Jet Energy Resolution for the Dijet Balance Method

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Status

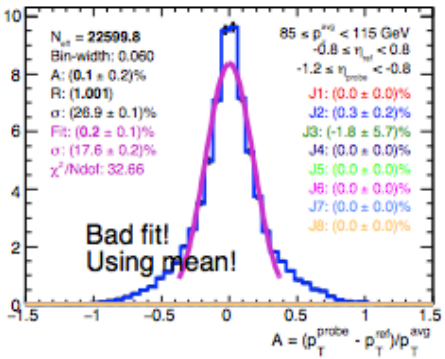
- Changed the resolution definition to take into account the difference in asymmetry for the probe and reference rapidity regions:

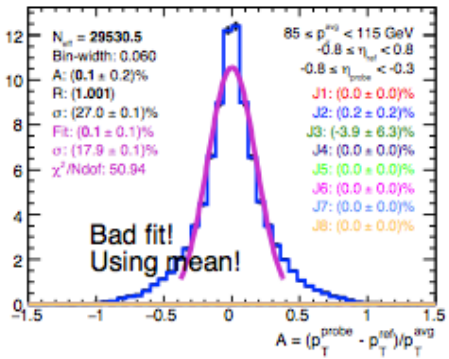
$$\sigma(\mathrm{A}) = \sqrt{2}\frac{\sigma(p_T)}{p_T}$$

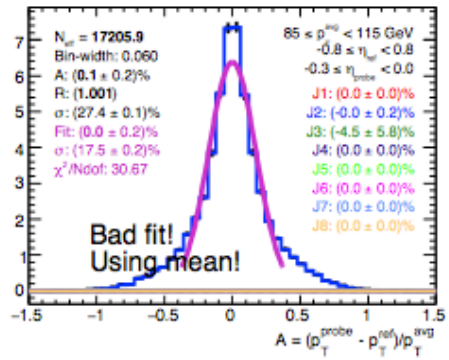
$$\frac{\sigma(p_T)}{p_T} = \sqrt{4\sigma^2(A_{(i,j)}) - 2\sigma^2(A_{(i,i)})}$$

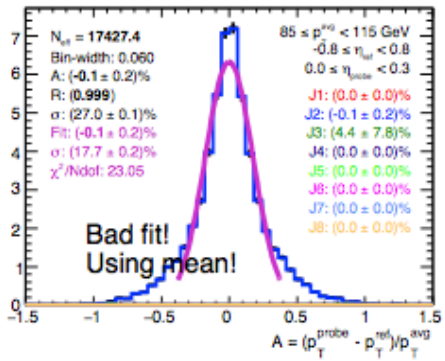
- Restricted fits for the asymmetry to $\pm$ 0.4 and Nsig = 1.5.
- Re-ran the subtractions for Powheg+Pythia8, Sherpa, pure Pythia and data

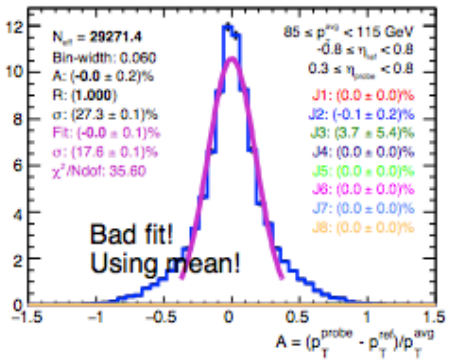
Powheg+Pythia8 Truth: Before extra restrictions

