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

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Abstract

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

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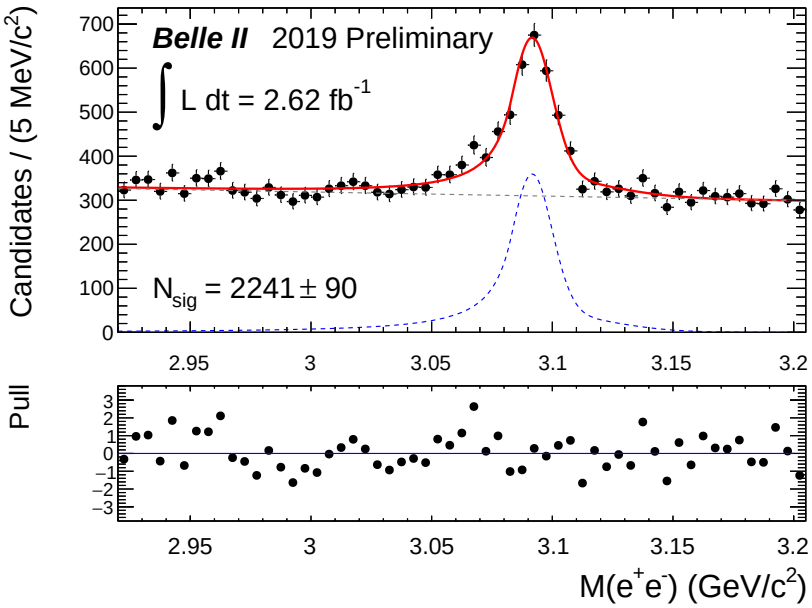

FIG. 1: The dielectron invariant mass of $J/\psi \to e^- e^-$ candidates for an integrated luminosity of 2.62 fb^{-1} using the `basf2` software release `release-03-02-02` on the `hlt_hadron` skim. This data set includes Phase 3 physics runs only, excluding runs $916 - 1005$ and $1216 - 1371$ from experiment 7. The selection criteria are as follows: $|dr| < 2.0$ cm, $|dz| < 5.0$ cm, $p_{\text{lab}} > 0.1$ 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° 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.

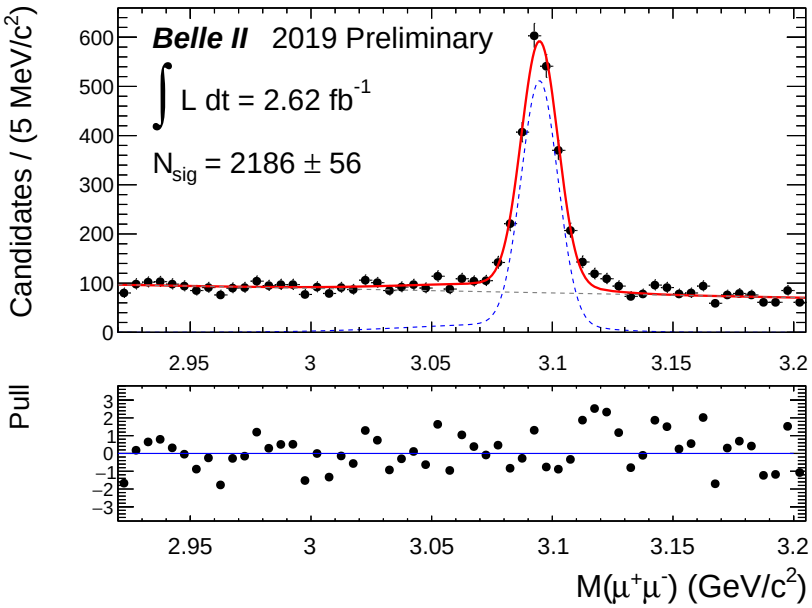

FIG. 2: The dimuon invariant mass of $J/\psi \to \mu^+\mu^-$ candidates for an integrated luminosity of 2.62 fb^{-1} using the same environment and track selection as Fig. 1, but with `muonID` > 0.95 for each muon candidate.
A Gaussian function summed with a Bifurcated Gaussian is used to model the signal and a first order polynomial is used to model the background.

