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Polarization Effects in the Compton Scattering from Atomically Bound Electrons

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Precise studies of the linear polarization for Compton scattered photons open the unique opportunity for a detailed test of the impulse approximation for energetic photon matter interaction. Compton scattering is the inelastic scattering of a photon off an electron, in which the scattered photon carries a lower energy than the incident photon. For scattering off bound electrons, the resulting Compton scattering peak is broadened due to the momentum distribution of the electrons. Additionally, the electron momentum distribution is expected to influence the polarization transfer from incident to scattered photon beam such that the linear polarization will vary across the Compton peak.
In an experiment, in which a highly linearly polarized hard x-ray beam was scattered off a gold target, the scattered radiation was analyzed with a special interest in its linear polarization. The result of the analysis of the Compton scattered radiation is presented and compared to a simulation developed in the framework of the impulse approximation.

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