Theory of long-range photoassociation of ultracold atoms with ultracold molecules

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As dense samples of ultracold bi-alkali molecules are available, their association with an excited ultracold atom to create triatomic molecules is now under reach. We present a model for atom-molecule photoassociation (PA) based on the long-range multipolar interactions between the partners, which have been shown quite complex due to the competition between the rotational energy of the molecule and the internal energy of the atom [1]. We first investigate the long-range couplings between the various entrance channels of the process, and their effect on the energy level spectrum of the excited atom-molecule complex. A preliminary estimate for the PA rate is derived, based on a one-dimensional approach of the collision between the atom and the molecules in a defined rovibrational level. We make an experimental proposal to observe the formation of excited trimers.

References:
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