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Phonons as a probe of electronic nematicity¹ EUN-AH KIM, Cornell University, SRIVATSAN CHAKRAM, Cornell University, PAUL GOLDBARD, UIUC, MICHAEL LAWLER, SUNY Binghamton University — We propose the use of acoustic phonons for studying signatures of nematic d-wave superconductivity, i.e. a d-wave superconductivity possessing broken C_4 symmetry. We show that the $C_4 \rightarrow C_2$ symmetrybreaking in nematic d-wave superconductors would cause broken symmetry in the phonon dispersion and decay rates. These effects result from the symmetry-allowed coupling between the nematic order parameter and deformations. The qualitative difference in the spatial structure of the phonon decay rate between ordinary d-wave and nematic d-wave superconductors suggests that acoustic phonons could be used as a probe of electronic nematicity. Recent developments in triple-axis spin-echo neutron scattering, which provides experimental access to the spatial structure of low-energy acoustic phonon decay rates, could make these effects observable in the near future.

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