Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Bilayer manganites: polarons in the midst of a metallic breakdown MARK GOLDEN, FREEK MASSEE, SANNE DE JONG[1], YINGKAI HUANG, University of Amsterdam, ANDREW BOOTHROYD, D. PRABHAKARAN, University of Oxford, ROLF FOLLATH, ANDREI VARYKHALOV, HZB, LUC PATTHEY, MING SHI, PSI, JEROEN GOEDKOOP, University of Amsterdam — The exact nature of the low temperature electronic phase of the manganite materials family, and hence the origin of their colossal magnetoresistive (CMR) transition is still a flagship issue in emergent correlated matter research. By combining new photoemission and tunneling data, we show that in the bilayer (N=2) manganite $La_{2-2x}Sr_{1+2x}Mn_2O_7$ the lattice/spin/orbital polaronic degrees of freedom win out, all across the CMR region of the phase diagram. This means that the generic ground state is that of a system in which strong interactions result in vanishing coherent quasi–particle spectral weight at the Fermi level for all locations in k–space. The incoherence of the charge carriers offers a unifying explanation for the anomalous charge-carrier dynamics seen in transport, optics and electron spectroscopic data. The stacking number N is the key factor for true metallic behavior, as an intergrowth-driven breakdown of the polaronic domination to give a robust metal possessing a traditional Fermi surface is seen in the bilayer system.

[1]Now at SLAC

Mark Golden
University of Amsterdam

Date submitted: 28 Nov 2010 Electronic form version 1.4