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Study the Compton scattering of entangled annihilation photons.

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In this work the study of Compton scattering of annihilation gammas in different polarization states is presented. The pairs of annihilation gammas are acquired as a result of positron-electron annihilation process. Polarization planes of two annihilation gammas are orthogonal to each other. However, the polarization of each photon in pair is indefinite. If one of the photons of the pair interacts with matter, the entanglement of the pair is broken and the pair becomes decoherent with determined polarization states of each gamma. Because Compton scattering depends on the polarization of the incident gamma, the scattering kinematics of entangled and decoherent pairs may differ significantly. The supposed difference is to be used in PET imaging. The experimental setup for the measurements of annihilation photons in different polarization states is discussed. It consists of two arms with 16 Compton polarimeters in each arm. The first results of the azimuthal correlations of the scattered photons are presented.

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