pPb 8TeV Upsilon v2 status

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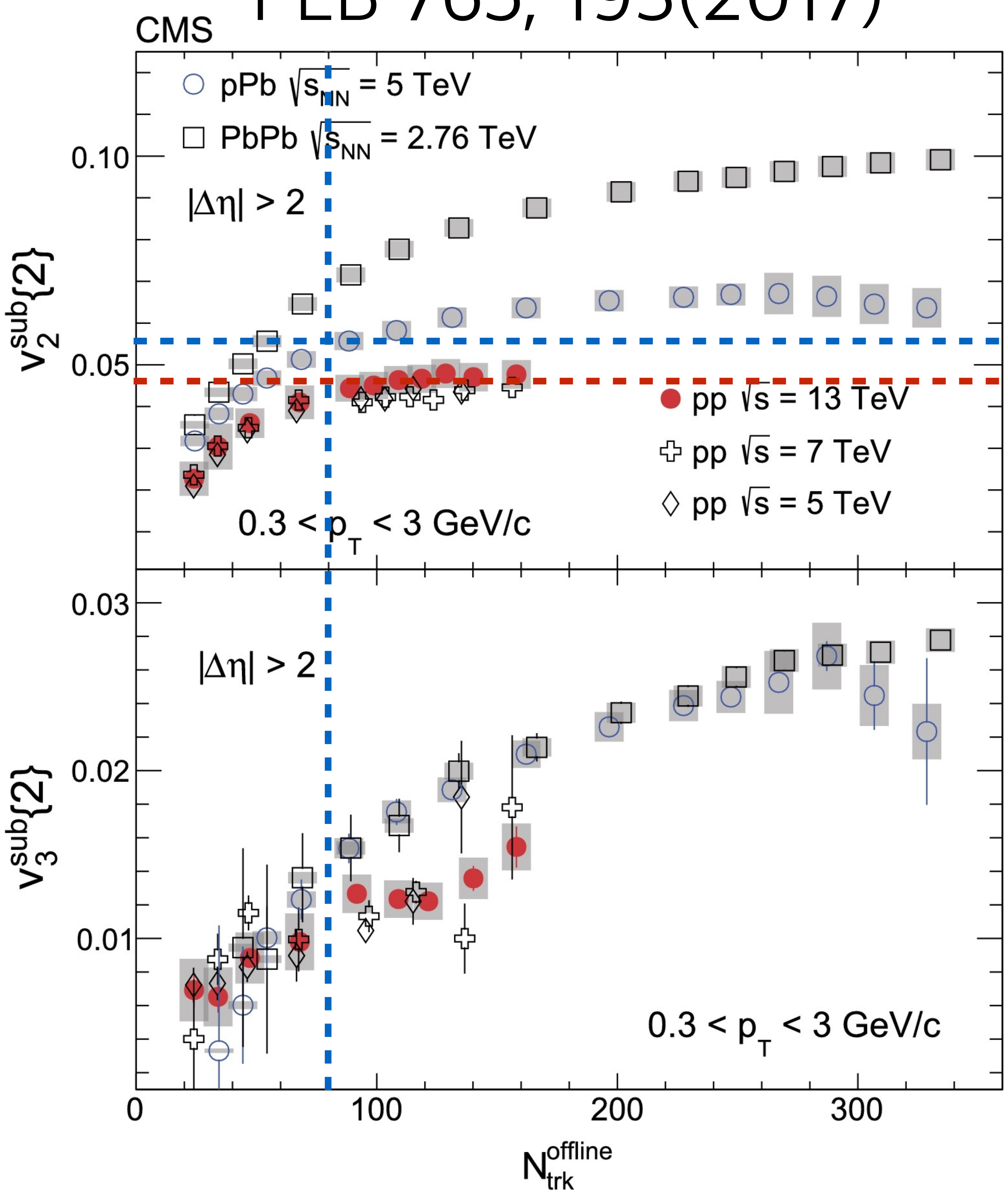
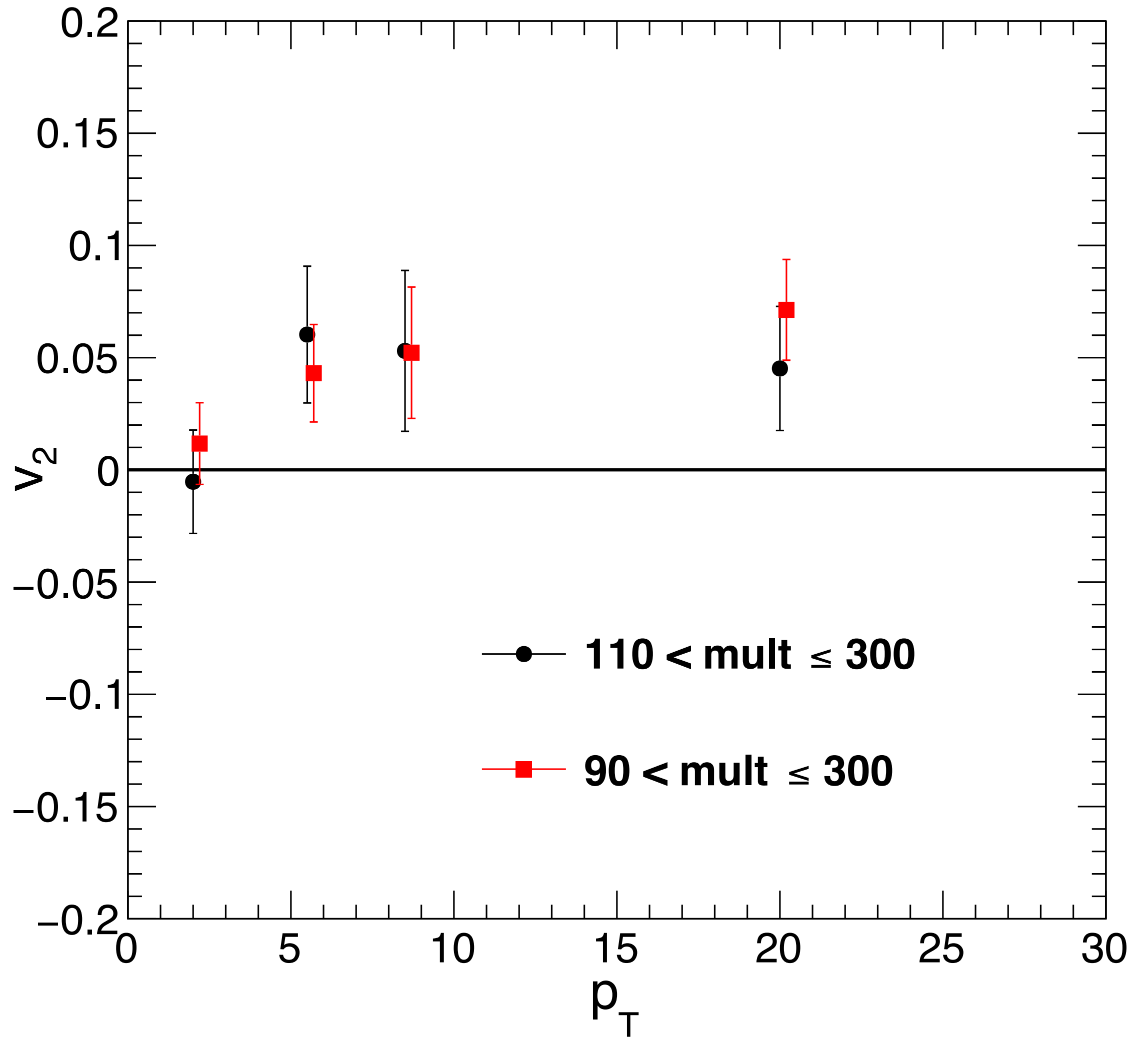
High-multiplicity

- What is high-multiplicity?
  - No clear definition
  - If there is heavy-ion like phenomena(i.e. ridge) at relatively high-multiplicity, it is high-multiplicity
- How about Υ case?
  - If v_2 is 0, can not define high-multiplicity
  - Should be defined with verified range in the previous analysis
  - Higher than 90 shows higher v_2 than pp

PLB 765, 193(2017)

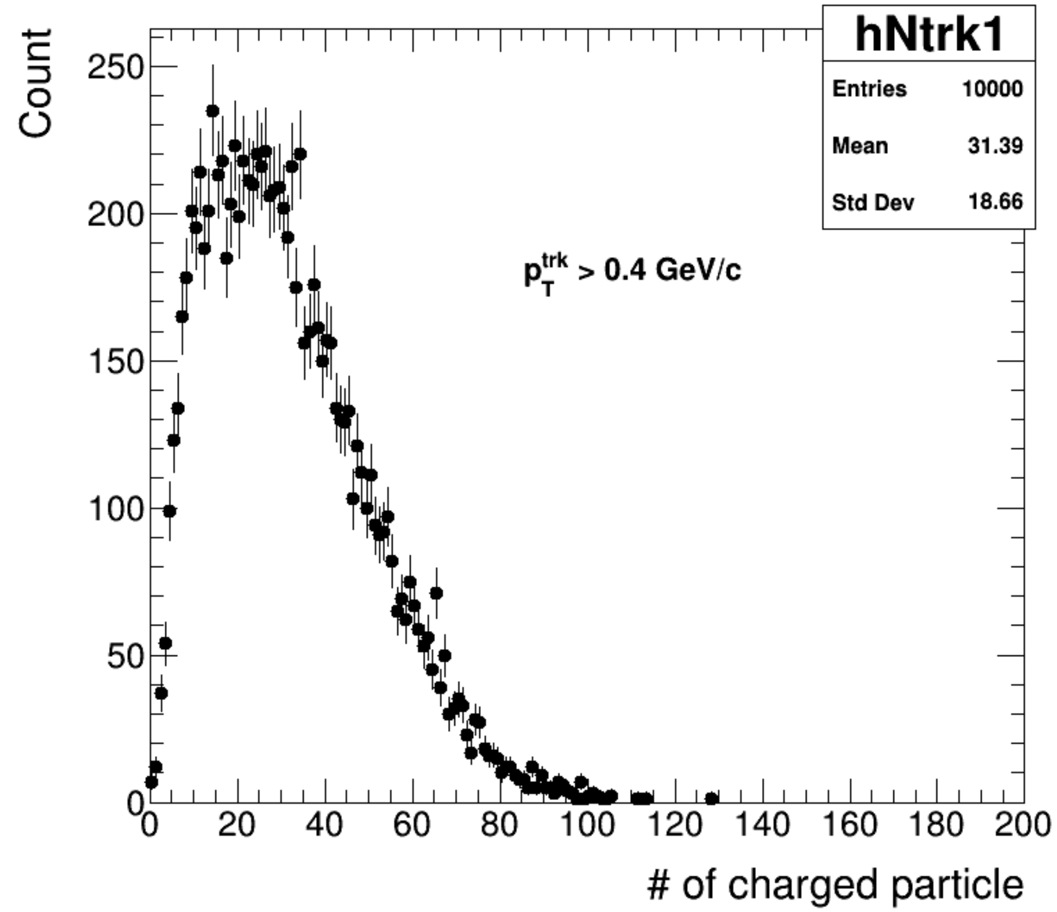


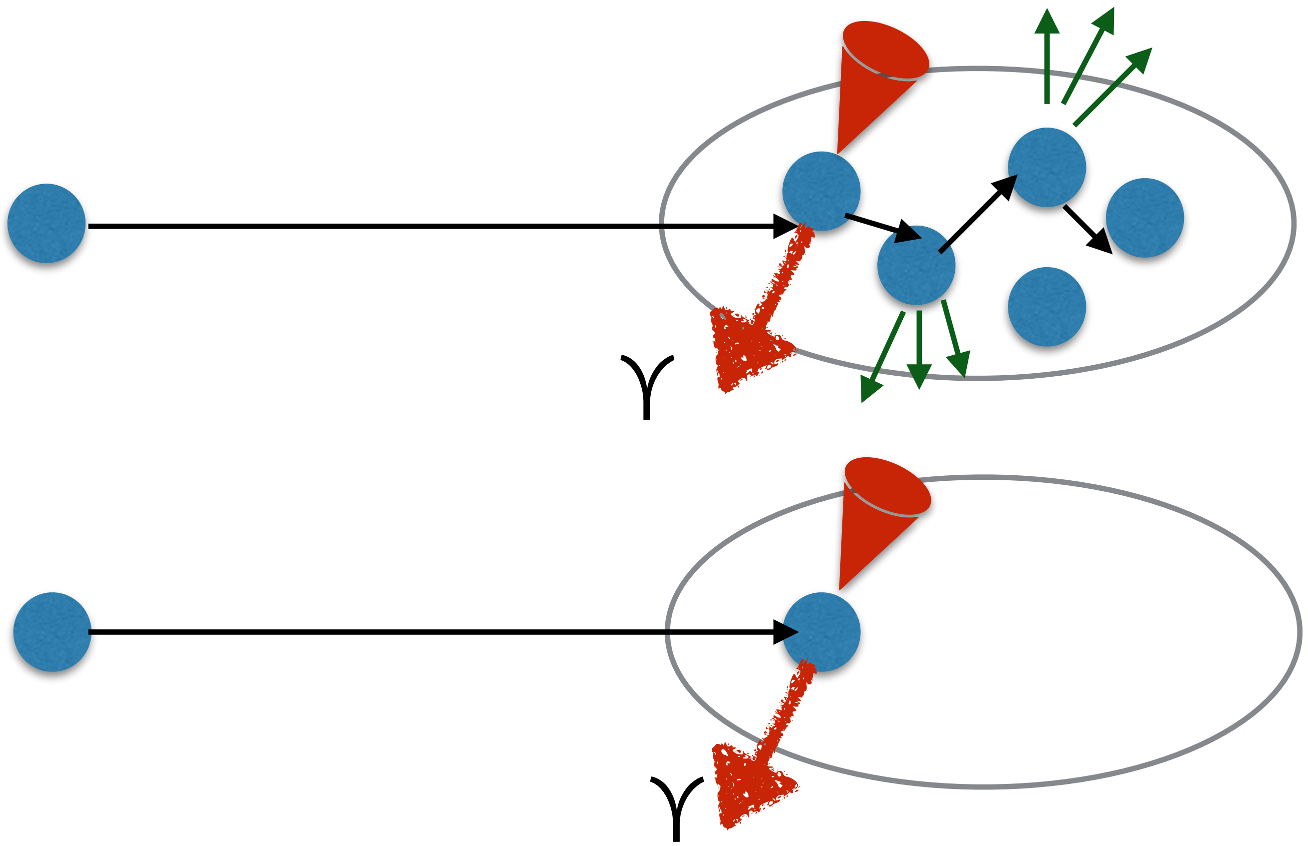
New high-multiplicity range



- Statistical uncertainty reduced with multiplicity 90~300
- Slight trend difference between two multiplicity range

