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Quantum pumping with ultra-cold atoms SETH AUBIN, College of William and Mary, KUNAL K. DAS, Fordham University — We propose an experimental scheme for implementing quantum pumps with ultra-cold atoms in an atom chip micro-magnetic trap. Quantum pumping has been the subject of considerable research in mesoscopic solid state systems, since it holds the promise of precise and reversible transport at the single electron level without the application of a bias potential. However, despite significant efforts, it has yet to be observed experimentally due to technical complications. A quantum pump can be simulated experimentally with ultra-cold atoms in a micro-magnetic potential consisting of two magnetic traps connected by a narrow quasi one-dimensional magnetic guide. The pumping potential is generated by a time-dependent optical dipole potential from one or more far off-resonance lasers focused onto the magnetic guide. An atomic system also offers the possibility of studying quantum pumping with bosons and fermions, and we present theoretical predictions for both types of atoms.

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