Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Ultrafast pump-probe reflectance study of multiferroic $\mathbf{Eu_{0.75}Y_{0.25}MnO_3}$ DIYAR TALBAYEV, ANTOINETTE J. TAYLOR, Los Alamos National Laboratory, RICHARD D. AVERITT, Boston University, CHENGLIN ZHANG, SANG-WOOK CHEONG, Rutgers University — Dynamical studies of multiferroic materials help unravel the fundamental interactions between various degrees of freedom and answer technological questions such as achievable switching speeds in multiferroic-based memory elements. We report the results of the ultrafast pump-probe reflectance study of multiferroic $Eu_{0.75}Y_{0.25}MnO_3$. The material undergoes antiferromagnetic ordering and, upon further cooling, ferroelectric ordering that strongly couples to the material's magnetic state. We measured the relaxation time of the pump-probe reflectance in this compound using 800-nm pump and probe pulses. The temperature dependence of the relaxation time follows that of the low-energy spectral weight that includes phonons and electro-active magnons [1]. This suggests a strong coupling between electronic (1.55 eV) and low-energy electro-active excitations in $Eu_{0.75}Y_{0.25}MnO_3$ that can be tuned by magnetic field. The relaxation time increases upon the application of magnetic field along the crystal's *c*-axis in the ferroelectric phase, but exhibits no change in the paraelectric phase. Our results indicate the importance of multiple energy scales (electronic, lattice, and magnetic) for the multiferroicity of $Eu_{0.75}Y_{0.25}MnO_3$. 1. R. Valdes Aguilar et al, Phys. Rev.B **76**, 060404(R) (2007)

Diyar Talbayev
Los Alamos National Laboratory

Date submitted: 27 Nov 2007 Electronic form version 1.4