

Abstract Submitted
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Coherent Control of Ground State NaK Molecules¹ ZOE YAN, JEE WOO PARK, HUANQIAN LOH, SEBASTIAN WILL, MARTIN ZWIERLEIN, MIT Department of Physics — Ultracold dipolar molecules exhibit anisotropic, tunable, long-range interactions, making them attractive for the study of novel states of matter and quantum information processing. We demonstrate the creation and control of $^{23}\text{Na}^{40}\text{K}$ molecules in their rovibronic and hyperfine ground state. By applying microwaves, we drive coherent Rabi oscillations of spin-polarized molecules between the rotational ground state ($J=0$) and $J=1$. The control afforded by microwave manipulation allows us to pursue engineered dipolar interactions via microwave dressing. By driving a two-photon transition, we are also able to observe Ramsey fringes between different $J=0$ hyperfine states, with coherence times as long as 0.5s. The realization of long coherence times between different molecular states is crucial for applications in quantum information processing.

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