

Rogue waves in selfgravitating BEC

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As an example of coupling gravity to a quantum mechanical system, we explore the effects of external gravitational fields and selfgravitation on Bose-Einstein condensates. For a theoretical description, we extend the well-known Gross-Pitaevskii equation with a particle interaction given by Newtonian gravity [1]. The nonlinearity due to a general interaction causes special nonlinear effects. It is expected that one of these effects are the so called rogue waves [2] originally observed in water waves in the ocean described by a nonlinear Schrödinger equation [3]. We investigate if these waves occur in a selfgravitating BEC and if they are able to locally increase the particle density by a few orders of magnitude such that the gravitational self-interaction may possibly become significant and observable.

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