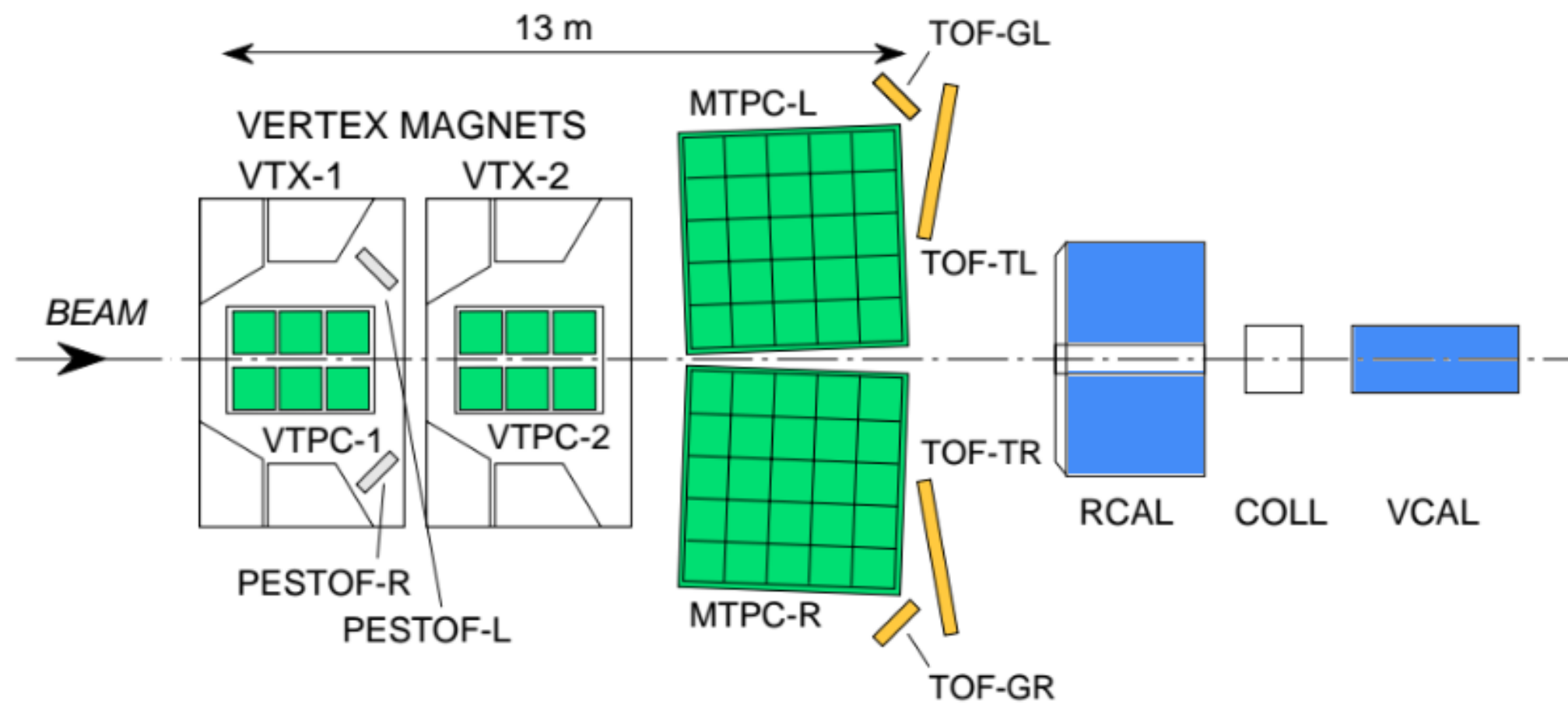
