Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Muller matrix ellipsometry of dynamic magnetoelectric effects in multiferroics[1] T.N. STANISLAVCHUK, R. BASISTYY, T.D. KANG, Department of Physics, NJIT, Newark, NJ, USA, M. KOTELYANSKII, Rudolph Technologies Inc., NJ, USA, G.L. CARR, National Synchrotron Light Source, Brookhaven National Lab, Upton, NY, USA, S-W. CHEONG, Rutgers Center for Emergent Materials and Department of Physics and Astronomy, Rutgers U., NJ, USA, A.A. SIRENKO, Department of Physics, NJIT, Newark, NJ, USA — Far-IR spectra of magneto-electric (ME) and multiferroic materials are in the focus of modern experimental and theoretical studies. Bi-anisotropic optical properties of these materials require consideration of not only dielectric susceptibility tensor $\hat{\varepsilon}(\omega)$ but also magnetic permeability $\hat{\mu}(\omega)$ and ME $\hat{\alpha}(\omega)$ tensors that cannot be distinguished from a single transmission or reflection spectrum. We report on the application of Mueller matrix spectroscopic ellipsometry (MM-SE) for studies of elementary excitations in multiferroic materials such as $TbMnO_3$, $TbMn_2O_5$, and $TbFe_3(BO_3)_4$ single crystals. We show that magnetic, electric, and ME dipole excitations, such as magnons, phonons, and electromagnons can be distinguished from each other using a single MM measurement without introducing any modeling arguments. The fit of MM spectra based on the Berreman's 4×4 propagation matrix formalism allowed us to determine parameters of electromagnon excitations separating the electric $\hat{\varepsilon}(\omega)$ and ME $\hat{\alpha}(\omega)$ tensors components.

[1]Work at NJIT was supported by DOE DE-FG02-07ER46382. Use of NSLS-BNL was supported by DOE DE-AC02-98CH10886.

T.N. Stanislavchuk
Department of Physics, NJIT, Newark, NJ, USA

Date submitted: 17 Nov 2012 Electronic form version 1.4