



More thoughts on the midpoint algorithm, a continuing discussion

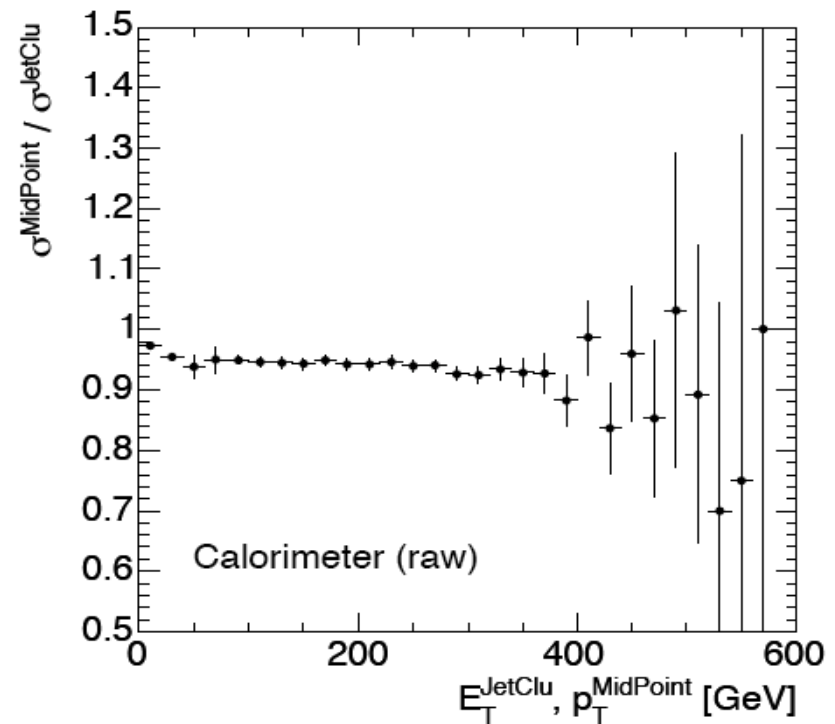
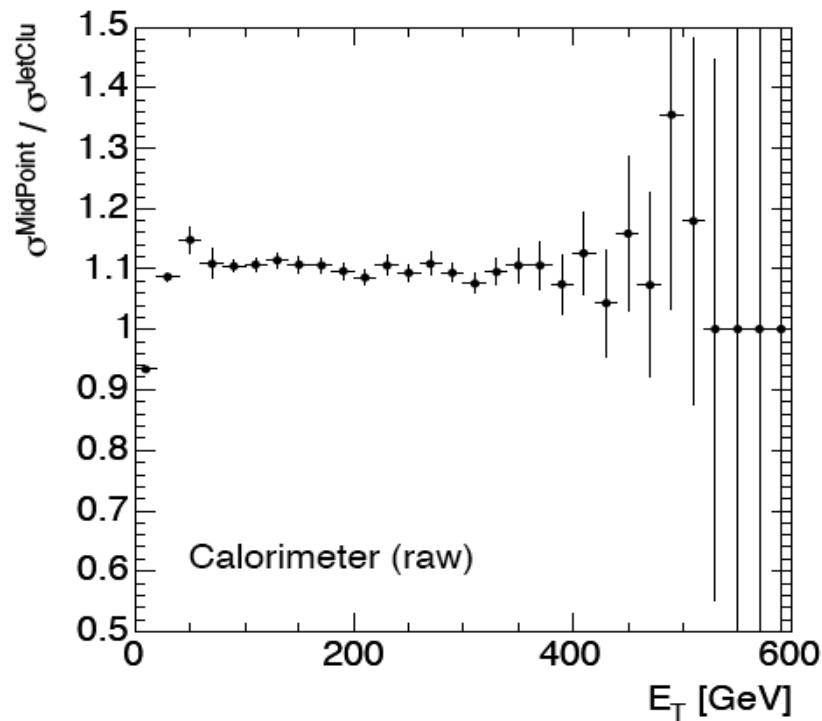
see also presentations at 7/23/04 and 8/6/04 QCD
meetings

J. Huston

A quick review: some studies of Matthias with Herwig



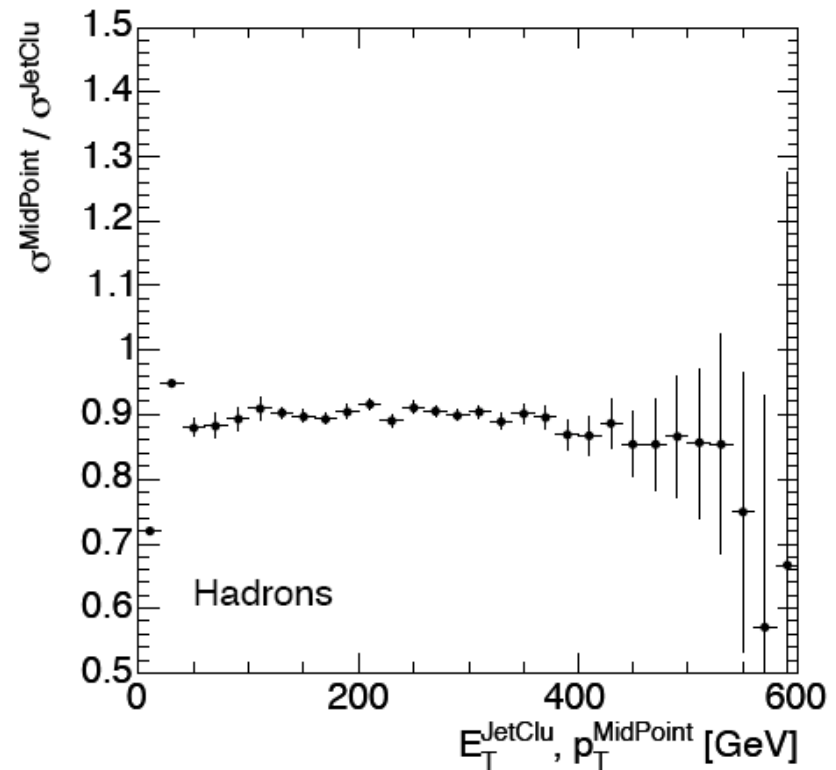
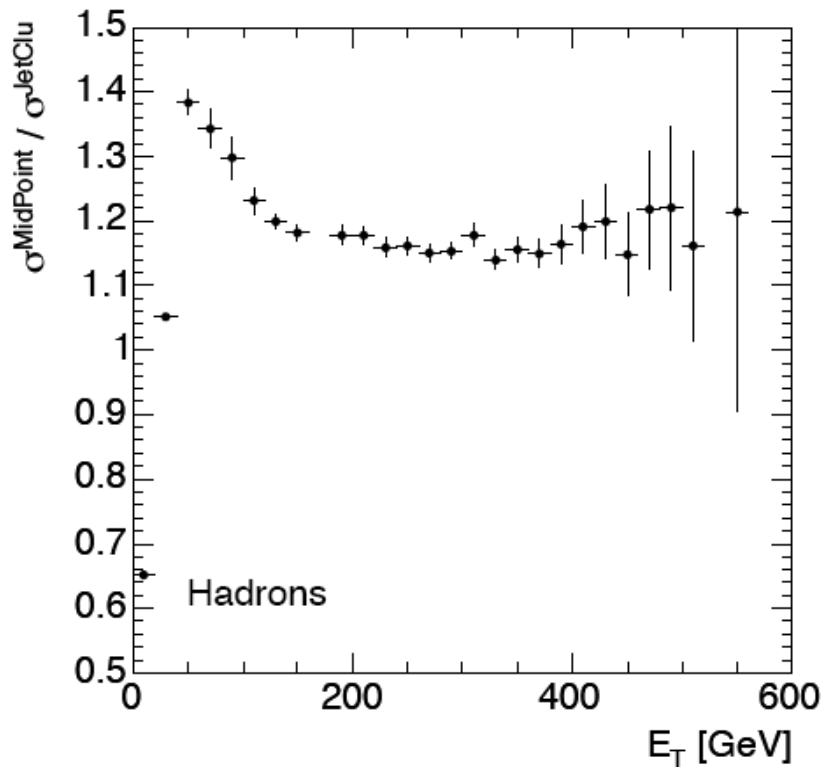
On left, the ratio of the midpoint to JetClu algorithm is shown plotted vs E_T ; on the right JetClu is plotted vs E_T and midpoint vs p_T



