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Characterization of the relaxation of the system subject to rapid potential change

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The physics of ultracold quantum gases has been the subject of a long-lasting and intense research activity, which started almost a century ago with purely theoretical studies, with the prediction in 1924 by Bose-Einstein of the existence of a novel phase of matter, the Bose-Einstein condensate. The field has a flourishing experimental development after the implementation of laser and evaporative cooling techniques that led to the first realization of a BEC in 1995. This phase of matter, exhibit discrete states and finite temperature. The distribution of the particle population or the probability of occupation among the various states adheres to the principles. In our experiment, we have an almost pure sodium Bose-Einstein Condensate in an optical trap. (1) In our Laboratory, we make a rapid change in potential to observe relaxation. In this case, there is a severe change in the density of states and the starting point, and the ending point are distinct in this aspect. In this case, relaxation must follow different routes where there is a need for the recognition of the atoms by the new physical condition imposed and finally the decay with the readjustment of the population in the quantum states. That is the aim of this work. Equilibrium in quantum many body systems like the BECs, imply well established statistic to be followed and distribution of population according. During the phase transition going from thermal to quantum degenerated state, the variation of population introduce an important characteristic feature, where the ground state of the system is heavily populated. of quantum statistics.

Palavras-chave: Laser cooling and trapping; Cold atoms; Bose-Einstein condensate.

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