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Spin Excitations of overdoped $La_{2-x}Sr_xCuO_4$ S. WAKIMOTO, JAEA, R.J. BIRGENEAU, UC Berkeley, C.D. FROST, RAL, A. KAGEDAN, H.K. KIM, U of Toronto, I. SWAINSON, CRL, J.M. TRANQUADA, BNL, K. YAMADA, IMR, H. ZHANG, U of Toronto — Spin excitations of LSCO in the overdoped regime have been studied by neutron scattering. Incommensurate excitations around 6 meV which are clearly observed in the $x = 0.25$ sample decrease with T_c as doping increases, and finally, become unobservable at $x = 0.30$ coincidentally with the disappearance of bulk superconductivity. High-energy measurements performed at the MAPS spectrometer show remarkably weakened magnetic excitations of the overdoped samples also in the high energy region. These observations are apparently consistent with a microscopic phase separation of the overdoped samples into the superconducting and Fermi liquid phases based on muSR results. in contrast, magnetization measurements of overdoped LSCO with and without Zn impurities have revealed that the superconductivity vanishes in the overdoped regime as a result of a competition between the superconductivity and paramagnetism which is induced even in the Zn-free overdoped LSCO.

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