

Overlay plots for comparison ATLAS–CMS–LHCb

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Roadmap for comparison between the experiment

Theoretical uncertainties of the extrapolation

- Baseline MC: MC@ NLO or Powheg with eg CT10 NLO PDF
→for pT: Alpgen or Sherpa
 - Uncertainty due to knowledge on PDFs
 - experimental input: PDF uncertainties as given by PDF set
 - fitting: different NLO PDF sets (HERA1.5, MSTW08NLO, NNPDF2.1)
 - not addressed yet: uncertainty due to α_s
 - Estimate effects due to modelling of parton showers and UE
 - same PDF but different parton showers
Powheg+Pythia versus Powheg+Herwig
 - Need to define common strategy for a consistent evaluation of the higher order electroweak corrections with their uncertainties
- Lots of MC studies needed to get the extrapolation factors,
not all MCs available for LHCb
- Conflict with our 2011/2012 analyses
- New approach, calculating the CF with FEWZ

Extrapolation with FEWZ

For comparisons on born level:

measurements are corrected to parton level

→ we can use NLO calculation for extrapolation to ATLAS/CMS fiducial region

- Calculate extrapolation factor at NLO with FEWZ (MSTW08)
- MSTW08 PDF uncertainty
- PDF fit: NNPDF, CTEQ (HERA1.5)
- theoretical uncertainties from scale variation or NNLO (not yet)

Tried extrapolation to ATLAS and CMS phase space for $Z(\eta)$, $W(\eta)$, Asymmetry

Example

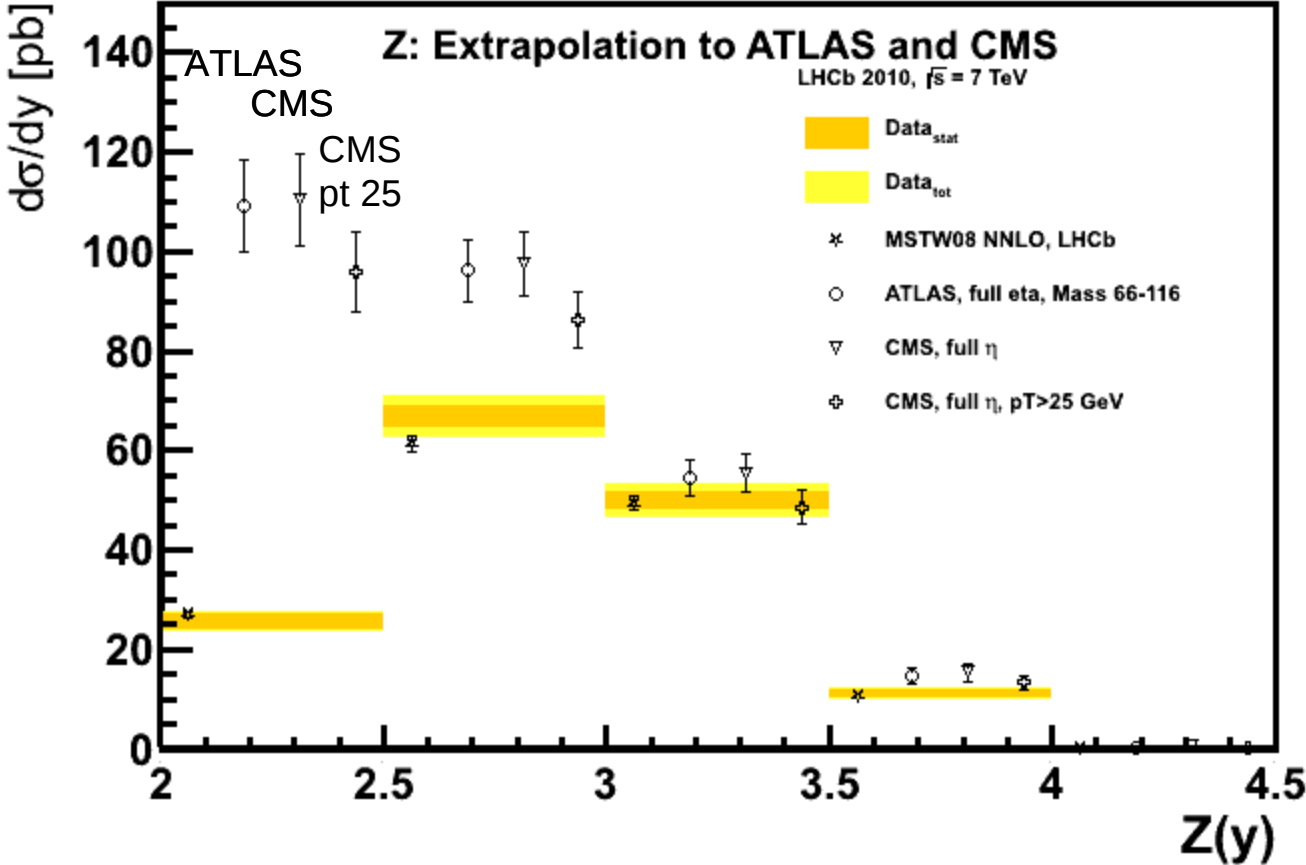
Z: extrapolation to ATLAS, M(66-116) no cut on eta(muon)

