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Analysis Update: p_{T} spectra as a function of R_{T} for pp collisions at $\sqrt{s} = 5.02$ TeV¶

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1D Unfolding of distributions $N_{\mathrm{ch}}^{\mathrm{TS}}$

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Purpose: To obtain a better estimate of the true distribution of the multiplicity of charged particles from the development of experimental distributions.

$N_{\mathrm{ch,true}}^{\mathrm{TS}}$: True multiplicity in the Transverse region.
$N_{\mathrm{acc}}^{\mathrm{TS}}$: Multiplicity distribution of measured events in the Transverse region.
$P(N_{\mathrm{acc}}^{\mathrm{TS}} | N_{\mathrm{ch,true}}^{\mathrm{TS}})$: Multiplicity response matrix.

$$P(N_{\mathrm{ch,true}}^{\mathrm{TS}} | N_{\mathrm{acc}}^{\mathrm{TS}}) = \frac{P(N_{\mathrm{acc}}^{\mathrm{TS}} | N_{\mathrm{ch,true}}^{\mathrm{TS}}) P(N_{\mathrm{ch,true}}^{\mathrm{TS}})}{\sum_{N_{\mathrm{ch,true}}^{\mathrm{TS}'}} P(N_{\mathrm{acc}}^{\mathrm{TS}} | N_{\mathrm{ch,true}}^{\mathrm{TS}'}) P(N_{\mathrm{ch,true}}^{\mathrm{TS}'})}$$

$P_0(N_{\mathrm{ch,true}}^{\mathrm{TS}})$

Initial guess

While($\chi_i^2 < 1$)

$$\hat{P}(N_{\mathrm{ch,true}}^{\mathrm{TS}}) = \frac{\hat{n}_{\mathrm{evt}}(N_{\mathrm{ch,true}}^{\mathrm{TS}})}{\sum_{N_{\mathrm{ch,true}}^{\mathrm{TS}'}} \hat{n}_{\mathrm{evt}}(N_{\mathrm{ch,true}}^{\mathrm{TS}'})}$$

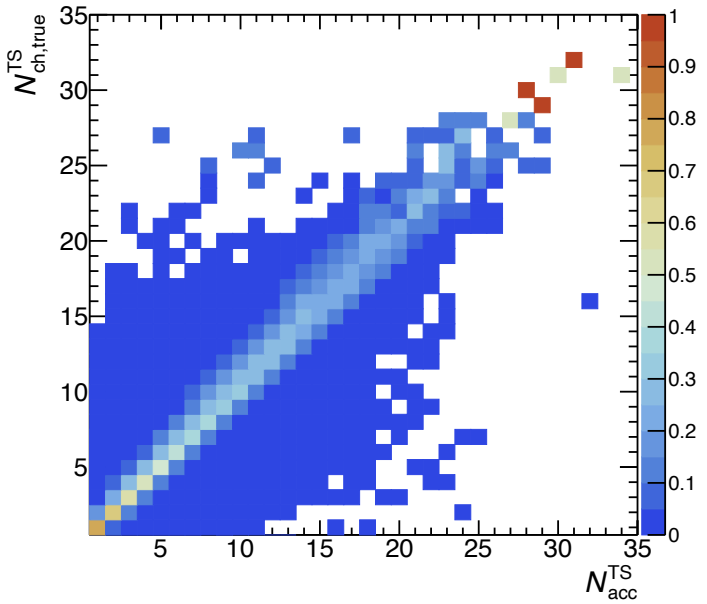
$$\hat{n}_{\mathrm{evt}}(N_{\mathrm{ch,true}}^{\mathrm{TS}}) = \frac{1}{\varepsilon(N_{\mathrm{ch,true}}^{\mathrm{TS}})} \sum_{N_{\mathrm{acc}}^{\mathrm{TS}}} P(N_{\mathrm{ch,true}}^{\mathrm{TS}} | N_{\mathrm{acc}}^{\mathrm{TS}})\, n_{\mathrm{evt}}(N_{\mathrm{acc}}^{\mathrm{TS}})$$

