

Measurement of the sensitivity of two particle correlations in pp collisions at $\sqrt{s_{NN}} = 13$ TeV to the presence of jets with the ATLAS detector

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Introduction

- In two particle correlation (2PC) measurements in nucleus-nucleus collisions, long-range correlations along $\Delta\eta$ are understood to arise from the collective expansion of the Quark-Gluon Plasma (QGP).
- The long-range correlations are also found in a small systems such as proton-nucleus ($p+A$) or pp collisions.
- The origin of the long-range correlation in small system is still under discussion.
- May arise from semi-hard processes
 - In this case, removing particles associated with jets would weaken the long-range correlation.
 - Or, selecting events with jets may enhance the two-particle correlations even if fragments of them jets are excluded.

Methodology

Jet reconstruction and corrections

- Reconstructed using the FastJet package.
- Anti- k_T algorithm with $R = 0.4$.
- The p_T^{jet} is corrected to account for the average combinatorial contribution of underlying event (UE) tracks.

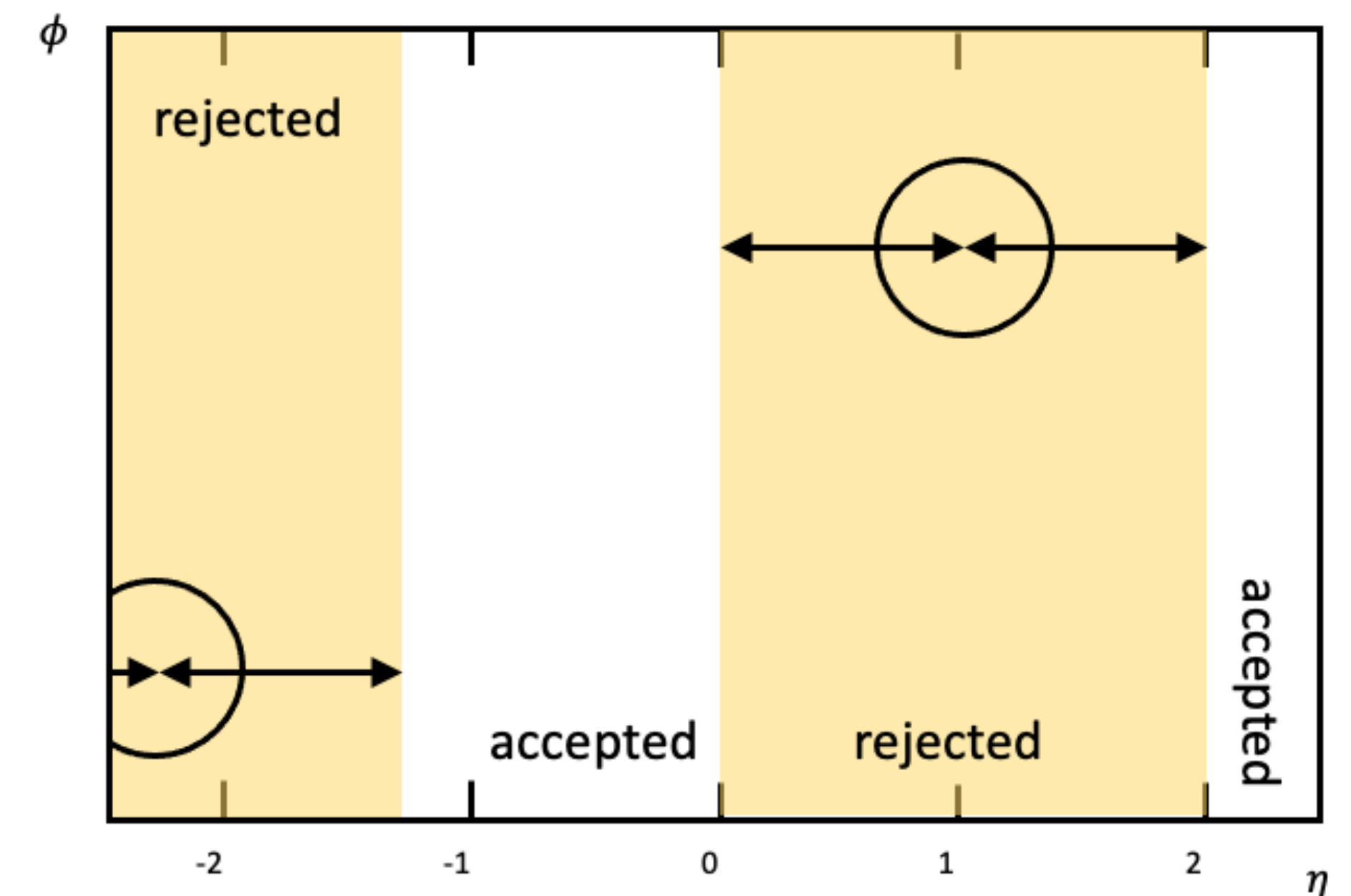
$$p_T^{\text{jet,corr}} = p_T^{\text{jet}} - \pi R^2 \rho(\eta, \phi, p_T)$$

