Inelastic X-ray Investigation of the Phonon Softening in NbSe$_2$
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We investigated the phonon softening in the charge density wave compound NbSe$_2$ using the high-resolution hard inelastic x-ray scattering beamline 30-ID-C at the Advanced Photon Source, Argonne National Laboratory. The two lowest $\Sigma_1$ phonon branches were measured from the zone center $\Gamma$ to the M point at temperatures between 250 K and 7 K across the CDW transition at $T_{\text{CDW}} = 33$ K. Density functional calculations for the lattice dynamical properties which predict an extended phonon breakdown are used to analyze the detailed nature of the softening phonon branch. Work supported by US DOE BES-DMS DE-AC02-06CH11357.

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