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Dendritic flux avalanches and nonlocal electrodynamics in thin superconducting films[1] A. GUREVICH, University of Wisconsin, I. ARANSON, V. VLASKO-VLASOV, V. VINOKUR, U. WELP, Argonne National Laboratory, M. WELLING, R. WIJNGAARDEN, Vrije University of Amsterdam — We present numerical and analytical studies of coupled nonlinear Maxwell and thermal diffusion equations, which describe nonisothermal dendritic flux penetration in superconducting films. We show that spontaneous branching of propagating flux filaments occurs due to nonlocal magnetic flux diffusion and positive feedback between flux motion and Joule heating. The branching is triggered by a thermomagnetic edge instability, which causes periodic stratification of the critical state. The resulting distribution of magnetic microavalanches depends on a spatial distribution of defects. Our results are in good agreement with experiments on Nb films.

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