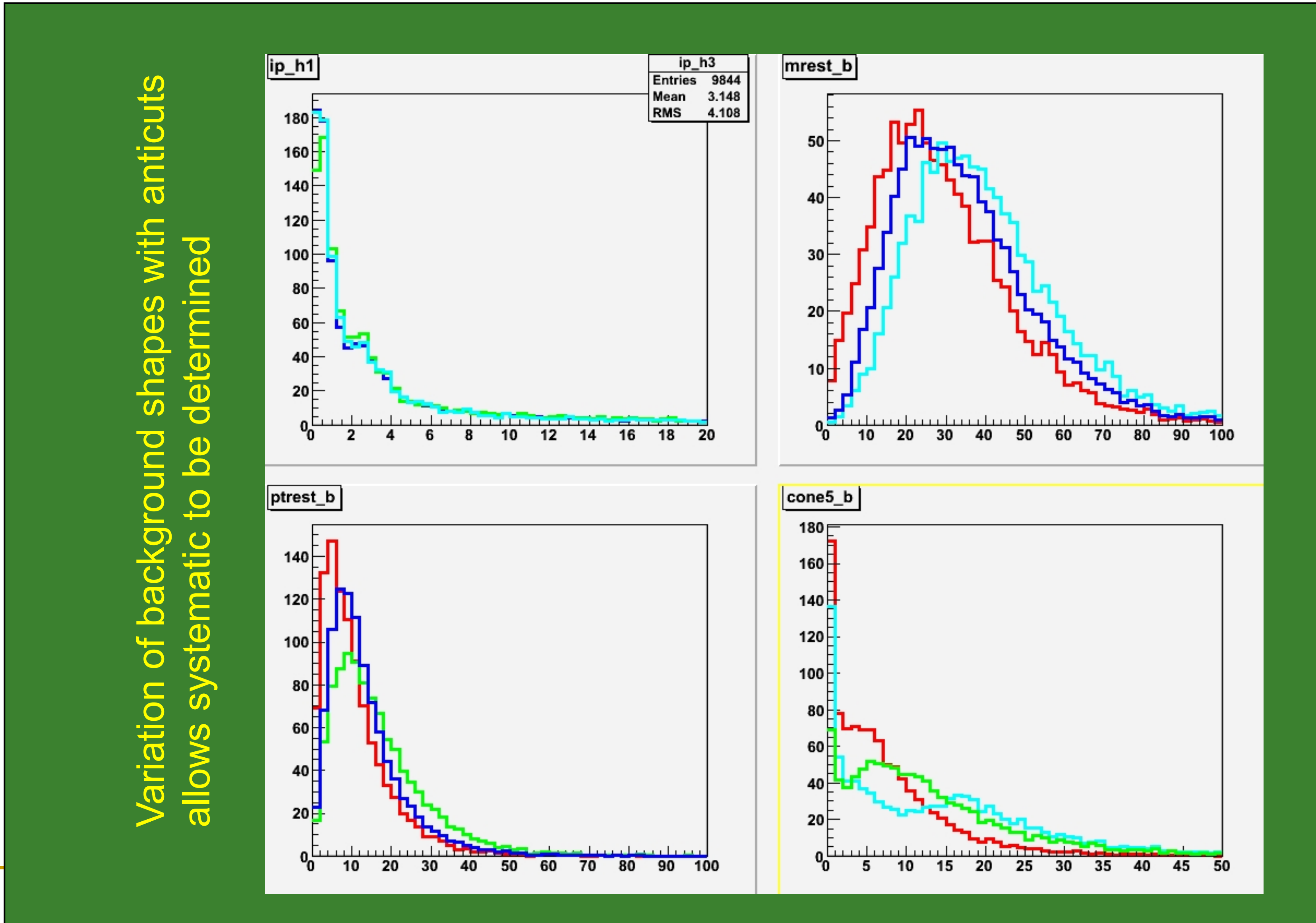
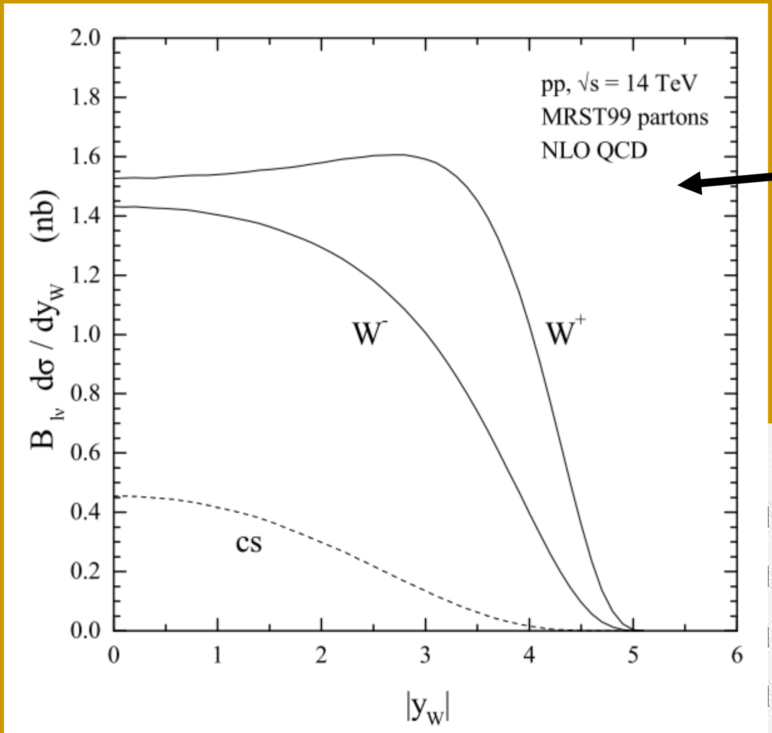
Backup

