Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Realization of Bismuthene — A Novel High-Tem-perature Quantum Spin Hall Candidate JOERG SCHAEFER, FELIX REIS, Department of Physics, University of Wuerzburg, Germany, GANG LI, ShanghaiTech University, Shanghai, China, LENART DUDY, MAXIMILIAN BAUERNFEIND, STEFAN GLASS, WERNER HANKE, RONNY THOMALE, RALPH CLAESSEN, Department of Physics, University of Wuerzburg, Germany — Quantum spin Hall materials promise revolutionary devices based on dissipationless spin currents in conducting edge channels. However, for current systems such as HgTe the decisive bottleneck preventing applications is the small bulk energy gap of less than 30 meV, requiring cryogenic operation temperatures. In our current study combining experiment and theory we demonstrate that the room-temperature regime, manifest in a large bulk energy gap, can be achieved by a new quantum spin Hall paradigm. In contrast to the previous mechanisms at work in graphene and HgTe, respectively, our approach specifically exploits the on-site atomic spin-orbit coupling as a third avenue. It is based on a substrate-supported monolayer of the high-Z element bismuth, and is experimentally realized as a honeycomb lattice of "bismuthene" on top of the insulator SiC(0001). Consistent with theory, we detect a huge bulk gap of ~0.8 eV and conductive edge states [1]. Our results demonstrate a concept for a quantum spin Hall wide-gap scenario, where the chemical potential resides in the global system gap, ensuring robust edge conductance.

[1] F. Reis *et al.*, arXiv:1608.00812

Joerg Schaefer
Department of Physics, University of Wuerzburg, Germany

Date submitted: 11 Nov 2016 Electronic form version 1.4