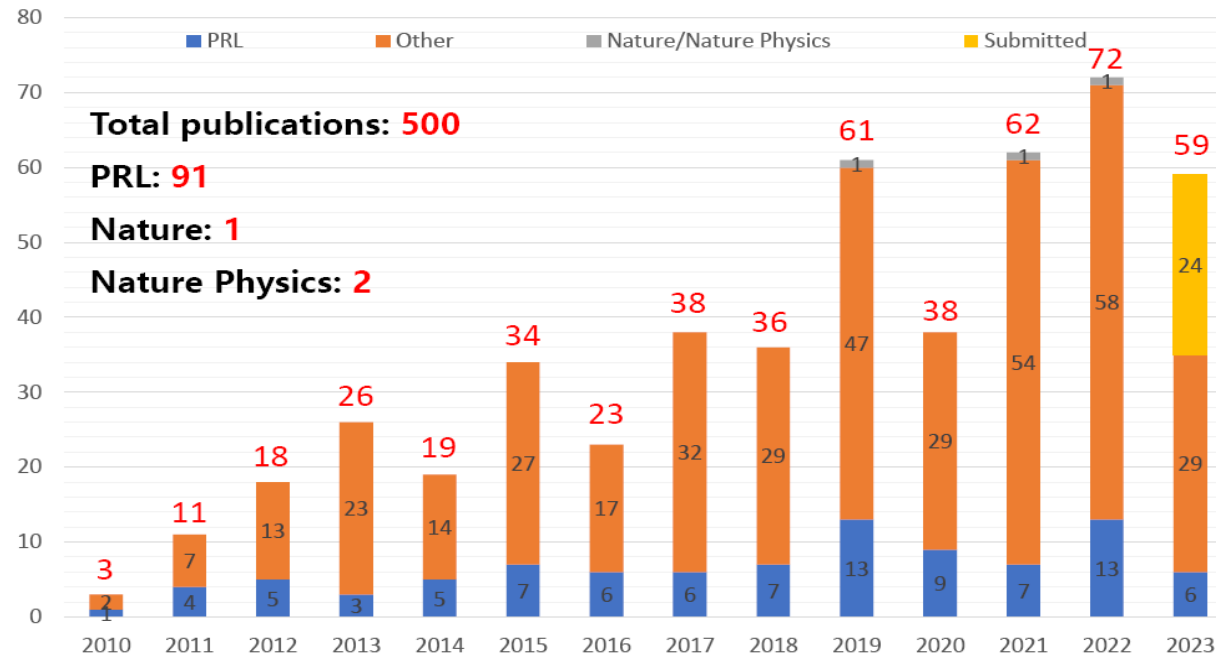


A closing remark

BESIII publications (May 9, 2023)

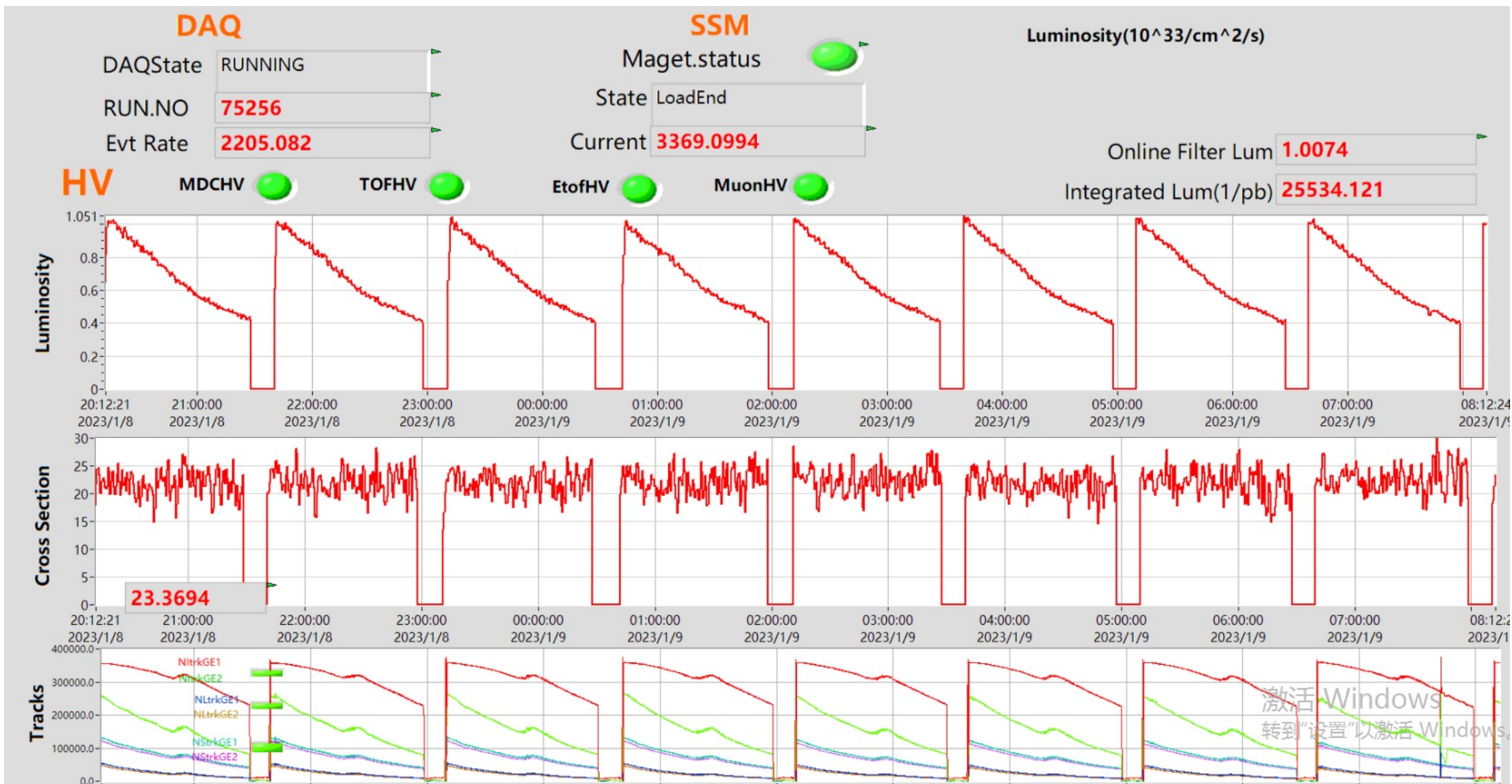


Hai-Bo Li (李海波)

