DiJet Production at the LHC:
Probing Higher Order Corrections

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(in preparation)

Small x Discussion

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Aims

Already have a number of interesting experimental analyses of inclusive jets by both Atlas and CMS.

Important signals, but also key to understanding of, e.g. *Hjj*

Main question:

▶ Have seen similarities in predictions from fixed-order+parton shower, and from wide-angle resummation.
How does that depend on the cuts applied?

Two parts:

▷ Investigate cuts which stabilise the NLO calculation (asymmetric)

▷ Propose analyses which probe differences in approach

NLO Cuts

Study alternative asymmetric cuts suggested by Gavin Salam.
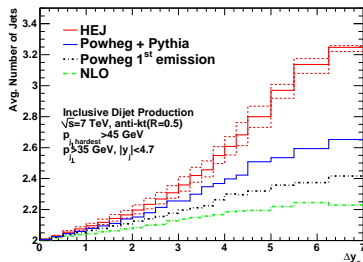Impose $p_{j\perp} > 35$ GeV, $|y_j| < 4.7$
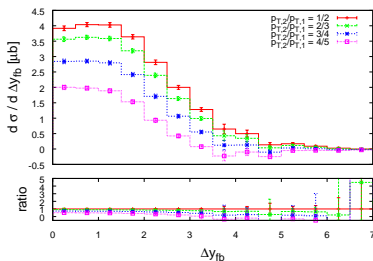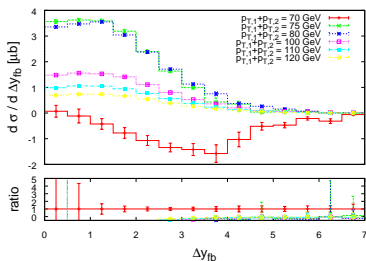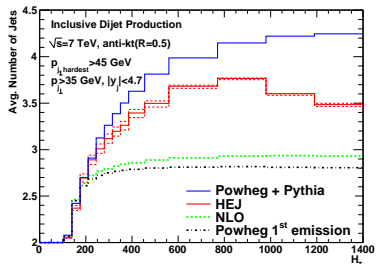

In addition,

left: $\dfrac{p_{j2\perp}}{p_{j1\perp}} > 2/3$ right: $p_{j1\perp} + p_{j2\perp} > 75$ GeV.

Unstable (negative!) unless $p_{j1\perp} = p_{j2\perp} = p_{\perp\min}$ excluded.
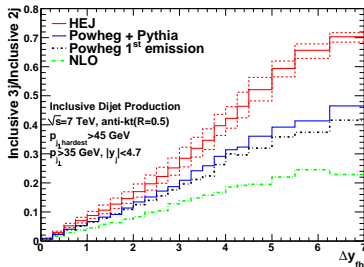
Average Number of Jets

$$\Delta y_{\mathrm{fb}} = y_{\max} - y_{\min} \qquad H_T = \sum_j p_{j\perp}$$

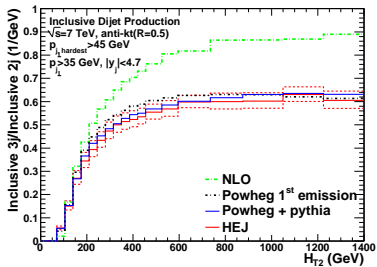$$p_{j\perp} > 35 \text{ GeV}, \quad p_{j\perp\mathrm{hardest}} > 45 \text{ GeV}, \quad |y_j| < 4.7$$

▷ Greater difference for these cuts than in Atlas veto paper.

▷ Initial plots show adding Ariadne to HEJ is small effect here.
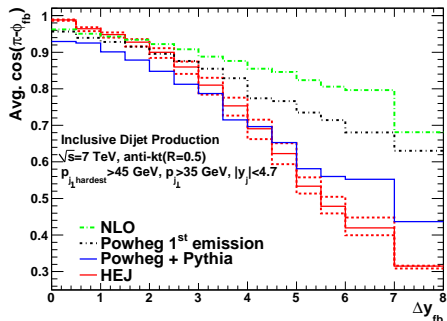
Ratio of Inclusive 3j to Inclusive 2j Rates

$$\Delta y_{\mathrm{fb}} = y_{\mathrm{max}} - y_{\mathrm{min}}$$

$$H_{T2} = p_{j1\perp} + p_{j2\perp}$$

$$p_{j\perp} > 35 \text{ GeV}, \quad p_{j\perp\mathrm{hardest}} > 45 \text{ GeV}, \quad |y_j| < 4.7$$

Azimuthal Decorrelation

Very similar final predictions, even as function of y_{fb}.

Outcomes

▷ Effect of asymmetric cuts important

▷ The impact of adding the parton shower to NLO is large

▷ There exist analyses which show good agreement between approaches, e.g.:
  ▸ Azimuthal decorrelation vs Δy_{fb}

▷ Many analyses probe differences, e.g.:
  ▸ $\sigma^{\mathrm{Incl}}(3j)/\sigma^{\mathrm{Incl}}(2j)$ vs Δy_{fb}
  ▸ Average number of jets vs Δy_{fb}, H_T