Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Exotic quantum properties under high magnetic fields and pressure-induced superconductivity in layered $ZrTe_5$ and pyrite $PtBi_2$ MINGLIANG TIAN, ZHAORONG TIAN, WEI NING, High Magnetic Field Laboratory, CAS, Hefei 230031, CHINA, MINGLIANG TIAN TEAM — Topological Dirac semimetal is a newly discovered class of materials which has attracted intense attention. This material can be viewed as a three-dimensional (3D) analog of graphene and has linear energy dispersion in bulk, leading to a range of exotic transport properties. Here we report direct quantum transport evidence of the 3D Dirac semimetal phase of semimetallic materials $ZrTe_5$ and pyrite $PtBi_2$ by angular-dependent magnetoresistance measurements under high magnetic fields up to 35 T, as well as the pressure-induced superconductivity. We observed very clear negative longitudinal magnetoresistance in ZrTe5 induced by chiral anomaly under the condition of the magnetic field aligned only along the current direction, and the extreme large unsaturated magnetoresistance in pyrite $PtBi_2$ up to 11.2 million percent at T = 1.8 K and 33 T, which surpasses the previously reported Dirac materials, such as LaSb, WTe_2 and NbP. Analysis of the Shubnikov de Haas oscillations suggest that both $ZrTe_5$ and $PtBi_2$ are likely a new topological semimetals.

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Date submitted: 11 Nov 2016 Electronic form version 1.4