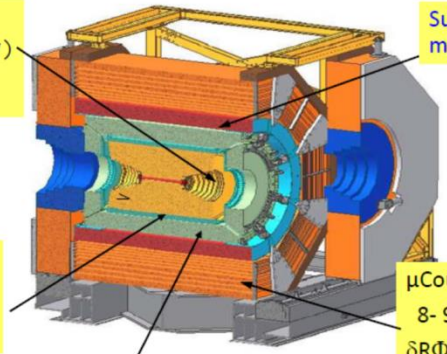
Overview of BESIII

LIU Beijiang (IHEP, CAS)
For BESIII collaboration

The 5th workshop on hadron physics in China and Opportunities in US
Huangshan, 2013

NIM A614, 345 (2010)

The BESIII Detector



Drift Chamber (MDC)
$\sigma P/P\ (^0/_0) = 0.5\%(1GeV)$
$\sigma_{dE/dx}\ (^0/_0) = 6\%$

Super-conducting magnet (1.0 tesla)

Time Of Flight (TOF)
σ_T: 90 ps Barrel
110 ps endcap

μCounter
8- 9 layers RPC
$\delta R\Phi$=1.4 cm~1.7 cm

EMC: $\sigma E/\sqrt{E}(^0/_0) = 2.5\ \%\ (1\ GeV)$
(CsI) $\sigma_{z,\phi}(cm) = 0.5 - 0.7\ cm/\sqrt{E}$

Linac

beam energy: 1.0 – 2.3 GeV

BEPC II
(Beijing Electron-positron collider)
2004: started BEPCII upgrade,
BESIII construction
2008: test run
2009 - now: BESIII physics run

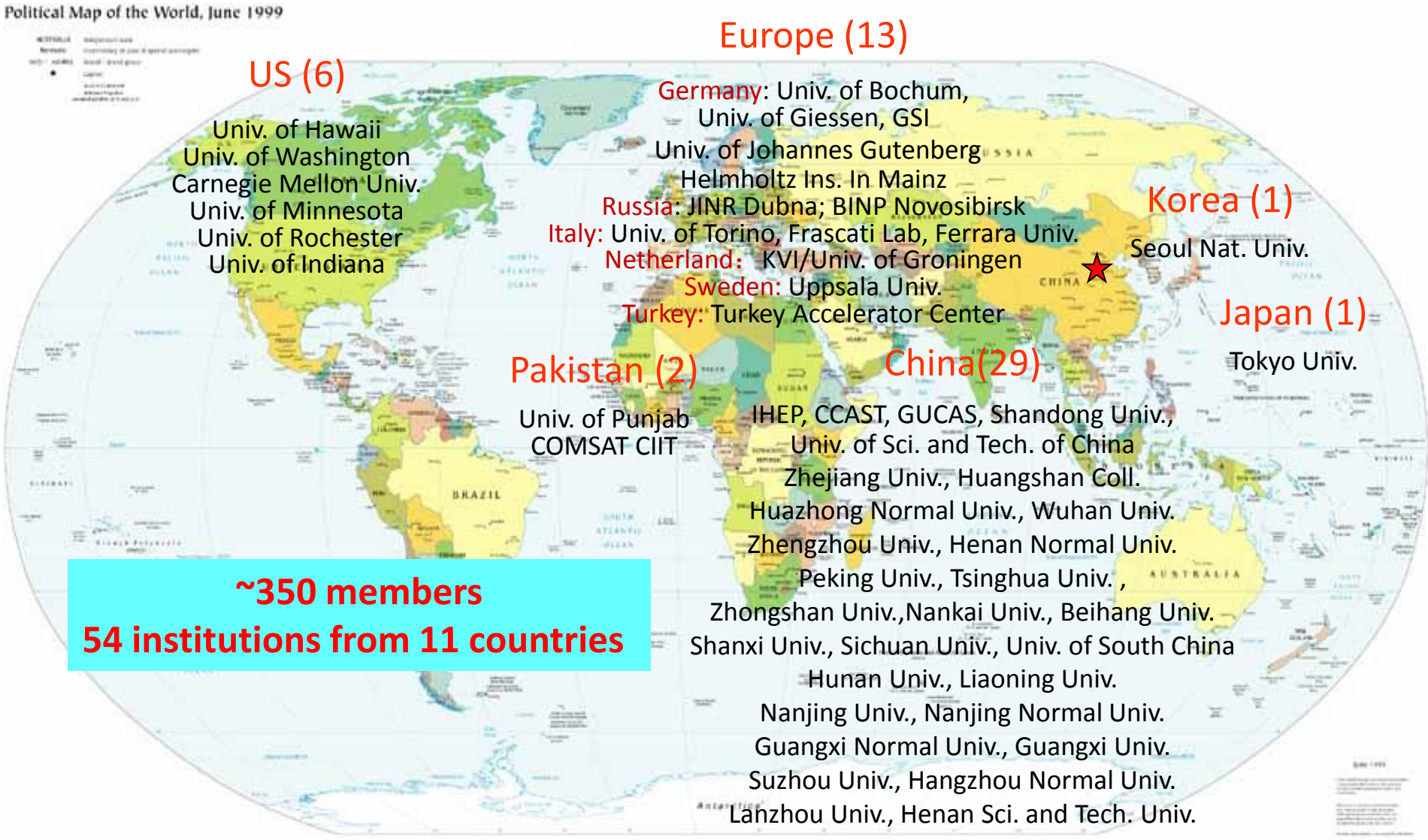
BES III
(Beijing Spectrometer)

Storage ring

- 1989-2005 (BEPC):
  Lpeak=1.0×10^{31} /cm^{2}s
- 2008-now (BEPCII):

Lpeak=7×10^{32}/cm^{2}s (design: 1×10^{33}/cm^{2}s)

BESIII Collaboration



US (6)

Univ. of Hawaii
Univ. of Washington
Carnegie Mellon Univ.
Univ. of Minnesota
Univ. of Rochester
Univ. of Indiana

Europe (13)

Germany: Univ. of Bochum,
Univ. of Giessen, GSI
Univ. of Johannes Gutenberg
Helmholtz Ins. In Mainz
Russia: JINR Dubna; BINP Novosibirsk
Italy: Univ. of Torino, Frascati Lab, Ferrara Univ.
Netherland: KVI/Univ. of Groningen
Sweden: Uppsala Univ.
Turkey: Turkey Accelerator Center

Korea (1)

Seoul Nat. Univ.

Japan (1)

Tokyo Univ.

Pakistan (2)

Univ. of Punjab
COMSAT CIIT

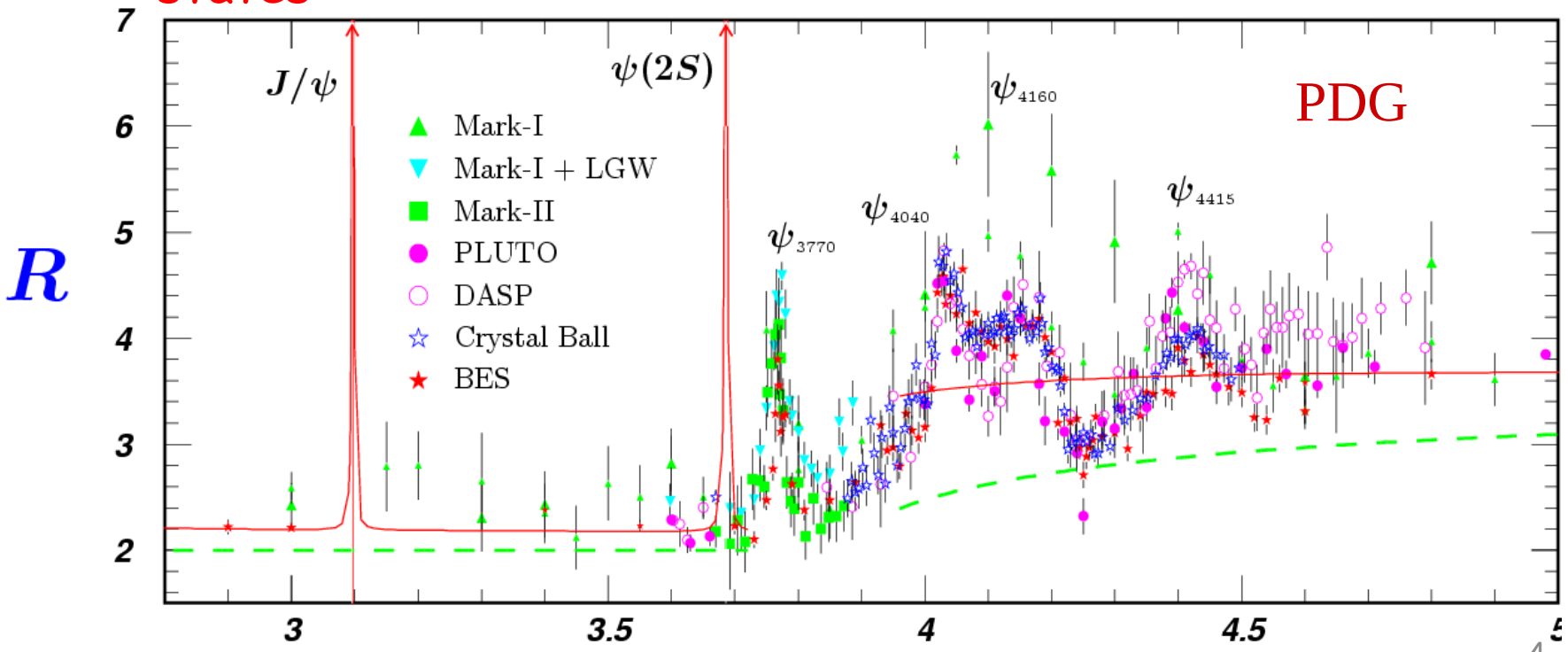
China(29)

IHEP, CCAST, GUCAS, Shandong Univ.,
Univ. of Sci. and Tech. of China
Zhejiang Univ., Huangshan Coll.
Huazhong Normal Univ., Wuhan Univ.
Zhengzhou Univ., Henan Normal Univ.
Peking Univ., Tsinghua Univ. ,
Zhongshan Univ.,Nankai Univ., Beihang Univ.
Shanxi Univ., Sichuan Univ., Univ. of South China
Hunan Univ., Liaoning Univ.
Nanjing Univ., Nanjing Normal Univ.
Guangxi Normal Univ., Guangxi Univ.
Suzhou Univ., Hangzhou Normal Univ.
Lanzhou Univ., Henan Sci. and Tech. Univ.

~350 members
54 institutions from 11 countries

Features of the BEPC Energy Region

- Rich of resonances: charmonia and charmed mesons
- Threshold characteristics (pairs of τ, D, D_s, …)
- Transition between smooth and resonances, perturbative and non-perturbative QCD
- Energy location of the glueballs, hybrids and multi-quark states



Physics of τ-charm region

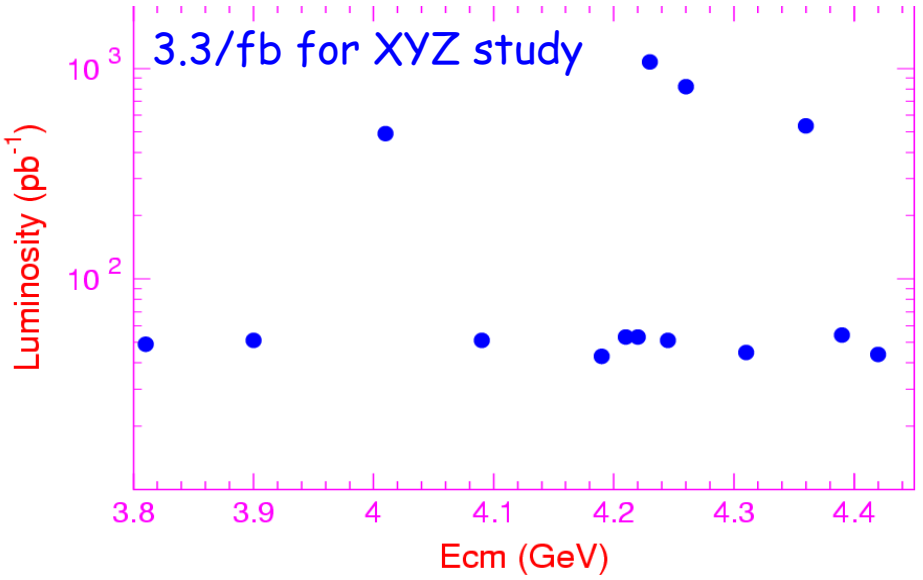
Charmonium physics:
- Spectroscopy
- transitions and decays

Light hadron physics:
- meson & baryon spectroscopy
- glueball, hybrid, multiquark
- two-photon physics
- e.m. form factors of nucleon

Open Charm physics:
- (semi) leptonic + hadronic decays
- decay constant, form factors
- CKM matrix: Vcd, Vcs
- D^0-D^0bar mixing and CP violation
- rare/forbidden decays

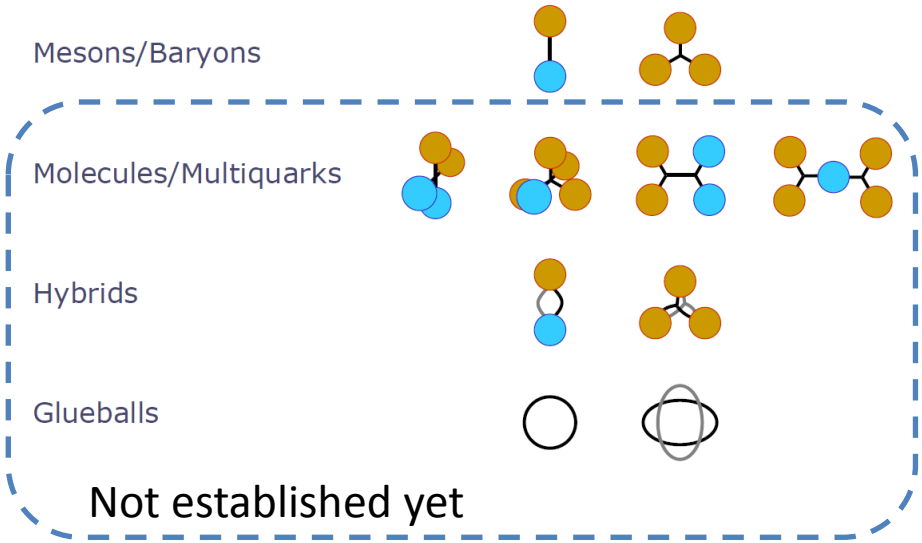
Tau physics:
- tau decays near threshold
- tau mass scan

…and many more.