Matthias studies



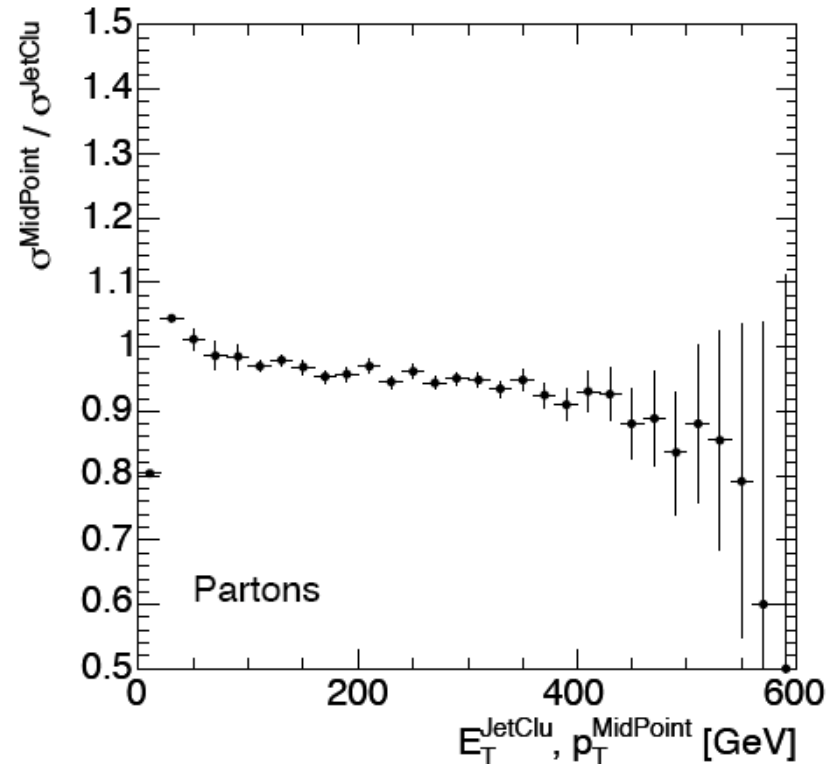
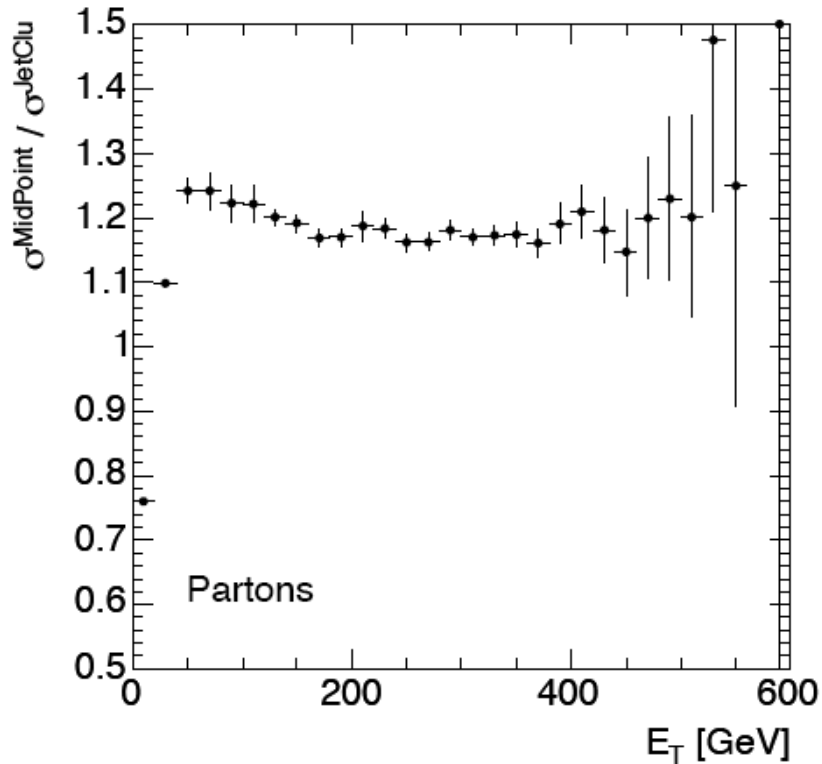
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Matthias studies



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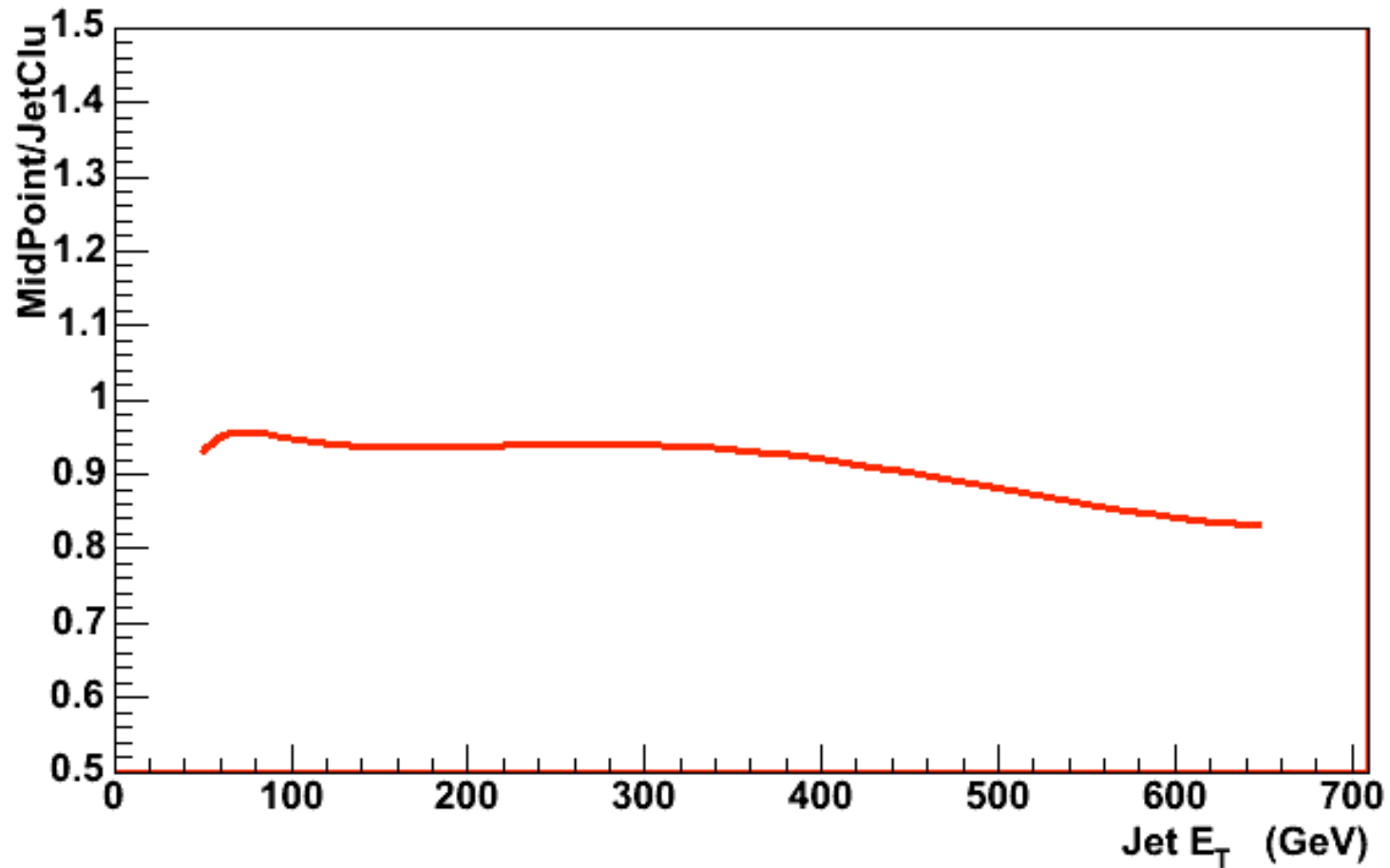