Institute of High Energy Physics, CAS, Beijing

BEPCII Run stably beyond the designed luminosity

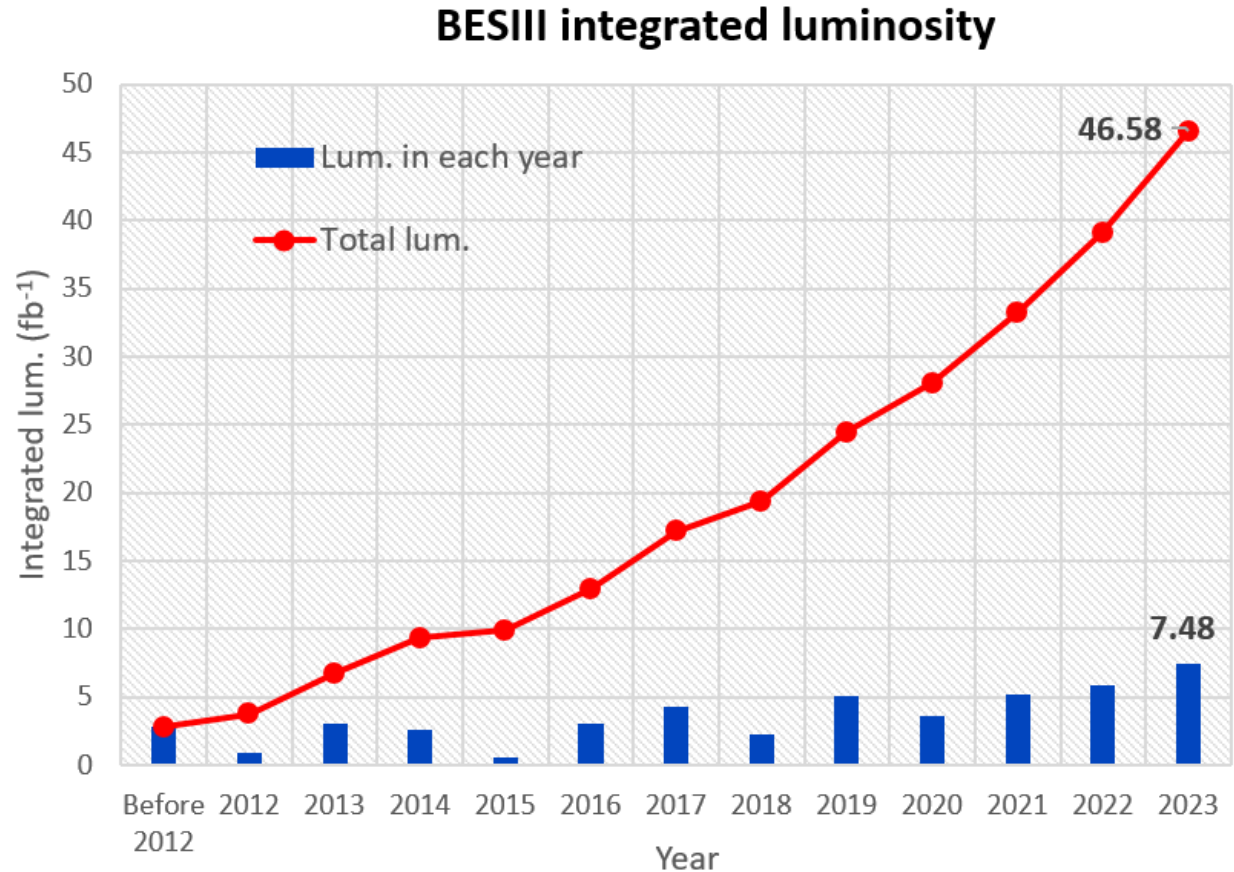
@ $E_{CM}=3770$ MeV



Total integrated luminosity: 2009-2023

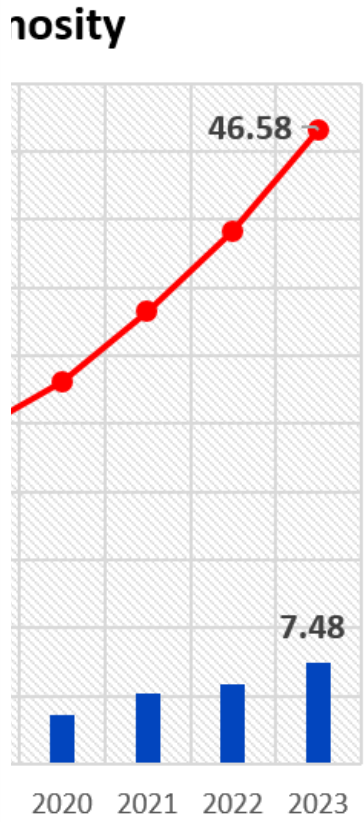
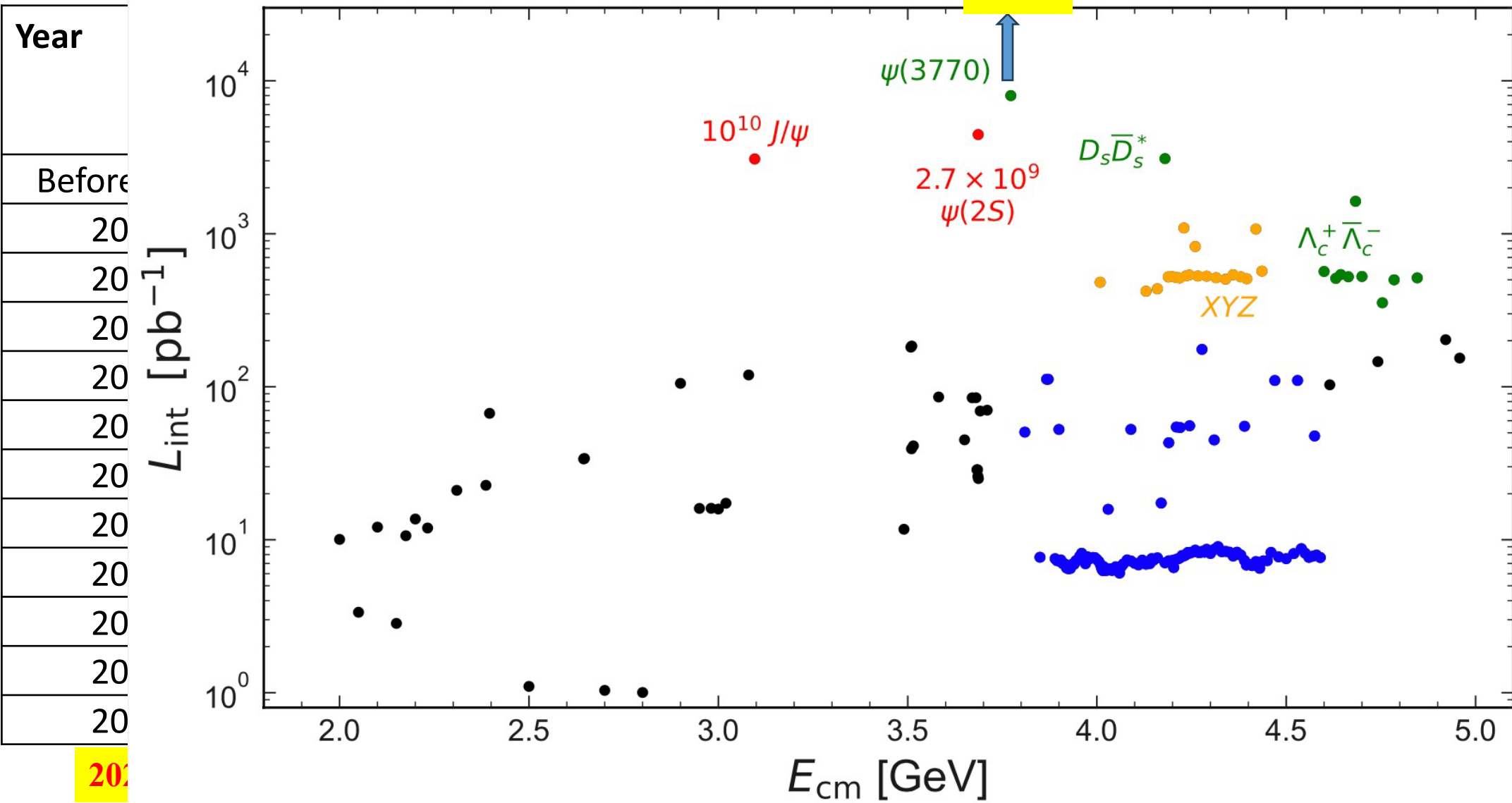
Year	Lum. in each year (fb ⁻¹) about 6 month running	Total lum. (fb ⁻¹)
Before 2012	2.81	2.81
2012	0.96	3.77
2013	3.0	6.77
2014	2.55	9.32
2015	0.6	9.92
2016	3.0	12.92
2017	4.24	17.16
2018	2.21	19.37
2019	5.1	24.47
2020	3.6	28.07
2021	5.2	33.27
2022	5.83	39.1

2023 8.0 47



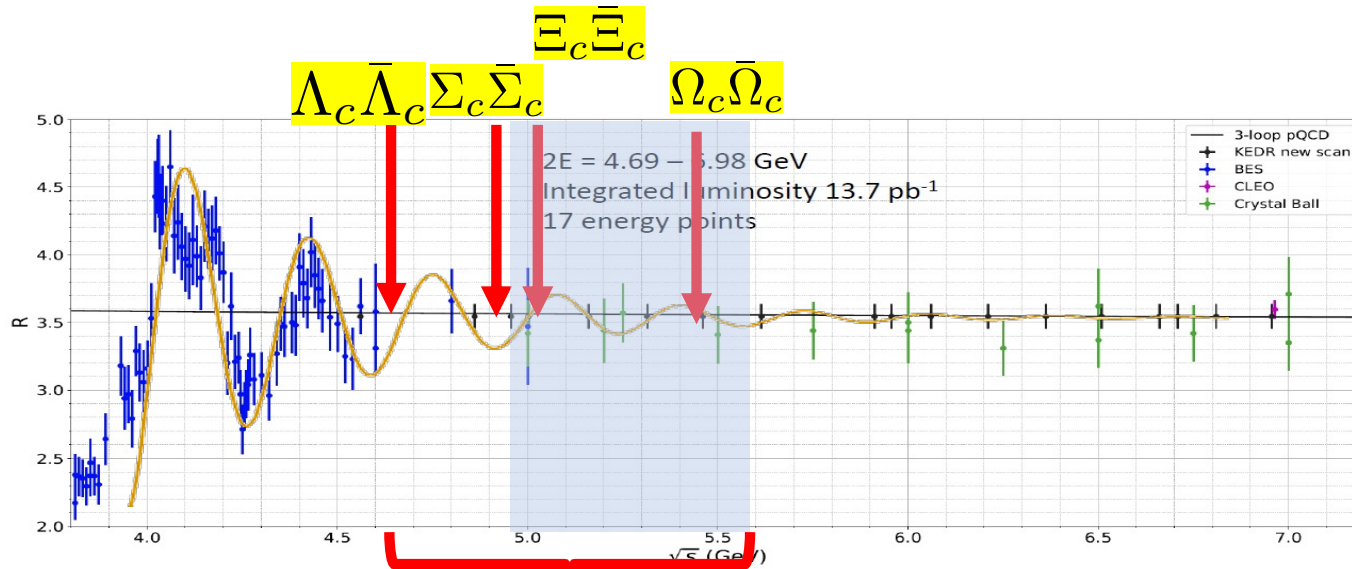
Thanks to machine people!

Total integrated luminosity: 2009-2023

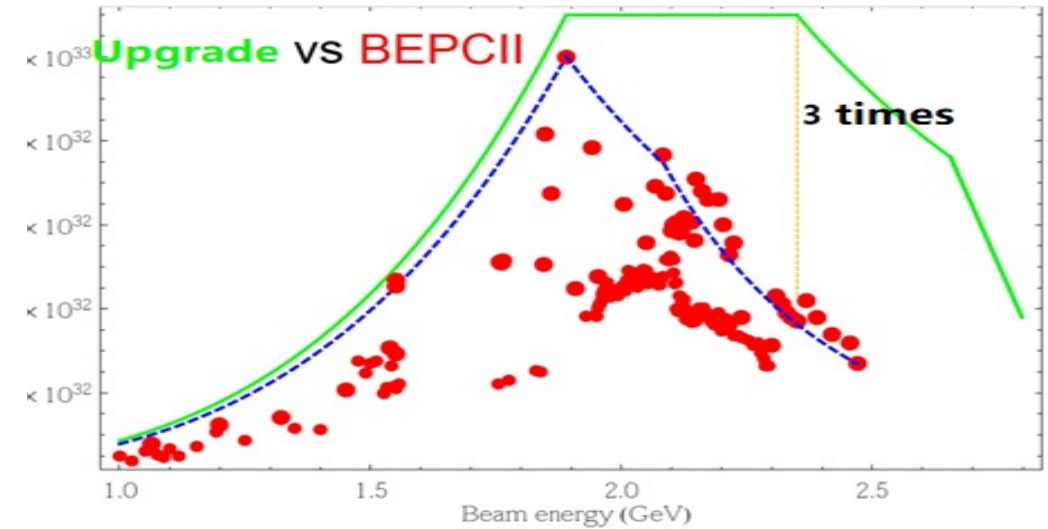


people!

BEPCII upgrades in 2024



Few data and potential physics for XYZ
 and charmed baryons



BEPCII upgrade:

Luminosity: 4.0 ~ 5.0 GeV : $1.2 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$

5.0 ~ 5.6 GeV: $(0.5-0.7) \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$

Construction: 2024. 6- 2024. 12

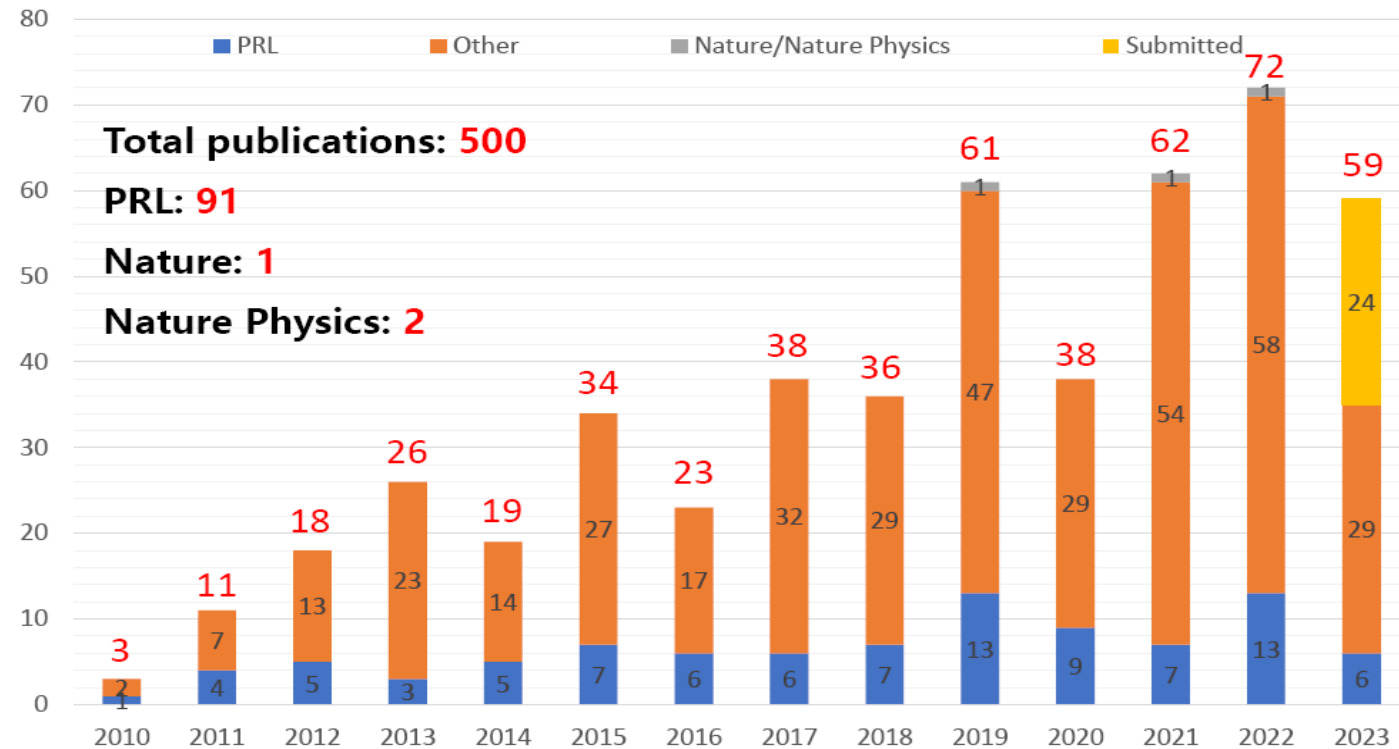
Acknowledgement

- Colleagues involved in the designs and constructions : BEPCII and BESIII
- Theorists from Yellow book (2008) to White paper (2017)
- Maintenances of the BEPCII machine running
- Great support from IHEP Lab
- International supports from BESIII member countries

Special thanks to NSFC, MOST, CAS , CCAST!

