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Hysteresis of Current in Noninteracting Atomic Fermi Gases in Optical Ring Potentials MEKENA METCALF, CHIH-CHUN CHIEN, CHEN-YEN LAI, Univ of California - Merced — Hysteresis is a ubiquitous phenomenon, which can be found in magnets, superfluids, and other many-body systems. Although interactions are present in most systems exhibiting hysteresis, here we show the current of a non-interacting Fermi gas in an optical ring potential produces hysteresis behavior when driven by a time-dependent artificial gauge field and subject to dissipation. Fermions in a ring potential threaded with flux can exhibit a persistent current when the system is in thermal equilibrium, but cold-atoms are clean and dissipation for reaching thermal equilibrium may be introduced by an external, thermal bath. We use the standard relaxation approximation to model the dynamics of cold-atoms driven periodically by an artificial gauge field. A competition of the driven time and the relaxation time leads to hysteresis of the mass current, and work done on the system, as a function of the relaxation time, exhibits similar behavior as Kramers transition rate in chemical reaction and one-dimensional thermal transport.

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