Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Evolution of the Coherent State and the Electronic Structure in the Kondo Insulator SmB_6[1] XIAOHANG ZHANG, Center for Nanophysics & Advanced Materials, University of Maryland, College Park and National Institute of Standards and Technology, N.P. BUTCH, Lawrence Livermore National Laboratory, P. SYERS, S. ZIEMAK, R.L. GREENE, J. PAGLIONE, Center for Nanophysics & Advanced Materials and Department of Physics, University of Maryland, College Park — As an exemplary Kondo insulator, SmB_6 has been studied for several decades; however, direct evidence for the development of the Kondo coherent state and the evolution of the electronic structure in the material has not been obtained due to the rather complicated electronic and thermal transport behavior. Recently, these open questions attracted increasing attention as the emergence of a time-reversal invariant topological surface state in the Kondo insulator has been suggested [1]. Here, we use the quasiparticle tunneling spectroscopy technique to directly investigate the temperature dependence of the electronic states in SmB_6. As a signature of the Kondo screening effect in the material, a Fano-like resonance line shape is observed in the tunneling spectroscopy at temperatures below ~ 100 K. We further demonstrate that inter-ion correlation has to be taken into account [2] in order to precisely describe the observed asymmetric tunneling conductance at low temperatures. Our quasiparticle tunneling spectroscopy results also provide important implications for the predicted nontrivial topology in the Kondo insulator.

[1] Dzero et al., PRL 104, 106408 (2010);
[2] Maltseva et al., PRL 103, 206402 (2009)

[1]This work is supported by the NSF under Grant No. DMR-1104256.

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Date submitted: 13 Nov 2012 Electronic form version 1.4