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Evidence for pressure-tuned quantum structural fluctuations in $KCuF_3$ S. YUAN, M. KIM, J. SEELEY, S. LAL, P. ABBAMONTE, S.L. COOPER, Department of Physics and Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL 61801 — Frustrated magnetic systems are currently of great interest because of the possibility that these materials exhibit novel ground states such as orbital and spin liquids. We provide evidence in the orbital-ordering material $KCuF_3$ for pressure-tuned quantum melting of a static structural phase to a phase that dynamically fluctuates even near T $\sim$ 0K.[1] Pressure-dependent Raman scattering measurements show that applied pressure above P* $\sim$ 7kbar reverses a low temperature structural distortion in $KCuF_3$, resulting in the development of a $\omega \sim 0$ fluctuational (quasielastic) response near T $\sim$ 0K. This pressure-induced fluctuational response is temperature independent and exhibits a characteristic fluctuation rate that is much larger than the temperature, $\Gamma >> K_BT$, consistent with quantum fluctuations of the CuF_6 octahedra. We show that a previous developed model of pseudospin-phonon coupling qualitatively describes both the temperature- and pressure-dependent evolution of the Raman spectra of $KCuF_3$. Work supported by the U.S. Department of Energy under Award No. DE-FG02-07ER46453 and by the National Science Foundation under Grant NSF DMR 08-56321.

[1] S. Yuan et al., arXiv:1107.1433 (2011).

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