Discussion

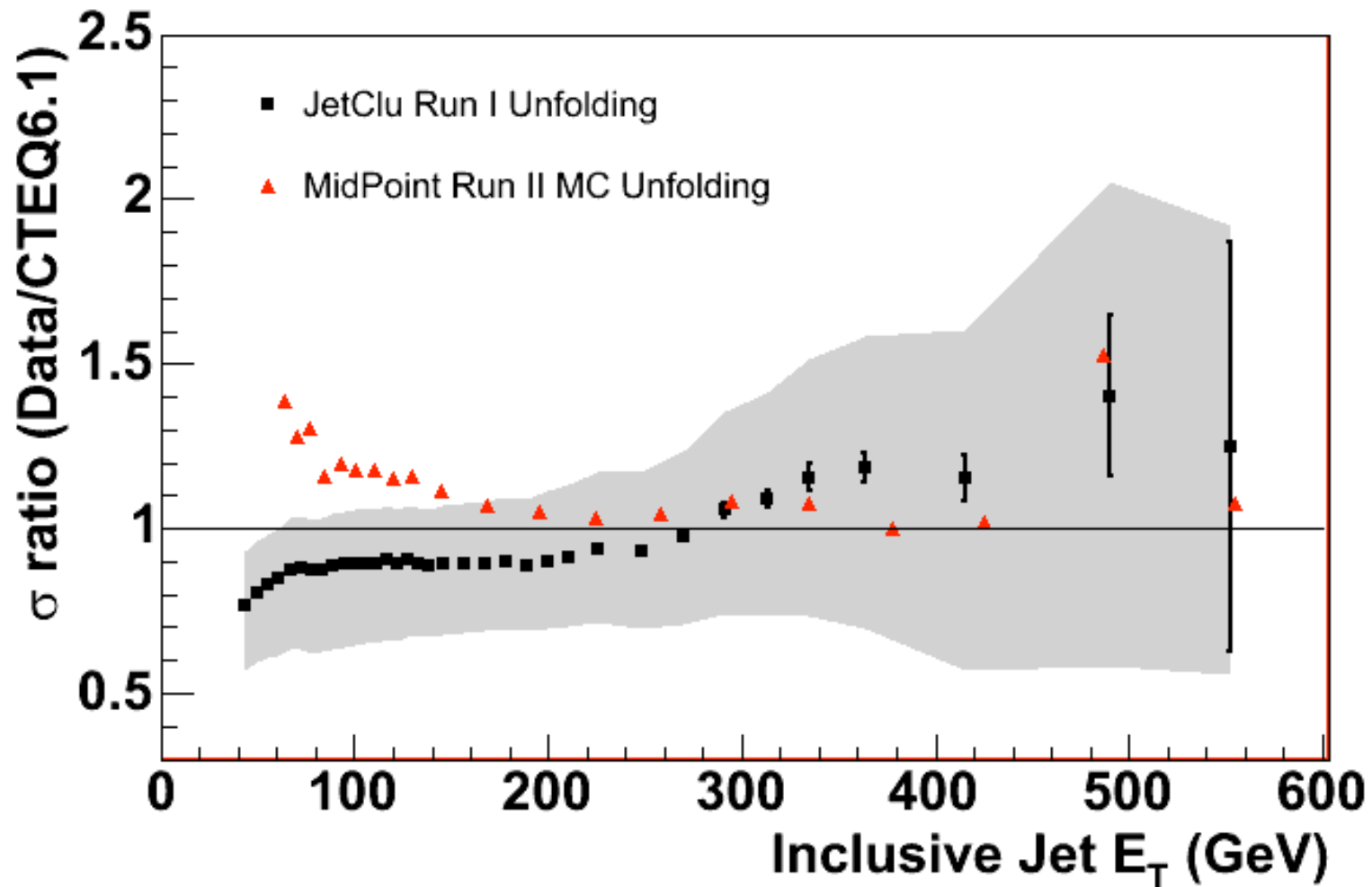


- At hadron level, with both JetClu and midpoint plotted versus E_T (a bad thing), ratio of JetClu to midpoint increases markedly at low E_T
- At hadron level, with JetClu plotted vs E_T and midpoint vs p_T (the correct thing), difference is basically a flat 10%, mostly from kinematic definitions
 - ◆ kinematic difference increases as p_T/E_T increases (see plot) but ΔE_T (because of algorithm differences) between the two algorithms is basically constant (and thus the effect decreases as p_T/E_T increases)
- Difference is smaller (and has a slope) at parton level, but similar to what is observed in EKS predictions (next slide)

Ratio of midpoint/JetClu predictions

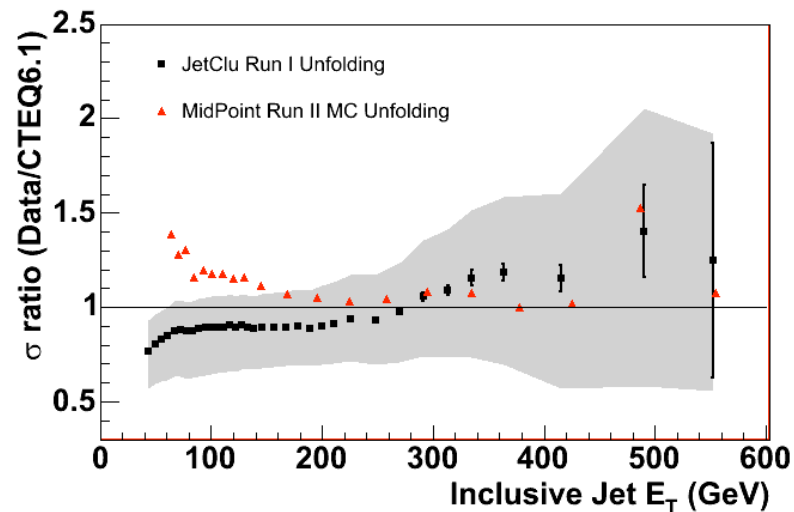
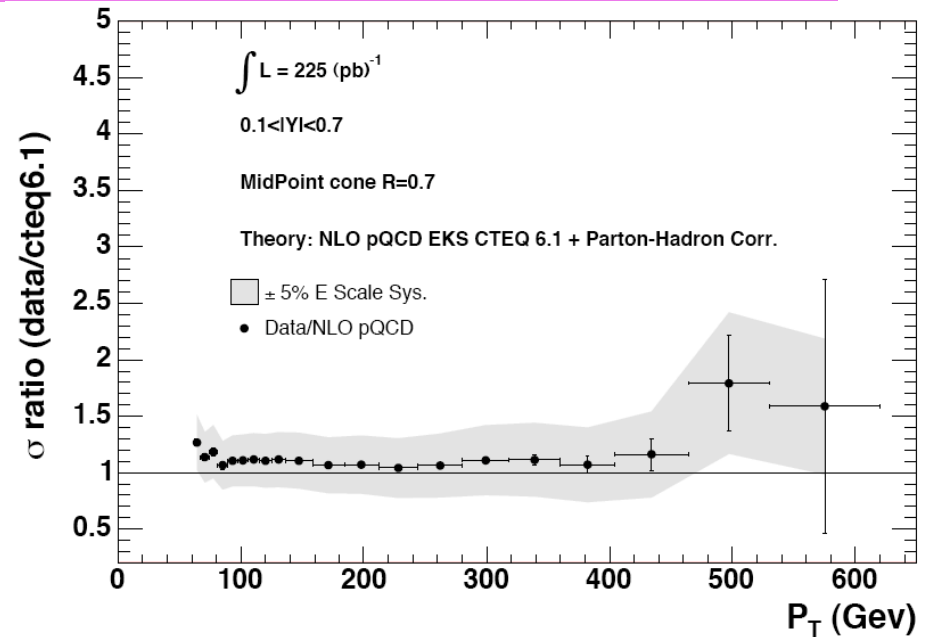
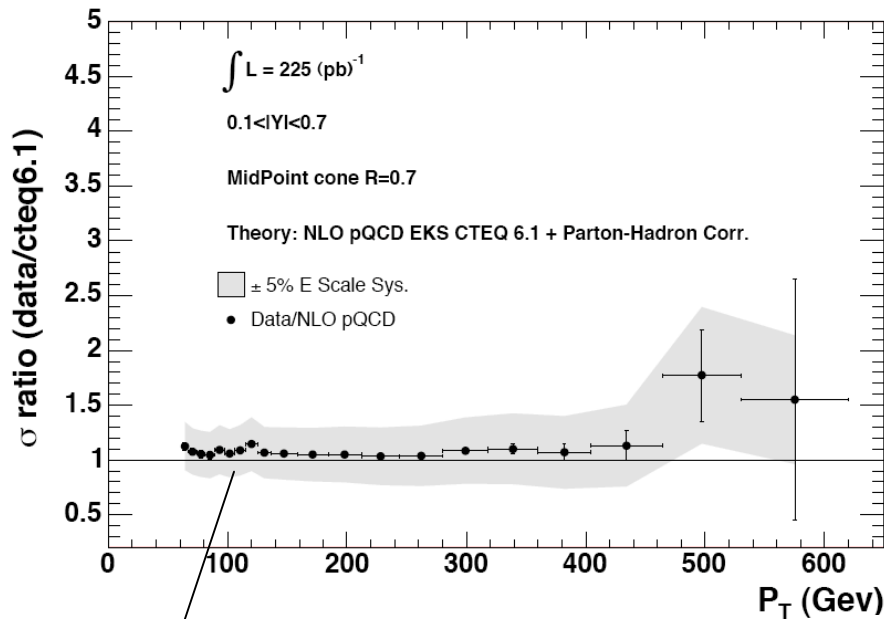


