

# Outcome of the WG: W&Z precision measurements

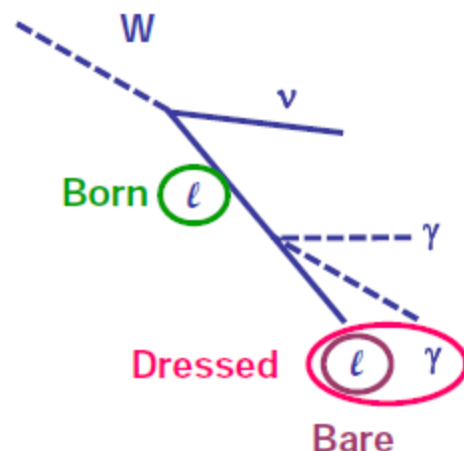
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on behalf of the LHC W&Z precision measurement WG



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# Proposal of how to achieve a better comparison

- Concentrate on comparisons between the three experiments, not on combination
- No extrapolation to the full phase space
- Each experiment defines the fiducial volume which is best suited
- Results are presented with full covariance matrices
- Agreed procedure of evaluation of theoretical uncertainties in acceptance correction
- Keep same fiducial volumes to allow direct comparison to 2010/2011
- Presentation of results
  - Born level: for comparison with NNLO calculations (DYNNLO, FEWZ)
  - Bare leptons (after FSR): muons: closer to the measured quantity
  - Dressed leptons: closer to the measured quantity, for comparisons with MC predictions
    - Dressed leptons include all FSR photons in cone  $\Delta R=0.1$ , partially corrects for FSR
- So far experiments presented for
  - ATLAS: Born, bare and dressed leptons
  - CMS: bare and born leptons (PYTHIA)
  - LHCb: Born and bare ( FSR calculated with PHOTOS)
- First step: each experiment provides correction factors in the volume of the measurements for (based on MC)
  - Born to bare leptons
  - Born to dressed leptons

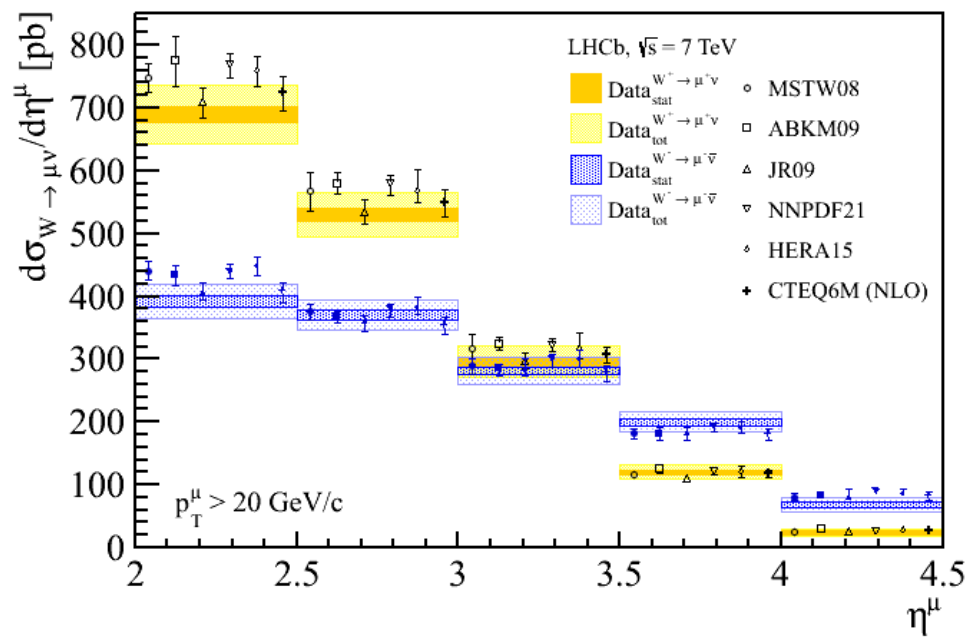
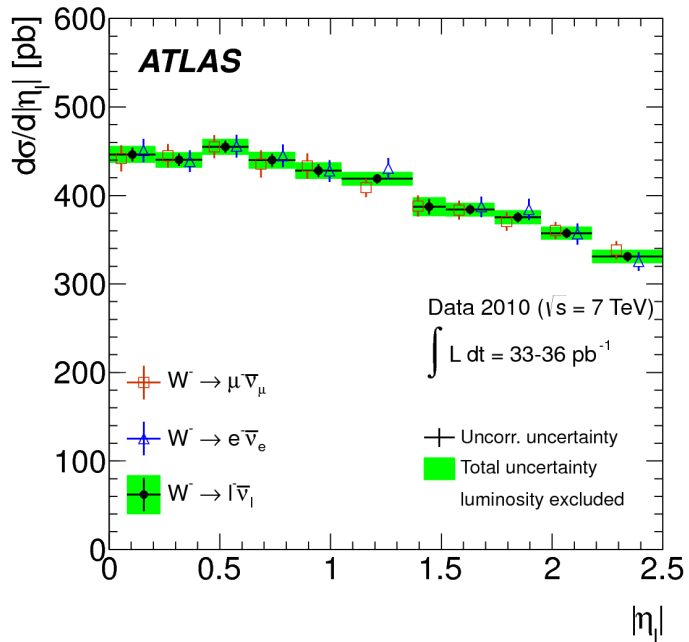
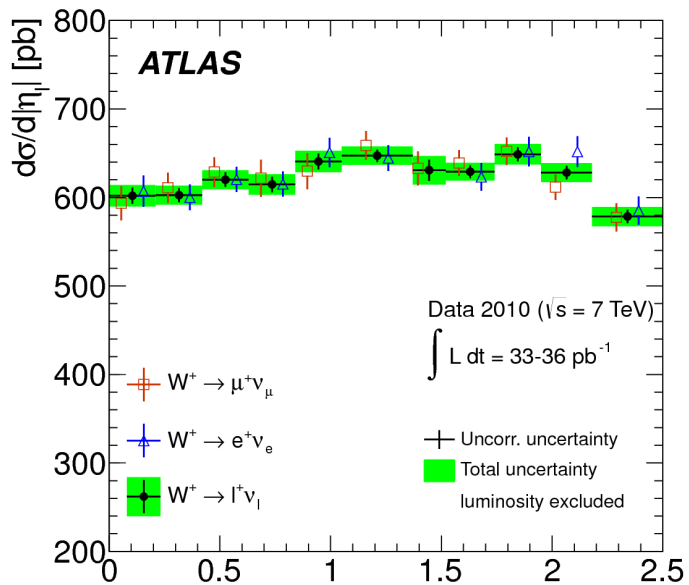