Low multiplicity



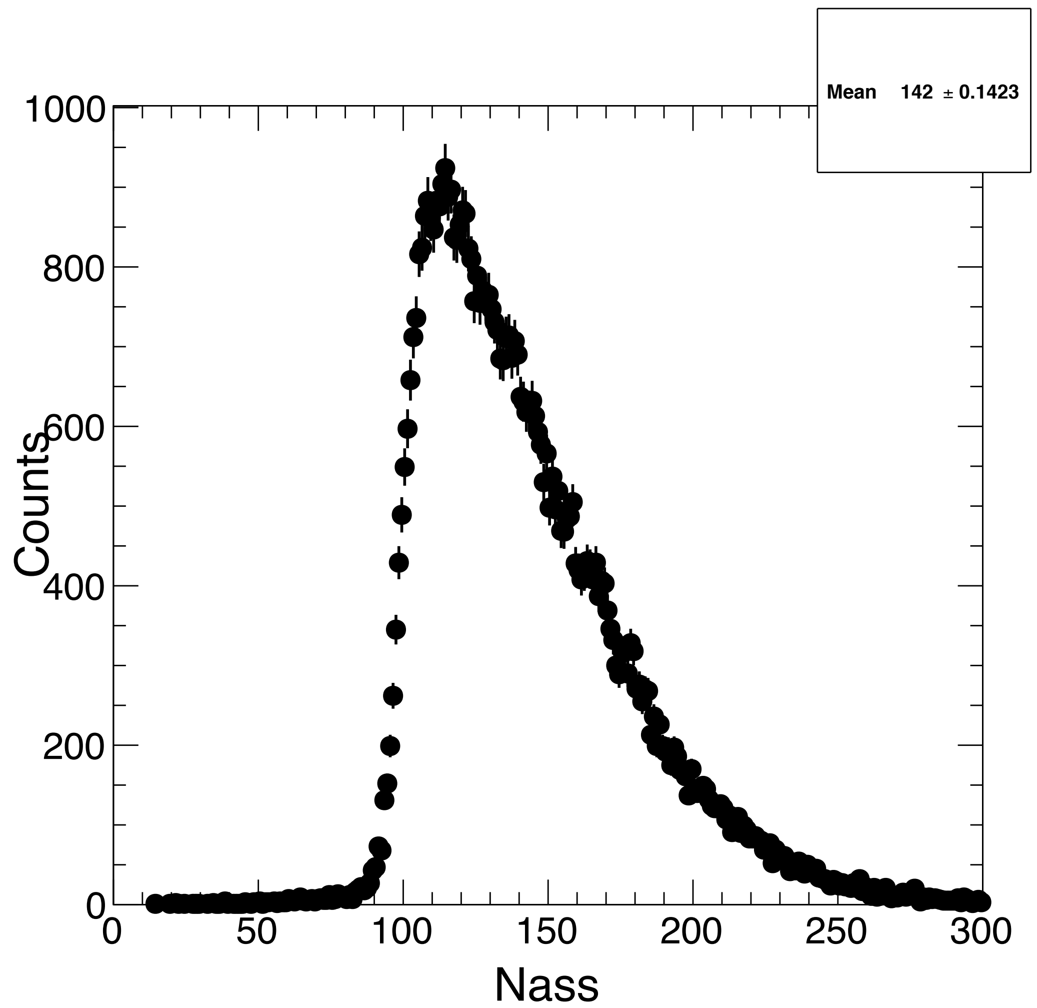


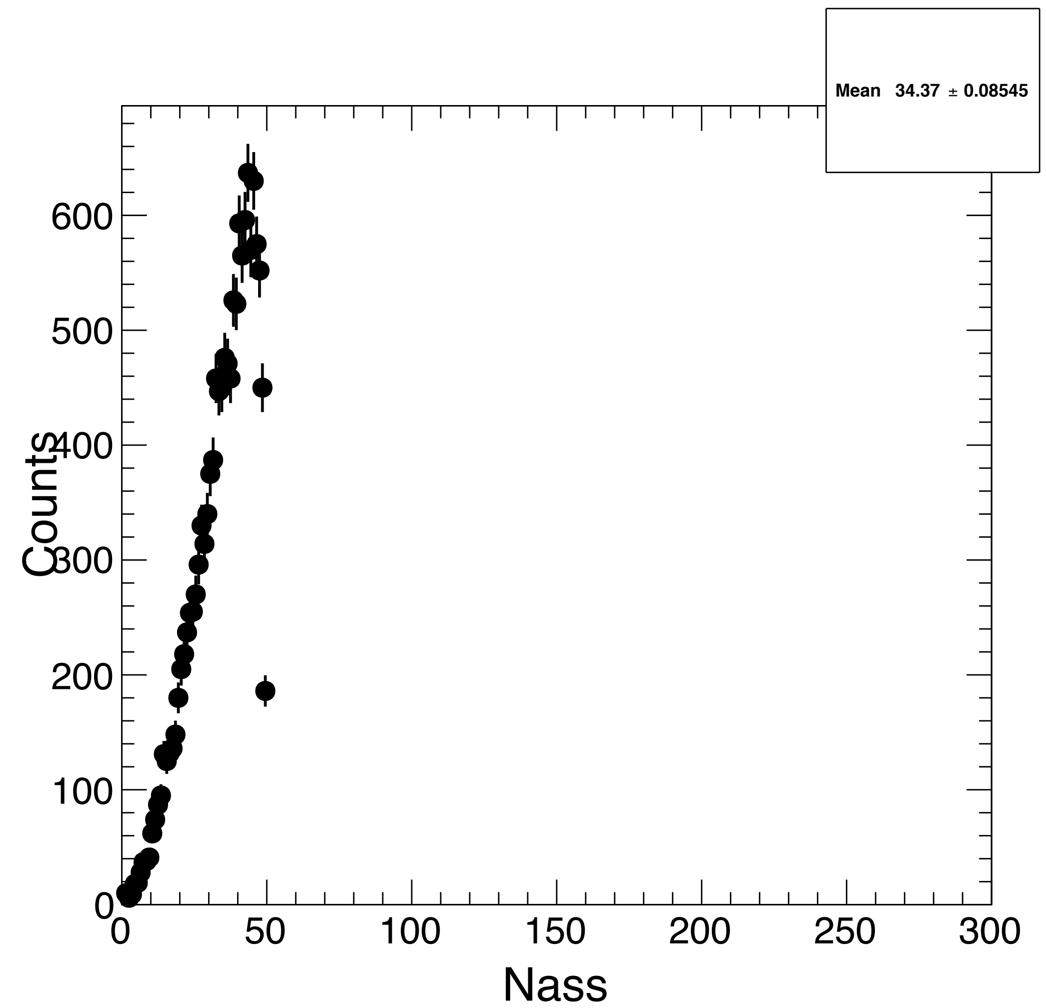
- Low-multiplicity range also need to retain enough ϒ
- Low-multiplicity subtraction is needed to estimate residual contribution from back-to-back jet correlations
- Ncoll == 1 is back-to-back jet correlation case
- Multiplicity 50 (31±18) is tentative multiplicity range

Low-multiplicity subtraction

- $v_2^{sub} = v_2(high) - v_2(low) \times \frac{N_{assoc}(low)}{N_{assoc}(high)} \times \frac{Y_{jet}(high)}{Y_{jet}(low)}$
- $Y_{jet}^{sig} = \frac{Y_{jet}^{peak} - (1-f)Y_{jet}^{bkg}}{f}$
- $Y_{jet} = Y_{jet}(|\Delta\eta| < 1) - Y_{jet}(|\Delta\eta| > 2)$
- Number of associator ratio and jet yield ratio are needed

Number of associator





- $v_2^{sub} = v_2(high) - v_2(low) \times \frac{N_{assoc}(low)}{N_{assoc}(high)} \times \frac{Y_{jet}(high)}{Y_{jet}(low)}$
- $Y_{jet}^{sig} = \frac{Y_{jet}^{peak} - (1-f)Y_{jet}^{bkg}}{f}$
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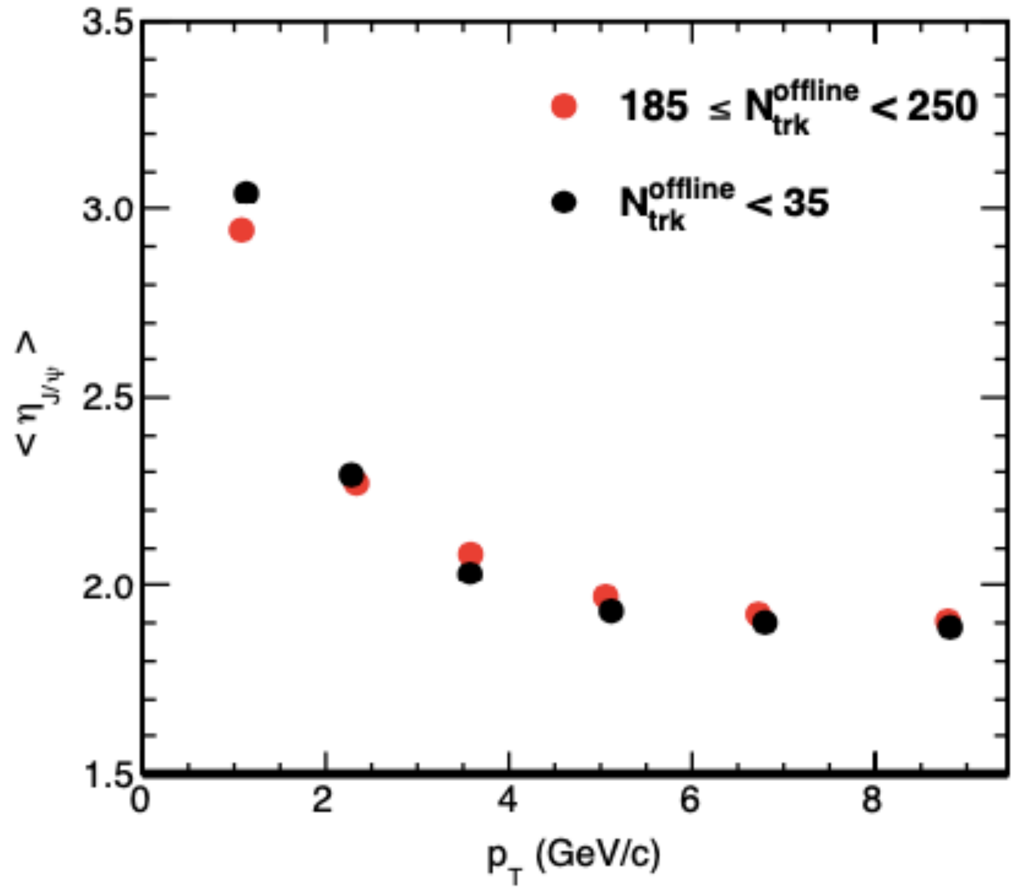
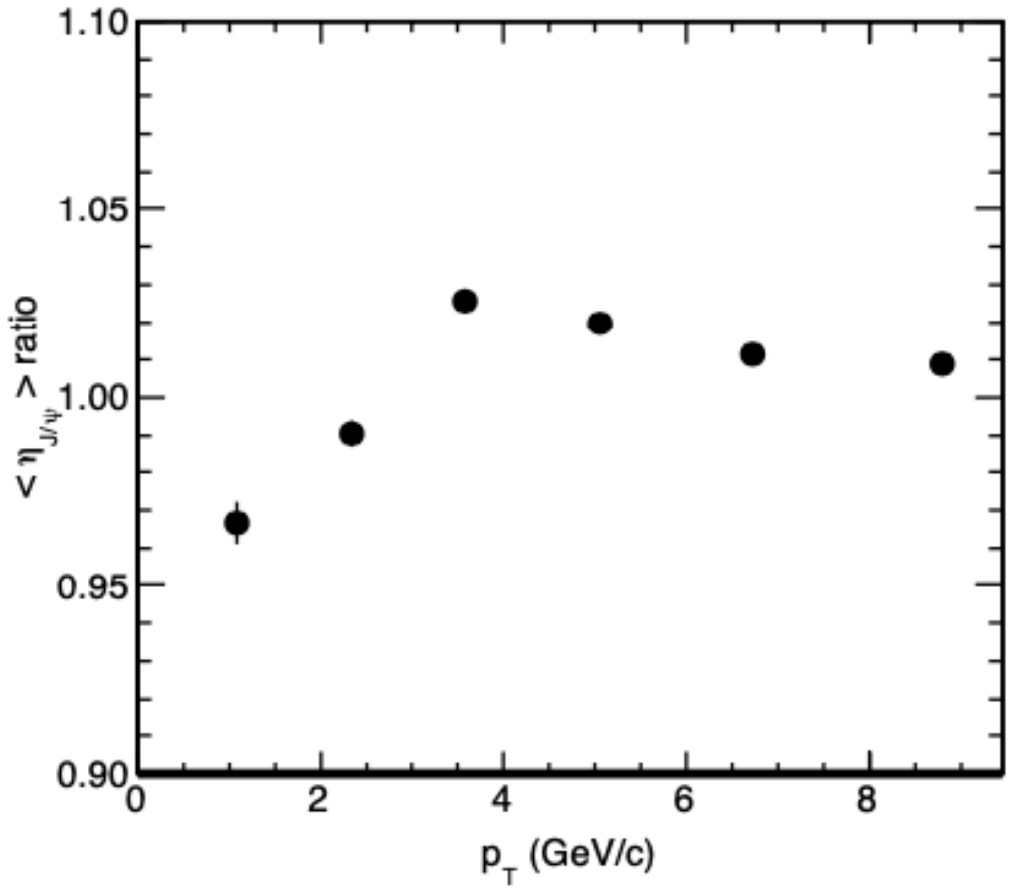
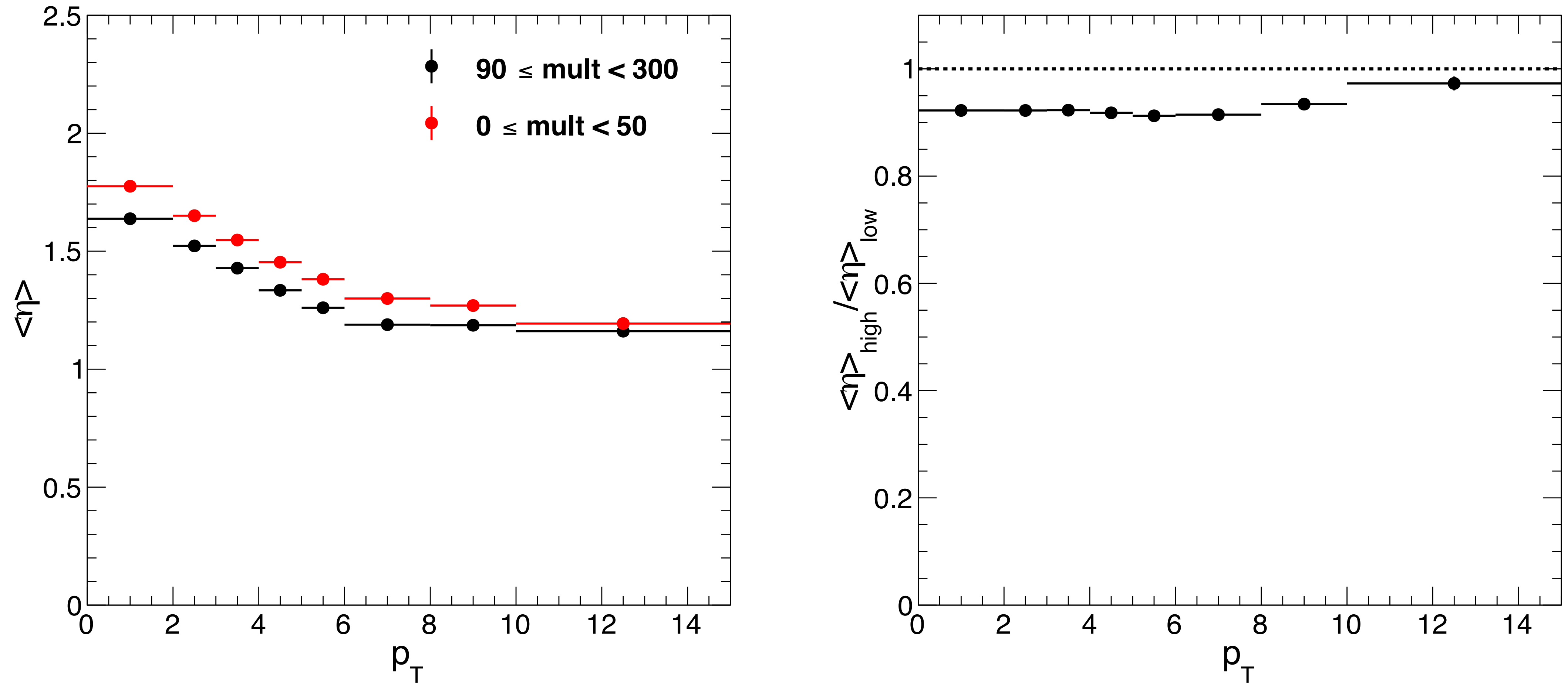
mean η of J/ψ





