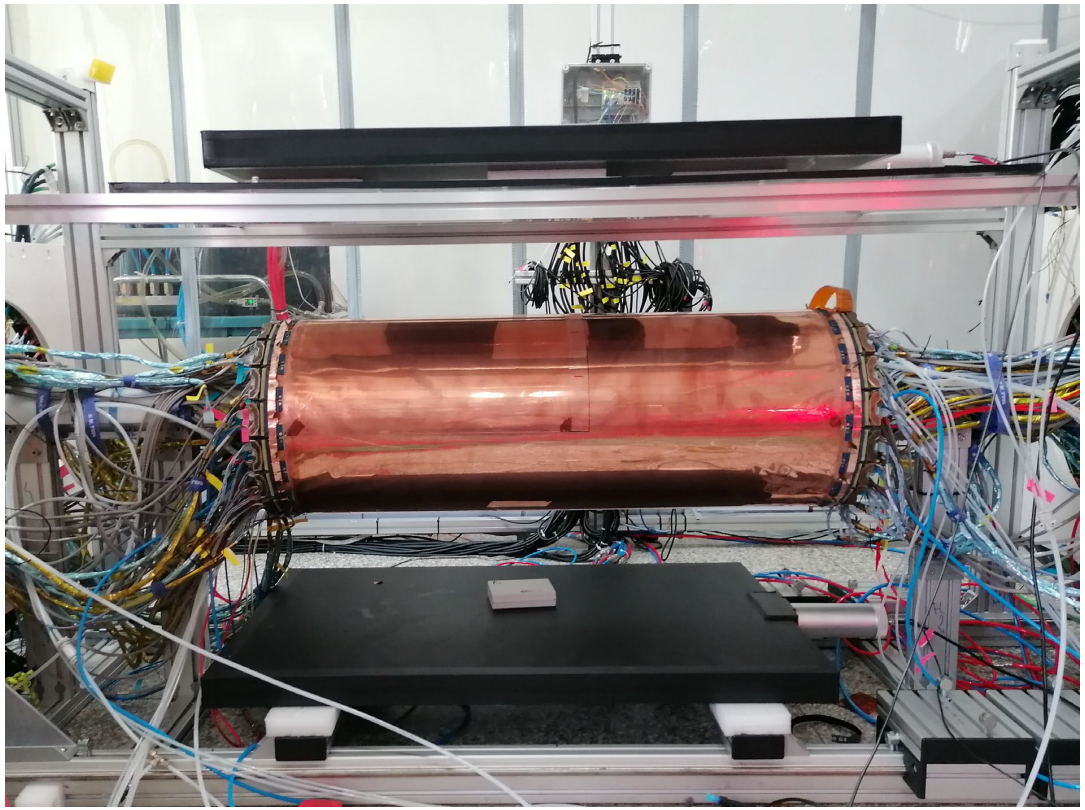
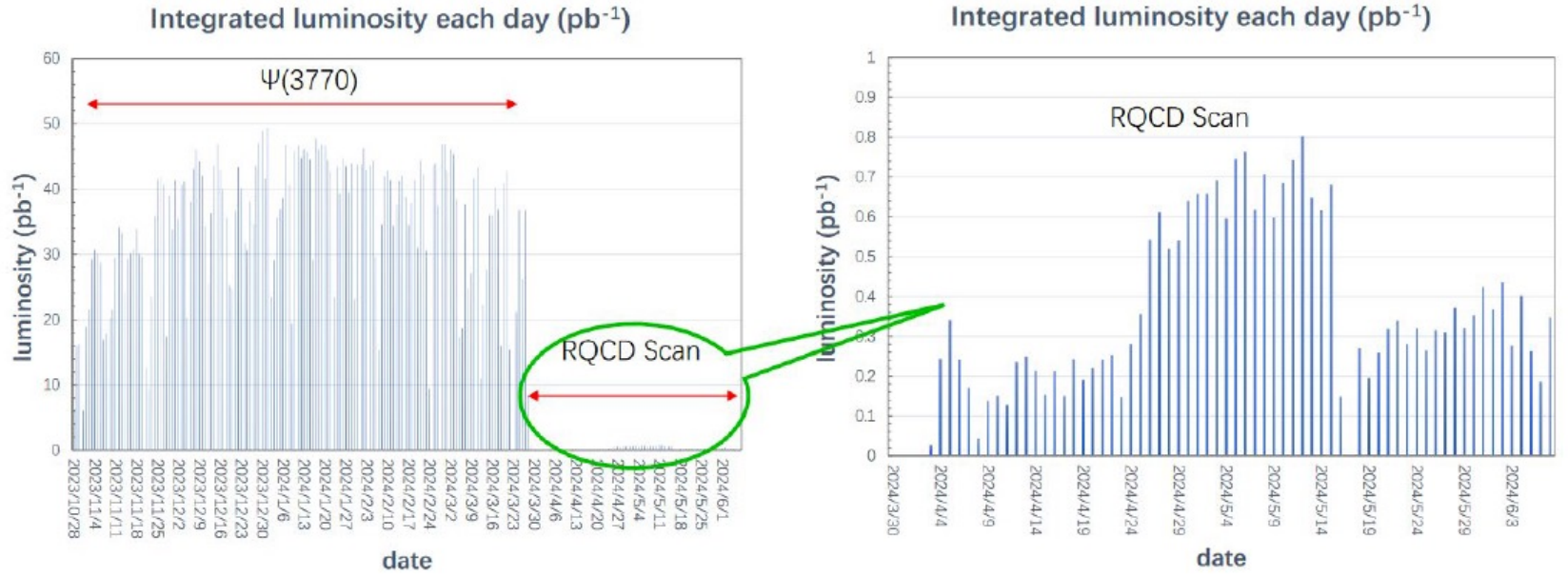
STATUS DI BESIII

M. Bertani , LNF 26 sett. 2024



BESIII data taking



Mingyi Dong
@July 2024

Data taking plan in 2023-2024 run period

- Psi(3770) data taking, 4.2 fb^{-1} (~ 4 months)
- Energy points: 3.768, 3.780 GeV, Integrated luminosity: 500pb^{-1}/each point (~ 1 month)
- Scan in 1.8-2.0 GeV, 23 points, 96 pb^{-1} (time remaining)
  - Aim to understand the structure around 1.9 GeV with finer scan results.
- Scan in 2.26-2.52GeV, 8 points, 160 pb^{-1}(time remaining)
  - Aim to find the new resonance around 2.4 GeV

Completed

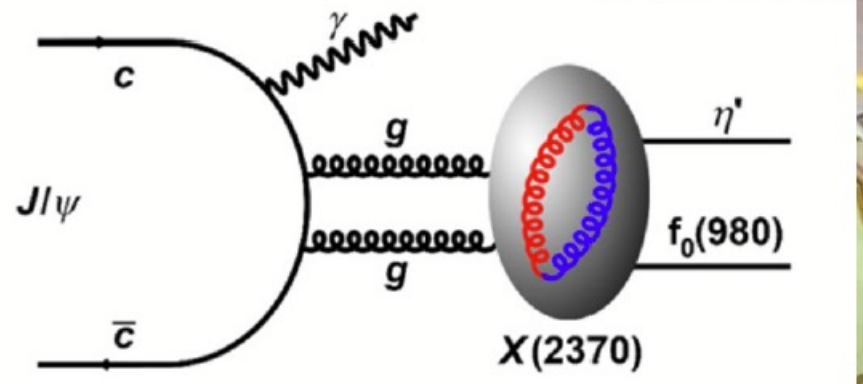


Fig.1. Schematic diagram of the J/ψ radiative decay to the X(2370) particle. (Credit: IHEP)

https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.132.181901

Physics highlights

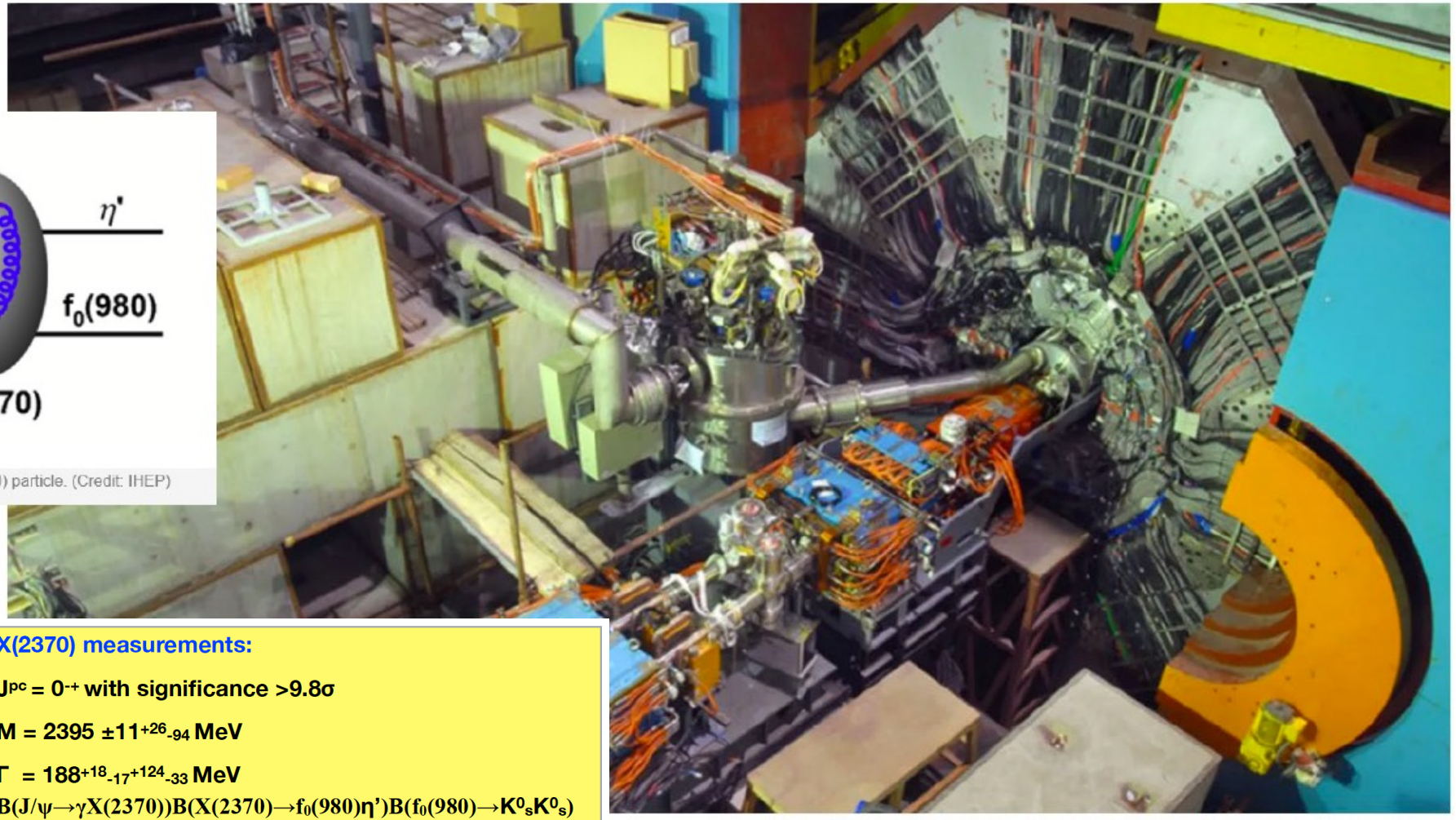
BIG THINK

NEWSLETTERS FOR BUSINESS MEMBERSHIP

STARTS WITH A BANG — MAY 7, 2024

New particle at last! Physicists detect the first "glueball"

