Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

**First demonstration of a superconducting detector cooled by solid-state refrigerators.** N.A. MILLER[1,2], J.A. BEALL[1], D.J. BENFORD[3], T.C. CHEN[4], J.A. CHERVENAK[3], W.D. DUNCAN[1], F. FINKBEINER[5], G.C. HILTON[1], K.D. IRWIN[1], S.H. MOSELEY[3], G.C. O'NEIL[1,2], D.R. SCHMIDT[1], L.R. VALE[1], R.F. SILVERBERG[3], J.N. ULLOM[1] — We have successfully cooled a Transition-Edge Sensor (TES) using solid-state refrigerators based on Normal metal/Insulator/Superconductor (NIS) tunnel junctions. The cooling mechanism is the preferential tunneling of the highest energy (hottest) electrons through the biased NIS junctions. We describe the cooling performance, temperature noise, and energy resolution of the NIS-cooled TES. In particular, we show that the NIS refrigerators introduce no detectable noise in the TES operation. NIS refrigerators can cool from temperatures near 0.3 K to below 0.1 K. Combining a pumped $^3$He system with NIS refrigerators provides a compact, lightweight alternative to adiabatic demagnetization refrigerators and dilution refrigerators. Bath temperatures near 0.1 K are desirable for state-of-the-art sensors for astronomy and materials analysis, as well as for a wide range of basic science applications. [1]National Institute of Standards and Technology (NIST) – Boulder [2]University of Colorado at Boulder [3]NASA/Goddard Space Flight Center [4]Global Science and Technology [5]SSAI

Nathan Miller

Date submitted: 20 Nov 2006 Electronic form version 1.4