W analysis

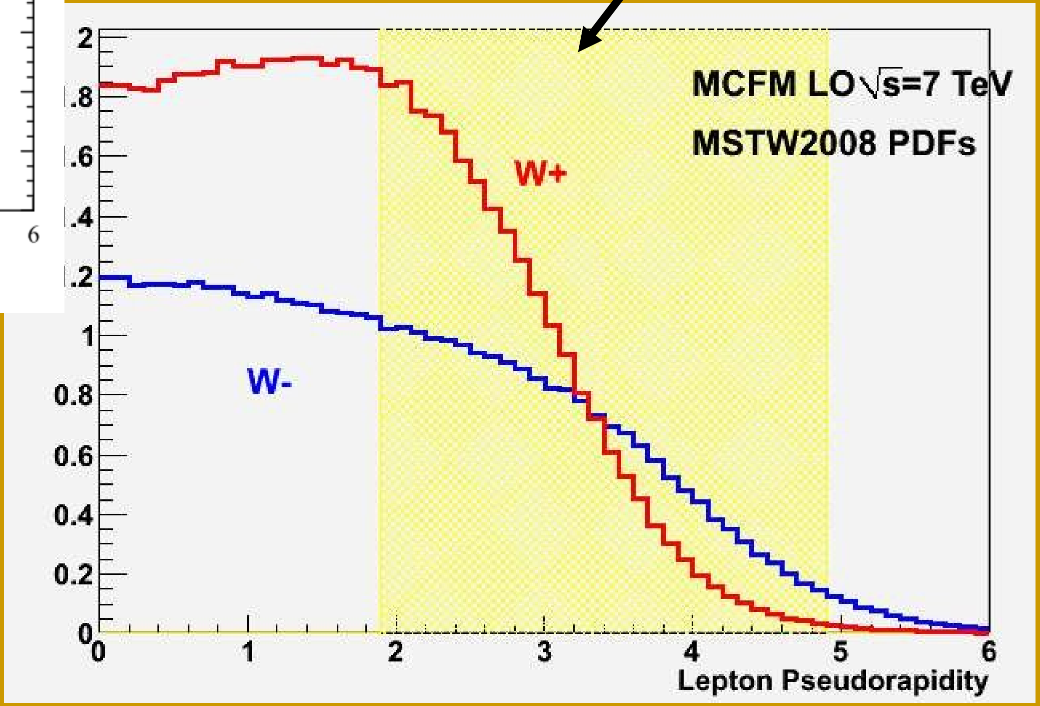
$$\sigma_{W\to\mu\nu}(\Delta\eta) = \frac{N^W_{tot} - N^W_{bkg}}{\epsilon_W L}$$