	Previous Data	BESIII now	Goal
J/ψ	BESII 58 M	1.2 B 20x	10 B
ψ (3686)	CLEO: 28M	0.5 B 20x	3 B
ψ (3770)	CLEO: 0.8/fb	2.9/fb 3.5x	20/fb
Above open charm threshold	CLEO: 0.6/fb@4160	0.4/fb @4040, 2/fb@4260, 0.5/fb @4360, Data for lineshape	5-10/fb
R scan & τ	BESII	R @2.23,2.4,2.8,3.4, 25/pb tau	

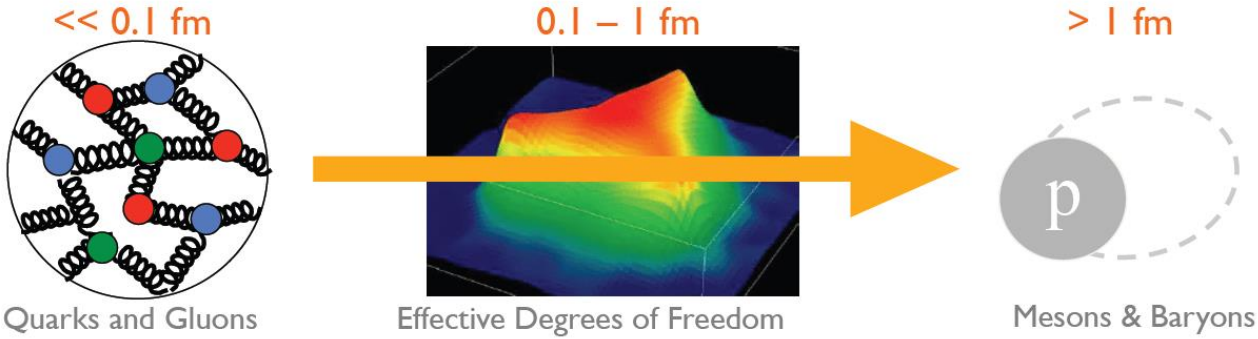
Hadron spectrum



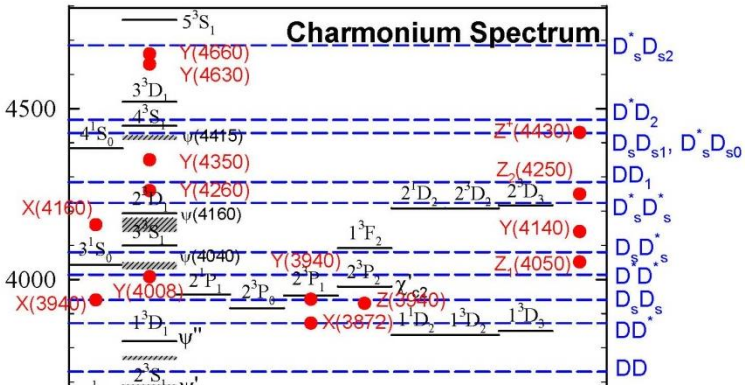
Continuous efforts in experiment and theory

- Hadron spectroscopy is a key tool to investigate QCD

- testing QCD in the confinement regime
- providing insights into the fundamental degrees of freedom



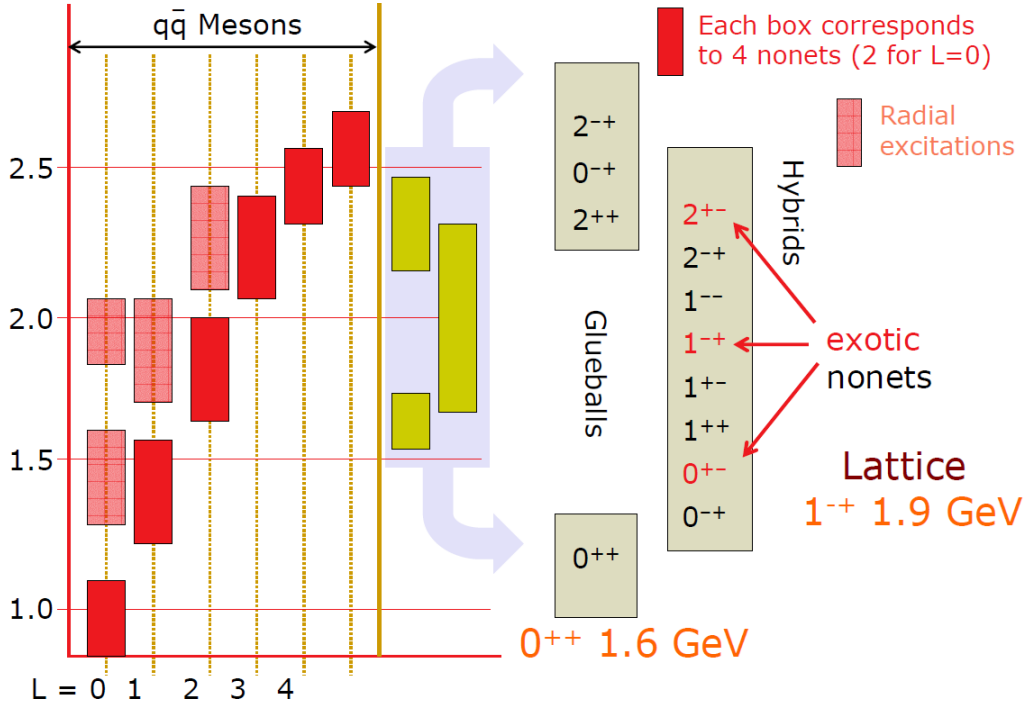
Where are the QCD exotics

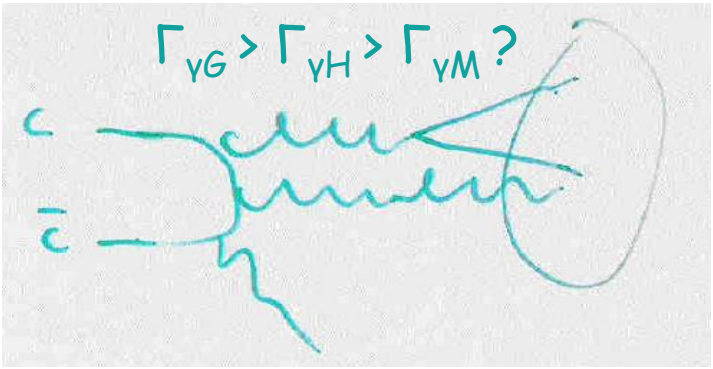


hybrids
molecules
hadrocharmonium
tetraquarks
threshold effects

Produce Y's directly
e+e- @4260/4360/…

BES provides some ideal hunting grounds *Power of high statistics*





"gluon-rich"

High lights from BESIII (1)

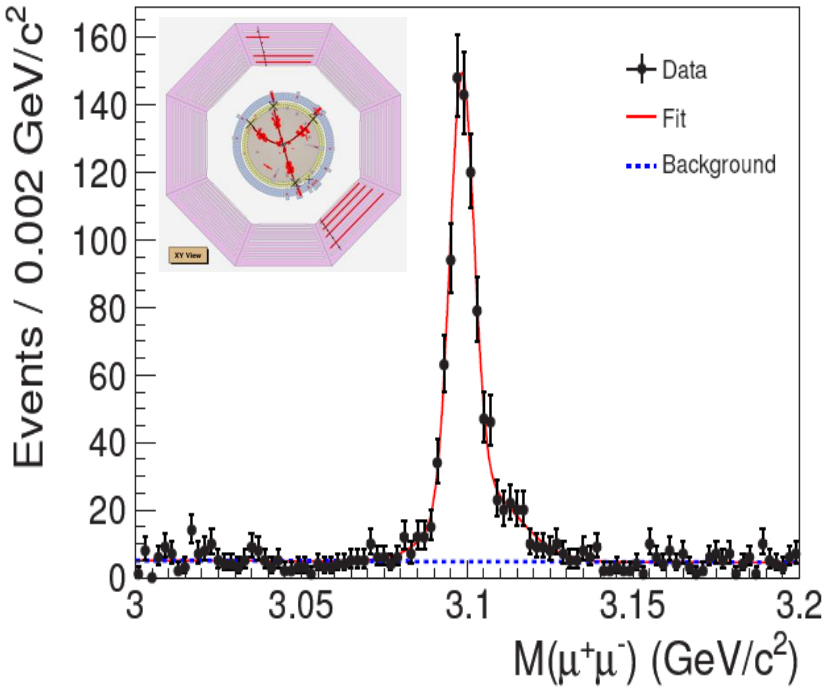
- $Z_c(3900)$, $Z_c(4020)$ & $Z_c(4025)$
- New information on the X(3872)

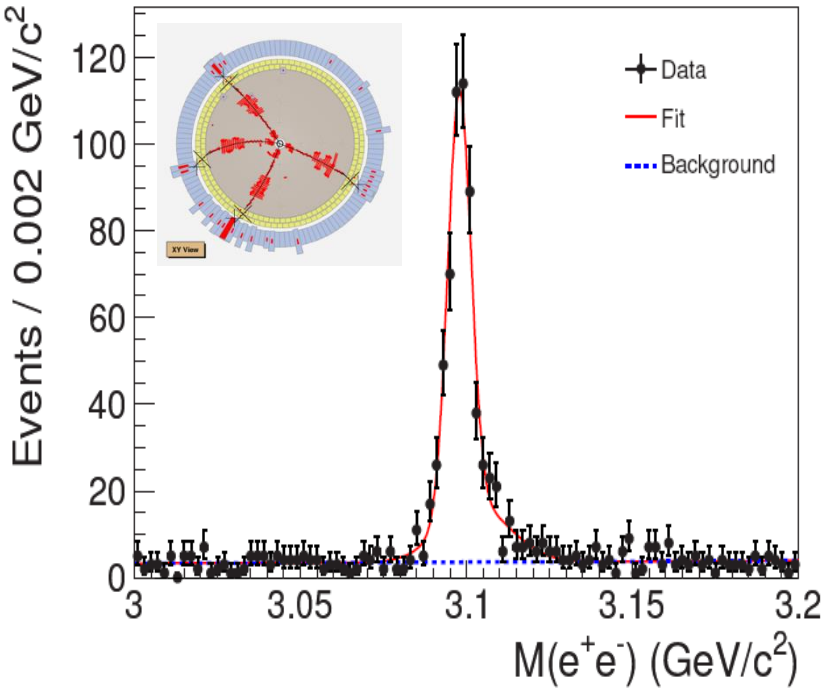
BESIII: Observation of the $Z_c(3900)$ — a charged charmonium-like structure

BESIII: PRL110, 252001 (2013)

