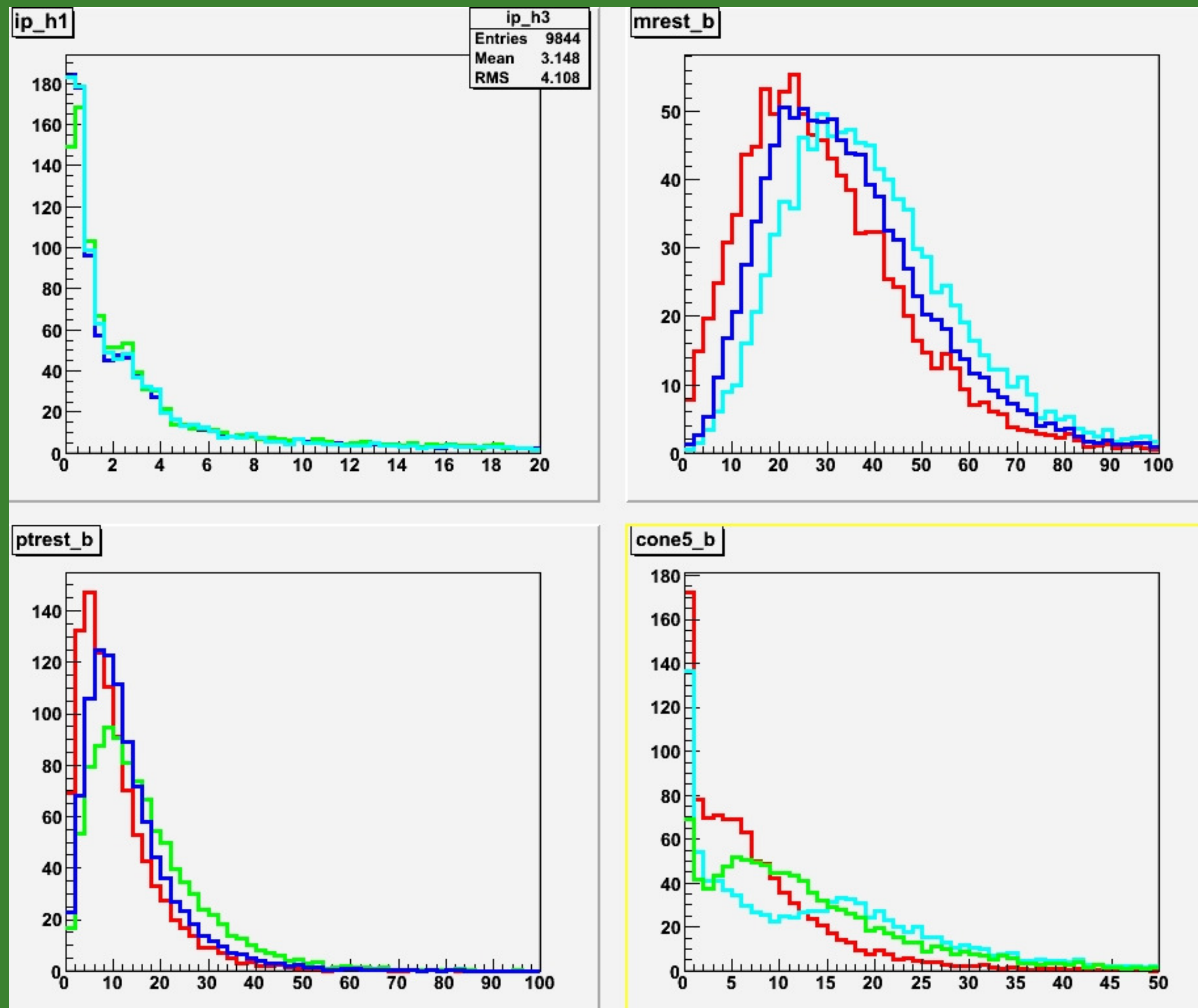
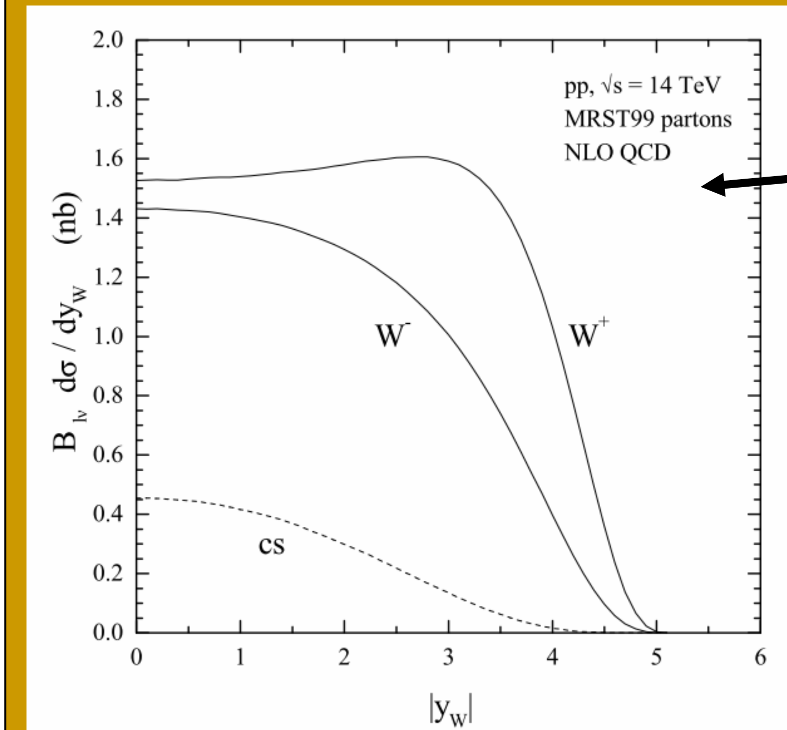
Backup

