BESIII XYZ粒子研究进展

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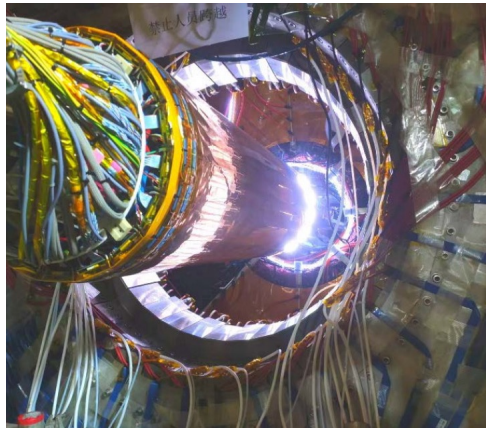


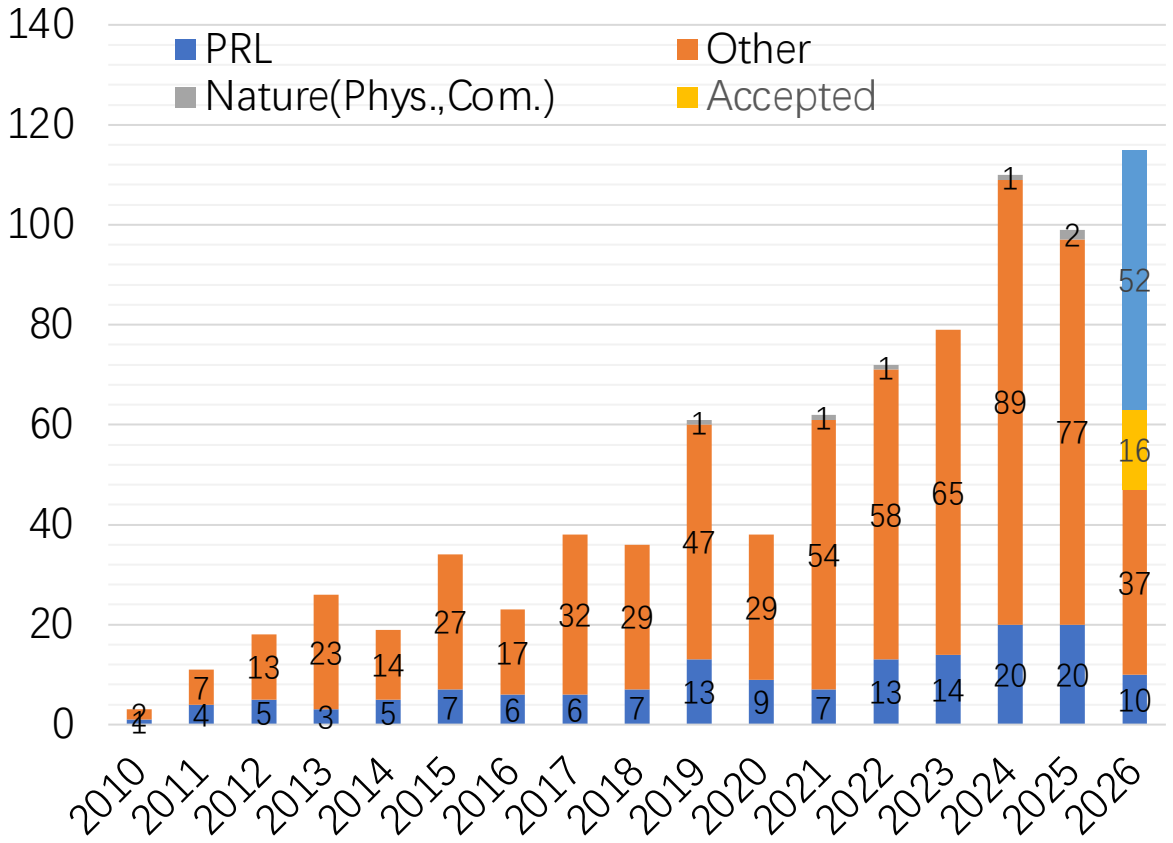
第九届强子谱和强子结构研讨会，18th Aug 2026，新乡

Outline

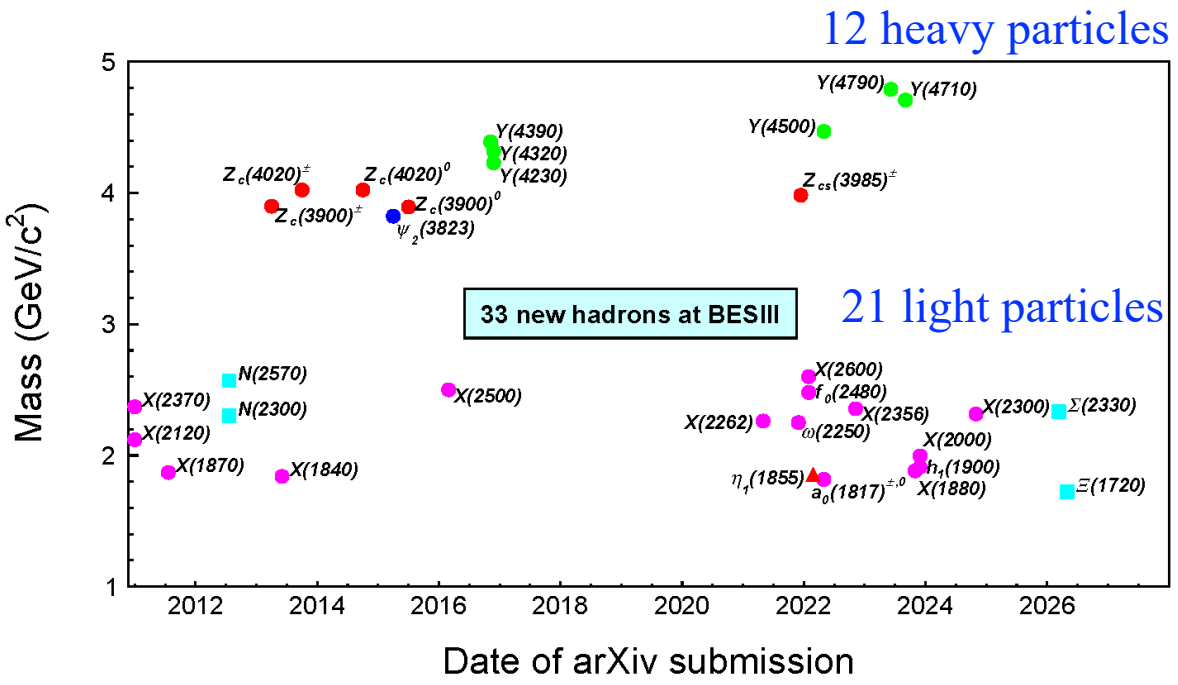
- Current Status of BESIII
- Charmonium-like Spectroscopy
- Charmonium Decays
- Summary

844 publications & 33个新强子

Total: 844 = 776 + 16 (accepted) + 52 (submitted)



Discover 33 new hadrons

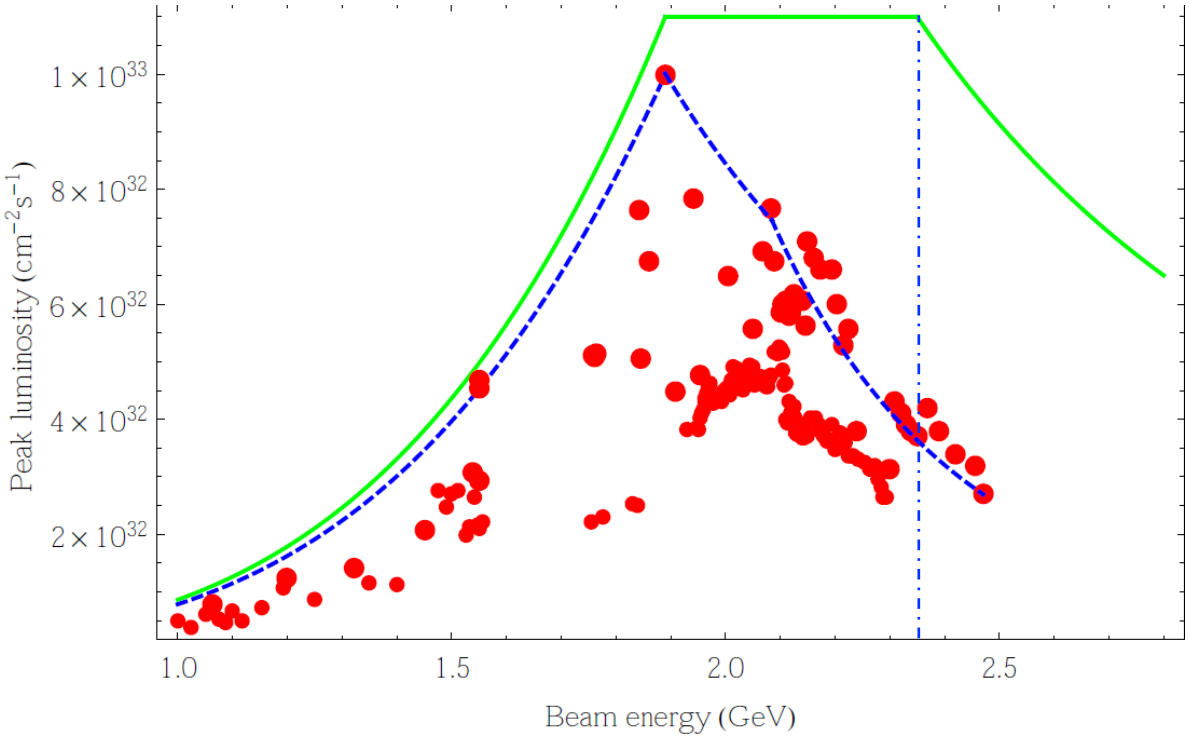


http://english.ihep.cas.cn/bes/re/pu/NewParticles/
Zhiqing Liu & Ryan Mitchell, Science Bulletin 68 (2023) 2148–2150

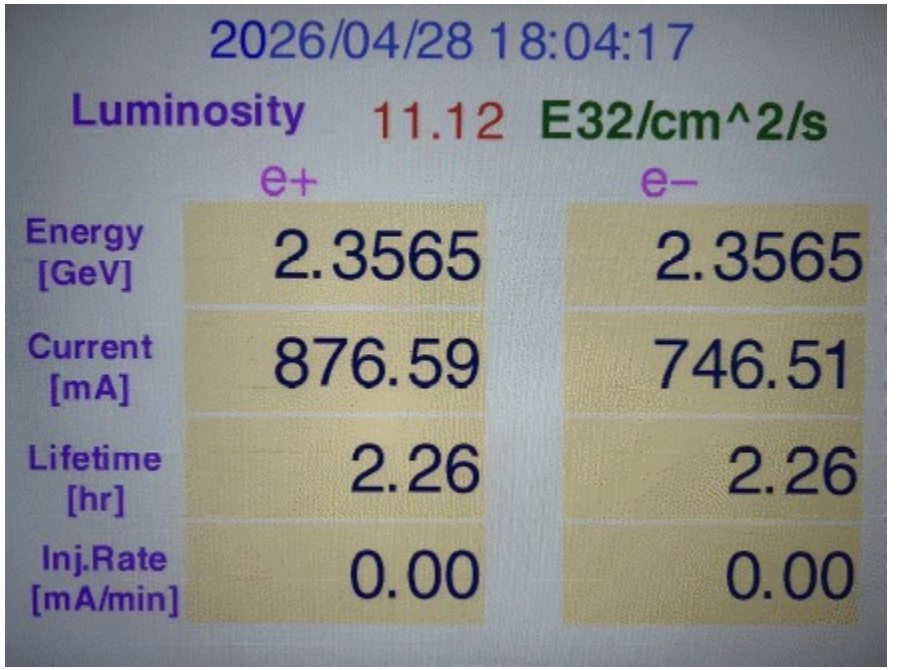
- 155 PRL+4 Nature(Physics)
- Fast growing (~100 / year)

BEPCII-U upgrade commission

BEPCII-U vs. BEPCII



讨论未来的取数计划。



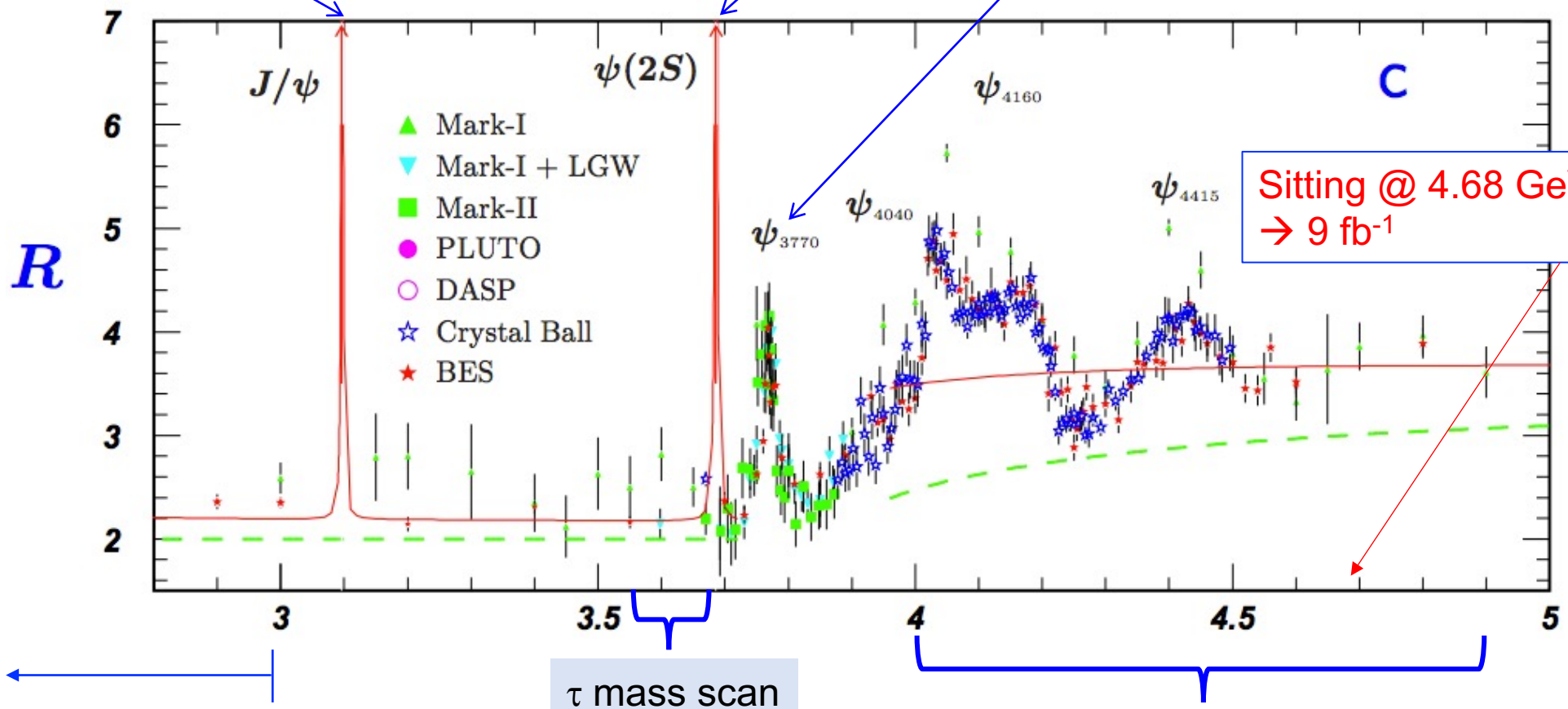
- Upgrade project approved by CAS in 2021.
- $\sqrt{s}$ up to 5.6 GeV; optimized @ 3.773 – 4.7 GeV.
- Luminosity enhanced by a factor of 3 @ 4.7 GeV.
- CGEM inner draft chamber installed.

