Coupling of fully symmetric As phonon to magnetism in iron based superconductors\textsuperscript{1} SHANGFEI WU, Rutgers University, WEILU ZHANG, Sophia University, LI LI, HUIBO CAO, ATHENA SEFAT, Oak Ridge National Laboratory, HSIANG-HSI KUNG, University of British Columbia, HONG DING, IOP,CAS, PIERRE RICHARD, Universite de Sherbrooke, GIRSH BLUMBERG, Rutgers University — Raman coupling to the fully symmetric As phonon $A_g$(As) in iron based superconductors is forbidden for the XY scattering geometry with cross-polarized light along the Fe-As directions in the tetragonal phase, whereas it becomes allowed in the orthorhombic phase: The emerging modes intensity indicates the lattice orthorhombicity, which is expected to be small. However, in the orthorhombic phase of several families of parent compounds of Fe-based superconductors ($\text{BaFe}_2\text{As}_2$, NaFeAs, FeSe, and LaFeAsO) \cite{1}, as well as in the gold doped compounds $\text{Ba(Fe}_{1-x}\text{Au}_x\text{)}_2\text{As}_2$ \cite{2}, we find that the $A_g$(As) phonon intensity is significantly enhanced when the magnetic order sets in below the Neel temperature $T_N$. The $A_g$(As) phonon also shows an asymmetric line shape below $T_N$ and an anomalous linewidth broadening upon Au doping. By the Fano model analysis, we conclude the temperature dependence of light coupling amplitude to the $A_g$(As) phonon follows the evolution of the magnetic order parameter. We propose that the intensity enhancement of the $A_g$(As) phonon is due to electronic anisotropy induced by the collinear spin density wave order. \cite{1}\text{Phys.Rev.Research 2, 033140 (2020)} \cite{2}\text{Phys.Rev B 102, 014501 (2020)}

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