Group meeting

2025/06/13

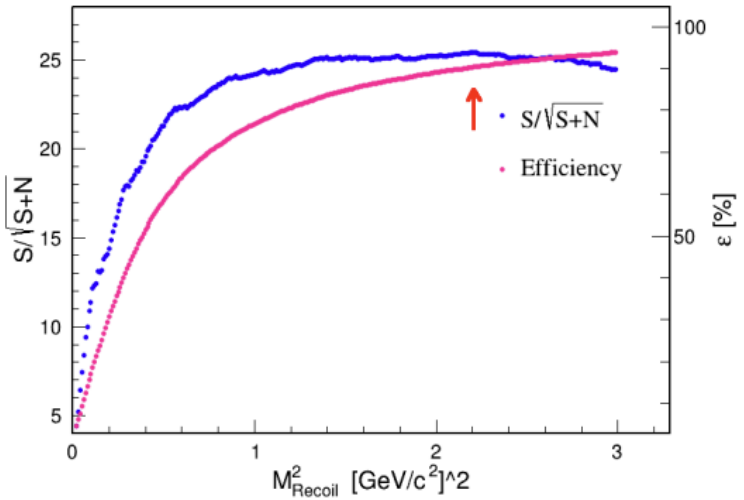
Optimized selection ($\pi^+\pi^- J/\psi$)

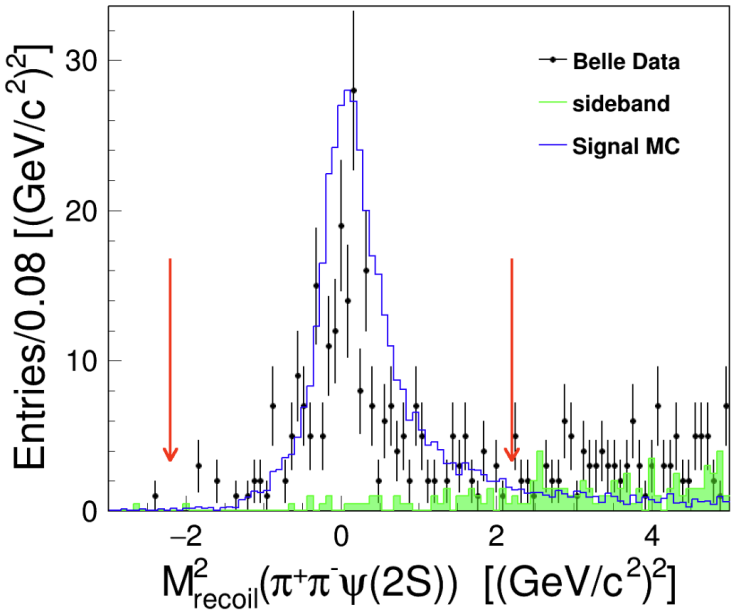
- Charged tracks
  - all charged tracks are required to originate from the vicinity of the interaction point | dr | < 1 cm, | dz | < 5 cm, where dr and dz are transverse and longitudinal distances in respect to interaction point (IP)
  - Ntrk < 8

