Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Theory for the Dependence on Thickness Shown by the Critical Current vs. Magnetic Field in Films of PLD-YBCO[1] MARTIN P. MALEY, Los Alamos National Laboratory, JOSE P. RODRIGUEZ, California State University at Los Angeles — The theoretical consequences of the proposal that the vortex lattice induced by perpendicular magnetic field in films of PLD-YBCO is in a thermodynamic Bose glass state are explored. Attention is focused on the high-field regime at the extreme type-II limit, in which case only a small fraction of the vortex lines are localized at the dislocations that thread the film along the c axis, and in which case the pinning of the vortex lattice is collective. The critical current density along the film is predicted to follow an inverse square-root power law as a function of external magnetic field in the collective-pinning regime. It gives a fair account of the critical current density at kG magnetic fields in films of PLD-YBCO that are microns thick, at liquid nitrogen temperature. It fails, however, for much thinner films at lower temperature. This failure is corrected by including the effect of point pins along the interstitial vortex lines that lie in between the correlated pins. They contribute an inverse dependence on film thickness to the critical current density in magnetic field oriented near the c axis.

[1]Supported in part by the Department of Energy.

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Date submitted: 29 Nov 2005 Electronic form version 1.4