Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

A concept of the upper threshold field for dendritic vortex avalanches in superconductors. VITALIY YURCHENKO, D.V. SHANTSEV, University of Oslo, I. MAASILTA, University of Jyväskylä, K. SENAPATI, Indian Institute of Technology in Kanpur, T.H. JOHANSEN, University of Oslo — Dendritic vortex avalanches in superconductors (SC), associated with thermo-magnetic instabilities, are known to destroy a metastable critical state and severely detriment performance of SC applications. Several thermo-magnetic models have been proposed to determine conditions under which a superconductor is to undergo a dendritic magnetic avalanche. However, there remains an omnipresent experimental fact that has not been given a theoretical explanation: instabilities always disappear above some upper threshold field. Our recently developed model [Phys. Rev. Lett. 97, 077002 (2006)] predicts divergence of the threshold field at low values of the critical current j_c. In its turn, at increasing magnetic field j_c becomes strongly suppressed by the field. We explain disappearance of the dendritic avalanches in terms of the divergence of the upper threshold field due to a strong dependence of the critical current on magnetic field $j_c(B)$ and support it by the results of our recent magneto-optical investigations of dendritic flux avalanches in NbN thin films. We then verify the model in a range of controllably varied j_c values.

Vitaliy Yurchenko
University of Oslo

Date submitted: 04 Jan 2007 Electronic form version 1.4