

# LH'15: Monte-Carlo working group

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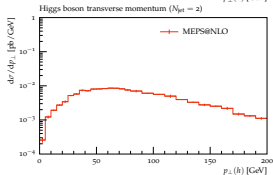
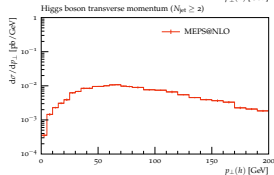
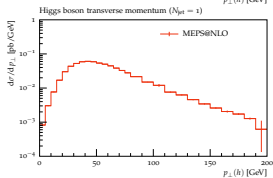
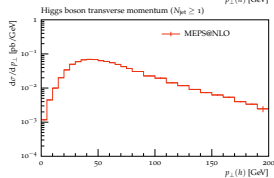
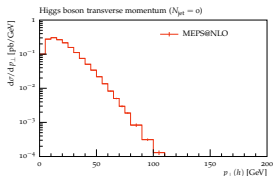
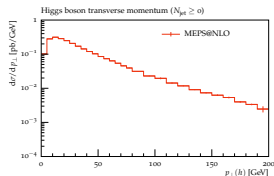
## Some topics

- $pp \rightarrow h + \text{jets}$  fixed-order vs. matched/merged calculations
- parton shower systematics
- matching/merging systematic uncertainties
- tuning in the presence of matching/merging
- extrapolation from fiducial region to  $4\pi$
- EW corrections
- $pp \rightarrow t\bar{t} + \text{jets}$  comparison
-

## $pp \rightarrow h + \text{jets}$

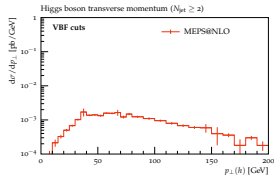
- common project with Loops and Multilegs group
- many observables have intricate phase space dependencies  
→ non-trivial to see which ones are described decently by fixed-order calculations
- even when picture seems clear there are surprises
  - xs, leading jet pT in dijet production
  - + leading jet pT in  $pp \rightarrow Z + 1\text{jet}$  with veto on 2nd jet
- existing RIVET routine (RIVET-2.2.1) for easy analysis
  - ready for fixed-order, merged and matched calculations
  - HEPMC or LHEF input
  - either stable Higgs or decay to photons→ compare at pQCD level

# $pp \rightarrow h + \text{jets}$

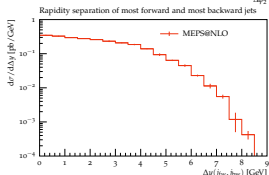
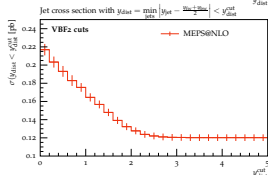
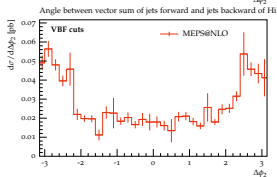
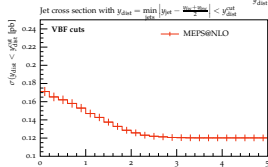
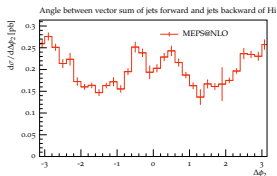
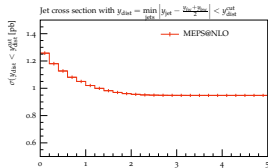


goals:

- study various observables
- some with intricate phase space dependence
- assess description

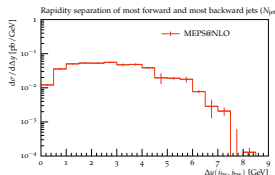


# $pp \rightarrow h + \text{jets}$



goals:

- study various observables
- some with intricate phase space dependence
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# Systematics

Parton showers:

- already discussed in previous incarnations of LH
- some work done by various groups
- none is exhaustive (encompasses not all arbitrary/systematic choices)
- rarely assessed in experiments

Matching/merging systematics:

- already discussed in previous incarnations of LH
- we had a nice table of what to do on the board
- rarely assessed in experiments

Non-perturbative modeling systematics:

- already discussed in previous incarnations of LH
- eigentunes, simplified variations
- rarely assessed in experiments