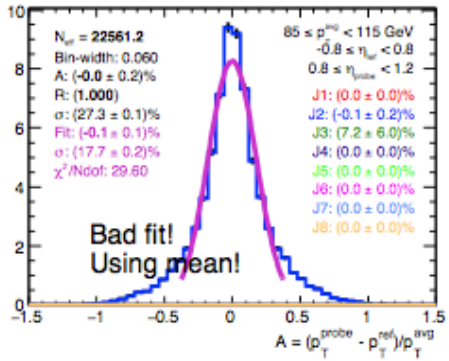


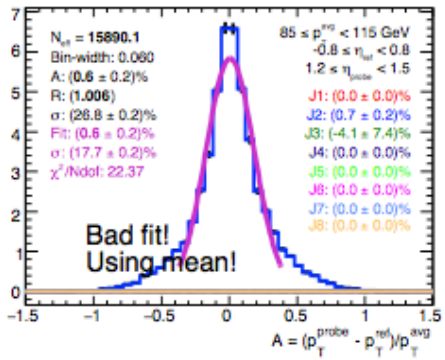


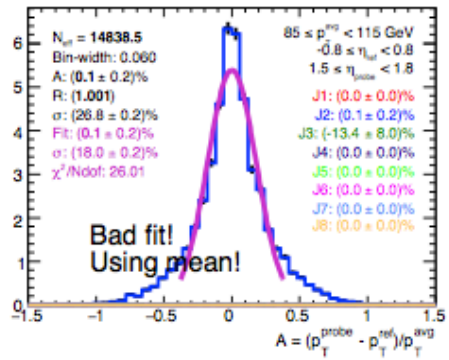


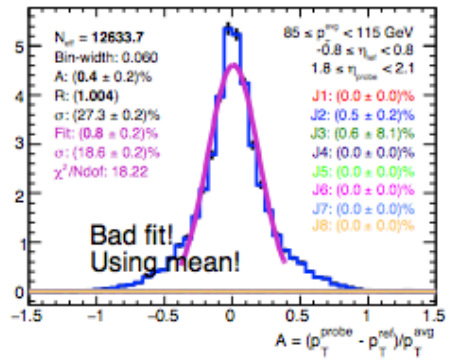




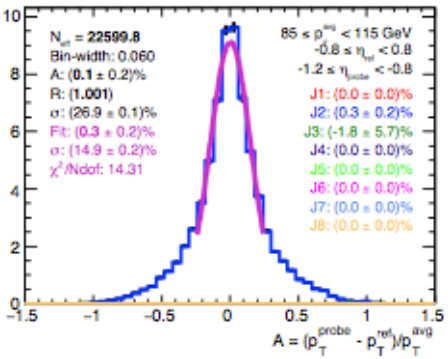


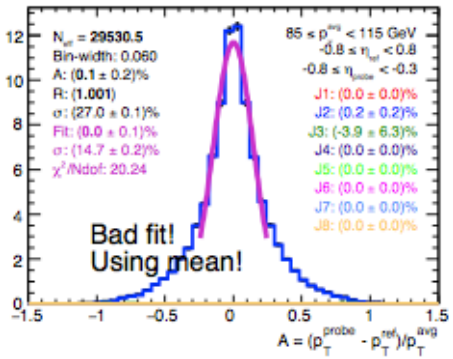


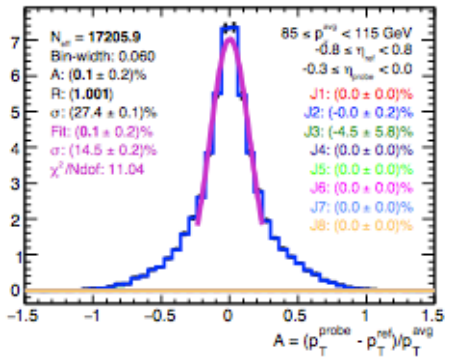


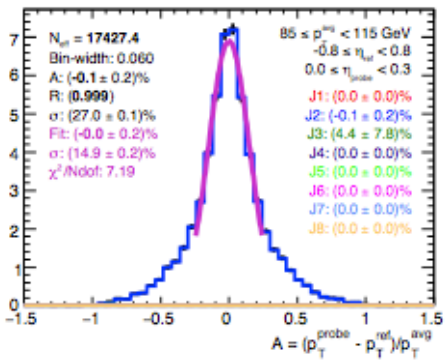


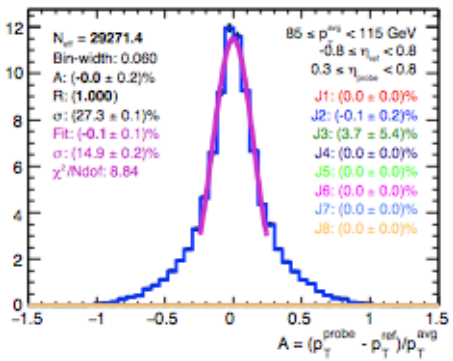
Powheg+Pythia8 Truth: After restrictions

