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A New High-Accuracy Analysis of Compton Scattering in Chiral EFT: Neutron Polarisabilities[1] HARALD W. GRIESSHAMMER, Institute for Nuclear Studies, Department of Physics, George Washington University, JUDITH A. MCGOVERN, University of Manchester, DANIEL R. PHILLIPS, Ohio University
— Low-energy Compton scattering tests the symmetries and interaction strengths of a target's internal degrees of freedom in the electric and magnetic fields of a real, external photon. In the single-nucleon sector, information is often compressed into the static scalar dipole polarisabilities which are experimentally not directly accessible but encode information on the pion cloud and the $\Delta(1232)$ excitation. The interaction of the photon with the charged pion-exchange also provides a conceptually clean probe of few-nucleon binding. After demonstrating the statistical consistency of the world's γd dataset including the new data from the MAX-IV collaboration described in the preceding talk, we present a new extraction of the neutron polarisabilities in Chiral Effective Field Theory: $\alpha_n = [11.55 \pm 1.25(\text{stat}) \pm 0.2(\text{BSR}) \pm 0.8(\text{th})]$ and $\beta_n = [3.65 \mp 1.25(\text{stat}) \pm 0.2(\text{BSR}) \mp 0.8(\text{th})]$, in 10^{-4} fm^3, with $\chi^2 = 45.2$ for 44 degrees of freedom. The new data reduced the statistical uncertainties by 30%. We discuss data accuracy and consistency, the role of the $\Delta(1232)$, and an estimate of residual theoretical uncertainties. Within statistical and systematic errors, proton and neutron polarisabilities remain identical.

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