The Higgs Search Systematics Meeting Wish List

Tom, Steve, Wade
and Everyone at the Meeting

Collected from the discussion, and our historical wish-list.

Some items may be missed!   Please add to it.

1) Set limits on sigma(gg->H)*Br(H->WW) putting
   WH, ZH, and VBF at their SM values at each mH

   We just did this with zero WH, ZH, and VBF in our 4th generation publication
   (in the arXiv today). Is this a worthwhile addition?

   What is the most useful way to present our results? R_{lim}? Others?

2) Make high-NN-score signal region plots for experimental
   input variables (to show that they are not on tails)

3) Make a high-NN-score plot for pt(H). y(H).

4) Plot delta(Phi_ll) for the different Higgs Pt spectra
   (Pythia, and reweighted to HQT, HNNLO, FEHIP, ...)

5) Investigate the impact of the different jet
   definitions between the experimental cone or midpoint jets of size 0.4
   and the K_T jets of Anastasiou, Grazzini, Dissertori, Stockli, and Webber

6) Consensus on alpha_s and PDF uncertainty errors:
   Joey: add them in quadrature; C-P: add linearly

7) Consensus on adding scale and PDF uncertainty errors – Joey, Tom, Babis – add in
   quadrature for ggH.

C-P suggests that when one included scale uncertainty
into the top cross section and refit the PDFs, the errors
added linearly.   Is this special to ttbar?

8) Check/add scale variation systematic
   uncertainties on predictions of observables used in PDF fits

9) 68% or 90% PDF uncertainties? Historically experimentalists
    have used 90% for acceptance uncertainties, but the arguments
    (different order PDFs and MC matrix elements) do not apply to cross section predictions

10) Check 4-flavor scheme vs. 5-flavor scheme predictions of the second
     b in Z+b+jets. Do we need to have some 4-flavor MC and some 5-flavor MC and match
     them like we do for t-channel single top?

11) Experimental analysis: Update the W+b+X cross section measurement ~ how
     often does the b-tagged jet contain two B hadrons?

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12) Update the Z+b+X measurements with more data

13) Consensus on using NNLO+NNLL ggH production cross section vs. just NNLO?
   (Frank and C.-P. disagree)

14) Experimentalists provide goodness-of-fit numbers

15) Prescriptions for prior shapes to use

   Consensus on the scale variation range – ggH and other processes

16) PDF correlations (Joey promises these…, but we have to know what to ask for)

17) Consensus on exp vs theory alpha_s uncertainties (does everyone agree with Frank?)

18) Biggest fears for failure modes for our existing simulations
(WW deltaPhi bump question from Kirill?) -- ways to address this.

19) Prescription to address ggH njets uncertainty. Does everyone
   agree with the "best calculation for each bin" method?

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Joey's Homework List

(1) repeat LHC exercise for Higgs production uncertainties using
    CTEQ6.6, MSTW2008 and NNPDF
     -calculate an effective K'-factor for going to NNLO for CTEQ and NNPDF

(2) calculate correlations between Higgs production cross sections
    and backgrounds (and among backgrounds and perhaps with
respect to some SM benchmark cross sections at the Tevatron);
    foremost among the backgrounds is WW production; any other specific suggestions?

(3) a comparison of predictions for Higgs kinematic
distributions similar to that done for the LHC in
http://arXiv.org/pdf/hep-ph/0403100 (p. 51)