Raman transitions between hyperfine clock states in a magnetic trap

Wed, 2016-07-06 13:46 - shimon machluf [1] **Date:** 2016-07-27
Author(s):
J. B. Naber, L. Torralbo-Campo, T. Hubert, and R. J. C. Spreeuw

Reference:
Phys. Rev. A 94, 013427 (2016)

URL:
https://journals.aps.org/pra/abstract/10.1103/PhysRevA.94.013427 [2]

We present our experimental investigation of an optical Raman transition between the magnetic clock states of ^{87}Rb in an atom chip magnetic trap. The transfer of atomic population is induced by a pair of diode lasers which couple the two clock states off-resonantly to an intermediate state manifold. This transition is subject to destructive interference of two excitation paths, which leads to a reduction of the effective two-photon Rabi-frequency. Furthermore, we find that the transition frequency is highly sensitive to the intensity ratio of the diode lasers. Our results are well described in terms of light shifts in the multi-level structure of ^{87}Rb. The differential light shifts vanish at an optimal intensity ratio, which we observe as a narrowing of the transition linewidth. We also observe the temporal dynamics of the population transfer and find good agreement with a model based on the system's master equation and a Gaussian laser beam profile. Finally, we identify several sources of decoherence in our system, and discuss possible improvements.

- RySQ [3]
- Result [4]
- 15.10.Ne Neutral atoms: electronic states [5]
- 15.20.Mc Magnetic atom chips [6]

Source URL:
http://qurope.eu/db/publications/raman-transitions-between-hyperfine-clock-states-magnetic-trap

Links:
[1] http://qurope.eu/users/shimimachluf
[2] https://journals.aps.org/pra/abstract/10.1103/PhysRevA.94.013427
[3] http://qurope.eu/category/projects/rysq
[4] http://qurope.eu/category/attribute/result
[5] http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1510ne-neutral-atoms-electron
[6] http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1520mc-magnetic-atom-chips