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Fluctuations of superconductivity near the quantum critical point of overdoped $La_{2-x}Sr_xCuO_4$ FAHAD MAHMOOD, Johns Hopkins University, IVAN BOZOVIC, Brookhaven National Laboratory, N. PETER ARMITAGE, Johns Hopkins University — It was widely believed that the overdoped regime of high-temperature cuprate superconductors can be described by the conventional physics of BCS superconductors. However, recent measurements by Bozovic et. al. (Nature 536, 309-311), conclude that even in this regime the superfluid density is a smooth function of the transition temperature (T_c) rather than being independent of it, in contrast with BCS predictions. It is important to understand the mechanism by which normal state charge carriers condense to form the superconducting state. Moreover, one expects that for critically overdoped $La_{2-x}Sr_xCuO_4$, superconducting fluctuations will be very significant due to the low superfluid densities. Here, we combine kHz range mutual inductance measurements and time-domain THz spectroscopy (TDTS) to probe the fluctuations of superconductivity in overdoped $La_{2-x}Sr_xCuO_4$ films grown by atomic-layer- by-layer molecular beam epitaxy (ALL-MBE). The fluctuations are described by quantifying and directly comparing both the low (kHz) and high (THz) frequency phase stiffness.

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