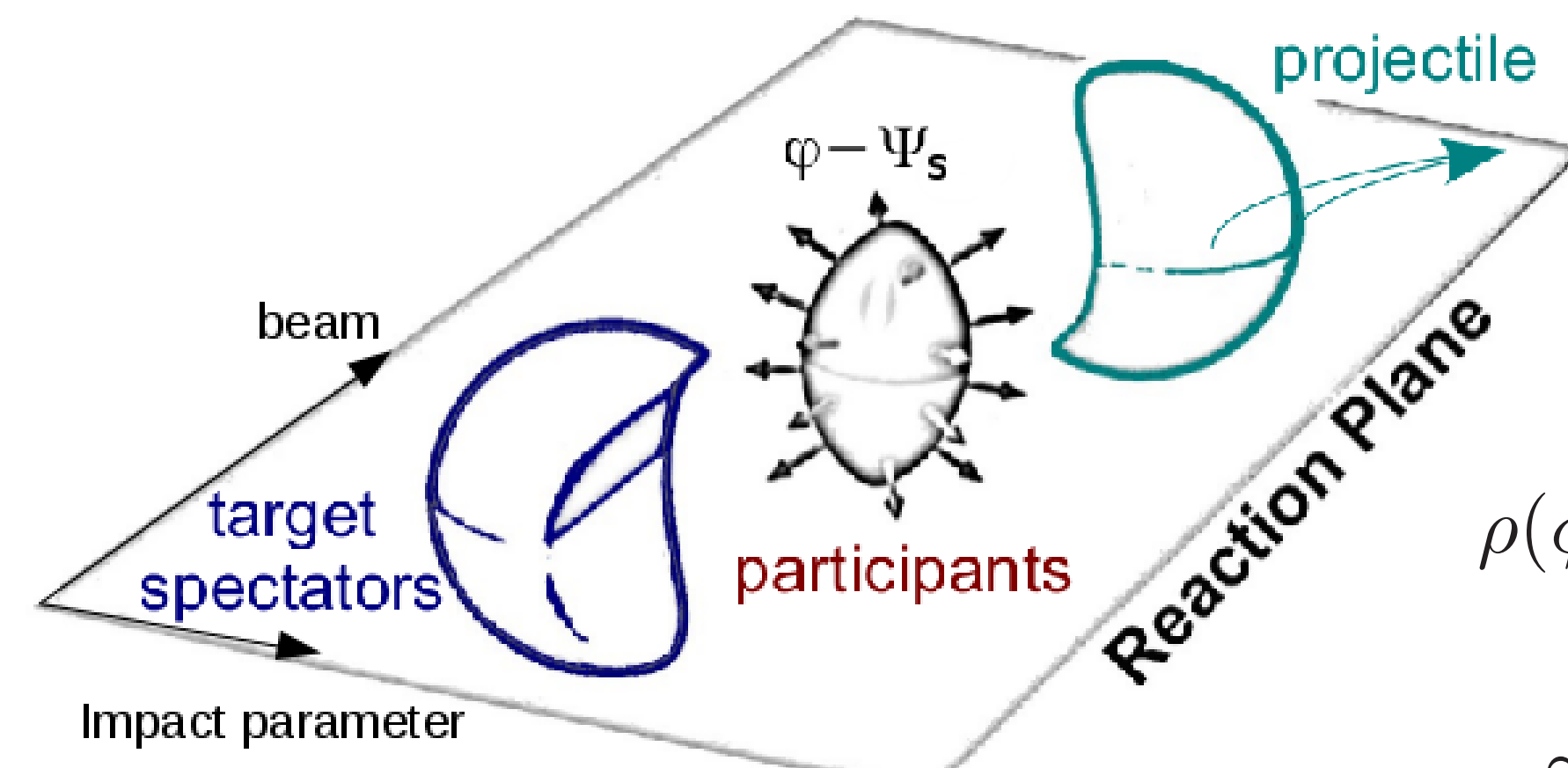


