Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A layered Dirac system candidate: Fermi surface and anomalous Berry phase in ZrSiSe[1] YU-CHE CHIU, KUAN-WEN CHEN, NHMFL and FSU, DAVID GRAF, NHMFL, QIONG ZHOU, NHMFL and FSU, THOMAS J. MARTIN, JULIA Y. CHAN, Department of Chemistry and Biochemistry, University of Texas at Dallas, MICHELLE JOHANNES, Center for Computational Materials Science, Navel Research Laboratory, RYAN E. BAUMBACH, LUIS BALICAS, NHMFL — ZrSiSe was recently claimed to correspond to a novel type of nodal Dirac system. We synthesized single crystals through a combination of solid state reaction and chemical vapor transport. The as-grown single crystals display residual resistivities on the order of 100 nOhmcm at 2K yielding a resistivity ratio surpassing 200. Magnetoresistance (MR) measurements reveal a non-saturating increase in the resistivity by a factor of 500000% under fields up to 35 Tesla. De Haas van Alphen measurements under high magneticfields reveal a Fermi surface that is more complex than previously reported, although its geometry generally agrees with band structure calculations that indicate Dirac-like dispersion in the bulk around the Fermi energy. The charge carrier effective masses extracted from Lifshitz-Kosevich (LK) fits to the amplitude of quantum oscillations were found to range between 0.08me to 0.5me where me is the free electron mass. Fittings of the oscillatory signal to the LK formalism further reveal the existence of cyclotron orbits displaying non-trivial Berry phases approaching pi, which is consistent with the expectations from band structure calculations.

[1]funded by DOE, NSF, NHMFL

Yu-Che Chiu
NHMFL and FSU

Date submitted: 31 Oct 2016 Electronic form version 1.4