

Parity effect and barrier renormalization in the dipole mode of a strongly correlated Bose gas

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We study quantum transport for an interacting, one-dimensional Bose gas confined in a harmonic potential with a localized barrier at its center. We focus on the dipolar oscillations induced by a sudden quench of the position of the center of the trap. At difference from the case of a purely harmonic confinement, where the oscillation frequency coincides with the one of the trap at arbitrary interactions, we find that the dipole mode frequency depends in a non-monotonous way on the interaction strength between the particles, yielding information the classical screening of the barrier and on its renormalization due to quantum fluctuations. Furthermore, we predict a parity effect which becomes most prominent in the strongly correlated regime.

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