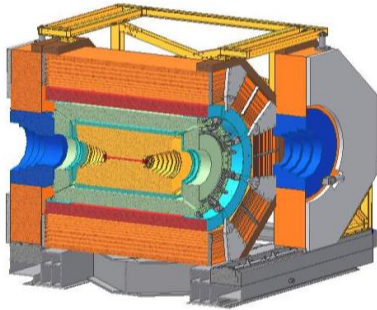


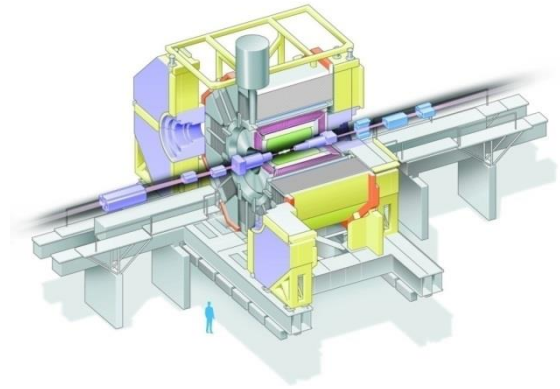
Experimental Results on $Z_c(3900)$ (BESIII & Belle)



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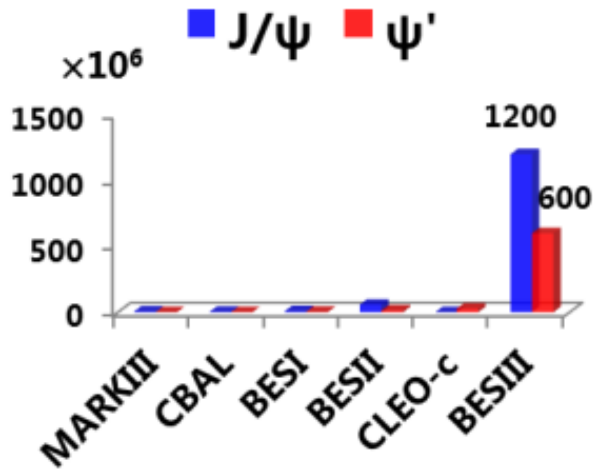


Outline

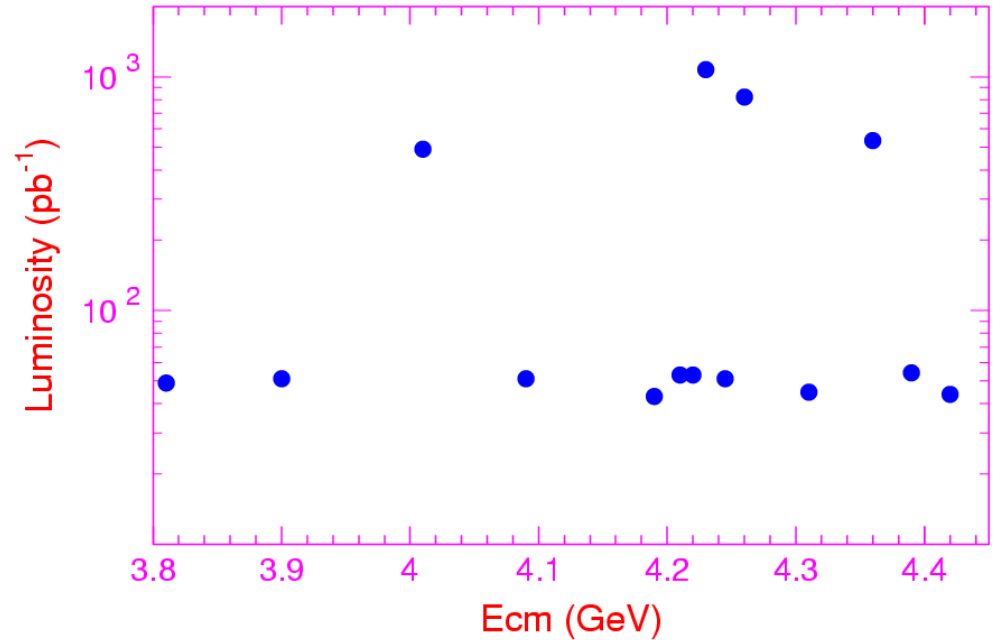
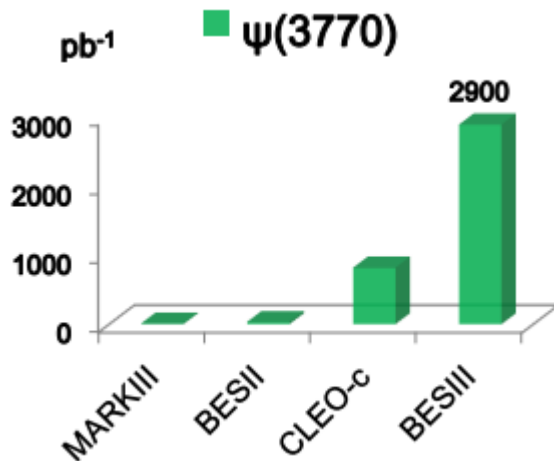
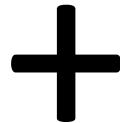
1. Discovery of $Z_c(3900)$ at BESIII.
2. Discovery of $Z_c(3900)$ at Belle.
3. CLEO's data (unpublished).
4. Comparison between different experiments.
5. Future Working Plan for $Z_c(3900)$.

BESIII's data

1. BEPCII is a symmetric Collider.
2. BESIII take data at e+e- c.m energy from 2 to 4.6 GeV.
3. Design luminosity $1 \cdot 10^{33}/\text{cm}^2/\text{s}$, reach 70%.