Glueballs are an unusual, unconfirmed Standard Model prediction, suggesting bound states of gluons alone exist. We just found our first one.



A view from above of the BES III detector at the electron-positron collider in Beijing, China. Exotic particles have newly been detected here, including X, Y, and Z mesons which don't fit the normal scheme of a quark-antiquark combination. With the X(2370) particle, we may have detected the first glueball in history.

X(2370) measurements:

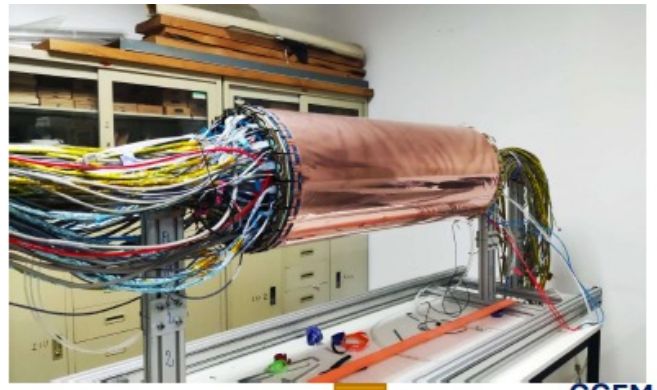
$J^{pc} = 0^{-+}$ with significance >9.8σ

$M = 2395 \pm 11^{+26}_{-94}$ MeV

$\Gamma = 188^{+18}_{-17}{}^{+124}_{-33}$ MeV

$B(J/\psi \to \gamma X(2370))B(X(2370) \to f_0(980)\eta')B(f_0(980) \to K^0_S K^0_S)$

$= 1.31 \pm 0.22^{+2.85}_{-0.84} \times 10^{-5}$



CGEM-IT

>2024 UPGRADE

2020
White Paper of BESIII

Jun. 2021
Feasibility Study Report

Apr. 2022
Design Finished

Jul. 2024
Shutdown for Installation

BEPCII keep running

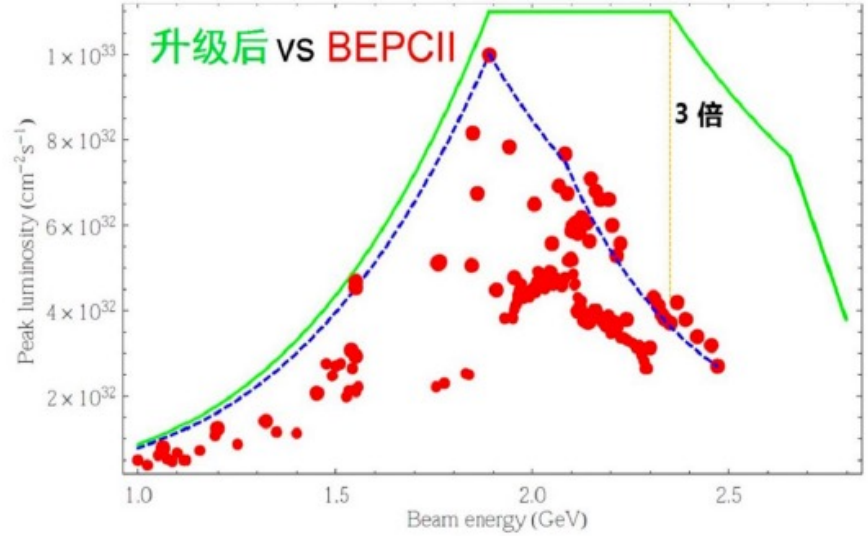
@Yfang WANG

Internal Review of Accelerator
May. 2020

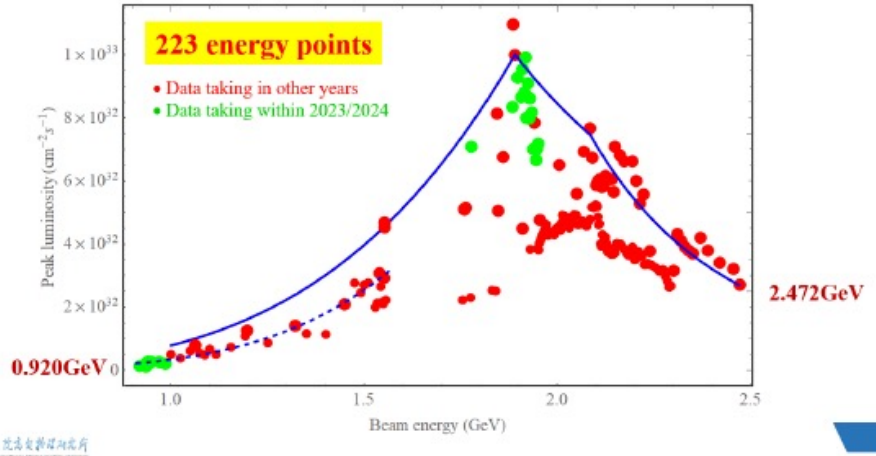
Project Approved
Jul. 2021

Fabrication Finished
Jun. 2024

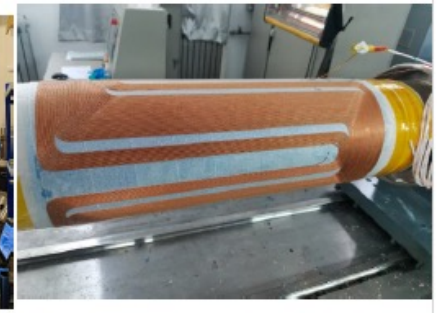
Commissioning
Jan. 2025



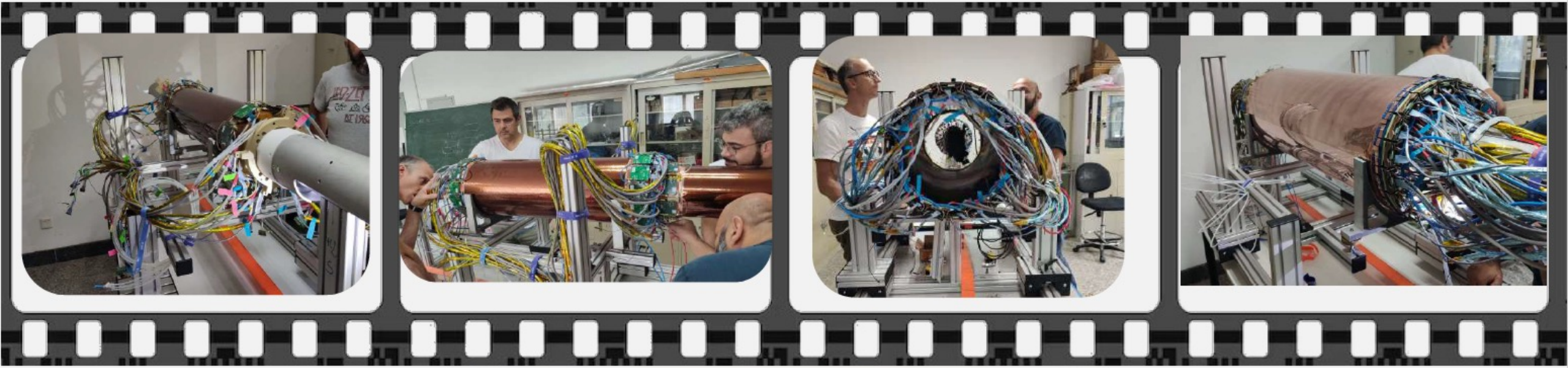
15 years data taking of BEPCII

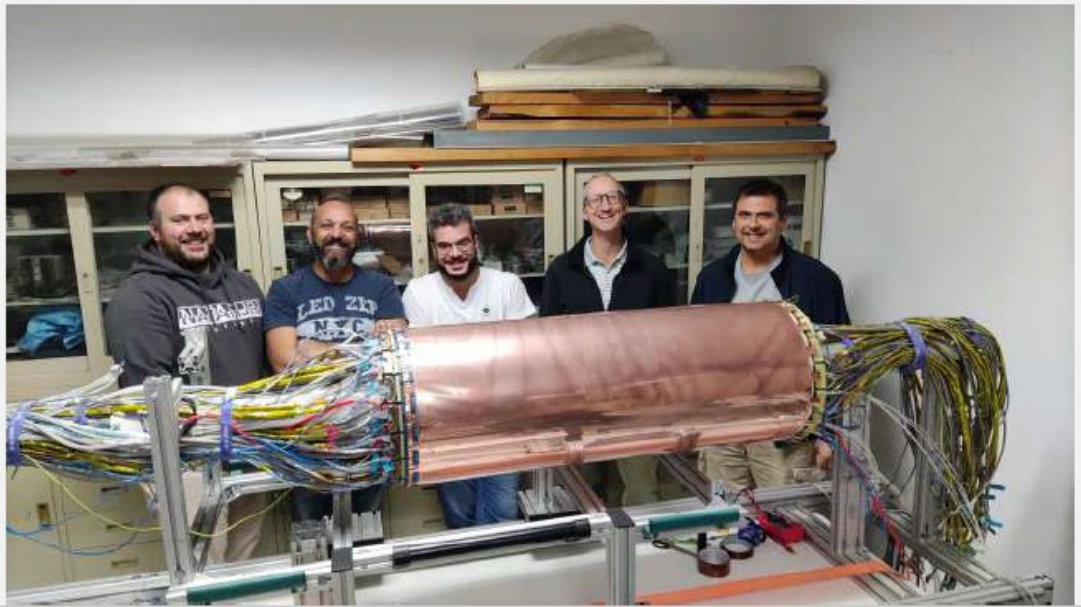


15



CGEM-IT





10/23

Final CGEM Review — Composition of Committee

Guy Wilkinson	[chair]	guy.wilkinson@cern.ch
Steve Olsen	[deputy chair]	solsen22@gmail.com
Jianbei Liu		liujianb@ustc.edu.cn
Yuanbo Chen		chenyb@ihep.ac.cn
Weidong Li		liwd@ihep.ac.cn
Kejun Zhu		zhukj@ihep.ac.cn
Shengsen Sun		sunss@ihep.ac.cn
Wolfgang Kuehn		w.kuehn@physik.uni-giessen.de

