

# Measurement of the azimuthal anisotropy of charged particle production in Xe+Xe collisions at $\sqrt{s_{NN}} = 5.44$ TeV with the ATLAS detector

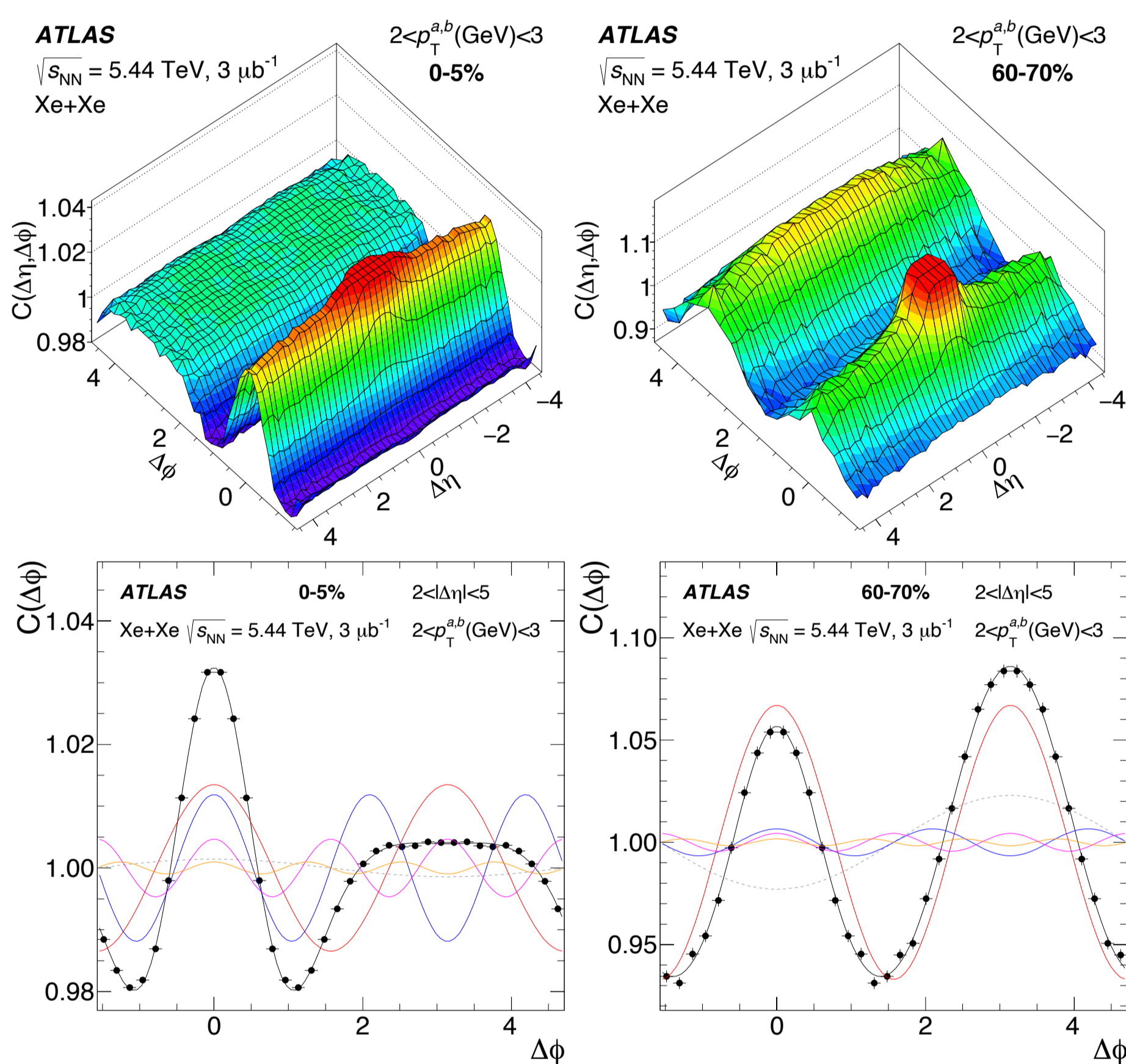
Pengqi Yin on behalf of the ATLAS collaboration

## Introduction

- The Xe nucleus is smaller than the Pb nucleus. Xe+Xe collisions are expected to have larger event-by-event fluctuation in the initial state geometry compared to Pb+Pb collisions.
- A smaller system also implies larger viscous effects in the hydrodynamic expansion of the produced quark gluon plasma (QGP).
- Thus the  $v_n$  measurement in Xe+Xe collisions and the comparison to those in Pb+Pb collisions allow the study of the interplay of these effects.