Data – On resonance & Scan

10 B J/ψ events: light hadron, hyperon

2.7 B ψ(2S) events: charmonium

20 fb^{-1} ψ(3770): D mesons



Sitting @ 4.68 GeV at the moment
→ 9 fb^{-1}

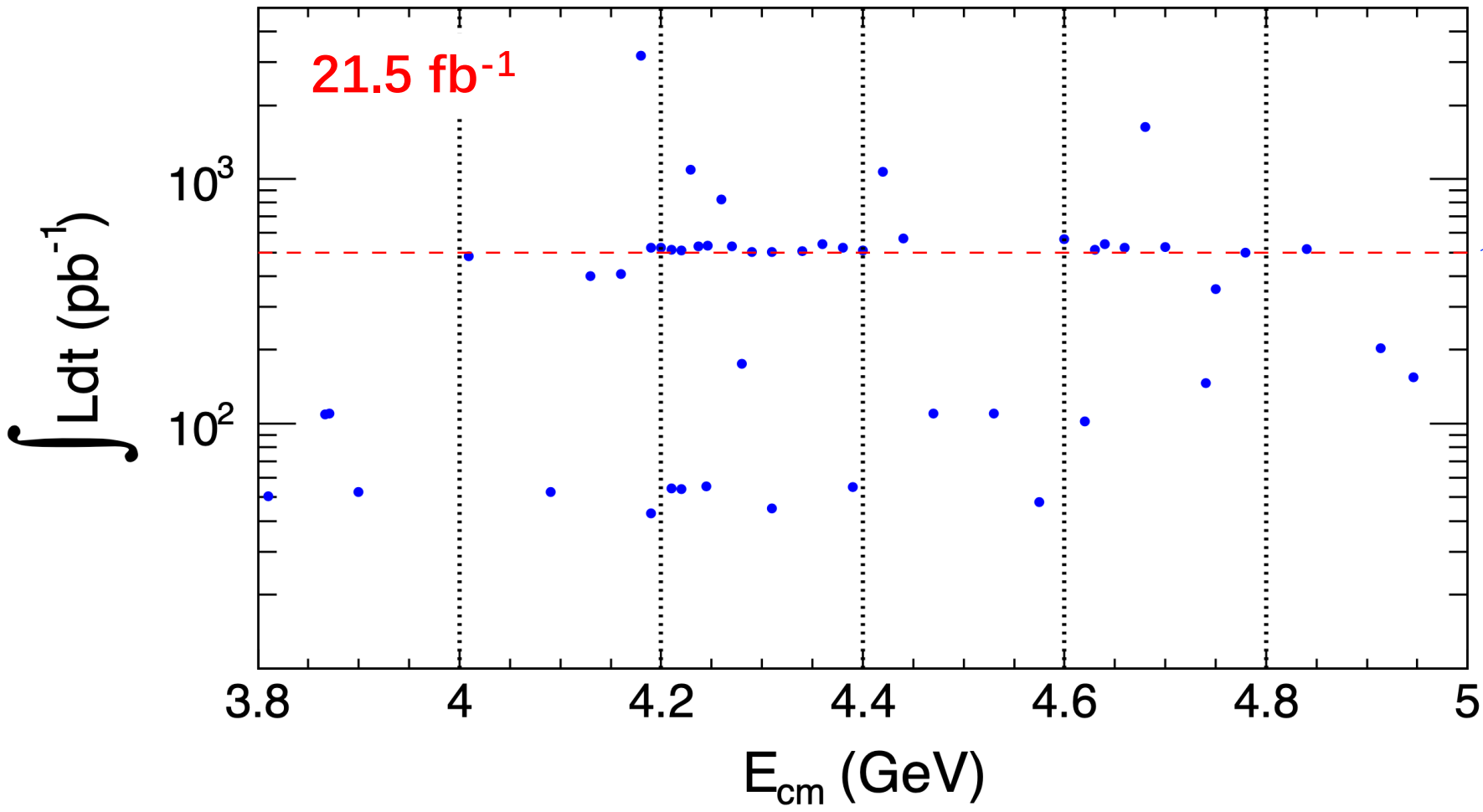
τ mass scan

Low energy scan: R-value, baryon pair

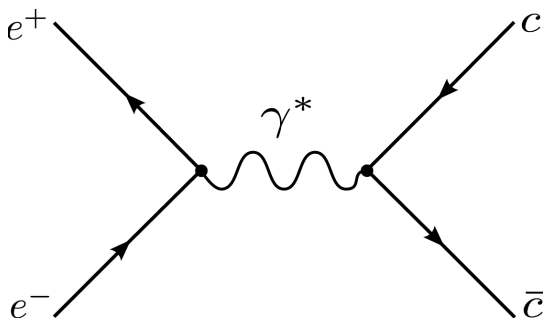
21.5 fb^{-1} High luminosity scan: XYZ, Ds, Λ_c…

BESIII high luminosity scan

Start from 2013, 0.5 fb^{-1}/10 MeV step scan from 4 – 4.9 GeV



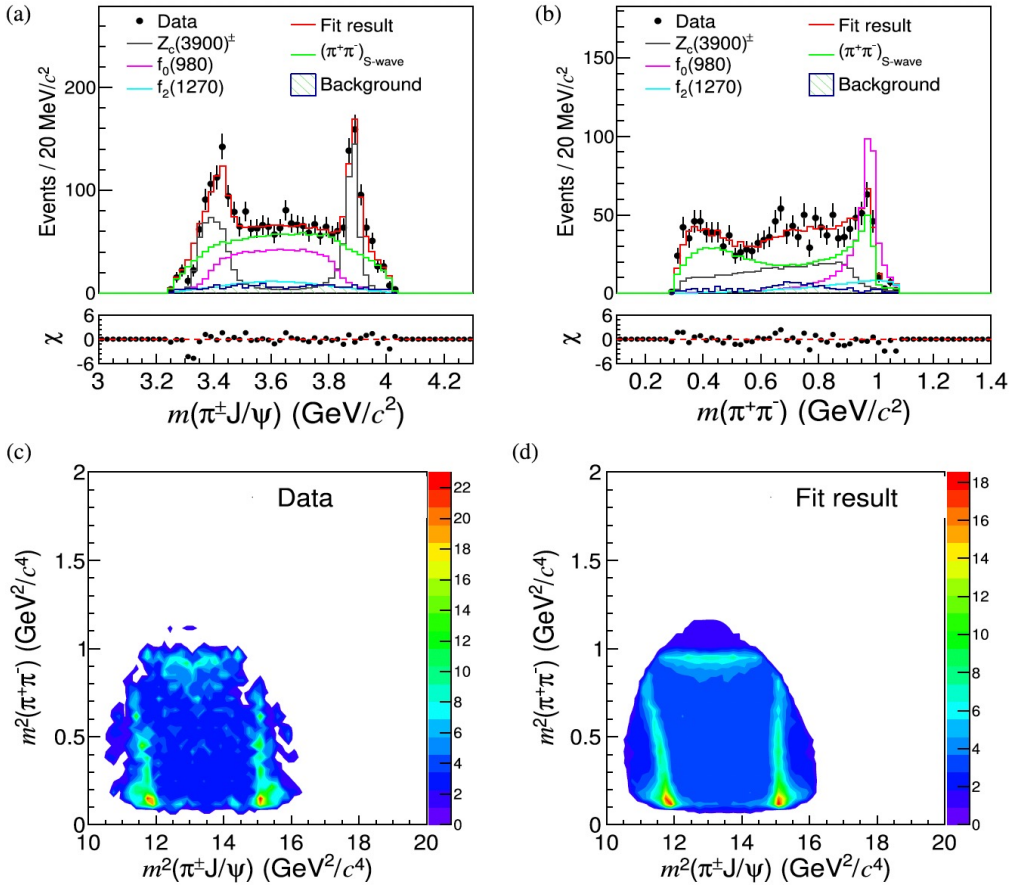
500 pb^{-1}, beam time
(1 month → <15 days)

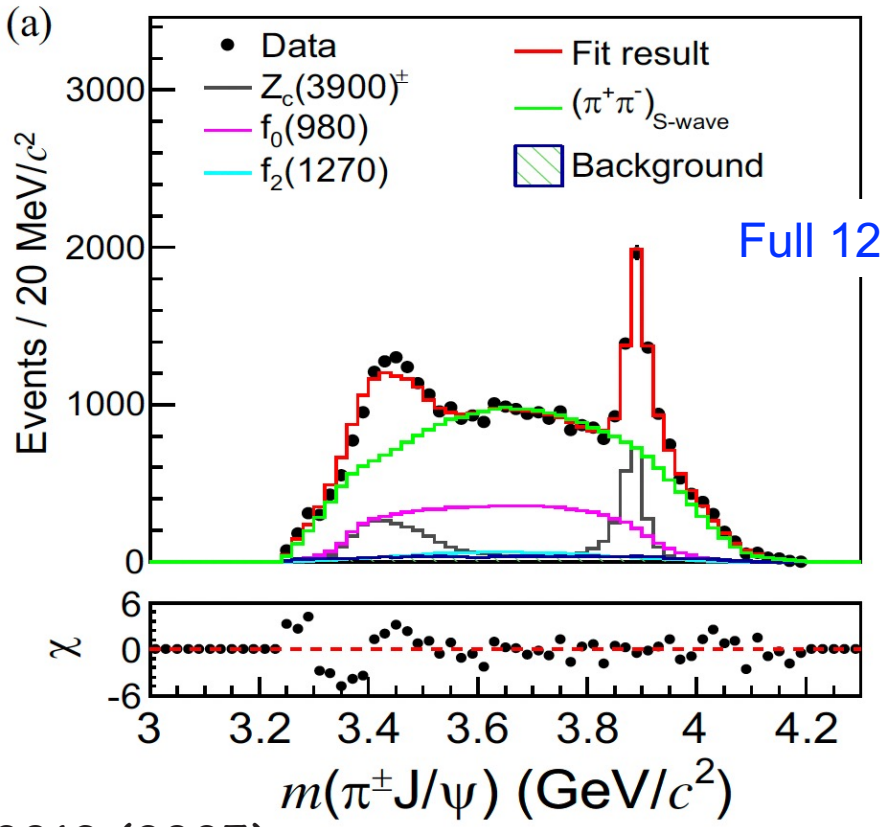


Charmonium-like Spectroscopy

$Z_c(3900)$ PWA

3 fb^{-1} @ 4.178 GeV





Full 12 fb^{-1} data

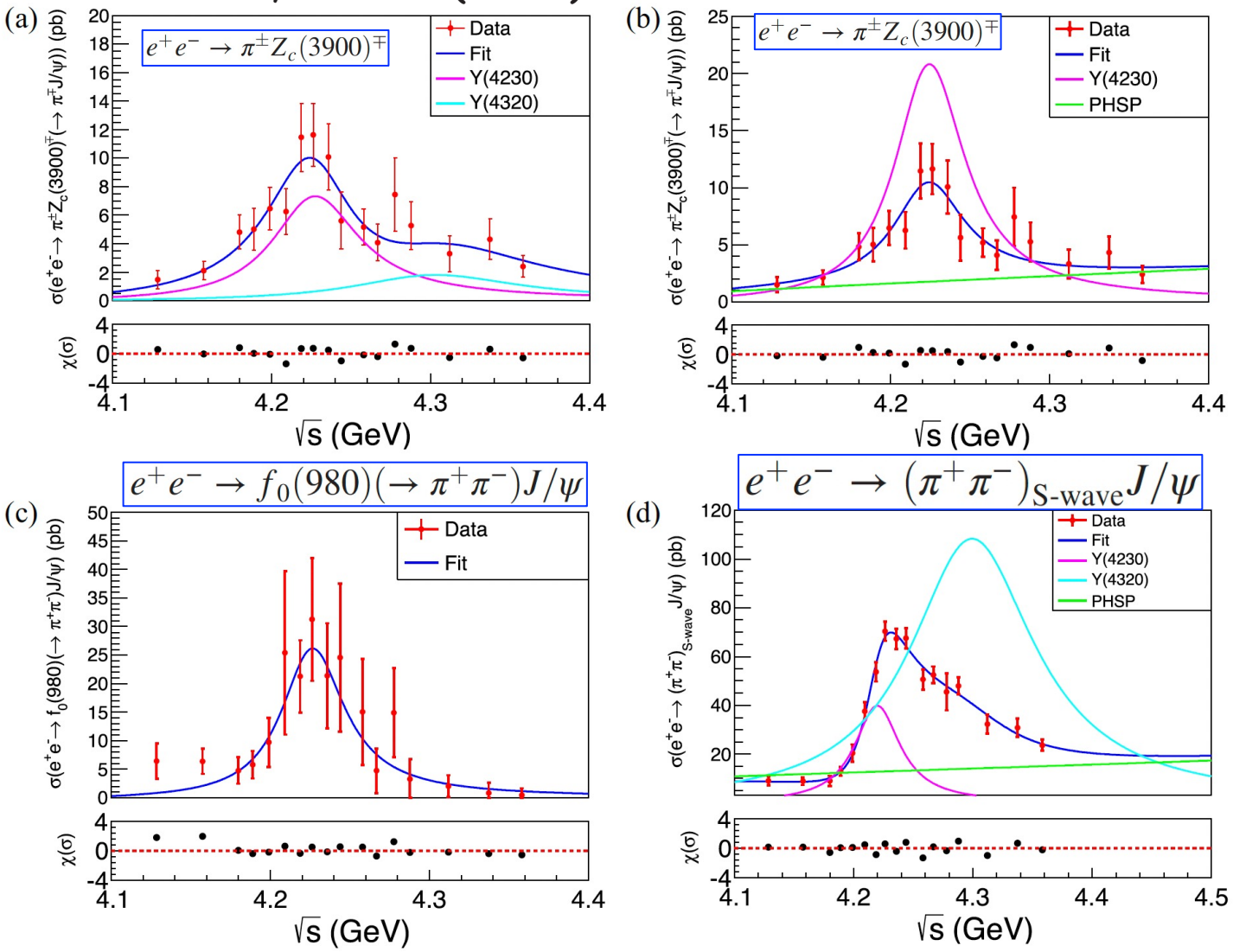
PRD 112, 092013 (2025)

Sample	M (MeV/c^2)	Γ (MeV)
4.1567–4.1989	3883.5 ± 1.6	38.6 ± 3.6
4.2091–4.2357	3884.0 ± 1.0	37.8 ± 1.6
4.2438–4.2776	3884.9 ± 1.8	34.2 ± 3.3
4.2866–4.3583	3890.0 ± 2.3	36.1 ± 4.2
Average	$3884.6 \pm 0.7 \pm 3.3$	$37.2 \pm 1.3 \pm 6.6$

- Due to different PHSP/production, grouped into 4 sets
- Agree with previous results (parameters / J^P)

$Z_c(3900)$ PWA – intermediate states

PRD 112, 092013 (2025)



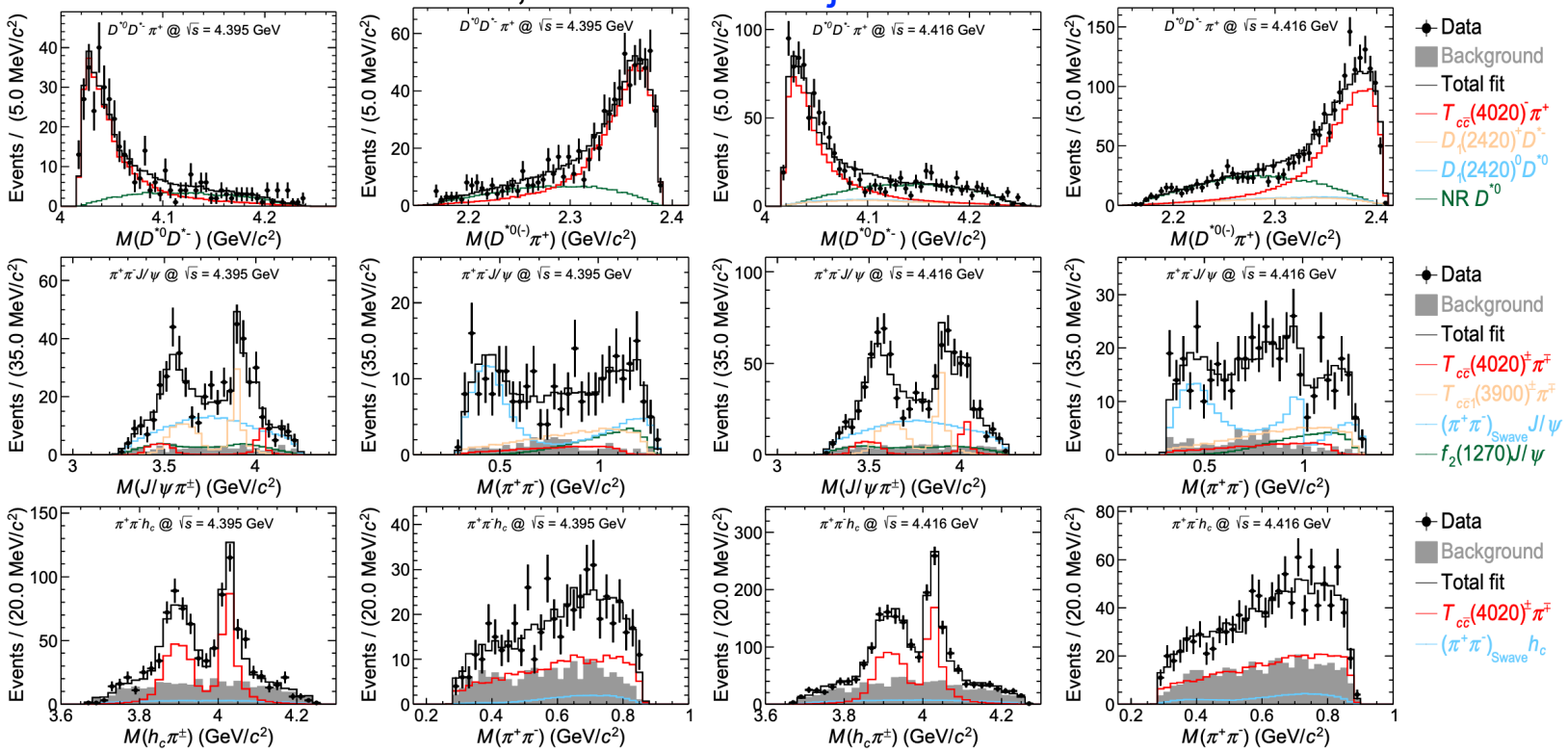
- Investigate the sub-processes production
- $\pi Z_c(3900)$ comes from Y(4230) decay
- $f_0(980)$ also comes from Y(4230) decay
- $(\pi\pi)_{\text{S-wave}}$ may have more sources, e.g. Y(4320)

