

Jet Issues in Higgs Physics

Brief overview of recent theory
developments

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Jet Bins

Resummation for 0-jet bin

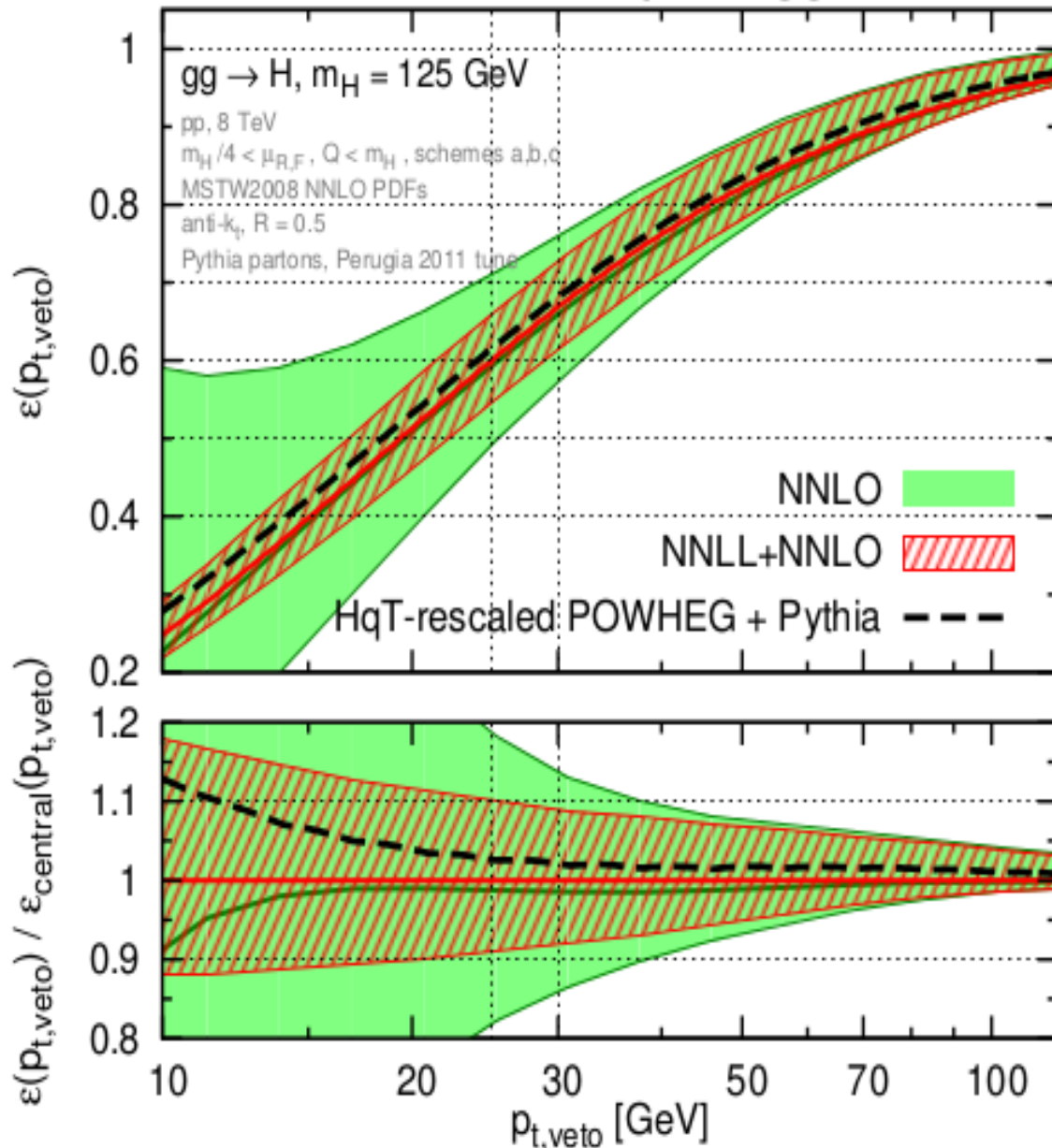
NLL+NNLO:

- Banfi, GPS, Zanderighi: 1203.5773 (+part of NNLL in appendix)

NNLL+NNLO:

- Becher, Neubert: 1205.3806 (current plots lack large NNLL constant)
- Tackmann, Walsh, Zuberi: 1206.4312 (critique of B&N factorization)
- Banfi, Monni, GPS, Zanderighi: 1206.4998
(different approach, powerful fixed order checks)

Jet veto efficiency for $gg \rightarrow H$



NNLL resummation reduces jet-veto efficiency by $\sim 30\%$

New proposal for 0,1-jet correlation matrix (efficiency & σ_{tot} uncorrelated)

