Contribution ID: **632** Type: **Oral**

# First-Order Event Plane Correlated Directed and Triangular Flow in BES-II Au+Au Collisions at STAR

*Wednesday, 6 September 2023 08:30 (20 minutes)*

In heavy-ion collisions, the measurements of anisotropic flow coefficient ($v_n$) offer insights into collective hydrodynamic expansion and transport properties of the produced medium at higher collision energies, while they are sensitive to the compressibility of the nuclear matter and nuclear equation of state at lower collision energies. The second phase of the Beam Energy Scan program (BES-II) was carried out at RHIC to focus on the most crucial energy range from $\sqrt{s_{NN}} = 7.7$ GeV to 27 GeV in collider mode and $\sqrt{s_{NN}} = 3$ GeV to 7.7 GeV in fixed-target mode, providing an ideal lever-arm to explore $v_n$. For such energies, the STAR BES-II upgrades enable us to measure $v_n$ in a wide pseudorapidity ($\eta$) range with high precision.

Directed flow ($v_1$) describes the collective sideward motion of produced particles and nuclear fragments in heavy-ion collisions, and it is sensitive to early non-equilibrium dynamics. The measurement of $v_1$ in a wide $\eta$ range allows us to test the phenomenon of limiting fragmentation and provides insights into the baryon-stopping mechanism. On the other hand, triangular flow ($v_3$) in nuclear collisions is often mentioned as being developed from event-by-event geometrical fluctuations in the participant region which has no correlation to the first-order event plane ($\Psi_1$). However, recent measurements at lower collision energies show a correlation between $v_3$ and $\Psi_1$.

In this contribution, we will show the measurement of charged particle $v_1$ over six units of $\eta$ in Au+Au collisions at $\sqrt{s_{NN}} = 27$ and 19.6 GeV and compare with transport and hydrodynamic model calculations. We will also show the results of $v_3$ in fixed-target mode for identified hadrons and light nuclei with respect to $\Psi_1$, comparing with theoretical models to identify the source of nonzero $v_3\{\Psi_1\}$ and to demonstrate its vital connection to the equation of state.

## Category

Experiment

## Collaboration (if applicable)

STAR

**Primary author:** LIU, Xiaoyu

**Presenter:** LIU, Xiaoyu

**Session Classification:** Collective Dynamics

**Track Classification:** Collective Dynamics