

On the pair correlations of neutral K , D , B and B_s mesons with close momenta produced in inclusive multiparticle processes

Wednesday, 27 September 2017 12:35 (20 minutes)

The phenomenological structure of inclusive cross-sections of the production of two neutral K mesons in hadron-hadron, hadron-nucleus and nucleus-nucleus collisions is theoretically investigated taking into account the strangeness conservation in strong and electromagnetic interactions. Relations describing the dependence of the correlations of two short-lived and two long-lived neutral kaons $K_S^0 K_S^0$, $K_L^0 K_L^0$ and the correlations of "mixed" pairs $K_S^0 K_L^0$ at small relative momenta upon the space-time parameters of the generation region of K^0 and \bar{K}^0 mesons have been obtained. These relations involve the contributions of Bose-statistics and S -wave strong final-state interaction of two K^0 (\bar{K}^0) mesons and of the K^0 and \bar{K}^0 mesons, as well as the additional contribution of transitions $K^+ K^- \rightarrow K^0 \bar{K}^0$, and they depend upon the relative fractions of generated pairs $K^0 K^0$, $\bar{K}^0 \bar{K}^0$ and $K^0 \bar{K}^0$. It is shown that under the strangeness conservation the correlation functions of the pairs $K_S^0 K_S^0$ and $K_L^0 K_L^0$, produced in the same inclusive process, coincide, and the difference between the correlation functions of the pairs $K_S^0 K_S^0$ and $K_S^0 K_L^0$ is conditioned exclusively by the production of the pairs of non-identical neutral kaons $K^0 \bar{K}^0$.

For comparison, analogous correlations for the pairs of neutral heavy mesons D^0 , B^0 and B_s^0 , generated in multiple inclusive processes with charm (beauty) conservation, are also theoretically analyzed – neglecting, just as for the K^0 mesons, the weak effects of CP violation. These correlations are described by quite similar expressions: in particular, just as for the case of K^0 mesons, the correlation functions for the pairs of states with the same CP parity ($R_{SS} = R_{LL}$) and with different CP parity (R_{SL}) do not coincide, and the difference between them is conditioned exclusively by the production of pairs $D^0 \bar{D}^0$, $B^0 \bar{B}^0$ and $B_s^0 \bar{B}_s^0$. However, contrary to the case of K^0 mesons, here the distinction of CP -even and CP -odd states encounters difficulties – due to the insignificant differences of their lifetimes and the relatively small probability of purely CP -even and CP -odd decay channels. Nevertheless, one may hope that it will become possible at future colliders.

Primary authors: Dr LYUBOSHITZ, Valery (Joint Institute for Nuclear Research, Dubna); Dr LYUBOSHITZ, Vladimir (Joint Institute for Nuclear Research, Dubna)

Presenter: Dr LYUBOSHITZ, Valery (Joint Institute for Nuclear Research, Dubna)

Session Classification: Spectroscopy of mesons

Track Classification: Spectroscopy of mesons