Unfolded multiplicity distribution

Measured multiplicity distribution

$$P(N_{\mathrm{ch,true}}^{\mathrm{TS}} | N_{\mathrm{acc}}^{\mathrm{TS}}) = \frac{P(N_{\mathrm{acc}}^{\mathrm{TS}} | N_{\mathrm{ch,true}}^{\mathrm{TS}}) P(N_{\mathrm{ch,true}}^{\mathrm{TS}})}{P(N_{\mathrm{acc}}^{\mathrm{TS}})}$$

Bayes' Theorem



Smearing matrix $P(N_{\mathrm{ch,true}}^{\mathrm{TS}} | N_{\mathrm{acc}}^{\mathrm{TS}})$

2D Unfolding of p_{T} spectra

First: Apply the tracking efficiency and secondary particle contamination

Second:

(Multiplicity response matrix, $P(N_{\mathrm{acc}}^{\mathrm{TS}} \,|\, N_{\mathrm{ch,true}}^{\mathrm{TS}})$) ✕ (Weight of the number of measured particles)

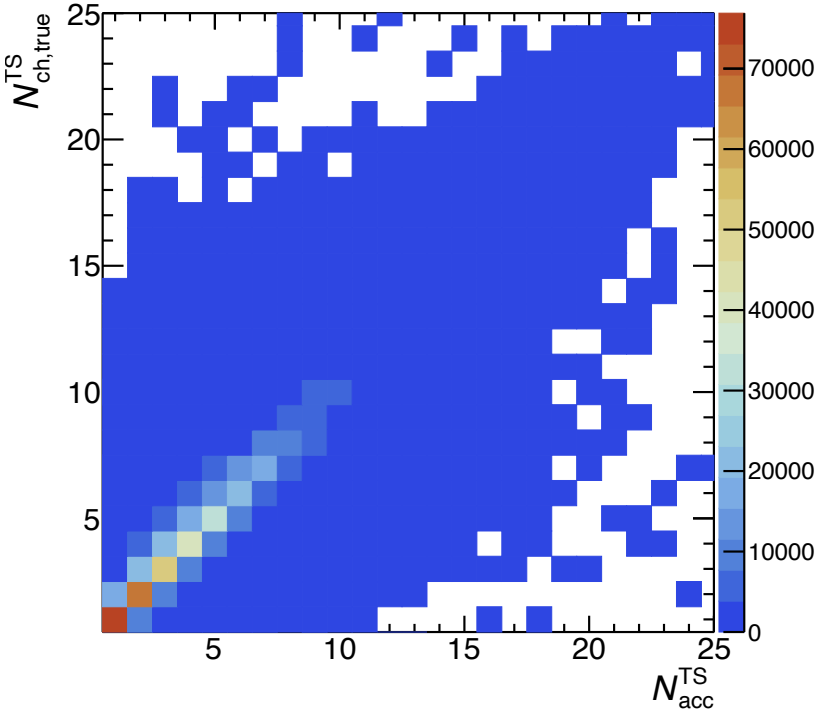
Weekly Report

☑ Run on GRID - improvement in the percentage of accepted jobs.