## Extrapolation from fiducial region to $4\pi$

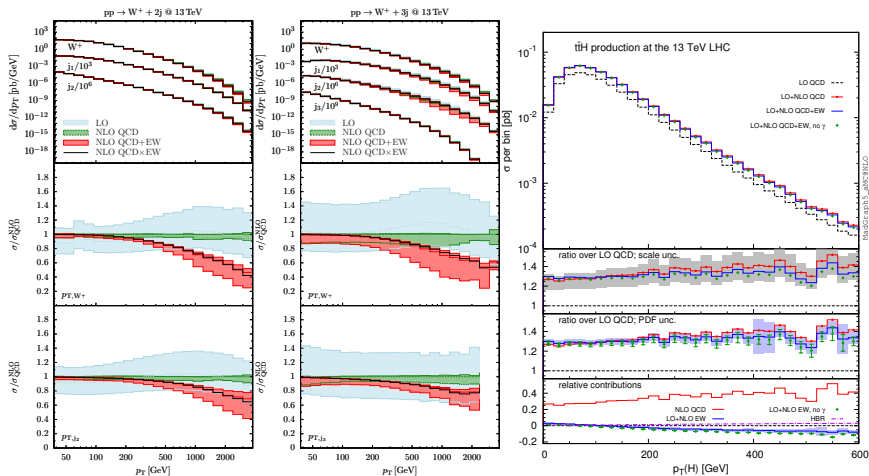
- commonly done to compare to NLO/NNLO/Resummed calculation which does not allow for fiducial cuts
- are the extrapolation uncertainties exhaustive
- when extrapolating include/not-include processes that only contribute outside fiducial region

example: Drell-Yan

- in fiducial region  $q\bar{q} \rightarrow \ell\ell$  and  $\gamma\gamma \rightarrow \ell\ell$  ( $\gamma$ PDF)
- suppressed by orders of magnitude in fiducial region but rather large in  $4\pi$ :  $\gamma\gamma \rightarrow \ell\ell$  (EPA –  $\gamma$ -bremsstrahlung)

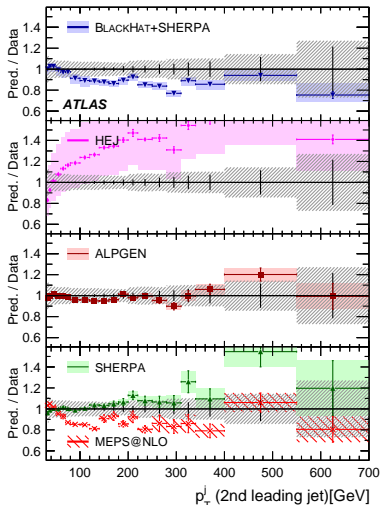
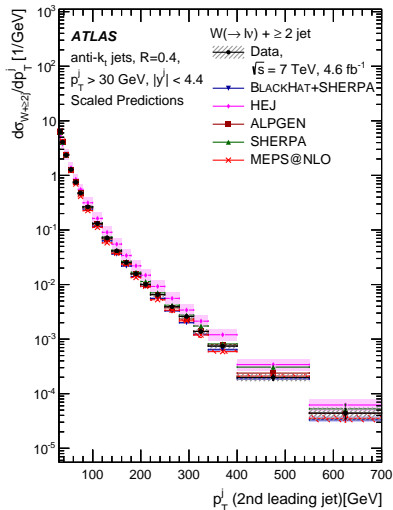
⇒ **Extrapolation to compare to a calculation or to describe physics process in  $4\pi$ ?**

# EW corrections





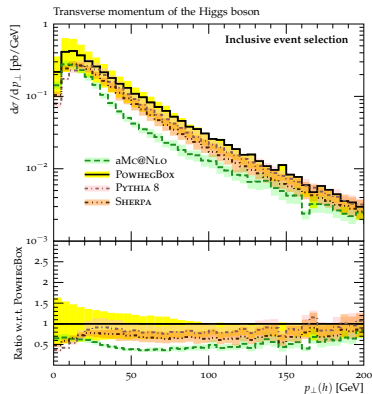
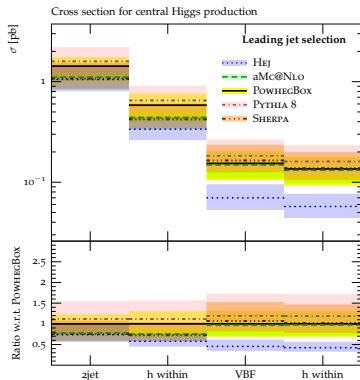
# EW corrections



