

Abstract Submitted  
for the MAR12 Meeting of  
The American Physical Society

**Conduction of topologically-protected charged ferroelectric domain walls**<sup>1</sup> WEIDA WU, YOICHI HORIBE, NARA LEE, S-W. CHEONG, Department of Physics and Astronomy and Rutgers Center for emergent materials, Rutgers University, Piscataway, NJ 08854 USA, JEFFERY GUEST, Center for Nanoscale Materials, Argonne National Laboratory, Argonne, Illinois 60439 USA — We report on the observation of nanoscale conduction at ferroelectric domain walls in hexagonal HoMnO<sub>3</sub> protected by the topology of multiferroic vortices using *in situ* conductive atomic force microscopy, piezo-response force microscopy, and kelvin-probe force microscopy at low temperatures. Conductance spectra reveal that only negatively charged tail-to-tail walls, in contrast to positively charged head-to-head walls, exhibit ohmic-like conduction in addition to Schottky-like rectification. Our results pave the way for understanding the semiconducting properties of the domains and domain walls in small-gap ferroelectrics.

<sup>1</sup>NSF-DMR-0844807, NSF-DMR-1104484 and DE-AC02-06CH11357

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Date submitted: 27 Nov 2011

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