W analysis

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

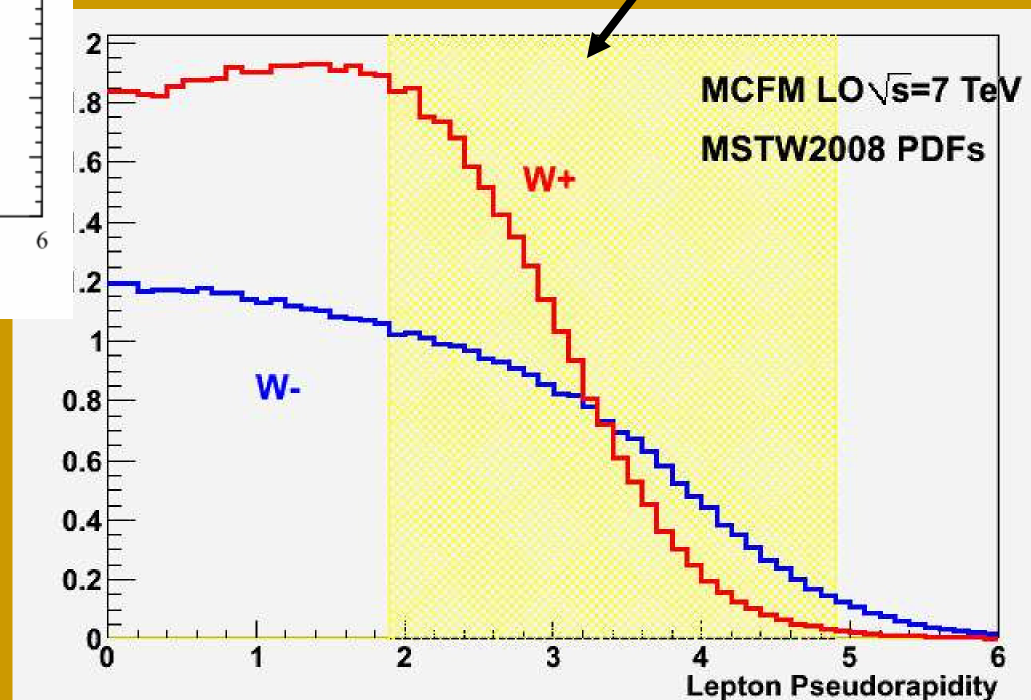
Variation of background shapes with anticuts allows systematic to be determined

