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**Signature of charge-order fluctuations in the phonon spectra of a polaronic metallic manganite**

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The colossal magnetoresistive layered manganites show a transition from a high temperature charge-ordered/polaronic insulating phase to a low temperature ferromagnetic metallic phase. The polaronic character of the metallic phase remains controversial because broad charge order peaks observed in the insulating phase disappear when  $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$  becomes metallic. Here we report results of inelastic neutron scattering measurements of lattice vibrations in  $\text{La}_{1.2}\text{Sr}_{1.8}\text{Mn}_2\text{O}_7$ , which show that polarons remain intact deep inside the ferromagnetic phase as fluctuations that strongly broaden and soften certain optic phonons. They appear near the wave vectors where the charge order peaks are observed above  $T_c$ . The insight that our findings offer is that polaronic signatures in metals may generally come from a competing insulating charge-ordered phase. It is highly relevant to cuprate superconductors where a similar giant phonon renormalization associated with a stripe phase has been reported.