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Novel photoassociation scheme toward the production of ultracold ground state Cesium molecules MATTHIEU VITEAU, AMODSEN CHOTIA, Laboratoire Aime Cotton, CNRS, Universite Paris-Sud, 91405 Orsay, France, MARIA ALLEGRINI, CNISM, Physics Department, Pisa University, 56127 Pisa, Italy, DANIEL COMPARAT, PIERRE PILLET, Laboratoire Aime Cotton, CNRS, Universite Paris-Sud, 91405 Orsay, France — It is proposed that bound states of ultracold Cs2 molecules in their ground singlet state can be produced by a novel photoassociation scheme. In particular, the final goal is to efficiently convert the population into true ground state (v=0, J=0) ultracold molecules. Indeed, a dense sample of ultracold molecules with neither vibration nor rotation would open the way to further important experiments from controlled chemistry to a Bose-Einstein molecular condensate. Photoassociation of cold atoms in a high vibrational level ($^1\Sigma_g^+$ or $^3\Sigma_u^+$) is followed by an optical pumping scheme by a shaped femtosecond laser. The broadband character of the femtosecond laser is used to excite the molecules to potentials that efficiently decay to lower vibrational levels and to modify the vibrational distribution. The first experimental attempts have revealed a reduction of the number of detected cold molecules. Simple rate-equation models of the dynamics have shown that optical pumping can be the predominant process.

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