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Doping dependent evolution of the polaron metal N. MANNELLA, K. TANAKA, S.-K. MO, W. YANG, H. ZHENG, J. MITCHELL, J. ZAANEN, T.P. DEVERAUX, N. NAGAOSA, Z. HUSSAIN, Z.-X. SHEN, University of Tennessee-Knoxville — Experimental and theoretical evidence has already suggested that the ferromagnetic metallic (FM) phase in colossal magnetoresistive manganites is not a conventional metal but rather a polaronic conductor. In the bilayer manganites $La_{2-2x}Sr_{1+2x}Mn_2O_7$ (LSMO), Angle Resolved Photoemission (ARPES) experiment revealed that the FM phase is a polaronic metal with a strong anisotropic character of the electronic excitations [1,2]. A small but well-defined quasiparticle (QP) with heavy mass along the [110] or "nodal" direction is found to account for the metallic properties and their temperature dependent evolution [2]. In this talk, we will discuss recent ARPES results on the x = 0.60 composition and contrast them to the x = 0.40 results. Recent work has shown that the region in proximity of x = 0.60 constitute the most metallic bilayer manganite with DC conductivity about one order of magnitude higher than that corresponding to the region $0.30 < x < 0.40$. Much as in the x = 0.40 composition, for x = 0.60 along the nodal direction we observe a peak-dip-hump structure with QP of heavy effective mass. Quantitative differences in the electron-phonon coupling constant λ, the QP spectral weight and the hump energy are fully consistent with the doping evolution of the transport properties. [1] Nature 438, 474 (2005), [2] Phys. Rev. B 76, 233102 (2007).

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