# Roadmap for a comparison between the experiments

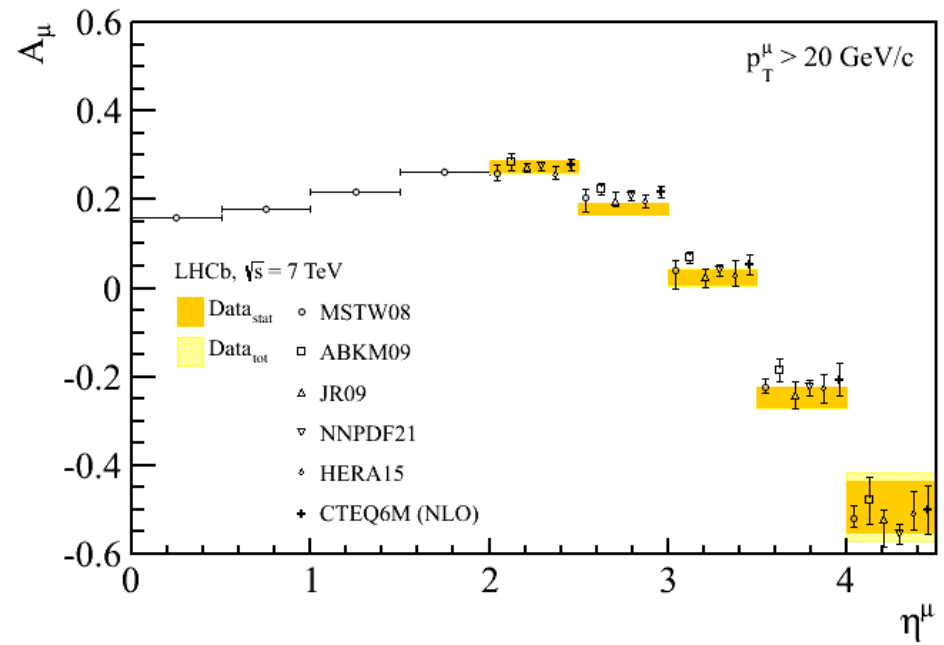
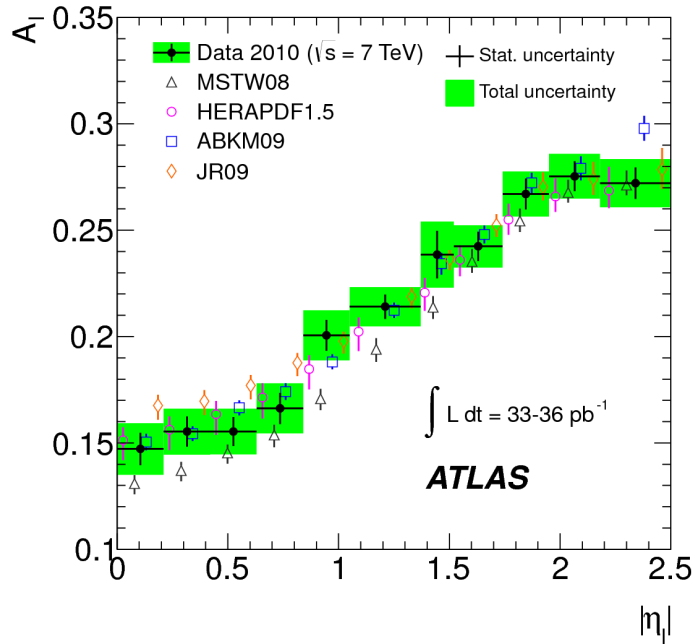
- Proposed plots for a comparison:
  - W–Lepton charge asymmetry vs  $\eta$
  - $W^+$  and  $W^-$  cross section vs  $\eta$
  - Z cross section vs rapidity (ATLAS and CMS)
  - Not yet foreseen to compare Z or W  $p_T$  distribution
- Each experiment extrapolates to the fiducial range of the other experiments
  - No extrapolation in pseudorapidity from LHCb to ATLAS/CMS
  - By changing the appropriate cuts
  - Or determine correction factors with MC, taking into account theoretical uncertainties
- Examples of cuts (2010) W–lepton asymmetry, W cross section vs  $\eta$

