Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Sensitive detection of spin flip using spin-mixing dynamics of ^{87}Rb Bose-Einstein condensates QI LIU, LING-NA WU, YI-QUAN ZOU, SHUAI-FENG GUO, JIA-HAO CAO, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University, MENG KHOON TEY, LI YOU, State Key Laboratory of Low Dimensional Quantum Physics, Department of Physics, Tsinghua University;Collaborative Innovation Center of Quantum Matter
— We revisit experimentally the spin-mixing dynamics in ^{87}Rb spinor Bose-Einstein condensates, starting with all atoms in the $F = 1$, $m_F = 0$ Zeeman sublevel. We show that the short-time dynamics in the parametric amplification regime [1] is extremely sensitive to the initial number of atoms in the $m_F = \pm 1$ state. This behavior is utilized to precisely characterize the degree of spin flip down to a few atoms. The longer-time evolution beyond the undepleted approximation is also investigated both experimentally and theoretically by considering the atom loss, as well as background radio-frequency noise.

[1] D. Linnemann et al., Phys. Rev. Lett. 117, 013001 (2016)

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Date submitted: 26 Jan 2018 Electronic form version 1.4