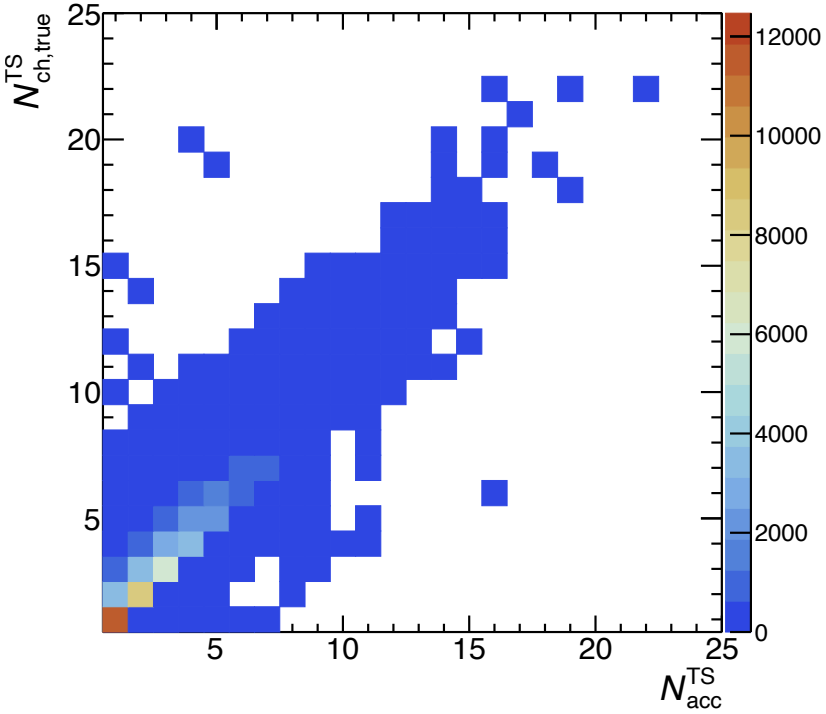
Jobs Overview		
State	Jobs	
	#	%
Done	210	61.4
Error_V	29	8.5
Error_E (TTL)	1	0.3
Error_E (mem)	66	19.3
Error_E (disk)	0	0.0
Error E_W	0	0.0
Other	36	10.5

Jobs Overview		
State	Jobs	
	#	%
Done	387	78.7
Error_V	29	11.4
Error_E (TTL)	4	0.6
Error_E (mem)	27	21.1
Error_E (disk)	0	0.0
Error E_W	1	0.0
Other	44	8.5

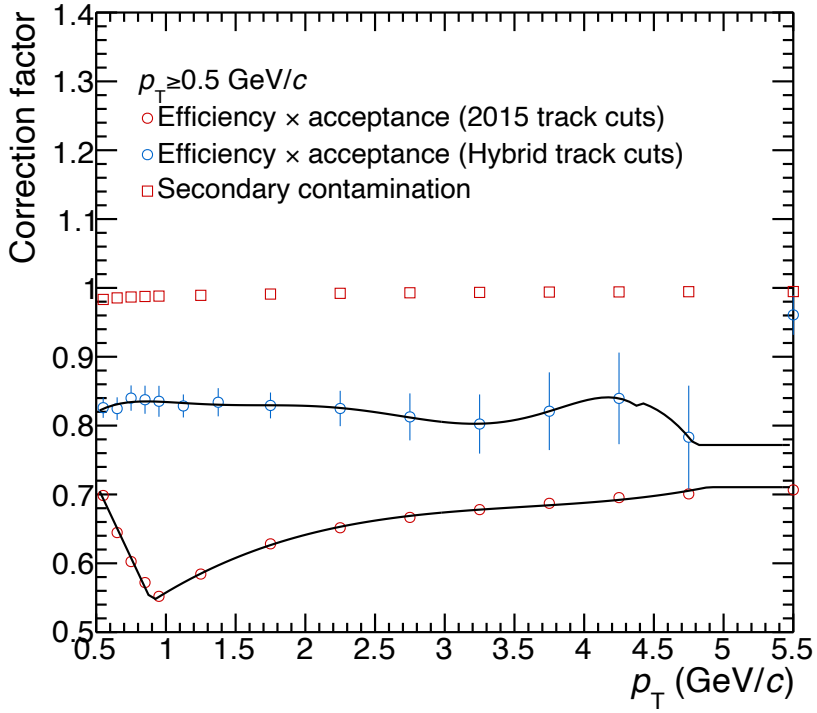
Response matrices and correction factor



Response matrix - 2015 track cuts



Response matrix - hybrid track cuts



Correction factor associated with efficiency by acceptance and secondary contamination

