Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Threshold Critical Current Density to Trigger Flux Avalanches in Superconducting Thin Films W.A. ORTIZ, DF/UFSCar, Brazil and Centre for Advanced Study, Norwegian Academy of Science and Letters, M. MOTTA, F. COLAUTO, DF/UFSCar, Brazil, R. ZADOROSNY, DFQ/UNESP, Brazil, T.H. JOHANSEN, Physics, Univ of Oslo and Centre for Advanced Study, Norwegian Academy of Science and Letters, R. DINNER, M. BLAMIRE, Materials Science, Cambridge Univ, UK, G.W. ATAKLTI, V.V. MOSHCHALKOV, A.V. SILHANEK, K.U.Leuven, Belgium — Under certain conditions of temperature and magnetic field, sudden flux bursts (avalanches) develop into superconducting films, as a consequence of thermomagnetic instabilities, which occur when heat dispersion is slower than magnetic diffusion. Based on a systematic study of the magnetic response (including magneto-optical imaging) of two Nb films - one plain and the other decorated with a square array of square antidots - we have found the existence of a threshold critical current density above which vortex avalanches are triggered. The experimental results reveal that this threshold value is nearly constant within the whole range of temperatures and magnetic fields investigated. The fact that an avalanche is triggered once the critical current reaches the threshold is in close correspondence with the behavior of granular material in sandpiles, which slides down whenever the slope exceeds the threshold repose angle. Our results are in perfect agreement with the predictions of a model for thermomagnetic instabilities in superconducting films, published previously by Yurchenko and coworkers [PRB 76, 092504 (2007)].

Wilson Ortiz
Grupo de Supercondutividade e Magnetismo, Departamento de Física,
Universidade Federal de São Carlos, 13565-905, São Carlos, SP, Brazil

Date submitted: 09 Nov 2011 Electronic form version 1.4