- Select $e^+e^- \to \pi^+\pi^- J/\psi$ @ 4.26 GeV

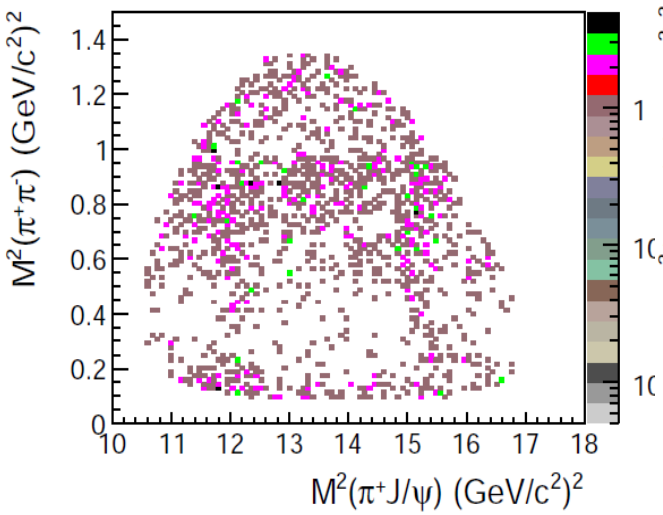
525/pb @4.26 GeV

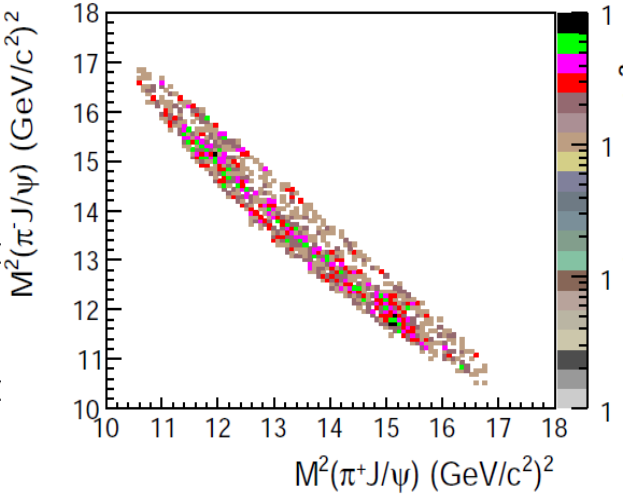


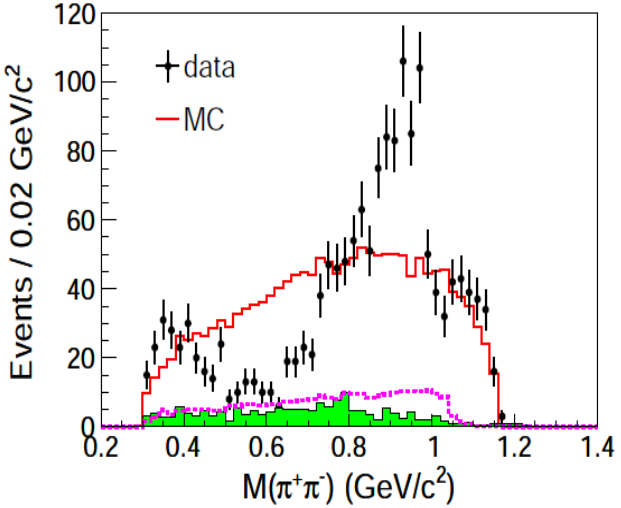


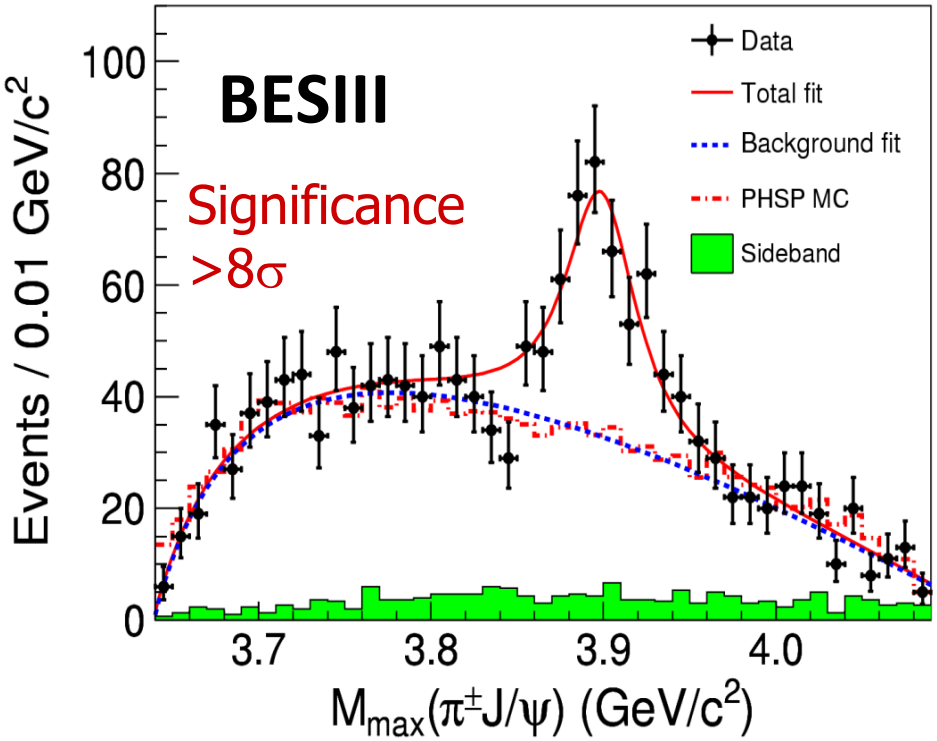
BESIII: $\sigma(e^+e^- \to \pi^+\pi^- J/\psi)$ = (62.9±1.9±3.7) pb,
Agree with BaBar & Belle! Best precision!

BESIII: PRL110, 252001 (2013)





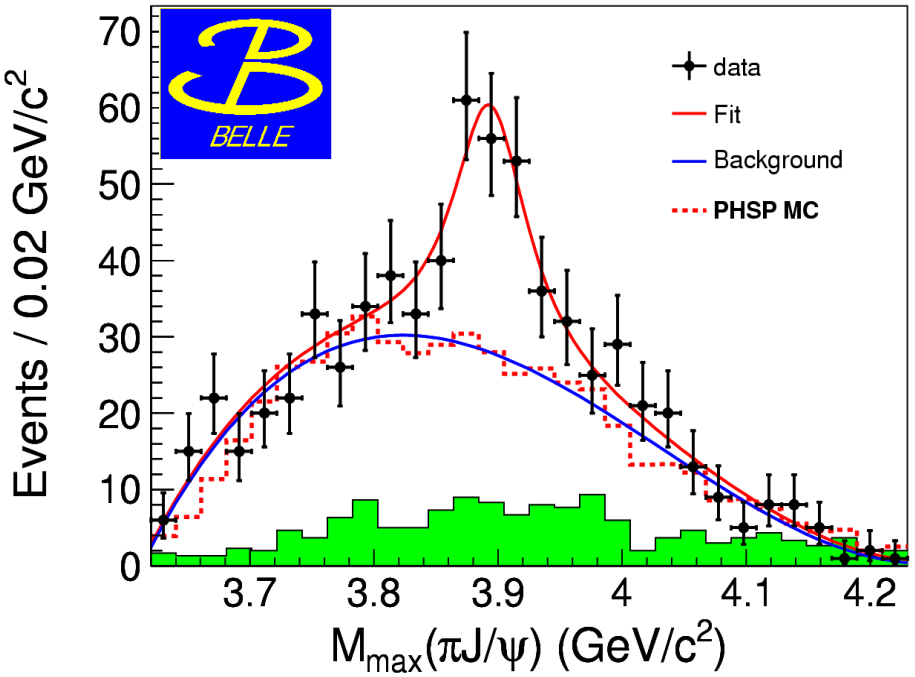


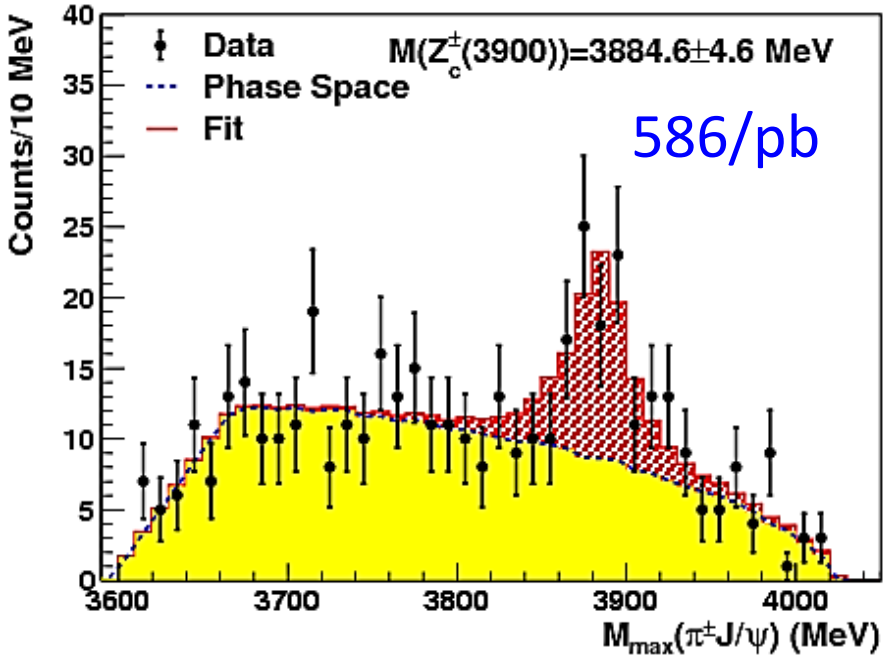


- M = 3899.0±3.6±4.9 MeV
- Γ = 46±10±20 MeV
- 307 ± 48 events

BELLE : $e^+e^- \to \pi^+\pi^- J/\psi$ from ISR
Belle: PRL 110, 252002(2013)

CLEOc data at 4.17 GeV
arXiv: 1304.3036





- M = 3894.5±6.6±4.5 MeV
- Γ = 63±24±26 MeV
- 159 ± 49 events
- >5.2σ

- M = 3885±5±1 MeV
- Γ = 34±12±4 MeV
- 81 ± 20 events
- 6.1σ

The nature of $Z_c(3900)$?

- Couples to $c\bar{c}$
- Has electric charge

Smoking gun signature of exotic

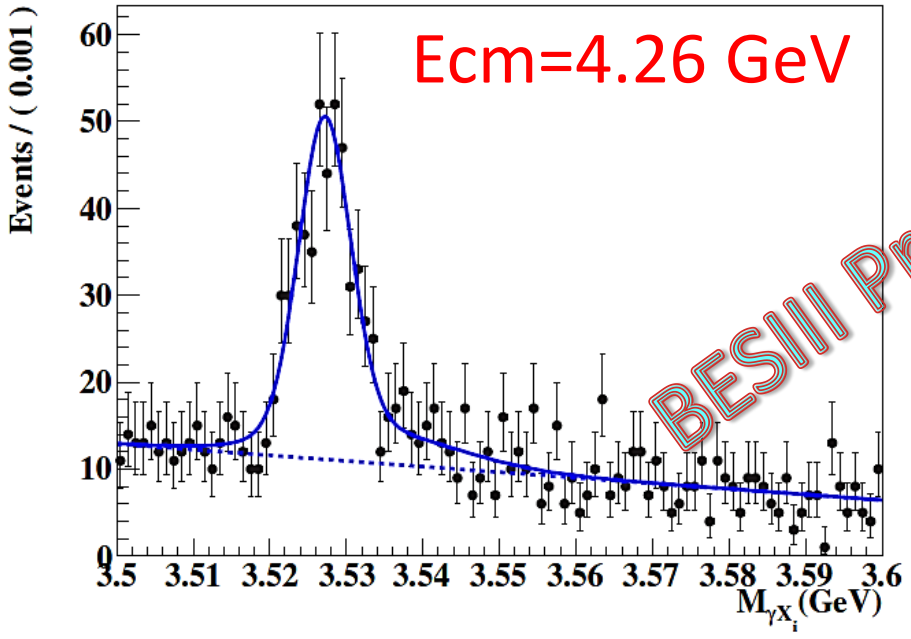
1. **Observation of a charged charmoniumlike structure in $e^+e^- \to \pi^+\pi^- J/\psi$ at $\sqrt{s} = 4.26$ GeV**

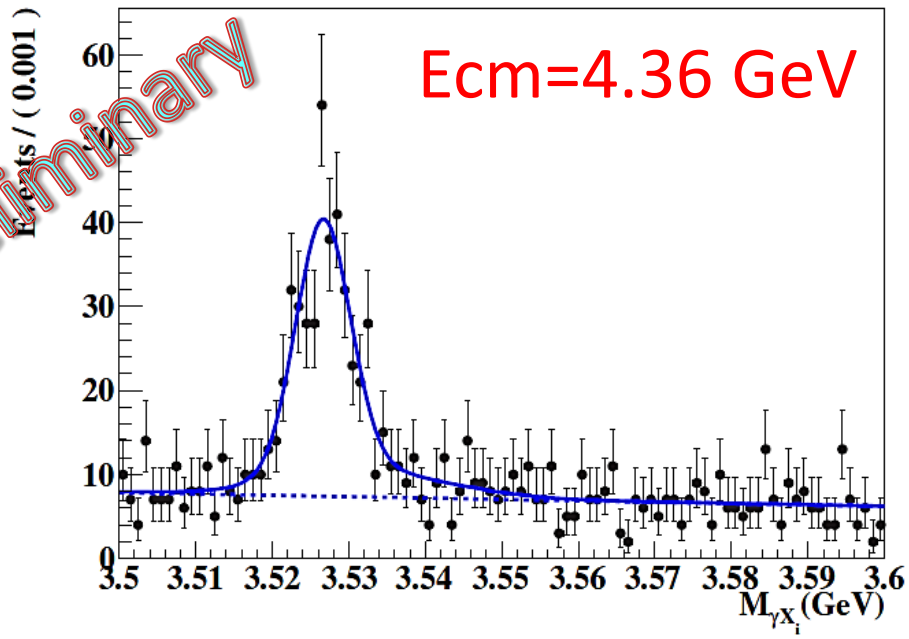
BESIII Collaboration (M. Ablikim (Beijing, Inst. High Energy Phys.) *et al.*). Mar 24, 2013. 7 pp.
Published in **Phys.Rev.Lett. 110 (2013) 252001**
e-Print: arXiv:1303.5949 **[hep-ex]** | PDF
References | BibTeX | LaTeX(US) | LaTeX(EU) | Harvmac | EndNote
ADS Abstract Service; Interactions.org article; Link to WIRED
详细记录 - Cited by 33 records