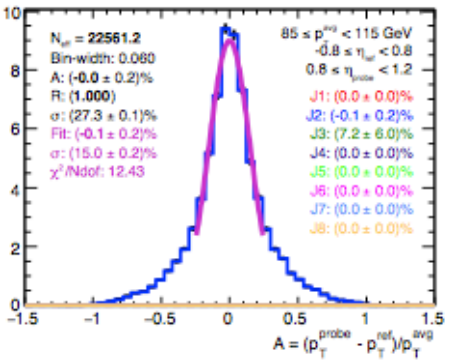


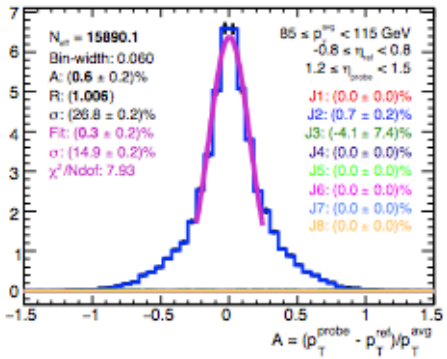


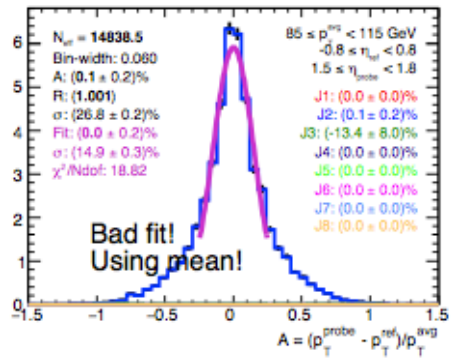


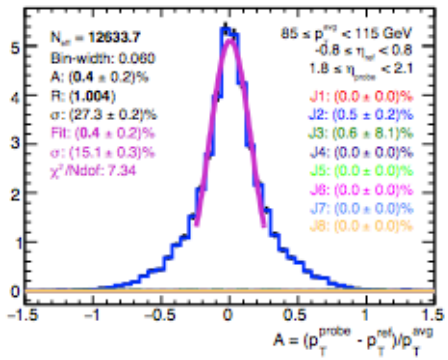




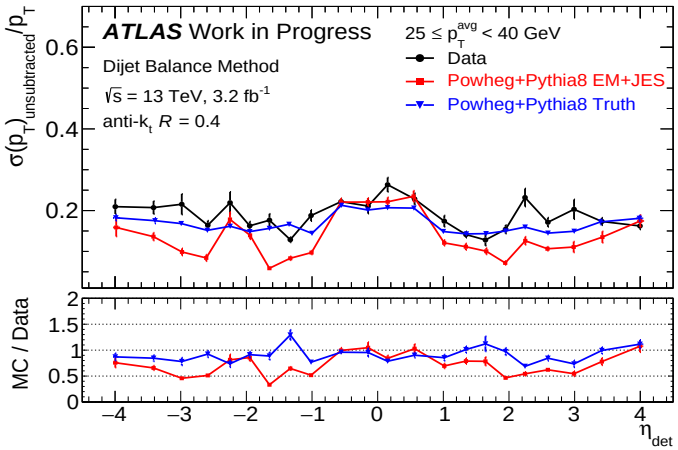


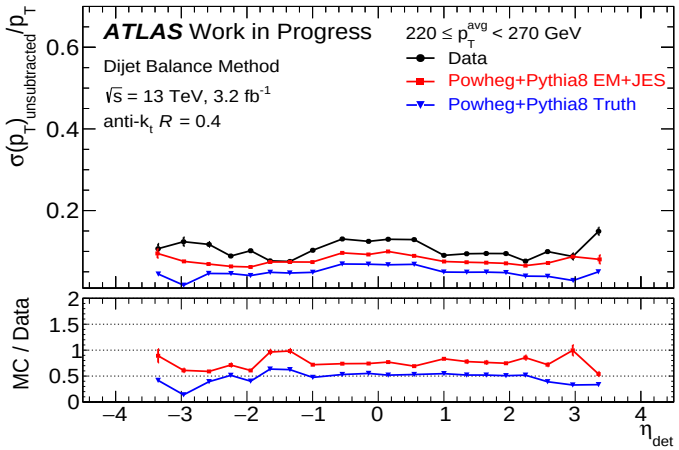


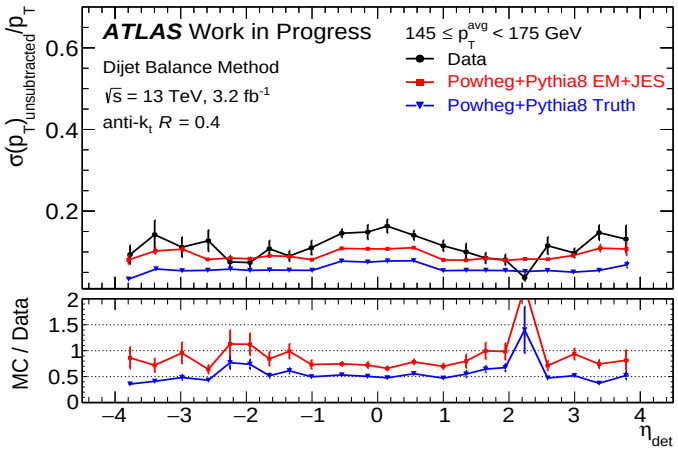


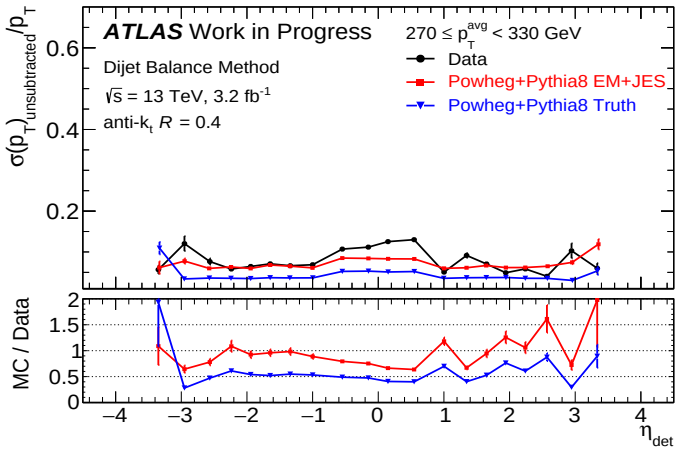


