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Hamiltonian monodromy CHEN CHEN, MEGAN IVORY, SETH AUBIN, JOHN DELOS, College of William and Mary, AMO TEAM — We say that a system exhibits monodromy if we take the system around a closed loop in its spectrum space, and we find that the system does not come back to its original state. We report a method for experimental realization of a newly discovered dynamical manifestation of monodromy by investigating the behavior of atoms in a trap. The trapping potential has long range attraction to and short range repulsion from the center. Calculations include two parts. First, we consider atoms as classical particles for which we can choose any desired set of initial conditions. As was shown previously for different systems, when we take the system around a monodromy circuit, a loop of initial conditions evolves into a topologically different loop. Second, we incorporate the limitations that would appear in experimental implementation. The atoms have a range of initial angles, initial angular momenta, and initial energies. Our work shows how real atoms can be driven by real forces around a monodromy circuit, and thereby shows how one can observe dynamical monodromy in a laboratory. Finally, we extend classical dynamical monodromy to quantum dynamical monodromy by examining wave function evolution under comparable conditions.

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