Table of Contents

Measurement of the cross-section for Z0 → e+e– production in pp collisions at √s = 7 TeV

The paper is available here ⧉.

More detailed information: ANA note 2012-078 ⧉

Abstract

A measurement of the cross-section for pp → Z → e+e- is presented using data at √s = 7 TeV corresponding to an integrated luminosity of 0.94 fb^{-1}. The process is measured within the kinematic acceptance p_T>20 GeV/c and 2< η <4.5 for the daughter electrons and dielectron invariant mass in the range 60-120 GeV/c^2. The cross-section is determined to be σ(pp → Z → e+e-)=76.0±0.8±2.0±2.6 pb where the first uncertainty is statistical, the second is systematic and the third is the uncertainty in the luminosity. The measurement is performed as a function of Z rapidity and as a function of an angular variable which is closely related to the Z transverse momentum. The results are compared with previous LHCb measurements and with theoretical predictions from QCD.

Figures
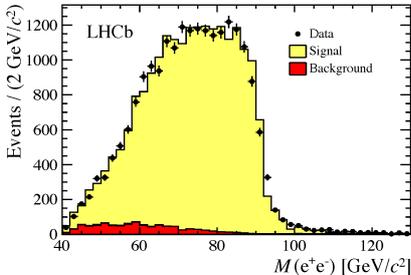
(Note, eps versions are available under attachments).

Caption	Figure
Fig.1 Invariant mass distribution of Z → e+e- candidates. The data are shown as points with error bars, the background obtained from same-sign data is shown in red (dark shading), to which the expectation from signal simulation is added in yellow (light shading). The Z → e+e- simulated distribution has been normalised to the (background-subtracted) data.	
Fig.2 Distribution of p_T for the ``tag'' electron in cases where an isolated cluster of energy of high E_T is found in the electromagnetic calorimeter. This is fitted with two components obtained from data, the Z → e+e- signal whose shape is taken from those candidates where the cluster is associated with an identified electron track, and background whose shape is obtained from candidates where the cluster is not isolated.	
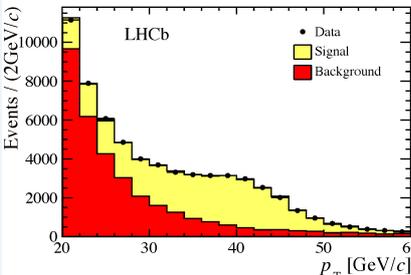
Fig.3 Cross-section for pp → Z → e⁺e⁻ measured in LHCb at √s = 7 TeV, shown as the yellow band. The inner (darker) band represents the statistical uncertainty and the outer the total uncertainty. The measurement corresponds to the kinematic acceptance, p_T>20 GeV/c and 2< η <4.5 for the leptons and 60<M<120 GeV/c² for the dilepton. The points show the various theoretical predictions with their uncertainties as described in the text.
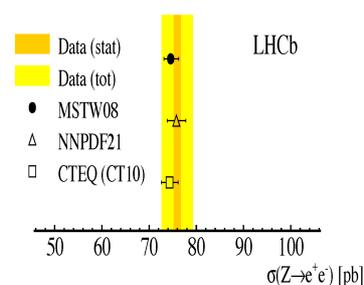
Fig.4(a) Differential cross-section for pp → Z → e⁺e⁻ as a function of Z rapidity. The measurements based on the √s = 7 TeV LHCb data are shown as the yellow bands where the inner (darker) band represents the statistical uncertainty and the outer the total uncertainty. NNLO QCD predictions are shown as points with error bars reflecting their uncertainties as described in the text.
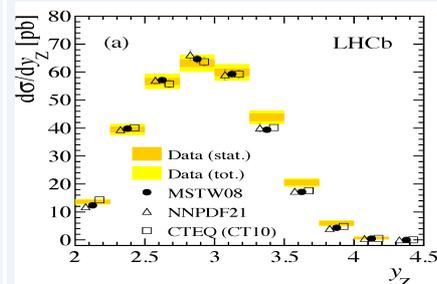
Fig.4(b) Differential cross-section for pp → Z → e⁺e⁻ as a function of φ*. The measurements based on the √s = 7 TeV LHCb data are shown as the yellow bands where the inner (darker) band represents the statistical uncertainty and the outer the total uncertainty. NNLO QCD predictions are shown as points with error bars reflecting their uncertainties as described in the text.
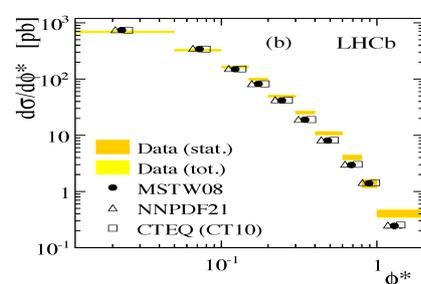
Fig.5(a) Ratios of various QCD calculations to data for the differential cross-section for pp → Z → e⁺e⁻ as a function of φ*. The measurements based on the √s = 7 TeV LHCb data are shown as the yellow band centred at unity where the inner (darker) band represents the statistical uncertainty and the outer the total uncertainty. NNLO QCD predictions shown as points with error bars reflecting their uncertainties as described in the text. Small lateral displacements of the theory points are made to improve clarity.
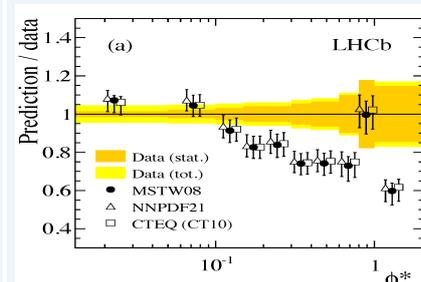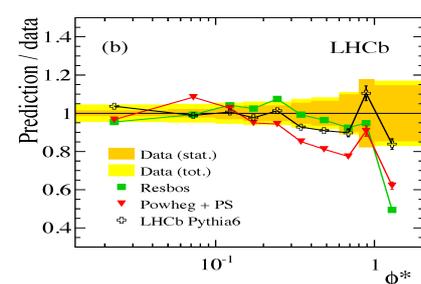
Fig.5(b) Ratios of the predictions of PYTHIA, RESBOS and POWHEG to the data shown as points, with error bars that reflect the statistical uncertainties in the predictions. For most points, these errors are so small that they are not visible.

-- DavidWard - 20-Dec-2012