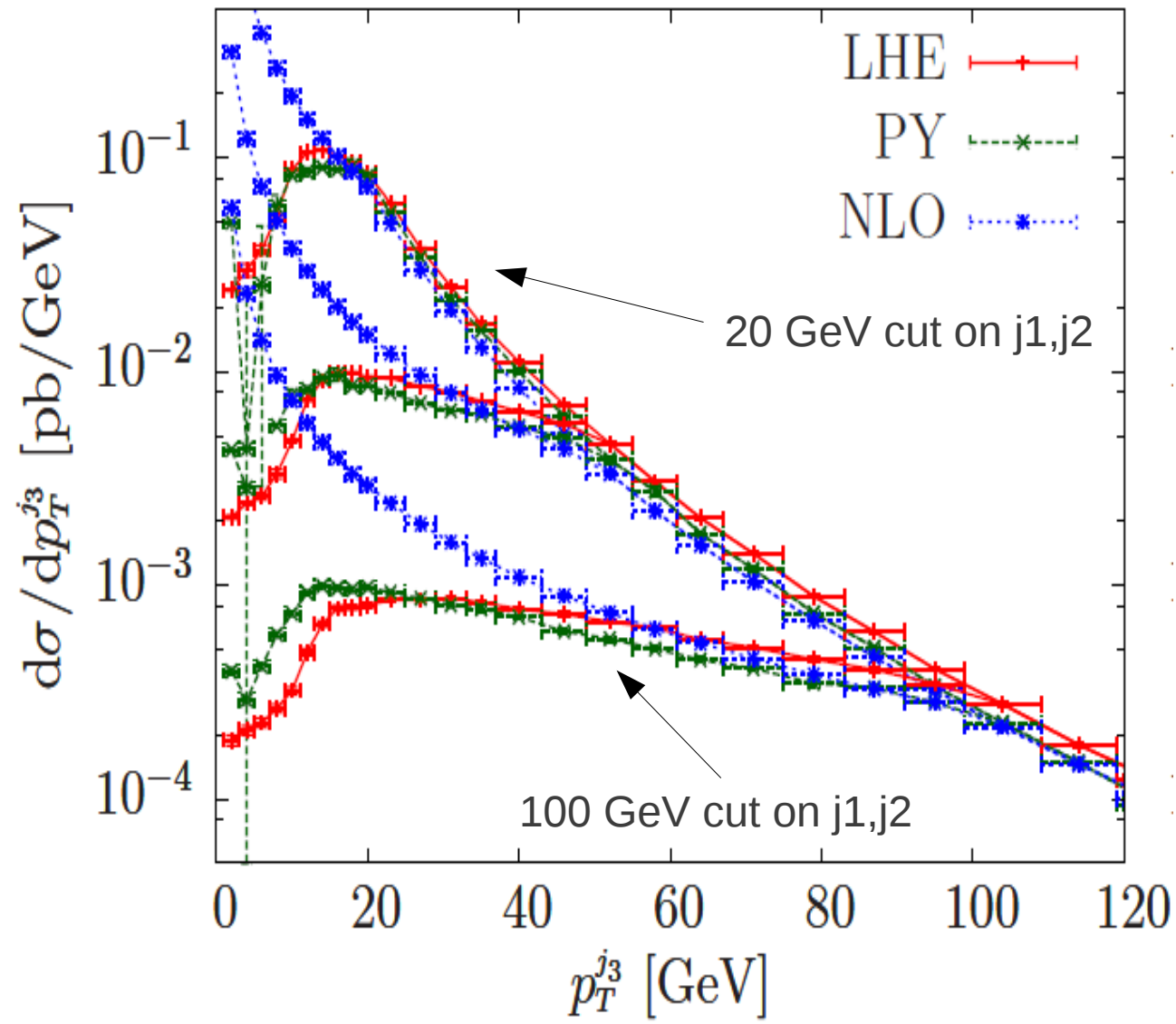
<http://jetvheto.hepforge.org/>

$ggF + 2 \text{ jets}$
(needed for separation of VBF)

H+1, H+2 @ NLO + shower

- POWHEG (+ MCFM + Madgraph)
Campbell et al, 1202.5475.
- Should also be possible within aMCatNLO,
Hirschi et al: 1103.0621. We can ask Stefano
Frixione who is here.