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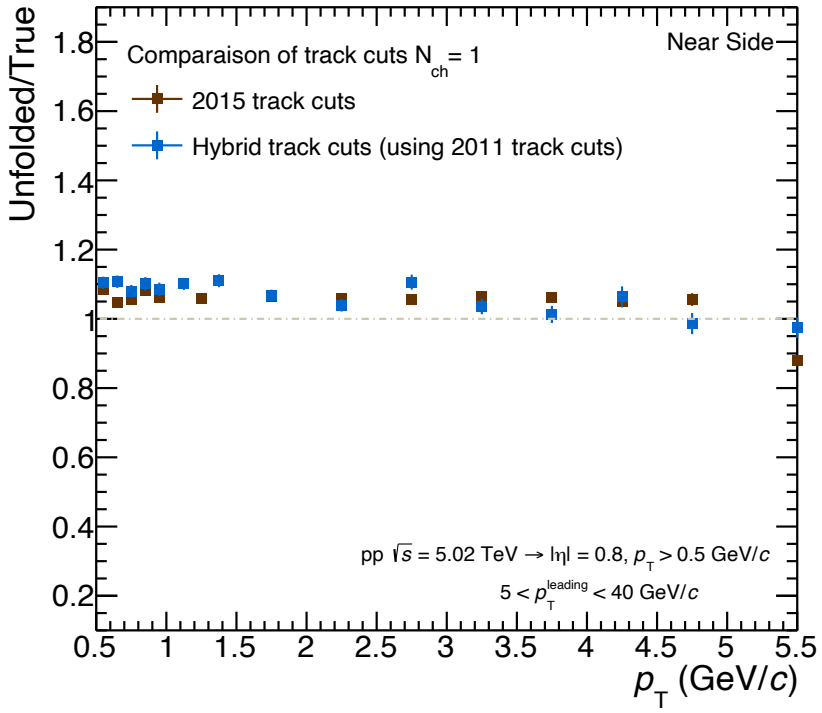
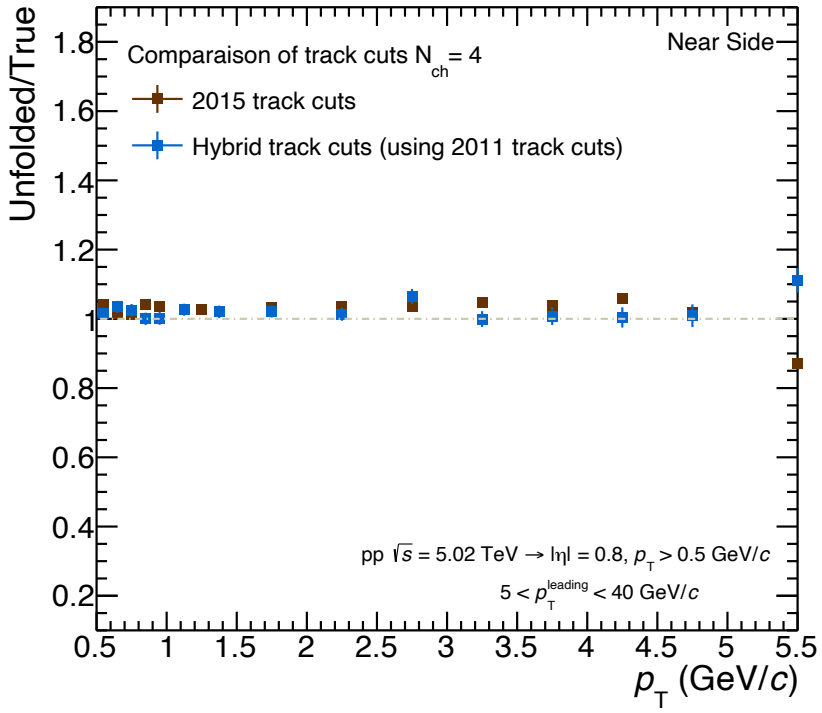
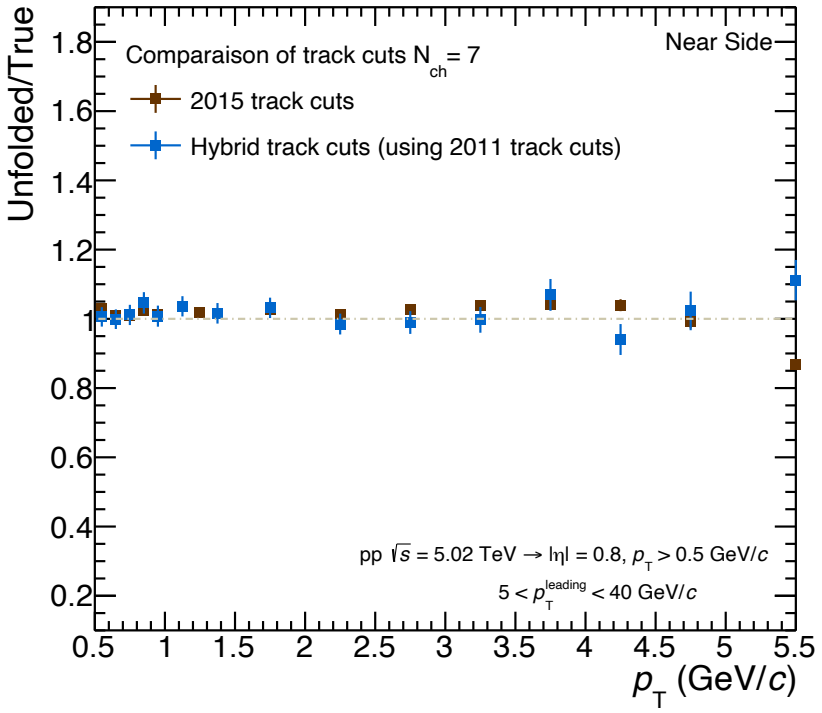
MC closure test

