

WG 2: EW gauge bosons, jets and MC modeling

- Dates
 - Meeting on 25-26th of April at CERN, with focus on measurements of sw^2
<https://indico.cern.ch/event/707969/>
<https://indico.cern.ch/event/707971/>
 - Meeting on 23-25th of May at LAL Orsay, with focus on measurements of m_W
<https://indico.cern.ch/event/707972/>
 - Meeting on 20th of June at CERN, with focus on preparing input to the general meeting on 21-22nd of June
<https://indico.cern.ch/event/708015/>

WG 2: EW gauge bosons, jets and MC modeling

- EW gauge bosons, jets and MC modeling restarted from run 1
 - NEW:
 - also QCD and jet physics and MC modeling now included
 - Kick-off meeting 13-14.Dec 2017
 - very nice presentation on jet issues by K. Rabbertz at kick-off meeting

From summary of kick-off workshop:



A few ideas

- **Compare available unfolded cross section data from ATLAS/CMS/LHCb to common MC prediction**
 - **Advantages:** does not require re-definition of phase spaces, Rivet routines availability make this an easily achievable target
 - **Goal:** compare the same generator setup to similar data, and spot incompatibilities, issues..
- **Define common fiducial phase space to extrapolate to with MC, and common binning (y , p_T jet etc..) across experiments**
 - **Advantage:** allows for direct data-to-data comparison
- **Combination of measurements from different experiments**
 - **Advantage:** already existing experience in other physics groups
 - **Caveats:** needs thorough discussion on systematic uncertainty treatment and correlations across experiments
 - **PDF fits** help in testing compatibility of the combined data for all the measurements



Work program – to be discussed

- Comparison of jet x-sections (7,8,13 TeV)
 - common plots with theory predictions (which ?)
 - comparison with theory including cov matrices
 - common definition of cov matrices, QCD fits for checks
- Comparison of heavy flavor xsections (7,8,13 TeV)
 - c-, b-, t-jets
- inclusive DY
 - p_T , y , mass
 - comparison between experiments
 - comparison with theory (which)
- Z+jets, W+jets
 - spectra
 - comparison with theory (which)

to be clarified:

- which MC samples
 - consistent tunes/PDFs
 - CMS/ATLAS ?

Topics

- consistent and complete QCD+EWK calculation for inclusive jets (Including virtual and real EWK corrections, also photons)
- role of vector-bosons in pdfs at the TEV scale: for $p_T > 1$ TeV, the bosons could be treated massless, and could influence the pdfs, but one might also determine Z and W parton densities and corresponding hard scattering x-section
- and ?

EWVG: Jets – experimental issues

- common measurements
 - define common binning in y and p_T (for inclusive jets, V+jets etc)
 - goal: direct comparison of jet measurements
 - combine/compare inclusive jet and V+jet measurements (same binning, same procedure)
 - flavor tagged x-sections: HQ inclusive jet and V+HQ
- corrections, uncertainties, unfolding
 - unfolding and evaluation/propagation for uncertainties, following discussions in other forum (stat and pdf)
 - common way of correlation matrices and set of sources
 - correlated uncertainties in inclusive jets, V+jets, HQ etc
 - define consistently NP - and parton shower corrections & uncertainties
- discussion on data combination:
 - discussion/understanding of correlated uncertainties between experiments

EWWG: Jets – theoretical issues

- consistent and complete QCD+EWK calculation for inclusive jet and V+jets
- factorization of EWK correction
- role of vector-bosons in pdfs at the TEV scale:
- scale choice for
 - inclusive jets (jet p_T , p_{Tmax}), dijet mass ($m/2$, $\langle p_{T12} \rangle$), $R_{3/2}$ ($\langle p_{T12} \rangle$, $HT/2$), $R_{4/3}$ ($HT/3$?), what to be used in Z+jets, W+jets ?
 - how define "scale uncertainties" in such cases?
- use of multi-jet + merged/matched PS predictions as compared to fixed-order times NP?

Theory issues (Marek):

- The description of $p_T(V)$ ($V=W/Z$) at low p_T is of interest both to our group and WG1. Together, we should organise a survey of available tools, their accuracies and how their results compare to one another, both in terms of central values and uncertainties.
- I would like to survey in how far the results of arXiv:1705.04664 (and similar studies), compiling state-of-the-art cross sections and uncertainties for $p_T(V)$ ($V=W/Z/\gamma$) (for large p_T) and their ratios at NNLO QCD + NLO EW, can be made use of in experiments in current and future BSM searches and precision SM measurements. Currently, this level of precision is only available in fixed-order calculation, but has been shown to be able to be ported reasonably to existing Monte-Carlo samples of NLO QCD accuracy by a one-dimensional reweighting in $p_T(V)$ to get a handle on acceptances etc.
- On the experimental side, is there a need to study the impact of precision NNLO QCD + NLO EW for dijet measurements beyond PDF determination (which should be addressed within the PDF4LHC WG). For example, their impact on ongoing multi-differential measurements in different fiducial volumes (forward, high- p_T , balanced, unbalanced, etc) or on reaches and exclusion potentials in searches for dijet resonances, contact interactions, etc.?

Organization

- Meetings:
 - subgroup meeting: April and May to prepare results