

Jet angularities for the Z +jet production at the LHC

In collaboration with S.Caletti, S.Marzani, D.Reichelt,
S.Schumann, G.Soyez and V.Theeuwes¹

Oleh Fedkevych

July 22, 2021



**UNIVERSITÀ
DEGLI STUDI
DI GENOVA**

¹JHEP 07 (2021) 076

The jet angularities are defined as

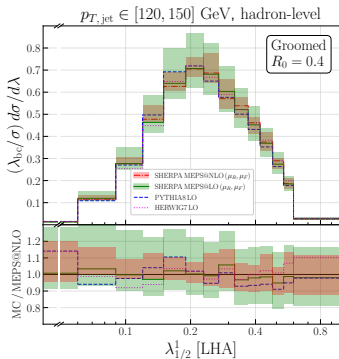
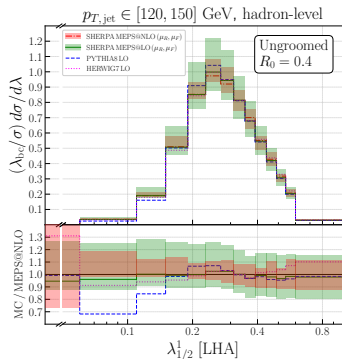
$$\lambda_{\alpha}^{\kappa} = \sum_{i \in \text{jet}} \left(\frac{p_{T,i}}{\sum_{j \in \text{jet}} p_{T,j}} \right)^{\kappa} \left(\frac{\Delta_i}{R_0} \right)^{\alpha},$$

where

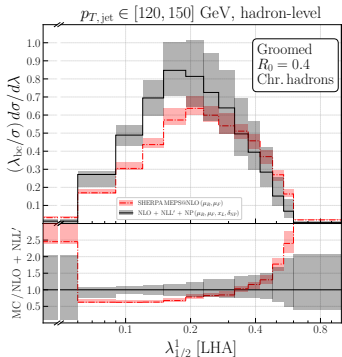
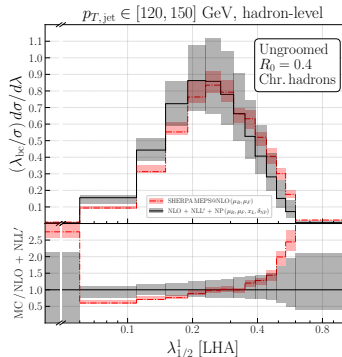
$$\Delta_i = \sqrt{(y_i - y_{\text{jet}})^2 + (\phi_i - \phi_{\text{jet}})^2},$$

is the Euclidean azimuth-rapidity distance of particle i from the jet axis.

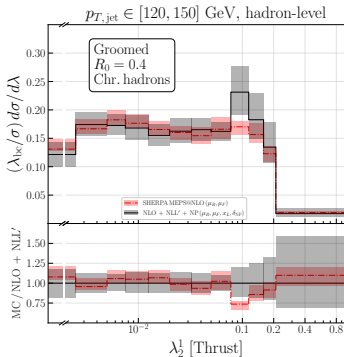
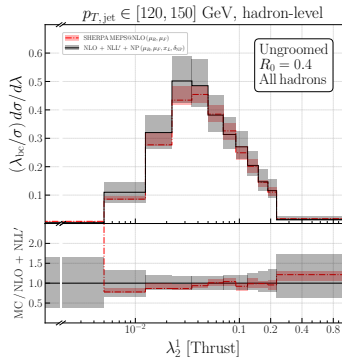
- ▶ The concept of infrared and collinear (IRC) safety requires $\kappa = 1$ and $\alpha > 0$.
- ▶ We consider $\lambda_{1/2}^1$ (LHA), λ_1^1 (Width) and λ_2^1 (Thrust) cases.
- ▶ For the grooming we use SoftDrop with $\beta = 0$ and $z_{\text{cut}} = 0.1$.



Comparison of hadron-level predictions for ungroomed and groomed jet-angularities in Zj production from Pythia and Herwig (both based on the LO Zj matrix element), and MEPS@LO as well as MEPS@NLO results from Sherpa. Here we use SoftDrop with $\beta = 0$ and $z_{\text{cut}} = 0.1$.

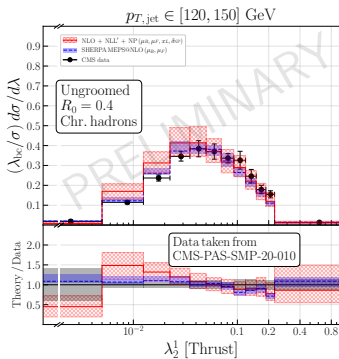
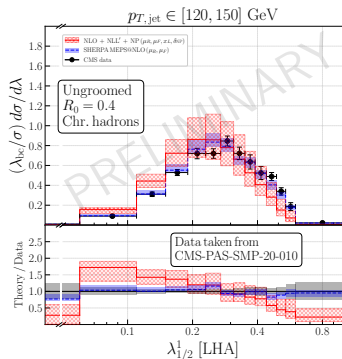


Comparison of hadron-level MEPS@NLO Sherpa results against NLO+NLL'+NP resummation. Here we use SoftDrop with $\beta = 0$ and $z_{\text{cut}} = 0.1$.



Comparison of hadron-level MEPS@NLO Sherpa results against NLO+NLL'+NP resummation. Here we use SoftDrop with $\beta = 0$ and $z_{cut} = 0.1$.

Theory vs. data (CMS-PAS-SMP-20-010)²



Comparison against preliminary CMS data. Also see the talk of Andreas Hinzmann and Benjamin Nachman at CERN-TH workshop: “Jets and their substructure from LHC data”

²See <https://cds.cern.ch/record/2759616?ln=en>