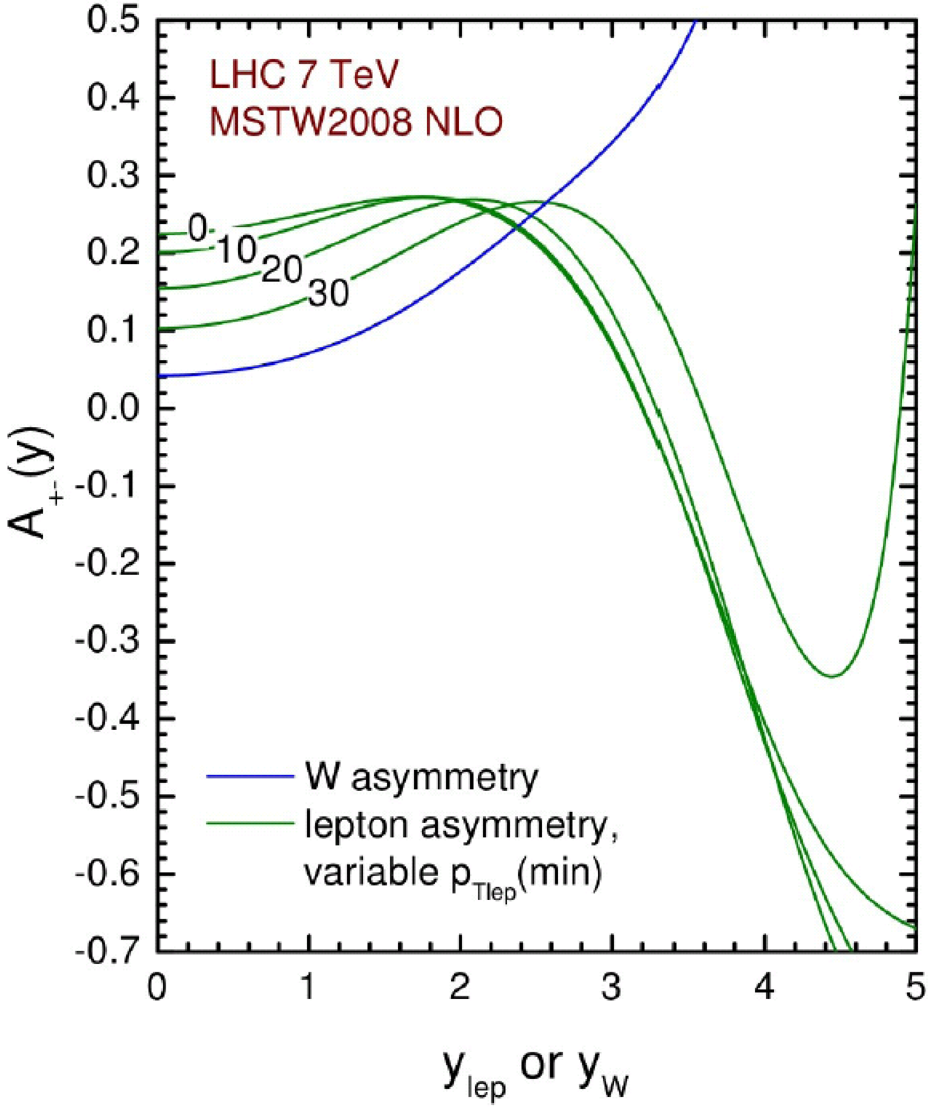




Boson Level

Lepton Level





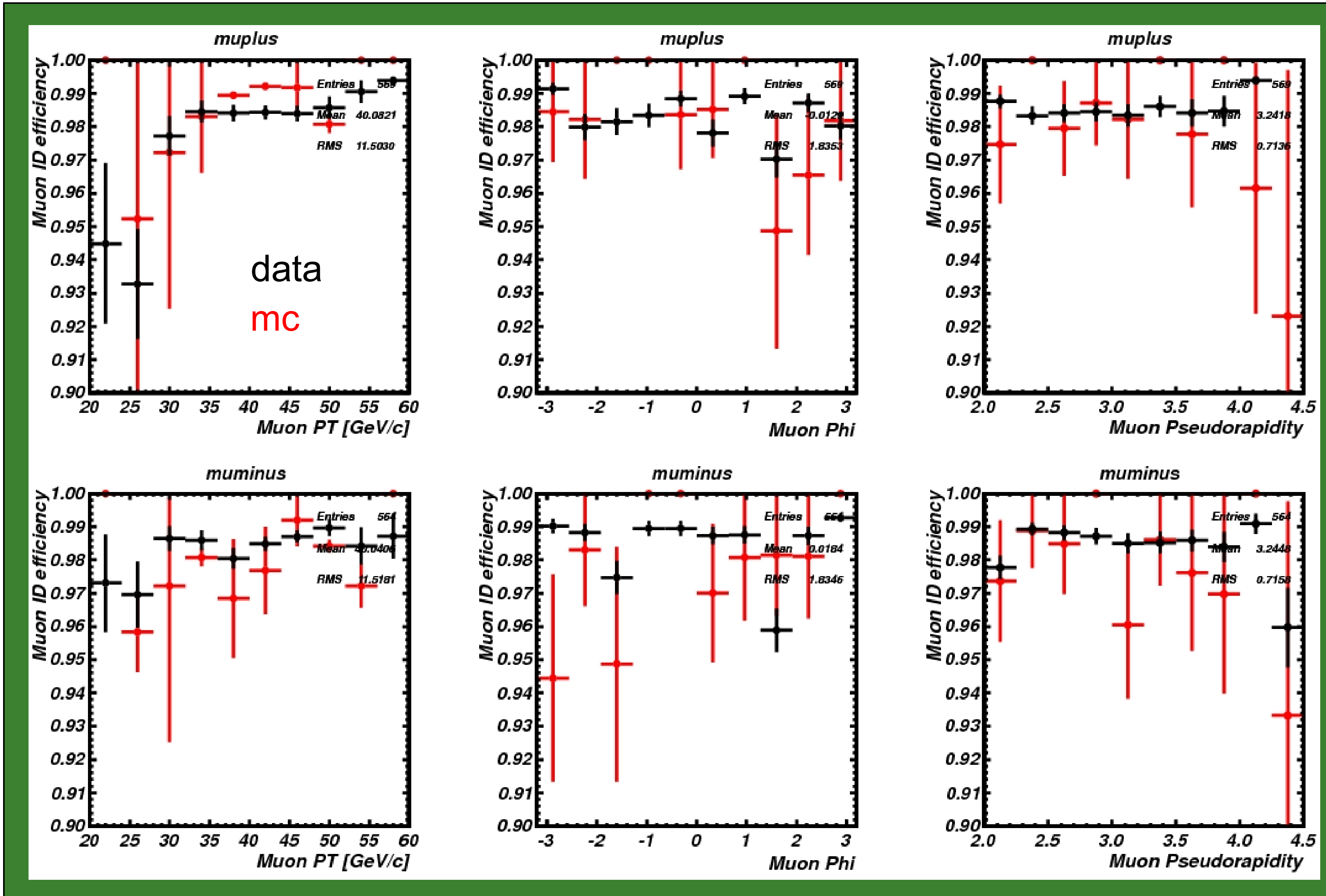
from J.Stirling

Z analysis

$$\epsilon_Z = A_z \epsilon_Z^{trig} \epsilon_Z^{track} \epsilon_Z^{muon} \epsilon_Z^{selection}$$