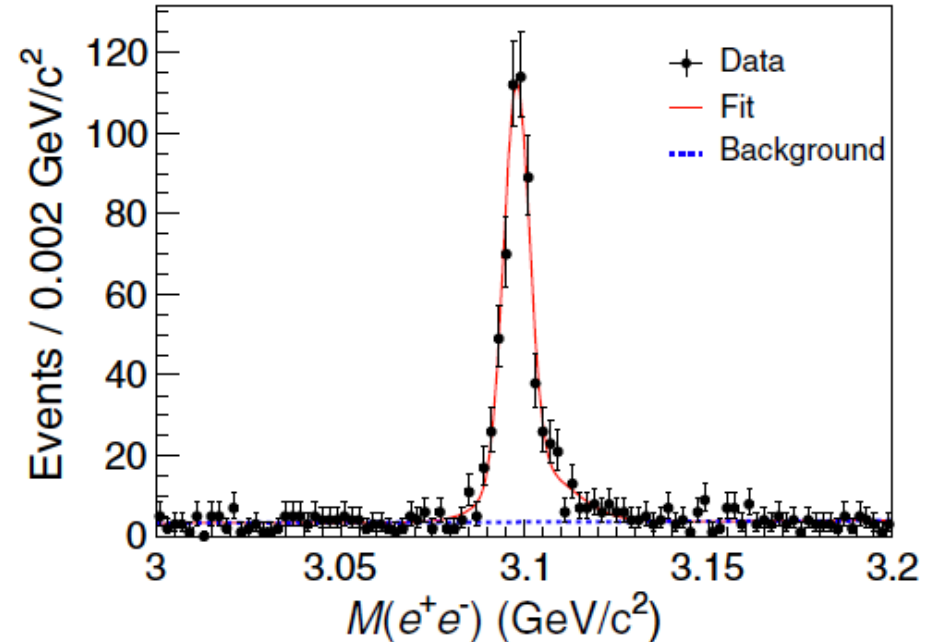
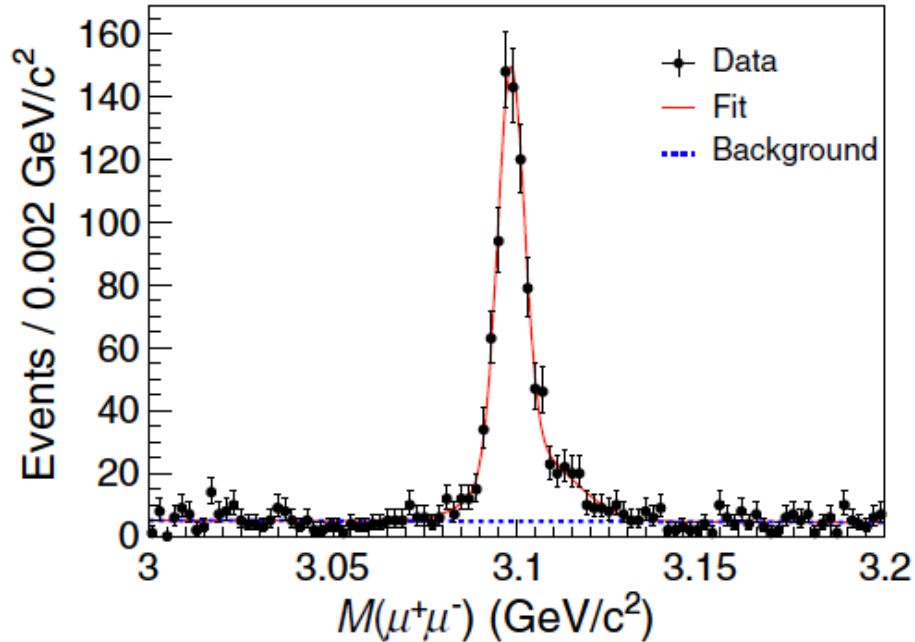
Not enough...



BESIII can study XYZ particle above 4 GeV with world's largest scan data sets.

$Z_c(3900)$ from BESIII

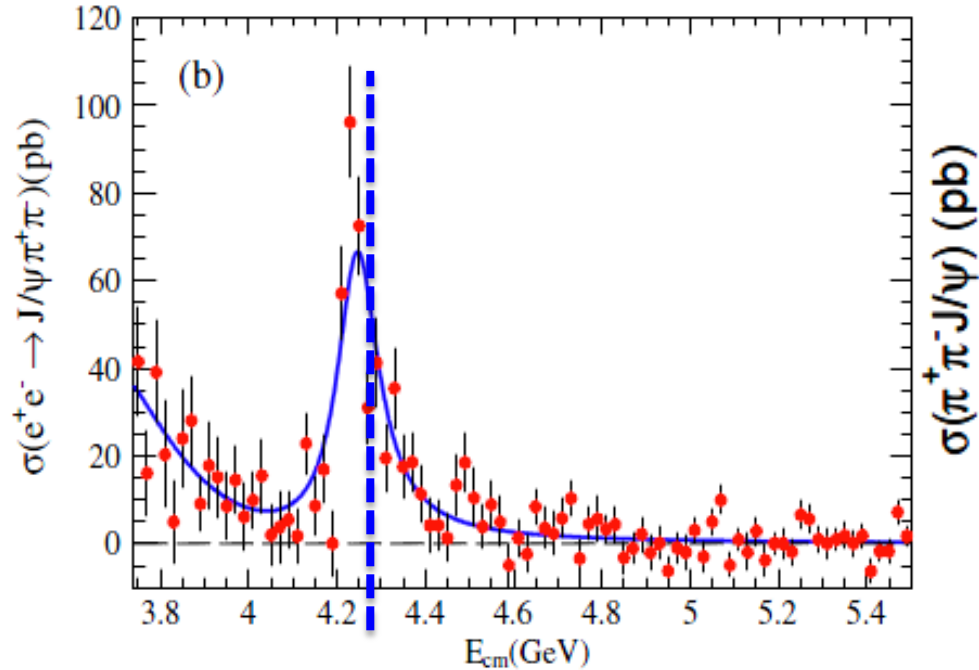
PRL 110,252001 (2013).



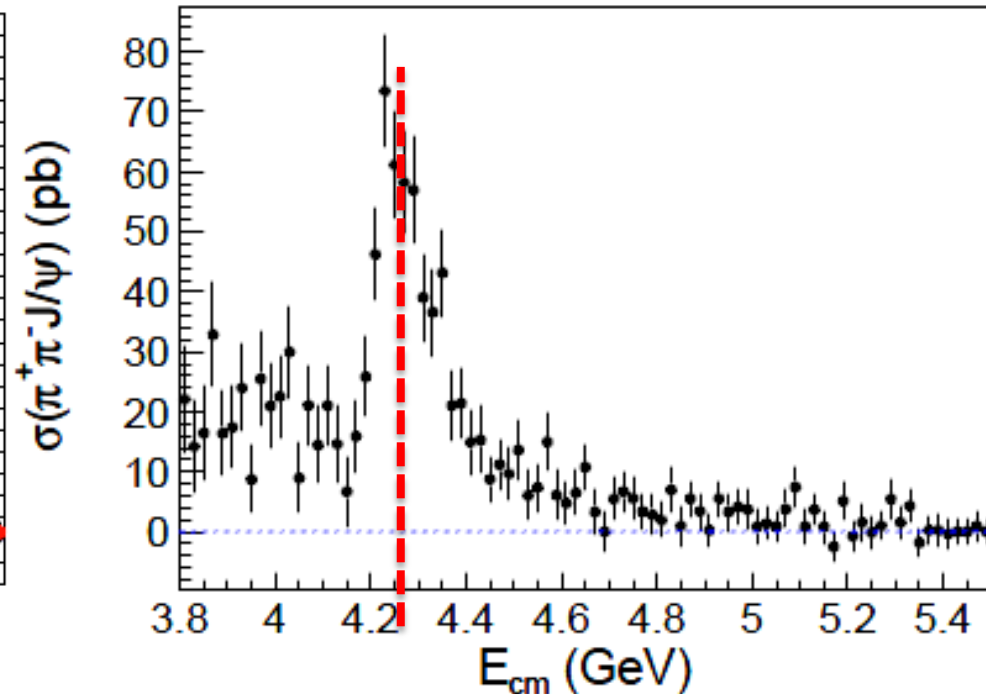
1. Dec, 2012 to Jan, 2013, BESIII accumulate 525 pb⁻¹ data @ 4.26 GeV.
2. Peak position of $\Upsilon(4260) \rightarrow \pi^+\pi^- J/\psi$ cross section.
3. $N(\mu^+\mu^-) = 882 \pm 33$; $N(e^+e^-) = 595 \pm 28$; purity $\sim 90\%$.

$Z_c(3900)$ from BESIII

PRD 86,051102(R) (2012).



