News from the last BESIII workshop

Isabella Garzia, UNIFE and INFN

March 24, 2023

BESIII workshop in March 2023

https://indico.ihep.ac.cn/event/18456/timetable/

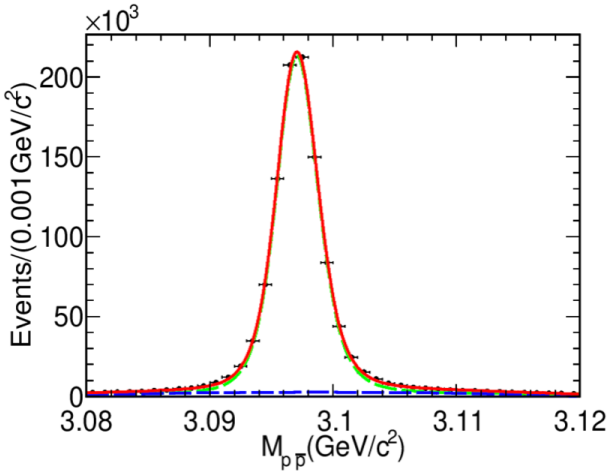
Collaboration meeting in June: 26-30 June 2023

Measurement the Branching Fraction of $J/\psi \to p\bar{p}$ via $\psi' \to \pi^+\pi^- J/\psi$

Meichen Yu , Francesca De Mori , Isabella Garzia , Li Gong , Xiaoshen Kang

Liaoning University

Fitting Result



PDF :

Signal : MC shape ⊗ Gaussian

Background : 2nd Chebyshev polynomial;

(QED contribution at **3.650** GeV)

$$N_{fit}(3686) = (1.0495 \pm 0.0011)\times 10^6$$

$$f = \frac{N(3686)}{N(3650)} = \frac{\mathcal{L}_{\psi(3686)}}{\mathcal{L}_{\psi(3650)}} \cdot \frac{\sigma_{\psi(3650)}}{\sigma_{\psi(3686)}} \cdot \frac{\varepsilon_{\psi(3686)}}{\varepsilon_{\psi(3650)}} = 8.236$$

$$Br(J/\psi \to p\bar{p}) = \frac{N_{obs}}{N_{\psi'}[\varepsilon \cdot B(\psi' \to \pi^+\pi^- J/\psi)]} = (2.099 \pm 0.002)\times 10^{-3}$$

consistent with PDG

PDG: $Br(J/\psi \to p\bar{p}) = (2.120 \pm 0.029)\times 10^{-3}$

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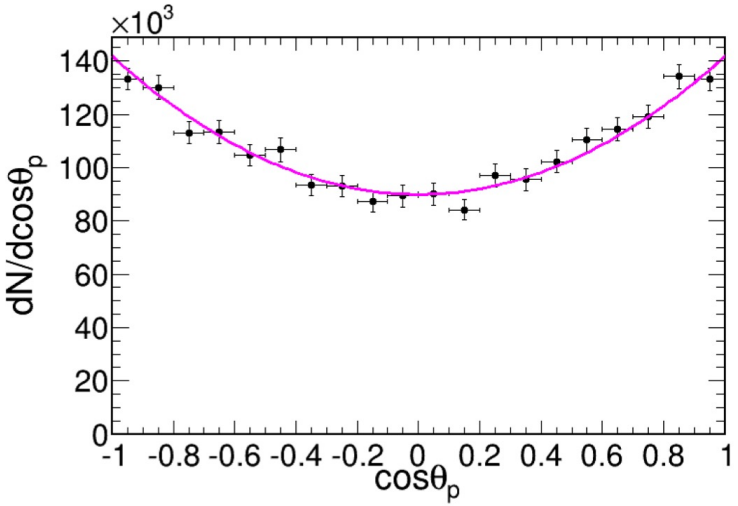
Angle Fit



