Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Dichroism and order parameter coupling in $BiFeO_3$ Films MIKEL BARRY, T. ZHAO, F. ZAVALICHE, M.P. CRUZ, Y.H. CHU, R. RAMESH, University of California, Berkeley, A. SCHOLL, A. DORAN, Advanced Light Source, Lawrence Berkeley National Laboratory — $BiFeO_3$ is an attractive material because it is a possible multiferroic and lead-free replacement for ferroelectric memory cells and piezoelectric sensors and actuators. We are probing the possibility of coupling between ferroelectricity and antiferromagnetism in epitaxial thin films of this system. X-ray linear dichroism based PEEM images were obtained using a high spatial resolution photoelectron emission microscope (PEEM). This combination of XLD and PEEM provides high spatial resolution along with elemental and chemical specificity and surface sensitivity. A Piezoforce microscope (PFM) was used to switch the ferroelectric state in micron-sized regions of the film, which were subsequently probed using temperature dependent PEEM measurements. Temperature dependent structural measurements were carried out to probe the changes in the ferroelectric order parameter with temperature. We observe a strong change in XLD as the temperature is raised to and beyond the Neel temperature. We will present the results of our approaches to decouple the XLD responses that arise from purely the structural distortion (i.e., due to ferroelectricity) and that arising from the antiferromagnetic state, as well as the results of the coupling experiments. This work is supported by an LBL-LDRD program and by the ONR under a MURI program.

Mikel Barry
University of California, Berkeley

Date submitted: 26 Nov 2005 Electronic form version 1.4