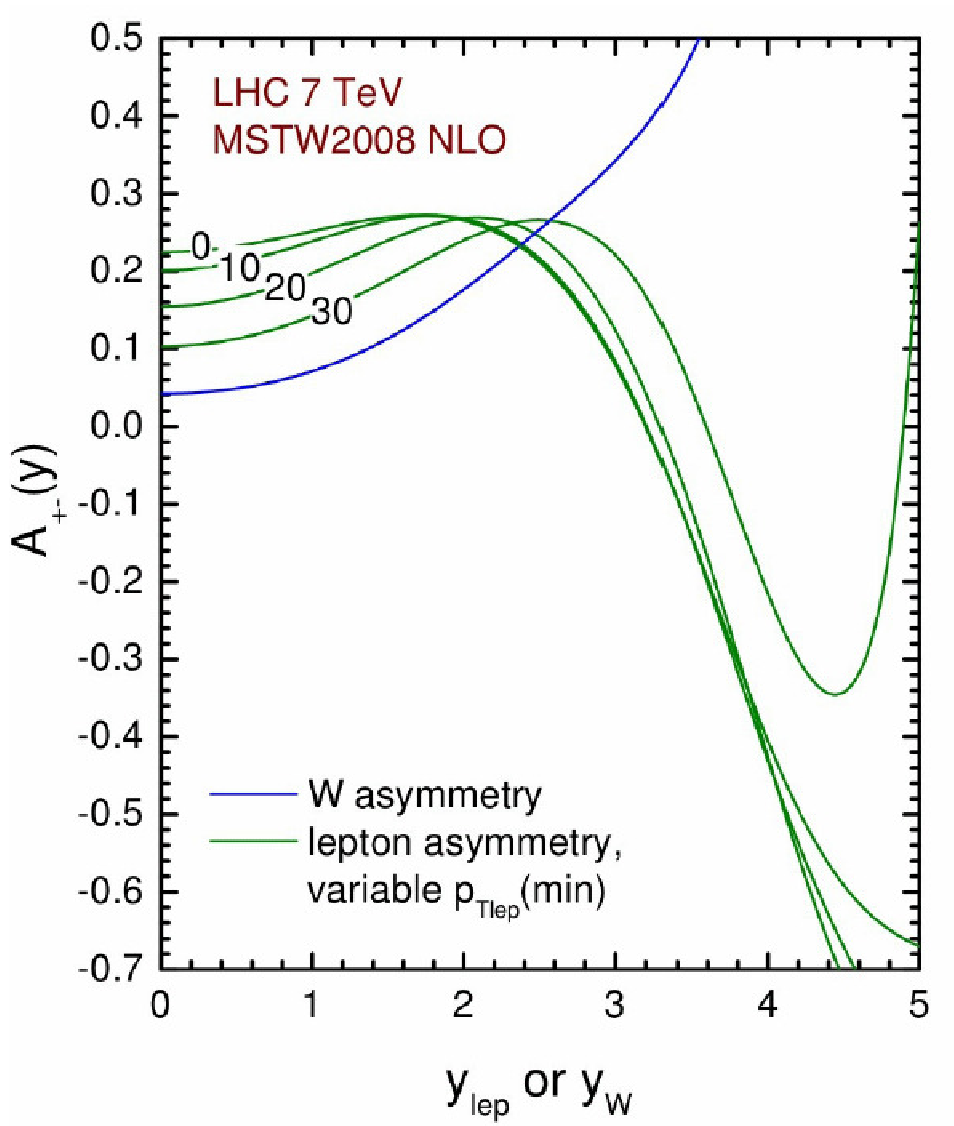




Boson Level

Lepton Level





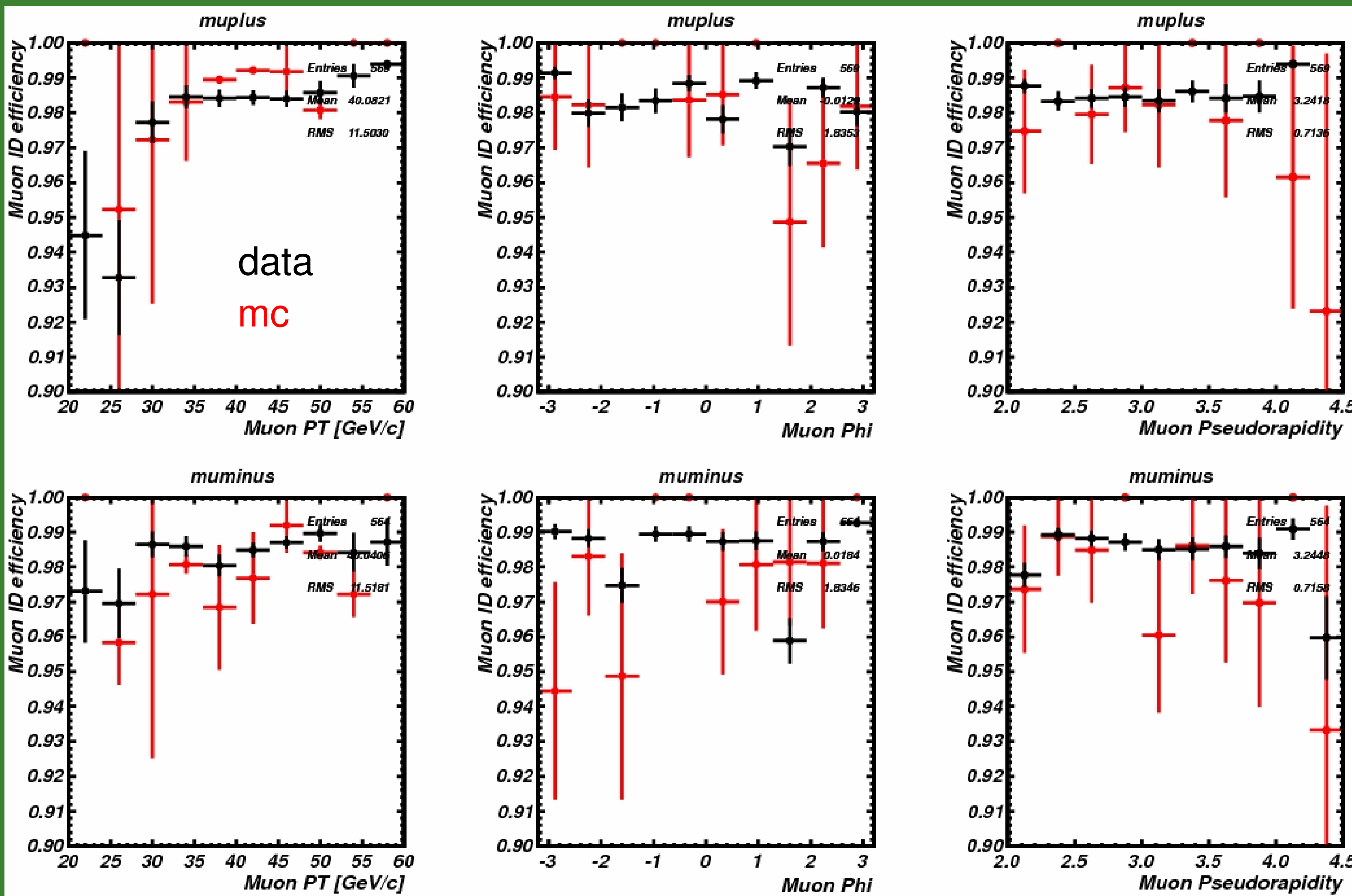
from J.Stirling