Comparing midpoint and JetClu results



...but without underlying event subtraction for midpoint

Gene's plots correcting for UE

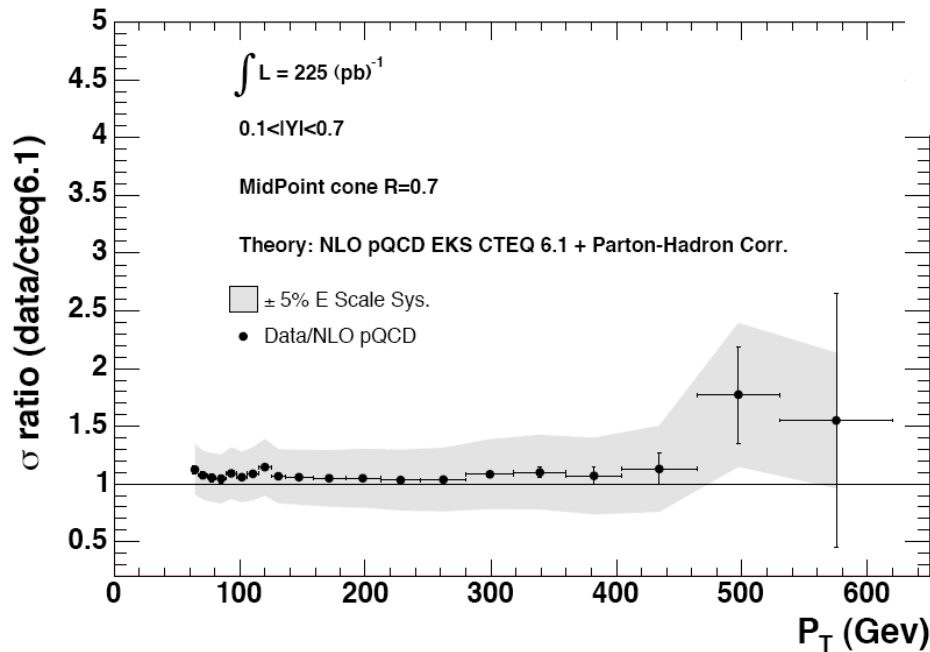
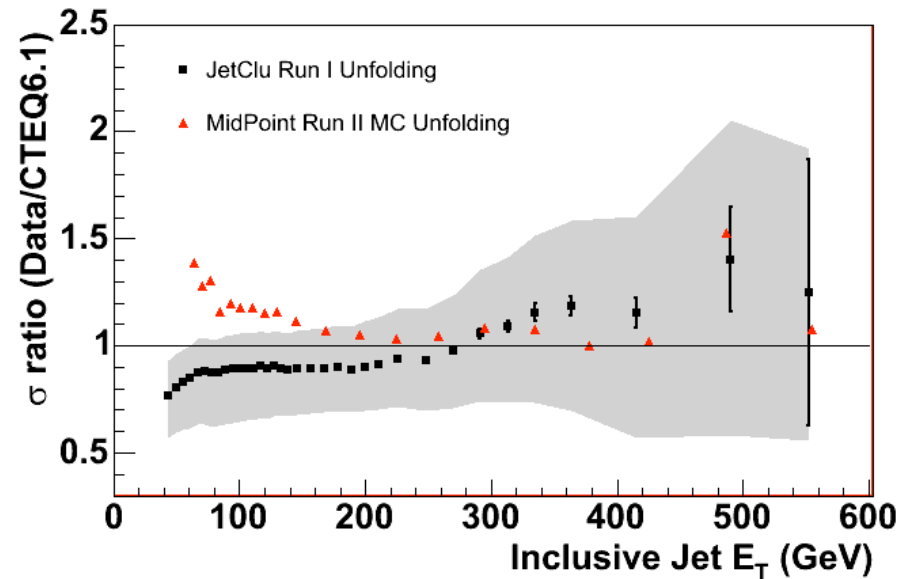


So midpoint seems very consistent with predictions (and more consistent with JetClu); except JetClu turns down at low E_T

Midpoint vs JetClu



- So at low E_T/p_T , after subtracting underlying event, difference in data/theory comparisons is of the order of 10-15%

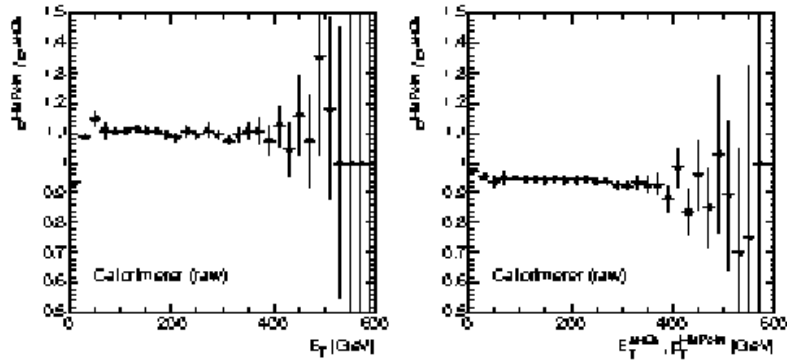


Do we accept this 10-15% difference? Any more subtleties with theory comparison/corrections?