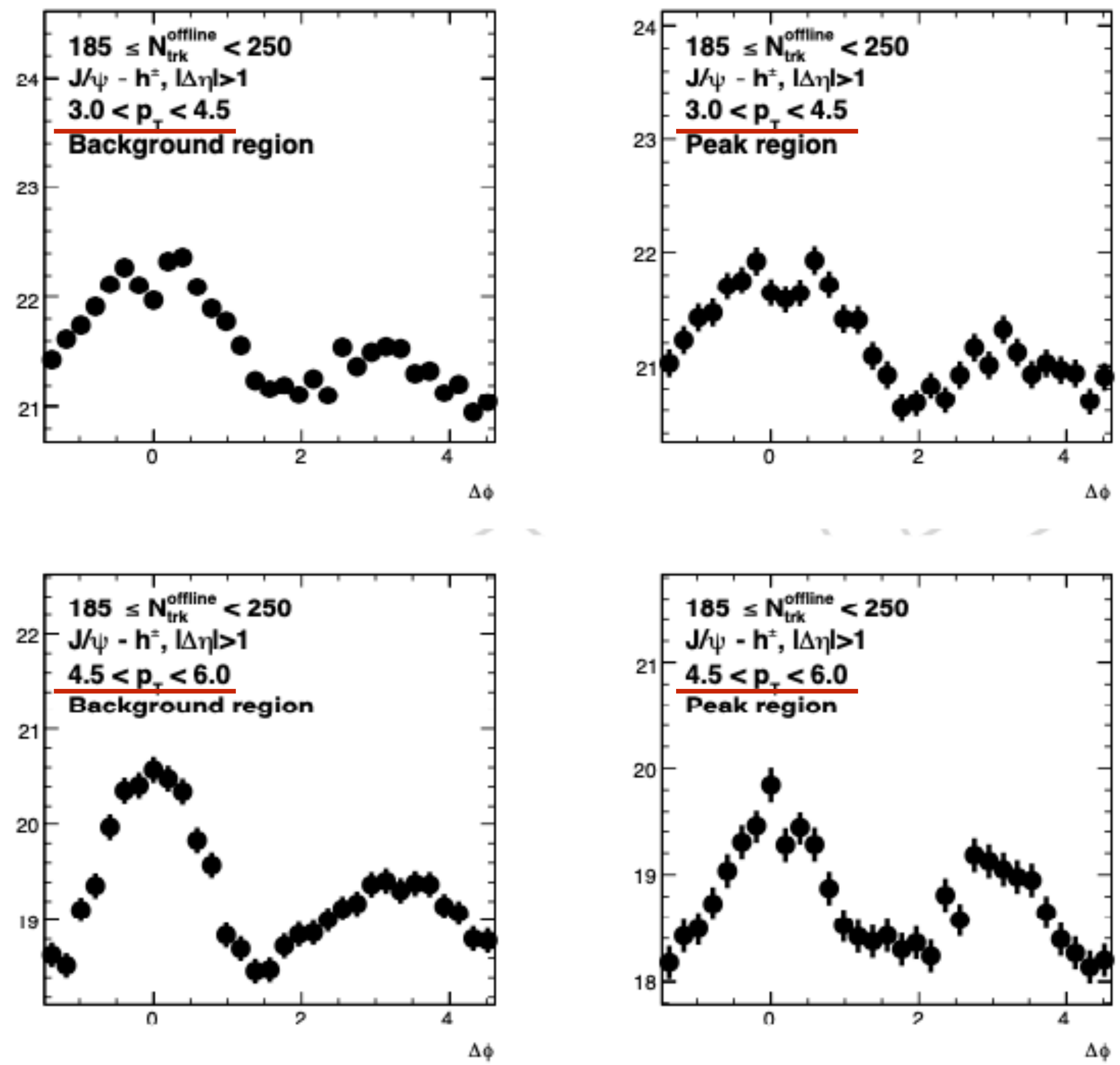
- Mean η distribution and ratio of J/ψ
- No strong multiplicity dependence has been observed for the entire p_T region measured. Thus, when taking the ratio of jet yield, the effect from truncation are largely cancelled

mean η of ϒ



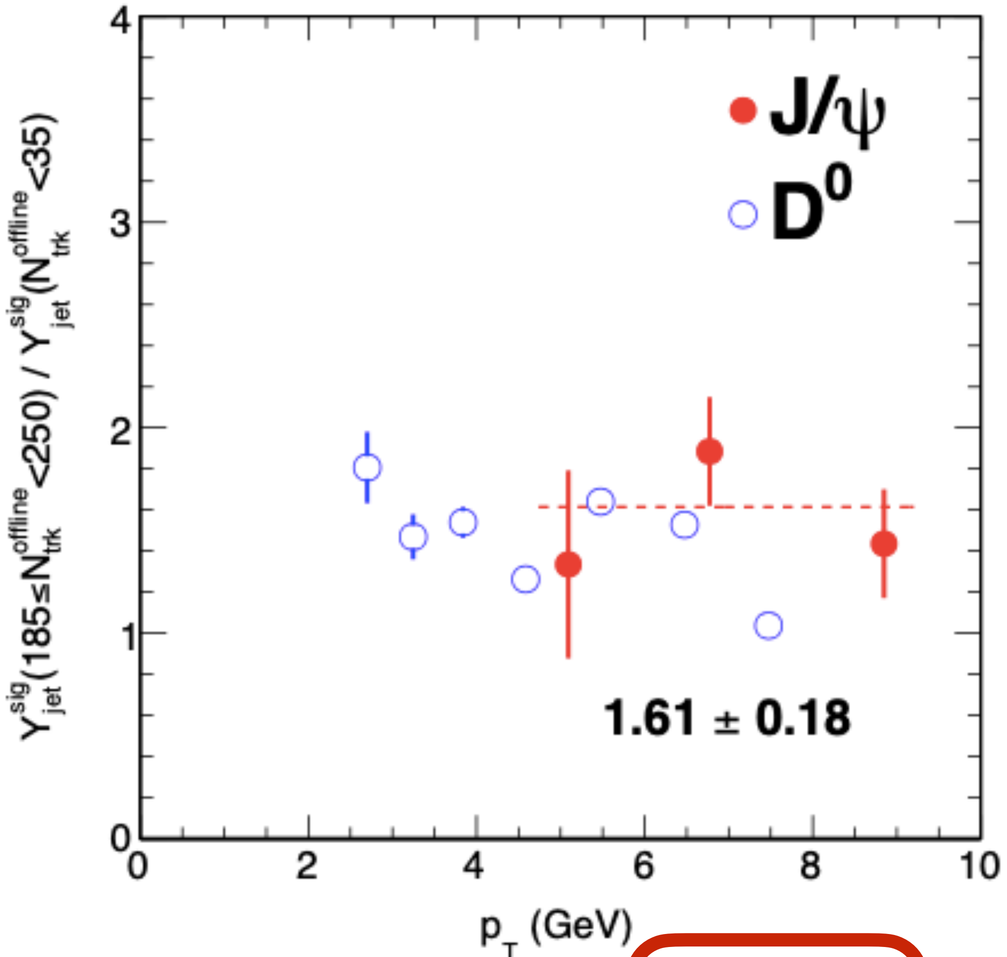
- Mean value of histogram is used as <η>
- Lower than J/ψ because J/ψ used only forward events
- Trend is different from J/ψ but ratio between high and low shows no strong multiplicity dependence as J/ψ
- ϒ case also can say that the effect from truncation are largely cancelled

J/ψ p_T range



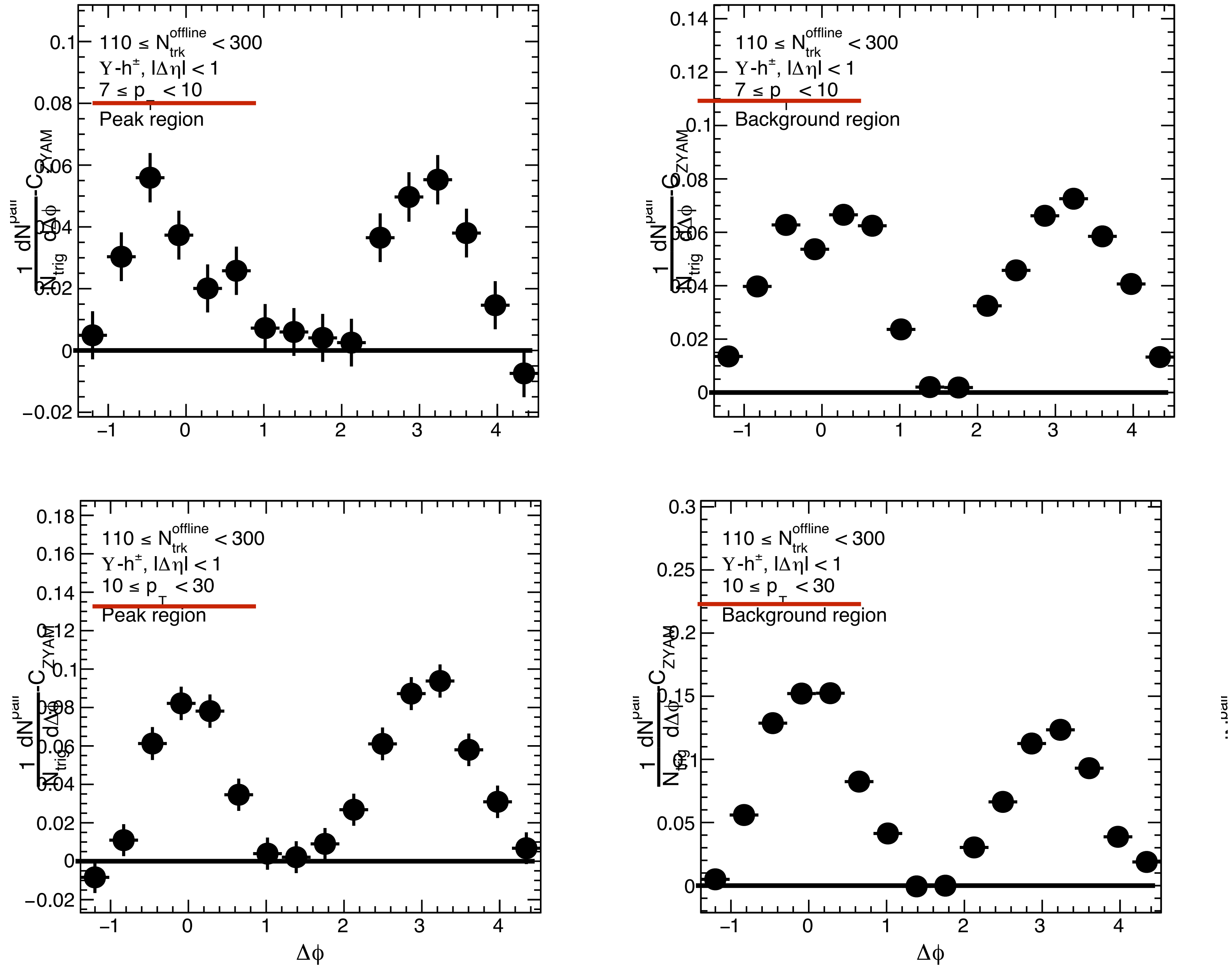
- J/ψ choose $p_T > 4.5$ to use regions which is not truncated
- 3 bin for J/ψ case(same binning with v_2)