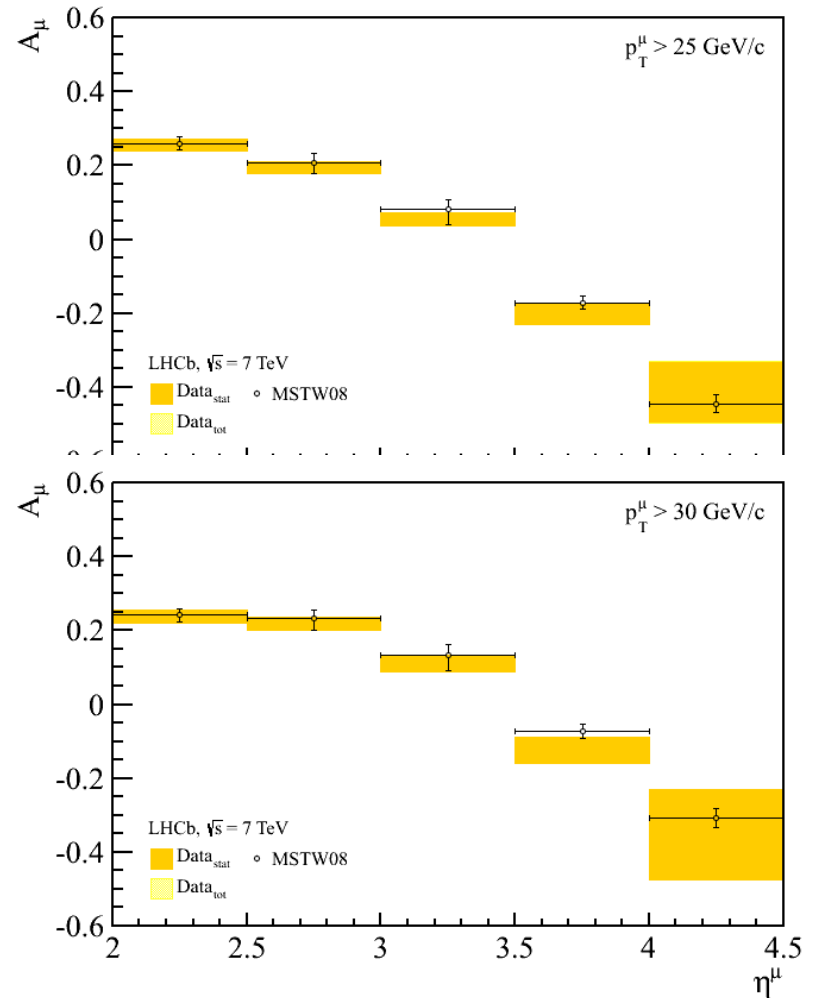
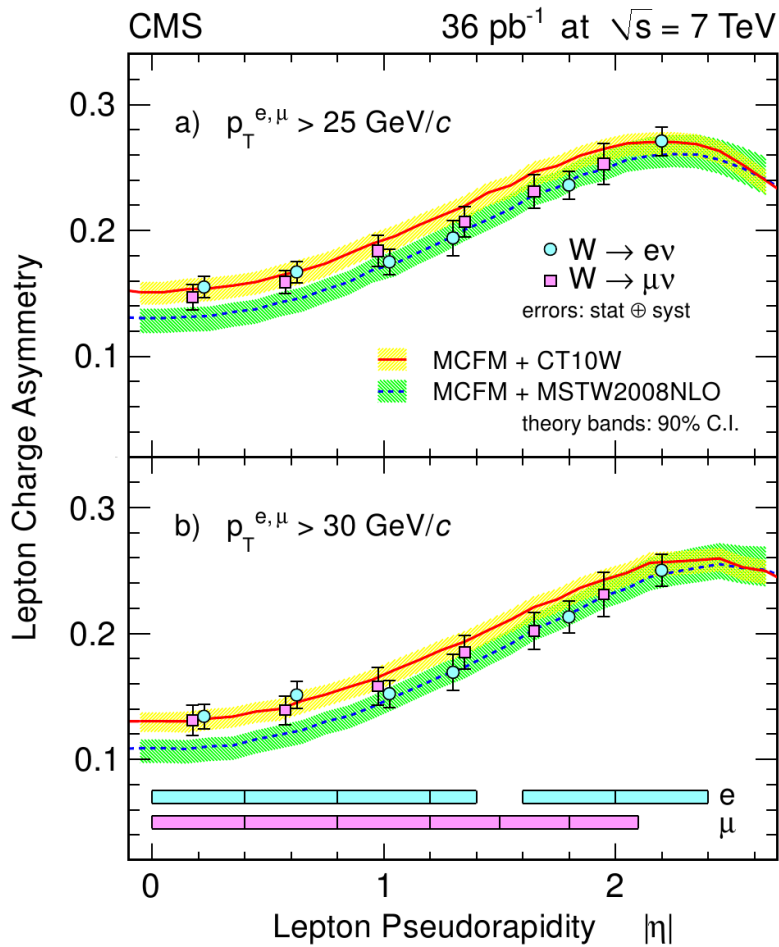
		$p_T$ [GeV/c]	$M_T, E_T^{\text{miss}}$
ATLAS	$ \eta  < 2.5$	20	$> 40, > 25$
CMS	$ \eta  < 2.5$	25, 30	
LHCb	$2 < \eta < 4.5$	20, 25, 30	

