Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Comparison of specific heat and magneto-resistance measurements in the same $SmFeAsO_{1-x}F_x$ crystals STANISLAW GALESKI, PHILIP MOLL, NIKOLAI ZHIGADLO, JANUSZ KARPINSKI, BERTRAM BATLOGG, Laboratory for Solid State Physics, ETH Zurich, Switzerland, PHYSICS OF NEW MATERIALS TEAM — We have performed resistivity and specific heat measurements in the same sub-microgram single crystals of an iron-based superconductor SmFeAsO1-xFx ($T_c \approx 50$K). This allowed for the first direct comparison of Hc2 curves from thermodynamic measurements with estimates from the magneto-resistance at commonly used criteria (10, 50, 90% ϱ_N). A criterion of 40-50% ϱ_N well describes H_{c2}(T) for both in and out of plane fields. We attribute the low field dependence of the criterion to filamentary superconductivity. The challenging heat capacity measurement on microscopic crystals (50μm in diameter, 10μm thick) was done using a commercially available gas-nanocalorimeter. The thermodynamic data was in good agreement with previous experiments performed on crystals from the same batch by other groups. H_{c2} slopes of 1.6 T/K for fields parallel to the c-axis and 12.3 T/K in the ab-plane were found yielding a ξ anisotropy $\gamma \approx 7$. This demonstrates that our experimental technique is both relatively fast to set up and furthermore reliable in fields up to 6T.

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Date submitted: 15 Nov 2013 Electronic form version 1.4