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%

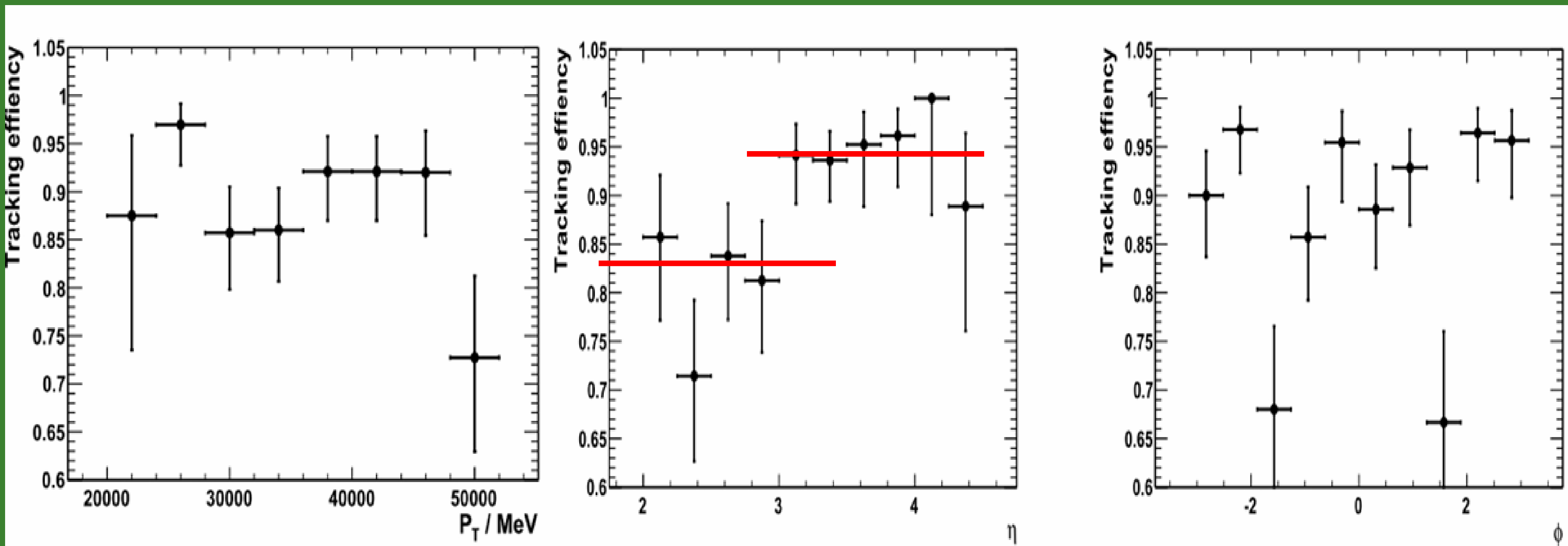
No evidence for charge bias or pt,Φ, or η dependence