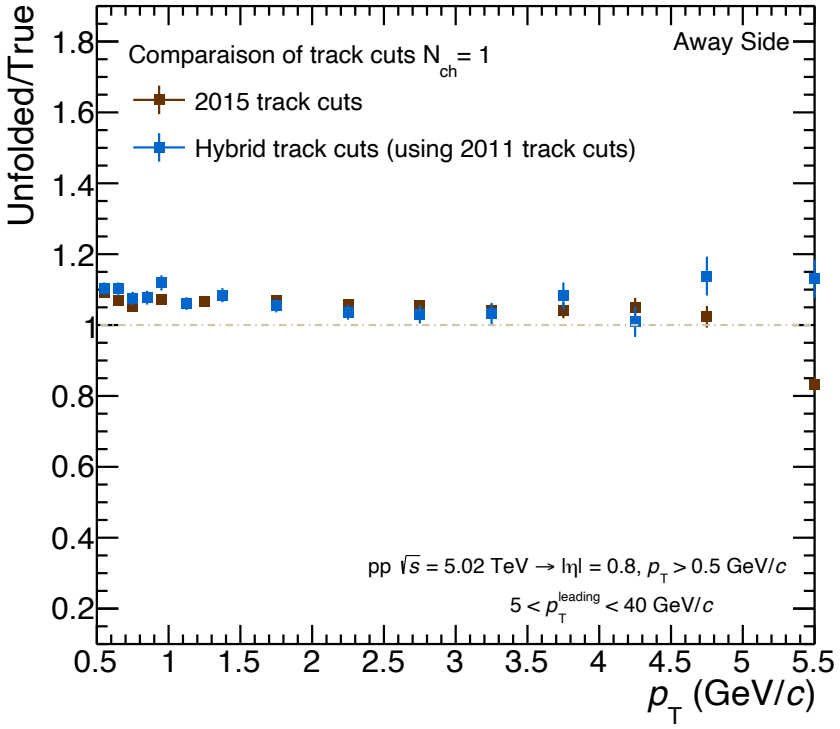
Near Side¶

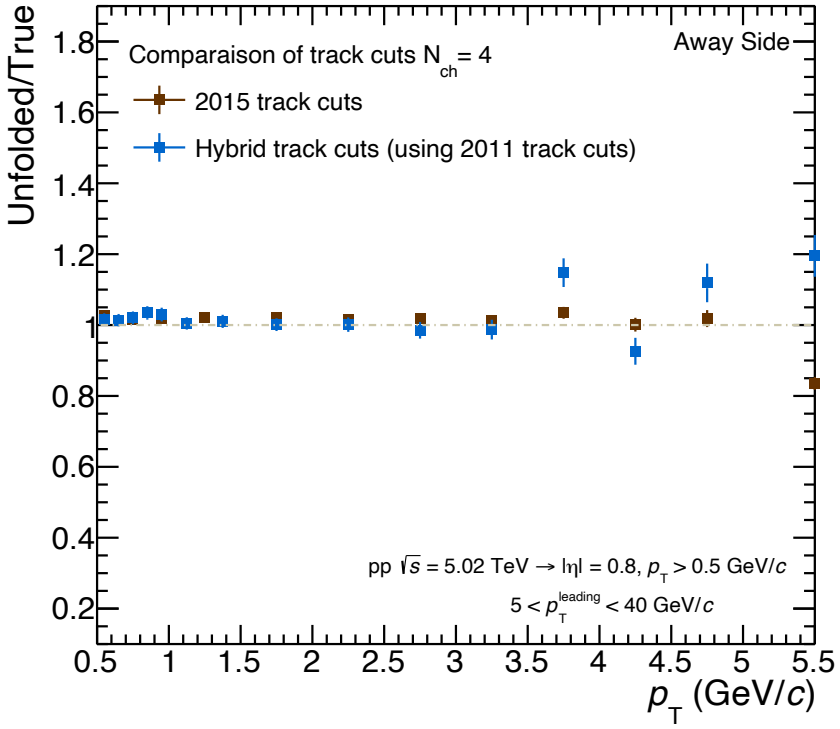

Comparaison of track cuts N_ch = 1
Near Side
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