WG1 summary

- summary of talks by:
  - Stenzel, Tricoli und Sarkar, Dittmar

Leptonic (plus γ) final states

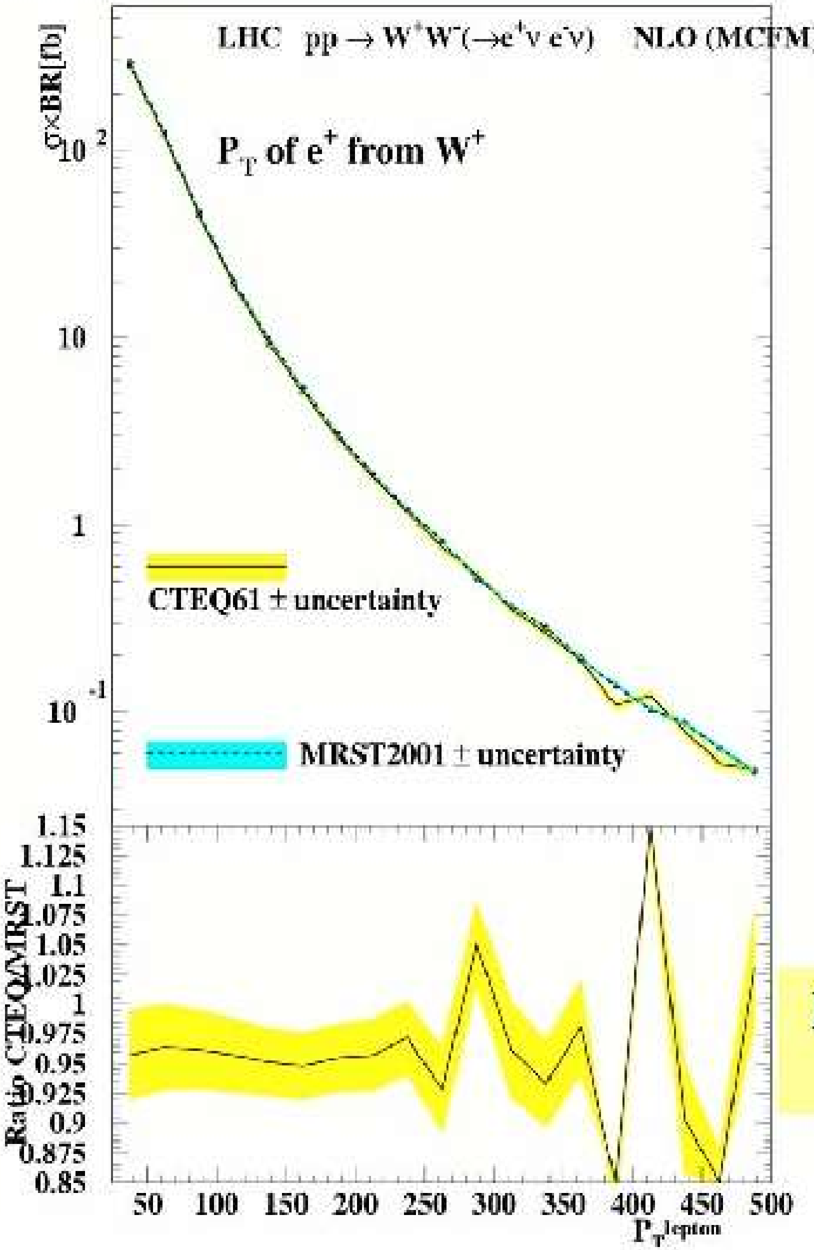
- resonance production of W and Z, the normalization process:
  ($q\bar{q} \to Z \to \ell\ell$ and $q\bar{q} \to W \to \ell\nu$)

