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**Approved plots: $X(3872)$ rediscovery from B decay
with 62.8 fb^{-1} of Phase 3 data at Belle II**

The Belle II Collaboration

Abstract

The decay of $B \rightarrow J/\psi\pi^+\pi^-K$ is studied using 62.8 fb^{-1} data collected at the $\Upsilon(4S)$ resonance. Evidence for $B \rightarrow X(3872)K$ with a statistical significance of 4.6σ is found. This note contains the public plots associated with the internal note BELLE2-NOTE-PH-2020-025.

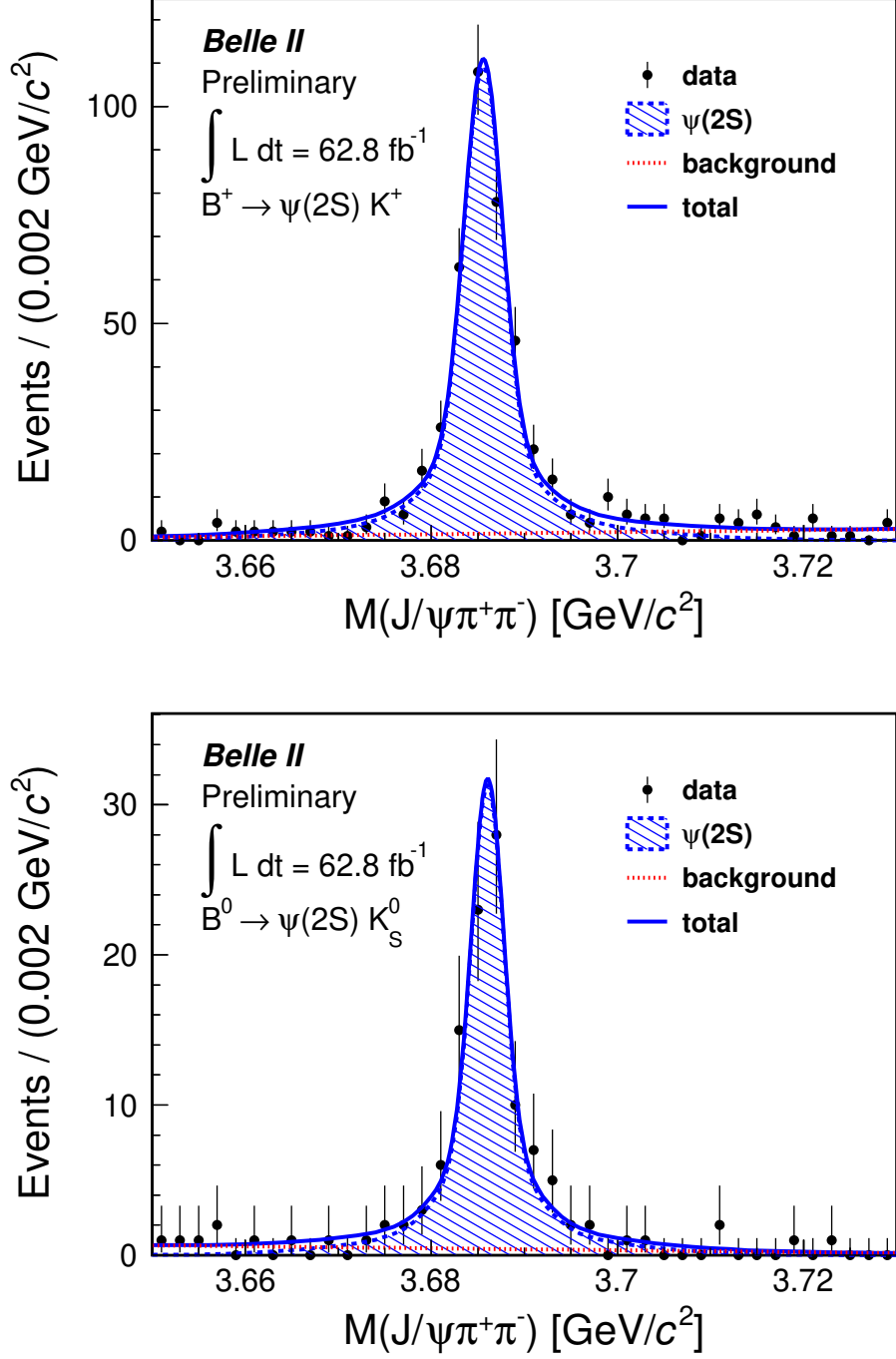


FIG. 1: The $M_{J/\psi\pi^+\pi^-}$ distributions on the $\psi(2S)$ signal region with the real data. Here, blue solid line shows total fit result. A triple Gaussian with a common mean are used as a probability density function (PDF) for the signal component, where parameters except the mean and scaling factor of the sigmas are determined with the signal Monte-Carlo (MC) samples. A first-order Chebyshev function is used as a PDF for the background component.

