Abstract Submitted
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Quantum fluctuations of breather parameters in atomic condensates[1] VLADIMIR YUROVSKY, Tel Aviv University, OLEKSANDR MARCHUKOV, Tel Aviv University and TU Darmstadt, BORIS MELAMED, Tel Aviv University, MAXIM OLSHANII, VANJA DUNJKO, University of Massachusetts Boston, RANDALL HULET, Rice University — A mean-field cold-atom breather, which can be formed by the application of a four-fold quench of the scattering length to the fundamental soliton in an attractive quasi-one-dimensional gas, is a nonlinear superposition of two solitons with the $1:3$ mass ratio and zero relative velocity. Formation of solitons with varying mass ratios and relative velocities, predicted by the Bethe-ansatz analysis [1] of the quench for up to $N = 23$ atoms, is a manifestation of quantum fluctuations. The fluctuations are analyzed here [2] within the Bogoliubov approach in the limit of large N, using two models of the vacuum state: white noise and correlated noise. The latter model, closer to the ab initio by construction, leads to a better agreement, within 20% accuracy, with the fluctuations estimated from the Bethe-ansatz results for small N. The variances of relative velocity, relative phase, initial distance, and soliton masses scale as N, $1/N$, $1/N^3$, and N, respectively. Effects of the trap potential on the quantum fluctuations are also analyzed. 1. V. A. Yurovsky, B. A. Malomed, R. G. Hulet, and M. Olshanii, Phys. Rev. Lett. 119, 220401 (2017). 2. O. V. Marchukov, B. A. Malomed, M. Olshanii, V. Dunjko, R. G. Hulet, and V. A. Yurovsky, arXiv:1911.01369.

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