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Spin alignment of vector mesons induced by spin density fluctuation

In recent years, spin polarization of hyperons and the spin alignment of vector mesons were observed by STAR in 20%-60% centrality collision, where the large angular momentum and the magnetic field were supposed to be the main reasons. However, in the most central collision with collision energy 200GeV, the rotation, magnetic field as well as the baryon number should vanish, spin alignment was also observed. Thus, it still remains challenge to explain the experimental data.

In this talk, I will present a new mechanism for the spin alignment of vector mesons: the spin density fluctuation. It is found that the spin alignment of vector meson is sensitive to the spin of constituent strange but is independent of the sign of the spin density, i.e., whether there is more spin-ups than spin-downs or vice versa, the same spin alignment of vector will be obtained. And due to interactions between quarks, especially the tensor and axial-vector interaction, the local spin density will not stay exact zero due to the fluctuation. Thus, though there is no global spin polarization of quarks, local spin density fluctuation will result in none zero spin alignment of vector meson. It is also found that the quark interactions induced by (anti-)instanton could be the source of spin alignment of phi and K^{*0} mesons.

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