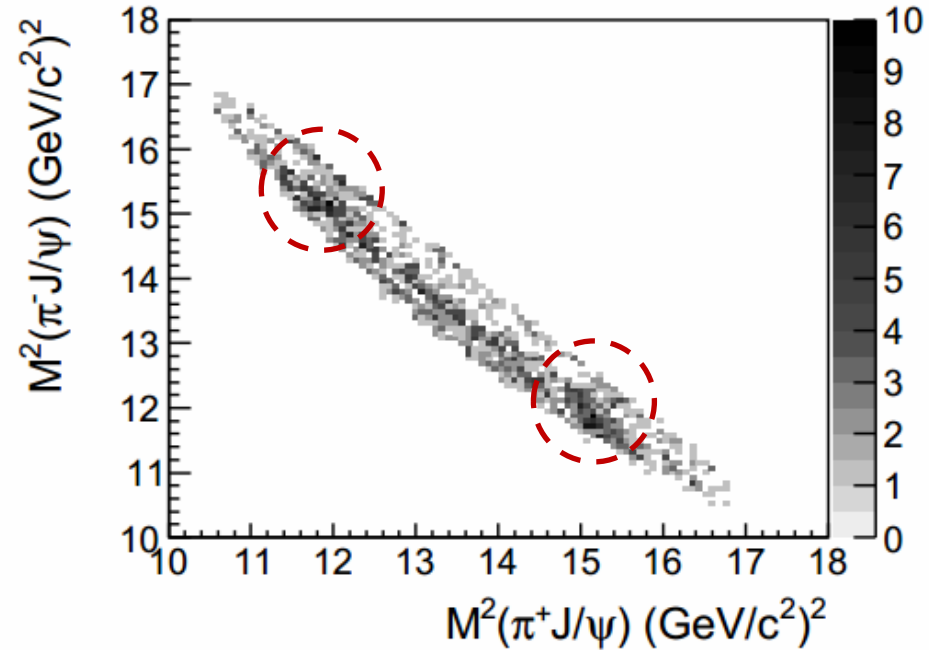
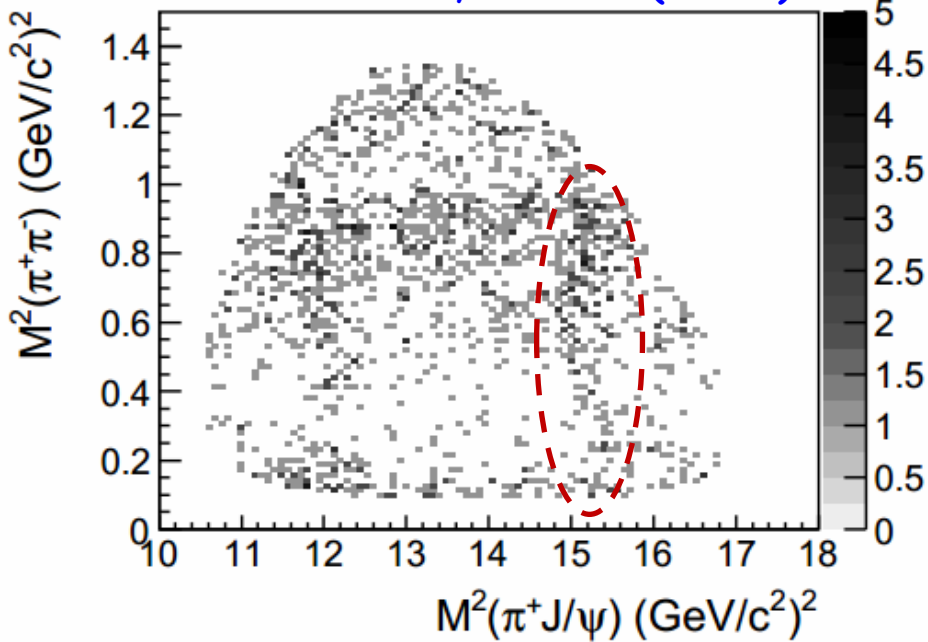
PRL 110,252002 (2013).



1. Dec, 2012 to Jan, 2013, BESIII accumulate 525 pb^{-1} data @ 4.26 GeV.
2. Peak position of $\Upsilon(4260) \rightarrow \pi^+\pi^-J/\psi$ cross section.
3. $N(\mu^+\mu^-) = 882 \pm 33$; $N(e^+e^-) = 595 \pm 28$; purity $\sim 90\%$.
4. Born cross section: $\sigma^B = (62.9 \pm 1.9 \pm 3.7) \text{ pb}$ at BESIII.
5. Good agreement with Belle and BaBar.

