Abstract Submitted
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Local measurement of superfluid density in iron-pnictide superconductors $Ba(Fe_{1-x}Co_x)_2As_2$ by magnetic scanning probes LAN LUAN, OPHIR M. AUSLAENDER[1], THOMAS M. LIPPMAN, CLIFFORD W. HICKS, BEENA KALISKY, JIUN-HAW CHU, JAMES G. ANALYTIS, IAN R. FISHER, JOHN R. KIRTLEY, KATHRYN A. MOLER, Stanford University — We use magnetic force microscopy (MFM) to measure the local penetration depth λ and its temperature dependence $\Delta\lambda$ in $Ba(Fe_{1-x}Co_x)_2As_2$ ($x \approx 0.05$,$T_c = 18.5K$) single crystals, complemented by the use of scanning SQUID susceptometry to measure $\Delta\lambda$ down to 0.4 K. We observe that the superfuid density ρ_s over the full temperature range is well described by a clean two-band fully gapped model. We demonstrate that MFM can measure the important and hard-to-determine absolute value of λ, as well as obtain its temperature dependence and spatial homogeneity in the same measurement. We find $\lambda_{ab} = 325 \pm 50$nm, hinting that the superconductivity is not limited by phase fluctuation in this underdoped sample. We observe uniform ρ_s on the submicron scale despite the highly disordered vortex pinning.

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