Event Sets

- **NoJet***: Events that do not have a jet with p_T^{jet} greater than 10 GeV
- **WithJet***: Events that have at least one jet with p_T^{jet} greater than 10 GeV
- **AllEvents***: NoJet + WithJet
- **Inclusive**: NoJet + WithJet

* With rejections of particles associated with jets

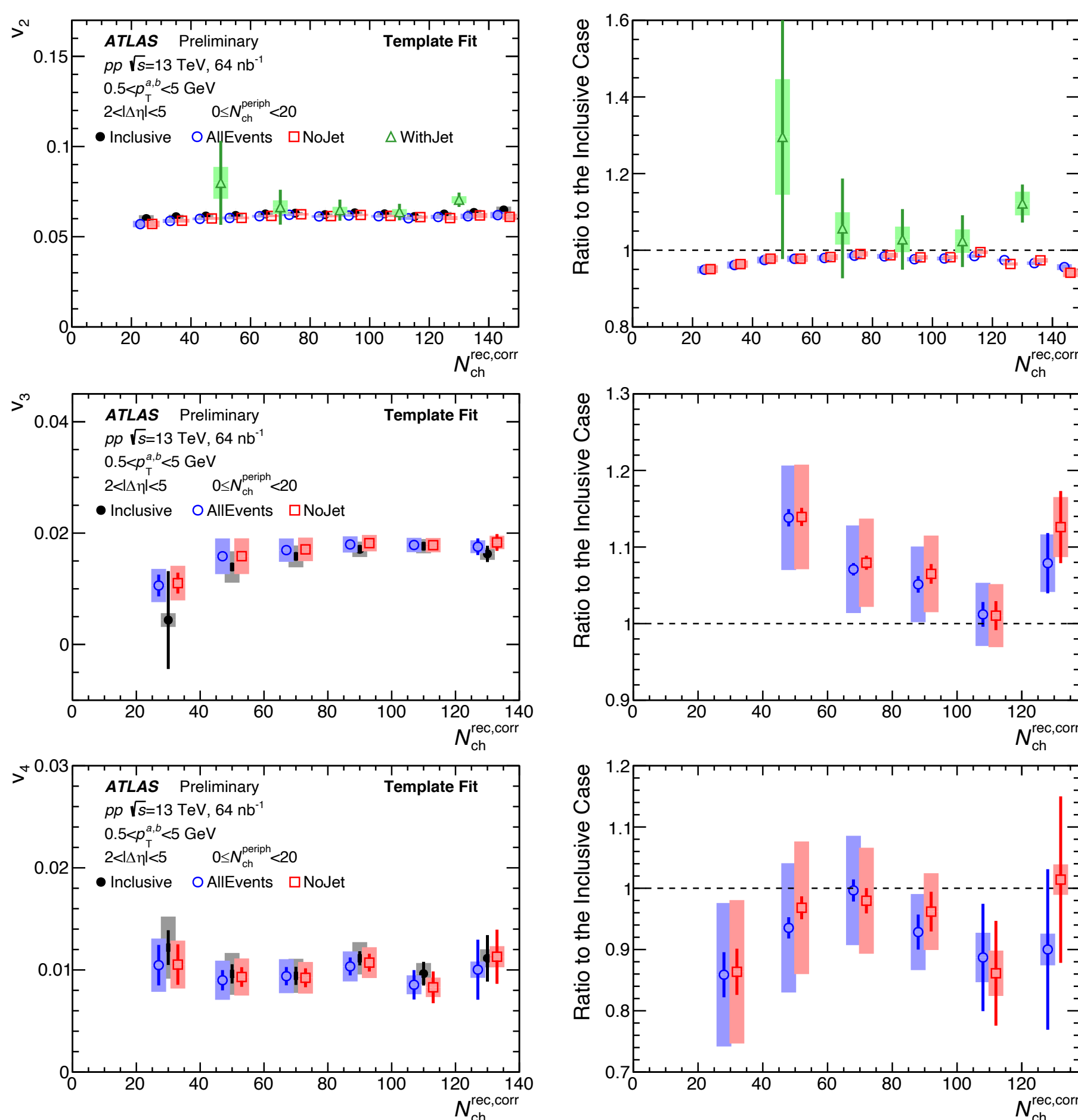
Rejection of jet-particles from 2PC



- Simply rejecting all tracks within a $R = 0.4$ cone of the jet axis would introduce artificial structures along the $\Delta\phi$ in 2PC.
- Instead, tracks within $|\Delta\eta| < 1$ of any $p_T^{\text{jet}} > 10$ GeV jet are removed from the analysis.

