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Quantitative analysis of the diffuse scattering from a bilayer manganite[1] S. ROSENKRANZ, J. CHEN, D.J.P. MORRIS, S.N. ANCONA, H. ZHENG, J.F. MICHELL, M. ANITESCU, R. OSBORN, Argonne National Laboratory, B.J. CAMPBELL, Brigham Young Univ. — Magnetoresistance in manganese oxides is strongly enhanced by the presence of Jahn-Teller polarons and short range correlations between them. While previous investigations have shown the existence of both local lattice distortions and short-range order, a detailed quantitative description of the local structure, how it evolves as a function of temperature and doping, and how it affects the physical properties is still lacking. Here we present a detailed analysis of the diffuse scattering measured over a large range of temperatures from a bilayer manganite exhibiting colossal magnetoresistance. Focusing on the diffuse scattering around a single Bragg Peak and utilizing a point-defect approximation, we are able to derive a complete picture of the detailed temperature dependence of the Jahn-Teller distorted MnO_6 octahedra. These results further serve as a first test of the formalism for the quantitative analysis of the diffuse scattering over a large volume of reciprocal space, including both diffuse scattering from local defects close to Bragg Peaks, as well diffuse scattering due to short-range correlations.

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