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Polarized Compton Scattering Experiments at the Mainz Microtron[1]

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Interactions between an electromagnetic wave and a proton are described at the basic level by the mass, charge, and anomalous magnetic moment of the proton. Such a description, however, assumes a point-like particle, something the proton is certainly not. The internal structure of the proton leads to higher order terms, such as the scalar and vector polarizabilities, in the interaction. To study these polarizabilities, a multi-experiment program has been undertaken at the Mainz Microtron to measure observables in Compton scattering that exhibit dependence on these parameters. This program has made use of the A2 tagged photon beam, with either a linear or circular polarization, proton targets of either unpolarized LH_2 or frozen-spin butanol with transverse or longitudinal polarization, as well as the nearly 4π detection capability of the Crystal Ball and TAPS detectors. The first of these measurements, the double-polarization asymmetry Σ_{2x}, also the first of its kind, has already been published. Measurements of the beam asymmetry Σ_3 and another double-polarization asymmetry Σ_{2z} have also been performed and are in various stages of analysis and publication. This talk will discuss the status of these measurements, as well as various fitting studies that are being performed with the data in hand, and plans for future measurements.

[1]on behalf of the A2 collaboration at MAMI