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All-optial quantum ratchet[1] CLINTON THOMPSON, GAUTAM VEMURI, Indiana University Purdue University Indianapolis (IUPUI), GIRISH AGARWAL, Oklahoma State University — A ratchet is a device in which there is directed motion of a particle in one direction, but in which motion is blocked in the opposite direction. This directed motion is a result of an underlying asymmetry between the potential in which the particle is moving and the quantum mechanical density distribution. Recently, quantum ratchets have been shown in Bose-Einstein condensates where the resultant motion of the particles is due to the asymmetry between the particle's wavefunction and the potential it is moving in. In this paper, we propose a theoretical realization of an all-optical quantum ratchet in a medium composed of an array of coupled waveguides. Such arrays of waveguides have proven to be very useful in studying a number of effects that arise in condensed matter physics and quantum physics. By coupling light into two adjacent waveguides, and calculating the expectation value for the position space operator, we demonstrate the ratchet like behavior of this quantum-mechanical system.

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