DAMOP16-2016-020073

Abstract for an Invited Paper
for the DAMOP16 Meeting of
the American Physical Society

Long-Lived Spin Coherence in Ultracold NaK Molecules

HUANQIAN LOH, Massachusetts Inst of Tech-MIT

A trapped sample of ultracold polar molecules, where long-range anisotropic interactions can be tuned at will, offers rich possibilities for quantum information processing and for exploring novel Hamiltonians. For these applications, two important prerequisites must be fulfilled: the ability to manipulate single quantum states and long coherence times between the quantum states. In particular, a long coherence time translates to long information storage times and to precise measurements of energy levels for probing new physics. In this talk, we report on the microwave control of individual hyperfine levels in the lowest two rotational states of ultracold fermionic ^{23}Na^{40}K molecules. Using Ramsey spectroscopy, we observe coherence times as long as 0.5 seconds between two nuclear spin states in the singlet rovibronic ground state. Upon decoherence, the mixture of two spin states remains fairly long lived, demonstrating the chemical stability of the ^{23}Na^{40}K molecules against two-body collisions and may enable further evaporative cooling of the molecular sample.