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Isotropic low-temperature upper critical field in $(Ba,K)Fe_2As_2^1$ HUIQIU YUAN, Department of Physics, Zhejiang University, SCOT BAILY, JOHN SINGLETON, FEDOR BALAKIREV, National High Magnetic Field Laboratory, G.F. CHEN, J.L. LUO, N.L. WANG, Beijing National Laboratory for Condensed Matter Physics — Furious activity has been generated by the discovery of superconductivity in the iron-arsenic-based compounds ReFeAs(O,F) (Re = lanthanide) and (A,K)Fe₂As₂ (A=Ba, Sr). Superconducting T_c s as high as 55 K have been observed, provoking comparisons with the "high $T_{\rm c}$ " cuprates. The layered crystal structure of the cuprates led to speculations that reduced dimensionality is necessary for "hightemperature" superconductivity; at first sight, the iron-arsenic compounds, which also possess layered structures, give additional credence to this idea. However, we report measurements in magnetic fields of up to 60 T, necessary to overcome the large upper critical fields, that demonstrate that the superconducting properties of single crystals of (Ba,K)Fe₂As₂ are in fact rather three dimensional. This is markedly different from the highly anisotropic properties of all previously-known layered superconductors (e.g. the cuprates and the crystalline organic metals); we suggest that it is attributable to the distinctive electronic structure of the iron-arsenide compounds. Our measurements indicate that in contrast to the assumptions based on the cuprates, reduced dimensionality is not a prerequisite for "high-temperature" superconductivity.

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