

Topical meeting of the LPCC EWWG

- Aim : address theoretical and experimental questions relevant in the context of precise measurements of the EW fundamental parameters.
- Earlier meetings:
 - Mainz : <https://indico.cern.ch/event/595512/>
 - Entire series accessible from <https://indico.cern.ch/category/3290/>
 - Next meeting being organized in Saclay : most likely 5-6 October
- In the past, these meetings have been focusing on m_W and the QCD and EW theoretical issues. Foreseen evolutions:
 - re-enlarge the scope to Drell-Yan production in general : cross sections, distributions, fundamental parameters (m_W , $\sin^2\theta_W$, ...)
 - Organize more frequent and more specific meetings, with two parts
 - Follow-up and homework from the previous meeting
 - Focus of the day, eg PDF uncertainties on m_W , EW corrections, ...

Today's focus : uncertainties on m_W from the p_T^W distribution

$$\begin{array}{l}
 \frac{\partial \sigma_W^{\text{True}}}{\partial p_T} \sim \frac{\partial \sigma_W^{\text{TH}}}{\partial p_T} \quad 2\text{-}5\% \text{ (NNLO+NNLL)} \\
 \sim \frac{\partial \sigma_Z^{\text{Exp}}}{\partial p_T} \times \frac{\partial \sigma_W^{\text{TH}} / \partial p_T}{\partial \sigma_Z^{\text{TH}} / \partial p_T} \quad 0.5\% \oplus 1\text{-}2\% \text{ ? (NLL!)} \\
 \sim \frac{\partial \sigma_W^{\text{Exp}}}{\partial p_T} \quad \sim 1\% \text{ ? (experimental)}
 \end{array}$$

Need progress!
(note : Tevatron counts no uncertainty here)

Need data – 100 pb⁻¹ before the end of Run 2?

Open remarks and questions

- The MW measurements from the DY observables aim at a relative error on MW of $1 \cdot 10^{-4}$
- the template fit procedure relies on theoretical distributions, based on a QCD model, which are compared to the experimental data

- precision

the evaluation of higher-order perturbative QCD and EW corrections may:

- reduce the theory uncertainty bands and enhance the significance of the data vs prediction comparison for all possible DY observables
- constrain the models where non-perturbative QCD effects are important

are theoretical uncertainties associated to perturbative calculations properly taken into account?
(not easy, in a global fit of several observables)

- accuracy

an improved agreement between data and predictions can be achieved introducing models describing e.g. non-perturbative QCD effects;

what are the associated uncertainties?

are these effects flavor/process independent? correlations between CC-DY and NC-DY ?

shall we sacrifice the predictivity of pQCD calculations in favour of models (i.e. higher accuracy)
or

can studying the apparent tensions between data and pQCD help to improve our understanding of the DY observables?