

Rotating three-dimensional solitons in Bose Einstein condensates with gravity-like attractive nonlocal interaction

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We study formation of rotating three-dimensional high-order solitons (azimuthons) in Bose Einstein condensate with attractive nonlocal nonlinear interaction. In particular, we demonstrate formation of toroidal rotating solitons and investigate their stability. We show that variational methods allow a very good approximation of such solutions and predict accurately the soliton rotation frequency. We also find that these rotating localized structures are very robust and persist even if the initial condensate conditions are rather far from the exact soliton solutions. Furthermore, the presence of repulsive contact interaction does not prevent the existence of those solutions, but allows to control their rotation. We conjecture that self-trapped azimuthons are generic for condensates with attractive nonlocal interaction.

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