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Quantum-state-dependent Collision Between Ultracold Triplet Ground State NaLi Molecule and Na Atom[1] HYUNGMOK SON, Harvard University/Massachusetts Institute of Technology, JULIANA PARK, Massachusetts Institute of Technology, JIANGTIAN YAO, University of Toronto, MARTIN W. ZWIERLEIN, ALAN O. JAMISON, WOLFGANG KETTERLE, Massachusetts Institute of Technology — There have been extensive efforts in understanding molecular collisions in the quantum regime. As the colliding bodies get heavier, due to their rich internal structures, theoretical simulation of the collisions becomes significantly complex and experimental observation of resolvable scattering resonances is predicted to be difficult. For this reason, most of experimental progress in this field has been accomplished with light molecules like H_2 and HD; however, the collision energy was in the mK-regime in these previous studies. Utracold NaLi – the lightest bi-alkali molecule – that lives long in the triplet manifold of the electronic spin offers a new platform for the study of molecule-atom and molecule-molecule scattering controlled at the quantum level. We report strongly hyperfine-state-dependent collisions between the triplet ground state NaLi molecules and Na atoms, which can help in understanding the short-range physics and the three-body potential energy surface. The observation of long lifetime of the NaLi molecules with the Na atoms in their stretched hyperfine states suggests a possibility of sympathetic cooling of the NaLi molecules.

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