Electrically Induced Transparency in ^{6}Li Atoms

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1. Introduction

The effect of electrically induced transparency occurs when a three-level system with one forbidden transition is exposed to strongly coherent radiation. Under certain conditions, the absorption in the medium drastically reduced. As a result, sharp jump in the dispersion of light in the medium near the resonance point appears. This leads to a decrease in the group velocity of light. The effect of electrically induced transparency can find applications in cooling chains of atoms, frequency conversion, and creation of optical quantum memory. In this work, we conducted an experiment to observe the effect of electrically induced transparency using lithium atomic vapor cell.

2. Experiment

The experimental setup is shown in the Fig. 3. The main transition of the Li_6 atoms are the D1 line (see Fig. 1). Transitions between $F = 1/2$ and $F' = 1/2, 3/2$ as well as between $F = 3/2$ and F' levels are allowed whereas transitions between $F = \frac{1}{2}$ and $F = \frac{3}{2}$ are forbidden. The laser used in this work was frequency calibrated. The calibration was carried out by obtaining a saturated spectroscopy in D1 line of Li_6. The two-pass optical scheme involved an acousto-optical modulator to change the frequency of the laser beam. The ^{6}Li atoms are affected by the bichromatic beam which consisted of two beams with orthogonal linear polarizations and different intensities. The main beam is tuned to the transition between $F = 3/2$ and F' with the intensity of 11 mW/cm^2, and the signal beam was set to go from $F = 1/2$ to F' with the intensity of 2 mW/cm^2.

3. Results

In our experiment, we observed the effect of electro-induced light transparency on lithium atoms and investigated the behavior of the effect depending on temperature and relative beam intensities. We obtained the width of the EIT resonance for the D1 line of approximately 1.2 MHz.

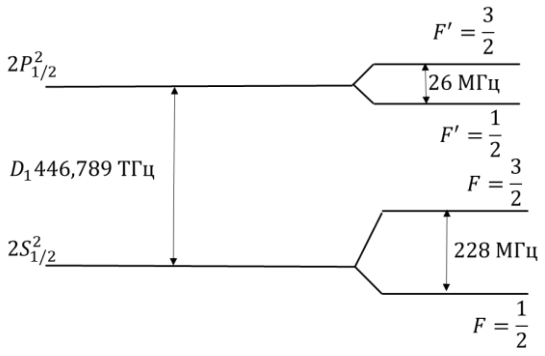

Fig.1: *A schematic energy level diagram for Li_6*

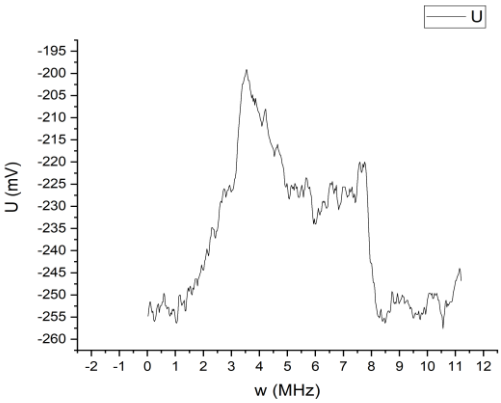

Fig.2: *Dependence of the intensity of the signal beam on the frequency difference*

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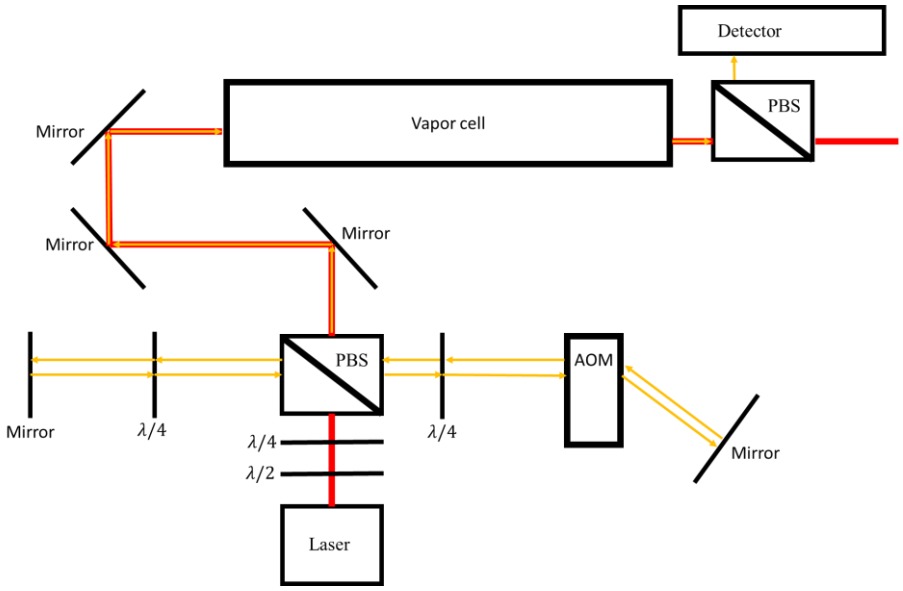

Fig.3: *Experimental setup*

References

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