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Breakdown of macroscopic quantum self-trapping in coupled mesoscopic one dimensional Bose gases[1] RAFAEL HIPOLITO, ANATOLI POLKOVNIKOV, Boston University — Two coupled BECs with a large population imbalance exhibit macroscopic quantum self-trapping (MQST) if the ratio of interaction energy to tunneling energy is above a critical value. Here we investigate effect of quantum fluctuations on MQST. In particular, we analyze the dynamics of a system of two elongated Bose gases prepared with a large population imbalance, where due to the quasi one dimensional character of the gas we no longer have true long range order, and the effect of quantum fluctuations is much more important. We show that MQST is possible in this system, but even when it is achieved it is not always dynamically stable. Using this instability one can construct states with sharply peaked momentum distributions around characteristic momenta dependent on system parameters. Our other finding is the nonmonotonic oscillating dependence of the decay rate of the MQST on the length of the wires. We also address the interesting question of thermalization in this system and show that it occurs only in sufficiently long wires.

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