Powheg+Pythia8 unsubtracted $\sigma(P_T)/P_T$



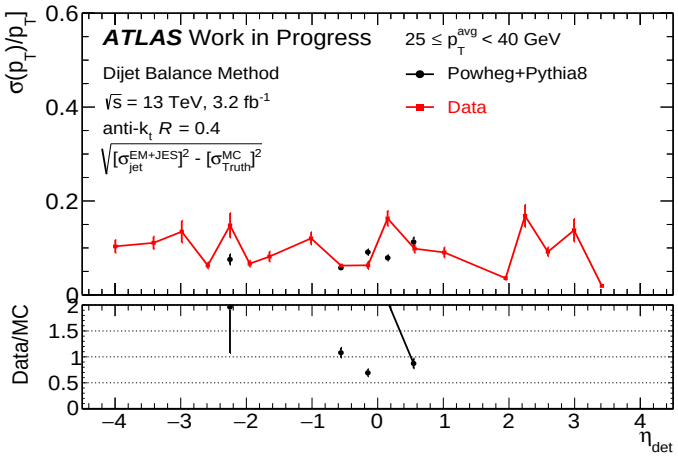


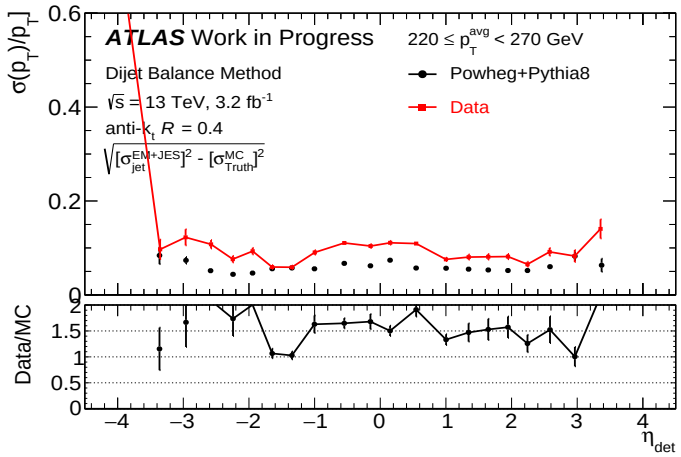


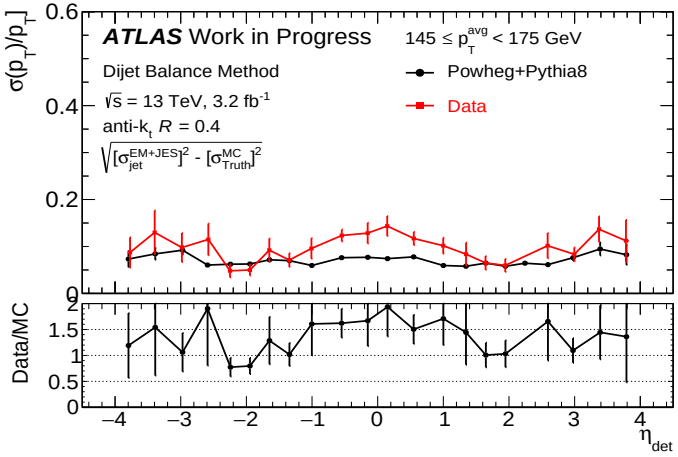


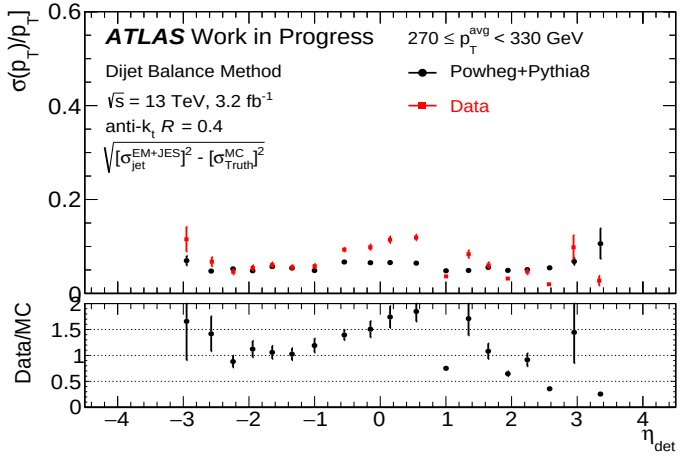
Reference region value is higher: Makes sense with subtraction needed for the probe region, but seems physically counter-intuitive?