500 publications → next 500 publications

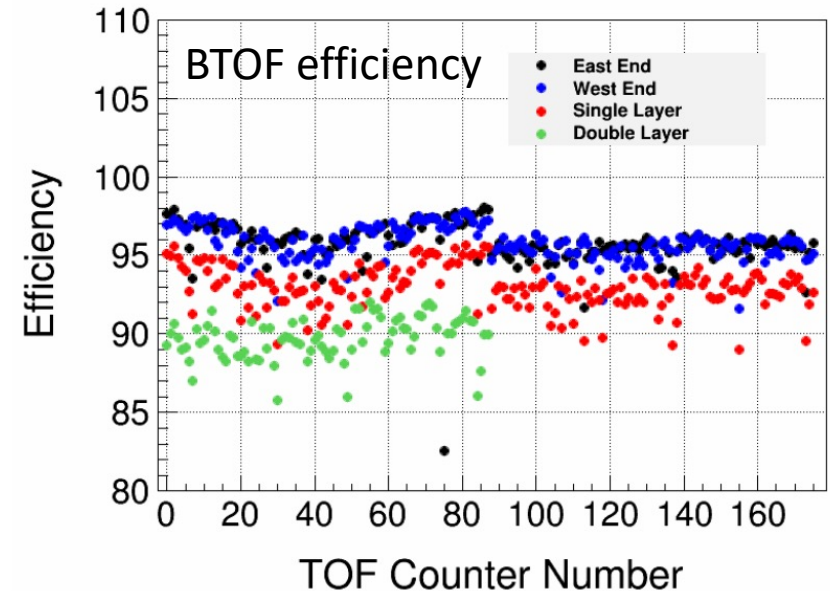
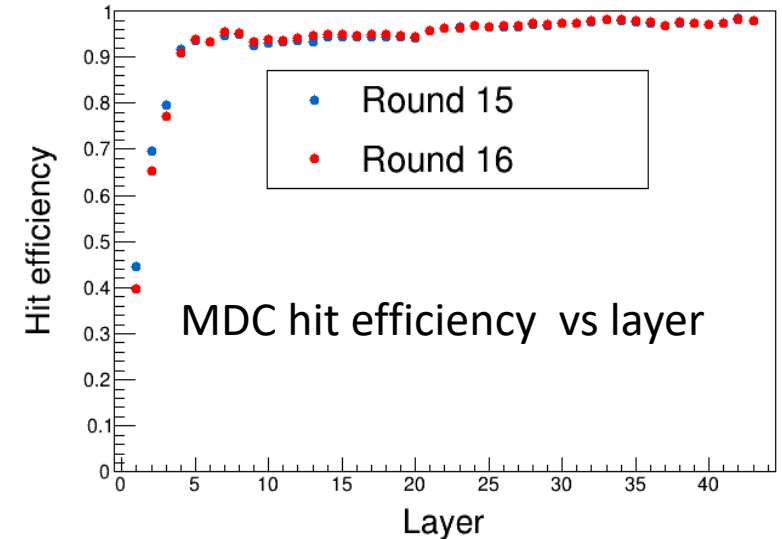
BESIII publications (May 9, 2023)



Thank you for joining us today!

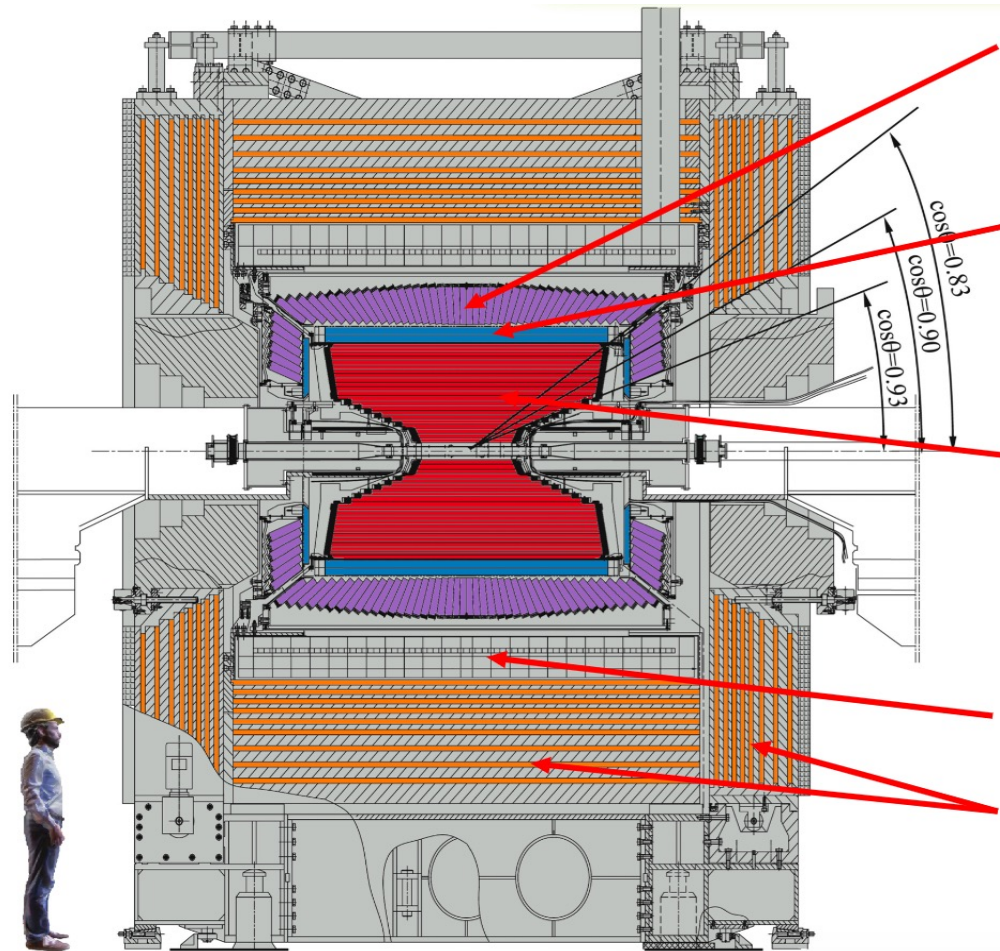
BESIII run status

- MDC :
 - No broken wire. 33 dead channels in total, 30 channels can be repaired due to preamp issues
 - Hit efficiency: 90%~97%, except for the first 3 layers
- EMC:
 - No dead crystal module. 27 unglued modules, light yield of 5 modules dropped to about 60-70%
 - Efficiency : Almost 100%, except for the 5 unglued modules
- BTOF:
 - No dead channel
 - Efficiency : 95%~97% for single end
- ETOF:
 - 6 dead channels can be repaired due to preamp issues
 - Efficiency : 98.5%, except for the dead channels
- MUC:
 - 1 module dead (east endcap layer0)
 - Efficiency : >90%



The State-of-Art BESIII Detector

Large coverage, excellent performance of resolution/PID for charged and neutral tracks



EMC: CsI crystals

$\Delta E/E = 2.5\%$ @ 1 GeV - Barrel

$\Delta E/E = 5.0\%$ @ 1 GeV - Endcaps

TOF:

$\sigma_T = 80$ ps Barrel

$\sigma_T = 110$ (60) ps Endcap

MDC: small cell & He gas

$\sigma_{xy} = 130$ μm

$\sigma_p/p = 0.5\%$ @ 1 GeV

$dE/dx = 6\%$

Magnet: 1T Super conducting

Muon ID: 9 layer RPC

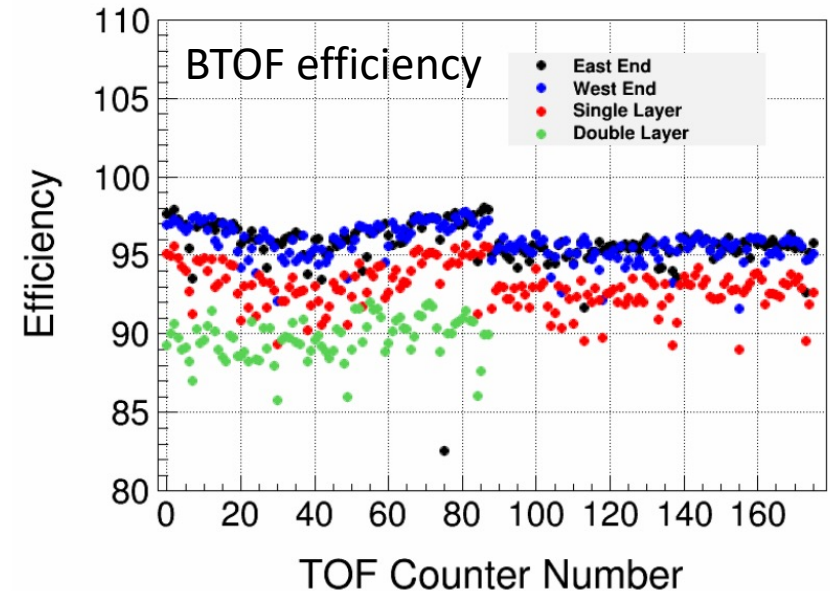
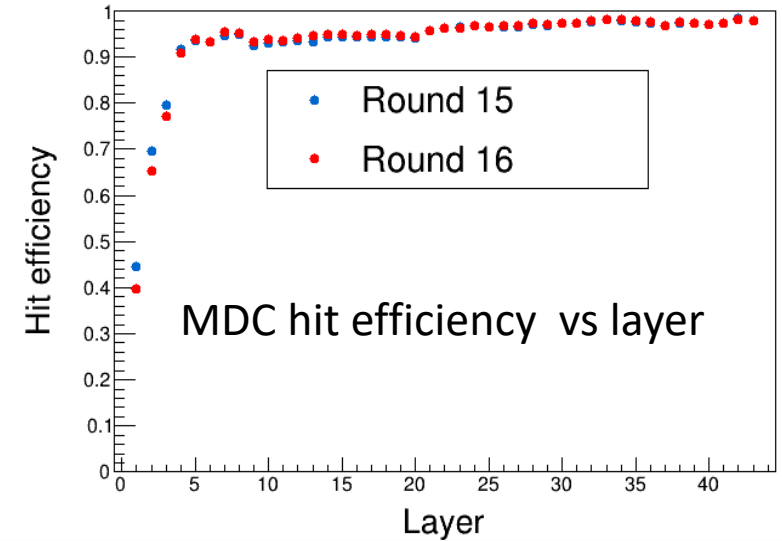
Trigger: Tracks & Showers