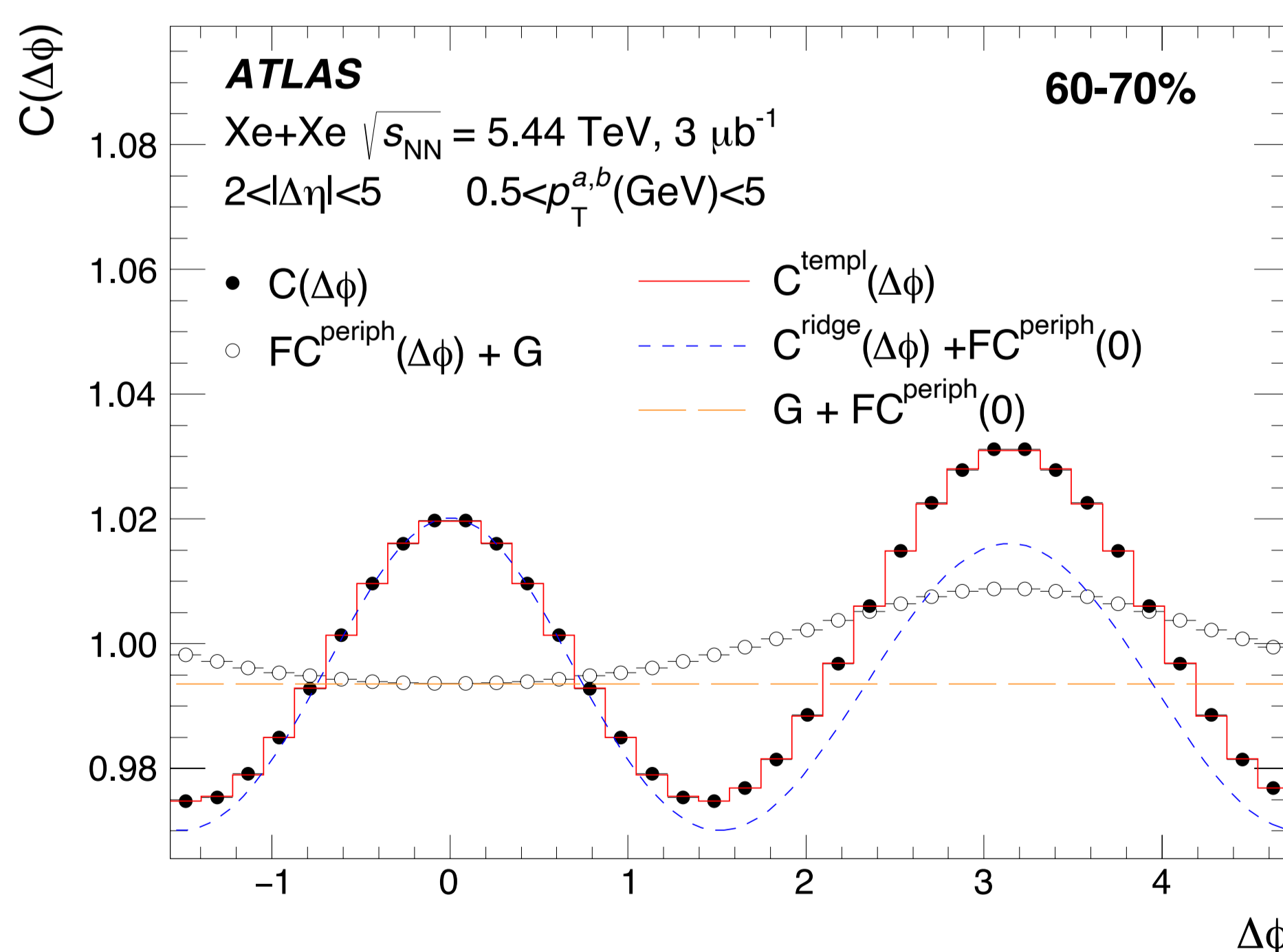
## Methodology

### Two particle correlations (2PC)



- 2D 2PCs and projection of long-range correlations.
- Large negative  $v_1$  is seen in peripheral event which is due to bias from dijet.