Process	$Y(4220)$ M (MeV/c^2)	$Y(4220)$ Γ (MeV)	$Y(4320)$ Significance
$\pi^\pm Z_c(3900)^\mp$ (model I)	$4225.7 \pm 6.8 \pm 6.8$	$66.5 \pm 16.1 \pm 24.1$	2.1σ
$\pi^\pm Z_c(3900)^\mp$ (model II)	$4223.1 \pm 6.4 \pm 0.6$	$53.8 \pm 19.1 \pm 0.3$	2.0σ
$f_0(980)J/\psi$ (model III)	$4225.6 \pm 4.5 \pm 0.6$	$48.4 \pm 9.8 \pm 0.2$	0.5σ
$(\pi^+\pi^-)_{\text{S-wave}}J/\psi$ (model IV)	$4218.8 \pm 3.4 \pm 3.7$	$43.5 \pm 5.3 \pm 5.0$	11.7σ
$Y(4220)^{\text{ave}}$	$4225.7 \pm 4.1 \pm 3.4$	$57.5 \pm 9.4 \pm 12.1$	

PWA of e+e-→D*Dπ [$D_1(2420)D$ & $\pi Z_c(3900)$] will come soon

$Z_c(4020)$ PWA

arXiv: 2603.05564; Multi-channel joint PWA



$\sqrt{s}$ (GeV)	Process (X)	$\mathcal{L}$ (pb^{-1})	$N_{\rm data}$	$N_{\rm bkg}$	$\mathcal{W}_{\rm bkg}$
4.416	$D^{*0}D^{*-}\pi^+$	1090.7	1038	—	—
	$\pi^+\pi^- J/\psi$		467	227	0.25
	$\pi^+\pi^- h_c$		1085	821	0.5
4.395	$D^{*0}D^{*-}\pi^+$	508.2	392	—	—
	$\pi^+\pi^- J/\psi$		260	118	0.25
	$\pi^+\pi^- h_c$		495	360	0.5

$$R(m) = \frac{1}{m^2 - m_0^2 + im\,\Gamma(m)},$$

$Z_c(3900)$ fixed

$$\Gamma(m) = \Gamma_{D^{*0}D^{*-}}(m) + \Gamma_{\pi^- J/\psi}(m) + \Gamma_{\pi^- h_c}(m) + \Gamma_{\rm unknown}(m),$$

$$\begin{aligned} m_{\rm pole1} &= 4022.44 \pm 1.55\,{\rm MeV}/c^2, \\ \Gamma_{\rm pole1} &= 38.54 \pm 2.94\,{\rm MeV}, \\ m_{\rm pole2} &= 4023.01 \pm 1.35\,{\rm MeV}/c^2, \\ \Gamma_{\rm pole2} &= 35.02 \pm 2.20\,{\rm MeV}. \end{aligned}$$

Production cross section	4.395 GeV	4.416 GeV
$\sigma^B(e^+e^- \to T_{c\bar{c}}(4020)^-\pi^+ + c.c.)\cdot\mathcal{B}[T_{c\bar{c}}(4020)^- \to D^{*0}D^{*-}]$	$335 \pm 21 \pm 35$	$336 \pm 26 \pm 28$
$\sigma^B(e^+e^- \to T_{c\bar{c}}(4020)^-\pi^+ + c.c.)\cdot\mathcal{B}[T_{c\bar{c}}(4020)^- \to \pi^- J/\psi](\times 100)$	$108 \pm 25 \pm 48$	$139 \pm 30 \pm 55$
$\sigma^B(e^+e^- \to T_{c\bar{c}}(4020)^-\pi^+ + c.c.)\cdot\mathcal{B}[T_{c\bar{c}}(4020)^- \to \pi^- h_c]$	$30 \pm 4 \pm 8$	$30 \pm 3 \pm 6$

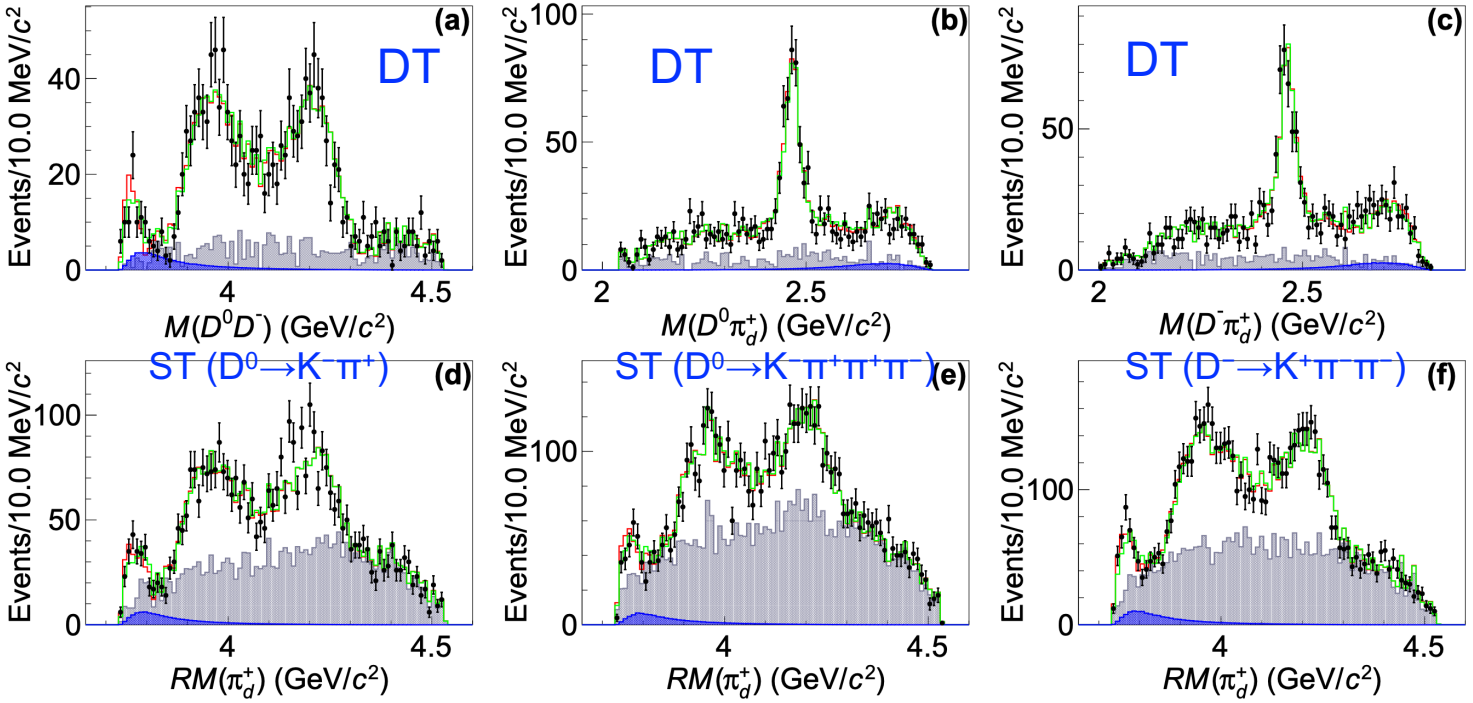
$J^P = 1^+$ significance 11.7σ over $1^-/2^+/2^-$

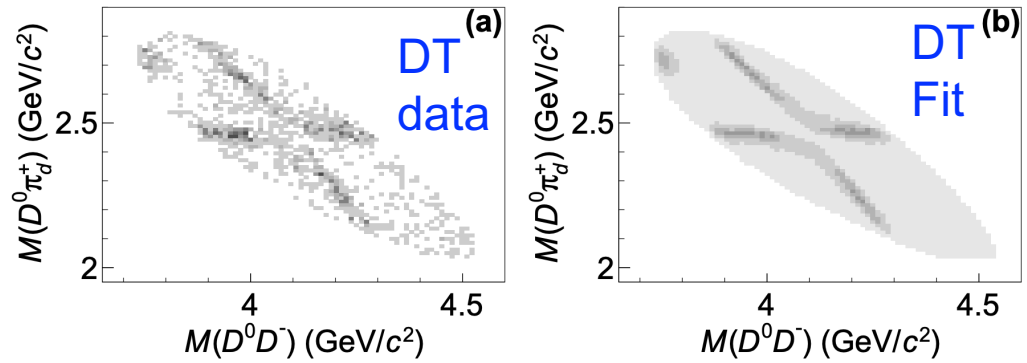
Observation of $X(3790)^- \to D^0D^-$

arXiv: 2607.29138

$e^+e^- \to D^0D^-\pi^+ + c.c.$

1667 pb^{-1} @ 4.68 GeV





Fit with X(3790)
Fit without X(3790)
X(3790) signal
Sideband background

$$\frac{1}{m^2 - m_0^2 + igm_0\frac{q}{m}}$$

Resonance	m_0 (MeV/c^2)	Γ_0 or g	FF (%)	$\mathcal{S}$
$D_2^*(2460)^+$	$2469.8 \pm 0.9 \pm 2.4$	$(42.6 \pm 1.6 \pm 0.7)$ MeV	9.1 ± 0.9	-
$\bar{D}_2^*(2460)^0$	$2468.4 \pm 0.9 \pm 1.8$	$(43.1 \pm 1.5 \pm 2.8)$ MeV	9.0 ± 0.9	-
$D_1^*(2760)$	$2716.8 \pm 2.4 \pm 6.3$	$(91 \pm 5 \pm 18)$ MeV	2.3 ± 0.3	6.4σ
$D_1^*(2600)$	$2563 \pm 14 \pm 22$	$(222 \pm 25 \pm 38)$ MeV	3.6 ± 0.4	5.5σ
$X(3790)^-$	$3794.7 \pm 6.0 \pm 8.7$	$(1.6 \pm 0.2 \pm 0.2)$ GeV	1.3 ± 0.3	5.3σ
$D_3^*(2750)$	-	-	2.9 ± 0.1	11σ
D^*	-	-	78.6 ± 2.2	-

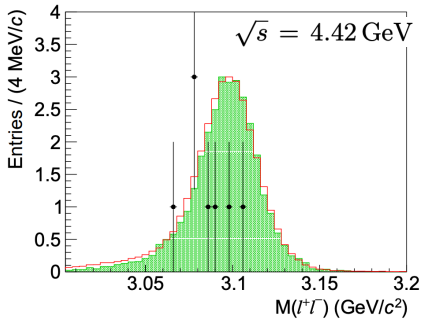
- Both DT & ST methods are used for events reconstruction
- Recoil the direct pion (π_d) to obtain the D^0D^-+c.c. system
- A charged charmonium-like structure X(3790) is needed in the PWA with statistical significance >5.3σ.
- M[X(3790)]=(3794.7±6.0±8.7) MeV/c^2; $J^P=1^-$ is favored

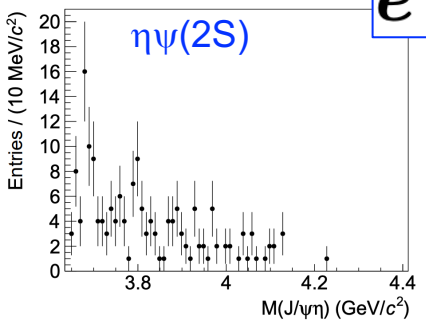
Search for $Z_c(3900)$ iso-scalar partner