Total weight: ~730 ton
Readout channels: ~40000
Data rate: 5kHz, 50Mb/s

Full operation since 2008. All sub-detectors are in very good status. 9

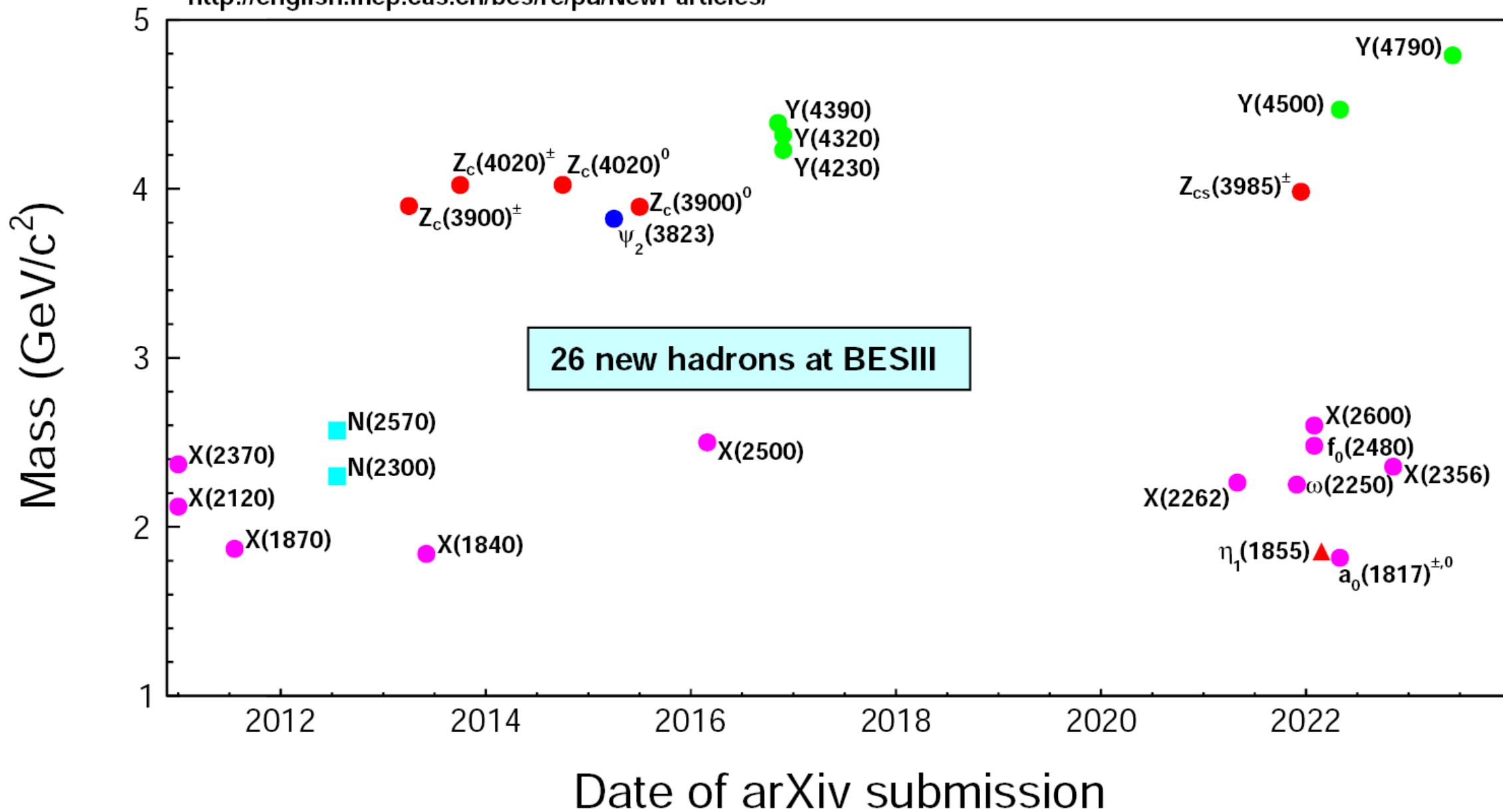
BESIII run status

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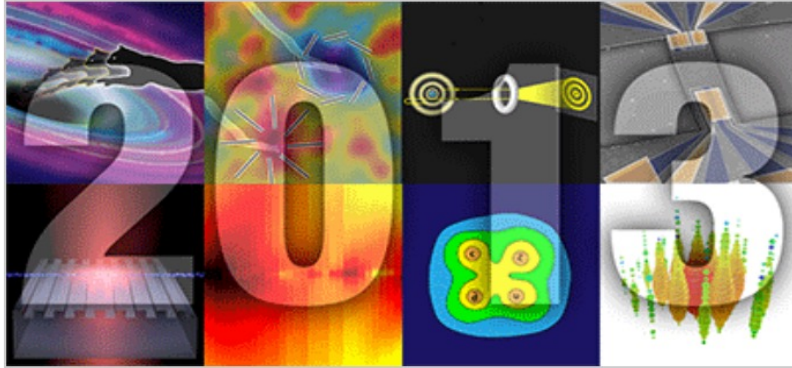


26 New Hadrons Discovered at BESIII

<http://english.ihep.cas.cn/bes/re/pu/NewParticles/>



Observation of $Z_{c(s)}$ states

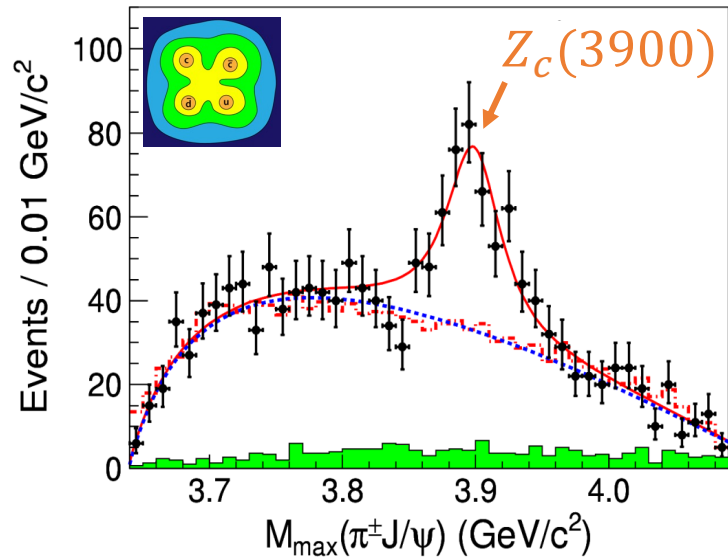


EDITORIALS AND ANNOUNCEMENTS

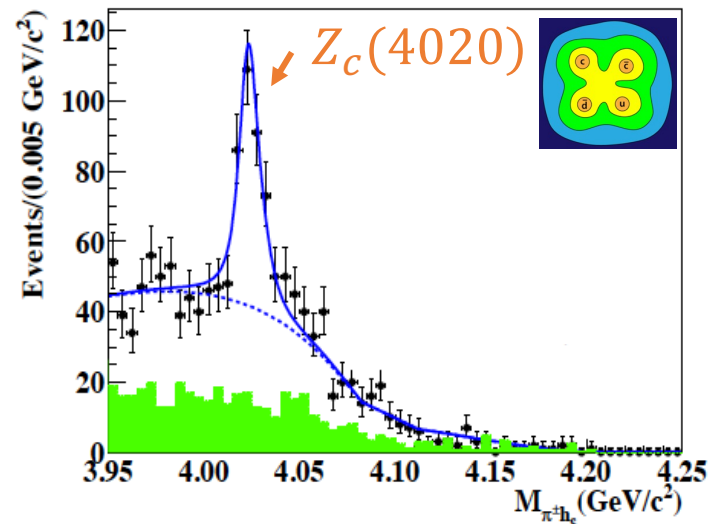
Highlights of the Year

December 30, 2013

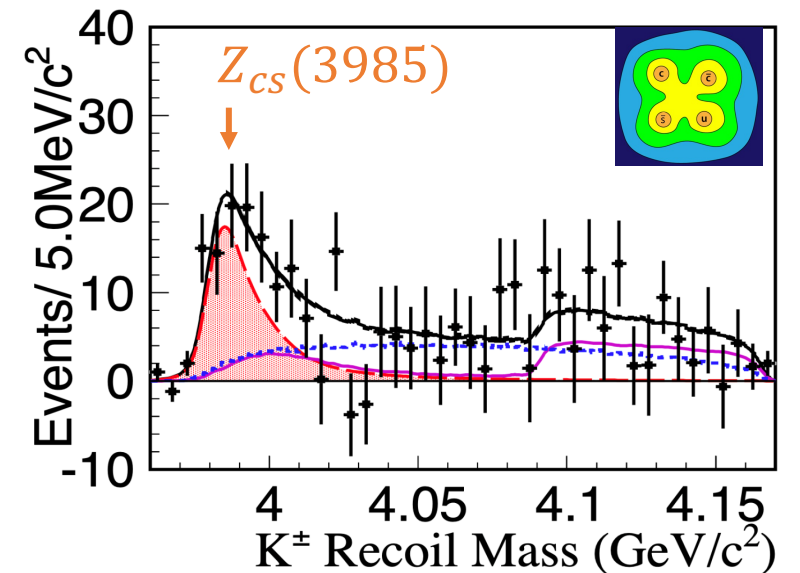
Physics looks back at the standout stories of 2013.



PRL 110, 252001 (2013)

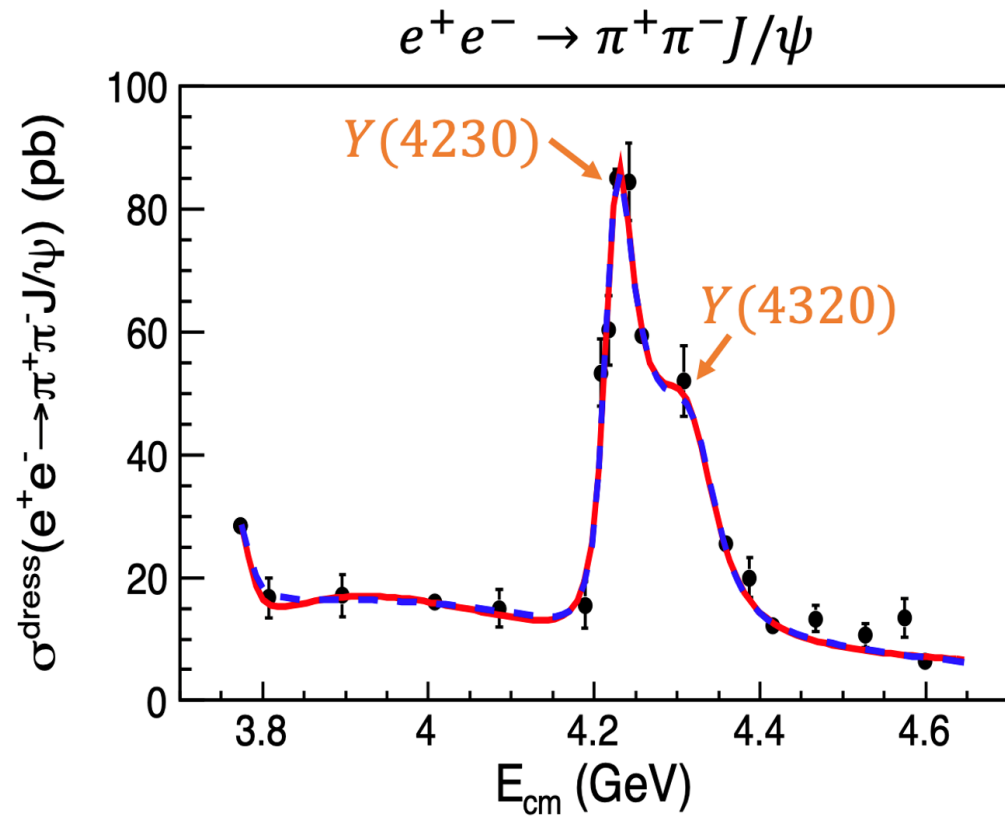


PRL 111, 242001 (2013)

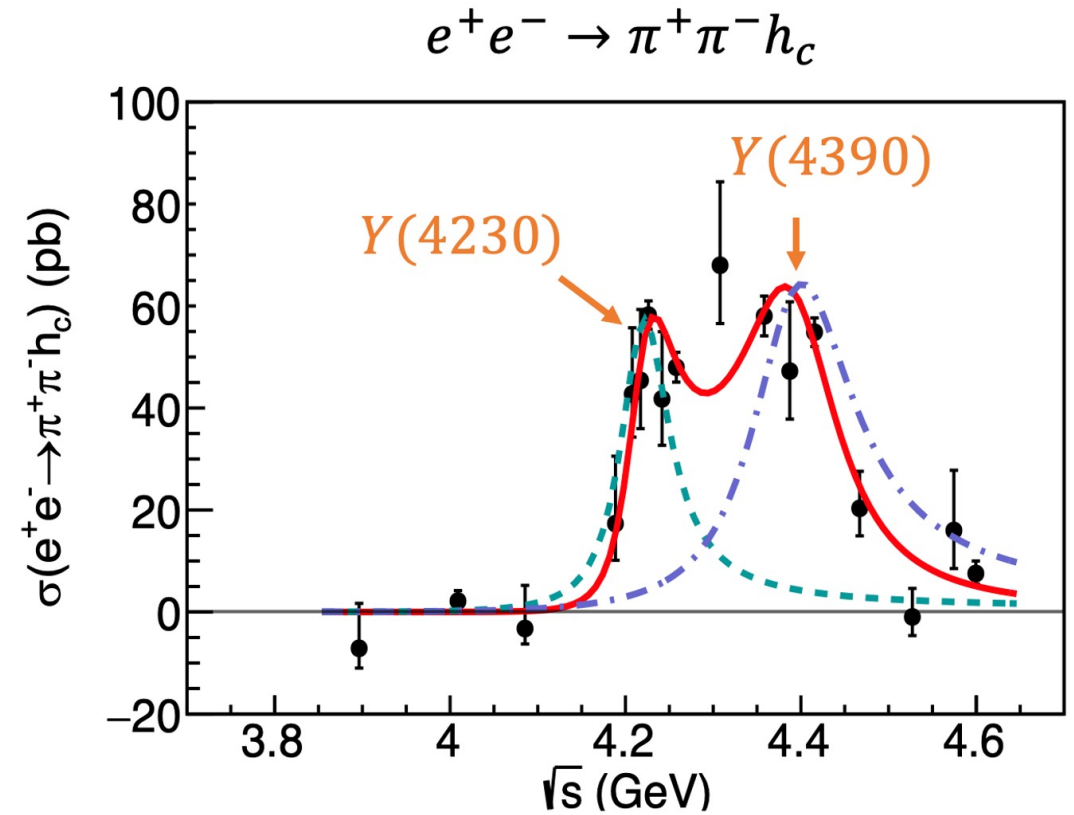


PRL 126, 102001 (2021)

