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Femtoscopic correlations of two identical particles with nonzero spin in the model of one-particle multipole sources

The process of emission of two identical particles with nonzero spin S and different helicities in relativistic heavy-ion collisions is theoretically investigated within the model of one-particle multipole sources. Taking into account the unitarity of the finite rotation matrix and the symmetry relations for d-functions, the general expression for the probability of emission of two identical particles by two multipole sources with angular momentum J, averaged over the angular momentum projections and over the space-time dimensions of the multiple particle generation region, has been obtained. For the case of unpolarized particles, the additional averaging over helicities is performed and the formula for two-particle correlation function at sufficiently large 4-momentum difference q is derived. For particles with nonzero mass, this formula is considerably simplified in the case when the angle β between the particle momenta equals zero, and also in the case when $J = S$.

In addition, the special cases of emission of two unpolarized photons by dipole and quadrupole sources, and emission of two “left” neutrinos (“right” antineutrinos) by sources with arbitrary J have also been considered, and the respective explicit expressions for the correlation function are obtained .

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