LHCb can measure for  $p_T > 20, 25, 30$  GeV/c; allows to check the extrapolation in  $p_T$   
2011 comparison  $p_T > 25$  GeV/c, 2012 not yet decided



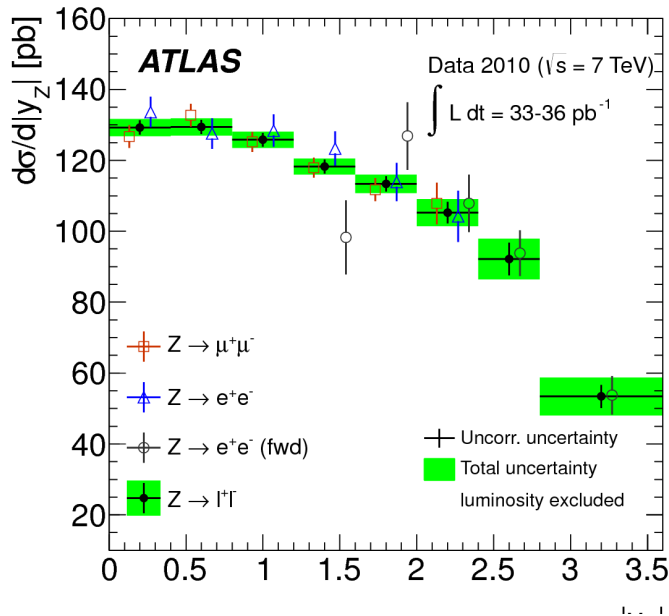
$$A_\mu = \frac{\sigma(W^+ \rightarrow \mu^+ \nu_\mu) - \sigma(W^- \rightarrow \mu^- \bar{\nu}_\mu)}{\sigma(W^+ \rightarrow \mu^+ \nu_\mu) + \sigma(W^- \rightarrow \mu^- \bar{\nu}_\mu)}$$





