MICROWAVE STIMULATION OF SUPERCONDUCTIVITY IN THE VORTEX STATE

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It is well known that a sufficiently high-power electromagnetic field of GHz frequency can stimulate superconductivity [1] because of the irradiation-induced redistribution of quasiparticles away from the superconducting gap edge [2]. By contrast, the fast motion of large-current-driven Abrikosov vortices usually triggers a flux-flow instability (FFI) [3,4] because of a decrease in the number of quasiparticles in the vortex cores. Can one, however, make these phenomena competing? For low magnetic flux densities (small magnetic fields), we have revealed that a dynamical quenching of the vortex state in Nb thin films *can be advanced* or *delayed* (Fig. 1) by tuning the power and frequency of the *microwave ac stimulus added to a dc bias current* [5]. The experimental findings are supported by time-dependent Ginzburg-Landau simulations and they can be explained, qualitatively, based on a model of "breathing mobile hot spots", implying a competition of heating and cooling of quasiparticles along the trajectories of moving fluxons whose core sizes vary in time.

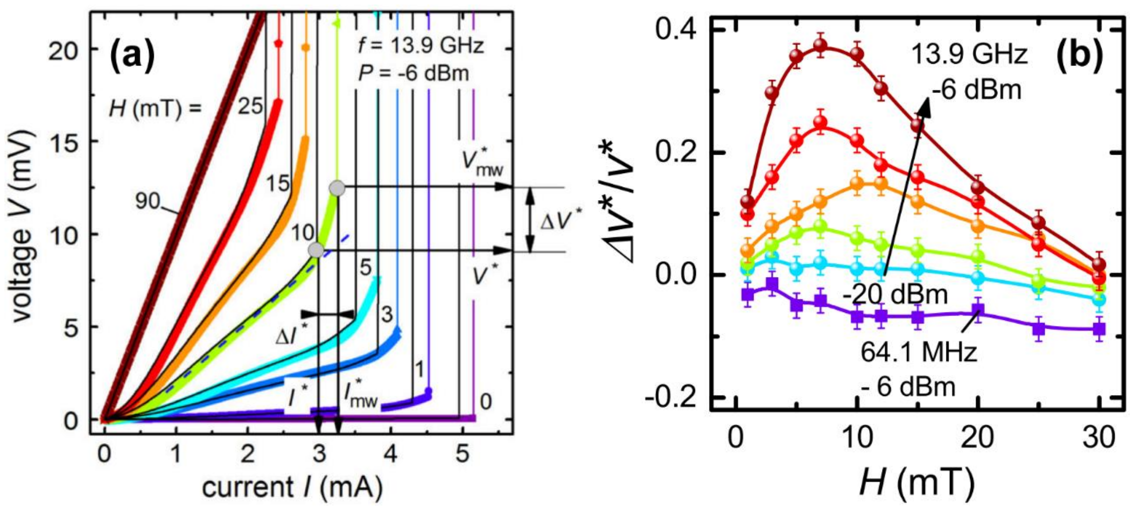

Fig. 1. (a) I-V curves of a Nb film at a $T = 0.988T_c$ in the unexcited state (solid lines) and in the presence of a rather high-power-level ac current (symbols). (b) Relative changes of the vortex velocity at the instability point for a series of microwave power levels at 13.9 GHz in comparison with the -6 dBm/64.1 MHz ac excitation.

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