Bin	xsec	correction	numeric	pdf up	pdf down	NNPDF	CT10
2-2.5	13.2497	4.1528	0.0078	0.0067	0.0081	0.012	0.012
2.5-3	30.0409	1.4894	0.0018	0.0015	0.0016	-0.0041	-0.0029
3-3.5	24.6387	1.0944	0.0017	0.0004	0.0004	-0.0002	-0.0015
3.5-4	5.6611	1.33	0.0041	0.0026	0.003	-0.0081	-0.0085
4-4.5	0.124	2.0221	0.0237	0.014	0.0457	-0.0241	-0.116

Bin	corr-xsec	correction	error up	error down
2-2.5	55.0228	4.1528	0.0158	0.0165
2.5-3	44.7441	1.4894	0.0048	0.0049
3-3.5	26.9656	1.0944	0.0023	0.0024
3.5-4	7.5292	1.33	0.0099	0.01
4-4.5	0.2507	2.0221	0.1193	0.127

Error on correction factor: numerical, PDF, max difference(CT10, NNPDF) summed in quadrature

Plots: Z x-section



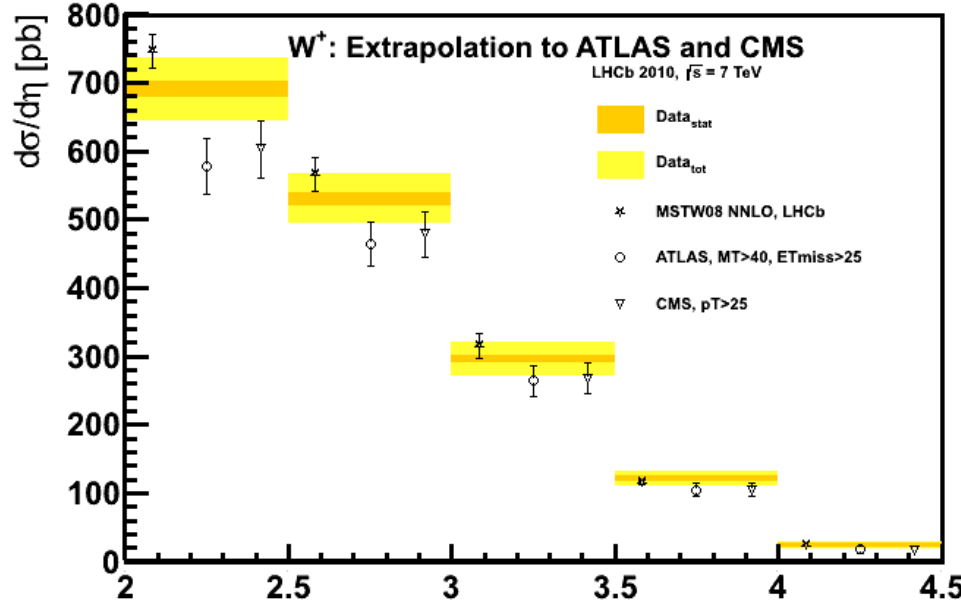
ATLAS: full eta range for muons, mass 66-116