Charge

- CGEM detector has been successfully constructed and is at IHEP in Beijing
- Time slot for installation: Summer 2024
  Upgrade to BEPC-II
- Question to be answered (and this is where we need the help of the committee):
  Is CGEM-IT as a complete system ready for installation in Summer 2024, to deliver physics quality data after the shutdown?
- Collaboration needs to decide by ≈ mid-March

Two stages of review:
Software (Now and 1st Dec)
Performance (February/March 2024)

→4 stages in reality

Software
@30Nov-1Dec 2023

Performance/Software
@29February-March 1

Go green with some recommendations by the RC

Status check
@28-29 May
@28 and 29 June

Go green by the RC and BESIII EB for CGEM installation

Software Review

Within Dec 2023

Internal review

Based on data already available

Performance Review

Within February 2024

Internal review

Cosmic run data from L1+L2+L3 needed

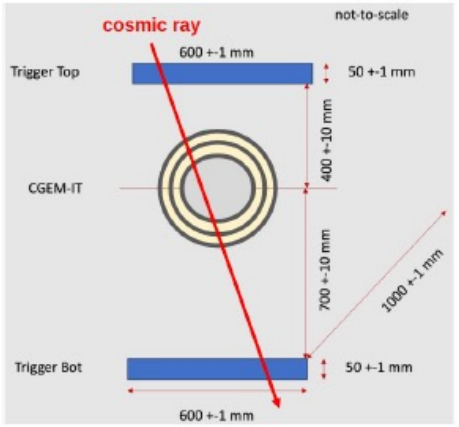
Installation Test and Risk assessment

Within March 2024

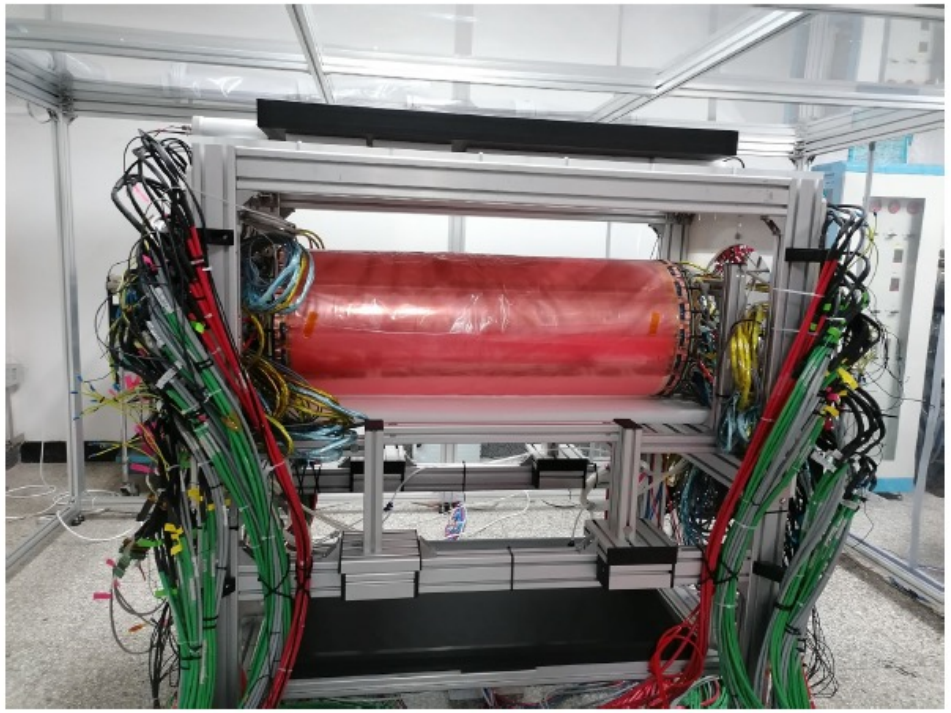
BESIII MDC and BEPCII personnel involved

