Abstract Submitted
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Formation of bright matter-wave breathers[1] D. LUO, Y. JIN, J. H. V. NGUYEN, R. G. HULET, Rice Univ, B. A. MALOMED, O. MARCHUKOV, V. A. YUROVSKY, Tel Aviv Univ, V. DUNJKO, M. OLSHANII, Umass, Boston — Solitons are non-dispersive wave packets that arise as solutions to the one-dimensional nonlinear Shrödinger equation. Due to the integrability of the equation, after a specific interaction quench, a fundamental soliton may be transformed into a nth-order soliton composed of n fundamental solitons, which are known as breathers.[2,3] The density profile oscillates in time, at a frequency determined by the chemical potential difference of the constituent solitons. A n-soliton breather is formed with the mass ratio of the constituent solitons of 1:3:...:2n-1, when the quench factor is n^2 where n is an integer. In this work, we first form a soliton from a Bose-Einstein condensate of ^{7}Li atoms in a quasi-1D harmonic potential formed from a single focused IR laser beam. We then quench the scattering length to form breathers. As we decrease the trap axial confinement strength sufficiently, the breathing frequency becomes independent of the axial confinement, which indicates that the geometry approaches the 1D-limit. We observe the density profiles of the n=2 and n=3 breathers.

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[2]V. E. Zakharov and A. B. Shabat, Soviet Physics JETP, 34, 1 (1972)
[3]J. Satsuma and N. Yajima, Prog. Theor. Phys. Supp. 55, 284 (1974)

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