

Supplementary material for LHCb-PAPER-2014-033

Pseudo- W

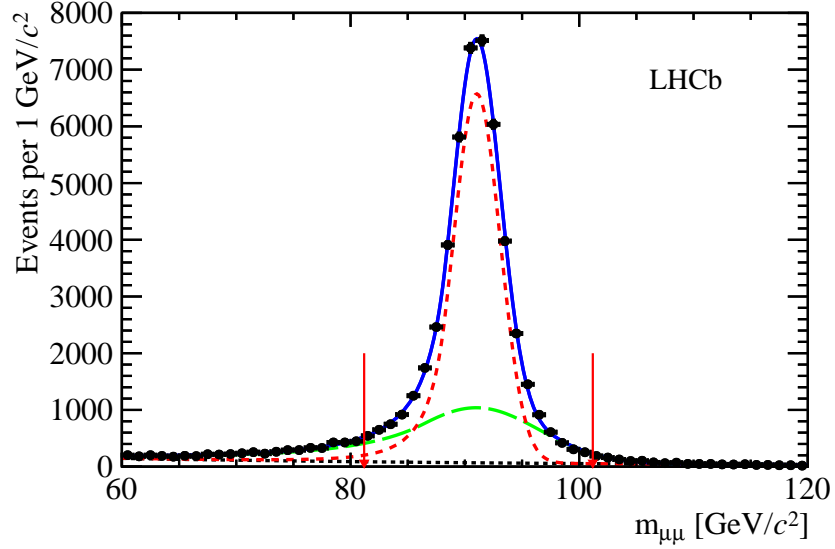


Figure 1: Reconstructed dimuon invariant mass of the selected $Z \rightarrow \mu\mu$ candidates. The (points) data are fitted with (red and green) two Crystal-Ball [1] functions with common mean for the signal and (black) one exponential for the γ^* component and the residual background. The red arrows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

The reconstructed dimuon invariant mass of selected $Z \rightarrow \mu\mu$ candidates is shown in Fig. 1.

Comparison with ATLAS and CMS

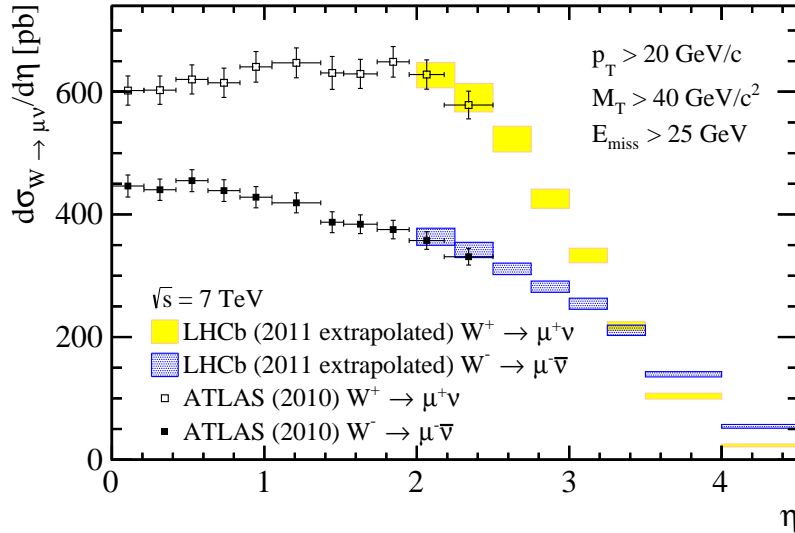


Figure 2: Differential W^+ and W^- cross-section in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty for W^+ (yellow) and W^- (blue), are extrapolated to the ATLAS fiducial volume ($M_T > 40$ GeV/c² and $E_{\text{miss}} > 25$ GeV) and compared to the ATLAS determinations (black markers).

The differential W^+ and W^- boson cross-sections as a function of the muon pseudorapidity are graphically compared to measurements performed by ATLAS [2]. A similar comparison is made for the lepton charge asymmetry as a function of the muon pseudorapidity with both ATLAS and CMS [3] determinations. Correction factors are calculated at NNLO to account for differences in the definition of the fiducial volumes of the measurements (ATLAS: $M_T > 40$ GeV/c² and $E_{\text{miss}} > 25$ GeV; CMS: $p_T > 25$ GeV/c) as described in Ref. [4]. Figures 2 and 3 present the extrapolated W^+ and W^- cross-sections and lepton charge asymmetry as a function of the muon pseudorapidity together with the published data of ATLAS. The extrapolated lepton charge asymmetry as a function of the muon pseudorapidity together with the published data of CMS is shown in Figure 4. The LHCb measurements complement the ATLAS and CMS determinations in the forward region. The graphical comparisons show a good agreement between the experiments in the overlapping kinematic region.

