## Multiple Compton scattering of entangled photons produced by ground-state parapositronium disintegration

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The effect of entanglement on the scattering distributions of Bell-state photons participating in multiple Compton scattering events is an open question. This study addresses this question by proposing a methodology to compute cross sections that, in turn, allow predictions to be made about the scattering distributions. The framework is applied to the Compton scattering of Bell states created through the disintegration of parapositronium in the ground state. The focus is on calculating the cross section for 3-Compton scattering events, where one of the photons undergoes intermediate Compton scattering, and then both photons are detected using Compton polarimeters operating in coincidence mode. The correlation amplitude that governs the strength of the azimuthal correlations between the scattered photons is analysed with respect to the intermediate scattering angle. The correlation amplitude exhibits various characteristics, including enhancement, reduction, sign inversion, or vanishes at specific intermediate scattering angles.

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