Summary of Top/EWK group

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Content of Summary

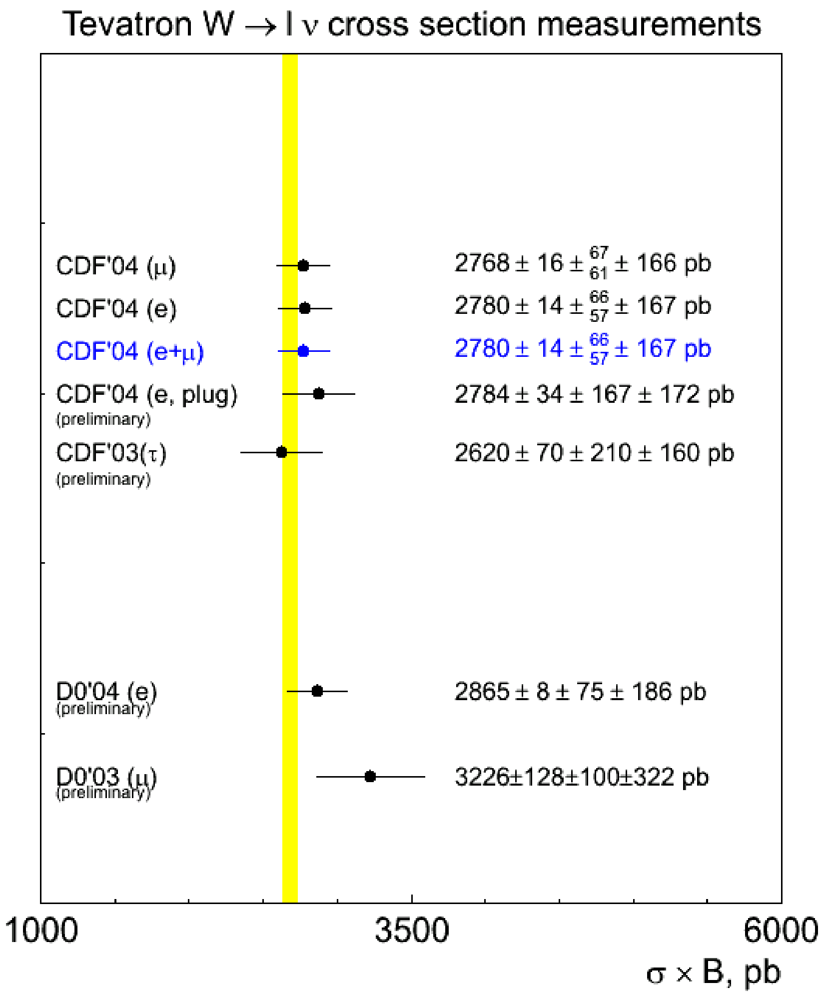
- Many very interesting plenary talks covered current status of experimental results and theory developments
- Rather than go over the information again, we decided to concentrate on the topics identified during discussions at the parallel sessions as of interest for Tevatron and LHC measurements
- Some personpower already identified to work on some of the outstanding issues
- Not an exhaustive list: will try to identify additional topics before our next working meeting

