Spin Polarisabilities and Compton Scattering from $\chi$EFT: Bridging QCD and Data\textsuperscript{1} HARALD W. GRIESSHAMMER, George Washington Univ, JUDITH A. MCGOVERN, University of Manchester, DANIEL R. PHILLIPS, Ohio University — Compton scattering from protons and neutrons probes their two-photon response in electric and magnetic fields of real photons, exploring the symmetries and interaction strengths of the internal degrees of freedom. With the scalar polarisabilities $\alpha_{E1}$ and $\beta_{M1}$ now reasonably understood, the focus turns to the so-far poorly explored spin-polarisabilities. They parametrise the stiffness of the nucleon spin in external electro-magnetic fields, analogous to rotations of the polarisation of light by optically active media (bi-refringence/Faraday effect) and are particularly sensitive to the directional dependence of the $\pi N \gamma$ interactions dictated by chiral symmetry and its breaking. This contribution addresses the potential of Chiral Effective Field Theory to relate between lattice QCD and ongoing or approved efforts at MAX-lab, HIGS and MAMI. We discuss high-intensity experiments with polarised targets and polarised beams which will allow the extraction of the spin-polarisabilities; $\chi$EFT predictions which indicate which observables for polarised protons, deuterons and $^3$He are particularly sensitive; convergence, residual theoretical uncertainties and possibilities for improvement; and chiral extrapolations in $m_N$ for lattice computations.

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