

Experimental and theoretical investigation of (e,2e) ionization of Ar(3p) in asymmetric kinematics at intermediate energies

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Synopsis Experimental and theoretical studies of electron-impact ionization of the 3p orbital of argon are reported. Good agreement is obtained with other benchmark experiments and state-of-the-art calculations.

Experimental and theoretical studies of electron-impact ionization of the 3p orbital of argon are reported. The relative triple-differential cross sections (TDCS) were measured in the coplanar asymmetric geometry. The experimental data at an incident electron energy of 200 eV, ejected electron energies of 15 eV and 20 eV, and scattering angles of 10°, 15°, and 20° were obtained with a conventional crossed-beam (e,2e) spectrometer.

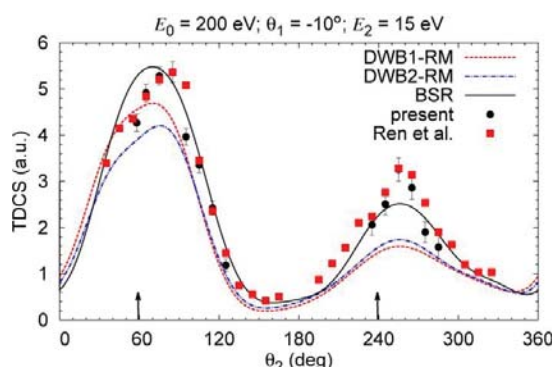


Figure 1. TDCS for electron-impact ionization of the Ar(3p) orbital. The solid circles are our current experimental results, while the squares represent the data of Ren *et al.* [1]. Both datasets were normalized to the BSR results [2] at the binary peak. Also shown are predictions from hybrid DWB1-RM and DWB2-RM models based on [3]. The arrows mark the positive and negative momentum-transfer directions.

The figure shows an example of our experimental data in comparison with recent measurements reported by Ren *et al.* [1]. Also

shown are theoretical predictions from first-order and second-order hybrid distorted-wave plus R-matrix models (DWB1-RM and DWB2-RM, respectively), and from a fully non-perturbative B-spline R-matrix (BSR) approach. In the latter, a large number of pseudo-states are included in the close-coupling expansion to simulate the effect of high-lying Rydberg states and to allow for the calculation of ionization processes.

As expected for the relatively high incident energy of 200 eV, a small scattering angle of $\theta_1 = -10^\circ$ for the projectile, and strongly asymmetric energy sharing with an ejected-electron energy of 15 eV, the hybrid theories show satisfactory agreement with experiment as well as the fully nonperturbative BSR theory⁴. Results for more challenging kinematics will be presented at the conference.

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References

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