$Z_c(3900)$ from BESIII

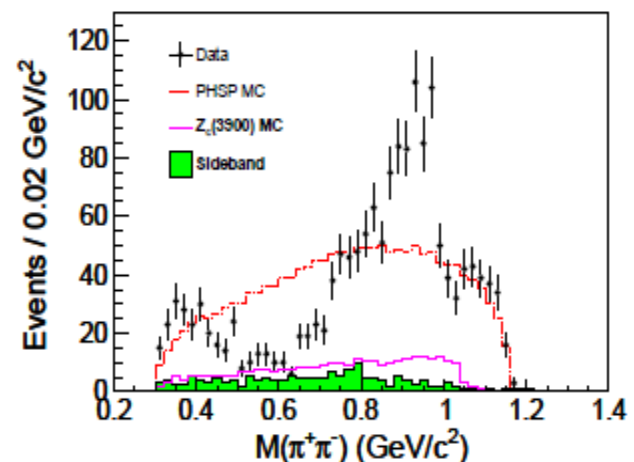
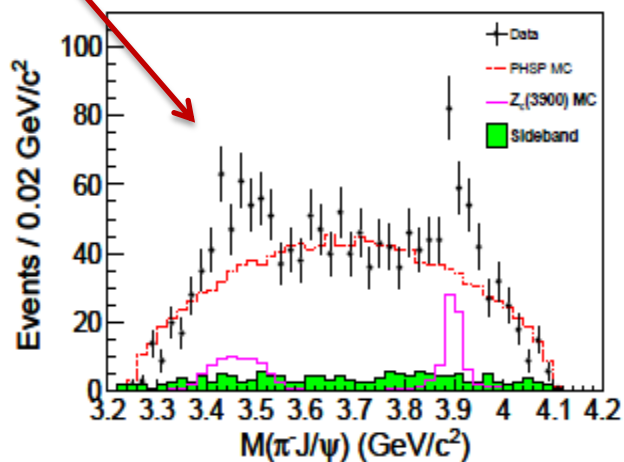
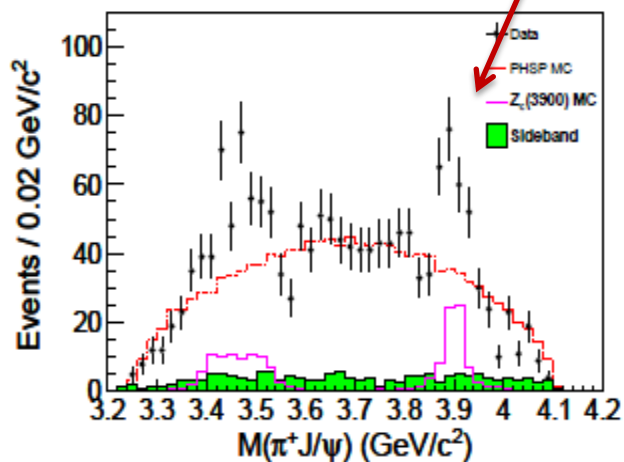
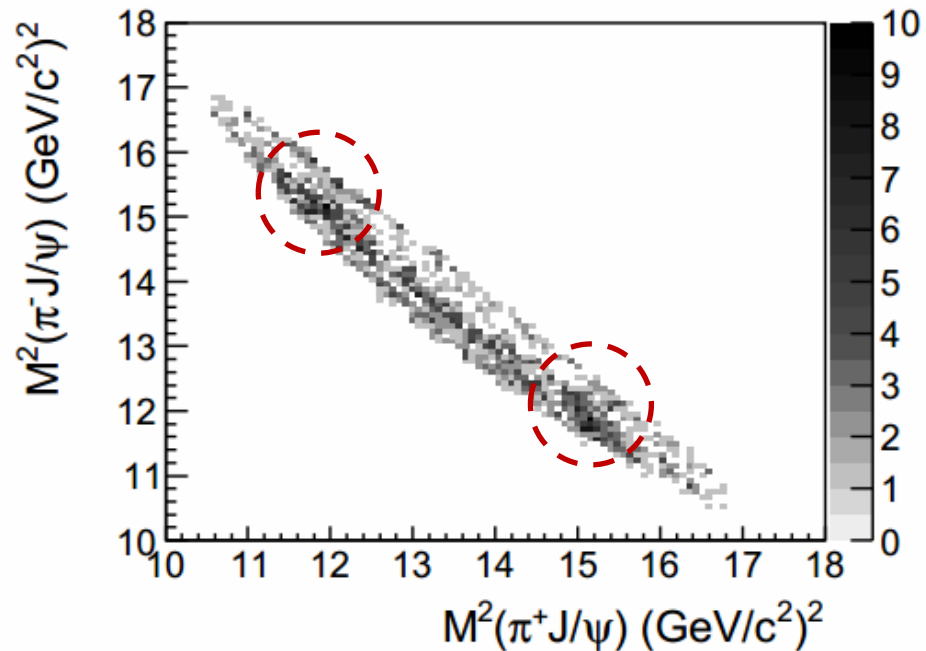
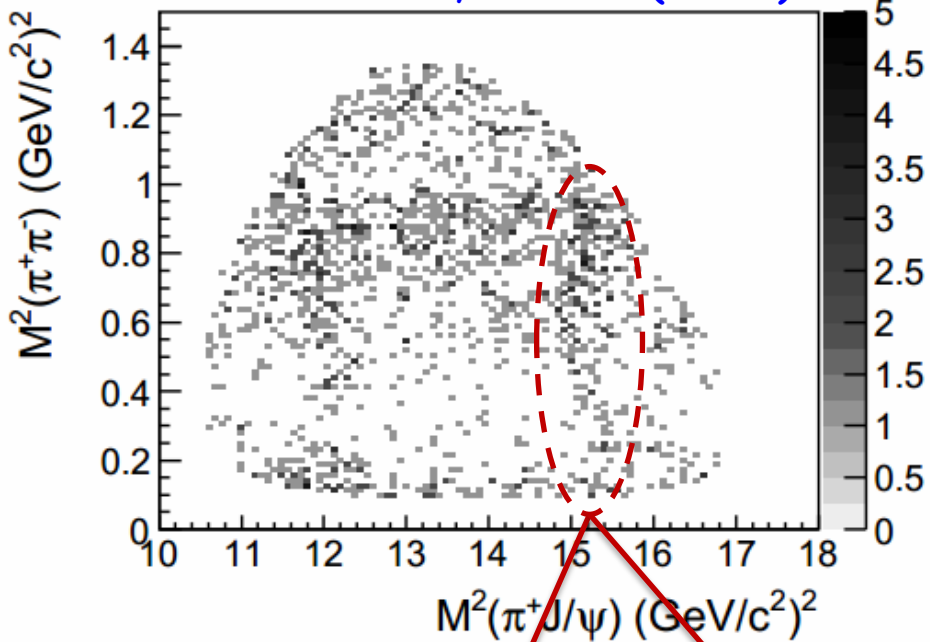
PRL 110,252001 (2013).

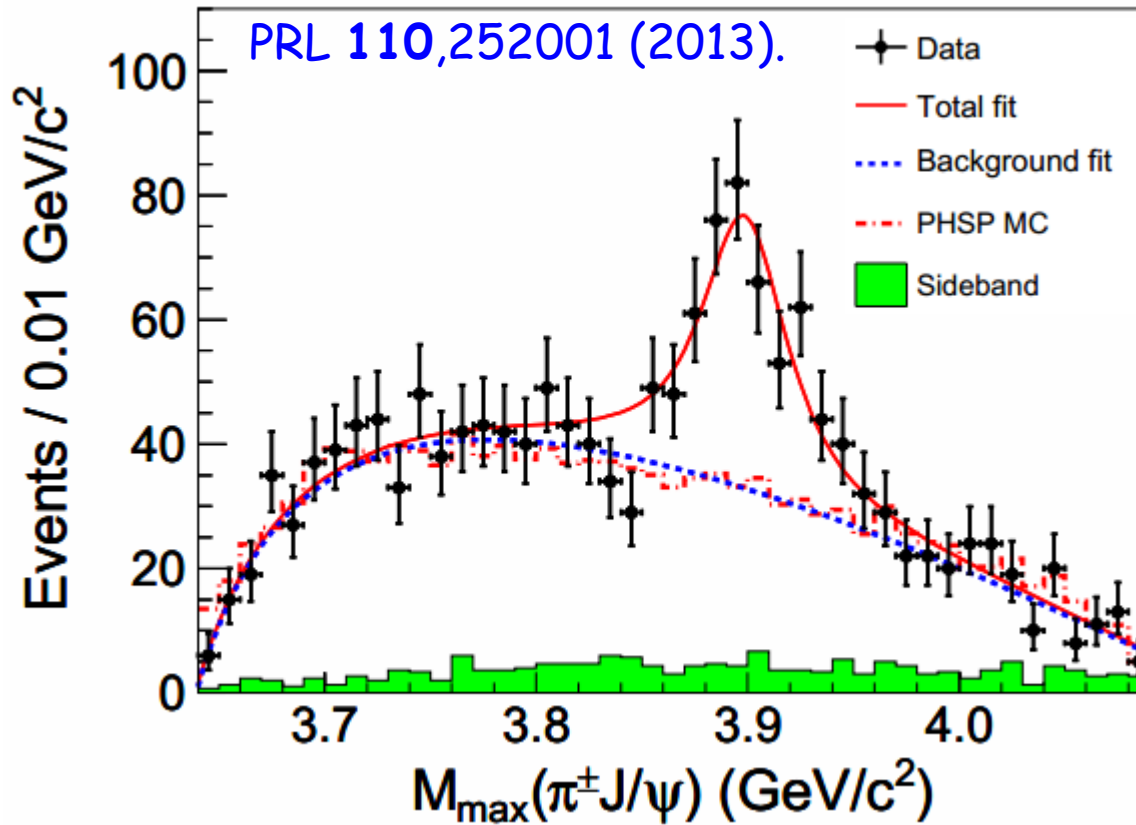


1. Structure in $M(\pi^\pm J/\psi)$ mass distribution.
2. Phase space reflection of $Z_c(3900)$.

$Z_c(3900)$ from BESIII

PRL 110,252001 (2013).

