Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Free flux flow: a probe into the field dependence of vortex core size in clean single crystals[1] A.A. GAPUD, O. GAFAROV, S. MORAES, University of South Alabama, J.R. THOMPSON, University of Tennessee and Oak Ridge National Laboratory, D.K. CHRISTEN, Oak Ridge National Laboratory, A.P. REYES, National High Magnetic Field Laboratory — The free-flux-flow (FFF) phase has been attained successfully in a number of clean, weak-pinning, low-anisotropy, low-T_c, single-crystal samples as a unique probe into type II superconductivity that is independent of composition. The "clean" quality of the samples have been confirmed by reversible magnetization, high residual resistivity ratio, and low critical current densities J_c with a re-entrant "peak" effect in $J_c(H)$ just below the critical field H_{c2}. The necessity of high current densities presented technical challenges that had been successfully addressed, and FFF is confirmed by a field-dependent ohmic state that is also well below the normal state. In these studies, the FFF resistivity $\rho_f(H)$ has been measured in order to observe the field-dependent core size of the quantized magnetic flux vortices as modeled recently by Kogan and Zelezhina (KZ) who predicted a specific deviation from Bardeen-Stephen flux flow, dependent on normalized temperature and scattering parameter λ. The compounds studied are: V_3Si, $LuNi_2B_2C$, and $NbSe_2$, and results have shown consistency with the KZ model. Other applications of this method could also be used to probe normal-state properties, especially for the new iron arsenides, as will be discussed.

[1]Funded by the Research Corporation and by an NSF-RUI grant.

Albert Gapud
University of South Alabama

Date submitted: 13 Dec 2011 Electronic form version 1.4