Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Surface Plasmons in 3D Topological Insulators[1] ANSHUL KOGAR, SEAN VIG, GIL CHO, ALEXANDER THALER, YIRAN XIAO, TAYLOR HUGHES, MAN-HONG WONG, TAI-CHANG CHIANG, GREG MACDOUGALL, PETER ABBAMONTE, Univ of Illinois - Urbana — Most studies of three-dimensional (3D) topological insulators have concentrated on their one-electron properties as exhibited by angle-resolved photoemission spectroscopy (ARPES) or by scanning tunneling microscopy (STM). Many-body interactions are often neglected in the treatment of models of topological insulators, such as in the Kane-Mele and Bernevig-Hughes-Zhang models. Using angle-resolved inelastic electron scattering from the surface, I will present data on the collective mode that owes its existence to the presence of many-body interactions, the surface plasmon (SP), in two known 3D topological insulators, Bi_2Se_3 and $Bi_{0.5}Sb_{1.5}Se_{1.5+x}Te_{1.5-x}$. Surprisingly, the SP was prominent even after depressing the Fermi energy into the bulk band gap. Having studied the SP as a function of doping, momentum transfer and its aging properties, I will present evidence to suggest that bulk-surface coupling is crucial in explaining many of its properties. A simple model with dynamic bulk screening will be presented showing qualitative agreement with the observations. Lastly, the relation of the observed surface plasmon to the predicted spin-plasmon mode and to the kinks seen in the electronic dispersion as measured by ARPES will be discussed.

[1]The work was supported as part of the Center for Emergent Superconductivity, an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science.

Anshul Kogar
Univ of Illinois - Urbana

Date submitted: 14 Nov 2014 Electronic form version 1.4