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e-Zn inelastic scattering at 80 eV

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Synopsis Stokes and Electron Impact Coherence Parameters (EICPs) for electronic excitation of 4^1P_1 state of zinc atoms have been measured for incident electron energy of 80 eV. The experimental data are presented together with Convergent Close Coupling (CCC) theoretical predictions. Our results are compared with recently published Relativistic Distorted–Wave Approximation (RDWA) calculations.

There has been a growing interest in studies of impact excitation of Zn atoms due to possible application of Zn in novel light sources and to a serious discrepancy between theory and experiment for the linear polarization Stokes parameter P_2 determined using spin-polarised electron impact excitation of the $(3d^{10}4s5s)^3S_1$ Zn state [1-4]. Therefore, it is important, to build up a body of knowledge relevant to electron impact on zinc with aim to test various aspects of the existing theoretical methods.

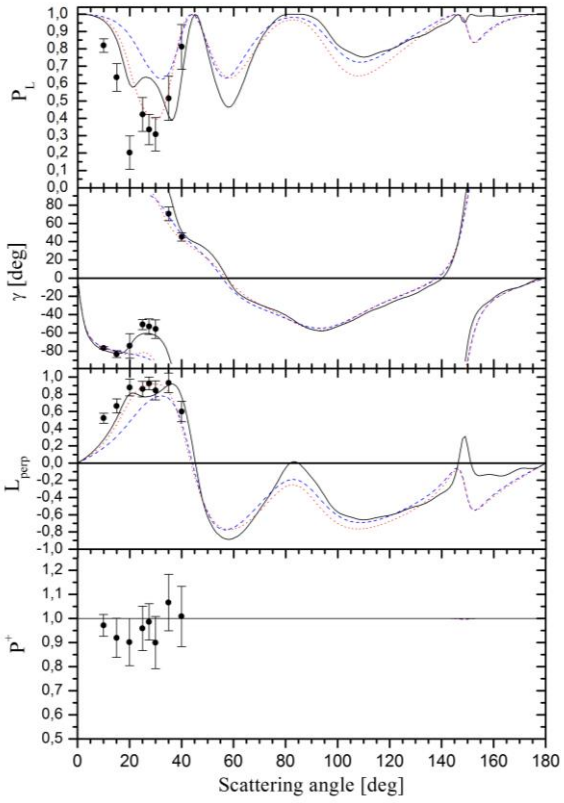

Figure 1. EICP parameters (P_L, γ, L_{perp}, P^+) for electronic excitation (80 eV) of 4^1P_1 Zn state. Experimental data (•) are presented together with, (—) CCC, (– –) SCRDWA and (· · ·) MC RDWA theoretical predictions [17].

This work is a continuation of our study on electron–zinc atom collisions [5-7], which is a part of our broader research on He-like atoms: Ca [8, 9], Cd [10–12] and He [13–14]. We present the set of experimental values of Stokes and Electron Impact Coherence Parameters (defined by Andersen *et al.* [15]) for 80 eV incident electron-energy, together with Convergent Close Coupling (CCC) theoretical predictions (for details see Napier *et al.* [16]). Our results are compared with the recently published results of RWDA modelling [17] of the same excitation process (Figure 1).

References

[1] L. Pravica *et al* 2011 *Phys. Rev. A* **83**, 040701
[2] J. F.Williams *et al* 2012 *Phys. Rev. A* **85**, 022701
[3] K. Bartschat and O. Zatsarinny 2013 *Phys. Rev. A* **87**, 016702
[4] C. J. Bostock *et al* 2013 *Phys. Rev. A* **87**, 016701
[5] M. Piwiński *et al* 2012 *Phys. Rev. A* **86**, 052706
[6] M. Piwiński *et al* 2013 *Eur. Phys. J.-Spec. Top.* **222**, 2273–2277
[7] M. Piwiński *et al* 2015 *Phys. Rev. A* in press
[8] D. Dyl *et al* 1999 *J. Phys. B: At. Mol. Opt. Phys.* **32**, 837–844
[9] D. Dziczek *et al* 1998 *Acta Phys. Polon. A* **93**, 717–721
[10] M. Piwiński *et al* 2002 *J. Phys. B: At. Mol. Opt. Phys.* **35**, 3821–3827
[11] D. Dziczek *et al* 2003 *Acta Phys. Polon. A* **103**, 3–11
[12] M. Piwiński *et al* 2006 *J. Phys. B: At. Mol. Opt. Phys.* **39**, 1945–1953
[13] Ł. Kłosowski *et al* 2007 *Meas. Sci. Technol.* **18**, 3801–3810
[14] Ł. Kłosowski *et al* 2009 *Phys. Rev. A* **80**, 062709
[15] N. Andersen *et al* 1988 *Phys. Rep.* **165**, 1–188
[16] S. A. Napier *et al* 2009 *Phys. Rev. A* **79**, 042702
[17] T. Das *et al* 2014 *Phys. Lett. A* **378**, 641–643

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