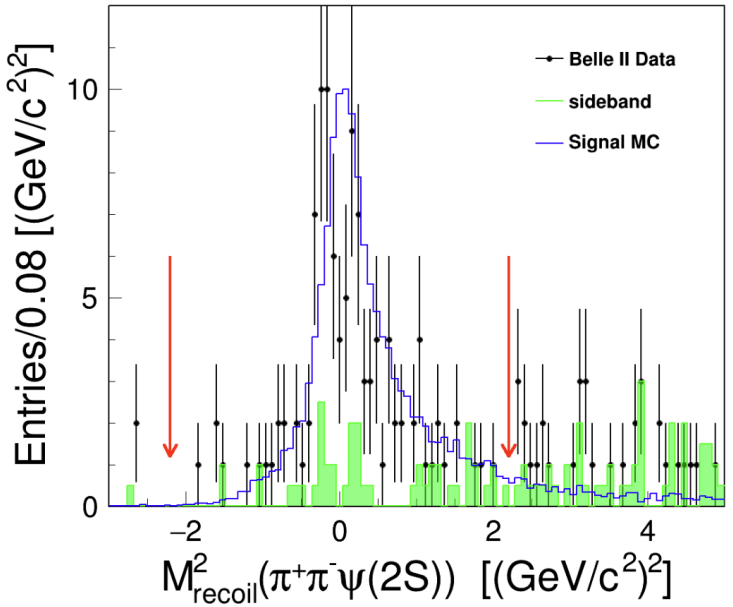
- Particle Identification
  - muIDBelle > 0.9 for one μ in $\psi(2S) \to \pi^+\pi^- J/\psi$ channel
  - muIDBelle > 0.5 for all μ in $\psi(2S) \to \mu^+\mu^-$channel
  - eIDBelle > 0.1 for all e
  - atcPIDBelle(2,3) > 0.6 and eIDBelle < 0.75 for all π
- Bremsstrahlung photons
  - within 0.05 radians of the original electrons.
- Best candidate for $||M_{\ell^+\ell^-} - M_{\ell^+\ell^-\pi^+\pi^-}| - 0.589|$

Optimized selection ($\pi^+\pi^- J/\psi$)

- $J/\psi, \psi(2S)$, Y reconstruction
  - Bremsstrahlung correction for $J/\psi \to e^+e^-$
  - ~~$|M_{\ell^+\ell^-} - M_{J/\psi}| < 45$ MeV $/c^2$~~
  - 3.0275 GeV $/c^2 < M_{l^+l^-} < 3.1375$ GeV $/c^2$
  - 2.885 GeV $/c^2 < M_{l^+l^-} < 2.995$ GeV $/c^2$ and 3.17 GeV $/c^2 < M_{l^+l^-} < 3.28$ GeV $/c^2$ for J/ψ sideband
  - ~~3.67 GeV $/c^2 < M_{\pi^+\pi^- J/\psi} < 3.7$ GeV $/c^2$~~
  - $|M_{\pi^+\pi^- J/\psi}(M_{\pi^+\pi^-\ell^+\ell^-} - M_{\ell^+\ell^-} + 3.097) - 3.686| < 11$ MeV $/c^2$
  - 3.653 GeV $/c^2 < M_{\pi^+\pi^- J/\psi} < 3.631$ GeV $/c^2$ & 3.719 GeV $/c^2 < M_{\pi^+\pi^- J/\psi} < 3.741$ GeV $/c^2$ for $\psi(2S)$ sideband
- $|M^2_{Rec}| < 2.2$ $(\mathrm{GeV}/c^2)^2$ for $\pi^+\pi^-\psi(2S)$ to identify ISR events.
- Efficiencies: 6.75%→6.76% for Belle, 8.96%→ 8.97% for Belle II.







