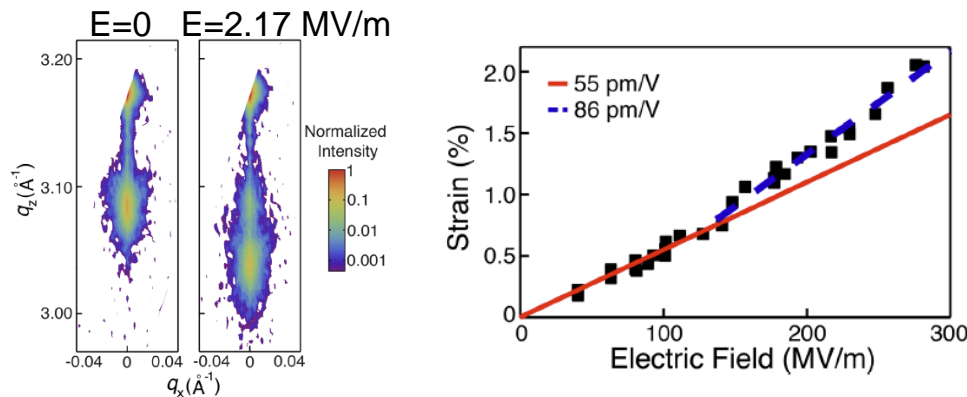


# Manipulation of perovskite dielectrics with high electric fields and large strains

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- High electric fields can produce large piezoelectric or electrostrictive strains
- Transient changes in crystallographic symmetry or in structural distortion
- Larger responses near phase transitions: enhanced materials for devices
- In situ structural probes based on synchrotron x-ray diffraction

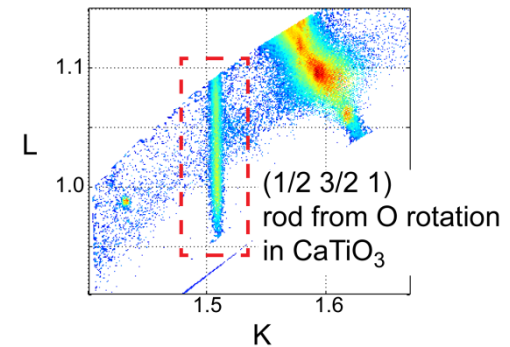
## Transient electric-field-driven transitions in BiFeO<sub>3</sub>



- Large piezoelectric strain in BiFeO<sub>3</sub>
- Nonlinear at high electric fields due to proximity of R-T transition

P. Chen, *et al.*, "Nonlinearity in the high-electric field piezoelectricity of epitaxial BiFeO<sub>3</sub> on SrTiO<sub>3</sub>," Appl. Phys. Lett. **100**, 062906 (2012).

## Octahedral Rotations in BaTiO<sub>3</sub>/CaTiO<sub>3</sub> Superlattices



- O octahedral rotation modified by applied fields
- Compare with DFT predictions

M. P. Cosgriff, *et al.*, in preparation (2012).

**Experiment at Spring-8 in May, 2012 supported by NSF through OISE-0844424.**