CMS: full eta range for muons

CMS pt25: full eta range for muons, pt>25 GeV

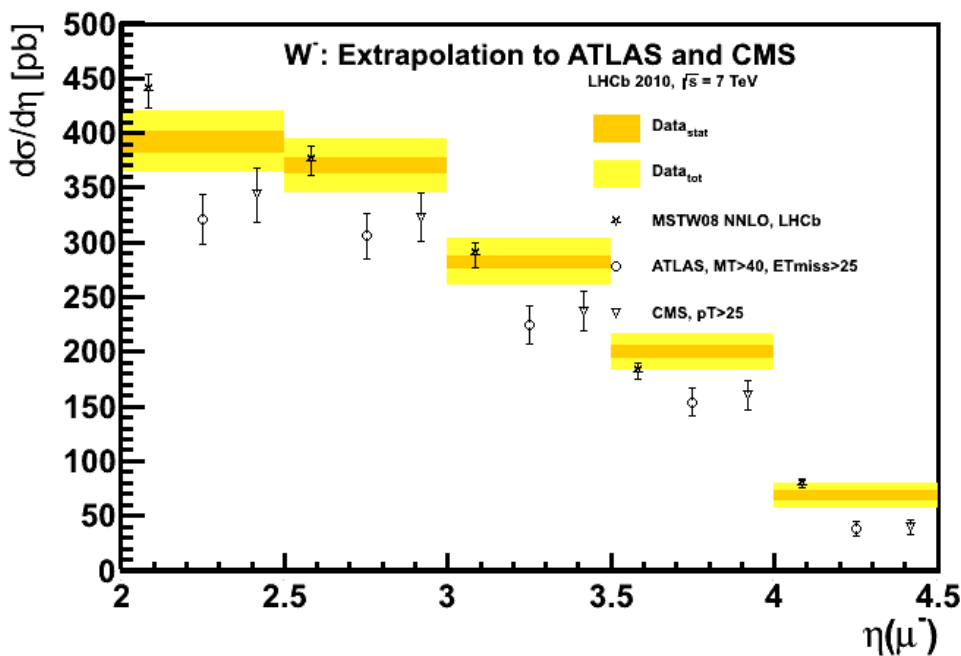
Note: uncertainty of extrapolated value dominated by measurement