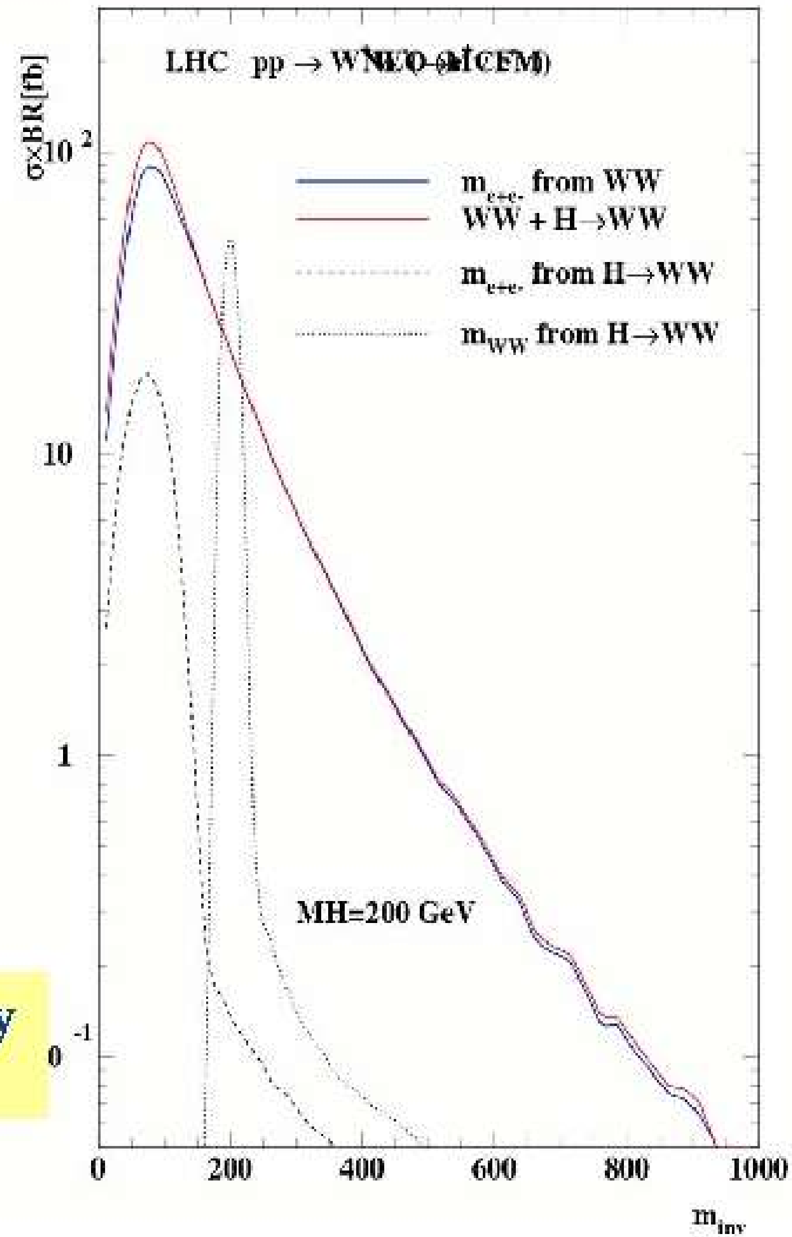
- high mass Drell–Yan lepton pairs
  $q\bar{q} \to (\gamma, Z)^* \to \ell\ell$ and
  $q\bar{q} \to W^* \to \ell\nu$

- boson pair physics (WW, WZ, ZZ, Wγ etc)
  $q\bar{q} \to WW(WZ, ZZ, W\gamma)$
  with $W, Z \to$ leptons
  ($ZZ \to \ell\ell\ell\ell$ has small cross section)

expect clean event samples, but diboson mass (Q^2)
sometimes not well measured($W \to \ell\nu$)
to be compensated with accurate Monte Carlo!