Abstract

Recently new data for Pb+Pb collisions were collected by the NA61/SHINE experiment during the Pb-ion beam energy scan program at the SPS. This motivated a new analysis of anisotropic flow relative to the spectator plane using Pb+Pb collisions at 40A GeV recorded by fixed target NA49 experiment at CERN SPS [1].



Anisotropic Transverse Flow



$$\rho(\phi - \Psi_s) \sim$$

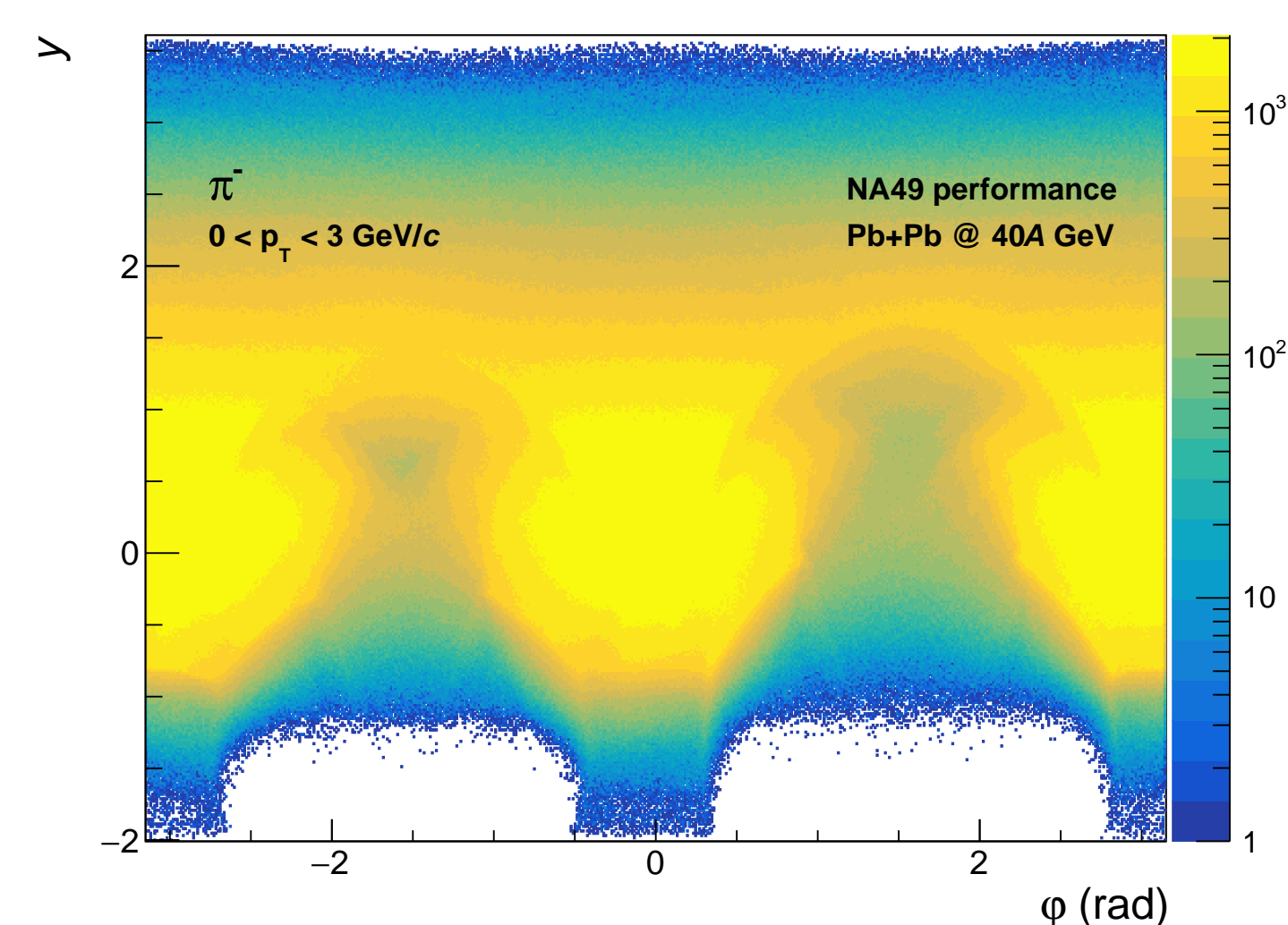
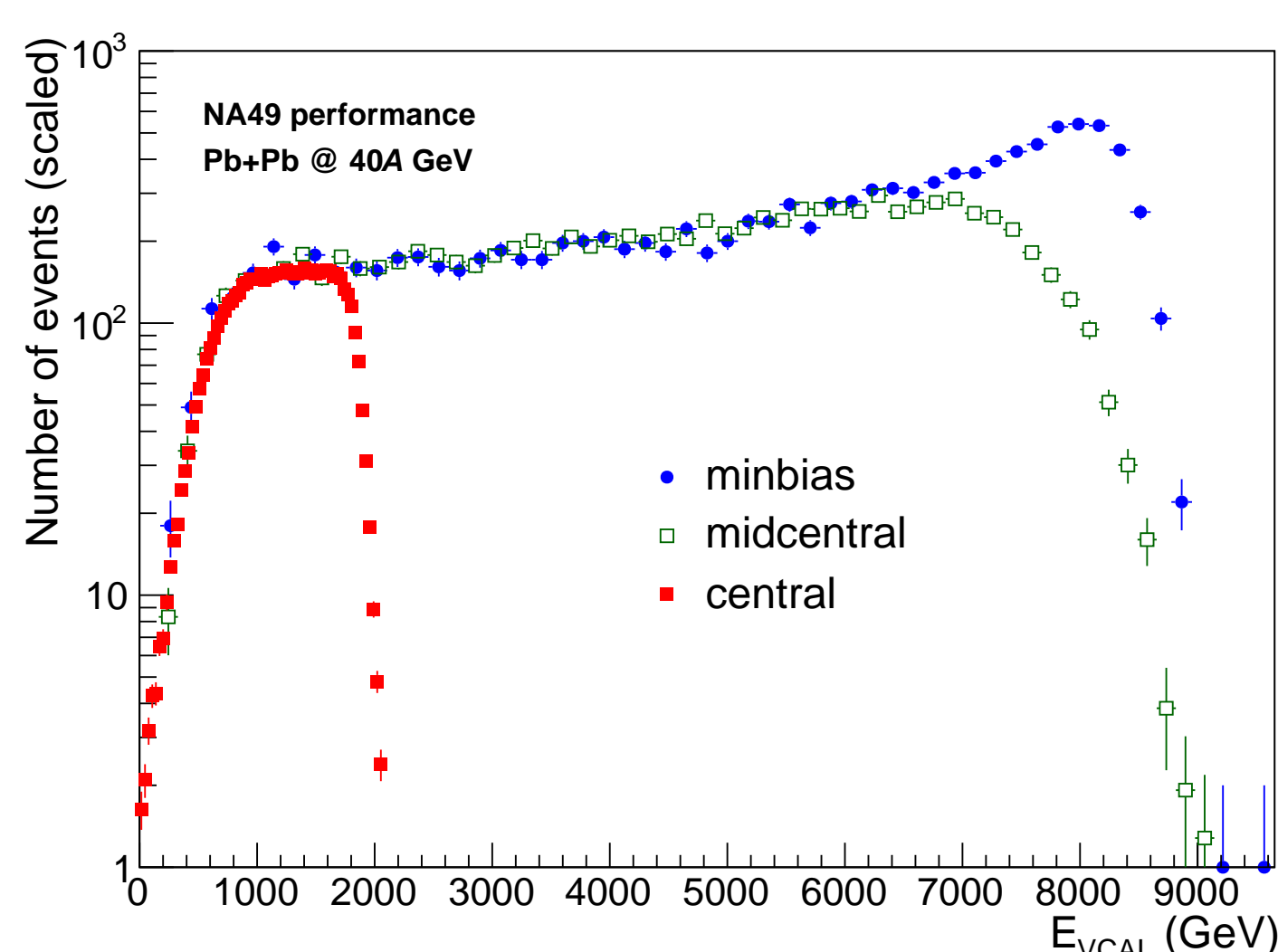
$$\sim 1 + 2 \sum_{n=1}^{\infty} v_n \cos n(\phi - \Psi_s)$$