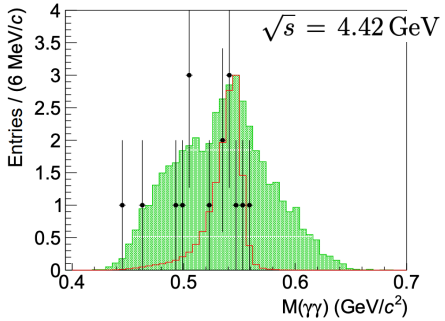
arXiv:2601.15882

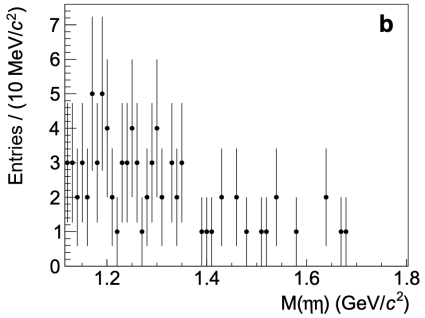
Full reconstruction

$e^+e^- \to \eta\eta J/\psi$

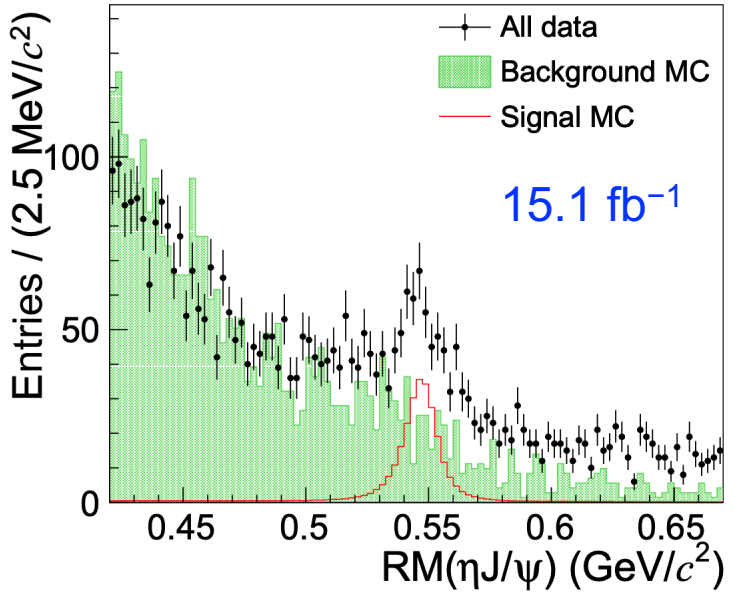


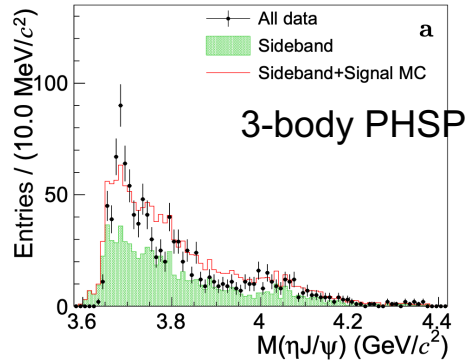


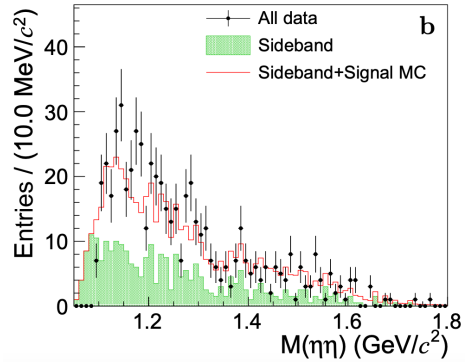


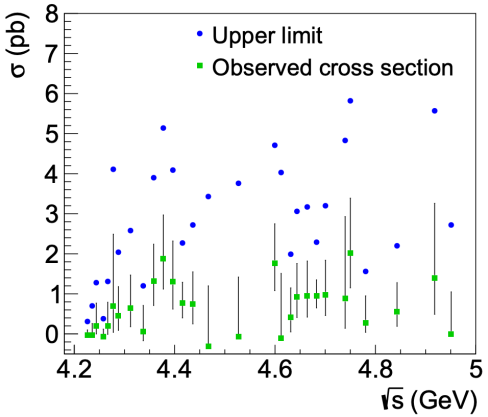


Partial reconstruction

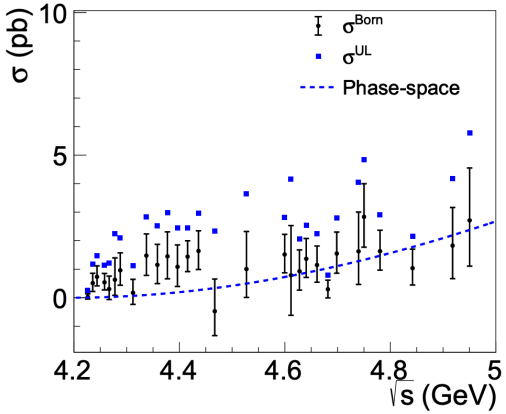








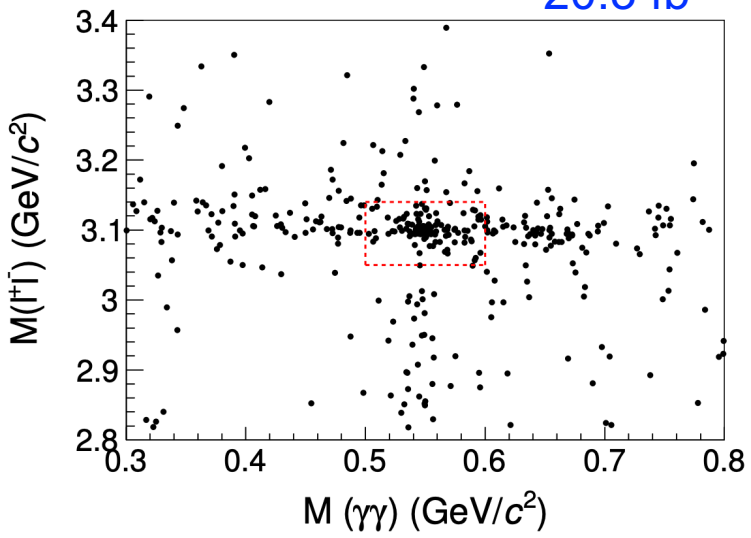
Suffer from low statistics, no evidence yet



Search for $Z_c(3900)$ iso-scalar partner

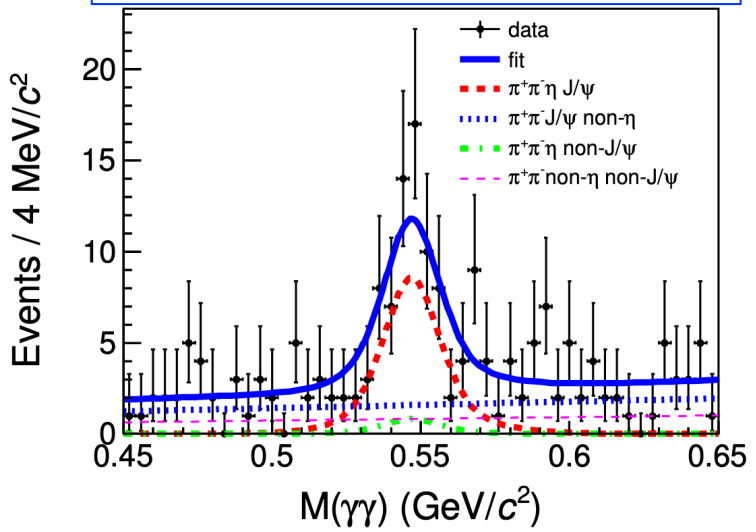
arXiv: 2607.07446

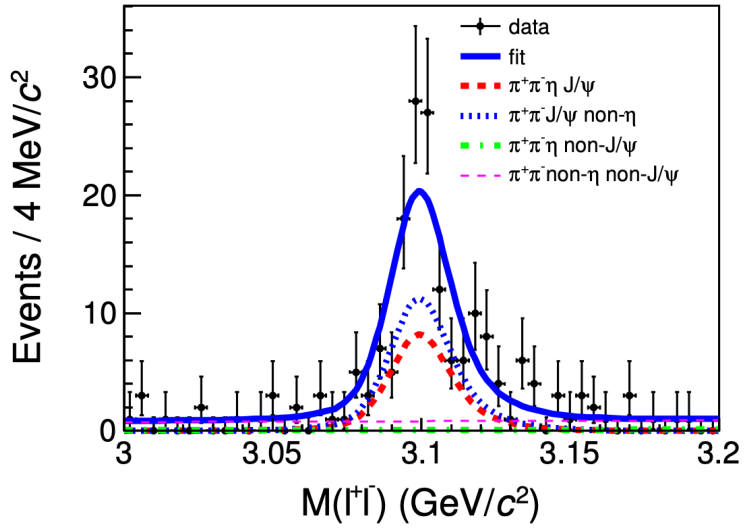
20.3 fb^{-1}

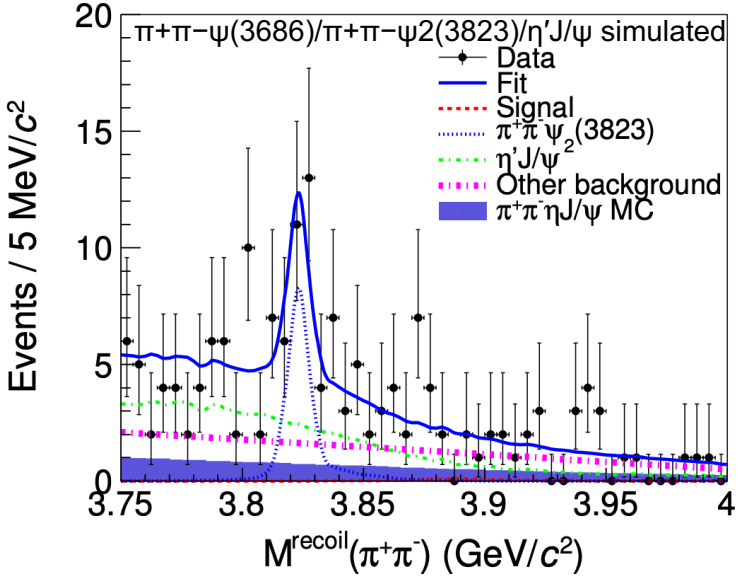


$e^+e^- \to \pi^+\pi^-\eta J/\psi$

E_{cm} = 4.18 - 4.95 GeV







$$f_{2D} = S_\eta S_{J/\psi} + B_{\gamma\gamma} S_{J/\psi} + S_\eta B_{\ell^+\ell^-} + B_{\gamma\gamma} B_{\ell^+\ell^-}$$

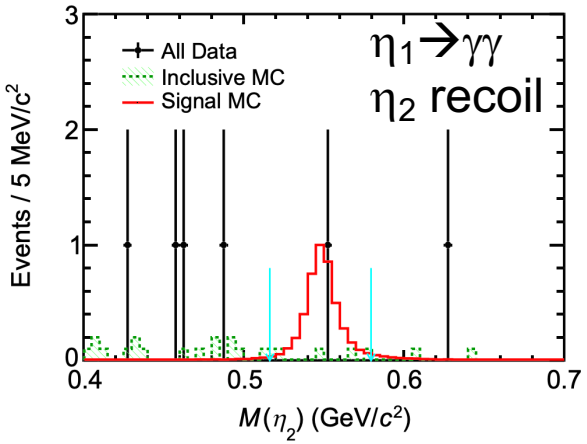
- The $\pi^+\pi^-\eta J/\psi$ events is observed with 6.0σ significance (N = 58.2±10.2±3.4)
- Can not determine the intermediate state within current statistics, e.g. $f_1(1285)/\eta(1295)$
- No obvious new structure in the M(ηJ/ψ) mass distribution
- Report the UL of average production cross section [o(0.1 pb)] & E_{cm}-dependent production cross section.

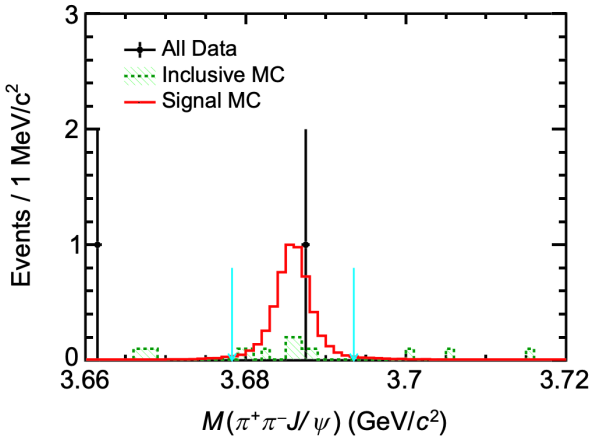
Search for 0^{--} molecule $\psi_0(4360)$

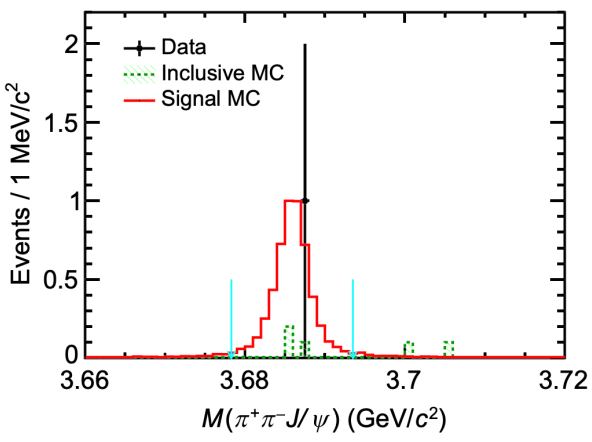
PRD 113, 092013 (2026)

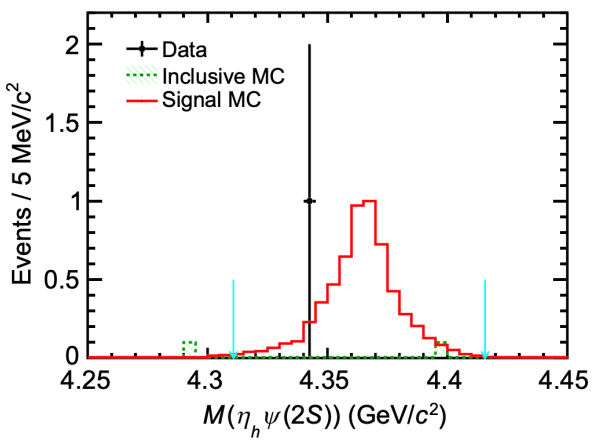
$e^+e^- \to \eta\eta\psi(2S)$

$e^+e^- \to \eta\psi_0(4360)$









$e^+e^- \to \eta\eta\psi(2S)$

$\sqrt{s}$ (MeV)	$\mathcal{L}(\text{pb}^{-1})$	N_{obs}	N_{sig}	N^{UL}	$(1+\delta^{\text{sig}}_{\text{ISR}})$	$(1+\delta_{\text{VP}})$	$\epsilon(\%)$	σ^{Born} (pb)	σ^{UL} (pb)
4843.07	525.16	0	$0.0^{+1.0}_{-0.0}$	<2.0	0.706	1.056	10.7	$0.0^{+1.1}_{-0.0}$	<2.3
4918.02	207.82	0	$0.0^{+1.0}_{-0.0}$	<2.0	0.750	1.056	9.7	$0.0^{+2.9}_{-0.0}$	<6.0
4950.93	159.28	1	$1.0^{+1.4}_{-0.7}$	<3.6	0.762	1.056	9.5	$3.9^{+5.5}_{-2.7} \pm 0.2$	<15

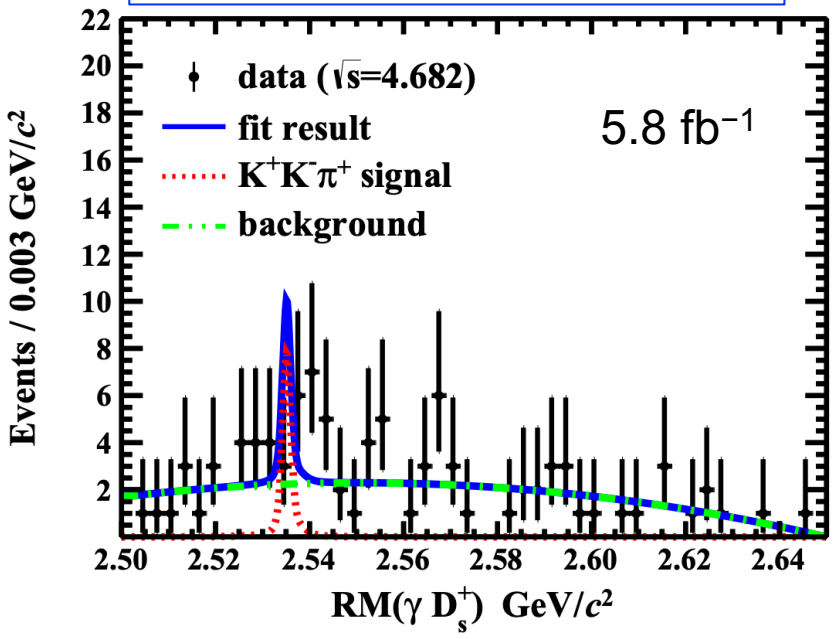
$e^+e^- \to \eta\psi_0(4360)$

$\sqrt{s}$ (MeV)	$\mathcal{L}(\text{pb}^{-1})$	N^{UL}	$(1+\delta^{\text{sig}}_{\text{ISR}})$	$(1+\delta_{\text{VP}})$	$\epsilon(\%)$	$\sigma^{\text{UL}} \cdot \mathcal{B}$ (pb)
4918.02	207.82	<2.0	0.676	1.056	9.6	<6.8
4950.93	159.28	<3.6	0.687	1.056	9.8	<16

