Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

AC current driven vortex dynamics in YBCO thin films and coated conductors ANDREA LUCARELLI, RAN YANG, GUNTER LUEPKE, College of William and Mary, FRANCESCO GRILLI, Los Alamos National Laboratory, TIMOTHY HAUGAN, GEORGE LEVIN, PAUL BARNES, Air Force Research Laboratory — The effect of an AC current and a static magnetic field on the vortex dynamics in $YBa_2Cu_3O_{7-x}$ (YBCO) thin films and coated conductors is studied by time-resolved magneto-optical imaging. Our measurements show that the AC current enables the vortex lattice in the YBCO thin film to reorganize into two coexisting states with different characteristics: a quasi-static state in the sample interior and a dynamic state near the edges. Vortices and anti-vortices, induced by the current during the cycle, penetrate from the edges into the sample and interact with the pinned vortices altering the flux lattice. We compare the AC current driven vortex dynamics in YBCO thin films and coated conductors with particular focus on the AC loss characteristics of multifilamentary samples. Finite-element method (FEM) calculations adopting a recently developed method, are used to compute current density, field profiles and AC losses during the cycle. The model assumes a thermal activation of the magnetic flux that leads to a nonlinear dependence of the electric field and current density. The FEM calculations show a very good agreement with the measured data.

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Date submitted: 20 Nov 2006 Electronic form version 1.4