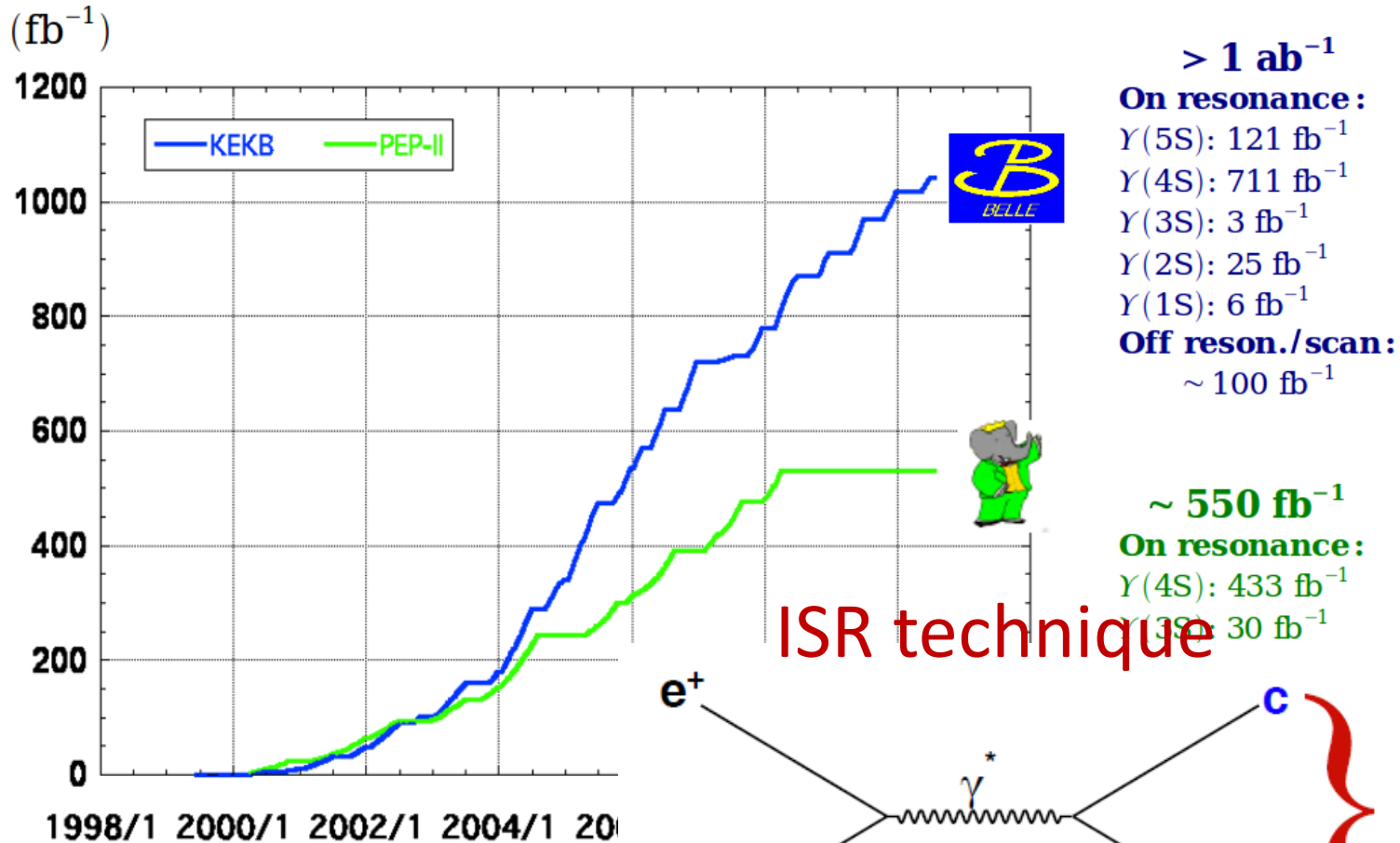




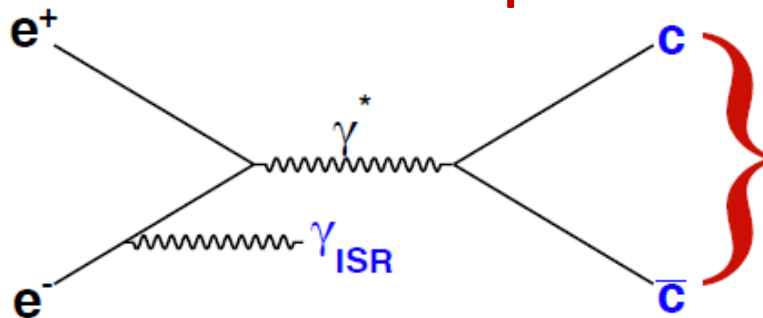
1. 1D fit to extract resonant parameters.
2. Divided Dalitz plot by diagonal line; Fit $M_{\max}(\pi^{\pm}J/\psi)$ mass distribution.
3. S-Wave Breit Wigner; p^*q phase space factor; efficiency applied.
4. $M=(3899.0 \pm 3.6 \pm 4.9)\text{MeV}$; $\Gamma=(46 \pm 10 \pm 20)\text{MeV}$.
5. Statistical significance: $>8\sigma$, discovery!

