01 Sep 2015

Coplanar Asymmetric Angles and Symmetric Energy Sharing Triple Differential Cross Sections for 200 EV Electron-Impact Ionization of Ar (3p)

Zehra Nur Ozer

Sadek M. Amami

Onur Varol

Murat Yavuz

et. al. For a complete list of authors, see https://scholarsmine.mst.edu/phys_facwork/1536

Recommended Citation

Z. N. Ozer et al., "Coplanar Asymmetric Angles and Symmetric Energy Sharing Triple Differential Cross Sections for 200 EV Electron-Impact Ionization of Ar (3p)," *Journal of Physics: Conference Series*, vol. 635, no. 5, Institute of Physics - IOP Publishing, Sep 2015.
The definitive version is available at https://doi.org/10.1088/1742-6596/635/5/052075

Journal of Physics: Conference Series **635** (2015) 052075 doi:10.1088/1742-6596/635/5/052075

Coplanar asymmetric angles and symmetric energy sharing triple differential cross sections for 200 eV electron-impact ionization of Ar (3p)

Zehra N. Ozer*[1], Sadek Amami[†], Onur Varol*, Murat Yavuz*, Mevlut Dogan*[2], Don Madison[†]

[*] Department of Physics, e-COL Laboratory, Afyon Kocatepe University, 03200, Afyon, Turkey
[†] Department of Physics, Missouri University of Science and Technology, Rolla, Missouri, USA

Synopsis We have measured triple differential cross sections (TDCSs) for electron-impact ionization of the 3p shell of Ar at 200 eV incident electron energy. The experiments have been performed in coplanar asymmetric energy sharing geometry. The experimental results are compared with the theoretical models of three body distorted wave (3DW) and distorted wave Born approximation (DWBA).

Cross sections for electron-impact ionization have been measured and calculated since the early days of collision physics since understanding the kinetics and dynamics of collisions is relevant to many practical applications.

The agreement between theoretical predictions and experiment has been improving especially for light atomic targets. Recently, the challenge for the theory is to extend new accurate methods for many electron atoms [1]. It has been recently shown by theory that describing multiple interactions between projectile and target, i.e. higher order effects, are important for these targets at intermediate energies [2-3]. Very recently [4], very good agreement between experiment and both the perturbative 3DW and non-perturbative BSR (*B*-spline *R*-matrix with pseudostates) was found for 64 eV ionization of Ne [4] in full 3 dimensions.

In this study, we measured TDCSs for 200 eV incident electron energy and equal energy sharing for outgoing electrons with $E_{sc}=E_{ej}=92.12$ eV for ionization of the inner shell Ar (3p) orbital. The kinematical arrangement used in the experiment is termed the coplanar asymmetric geometry, in which the scattered electron is detected at a fixed forward angle θ_{sc} in coincidence with an ejected electron detected at varying angles θ_{ej}. (Obviously we do not know which electron is scattered and which one is ejected but we use this terminology only to distinguish between the two final state electrons.) The experimental results are compared with recent DWBA and 3DW calculations (Figure 1). Although the DWBA and 3DW results are very similar, the 3DW is in noticeably better agreement with experimental data. The results will be discussed at the conference in detail.

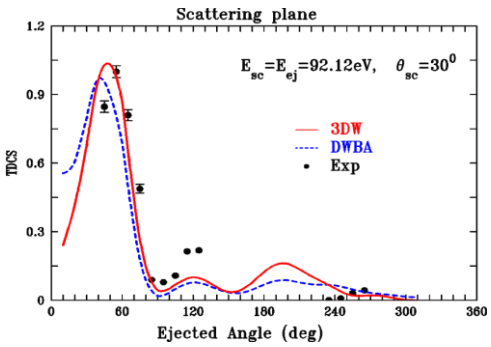

Figure 1. Experimental and theoretical TDCS results for Ar (3p) ionization at 200 eV electron impact.

Acknowledgments

This work was supported by TUBITAK through grant 109T738 and AKU, BAPK through grants 14.FENED.06 and 14.HIZ.DES.80. The theoretical work of SA and DM was supported by US National Science Foundation under Grant. No. PHY-1068237.

References

[1] M. A. Haynes and B. Lohmann 2001 *Physical Review A* 64 044701.
[2] O. Zatsarinny and K. Bartschat 2011 *Physical Review Letters* 107 023203.
[3] S. Amami *et al* 2014 *Physical Review A* 90(1) 012704.
[4] X. Ren *et al* 2015 *Physical Review A* 91 032707.

[1]E-mail: zehraerengil@aku.edu.tr

[2]E-mail: mdogan@aku.edu.tr