Rediscovery of the $B \to K\psi(2S)$ $(\psi(2S) \to J/\psi\pi^+\pi^-)$ decay with the early Phase 3 data at Belle II

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Abstract

This note contains approved plots of rediscovery of the $B \to K\psi(2S)$ decay with full early phase3 data. More details at: BELLE2-NOTE-PH-2019-049.
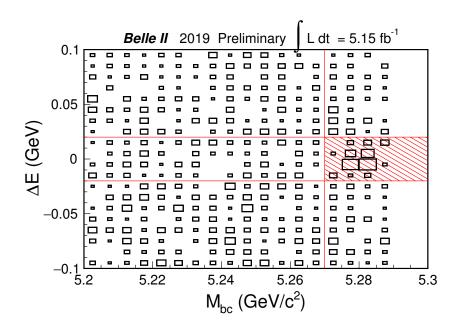
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FIG. 1: A 2-dimensional histogram of ΔE and $M_{\rm bc}$ with $3.67\ {\rm GeV}/c^2 < M_{J/\psi\pi^+\pi^-} < 3.71\ {\rm GeV}/c^2$ for the data. The red hatched region is the B signal region. Further detail is described in BELLE2-NOTE-PH-2019-049.
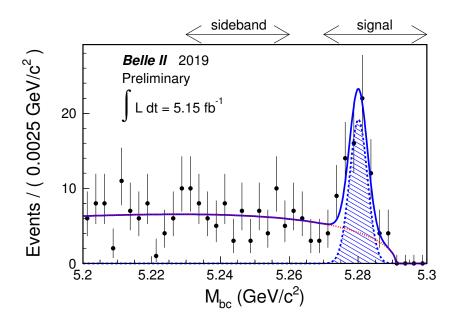
FIG. 2: M_{bc} distribution without the M_{bc} requirement after the all selection for the data. The fit is performed with a single Gaussian for the signal component and an ARGUS function for the background component. The blue solid line shows the total fit result. The blue hatched area and the red dashed line represent the signal component and the background component, respectively. Top arrows shows M_{bc} signal an sideband regions for later analysis. Further detail is described in BELLE2-NOTE-PH-2019-049.
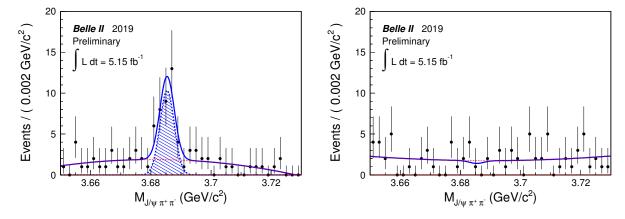

FIG. 3: $M_{J/\psi\pi^+\pi^-}$ distribution in the M_{bc} signal region for the data (left) and that in the M_{bc} sideband region (right) with signal hypothesis. The blue solid line shows the total fit result of an Unbinned Extended Maximum-likelihood simultaneous fit on a M_{bc} signal region and on a M_{bc} sideband region. The fit components for the M_{bc} sideband region are the $\psi(2S)$ signal from non-B decays and the combinatorial background. On the M_{bc} signal region, there are 3 components, which are the $\psi(2S)$ signal from B decays in addition to the components of the sideband region. The probability density function (PDF) for $\psi(2S)$ is a single Gaussian and the PDF for combinatorial background is a 2nd-order Chebyshev polynomial. The blue hatched area is the $\psi(2S)$ component from B decays, and red dashed lines show the combinatorial background. Further detail is described in BELLE2-NOTE-PH-2019-049.

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