Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Controlling superlong relaxation of photoexcited Dirac fermions in Bi_2Te_2Se[1] HAIMING DENG, ZHIYI CHEN, SHIHUA ZHAO, LIA KRUSIN-ELBAUM, City College of New York - CUNY, MARCIN KONCZYKOWSKI, Ecolé Polytechnique, France, EVANGELOS PAPALAZAROU, Université Paris-Saclay, France — Among the recently engineered topological insulators (TIs) ternary compound Bi_2Te_2Se (BTS) displays the highest to-date bulk resistivity (1-6 Ω cm at 4 K). It is of particular interest in novel photonic and optoelectronic applications owing to the unusually long relaxation time ($\tau > 4$ μs) of photoexcited Dirac electrons. Yet, the origin of these long-lived photoexcited carriers, observed by angle- and femtosecond time-resolved photoelectron spectroscopy (tr-ARPES)[1], has not been resolved. Here, we report on transport measurements of electrostatically gated BTS structures which, in conjunction with ARPES studies, demonstrate that τ is controlled by the subsurface band bending and trap states. As expected from the trap states, gate voltage dependence of BTS resistivity at low temperatures is hysteretic and asymmetric, suggesting that long relaxation times can be ultimately tuned by a charge transfer to the surface. Gating hysteresis can be manipulated by doping BTS with small amounts (1%) of Sn and by cooling the system under applied gate voltage, pertinent to engineering a lifetime switch for photoexcited Dirac fermions. [1] E. Papalazarou *et al*, preprint (2016).

[1]Supported by NSF-DMR-1312483-MWN and NSF DMR-1420634

Haiming Deng
CUNY-Graduate Ctr

Date submitted: 10 Nov 2016 Electronic form version 1.4