

Abstract Submitted  
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**Rydberg scattering in K(12p)-CH<sub>3</sub>NO<sub>2</sub> collisions: role of transient ion pair states**<sup>1</sup> M. KELLEY, S. BUATHONG, F. B. DUNNING, Rice University — Studies of heavy-Rydberg ion pair formation through non-dissociative electron transfer in collisions between Rydberg atoms and attaching targets have focused on targets that form valence-bound anions. Collisions with CH<sub>3</sub>NO<sub>2</sub>, lead to formation of dipole-bound anions which can, through internal couplings, result in creation of valence-bound anions. Our measurements, however, provide no evidence for formation of long-lived ion pair states. Rather, the data show that collisions lead to strong Rydberg atom scattering with collision cross sections comparable to the geometrical size of the Rydberg atom. This scattering is attributed to creation of transient K<sup>+</sup>..CH<sub>3</sub>NO<sub>2</sub><sup>-</sup> ion-pair states with lifetimes sufficient to allow significant scattering of the K<sup>+</sup> and CH<sub>3</sub>NO<sub>2</sub><sup>-</sup> ions but which, on time scales  $\gtrsim 10$  ps, are destroyed by field-induced detachment from the anion due to the field of the K<sup>+</sup> ion. Following detachment, the electron remains bound to the K<sup>+</sup> ion in a Rydberg state.

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