Observation of Y states



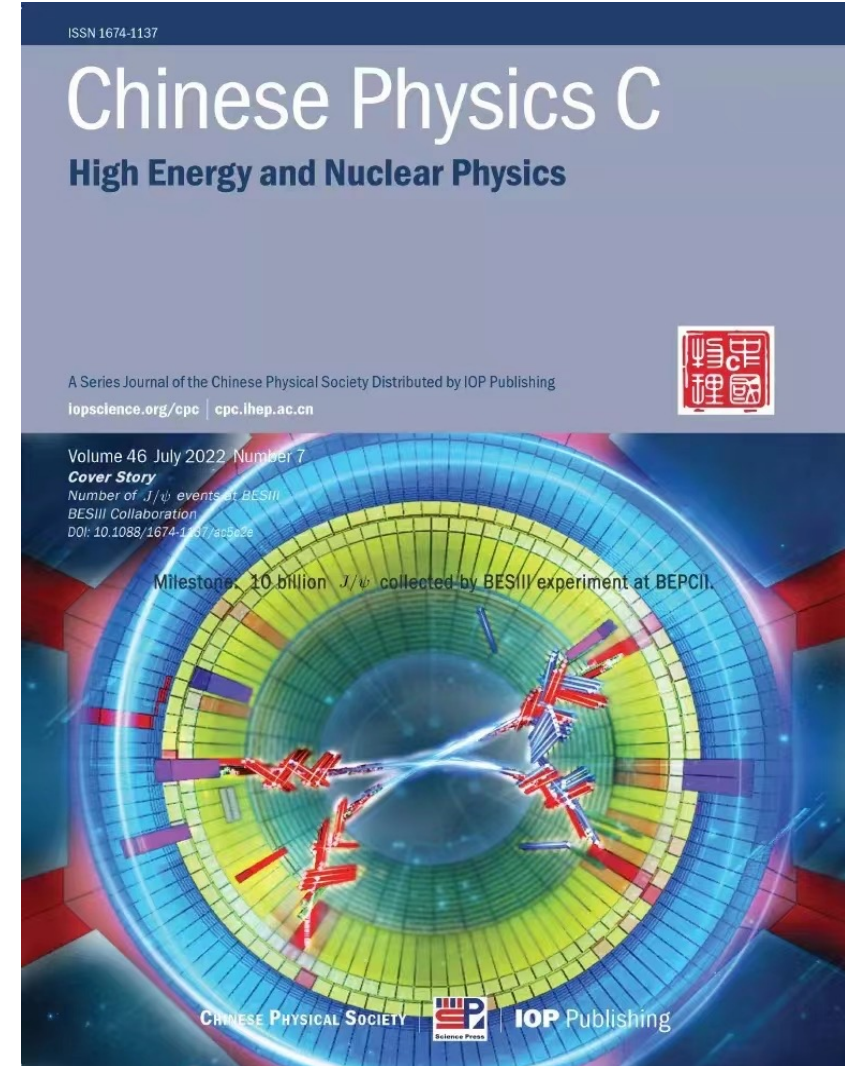
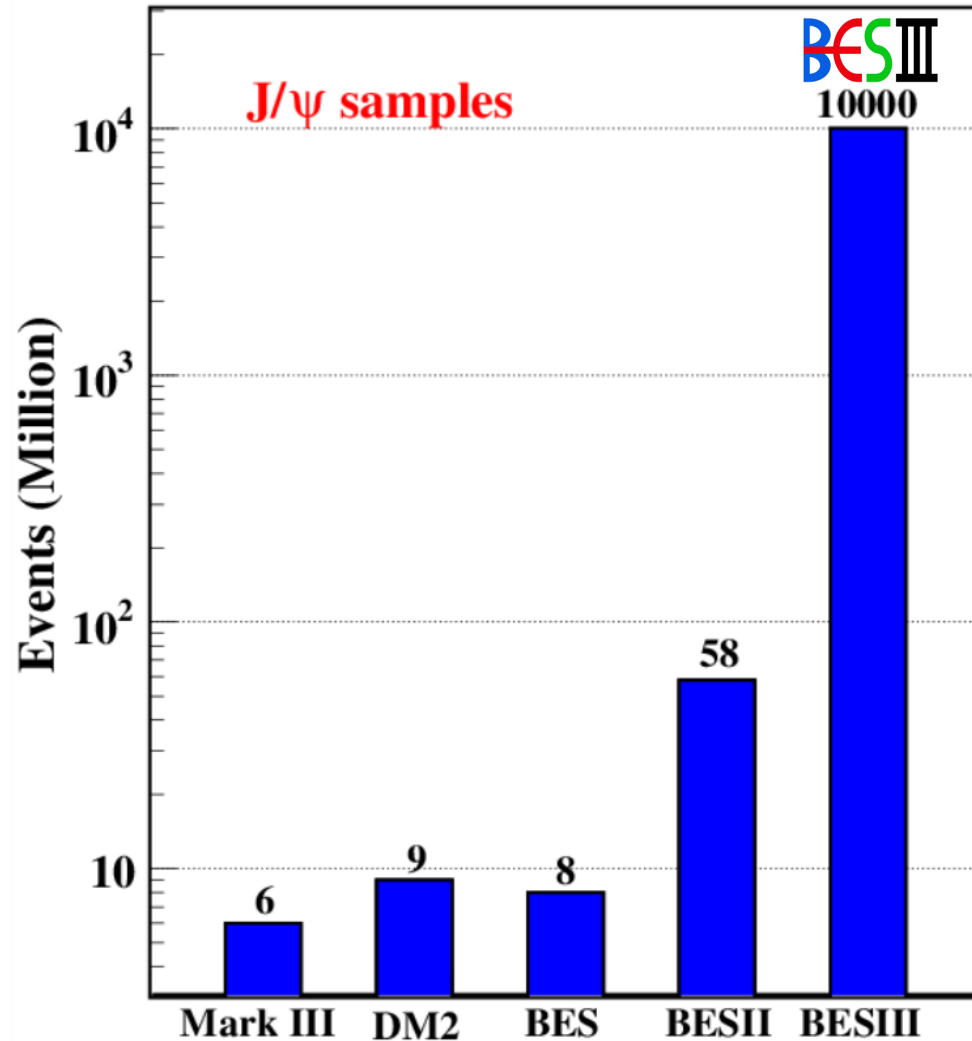
PRL 118, 092001 (2017)



PRL 118, 092002 (2017)

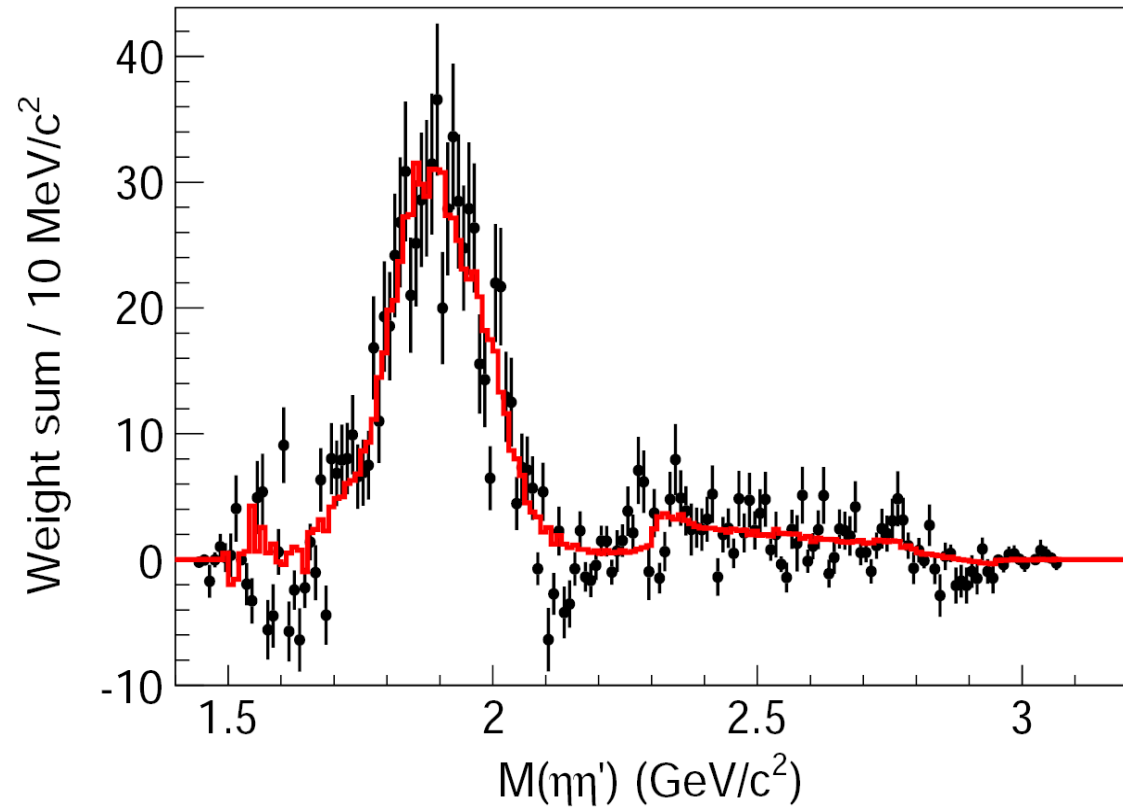
The World's Largest J/ψ Sample

CPC 46, 074001 (2022)



