APS/123-QED Selfsynchronization and dissipation-induced threshold in collective atomic recoil lasing
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abstract Networks of globally coupled oscillators exhibit phase transitions from incoherent to coherent states. Atoms interacting with the counterpropagating modes of a unidirectionally pumped high-finesse ring cavity form such a globally coupled network. The coupling mechanism is provided by collective atomic recoil lasing (CARL), i.e. cooperative Bragg scattering of laser light at an atomic density grating, which is self-induced by the laser light. Under the rule of an additional friction force, the atomic ensemble is expected to undergo a phase transition to a state of synchronized atomic motion. We present the experimental investigation of this phase transition by studying the threshold behavior of the CARL process.