Nonflow contaminations in flow measurements

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Collision-system and beam-energy dependence of anisotropic flow fluctuations

event selection was varied via cuts on the vertex positions determined in the TPC along the beam direction, v_z, to $v_z > 0$ cm and $v_z < 0$ cm. (ii) Track selection was varied by (a) reducing the distance of closest approach (DCA) between a track and the primary vertex, from its nominal value of 3 cm to 2 cm, and (b) increasing the number of TPC space points used from more than 15 points to more than 20 points. (iii) The pseudorapidity gap, $\Delta\eta = \eta_1 - \eta_2$ for the track pairs, used to mitigate the non-flow effects due to resonance decays, Bose-Einstein correlations, and the fragments of individual jets, was varied from $|\Delta\eta| > 0.6$ to $|\Delta\eta| > 0.8$. The $\Delta\eta$ cut does not entirely suppress possible long-range non-flow contributions (e.g., jets in a dijet event), which increase from central to peripheral events and decrease with beam energy. Estimates of the systematic uncertainty due to this residual non-flow contribution can be made via several techniques [66–69]. The peripheral subtraction method [66] indicates uncertainties that range from 1% in central collisions to 13% in peripheral collisions at $\sqrt{s_{\rm NN}}$ =200 GeV. Due to the lower jet yields for beam energies $\lesssim$ 63 GeV [70], the much smaller associated uncertainties are not included in their respective overall systematic uncertainty estimate.

For identified particle species, the particle identification cuts were also varied about their nominal values [71]. The overall systematic uncertainty, assuming independent sources, was estimated via a quadrature sum of the uncertainties resulting from the respective cut variations. They range from 4% to 6% for $v_2\{2\}$ [72], 2% to 4% for $v_2\{4\}$ and $v_2\{6\}$, and 4% to 8% for $v_2\{4\}/v_2\{2\}$, from central to peripheral collisions, depending on the beam energy. The $\Delta\eta$-associated uncertainty dominates the overall uncertainty of $v_2\{4\}/v_2\{2\}$ since the effects of the other cut variations approximately cancel.

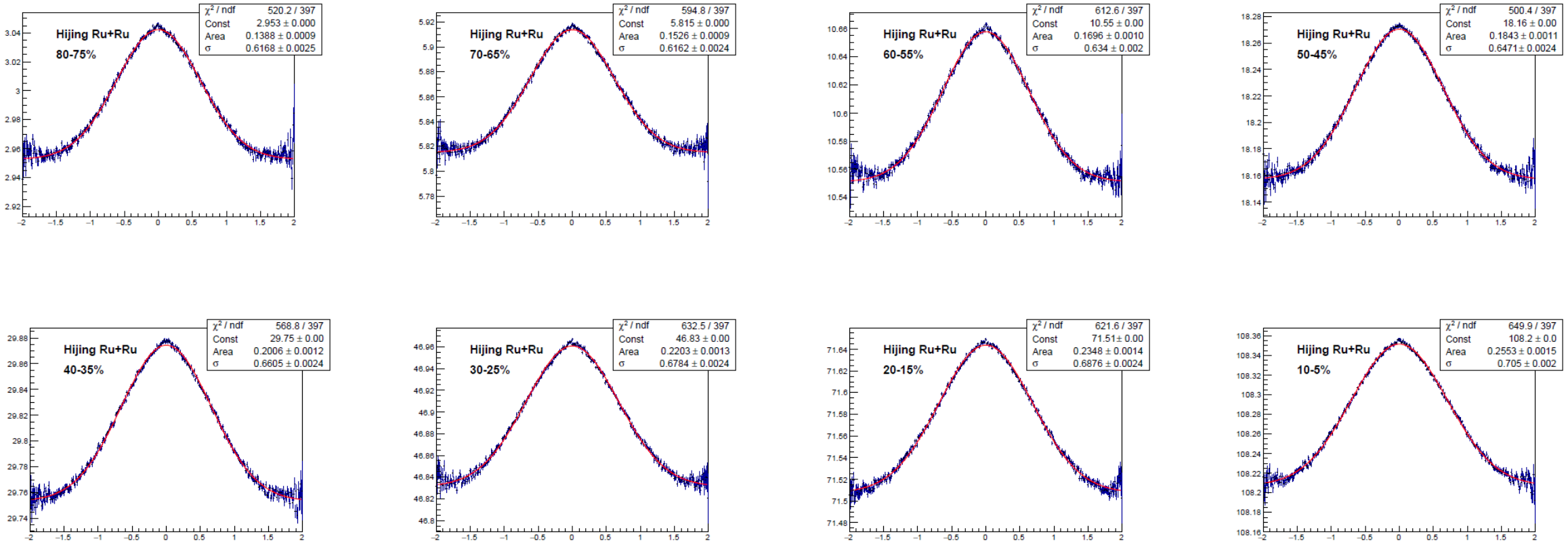
In Fig. 1 the $p_{\rm T}$-integrated two-, four-, and six-particle elliptic flow (a) and the ratio $v_2\{4\}/v_2\{2\}$ (b), are presented as a function of centrality for Au+Au collisions

Nonflow systematic uncertainty is estimated by varying Δη cut from 0.6 to 0.8

Residual nonflow is acknowledged. Numbers from peripheral subtraction are mentioned. These numbers are not included in the quoted systematic uncertainties as far as I can tell.

“the much smaller associated uncertainties are not included” comes out of nowhere. The systematics are NOT even included for 200 GeV.