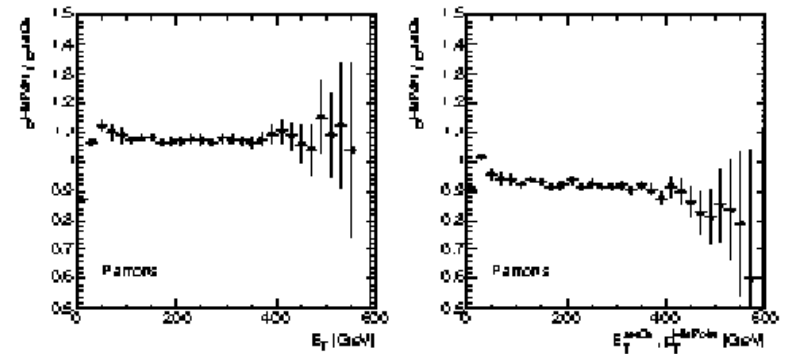
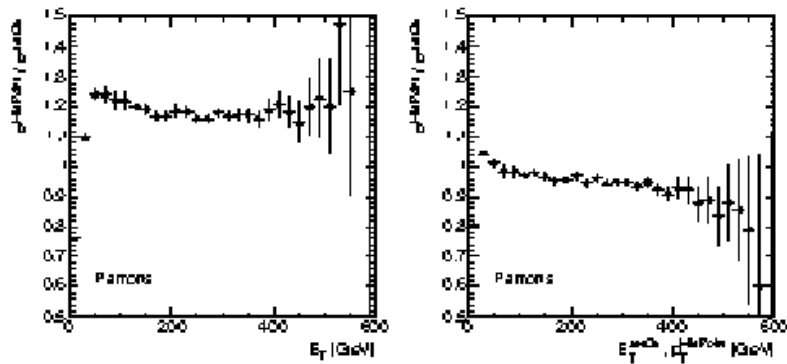
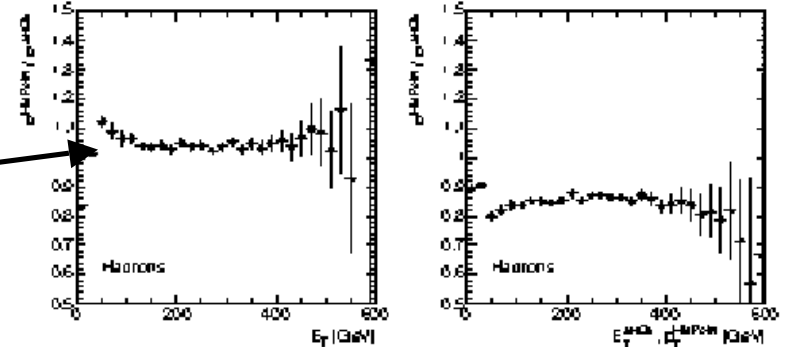
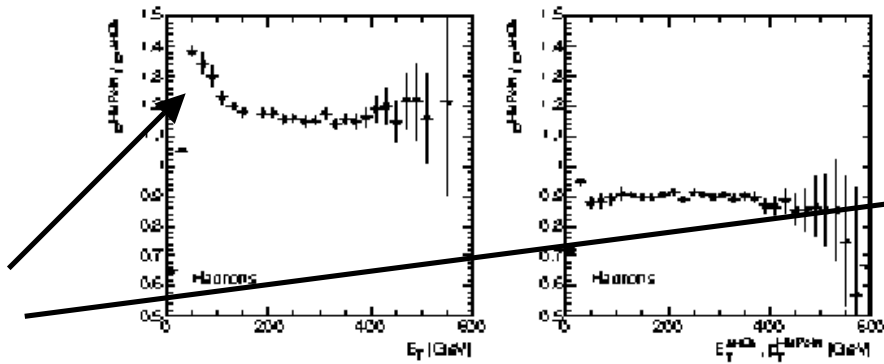
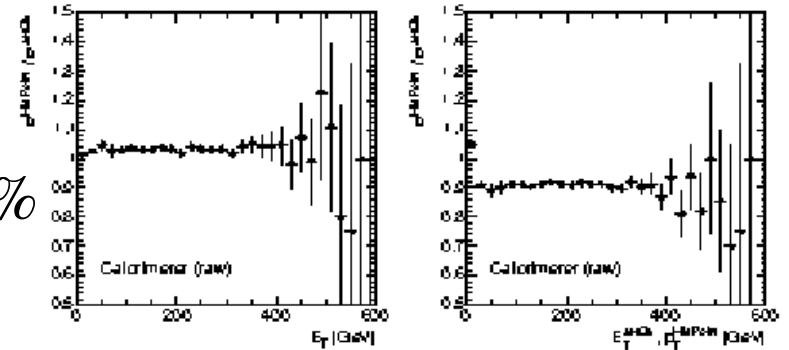
Effect of split/merge percentage



50%



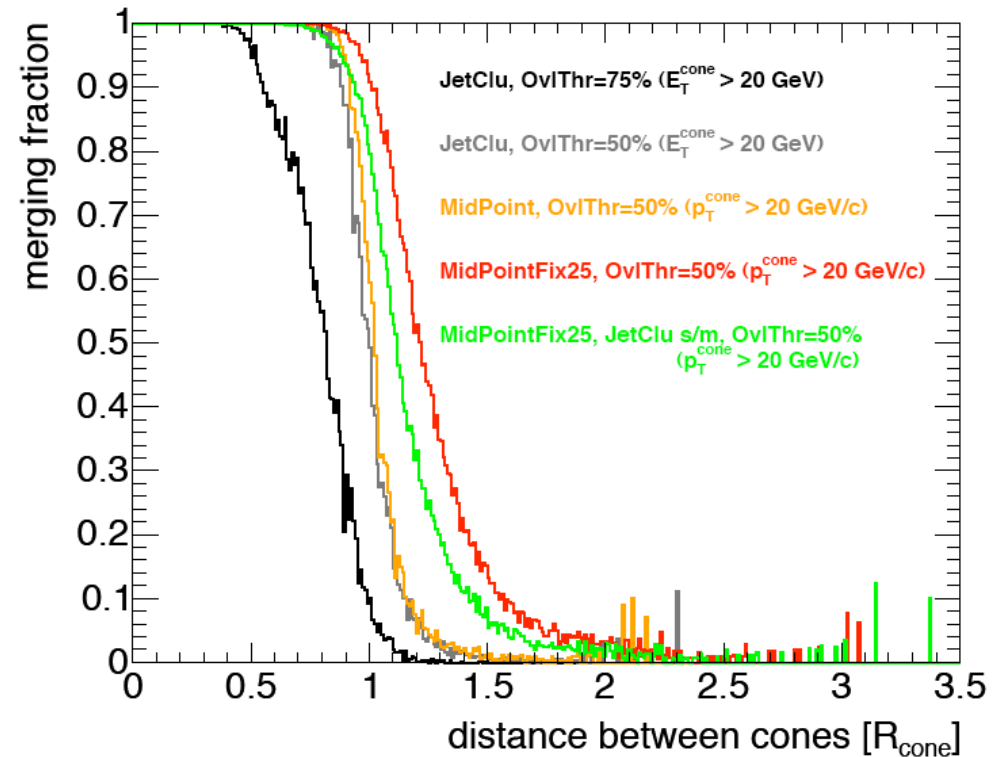
75%



...but some questions for data and theory



- The split/merge criterion is 75% in JetClu and 50% in midpoint
- This affects the cross section in the data/Monte Carlo
- NLO theory doesn't know about 50% or 75%
 - ◆ all of the partons are < 1 fermi in size, so no sharing
- The only thing NLO theory knows about is R_{sep}
- Is R_{sep} different for Jetclu and midpoint?



Above shows the probability of splitting/merging if 2 stable cones are placed a distance R apart (in units of R_{cone})

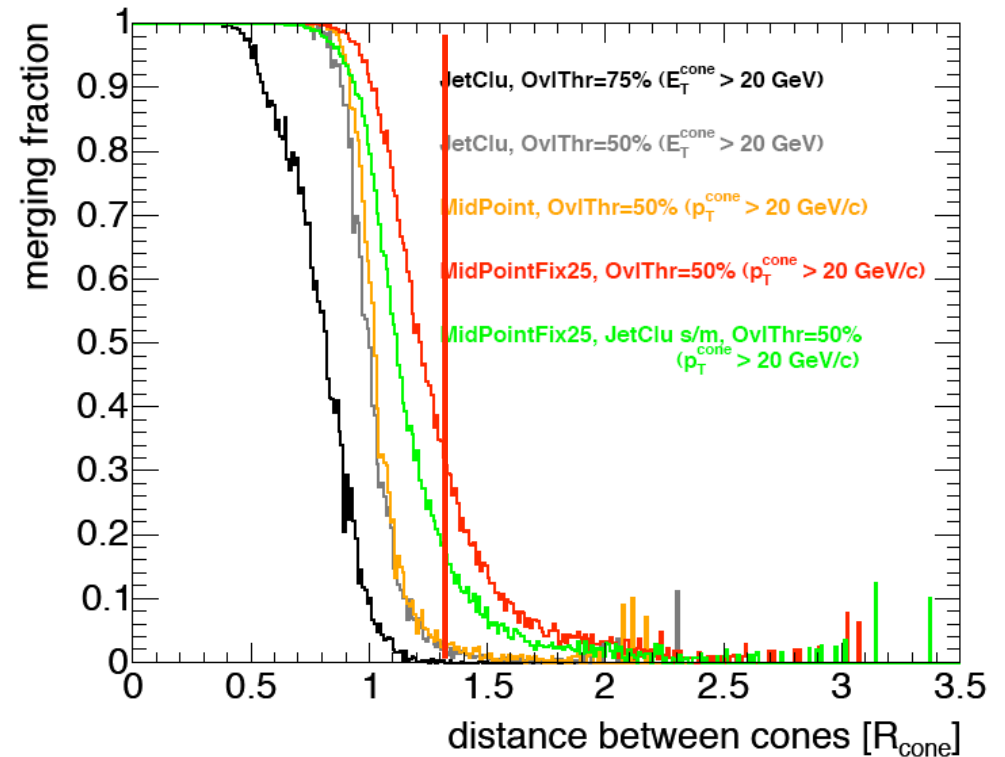
Split/merge % does affect curve
Midpoint and JetClu are different

