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Two-Photon Pathway to Ultracold Fermionic Ground State Molecules of NaK JEE WOO PARK, JENNIFER SCHLOSS, ZOE YAN, HUAN-QIAN LOH, SEBASTIAN WILL, MARTIN ZWIERLEIN, Massachusetts Institute of Technology — Interactions beyond the simple contact interaction open up a new paradigm in the field of ultracold quantum gases. Fermionic ground state molecules with strong dipolar interactions serve as an ideal system to explore the rich physics of dipolar quantum gases with intriguing phenomena such as supersolidity and emergence of topological phases. Fermionic ^{23}Na^{40}K molecules are particularly well suited for this purpose. In their absolute ground state, these molecules are chemically stable and posses a large electric dipole moment of 2.72 Debye. In this talk, we report on a two-photon pathway to transfer loosely bound ^{23}Na^{40}K Feshbach molecules to the absolute ground state. We conducted high-resolution one- and two-photon spectroscopy of ultracold ^{23}Na^{40}K Feshbach molecules, and identified a pathway to the rovibrational singlet ground state via a resonantly mixed $B^1\Pi{\sim}c^3\Sigma^+$ intermediate state. This pathway is used in our experiment to transfer loosely bound Feshbach molecules to the absolute ground state with high efficiency. Our work thus paves the way towards the creation of a strongly dipolar Fermi gas of chemically stable molecules.

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