



Contribution ID: 148

Type: Talk

## Polarisabilities of the proton and neutron from Compton scattering

Friday, July 3, 2015 12:30 PM (40 minutes)

We have recently completed a high-precision extraction of the proton spin-independent polarisabilities from the world database of low-energy Compton scattering experiments, within the framework of chiral effective field theory ( $\chi$ EFT) with pions, nucleons, and the Delta(1232) as explicit degrees of freedom [1]. Our Baldin-sum-rule-constrained results are [2]

$$\alpha_p = 10.65 \pm 0.35(\text{stat}) \pm 0.2(\text{Baldin}) \pm 0.3(\text{theory}),$$

$$\beta_p = 3.15 \pm 0.35(\text{stat}) \pm 0.2(\text{Baldin}) \pm 0.3(\text{theory}).$$

These were obtained in the heavy-baryon formulation, but almost identical results have been obtained in a covariant calculation [3]. With the publication this year by Myers et al. of the results of the deuteron Compton scattering experiment using the Tagged-Photon Facility at the MAX IV Laboratory in Lund, Sweden, the world  $\gamma$ -d database has doubled in size, allowing the extraction of the isoscalar polarisabilities with unprecedented accuracy, and combined with the proton results we obtain [4]

$$\alpha_n = 11.65 \pm 1.25(\text{stat}) \pm 0.2(\text{Baldin}) \pm 0.8(\text{theory}),$$

$$\beta_n = 3.55 \pm 1.25(\text{stat}) \pm 0.2(\text{Baldin}) \pm 0.8(\text{theory}).$$

A new generation of experiments with polarised beams have been performed at the Mainz Microtron, with the first results published this year by Martel et al. [5]. These experiments are sensitive to the spin polarisabilities, and we will discuss the predictions of  $\chi$ EFT for the relevant cross sections cross sections and asymmetries.

### References

1. H. W. Griesshammer, J. A. McGovern, D. R. Phillips and G. Feldman, Prog. Part. Nucl. Phys. 67 (2012) 841 [arXiv:1203.6834 [nucl-th]].
2. J. A. McGovern, D. R. Phillips and H. W. Griesshammer, Eur. Phys. J. A 49 (2013) 12 [arXiv:1210.4104 [nucl-th]].
3. V. Lensky and J. A. McGovern, Phys. Rev. C 89 (2014) 032202. [arXiv:1401.3320 [nucl-th]].
4. L. S. Myers et al. COMPTON@MAX-lab Collaboration], Phys. Rev. Lett. 113 (2014) 26, 262506 [arXiv:1409.3705 [nucl-ex]].
5. P. P. Martel et al. [A2 Collaboration], Phys. Rev. Lett. 114 (2015) 11, 112501 [arXiv:1408.1576 [nucl-ex]].

**Presenter:** MCGOVERN, Judith (University of Manchester)

**Session Classification:** Plenary Session 10