)

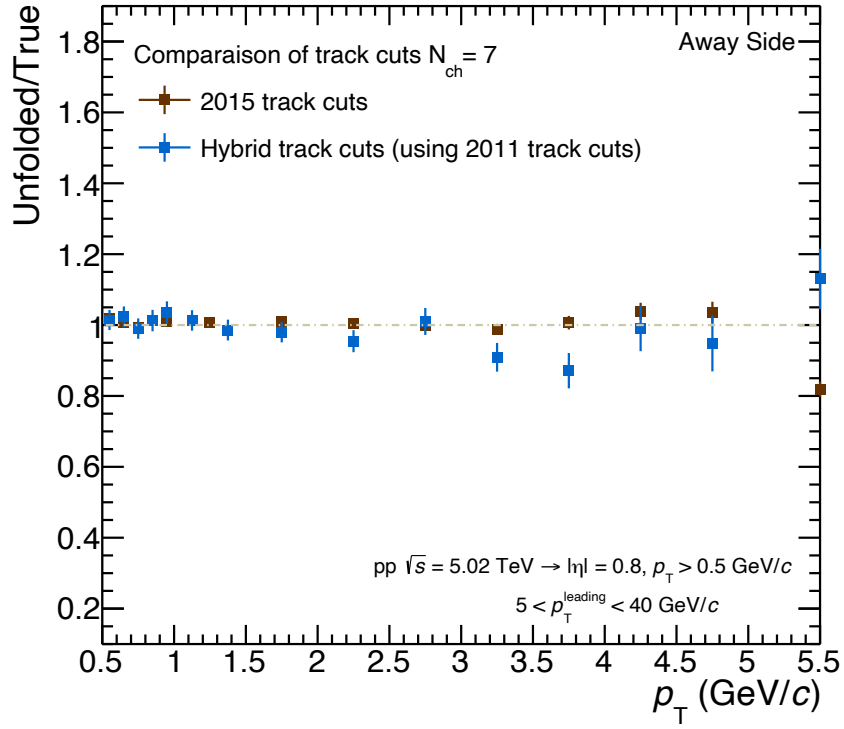

Comparaison of track cuts N_ch = 4
Near Side
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)