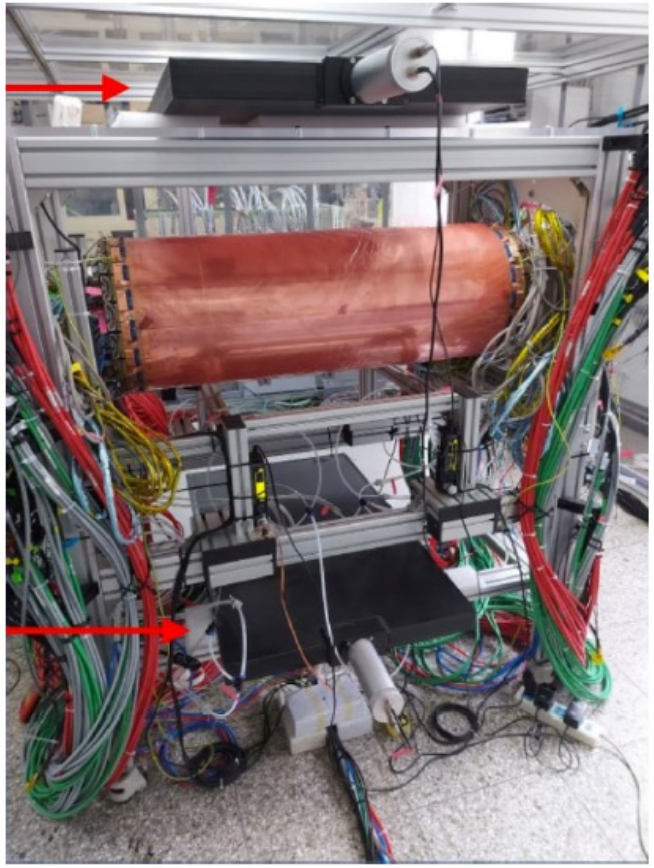
Submit Installation Plan to IHEP

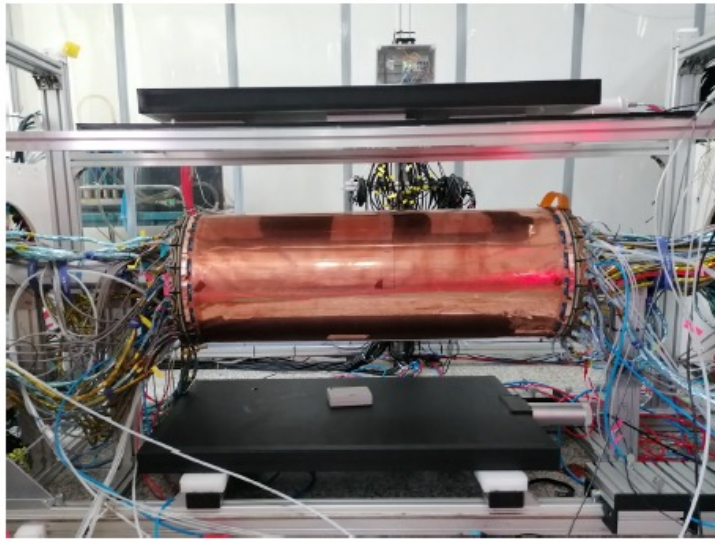
COSMIC RAY TEST



> CGEM-IT Performance Review

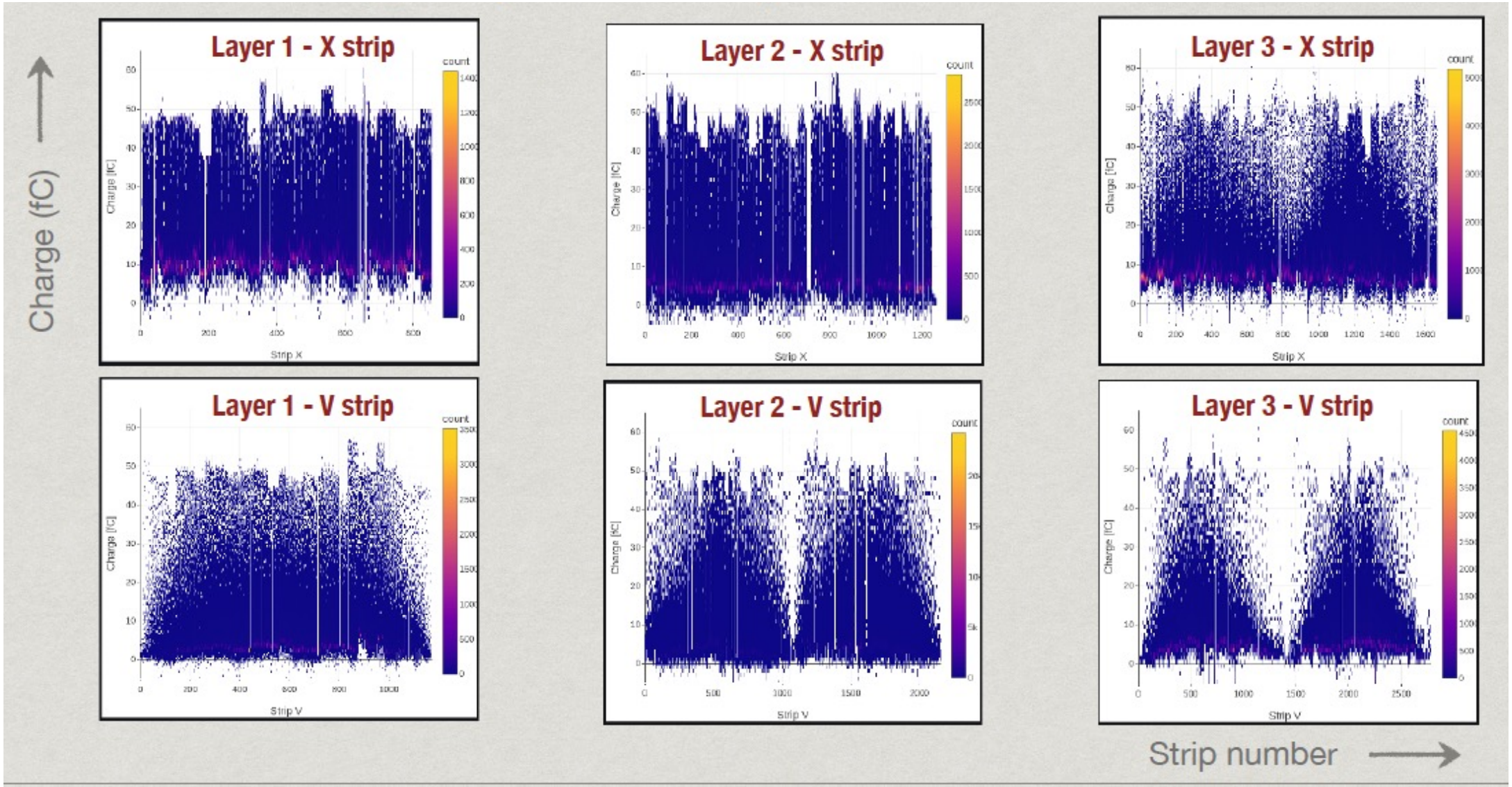






2M triggers

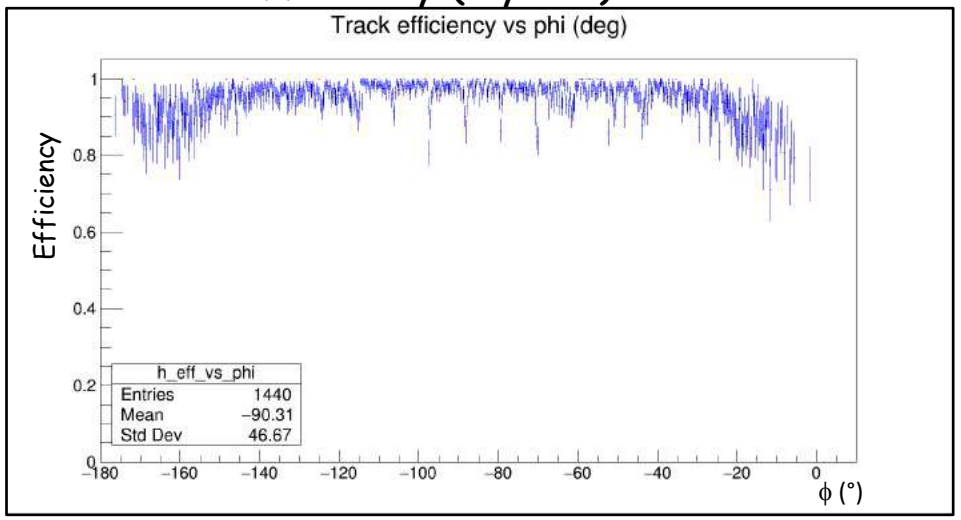
Charge hit per strip

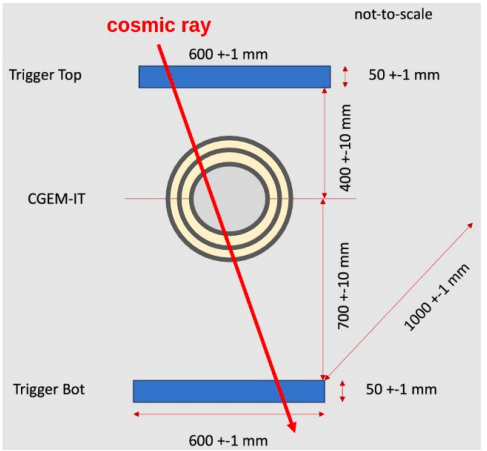


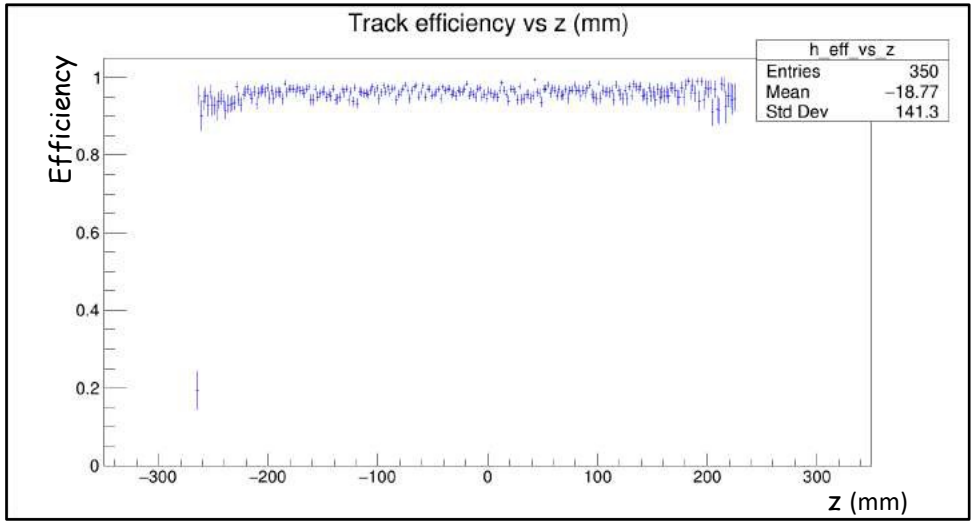
CGEM commissioning with cosmic ray test

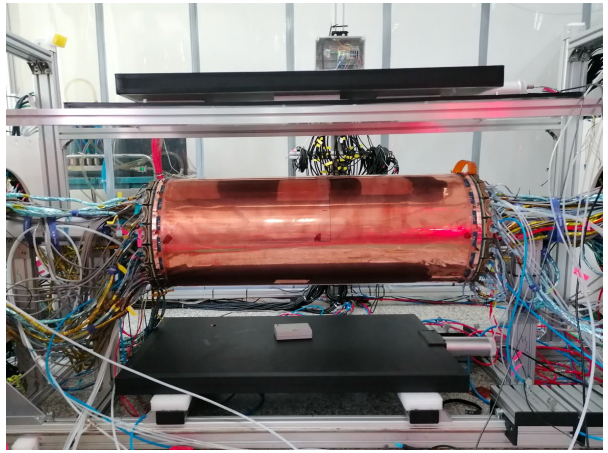
>CGEM-IT Performance Review

Track efficiency (layer 1)

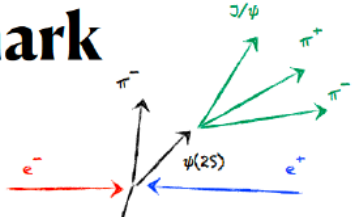


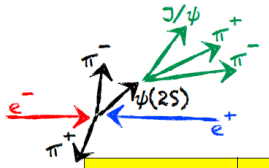






Study of the $e^+e^- \to \pi^+\pi^-\psi(2S)$ benchmark channel at $\sqrt{s} = 4.612$ GeV





Efficiencies

√s = 4.612 GeV	Events (Reso250 Eff95)	Efficiency [%]	√s = 4.612 GeV	Events (Reso250 Eff100)	Efficiency [%]	√s = 4.612 GeV	Events (Reso130 Eff95)	Efficiency [%]	√s = 4.612 GeV	Events (Nominal)	Efficiency [%]
Total Tracks	150003		**Total Tracks**	150003		**Total Tracks**	150003		**Total Tracks**	150000	
Fiducial Cuts	111294	**74,2**	**Fiducial Cuts**	113279	**75,5**	**Fiducial Cuts**	112238	**74,8**	**Fiducial Cuts**	113216	**75,5**
Kinetic PID Cuts	100801	**67,2**	**Kinetic PID Cuts**	103021	**68,7**	**Kinetic PID Cuts**	102057	**68,0**	**Kinetic PID Cuts**	103301	**68,9**
Kalman Fit 6C Cuts	39842	**26,6**	**Kalman Fit 6C Cuts**	41668	**27,8**	**Kalman Fit 6C Cuts**	41116	**27,4**	**Kalman Fit 6C Cuts**	41902	**27,9**

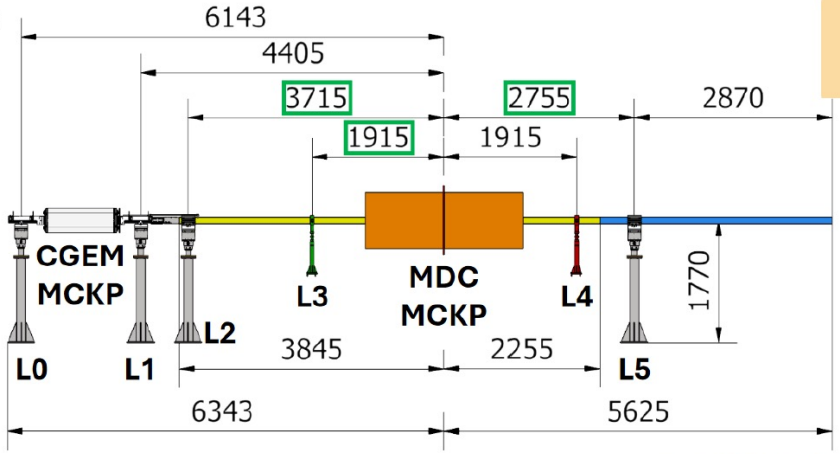
√s = 4.612 GeV			
Total Tracks			
Fiducial Cuts	At least 5 Tracks	$R_{xy} < 1$cm $R_z < 10$ cm $\lvert\cos(\theta)\rvert < 0.93$	
Kinetic PID Cuts	6 Tracks	With 2 leptons and 4 pions	3p discriminates π/ℓ E/p discriminates μ/e
Kalman Fit 6C Cuts	6 tracks with 6C Kalman fit	Constraint on 4p, J/ψ, and ψ(2s) mass	χ^2 is ok with J/ψ and ψ(2S) pre-fit windows

