

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

First order quantum phase transition under the superconducting dome of $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$ ¹ T. HU², H. XIAO³, Y.P. SINGH, D.J. HANEY, X.Y. HUANG, M. DZERO, Kent State University, USA, H.H. WEN, Nanjing University, China, C.C. ALMASAN, Kent State University, USA — We present the results of magnetoresistivity and magnetization measurements performed under pressure (P) on single crystals of $\text{Ba}(\text{Fe}_{1-x}\text{Co}_x)_2\text{As}_2$ ($x = 0, 0.042, 0.06, 0.08$). Our results show that the antiferromagnetic phase macroscopically coexists with the superconducting phase and can be induced by the magnetic field locally nucleated in the vortex core for the $x = 0.06$ sample. In addition, the diamagnetic signal of the $x = 0.06$ sample shows a huge jump around $P = 0.5$ GPa, where the superconducting transition temperature displays a maximum. This suggests that a first order antiferromagnetic quantum phase transition (QPT) is present inside the superconducting dome, and that the superconductivity in this system is closely related to this QPT. A magnetic tricritical point is observed inside the superconducting dome, and no quantum critical point is expected in zero magnetic field.

¹This work was supported by NSF (DMR-1006606 and DMR-0844115), ICAM Branches Cost Sharing Fund from Institute for Complex Adaptive Matter, and Ohio Board of Regents (OBR-RIP-220573) at KSU. H.X. was supported by NSFC (11104335) and the MOST (2011CBA00102).

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Date submitted: 17 Nov 2012

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