Anisotropic transverse flow is quantified by Fourier coefficients in the decomposition of the particle azimuthal distribution relative to the collision symmetry plane (Ψ_s). Ψ_s can be determined by the projectile (target) spectator deflection Ψ_{proj} (Ψ_{targ}) or the shape of the participant zone Ψ_{pp} .

Data

NA49 subsystems used for the analysis:

- VTPC-1, VTPC-2, MTPC for tracking and pion identification;
- hadron calorimeters VCAL, RCAL for spectator plane estimation;
- VCAL for centrality determination.



Only events up to 33.5% ($E_{VCAL} = 5490$ GeV) were used in the analysis due to large trigger bias for peripheral collisions.

Corrections for detector azimuthal anisotropy in flow analysis are applied using an extension of the Qn-Corrections Framework [2, 3, 4].

Flow Observable

$$v_n^A(p_T, y) = \frac{2 \langle u_{i,n}(p_T, y) Q_{i,n}^A \rangle}{R_{i,n}^A}, \quad \alpha^2$$

where flow vectors u_n and Q_n :

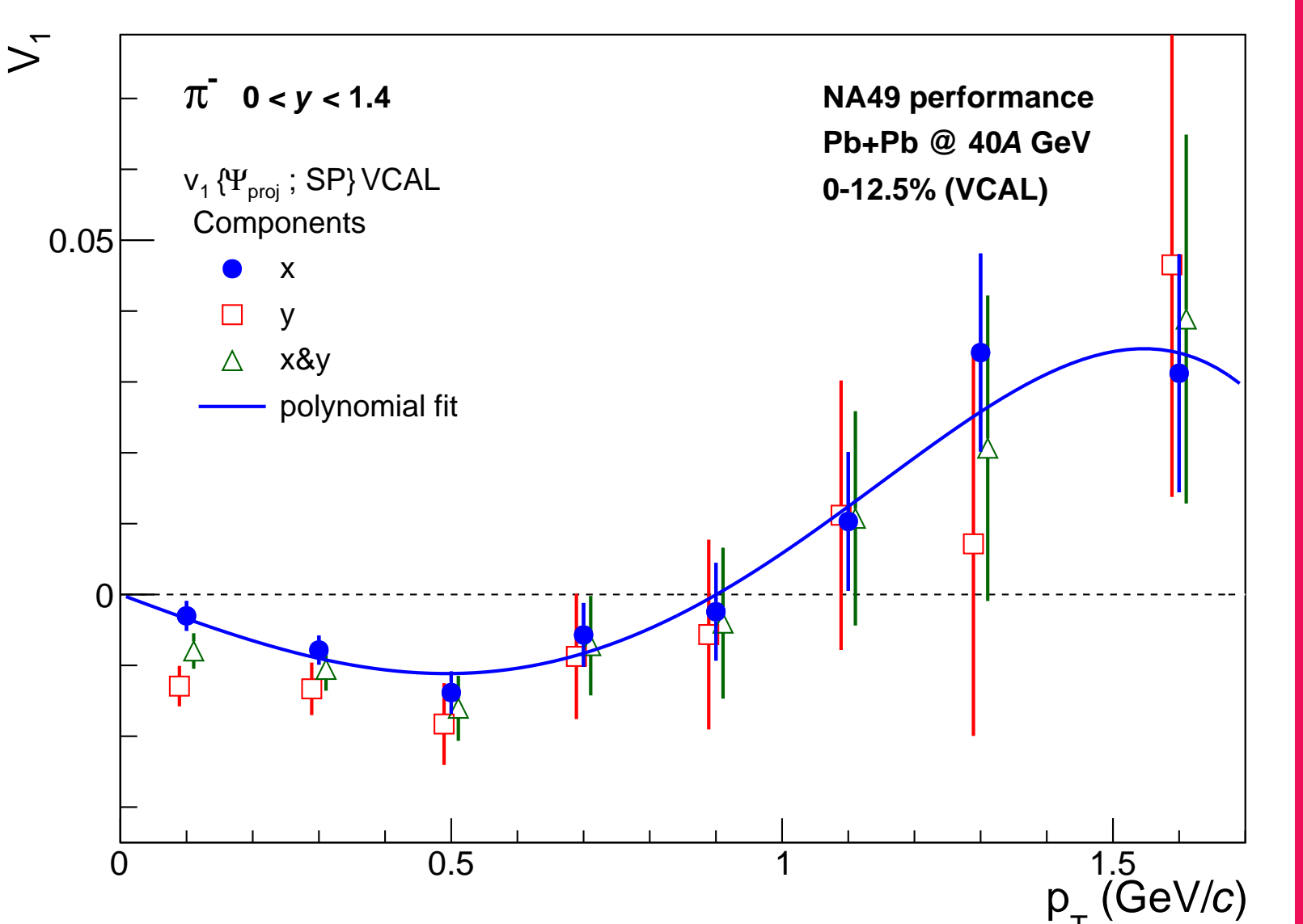
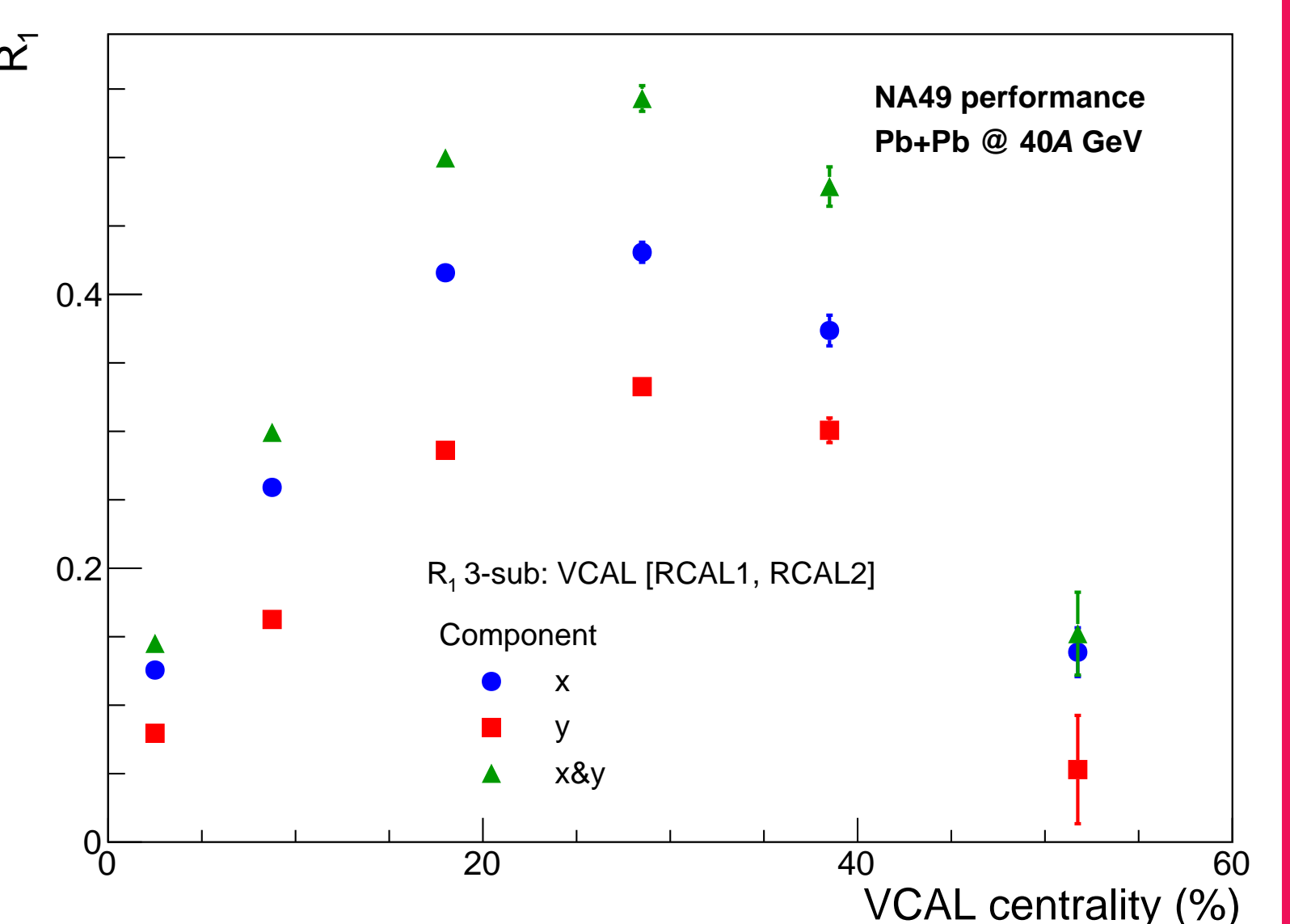
$$u_n = u_{x,n} + i u_{y,n} = \cos n\phi + i \sin n\phi$$