Yield ratio(J/ψ)



- $v_2^{sub} = v_2(high) - v_2(low) \times \frac{N_{assoc}(low)}{N_{assoc}(high)} \times \frac{Y_{jet}(high)}{Y_{jet}(low)}$
- $Y_{jet}^{sig} = \frac{Y_{jet}^{peak} - (1-f)Y_{jet}^{bkg}}{f}$
- $Y_{jet} = Y_{jet}(|\Delta\eta| < 1) - Y_{jet}(|\Delta\eta| > 2)$

Υ p_T range



- Just one bin for Υ
- Different binning with v_2 is needed [9, 10, 12, 15]

Yield ratio(Υ)

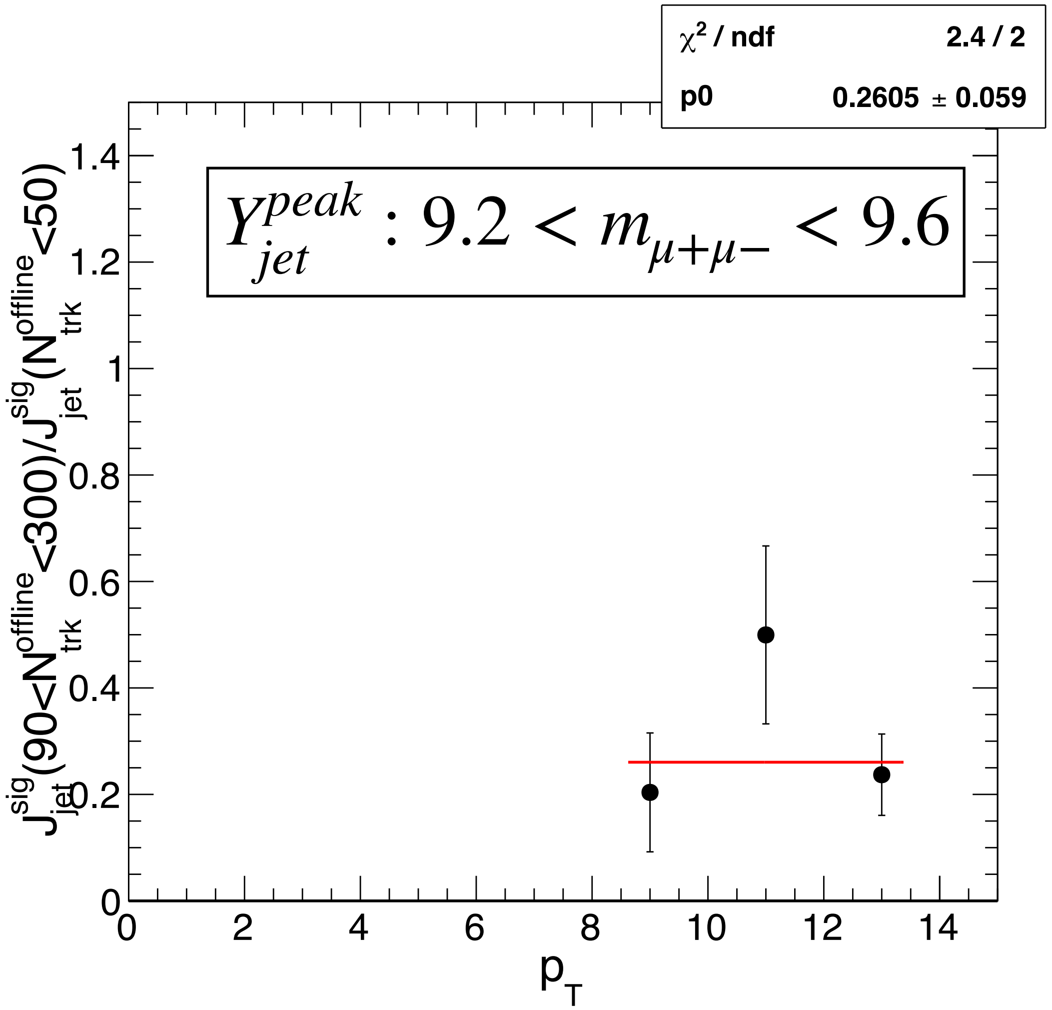
- Peak region is narrower than whole Υ(1S) region due to Υ(2S) contamination
- To extract jet yield of signal, f at the Υ(1S) PDG mass is used
- Ratio is 0.4 (110 < mult. < 300) while J/ψ is opposite
- Yield at low-multiplicity is higher than high-multiplicity

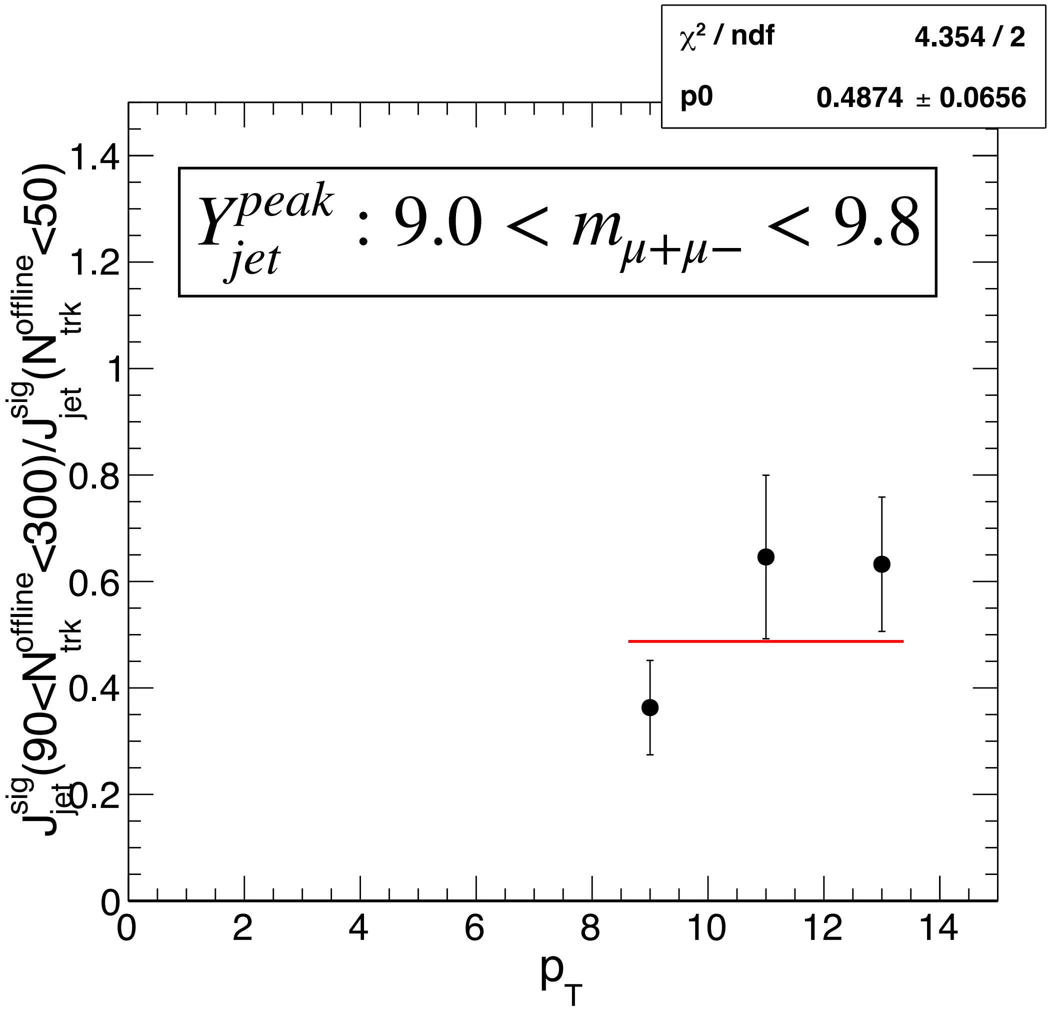
- $v_2^{sub} = v_2(high) - v_2(low) \times \frac{N_{assoc}(low)}{N_{assoc}(high)} \times \frac{Y_{jet}(high)}{Y_{jet}(low)}$
- $Y_{jet}^{sig} = \frac{Y_{jet}^{peak} - (1-f)Y_{jet}^{bkg}}{f}$
- $Y_{jet} = Y_{jet}(|\Delta\eta| < 1) - Y_{jet}(|\Delta\eta| > 2)$

$Y_{jet}^{peak} : 9.2 < m_{\mu+\mu-} < 9.6$

$Y_{jet}^{bkg} : 8 < m_{\mu+\mu-} < 9,\ 12 < m_{\mu+\mu-} < 14$

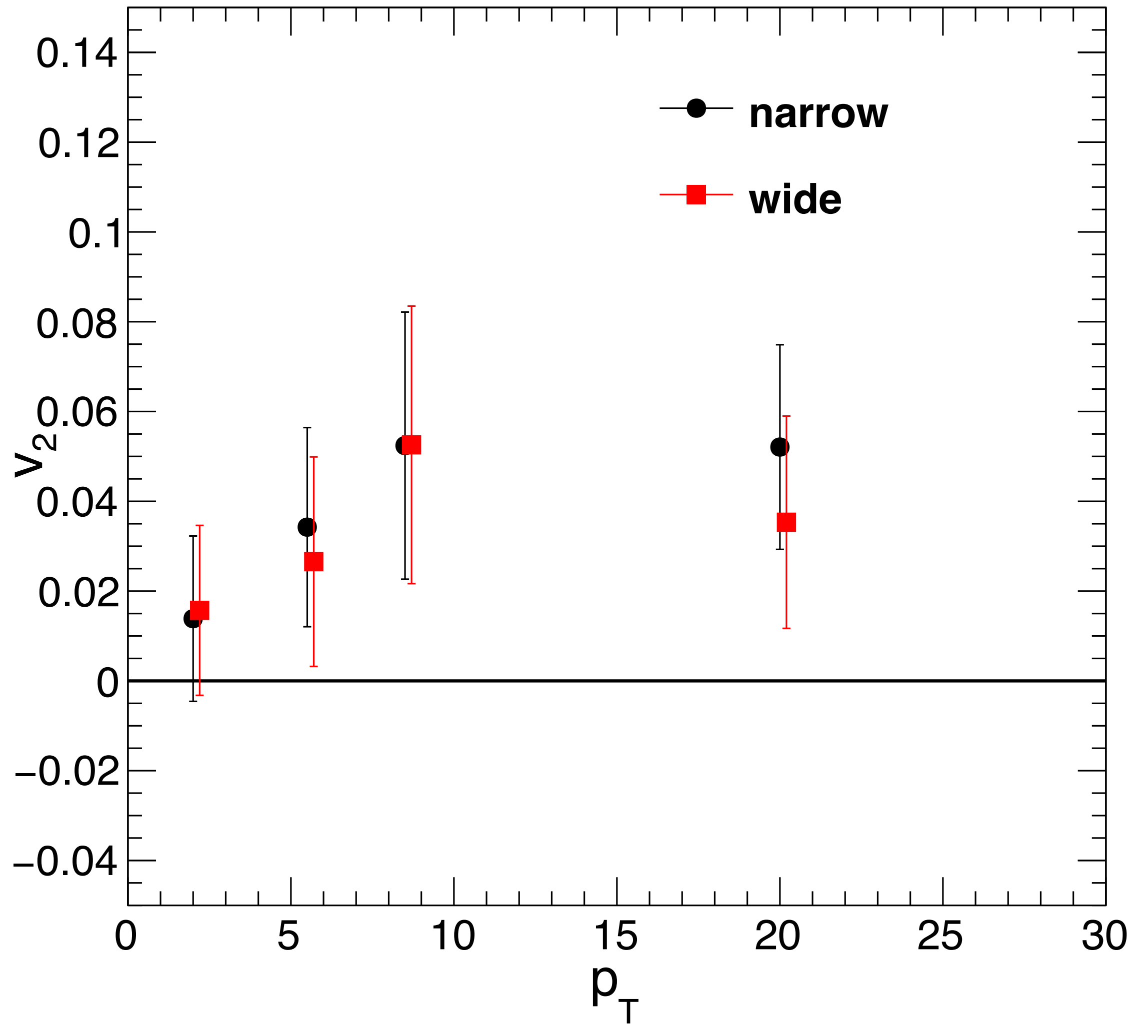
Yield ratio(Υ)





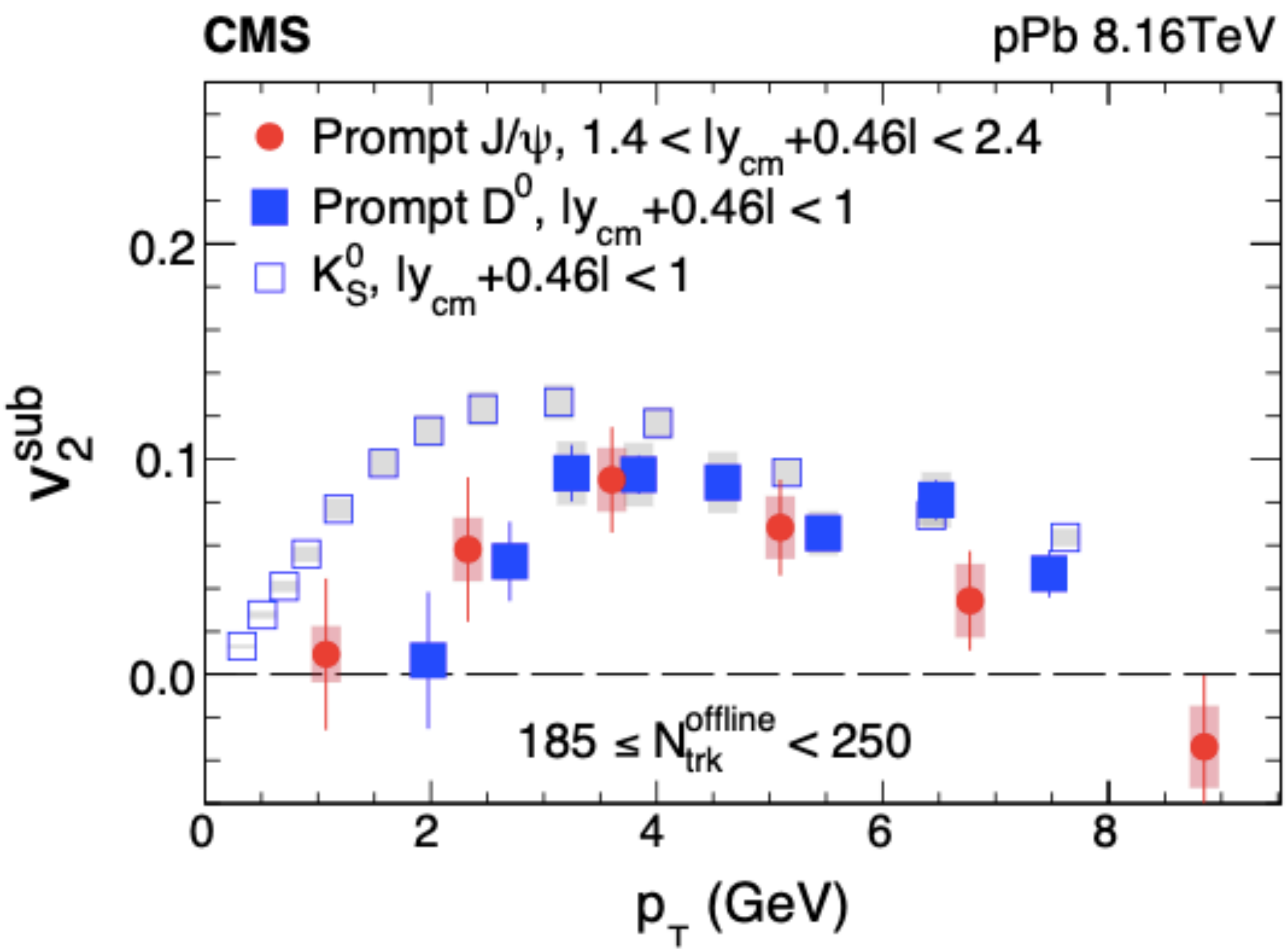
- $$Y_{jet}^{sig} = \frac{Y_{jet}^{peak} - (1-f)Y_{jet}^{bkg}}{f}$$
- Jet yield ratio is different for peak region range definition
- Need to check integrated signal fraction for wide range

