Abstract Submitted
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Enhanced creation efficiency of polar molecules with a species-selective dipole trap[1] BO YAN, BRIAN NEYENHUIS, STEVEN MOSES, JACOB COVEY, DEBORAH JIN, JUN YE, JILA, NIST, and University of Colorado, Boulder — Quantum degenerate ultracold polar molecules offer the possibility to study many-body physics and exotic phases of matter. In our experiment, we create ultracold fermionic ground-state KRb molecules near quantum degeneracy. A high atom-molecule conversion efficiency at very low temperatures should enable us to create a quantum degenerate dipolar gas. However, the efficiency of molecule creation has two main challenges at very low temperatures. First, the mass and polarizability differences between K and Rb result in a gravitational sag between the two atomic clouds. Second, the differing quantum statistics (bosonic Rb vs. fermionic K) cause a size mismatch between the two clouds when T/Tc<1 for Rb. To overcome these issues, we have implemented a species-selective dipole trap around 790 nm that has a trapping force on K but not Rb, in addition to the original dipole trap at 1064nm. This new dipole trap allows us to adjust the size and position of the K cloud for optimal spatial overlap with Rb, which can significantly increase the molecule creation efficiency at very low temperatures. This should lead to a colder, denser gas of ground-state molecules and should allow us to create a degenerate dipolar gas.

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