Dynamical Generation of Solitons and Bloch Waves with Ultracold Atoms in a Ring Trap

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We present methods to dynamically generate the full range of stationary solutions of interacting ultracold atoms confined to a ring-shaped trap, using an azimuthal lattice of varying period, depth and rotation rate. These include soliton solutions as well as Bloch waves. This study is based on first determining a comprehensive landscape of stationary solutions, that we will also describe. We consider both repulsive and attractive interactions among the atoms. The diversity of solutions available in a ring trap, by tuning various parameters, suggests the use of such traps as soliton factories to study nonlinear physics in broader applications, such as in optics or in other dynamical systems.