Tested 4 cases: Tracking Resolution (XV) and Efficiency

250 μm and 100%
250 μm and 95% → Current Working Scenario
130 μm and 100% → Nominal Case
130 μm and 95%

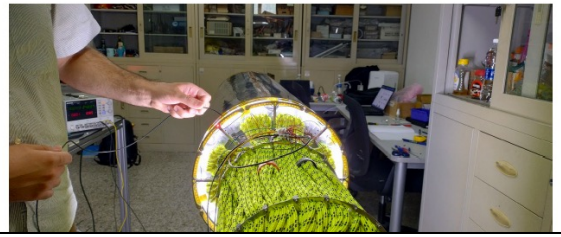
No significant decrease in signal efficiency, up to 1.3 percentage point

A decrease in track efficiency impacts more than a worsening of the resolution

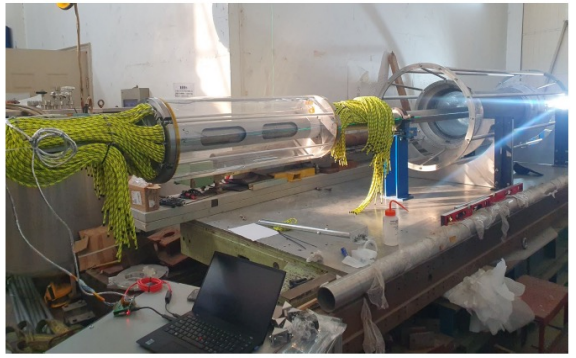


Installation Test and Risk assessment

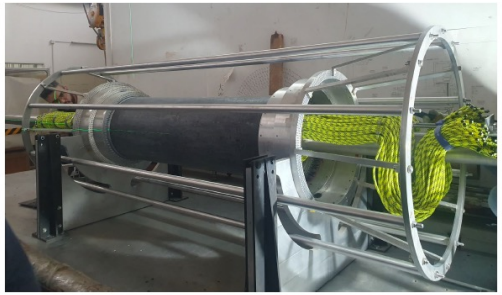
- Prove the **feasibility** of the insertion with real dimensions — OK
- Test changes and improvements to the **tooling** — OK
- Finalize the **procedure** for CGEM installation — WIP
- **Practice** with the rail adjustment mechanisms — OK



Installation Test and Risk assessment



First test in February: successful!

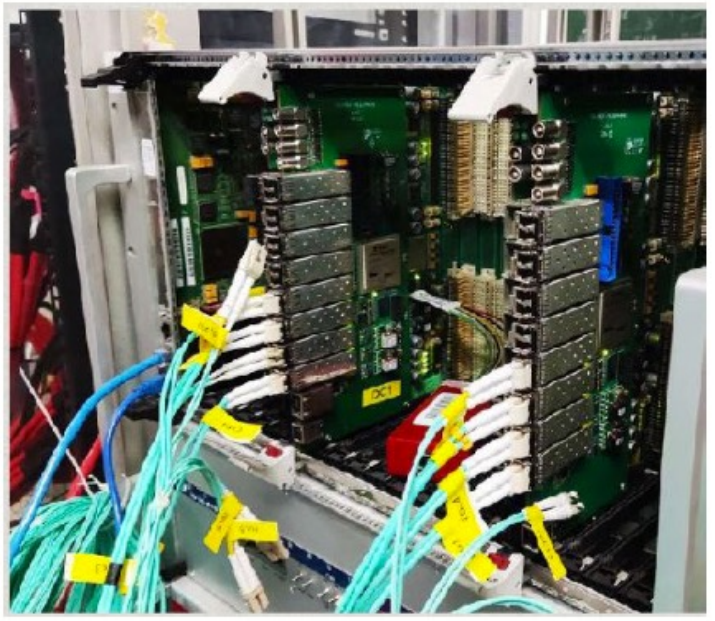


DAY 2: Insertion Complete

Installation Test and Risk assessment

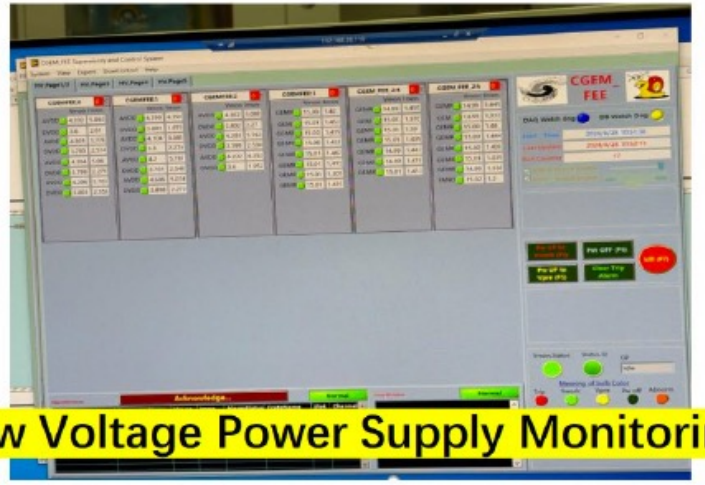
DAY 4: Mockup Extracted

CGEM-IT DAQ/SC integration

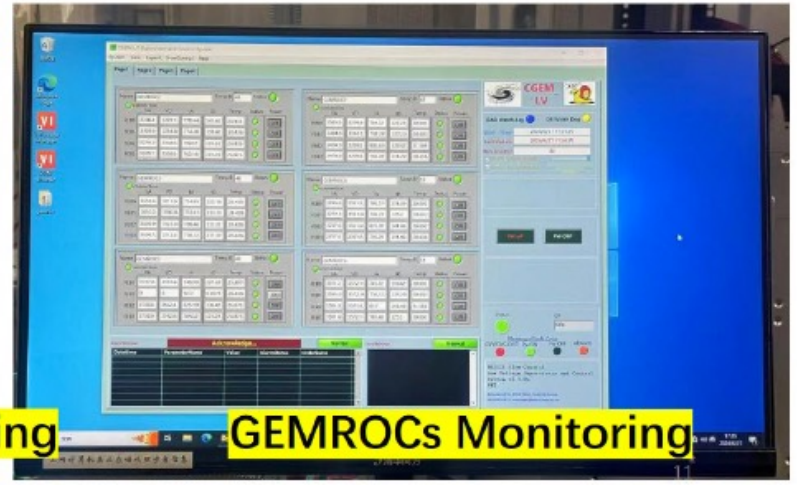


WIP
- ✓ 21/22 GEMROC read
- ✓ 2 GEM-DC in parallel

WIP
- ✓ Monitoring



Low Voltage Power Supply Monitoring



GEMROCs Monitoring

Overall recommendation

The Review Committee congratulates the CGEM colleagues on their continued hard work.

We recommend that the team proceeds with the removal of the inner MDC, and the insertion of the CGEM. *This, however, is subject to further discussions with the relevant engineering experts at IHEP, and there being absolute confidence that the extraction can be performed without damage to the outer MDC.*

Dear Yifang,

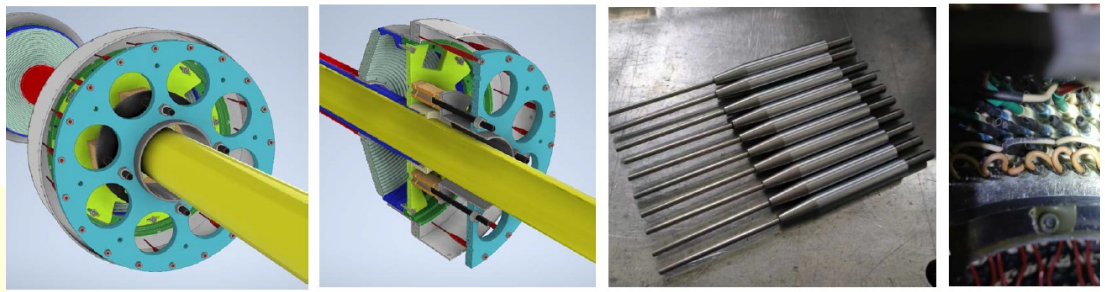
CC: Xiaoyan, Marco, Wolfgang, Xiaorui , Mingyi and Zheng,

At BESIII EB meeting on July 2nd, Guy presented the recommendation of the CGEM review committee(RC) after the CGEM wc installation of CGEM, but start work on the

MDC only when/if there is absolute confidence that the extraction procedure does not endanger the MDC, and EB agrees

Scheme 2U

- Using a self-supporting structure for extraction of inner chamber



- 19 pushing rods and 4 pulling rods are used
- Pushing rods fixed on the first step of MDC instead of the Al ring of the first step
- Pulling force applied on the Al ring, while pushing force applied on the first step of MDC
- No force on the step part, protecting frame structure is not required , and no drilling required
- The rigidness of pushing rods is much better than the pushing rods in scheme2

Review of extraction of the inner chamber

- On August 19
- Review committee:
  Kaixi Huang, Guoping Lin, Junguang Lv, Yuanbai Chen, Xiaoyan Ma, Kejun Zhu, Zheng Wang(Chair)
- Presentation:
  Scheme and procedures for pulling out the inner chamber
- Review report:
  the review committee believed that the project team had made adequate preparations, and the proposed four plans are feasible with manageable risks. They agreed to commence the removal of the inner chamber, starting with scheme 2U, and to decide on the subsequent plans based on the actual implementation senarios.

Review Report for the Removal Scheme of the BESIII Inner Drift Chamber

Review Committee: Kaixi Huang, Guoping Lin, Junguang Lv, Yuanbai Chen, Xiaoyan Ma, Kejun Zhu, Zheng Wang(Chair)

On August 19th, 2024, the Experimental Physics Division organized a review committee (listed above) to evaluate the removal scheme of the BESIII inner drift chamber. The review meeting took place in the BESIII Control Room. Mingyi Dong, on behalf of the project team, presented four removal schemes for the inner drift chamber and recent test results on the drift chamber model in Hall 3. After questioning and thorough discussion, the review committee believed that the project team had made adequate preparations, and the proposed four plans are feasible with manageable risks. They agreed to commence the removal of the inner chamber, starting with scheme 2U, and to decide on the subsequent plans based on the actual implementation senarios.