$Z_c(3900)$ from Belle

Integrated luminosity of B factories

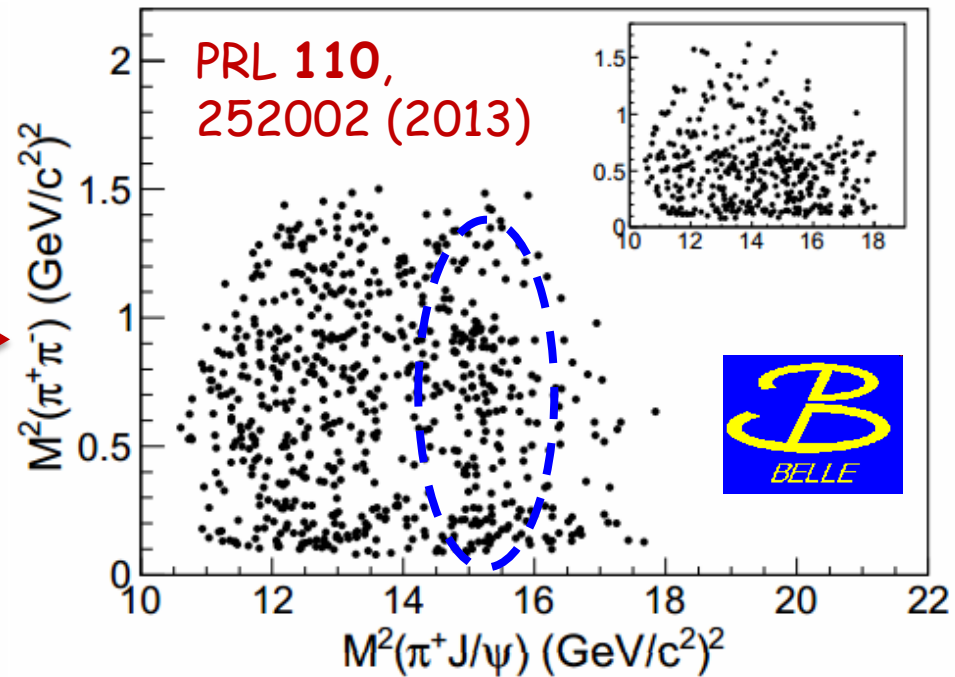
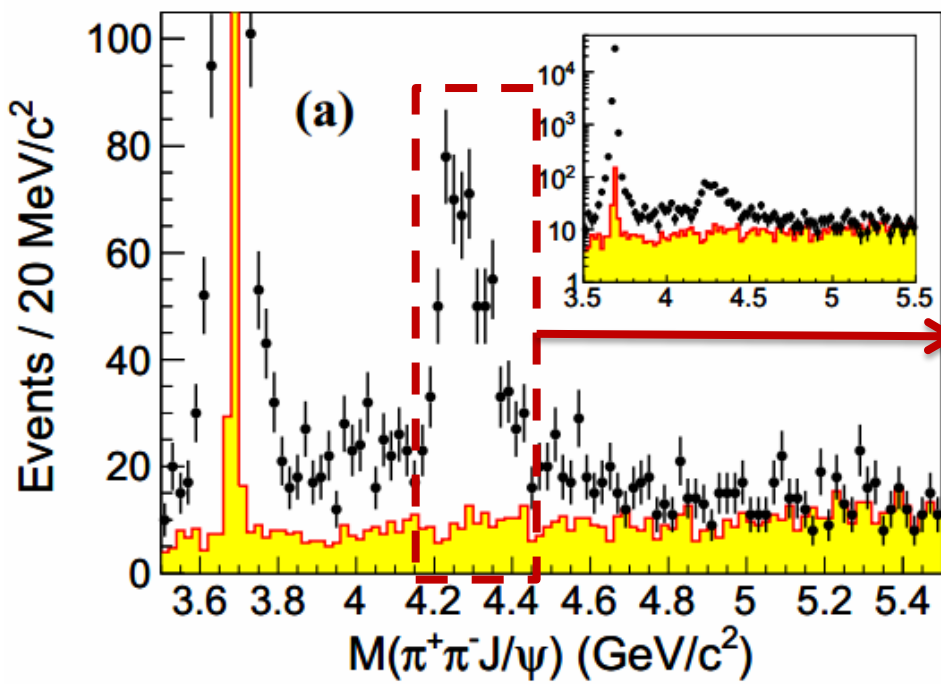


ISR technique



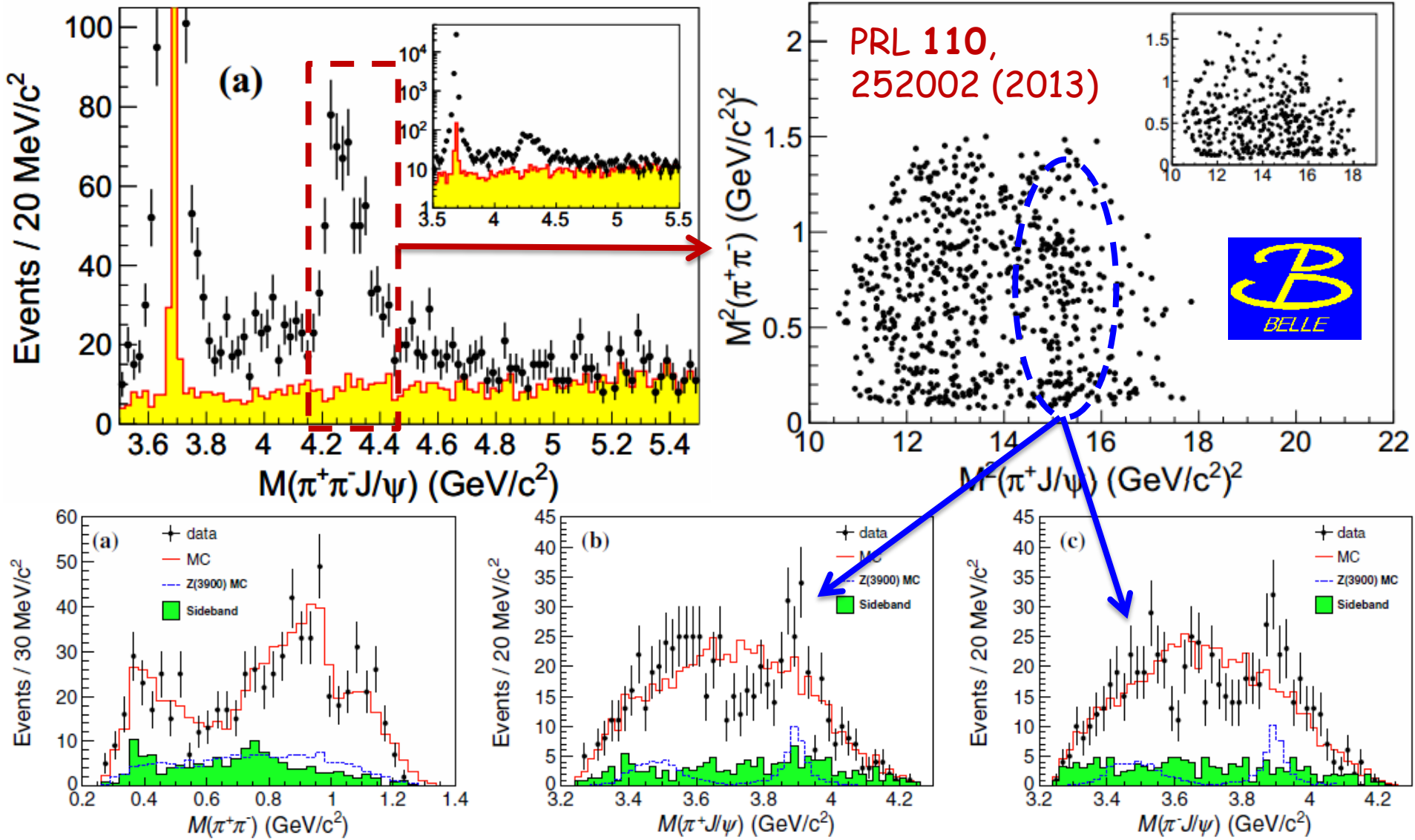
$J^{PC} = 1^{--}$
 $\psi', \psi'', Y \dots$

