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**Direct observation of intrinsic localized modes as precursors to polar nanoregions in a relaxor ferroelectric** MICHAEL MANLEY, OLIVIER DELAIRE, Oak Ridge National Laboratory, JEFFREY LYNN, National Institute of Standards and Technology, ALAN BISHOP, Los Alamos National Laboratory, RAFFI SAHUL, TRS Technologies Inc., JOHN BUDAI, Oak Ridge National Laboratory — Displacive ferroelectric phase transitions can be understood in terms of a soft zone center phonon tending towards zero frequency as the material is cooled towards the transition. Relaxor ferroelectrics are less well understood but there is a growing consensus that dispersed polar nanoregions (PNRs), pinned by chemical inhomogeneities, are responsible for the behavior. Furthermore, it has been argued that PNRs form via soft localized phonon modes, modeled as intrinsic localized modes (ILMs), tending towards zero frequency as the material is cooled into the relaxor region, but these modes have never been observed directly. In this talk, neutron scattering measurements will be presented that reveal the existence of a dispersionless (localized) mode appearing near the Burns temperature in PMN-PT. The local mode softens and diminishes in intensity on cooling towards the relaxor region, ultimately vanishing as the PNRs form.

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