Powheg+Pythia8 subtracted $\sigma(P_T)/P_T$



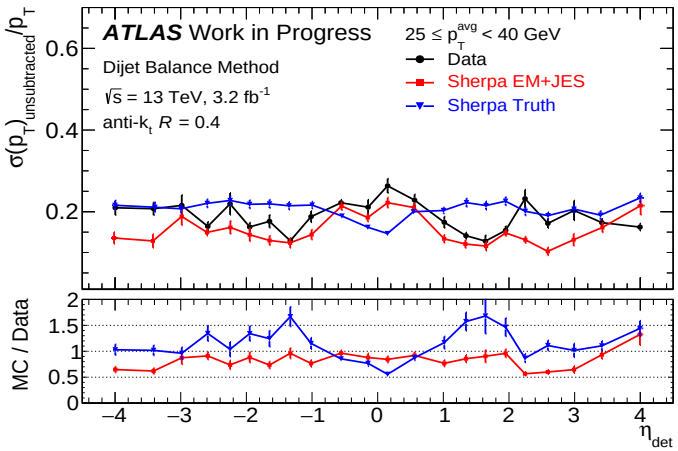


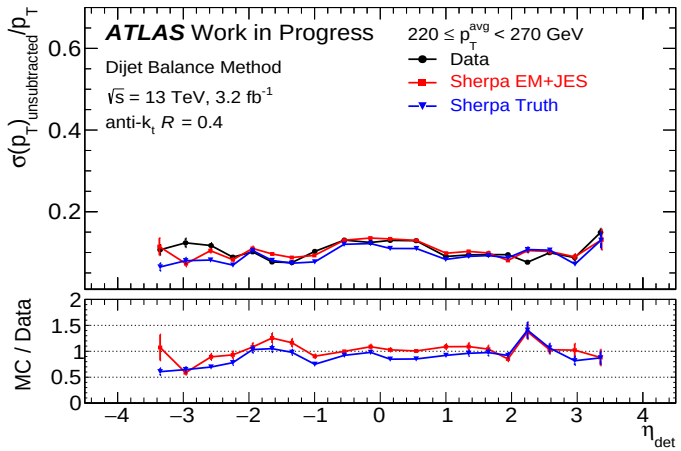


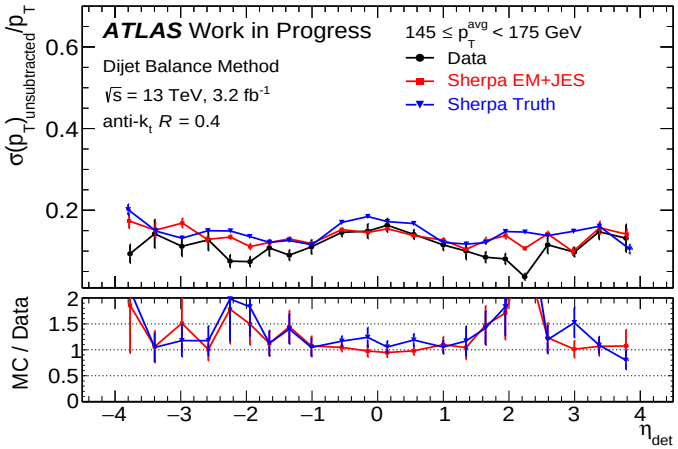


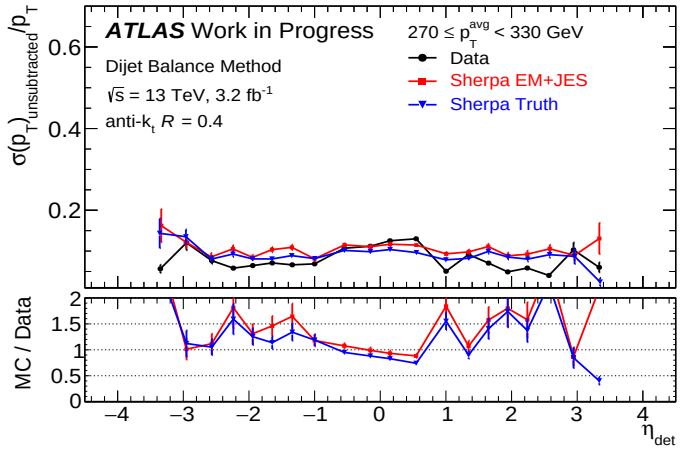
- Bump in reference region doesn't quite cancel out - but smaller.
- Bug in code: some points don't join up - for no apparent reason (Looking in to it)