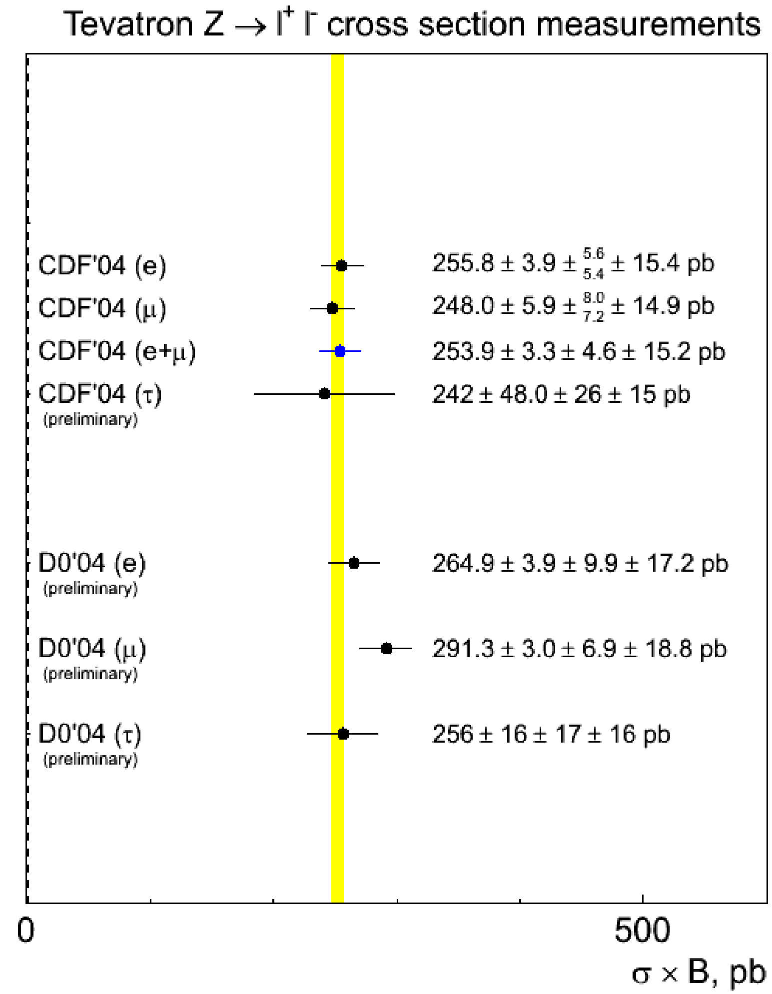
Outline of talks

- Items identified as of interest for LHC in topics of
  - EWK, including single top (exp)
  - EWK (theory)
  - Top (exp)
  - Top, including single top (theory)

  \+ some organization announcements.

Inclusive W/Z x-section measurements





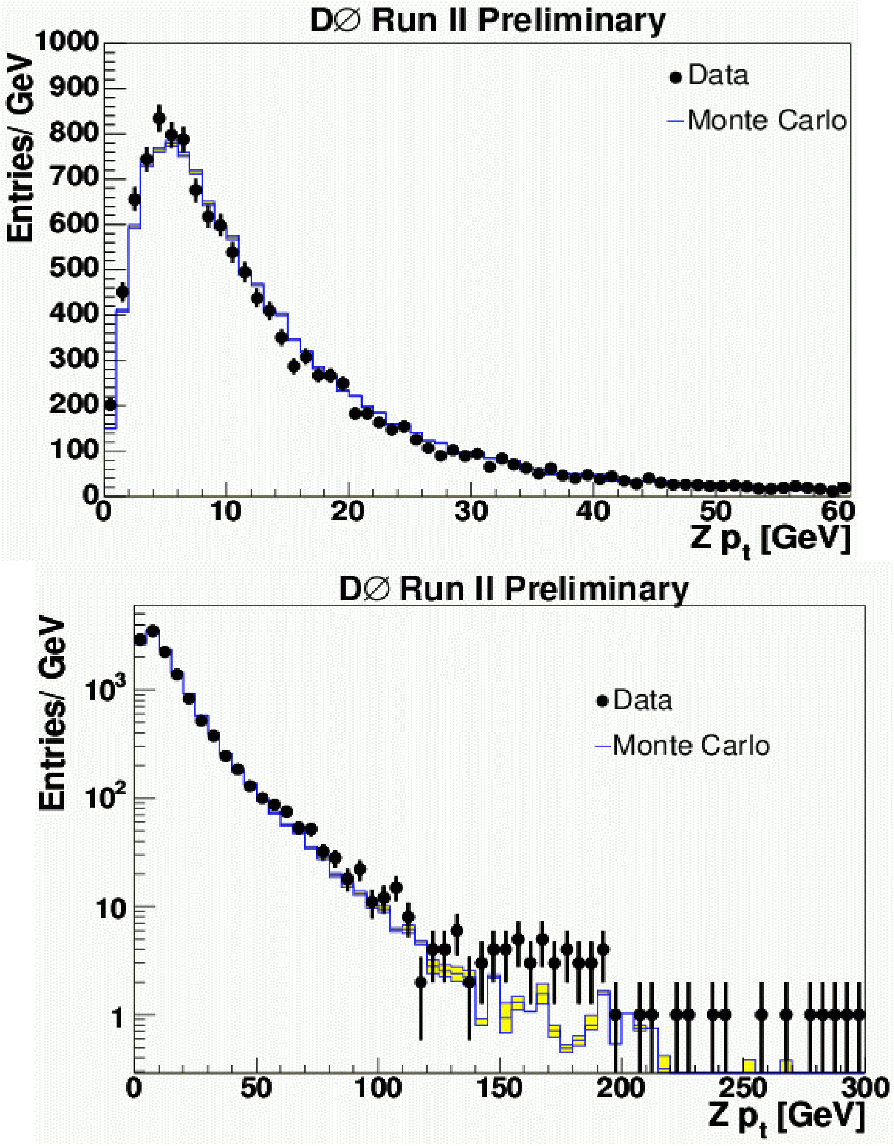
- Overall good agreement with the NNLO calculations
- Experimental uncertainties (~6%) dominated by the luminosity

