Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

RF spectroscopy for a ground-state hyperfine transition of ^{7}Li using magic polarization HUIDONG KIM, D. CHO, Korea University — We report the way to eliminate the inhomogeneous broadening for a ground-state hyperfine transition of an alkali metal atom in an optical trap by using a properly polarized trapping field. The ac Stark shift contribution from the vector polarizability has opposite sign for a pair of ground hyperfine levels. It can be used to eliminate the inhomogeneous broadening from the difference in the scalar polarizabilities due to the hyperfine splitting. The size of the vector term is determined by the polarization state of the trapping field, and by controlling the polarization tightly we can achieve a very narrow linewidth. Conceptually, this way is suitable for all alkali metals. However, for the realization tolerance of polarization control is important issue. As a result, we can know that lithium gives the largest tolerance to achieve 1 Hz linewidth as our goal because of its small fine structure. This way, so called magic polarization, is not applicable to 0-0 transition. Therefore that is not solution for atomic clock, however magic polarization has significant implications for an electric dipole moment measurement and quantum information processing using an optical lattice. We are constructing a lithium apparatus for the magic polarization experiment and we will report the progress.

Huidong Kim
Korea University

Date submitted: 31 Jan 2011 Electronic form version 1.4