WW pair production: P_T and M_{inv}





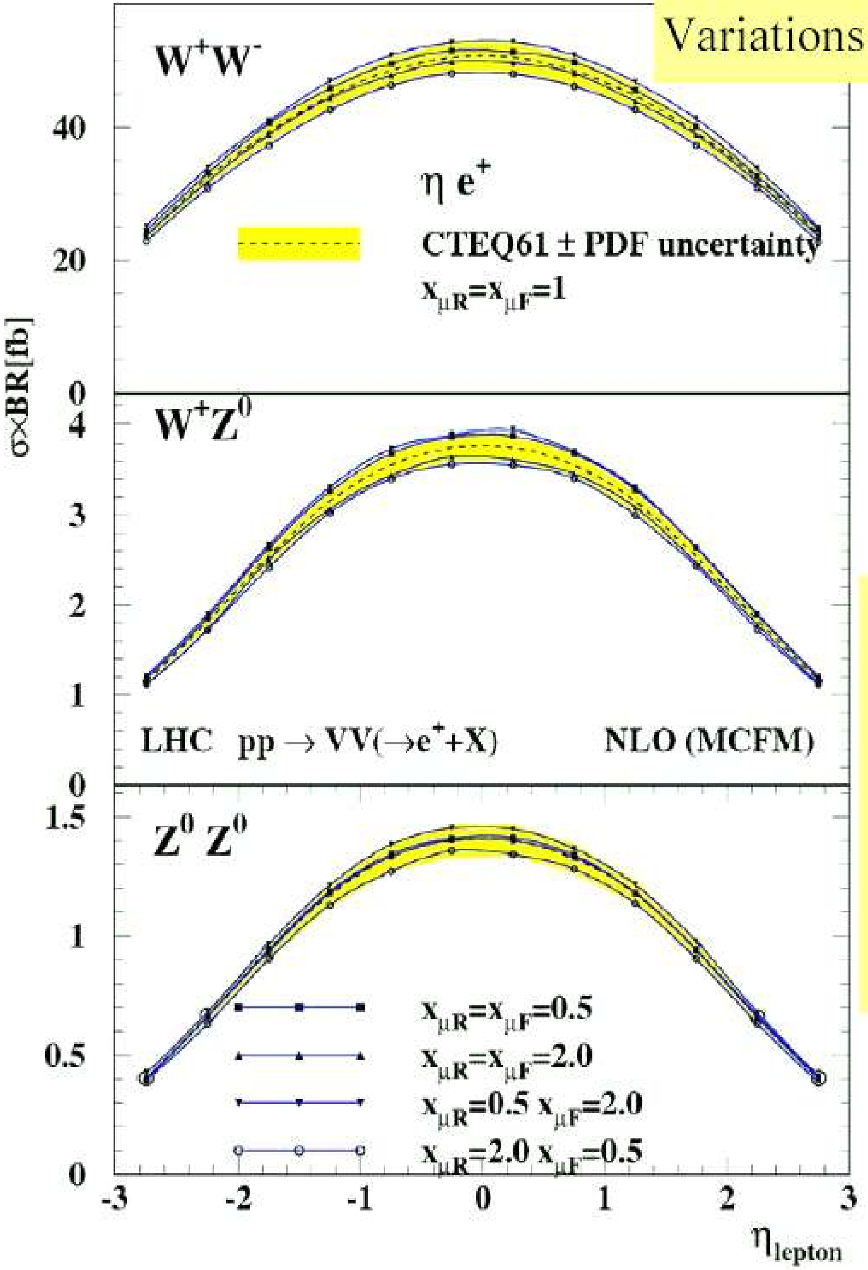
PDF uncertainty
+/- 3-4 %

Stenzel - W/Z p.