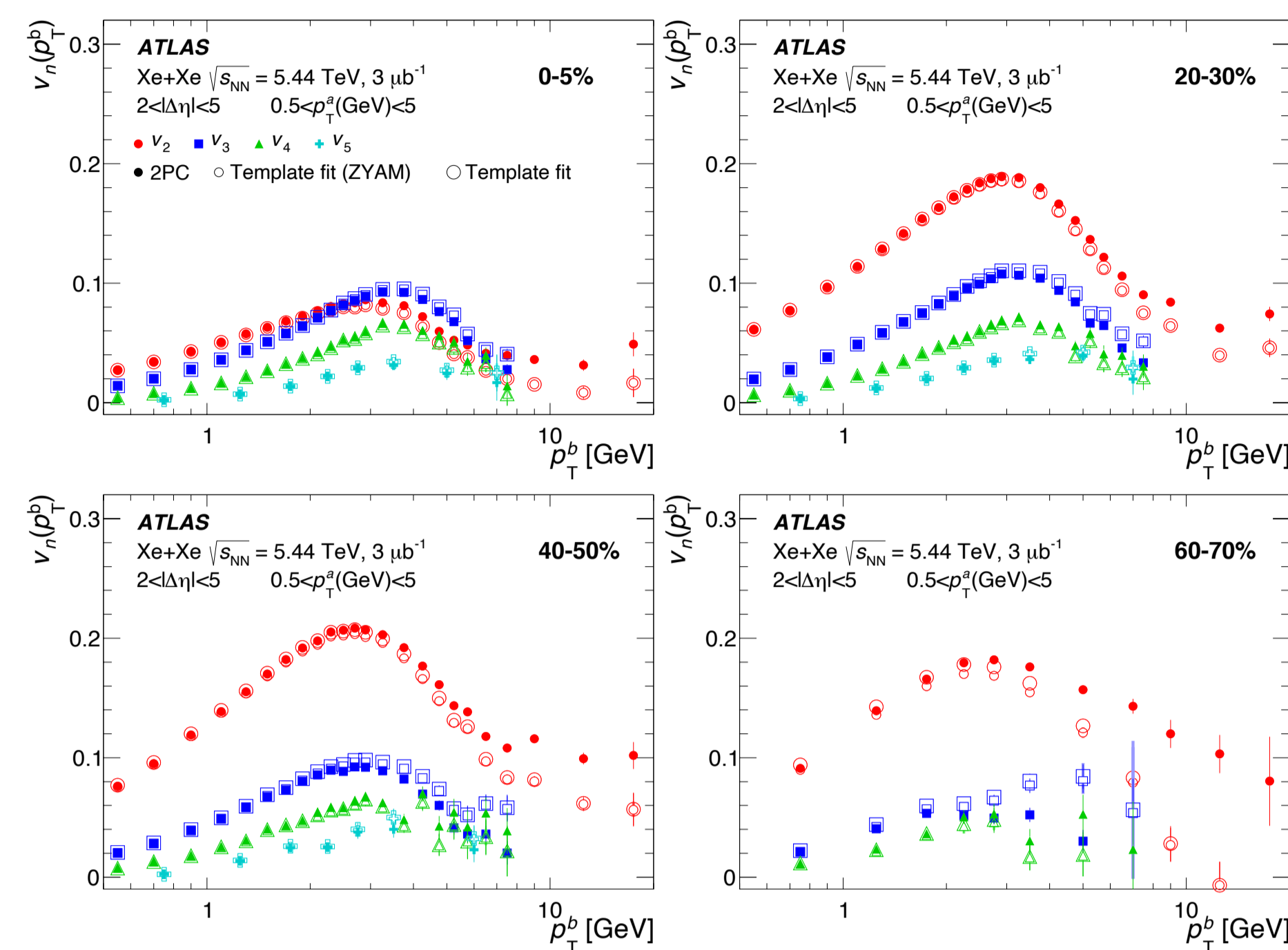
### Template fit method



- A template fit method is used to extract long-range correlation.
- Fit the correlation with template of two components:
  - Jet background:  $pp$  peripheral events
  - True signal:  $G(1+2\sum_{n=2} v_{n,n} \cos(n\Delta\phi))$

