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Manipulation of the vibration of cold ground-state Cesium molecules MATTHIEU VITEAU, AMODSEN CHOTIA, MARIA ALLEGRINI, DANIEL COMPARAT, PIERRE PILLET, Laboratoire Aimé Cotton, CNRS, Université Paris-Sud, Bâtiment 505, Campus d'Orsay, 91405 Orsay, France — Creating in an efficient way, a large and dense sample of ultracold molecules in their fundamental ground state, i.e. with neither vibration nor rotation, is an important step toward the realization in further experiments. Among them, cold collisions, controlled chemistry, or accurate spectroscopic measurement. One further motivation is the possibility to go towards the realization of a Bose-Einstein molecular condensate. But all existing experiments of cold molecules (Feshbach resonance, photoassocation) formed molecules in high vibrational state, mostly close to the dissociation limit. We want to explore different schemes to create or transfer cold molecules (Cs_2) to the electronical and vibrational fundamental state ($^1\Sigma_g^+$ v=0). We have studied the photoassociation of cold atoms in a high vibrational level ($^1\Sigma_g^+$ or $^3\Sigma_u^+$) follow by an optical pumping scheme. We use a shaped femtosecond laser to realize the optical repumping step in order to excite the molecules to a potential which have good decay to lower vibrational levels.

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