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Langevin Molecular Dynamics of Driven Magnetic Flux Lines[1]
ULRICH DOBRAMYSL, MICHEL PLEIMLING, UWE C. TÄUBER, Department of Physics, Virginia Tech — The characterization of type-II superconducting materials and their technological applications in external magnetic fields require a thorough understanding of the stationary and dynamical properties of vortex matter. The competition of repulsive interactions and attractive material defects renders the physics of externally driven magnetic flux lines very rich. We study the non-equilibrium steady states as well as transient relaxation properties of driven vortex lines in the presence of randomly distributed point pinning centers. We model the vortices as interacting elastic lines and employ a Langevin Molecular Dynamics (LMD) algorithm to extract steady-state and non-stationary time-dependent behavior. We compare the efficiency and accuracy of LMD to previously obtained Metropolis Monte Carlo steady-state force-velocity and gyration radius data. In future work we intend investigate the transient two-time height-height correlation and response functions.

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