ε_W=98.2 ± 0.5%
ε_Z=96.5± 0.7%

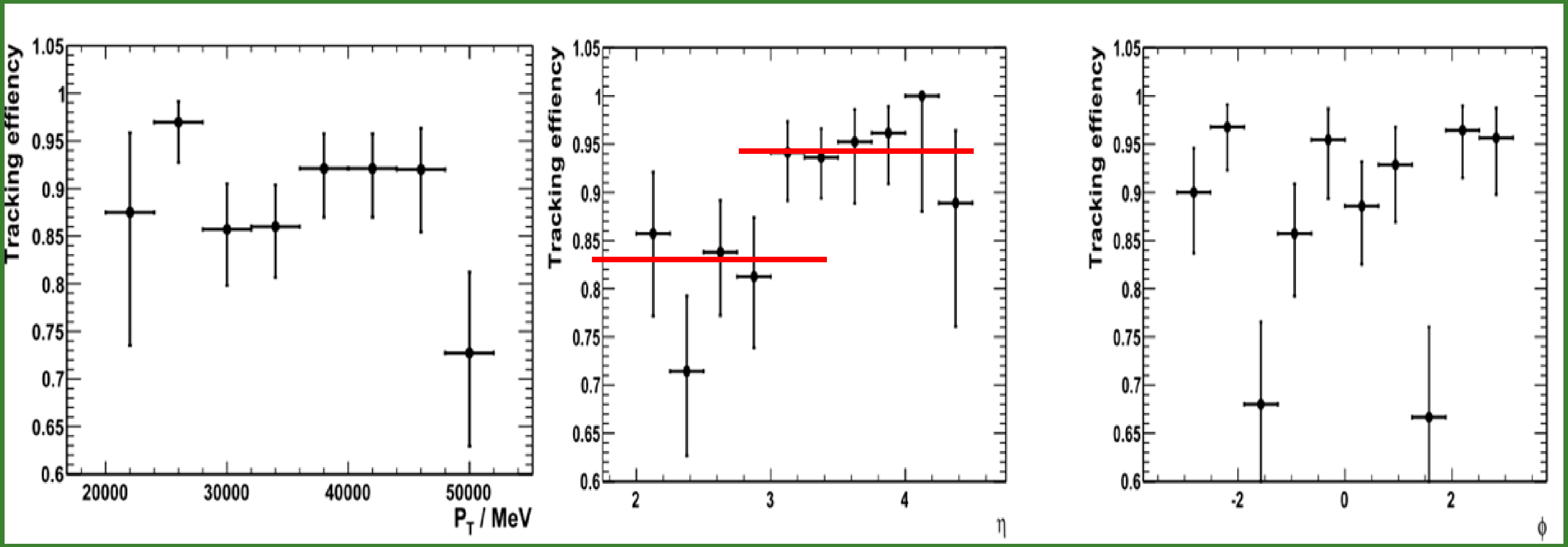
No evidence for charge bias or pt,Φ, or η dependence



Z analysis

$$\epsilon_Z = A_z \epsilon_Z^{trig} \epsilon_Z^{track} \epsilon_Z^{muon} \epsilon_Z^{selection}$$

