Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Evidence for Two Energy Gaps in Superconducting $Ba_{0.6}K_{0.4}Fe_2As_2$ Single Crystals and Breakdown of the Uemura Plot[1] CONG REN, ZHAO-SHENG WANG, HUI-QIAN LUO, HUAN YANG, LEI SHAN, HAI-HU WEN, National Laboratory for Superconductivity, Institute of Physics and Beijing National Laboratory for Condensed Matter Physics, CAS, NATIONAL LABORATORY FOR SUPERCONDUCTIVITY,IOP TEAM — We report a detailed investigation on the lower critical field H_{c1} of the superconducting $Ba_{0.6}K_{0.4}Fe_2As_2$ (FeAs-122) single crystals. A pronounced kink is observed on the $H_{c1}(T)$ curve, which is attributed to the existence of two superconducting gaps. By fitting the data $H_{c1}(T)$ to the two-gap BCS model in full temperature region, a small gap of $\Delta_a(0) = 2.0 \pm 0.3$ meV and a large gap of $\Delta_b(0) = 8.9 \pm 0.4$ meV are obtained. The in-plane penetration depth $\lambda_{ab}(0)$ is estimated to be 105 nm corresponding to a rather large superfluid density, which points to the breakdown of the Uemura plot in FeAs-122 superconductors.

[1]This work is supported by the Natural Science Foundation of China(973 project No: 2006CB60100, 2006CB921107, 2006CB921802), and Chinese Academy of Sciences (Project ITSNEM)

Cong Ren
National Laboratory for Superconductivity, Institute of Physics and Beijing
National Laboratory for Condensed Matter Physics, CAS

Date submitted: 02 Dec 2008 Electronic form version 1.4