Comparaison of track cuts N_ch = 7
Near Side
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)

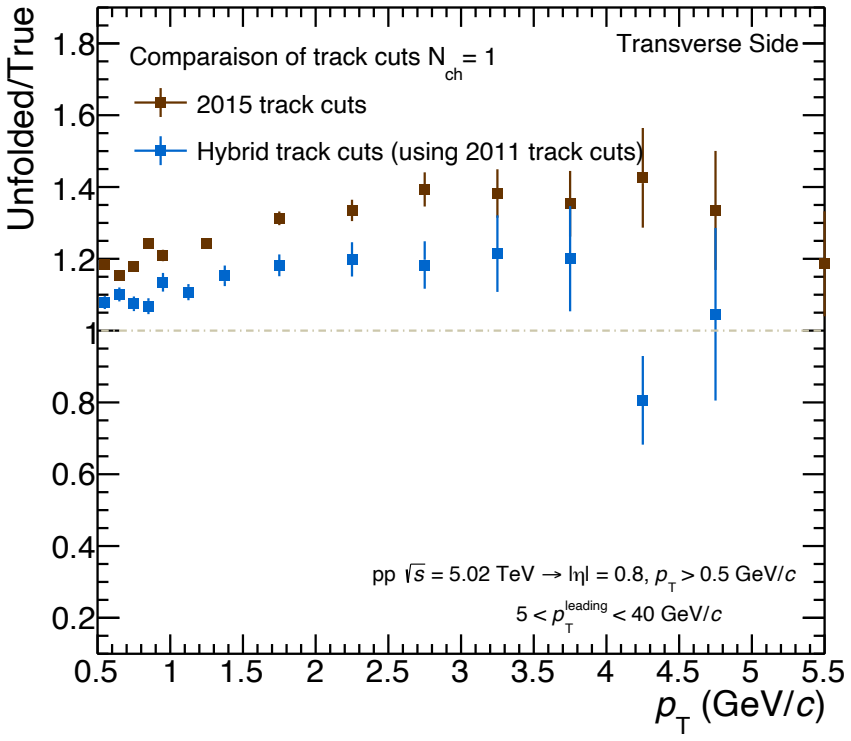
Away Side¶

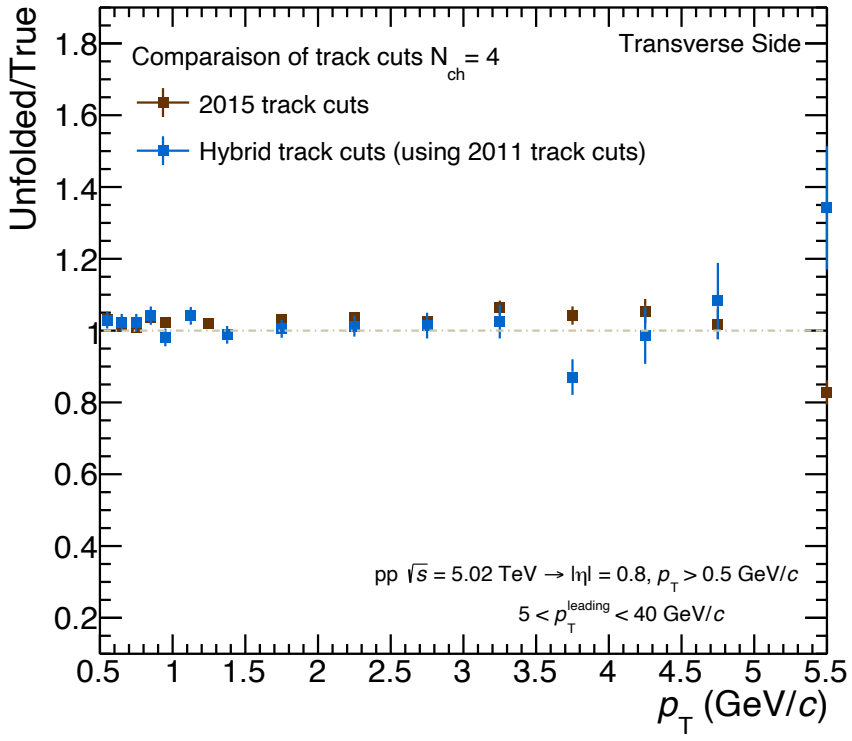

Away Side
Comparaison of track cuts N_ch = 1
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)

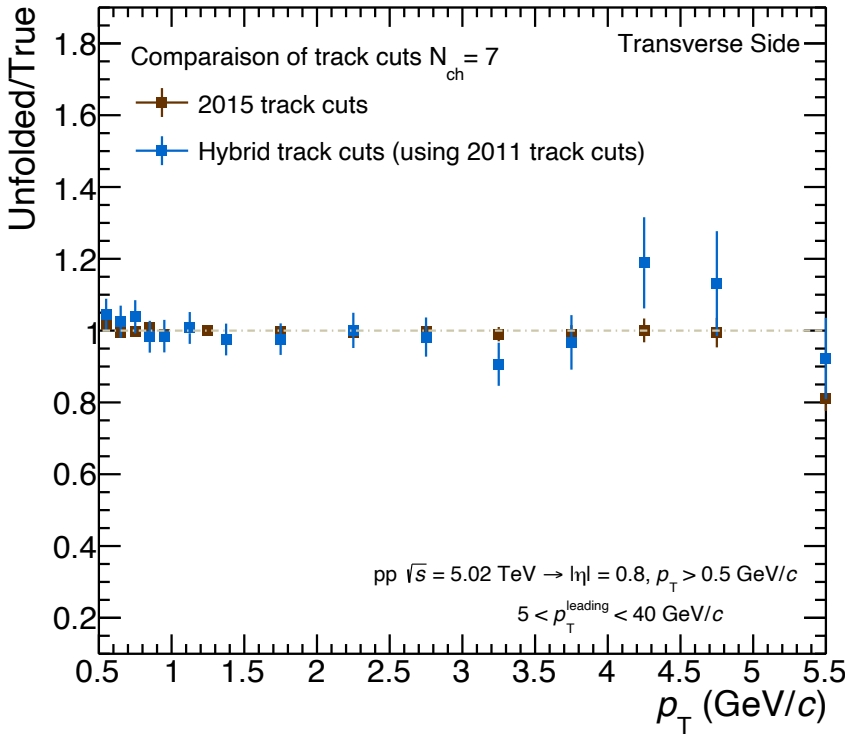

Away Side
Comparaison of track cuts N_ch = 4
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)


Away Side
Comparaison of track cuts N_ch = 7
2015 track cuts
Hybrid track cuts (using 2011 track cuts)
pp √s = 5.02 TeV → |η| = 0.8, p_T > 0.5 GeV/c
5 < p_T^leading < 40 GeV/c
Unfolded/True
p_T (GeV/c)

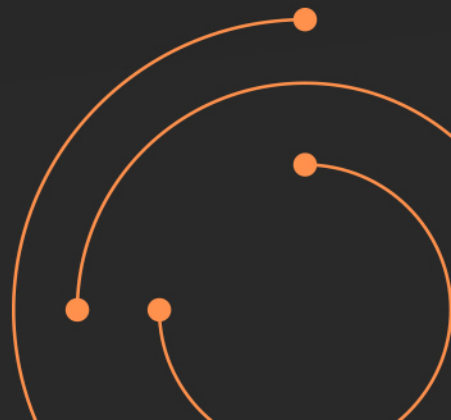
Transverse Side¶







Next steps

- Run on GRID - MC (pp, p+Pb, Pb+Pb) with modes MC closure and normal. Also with data pp, p+Pb and Pb+Pb.
- Analyze the results.

Thank you