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Steering Persistent Current of Particles in a Ring Lattice Using an AC Impurity

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Abstract:

We study the dynamics of persistent currents in ring lattices in the presence of an AC impurity. The system is described by a Bose-Hubbard model with periodic boundary conditions where the presence of a Peierls phase is considered. We find that the motion of matter waves can be controlled by applying an external AC field on a single site of the ring lattice. In particular, in the high frequency regime of the AC field, we show that by tuning the interaction strength between particles, the flux of particles is reversed. These results could be of interest in superfluid dynamics observed in recent experiments.