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Hidden itinerant-spin extreme in heavily-overdoped LSCO revealed by dilute Fe doping: A combined neutron scattering and ARPES study RUIHUA HE, Stanford & ALS, M. FUJITA[1], M. ENOKI, Tohoku, M. HASHIMOTO, Stanford, S. IIKUBO, Tohoku, S.-K. MO, ALS, H. YAO, Berkeley, T. ADACHI, Y. KOIKE, Tohoku, Z. HUSSAIN, ALS, Z.-X. SHEN, Stanford, K. YAMADA, Tohoku — Fluctuations of the localized spins on Cu and the itinerant spins of doped holes have been theoretically conceived to be both essential for high-Tc superconductivity. While the former clearly leads to an antiferromagnetic order in the undoped Mott phase (the localized-spin extreme), it has remained open whether the latter has an inherent tendency towards the formation of some magnetic order at very high dopings where it becomes dominant (the itinerant-spin extreme). By perturbing the non-magnetically-ordered heavily-overdoped LSCO with 1% Fe doping, we found by elastic neutron scattering an incommensurate magnetic order induced below 20 K, which cannot be ascribed to the localized spins on Cu or doped Fe. ARPES study of the itinerant doped holes suggests that this order is driven by a strong Fermi surface nesting, which is inherent in the pristine LSCO but has so far eluded a clean revelation. Our finding presents the first experimental example of the long-sought itinerant-spin extreme for cuprates and supports its important fluctuations that should be considered along with its localized counterparts for HTSC at intermediate dopings.

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