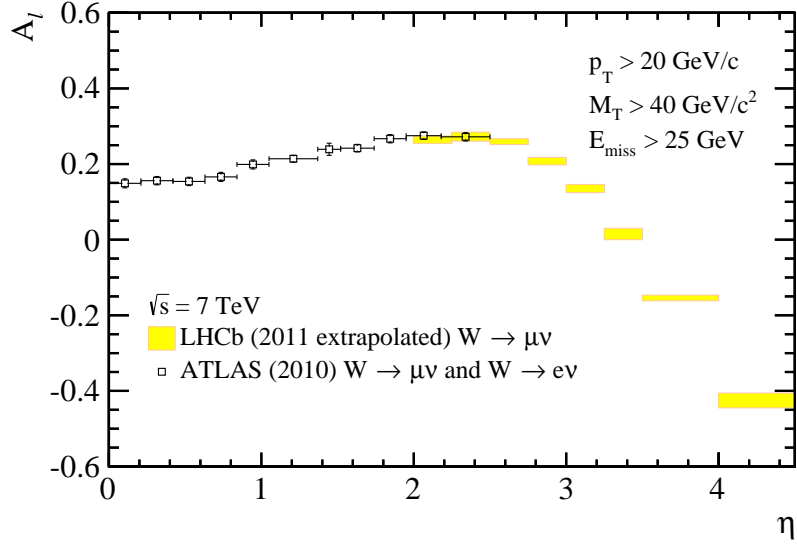


Figure 3: Lepton charge asymmetry in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty (yellow), are extrapolated to the ATLAS fiducial volume ($M_T > 40$ GeV/c² and $E_{\text{miss}} > 25$ GeV) and compared to the ATLAS determinations (black markers).

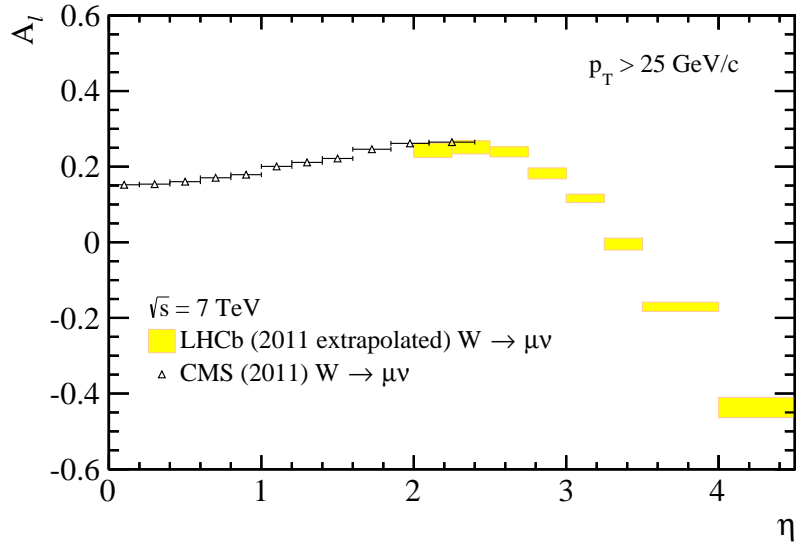


Figure 4: Lepton charge asymmetry in bins of muon pseudorapidity. Measurements, represented as bands corresponding to the total uncertainty (yellow), are extrapolated to the CMS fiducial volume ($p_T > 25$ GeV/c) and compared to the CMS determinations (black markers).

References

- [1] T. Skwarnicki, *A study of the radiative cascade transitions between the Upsilon-prime and Upsilon resonances*, PhD thesis, Institute of Nuclear Physics, Krakow, 1986, DESY-F31-86-02.
- [2] ATLAS collaboration, G. Aad *et al.*, *Measurement of the inclusive W^\pm and Z/γ^* cross sections in the electron and muon decay channels in pp collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector*, Phys. Rev. **D85** (2012) 072004, [arXiv:1109.5141](#).
- [3] CMS collaboration, S. Chatrchyan *et al.*, *Measurement of the muon charge asymmetry in inclusive $pp \rightarrow W + X$ production at $\sqrt{s}=7$ TeV and an improved determination of light parton distribution functions*, [arXiv:1312.6283](#).
- [4] LHCb collaboration, *Graphical comparison of the LHCb measurements of W and Z boson production with ATLAS and CMS*, LHCb-CONF-2013-005.