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Phase Diagram and Glassy Dynamics of Moving Vortex Lattices

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Much progress was made in understanding the equilibrium properties of vortex systems including the discovery of a topologically ordered Bragg glass phase at low temperatures. By contrast little is known of the dynamics of vortex phases or of their fate once they are driven out of equilibrium and start moving. We describe results of time resolved transport measurements that probe the dynamics of vortex lattices and capture their evolution in response to an applied current pulse. The experiments lead to a dynamic phase diagram consisting of four regions defined by distinctly different response characteristics. In particular it contains a moving Bragg glass state which is the dynamic counterpart of the static Bragg glass. Once the driving force is turned off, the moving Bragg glass relaxes not to the initial stationary state, but to a new state whose properties strongly depend on the relaxation time. This state exhibits simple aging and memory of the direction of the previous moving state indicating that it is a true glass.

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