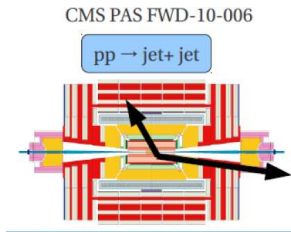


Jets at the LHC beyond NLO DGLAP

Jeppe R. Andersen, Jennifer M. Smillie (and POWHEG)

CMS Forward and small-x, Jan. 31 2012

Simultaneous production of central and forward jet



Jets: anti-kt, $R=.5$, $p_t > 35\text{GeV}$

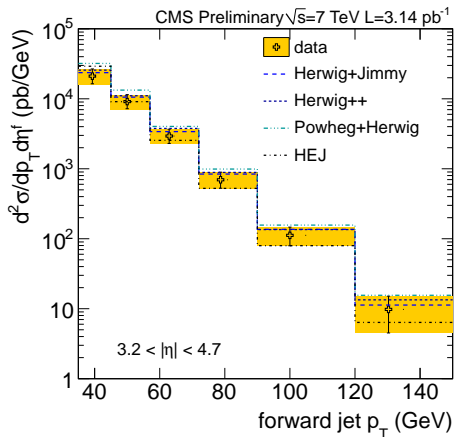
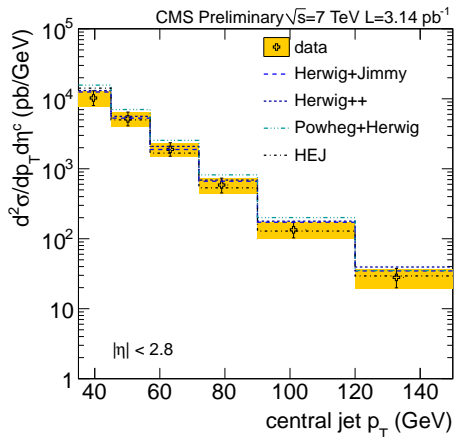
central : $|\eta| < 2.8$

forward : $3.2 < |\eta| < 4.7$

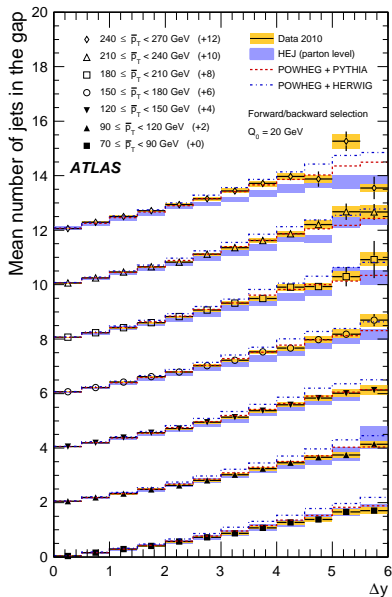
(not particularly large rapidity spans, typically 1 unit).

Measure the p_t -spectrum of the central and the forward jet. Any difference is obviously due to additional radiation.

Comparison to Theory



Atlas Study of Further Jet Activity in Dijet Events

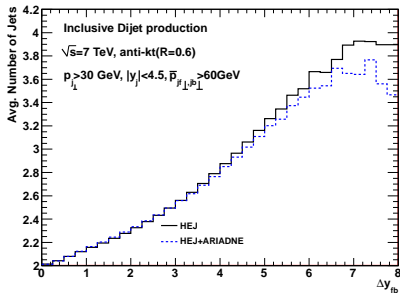


The ATLAS event selection does not cleanly separate the two “drivers” of jet production. (cut on \bar{p}_t induces large p_t -hierarchy on forward/backward jet, besides the hierarchy between large \bar{p}_t and Q_0 , the general jet scale)

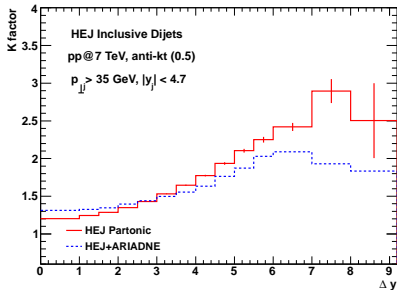
HEJ slightly undershoots the jet activity when large ratios of transverse scales are imposed (fully understood).

Very good agreement in the most important regions of phase space
 Obviously *beyond* NLO (more than one extra jet on average at large Δy !)

Impact of Shower - avg. jets and dijet “K-factor”



Impact rather small in this case



Impact rather large in this case (because of huge effect of combinatorics when the hard jet count decreases by just one due to jet broadening)

Fruitful combination. . .

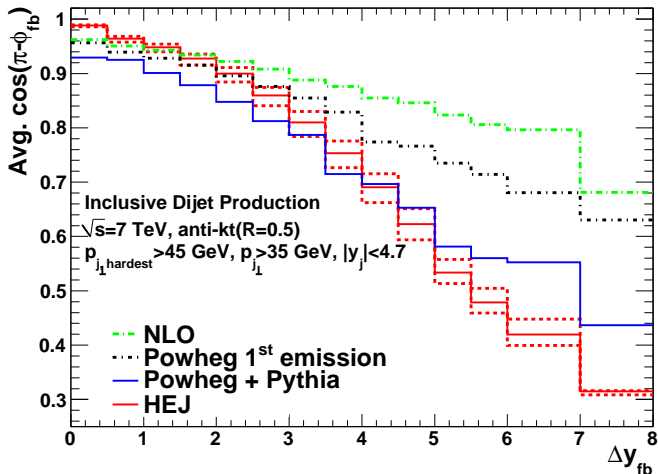
- Simple CMS cuts

Additional: Requiring the hardest jet slightly harder than the general jet scale ensures a physical behaviour of the NLO calculation.

- ATLAS study

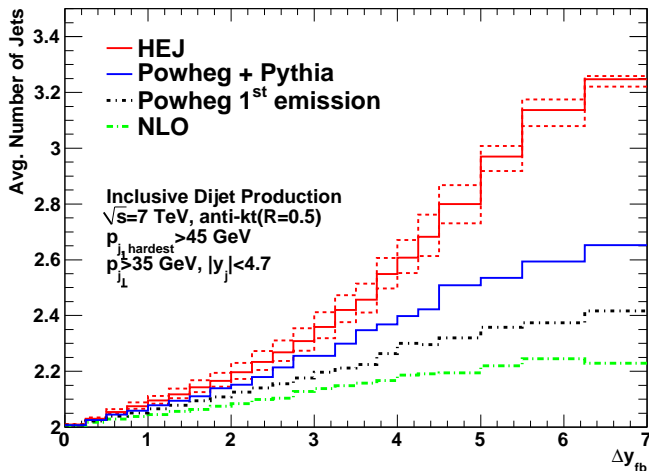
Azimuthal Decorellation vs. Rapidity

In Collaboration with POWHEG



Similarities: NLO+Shower, HEJ (all-order hard resummation)

Difference: NLO



Clear differences: NLO, NLO+Shower, HEJ (all-order hard resummation)

- The LHC has the energy to probe the Multi-Regge-Kinematic region
- Effects of multiple hard emissions have already been observed
- . . . but the analyses can be made much cleaner
- Please do so, since this will teach us much about QCD; and about jet veto effects in h +dijets.
- Longer discussion at <http://andersen.web.cern.ch/andersen/talks/AndersenBlois.pdf>