Scale dependence

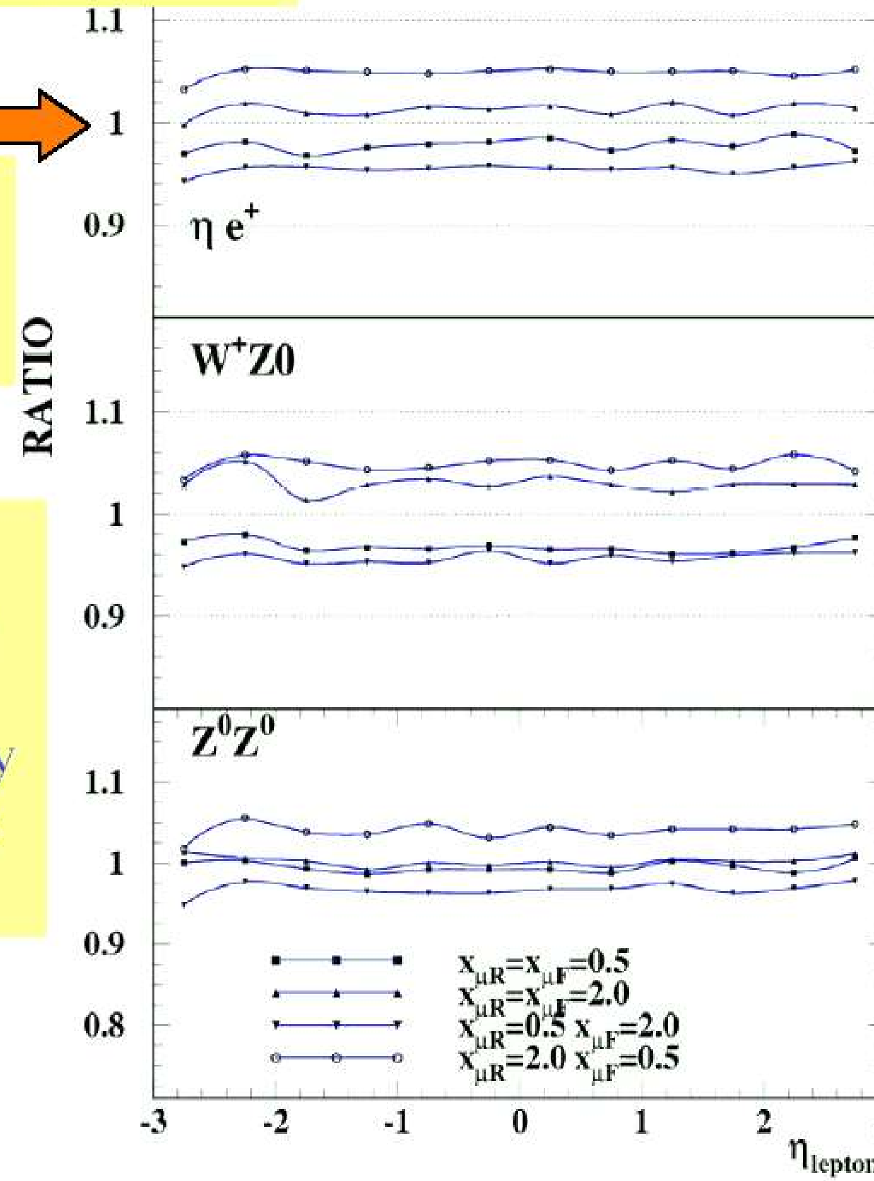
Nominal scales $\mu_R = \mu_F = M_W$ (resp. M_Z)

