suggesting more researches should be carried out to understand the mysterious transitions. We performed temperature- and angle-dependent in-plane and out-of-plane magnetoresistance measurements in the ultra-quantum limit on graphite. Our experiments reveal the transition between 22T and 53T is more complicating and interesting than the previous reports. We explain the cause of the transition properly with novel understanding.

1This research performed under the DOE BES “Science at 100 tesla” and supported at the NHMFL by NSF Cooperative Agreement No. DMR-1157490. Z. Z acknowledges the supports from LANL “Director’s funding” and Chinese “Youth 1000 Talents Plan”
2Wuhan National High Magnetic Field Center, School of Physics, Huazhong University of Science and Technology, 1037 Luoyu Road, 430074 Wuhan
3National High Magnetic Field Laboratory, Florida State University, 1800 E. Paul Dirac Dr., Tallahassee, Florida 32310