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Macroscopic two-state systems in trapped atomic condensates

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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.

[1] D. Solenov and D. Mozyrsky, arXiv:1009.1901 [cond-mat.quant-gas].

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