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Optically induced parametric magnetic resonances RICARDO JIMENEZ, SVENJA KNAPPE, JOHN KITCHING, Time and Frequency Division. NIST-Boulder — Optically pumped vector magnetometers based on zero-field resonances have reached very high sensitivities by operating at high atomic densities where dephasing due to spin-exchange collisions can be suppressed [1]. Simplified setups, with just one laser beam have measured magnetic fields from the human brain and heart . A key feature in these magnetometers is the introduction of an rf magnetic field along the measurement axis to generate a parametric resonance. Lock-in detection of the transmitted light, at an odd harmonic of the modulation frequency, allows the reduction of the low frequency noise and generates a resonance with dispersive shape. Here we study a zero-field vector magnetometer where the parametric resonances are induced by the vector AC stark-shift of light. This approach does not produce any external magnetic field that could disturb the reading of other magnetometers in the vicinity and could provide an alternative in applications where an applied AC-field cannot be used. We have characterized the vector AC stark-shift effect of light on Rb atoms contained in a micromachined vapor cell with buffer gas. We have obtained parametric resonances induced by modulation of the light-shift. We also analyze the detunings and intensities of the light-shift beam that maintain the magnetometer within the spin-exchange relaxation-free regime. [1] Allred et al.,Phys.Rev.Lett. 89, 130801 (2002)

Ricardo Jimenez
Time and Frequency Division. NIST-Boulder

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