$W\rightarrow l\,\nu$ as luminosity monitor

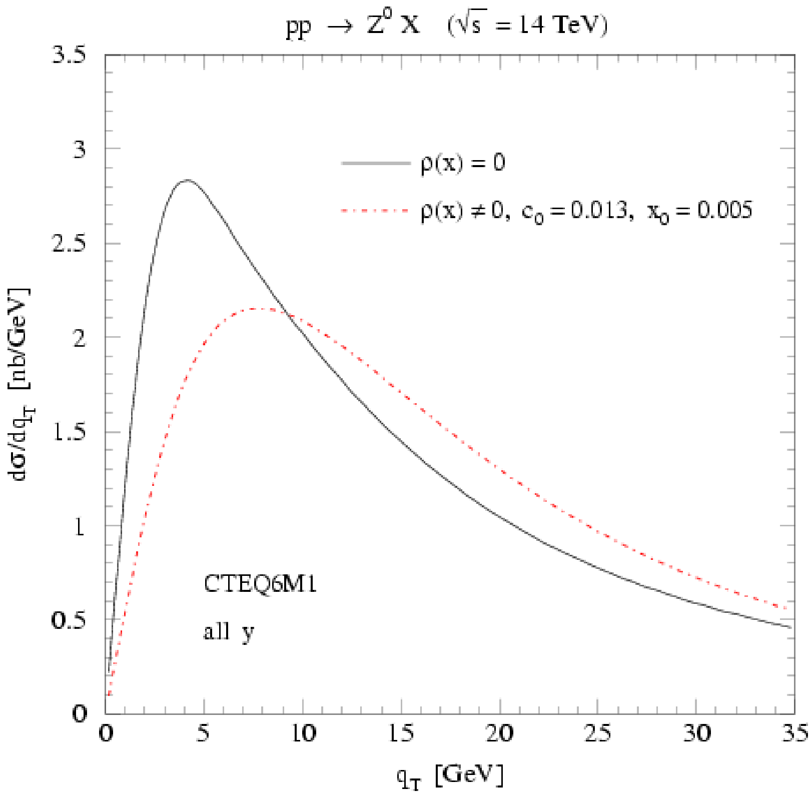
- Current method based on σ_{inel}(ppbar)= 61.7±2.4 mb @ 1.96 TeV (4%)
- Can we do better using the cross section for $W\rightarrow l\nu$ measurement?
- Recent paper by Frixione and Mangano (hep-ph/0405130) investigate contributions of uncertainties in acceptance calculation to the $W\rightarrow l\nu$ x-sec measurement (currently ~2%)
- Tevatron and LHC would benefit from experimental and theoretical work

