Abstract Submitted
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Infrared phonons as a probe of spin liquid in kagome antiferromagnet Herbertsmitite[1] ANDREI SUSHKOV, GREGORY JENKINS, DENNIS DREW, Center for Nanophysics and Advanced Materials, University of Maryland, College Park, MD 20742, USA, TIAN-HENG HAN, University of Chicago, Chicago, IL 60637, USA, YOUNG LEE, Massachusetts Institute of Technology, Cambridge, MA 02139, USA — Phonons are sensitive to magnetic interactions between ions through the spin-phonon coupling mechanism where the phonon resonance frequency is proportional to $< S_i S_j >$ spin-spin correlation function. In our earlier work [1], we observed strong magnetic phonon splitting at the magneto-structural transition in cubic spinel ZnCr2O4. In Herbertsmithite ZnCu3(OH)6Cl2, neither magnetic ordering nor structural transition was observed down to mK temperatures. Recent theoretical work predicts a resonating bond ground state in Herbertsmithite that breaks p6 chiral symmetry and lifts the degeneracy between two zone center optical phonon modes [2]. From fits to reflectivity spectra we have obtained the temperature dependence of all IR-active phonons polarized both in and perpendicular to the kagome plane. Observed signatures of magnetic interaction effects on the phonon parameters will be discussed.

[1] Sushkov, A. B., Tchernyshyov, O., Ratcliff, W., Cheong, S. W. & Drew, H. D. Probing Spin Correlations with Phonons in the Strongly Frustrated Magnet ZnCr2O4. Phys. Rev. Lett. 94, 137202 (2005).
[2] Capponi, S., Chandra, V. R., Auerbach, A. & Weinstein, M. p6 chiral resonating valence bonds in the kagome antiferromagnet. Phys. Rev. B 87, 161118 (2013).

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