- DD^* molecule?
- Tetraquark state?
- Threshold effect?
- …

Further experimental studies are vitally important

Observation of $e^+e^- \to \pi^+\pi^- h_c(1P)$ at BESIII





BESIII Preliminary

$N(h_c)=416\pm28$

Lum=827/pb

$\sigma^B= 41.0\pm2.8\pm7.4$ pb

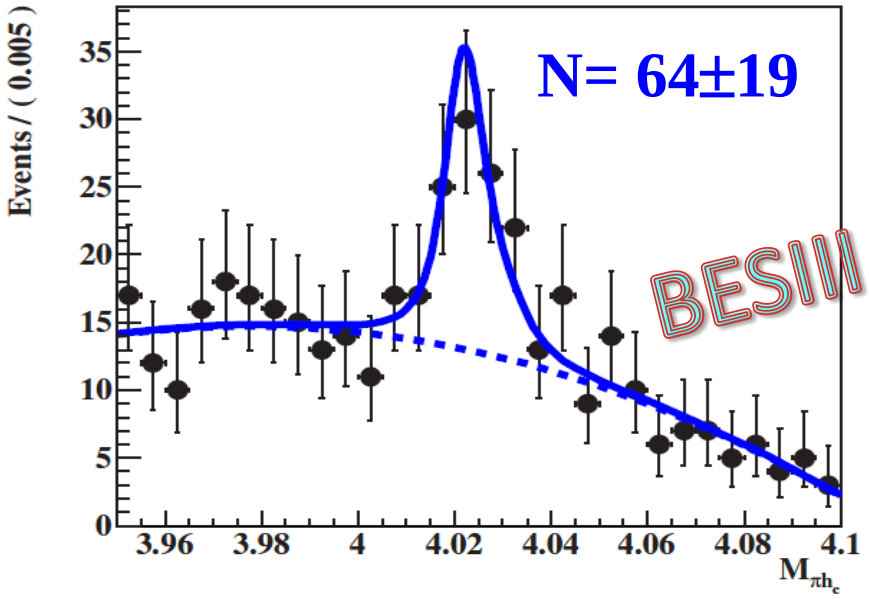
$N(h_c)=357\pm25$

Lum=544/pb

$\sigma^B= 52.3\pm3.7\pm9.2$ pb

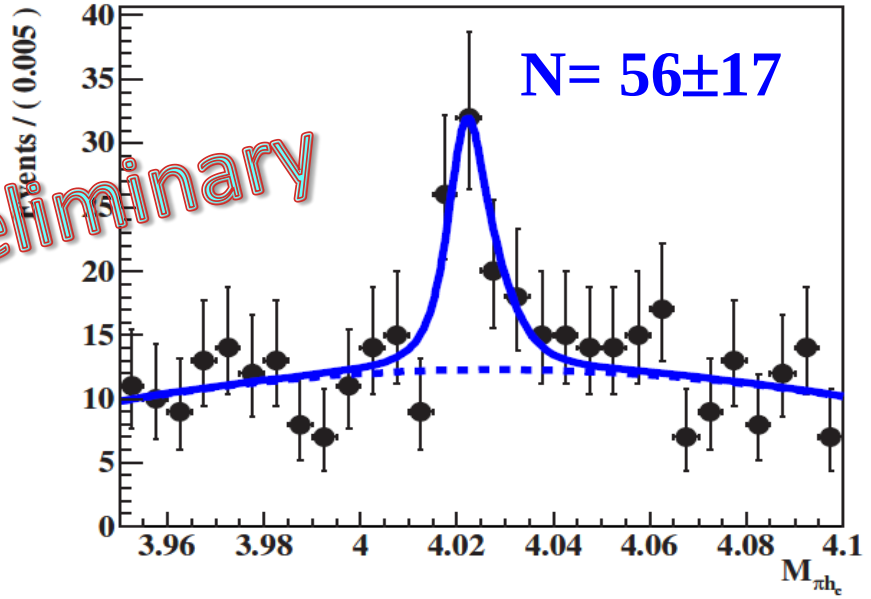
Observation of $Z_c^{\pm}(4020)$ in $e^+e^- \rightarrow \rightarrow \pi^+\pi^- h_c(1P)$

Ecm=4.26 GeV



Ecm=4.36 GeV

LP2013, C. Z. Yuan



BESIII Preliminary

Simultaneous fit to 4.26/4.36 GeV data and 16 η_c decay modes.

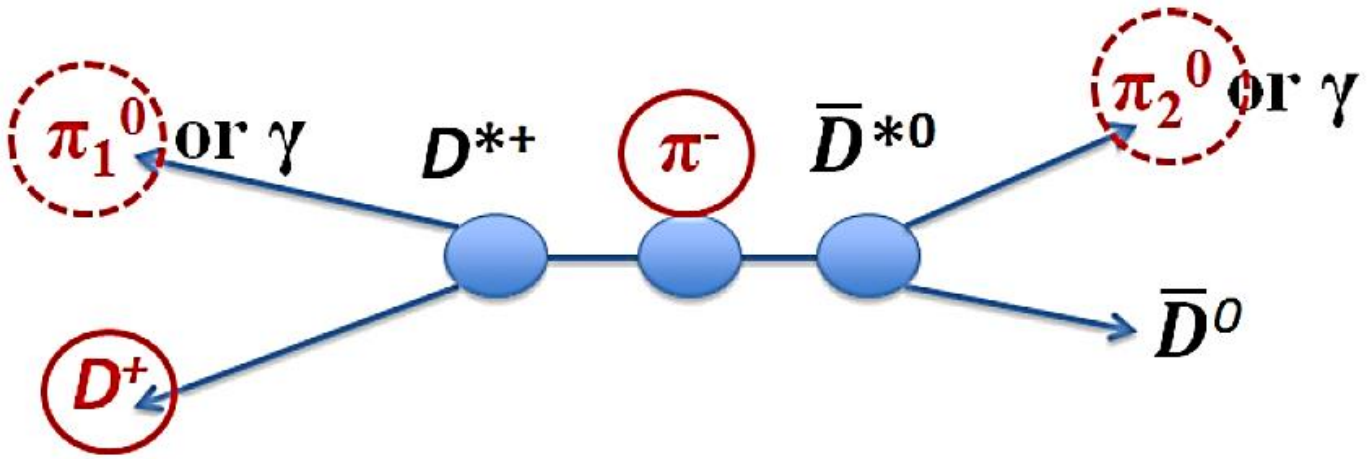
$M(Z_c(4020)) = 4021.8 \pm 1.0 \pm 2.5$ MeV

$\Gamma(Z_c(4020)) = 5.7 \pm 3.4 \pm 1.1$ MeV $\quad 6.4\sigma$

$$R = \frac{\sigma(e^+e^- \rightarrow \pi^\pm Z_c^\mp \rightarrow \pi^+\pi^- h_c(1P))}{\sigma(e^+e^- \rightarrow \pi^+\pi^- h_c(1P))} = (16.2 \pm 4.1 \pm 0.7)\% \qquad (16.6 \pm 5.2 \pm 0.8)\%$$

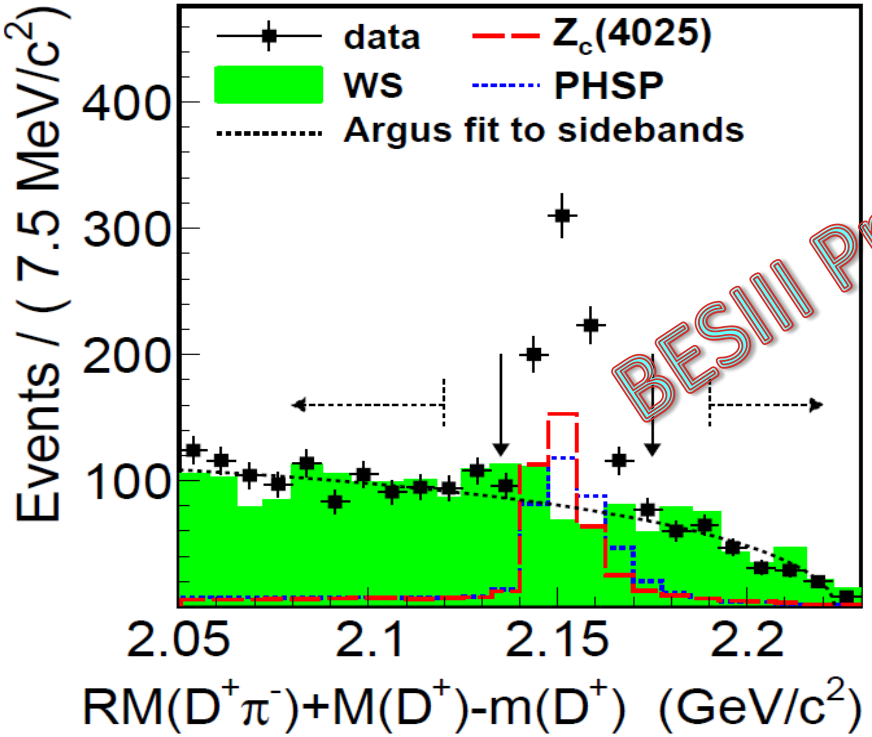
Observation of $e^+e^- \to \pi^- (D^*\underline{D}^*)^+ + c.c.$ @4.26 GeV

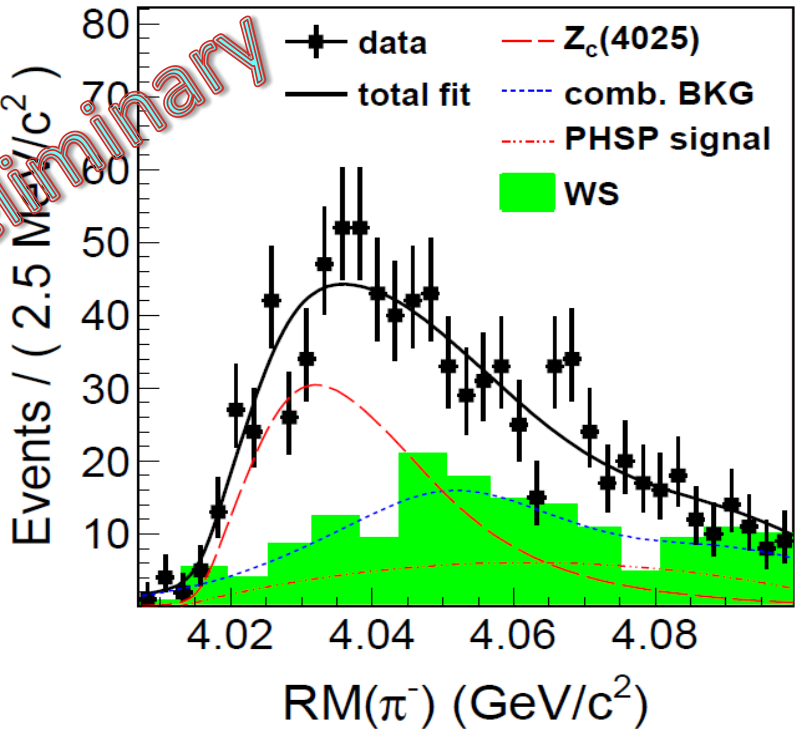
- 827 pb^{-1} data at Ecm=4.26 GeV
- Tag a D^+ and a bachelor π^-, reconstruct one π^0 to suppress the background.



Topology of the decays of the signal process. Thick line circled D^+ and π^- are detected in the final states and at least one of the dashed line circled π_1^0 or π_2^0 is tagged.

Observation of Zc(4025) in $e^+e^- \to \pi^- (D^* \underline{D}^*)^+ + c.c.$





BESIII Preliminary

Fit to $\pi^\pm$ recoil mass yields 401±47 $Z_c(4025)$ events. >10σ

$M(Z_c(4025)) = 4026.3 \pm 2.6 \pm 3.7$ MeV;

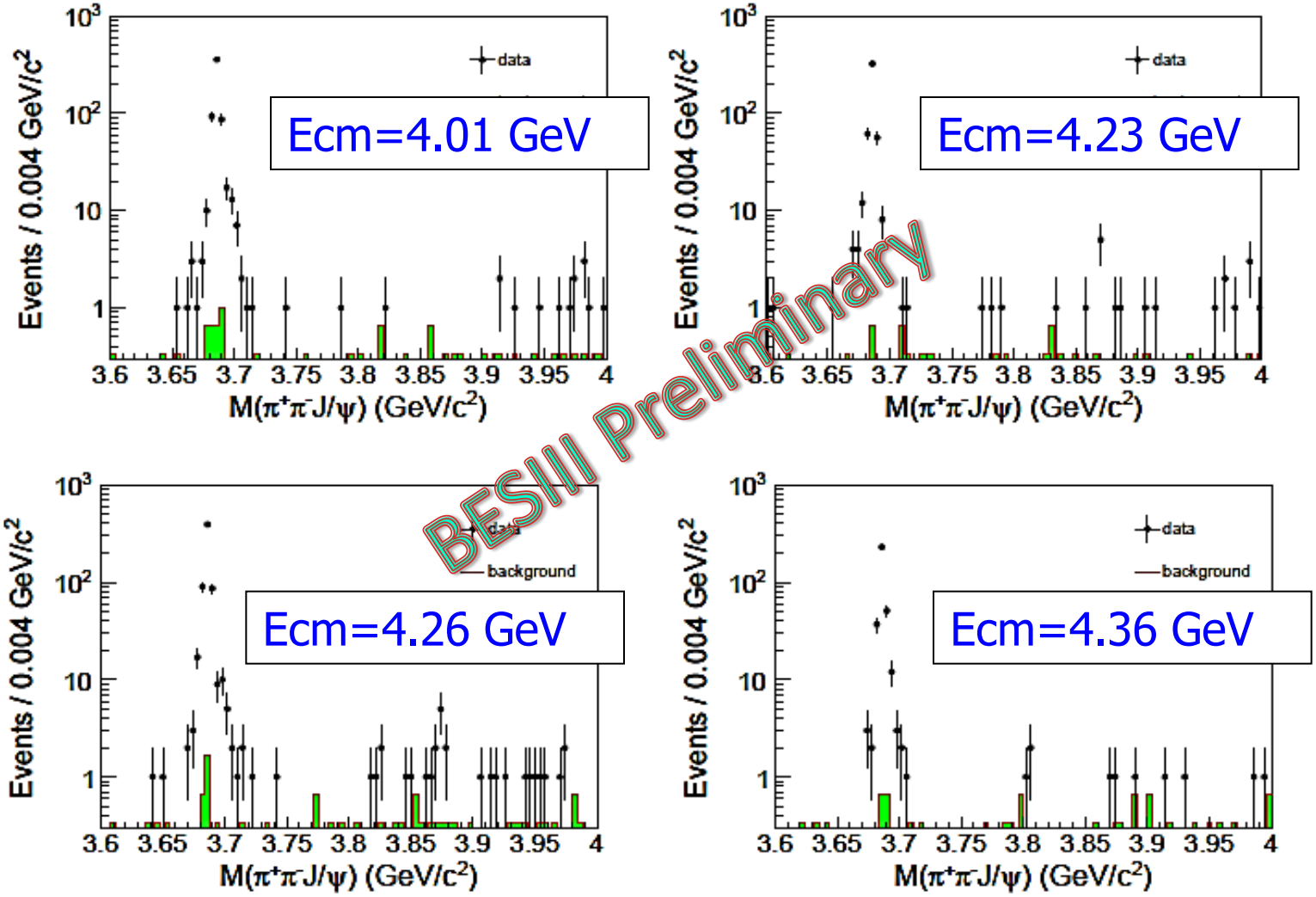
$\Gamma(Z_c(4025)) = 24.8 \pm 5.7 \pm 7.7$ MeV

$$\sigma(e^+e^- \to \pi^\pm (D^* \bar{D}^*)^\mp) = (137 \pm 9 \pm 15)\ \text{pb}$$

$$R = \frac{\sigma(e^+e^- \to \pi^\pm Z_c^\mp \to \pi^\pm (D^* \bar{D}^*)^\mp)}{\sigma(e^+e^- \to \pi^\pm (D^* \bar{D}^*)^\mp)} = (65 \pm 9 \pm 6)\,\%$$