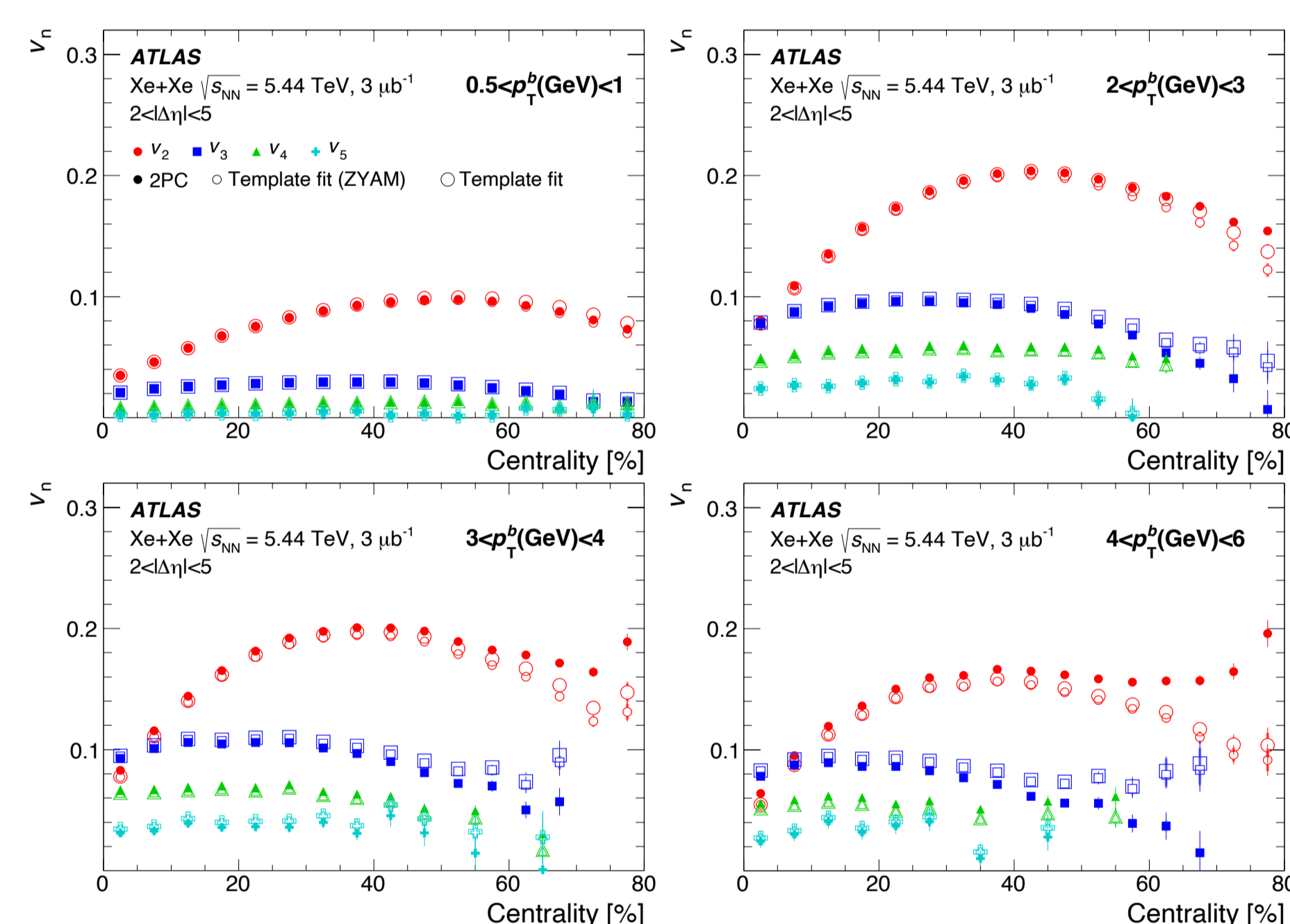
## Results

### $p_T$ dependence



- The  $p_T$  dependence of the  $v_n$  obtained from the 2PC and template fit method in different centralities.
- The jet bias from 2PC method at high  $p_T$  and in peripheral events is removed by the template fit method.

