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Probing of Strain Mediated Hybrid Multiferroic Devices EDWIN FOHTUNG, J. KIM, M. MARSH, Department of Physics, University of California-San Diego, NA LEI, Institut d'Electronique Fondamentale, Universit Paris-Sud, S. CHEN, S. SINHA, Department of Physics, University of California-San Diego, D. RAVELOSONA, Institut d'Electronique Fondamentale, Universit Paris-Sud, ERIC FULLERTON, Center for Magnetic Recording Research, University of California-San Diego, OLEG SHPYRKO, Department of Physics, University of California-San Diego — Smart materials for sensor technology, (non) volatile device memories for information technology, and ultrasound generators in medical imaging have one thing in common, their active elements consist of ferroelectrics (FE) driven by voltages or ferromagnetics (FM) driven by magnetization. In the quest to design high functionality devices to meet today's consumer technological demands, high focus has been given to multiferroic [1]. However, the coexistence of magnetic order and ferroelectric polarization combined in a single-phase material has proven to be rear as most of these materials tend to have low magnetic ordering temperatures and are often antiferromagnets, in which the magnetoelectric (ME) coupling effect is intrinsically small. We utilize an alternative approach to design multiferroic-hybrid devices based on FE-FM composites where the ME coupling emerges from strain-mediated interaction between individual phases [2]. We develop a nonlinear thermodynamic theory for strain-mediated direct ME effect and Bragg Ptychographic Coherent Diffraction Imaging (BCDI) serves as the unique tool of choice for sub-nanometer resolution nondestructive probing of the order parameters in the devices [1] N. Spaldin and M. Fiebig, Science 309, 391 (2005). [2] E. Fohtung et al., submitted (2012)

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