Measuring Coexisting Phases in La$_{0.625-y}$Pr$_y$Ca$_{0.375}$MnO$_3$ Mark H. Burkhardt, SIMES, SLAC National Accelerator Laboratory and Stanford University, M.A. Hosain, S. Sarkar, H.A. Dürr, J. Stöhr, SIMES, SLAC National Accelerator Laboratory, Y.-D. Chuang, A.G. Cruz Gonzalez, A. Doran, A. Scholl, A.T. Young, Advanced Light Source, Lawrence Berkeley National Laboratory, Y.J. Choi, S.-W. Cheong, Rutgers Center for Emergent Materials and Department of Physics & Astronomy — Manganite compounds in the La$_{0.625-y}$Pr$_y$Ca$_{0.375}$MnO$_3$ series are known for exhibiting phase separation over a large temperature range. We combined the x-ray photoemission electron microscopy (PEEM) and resonant elastic soft x-ray scattering (RSXS) techniques to study the interplay between the low-temperature ferromagnetic and intermediate temperature charge-ordered/antiferromagnetic phases, respectively, in La$_{0.35}$Pr$_{0.275}$Ca$_{0.375}$MnO$_3$. We found that the system is driven by glassy polarons, which are present above the curie temperature $T_C$ in many ferromagnetic metallic manganites. They stunt the growth of the ferromagnetism on cooling: we clearly observe the onset of small, strained ferromagnetic domains almost 30 K above the temperature where ferromagnetism fully sets in, and the ferromagnetism has a very unconventional temperature dependence even below $T_C$. This relationship could explain the need for such high magnetic fields to induce colossal magnetoresistance.

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