Matter-wave solitons supported by field-induced dipole-dipole repulsion with a spatially modulated strength

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Abstract:

In this talk, we demonstrate the existence of one and two-dimensional (1D and 2D) *bright* solitons in the Bose-Einstein condensate (BEC) with *repulsive* dipole-dipole interactions (DDIs) induced by a polarizing field, oriented perpendicular to the plane in which the BEC is trapped, whose strength grows from the center to periphery. Accordingly, the 2D setting is isotropic. These systems support stable 1D and 2D fundamental solitons, twisted solitons in 1D, and solitary vortices in 2D. Scaling properties of the soliton families are explained in an analytical form. The Thomas-Fermi approximation (TFA) is elaborated too, for fundamental solitons. The mobility of the solitons is limited to a vicinity of the central point. The setting with a 1D double-well modulation function is considered too. Stable even and odd solitons are found in it, along with regimes of Josephson oscillations.