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Energy gaps in failed superconductor $\mathbf{La_{1.875}Ba_{0.125}CuO_4}$ R.-H. HE, Dept of Phys, Appl Phys, SSRL, Stanford Univ., K. TANAKA, SSRL, Stanford and ALS, LBNL, S.-K. MO, SSRL, Stanford and ALS, Berkeley, T. SASAGAWA, SSRL, Stanford and Mat. and Struc. Lab,TIT, Japan, M. FUJITA, Inst. of Mat. Res.,Tohoku Univ, Japan, N. MANNELLA, SSRL, Stanford and ALS, Berkeley, K. YAMADA, Tohoku, Japan, Z. HUSSAIN, ALS, Berkeley, Z.-X. SHEN, SSRL, Stanford — By angle-resolved photoemission spectroscopy with improved energy and momentum resolution, we find in the normal state of $La_{2-x}Ba_xCuO_4$ x = 1/8 a strong existence of the nodal quasi-particle together with a *d*-wave energy gap along the underlying Fermi surface extending over a significant range in the momentum space before an abrupt take-off of the gap close to the antinodal region. This suggests the presence of a novel nodal metal state, which is different from the one proposed that assumes a single *d*-wave extension of the pseudogap from the antinode toward the node along the whole underlying Fermi surface. This state is compatible with the static stripe ordering but only involves a precursor pairing of the electrons away from the antinodal region. We argue that the traditional pseudogap defined exclusively for the antinodal states has a distinct origin than its new nodal counterpart, i.e., a *d*-wave gap above T_c. Moreover, this normal state gap function is found to be quantitatively very similar with those of $La_{2-x}Sr_xCuO_4$ x$\sim$1/8 (T_c <<4K) in the superconducting state, pointing to a universal doping dependence of the pairing strength for La-based cuprates, which also highlights the inherent lack of a global phase coherence in $La_{2-x}Ba_xCuO_4$ x = 1/8 that makes it a failed superconductor.

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