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**Quantum fluctuations of a Bose-Josephson junction on a quasi-one-dimensional ring trap** NICOLAS DIDIER, ANNA MINGUZZI, Université Joseph Fourier, Laboratoire de Physique et de Modélisation des Milieux Condensés, C.N.R.S., ROBERTA CITRO, Università degli Studi di Salerno, Dipartimento di Fisica “E. R. Caianiello”, 84081 Baronissi (Sa), Italy, FRANK W.J. HEKKING, Université Joseph Fourier, Laboratoire de Physique et de Modélisation des Milieux Condensés, C.N.R.S. — Ring traps for ultracold atomic gases are becoming experimentally feasible. We study the theory of quantum fluctuations of a Bose Einstein condensate confined to a quasi one-dimensional ring trap where a Josephson junction is realized with a localized barrier potential. We consider the situation where the transverse confinement of the trap is so tight that only longitudinal quasi-1D motion is allowed along the ring. The condensate is treated as a Luttinger liquid and the low energy properties are described within the bosonization formalism. For a very large barrier, we study the one-particle density-matrix including the correction due to the density fluctuations. Our analysis reveals different power law decays depending on the location of the probed points, i.e. whether they are chosen in the bulk or at the edge of the ring under consideration. This quasi-long range order could be probed using an interference measurement. In the Tonks-Girardeau limit, the density-density correlation function tends to the exact result obtained from the Bose-Fermi mapping. The momentum distribution is calculated and compared to the result for a very small barrier. Furthermore, for a barrier of finite height, within the renormalization group approach, we study how quantum fluctuations reduce the effective Josephson coupling energy.

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