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Manifestation of quantum correlations in the interpolating helicity amplitudes between the instant form dynamics and the light-front dynamics for the annihilation/production process of two spin-1 particles¹ DEEPASIKA DAYANANDA, CHUENG-RYONG JI, North Carolina State University — Two fundamental spin-1/2 particles can combine to yield either a scalar particle with the anti-symmetric spin structure invariant under the rotation and boost or a vector particle with three helicity states with the symmetric spin-structure not invariant in general. In particular, the symmetric helicity-0 state of the vector particle distinguishes its quantum correlation effect from the antisymmetric helicity-0 state of the scalar particle. We manifest such clear difference between spin-1 and spin-0 particles, using the previous investigation of spin-1/2 particle's generalized helicity interpolating between the instant form dynamics (IFD) and the light-front dynamics (LFD). As the Jacob and Wick helicity defined in IFD is not invariant under the boost while the light-front helicity defined in LFD is invariant under the boost, we found that the quantum correlation effect manifests itself as the helicity boundary between the IFD and the LFD which appears in the helicity amplitudes of scattering processes by boosting the reference frame. To illustrate this characteristic manifestation, we exhibit the boundaries corresponding to the phase changes due to the distinguished quantum correlation effects between the scalar and vector particles in pair annihilation/production processes.

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