Search for 1^{-+} hybrid/molecule & baryonium

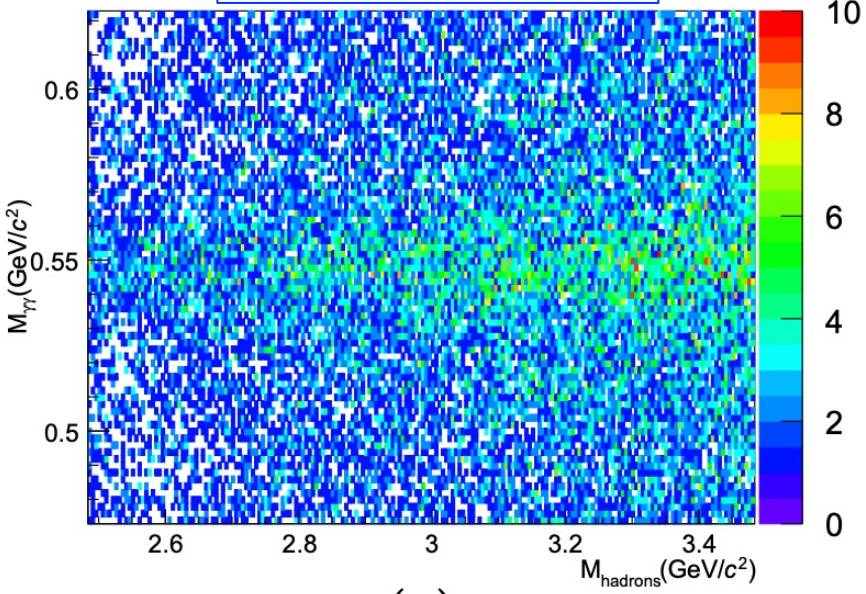
arXiv: 2503.11015

$e^+e^- \to \gamma D_s^+ D_{s1}^-(2536)$



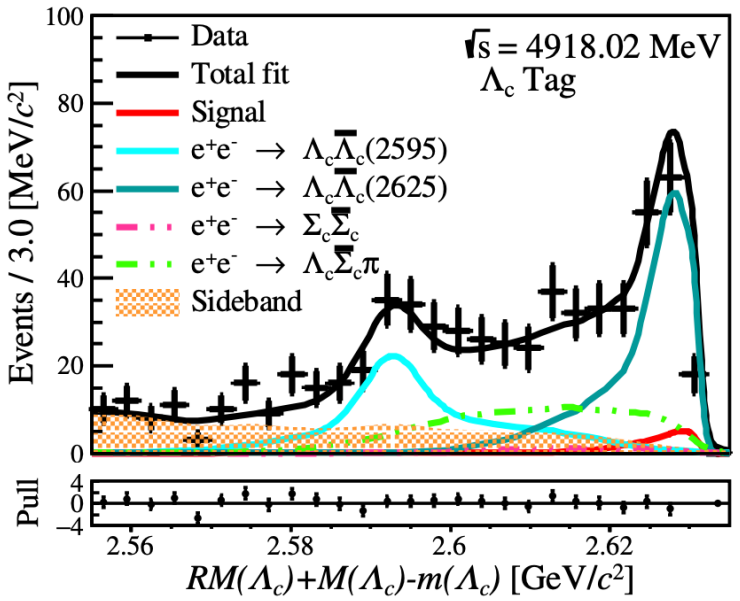
arXiv: 2504.13539

$e^+e^- \to \gamma\eta^{(\prime)}\eta_c$



arXiv: 2508.18594

$e^+e^- \to \pi^+ H_c^-,\ H_c^- \to \pi^- \Lambda_c^+ \bar{\Lambda}_c^-$

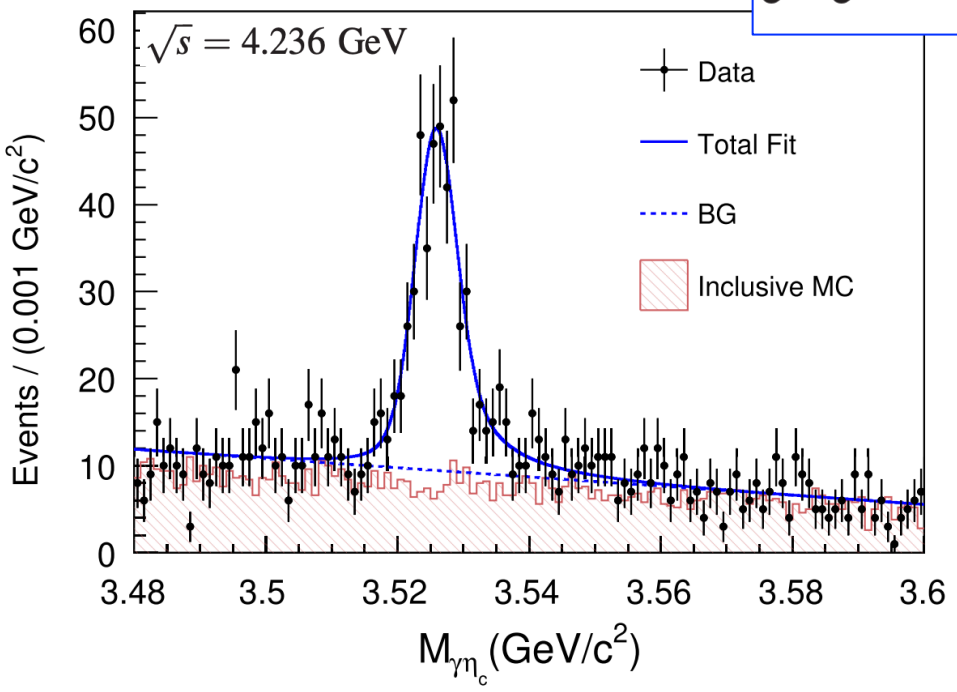


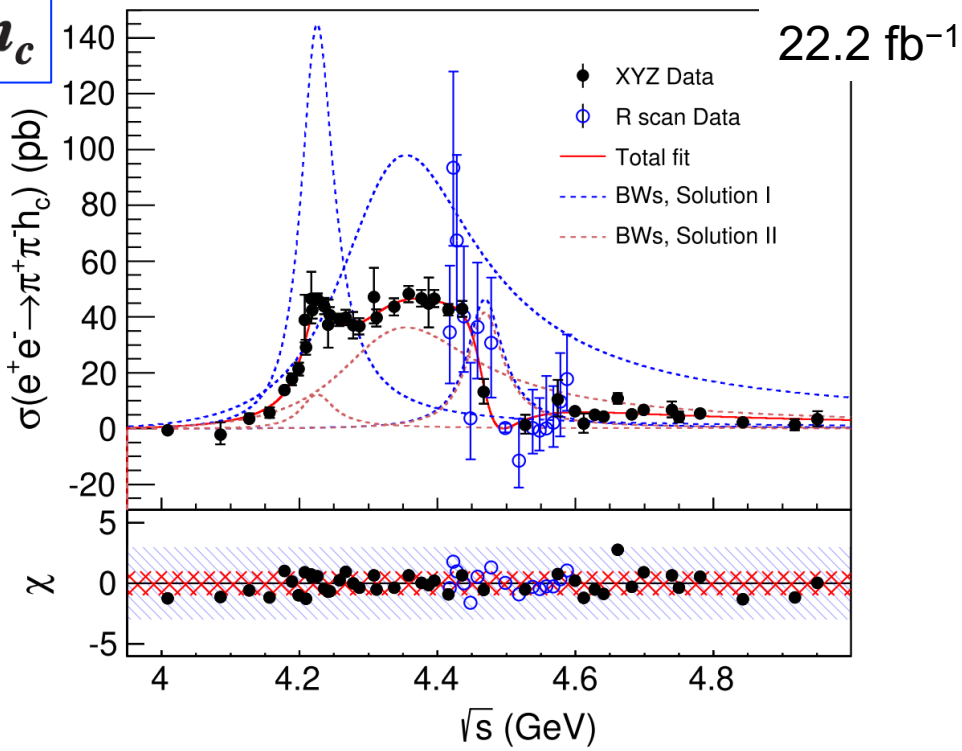
- Search for a molecule state in $D_sD_{s1}(2536)$ system
- Search for a hybrid state in $\eta/\eta'\eta_c$ final state
- Search for a bound state $H_c \to \Lambda_c\Sigma_c$

e^+e^-→hidden charm cross section

PRL 135, 071901 (2025)

$e^+e^- \to \pi^+\pi^- h_c$





$$|BW_1(\sqrt{s}) + e^{i\phi_2} BW_2(\sqrt{s}) + e^{i\phi_3} BW_3(\sqrt{s})|^2$$

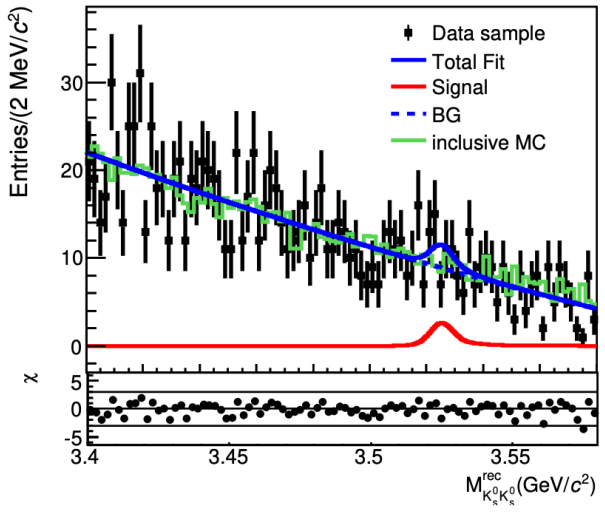
Parameter	R_1	R_2	R_3
M (MeV/c^2)	$4223.6^{+3.6+2.6}_{-3.7-2.9}$	$4327.4^{+20.1+10.7}_{-18.8-9.3}$	$4467.4^{+7.2+3.2}_{-5.4-2.7}$
Γ (MeV)	$58.5^{+10.8+6.7}_{-11.4-6.5}$	$244.1^{+34.0+24.2}_{-27.1-18.3}$	$62.8^{+19.2+9.9}_{-14.4-7.0}$
$\Gamma_{ee} \cdot \mathcal{B}(R \to \pi^+\pi^- h_c)$ (eV)	$10.2^{+1.2+1.4}_{-1.5-1.4}$ $(0.9^{+0.4+0.3}_{-0.4-0.2})$	$29.1^{+5.7+4.4}_{-3.9-3.4}$ $(10.8^{+2.5+1.9}_{-1.8-1.5})$	$3.9^{+3.5+1.7}_{-1.7-0.5}$ $(3.5^{+3.0+1.5}_{-1.6-0.7})$
ϕ (rad)	...	$3.6^{+0.1+0.1}_{-0.1-0.1}$ $(0.7^{+0.3+0.2}_{-0.3-0.2})$	$0.7^{+0.3+0.1}_{-0.3-0.2}$ $(-2.2^{+0.3+0.2}_{-0.3-0.1})$

- R1 → Y(4230)
- R2 → Y(4320)/Y(4360)
- Inclusion of R3 is necessary for reproducing the drop ~4.5 GeV.
- Interference/mixing of charmonium can not explain

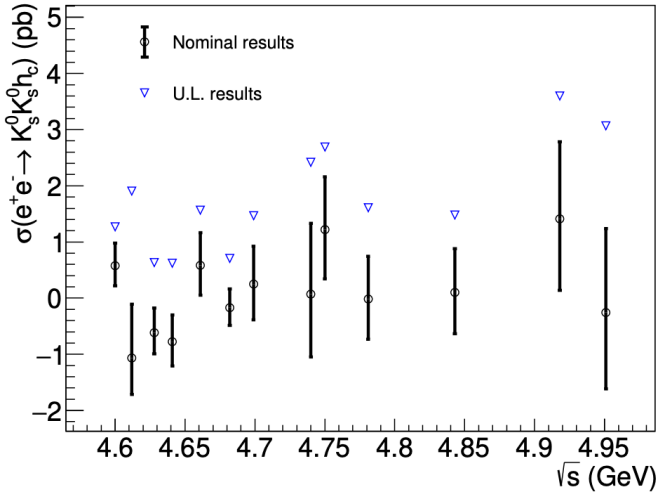
e^+e^-→hidden charm cross section

JHEP05(2025)144

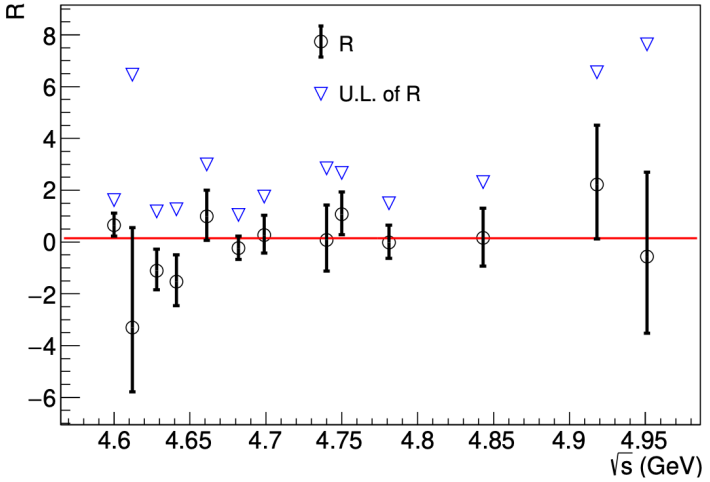
6.4 fb^{-1}



$e^+e^- \to K^0_S K^0_S h_c$



$\frac{\sigma(e^+e^- \to K^0_S K^0_S h_c)}{\sigma(e^+e^- \to K^0_S K^0_S J/\psi)}$ =0.15±0.22

