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Faraday Spectroscopy of Atoms Confined in a Dark Optical Trap MATTHEW TERRACIANO, SPENCER OLSON, MARK BASHKANSKY, FREDRIK FATEMI, Naval Research Laboratory — We demonstrate sensitive Faraday spectroscopy with atoms confined in dark optical traps. Atoms in blue-detuned traps are confined to regions of darkness, dramatically reducing off-resonant photon scattering and light shifts compared to red-detuned traps. We use this technique to continuously sample time-varying magnetic fields with minimal trap-induced dephasing. A hollow laser beam, formed by a spatial light modulator, is crossed in a bow-tie configuration and is loaded from a ^{85}Rb MOT. Trapped atoms are continuously probed with a linearly-polarized off-resonant (Δ = -3 GHz) beam which is monitored with a polarimeter to detect the Larmor precession. The sample is spin polarized every 1-2 ms allowing for continuous sampling of the magnetic field for 400 ms in a signal shot. We present the ability of this technique to measure various time-varying fields with $\sim$10 μG resolution as well as to compensate for unwanted magnetic field fluctuations (eddy currents, ambient AC line noise).

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