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Closed Orbits in Phase Space ANDREW MURPHY, JACE HAESTAD, THOMAS MORGAN, Department of Physics, Wesleyan University — We report characteristics of closed classical orbits in an electric field in phase space produced in photoabsorption. Rydberg states of atomic and molecular hydrogen and helium are considered. The core potential used for the hydrogen molecule is an effective one electron one center core potential evaluated at the internuclear equilibrium distance. Poincare surfaces of section in phase space are generated by integrating the equations of motion in semiparabolic coordinates $u = (r+ z)^{1/2}$ and $v = (r - z)^{1/2}$, and plotting the location in phase space (p_v versus v) whenever $u = 0$, with the electric field in the z direction. Combination orbits produced by Rydberg electron core scattering are studied and the evolution in phase space of these combination orbits due to scattering from one closed orbit into another is investigated. Connections are made to measured laser photoabsorption experiments that excite Rydberg states ($20 < n < 30$) and produce accompanying scaled energy recurrence spectra. The phase space structures responsible for the spectra are identified.

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