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Study of $B^0 \to J/\psi\ K^{*0}(\to K^+\pi^-)$ decays with early phase3 data

Miho Fujii and Kenkichi Miyabayashi*

Nara Women's University, Nara, Japan

Abstract

We report a study for reconstruction of $B^0 \to J/\psi K^{*0}$ decays with the early 2019 phase 3 data of the Belle II experiment.

*Electronic address: miyabaya@cc.nara-wu.ac.jp

We combined the candidate event samples by $J/\psi \to e^+e^-$ and $\mu^+\mu^-$ modes, there are 50 events in the signal box. With this yield of candidate events, we found that fit can converge with floating the mean and σ of the signal Gaussian. We select events with a ΔE in the range -0.07 GeV $< \Delta E < 0.03$ GeV in $J/\psi \to e^+e^-$ case and -0.03 GeV $< \Delta E < 0.03$ GeV in $J/\psi \to \mu^+\mu^-$ case, and performed a fit to the $M_{\rm bc}$ distribution. The probability density function (PDF) is composed by summing the signal component with a single Gaussian with a floating mean (μ) and width (σ) and the background component with an ARGUS function with a fixing $m_0 = 5.291$ GeV, power (p) $= 0.5$ and slope (c) $= -50.0$. The plots requesting approval are shown in Fig. 1. The signal Gaussian's mean $= 5.28150 \pm 0.00040$ GeV/c^2 and $\sigma = 2.71 \pm 0.30$ MeV/c^2. We got $N_{\rm sig} = 48.6 \pm 7.0$ events as the signal yield. Note that numerical value of the integrated luminosity in the plots have been updated on 2019 Aug. 7th.

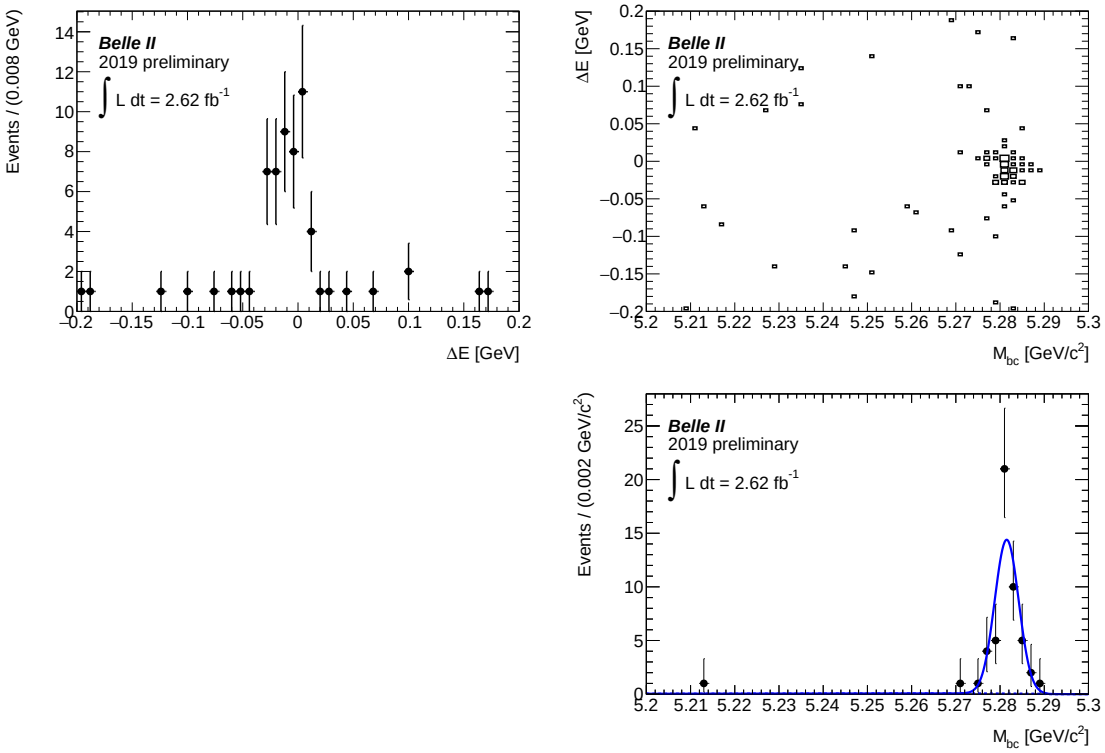

FIG. 1: For $J/\psi \to e^+e^-$ and $\mu^+\mu^-$ cases combined, ΔE distribution in 5.27 GeV/c^2 $< M_{\rm bc} <$ 5.29 GeV/c^2 (upper left), $M_{\rm bc}$-ΔE 2D distribution (upper right) and $M_{\rm bc}$ distribution with applying the proper ΔE requirements (lower).