Supplementary material for LHCb-PAPER-2015-049

We thank B.F.L. Ward for providing MC@NLO [1] + HERWIG++ [2] and MC@NLO + HERWIRI [3] predictions.

- The differential $Z$ boson production cross-section as a function of $p_{T,Z}$, $\phi_\eta^*$ and $\eta^\mu$ is shown in Figs. 1, 2, 3, 4 and 5.
- The comparison between the present measurements with those of Ref. [4] is shown in Figs. 6 and 7.
- The differential $Z$ boson production cross-section at $\sqrt{s} = 7$ TeV as a function of $\eta^\mu$, and the differential $W^\pm$ to $Z$ ratios are shown in Figs. 8 and 9.
- The energy evolution of the $W^+$, $W^-$ and $Z$ boson production cross-section is shown in Fig. 10.
Figure 1: Normalised differential cross-section as a function of $p_{T,Z}$ on (top) logarithmic and (bottom) linear scales. The measurements are compared to the predictions of POWHEG + HERWIG and POWHEG + PYTHIA.
Figure 2: Normalised differential cross-section as a function of $\phi^*_\eta$ on (top) logarithmic and (bottom) linear scales. The measurements are compared to the predictions of POWHEG + HERWIG and POWHEG + PYTHIA.
Figure 3: Normalised differential cross-section as a function of $p_{T,Z}$ on (top) logarithmic and (bottom) linear scales. The measurements are compared to MC@NLO + HERWIG (HW) and MC@NLO + HERWIRI (HERWIRI). HERWIG is configured with two choices of the root mean-square-deviation of the intrinsic $k_T$ distribution, 0 and 2.2 GeV/c.
Figure 4: Normalised differential cross-section as a function of $\phi^*_\eta$ on (top) logarithmic and (bottom) linear scales. The measurements are compared to MC@NLO + HERWIG (HW) and MC@NLO + HERWIRI (HERWIRI). HERWIG is configured with two choices of the root mean-square-deviation of the intrinsic $k_T$ distribution, 0 and 2.2 GeV/c.
Figure 5: Differential Z cross-section in bins of muon pseudorapidity. Measurements, represented as bands, are compared to (markers, displaced horizontally for presentation) NNLO predictions with different parameterisations of the PDFs.
Figure 6: Differential $Z$ boson production cross-section as a function of (top) $y_Z$ and (bottom) $\phi_\eta^*$. 
Figure 7: Summary of the $Z$ boson cross-section.
Figure 8: Differential $Z$ cross-section in bins of muon pseudorapidity at 7 TeV. Measurements, represented as bands, are compared to (markers, displaced horizontally for presentation) NNLO predictions with different parameterisations of the PDFs.

Figure 9: Differential $W^+$ and $W^-$ to $Z$ cross-section ratios in bins of muon pseudorapidity at $\sqrt{s} = 7$ TeV. Measurements, represented as bands, are compared to (markers, displaced horizontally for presentation) NNLO predictions with different parameterisations of the PDFs.
Figure 10: Summary of the $W$ and $Z$ cross-section as a function of the centre-of-mass energy. Measurements, represented as markers, are compared to NNLO predictions calculated with the MSTW08 PDF set.
References