Variations $\frac{1}{2} < x_\mu < 2,\ \mu = x_\mu \cdot M_W$



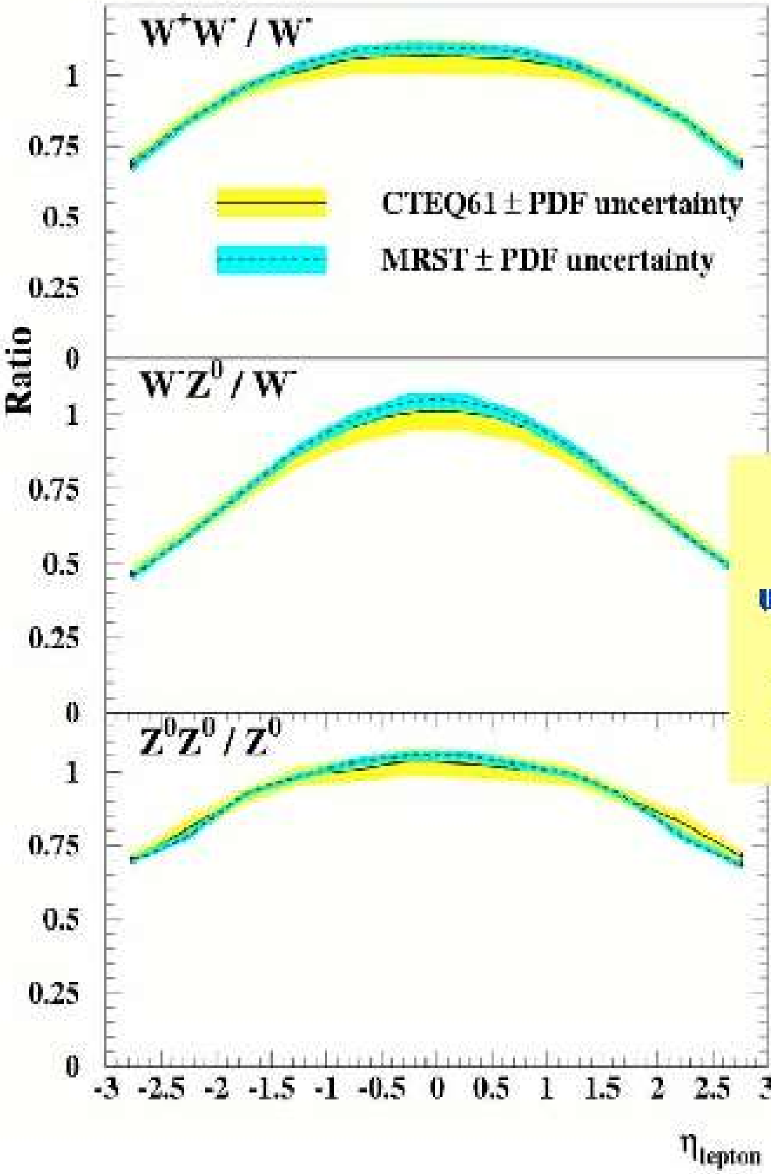
Ratio wrt nominal scales

scale uncertainty +/- 5 % dominated by asymmetric scales



Stenzel - W/Z p

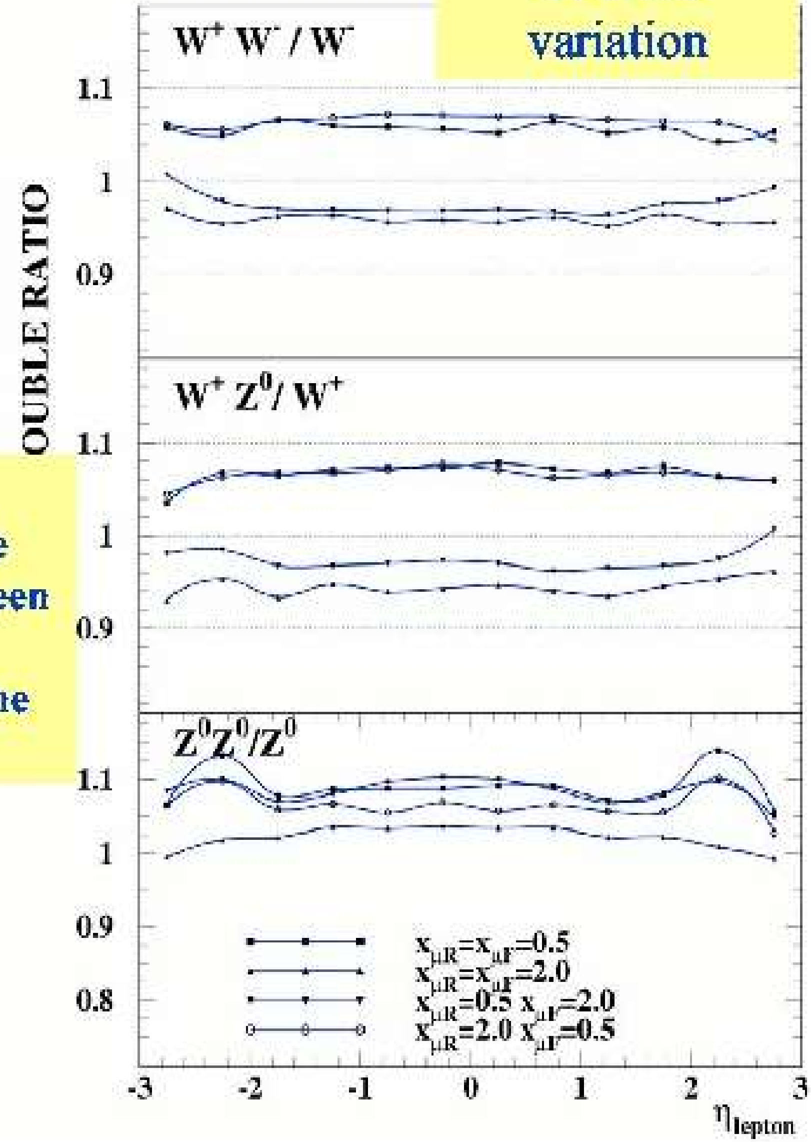
Ratio VV/V for lepton pseudo-rapidity



PDF and scale uncertainties are uncorrelated between VV and V
No reduction in the ratio!

