

Wave functions, relative phase and interference for Bose-condensed atoms

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A few general remarks will be presented concerning the quantum description of an ensemble of identical bosons. Using a Fock-space approach and the expression of the detection signals in terms of correlation functions of the atomic field operators, one will try to answer a few general questions. When is it possible to describe the system, in an approximate way, by a macroscopic wave function in 3D space (matter wave)? Is it possible to define a relative phase between 2 condensates, will a fixed total number of atoms? What are the "objects" which interfere in an interference experiment? What are the differences with the corresponding effects for light waves?