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Josephson effect(s) for strongly-correlated quantum gases in one dimension (ONLINE presentation)

vendredi 3 septembre 2021 15:00 (1 heure)

We study Josephson oscillations of two strongly correlated one-dimensional bosonic clouds separated by a localized barrier. Using a quantum-Langevin approach and the exact Tonks-Girardeau solution in the impenetrable-boson limit, we determine the dynamical evolution of the particle-number imbalance, displaying an effective damping of the Josephson oscillations which depends on barrier height, interaction strength and temperature. We show that the damping originates from the quantum and thermal fluctuations intrinsically present in the strongly correlated gas. Thanks to the density-phase duality of the model, the same results apply to particle-current oscillations in a one-dimensional ring where a weak barrier couples different angular momentum states. In the latter case, depending on interaction strength and temperature, we identify various dynamical regimes where the current oscillates, is self-trapped or decays with time and involve phase slips of thermal or quantum nature. We finally link the current oscillations in the large barrier limit to quantum shock waves.

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