Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Zeeman splitting and dynamical mass generation in Dirac semimetal $ZrTe_5$ YANWEN LIU, XIANG YUAN, CHENG ZHANG, Fudan Univ, ZHAO JIN, Huazhong University of Science and Technology, AWADHESH NARAYAN, University of Illinois at UrbanaChampaign, CHEN LUO, East China Normal University, ZHIGANG CHEN, LEI YANG, JIN ZOU, The University of Queensland, XING WU, East China Normal University, STEFANO SANVITO, Trinity College, ZHENGCAI XIA, LIANG LI, Huazhong University of Science and Technology, ZHONG WANG, Tsinghua University, FAXIAN XIU, Fudan Univ — Dirac semimetals have attracted extensive attentions in recent years. It has been theoretically suggested that many-body interactions may drive exotic phase transitions, spontaneously generating a Dirac mass for the nominally massless Dirac electrons. So far, signature of interaction-driven transition has been lacking. In this work, we report high-magnetic-field transport measurements of the Dirac semimetal candidate ZrTe5. Owing to the large g factor in ZrTe5, the Zeeman splitting can be observed at magnetic field as low as 3 Tesla. Most prominently, high pulsed magnetic field up to 60 Tesla drives the system into the ultra-quantum limit, where we observe abrupt changes in the magnetoresistance, indicating field-induced phase transitions. This is interpreted as an interaction-induced spontaneous mass generation of the Dirac fermions. Our work establishes Dirac semimetals as ideal platforms for investigating emerging correlation effects in topological matters. Reference: Yanwen Liu, et al. Nature Communications 7, 12516 (2016)

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Date submitted: 14 Nov 2016 Electronic form version 1.4