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Backaction driven transport of Bloch oscillating atoms in ring cavities B. PRASANNA VENKATESH, Asia Pacific Center for Theoretical Physics, J. GOLDWIN, University of Birmingham, D.H.J. O'DELL, McMaster University — We predict that an atomic Bose-Einstein condensate strongly coupled to an intracavity optical lattice can undergo resonant tunneling and directed transport when a constant and uniform force is applied. The bias force induces Bloch oscillations, causing amplitude and phase modulation of the lattice which resonantly modifies the site-to-site tunneling. For the right choice of parameters a net atomic current is generated. The direction and amplitude of the transport velocity depend on the detuning between the pump laser and the cavity, and transport can be enhanced through imbalanced pumping of the two counter-propagating running wave cavity modes. Our results add to the cold atoms quantum simulation toolbox, with implications for quantum sensing and metrology.

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