Abstract Submitted
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Formation of ultracold molecules induced by a high-power single frequency fiber laser[1] HENRY FERNANDES PASSAGEM, RICARDO COLIN-RODRIGUEZ, PAULO VENTURA DA SILVA, University of Sao Paulo, NADIA BOULOUFA-MAAFA, OLIVIER DULIEU, Universite Paris-Sud, LUIS MARCASSA, University of Sao Paulo — Photoassociation of a pair of ultracold atoms is a quite simple and rapid approach for cold molecule formation. The main limitation of PA is that the latter step is incoherent, so that the population of the created molecules is spread over many vibrational levels with weak or moderate binding energies. If the excited electronic molecular state exhibits a peculiar feature at short internuclear distance like a potential barrier or an avoided crossing, the population of deeply-bound ground state levels may be significantly enhanced. In this work, the influence of a high-power single frequency fiber laser on the formation of ultracold $^{85}Rb_2$ molecules is investigated as a function of its frequency (in the 1062-1070 nm range) in a magneto optical trap. We found evidence for the formation of ground state $^{85}Rb_2$ molecules in low vibrational levels ($v \leq 20$) with a maximal rate of 10^4 s^{-1}, induced by short-range photoassociation by the fiber laser followed by spontaneous emission. When this laser is used to set up a dipole trap, we measure an atomic loss rate at a wavelength far from the PA resonances only 4 times smaller than the one observed at a PA resonance wavelength. This work may have important consequences for atom trapping using lasers around 1060 nm.

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