...but some questions for data and theory



Tue Aug 10 01:29:00 21

- What value of R_{sep} do we use with JetClu (and midpoint)?
 - ◆ 1.3
- That's not the 50% point for JetClu curve, although close to it for midpoint curve



Above shows the probability of splitting/merging if 2 stable cones are placed a distance R apart (in units of R_{cone})

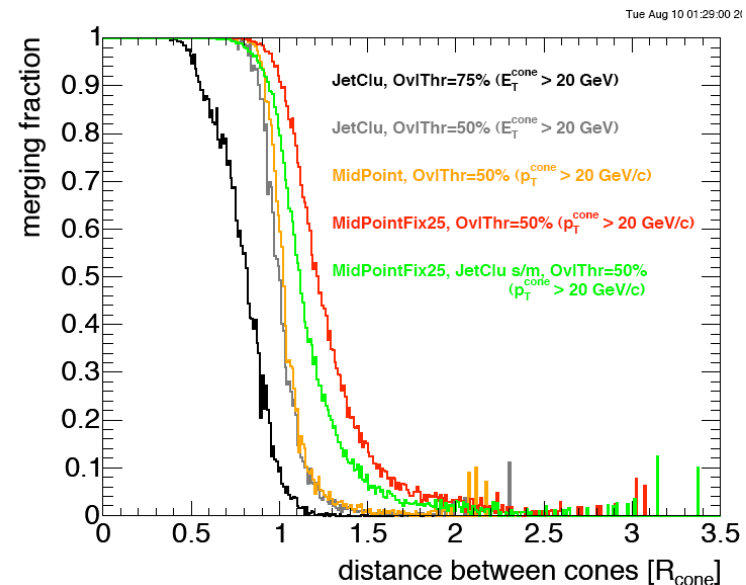
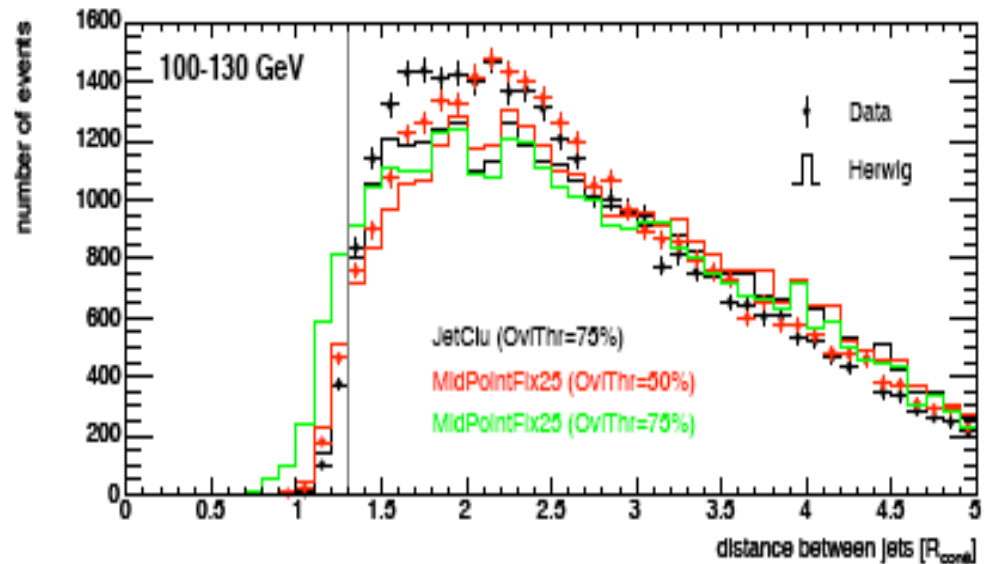
Split/merge % does affect curve

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Plot ΔR between jets



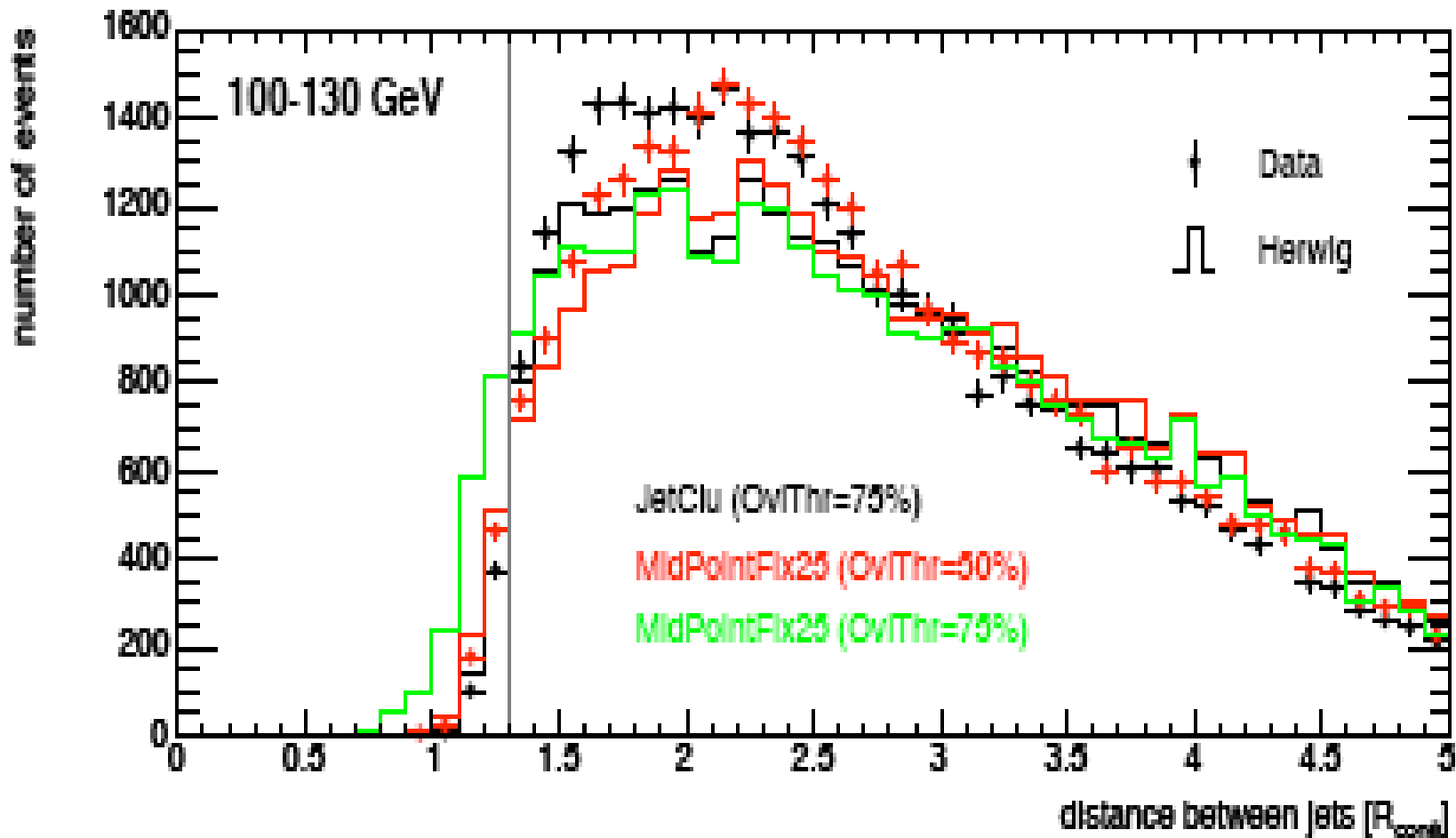
- Now JetClu and midpoint are closer to each other and to having a threshold of about $1.3 \cdot R_{\text{cone}}$
- So if 2 jets are within a ΔR of $1.3 \cdot R_{\text{cone}}$ of each other, then they will merge
 - ◆ in the case of midpoint, because that's approximately where there's a 50% chance of merging
 - ◆ in the case of JetClu, because the algorithm will produce **no stable cones within a ΔR of $1.3 \cdot R_{\text{cone}}$**
 - ◆ **Is this an act of God?**