ε_{W+}=73 ± 3%
ε_{W-}= 78 ± 3%
ε_Z = 83 ± 3%



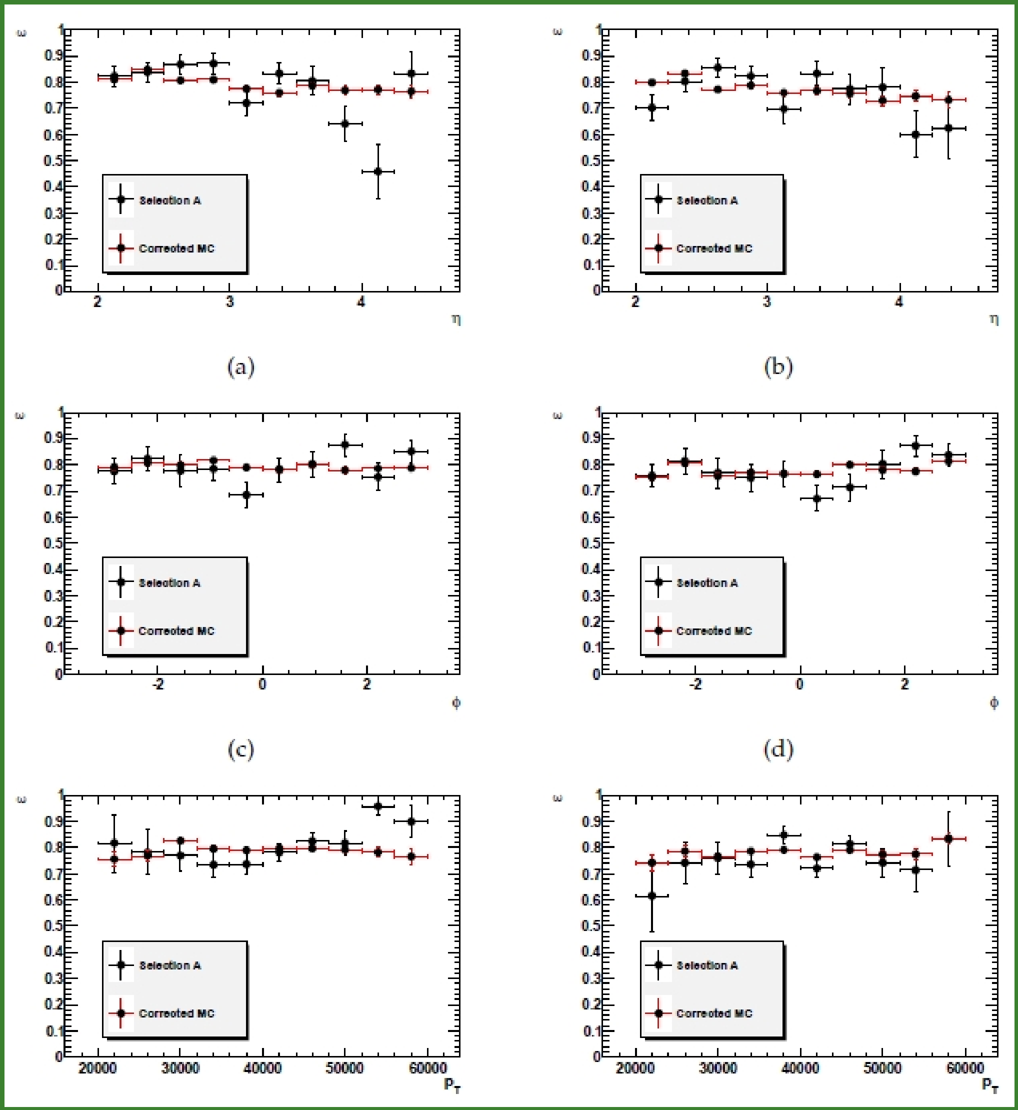
Flat with pt. Lower efficiency η<3. Lower efficency in VELO overlap.
Apply event-by-event weighting for Z analysis

(For W analysis, tighter tracking requirements lower the efficiency.
Requiring TT: ε= 0.66,0.75,0.90 for η<2.5, 2.5<η<3, η>3.
The different W+/W- pseudorapidity distributions lead to efficiency charge asymmetry)

Z analysis

$$\epsilon_Z = A_z \epsilon_Z^{trig} \epsilon_Z^{track} \epsilon_Z^{muon} \epsilon_Z^{selection}$$

ε_W =72 ± 1%
ε_Z =86 ± 1%



Consider flat in pt,Φ,η

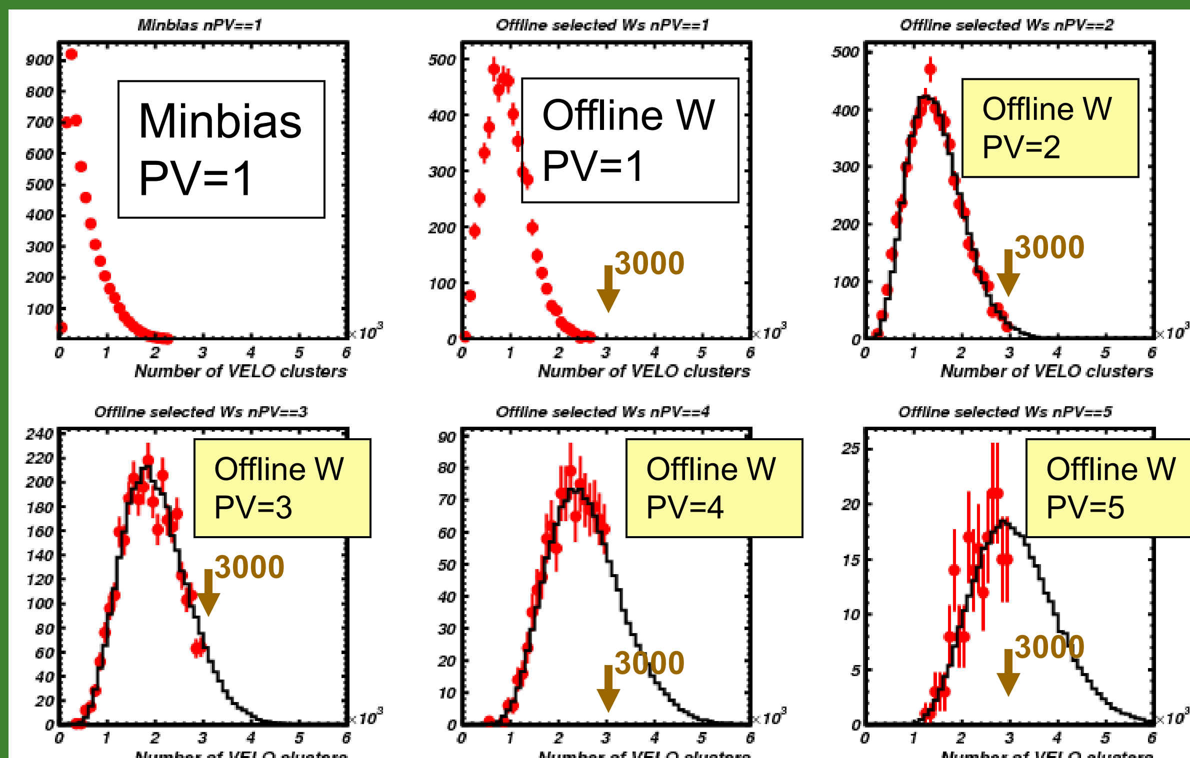
(scaling of uncertainties for good flat fit gives systematic)