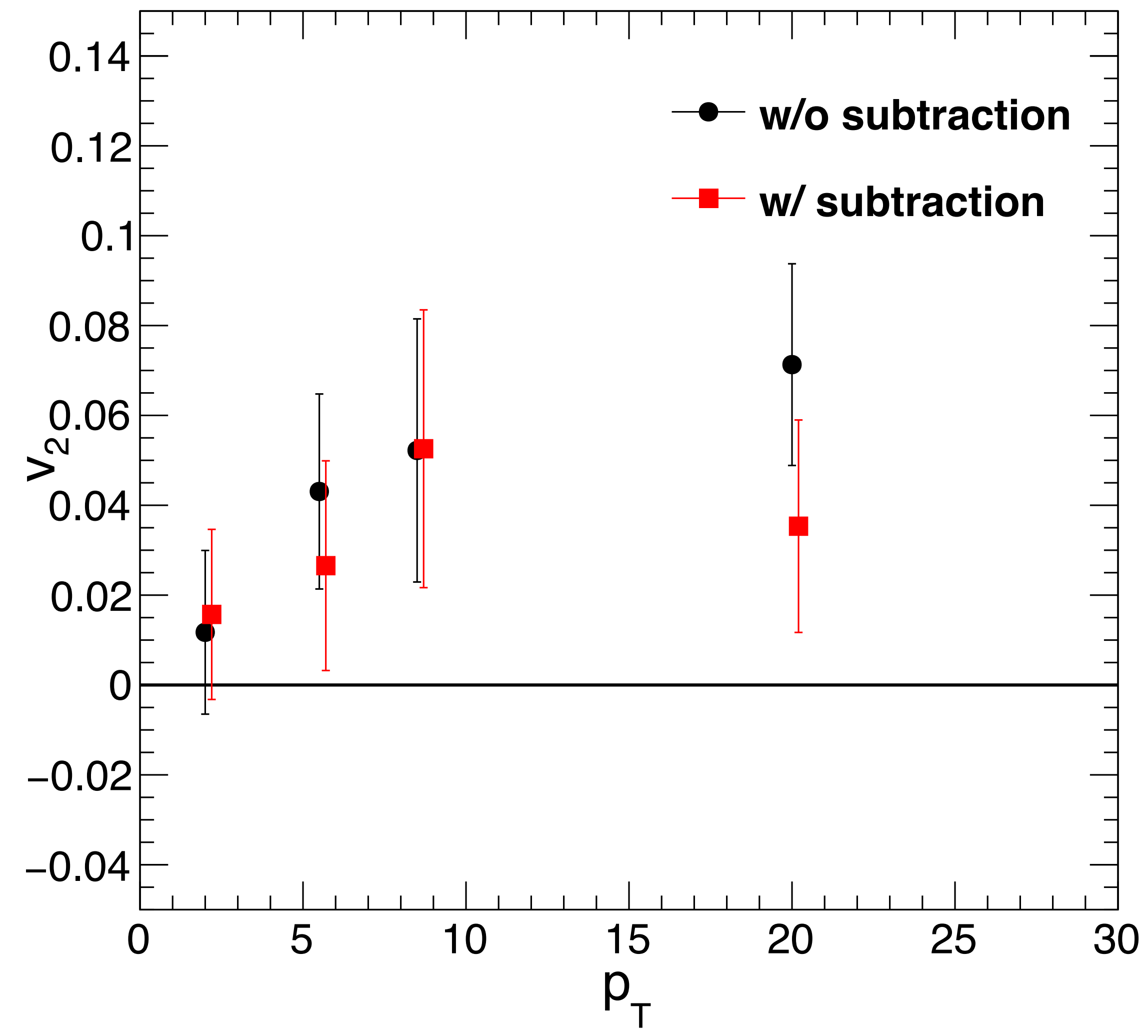
Low-multiplicity subtraction



- Effect of peak region width increases along p_T

Comparison of high, sub





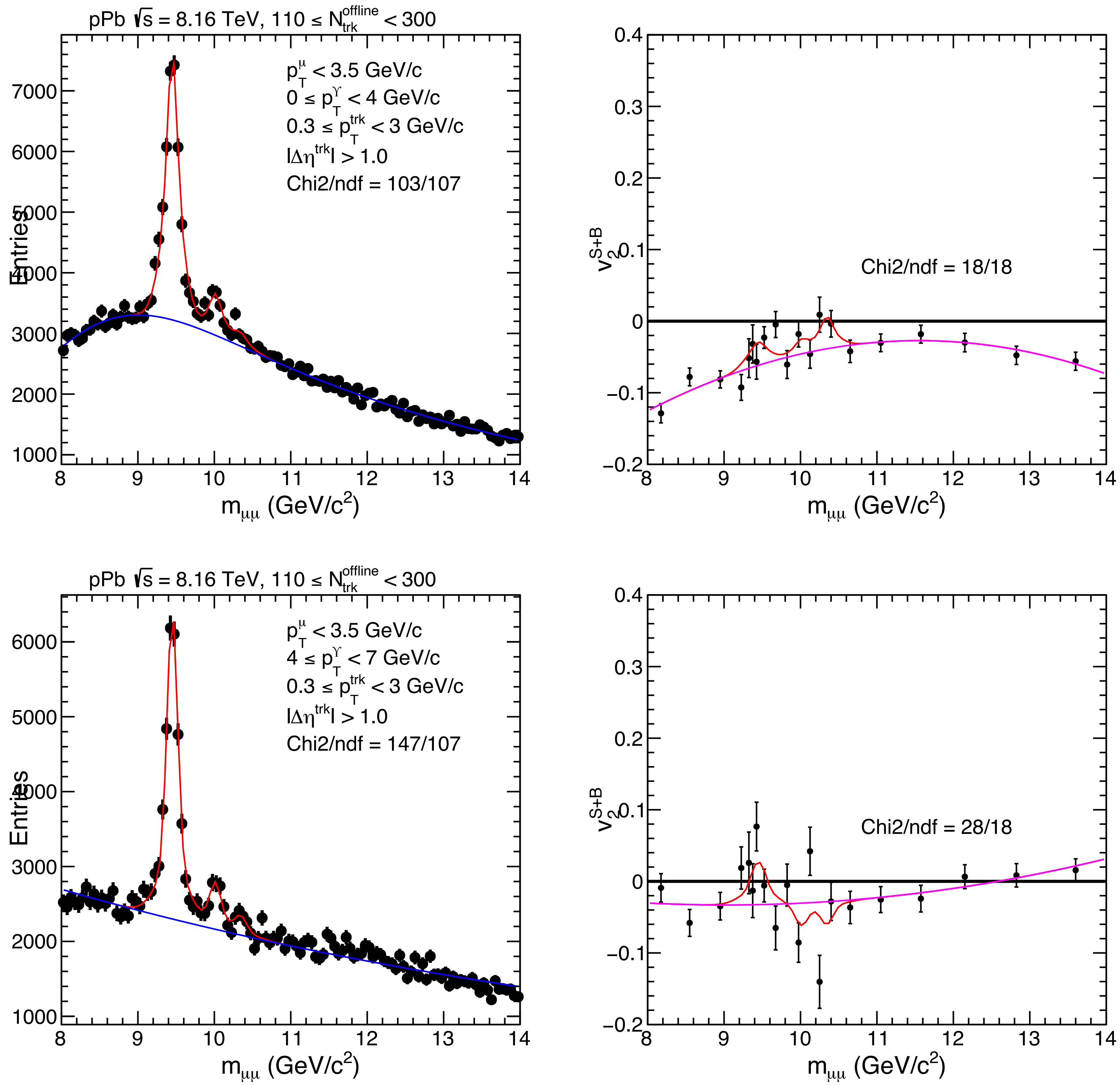
- Considering systematics mean points touch 0 after subtraction while J/ψ is 0.1

Summary

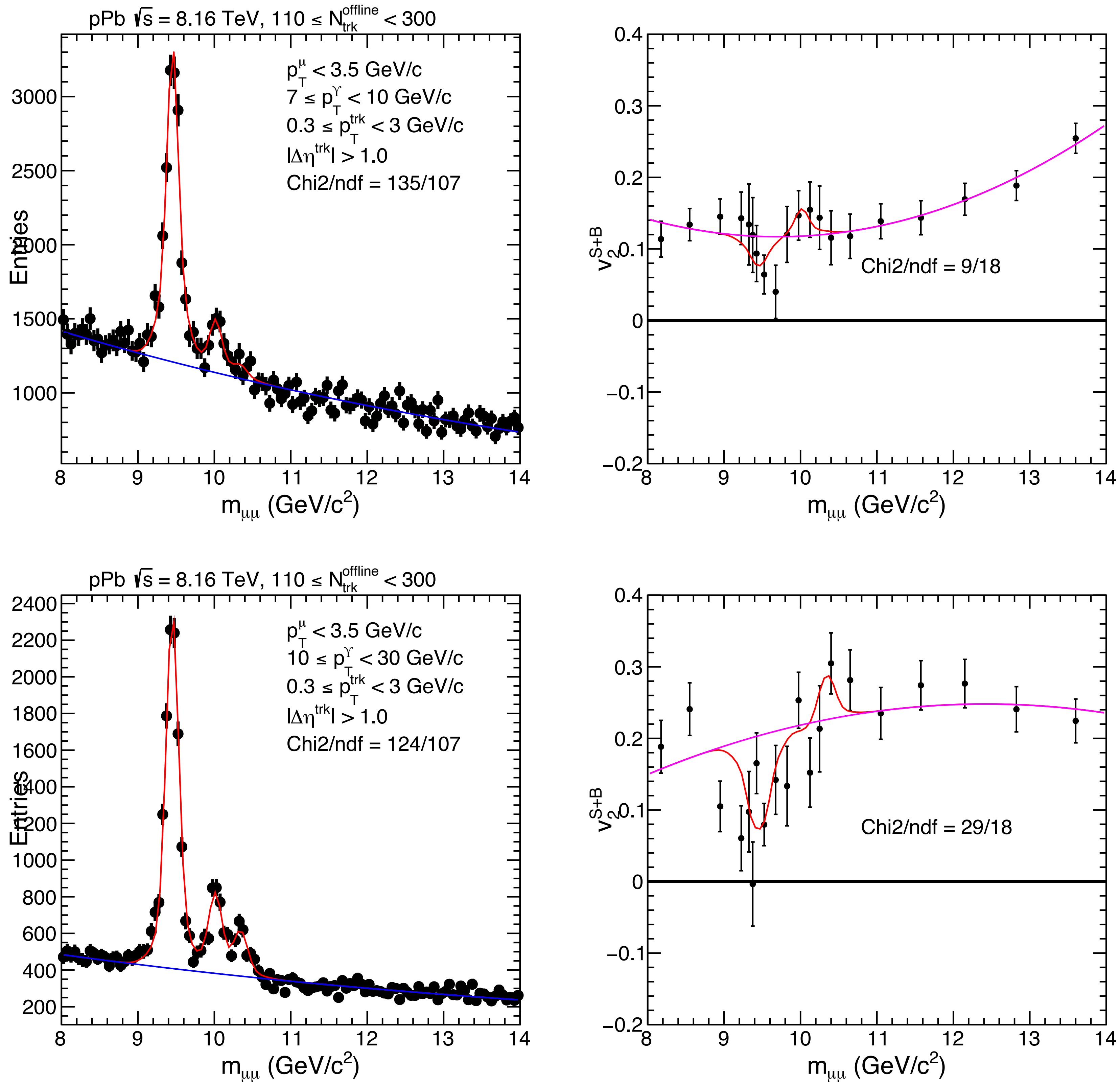
- High-multiplicity range extended to 90
  - - Large charged hadron v_2 compared to saturated pp charged hadron v_2
- Components of low-multiplicity subtractions are almost ready
- 1. Low-multiplicity v2: need to define range with MC
- 2. Number of associator ratio: ready
- 3. Jet yield ratio: tendency is different with other particle (J/ψ, D^0)
- Low-multiplicity subtracted result touches 0

