

Abstract Submitted
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Unconventional magnetic field-temperature superconducting phase-diagram in Co doped BaFe₂As₂ YOUNJUNG JO, National High Magnetic Laboratory, R.H. LIU, H. CHEN, X.H. CHEN, Hefei National Laboratory, L. BALICAS, National High Magnetic Laboratory, NATIONAL HIGH MAGNETIC FIELD LABORATORY TEAM, HEFEI NATIONAL LABORATORY COLLABORATION — Here, we report electrical transport and preliminary torque magnetometry measurements in underdoped Ba(Fe_{1-x}Co₂As₂) single crystals under high magnetic fields. For fields perpendicular to the conducting planes one observes an upward curvature for the temperature dependence of the upper critical field $H_{C2}(T)$ which contrasts markedly with one expects for conventional superconductors. While for fields along the conducting planes $H_{C2}(T)$ behaves nearly linearly in temperature down to low temperatures. For both configurations $H_{C2}(T)$ is found to surpass the weak coupling Pauli limiting field e.g., for a sample displaying a superconducting transition temperature $T_c \simeq 9.7$ K one observes $H_{C2}(T \rightarrow 0 \text{ K}) \geq 35$ T for fields along an in-plane direction. This value surpasses the expected Pauli limiting field by a factor of two. Thus, the resulting phase-diagram presents strong similarities with the one reported for poly-crystalline LaFeAsO_{1-x}F_x and which was recently claimed to be described by a model based on a two-gap strong coupled superconducting state. Our on-going torque magnetometry measurements are expected to check the validity of this interpretation.

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