Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Dynamic state switching in nonlinear multiferroic cantilevers YI WANG, Department of Physics, University of Maryland, College Park, Maryland 20742, USA, TIBERIU-DAN ONUTA, Department of Materials Science and Engineering, University of Maryland, College Park, Maryland 20742, USA, CHRISTIAN J. LONG, Department of Physics, University of Maryland, College Park, Maryland 20742, USA, SAMUEL E. LOFLAND, Department of Physics and Astronomy, Rowan University, Glassboro, New Jersey 08028, USA, ICHIRO TAKEUCHI, Department of Materials Science and Engineering, University of Maryland, College Park, Maryland 20742, USA — We demonstrate read-write-read-erase cyclical mechanical-memory properties of all-thin-film multiferroic heterostructured $Pb(Zr_{0.52}Ti_{0.48})O_3$ / $Fe_{0.7}Ga_{0.3}$ cantilevers when a high enough voltage around the resonant frequency of the device is applied on the $Pb(Zr_{0.52}Ti_{0.48})O_3$ piezo-film. The device state switching process occurs due to the presence of a hysteresis loop in the piezo-film frequency response, which comes from the nonlinear behavior of the cantilever. The reference frequency at which the strain-mediated $Fe_{0.7}Ga_{0.3}$ based multiferroic device switches can also be tuned by applying a DC magnetic field bias that contributes to the increase of the cantilever effective stiffness. The switching dynamics is mapped in the phase space of the device measured transfer function characteristic for such high piezo-film voltage excitation, providing additional information on the dynamical stability of the devices.

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Date submitted: 26 Nov 2012 Electronic form version 1.4