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On the correlations of polarizations in the system of two photons produced in hadronic decays

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The theoretical study of correlations of the linear and circular polarizations in the system of two γ quanta emitted in hadronic decays (in particular – in the rare two-photon decays of the neutral kaons K_S^0 and K_L^0) has been performed. The polarization of a two-photon state is described by the one-photon Stokes parameters and by the components of the correlation “tensor” in the Stokes space. It is shown that the correlations between the Stokes parameters

in the case of the two-photon decays $\pi^0 \rightarrow 2\gamma$, $\eta \rightarrow 2\gamma$, $K_L^0 \rightarrow 2\gamma$, $K_S^0 \rightarrow 2\gamma$ and the cascade process $|0\rangle \rightarrow |1\rangle + \gamma \rightarrow |0\rangle + 2\gamma$ ($|0\rangle$ and $|1\rangle$ are states with the spin 0 and 1, respectively) have the purely quantum character: the incoherence inequalities of the Bell type for the components of the correlation “tensor”, established previously

for the case of classical “mixtures”, are violated (i.e. there is always one case when the modulus of sum of two diagonal components of the correlation “tensor” exceeds unity). The general analysis of the registration procedure for the system of two correlated photons by two one-photon detectors is performed.

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