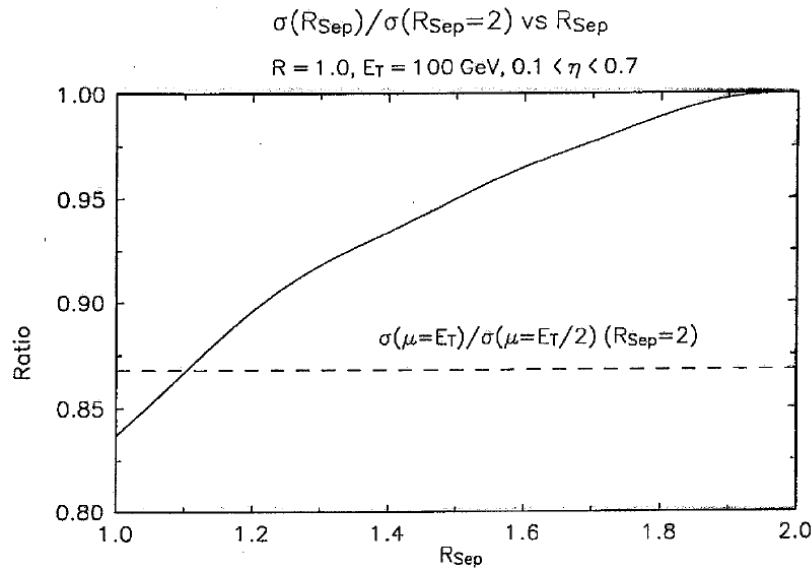
JetClu and Midpoint



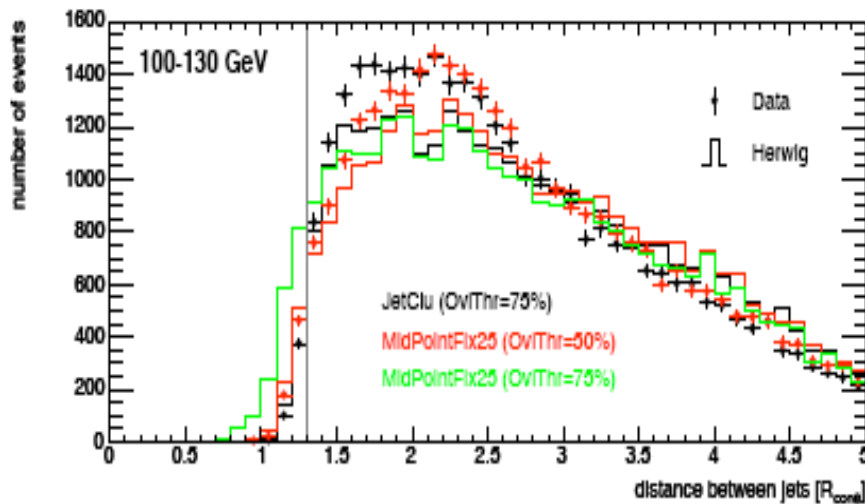
The jet separation plots do look different for JetClu and midpoint, so perhaps R_{sep} should be 0.1-0.2 larger for midpoint (few % effect)



R_{sep}



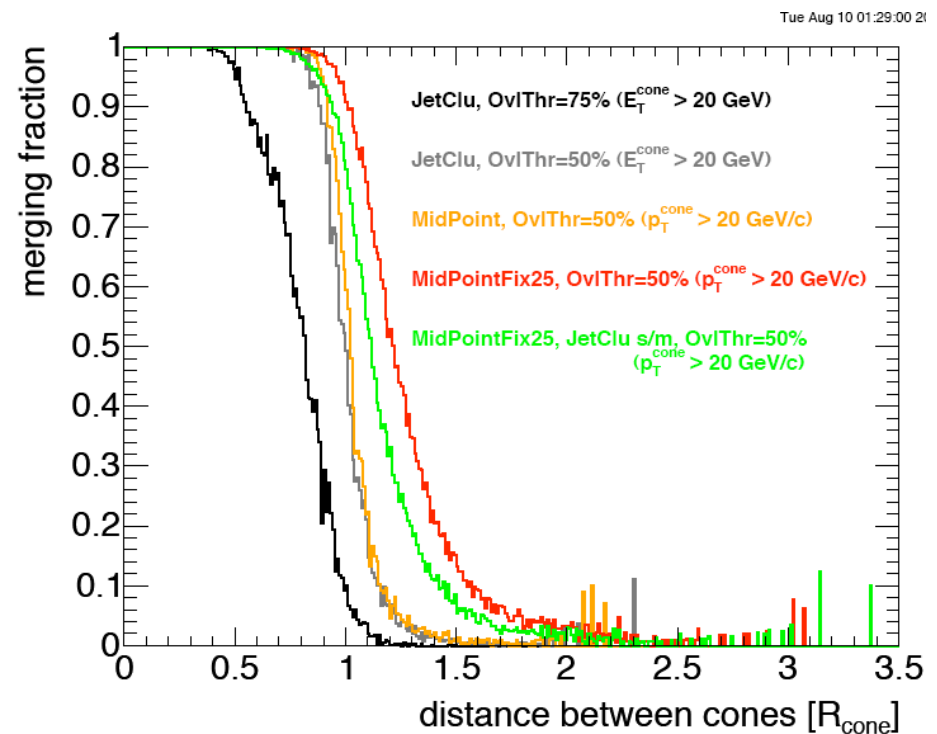
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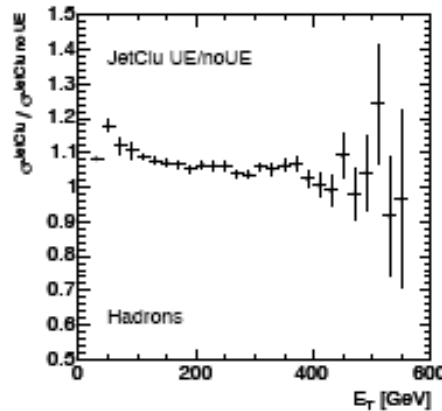
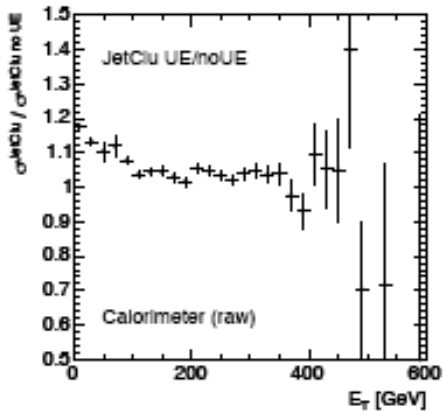
Another subtlety



