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Constant Effective Mass Across the Underdoped Region of the High Tc Cuprates WILLIE PADILLA, Los Alamos National Laboratory, YUNSANG LEE, MICHAEL DUMM, Department of Physics, University of California at San Diego, La Jolla, CA 92093-0319, GIRSH BLUMBERG, Bell Laboratories, Lucent Technologies, Murray Hill, New Jersey 07974, USA, SHIMPEI ONO, KOUJI SEGAWA, , SEIKI KOMIYA, YOICHI ANDO, Central Research Institute of Electric Power Industry, Komae, Tokyo 201-8511, Japan, DIMITRI BASOV, Department of Physics, University of California at San Diego, La Jolla, CA 92093-0319
— We investigate the hole dynamics in two prototypical high temperature superconducting systems: $La_{2-x}Sr_xCuO_4$ and $YBa_2Cu_3O_y$ using a combination of DC transport and infrared spectroscopy. By exploring the effective spectral weight obtained with optics in conjunction with DC Hall results we find a constant effective mass across the entire underdoped regime. The transition to the Mott insulating state in these systems is of the "vanishing carrier number" type as we observe no mass divergence as one proceeds to undoped phases. We discuss the implications of these results for the understanding of both transport phenomena and pairing mechanism in high-T_c systems.

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