Abstract Submitted
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Effect of Quantum Fluctuations on the Dipolar Motion of Bose-Einstein Condensates in Optical Lattices[1] DAW-WEI WANG, Department of Physics, National Tsing-Hua University, Hsinchu, Taiwan, ROC, A. POLKOVNIKOV, Physics Department, Harvard University, Cambridge, Massachusetts 02138, USA — We reexamine dipolar motion of condensate atoms in one-dimensional optical lattices and harmonic magnetic traps including quantum fluctuations within the truncated Wigner approximation. In the strong tunneling limit we reproduce the mean field results with a sharp dynamical transition at the critical displacement. When the tunneling is reduced, on the contrary, strong quantum fluctuations lead to finite damping of condensate oscillations even at infinitesimal displacement. We show that there is a smooth crossover between the chaotic classical transition at finite displacement and the superfluid-to-insulator phase transition at zero displacement. We further analyze the time dependence of the density fluctuations and of the coherence of the condensate and find several nontrivial dynamical effects, which can be observed in the present experimental conditions.Many of our prediction has been observed recently by C. D. Fertig et al, in cond-mat/0410491.

[1]Phys. Rev. Lett. 93, 070401 (2004)

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