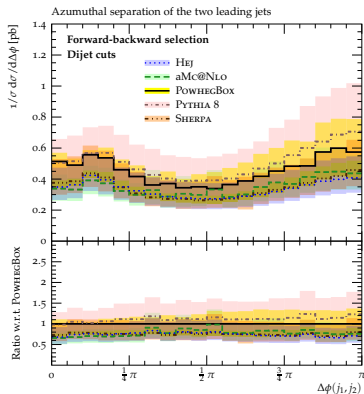
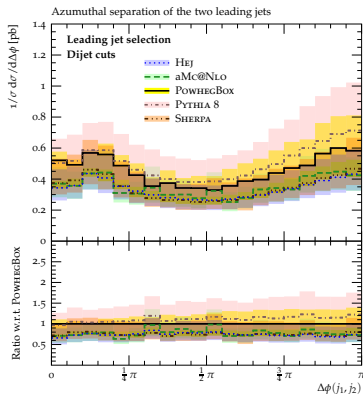
## Generator comparison – $pp \rightarrow t\bar{t} + \text{jets}$

- benchmarking predictions and uncertainties of different generator/calculations
  - ideally mix of fixed-order, matched, merged
- $pp \rightarrow W + \text{jets}$  (LH'11),  $pp \rightarrow h + \text{jets}$  (LH'13)
- propose  **$pp \rightarrow t\bar{t} + \text{jets}$** 
  - process of interest in its own right
  - background to  $tth$  and BSM
- ideally have all existing methods contributing
- should start discussing soon to fix observables etc.
- identify main objective

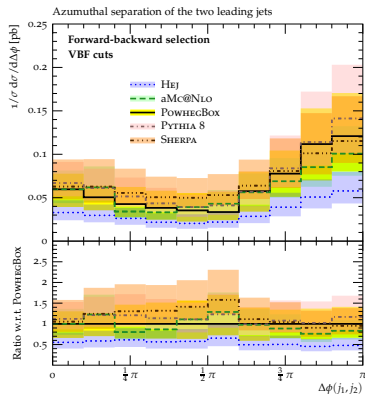
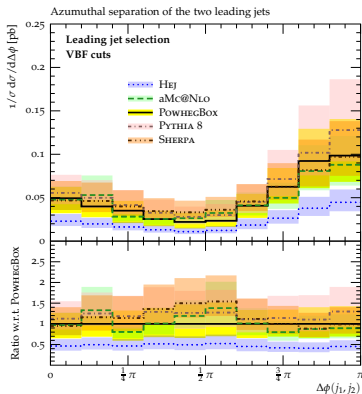
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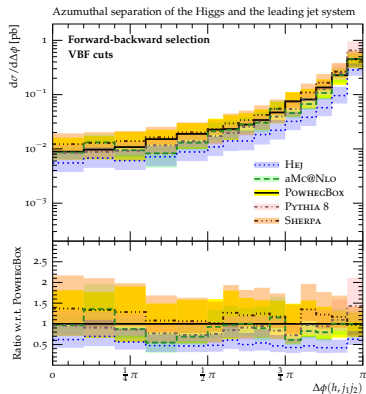
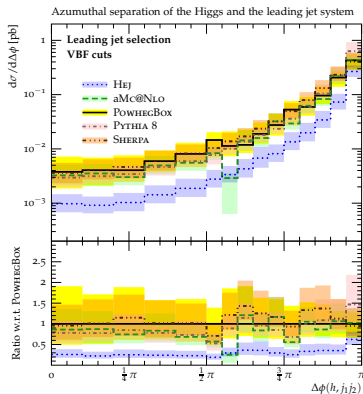
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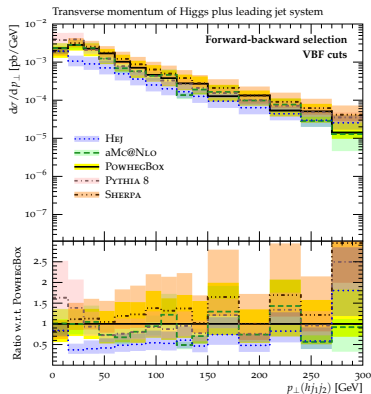
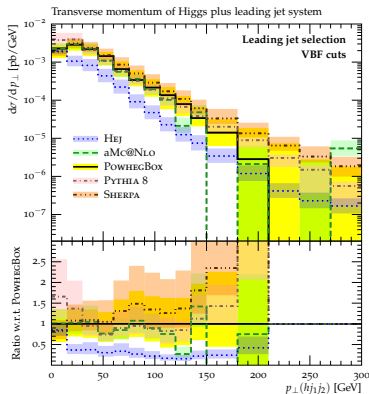
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# Generator comparison – $pp \rightarrow t\bar{t} + \text{jets}$



# First events

Wed 10:00 ttbar (?) setup (focus/scope/observables)

Thu 16:00 hjets discussion via Vidyo



Thank you for your attention!