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**Material transitions and phonon softening correlations in FeSe**

ADRIAN MERRITT, Univ of Colorado - Boulder, ALFRED BARON, SPring-8, Japan, THOMAS WOLF, Karlsruhe Institute of Technology, DMITRY REZNIK, Univ of Colorado - Boulder — In  $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$ , cooling through the structural transition leads to a softening and then a hardening of the transverse acoustic phonons with small wave vector  $q$ , which reflect nematic fluctuations with the same  $q$ . These  $|q|>0$  fluctuations build up below the superconducting transition in contrast with  $q=0$  where nematic fluctuations compete with superconductivity. I will discuss these effects in FeSe. We tracked the transverse acoustic phonon dispersion of single-crystal FeSe using inelastic X-ray scattering at SPring-8 and the Advanced Photon Source. We found a similar result where the acoustic phonon softens at low  $q$  through the structural transition and gradually recovers its previous energy upon further cooling. These results as well as the behavior across the superconducting transition will be presented and the implications for our understanding of Fe-based superconductors will be discussed.

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