A supersonic beam of metastable $\text{He}_2^+$ molecules was generated using a pulsed discharge at the exit of a pulsed valve prior to the gas expansion into vacuum. Transitions to high np Rydberg states were recorded using photoionization and Rydberg-state-resolved threshold ionization spectroscopy. Overview scans at moderate resolution (0.3 cm$^{-1}$) were obtained with ionization fields ranging from 1.3 to 133 V/cm, lowering the ionization thresholds by 5.5 and 55 cm$^{-1}$, respectively. Using a solid-state UV laser system with a 20 MHz bandwidth, high-resolution spectra of Rydberg series with $n$ up to 150 and with resolved fine structure of the initial $\text{He}_2^+$ 3$\Sigma^+$ ($N''$) state were recorded. The assignment of the observed Rydberg states is based on multichannel quantum defect theory calculations from a recent study of pulsed-field-ionization zero-kinetic-energy (PFI-ZEKE) photoelectron and photoionization spectra of $\text{He}_2$ (see following talk). The extrapolation of the observed Rydberg series to their limits enabled the determination of the ionization energy of the a 3$\Sigma^+$ state and the rotational structure of the $\text{He}_2^+$ ion with a precision of better than 20 MHz.

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**References**