

光谱

Ba原子 $6s^2 1S_0 - 6s6p^3P_1$ 跃迁Hanle效应实验研究

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摘要:

Ba原子是光频标的候选者之一, 对其进行有效的激光冷却与囚禁需要相关能级的寿命和跃迁几率的信息。Ba原子激发态 $6s6p^3P_1$ 能级在激光冷却实验中很重要, 通过Hanle效应实验测量了这一能级的寿命和自发辐射率, 从理论和实验上研究了探测激光有限线宽和光强对Ba原子基态 $6s^2 1S_0$ 与激发态 $6s6p^3P_1$ 之间跃迁(波长791 nm)的Hanle效应的荧光信号的影响。在考虑了激光线宽和光强因素后所得到的激发态 $6s6p^3P_1$ 的能级寿命和自发辐射率与其他方法给出的结果很好符合。

关键词: 光谱学 能级寿命 Hanle效应 线宽 Ba原子 原子频标

Hanle Effect of $6s^2 1S_0 - 6s6p^3P_1$ transition of barium atom

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Abstract:

Barium atom is one of candidates for optical atomic clock. Laser cooling and trapping the atom needs sufficient spectroscopic information of relevant energy levels. The excited energy level $6s6p^3P_1$ is very important in the experiment of laser cooling and trapping barium atoms. Hanle effect was examined both theoretically and experimentally for the $6s^2 1S_0$ to $6s6p^3P_1$ transition at 791nm. A theoretical model was developed to include the influence of linewidth and intensity of probe laser on the fluorescence of Hanle effect. By fitting the experimental measurement with the model, lifetime and transition probabilities of $6s6p^3P_1$ state to lower states were obtained and found to be in good agreement with other reports.

Keywords: spectroscopy lifetime Hanle effect linewidth Ba atoms optical atomic clock

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