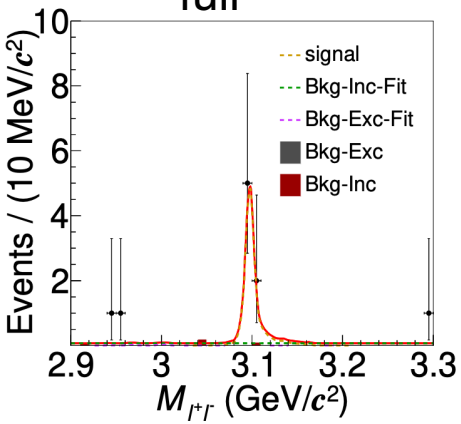


$e^+e^- \to K^0 K^- \pi^+ J/\psi$

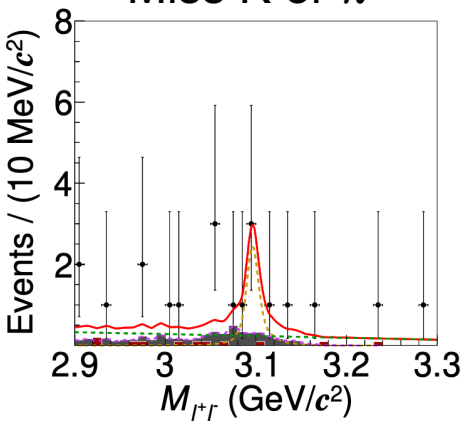
8.86 fb^{-1}

arXiv: 2510.13274

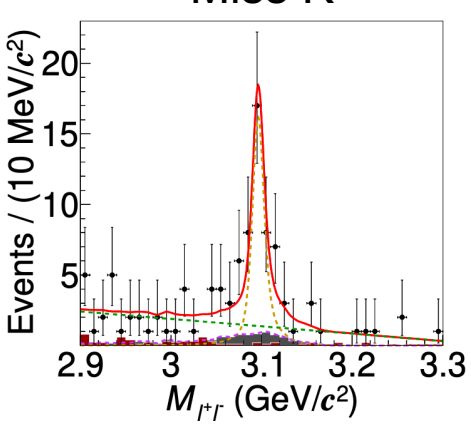
full

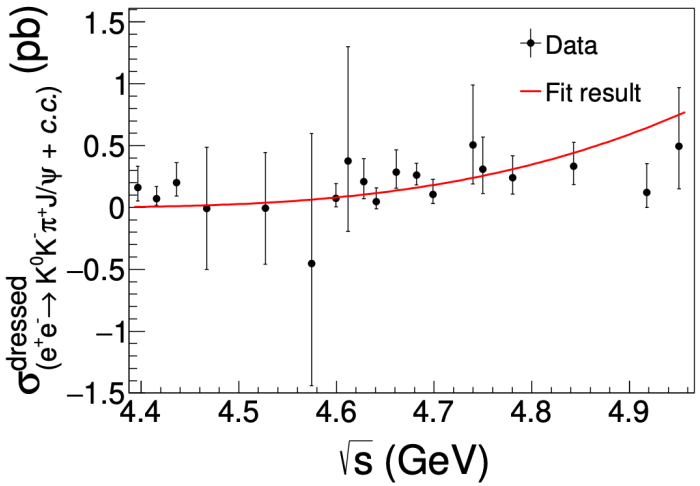


Miss K or π



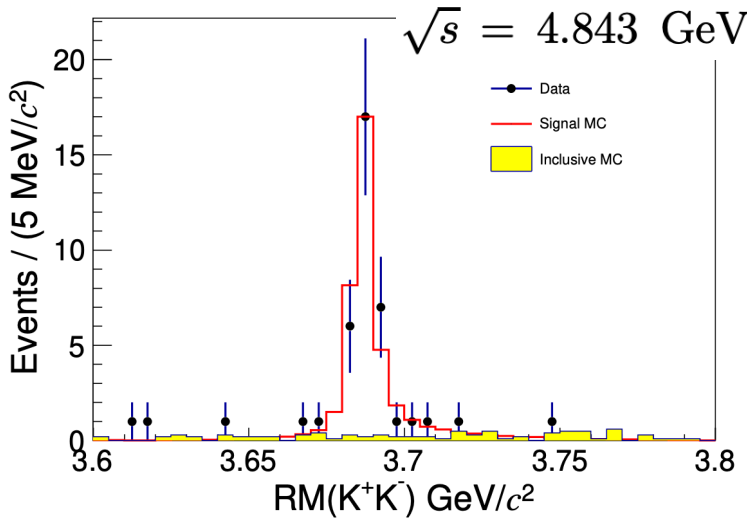
Miss K^0



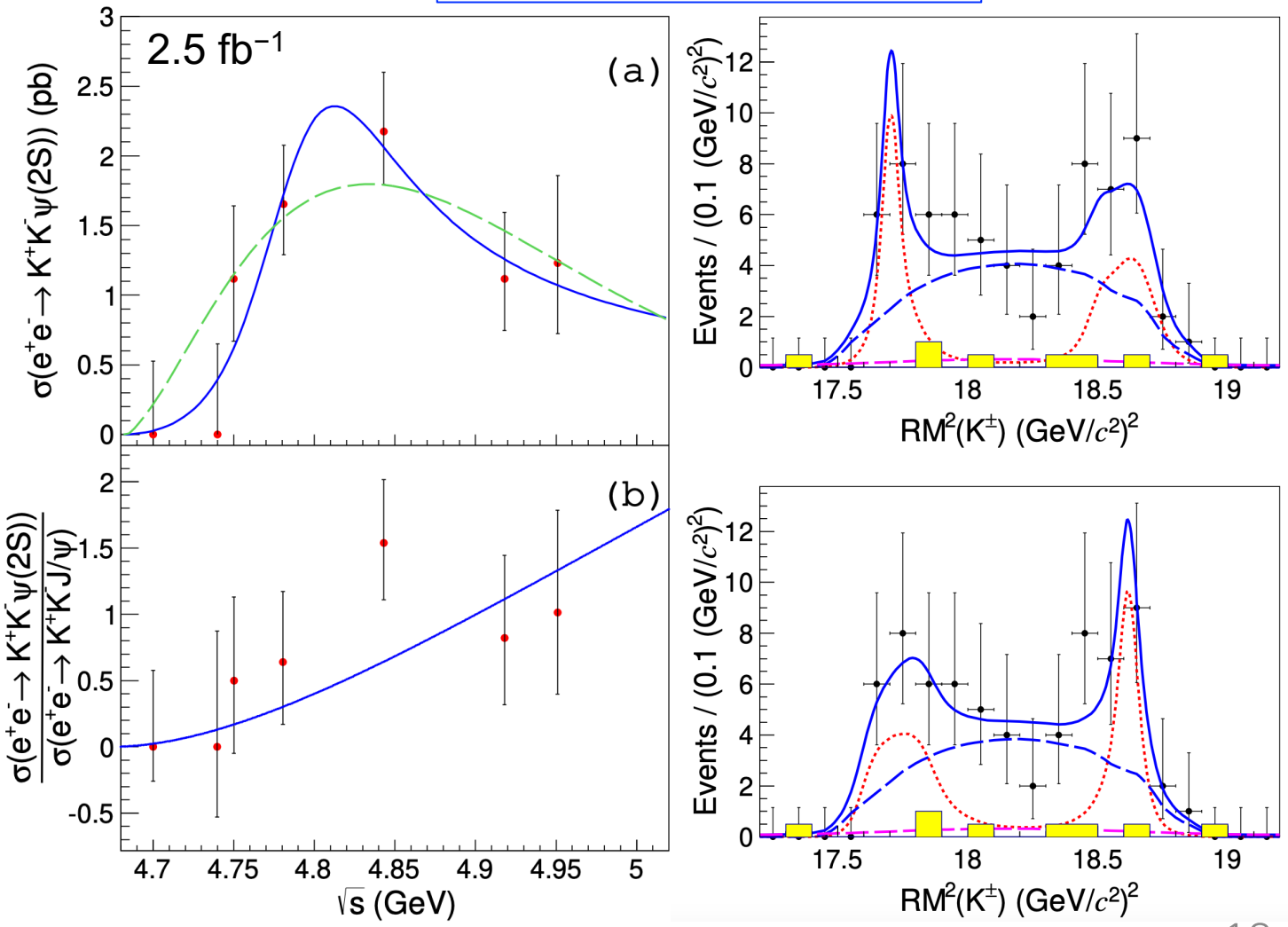


e^+e^-→hidden charm cross section

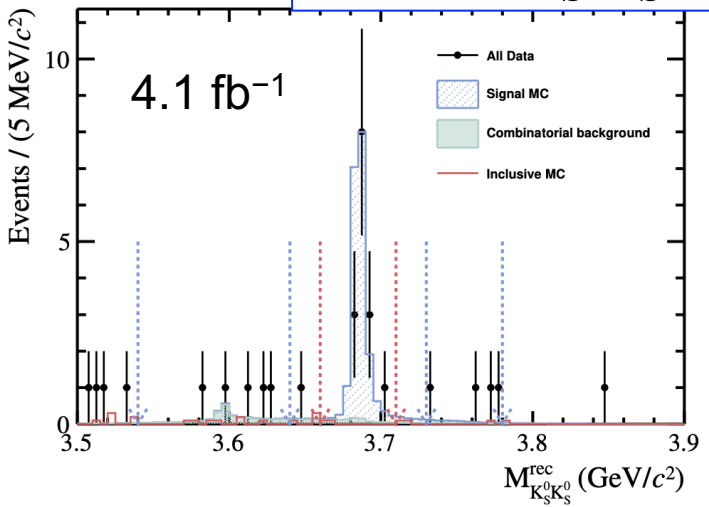
arXiv: 2407.20009



$e^+e^- \to K^+K^-\psi(2S)$

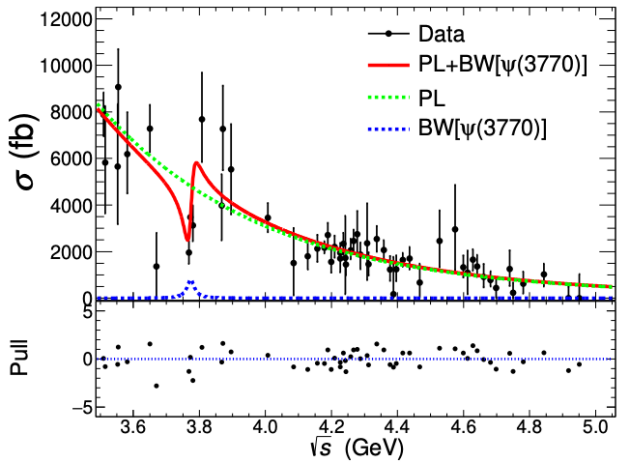


arXiv: 2411.15752 $e^+e^- \to K^0_S K^0_S \psi(3686)$

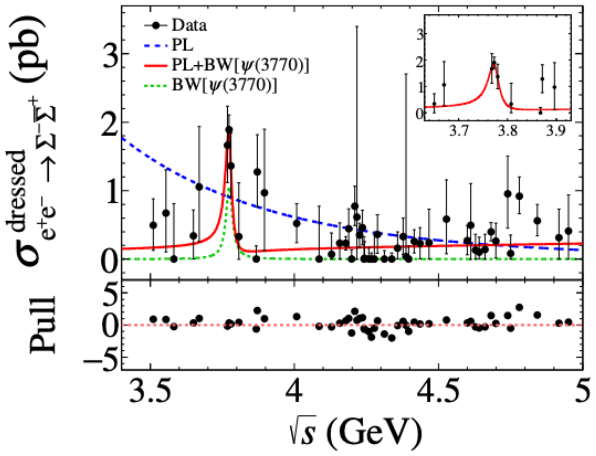


e^+e^-→light baryon/hadron cross section

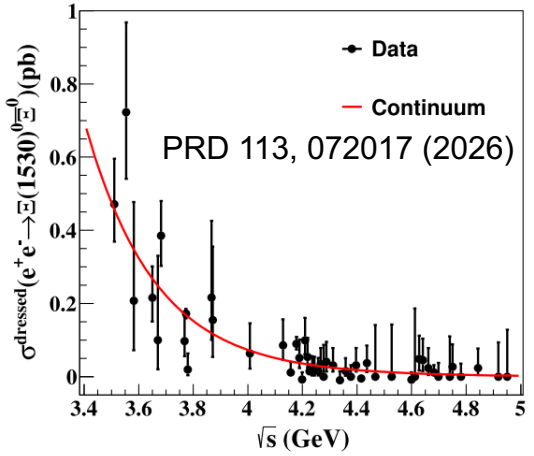
$e^+e^- \to K^+\Xi^0\bar{\Sigma}^-$ arXiv: 2605.19780



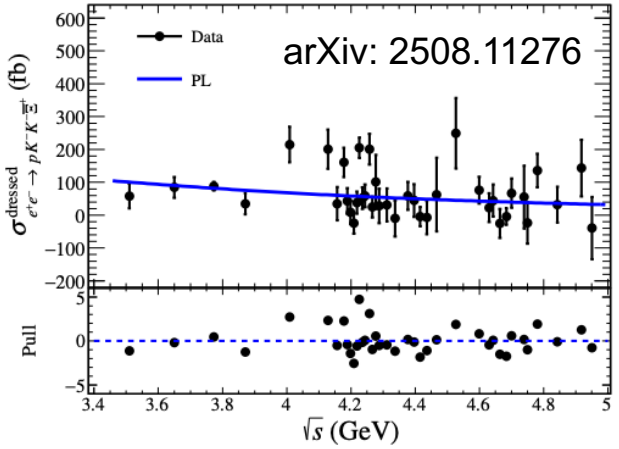
$e^+e^- \to \Sigma^-\bar{\Sigma}^+$ arXiv: 2602.23835



$e^+e^- \to \Xi(1530)^0\bar{\Xi}^0$

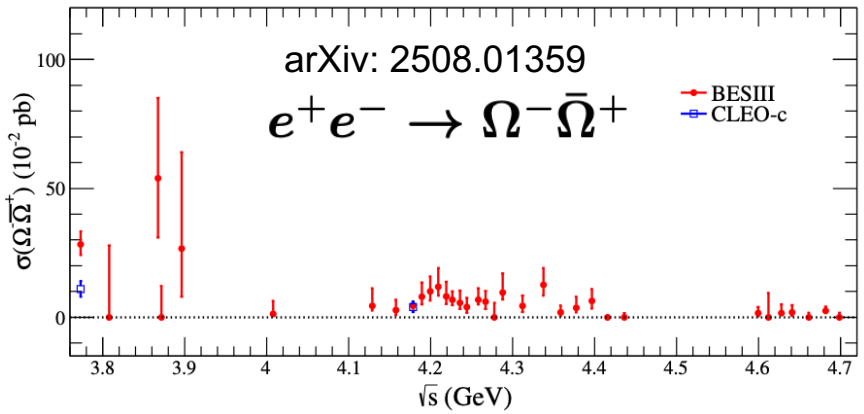


$e^+e^- \to pK^-K^-\bar{\Xi}^+$



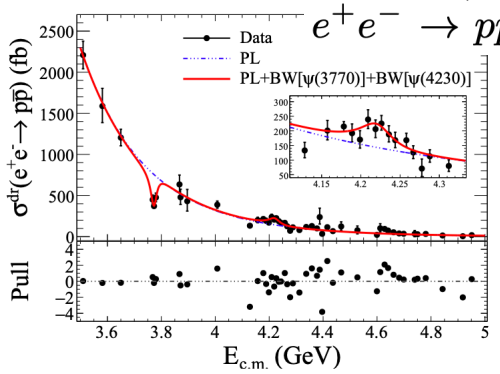
arXiv: 2508.01359

$e^+e^- \to \Omega^-\bar{\Omega}^+$



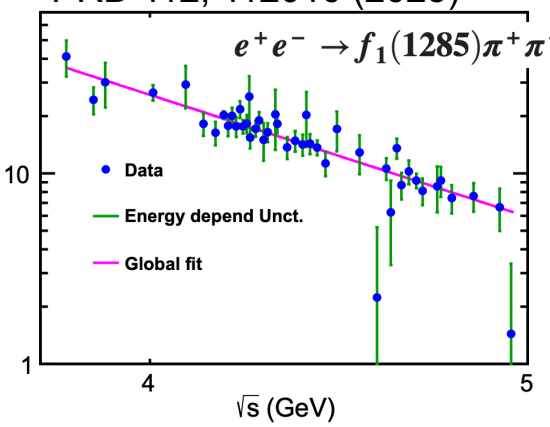
arXiv: 2606.22759

$e^+e^- \to p\bar{p}$



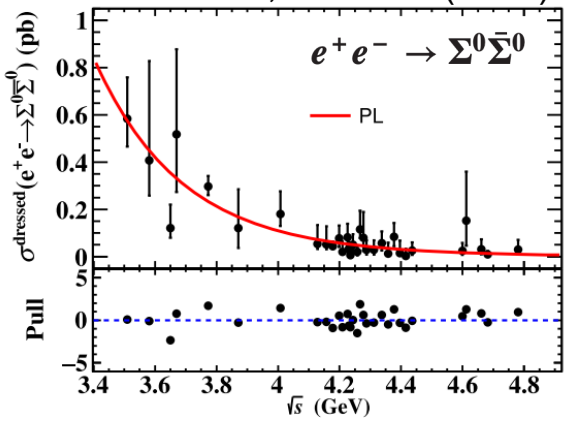
PRD 112, 112010 (2025)

$e^+e^- \to f_1(1285)\pi^+\pi^-$



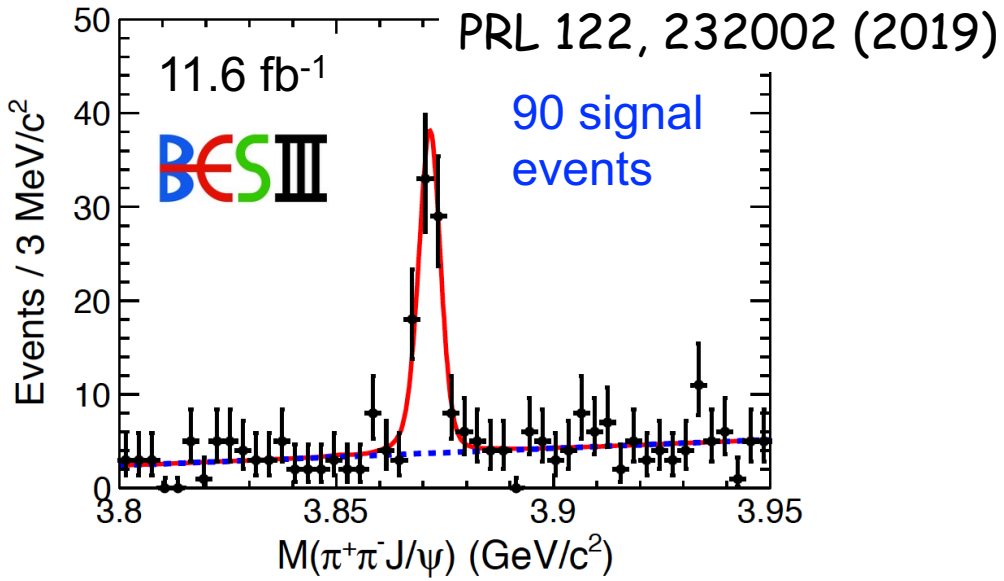
PRD 111, L051502 (2025)