Sherpa unsubtracted $\sigma(P_T)/P_T$



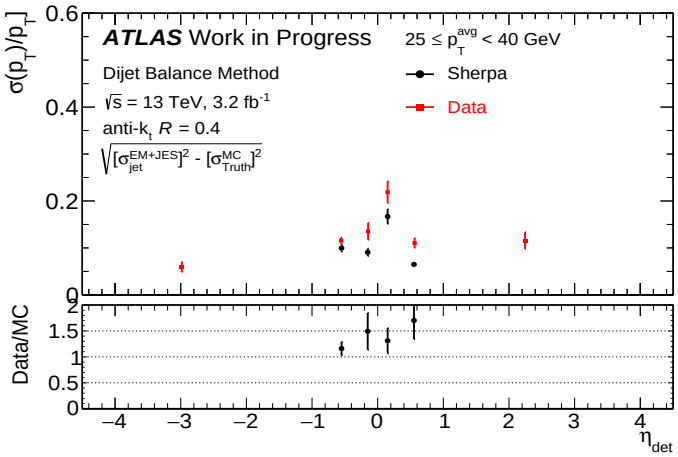


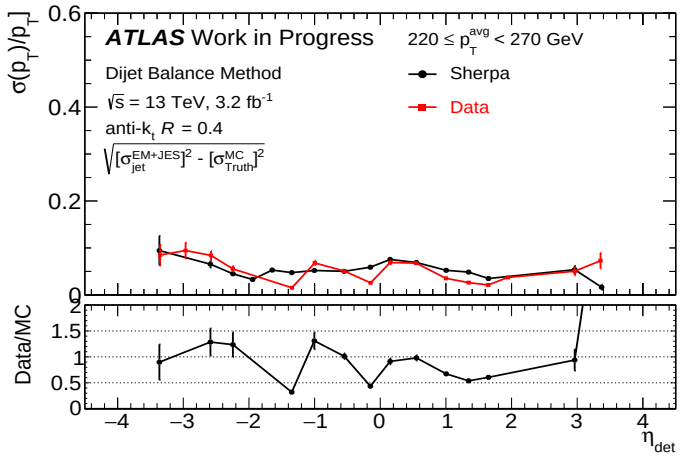


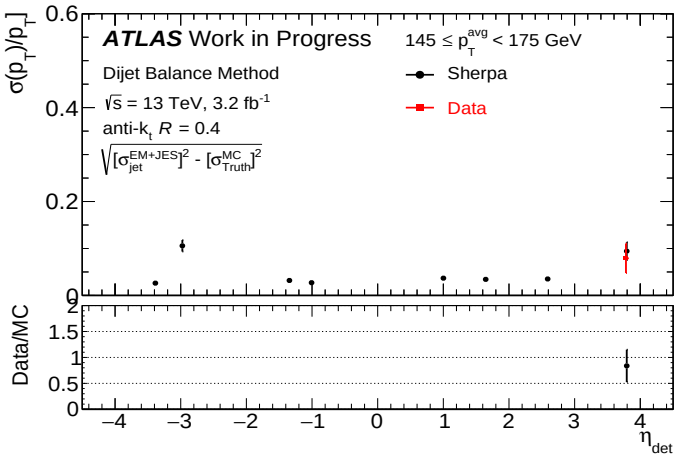


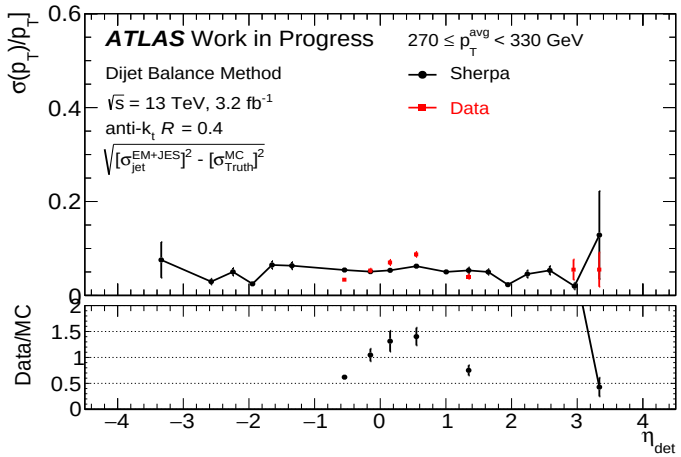
There are still a number of eta bins of truth higher than Reco after fit restriction