Z analysis

$$\epsilon_Z = A_Z \epsilon_Z^{trig} \epsilon_Z^{track} \epsilon_Z^{muon} \epsilon_Z^{selection}$$

$\varepsilon_W = 72 \pm 1\%$
$\varepsilon_Z = 86 \pm 1\%$

But there are also **Global Event Cuts** in the Trigger



GEC: 90±1%

How can W,Z constrain PDFs?

From global fits, PDFs described by a set of orthogonal eigenvectors, which have a 'central' value $\vec{e}_0$, and 'uncertainties' $\vec{e}_i$.

$\frac{d\sigma}{dy}(\vec{e}_0)$ is the value of the differential cross-section obtained using the central value.

$\frac{d\sigma}{dy}(\vec{e}_1)$ is the value of the differential cross-section obtained moving one unit along eigenvector 1

$\frac{d\sigma}{dy}(\vec{e}_1)-\frac{d\sigma}{dy}(\vec{e}_0)$ is the change in the differential cross-section when I move one unit along eigenvector 1

$0.5*\left\{\frac{d\sigma}{dy}(\vec{e}_1)-\frac{d\sigma}{dy}(\vec{e}_0)\right\}+0.3*\left\{\frac{d\sigma}{dy}(\vec{e}_3)-\frac{d\sigma}{dy}(\vec{e}_0)\right\}$ is the change in the differential cross-section when I move 0.5 along e.v. 1 and 0.3 along e.v. 3

How can W,Z constrain PDFs?

From global fits, PDFs described by a set of orthogonal eigenvectors, which have a 'central' value $\vec{e}_0$, and 'uncertainties' $\vec{e}_i$.

$$\frac{d\sigma}{dy}(\delta_1,\delta_2 ... \delta_N) = \frac{d\sigma}{dy}(\vec{e}_0) + \sum_i^N \delta_i \left\{ \frac{d\sigma}{dy}(\vec{e}_i) - \frac{d\sigma}{dy}(\vec{e}_0) \right\}$$

(where δ_i is #sigmas along e_i)

Current knowledge of PDFs mapped out by sampling δ_i from unit multinomial distribution.

Perform pseudo-experiments, generating LHC data and fitting for δ_i, to see how eigenvector knowledge improves.

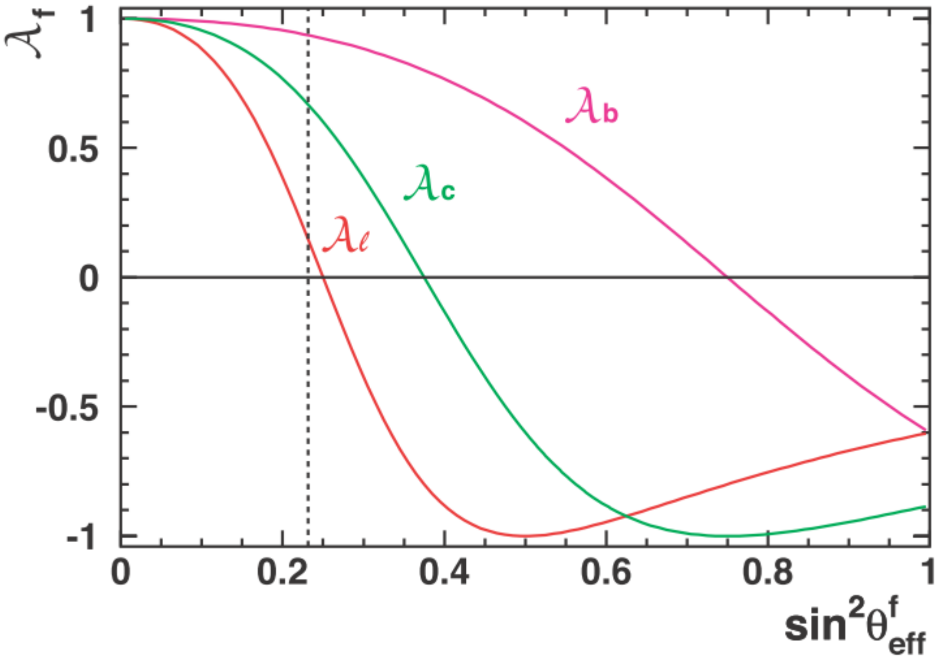
$$\chi^2 = \sum_{bin} \left(\frac{N_{bin} - f(\delta_1,\delta_2 .., \delta_N)}{\Delta_{bin}} \right)^2 + \sum \delta_i$$