Back up

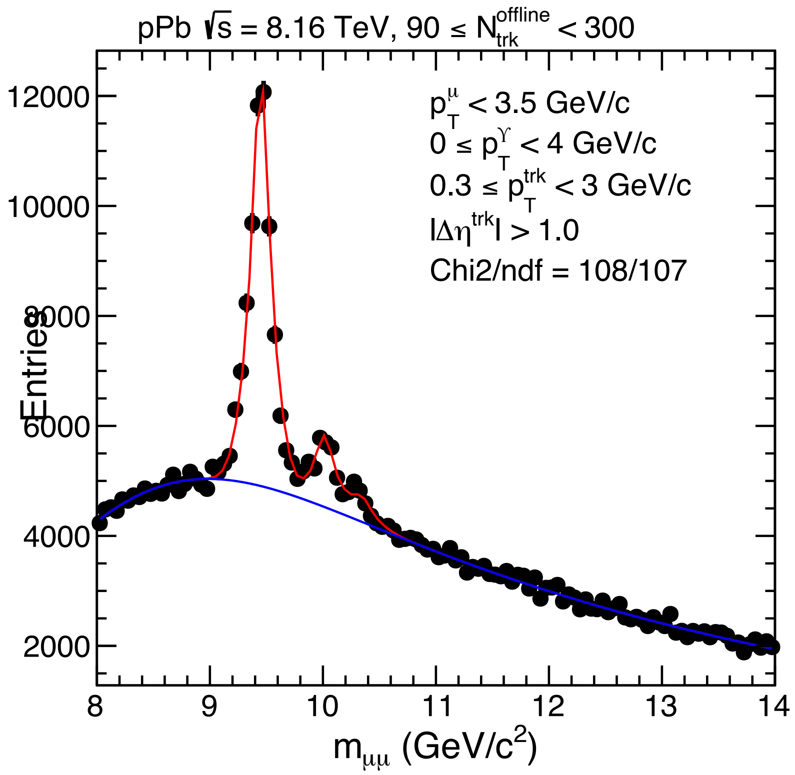
Simultaneous fitting 110 < mult. < 300

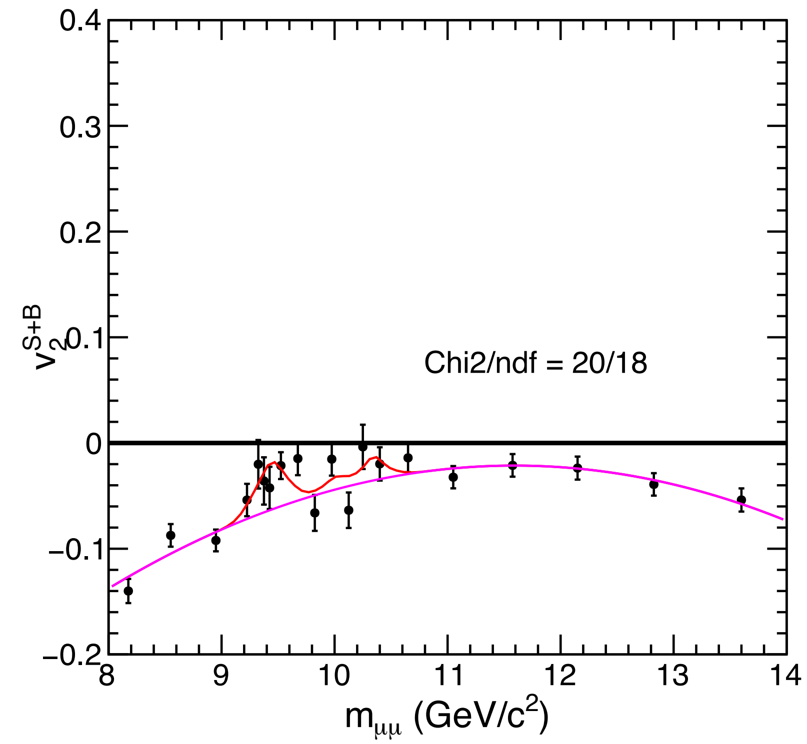


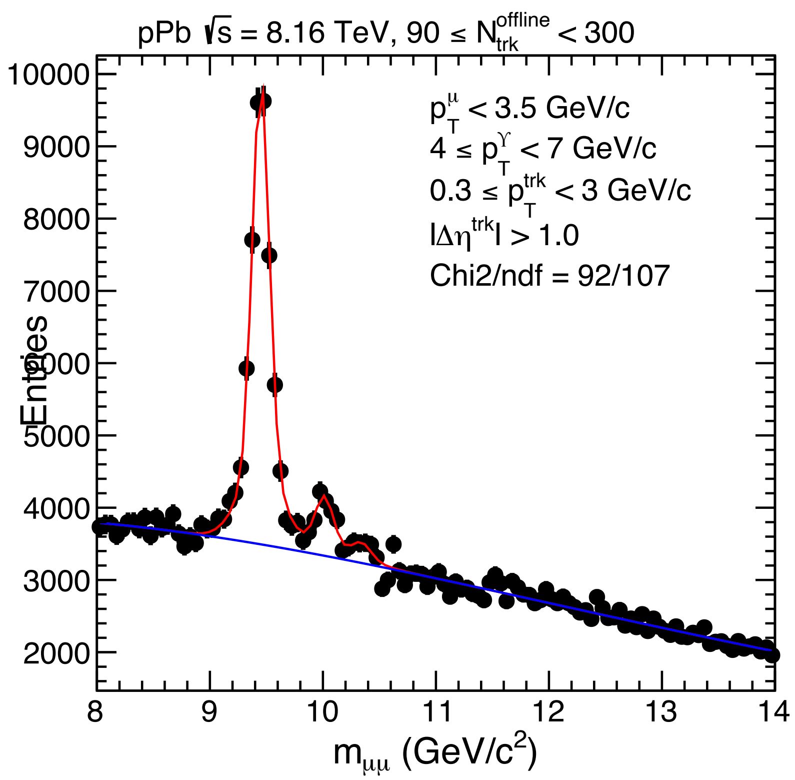
Simultaneous fitting 110 < mult. < 300

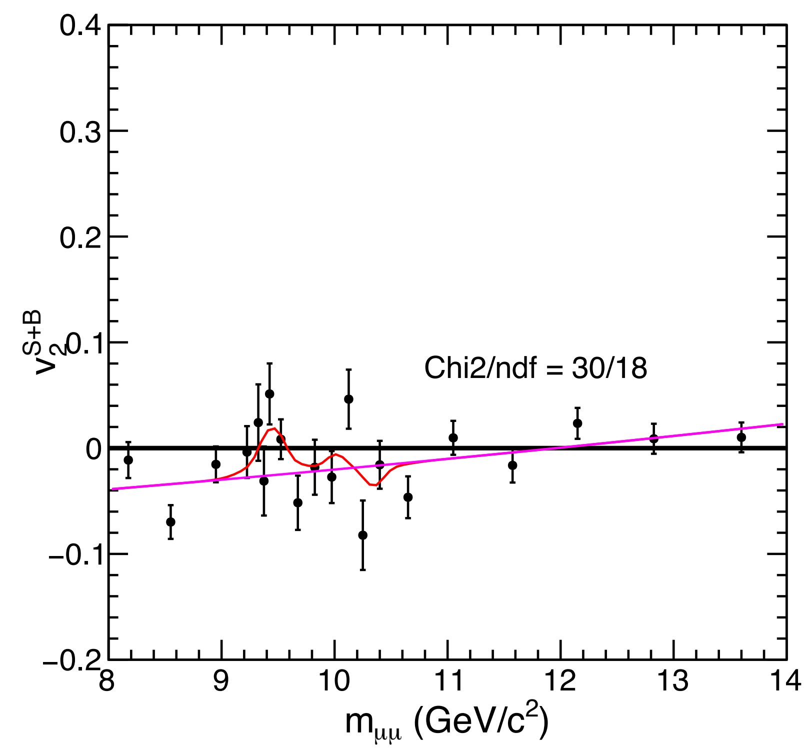


Simultaneous fitting 90 < mult. < 300

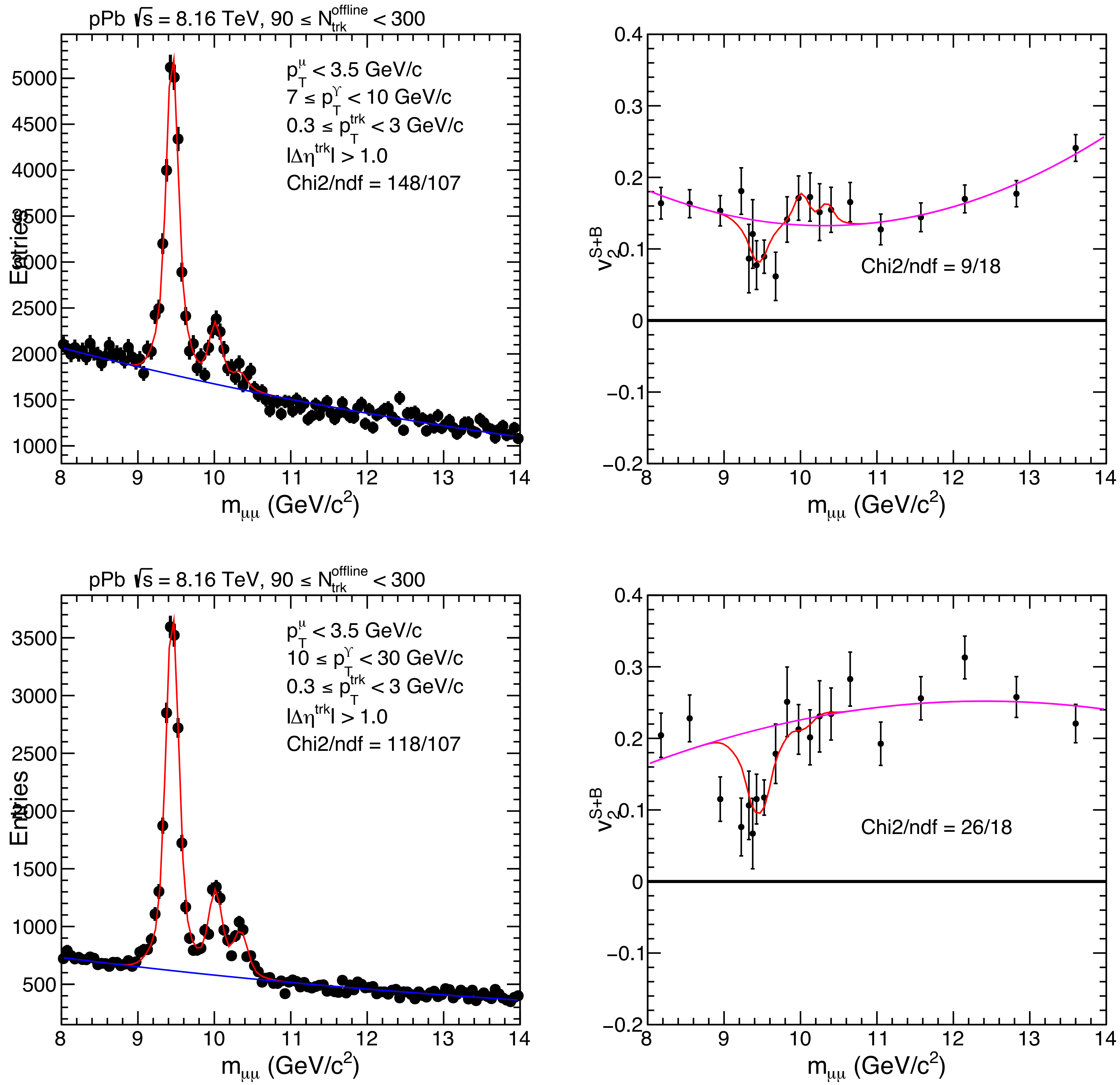




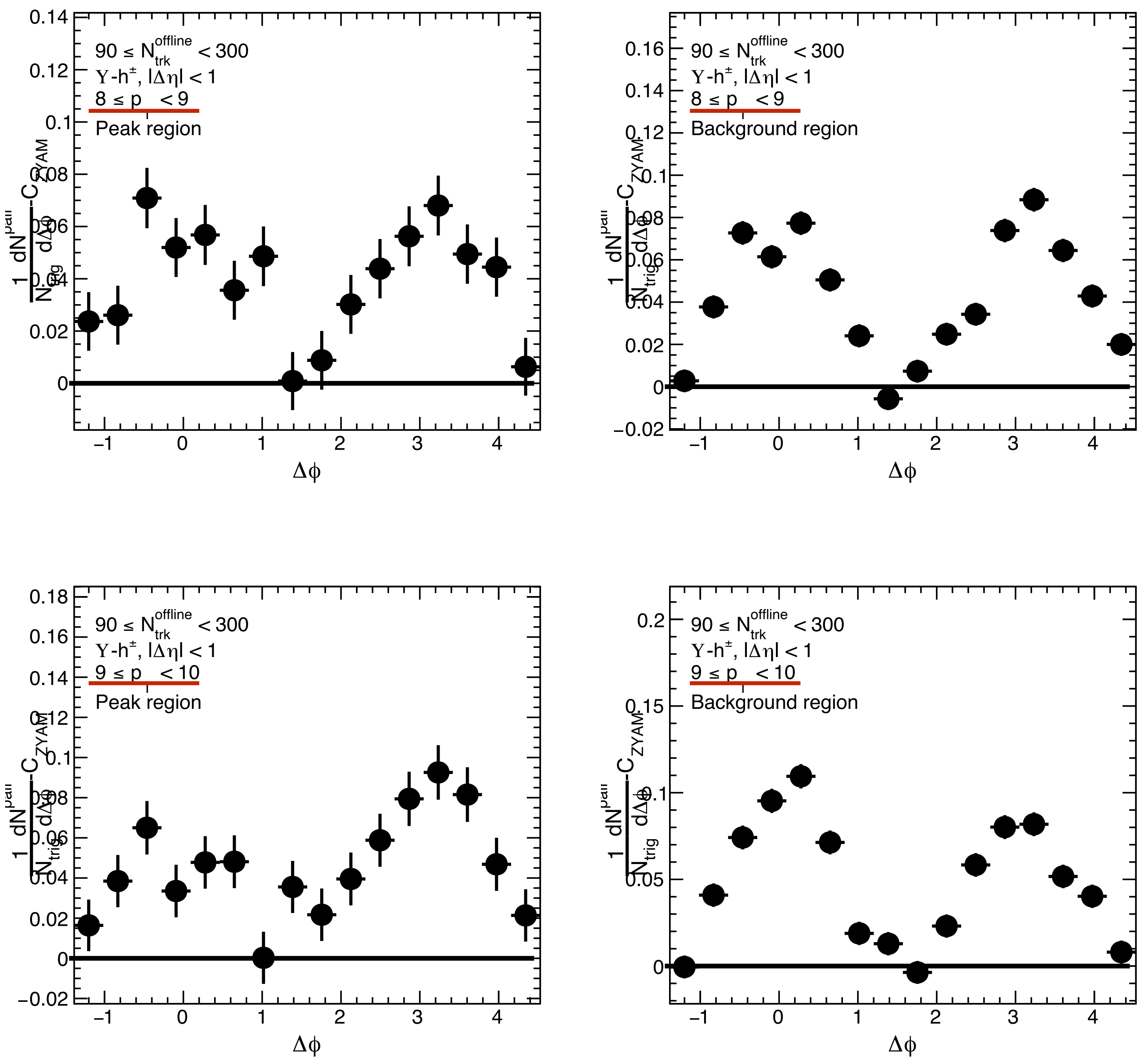




Simultaneous fitting 90 < mult. < 300



90 < mult. < 300 (9.2 < m < 9.6)