Sherpa subtracted $\sigma(P_T)/P_T$



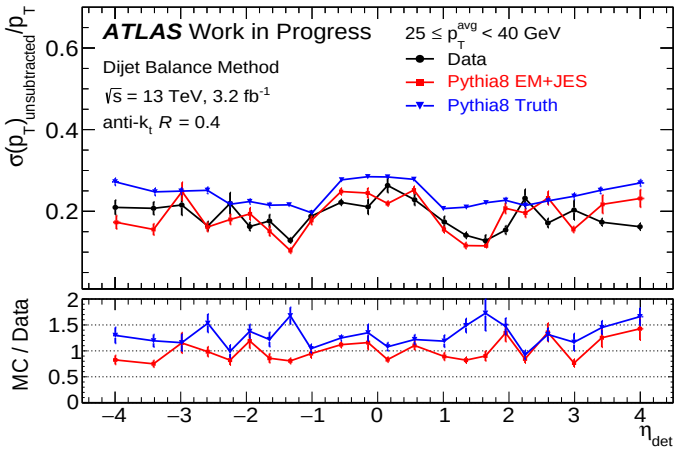


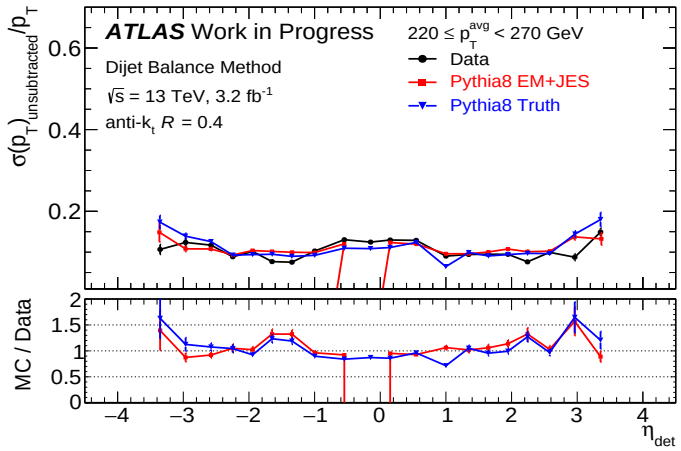


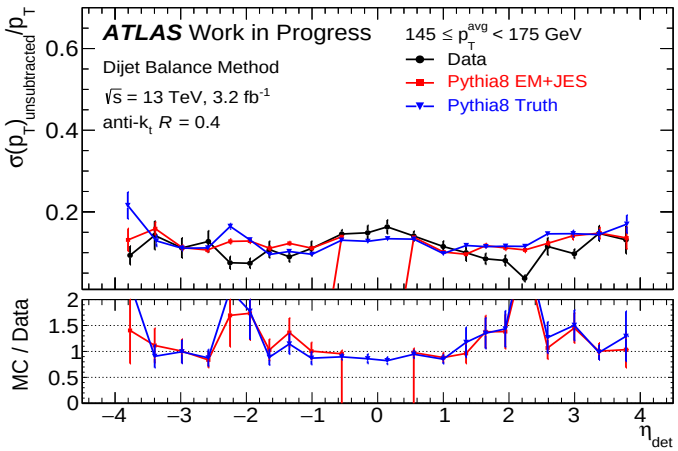


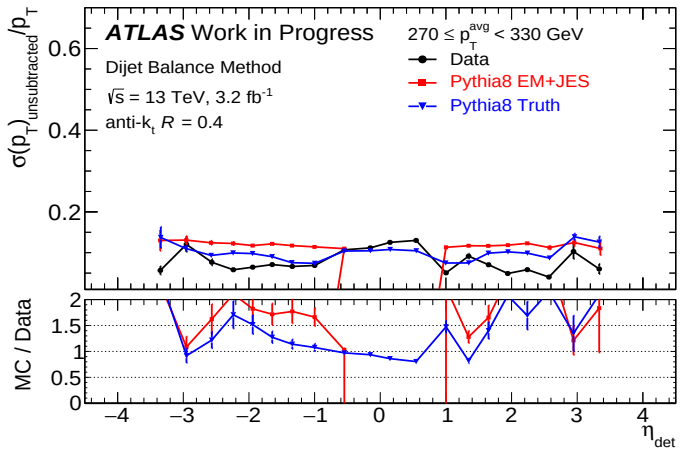
- The truth being larger than the reco means a lack of points on the subtraction plots. (But this is better than before the fit had been restricted)
- Also, same issue with lack of line connecting points

