Contribution ID: **438**   Type: **Oral Presentation**

Measurement of global spin alignment of K^{*0}, $K^{*\pm}$ and ϕ vector mesons using the STAR detector at RHIC

Wednesday, 6 November 2019 11:20 (20 minutes)

Measurements of the polarization of the particles produced in relativistic heavy-ion collisions can provide insights into the initial conditions and evolution of the strongly interacting system during a collision. The global spin alignment is quantified by the diagonal spin density matrix element (ρ_{00}) with respect to the quantization axis, i.e. normal to the reaction plane. In non-central heavy-ion collisions, a large initial global angular momentum is expected to be present. This can induce a non-vanishing polarization for hadrons with non-zero spin reflecting the dynamics of the medium. Furthermore, since the magnetic moment of charged and neutral K^* mesons differ by about a factor of seven, the comparison of their ρ_{00} may offer an additional insight into the rotation of the fireball.

We will present transverse momentum (p_T) and collision centrality dependence of ρ_{00} of $K^{*0}(d\bar{s})$, $\overline{K}^{*0}(\bar{d}s)$, $K^{*+}(u\bar{s})$, $K^{*-}(\bar{u}s)$ and $\phi(s\bar{s})$ vector mesons in Au + Au collisions at $\sqrt{s_{NN}}$ = 27, 54.4 and 200 GeV using high statistics data sets collected by the STAR experiment at RHIC. The improved precision relative to previous results allows us to perform the first detailed study of the centrality and p_T dependence of the ρ_{00} at these three energies. The ρ_{00} results of the K^{*0} and ϕ mesons will be compared with the earlier data from RHIC and LHC energies. Physics implication of our results to the vorticity of the medium will also be discussed.

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Session Classification: Parallel Session - Chirality II

Track Classification: Chirality, vorticity and spin polarization