Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Controlling microwave driven vortex avalanches by superconductivity stimulation ANTONIO LARA, FARKHAD G. ALIEV, Universidad Autonoma de Madrid, Spain, ALEJANDRO V. SILHANEK, Université de Liège, Belgium, VICTOR V. MOSHCHALKOV, Katholieke Universiteit Leuven, Belgium — The response of superconducting devices to electromagnetic radiation is a core concept implemented in diverse applications, ranging from the currently used voltage standard to single photon detectors in astronomy. Surprisingly, a sufficiently high power subgap radiation may stimulate superconductivity itself. Recently we have demonstrated the possibility of stimulating also type II superconductors, in which the radiation may cause nonlinear response of the vortex core [1]. This effect opens the possibility of effective control over vortex avalanches. Here we report on a detailed study of superconductivity enhancement and avalanche control by GHz radiation in type II superconducting Pb films in the presence of vortices. The magnetic field dependence of the vortex related microwave losses in a film with periodic pinning reveals a reduced dissipation of mobile vortices in the stimulated regime due to a reduction of the core size. Results of numerical simulations support the validity of this conclusion. Moreover, we demonstrate that microwave stimulated superconductivity induces a notable increase of microwave depinning power needed to trigger avalanches in the proximity of vortex depinning frequencies. Our findings open new ways to control the vortex dissipation and depinning induced avalanches by using superconductivity stimulation.

[1] A. Lara et al., submitted

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Date submitted: 12 Nov 2014 Electronic form version 1.4