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Singlet Pathway to the Ground State of Ultracold Polar Molecules[1] SOFIA BOTSI, ANBANG YANG, SUNIL KUMAR, SAMBIT B. PAL, MARK M. LAM, Centre for Quantum Technologies, National University of Singapore, IEVA CEPAITE, The University of Edinburgh, ANDREW LAUGHARN, University of Maryland, KAI DIECKMANN[2], Centre for Quantum Technologies, National University of Singapore — We demonstrate a two-photon pathway to the ground state of ^{6}Li^{40}K molecules that involves only singlet-to-singlet optical transitions. We start from a molecular state which contains a significant admixture from the singlet ground state potential by selecting the Feshbach resonance for molecule association. With the only contributing singlet state to the molecular state being fully stretched and with control over the lasers polarization we address a sole hyperfine component of the excited $A^1\Sigma^+$ potential without resolving its hyperfine structure. This scheme ensures access to only one ground state hyperfine component with sufficient Franck-Condon factors and moderate laser powers for both coupling transitions. Its implementation results in large and balanced Rabi frequencies, a favorable condition for the coherent transfer to the ground state. We perform dark resonance spectroscopy to precisely determine the transition frequencies of the states involved. The strong dipolar nature of ^{6}Li^{40}K is revealed by Stark spectroscopy, as it is necessary for the study of dipolar interactions in an optical lattice.

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