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Investigating short-range magnetism in strongly correlated materials via magnetic pair distribution function analysis and *ab initio* theory BENJAMIN FRANDSEN, Columbia University, KATHARINE PAGE, Oak Ridge National Laboratory, MICHELA BRUNELLI, European Synchrotron Radiation Facility, JULIE STAUNTON, University of Warwick, SIMON BILLINGE, Columbia University — Short-range magnetic correlations are known to exist in a variety of strongly correlated electron systems, but our understanding of the role they play is challenged by the difficulty of experimentally probing such correlations. Magnetic pair distribution function (mPDF) analysis is a newly developed neutron total scattering method that can reveal short-range magnetic correlations directly in real space, and may therefore help ameliorate this difficulty. We present temperature-dependent mPDF measurements of the short-range magnetic correlations in the paramagnetic phase of antiferromagnetic MnO, an archetypal strongly correlated transition-metal oxide. We observe significant correlations on a $\sim$1 nm length scale that differ substantially from the low-temperature long-range-ordered spin arrangement. With no free parameters, *ab initio* calculations using the self-interaction-corrected local spin density approximation of density functional theory quantitatively reproduce the magnetic correlations to a high degree of accuracy. These results yield valuable insight into the magnetic exchange in MnO and showcase the utility of the mPDF technique for studying magnetic properties of strongly correlated electron systems.

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