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%



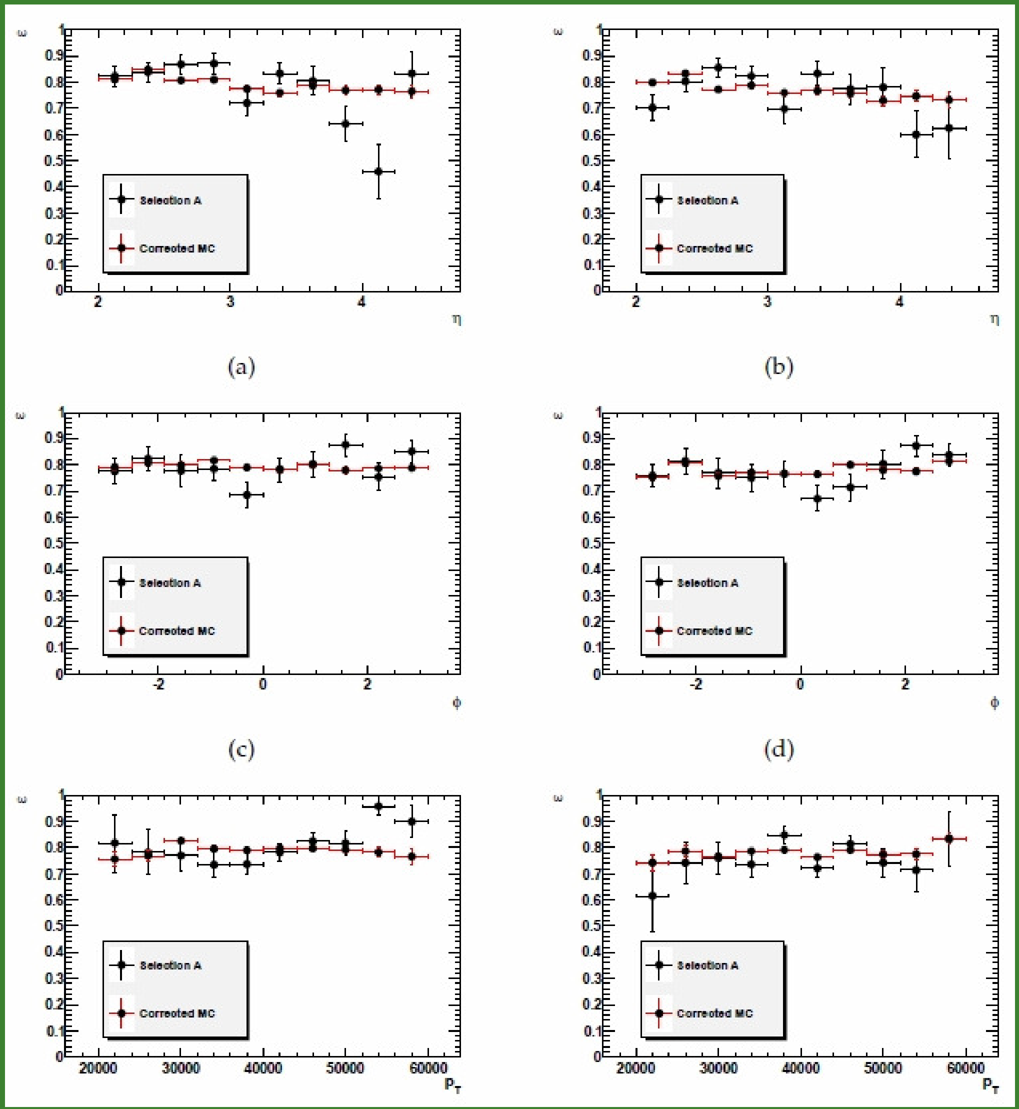
Flat with pt. Lower efficiency η<3. Lower efficency in VELO overlap.
Apply event-by-event weighting for Z analysis

