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Observation in molecular hydrogen of inelastic collisions between a high Rydberg electron and the rotating ion core THOMAS MORGAN, Wesleyan University, JOHN DAVID WRIGHT, Yale University — Semi-classically, Rydberg electrons in low angular momentum states pass near the ion core during their trajectory, which results in the exchange of both energy and angular momentum. We have observed inelastic collisions that change both the ion core rotational quantum number and the electron principal quantum number. The observations are performed using fast molecular beam - laser scaled energy spectroscopy. The Rydberg state is measured using field ionization. The experimental spectrum is Fourier transformed to interrogate the Rydberg electron - ion core collision dynamics. This recurrence spectrum reveals peaks that result from rotationally inelastic collisions between the electron and the molecular ion core. The energy dependence of the collision has been studied below the saddle classical ionization threshold. The data are compared with united atom equivalent helium and show interesting interference effects not found in helium. Also, it is found that closed classical orbits exist in the molecule but exhibit quite different intensity and energy distributions compared to helium.

Thomas Morgan
Wesleyan University

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