Recommendations:

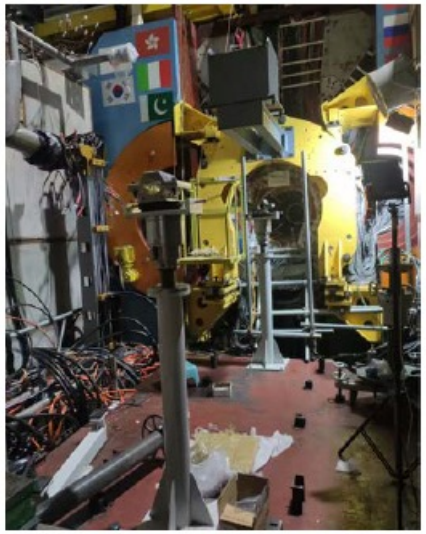
1. Determining the working gas parameters to be used during the removal of the inner drift chamber in order to avoid irreversible damage to the drift chamber. Effective ventilation methods should be taken during the removal process to ensure personnel safety.
2. Before and after pulling out the inner chamber, perform initial position calibration on the drift chamber.
3. Gas leakage should be checked after installation of the carbon fiber cylinder, and taking a few days of cosmic ray data before the installation of CGEM, these data will be helpful to check any deformation, performance and gas leakage for outer chamber.

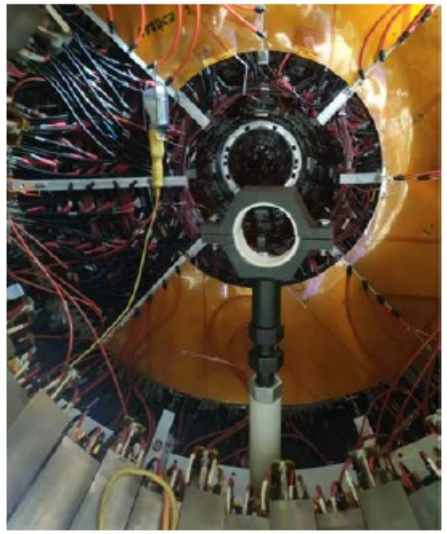
Chair:

25 August, 2024

Procedure of removing inner MDC (3)

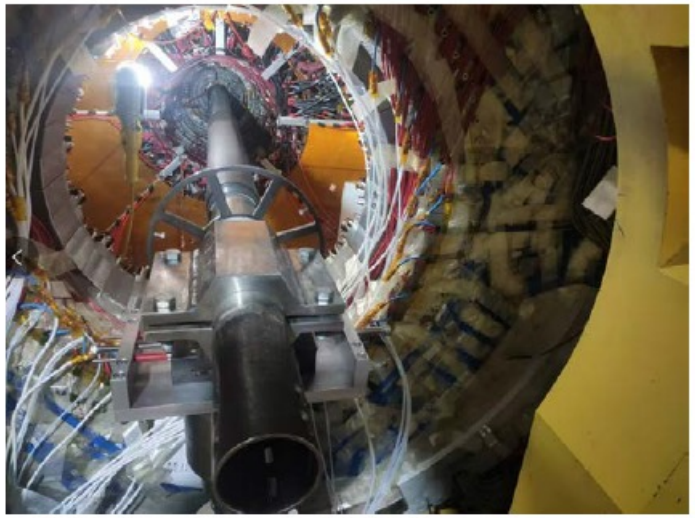
After Elba meeting, one week ago !



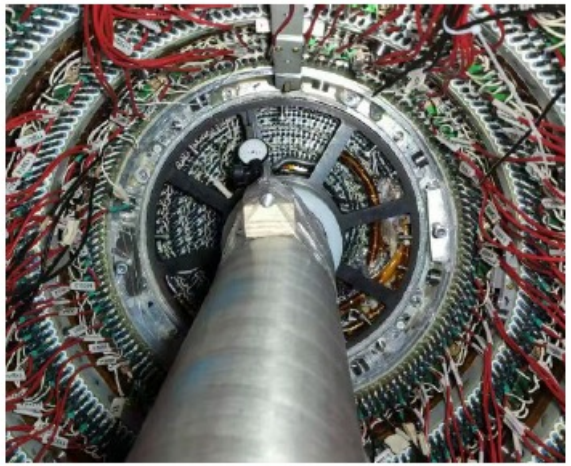


Install support legs

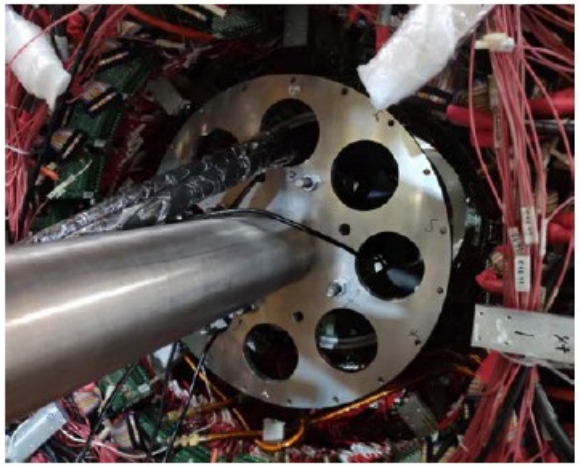
Install long rail (from east to west)



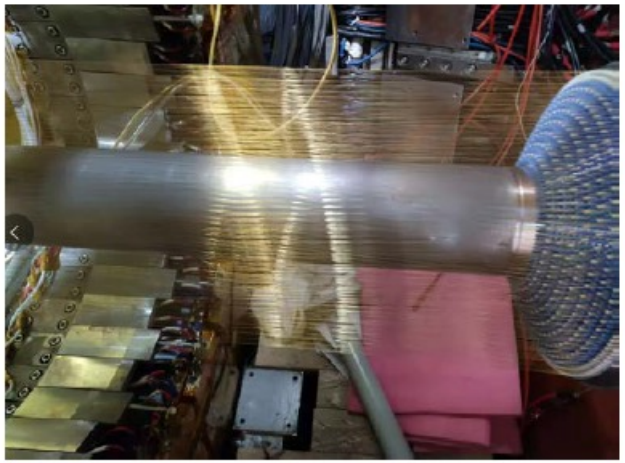
Install protecting sleeve for iMDC



fix connecting flange on west side



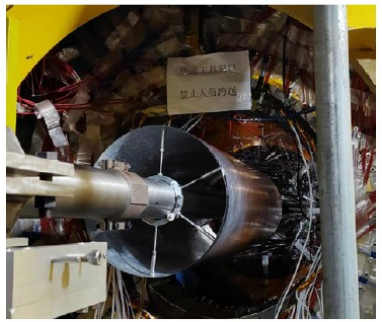
Install pull-out devices on east side



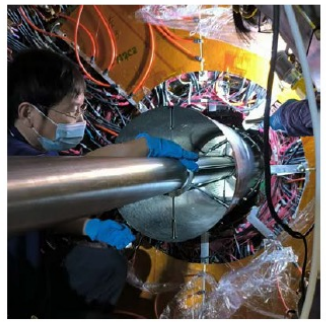
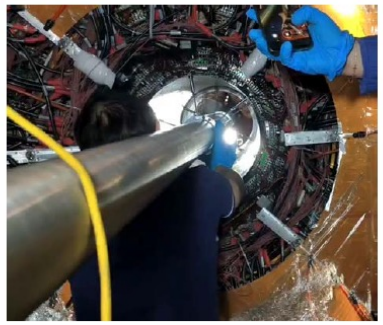
Pull out iMDC and and slide it out of the rail

Installation of new CF cylinder

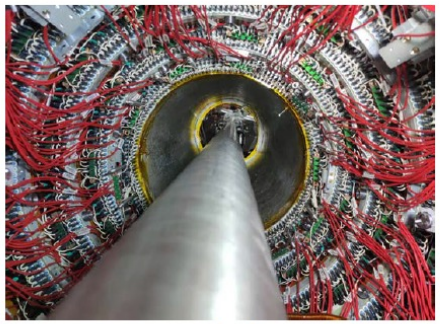
After Elba meeting, one week ago !

Install CF cylinder from east to west by fixture

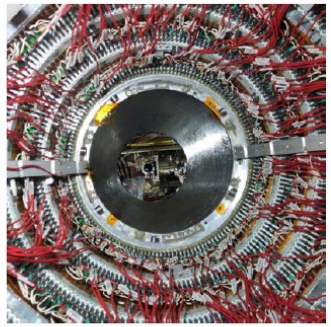



Push CF cylinder into place

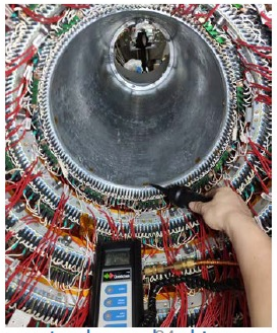


remove the long rail





Sealing on east side and west side



Leakage checking

- The extraction of the inner chamber was well prepared and tested with the prototype
- The inner drift chamber was pulled out successfully and safely (Many thanks to Facilities Operation Group and Accelerator Laser Measurement Team)
- The gas sealing and leakage checking was performed. Currently, there is no obvious leakage
- Plan in this week
  - Replace the dead preamps of MDC step part
  - Laser measurement of MDC position after removing the iMDC
  - High voltage training and cosmic-ray tests
  - Installation of CGEM-IT will start on Sep. 29 as planned

