# Effect of the electron-phonon coupling on phonons in iron based superconductors

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The discovery of high-temperature iron-based superconductors has attracted intensive theoretical and experimental research efforts. The compounds experience both a magnetic and a structural phase transition at 100-200 K. Both transitions are suppressed with the subsequent appearance of superconductivity by electron doping via either partial substitution of oxygen by fluorine or oxygen deficiency achieved via high pressure synthesis. Lattice dynamics is also affected by the presence or suppression of the structural and magnetic transitions.

Here we present the study of the lattice dynamics in the 1111 and 122-families of iron-based superconductors upon doping and temperature change using nuclear inelastic scattering with 0.7 meV energy resolution. The fluorine doping of the *L*FeAsO (*L*=La, Nd, Sm) compounds leads to the anomalies in the phonon behavior at 16 meV peak, which shows hardening with cooling not observed at the parent compounds [1]. This relative hardening can be explained by the reconstruction of the phonons in the parent compounds across transition. The modification of the phonon modes at 16-20 meV is also observed for the EuFe*2*As*2* above magnetic and structural transition temperature. Here, phonon broadening is seen which can be explained by the fast fluctuation of the structural and magnetic ordering.

The anomalies of the phonon behavior in both studies are of the order of 1 meV or less. Thus, in order to see in details their temperature evolution it is crucial to have energy resolution of the monochromator of the order of 0.1meV.

**References**

[1] - I.Sergueev et al, Phys. Rev. 87, 064302 (2013).