FORMATION OF STRONGLY FREQUENCY-SHIFTED EIT RESONANCES USING FORBIDDEN TRANSITIONS OF CESIUM

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It is well known that many of the most-used techniques in modern atomic physics were first demonstrated in hot atomic vapors. Nowadays, optical processes occurring in Alkali vapors confined in vapor cells have important applications in various fields, such as optical atomic clocks, atomic magnetometers, atomic gyroscopes, etc. Therefore, the investigation of the peculiarities of atomic transitions of alkali atoms is of utmost importance. Moreover, relatively cheap lasers are available for the main optical transitions (D lines) of most alkali atoms making them convenient to study experimentally. Here, we study the $\Delta F = \pm 2$ (forbidden) transitions occurring between the Zeeman sublevels of Cesium D_2 line. One of the most important peculiarities of these transitions is that when applying an external magnetic field, the magnetic-field induced mixing of Zeeman states leads to a significant increase of the transition probabilities. We use for the first time the σ^+ ($\Delta m = +1$) $\Delta F = +2$ transitions of Cesium D_2 line as probe radiation to form EIT resonances[1] in strong magnetic fields (1 - 3 kG), while the coupling is resonant with $F_g = 4 \rightarrow F_e = 5$ transitions. Due to the large frequency shift of the transitions with respect to the external magnetic field, a strong 12 GHz shift was observed making these results useful for potential applications in frequency stabilization.[2] Sufficient spectral resolution is obtained experimentally by probing a Cesium vapor confined in a cell which thickness is of the order of the wavelength of the optical line (852 nm). Preliminary calculations taking into account the geometry of the cell[3] are in reasonable agreement with the experiment.

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