Fit Function : $\frac{dN}{dcos\theta} = A(1 + \alpha \cos^2\theta)$

FCN=-2.7662e+07 FROM HESSE	STATUS=OK		10 CALLS	100 TOTAL
	EDM=0.000377571	STRATEGY= 1	ERROR MATRIX ACCURATE	
EXT PARAMETER			INTERNAL	INTERNAL
NO. NAME	VALUE	ERROR	STEP SIZE	VALUE
1 alpha	5.75959e-01	3.37763e-03	9.92938e-04	2.98908e+00
2 neta	2.14510e+06	1.46462e+03	6.00358e-05	-4.82196e-01
		ERR DEF= 0.5		

$\alpha = 0.576 \pm 0.003$

$\alpha = 0.595 \pm 0.012$

Phys. Rev. D 86, 032014 (2012)

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link to the slides here

Status update on pipiJpsi around psi(2S) mass

G Mezzadri on behalf of the working group

2023/03/13 P&S workshop

link to the slides here

Update the analysis of $h_c \to e^+e^-\eta_c$

Shuangli Yang[1], Shuangshi Fang[2], Xiaorui Lyu[1]

[1]University of Chinese Academy of Sciences

[2]Institute of High Energy Physics

Mar 16, 2023 /Beijing

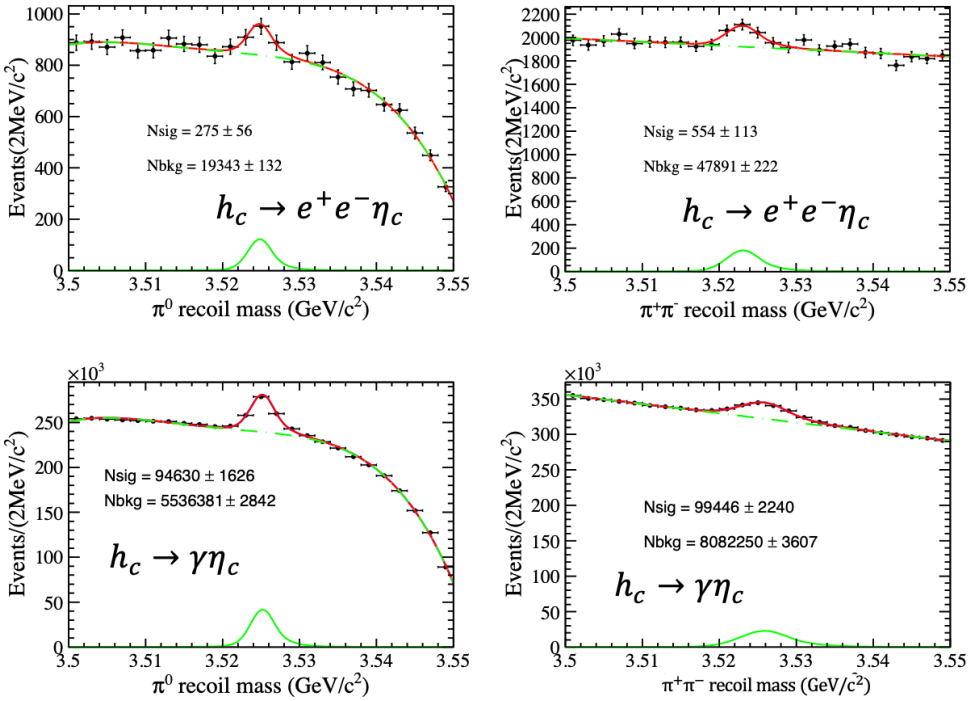
link to the slides here

$\psi(3686) \to \pi^0 h_c, h_c \to e^+e^-\eta_c$ $e^+e^- \to \pi^+\pi^- h_c, h_c \to e^+e^-\eta_c$

Event Selection

- A simultaneous unbinned maximum likelihood fit to π^0 recoil mass in data is performed, and the PDF can be written as

$$BW(M,\Gamma) \otimes CB\ shape(m,\sigma,\alpha,n) + background$$



- ✓ m, σ, α, n: the parameters of CB are fixed which got from Signal MC
- ✓ The width(Γ) of h_c is fixed to 0.7 MeV , and the mass(M) of h_c is free
- ✓ background: Chebyshev polynomial.