### Centrality dependence

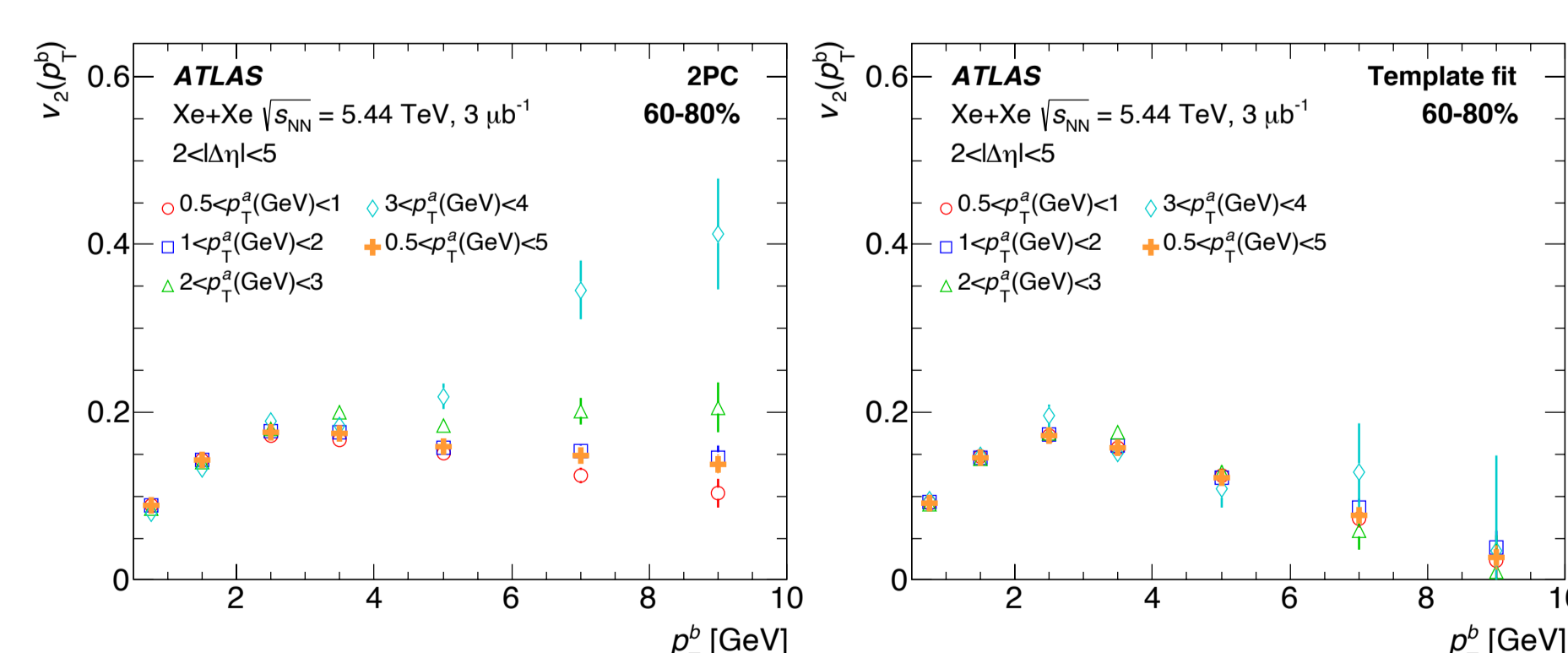


- The centrality dependence of the  $v_n$  obtained from the 2PC and template fit measurements with different  $p_T^b$ .
- The jet bias from 2PC method at high  $p_T$  and in peripheral events is removed by the template fit method.