Stenzel - W/Z p.

Double Ratio for scale variation



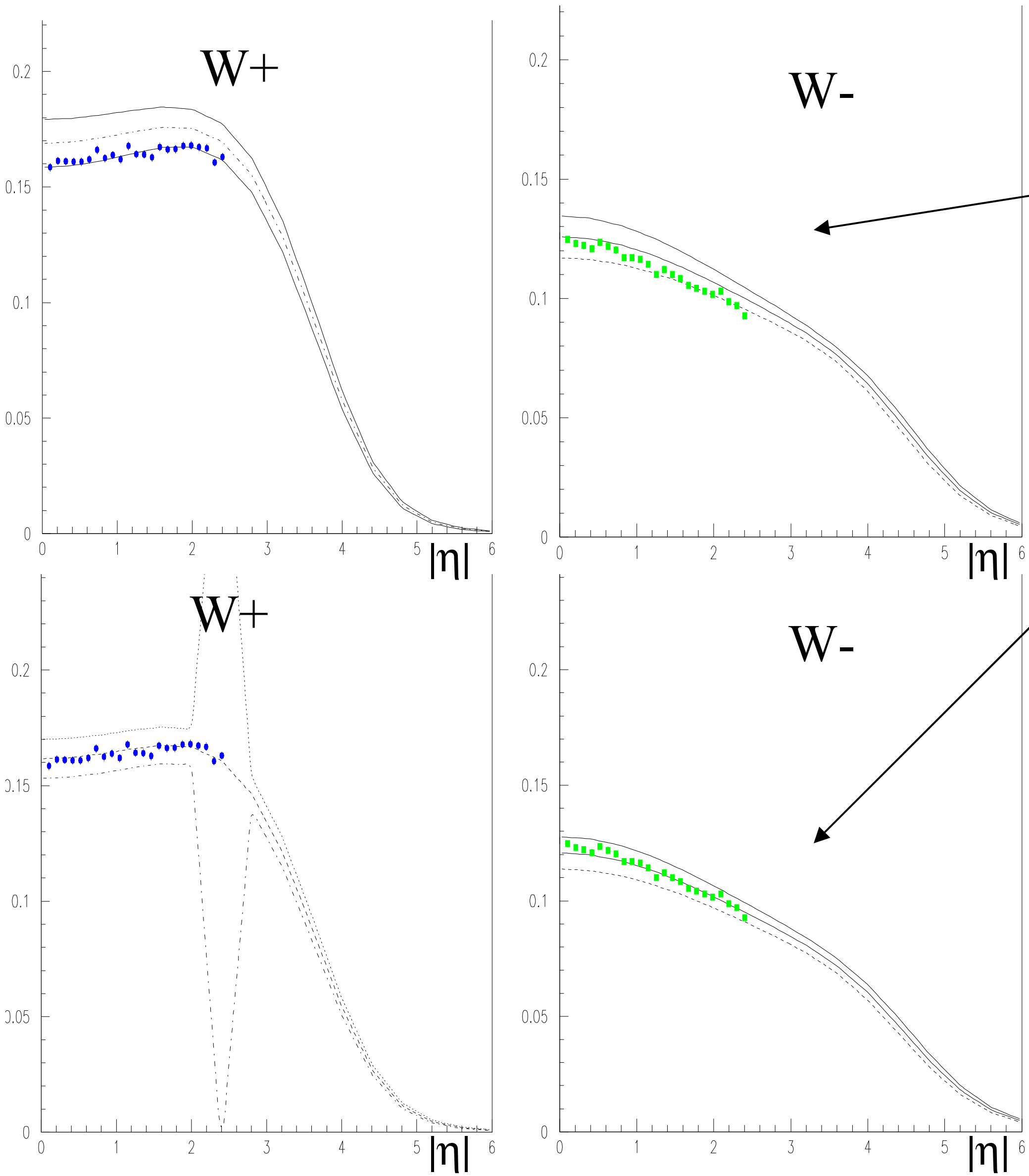
Conclusions

- study of WW,WZ and ZZ production with experimental cuts
- differential distributions (rapidity, $P_{T,}$ m_{inv})
- systematic uncertainties:
  - PDF : 3.5-4%
  - Perturbative 3.6 – 4.1 %
- Systematics for VV and V is uncorrelated, does not cancel in the VV/V ratio

