

Singlet Pathway to the Ground State of Ultracold Polar Molecules

Kai Dieckmann

Centre for Quantum Technologies, National University of Singapore, Singapore

Email: phydk@nus.edu.sg

Starting from weakly bound Feshbach molecules, we demonstrate a two-photon pathway to the dipolar ground state of bi-alkali molecules that involves only singlet-to-singlet optical transitions. This pathway eliminates the search for a suitable intermediate state with sufficient singlet-triplet mixing and the exploration of its hyperfine structure, as is typical for pathways starting from triplet dominated Feshbach molecules. By selecting a Feshbach state with a stretched singlet hyperfine component and controlling the laser polarizations, we assure coupling to only single hyperfine components of the $A^1\Sigma^+$ excited potential and the $X^1\Sigma^+$ rovibrational ground state. In this way an ideal three level system is established, even if the hyperfine structure is not resolved. We demonstrate this pathway with ${}^6\text{Li}^{40}\text{K}$ molecules, and discuss our progress on its application to coherent transfer to the dipolar ground state.