### Factorization of $v_n$

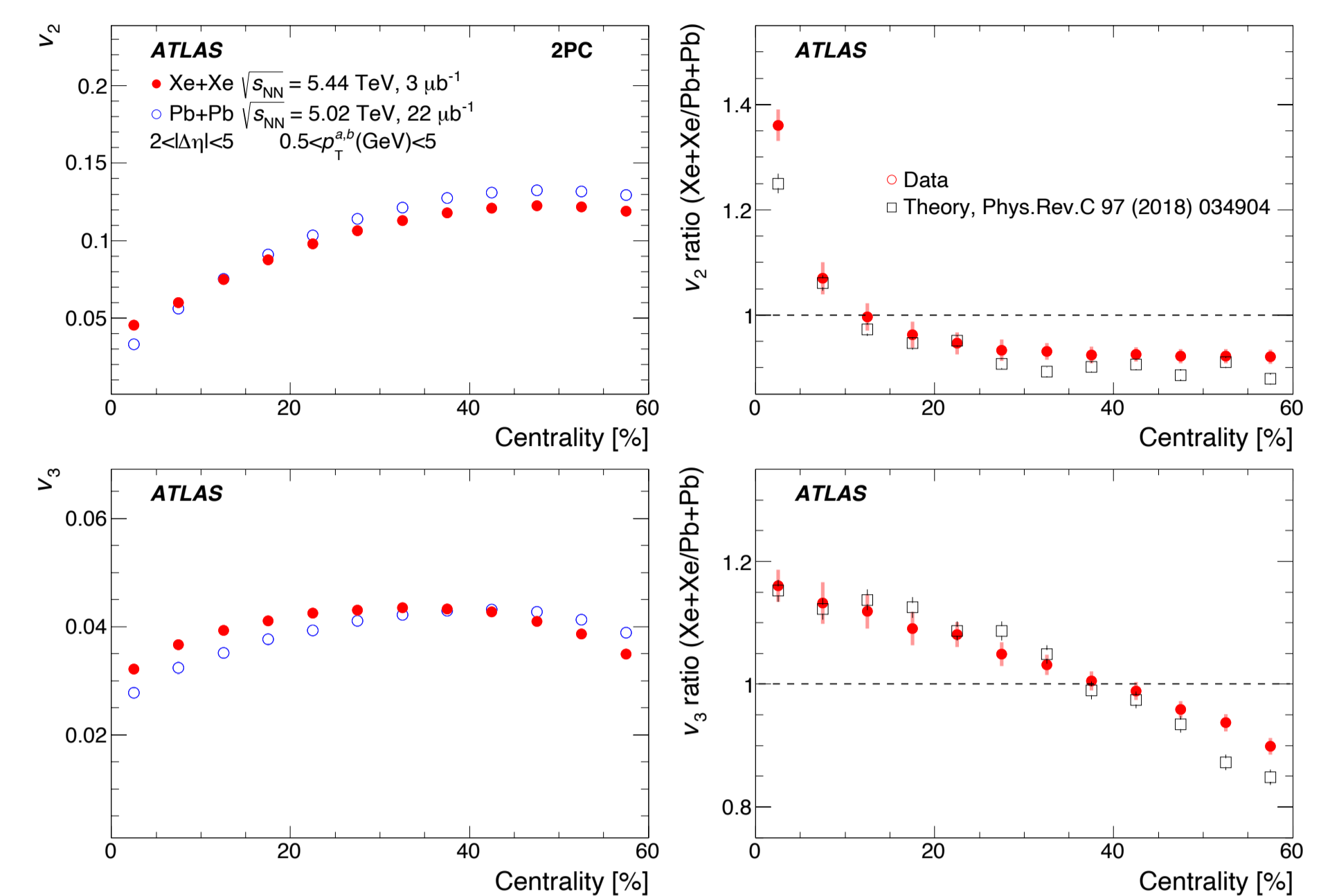
The  $v_n(p_T^b)$  can be evaluated from the measured  $v_{n,n}$ :