Pt distribution of 3rd jet In H+2 @ NLO



Campbell et al (POWHEG)

VH associated production ($H \rightarrow bb$)

New Calculations / Studies for VH

Fixed order:

- Fully differential VH at NNLO: Ferrera, Grazzini & Tramontano, 1107.1164
- Fully differential VH at NLO for production and decays: Banfi & Cancino, 1207.0674

Resummation:

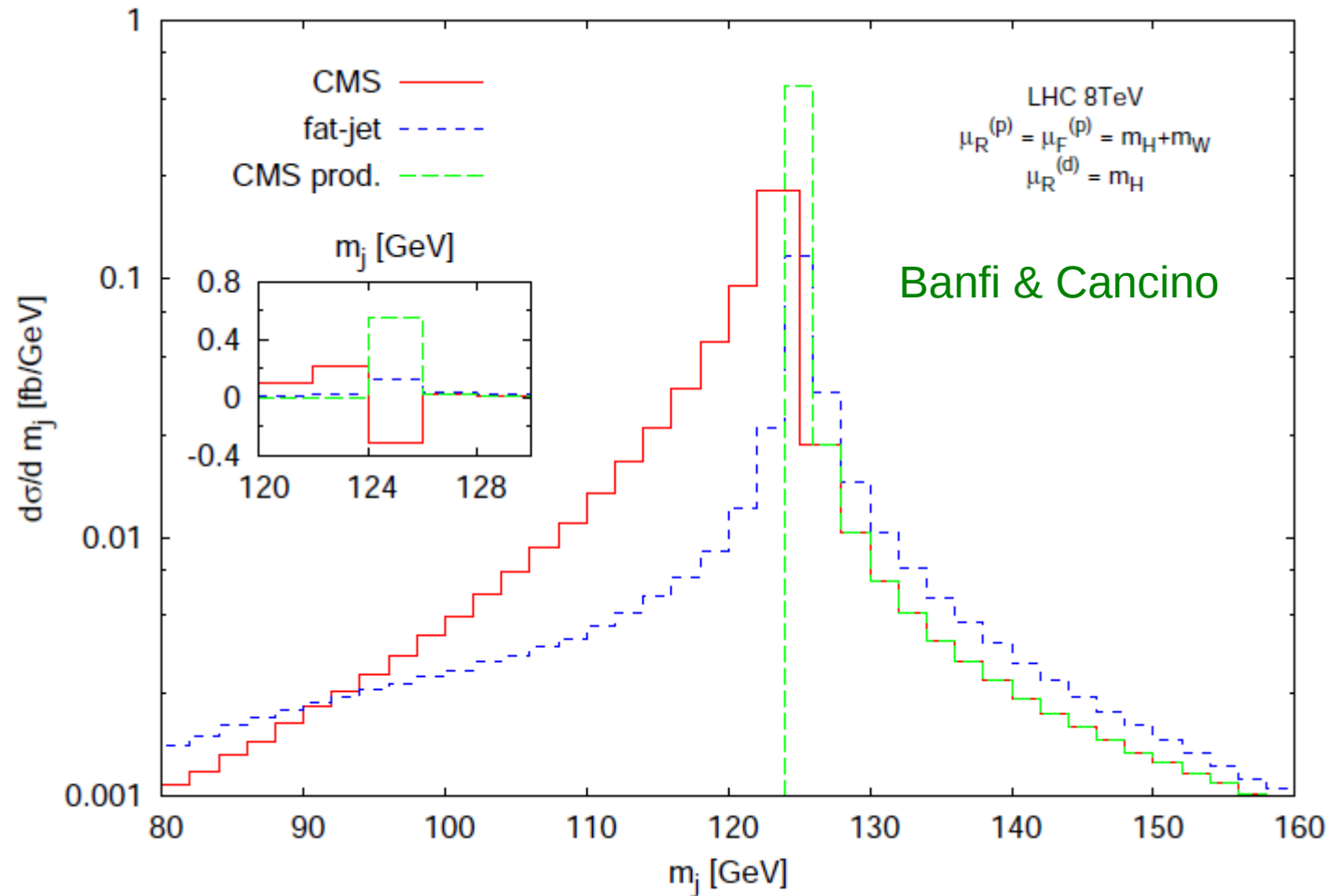
- NLL pt resummation for WH system: Dawson et al, 1207.4207

With shower:

- NLO in prodⁿ and decay in Herwig++: Richardson & Winn, 1207.0380

NB: decays in some MCs (e.g. Pythia) are automatically NLO

Comparisons of $H \rightarrow bb$ “Traditional” and fat-jet analyses



They find big differences between fat-jet & 2-jet analyses, in this and other distributions.

