Approved plots for $J/\psi \rightarrow \ell^+\ell^-$ in Proc9

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Abstract

Approved plots for the dilepton yields of $J/\psi \rightarrow \ell^+\ell^-$ for the analysis documented in BELLE2-NOTE-PH-2019-050.

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FIG. 1: The dielectron invariant mass of $J/\psi \rightarrow e^-e^-$ candidates for an integrated luminosity of 2.62 fb$^{-1}$ using the basf2 software release release-03-02-02 on the hlt\_hadron skim. This data set includes Phase 3 physics runs only, excluding runs 916 – 1005 and 1216 – 1371 from experiment 7. The selection criteria are as follows: $|dr| < 2.0$ cm, $|dz| < 5.0$ cm, $p_{lab} > 0.1$ GeV/c and electronID $> 0.95$ for each electron candidate. A vertex fit using TreeFitter was applied, selecting candidates with a p-value $> 0.001$. A bremsstrahlung correction was applied by adding the momentum and cluster energy of a photon with $E < 1.0$ GeV within a $5^\circ$ cone of the electron candidate. A Crystal Ball function summed with a Bifurcated Gaussian is used to model the signal and a first order polynomial is used to model the background.
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\[ \int L \, dt = 2.62 \text{ fb}^{-1} \]

\[ N_{\text{sig}} = 2186 \pm 56 \]

FIG. 2: The dimuon invariant mass of \( J/\psi \rightarrow \mu^+\mu^- \) candidates for an integrated luminosity of 2.62 fb\(^{-1}\) using the same environment and track selection as Fig. 1, but with \text{muonID} > 0.95 for each muon candidate.

A Gaussian function summed with a Bifurcated Gaussian is used to model the signal and a first order polynomial is used to model the background.

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\[ \int L \, dt = 2.62 \text{ fb}^{-1} \]

\[ N_{\text{sig}} = 1608 \pm 54 \]

FIG. 3: The dielectron invariant mass of \( J/\psi \rightarrow e^-e^- \) candidates for an integrated luminosity of 2.62 fb\(^{-1}\) using the same environment and track selection as the Fig. 1 but with further selection criteria applied to \( J/\psi \) candidates in \( B\bar{B} \) events. The momentum of the reconstructed \( J/\psi \) candidate in the \( \Upsilon(4S) \) frame is required to be below 2.0 GeV/c and the ratio between the (event-based) second-order and zeroth-order Fox-Wolfram moment, \( R_2 \), is below 0.4.
FIG. 4: The dimuon invariant mass of $J/\psi \rightarrow \mu^+\mu^-$ candidates for an integrated luminosity of 2.62 fb$^{-1}$ using the same environment and track selection as Fig. 2, with extra selection criteria applied to isolate $J/\psi$ candidates in $B\bar{B}$ events, listed in Fig. 3.