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An infrared study of the pancake vortex state in $La_{2-x}Sr_xCuO_4$ across the phase diagram ALEXANDER SCHAFGANS, ANDREW LAFORGE, Department of Physics, University of California, San Diego, SASA DORDEVIC, Department of Physics, The University of Akron, MUHAMMAD QAZILBASH, Department of Physics, University of California, San Diego, SEIKI KOMIYA, Central Research Institute of Electric Power Industry, Iwato-kita, Komae, Tokyo, YOICHI ANDO, Institute of Scientific and Industrial Research, Osaka University, DIMITRI BASOV, Department of Physics, University of California, San Diego — We report on a doping dependent study of the far-infrared interlayer response in the high-temperature superconductor $La_{2-x}Sr_xCuO_4$ (La214). A magnetic field up to 8 Tesla applied perpendicular to the CuO_2 planes is found to increasingly suppress the Josephson plasma resonance (JPR) with decreased doping. By 6 Tesla at a temperature of 8 Kelvin, the c-axis reflectivity is identical to that of the normal state in the most underdoped samples, suggesting the sample is in a two dimensional superconducting state. This behavior is in contrast to fields parallel to the CuO_2 planes, where only a small suppression of the JPR is seen up to 17 Tesla. Vortex wandering and static spin density waves are considered as possible mechanisms for plane decoupling.

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