Table of Contents

Measurement of the forward W boson cross-section in pp collisions at √s = 7

Documentation is available here (LHCb-PAPER-2014-033).

More detailed information: ANA note 2014-049

arXiv:1408.4354, JHEP 12 (2014) 079

Abstract

Abstract A measurement of the inclusive W μ production cross-section using data from pp collisions at a centre-of-mass energy of s√=7TeV is presented. The analysis is based on an integrated luminosity of about 1.0fb−1 recorded with the LHCb detector. Results are reported for muons with a transverse momentum greater than 20GeV/c and pseudorapidity between 2.0 and 4.5. The W + and W - production cross-sections are measured to be

(W+ μ+)=861.0±2.0±11.2±14.7pb,

(W- μ-)¯=675.8±1.9±8.8±11.6pb,

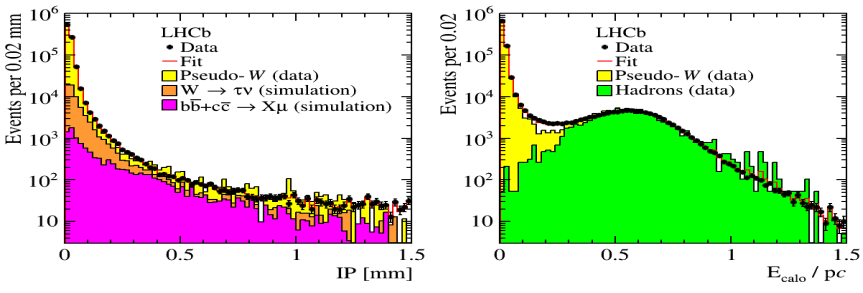
where the first uncertainty is statistical, the second is systematic and the third is due to the luminosity determination. Cross-section ratios and differential distributions as functions of the muon pseudorapidity are also presented. The ratio of W + to W- cross-sections in the same fiducial kinematic region is determined to be

(W+ μ+) (W- μ- ¯)=1.274±0.005±0.009,

where the uncertainties are statistical and systematic, respectively. Results are in good agreement with theoretical predictions at next-to-next-to-leading order in perturbative quantum chromodynamics.

Figures

(Note, eps versions are available under attachments).

Caption	Figure
Figure 1: Fit to (left) the impact parameter distribution and (right) the relative energy deposition in the calorimeters. The data are compared to fitted contributions described in the legends.	

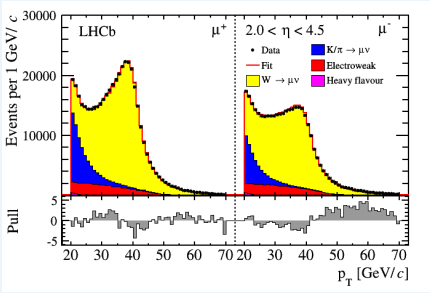


Figure 2: Transverse momentum distribution of the (left panel) positive and (right panel) negative muon candidates in the fiducial pseudorapidity range. The data are compared to fitted contributions described in the legend. The fit residuals normalised to the data uncertainty are shown at the bottom of each distribution.

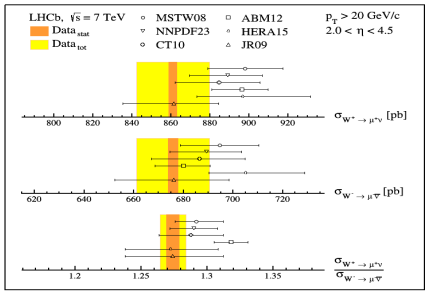


Figure 3: Summary of the W cross-section determinations. Measurements, represented as bands corresponding to the statistical (orange) and total (yellow) uncertainty, are compared to NNLO predictions for various parameterisations of the PDFs (black markers).

