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Properties of rotationally excited H_2^+ from fine structure measurements of high-L Rydberg states of H_2[1] ERICA SNOW, SUNY Fredonia — Measurement of the fine structure pattern of high-angular momentum Rydberg states provides information about the basic properties of the ion core, such as the Quadrupole moment and polarizability. Resonant Excitation Stark Ionization Spectroscopy (RESIS) uses a Doppler-tuned CO_2 laser to resonantly excite transitions in a fast molecular beam, which are detected by Stark ionization. Reported here is the analysis of the fine structure measurements of the high-L Rydberg states of the rotationally excited (R=2) ground vibrational level of molecular hydrogen. This determines the Quadrupole moment and scalar and tensor dipole polarizabilities of H_2^+. The experimental progress made using a novel approach to the detection techniques of RESIS which will allow the first measurements of the higher rotational levels of H_2 that were previously unattainable due to their fast autoionization rates will also be discussed.

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