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Optimization of FM and AM Pumping light for CPT Resonances at High Buffer Gas Pressure A. POST, Y.-Y. JAU, N. N. KUZMA, F. GONG, W. HAPPER, Princeton University — Coherent-population trapping (CPT) using modulated light is a promising method for miniature atomic clocks because the light both generates and detects the clock resonance. Traditionally, the sidebands of frequency-modulated (FM) light have been used to generate coherences in the ground state hyperfine structure of alkali-metal atoms. The first order sidebands, which are separated by a frequency equal to the ground-state hyperfine splitting of the alkali metal, adequately excite the clock resonances provided that the buffer gas pressure in the cell is not too high. High buffer gas pressures offer practical advantages for miniature frequency standards, including suppression of diffusion losses in miniature cells, smaller light shifts, and lower frequency stability standards for the pumping light. Higher gas pressures also broaden the optical absorption lines and reduce the contrast of FM CPT. We show that CPT signals using amplitude-modulated (AM) light do not degrade as severely with increasing pressure. Optimum waveforms for AM light at high and low pressures will be discussed, considering constant light polarization and alternating-circular polarization utilized by the push-pull pumping method[1]. We present push-pull CPT data with both AM and FM light at varying buffer gas pressure and compare with theory.
[1]Y.-Y. Jau, E. Miron, A. B. Post, N. N. Kuzma, and W. Happer, Phys. Rev. Lett. **93**, 160802 (2004)

A. Post
Princeton University

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