Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electrical dressing of domain walls in hexagonal $ErMnO_3$ DENNIS MEIER, JAN SEIDEL, UC Berkeley, ANDRES CANO, European Synchrotron Radiation Facility, KRIS DELANEY, UC Santa Barbara, YU KUMAGAI, ETH Zuerich, MAXIM MOSTOVOY, University of Groningen, NICOLA A. SPALDIN, MANFRED FIEBIG, ETH Zuerich, RAMAMOORTHY RAMESH, UC Berkeley — Domain walls are natural mobile nanoscale objects that can exhibit structural, physical, and chemical properties which drastically differ from the surrounding bulk material. This applies to a large variety of phenomena including chemical/electrical transport, multiferroicity, or superconductivity. Unfortunately, in contrast to bulk materials, very little is known about involved length scales and control parameters when it comes to domain walls and experimental evidence is highly desirable. Here, we report on electrical dressing of trimerization-polarization walls in $ErMnO_3$. Using piezoforce-response microscopy and conductive atomic force microscopy we reveal that two characteristic length scales are to be distinguished: A first one corresponding to the structural / ferroelectric changes occurring at the wall and a second one referring to the associated electric properties. Furthermore, we demonstrate the response of the electrically dressed walls to external electric fields and develop a model that explains this response. Our results are expected to generally apply to domain walls in ferroelectric semiconductors and provide new insight into the interplay of charge and lattice degrees of freedom at domain walls.

Dennis Meier
UC Berkeley

Date submitted: 31 Oct 2011 Electronic form version 1.4