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Possible effect of mixed phase and deconfinement upon spin correlations in the $\Lambda\bar{\Lambda}$ pairs generated in relativistic heavy-ion collisions

Spin correlations for the $\Lambda\Lambda$ and
$\Lambda\bar{\Lambda}$ pairs, produced in relativistic heavy-ion collisions, and related angular correlations at the joint registration of space-parity nonconserving hadronic decays
of two hyperons are theoretically analyzed. These correlations give important information about the character and mechanism of multiple processes, and the advantage of the $\Lambda\Lambda$ and $\Lambda\bar{\Lambda}$ systems over others is due to the fact that the P-odd decays
$\Lambda \to p + \pi^-$, $\bar{\Lambda} \to \bar{p} + \pi^+$ serve as effective analyzers of spin states of the Λ and $\bar{\Lambda}$ particles. The correlation tensor components can be derived by the method of
"moments" – averaging the combinations of trigonometric functions of proton (antiproton) flight angles over the double angular distribution of flight directions for products of two decays. The properties of the "trace" T of the correlation tensor (a sum of 3 diagonal components), determining the angular correlations and the relative fractions of the triplet and singlet states of respective pairs, are discussed.

Spin correlations for pairs of
identical and non-identical particles ($\Lambda\Lambda$, $\Lambda\bar{\Lambda}$)
are generally considered here within the conventional model of one-particle sources, implying that correlations vanish at enough large relative momenta. However, under these conditions (especially at ultrarelativistic energies), for two non-identical particles ($\Lambda\bar{\Lambda}$) the two-particle annihilation sources – quark-antiquark and two-gluon ones – start playing a noticeable role and lead to the difference of the
correlation tensor from zero. In particular, such a situation may arise, when the system
passes through the "mixed phase" and – due to the multiple production of free quarks and gluons in the process of deconfinement of hadronic matter – the number of two-particle sources strongly increases.

Experimental Collaboration

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