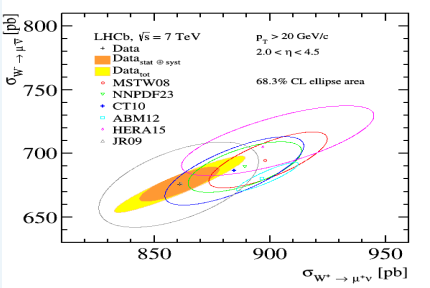


Figure 4: Two-dimensional plot of the measured (total (yellow) and excluding the luminosity (orange) uncertainty) W^+ and W^- cross-sections compared to NNLO predictions for various parameterisations of the PDFs (coloured markers). The uncertainty of the theoretical predictions corresponds to the

PDF uncertainty only; the correlation is determined using the different error eigenvector sets. The ellipses correspond to a 68.3% CL coverage.

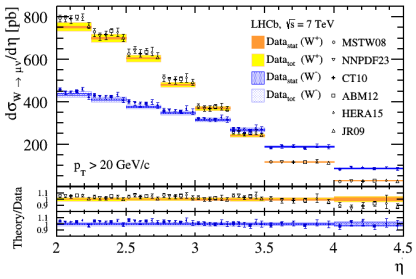


Figure 5: Differential W^+ and W^- cross-section in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the statistical (orange (blue) for W^+ (W^-)) and total (yellow (light blue) for W^+ (W^-)) uncertainty, are compared to NNLO predictions with different parameterisations of the PDFs (black (blue) markers for W^+ (W^-), displaced horizontally for presentation).

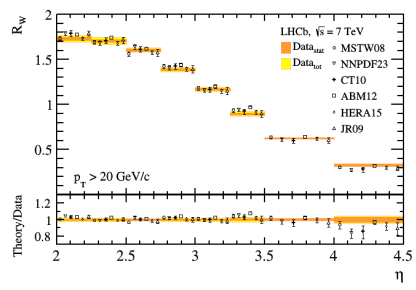


Figure 6: Ratio of W^+ to W^- cross-sections in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the statistical (orange) and total (yellow) uncertainty, are compared to NNLO predictions for various parameterisations of the PDFs (black markers, displaced horizontally for presentation).

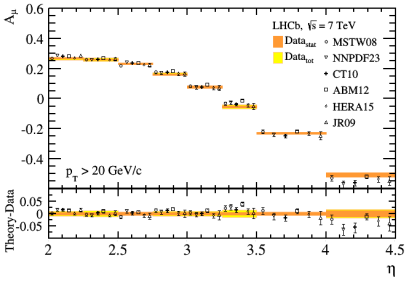


Figure 7: Lepton charge asymmetry in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the statistical (orange) and total (yellow) uncertainty, are compared to NNLO predictions for various parameterisations of the PDFs (black markers, displaced horizontally for presentation).

Figure 8: Transverse momentum distribution of the (left panel) positive and (right panel) negative muon candidates in eight bins of pseudorapidity. The data are compared to fitted contributions described in the legend. The fit residuals normalised to the data uncertainty are shown at the bottom of each distribution.

