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Enhanced scattering amplitude at short internuclear distances in the photoassociation of ultracold LiCs molecules P. PELLEGRINI, R. CÔTÉ, Physics Department, University of Connecticut, Storrs, USA, O. DULIEU, Laboratoire Aimé Cotton, CNRS, Orsay, France, J. DEIGLMAYR, A. GROCHOLA, M. REPP, R. WESTER, M. WEIDEMÜLLER, Physikalisches Institut, Albert-Ludwigs-Universität Freiburg, Germany — The realization of a dense and stable sample of heteronuclear diatomic molecules is the subject of an important research effort. The permanent dipole moments that can be found in these systems offer many new applications and phenomena. Photoassociation (PA) of ultracold atoms is widely used to form ultracold molecules. Although it usually leads to the formation of highly excited vibrational molecules, it was recently used to achieve a gas of ultracold LiCs molecules in their absolute ground level [Deiglmayr et al., Phys. Rev. Lett. 101, 133004 (2008)]. Here we present the theoretical analysis of the above-mentioned PA experiment. A full quantum coupled-channel calculation was performed for the determination of the initial scattering wave-function and absolute PA rates at large detuning were calculated. The high measured PA rates were found to be the consequence of a broad Feshbach resonance which strongly perturbed the initial collisional wave function at short internuclear distances. This effect can appear in other systems and opens interesting perspectives for the formation of ultracold molecular gases.

Philippe Pellegrini
Physics Department, University of Connecticut, Storrs, USA

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