$$Q_n = Q_{x,n} + i Q_{y,n} = \sum_k w_k u_n$$

and resolution correction R_n :

$$R_{i,n}^A = \sqrt{2 \frac{\langle Q_{i,n}^A Q_{i,n}^B \rangle \langle Q_{i,n}^A Q_{i,n}^C \rangle}{\langle Q_{i,n}^B Q_{i,n}^C \rangle}}$$

where $i = x, y$. Three-subevent technique is applied for determination of the spectator plane resolution using VCAL (subevent A) and RCAL (5 central rings for subevent B and 5 peripheral for subevent C). In both cases module energy is taken as a weight w_k . X-components are used to present final results.



Results

Comparison of $v_1(p_T)$ with NA49 published results [5]

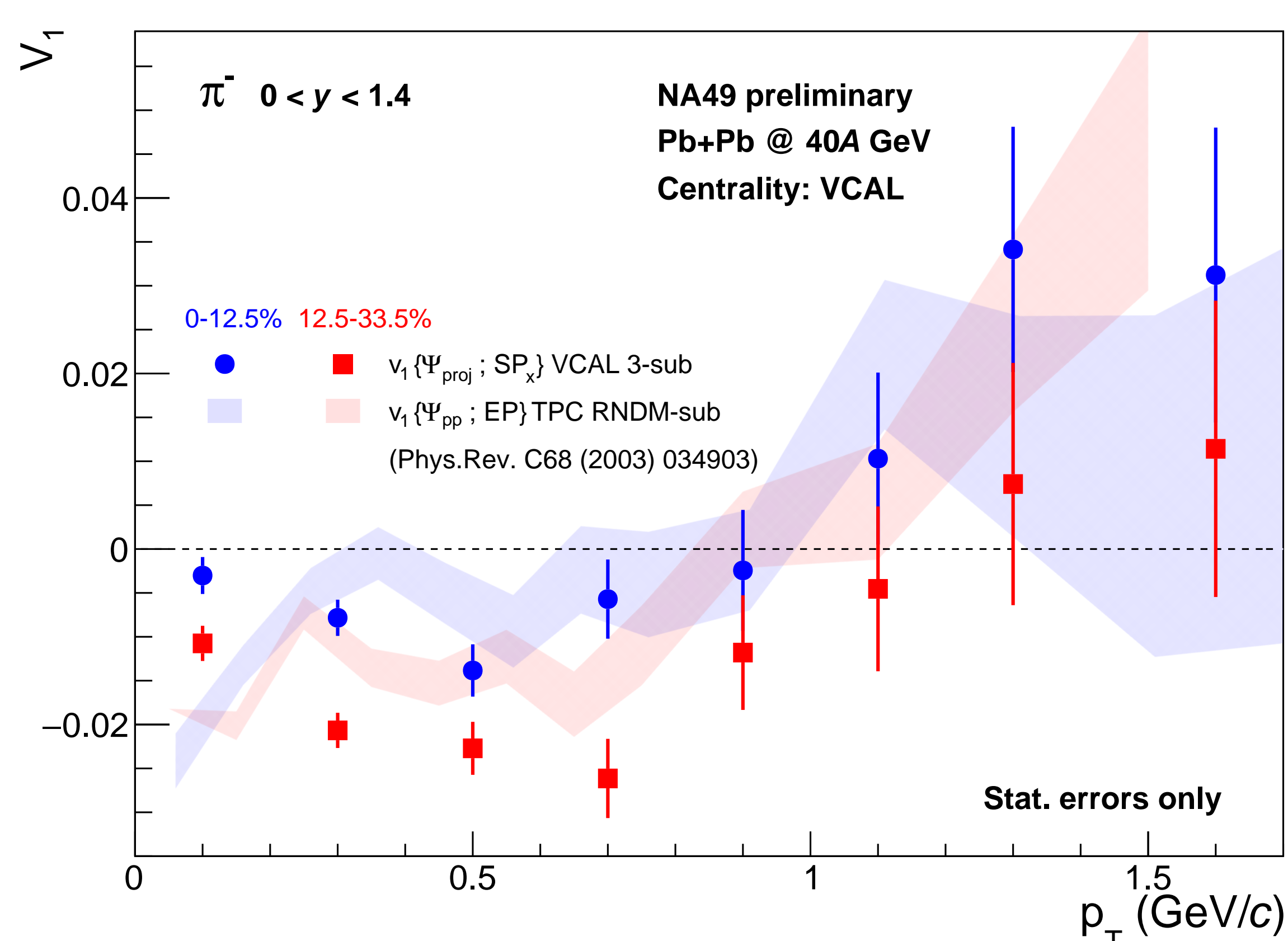
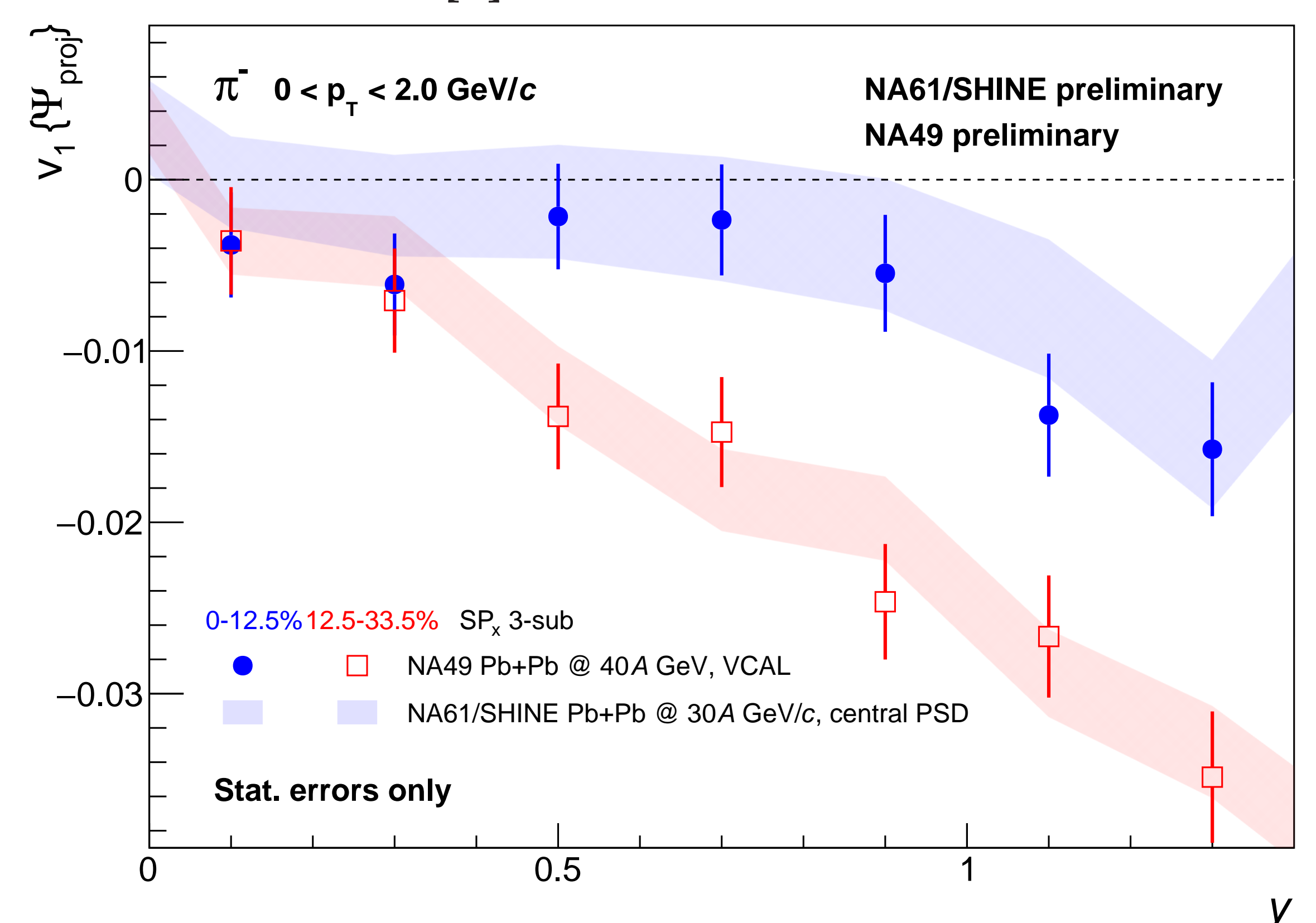


Figure notations:
EP - event plane
SP - scalar product
3-sub - three subevent
RNDM-sub - random subevent

Comparison of $v_1(y)$ with NA61/SHINE preliminary results [6] for Pb+Pb @ 30A GeV/c



Summary

Directed flow v_1 of π^- relative to projectile spectator plane is measured for Pb+Pb collisions at 40A GeV recorded by the NA49 experiment. New measurement extends the previously published results by the NA49 collaboration [5] for v_1 relative to the production plane. Comparison with preliminary results by the NA61/SHINE collaboration [6] at lower beam momentum of 30A GeV/c shows little change in v_1 in the this energy range.

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