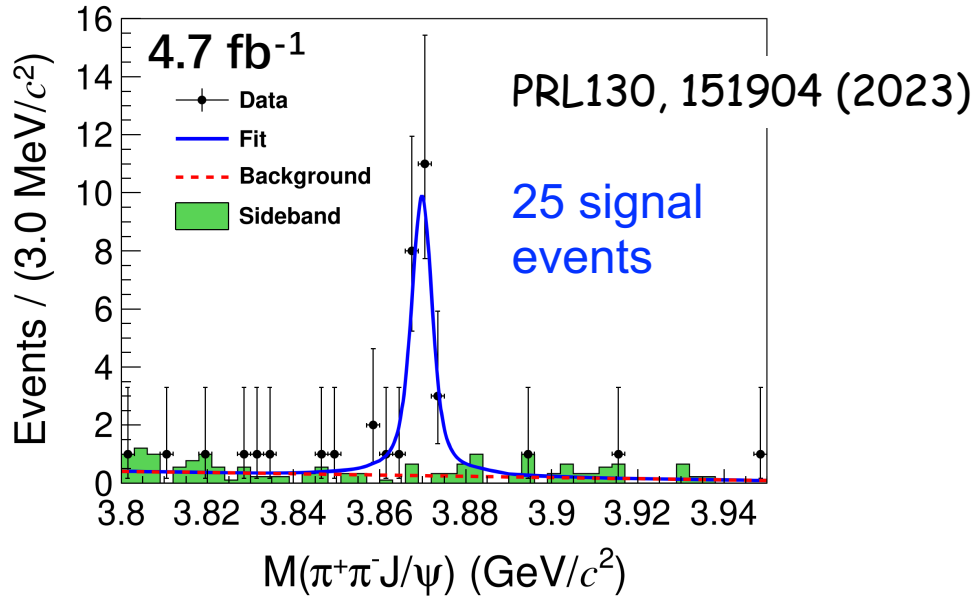
$e^+e^- \to \Sigma^0\bar{\Sigma}^0$

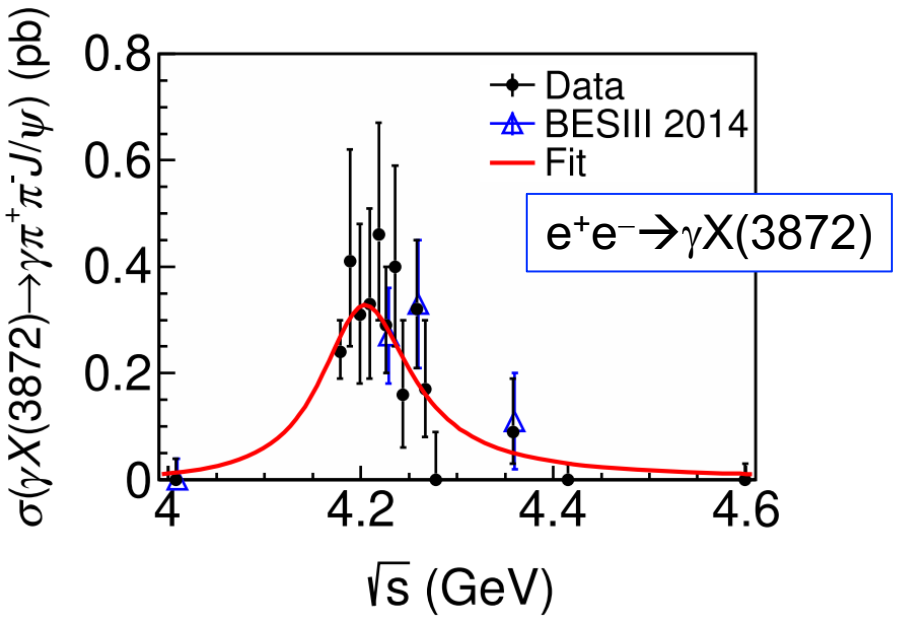


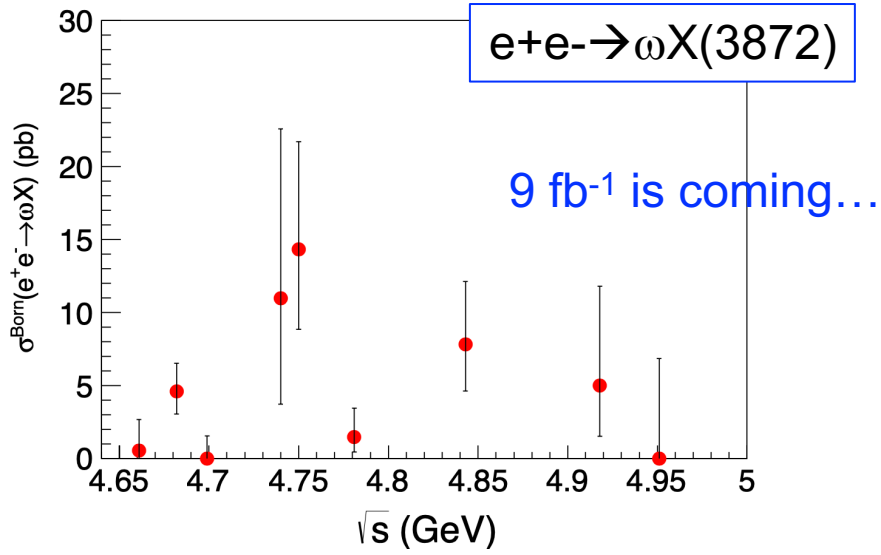
- Charmonium-like states coupling is weak → not a compact structure?
- Perhaps ψ(3770) contribution is observed !

Study of X(3872)



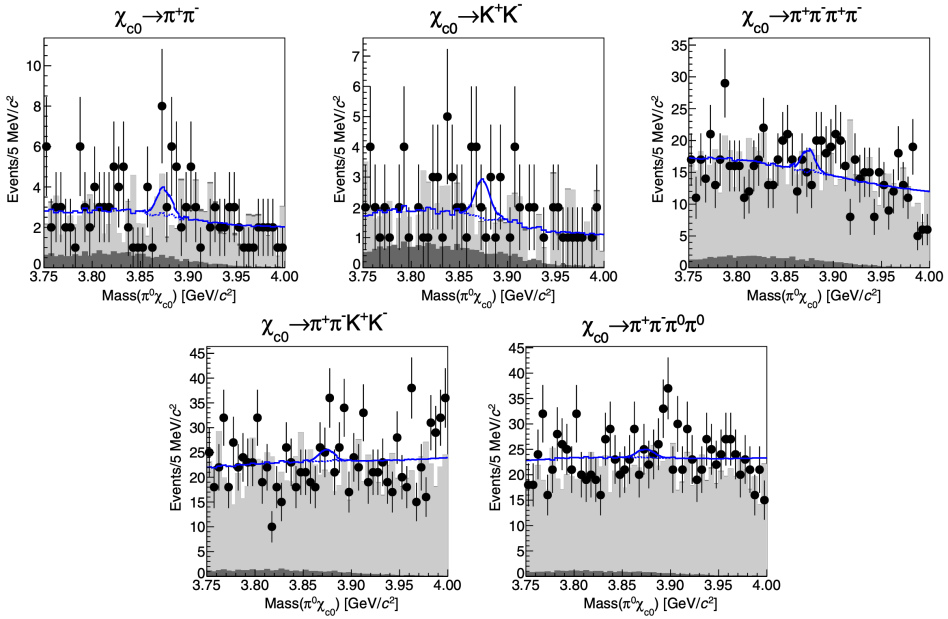






Production & Decay

PRD 105, 072009 (2022)

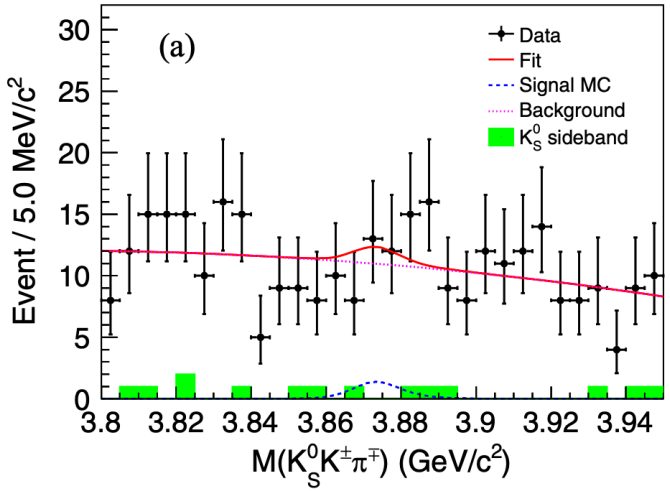


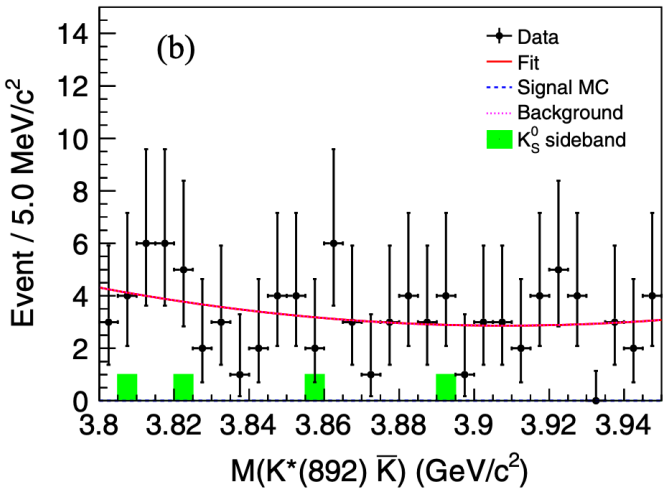
BESIII

$$\mathcal{R}_1 = \frac{\mathcal{B}(X(3872)\to K^0_S K^\pm\pi^\mp)}{\mathcal{B}(X(3872)\to\pi^+\pi^- J/\psi)} < 0.07$$

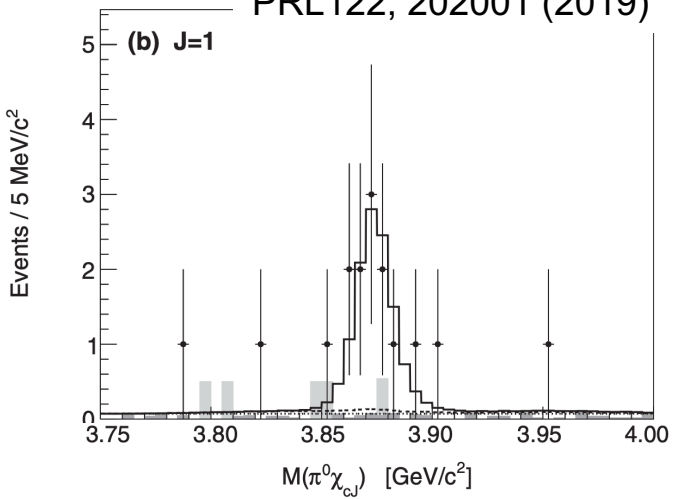
$$\mathcal{R}_2 = \frac{\mathcal{B}(X(3872)\to K^*(892)\bar{K})}{\mathcal{B}(X(3872)\to\pi^+\pi^- J/\psi)} < 0.10$$

PRD 113, L071102 (2026)





PRL122, 202001 (2019)



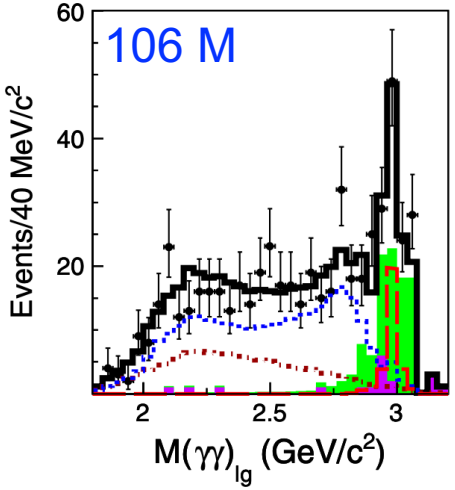
$$\frac{\mathcal{B}(X(3872)\to\pi^0\chi_{c0})}{\mathcal{B}(X(3872)\to\pi^0\chi_{c1})} < 4.5 \text{ @90\%}$$

$$\frac{\mathcal{B}(X(3872)\to\pi^0\chi_{c1})}{\mathcal{B}(X(3872)\to\pi^+\pi^- J/\psi)} = 0.88^{+0.33}_{-0.27} \pm 0.10$$

Charmonium Decays

EM decay $\eta_c \to \gamma\gamma$

$\psi(2S) \to \pi^+\pi^- J/\psi$ with $J/\psi \to \gamma\eta_c \to 3\gamma$



PRD 87, 032003 (2013)

$\mathcal{B}(J/\psi \to \gamma\eta_c) = (1.7 \pm 0.4) \times 10^{-2}$
$\mathcal{B}(\eta_c \to \gamma\gamma) = (2.6 \pm 0.7 \pm 0.7) \times 10^{-4}$

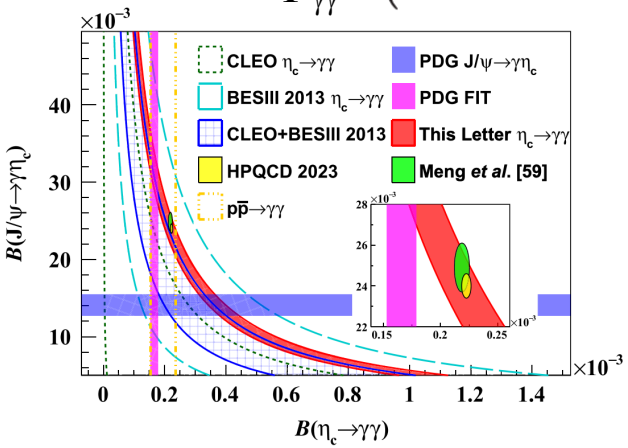
$\Gamma(\eta_c)$=(30.5±0.5) MeV

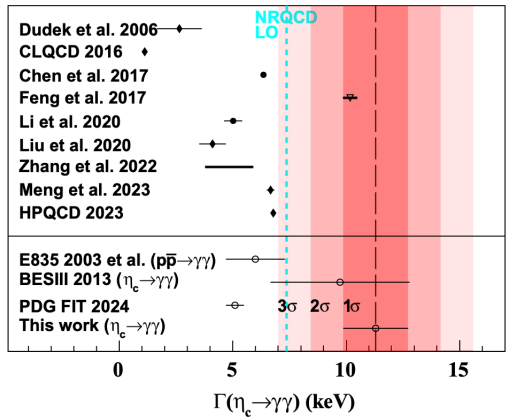
PRL 134, 181901 (2025)

$\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma) = (5.23 \pm 0.26_{\text{stat}} \pm 0.30_{\text{syst}}) \times 10^{-6}$

2.7 B

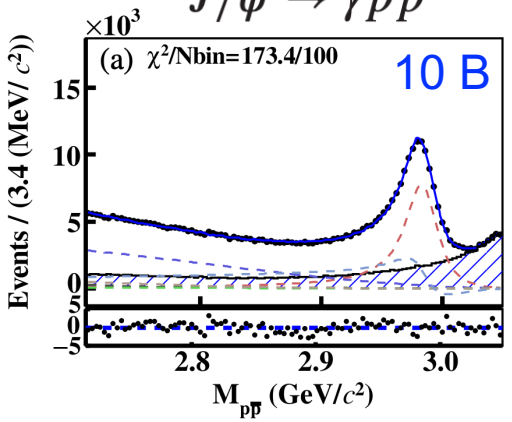
$\Gamma_{\gamma\gamma} = (11.30 \pm 0.56_{\text{stat}} \pm 0.66_{\text{syst}} \pm 1.14_{\text{ref}})$ keV



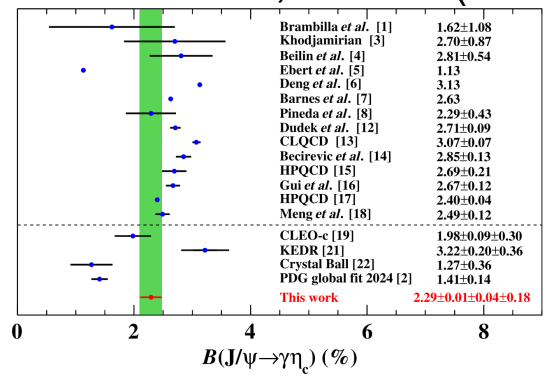


Interference not considered

$J/\psi \to \gamma p\bar{p}$



PRL 136, 051901 (2026)



$\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p}) = (2.11 \pm 0.02_{\text{stat}} \pm 0.07_{\text{syst}}) \times 10^{-5}$

$[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)]$ from E760/E835 $p\bar{p}$ annihilation & Belle $\gamma\gamma$ fusion

$$\mathcal{B}(J/\psi \to \gamma\eta_c) = \sqrt{\frac{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}} = (2.29 \pm 0.01 \pm 0.04 \pm 0.18)\%,$$

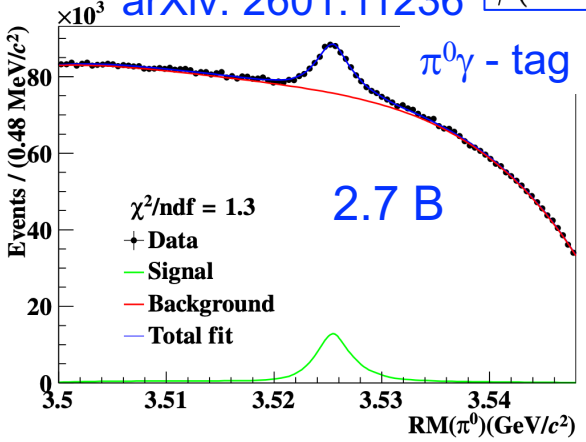
$$\mathcal{B}(\eta_c \to \gamma\gamma) = \sqrt{\frac{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})]}} = (2.28 \pm 0.01 \pm 0.04 \pm 0.18) \times 10^{-4},$$

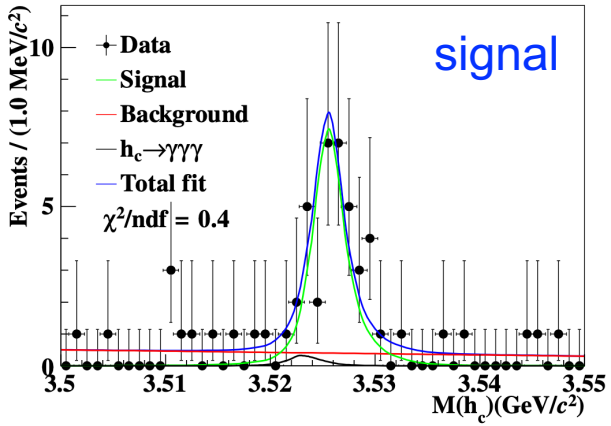
$$\mathcal{B}(\eta_c \to p\bar{p}) = \sqrt{\frac{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})]}{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}} = (0.92 \pm 0.01 \pm 0.02 \pm 0.07) \times 10^{-3}$$

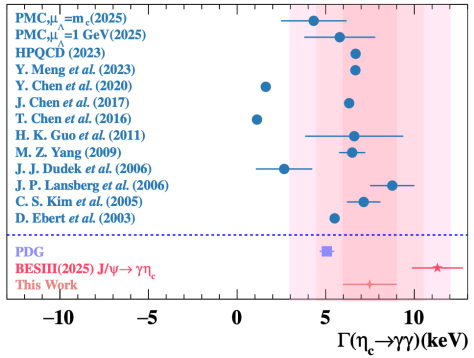
EM decay $\eta_c \to \gamma\gamma$

arXiv: 2601.11236

$$\psi(3686) \to \pi^0 h_c, h_c \to \gamma\eta_c, \eta_c \to \gamma\gamma$$







First absolute measurement !