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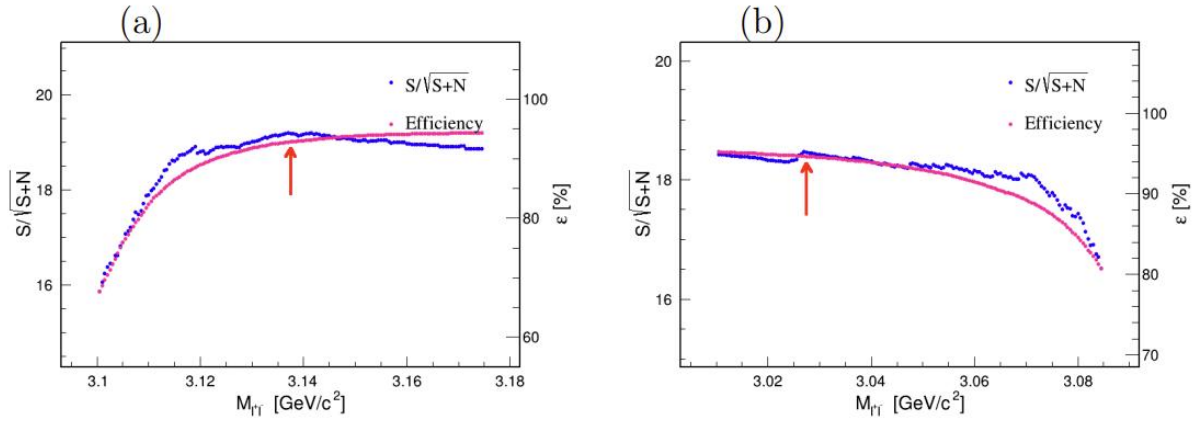
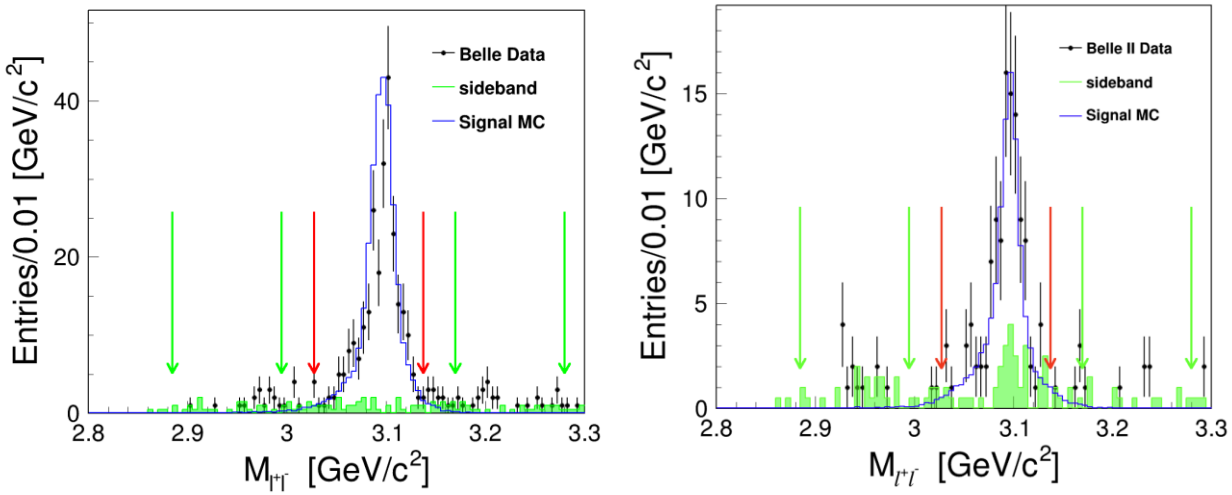
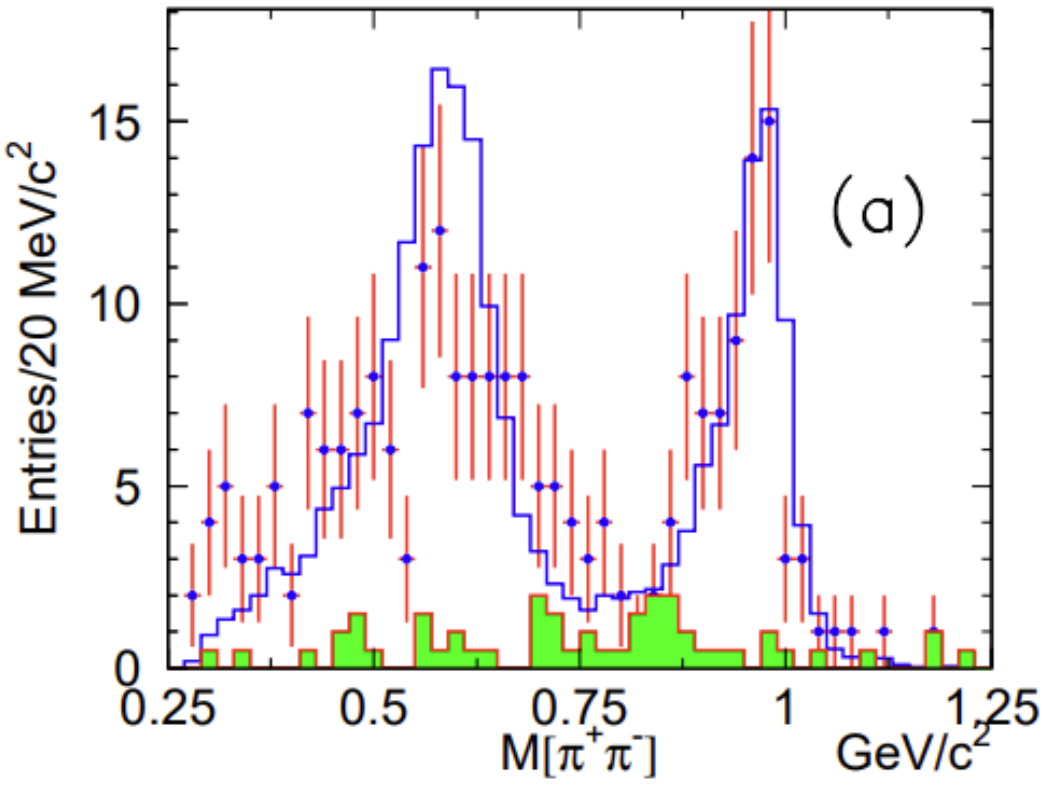