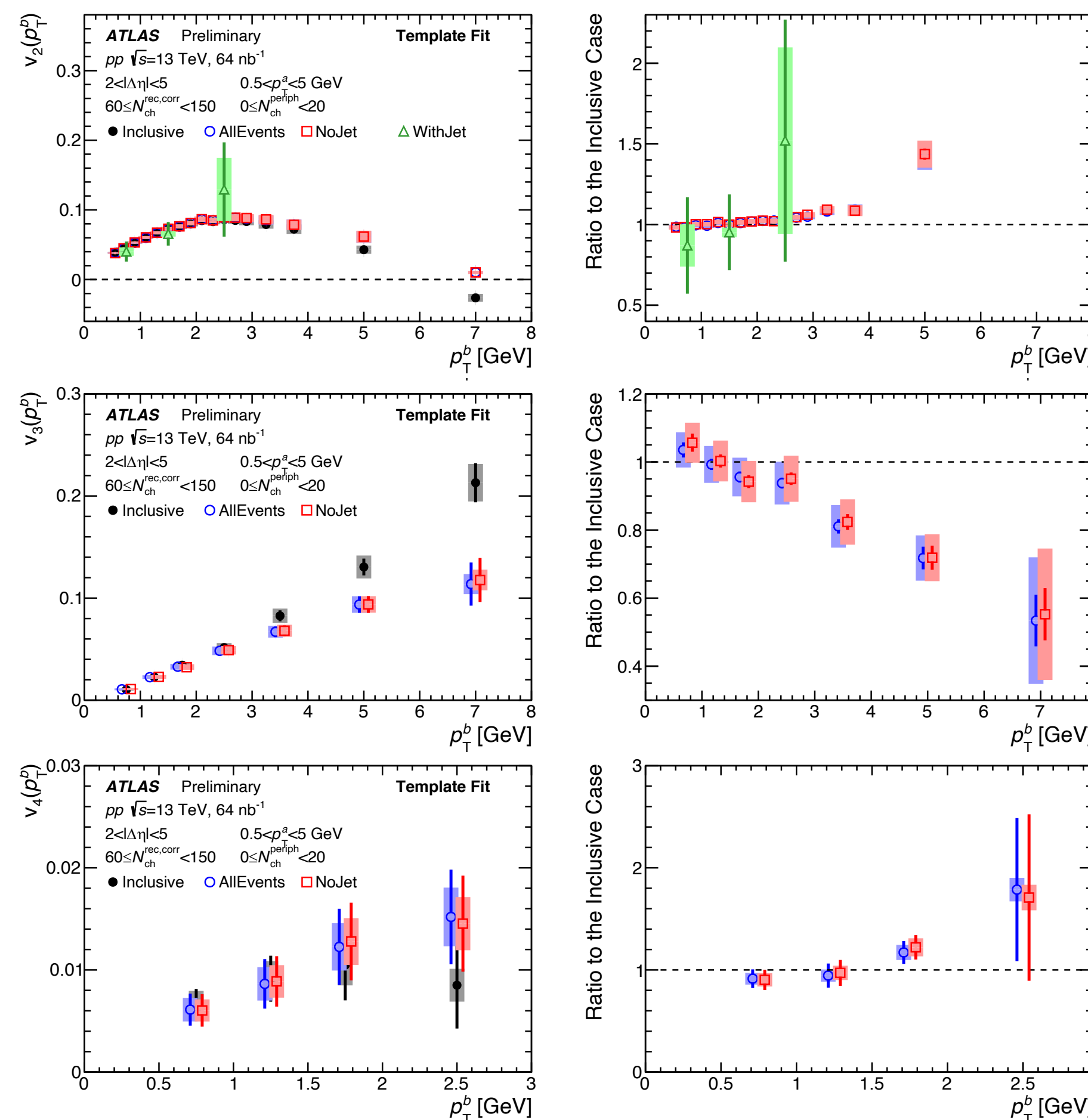
Results

Multiplicity dependence



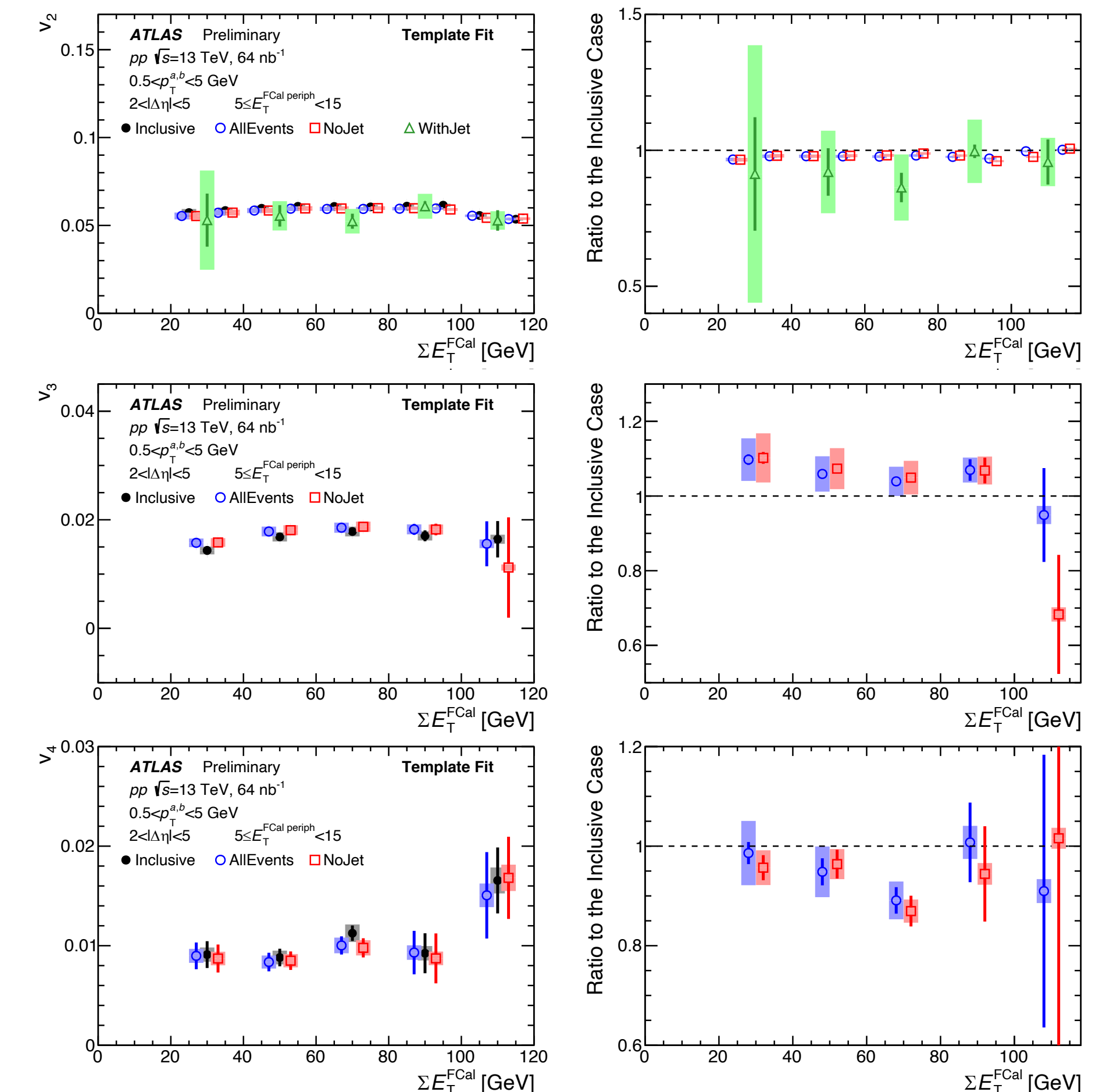
- The multiplicity dependence of the v_n obtained from template fit method.
- The v_n are weakly vary with multiplicity.
- The v_2 in **AllEvents** and **NoJet** sets are only slightly smaller than the **Inclusive** set.
- The v_2 in the **WithJet** set are consistent with the **Inclusive** set within uncertainties.
- The v_3 are larger in **AllEvents** and **NoJet**.
 - Indicate possible non-flow bias in **Inclusive**.

p_T dependence



- The p_T dependence of the v_n obtained from template fit method.
- The v_n values are observed to be similar over the $p_T^b = 0.5 - 3$ GeV range.
- At higher p_T , the v_2 in **AllEvents** and **NoJet** sets are larger than the **Inclusive**.
- The v_3 at higher p_T show considerably large differences compare with **Inclusive**.
 - Indicate possible non-flow bias in **Inclusive**.

ΣE_T^{FCal} dependence



- The ΣE_T^{FCal} dependence of the v_n obtained from template fit method.
- The ΣE_T^{FCal} , a measure of the event activity, is less biased than multiplicity.
- The observed differences for v_2 and v_3 between the **AllEvents/NoJet** sets and the **Inclusive** set are similar to that observed in the multiplicity dependence.
- The v_2 in **WithJet** set are consistent with the other sets within uncertainties.

Conclusion: These measurements indicate that long-range correlations in pp collisions are only slightly affected when particles associated with hard or semi-hard processes in the event are removed.

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