Summary of uncertainties

	W/Z	W/Z + jet	WW/ZZ
Δ_{PDF}[%]	± 5.3	± 4.3	± 3.7
Δ_{Pert}[%]	± 5.4	± 9.1	± 3.8

PDF Fits to generated data –fit PDF different from generator PDF



930,000 W+ & W- events generated with **CTEQ6.1,** decay to e+ & e-

(<u>NO detector simulation</u>)

vs **ZEUS02** predictions- central values differ

These events can be included in the ZEUS fit - for the DIS data remains acceptable Central values of PDF parameters shift - particularly low-x gluon parameter

Errors on PDF parameters at Q^2_0 reduced - particularly low-x gluon parameter

$xg(x) = x^{-\lambda}$, $\lambda = -.187 \pm .046$

Becomes $\lambda = -.165 \pm .029$

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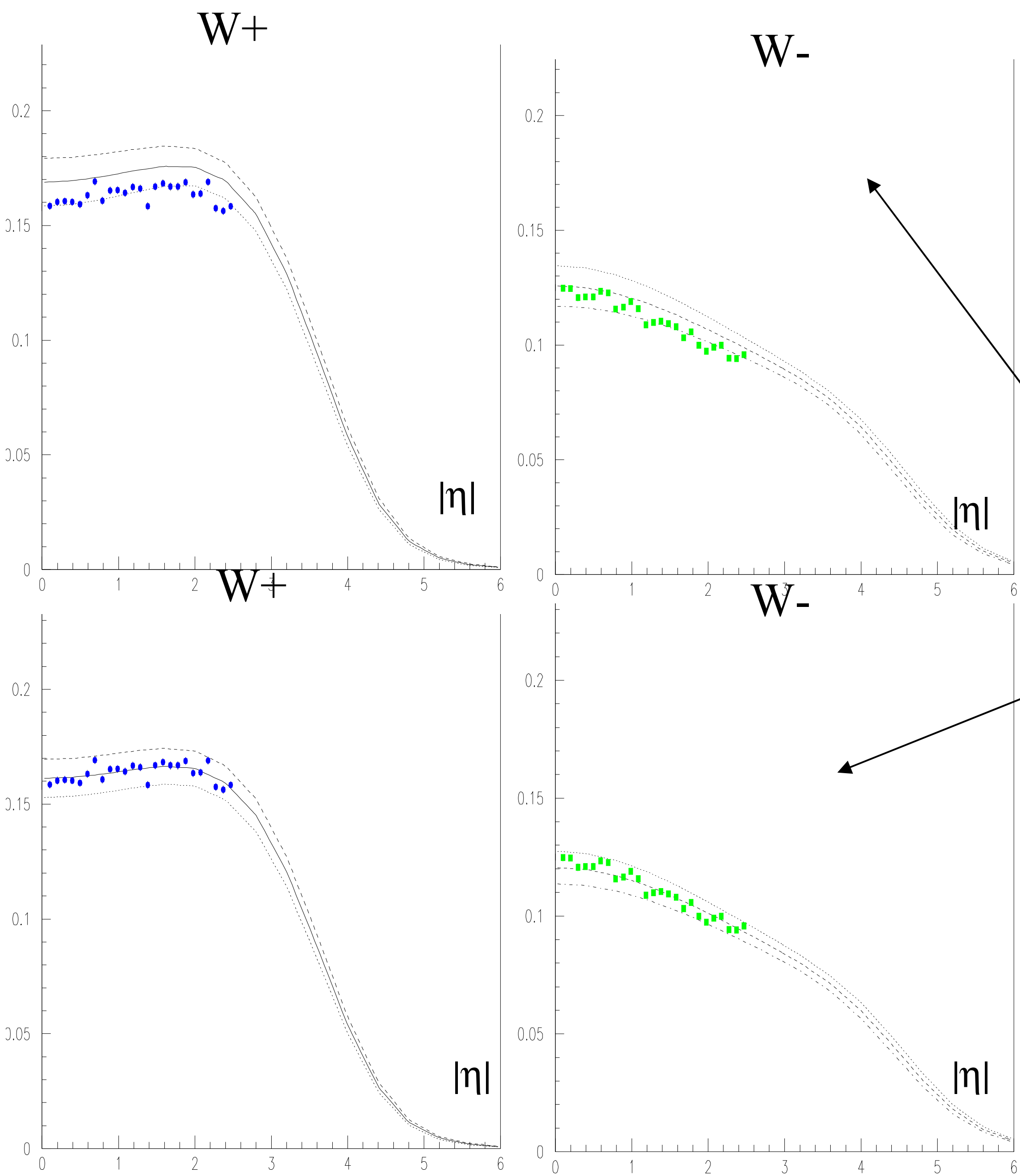
PDF fits to generated data – generate with one PDF- simulate detector – correct with different PDF