(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

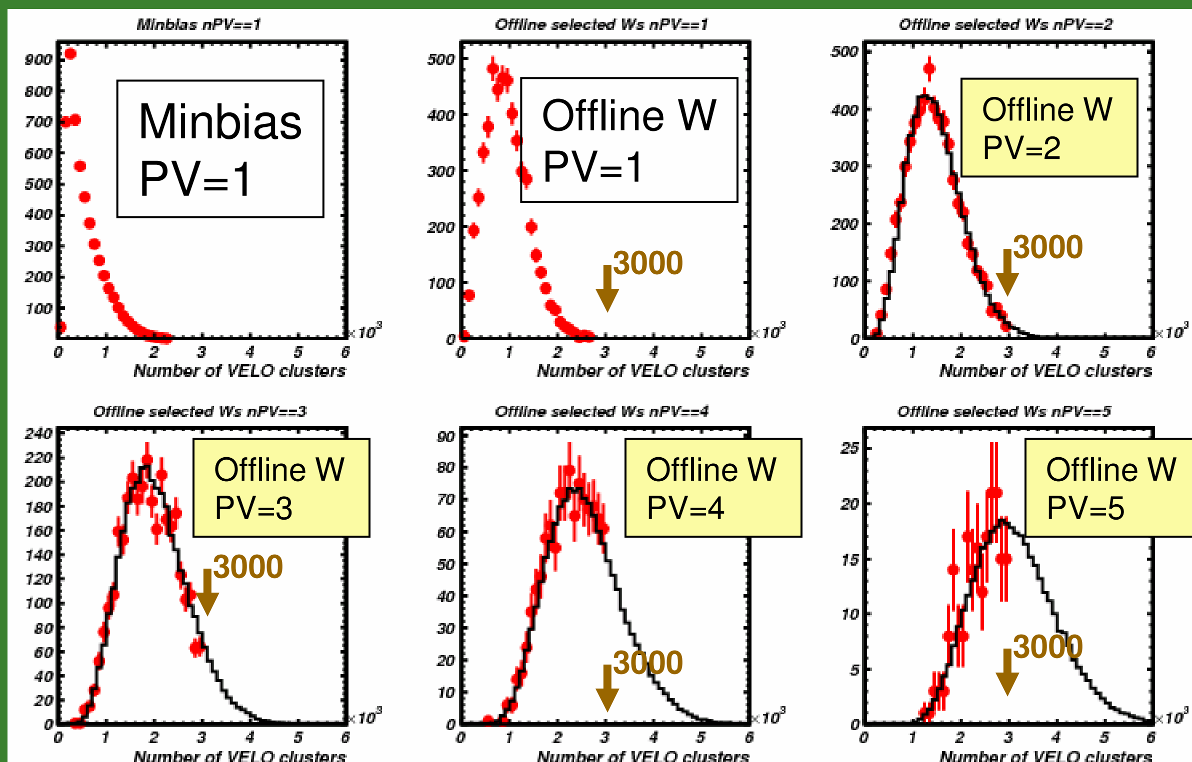
(scaling of uncertainties for good flat fit gives systematic)

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' $\vec{e}_i$.

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

(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.

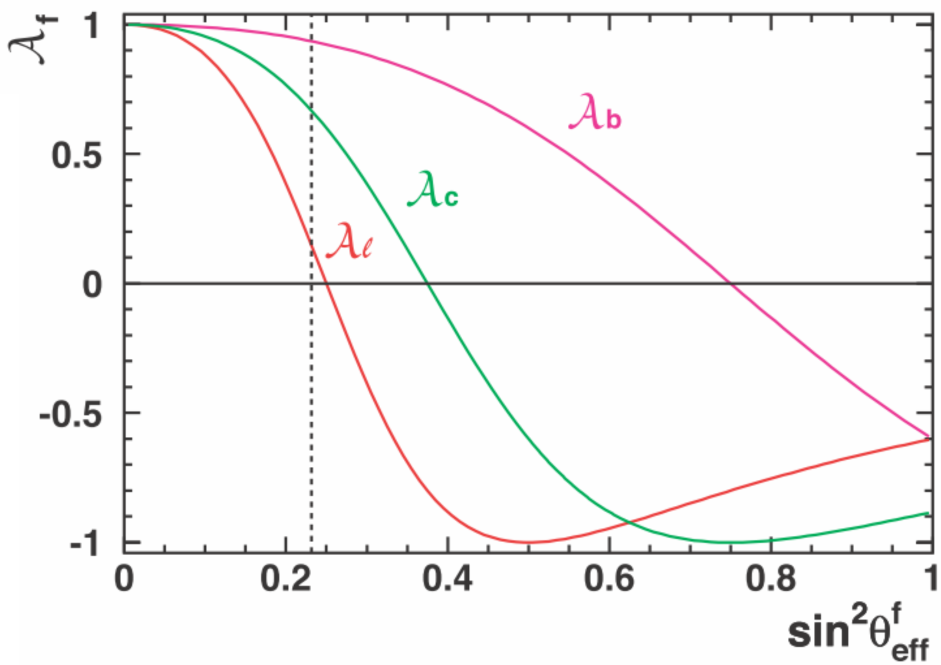
$$\chi^2=\sum_{bin}\left(\frac{N_{bin}-f(\delta_1,\delta_2..,\delta_N)}{\Delta_{bin}}\right)^2+\sum\delta_i$$

