Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Spin-lattice coupling and thermal transport in multiferroic $CuCrO_2$[1] DIPANSHU BANSAL, JENNIFER NIEDZIELA, Oak Ridge National Laboratory, AYMAN SAID, Argonne National Laboratory, ANDREW MAY, GEORG EHLERS, DOUGLAS ABERNATHY, ASHFIA HUQ, MELANIE KIRKHAM, Oak Ridge National Laboratory, HAIDONG ZHOU, University of Tennessee, Knoxville, OLIVIER DELAIRE, Duke University — The co-existence and interplay of ferroelectricity and magnetism in multiferroic materials is of both fundamental and technological importance. We report extensive neutron and x-ray scattering measurements of lattice dynamics in $CuCrO_2$ ($7 \leq T \leq 530$ K) across the concomitant magnetic and ferroelectric transition (T_N ~24 K). These experiments are complemented by first-principles simulations of the phonons. Our phonon dispersions and density of states measurements reveal very anisotropic vibrations of Cu atoms that are also supported by additional atomic displacement parameters from neutron diffraction. Little overall change in phonon frequencies is observed across T_N. We find that spin fluctuations persist up to ~300 K, far above T_N. Furthermore, modeling of the thermal conductivity indicates that these spin fluctuations above T_N constitute a strong source of phonon scattering, significantly suppressing thermal transport. We compare our results on $CuCrO_2$ with another geometrically frustrated multiferroic, $YMnO_3$.

[1]U.S. Department of Energy Office of Science Early Career Research Program under Award No. DE-SC0016166

Dipanshu Bansal
Oak Ridge National Lab

Date submitted: 10 Nov 2016 Electronic form version 1.4