Pure Pythia8 unsubtracted $\sigma(P_T)/P_T$



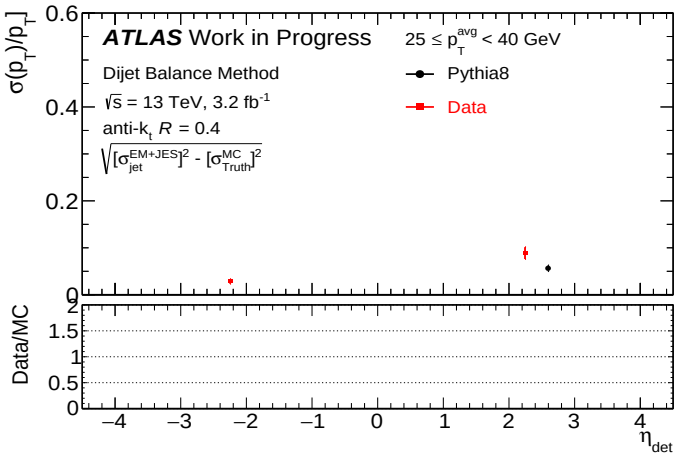


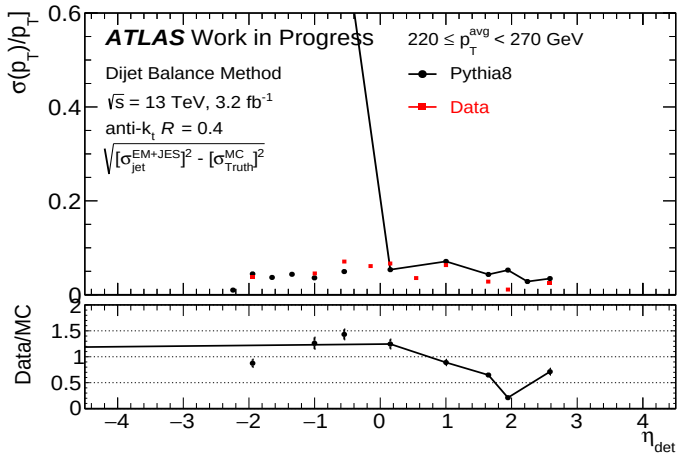


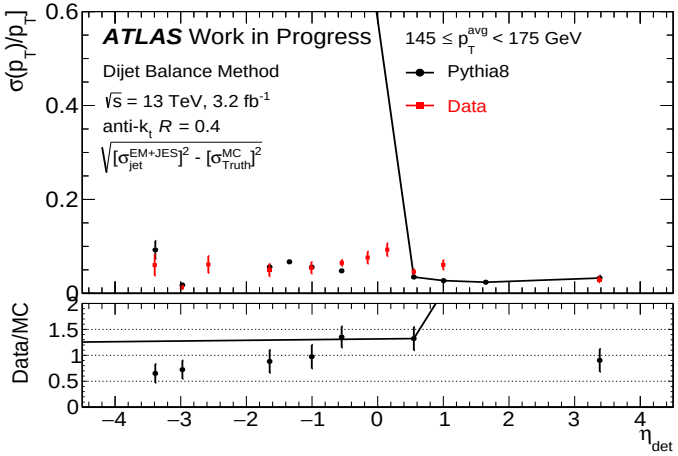


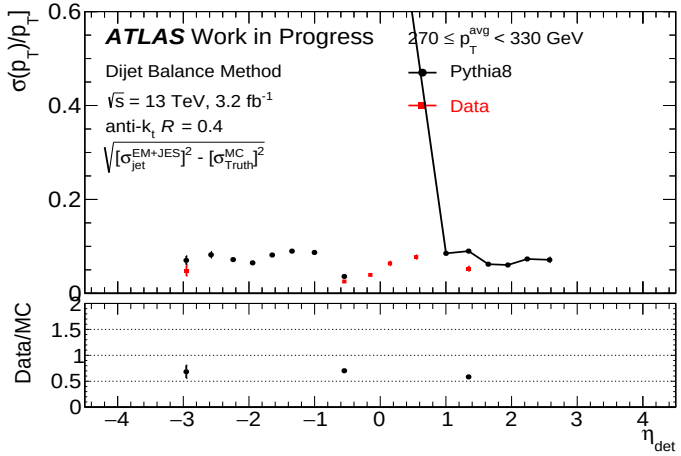
- Also has a number of eta bins with truth higher than Reco even with restricted fits
- Bug in code: Causing strange behaviour of reco at central eta region (What could this be due to?)

Pure Pythia8 subtracted $\sigma(P_T)/P_T$









- Same Issue as with Sherpa: The truth being larger than the reco means a lack of points on the subtraction plots.

To-Do:

- How to fix subtraction problem without restricting fits further? (Restricting further causes problems with both truth and reco.)
- Fix bugs in code causing lack of connecting points and sudden negative values at central eta for Pythia8.
- Calculate MC detector resolution from:

$$\frac{P_T^{reco} - P_T^{truth}}{P_T^{reco}}$$

in bins of (P_T^{reco}, η) for ΔR matched jets for each MC.