Top-Quark Physics Review 2013 for Particle Data Group

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Plans and considerations taking advisory group comments into account.

Top-Quark Physics Review 2013
General structure

So far place emphasize on ttbar and single-top (SM) at Tevatron with mentioning of early LHC results

A. Introduction
B. Top quark production at Tevatron and LHC (theory)
C. Top quark measurements
C.1. Top quark production
C.1.1 ttbar production
C.1.2 (ew) single-top production (incl. Vtb)
C.1.3 Top quark forward-backward & charge asymmetry
C.2 Top quark properties
C.2.1 Top quark mass measurements
C.2.2 Top quark spin correlations and width
C.2.3 W boson helicity in top quark decay
C.2.4 Top quark electric charge
C.3 searches for non-Standard Model top quark production & decay

Top-Quark Physics Review 2013
Theory sections

Theory section presently very NLO Xsec focused

- update to NNLO state of the art
- discuss total Xsec vs. differential Xsec vs. MC generators
- discuss MC specifics of implemention towards modelling
  (as important systematic uncertainty)
- discuss also theory of top (+jets / gamma / …) as background
  for other physics results / searches.
- here or in subsections discuss measurement method
  sensitivities to details of MC / theory implementation
- here or in top mass section discuss concept of mass in
  different channels and methods
- discuss ttbar as well as single-top (incl. Vtb) & some new models
- mention some highlights at a future lepton collider ?
  for example mass & width from threshold scan?

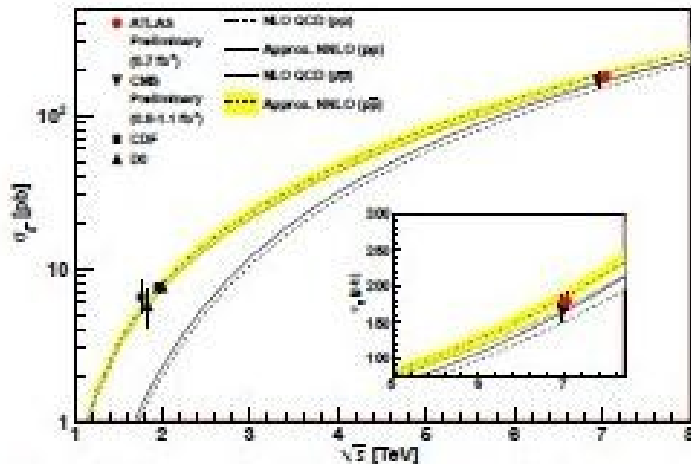**Presently have one summary plots of ttbar Xsec vs sqrt(s)**

Figure 1: Measured and predicted $t\bar{t}$ production cross sections from Tevatron energies in $p\bar{p}$ collisions to LHC energies in pp collisions. Tevatron data points at $\sqrt{s} = 1.8$ TeV are from Refs. [25] and [26]. Those at $\sqrt{s} = 1.96$ TeV are from Refs. [17] and [18]. The ATLAS and CMS data points are from Refs. [20] and [22], respectively. Theory curves are generated using HATHOR [5] with input from Ref. [27] for the NLO curves and Ref. [2] for the approximate NNLO curves. Figure adapted from Ref. [19].
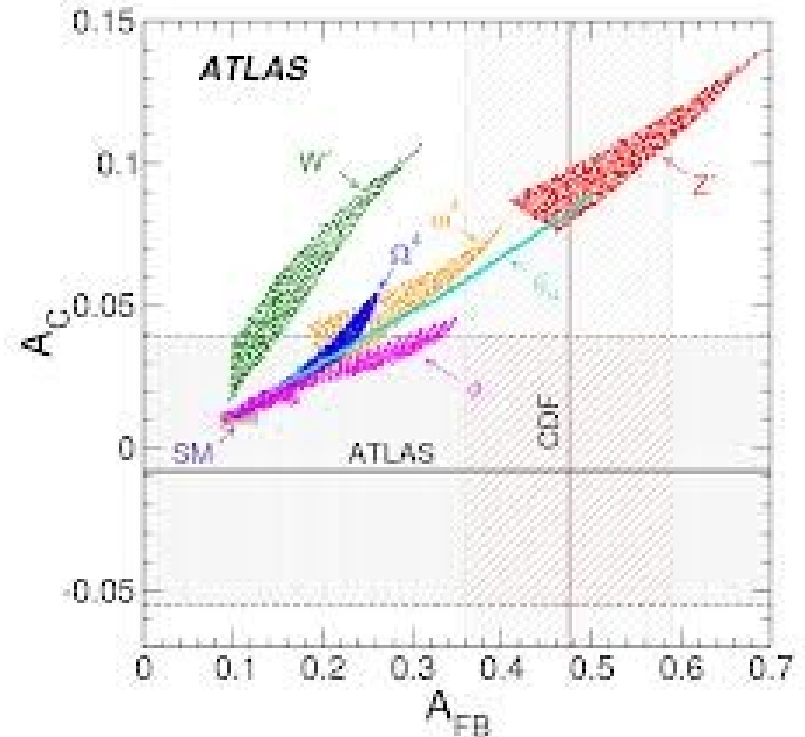
Considering to add similar plots to simplify discussion on
- single-top Xsec
- A_{FB} asymmetries in pp vs ppbar
- maybe other sqrt(s) dependent quantities ?

Top-Quark Physics Review Measurements 1

We feel that

- W polarisation and spin correlations get less important → reduce

- A_{FB} saga still important → include asymmetry plot of pp vs ppbar

- more details about top reco @ LHC, in particular boosted tops

- add/expand ttbar+gamma, ttbar+Z, t(t->Wb), ttbar+jet

- add/discuss ttbar+h
analysis techniques in ATLAS and CMS are top driven
Limits / results / Yukawa coupling might better fit in Higgs review?

- reduce top → H$^\pm$ b, as result of many analyses, complexe,
presently relatively little progress → maybe in Higgs review?

Top-Quark Physics Review
Measurements 2

- keep/expand dsigma/dm(ttbar), top width, lifetime

- shift focus from SM to sensitivity to new models:
  single top interpretation in FCNC, W' …

- add new analyses such as
  Same-sign top
  Four top searches
  Top + missing Et (stop → top + neutralino …)
  Possibly add FNCN analysis top → u/c+H analog to top → u/c +Z,γ

- discussion of
  Top review vs Higgs / SUSY / Exotics reviews
  What to do about citation of preliminary vs. published results
  Tevatron moves to ultimate legacy measurements (published)
  Previously had complete result overview → maybe only cite best
  Top properties (one number) vs sqrt(s) dependent results

Top-Quark Physics Review
Time Scales

- ATLAS, CMS, CDF and D0 will prepare (complete) results of 7 & 8 TeV data or even legacy results for TOP 2013

http://top2013.desy.de

Would be nice to include those, i.e. move deadline after conference