Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Observation of acoustic-phonon-like mode driven by magnetic imbalance between neighboring Fe atoms in $Fe_{1+y}Te$ ($y < 0.12$)[1] DAVID FOBES, IGOR ZALIZNYAK, ZHIJUN XU, GENDA GU, JOHN M. TRANQUADA, XU-GANG HE, WEI KU, Brookhaven National Lab, Upton, NY 11973, USA, OVIDIU GARLEA, Oak Ridge National Lab, Oak Ridge, TN, 37831, USA — We have studied the evolution with temperature of the low-energy inelastic spectra of $Fe_{1+y}Te$ ($y < 0.12$), a parent compound of the iron-chalcogenide superconductor family, revealing an acoustic mode at an unexpected position. Recently, we found evidence for the formation of a bond-order wave leading to ferro-orbital order in the monoclinic phase, in part due to the observation of an elastic structural peak at (100) in the low-temperature monoclinic phase [D. Fobes, *et al.*, arXiv:1307.7162]. In the inelastic spectra we observe a sharp acoustic-phonon-like mode dispersing out of the (100) position in the monoclinic phase. Surprisingly, the mode survives in the tetragonal phase, despite the absence of a Bragg peak at (100); such a peak is forbidden by symmetry. LDA calculations suggest this mode could involve significant magnetic scattering. By assuming in-phase virtual displacement of the Fe atoms from their equilibrium position in a frozen phonon calculation, we have found a small but significant imbalance in the magnetic moments between the two Fe atoms within the unit cell, suggesting magnetic contribution to the mode.

[1]Work at BNL supported by Office of Basic Energy Sciences, US DOE, under Contract No. DE-AC02-98CH10886. Research conducted at ORNL Spallation Neutron Source was sponsored by the Scientific User Facilities Division, Office of Basic Energy Sciences, US DOE.

David Fobes
Brookhaven National Laboratory

Date submitted: 12 Nov 2013 Electronic form version 1.4