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Stimulated Raman Transitions for Measuring Collisional Shifts in Ground State Hyperfine Levels KRISHNA MYNENI, U.S. Army RDECOM, Aviation and Missile Center, Redstone Arsenal, AL 35898, HONGROK CHANG, General Atomics, Electromagnetic Systems Group, 678 Discovery Dr., Huntsville, AL 35806, FRANK NARDUCCI, Naval Postgraduate School, Dept. of Physics, Monterey, CA 93943, PETER BERTONE, NASA Marshall Space Flight Center, Huntsville, AL 35812 — We demonstrate the use of stimulated Raman transitions to measure collisional shifts in low density atomic vapor cells with rubidium-perturber mixtures, at perturber partial pressures of 0.01 to 100 Torr. Traditionally, optical-radio frequency (RF) double resonance has been used to measure the ground state hyperfine doublet spacing in alkali-metal vapor in the presence of buffer gases at known densities. Stimulated-resonance Raman interaction has also been used to measure hyperfine level spacing in the yttrium ion (Y^+) and to demonstrate stable oscillators by locking to a two-pulse Ramsey fringe. Instead of stimulated-resonance Raman interaction, we use far detuned Raman transitions with a pulse sequence similar to that used in light-pulse atom interferometry to make precision hyperfine interval measurements of ^{87}Rb. This procedure does not use the Raman-induced fluorescence for the detection of resonance. The Raman pulse width(s) and detection pulse intensity are optimized for high signal to noise ratio in the resonance signal. We show data for Rb-Ne and Rb-Ar vapor cells, discuss the systematic errors posed by AC Stark shifts in the measured intervals, and how to zero these errors.

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