$$v_n(p_T^b) = \frac{v_{n,n}(p_T^a, p_T^b)}{\sqrt{v_{n,n}(p_T^a, p_T^a)}}$$

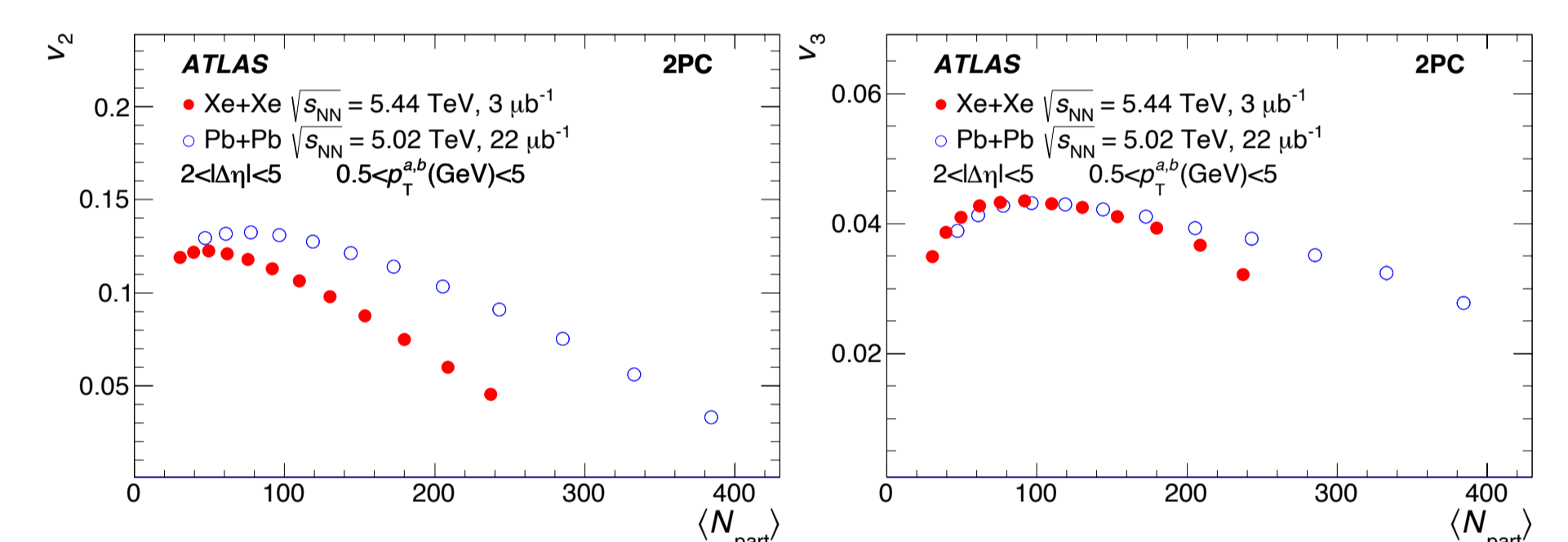


- Template fit  $v_n(p_T^b)$  is independent of  $p_T^a$ .

