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Absolute doubly differential cross section measurements for 180° resonant elastic scattering of quasi-free electrons on B^{3+} ions¹
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The resonant elastic scattering of quasi-free electrons on two-electron ions is investigated in collisions of 3–8 MeV B^{3+} ions with H_2 targets. High resolution spectra of the electron emission yield at 0° with respect to the beam direction were recorded utilizing a single stage hemispherical spectrograph with a focusing lens and a large position sensitive detector. Absolute doubly differential cross section measurements were obtained after calibrating the spectrograph overall efficiency, based on the bare B^{5+} ion induced binary encounter electron yield. Contributions from both metastable $1s2s\ ^3S$ and $1s^2\ ^1S$ ground state were accounted for using a new technique that allows for the precise determination of the $1s2s\ ^3S$ metastable component. Resonances superimposed on the binary encounter peak, were attributed to the formation of doubly-excited three-electron $1s2lnl'$ states. In addition, the $2s2p\ ^2D$ triply-excited state populated from the B^{3+} ($1s2s\ ^3S$) metastable part of the beam was also observed. R-matrix calculations were utilized within the impulse approximation and compared to the measurements. Overall fairly good quantitative agreement was found between the two.

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