

1 First-Order Event Plane Correlated Directed and 2 Triangular Flow in BES-II Au+Au Collisions at STAR

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6 Abstract

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

16 Directed flow (v_1) describes the collective sideward motion of produced particles and
17 nuclear fragments in heavy-ion collisions, and it is sensitive to early non-equilibrium
18 dynamics. The measurement of v_1 in a wide η range allows us to test the phenomenon
19 of limiting fragmentation and provides insights into the baryon-stopping mechanism.
20 On the other hand, triangular flow (v_3) in nuclear collisions is often mentioned as being
21 developed from event-by-event geometrical fluctuations in the participant region which
22 has no correlation to the first-order event plane (Ψ_1). However, recent measurements
23 at lower collision energies show a correlation between v_3 and Ψ_1 .

24 In this contribution, we will show the measurement of charged particle v_1 over
25 six units of η in Au+Au collisions at $\sqrt{s_{NN}} = 27$ and 19.6 GeV and compare with
26 transport and hydrodynamic model calculations. We will also show the results of v_3 in
27 fixed-target mode for identified hadrons and light nuclei with respect to Ψ_1 , comparing
28 with theoretical models to identify the source of nonzero $v_3\{\Psi_1\}$ and to demonstrate
29 its vital connection to the equation of state.