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Proton leading scalar and spin polarisabilities from proton Compton scattering data

We present the results of a partial wave analysis of the global real Compton scattering (RCS) database, extracting the leading scalar and spin polarisabilities of the proton. Exploring the nucleon using electromagnetic probes reveals a fine and intricate interplay between its various structural properties. As an example, the nucleon polarisabilities encode the two-photon response, such as measured in RCS [1, 2]. On the other hand, their precise knowledge is very important for the analysis of atomic spectra, especially in muonic atoms [3], which serves to constrain the details of the nucleon charge distribution such as the charge radius. The polarisabilities are introduced as the coefficients in the low-energy expansion (LEX) of the RCS amplitudes, and can, in principle, be extracted using the LEX to analyse the RCS data [1, 4]. However, the energies where quality experimental data are available are too high to use the LEX for an analysis, forcing one to use a more sophisticated framework such as effective field theories [5, 6], dispersion relations [7], or partial wave analysis [8]. We use the latter framework here, include the most recent RCS data from MAMI [9] and HIGS [10], and introduce a few further modifications in the formalism. The results of our refined analysis are presented in this contribution.

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