PHOTOASSOCIATION OF ULTRACOLD GROUP II ATOMS IN 1D AND 2D OPTICAL LATTICES

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Photoassociation of group II atoms near the intercombination atomic transition ($^1S_0$-$^3P_1$) is characterized by very narrow photoassociation lines, which are sensitive to photon recoil shifts and Doppler broadening. These effects can be suppressed by confining the atoms in a tight optical lattice, as was recently demonstrated experimentally.

On the other hand, optical lattices can induce interesting effects on group II photoassociation spectra. The theory of photoassociation in 1D and 2D optical lattices will be presented. It will be shown that the photoassociation line shape depends on the dimensionality of the lattice. These effects may be used to improve the spectroscopic resolution, or to measure quantities such as resonance strengths or scattering lengths. The determination of these quantities is of importance for the optical control of group II atoms.