Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Pulsed-field contactless mapping of the anisotropic upper critical field in LiFeAs superconducting crystals K. CHO, H. KIM, M.A. TANATAR, R. PROZOROV, Ames Laboratory, USA, Y.J. SONG, Y.S. KWON, Sungkyunkwan University, Rep. of Korea, W.A. CONIGLIO, C.C. AGOSTA, Clark University, USA, A. GUREVICH, National High Magnetic Field Laboratory, USA — Angle - resolved measurements of the upper critical field were performed using a tunnel diode resonator in the stoichiometric iron arsenide superconductor LiFeAs (T_c=18 K) in pulsed magnetic fields up to 50 T at temperatures down to 0.6 K. Complete $H_{c2}^{\|c}(T)$ and $H_{c2}^{\perp c}(T)$ curves with $T \to 0$ extrapolated values of $H_{c2}^{\|c}(0) = 17 \pm 1$ T and $H_{c2}^{\perp c}(T) = 26 \pm 1$ T were obtained. The anisotropy, $\gamma_{H_{c2}} \equiv H_{c2}^{\perp c}/H_{c2}^{\|c} \approx 2$, close to T_c has revealed the essentially three-dimensional electronic structure of the material. Both temperature - dependent $H_{c2}(T)$ can be well fit within a single set of band structure, magnetism and scattering parameters. In a configuration with $H \parallel c$, $H_{c2}^{\|c}(T)$ is limited by orbital effects with modest scattering. In the perpendicular orientation, $H_{c2}^{\perp c}(T)$ shows a notable low-temperature saturation and a strong departure from the orbital Werthamer-Helfand-Hohenberg model. Instead, fitting results suggest paramagnetic Pauli limiting and the development of a spatially - modulated superconducting state.

Kyuil Cho
Ames Laboratory, USA

Date submitted: 05 Nov 2010 Electronic form version 1.4