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Anomalous dimensional crossover in critical microwave-conductivity fluctuations of superconducting $La_{2-x}Sr_xCuO_4$ thin films HARUHISA KITANO, TAKEYOSHI OHASHI, ATSUTAKA MAEDA, Department of Basic Science, University of Tokyo, ICHIRO TSUKADA, Central Research Institute of Electrical Power Industry — We demonstrate that there are two dimensional crossover lines separating the phase diagram of $La_{2-x}Sr_xCuO_4$ (LSCO) into three regions with different universality classes, by using a dynamic scaling analysis of the microwave complex conductivity. For underdoped LSCO from x=0.07 to x=0.14, we show clear evidence for the 2D-XY universality class (the BKT transition in the nearly decoupled CuO_2 planes), while the 3D-XY universality class is observed for nearly optimally doped region (x=0.15, 0.16). Surprisingly, for overdoped LSCO with x>0.17, we found that the critical behavior strongly suggested the 2D universality class, in contrast to the reduction of anisotropic properties with hole-doping. We discuss the implication of these results in terms of the effect of the quantum critical fluctuations.

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