

Compton scattering of annihilation photons in entangled and decoherent polarization states.

Thursday, 27 October 2022 15:15 (15 minutes)

Our work concentrates on studying the Compton scattering kinematics of annihilation photons in different polarization states. Pairs of entangled annihilation photons with mutually orthogonal polarization are produced in positron-electron annihilation in a radioactive source. The Compton scattering of such photons is accurately theoretically and experimentally studied. In contrast, the polarization states of decoherent annihilation photon pairs were not measured. Such states are obtained in decohering process of photons interaction in surrounding matter. For example, during the Compton scattering of one of the photons, the entanglement of annihilation pair is lost and the photons become decoherent. For a long time, it was assumed that Compton scattering of decoherent pairs should be vastly different from that of entangled ones. Supposed difference in scattering kinematics of these two photon types is planned to use in future generation of Positron Emission Tomography. However, recent theoretical papers predict similar scattering cross-sections for decoherent and entangled photons. Our experiment confirms this statement. We present the results of measurements with the experimental setup composed of Compton polarimeters.

Primary author: STRIZHAK, Alexander (INR RAS)

Presenter: STRIZHAK, Alexander (INR RAS)

Session Classification: Experimental Nuclear Physics

Track Classification: Experimental Nuclear Physics