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# BOOK OF ABSTRACTS

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# Nonlinear Optical Pumping of a Slow and Cold Cs Beam

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A cesium beam is produced out of a modified pyramidal Magneto-Optical Trap used as an atomic funnel [1]. Briefly, the trapping and repumping radiations are sent into an arrangement of prisms and mirrors shaped in the form of a hollow pyramid, realizing the beam configuration of a standard MOT. A hole (area $\approx 2mm^2$) is drilled at the pyramid apex, hence no laser radiation is retroreflected along the pyramid axis. A continuous beam of atoms is then leaving the hole with longitudinal velocity around 12 m/s. Right after the hole, the beam is collimated by 2-D transverse optical molasses.

We investigated the dynamical aspects of the excitation process in the atoms belonging to the beam, slowly moving through a weak resonant excitation radiation with a Gaussian profile. The populations of the $6^2P_{3/2}$ HF sublevels $F_e$=3,4,5 have been probed in a two-photon photoionization scheme with a low ionization rate, leading to negligible perturbation. The comparison of the experimental data [2] with results of accurate numerical simulations highlights the effects of optical pumping phenomena under a weak excitation limit, involving both hyperfine and Zeeman structure of the energy levels. Thanks to the long transit time ($\approx$100ms) enabled by the sub-thermal velocity of the beam, even a tiny mixture within the HF sublevels, due to the excitation laser coupling, results in essential modifications of the optical pumping effects. In particular, the circular transition $6^2S_{1/2}$, $F_g$=4 $\rightarrow$ $6^2P_{3/2}$, $F_e$=5 becomes semi-open due to the laser stimulated mixing between sublevels $F_e$=5 and $F_e$=4.

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**References**

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