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### **Inelastic Neutron Scattering from Fe Pnictide Superconductors<sup>1</sup>**

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We present inelastic neutron scattering data from both single crystal and polycrystalline specimens of several of the new Fe-based superconducting materials. The phonon density of states (PDOS) was determined for  $\text{LaFeAsO}_{1-x}\text{F}_x$ . The PDOS for the nonsuperconducting parent compound  $\text{LaFeAsO}$  was found to be nearly identical to that of superconducting  $\text{LaFeAsO}_{0.89}\text{F}_{0.11}$ . Good agreement was found between first principal calculations and the experimentally determined PDOS with the exception of a small difference in some of the Fe mode frequencies. The experimental PDOS is not consistent with conventional phonon mediated superconductivity. In the case of  $\text{Ba}_{0.6}\text{K}_{0.4}\text{Fe}_2\text{As}_2$ , a magnetic excitation appears below  $T_c$  that is not present at any temperature in the parent compound  $\text{BaFe}_2\text{As}_2$ . The excitation occurs at an energy of 14 meV and at a wave vector consistent with antiferromagnetic correlations in the FeAs plane. The existence of this excitation is strong evidence for an unconventional superconducting gap symmetry and demonstrates that the superconducting order parameter is strongly coupled to magnetic degrees of freedom in the Fe-based superconductors.

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