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

Branching Fraction Ratio Measurement

➢ The branching fraction ratio $\mathcal{R}$ is calculated to be:

$$\mathcal{R} = \frac{\mathcal{B}(h_c \to e^+e^-\eta_c)}{\mathcal{B}(h_c \to \gamma\eta_c)} \equiv \frac{N^{obs}_{e^+e^-\eta_c}}{N^{obs}_{\gamma\eta_c}} \times \frac{\epsilon_2}{\epsilon_1}$$

✓ $N^{obs}_{e^+e^-\eta_c}$ and $N^{obs}_{\gamma\eta_c}$: The h_c yields got from the fit

✓ ϵ: The detection efficiency which got from Signal MC

Mode	$N^{obs}_{e^+e^-\eta_c}$	$N^{obs}_{\gamma\eta_c}$	ϵ_1	ϵ_2	$\mathcal{R}(\%)$	Significance
Mode I	275 ± 56	94630 ± 1626	5.38%	7.99%	$(0.43 \pm \pm 0.09)\%$	5.3σ
Mode II	554 ± 113	99446 ± 2240	24.76%	33.12%	$(0.75 \pm 0.15)\%$	

✓ Mode I: $\psi(3686) \to \pi^0 h_c$

✓ Mode II: $e^+e^- \to \pi^+\pi^- h_c$

➢ Compare the Branch fractions with previous results

Decay mode	previous	Now
$h_c \to e^+e^-\eta_c$	$(57.68 \pm 14.42)\times10^{-4}$	$(22.18 \pm 4.52)\times10^{-4}$
$h_c \to \gamma\eta_c$	$(52.86 \pm 1.71)\times10^{-2}$	$(51.38 \pm 0.88)\times10^{-2}$

➢ Compare the mass value of h_c with previous results

Decay mode	Previous(MeV/c^2)	Now(MeV/c^2)	PDG(MeV/c^2)
$h_c \to e^+e^-\eta_c$	3522.88 ± 0.42	3525.11 ± 0.50	3525.38 ± 0.11

✓ The differences of $\mathcal{B}(h_c \to e^+e^-\eta_c)$ and M_{h_c} between two results are too large, why?

TABLE I. Results of the fits to the π^0 recoiling mass spectra with statistical (first) and systematic (second) uncertainties. The last column provides current PDG values.

Variable	Value	PDG value [5]
$M(h_c)$ (MeV/c^2)	$3525.32 \pm 0.06 \pm 0.15$	3525.38 ± 0.11
$\Gamma(h_c)$ (MeV)	$0.78^{+0.27}_{-0.24} \pm 0.12$	$0.70 \pm 0.28 \pm 0.22$ (BESIII [7])
$N_{\rm Tag}(h_c)$	23118^{+1500}_{-1398}	...
$\mathcal{B}_{\rm Inc} \times \mathcal{B}_{\rm Tag}$ (10^{-4})	$4.22^{+0.27}_{-0.26} \pm 0.19$	4.58 ± 0.64 (BESIII [6]) 4.16 ± 0.48 (CLEO [8])
$N_{\rm Inc}(h_c)$	46187 ± 2123	...
$\mathcal{B}_{\rm Inc}$ (10^{-4})	$7.32 \pm 0.34 \pm 0.41$	$8.40 \pm 1.30 \pm 1.00$ (BESIII [6]) $9.00 \pm 1.5 \pm 1.3$ (CLEO [25])
$\mathcal{B}_{\rm Tag}$ (%)	$57.66^{+3.62}_{-3.50} \pm 0.58$	$53 \pm 7 \pm 8$ (BESIII [6]) $48 \pm 6 \pm 7$ (CLEO [8])

Comparison with M. Scodeggio analysis published in 2022

- Compare the Branch fractions with previous results

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中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