LP2013, C. Z. Yuan

BESIII: Observation of $e^+e^- \rightarrow \gamma X(3872) \rightarrow \gamma\pi^+\pi^- J/\psi$

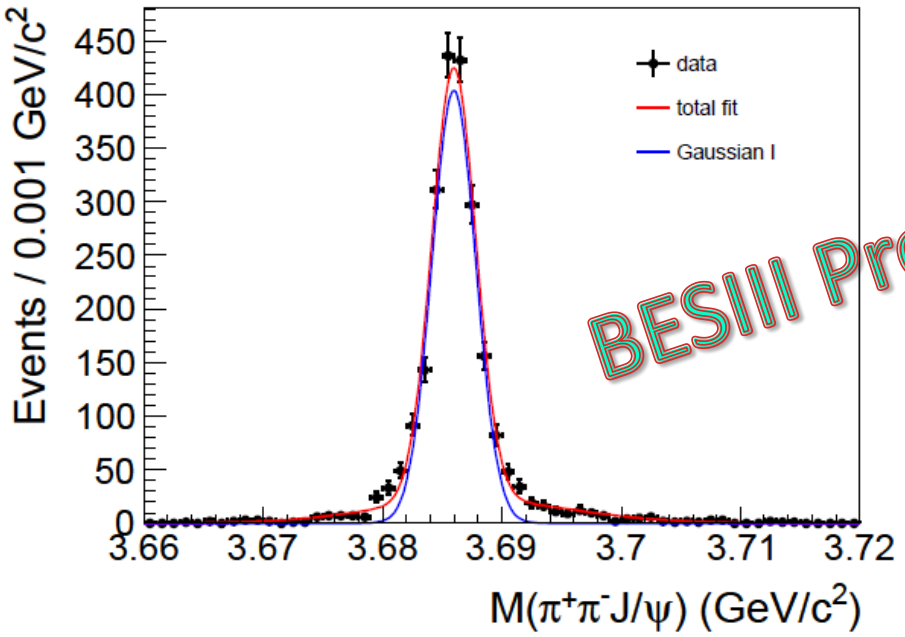


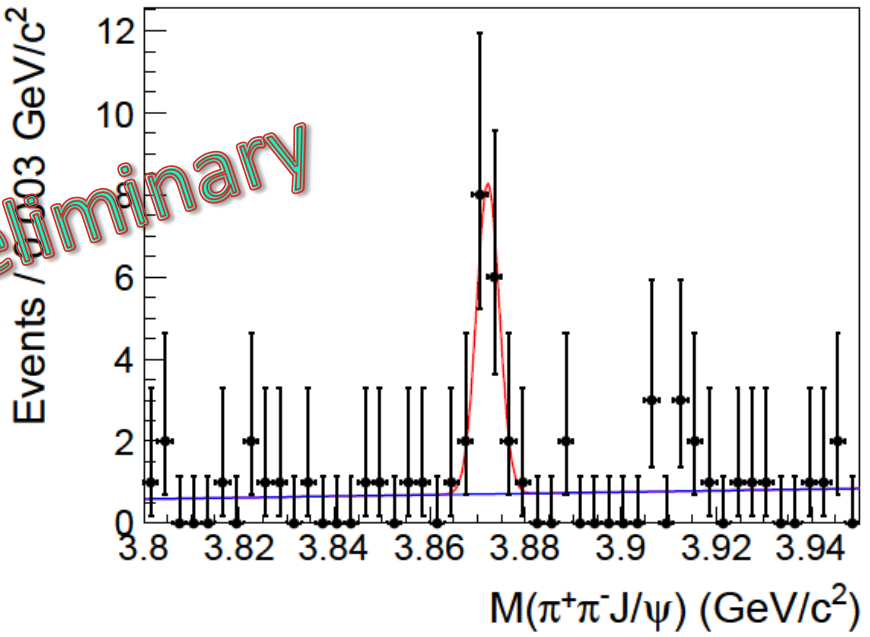
Clear ISR ψ' signal for data validation
X(3872) signal at around 4.23-4.26 GeV

LP2013, C. Z. Yuan

BESIII: Observation of $e^+e^- \rightarrow \gamma X(3872)$

LP2013, C. Z. Yuan





BESIII Preliminary

ISR ψ' signal is used for rate, mass, and mass resolution calibration.

N(ψ')=1242 ; Mass=3685.96±0.05 MeV; σ_M=1.84 ±0.06 MeV

N(X(3872))=15.0±3.9 5.3σ

M(X(3872)) = 3872.1±0.8±0.3 MeV [PDG: 3871.68 ±0.17 MeV]

BESIII: Observation of $e^+e^- \rightarrow \gamma X(3872)$

$\sqrt{s}$ (GeV)	$\sigma^B[e^+e^- \to \gamma X(3872)] \cdot \mathcal{B}(X(3872) \to \pi^+\pi^- J/\psi)$ (pb)
4.009	< 0.13 at 90% C.L.
4.230	$0.32 \pm 0.15 \pm 0.02$
4.260	$0.35 \pm 0.12 \pm 0.02$
4.360	< 0.39 at 90% C.L.

BESIII Preliminary

It seems X(3872) is from Y(4260) decays. At 4.26 GeV,

$\sigma^B(e^+e^- \to \pi^+\pi^- J/\psi) = (62.9 \pm 1.9 \pm 3.7)$ pb,

$$\frac{\sigma[e^+e^- \to \gamma X(3872)] \cdot \mathcal{B}(X(3872) \to \pi^+\pi^- J/\psi)}{\sigma(e^+e^- \to \pi^+\pi^- J/\psi)} = (5.6 \pm 2.0) \times 10^{-3}$$

If we take $\mathcal{B}(X(3872) \to \pi^+\pi^- J/\psi) \sim 5\%$, (>2.6% in PDG)

$\frac{\sigma(e^+e^- \to \gamma X(3872))}{\sigma(e^+e^- \to \pi^+\pi^- J/\psi)} \sim 11.2\%$ Large transition ratio !

LP2013, C. Z. Yuan

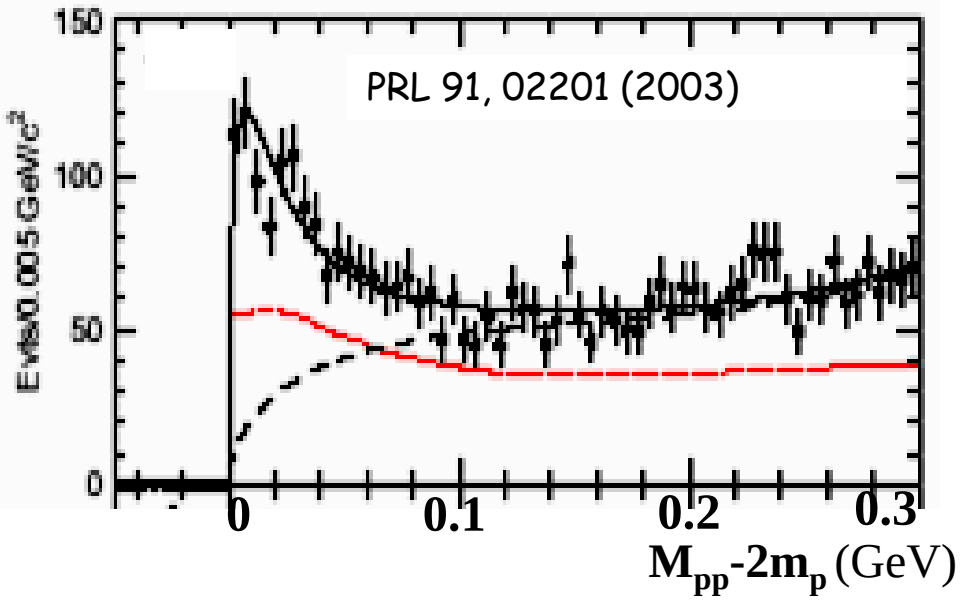
High lights from BESIII (2)

- $X(p\bar{p}) in\ J/\psi, \psi' \rightarrow \gamma p\bar{p}$
- $X(1835) in\ J/\psi \rightarrow \gamma\eta'\pi^+\pi^-$
- $isospin\ violating\ decay\ in\ J/\psi \rightarrow \gamma\eta(1405), \eta(1405) \rightarrow \pi f_0(980)$

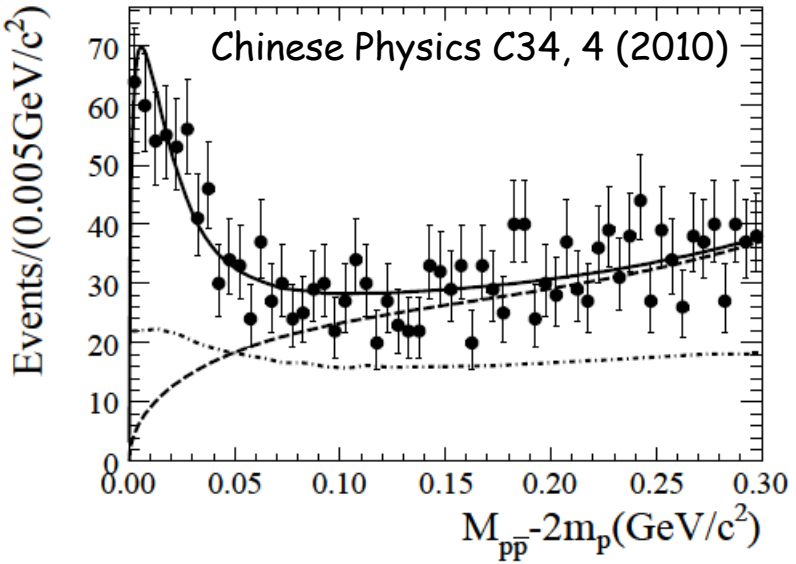
using 2009 data sets ($225*10^6$ J/ψ,$106*10^6$ ψ')

Enhancement at $M_{p\bar{p}}$threshold in $J/\psi \to \gamma p\bar{p}$

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



$\psi' \to \pi^+\pi^- J/\psi, J/\psi \to \gamma p\bar{p}$



Observed at BES2

Agree with spin zero expectation

$M = 1859^{+3}_{-10}{}^{+5}_{-25}\ MeV/c^2, \Gamma < 30\ MeV/c^2\ (90\%\ CL)$

Confirmed at BES3

$M = 1861^{+6}_{-13}{}^{+7}_{-26}\ MeV/c^2, \Gamma < 38\ MeV/c^2\ (90\%\ CL)$

Many possibilities:

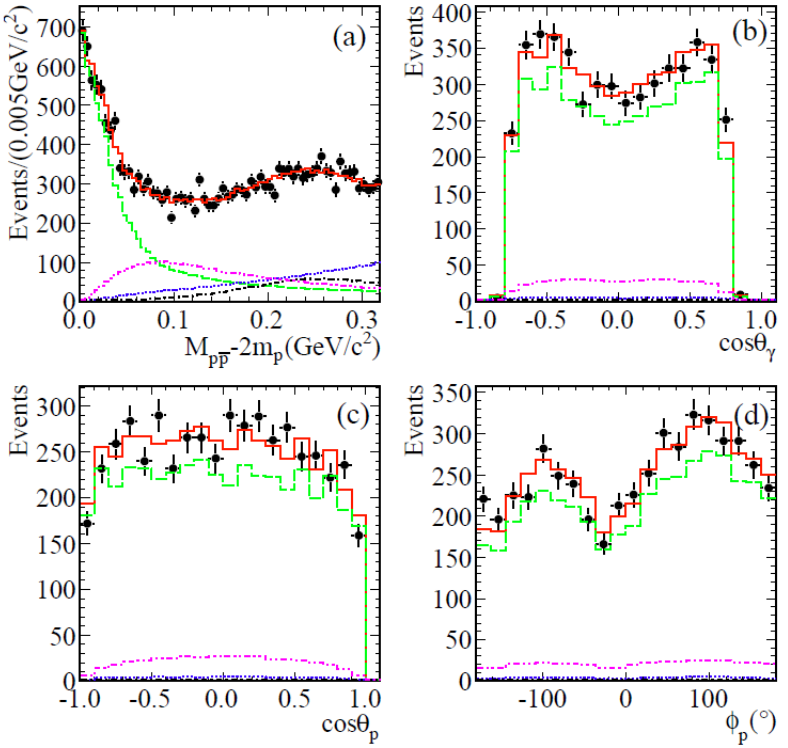
ordinary meson/$p\bar{p}$ bound state/multiquark/glueball/final state interaction (FSI)