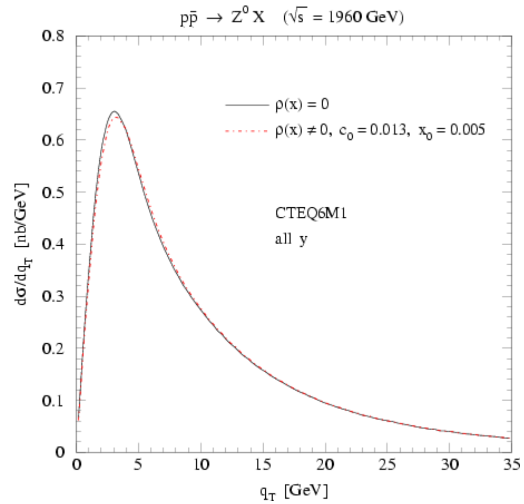
Run II differential W/Z cross sections

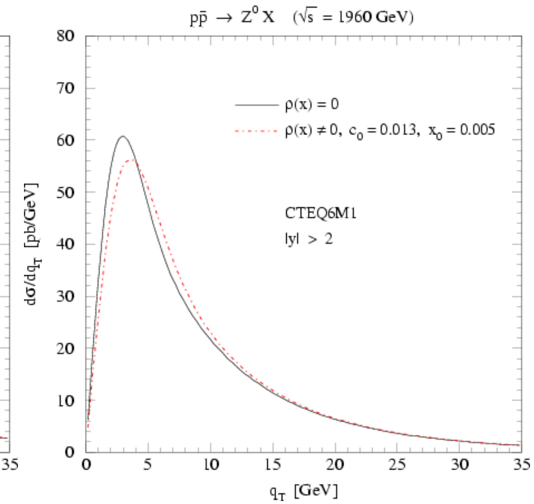
- $d\sigma(ppbar\text{->}W/Z)/d\,p_T$
- Low Pt end: one of the important inputs for W mass and width measurement
- Need good understanding of the resolution (exp)
- Need understanding of the soft gluon resummation (th)
- High-Pt end: any hints of new physics?
- Need good understanding of backgrounds



Rapidity dependence important at LHC







S. Berge et al., hep-ph/0401128

Dashed line includes additional terms responsible for the broadening of the distributions at low-x.

Can we learn something useful for the LHC by measuring $d\,\sigma(\text{ppbar->W/Z})/d\,pT\,d\eta$?

W mass measurement

- Well laid out plans for standard method (fit to $M_T(W)$ distribution)
  - Detector calibration/alignment
  - Constraining $P_T(W)$ with $P_T(Z)$
  - Constraining PDFs with measurement of the W charge asymmetry
  - etc.

  Expected to reach a precision of 18MeV by the end of Run II for e/mu combined

W mass: Ratio method

- Use ratio of W and Z masses to measure W mass
  - Uncertainties cancel in ratio
  - Statistically dominated by # of Z's

DØ Run 1 Experience (82 pb^{-1})

Source	Uncertainty (MeV)
Statistics	211
Electron Energy Scale	5
Underlying Event	30
Zero Suppression	5
Hadronic Resolution	15
Electron Efficiency (EC vs CC	20

- Would benefit from taking a new look.

Experimentally, investigate if certain detector effects would not cancel due for instance, for nonlinearities in the response.

Single Top searches

- DØ and CDF have set limits on the production of single top production

95% C.L. limits Observed (Expected)

Channel	CDF (pb)	D0 (pb)
s+t	<17.8 (13.6)	<23 (20)
t	<10.1 (11.2)	<25 (23)
s	<13.6 (12.1)	<19 (16)

Run II (~160 pb^{-1})

Analyses turns out to be harder (experimentally) than expected from phenomenological predictions
Something to keep in mind when making predictions about Higgs search at LHC.

Single top observation

- Current analyses would need several fb^{-1} for observation
  - Particle ID, b-tagging not as efficient as predicted
  - Large systematic uncertainties from background modelling and detector understanding
  - Analyses methods need optimization to make and observation soon
- Work in progress
  - Ever improving particle ID and understanding of detector effects
  - Accurate models for signal and background benefits from recent NLO calculations
  - Working on multivariate analysis techniques (NN, Matrix Element, ...)
- Need to work with theorists to identify variables that give good signal-background separation – not just at parton level, but for experimental observables.

Preliminary List of topics identified

1) VB Asymmetries (input to PDFs)
2) Differential VB x-sections ($d\sigma/dp_T d\eta$)
3) W mass
   a) $M_T(W)$ fit method needs 1 & 2, LHC benefits from 2
   b) Ratio method, does uncertainty really scale with number of Z's? (detector effects)
4) W cross section as normalization to calculate luminosity
5) Single top: good example of a place where cooperation with phenomenologists is needed to make an observation soon.