

# “Questions to theory”

**Roberto Chierici (Lyon), Markus Cristinziani (Bonn)**  
**on behalf of the TOPLHCWG experimentalists**

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## Collected questions from the collaborations

- <https://twiki.cern.ch/twiki/bin/view/LHCPhysics/QuestionsToTheorists>

## Topics

- generator setup and modelling systematic
- top mass
- differential distributions
- single top

## Intrinsic uncertainties: scales

- scale variation: up/down has a small effect; expected?
- shall we vary the functional form?

## Follow-up of P.Nason's presentation Dec.'11

- parameter: ratio of S to F events
- suggested to vary parameter HDAMP
- effect on  $t\bar{t}$   $p_T$  appears to be large
- what shall we expect for top  $p_T$ ?  
→ anything else to vary?

## One coherent variation (à la CMS)

- scale up ( $4 \cdot Q^2$ )
  - *scalefact* = 2
  - *alpsfact* = 2
  - *PARP*(64) = 4.
  - *PARP*(72) = 0.125
- scale down ( $Q^2/4$ )
  - *scalefact* = 0.5
  - *alpsfact* = 0.5
  - *PARP*(64) = 0.25
  - *PARP*(72) = 0.5

## Possible alternative: 3 independent variations

- scalefact up/down
  - *scalefact* = 2 / 0.5
- ISR up/down
  - *alpsfact* = 2 / 0.5
  - *PARP*(64) = 4. / 0.25
- FSR more/less
  - *PARP*(72) = 0.7905 / 0.2635
  - *PARJ*(82) = 0.5 / 1.66

**Which one is more correct?**

see also Liza Mijovic's talk

## Jet multiplicity

- Powheg/Pythia very different from MC@NLO/Herwig. Why?
- can we disentangle the PS component?

## Spin correlations

- why do Powheg and MC@NLO predict different spin correlations?

## aMC@NLO

- extra parton gen. not yet possible → difference to MC@NLO?
- status of scale uncertainties via weights? Ready to be used?

## Initial states at parton level (NLO)

- $q(\bar{q})$ -g fraction is very small/negative. Treatment in MC?
- is it physically meaningful to look at origin of  $t\bar{t}$  events?
- interface of negative fractions to NLO PDFs?

## Color reconnection

- any better suggestion than on/off?
  - e.g. define a region in parameter space, develop model?

## Fragmentation

- will be discussed in the next session

## Mass definition

- ambiguity pole vs  $\overline{MS}$  mass
- relation at 4-loop level
- EW corrections
- relation pole-MC mass; uncertainty in current analyses

## Combination

- different baseline MC used: shall we correct to a common MC before combining?

## Full NNLO

- status of  $p_T(\text{top})$  and  $m_{\ell b}$  at full NNLO?

## Marginalisation of theory uncertainties

- e.g. scales ( $\cdot 2, /2$ ) significantly different from data
- can constrain using data  $\rightarrow$  depart from recipe
- could be too aggressive. Recommendation?

## Parton-shower uncertainties

- how can we constrain in single-top events using data?
- observable to be probed?

## TopFit

- important to extend to take correlations into account
- wish a similar program for FCNC anomalous couplings

\*more questions addressed in yesterday's talk by Rikkert.