BESIII

PWA of $J/\psi \to \phi\pi^+\pi^-\eta'$

[1]Yanping Huang,[1]Ligang Shao, [1]Yuqing Wang, [2]Jiajun Wu

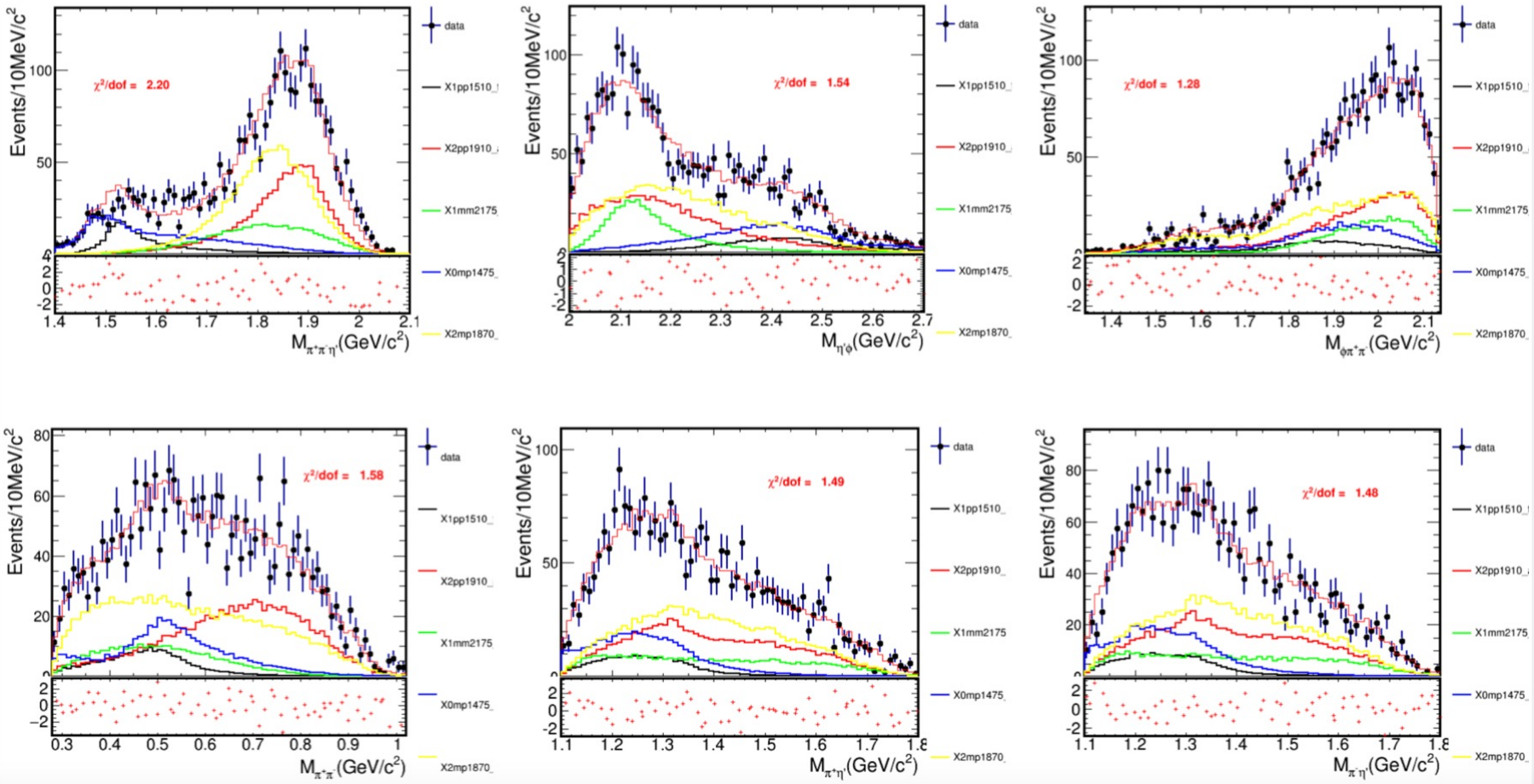
[1]*Institute of High Energy Physics*

[2]*University of Chinese Academy of Sciences*

https://indico.ihep.ac.cn/event/18456/contributions/129503/attachments/67317/79856/workshop_phipipietap_20230313.pdf