# Proposed plots

# Z production

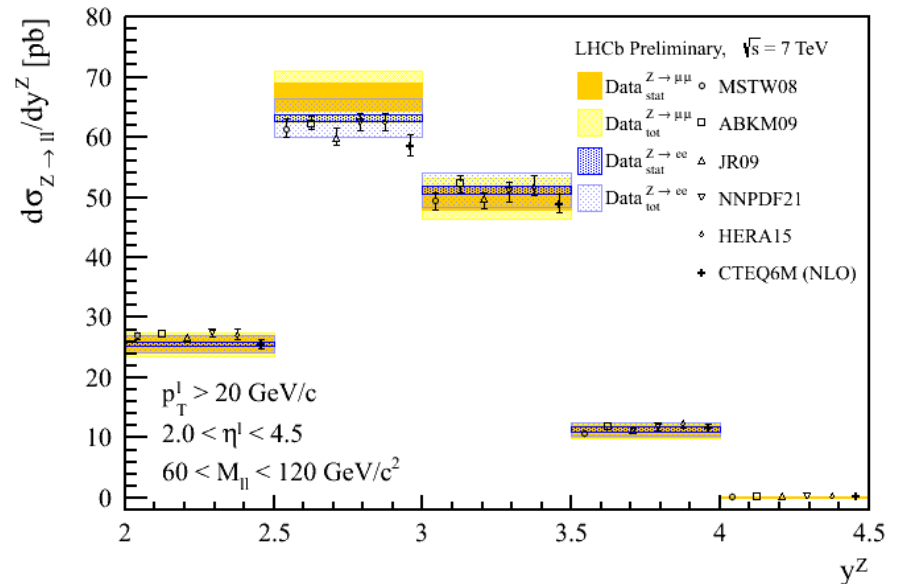
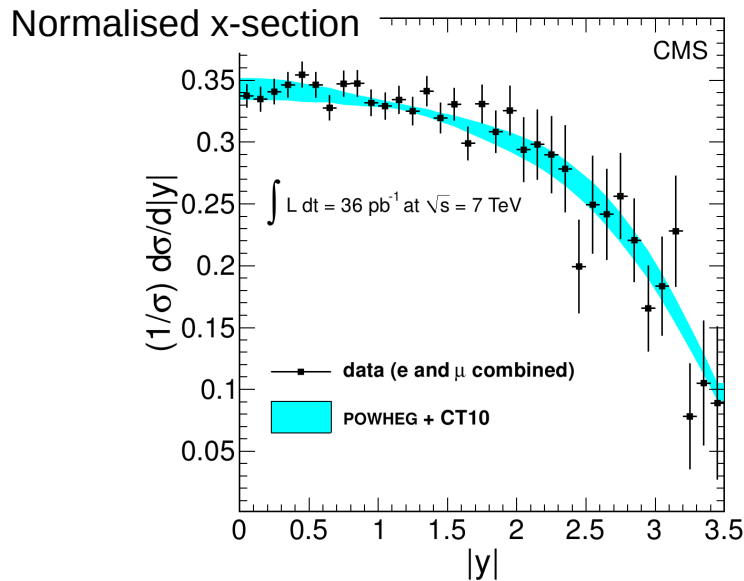


ATLAS:  $66 < M_{||} < 116 \text{ GeV}/c^2$

CMS/LHCb:  $60 < M_{||} < 120 \text{ GeV}/c^2$

Comparison ATLAS/CMS with LHCb not yet defined

LHCb:  $2 < \eta < 4.5$



# Roadmap for a comparison between the experiments

- Each experiment provides correction factors in fiducial range of the other experiments
  - Born to bare leptons
  - Bare to dressed leptons
  - Important cross check of determination of correction factors
- Each experiment is responsible for the overlay plots with their best measurement
- Questions:
  - are these the best plots for the comparison?
    - Lepton charge asymmetry vs  $\eta$
    - $W^+$  and  $W^-$  cross section vs  $\eta$
    - Z cross section vs rapidity
  - Is there interest in measurements with dressed photons?



# Conclusion

Agreed on

- Method for the evaluation of theoretical uncertainties in acceptance correction
- Set of plots we want to show for comparison of the three experiment
- Extrapolation into fiducial volumes of ATLAS/CMS/LHCb
- No extrapolation in pseudorapidity foreseen
- Overlay plots in fiducial volume of each experiment