Plots: W x-section

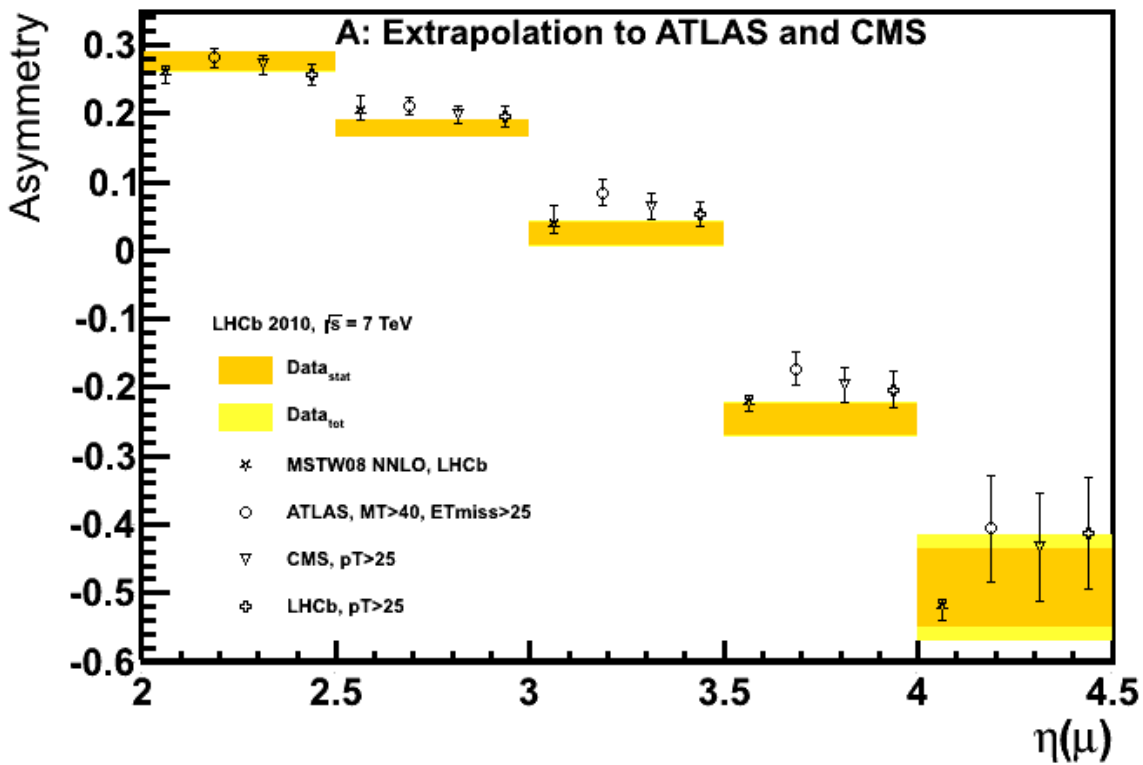


ATLAS: $MT > 40$, $E_{tmiss} > 25$
 CMS: $p_T > 25$ GeV

$p_T > 25$ GeV: x-check with measurement possible
 (not published) agreement within uncertainties

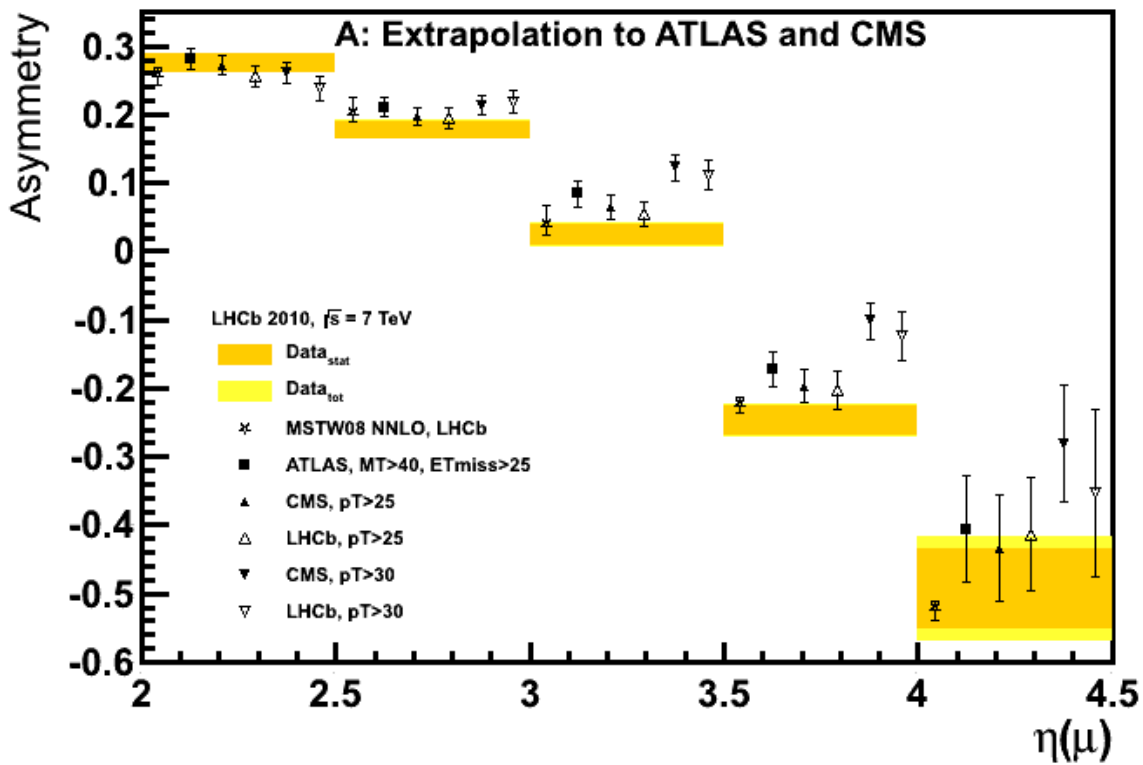


Plots: W charge asymmetry



x-check with published LHCb data possible

Plots: W charge asymmetry



extrapolation to $p_T > 30$
 x-check with published LHCb data possible – ok
 but uncertainties are correlated

Summary

Method as proposed by LHC electroweak group:

- lack of manpower & time
- lack of MC
- presently not feasible for LHCb

FEWZ method

- fast, all the CF available
- x-check with MC method from ATLAS/CMS
- x-check with data: ok
- missing: theory uncertainties
- consider electroweak corrections?
- uncertainties due to parton showering: is this needed?
- presently: uncertainties dominated by measurement not by extrapolation