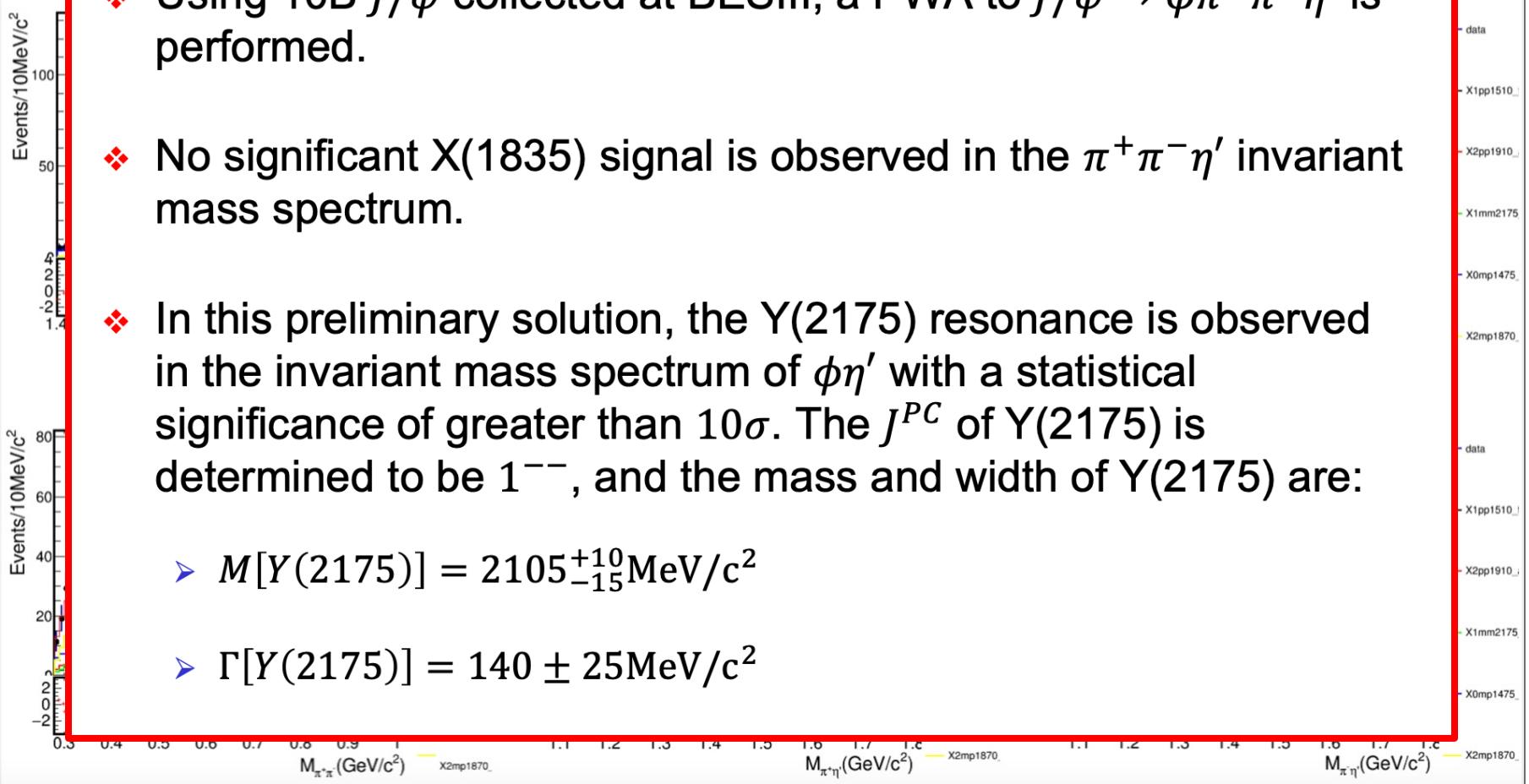
Projection plots

Total intensity of sum of all interference terms: -13.7%



Projection plots

- Using 10B J/ψ collected at BESIII, a PWA to $J/\psi \to \phi\pi^+\pi^-\eta'$ is performed.
- No significant X(1835) signal is observed in the $\pi^+\pi^-\eta'$ invariant mass spectrum.
- In this preliminary solution, the Y(2175) resonance is observed in the invariant mass spectrum of $\phi\eta'$ with a statistical significance of greater than 10σ. The J^{PC} of Y(2175) is determined to be 1^{--}, and the mass and width of Y(2175) are:
  - $M[Y(2175)] = 2105^{+10}_{-15}\mathrm{MeV/c^2}$
  - $\Gamma[Y(2175)] = 140 \pm 25\mathrm{MeV/c^2}$