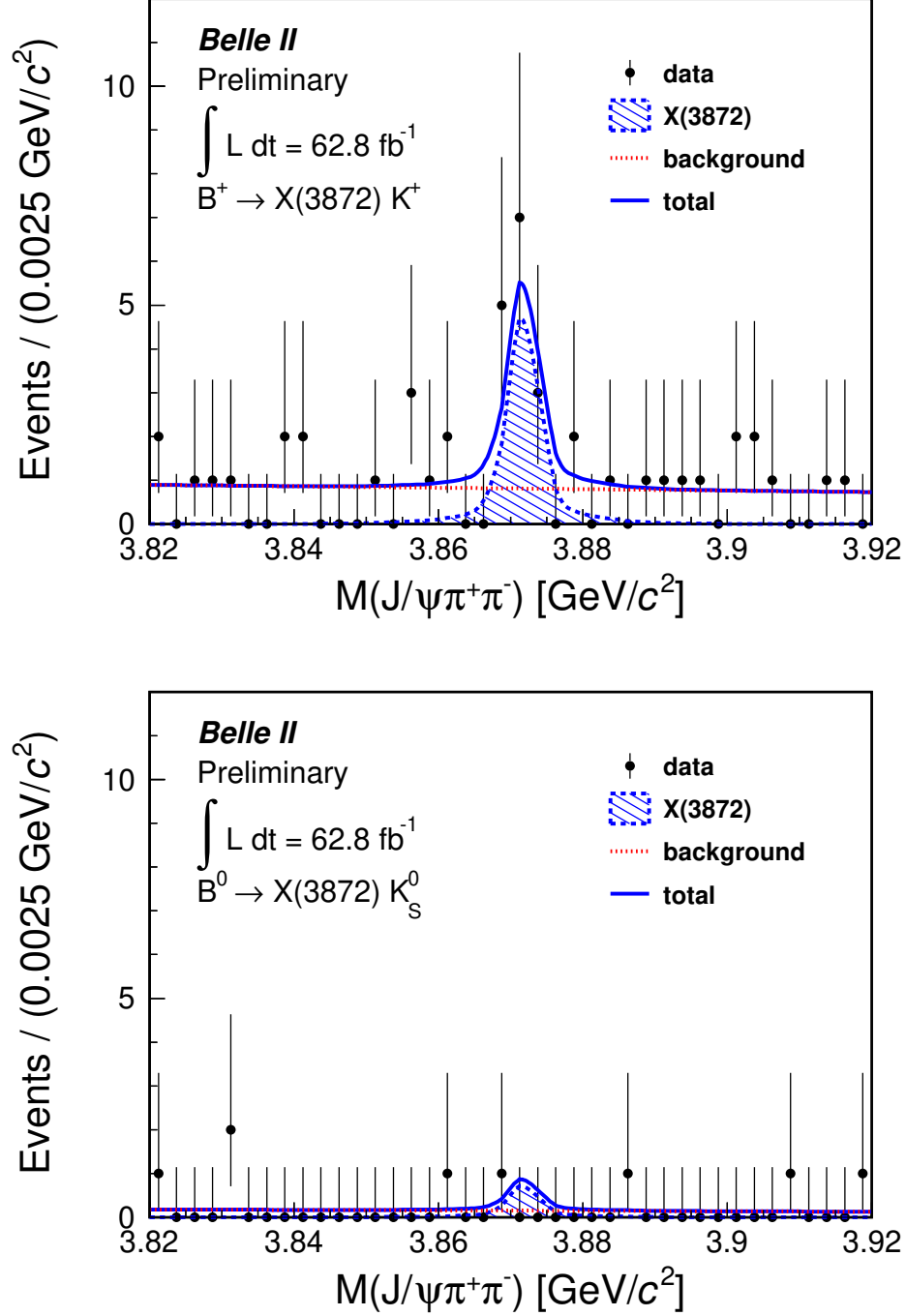


FIG. 2: The $M_{J/\psi\pi^+\pi^-}$ distributions on the $X(3872)$ signal region with the real data. Here, blue solid line shows total fit result. A histogram PDF generated with signal MC samples assuming the world average mass of $X(3872)$ [1] and the Breit-Wigner width of the LHCb measurement [2] is used as a PDF for the signal component. A first-order Chebyshev function is used as a PDF for the background component. A simultaneous fit is performed so as to combine the distribution for B^0 decay and that for B^+ decay, where a ratio of the expected signal yields is constraint. Here, $\mathcal{B}(B^0 \rightarrow X(3872)K^0)/\mathcal{B}(B^+ \rightarrow X(3872)K^+) = 0.50$ is assumed [3], and the signal efficiency is determined with the signal MC samples. The $X(3872)$ signal yields is 14.4 ± 4.6 , and the statistical significance is 4.6σ .

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- [1] M. Tanabashi *et al.* (Particle Data Group), Phys. Rev. D **98**, 030001 (2018).
[2] R. Aaij *et al.* (LHCb Collaboration), J. High Energ. Phys. **2020**, 123 (2020).
[3] S.-K. Choi *et al.* (Belle Collaboration), Phys. Rev. D **84**, 052004 (2011).