Summary of Florence meeting

- Experimentalist's wish-list
- Salient issues (as far as we understand!)
- TO DO for ATLAS and CMS

Electroweak corrections

- The forthcoming DY report (*Alessandro*) and mW theory systematics evaluation (*Homero*) will constitute a very powerful benchmark.
  - Is it possible to implement a repository of codes, for reproducibility?
  - Z also important, as the energy / momentum scale extraction is affected (*Maria*)

- Two important reference points (used by the collaborations):
  - Powheg QCD + Photos
  - Powheg EW + Photos

    (Photos = iterative emission of real photons; each emission is treated according to a full NLO QED matrix element : http://arxiv.org/abs/0906.4052v2)

- Estimation of residual uncertainties (beyond NLO)
  - From differences among the various codes?
  - From missing final states, e.g emission of fermion pairs (radiation of $\gamma^* \rightarrow e^+e^-$)?

Polarization coefficients

- The Powheg prediction of A0 ~ -0.05 at low pT corresponds to a shift of ~40 MeV in Mw, when compared to A0 ~ 0. It's a large effect (larger than most other uncertainties!)

- How to address this:
  - Can one define predictions and uncertainties from the QCD point of view (with and without parton shower)?
  - Is there an issue with Powheg?

- Given the lever arm of this effect, need to define a way to control this using data
  - Usefulness of the Z sample (allows an accurate measurement)
  - How to extrapolate a control measurement on Z events to the W sample?
  - Some coefficients (in particular A4, which is ~ F/B asymmetry) are directly affected by the PDFs. How to avoid double counting these uncertainties, and PDF uncertainties evaluated separately?

pT(W,Z) : Z tuning & Z → W extrapolation

- Parton shower tuning
  - Current approaches (*Stefano, Luca*)
    - Powheg+Pythia (ATLAS)
    - RESBOS; DYRES (CMS)

    Enough? Other important attempts?

- Ensure a common PDF at this level. A first exercise would consist in comparing the tuned pT(W) predictions in all approaches

- Relation between pT spectrum and incoming quark masses:
  - As threshold effects in the evolution
  - Mass effects in the PS branchings

  how to evaluate this specific uncertainty?

pT(W,Z) : Z tuning & Z → W extrapolation

- First-principles prediction of W or Z pT distributions gives ~5% accuracy. Need ~0.5% on the W pT spectrum

- What is the uncertainty on the prediction of pT(W) / pT(Z)?
  - How to define scale uncertainties in a ratio of cross sections?
  - DYRES plot (*Giancarlo*) shows ~1% agreement, assuming identical QCD scales, but still reflecting the expected differences in the initial state

- Z → W extrapolation : is it possible to define a toy process, used to evaluate the universality between W and Z production, purely from the pQCD point of view, and removing parasitic differences (different incoming partons / PDFs, heavy quark masses)?
  - e.g compare the pT distribution of W and Z, produced at given rapidity, from 1st generation quarks only?
  - If possible / well defined, this would be a starting point on top of which one would include the effects of different PDFs, heavy quark contributions, etc

PDF ⊗ Parton shower

- Issue : when tuning PS parameters using Z events, PDF biases can distort pT(Z), be absorbed in the PS parameters and incorrectly transmitted to the W.
  - Example : an excess of bb→Z events enhances the pT(Z) tail and would be transmitted to the W model via the PS parameters, although b-quarks do not contribute to W production
- How to address this point
  - Consistently?
  - Efficiently? (→risk of having to generate numerous samples / variations)
- Combined PDF + PS/resummation fits : is this realistic on a fairly short timescale?

For the experiments

- Main point : ensure we can compare measurement results in a consistent way. Two complementary approaches:

  - Compare existing measurement results :
    - W, Z pT spectra
    - Z rapidity; W charge asymmetry and/or eta(lepton)

    Difficulty : extrapolation to a common fiducial phase space (and sometimes c.o.m energy)

  - Generator-level kinematic distributions for given boson mass?
    - Lineshape
    - pT(W,Z)
    - …

    with uncertainties corresponding to the corresponding quoted Mw systematic?

→ can we take this on-board for a future meeting?

→ can we envisage to perform these comparisons ahead of publishing results?