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Spin correlations of muons and tau leptons in $ee \rightarrow \mu\mu$ and $ee \rightarrow \tau\tau$ and of leptons in the final state of $gg \rightarrow ee, \mu\mu, \tau\tau$

The spin structure of the processes $e^+e^- \rightarrow \mu^+\mu^-$ and $gg \rightarrow e^+e^-$ are theoretically investigated. It is demonstrated that, if the primary particles are unpolarized, the final state lepton pair remains unpolarized as well but their spins prove to be strongly correlated. Explicit expressions for the elements of the spin density matrices and the components of the correlation tensor of the final state lepton system are derived. It is established that the spin correlations have a pure quantum character, since one of the Bell-type incoherence inequalities for the correlation tensor components is always violated.

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