

The Atomic Tunneling Current in Two-Species Bose-Einstein Condensates

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Abstract: It is shown that the atomic tunneling current and the Shapiro-like steps strongly depend on the initial number of atoms in each condensate and the initial phase difference between the two condensates which are initially in even (odd) coherent states. The nonlinearity of interatomic interactions in the two condensates may lead to the atomic tunneling current and Shapiro-like step between the two condensates. It is found that the interatomic nonlinear interactions can induce the atomic tunneling current and Shapiro-like step between two condensates even though there does not exist the interspecies Josephson-like tunneling coupling. The static atomic tunneling current flows in positive or negative direction, which depends on the phase difference of the two-species condensates.

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