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Superconducting plasma edge along the *c* axis in $La_{2-x}Ba_xCuO_4$[1]

C. C. HOMES, M. HÜCKER, JINSHENG WEN, ZHIJUN XU, G. D. GU, J. M. TRANQUADA, Condensed Matter Physics and Materials Science Dept., Brookhaven National Laboratory, Upton, NY — The optical properties of $La_{2-x}Ba_xCuO_4$ (LBCO) have been measured for a number of temperatures over a wide frequency range along the poorly-conducting c axis for the $x = 0.095$, 0.125 and 0.155 Ba concentrations. In slightly underdoped LBCO ($x = 0.095$, $T_c \simeq 32$ K), a sharp plasma edge is observed in the reflectance at low frequency below T_c; this plasma edge is associated with Josephson coupling of the copper-oxygen planes and the formation of a bulk three-dimensional superconducting state. A plasma edge is also observed in the more heavily-doped material ($x = 0.155$, $T_c \simeq 32$ K) below T_c at higher frequency; however, it is significantly broader in character. Interestingly, for the $x = 1/8$ doping, static charge and spin stripe order develop at 54 and 42 K, respectively; the superconducting transition is strongly suppressed ($T_c \simeq 3$ K) and the plasma edge is not observed. The failure to observe a plasma edge for this doping is consistent with the recently proposed view that the layers are decoupled due to the formation of spin stripes, blocking the formation of a coherent three-dimensional superconducting state.

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