$Z(3900)^\pm$ from Belle

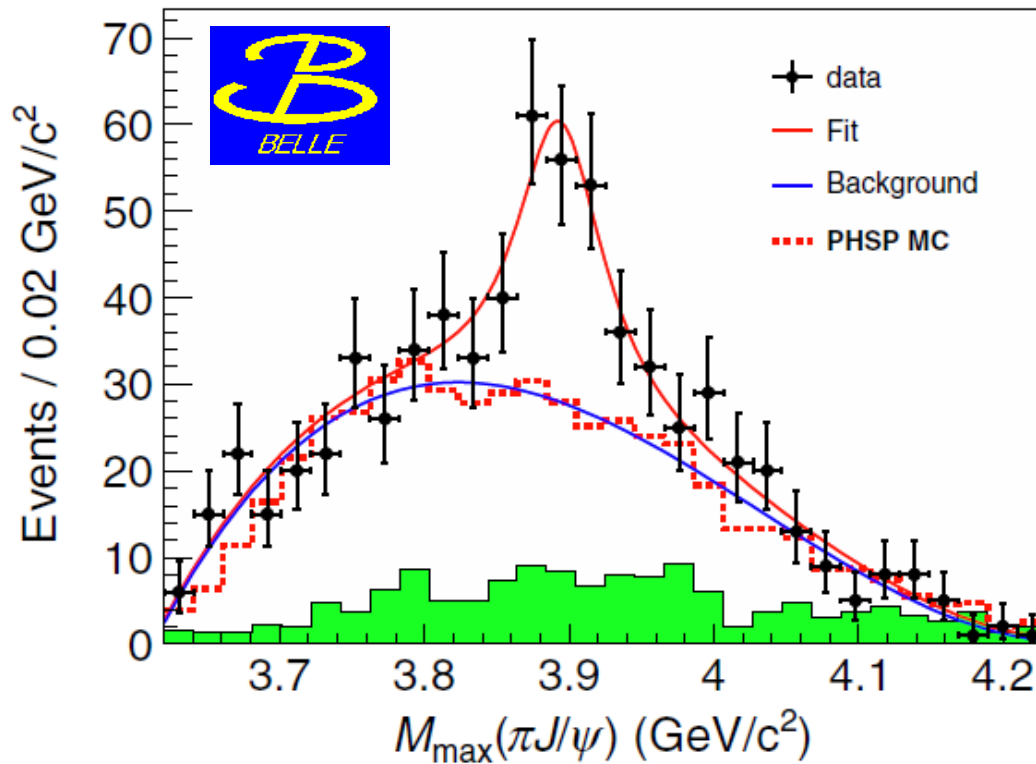


1. Belle collected data at/near $Y(nS)$ ($n=1, \dots, 5$) resonance.
2. Almost full Belle data sample used: Lum=967 fb⁻¹ data.
3. Using ISR photon non-tagged method, $Y(4260)$ was observed significantly.
4. $4.15 < M(\pi^+\pi^-J/\psi) < 4.45$ GeV to select $Y(4260)$ resonance.
5. Dalitz plot also shows structures.

$Z(3900)^\pm$ from Belle

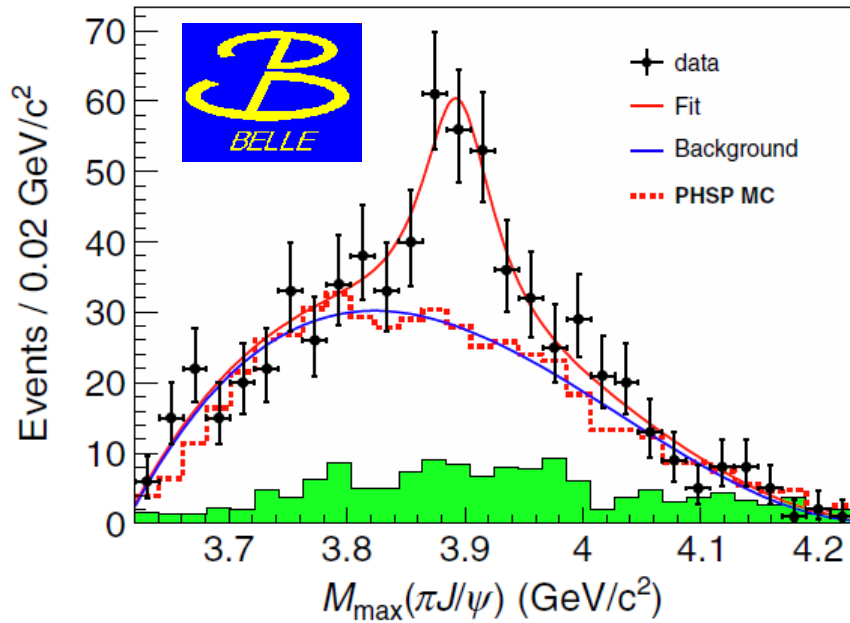
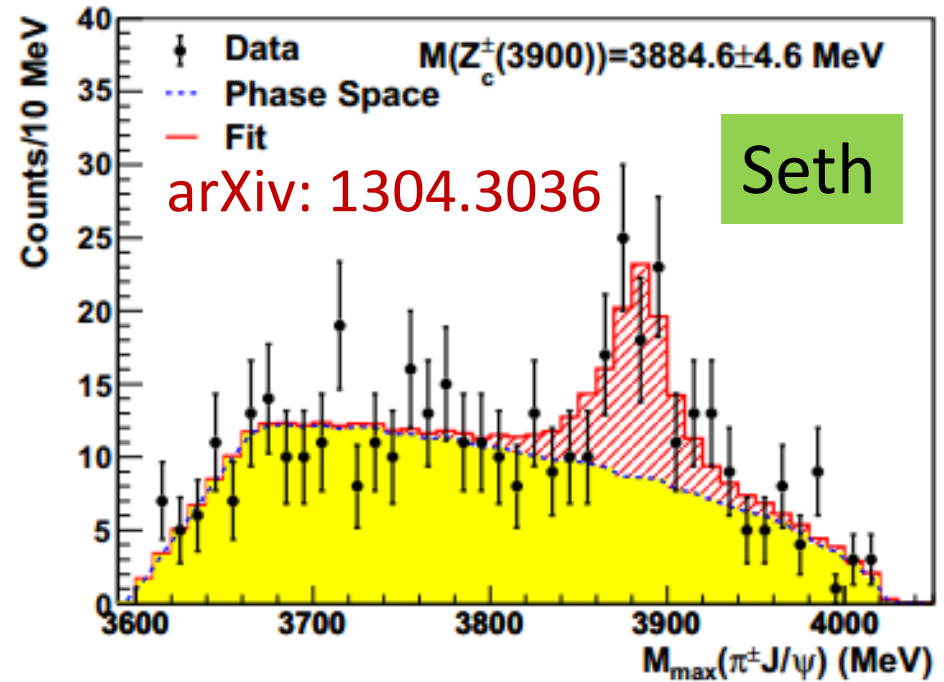
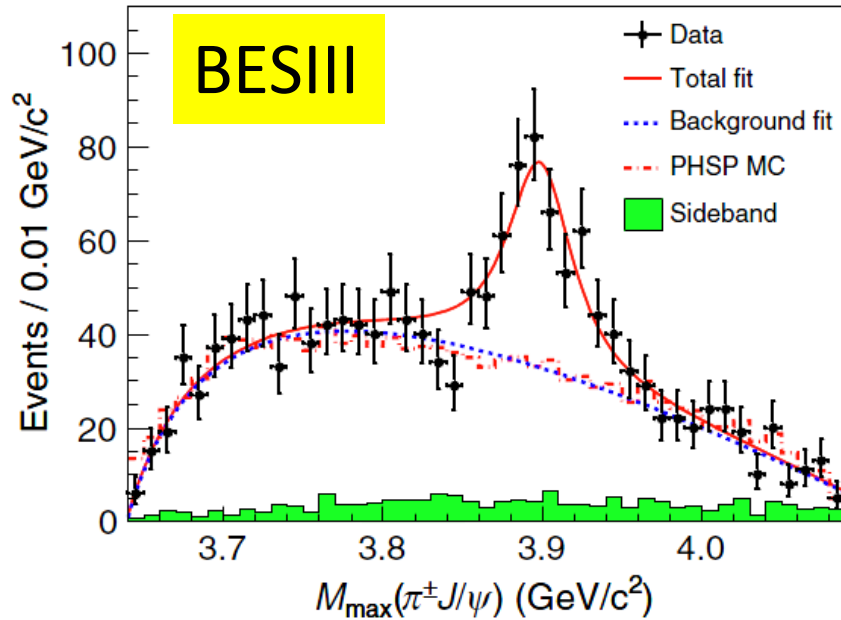


