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# Non-linear effects in modulated 1D atomic BEC

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We study the dynamical effects following a sudden change of the transverse trapping frequency in an elongated BEC, which induces periodic oscillations of the radial density (the breathing mode). At early times, we observe an exponential growth of resonant longitudinal phonons, in agreement with the BdG predictions. We then observe an ordered sequence of phenomena induced by nonlinearities. The first is a loss of the nonseparability of the resonant phonon pairs. This is followed by the saturation of the exponential growth and a strong depletion of condensed atoms, which abruptly reduces the correlation length of the order parameter. Finally, the atomic spectrum becomes broad, featureless and almost incoherent, in agreement with experimental results. The link between this sequence and the preheating scenario in inflationary cosmology is striking, as is the similarity of techniques used to study them.

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