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Ballistic atom pumps ANDRWE PYLE, TOMMY BYRD, MEGAN IVORY, The College of William & Mary, KEVIN MITCHELL, University of California, Merced, KUNAL DAS, Kutztown University of Pennsylvania, SETH AUBIN, JOHN DELOS, The College of William & Mary — Researchers have long been interested in electron transport through mesojunctions containing time-dependent potential barriers, a process often called "quantum pumping." A useful model of such a system is a ballistic atom pump: two reservoirs of neutral ultracold atoms connected by a channel containing oscillating repulsive potential-energy barriers. We report on experimental plans and progress to observe pumping dynamics with a freely propagating ^{87}Rb BEC directed at a tightly focused blue-detuned laser beam. Classically, this system can create net particle transport in either direction, and, even if there is no net particle transport, energy can be pumped out of or into each reservoir. Such pumps can also heat or cool one or both reservoirs. In a quantum mechanical description of the pump, we find that the momenta of the particles scattered by the pump acquire multiple Floquet sidebands, while mostly respecting the range of classically allowed energies. Semiclassical and quantum simulations of the scattering process are in good agreement. Initial experimental efforts are directed at observing the Floquet momentum sidebands of the BEC.

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