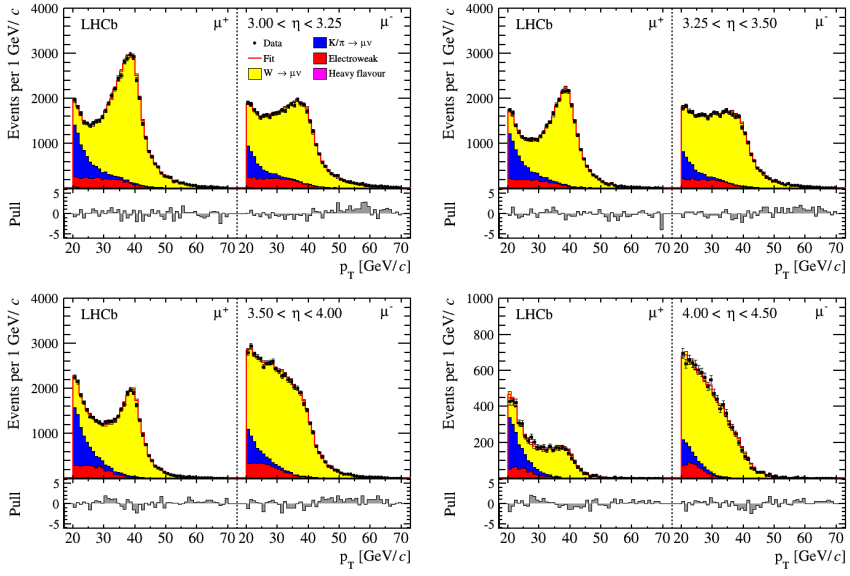
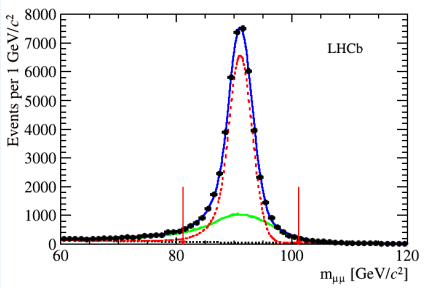
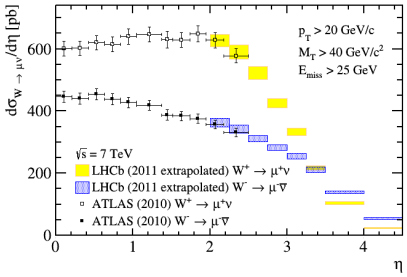


Figure 9: Transverse momentum distribution of the (left panel) positive and (right panel) negative muon candidates in eight bins of pseudorapidity. The data are compared to fitted contributions described in the legend. The fit residuals normalised to the data uncertainty are shown at the bottom

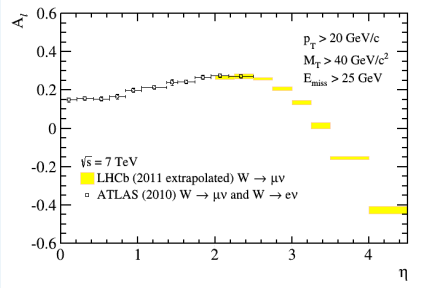
of each distribution.



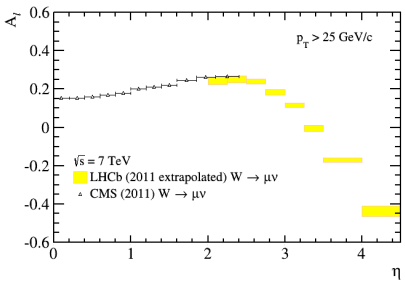
Supplementary Figure 1-S: Reconstructed dimuon invariant mass of the selected Z μμ candidates. The (points) data are fitted with (red and green) two Crystal-Ball [34] functions with common mean for the signal and (black) one exponential for the component and the residual background. The red arrows indicate the pseudo-W signal region.



SupplementaryFigure 2-S: Differential W + and W − cross-section in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty for W + (yellow) and W −(blue), are extrapolated to the ATLAS fiducial volume ($M_T > 40$ GeV/c^2 and Emiss > 25 GeV) and compared to the ATLAS determinations (black markers).



Supplementary Figure 3-S: Lepton charge asymmetry in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty (yellow), are

extrapolated to the ATLAS fiducial volume (M_T > 40 GeV/c^2 and Emiss > 25 GeV) and compared to the ATLAS determinations (black markers).	
Supplementary Figure 4-S: Lepton charge asymmetry in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty (yellow), are extrapolated to the CMS fiducial volume (p_T > 25 GeV/c) and compared to the CMS determinations (black markers).	

-- KatharinaMueller - 30 Jul 2014

This topic: LHCb > Wmu2011
Topic revision: r5 - 2015-03-17 - KatharinaMueller