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Scattering of Ultracold Atoms from an Oscillating Barrier ANDREW PYLE, CHARLES FANCHER, William and Mary College, MEGAN IVORY, Cold Quanta, KUNAL DAS, Kutztown University of Pennsylvania, TOMMY BYRD, Purdue University, KEVIN MITCHELL, UC Merced, JOHN DELOS, SETH AUBIN, William and Mary College — We present progress on an experiment to study 1D quantum mechanical scattering by an amplitude-modulated barrier. The barrier oscillating at frequency ω imparts or subtracts kinetic energy in discrete amounts from the scattered atoms. Simulations confirm that the atomic energy spectrum resembles a comb with a tooth spacing of $\hbar\omega$. We present an atom chip-based system to study the scattering dynamics with Bose-Einstein condensates (BEC). A BEC is released from an optical dipole trap, while a modulated magnetic field gradient controls the vertical motion of the BEC as it travels towards a focused laser beam that serves as the barrier. Detection is carried out with a time of flight technique to resolve discrete atomic sidebands. This is a first step towards implementing a pump with atoms based on two such barriers modulated out of phase with one another. Ballistic quantum pumping was originally proposed for ballistic electron transport in nanowires, but has proven difficult to implement. The atomic approach is a route around the bottleneck in solid state systems, as optical superlattice experiments have recently confirmed. Work supported by W&M.

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