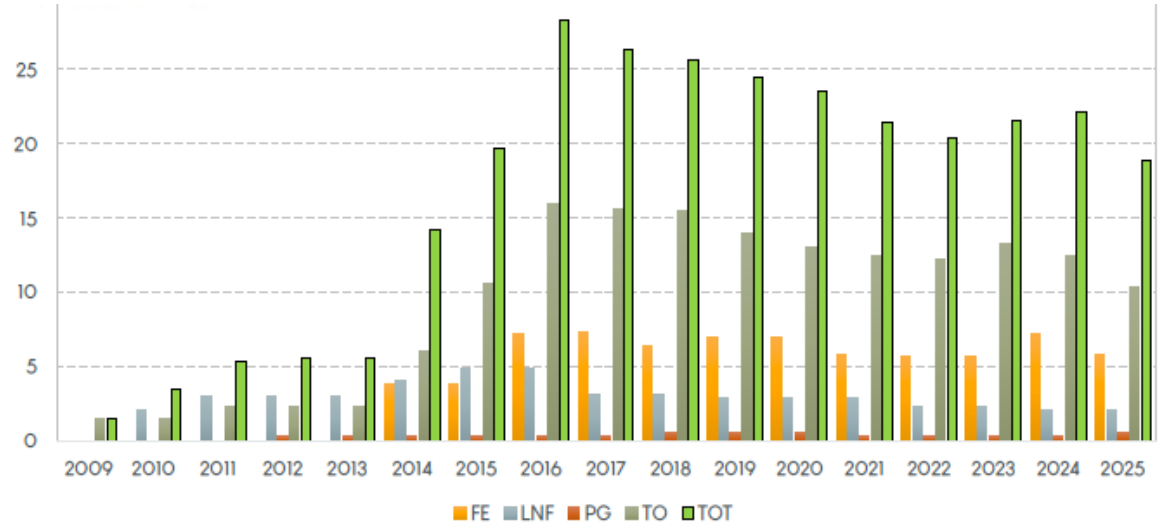
Abbiamo ricevuto il semaforo verde dalla Review Committee e dall'Executive Board ad installare il rivelatore CGEM.

Sono le persone di questa collaborazione che stanno facendo la differenza perché sono stati mesi "a dir poco" impegnativi...

...siamo pronti!

Schedule (may be updated each week)

No.	tasks	Duration (day)	Start time and stop time	Sub-system involved
1	Removal of equipment of machine		July 1- Aug. 6	Utility, Small angle lum. Detector and ZDD, Beam pipe, slow control
2	Pull-out of EEMC			Utility, EMC, TOF, MDC, MUC
3	Removal of inner chamber (Operate simultaneously on both sides)	51	Aug. 7- Sep.7 Sep.8- Sep. 28	MDC, MDC electronics, Gas, Mechanics, Laser Alignment group, Trigger, DAQ, Slow control
4	Installation of CGEM	44	Sep.29- Nov. 11	CGEM group, MDC, MDC electronics, Gas, Mechanics, Laser Alignment group, Trigger, DAQ, Slow control
5	Recover EEMC		Nov. 12-Dec. 30	Utility, EMC, TOF, MDC, MUC
6	Recover equipment of machine			Utility, Small angle lum. Detector, ZDD, Beam pipe, slow control,
total		180 days	July 1- Dec.30	



FTE
~40 authors (~7% of the total)
~0.6 authors/FTE
55 physicists + technologists+technicians

	FTE/f	FTE/t
FE	5.5	0.25
LNF	1.4	0.70
PG	0.6	-
TO	7.45	2.95

Richieste Riunione luglio: sblocco 9 keuro apparati per spare GEMROC (4 pezzi)

Richieste Riunione settembre: faremo richieste aggiuntive per missioni per installazione: calcolo in corso

Richieste BESIII 2025

	Richieste	sj	
Altro consumo	1.5 k€		Gas per test (FE): 0.63/l miscela Ar/Iso -> 1.5 keuro corrispondono a 2400 l circa, consumo setup =5l/h circa ->equivale a 20 giorni di test circa
Consumo	3.5 k€ 60 k€		Acquisto schede HV/ massa spare (LNF)-1.5 keuro Valvole e componentistica spare per sistema cooling (TO)-2 keuro Quota joint IHEP-INFN fellowship
Apparati		9 k€	Sj a restituzione 2024 e sj a completamento moduli FPGA per spare GEMROC e nuove patch card per interfacciarsi con le GEMROC_IFC esistenti e già finanziate (4 pezzi)
Inventario	2 k€		Flussometri/pressometro spare (TO)
Licenze sw	3 k€		0.5 k€: Europractice 1k€: Synopsis+Mentor Graphics 1.5 k€: Labview
Totale			70 k€ + 9 k€ sj

Missioni ESTERO	k€
Beam commissioning CGEM IT (mesi 1-6)	191
Manutenzione CGEM IT (mese 7)	76
Expert on call	54
Turni presa dati	43
BESIII CM/P&Sw	188
Coordinamento FEST	6
Totale	558

Missioni ITALIA	k€
Analisi dati\performance	17
Sviluppo uTPC\DAQ	12
Attività dottorandi\Post-doc	12
Meeting BESIII Italia	25.5
CNS1	6
Totale	72.5

29 ricercatori, 14 tecnologi, 12 tecnici

Sede	FTE	Missioni 2025		FTE	Missioni 2024	
		Richieste			Richieste	SJ
FE	5,75	209.5		7,2	216	
LNF	2,1	90		2,1	88,5	
PG	0,6	8.5	Sotto Frascati per missioni RISE	0,3	5,0	
TO	10,4	322.5		12,45	474.5	
TOT BESIII	18.85	**630.5 (di cui 552 sotto RISE)**		22.05	**784**	

BESIII

RELAZIONE DEI REFEREES

E. De Lucia, M. Dorigo, T. Dorigo, G. Ortona, A. Perrotta

CSN1 - 9 settembre 2024

Richieste 2025

- Richiesta totale: **738k, di cui 630.5k missioni** e 107.5k resto (con 60k borse IHEP-INFN).
- Richieste di missioni molto dettagliate, divise tra quelle valorizzabili con RISE (Cina) e non. **Notiamo (ancora) richieste per missioni elevate, soprattuto per l'Italia (3.8k/FTE).**
- Criteri di proposta per missioni:
  - Linee guida CSN1 per assegnare un metabolismo. Considerato per meeting collaborazione, analisi performance/fisica/software): 1MP x FTE (missioni estere) + 1k x FTE (Italia).
  - Considerato 1MP = 4.6k = 3.6k (diaria) + 1k (viaggio).
  - Gettone di 3k per ogni responsabilità (1 gettone se stessa persona ricopre più ruoli).
  - Alcune richieste per collaborazione dottorandi tra sedi trattate a parte dei metabolismi
  - Missioni per turni/beam-commissioning/operations ad IHEP valutate una per una, aggiustando dove ci sembrava esserci un double counting.

Attività prevista nel 2025

- CGEM
  - commissioning sotto fascio di meccanica e elettronica/integrazione (allineamento detector; catena elettronica completa; integrazione con DAQ e SC di BESIII; valutazione performance sotto fascio)
- ANALISI
  - Sottomissione articolo LFV nel decadimento $\psi(2S)\to\tau\tau$;
  - Inizio CWR: misura fase relativa in $J/\psi\to p\bar{p}$; Zc(4430) in $\psi(2S)\to\pi\pi$;
  - Continuazione: BF($J/\psi\to N\bar{N}$) e $J/\psi\to 3\gamma$ da $\psi(2S)\to\pi\pi J/\psi$; fit globale $ee\to c\bar{c}$ con modello della matrice K; fattori di forma Λ e Σ.
- COMPUTING
  - Mantenimento documentazione BESIII; manutenzione VM per analisi standalone CGEM; consolidamento delle varie installazioni

Sommario

- Ci congratuliamo per il successo della review e l'approvazione per l'installazione del rivelatore CGEM. Vi auguriamo che tutto proceda al meglio in quest'ultimo passo e con il commissioning.
- **Approviamo la richiesta aggiuntiva 2024 di 28k di missioni** per il commissioning del rivelatore, a fronte delle spese non preventivate ma necessarie per la review e la manutenzione straordinaria. **Approviamo gli sblocchi sj richiesti.**
- Per il 2025 richiesti 738k, **proponiamo 517k**:
  - **185.5k missioni**
  - **331.5k resto (di cui 231.5k RISE come consumi a TO)**

spares

ITALIAN ANALYSES

1. Phase measurements task force
   - Measurement of the phase between Strong and Electromagnetic $J/\psi \to p\bar{p}$ Decay Amplitudes– under review
   - $J/\psi \to K^+K^-$ via $\psi(2S) \to \pi^+\pi^- J/\psi$– CWR started in August 23
   - Study of $\pi^+\pi^- J/\psi$ around psi(2S) mass using 2018 scan data– MC studies and fits optimization ongoing
2. Analysis of $J/\psi \to p\bar{p}$ via $\psi(2S) \to \pi^+\pi^- J/\psi$
   - Collaboration with Meichen Yu started. Analysis in a good shape
3. Study of the $e^+e^- \to \pi^+\pi^-\psi(2S)$ reaction at $\sqrt{s} > 4.600$ GeV and search for the charged Zc(4430) exotic state– analysis very close to the review
4. Psi(2S)–>tau tau: a way to test LFUV @ BESIII– in review; first draft ready and submitted to the analysis reviewers

>F. De Mori

5

Begin forwarded message:

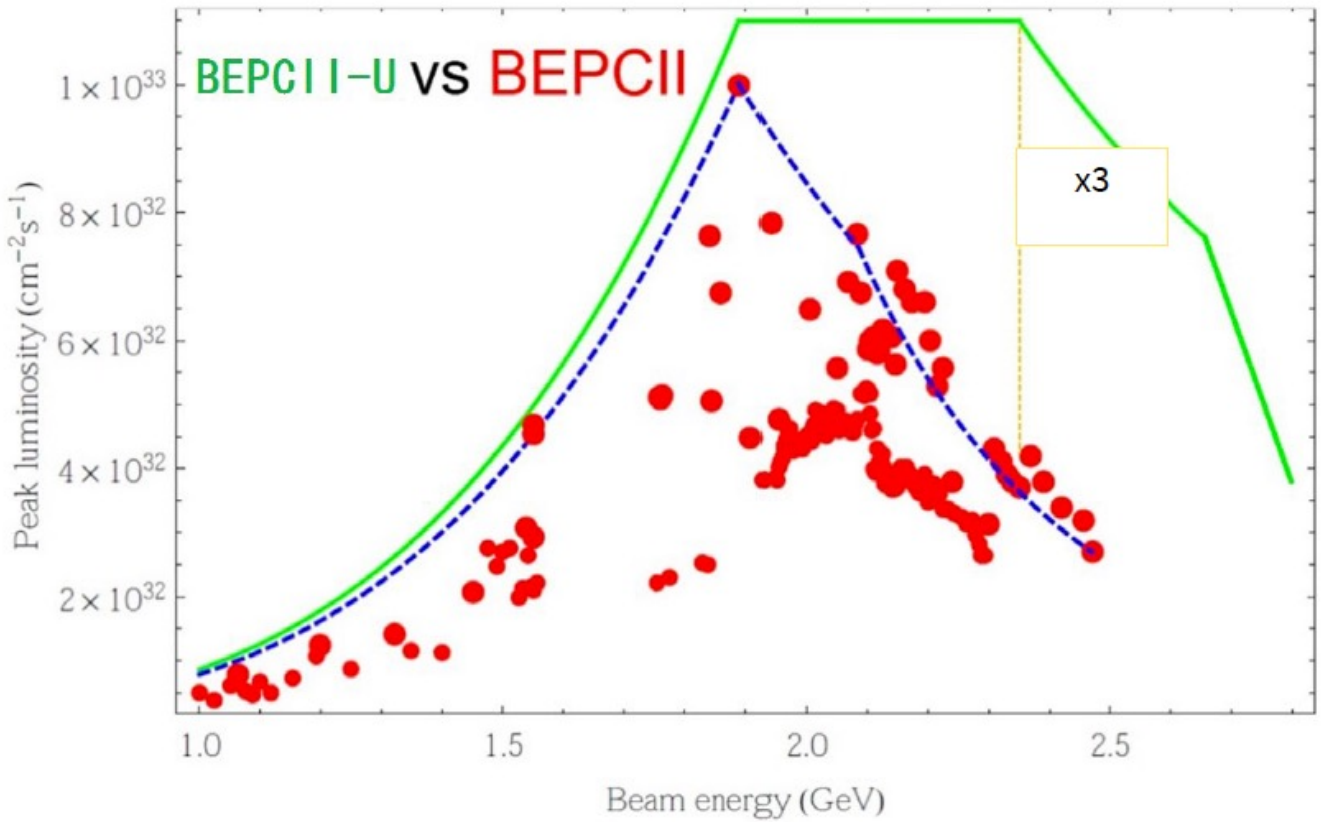
From: Francesca De Mori <demori@to.infn.it>
Subject: **[Bes3_member] Acceptance DS13705 Ablikim (fwd)**
Date: 27 June 2024 at 22:42:16 CEST
To: paper604@hnbes3.ihep.ac.cn
Cc: bes3_member@ihep.ac.cn
Resent-From: bes3_member@ihep.ac.cn

Dear all,
We are pleased to inform you that our paper "Precision measurement of the branching fraction of J/ psi->K+K- via psi(2S) -> pi+ pi- J/psi" has been accepted for publication as a Regular Article in Physical Review D.

S. Spataro standing member of BESIII Publication Committee

Physics highlights

BEPCII-U



- 2024 .7-12, Shut down for hardware dismantling and installation
- 2025-2028, Operation at 2.3~2.5 GeV, prepare for energy upgrade
- 2028.6-9, Energy upgrade to 2.8 GeV
- 2028.9~2030, Operation at 2.5~2.8 GeV

@LIU Yu Dong

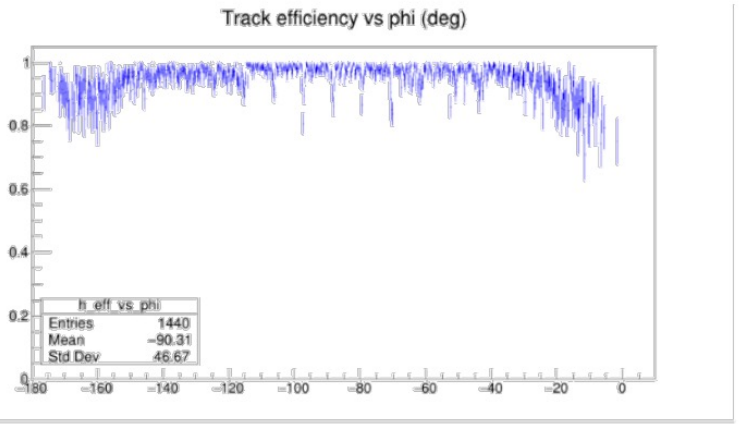
	BEPCII	BEPCII-U
luminosity $[10^{32}\mathrm{cm}^{-2}\mathrm{s}^{-1}]$ @2.35GeV	**3.5**	**11**
β_y^* [cm]	**1.5**	**1.35**
Beam current[mA]	400	900
SR Power [kW]	**110**	**250**
$\xi_{y,\mathrm{lum}}$	**0.029**	**0.033**
emittance[nmrad]	**147**	**152**
couple [%]	**0.53**	**0.35**
Bucket Height	0.0069	0.011
$\sigma_{z,0}$ [cm]	1.54	1.07
σ_z [cm]	**1.69**	**1.22**
Rf voltage	1.6MV	3.3MV

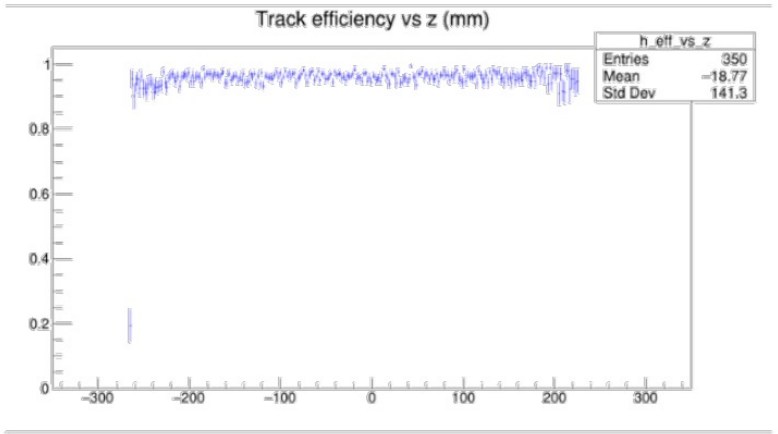
✓ **Phase I: @ 2.35GeV,**
luminosity tripled to $11\times10^{32}\mathrm{cm}^{-2}\mathrm{s}^{-1}$

✓ **Phase II: Push higher energy, 2.47GeV >>2.80GeV**

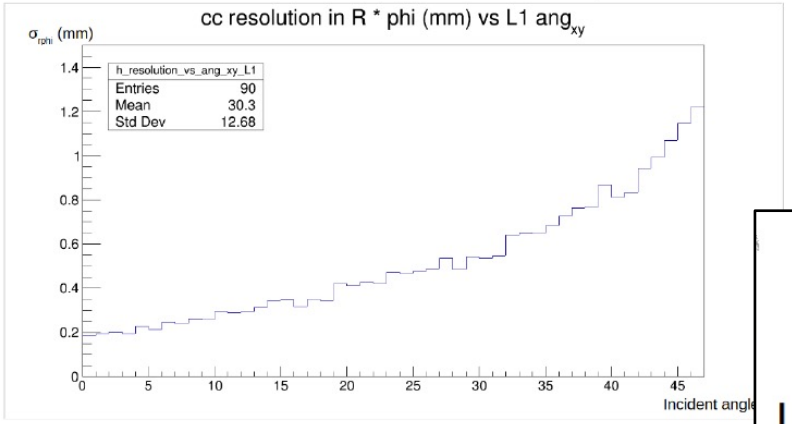
CGEM software working list (2024)

Lianliang Wang





Layer 1 bottom



G.Mezzadri

MGreco, CNS1-17 luglio 2024

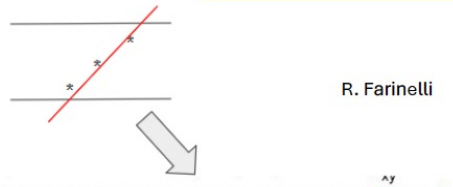
>CGEM-IT
Performance Review

L1 - L2 - L3 μTPC

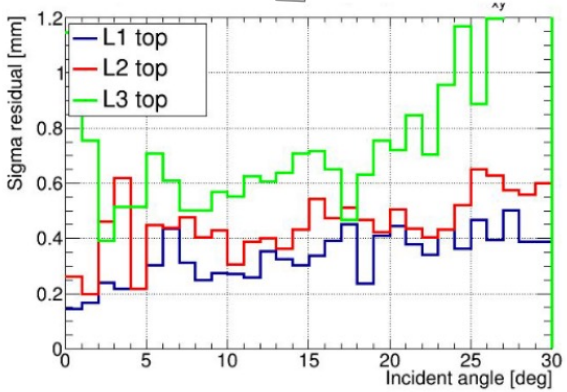
The optimization of the the time calibration is performed only on L1 then only the sigma for positive angle is reported.

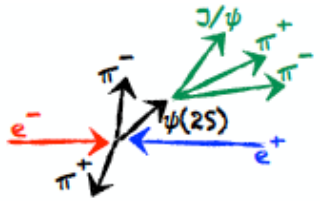
μTPC on L1 ~ 300 μm
L2 ~ 400 μm
L3 ~ 600μm.

Remember:
the contribution of the tracking system is larger on L3: L3>L2>L1



R. Farinelli





Invariant Mass Resolution

√s = 4.612 GeV (Reso250 Eff95)	Resolution [MeV]	√s = 4.612 GeV (Reso250 Eff100)	Resolution [MeV]	√s = 4.612 GeV (Nominal)	Resolution [MeV]
J/ψ	19 ± 1	J/ψ	18 ± 1	J/ψ	17 ± 1
ψ(2S)	19 ± 1	ψ(2S)	19 ± 1	ψ(2S)	17 ± 1

√s = 4.612 GeV (Reso130 Eff95)	Resolution [MeV]	√s = 4.612 GeV (ResoX130 ResoV400 Eff100)	Resolution [MeV]
J/ψ	16 ± 1	J/ψ	17 ± 1
ψ(2S)	16 ± 1	ψ(2S)	17 ± 1

Extracted from the variance of the fitted shape

Also the study on the invariant mass resolution confirms no strong differences wrt the nominal case (less than 1.5σ)