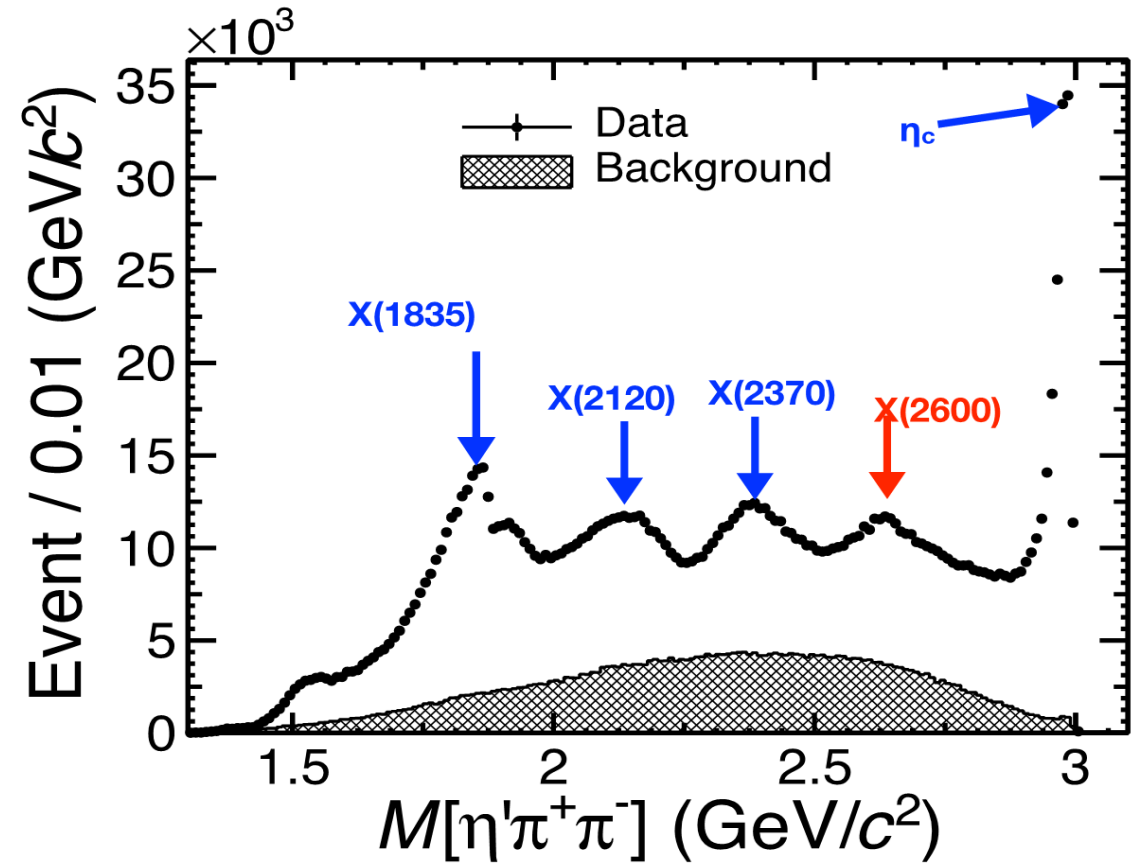
New Light Hadrons

Observation of exotic state $\eta_1(1855)$



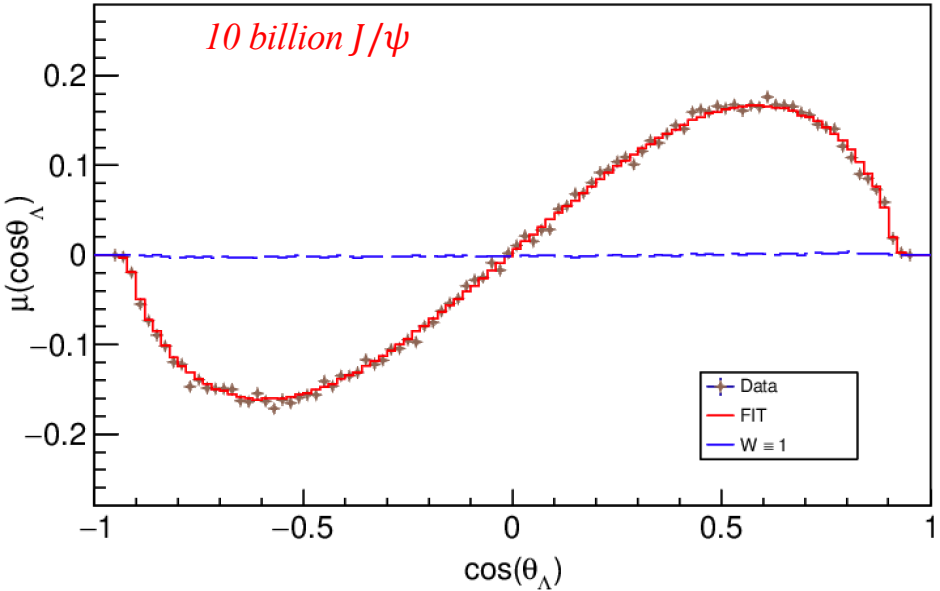
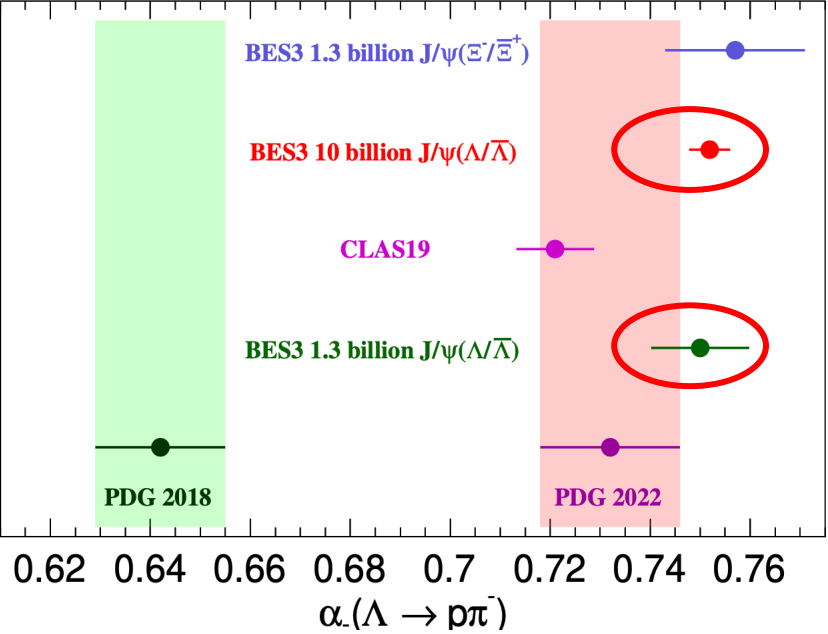
PRL 129, 192002 (2022)

New resonances in the $\eta'\pi^+\pi^-$ spectrum

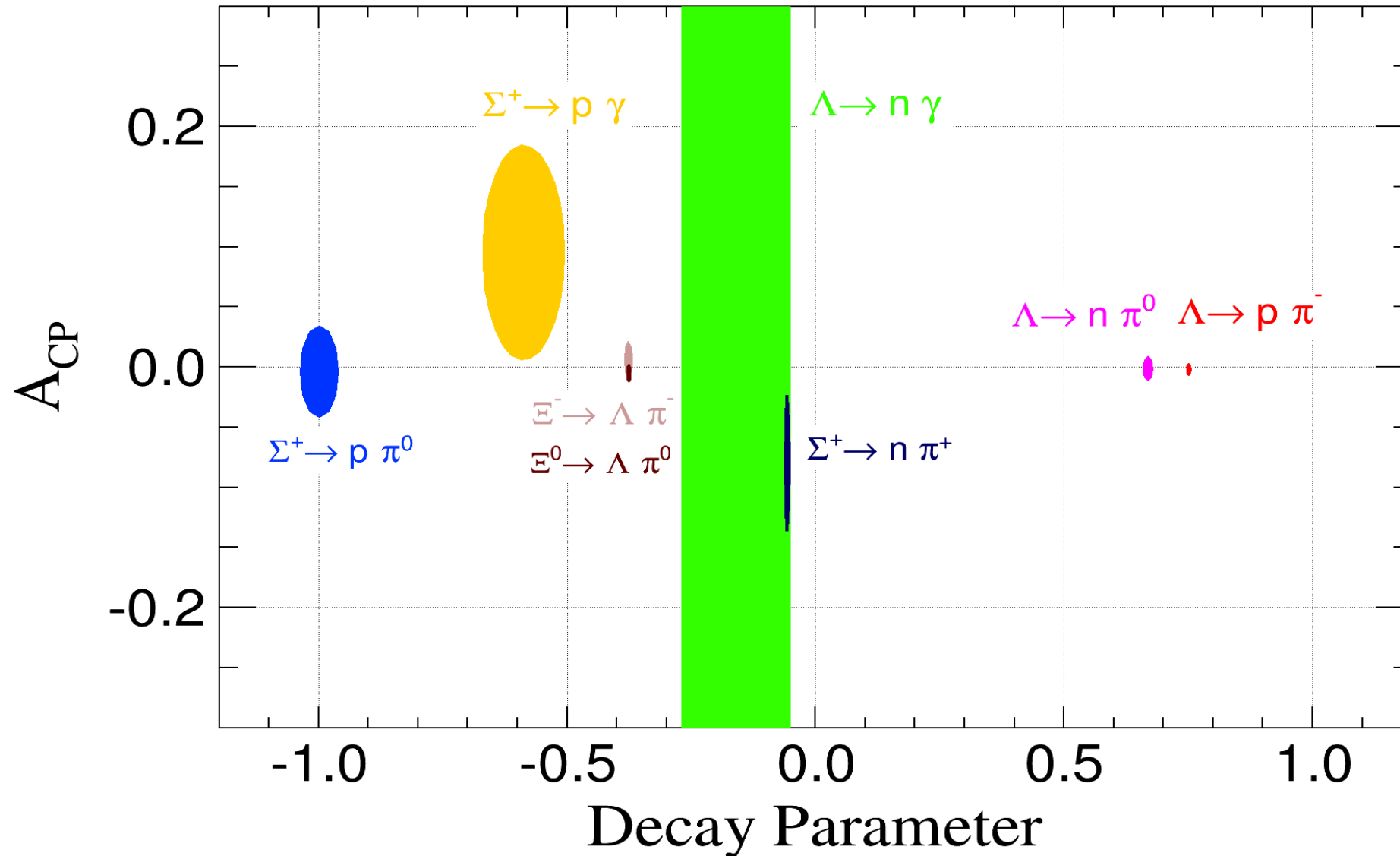


PRL 129, 042001 (2022)

New Approach to Probe Polarization and CP Violation

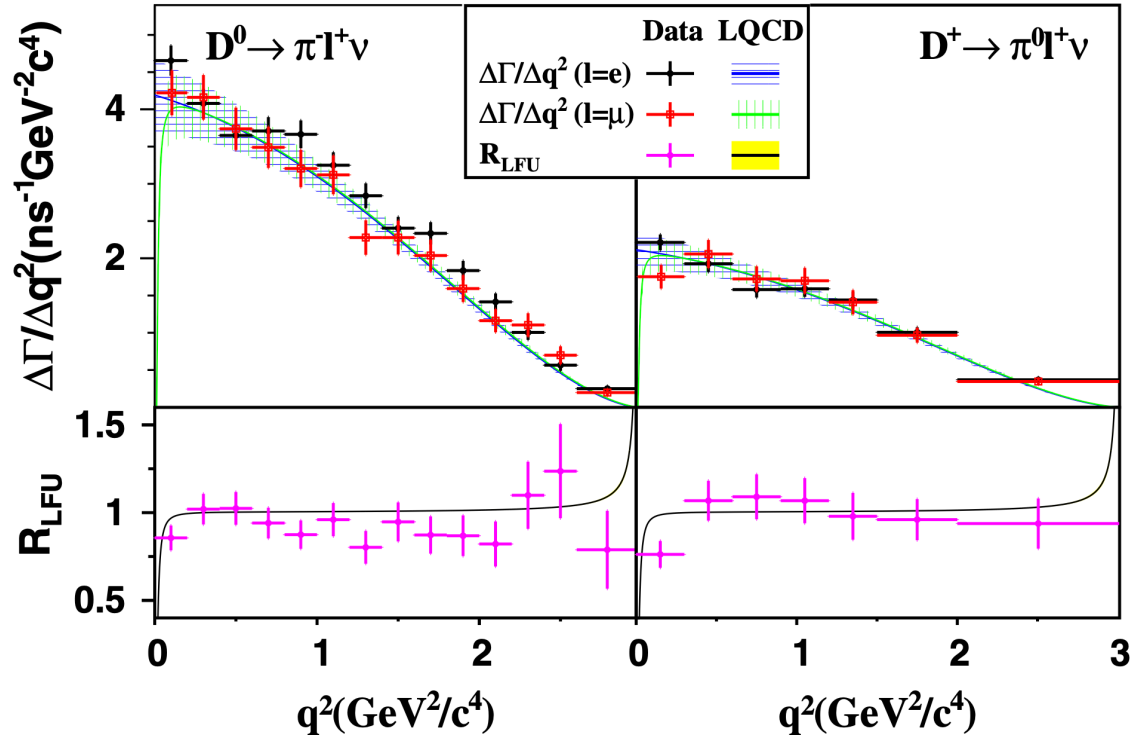


New Precision Frontiers: Hyperon Physics



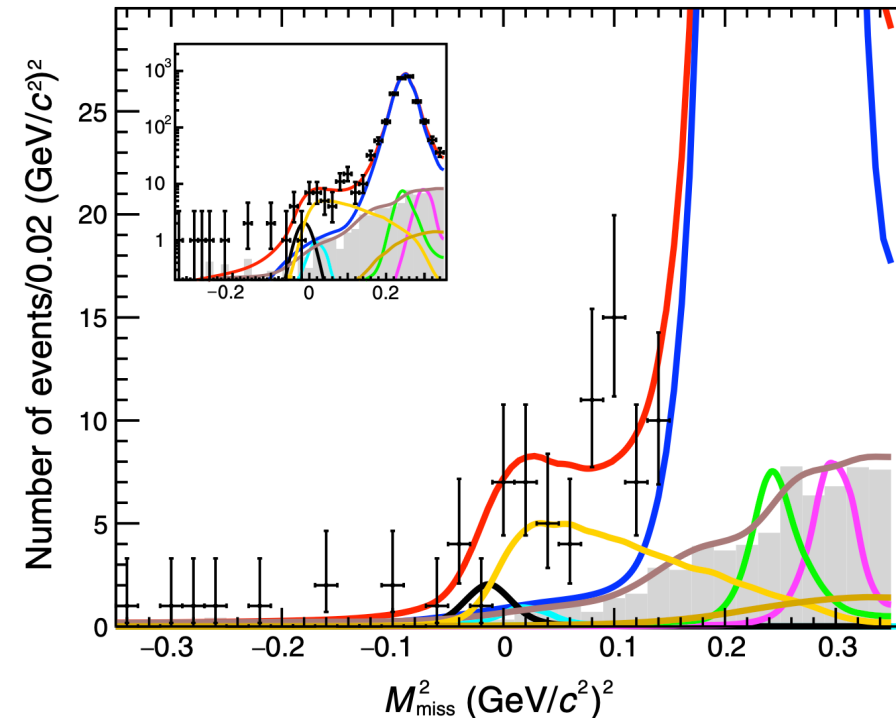
Precision Charm Physics $\rightarrow 20 \text{ fb}^{-1}$ on $\psi(3770)$

