

# High resolution spectroscopy of atoms and molecules in monochromatic fields

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The study of the behavior of simple atoms and molecules in both weak and intense monochromatic fields is of considerable interest because it provides important tests of theoretical predictions related to fundamental systems, and because it is essential to a complete understanding of powerful new spectroscopic techniques. Such studies are made possible by the availability of highly stabilized single frequency lasers that can be precisely tuned over a wide range of frequencies.

The paper will describe recent experiments that are specifically designed to probe the details of atom-field interaction, whether observed in emission or in absorption by means of a weak probe field. The results will show the clear distinction between elastic (single photon) and inelastic (multi-photon) processes in both two-level and three-level systems. The paper will emphasize the considerable care taken to ensure that the experimental conditions are consistent with the theoretical calculations. In fitting the data, allowance must be made for the many momentum conserving atomic recoils that must take place when two-level atoms are subjected to intense fields.

## 单色光场中原子和分子的高分辨光谱学

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单个原子和分子在强、弱两种单色场中行为的研究是颇有兴趣的,因为它为基本体系的理论预测提供了重要的检验,又因为它对于强有力的新光谱技术的透彻了解也是必不可少的。由于目前在宽广的频率范围内可以精确调谐的高度稳定单频激光器的实现,这类研究已成为可能。

本文描述了为探测原子-场相互作用的细节所专门设计的一些最近的实验,这些实验无论在发射或吸收情况下利用了弱的探测场。实验结果表明二能级和三能级体系中的弹性(单光子)和非弹性(多光子)过程之间具有明显的区别。本文强调了相当多的注意以保证实验条件与理论计算之间相符合。为了使数据切合,必须考虑在强场作用下的二能级原子发生了多种动能守恒的原子反冲。