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Polaron-Mediated Spin Correlations in Metallic and Insulating $\mathbf{La}_{1-x}A_x\mathbf{MnO}_3$ JOEL HELTON, US Naval Academy, DANIEL PAJEROWSKI, YIMING QIU, YANG ZHAO, NIST Center for Neutron Research, DMITRY SHULYATEV, YAKOV MUKOVSKII, National University of Science and Technology "MISiS", GEORGII BYCHKOV, SERGEI BARILO, Belarus Academy of Sciences, JEFFREY LYNN, NIST Center for Neutron Research — Neutron spectroscopy measurements reveal short-range spin correlations near and above the ferromagnetic-paramagnetic phase transition in manganite materials of the form $La_{1-x}A_xMnO_3$ (A=Ca, Sr, or Ba), including samples with an insulating ground state as well as colossal magnetoresistive samples with a metallic ground state. Quasielastic magnetic scattering is revealed that forms clear ridges running along the [100]-type directions in momentum space. A simple model consisting of a conduction electron hopping between spin polarized Mn ions that becomes self-trapped after a few hops captures the essential aspects of this magnetic component of the scattering. We associate this scattering component with the magnetic part of diffuse polarons, as we observe a temperature dependence similar to that of the diffuse nuclear scattering arising from individual polarons.

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