Spin-parity analysis

is essential for determining place in the spectrum and possible nature

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

- PWA of $J/\psi \to \gamma p\bar{p}$ was first performed
- The fit with a BW and S-wave FSI (I=0) factor can well describe $p\bar{p}$ mass threshold structure.
- It is much better than that without FSI effect ($\Delta 2\ln L = 5, 7.1\sigma$)
- Different FSI models → Model dependent uncertainty



Phys. Rev. Lett. 108, 112003 (2012)

Spin parity, mass, width and branching ratio:

$J^{PC} = 0^{-+}, > 6.8\sigma$ *better than other* J^{PC} *assignments*,

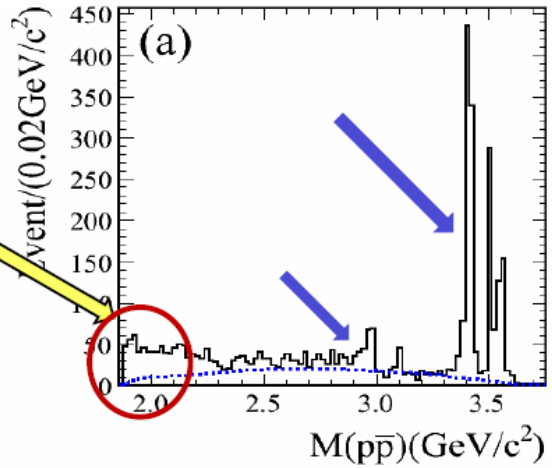
$M = 1832^{+19}_{-5}(stat)^{+18}_{-17}(sys) \pm 19(model) MeV/c^2$,

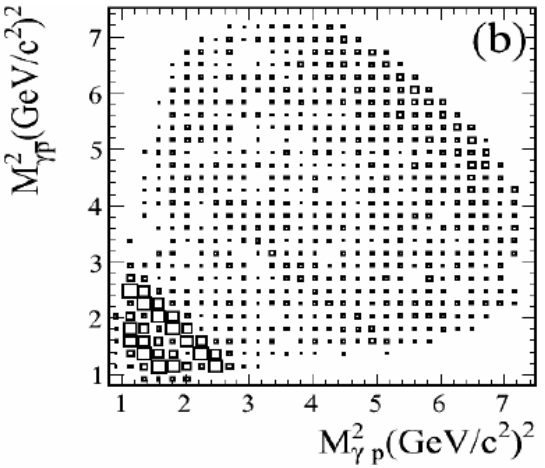
$\Gamma = 13 \pm 39(stat)^{+10}_{-13}(sys) \pm 4(model) MeV/c^2$, $\quad \Gamma < 76\ MeV/c^2\ (90\%\ CL)$,

$B(J/\psi \to \gamma X)B(X \to p\bar{p}) = \left(9.0^{+0.4}_{-1.1}(stat)^{+1.5}_{-5.0}(sys) \pm 2.3(model)\right) * 10^{-5}$

$M_{p\bar{p}}$ threshold structure in $\psi' \to \gamma p\bar{p}$

Obviously different line shape of ppbar mass spectrum near threshold from that in J/ψ decays





PWA results:

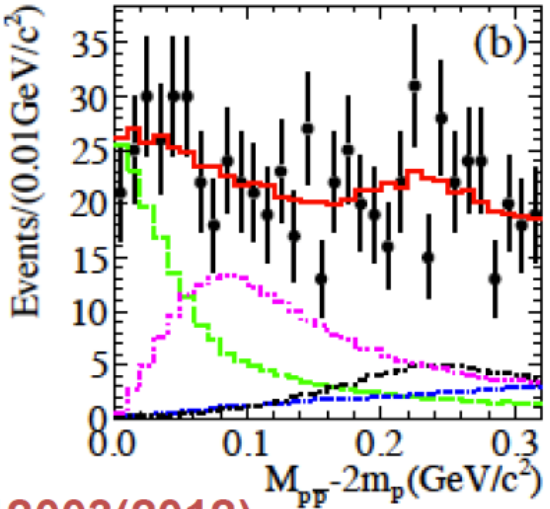
- Significance of X(ppbar) is > 6.9 σ .
- The production ratio R: **first measurement**

$$R = \frac{B(\psi' \to \gamma X(p\bar{p}))}{B(J/\psi \to \gamma X(p\bar{p}))}$$

$$= (5.08^{+0.71}_{-0.45}(\text{stat})^{+0.67}_{-3.58}(\text{syst}) \pm 0.12(\text{mod}))\%$$

- It is suppressed compared with "12% rule".

PWA Projection:

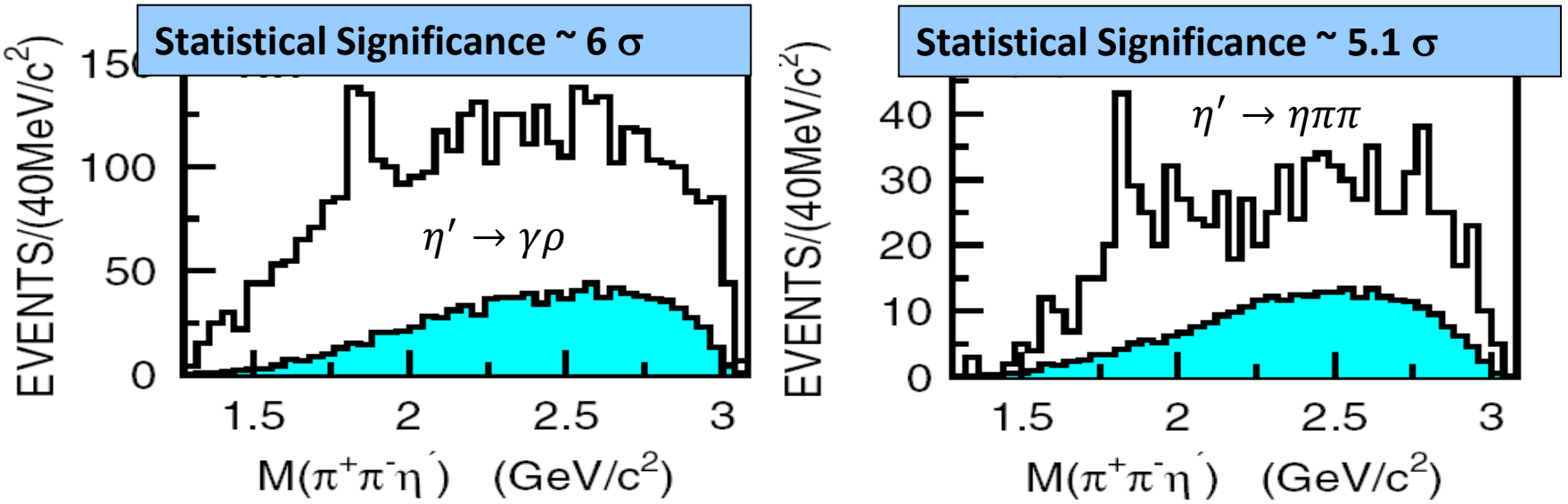


PRL 108,112003(2012)

X(1835) in $\eta'\pi^+\pi^-$

$J/\psi \to \gamma\eta'\pi^+\pi^-$ @ BESII

BESII: PRL 95,262001(2005)



M=1833.7±6.1(stat)±2.7(syst)MeV

Γ=67.7±20.3(stat)±7.7(syst)MeV

Theoretical interpretation:

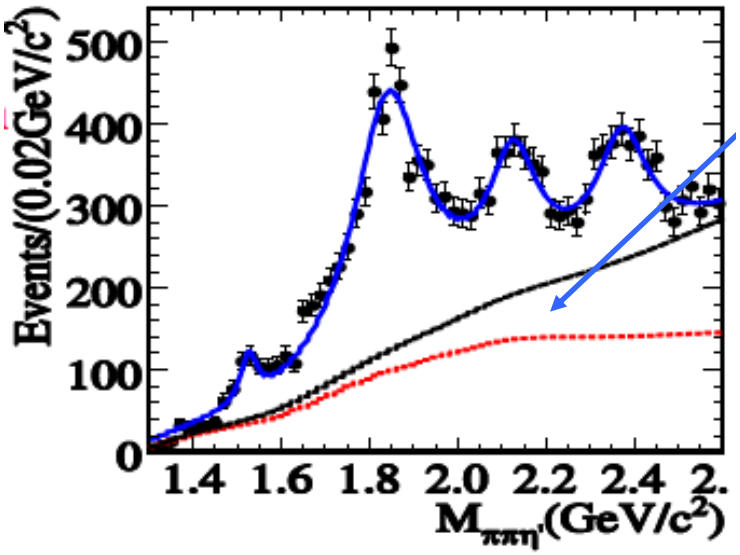
- **$p\bar{p}$ bound state, η excitation ….**
- **Are X($p\bar{p}$) and X(1835) from the same source?**

X(1835) in $J/\psi \to \gamma\eta'\pi^+\pi^-$ at BESIII

BESIII: PRL 108 (2011)112003

- **Fit with four resonances (acceptance weighted BW ⊗gaussian)**
- **Three background components:**
  - ① Contribution from non-η' events estimated by η' mass sideband
  - ② Contribution from $J/\psi \to \eta'\pi^+\pi^-\pi^0$ with re-weighting method
  - ③ Contribution from "PS background":

$$f_{bkg}(x) = (x-m_0)^{\frac{1}{2}} + a_0(x-m_0)^{\frac{1}{2}} + a_1(x-m_0)^{\frac{5}{2}}, m_0 = 2m_\pi + m_{\eta'}$$



Red line: estimated contribution of ①+ ②

Black line: total background

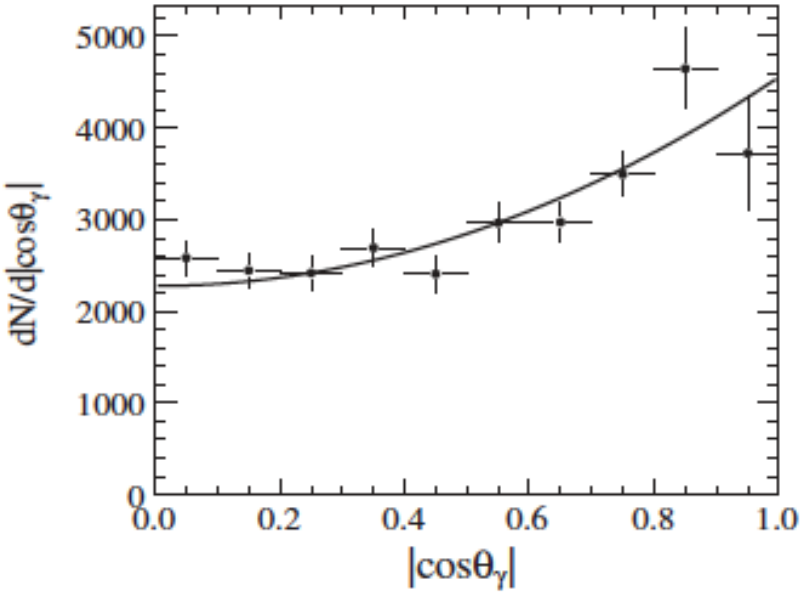
resonance	M(MeV/c^2)	Γ(MeV/c^2	significance
X(1835)	1836.5 ± 3.0	190.1 ± 9.0	$>> 20\sigma$
X(2120)	2122.4 ± 6.7	84 ± 16	$> 7.2\sigma$
X(2370)	2376.3 ± 8.7	83 ± 17	$> 6.4\sigma$

Stat. sig. is conservatively estimated:
fit range, background shape,
contribution of extra resonances

narrow!!

The angular distribution of the X(1835)

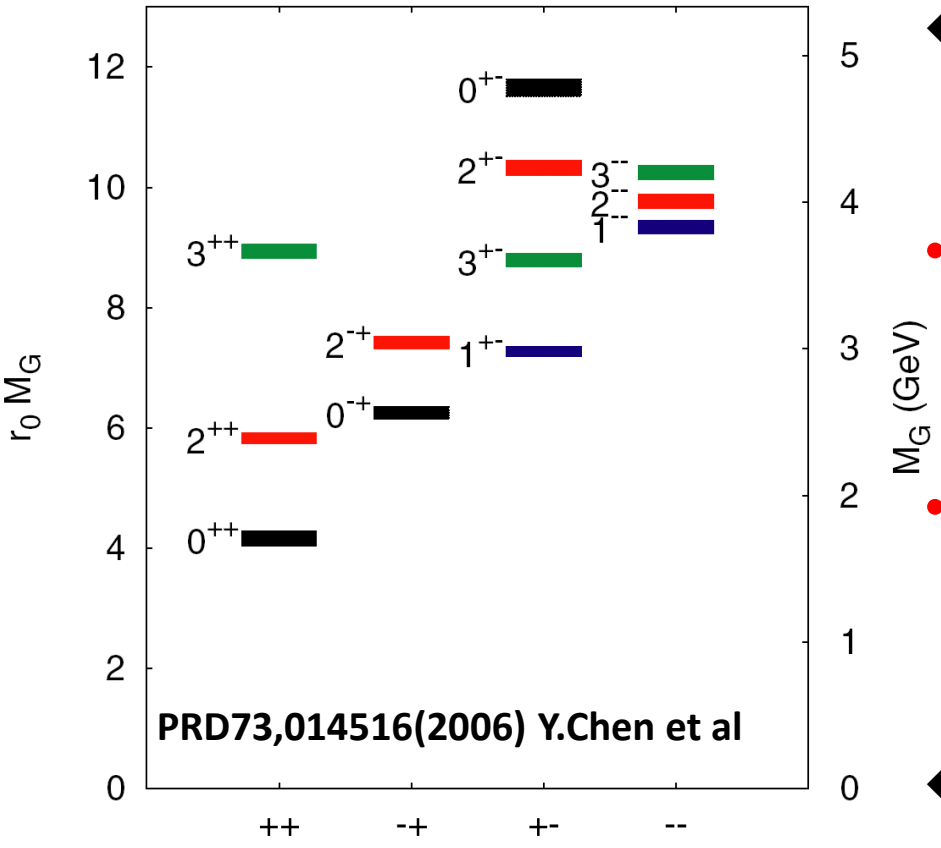
BESIII: PRL 108 (2011)112003



- **With bin-by-bin mass spectrum fit, we can obtain background-subtracted, acceptance-corrected angular distribution**

- **Consistent with the expectation for a pseudoscalar, other assumptions are not excluded.**

Why are X(2120) and X(2370) interesting?



