Contribution ID: **217** Type: **not specified**

Chiral magnetic effect search in p+Au, d+Au and Au+Au collisions at RHIC

Friday, 1 September 2017 15:15 (25 minutes)

Metastable domains of fluctuating topological charges can change the chirality of quarks and induce local parity violation in quantum chromodynamics. This can lead to observable charge separation along the direction of the strong magnetic field produced in relativistic heavy-ion collisions, a phenomenon called the chiral magnetic effect (CME). A major background source for CME measurements is the intrinsic particle correlations (such as resonances/jets decay) coupled with the azimuthal elliptical anisotropy v2. In heavy-ion collisions, the magnetic field direction and event plane azimuthal angle Ψ2 are correlated, thus the CME and the v2-induced background are entangled. In small system p+Au and d+Au collisions, the Ψ2 is mostly due to geometry fluctuations, and thus magnetic field direction and Ψ2 are uncorrelated. The correlation measurements in small system collisions with respect to Ψ2 are only sensitive to v2-induced background while any CME is averaged to zero.

In this talk, we will present the STAR measurements of two-particle correlations with respect to Ψ2 in p+Au, d+Au and Au+Au collisions at sNN$^{\overline{\quad\quad}}\sqrt{}$ = 200 GeV. These results are analyzed as a function of particle multiplicity to shed light on the background contaminations of the CME measurements in heavy-ion collisions. The interpretation of these results in terms of CME and/or background may require improved analysis strategies such as the less background sensitive observables and/or upcoming data such as the planned isobar collisions at RHIC.

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Session Classification: Hot and dense matter physics (QGP and heavy ion collision)

Track Classification: 1) Hot and dense matter physics (QGP and heavy ion collision)