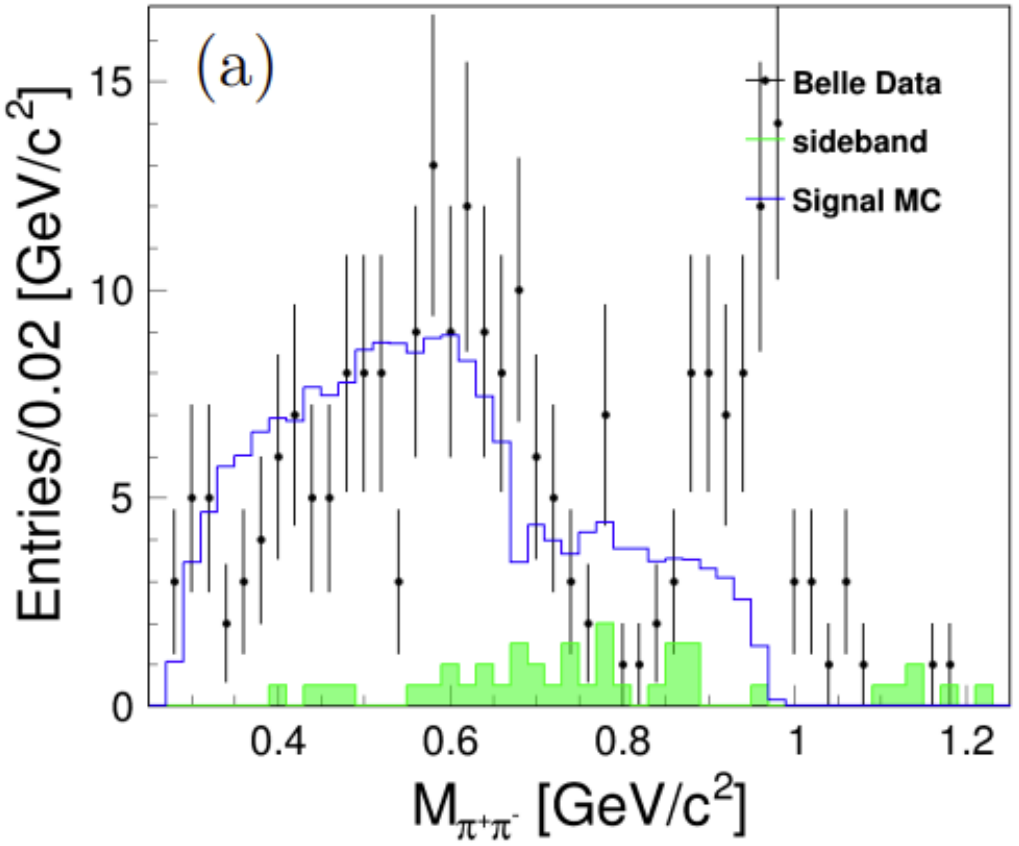
FIG. 6: FOM results of $M_{\ell^+\ell^-}$ with all other selection criteria required. (a) represents the upper limit optimization; (b) represents the lower limit optimization.



