

Abstract Submitted  
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**Phonon anomalies induced by polar nano-regions in a relaxor ferroelectric** GUANGYONG XU, Brookhaven National Laboratory, JINSHENG WEN, Brookhaven National Lab/Stonybrook University, CHRIS STOCK, Johns Hopkins University, PETER GEHRING, National Institute of Standards and Technology — Inelastic neutron scattering was used to measure both acoustic and optic phonons polarized along (110) (T2 mode) in the relaxor ferroelectric compound PZN-4.5PT. In the low temperature rhombohedral phase, a single domain state was achieved by cooling the single crystal sample under an external electric field of 2 kV/cm along the [111] direction. Phonon measurements were performed near the (2,2,0) and (2,-2,0) Bragg peaks. We have found that the TA2 phonon couples closely to the diffuse scattering, which arises from polar nano-regions in the system. With the redistribution of diffuse scattering under the external field (see Ref. 1), a clear hardening of TA2 mode was observed near the (2,2,0) Bragg peak, while the TA2 mode near (2,-2,0) Bragg peak softens significantly and becomes over-damped. Our results indicate local inhomogeneities such as the PNR can have direct and significant effects on the lattice dynamics and stability of the whole system. Ref. 1: “Electric-field-induced redistribution of polar nano-regions in a relaxor ferroelectric”, Guangyong Xu, Z. Zhong, Y. Bing, Z.-G. Ye, and G. Shirane, Nature Materials 5, 134, (2006).

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