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Rydberg-State-Resolved Resonant Energy Transfer in Cold Collisions of Ammonia Molecules with Rydberg Helium Atoms[1] STEPHEN HOGAN, KLAUDIA GAWLAS, University College London — The large electric dipole moments associated with transitions between Rydberg states of atoms make them ideal model systems with which to study Frster resonance energy transfer in collisions with other Rydberg atoms or molecules, or polar ground state molecules. Here we report Rydberg-state-resolved measurements of the resonant transfer of energy from the ground-state inversion sublevels in NH_3 to He atoms in triplet Rydberg states with principal quantum number $n = 38$. These intrabeam collision studies were performed at translational temperatures of 1 K in seeded pulsed supersonic beams. Electric fields of up to 15 V/cm were used to tune individual Rydberg-state-to-Rydberg-state transitions into resonance with the NH_3 inversion transitions. Resonant energy transfer in the atom-molecule collisions was identified by Rydberg-state-selective electric-field ionization. The experimental data, with resonance widths of 500 MHz, have been compared to a theoretical model of the resonant dipole-dipole interactions between the collision partners based on the impact parameter method.

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