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.



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

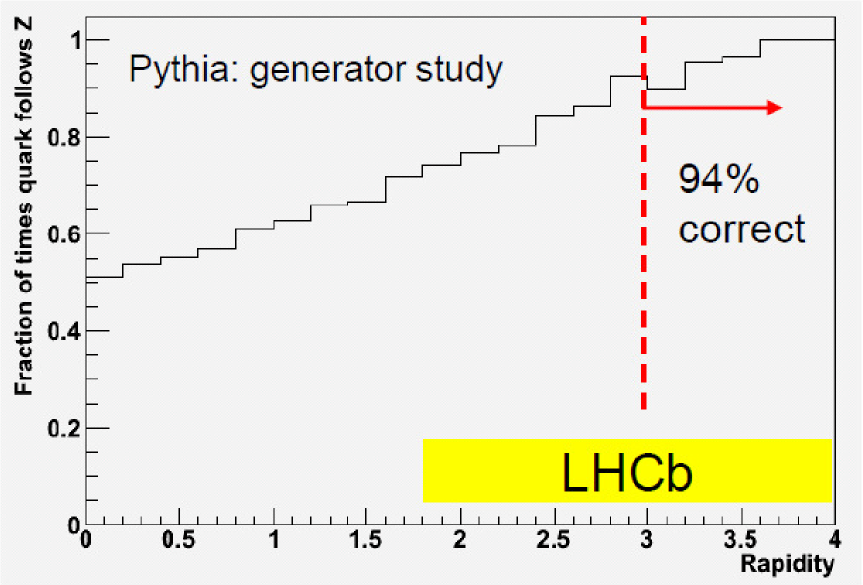
A_{FB} sensitive to $\sin^2\theta_W$

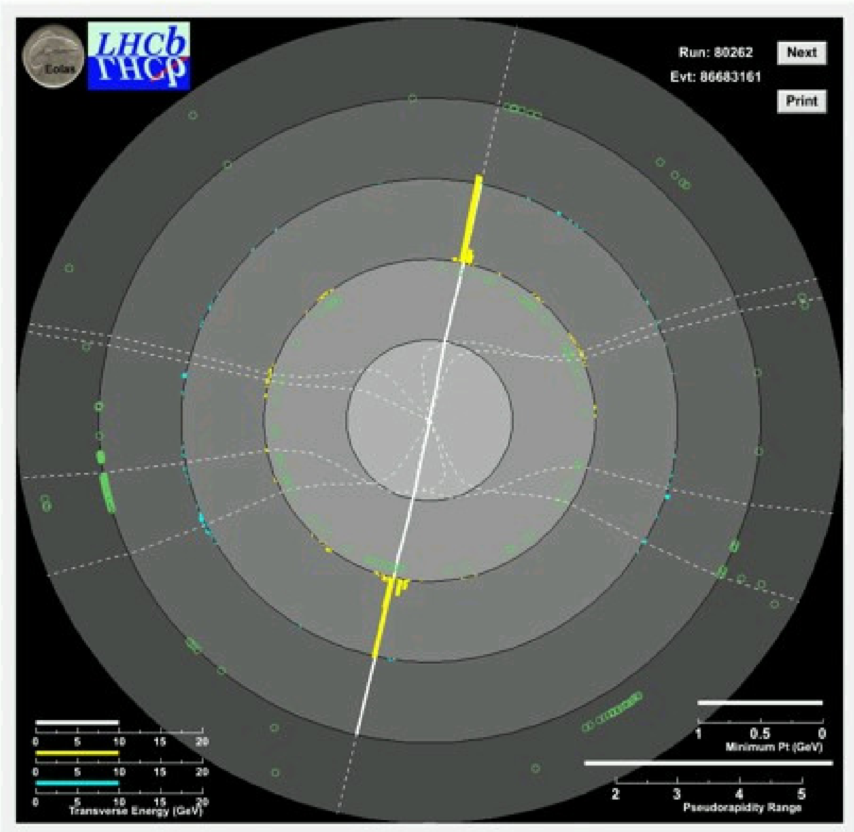
Uncertainties from :

