

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Anomalous Dielectric Loss at Ferroelectric Domain Walls Revealed by Microwave Impedance Microscopy XIAOYU WU, YUAN REN, Department of Physics, University of Texas at Austin, RONGWEI HU, SANGWOOK CHEONG, Department of Physics and Astronomy, Rutgers University, KEJI LAI, Department of Physics, University of Texas at Austin — Domain walls (DWs) in multiferroic materials, within which the ferroic order parameter changes its orientation, may possess emergent properties that are absent in the bulk domains. Combining the standard piezo-force microscopy (PFM), conductive atomic-force microscopy (C-AFM), and a novel microwave impedance microscopy (MIM) technique, we observed strong dielectric loss at the domain walls and vortex cores on the (001) charge neutral surface of hexagonal manganite YMnO_3 . The DW contrast was detected for a broad frequency range between 100MHz and 3GHz. The equivalent DW conductivity inferred from the MIM signals is estimated to be five orders of magnitude higher than that of the bulk YMnO_3 , which cannot be explained within the existing theoretical framework. By applying a DC bias on the MIM probe, we have also observed the transition from DW contrast to domain contrast in the impedance images. The MIM technique provides a unique opportunity to probe the nanoscale electronic anomalies in various topological defects, which will be crucial for future device applications of multiferroics.

Xiaoyu Wu
Department of Physics, University of Texas at Austin

Date submitted: 11 Nov 2014

Electronic form version 1.4