Abstract Submitted
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Higher-order matter-wave solitons formed by inter- action quenches[1] Y. JIN, D. LUO, J. H. V. NGUYEN, R. G. HULET, Rice University, Houston, B. MALOMED, O. MARCHUKOV, V. YUROVSKY, Tel Aviv University, Israel, V. DUNJKO, M. OLSHANII, UMass, Boston — Solitons are 1D nonlinear waves that propagate without dispersion. Higher-order solitons, i.e. coherent superpositions of fundamental solitons known as breathers, can be formed using a specific interaction quench. We experimentally produce and characterize higher-order matter-wave solitons. Using a ^{7}Li BEC whose interactions are tuned using a Feshbach resonance, an nth order breather is created by suddenly increasing the strength of the attractive interactions by a factor of n^2, where n is an integer. The breathing frequency is determined by the chemical potential difference between the constituent solitons[2,3]. We show that the breathing frequency depends on the aspect ratio of the confinement and the strength of the post-quench non-linearity. The frequency is independent of the axial confinement when it is sufficiently weak. We demonstrate the realization of both the second (n=2) and third (n=3) order breather.

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