Effect on MSTW08, CTEQ6.5, ALEKHIN2002, NNPDF2.0 studied.

$$A_{FB}^{0,f} = \frac{3}{4} A_f \left(uA_u + dA_d + sA_s \right) \qquad A_f = \frac{2 g_{Vf} g_{Af}}{g_{Vf}^2 + g_{Af}^2}$$

A_{FB} sensitive to $\sin^2\theta_W$

A_{FB} in muon channel at LHC is about 5 times larger than at LEP.



$$A_{FB}^{0,f} = \frac{3}{4} A_f (uA_u + dA_d + sA_s) \qquad A_f = \frac{2 g_{Vf} g_{Af}}{g_{Vf}^2 + g_{Af}^2}$$

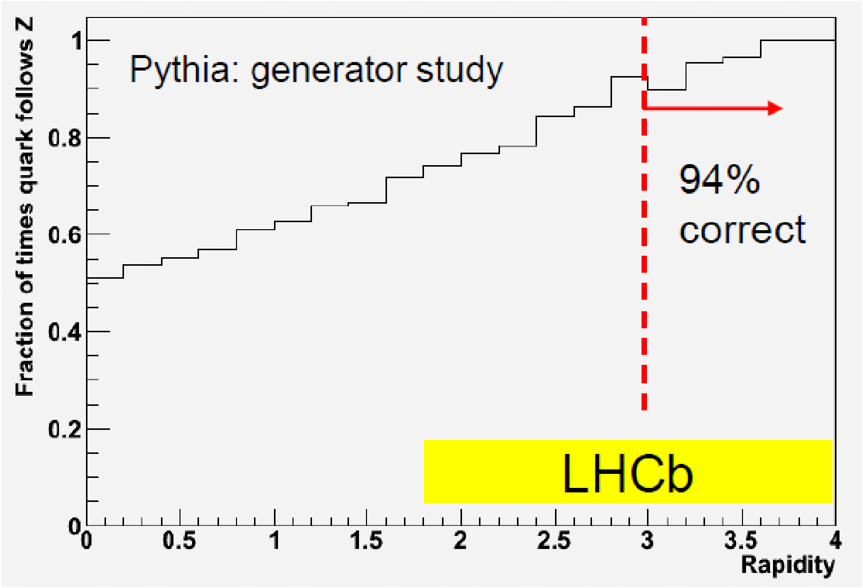
A_{FB} sensitive to $\sin^2\theta_W$

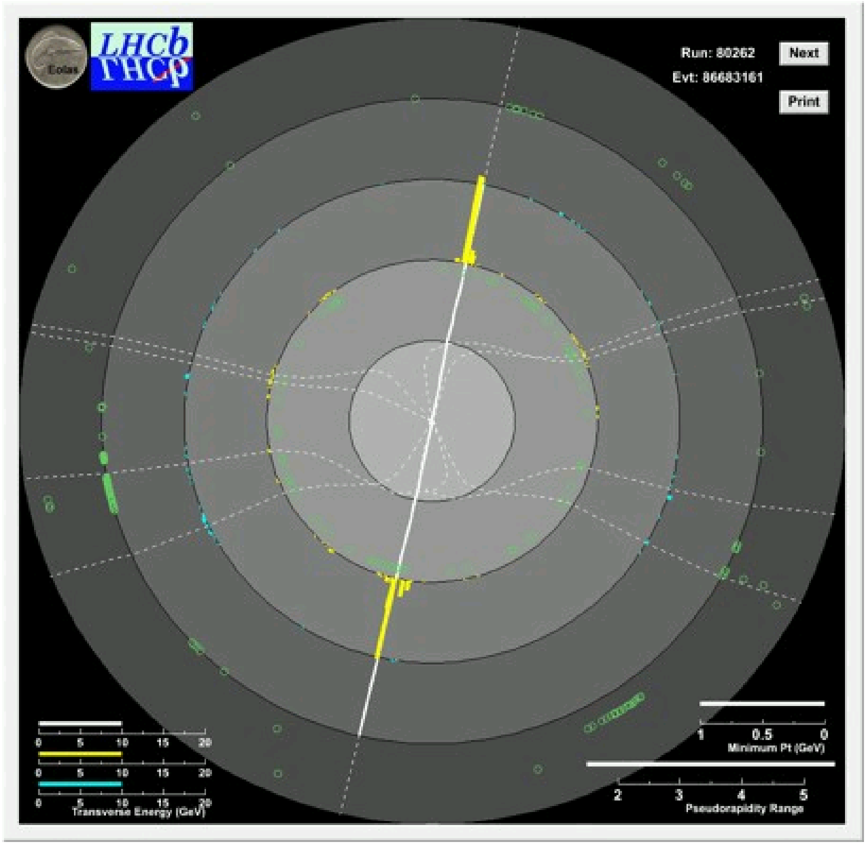
Uncertainties from :