930,000 W+ & W- events generated with **CTEQ6.1,** decay to e+ & e-

passed through **ATLFAST**

and then corrected from **Detector** back to **Generator** level with **ZEUS02**

vs **ZEUS02** predictions -central values differ

These events can be included in the ZEUS fit - for the DIS data remains acceptable. Central values of PDF parameters shift - particularly low-x gluon parameter

Errors on PDF parameters at Q^2_0 reduced - particularly low-x gluon parameter

$xg(x) = x^{-\lambda}$, $\lambda = -.187 \pm .046$

Becomes $\lambda = -.155 \pm .030$

Conclusions

I showed W^{+-} -> e^{+-} rapidity distributions with the full quoted ***PDF uncertainty*** for MRST02,CTEQ61,ZEUS2002

I showed that the ***PDF re-weighting*** technique can be useful to save generation time especially to evaluate the PDF uncertainties.

Good agreement between ***Herwig+K-Factors*** and ***MC@NLO***

The ***Background*** is very small after selection cuts

Charge Misidentification systematic uncertainty can be < 2% in central rapidity region < 4% at high rapidity

Statistical errors are negligible on W reconstruction at LHC

Including the W Rapidity distributions in our **global data PDF Fits we reduce the PDF errors**, especially the ones associated to *gluon parameters*:

Error on low-x gluon parameter λ reduced of ~35-37%

Moreover the central values might be sensibly affected too:

Change of the central value of λ of ~ 12-17%

The convolution of ATLFAST Detector Smearing and PDF choice for the corrections introduces a relative **variation of the cross-section** of about $\Delta\sigma_W$ **~ 4%**

Experimental systematic errors

for high Q^2 LHC Physics
Can one guess them today?

Michael Dittmar (ETH-Zürich/CMS)

- Introduction
- some assumptions
- LHC final states
- learning from previous experiments
- guessing the systematic errors

Assumptions

1. ATLAS/CMS can be realized according to their design
   for most cases: they should function "better" than CDF/D0!
   (this is not the case for b-tagging!)

2. LHC experimentation more difficult than
   Tevatron/LEP measurements!

3. LEP (II) systematic errors can be used to guess limitations for
   LHC experiments! (like detector stability)

   \+ efficiency uncertainties for isolated leptons, photons, jets and missing E_T.

   ++ difficulties of counting jets

- modelling of Standard Model backgrounds
  → uncertainties must be larger at the LHC!

Guessing (optimistic) experimental systematic limits for the LHC

$\Delta\epsilon/\epsilon \geq 1\%$ for isolated leptons and photons(?) $p_t \geq 20$ GeV.

$\Delta\epsilon(b)/\epsilon(b) \geq 5\%$ for "isolated" b-flavoured jets $p_t \geq 20$ GeV.

Jet Veto $\Delta\epsilon/\epsilon \geq$ few % (larger errors if one does jet "counting"!

Ratio measurements W^+/W^-, W/Z etc.. relative errors of 0.5-1% not impossible!

$t\bar{t}$ cross section relative to W and Z difficult to imagine errors smaller than 5-10%!

background uncertainties (from theory and cut efficiencies):
$\Delta B/B =$ 5-10%???
thus signal/background ratios larger than 0.25-0.5 required for "discovery channels"!