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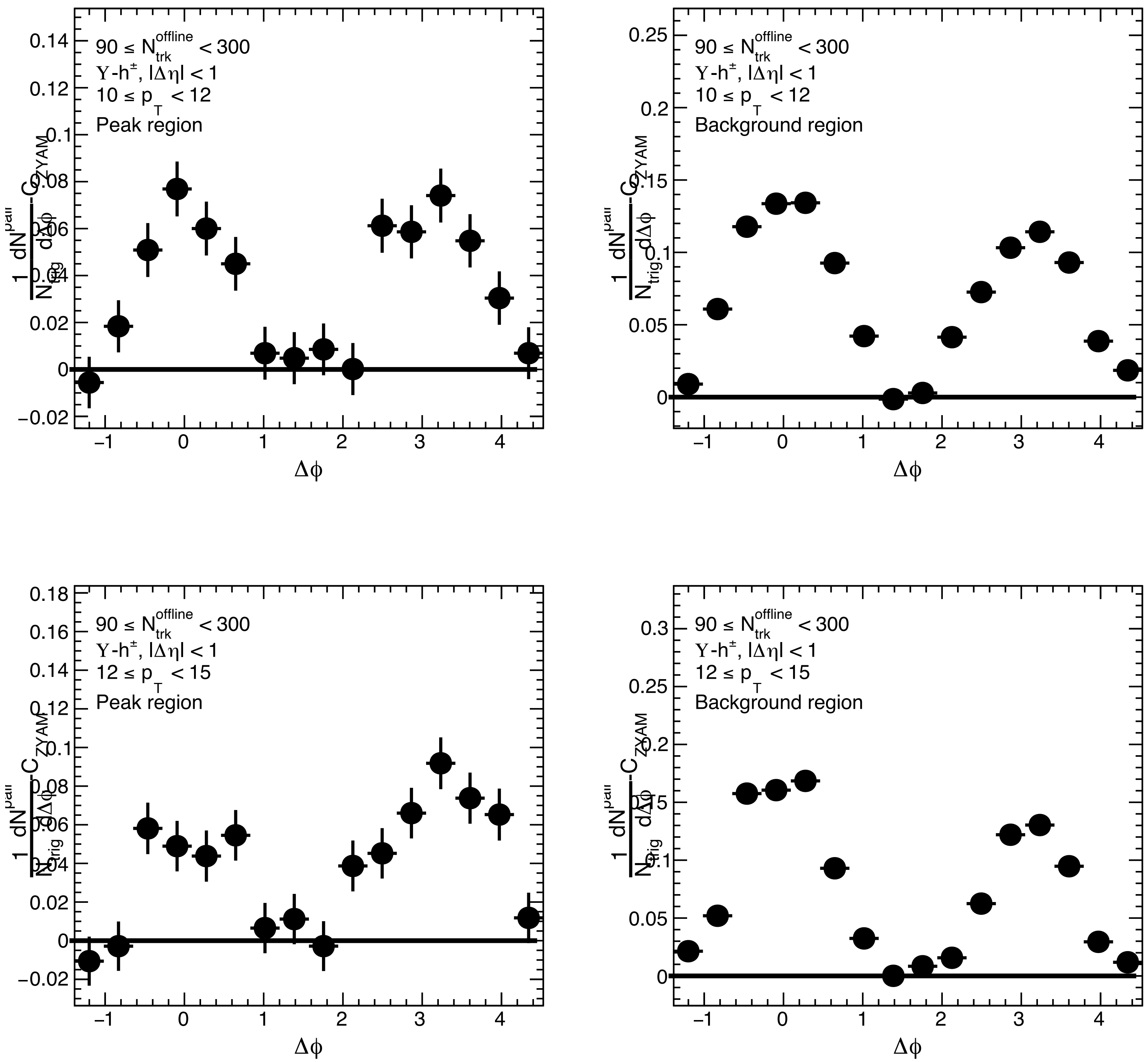
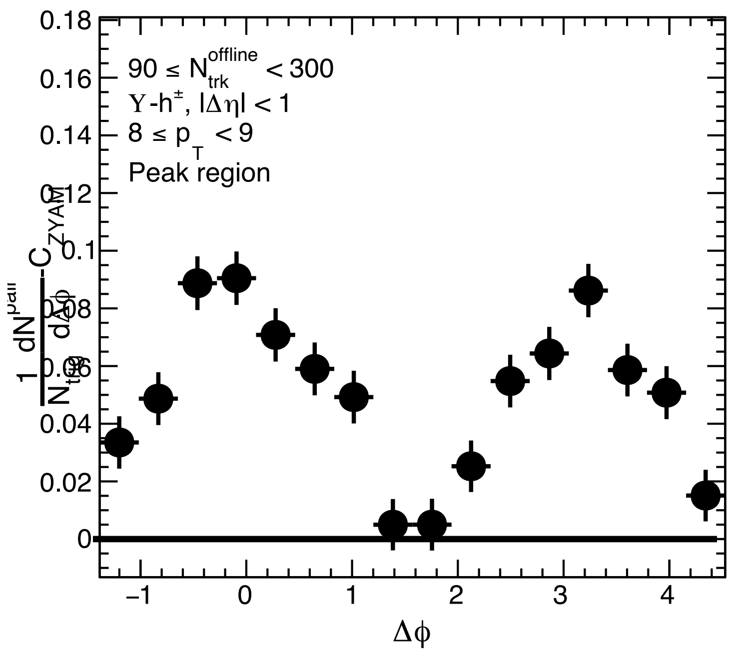
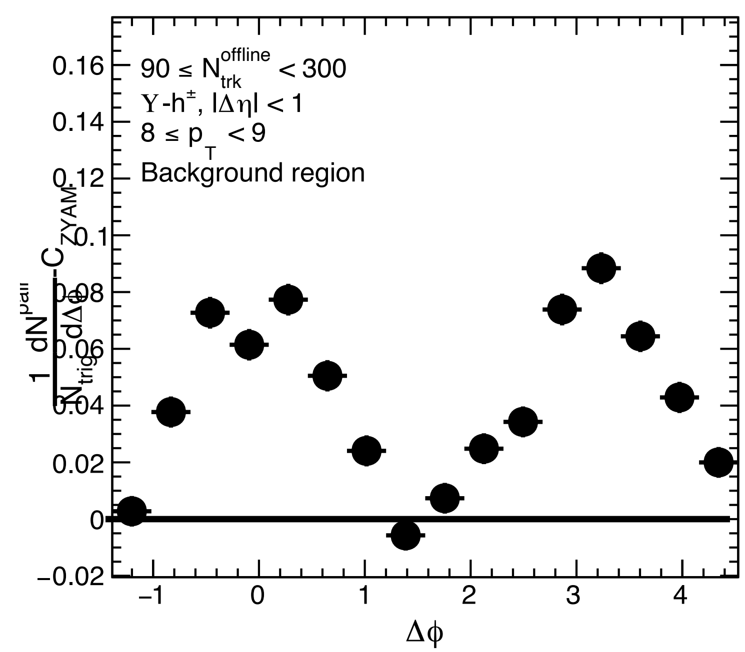
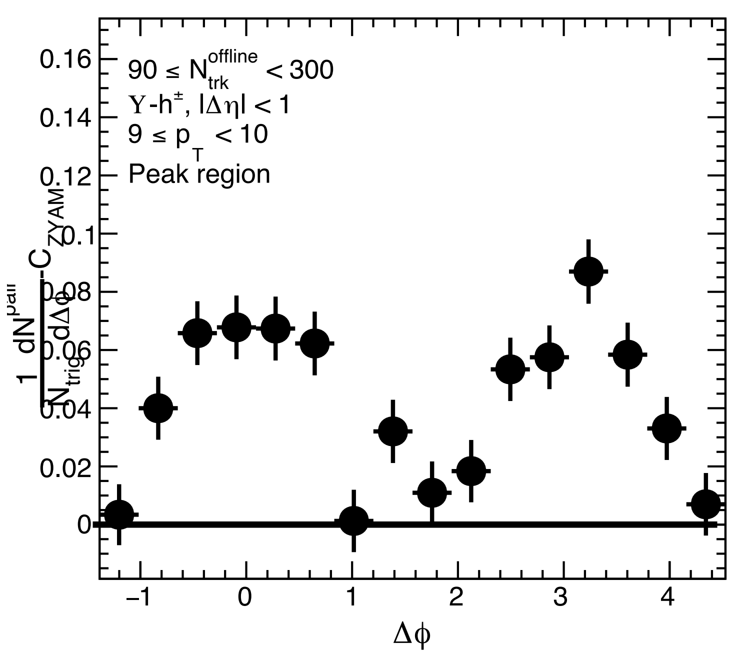
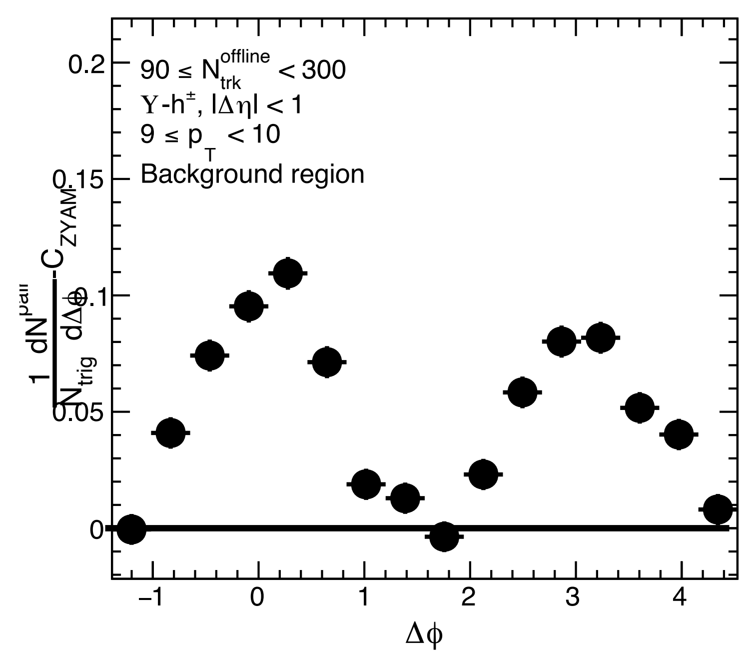


90 < mult. < 300 (9.0 < m < 9.8)









