Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Neutron Scattering Study of the Relaxor Ferroelectric PZN - 4.5%PT under an [001]-Oriented Electric Field[1] ZHIJUN XU, JINSHENG WEN, GUANGYONG XU, Brookhaven National Lab, CHRIS STOCK, ISIS, RAL, U.K., JASON GARDNER, PETER GEHRING, NCNR, NIST — Polar nano-regions (PNR) are believed to play important roles in determining many special properties of relaxor ferroelectric materials. We have performed a series of neutron diffuse scattering and neutron spin echo measurements on single crystals of $Pb[(Zn_{1/3}Nb_{2/3})_{0.955}Ti_{0.045}]O_3$(PZN-4.5%PT) to study the PNR under the influence of an [001] oriented electric field. Our results suggest that the short-range polar structure in this compound is complicated. In addition to the previously known PNR having <110>-oriented polarizations, we found PNR with <100>-oriented polarizations. The diffuse scattering intensity from <100>-oriented PNR can be partially suppressed by an external electric field applied along [001], while that from the <110>-oriented PNR exhibits little to no change. Our neutron spin echo measurements further show that the diffuse scattering intensity from the <100>-oriented PNR contains both static and dynamic components. On cooling, the static to dynamic ratio increases, suggesting that the short-range polar order freezes gradually.

[1]Work supported by Office of Science, U.S. DOE, under Contract No. DEAC02-98CH10886.

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Date submitted: 28 Nov 2009 Electronic form version 1.4