HIGH INTENSITY EFFECTS IN PHOTOASSOCIATION SPECTROSCOPY OF ULTRACOLD STRONTIUM ATOMS

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Photoassociation can be used to realize high precision spectroscopy of excited molecular states at very large internuclear separation. In this process, two colliding ultracold atoms in their ground state absorb a photon from a laser field resonant with an excited rovibrational bound level of the excited electronic molecular state. Usually, the theoretical treatment is based on a perturbative approach which is valid only at low laser intensities. However, because of the very favorable transition dipole moments in strontium, one can reach the saturated regime with laser intensities experimentally reachable. We present a non-perturbative analysis of photoassociation spectra in strontium at high intensities. We discuss new features experimentally observed in the lineshapes. We explore the role played by the last bound level of the ground molecular potential at these high intensities, as well as the influence of higher partial waves on the line profiles.