### Comparisons with Pb+Pb

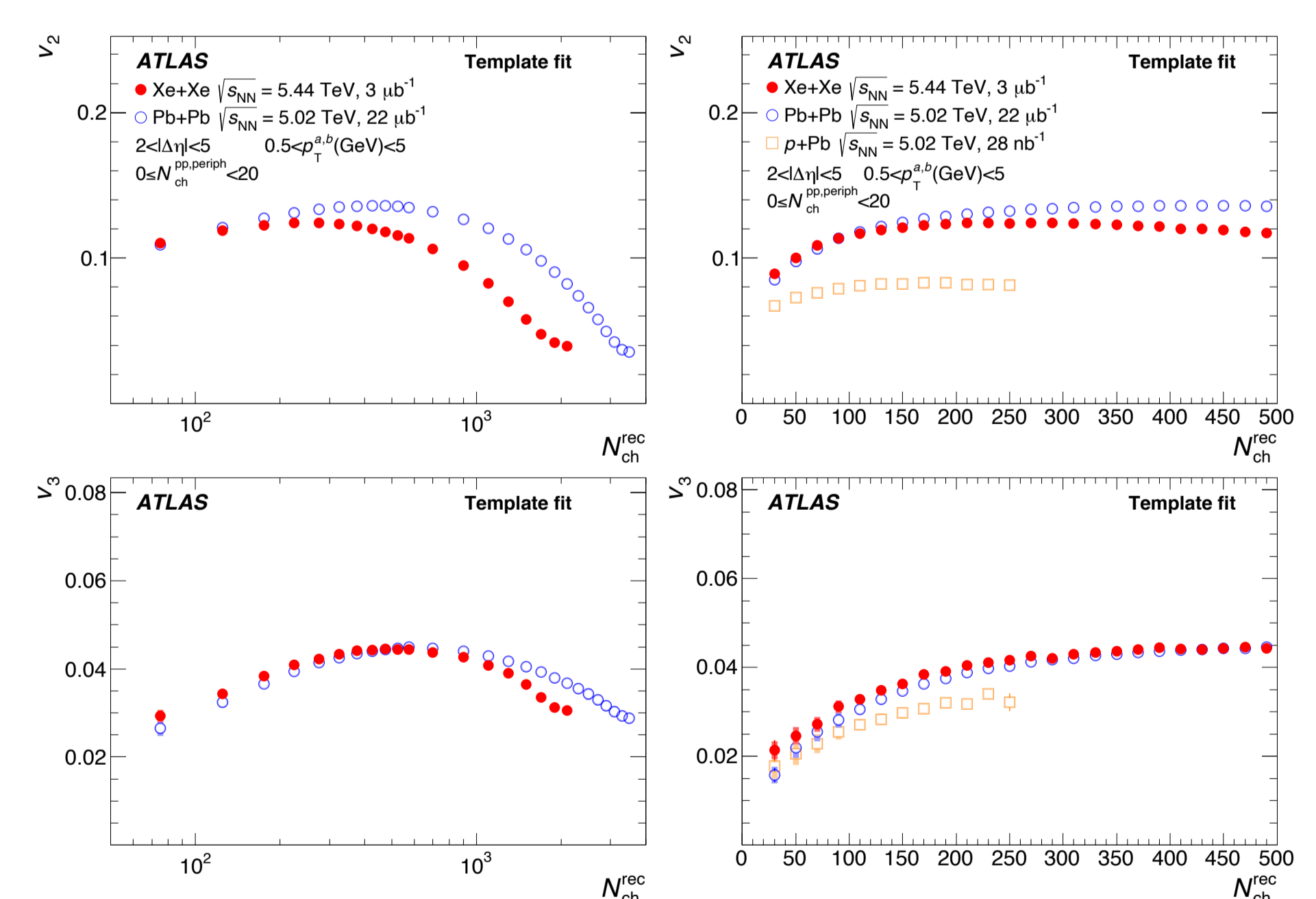


- Comparisons of the  $v_2$  and  $v_3$  as a function of centrality.
- In the most central events, the Xe+Xe  $v_n$  are larger than the Pb+Pb  $v_n$ .
- With decreasing centrality, the Xe+Xe  $v_n$  become smaller, which indicates the increased role of viscous effect.



- Comparisons of the  $v_2$  and  $v_3$  as a function of  $\langle N_{part} \rangle$ .
- The  $v_3$  between Xe+Xe and Pb+Pb are comparable for  $\langle N_{part} \rangle < 200$ .

### Comparisons with more systems



- Comparisons of the  $v_2$  and  $v_3$  measured in Xe+Xe, Pb+Pb, and p+Pb collisions as a function of  $N_{ch}^{rec}$ .
- The trends follow what was observed in the  $\langle N_{part} \rangle$  dependence.

## Acknowledgement

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