Contribution ID: **26** Type: **Talk**

Nematic Correlation Length in Iron-Based Superconductors

Tuesday, December 7, 2021 4:40 PM (25 minutes)

Nematicity is ubiquitous in electronic phases of high-T_c superconductors, particularly in the Fe-based systems. We used inelastic neutron and x-ray scattering to extract the temperature-dependent nematic correlation length ξ from the anomalous softening of acoustic phonon modes in $Ba(Fe_{1-x}Co_x)_2As_2$ and FeSe. 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 nemato-elastic coupling that is likely detrimental to superconductivity.

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Session Classification: Quantum Phenomena

Track Classification: Quantum Phenomena