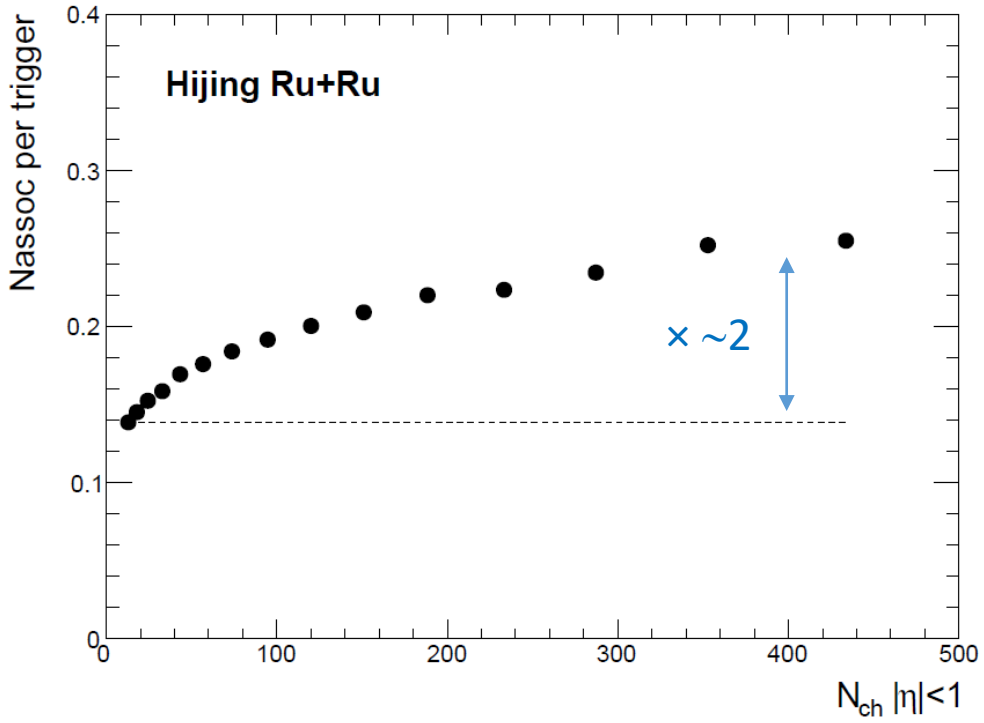
Hijing simulation Ru+Ru 200 GeV



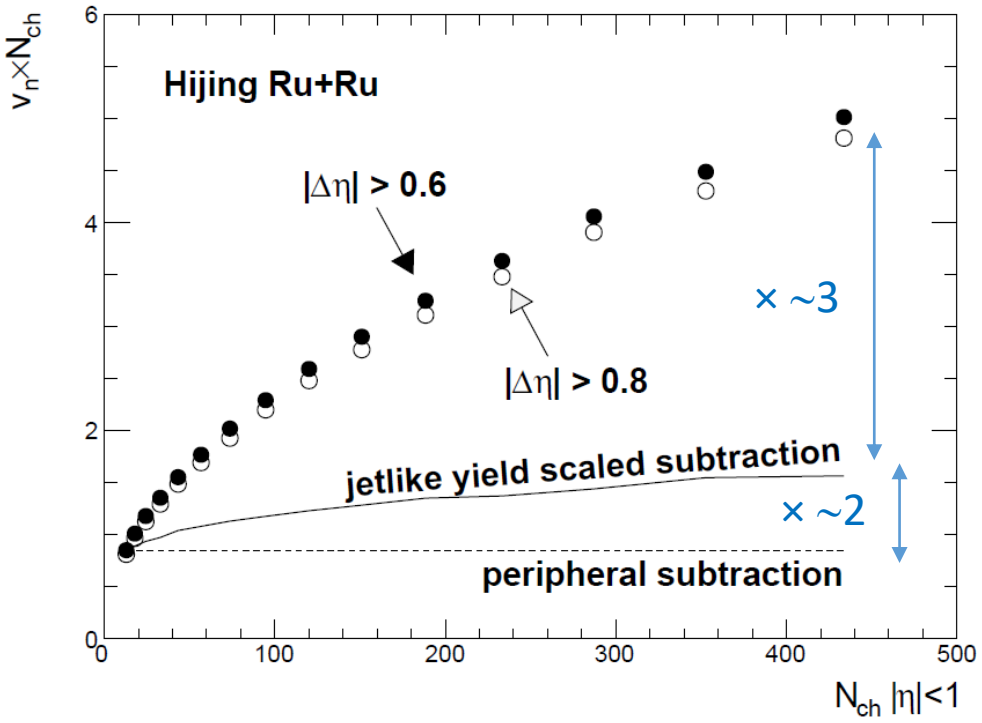
$1/N_{trig} \times dN/d\Delta\eta$

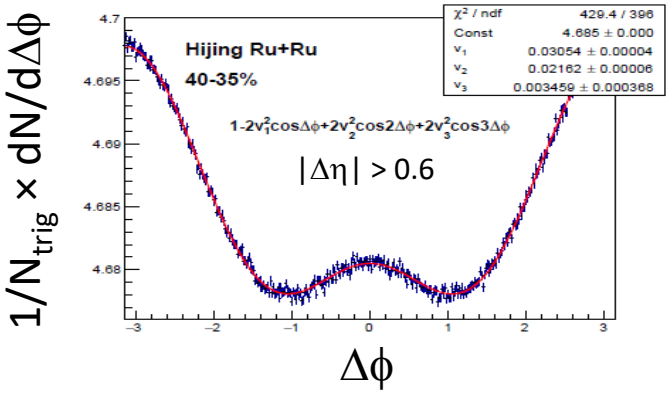
$\Delta\eta$

Near-side jetlike yield



Nonflow caused v2





- Jetlike modification is significant
- Away-side contribution is large
- $\Delta\eta$=0.6 –> 0.8 change is minimal