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Expansion of Bose-Hubbard Mott insulators in optical lattices[1]
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We present a study of the expansion of bosonic Mott insulators in the presence of an optical lattice after switching off a confining potential. We use the Gutzwiller mean-field approximation and consider two different setups. In the first one, the expansion is restricted to one dimension. We show that this leads to the emergence of two condensates with well-defined momenta, and argue that such a construct can be used to create atom lasers in optical lattices. In the second setup, we study Mott insulators that are allowed to expand in all directions in the lattice. In this case, a simple condensate is seen to develop within the mean-field approximation. However, its constituent bosons are found to populate many nonzero momentum modes. An analytic understanding of both phenomena in terms of the exact dispersion relation in the hard-core limit is presented.

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