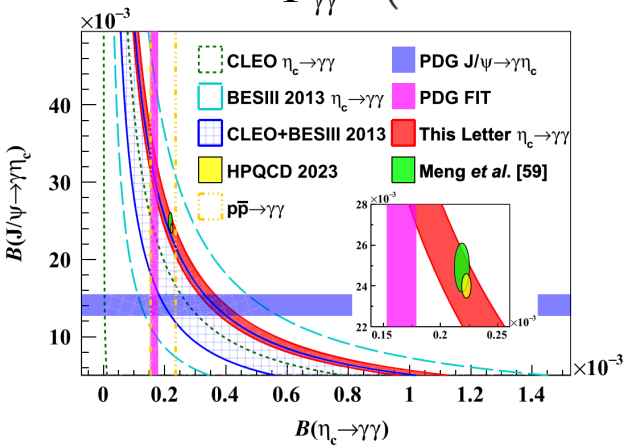
$$\mathcal{B}(\eta_c \to \gamma\gamma) = (2.45 \pm 0.48_{\text{stat.}} \pm 0.09_{\text{syst.}}) \times 10^{-4}$$

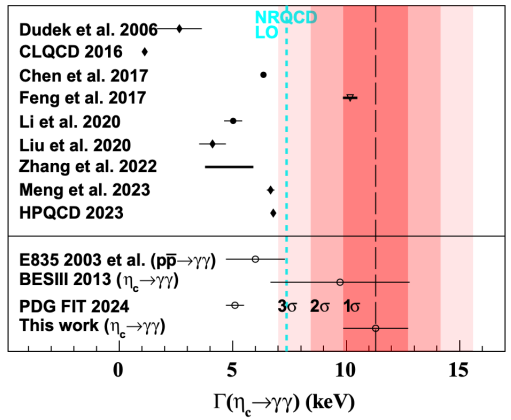
PRL 134, 181901 (2025)

$$\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma) = (5.23 \pm 0.26_{\text{stat}} \pm 0.30_{\text{syst}}) \times 10^{-6}$$

2.7 B

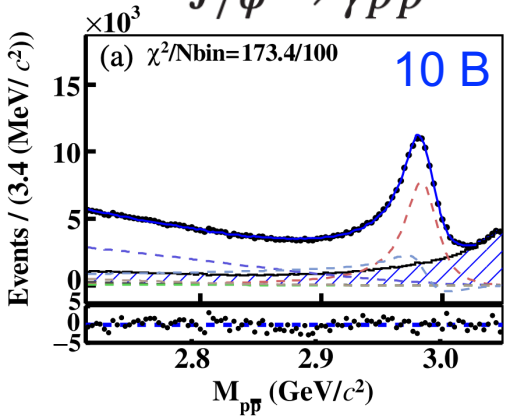
$$\Gamma_{\gamma\gamma} = (11.30 \pm 0.56_{\text{stat}} \pm 0.66_{\text{syst}} \pm 1.14_{\text{ref}})\ \text{keV}$$



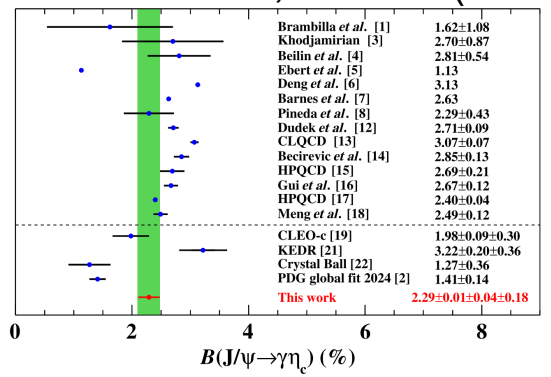


Interference not considered

$$J/\psi \to \gamma p\bar{p}$$



PRL 136, 051901 (2026)



$$\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p}) = (2.11 \pm 0.02_{\text{stat}} \pm 0.07_{\text{syst}}) \times 10^{-5}$$

$[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)]$ from E760/E835 $p\bar{p}$ annihilation & Belle $\gamma\gamma$ fusion

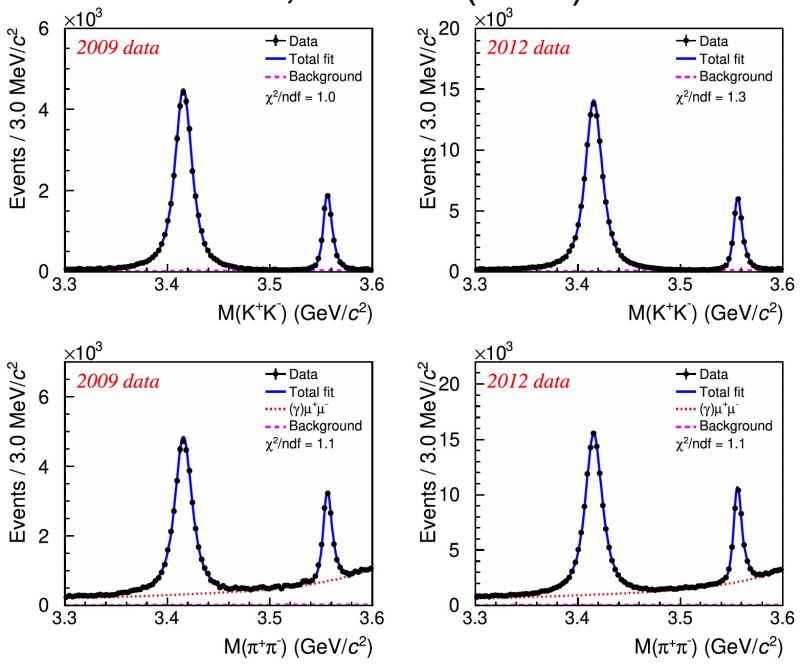
$$\mathcal{B}(J/\psi \to \gamma\eta_c) = \sqrt{\frac{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}} = (2.29 \pm 0.01 \pm 0.04 \pm 0.18)\%,$$

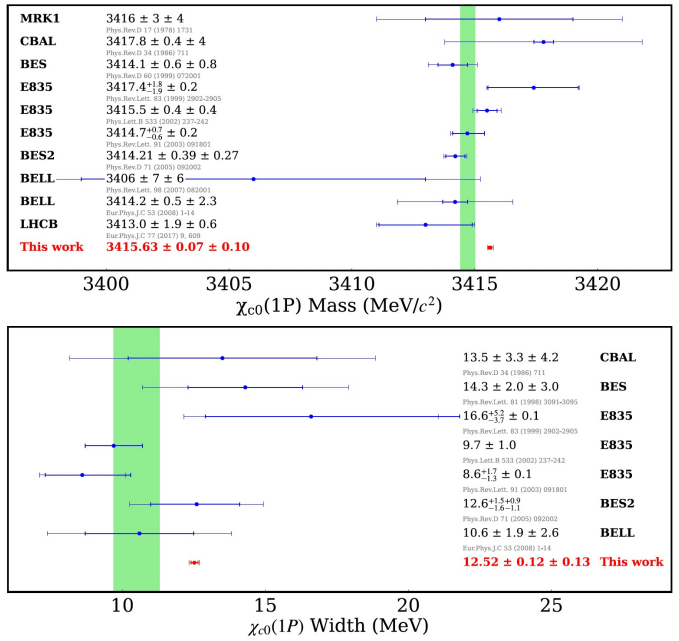
$$\mathcal{B}(\eta_c \to \gamma\gamma) = \sqrt{\frac{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})]}} = (2.28 \pm 0.01 \pm 0.04 \pm 0.18) \times 10^{-4},$$

$$\mathcal{B}(\eta_c \to p\bar{p}) = \sqrt{\frac{[\mathcal{B}(\eta_c \to p\bar{p}) \times \mathcal{B}(\eta_c \to \gamma\gamma)] \times [\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to p\bar{p})]}{[\mathcal{B}(J/\psi \to \gamma\eta_c) \times \mathcal{B}(\eta_c \to \gamma\gamma)]}} = (0.92 \pm 0.01 \pm 0.02 \pm 0.07) \times 10^{-3}$$

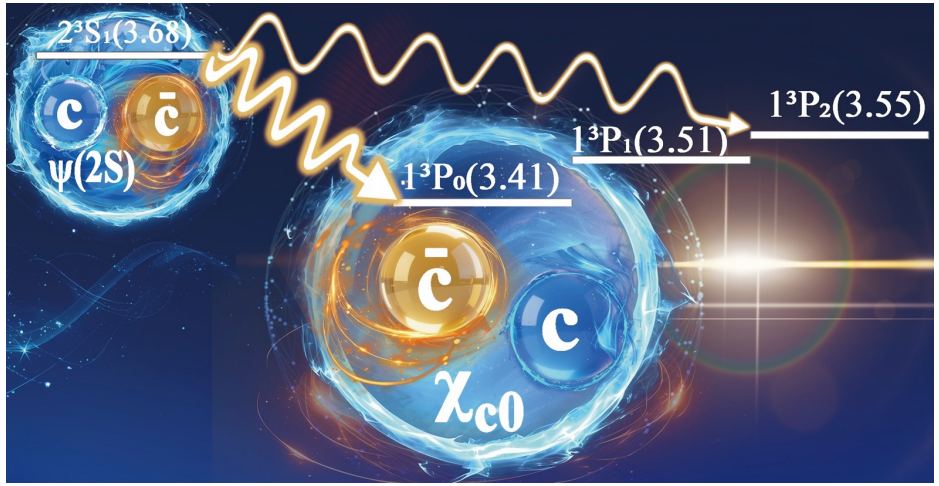
Resonance parameters of $\chi_{c0,c2}$

CPC 49, 091001 (2025)





中国物理C封面



$\chi_{c1}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3510.67 ± 0.05 OUR AVERAGE				Error includes scale factor of 1.2.

$\chi_{c2}(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3556.17 ± 0.07 OUR AVERAGE				

$$\Delta M_{20} = (140.54 \pm 0.07 \pm 0.07)\ \text{MeV}/c^2$$
$$M(\chi_{c0}) = (3415.63 \pm 0.07 \pm 0.07 \pm 0.07)\ \text{MeV}/c^2$$
$$\Gamma(\chi_{c0}) = (12.52 \pm 0.12 \pm 0.13)\ \text{MeV}$$

$$\mathcal{R} = \frac{\mathcal{B}(\chi_{c0} \to \pi^+\pi^-)}{\mathcal{B}(\chi_{c0} \to K^+K^-)} = (0.95 \pm 0.01 \pm 0.01)$$

m_{1P}(COG) = $(m_{\chi c0}+3m_{\chi c1}+5m_{\chi c2})/9$ = 3525.39±0.04 MeV
vs $m_{hc}(1P)$ = 3525.37±0.14 MeV

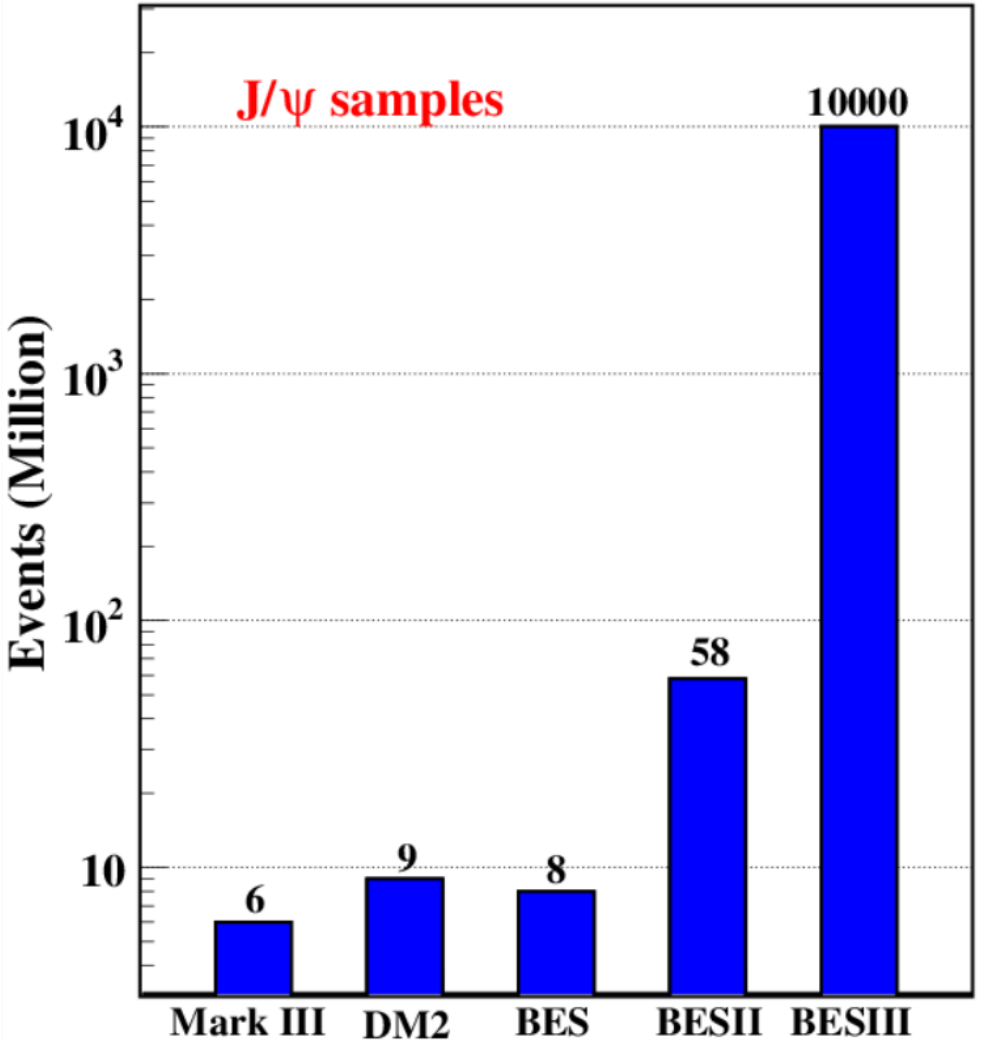
→no obvious 'Chiral Suppression'
[to explain $f_0(1710)$ as glueball]

Summary

- BESIII is still an active & productive experiment after 17 years.
- Charmonium(-like) spectroscopy produces cutting-edge results.
- World's largest $\psi(2S)$ dataset & precise charmonium era @ BESIII.
- BEPCII-U commissioned in 2026 & Big opportunity for XYZ physics.

谢谢大家！

BESIII – A Hyperon/light meson factory



- Br(J/ψ→γη') ~ 5*10^{-3}, η' yield ~50 Million
- Br(J/ψ→γη) ~ 1*10^{-3}, η yield ~10 Million
- Br(J/ψ→ΛΛ) ~ 1.9*10^{-3}; Λ yield ~20 Million
- Br(J/ψ→$\Sigma^+\Sigma^-/\Sigma^0\Sigma^0$) ~ 1.2*$10^{-3}$; Λ yield ~12 Million
- Br(J/ψ→$\Xi^-\Xi^+/\Xi^0\Xi^0$) ~ 1*10^{-3}; Λ yield ~10 Million

Polarization / NP Search (CP violation, EDM) / Decay dynamics

三代北京谱仪(BES/BESII/BESIII)

1988年10月24日，邓小平同志“中国要在高科技领域占有一席之地”

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