- Forward (quark) direction
- PDF knowledge of sea

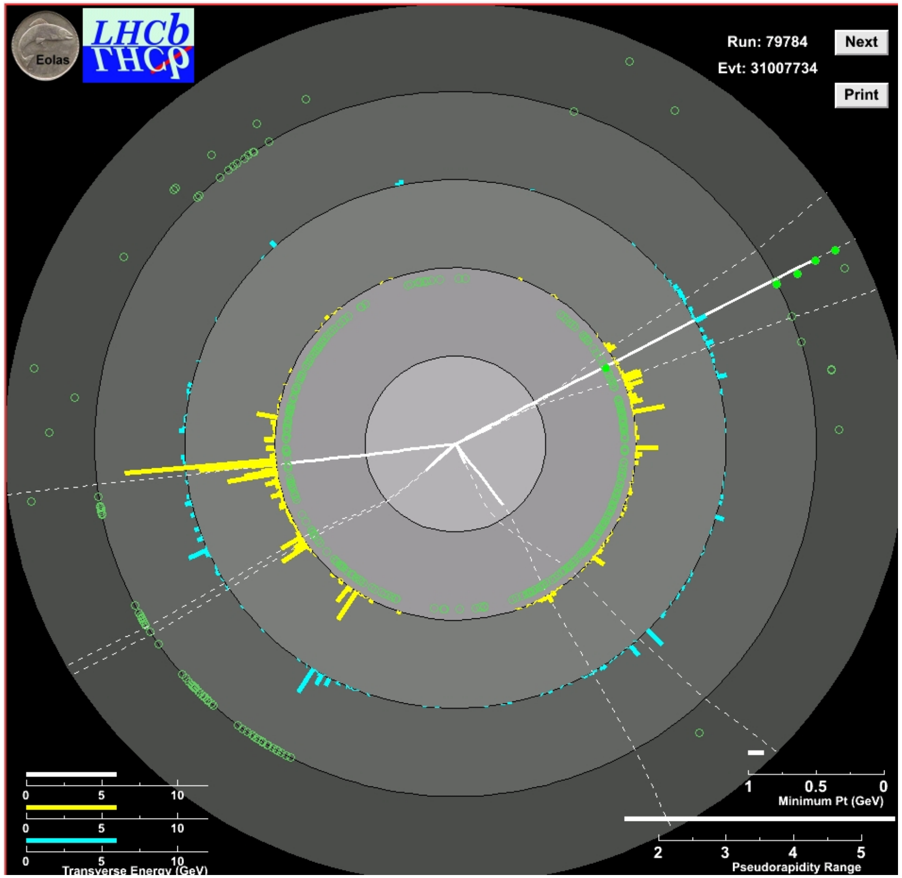
LHCb:

- predominately valence - sea collisions
- ss contribution reduced



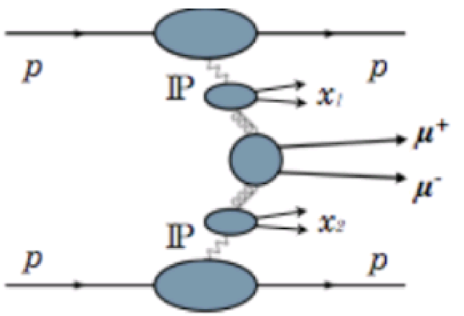

LHCb
Eolas
Run: 80262
Evt: 86683161
Next
Print
Minimum Pt (GeV)
Pseudorapidity Range
Transverse Energy (GeV)

Z->ee


LHCb
Eolas
Run: 79784
Evt: 31007734
Next
Print
Minimum Pt (GeV)
Pseudorapidity Range
Transverse Energy (GeV)

Z->tautau

Diphoton dimuon background study

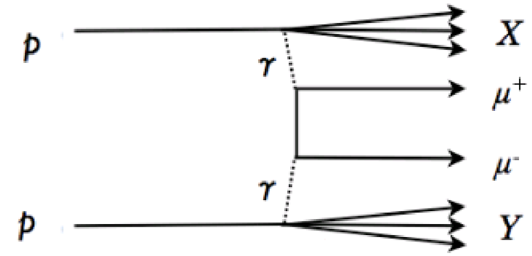


<u>Dimuons from Double Pomeron Exchange (DPE)</u>

Generated with Pomwig (Does not contain Multi Parton Interactions)

Pythia used to estimate effect of MPI (Pomwig predictions scaled by 0.3)

H1 pomeron PDFs (06 and 97 NLO) used



<u>Dimuons from Inelastic diphoton fusion</u>

One or both protons dissociate during interaction

Generated with LPAIR

A.Suri and D.R.Yennie Proton PDFs used

<u>Mis-Id from Min Bias Data</u>

Min Bias events dominated by pions and kaons

Apply all cuts except requiring that the track is a muon

Scale distribution by probability for pions/kaons to be identified as muons

(Mis-Id Probability as a function of Particle P determined in separate study)