Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Visualizing the Topologically Induced States of Strongly Correlated Electrons in SmB_6[1] HARRIS PIRIE, JENNIFER E. HOFFMAN, Harvard University and University of British Columbia, YANG HE, MICHAEL M. YEE, ANJAN SOUMYANARAYANAN, Harvard University, DAE-JEONG KIM, ZACHARY FISK, University of California, Irvine, DIRK MORR, University of Illinois, Chicago, MOHAMMAD HAMIDIAN, Harvard University and University of California, Davis
— The synergy between strong correlations and a topological invariant is predicted to generate exotic topological order, fractional quasiparticles and new platforms for quantum computation. SmB_6 is a promising candidate in which interactions generate an insulating state whose gap arises from heavy fermion hybridization of low lying f-states with a Fermi sea. We used spectroscopic imaging scanning tunneling microscopy to visualize the hybridization of distinct crystal-field-split f-levels and the temperature-dependent evolution of an insulating gap spanning the chemical potential. Here, armed with a clear description of the bulk bands, we look within the insulating gap and directly image two dispersing surface states converging to a Dirac point close to the chemical potential. We show that these measurements are consistent with Dirac cones centered at the X and Γ points in the surface Brillouin zone corresponding to a strong topological invariant. The observation of topological states induced from strong correlations establishes SmB_6 as an exciting playground for exotic physics.

[1]This work was supported by the Moore foundation, Canada Excellence Research Chair Program and the US National Science Foundation under the grant DMR-1401480.

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Date submitted: 15 Feb 2017 Electronic form version 1.4