Contribution ID: **216** Type: **Poster**

Quark coalescence model for spin alignment and polarization of hadrons

Wednesday, 6 April 2022 18:02 (4 minutes)

In non-central heavy-ion collisions, a large orbital angular momentum is created along the direction opposite to the reaction plane, which will be transferred to the spin of quarks through the spin-orbit coupling in parton scatterings. In our recent work, we formulate an improved coalescence model through spin density matrix with phase space dependence, which provides a uniform way to compute spin alignments of vector mesons and polarizations of baryons from polarizations of quarks and antiquarks. Within this model, various sources of spin polarization are studied, including vorticity fields, electromagnetic fields, and mean fields of vector mesons. We find that the electric part of the vector ϕ field can qualitatively explain the positive deviation from 1/3 for the spin alignment of ϕ mesons measured by the STAR collaboration. On the other hand, the spin alignment of K^{*0} mesons is dominated by the electric part of vorticity fields and our model prediction also qualitatively agrees with experimental results.

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Session Classification: Poster Session 1 T02

Track Classification: Chirality, vorticity and spin polarization