COLLINS ASYMMETRY OF CHARGED HADRONS AT BESⅢ

Nan-Yang Wang[1], Bin-Long Wang[1], Ying Wang[2], Xiao-Rui Lyu[1], Qian Liu[1],
Zheng-Yun You[2], Yang-Heng Zheng[1]
[1]UCAS(中国科学院大学)
[2]SYSU(中山大学)

BESIII Collaboration Meeting
2022-6-13

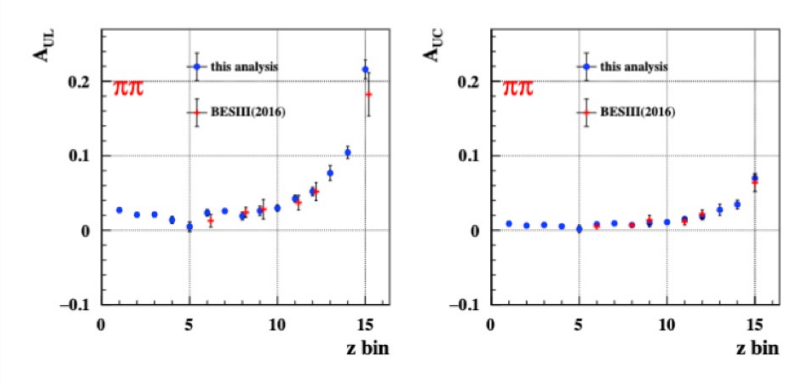
- Data
  - 446.5 pb^{-1} @3.51GeV

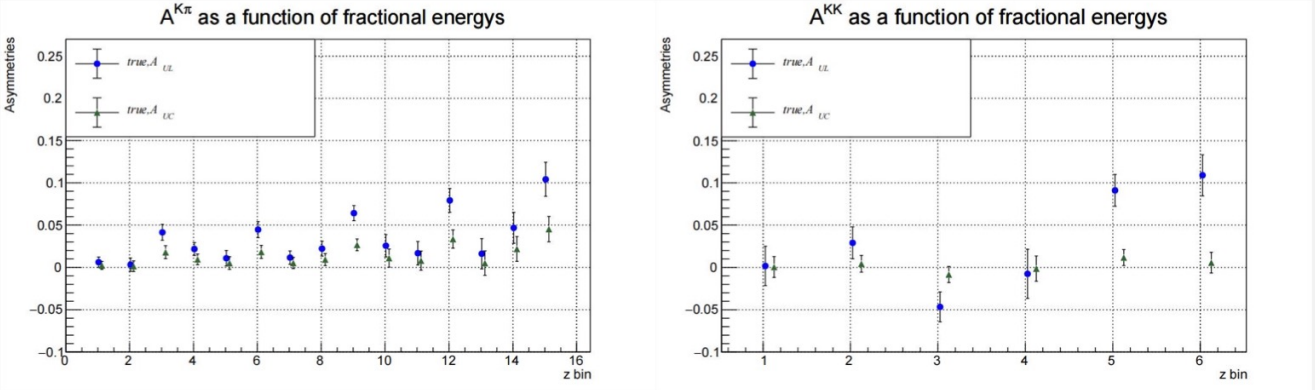
Data info.	Run number	Energy(GeV)	Lum.(pb^{-1})
$\chi_{c1}(P2)$	51584-51656	3.5099	39.3
$\chi_{c1}(P3)$	51657-51893	3.5082	181.5
$\chi_{c1}(P4)$	51894-52090	3.5106	184.6
$\chi_{c1}(P5)$	52298-52332	3.5148	41.1

old BESIII ana: 62 pb-1 @ 3.65 [link]

RESULTS AND COMPARISON

this analysis:





Conferenze italiane: IFAE + SIF