Macroscopic two-state systems in trapped atomic condensates

DMITRY MOZYRSKY, DMITRY SOLENOV, Los Alamos National Laboratory — We consider a macroscopic two-state system based on persistent current states of a Bose-Einstein condensate (BEC) of interacting neutral atoms confined in a ring with a weak Josephson link [1]. We demonstrate that macroscopic superpositions of different BEC flows are energetically favorable in this system. Moreover, a macroscopic two-state dynamics emerges in the low energy limit. We also investigate fundamental limitations due to the noise inherent to the interacting BEC of Josephson-ring geometry. We show that the coherent macroscopic dynamics is readily measurable for an experimentally accessible range of parameters.