Recap of ptZ and ptW/ptZ discussion

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ptZ and ptW/ptZ predictions

Motivation:

    provide best predictions for these two distributions

    include in a systematic way leading and subleading corrections

    assess the overall residual theoretical uncertainty

Available QCD predictions can be divided in two groups:

    all orders analytical resummation of log(ptV/MV) enhanced terms

        RadISH { N3LL (small ptV) + NNLO (large ptV) QCD }

        DyRes/DYTurbo, ResBos2, Geneva { NNLL + NLO QCD }

    MC simulation of QCD radiation effects, matching exact matrix elements and Parton Shower

        POWHEG, Sherpa, (aMC@NLO ?)   { NLL + LO QCD }

        DYNNLOPS?, UN2LOPS   { NLL + NLO QCD }

First phase of comparison (current):

codes implementing analytical resummation of log(ptV/MV) enhanced term

Second phase of comparison (future):

discuss how the predictions of analytical codes can "guide" the implementation of MC event generators

First phase of comparisons

RadISH, DyRes/DYTurbo, ResBos2, Geneva   only QCD corrections

    set-up: it needs to be documented in one single place (EW WG1 twiki ?)
          couplings, masses
          QCD scales (when possible)
          standard lepton acceptance cuts
          full phase space (i.e. no acceptance cuts on the leptons) (under discussion)
          PDF choice: for technical comparisons any perturbatively consistent choice is equivalent;
                would a QED PDF choice prepare the stage for the inclusion of EW effects ?

    preliminary benchmark points: M_{ll} = 66, 91, 116, 500 GeV, Y_Z = 0.0, 3.0

    future steps: comparison of central values
                  QCD scales uncertainty bands

    flavour dependence of the results: massless perturbative description (only uubar, ddbar, all)
                     PDF role
                     handling of heavy quark thresholds

final goal: assessment of the perturbative QCD theoretical uncertainty on ptV and ptW/ptZ

Second phase of comparison

Monte Carlo event generators   only QCD corrections
POWHEG, Sherpa, (aMC@NLO, DYNNLOPS? UN2LOPS?) Pyhtia, Herwig

the MC study should follow the analytical one,
to benefit of the progress in the analysis of the purely perturbative contributions

MC codes offer a variety of handles to model the non-perturbative region
    (quark masses and massive kinematics, non-perturbative effects, underlying event simulation)
    a discussion will be needed to define
    → what we can compare (apples with apples):
        e.g. the purely perturbative part of the Parton Showers
    → which combinations (if any) of handles can be considered equivalent
        (and the metric used to define it)
    → how we combine the different treatments to define an uncertainty

    set-up: all the choices made for analytical codes must be kept
              more choices are required to specify the model dependent part of the codes

Additional effects correcting ptV distributions

The QCD codes under study can handle some, but not all, classes of subleading effects
"subleading" effects ≡ effects with an impact at the 1% level on the shape of ptV distribution

quark mass corrections (matrix elements, kinematics)
QED corrections,   these effects distinguish W from Z
flavour dependent initial state non-perturbative corrections

dedicated study (benchmarking)
discussion about their inclusion in the prediction of ptZ and ptW/ptZ

First steps: the setup

PDF choice: including DGLAP QED evolution?   which PDF set?

gauge boson masses: constant width
                       numerical value must (?) be consistent with the PDG value

electromagnetic coupling: $\alpha(0)$,   discussion about possible refinements for photon-induced proc.