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Quantum Physics

Regular and chaotic Bose-Einstein condensate in an accelerated Wannier-Stark lattice

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We investigate a Bose-Einstein condensate held in a quasi-one-dimensional Wannier-Stark lattice which is a combination of linear potential with an accelerated optical lattice. It is demonstrated that the system can be reduced to a periodically driven Gross-Pitaevskii one, in which we find the first exact analytical solution and the regular and chaotic numerical solutions with accelerated atomic flow densities. The results suggest an experimental scheme for generating and controlling the accelerating regular and chaotic matter-waves.

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