Tests of lepton flavor universality



PRL 121, 171803 (2018)
PRL 122, 011804 (2019)
PRL 124, 231801 (2020)

Precision measurement of $D_{(s)}^+ \rightarrow l^+ \nu_l$ Test of LQCD and EW

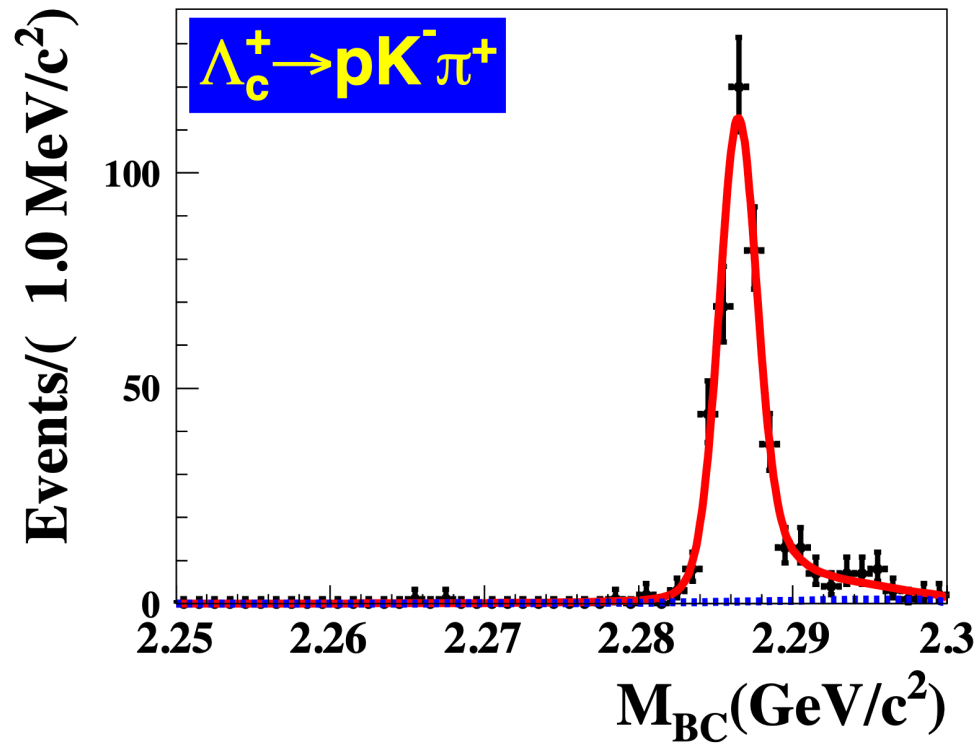


PRL 123, 211802 (2019)
PRL 122, 071802 (2019)
PRL 127, 171801 (2021)

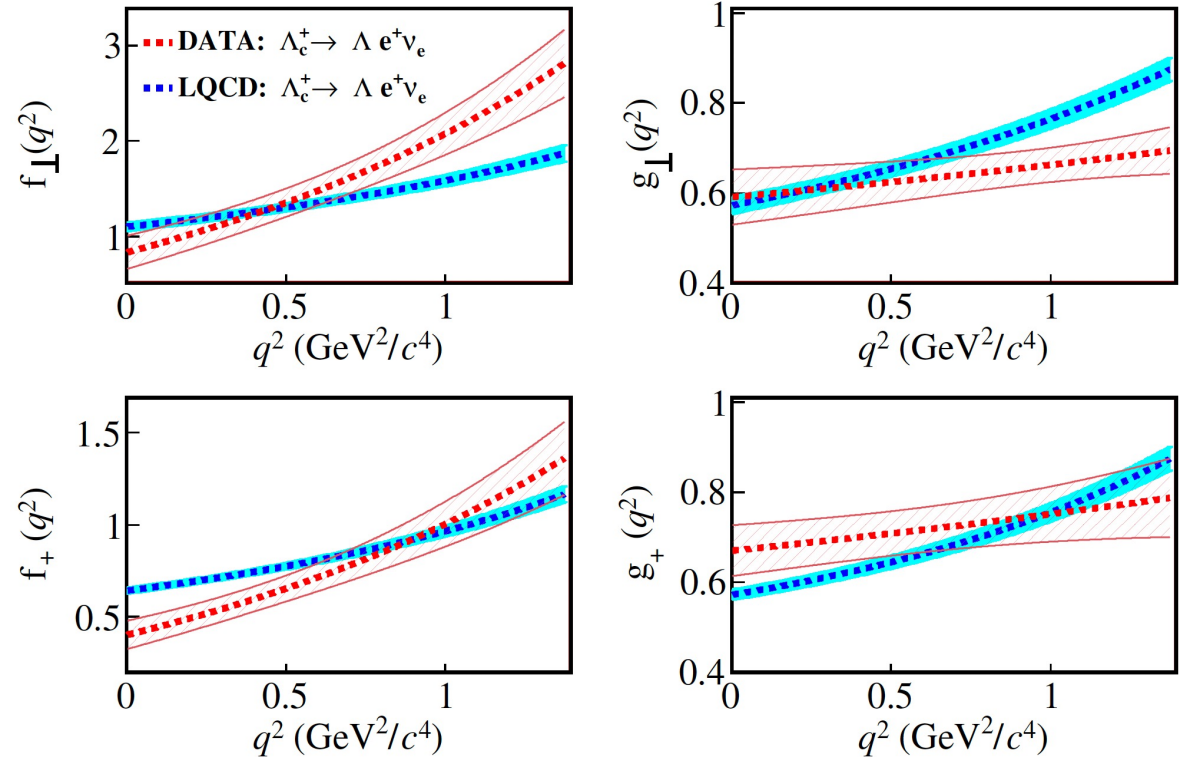
Charmed Baryon Decays at Threshold

Absolute measurements of branching fractions of hadronic Λ_c^+ decays

First measurements of absolute branching fraction and form factors of $\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e$



PRL 116, 152001 (2016)

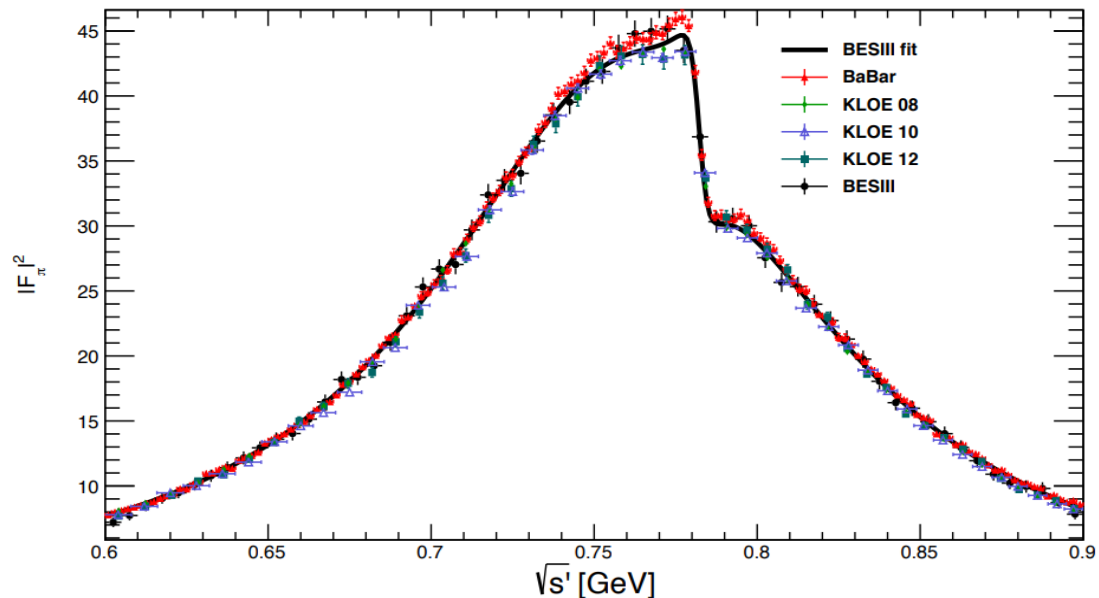


PRL 129, 231803 (2022)

PRL 115, 221805 (2015)

Precision Test of the Standard Model

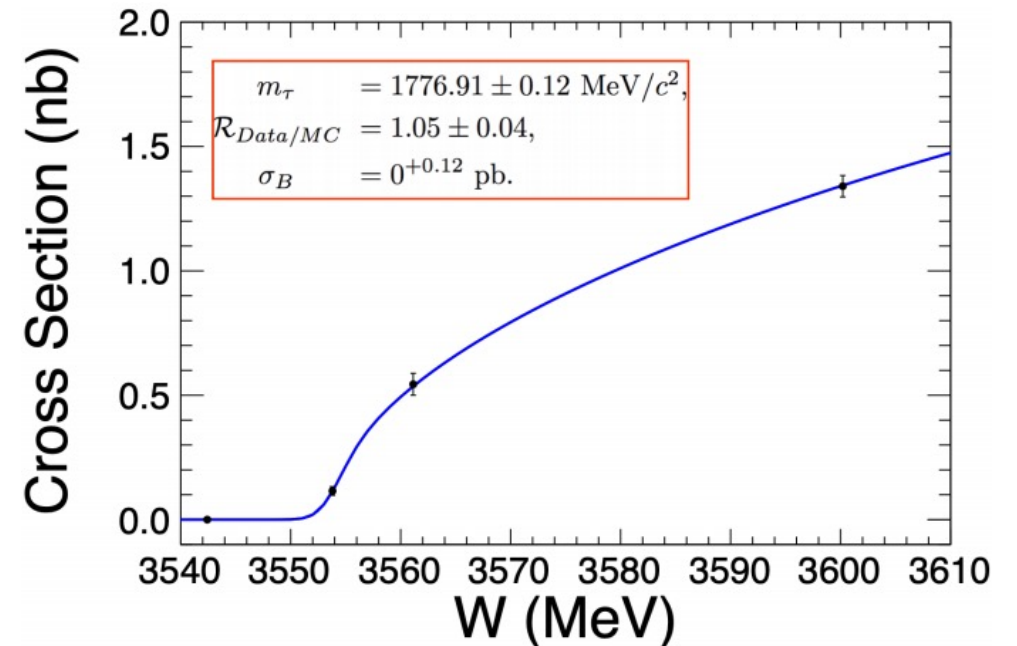
- $e^+e^- \rightarrow \pi^+\pi^-$ is the most important channel in the uncertainty of the SM calculation of a_μ
- BESIII precision: **0.9%** (will be further improved with $20 \text{ fb}^{-1} \psi(3770)$ data)



PLB 753, 629 (2016)

- τ mass: essential input for lepton flavor universality test
- BESIII provides the **most precise** measurement:

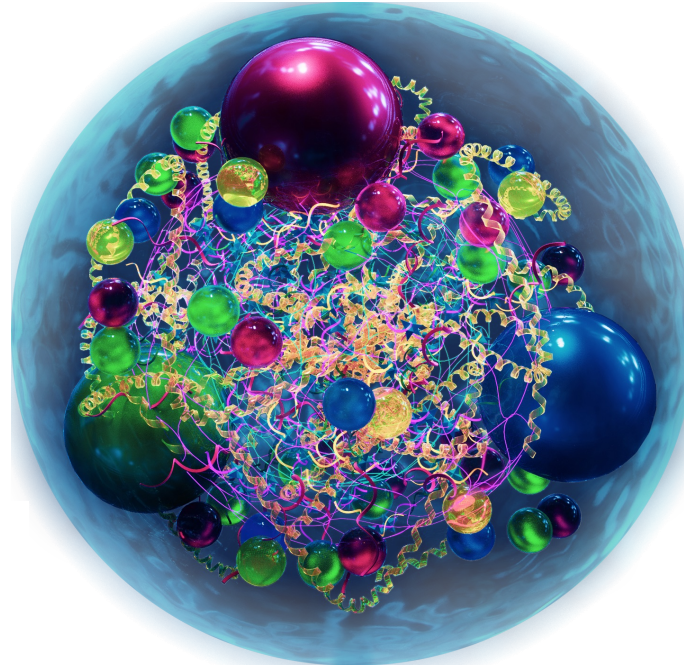
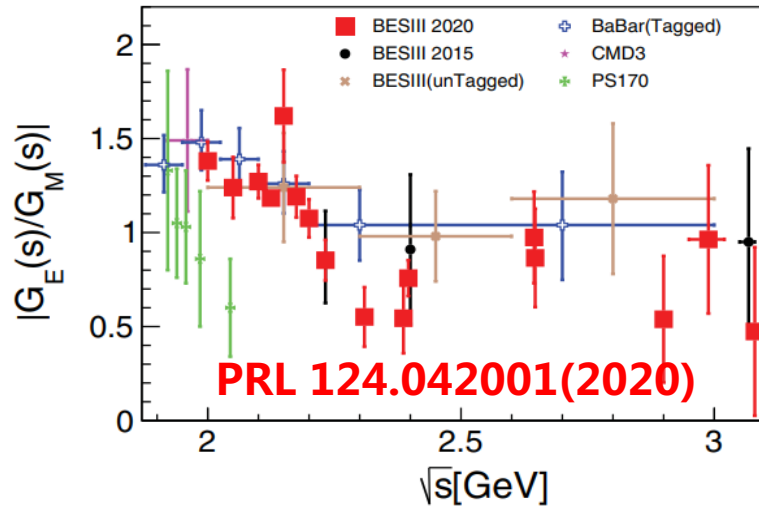
$$m_\tau = 1776.91 \pm 0.12_{-0.13}^{+0.10} \text{ MeV} / c^2$$



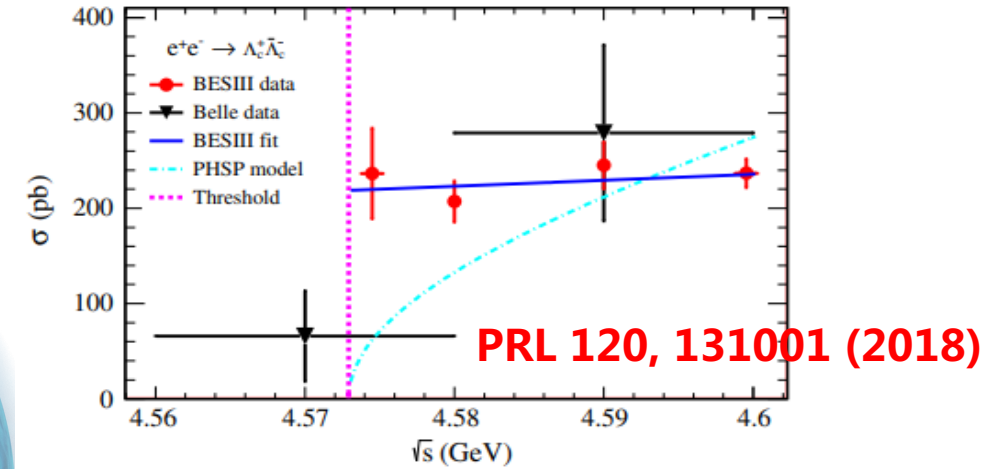
PRD 90, 012001 (2014)

Baryon Electromagnetic Form Factors

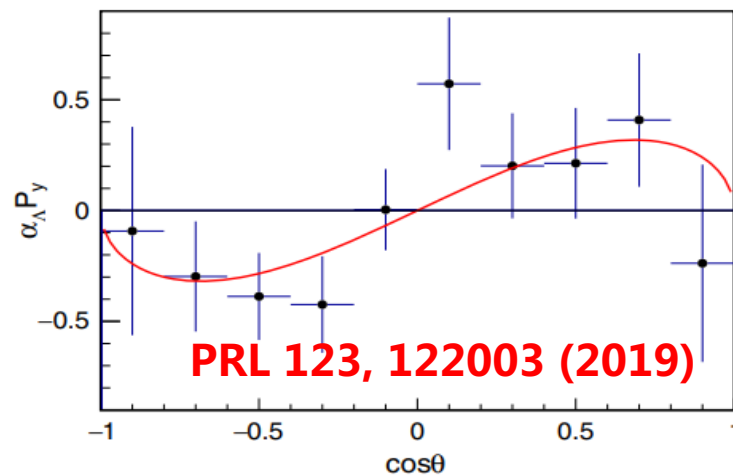
Precise measurement of proton EMFF



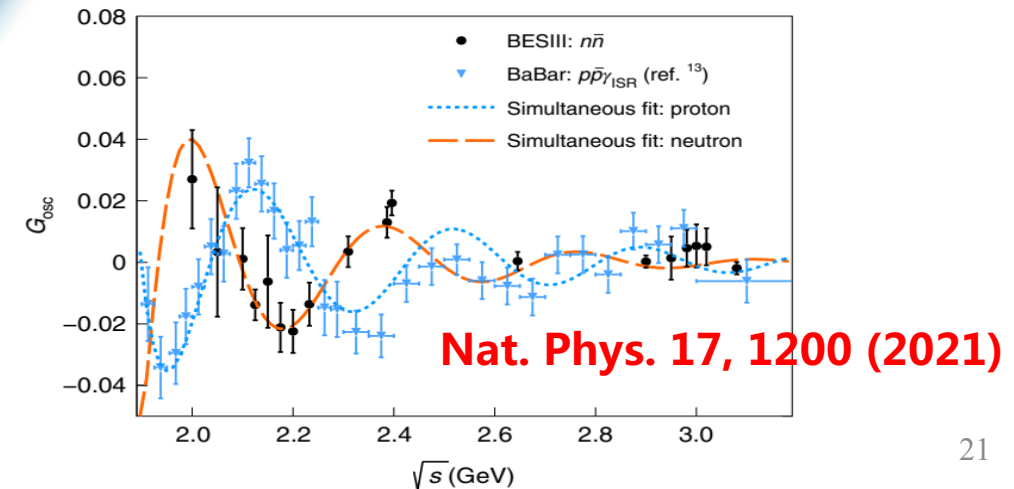
Threshold effect of Λ_c



Determination of Λ EMFF

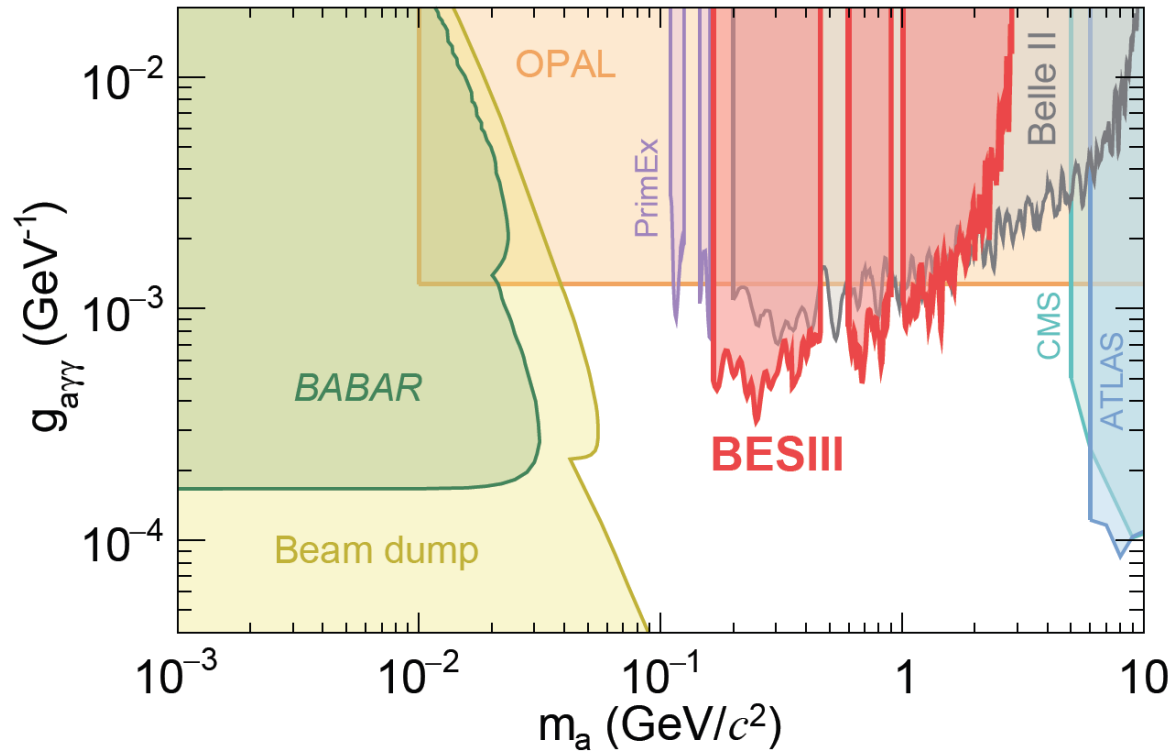


Oscillating feature in neutron EMFF



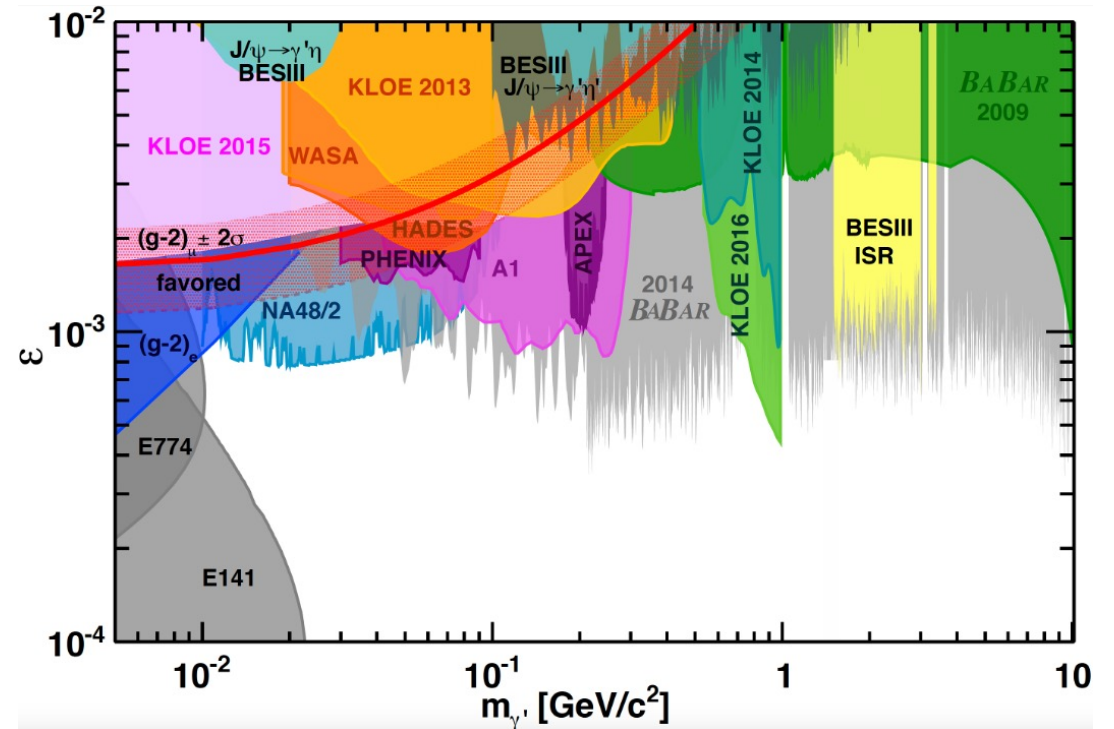
Search for ALP and Dark Photon

Search for Axion-Like-Particle



PLB 838, 137698 (2023)

Search for Dark Photon



PLB 774, 252 (2017)