Journal club minutes - July 25th -Top minutes

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July 25th 2018 - Journal club meeting minutes
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Top production - Part 2: Xiangyang chairs, Marjorie is expert.
Minutes do not claim to be coherent or complete.

Topics:

- The N events equation
- How different MC campaigns in the same analysis contribute to the systematic uncertainty.
- Why or why not to include taus in b-decay measurements
- Pythia history

Details:

- Our focus today is e-mu events with b-tagging
- We start by going over some basics.
    - Marjorie: one question, how do we express N in terms of lumi and cross-section? Someone writes the formula on the board (see Thomson chapter 2).
    - Then we talk about efficiency and acceptance: separate your kinematic region and detector efficiency: important for systematic uncertainties
    - and, of course, A x sigma = fiducial cross-section, another good reason for quoting this is it's what is most cleanly related to the measurement and things like scale-uncertainty are shifted to theorists
- Structure of paper in general is discussed
    - Xiangyang: If you were asked to add more of a motivation: what would you think of? This turns out to be a trick question, he doesn't think you could add anything more.
    - Marjorie summaries the motivation: used to tune generators, reduce systematics for BSM searches - in most BSM models the theoretical calculation is quoted as a background rather than the measurement, although they are actually using the measurements indirectly because of what we get rid of. as we do a better job of measuring then we should quote the measured one instead
- The next chapter is the state-of-the art calculation
- Rebecca asks about reference [34], which is quoted in the text as a reason to run mutliple MC campaigns. How does this help?
    - Marjorie clarifies how using different MC generators might change the N-events

formula. If you have a systematic uncertainty on the x-section, the overall number doesn't matter but the shape does as it can change the acceptance/efficiency and using the different MC campaigns allows you establish the uncertainty on your shape.

- Neha: using MG+Py predicts a certain x-section but we don't care about the number, we care about the shape. We use the more careful x-section calculations to get our overall scaling. Marjorie agrees.
- Xiangyang: Acceptance will be affected most, epsilon will be less affected.
- Marjorie: another comment, we usually quote A x epsilon, if two MCs have different acceptances, you don't care, you just care about the efficiency
- Greg: how is this contributing to the systematic error? we discuss the abstract and table 4 and decide hadroniaation is the main contributing factor Pythia and Herwig.
- Fig. 2.8 includes how often the electrons are inside the fiducial region. For the W going to b's: if the lepton comes from a tau, is it coming from signal or background?
- If we call b->tau background (just as an example - this not done here!), then you have to use a scale factor. Look at lepton pT and have a scale factor binned in that. Important to do it binned rather than just update the N events.
  - Marjorie is surprised they do include tau as signal. I ask why, Neha says because they mostly decay hadronically, Marjorie says the pT cut is a major contributing factor but also the modeling is hard (Neha says: spin!).
- ttbar tune: xiangyang thinks it's out of date
  - Mark asks if using this older tune makes a huge difference: marjorie says that it's more of a question of trying to factorise between the hard scatter
  - Pythia8 started out as being a rewrite of pythia6 in c++: since they changed a bunch of tunes in 8 you can't just directly compare the 2 (awkward)
  - Pythia is developed by people at Lund, Fermilab, slac. Theorists.
  - Pythia worked at the temple Delphi (greek myths)

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Next week: ttbar production cross-section sections 5-end + top mass discussion!
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