Probably still needs to be understood

Other developments

Merging different multiplicities
Handling multi-scale problems in POWHEG

[Work not all yet directly applied to Higgs, but you might want to keep an eye on it]

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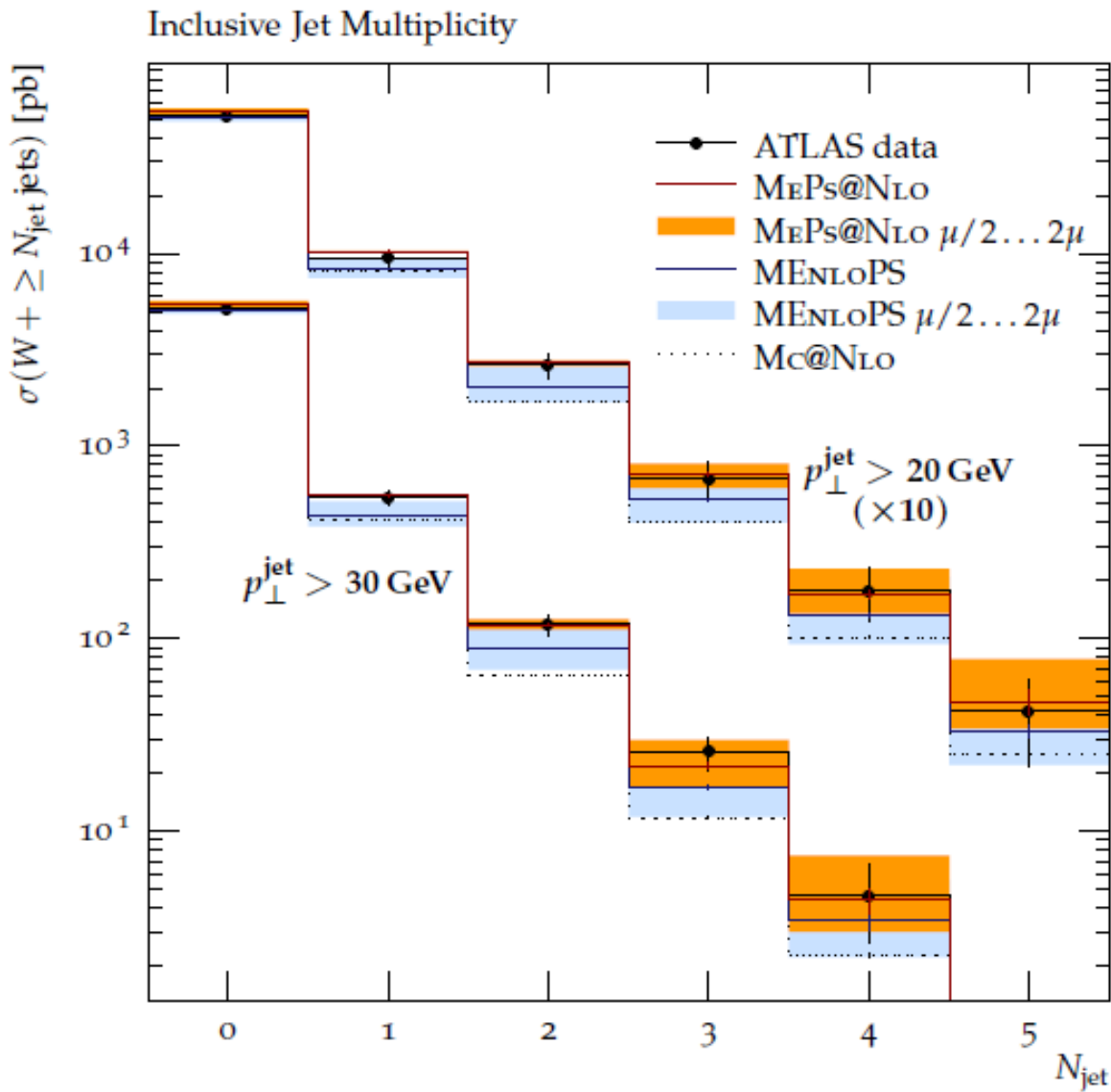
Merging Multiplicities (e.g. $W+0@NLO$, $W+1@NLO$, etc.):

- In Sherpa, with showers: Hoeche, Krauss, Schonherr, Siegert 1207.5030
- Without showers, LoopSim method: Rubin, GPS & Sapeta 1006.2144

[even without shower, can provide powerful info]

Handling, e.g. $H+2j@NLO+shower$ with jet-cut $\ll M_H$:

- Multi-scale Improved NLO (MINLO) approach: Hamilton, Nason & Zanderighi, 1206.3572



Sherpa merged
W+0, W+1, W+2
NLO + shower
samples