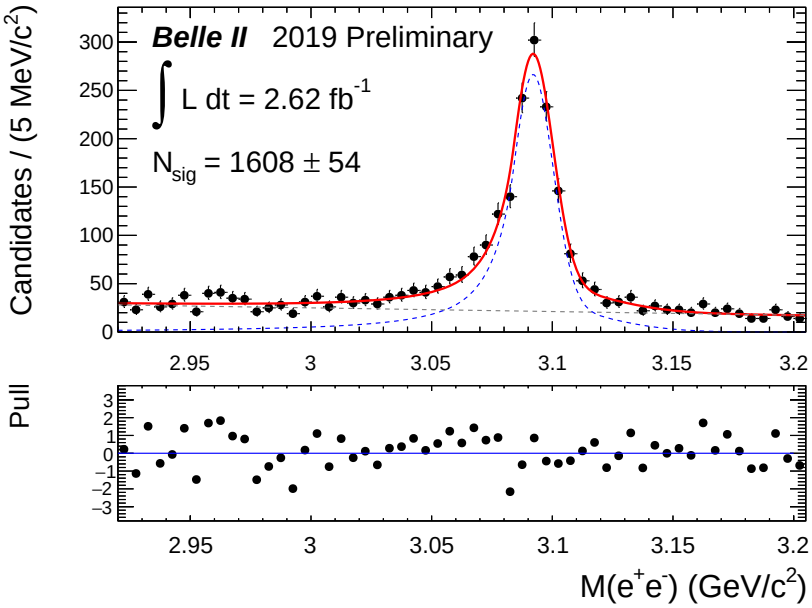

FIG. 3: The dielectron invariant mass of $J/\psi \to e^-e^-$ candidates for an integrated luminosity of 2.62 fb^{-1} using the same environment and track selection as the Fig. 1, but with further selection criteria applied to remove background events. The momentum of the reconstructed J/ψ candidate in 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.

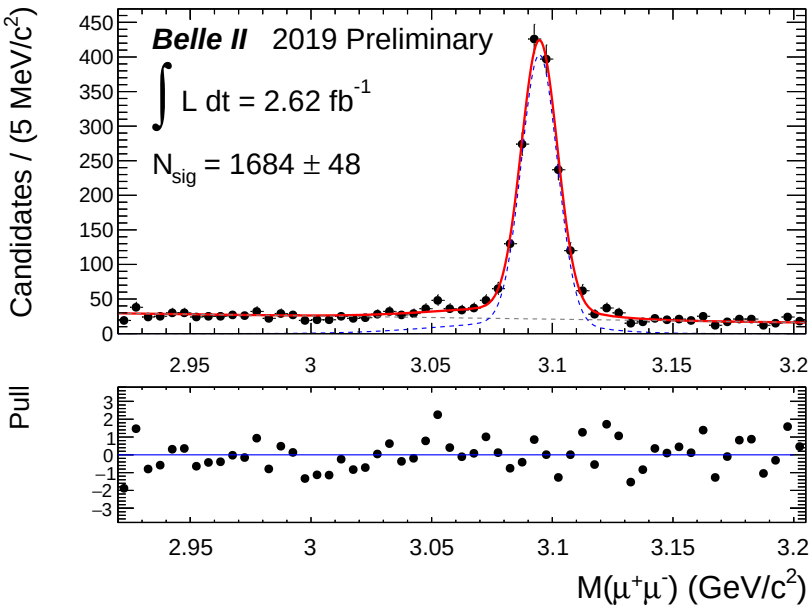

FIG. 4: The dimuon invariant mass of $J/\psi \to \mu^+\mu^-$ candidates for an integrated luminosity of 2.62 fb^{-1} using the same environment and track selection as Fig. 2, with extra selection criteria applied to remove background events, listed in Fig. 3.