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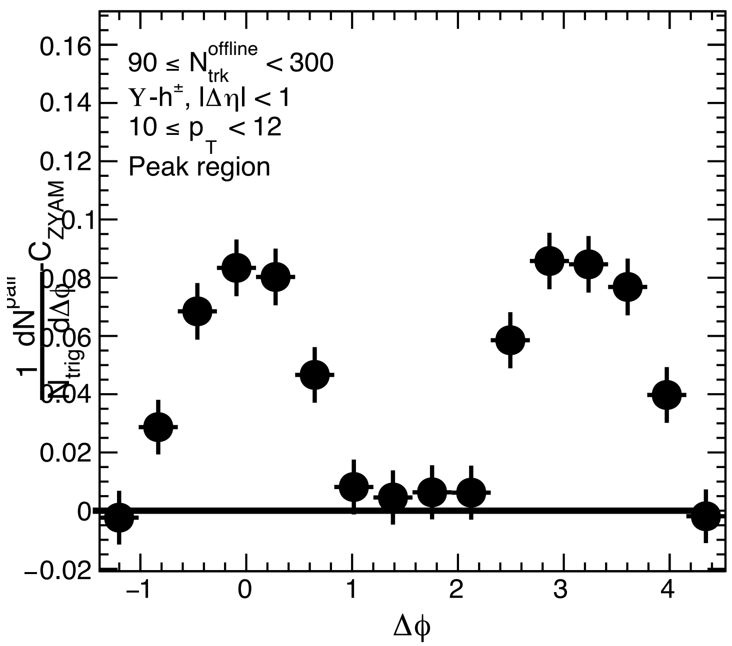
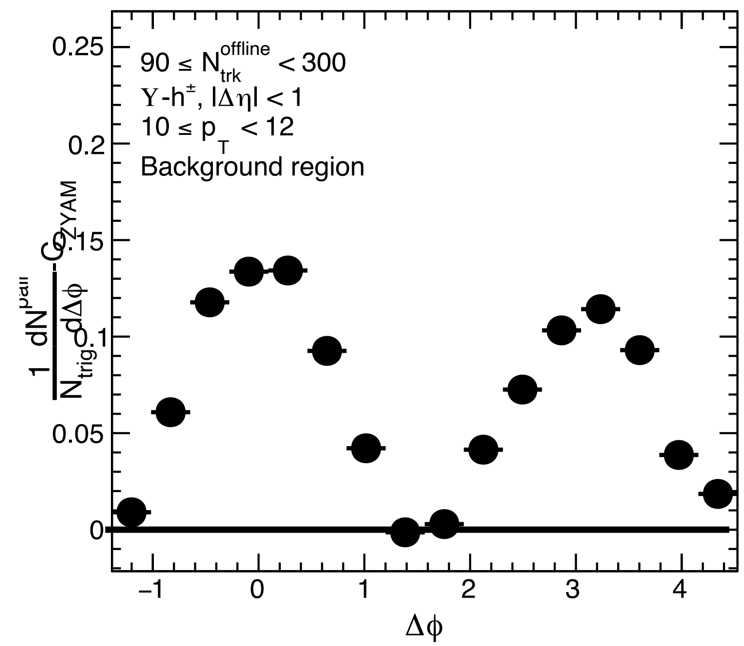
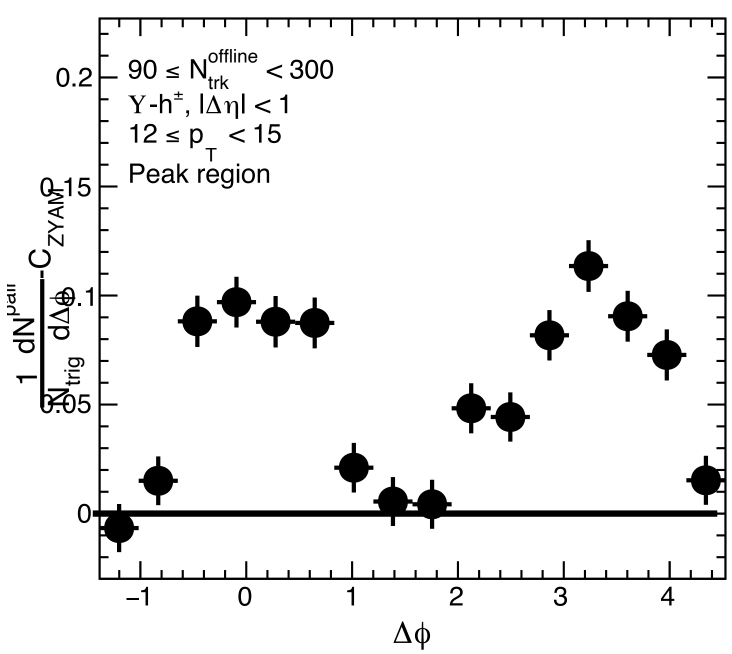
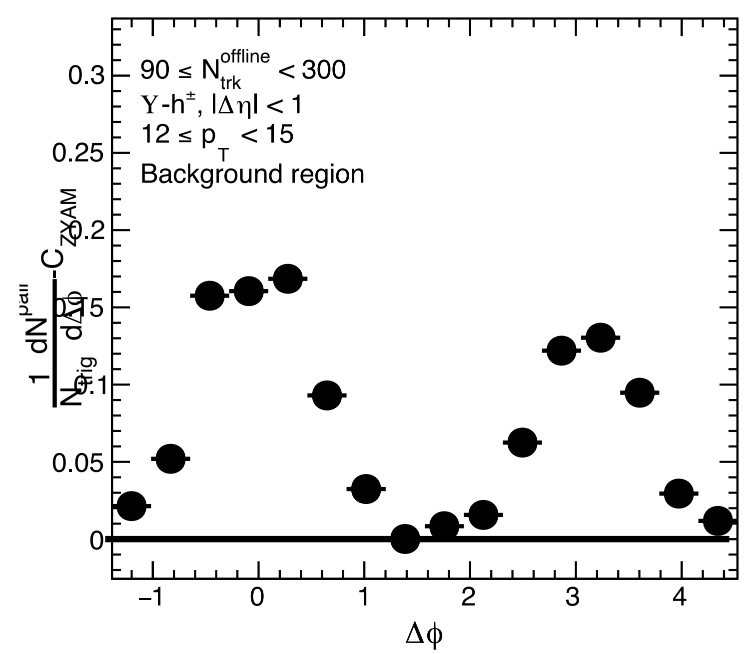
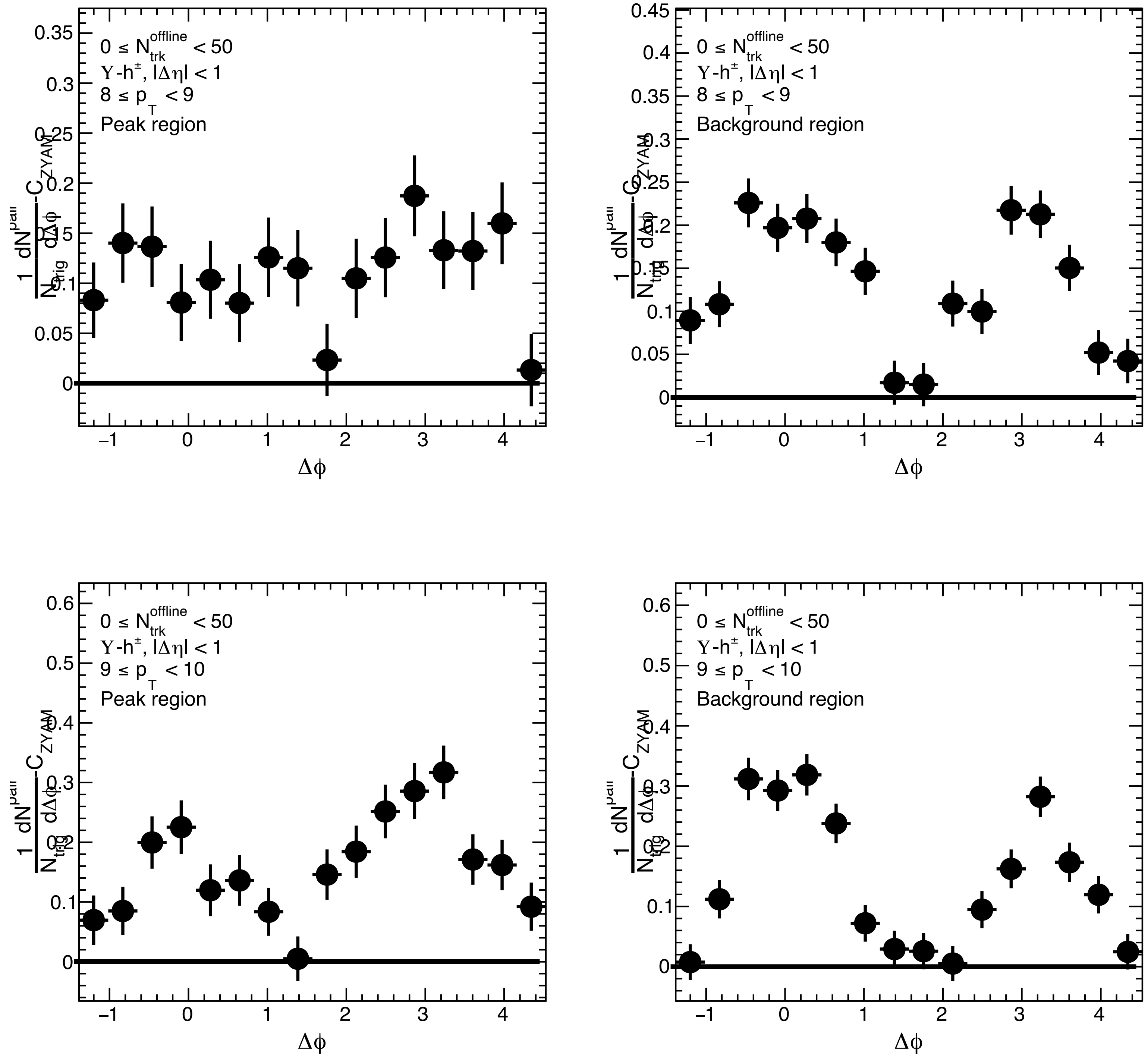








0 < mult. < 50 (9.2 < m < 9.6)



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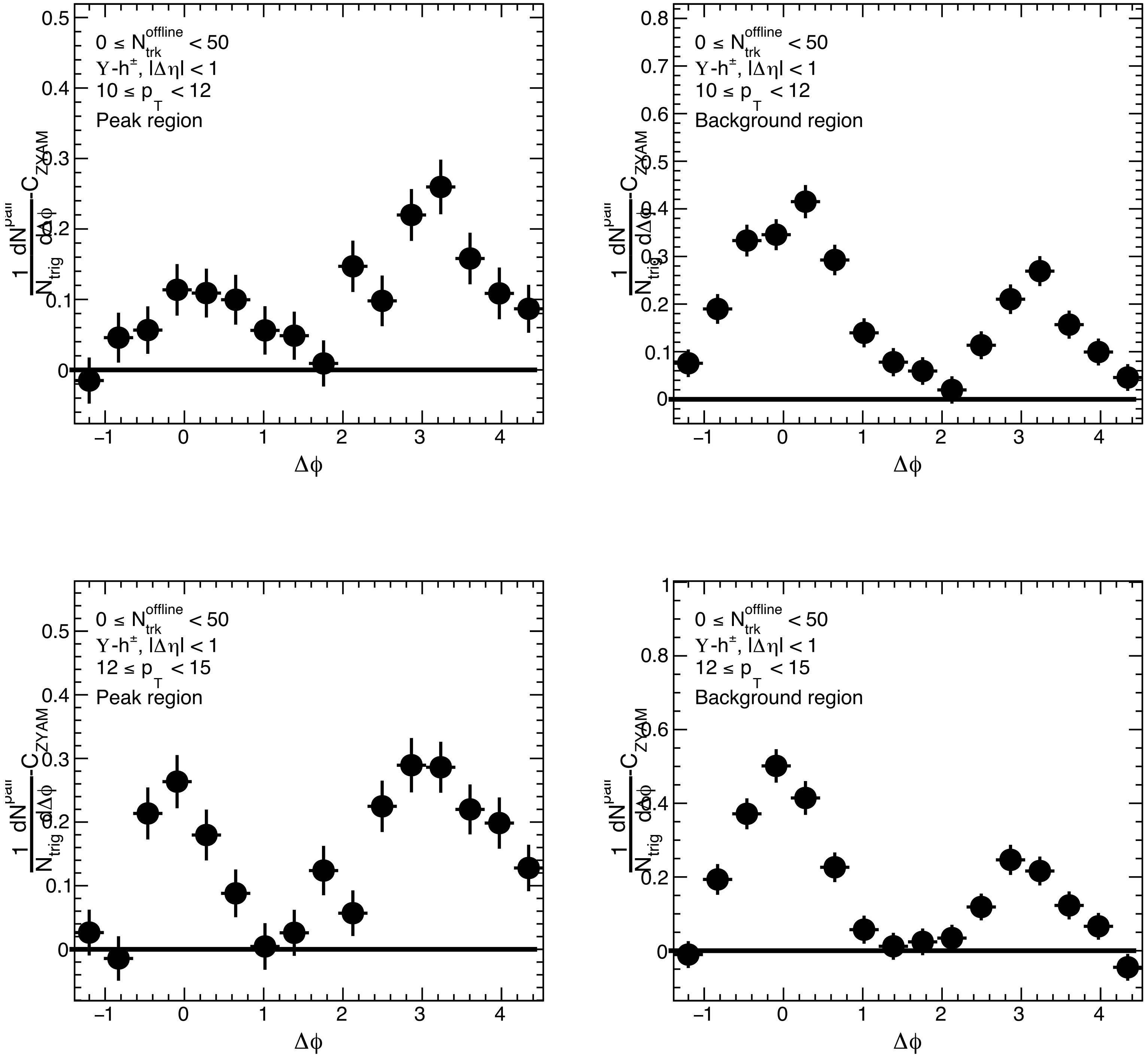

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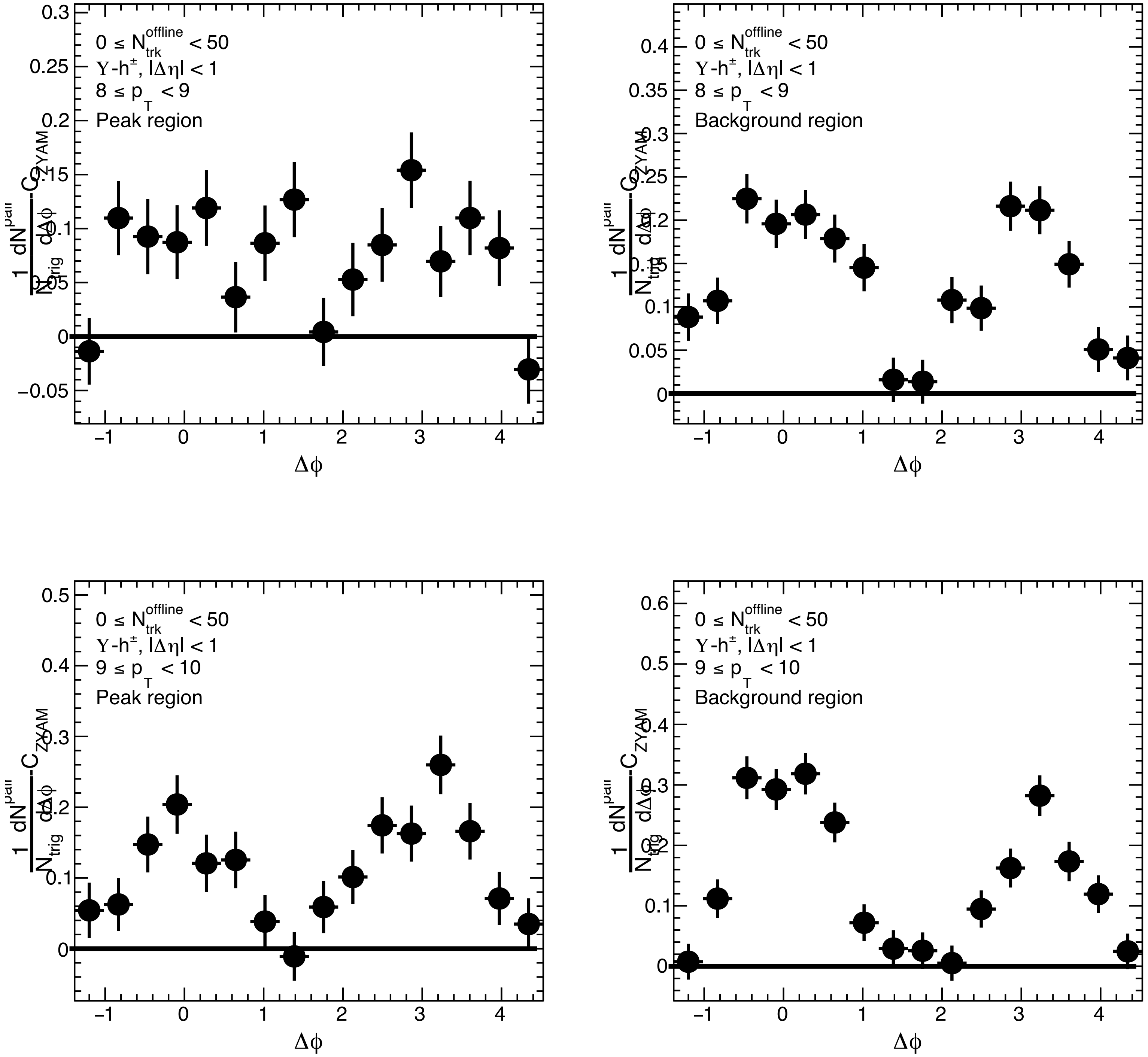

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