



Invitation

LMU-Seminar

Title: Ideal gas of vortices and a filament phase in type-II superconductors

Speaker: Prof. Vladimir Kozhevnikov - Department of Physics, Tulsa Community College, USA

Time: Thursday, June 23rd 2016, 14:00

Place: WBBA/008

Abstract:

In spite of enormous amount of literature on properties of type-II superconductors, above H_{c1} we know them only scarcely. For instance, we know very little about magnetic properties of type-II samples of other than cylindrical geometry (cylinders or slabs in a parallel field), and even for cylinders our knowledge on some principal issues is controversial. Recently we undertook an experimental and theoretical study of the mixed state using niobium single crystal and high purity film samples. A bit more specifically, residual resistivity ratio of a 5- μm thick film was 640, this is a record pure film of type-II material. Experiments included measurements of magnetization, electrical transport, bulk μSR and scanning Hall-probe microscopy imaging. Results of this study will be presented in this talk. In particular, it will be shown that vortices in samples of a transverse geometry (slabs and films in a perpendicular field) do not interact, thus making a sort of an ideal gas with zero temperature; in other sample-field configuration the vortex gas becomes "real" with maximum deviation from this ideal-gas state in the cylinders. It will be also shown that H_{c2} and H_{c3} critical fields are the same regardless on the sample geometry, and that superconductivity between these fields makes filaments parallel to the applied field; density of the filaments is maximal at H_{c2} and gradually vanishes at H_{c3} .

References:

1. V. Kozhevnikov, A.-M. Valente-Feliciano, P. J. Curran, G. Richter, A. Volodin, A. Suter, S. Bending and C. Van Haesendonck, Cond-mat 1603.04105v1 (2016).
2. V. Kozhevnikov, A.-M. Valente-Feliciano, P. J. Curran, A. Suter, A. H. Liu, T. G. Richter, T. Prokscha, E. Morenzoni, S. Bending and C. Van Haesendonck, in preparation.