Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Linked Temperature Evolution of the bulk gap and helical topological surface states in SmB_6[1] J.D. DENLINGER, Lawrence Berkeley Nationall Lab, J.W. ALLEN, KAI SUN, U. of Michigan, JEONGSOO KANG, Catholic U. of Korea, J.W. KIM, C.J. KANG, J.H. SHIM, B.I. MIN, POSTECH, D.-J KIM, Z. FISK, UC Irvine — The paradigm mixedvalent insulator SmB_6 with a temperature dependent bulk gap has recently become the first paradigm example of a strongly correlated topological insulator with f-d band inversion and with experimental evidences for in-gap surface states and surface transport. In this work temperature- and polarization-dependent angle-resolved photoemission on cleaved <100>surfaces of SmB_6 quantifies the T-evolution of (i) the Sm 4f state coherence, (ii) the X-point f-conduction band energy and many-body gap destabilization, and (iii) the intimately connected fate of topologically protected in-gap states. DFT and DFT+DMFT calculations confirm early theory [1] that hybridization between boron 2p and Sm 4f states provides crucial assistance in the full opening of the many-body f-d gap. Also a dimensional crossover above 100K from 3D bulk d-band states crossing E_F at high T to low T 2D in-gap surface states is shown to coincide with the development of a circular dichroism signature of in-gap state helicity.

[1] R.M. Martin and J. W. Allen, J. Appl. Phys. 50, 7561 (1979).

[1]Supported by U.S. DOE at the Advanced Light Source (DE-AC02-05CH11231).

Jonathan Denlinger
Lawrence Berkeley National Laboratory

Date submitted: 14 Nov 2014 Electronic form version 1.4