- Forward (quark) direction
- PDF knowledge of sea

LHCb:

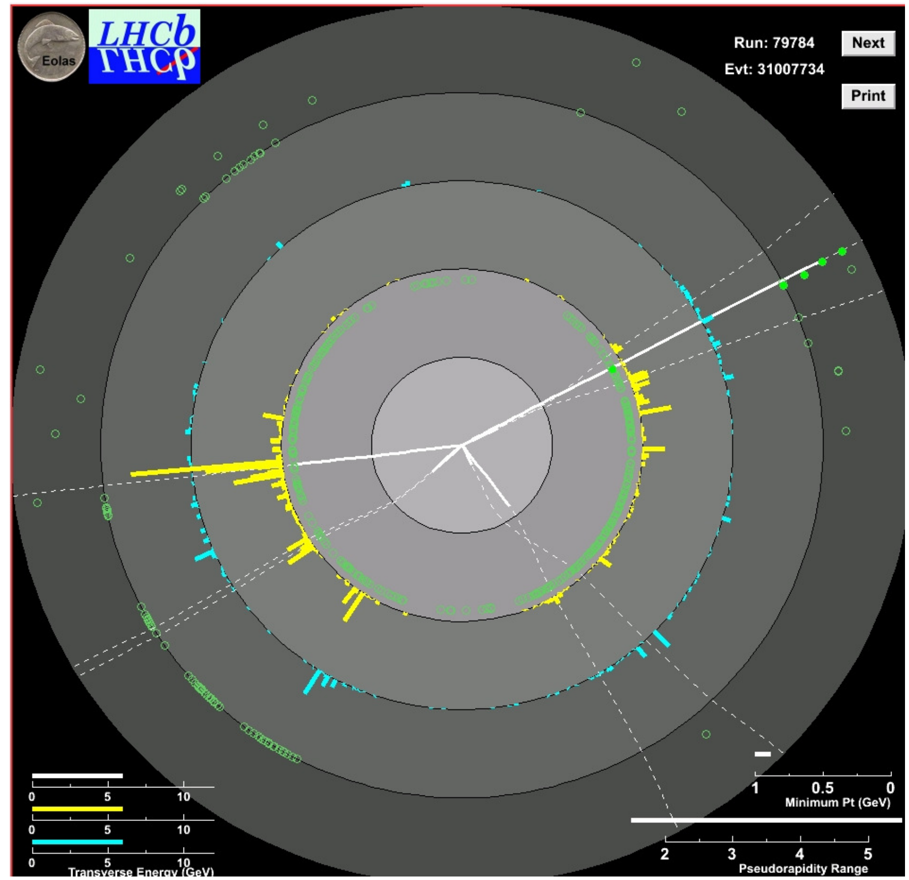
- predominately valence - sea collisions
- ss contribution reduced





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

Z->ee

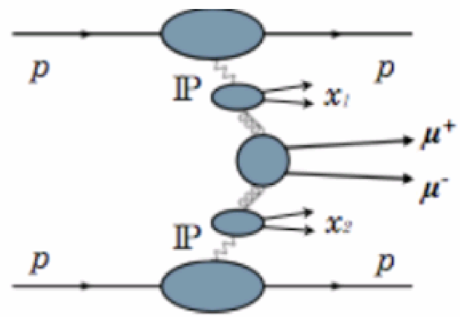


LHCb
Eolas
Run: 79784
Evt: 31007734
Next
Print
Minimum Pt (GeV)
Pseudorapidity Range
Transverse Energy (GeV)

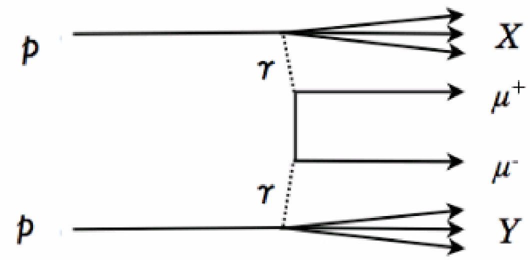
Z->tautau

Diphoton dimuon background study

Dimuons from Double Pomeron Exchange (DPE)
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



Dimuons from Inelastic diphoton fusion
One or both protons dissociate during interaction
Generated with LPAIR
A.Suri and D.R.Yennie Proton PDFs used



Mis-Id from Min Bias Data
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)