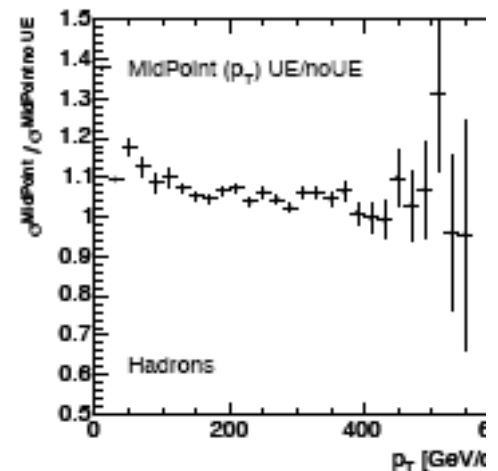
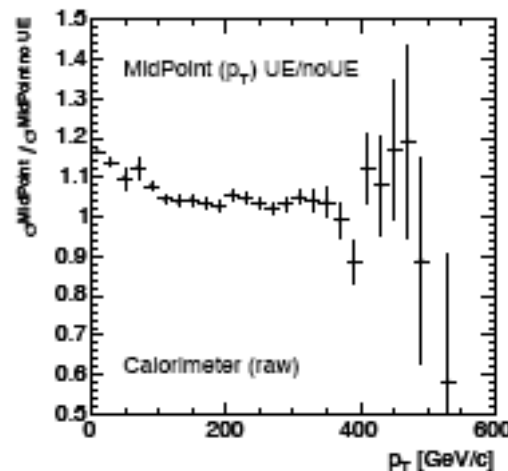
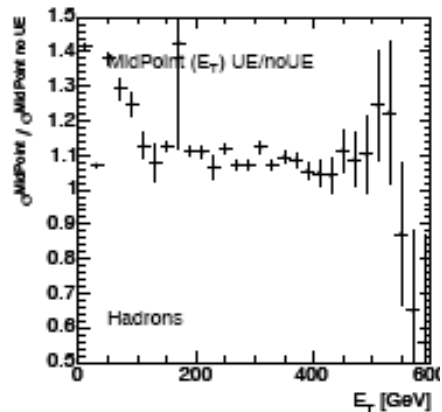
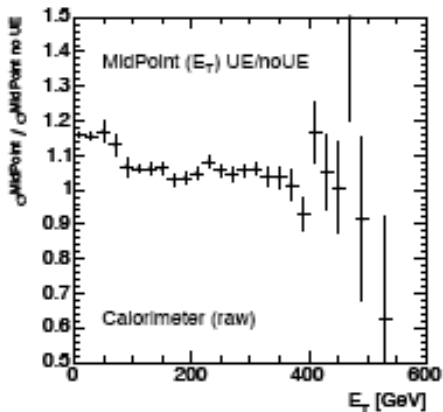
- JetClu and midpoint split/merge algorithms differ by more than just percentage of overlap
- Midpoint does an iterative splitting/merging
- JetClu has enough after 1 go
- Makes a bit of a difference in merging fraction



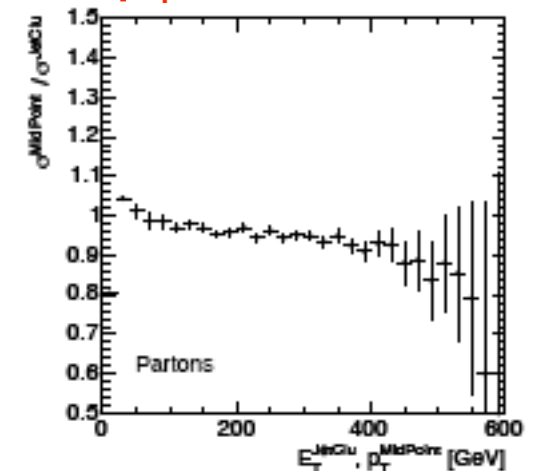
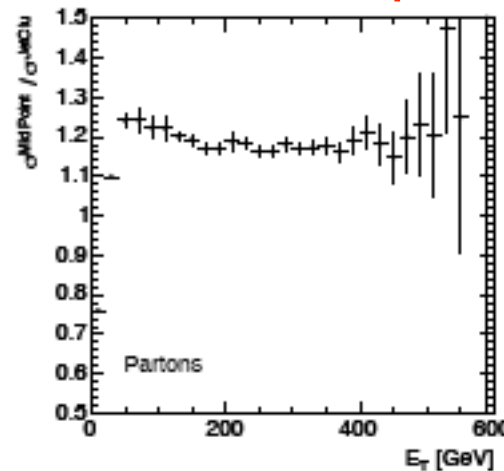
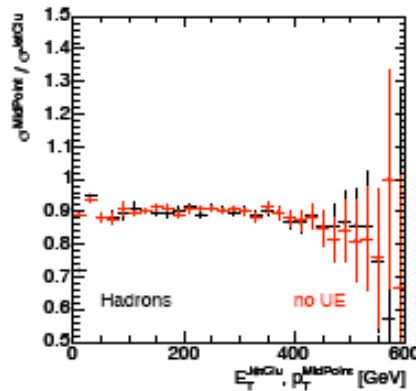
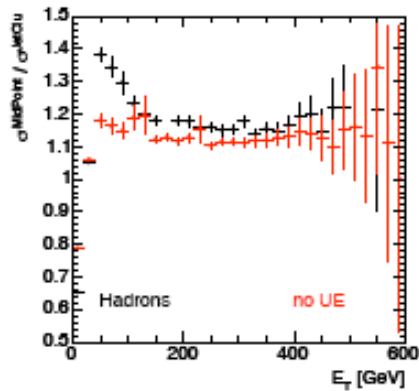
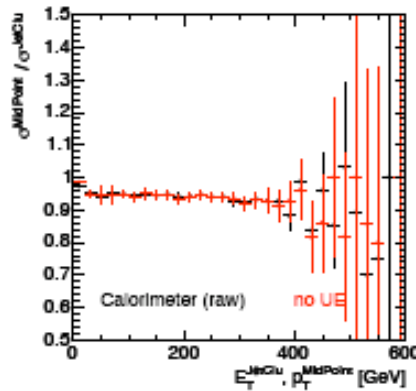
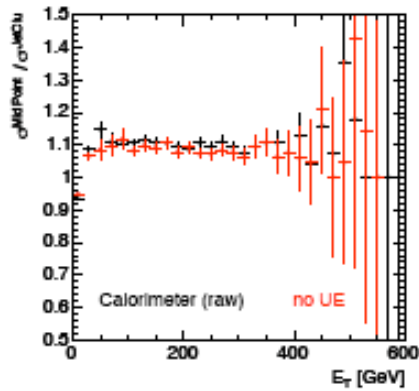
Another (related) question: is the UE subtraction the same



- At hadron level, with midpoint jets plotted versus E_T , great sensitivity to UE
- Not so much at calorimeter level
- Not so much when plotted versus p_T



Midpoint/JetClu



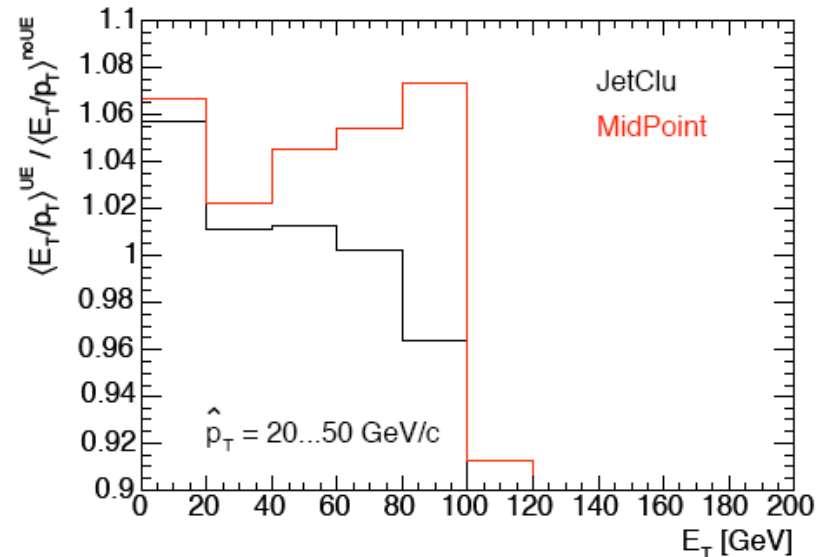
- Ratio of midpoint/JetClu does not seem dependent on UE if

- ◆ work at calorimeter level
- ◆ plot JetClu vs E_T , midpoint vs p_T

Why?



- Suspect that midpoint splitting/merging algorithm (50% instead of 75% and iterative split/merge procedure) can pull in UE
- Consequences
 - ◆ soft UE at periphery of jet contributes to jet mass at particle level
 - ◆ p_T variable is insensitive to this effect
 - ◆ because of softness of particles, calorimeter level is less sensitive



OK, then?

This is using Herwig UE and no multiple interactions