PRD82,074026,2010
J.F. Liu, G.J. Ding and M.L.Yan
PRD83:114007,2011
J.S. Yu, Z.-F. Sun, X. Liu, Q. zhao
and more…

- First distinct resonant structures observed above 2 GeV
- LQCD predicts the lowest lying 0^{-+} glueball: around 2.4 GeV/c^2.
- $J/\psi \to \gamma\pi\pi\eta'$ decay is a good channel for finding 0^{-+} glueballs.
- Nature of X(2120)/X(2370)
  - pseudoscalar/tensor glueballs?
  - η/η' excitations?
  - …

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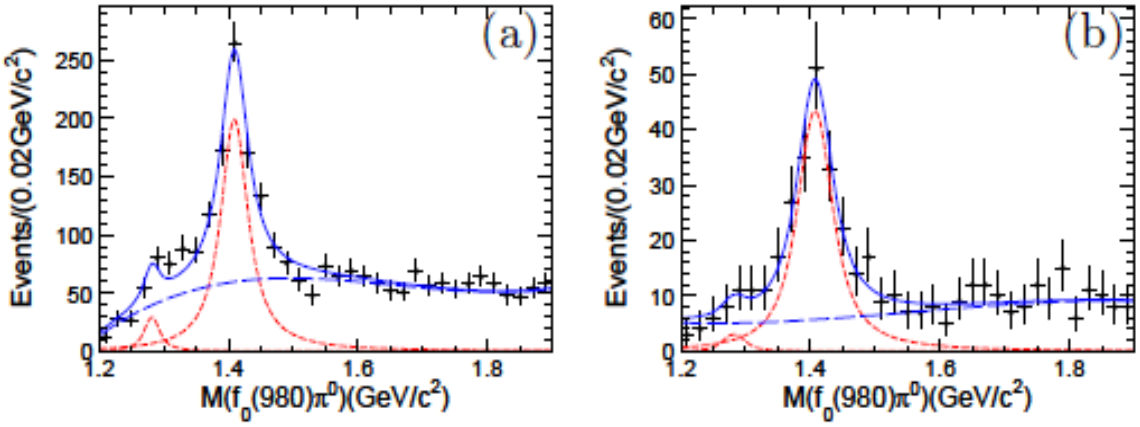
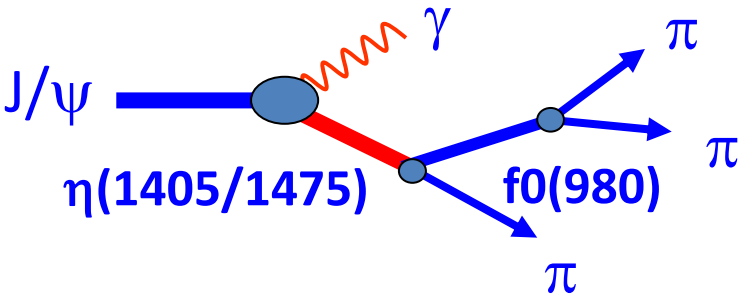
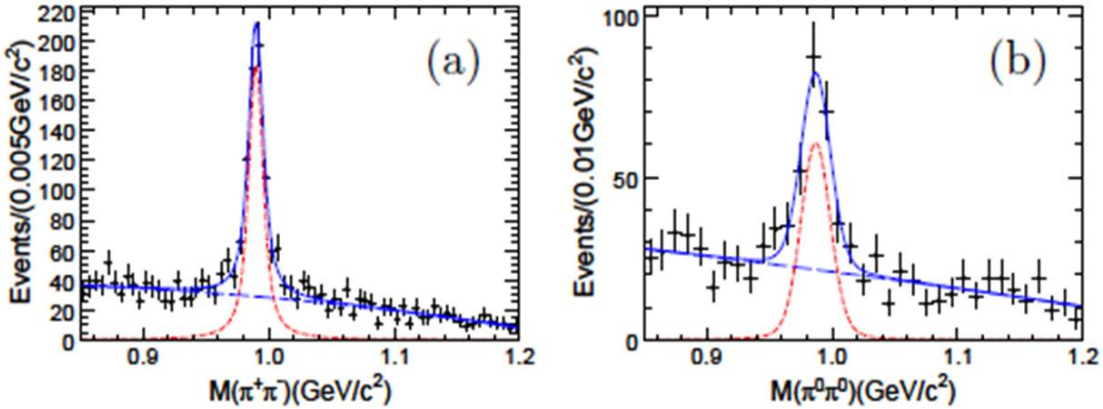
Isospin-violating decay of J/ψ → γππ

BES III, Phys. Rev.Lett. 108, (2012) 182001

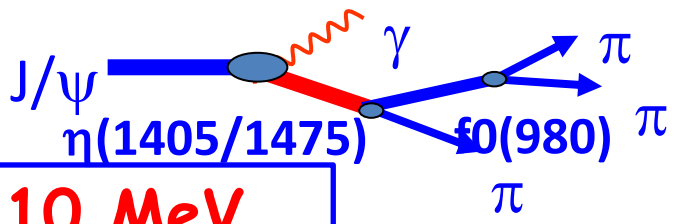






Isospin-violating decay of J/ψ → γππ

newly appeared in PDG review 2012



f0(980) is extremely narrow: Γ ≅ 10 MeV.

PDG: Γ(f0(980)) ≅ 40~100 MeV.

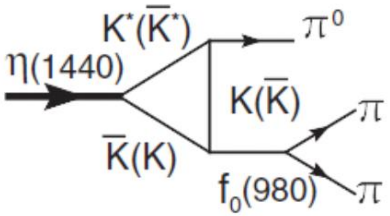
Anomalously large isospin violation:

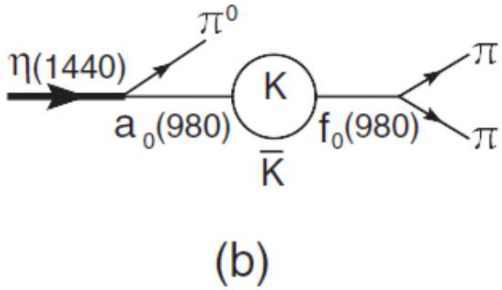
$$\frac{Br(\eta(1405) \to f_0(980)\pi^0 \to \pi^+\pi^-\pi^0)}{Br(\eta(1405) \to a_0^0(980)\pi^0 \to \eta\pi^0\pi^0)} \cong (17.9 \pm 4.2)\%$$

$$\xi_{af} = \frac{Br(\chi_{c1} \to f_0(980)\pi^0 \to \pi^+\pi^-\pi^0)}{Br(\chi_{c1} \to a_0(980)\pi^0 \to \eta\pi^0\pi^0)} < 1\%(90\%\ C.L.)$$

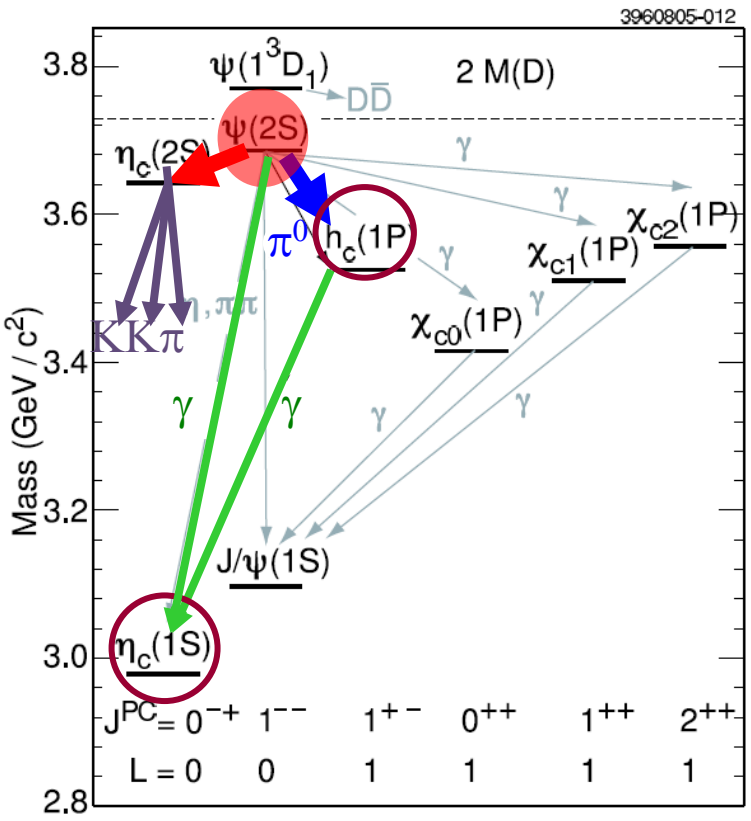
PRD, 83(2100)032003

J.J. Wu, X.H. Liu, Q.Z. and B.S. Zou, PRL(2012)





High lights from BESIII (3)



- resonance parameters of the η_c:
  charmonium ground state

BESIII: PRD 86, 092009 (2012)

- properties of the h_c :
  most recently discovered charmonium state

BESIII: PRL 104, 132002 (2010), PRD 86, 092009 (2012)

- M1 transition $\psi' \rightarrow \gamma \eta_c'$:
  first observation

BESIII: PRL109, 042003 (2012)

$\eta_c(2S)$

- Crystal Ball's "first observation" of $\psi' \to \gamma X$ never been confirmed

  PRL 48 70 (1982)

- Observed in different production mechanisms
  - $B \to K\eta_c(2S)$
  - $\gamma\gamma \to \eta_c(2S) \to KK\pi$
  - double charmonium production

Belle: PRL 89 102001 (2002), NPPS.184 220 (2008), PRL 98 082001(2007)
CLEOc: PRL 92 142001 (2004)
BaBar: PRL 92 142002 (2004); PR D72 031101(2005), PR D84 012004 (2011)

Experiment	M [MeV]	Γ [MeV]	Process
Belle [1]	$3654 \pm 6 \pm 8$	—	$B^\pm \to K^\pm \eta_c(2S), \eta_c(2S) \to K_S K^\pm \pi^\mp$
CLEO [2]	$3642.9 \pm 3.1 \pm 1.5$	$6.3 \pm 12.4 \pm 4.0$	$\gamma\gamma \to \eta_c(2S) \to K_S K^\pm \pi^\mp$
BaBar [3]	$3630.8 \pm 3.4 \pm 1.0$	$17.0 \pm 8.3 \pm 2.5$	$\gamma\gamma \to \eta_c(2S) \to K_S K^\pm \pi^\mp$
BaBar [4]	$3645.0 + 5.5^{+4.9}_{-7.8}$	—	$e^+e^- \to J/\psi c\bar{c}$
PDG [5]	3638 ± 4	14 ± 7	—

- M1 transition $\psi' \to \gamma\eta c(2S)$

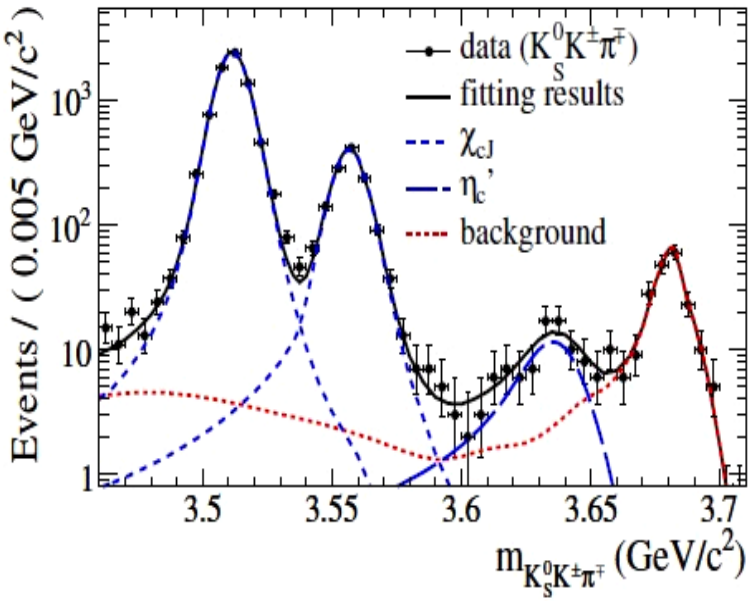
CLEOc found no signals in 25M ψ'.

