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Observation of a ubiquitous three-dimensional superconducting gap function in optimally-doped $Ba_{0.6}K_{0.4}Fe_2As_2$ Y.-M. XU, Lawrence Berkeley National Laboratory, Y.-B. HUANG, Chinese Academy of Sciences, X.-Y. CUI, E. RAZZOLI, M. RADOVIC, M. SHI, Swiss Light Source, G.-F. CHEN, Renmin University, P. ZHENG, N.-L. WANG, Chinese Academy of Sciences, C.-L. ZHANG, Oak Ridge National Laboratory, P.-C. DAI, The University of Tennessee, J.-P. HU, Purdue University, Z. WANG, Boston College, H. DING, Chinese Academy of Sciences — The knowledge of the quasi-three-dimensional (3D) superconducting (SC) gap is essential for understanding the superconducting mechanism of the iron-pnictides highlighted by their multiband and quasi-3D electronic structure. By using the k_z-capability of angle-resolved photoemission, we completely determined the SC gap on all five FSs in 3D on $Ba_{0.6}K_{0.4}Fe_2As_2$ samples. We found a significant k_z dispersion of the SC gap which can only derive from interlayer pairing. Remarkably, the SC energy gaps can be described by a single 3D gap function with two energy scales characterizing the strengths of intra-layer (Δ_1) and interlayer (Δ_2) pairing. The anisotropy ratio Δ_2/Δ_1, determined from the gap function, is close to the c-axis anisotropy ratio of the magnetic exchange coupling J_c/J_{ab} in the parent compound. The ubiquitous gap function for all the 3D FSs reveals that pairing is short-ranged and strongly constrain the possible pairing force in the pnictides.

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