Poster

NONLINEAR SPECTROSCOPY OF ALKALI ATOMS IN COLD MEDIA

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An interest in the fluorescence spectrum of sodium atoms, incipient in astrophysics during the first analysis of the comets luminosity, has increased after the discovery of the sodium cloud-nebulas in the vicinity of Jupiters Galilean moons - Io and Europe, as well as Jupiter itself. We are concerned here with nonlinear spectroscopy of D2-lines of alkali atoms embedded in cold media. Specifically, we investigate the dynamical aspects of the laser excitation process in the atoms belonging to a cold beam (velocity around 12 m/s) produced out of a modified pyramidal Magneto-Optical Trap (Porfido et al. 2015). Thanks to the long transit time (~ 0.1 ms) through the excitation zone, even a tiny mixture within the Hyper-Fine (HF) sublevels of the resonant $np3/2$ state due to the laser coupling results in essential modifications of the optical pumping effects. In particular, the closed HF transitions become partially open with the simultaneous appearance of asymmetry in the corresponding absorption lines because of the AC Stark shifts of the involved states.

An example of the absorption profile for the closed $6^2s1/2,\ F = 4 \rightarrow^2 p3/2,\ F = 5$ transition in Cs is analysed, showing the expected asymmetrical shape in particular around 20 MHz detuning.

References

Porfido, N., Bezuglov, N. N., Bruvelis, M., Shayeganrad, G., Birindelli, S., Tantussi, F., Guerri, I., Viteau, M., Fioretti, A., Ciampini, D., Allegrini, M., Comparat, D., Arimondo, E., Ekers, A. and Fuso, F.: 2015, *Phys. Rev. A*, **92**, 043408.