Uehara's comments

6. L42 Here is another unseparated kind of the process of C-even pi+pi- psi(2S) final states, like as the "rho psi(2S)". This can't be the Y resonance, but they are the signals as the pi+pi- psi(2S) and the C states cannot be distinguished event by event basis. How do you treat these? I think that you need careful and exhaustive discussion for the C-even component.





Uehara's comments

11. Fig.6 (a)(b):I find some small bump at the upper tail of psi(2S) around 3.695MeV/c2 in each of the two figures. Is it a statistical fluctuation?

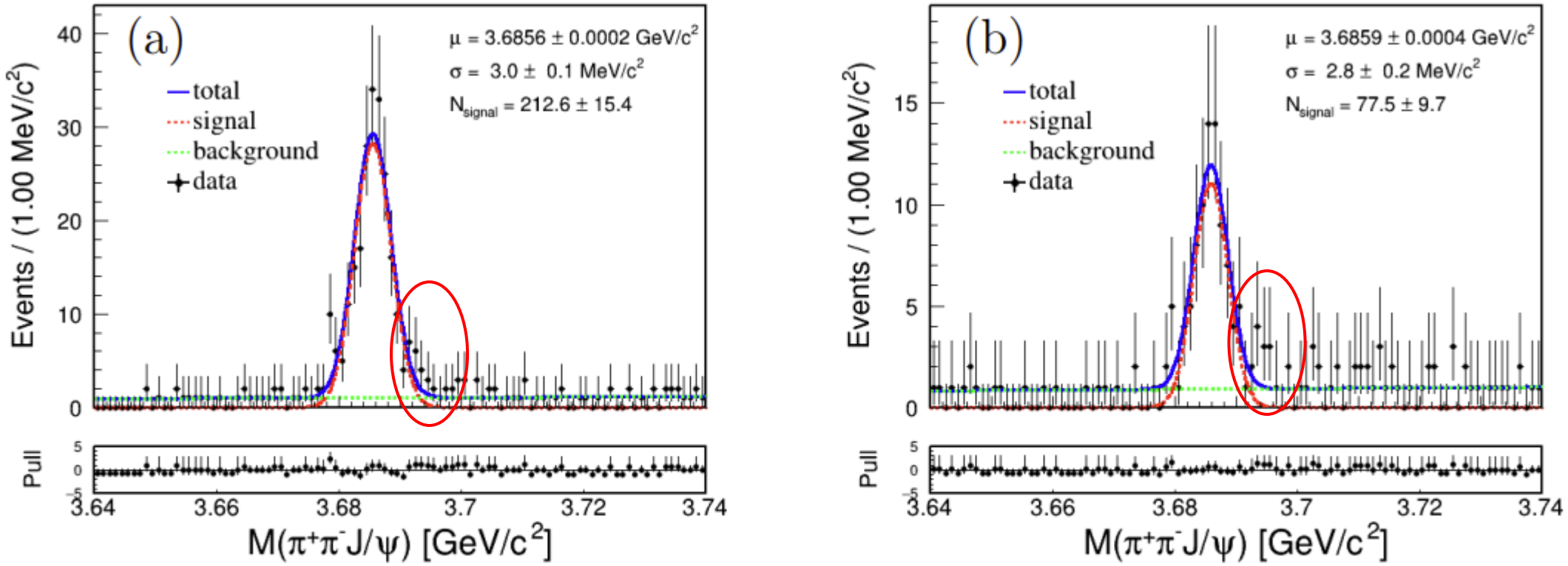


FIG. 6: Distributions of $M_{\pi^+\pi^- J/\psi}$ in $\psi(2S) \to \pi^+\pi^- J/\psi$ mode with fitting results, all other selection criteria are required. (a) is from Belle Data, (b) is from Belle II data.