Nematic Correlation Length in Iron-Based Superconductors Probed by Inelastic X-Ray Scattering

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Nematicity is ubiquitous in electronic phases of high-T_c superconductors, particularly in the Fe-based systems. We used inelastic x-ray scattering to extract the temperature dependent nematic correlation length ξ from the anomalous softening of acoustic phonon modes in FeSe, underdoped $Ba(Fe_{0.97}Co_{0.03})_2As_2$, and optimally doped $Ba(Fe_{0.94}Co_{0.06})_2As_2$. In all cases, we find that ξ is well described by a power law $(T-T_0)^{-1/2}$ extending over a wide temperature range. Combined with the previously reported Curie-Weiss behavior of the nematic susceptibility, these results point to the mean-field character of the nematic transition, which we attribute to a sizable nematoelastic coupling that is likely detrimental to superconductivity.