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Formation of heavy-Rydberg ion-pair states in Rydberg atom collisions with attaching targets¹ CHANGHAO WANG, MICHAEL KELLEY, SITTI BUATHONG, F. BARRY DUNNING, Department of Physics & Astronomy, Rice University — Electron transfer in collisions between $K(np)$ Rydberg atoms and electron attaching molecules can lead to formation of heavy-Rydberg ion-pair states comprising a weakly-bound positive-negative ion pair orbiting at large internuclear separations. In the present work ion-pair states are created in a small collision cell and allowed to exit into an analysis region where their binding energy and velocity distributions are determined with the aid of electric-field-induced dissociation and a position sensitive detector. Ion pair production is analyzed using a Monte Carlo collision code that models both the initial Rydberg electron capture and the subsequent behavior of the product ion pair. The data demonstrate that collisions with SF_6 and CCl_4 lead to formation of long-lived ion pair states with a broad distribution of binding energies whose velocity distribution is strongly peaked in the forward direction.

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