Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Fluxon ratchet dynamics in a Josephson junction array[1] KENNETH SEGALL, ADAM DIOGUARDI, NIKHIL FERNANDES, USHNISH RAY, Colgate University, JUAN MAZO, FERNANDO NARANJO, University of Zaragoza — We present theoretical and experimental work on the ratchet dynamics of fluxons in an array of Josephson junctions. Fluxons trapped in a parallel array of Josephson junctions upon cooldown experience a potential determined by the junction critical currents and the cell inductances. By varying these quantities in an asymmetric way, the potential can be made ratchet. We probe the dynamics of the fluxon with switching current measurements, which allow determination of the transition rate of the fluxon from its pinned state to a running state. We find two temperature regimes, both experimentally and in simulations. At low temperatures, the fluxon behaves like a single particle and undergoes thermal activation. At intermediate temperatures, the fluxon undergoes diffusion for several periods and then jumps to the running state. The dynamics in this region cannot be explained with a single particle picture. We have observed two temperature-dependent crossovers in the direction of transport in this temperature region. We present temperature-dependent measurements, comparisons with simulation, and possible interpretations of the crossovers.

[1]Funding from NSF DMR Condensed Matter and Research Corporation

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Date submitted: 20 Nov 2006 Electronic form version 1.4