

Some topics for SM discussion

- This discussion session covers today's plenary session (except the small component from BSM, except if someone really wants to bring up something specific?) and yesterday's parallel session
- We have about one hour for the discussion and many points of interest as the questions already illustrated.
- These slides are just trying to organise the discussion into a few broad topics with a fixed time (roughly) allowed for each one of them and with the order not totally arbitrary (plenary session discussion points first and parallel session last)
- Two caveats:
 - despite the success of the LHC programme during run-1, we are still learning how to do precision measurements in ATLAS and CMS
 - this is why we have not digested fully yet to the best of our understanding, neither our detector performance nor how well we can constrain the theoretical uncertainties (eg PDFs) from our own data.

Le meilleur est encore à venir!

Some topics for SM discussion

- **Topic 1: 15'**
Precision electroweak measurements at the LHC and beyond
(mostly m_W and $\sin^2\theta_W$ but also m_Z)
- **Topic 2: 15'**
Precision top mass and coupling measurements at the LHC and beyond
- **Topic 3: 15'**
State-of-the-art MC tools and theory calculations
- **Topic 4: from yesterday's parallel session 15'**
 - Double-parton scattering, MPI and UE models, tunes
 - Pile-up mitigation tools

Some topics for SM discussion

- Precision EW measurements at the LHC and beyond
 - EW fits: shouldn't these be more optimistic about the LHC potential, i.e. 5 MeV for m_W and inclusion of a reasonable expectation for $\sin^2\theta_W$? And shouldn't they include the FEC much more precise expectations in such plots and predictions for the future? If not, why not?
 - Methodology of m_W measurement at the LHC:
 - * Should ATLAS and CMS do a measurement of m_Z (muon channel only) first as CDF has done with almost LEP accuracy (7 MeV!)?
 - * Hadronic recoil: is the TeVatron RESBOS-only approach sustainable? Probably not, CDF and D0 might be both consistently off from the true m_W because of their reliance on the Z to W extrapolation. In pp collisions there are far more reasons to move away from this approach.
 - * Is pile-up a limiting factor? Likely yes, since m_T is the least sensitive observable to theoretical uncertainties on pTW.
- Should ATLAS and CMS ask for a low-lumi run dedicated to precision measurements? Would end of run-2 be the best time for this? What it means is ~ one year of data-taking with < 5 interactions per BX...

Some topics for SM discussion

- Precision top measurements at the LHC and beyond
 - EW fits: how will these deal with the by now discrepant measurements between CMS and D0 (about 3.3σ)?
 - Is there a best-fit methodology for the top-quark mass? D0 claims they have demonstrated that the matrix-element method used for their best measurement is a clear improvement over other template methods.
 - Should ATLAS and CMS use the same MC to have the same MC to pole-mass or \overline{MS} -mass offset and uncertainty? If yes, which one?
 - Is there any real reason from the theory side for measuring m_{top} to better than ~ 0.5 GeV accuracy? The vacuum stability argument is not a serious one (in my view!).
 - What is likely to be the ultimate (end of run-2) precision from the theory on m_{top} for the Xsection-based measurement and for the direct mass measurements?

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- MC tools and theoretical calculations
 - Very complete and nice summary given today!
 - Theoretical effort focuses often more on signals such as Higgs and SUSY which do not require the same accuracy as the SM precision measurements:
 - * how soon could we have NNLO tools for diboson differential distributions?
 - * how soon could we have NNLO tools for Wbb or $ttbb$ production?
 - * Etc, etc...
 - Automatic tools at NLO in QCD can still be very inaccurate for various reasons: missing EW corrections, parton shower matching choice leading to distortion of basic distributions (excellent example is Z polarisation), choice of scale
 - How can we improve recipes for scale uncertainties. One suggestion was made yesterday, others exist, but in any case we need more NNLO calculations to test the assumptions on systematics using the NLO to NNLO differences as one way to cross-check things.

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- **DPI cross-sections, MPI/UE/tunes**
 - only W+jj effective DPI cross-section has been measured by ATLAS and CMS and is ~ 15 mb
 - this is most likely not a universal number (it depends on incoming partons for sure, but perhaps also on Q^2 -scale etc). Which other measurements should be done? Gluon-dominated versus quark-dominated? Same-sign W's? Photons + jets?
 - MPI/UE/tunes is a different issue from DPI. The uncertainties derived here for eg Higgs measurements are usually based on fragile recipes (two-point one-sigma systematic derived from Pythia versus Herwig) or even worse (switch on and off MPI in UE as suggested in Higgs XS WG!). In this field, need to learn more about how to tune UE model depending on measurement itself.
- **Pile-up mitigation**
 - Highly successful and ever more sophisticated methods developed by ATLAS and CMS during run-1. Impact on systematics? UE subtraction? Which beam-spot size in z is optimal for the future?