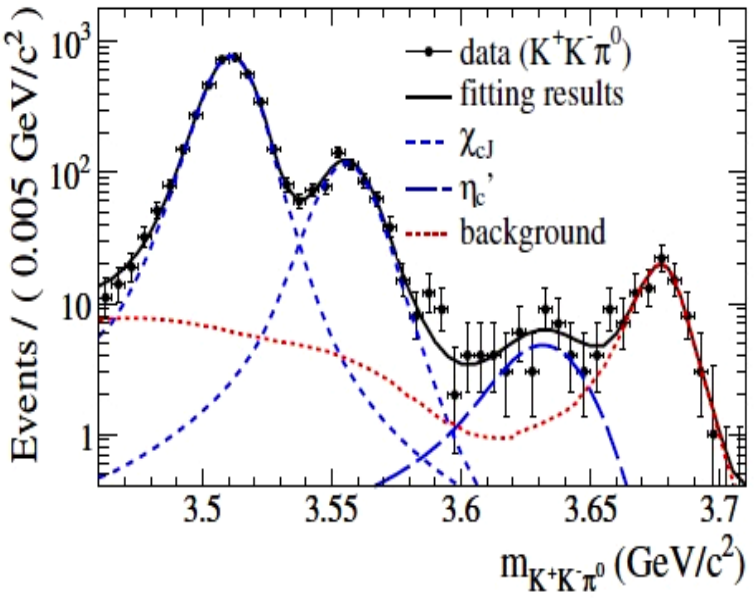
$BF(\psi' \to \gamma\eta_c(2S)) < 7.6 \times 10^{-4}$ CLEOc: PRD 81 052002 (2010)

Experimental challenge : detect photons of 50 MeV

First observation of $\psi' \to \gamma\eta_c(2S)$@BESIII

Statistical significance >10 σ BESIII: PRL109, 042003 (2012)





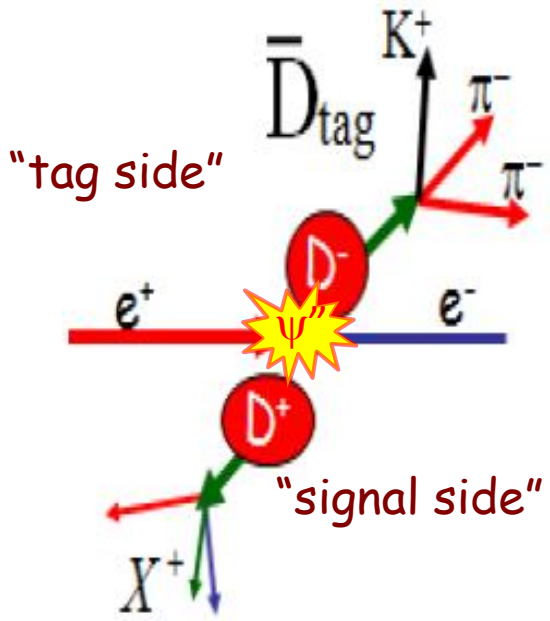
- Observed signal in $K_sK^+\pi^-$+c.c., found evidence in $K^+K^-\pi^0$
- First measured $Br(\psi' \to \gamma\eta_c(2S)) = (6.8 \pm 1.1 \pm 4.5) \times 10^{-4}$

Potential model expectation: (0.1-6.2)$\times 10^{-4}$ PRL 89 162002 (2002)

CLEOc: <7.6$\times 10^{-4}$ PRD 81 052002 (2010)

Charm physics @ BESIII

- semi-leptonic form factors
- f_D & f_{Ds} decay consts.
- CKM matrix: V_{cd}, V_{cs}
- D^0-D^0 mixing and *CPV*
- strong phases
- rare decays



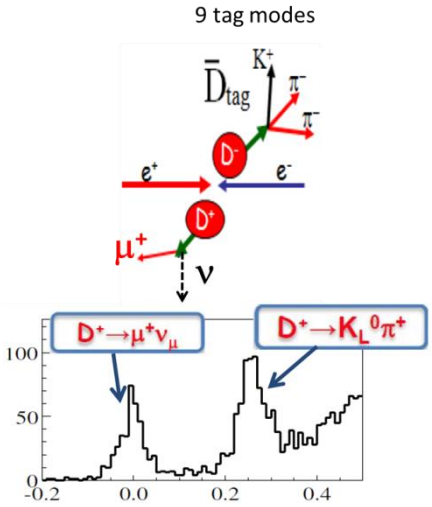
Advantage of open charm at threshold

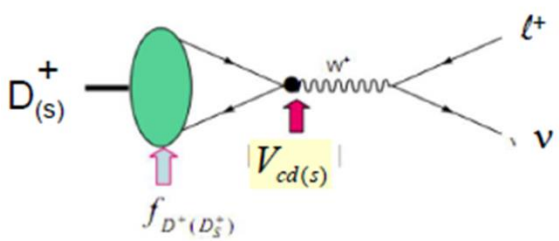
- ✓ **Threshold production: clean**
- ✓ **Known initial energy and quantum numbers**
- ✓ **D tagging**
- ✓ **Absolute measurements**

D+ → μν (BESIII: 2.9 fb^{-1})

arXiv:1209.0085

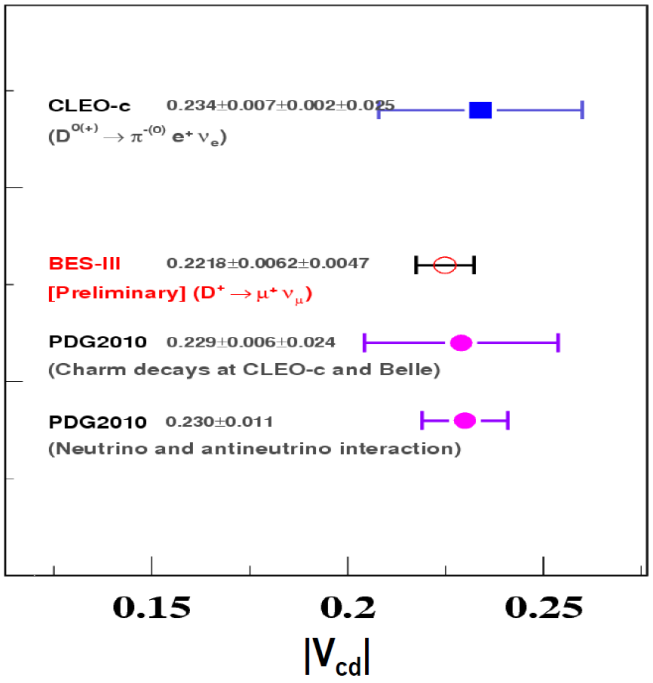
CHARM2012, G. Rong





$$\Gamma_{SM}(D_{(s)}^{+} \to l^{+}\nu) = \frac{G_F^2}{8\pi} m_l^2 m_{D_{(s)}} \left(1 - \frac{m_l^2}{m_{D_{(s)}}^2}\right)^2 |V_{cd(s)}|^2 f_{D_{(s)}^+}$$

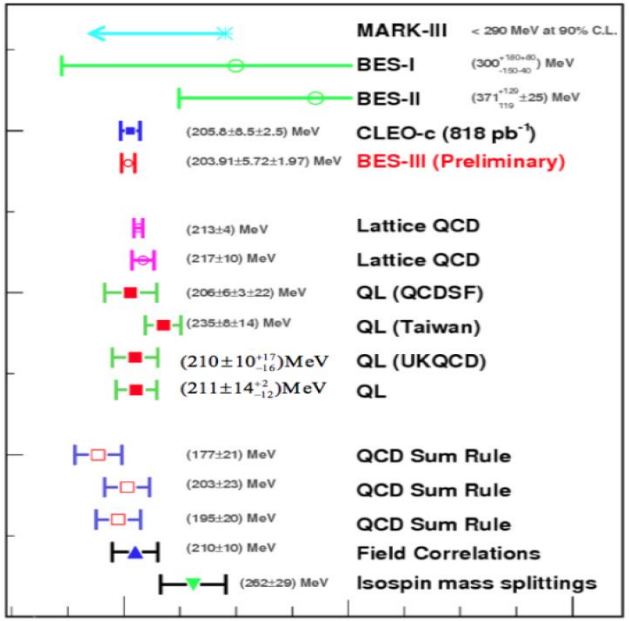
BESIII preliminary ($2.9 fb^{-1}$) : f_D = (203.91 ± 5.72 ± 1.97) MeV, $|V_{cd}|$ = 0.2218 ± 0.0062 ± 0.0047



Most precise measurement of $|V_{cd}|$

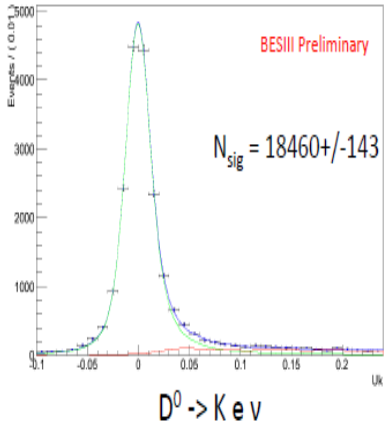
Precise test of LQCD calculation of f_D

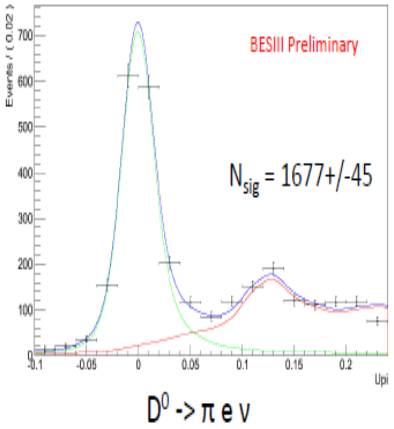
(Input τ_{D+}, m_{D+}, $m_{\mu+}$ of PDG10 and V_{cd} of CKM-Fitter)



$D^0 \to K^-/\pi^- e^+\nu$ (BESIII: 0.9 fb^{-1})

BESIII Preliminary **CHARM2012, C. L. Liu**

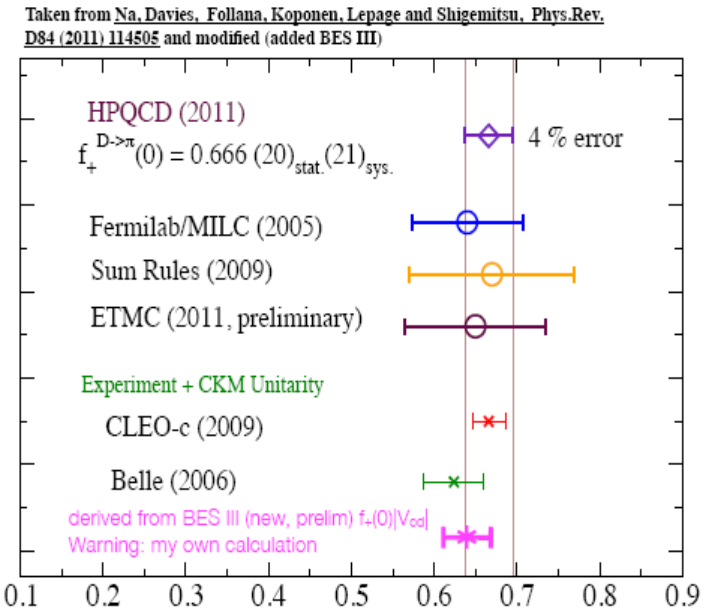




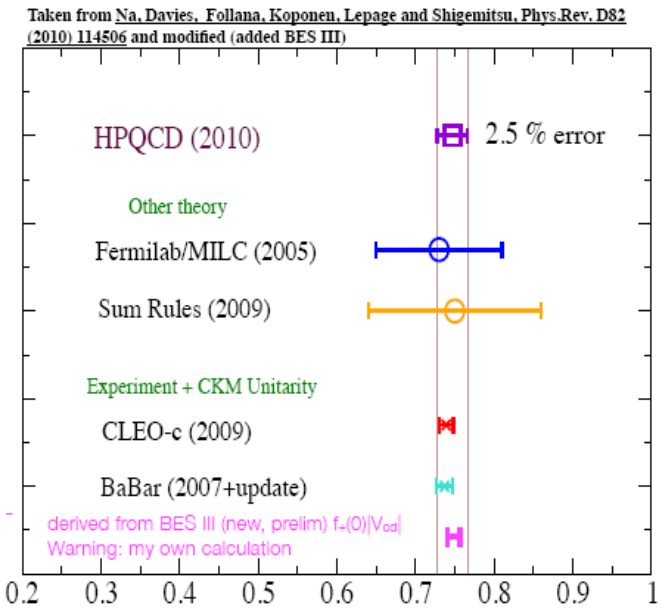
Mode	measured branching fraction(%)	PDG	CLEOc
$\bar{D}^0 \to K^+ e^- \bar{\nu}$	3.542 ±0.030±0.067	3.55 ±0.04	3.50 ±0.03 ±0.04
$\bar{D}^0 \to \pi^+ e^- \bar{\nu}$	0.288 ±0.008±0.005	0.289 ±0.008	0.288 ±0.008±0.003

$$U = E_{miss} - |\vec{P}_{miss}| \approx 0$$

- Systematic uncertainties are preliminary
- Good consistency with CLEO-c, statistical precision comparable with only 1/3 data analyzed



$f_+^{D\to\pi}(0)$



$f_+^{D\to K}(0)$

From J. Rademacker @ FPCP2012

Summary

- BEPCII is operating near design luminosity & BESIII is performing at state-of-art levels
  - 0.5 Billion of $\psi(2S)$ and 1.2 Billion of J/ψ events accumulated
  - 2.9 fb^{-1} at $\psi(3770)$ so far.
  - 3.3 fb^{-1} data for high statistic studies of XYZ
- Excellent for precision measurements and new discoveries. Charming program of physics for the future.

Thank you