$Z(3900)^\pm$ from Belle



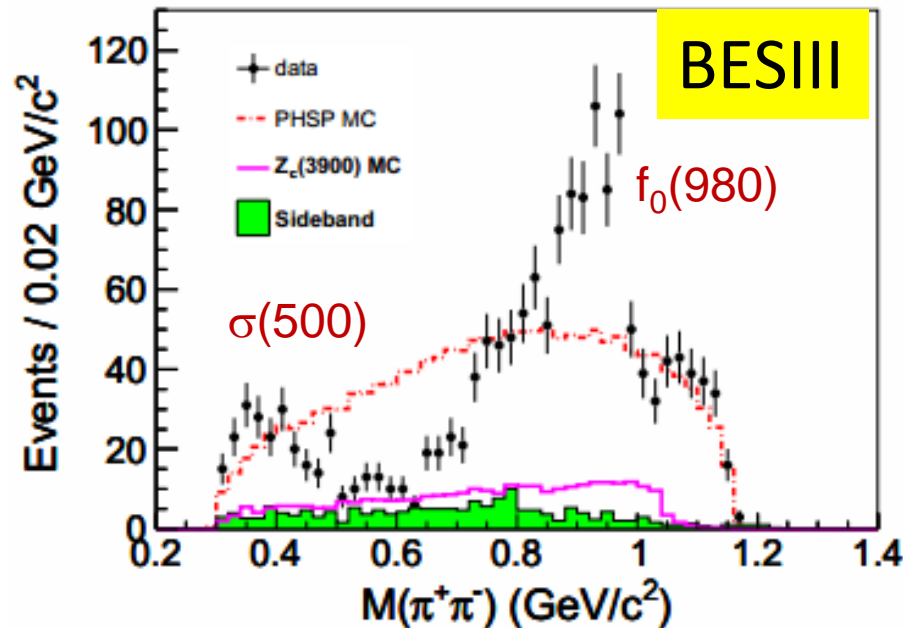
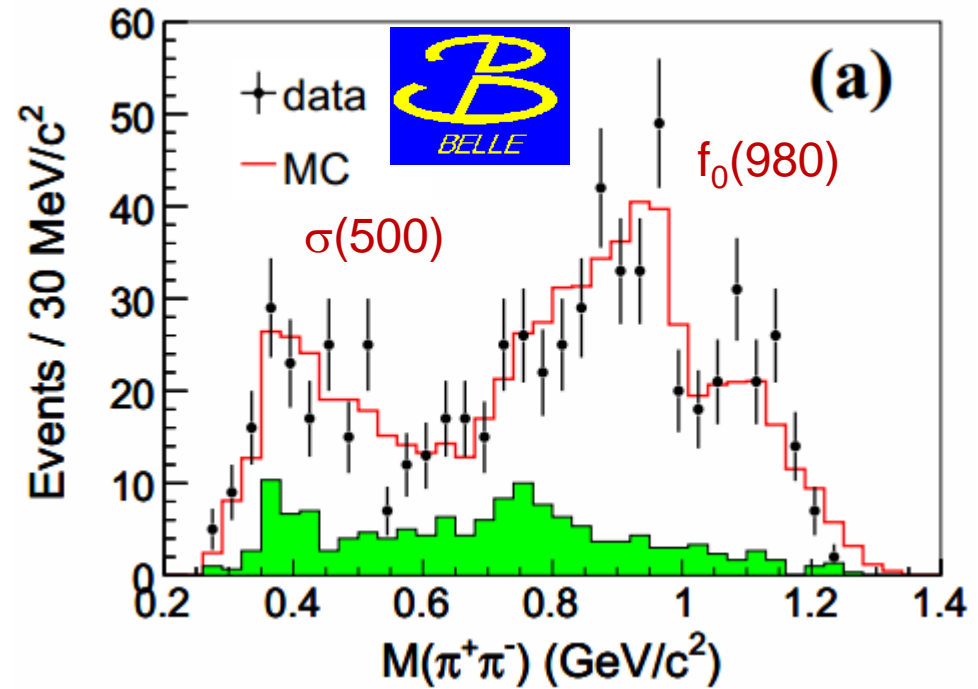
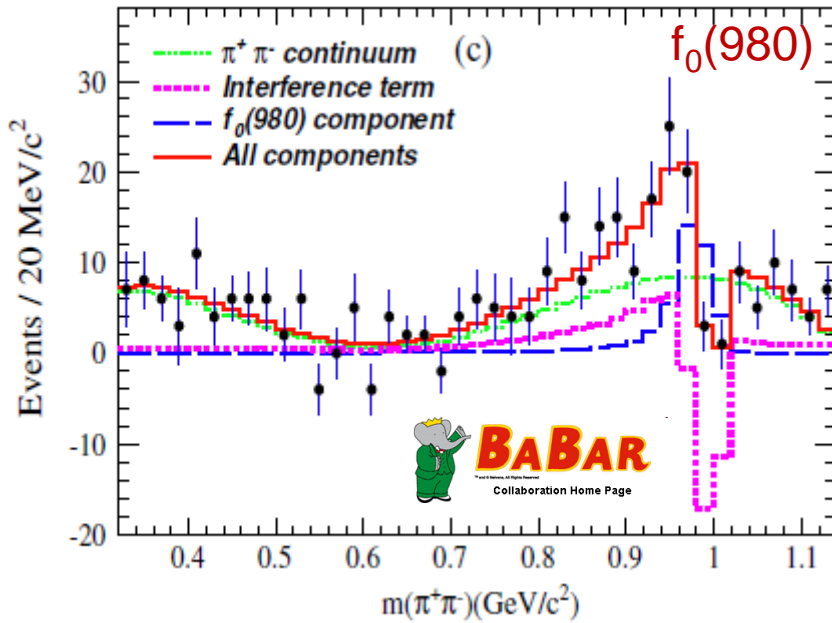
1. Belle use the same fit strategy to $M_{\max}(\pi^\pm J/\psi)$ distribution.
2. S-Wave BW, p^*q phase space factor, efficiency applied.
3. Belle observed 689 events, with 139 background.
4. $M=(3894.5 \pm 6.6 \pm 4.5)$ MeV; $\Gamma=(63 \pm 24 \pm 26)$ MeV.
5. Significance: 5.2σ .

BESIII + Belle + CLEO's data



1. $Z_c(3900)=Z(3900)^{\pm}$.
2. CLEO's data at 4.17 GeV by K. Seth.
3. $M=3885 \pm 5$ MeV, $\Gamma=34 \pm 13$ MeV.
4. Significance: 6σ (Still not published for unknown reason!)

$M(\pi^+\pi^-)$ amplitude in $\Upsilon(4260) \rightarrow \pi^+\pi^-J/\psi$



1. The $\pi^+\pi^-$ amplitude is similar in $\Upsilon(4260) \rightarrow \pi^+\pi^-J/\psi$ decay.
2. Help understand the $\Upsilon(4260)$ and $Z_c(3900)$?

Summary