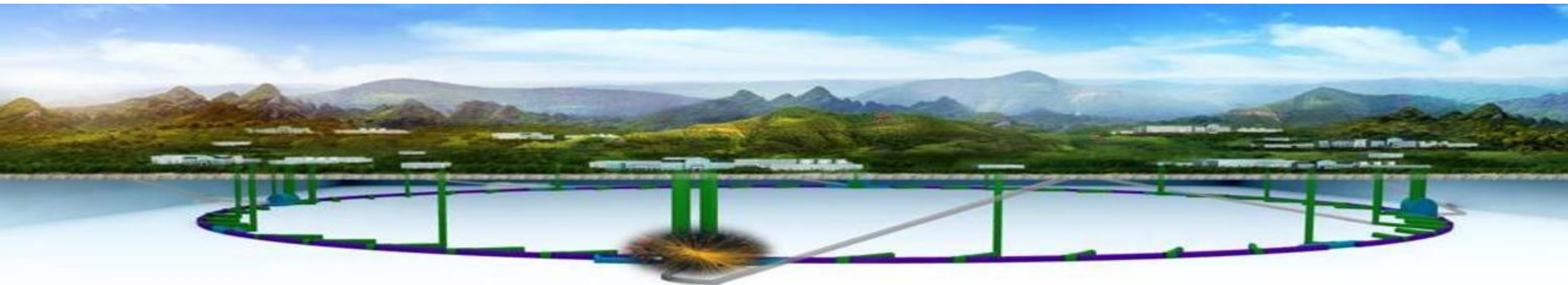


CEPC and the Future Plan of HEP in China

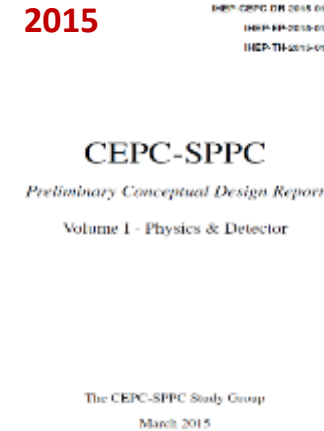
Yifang Wang
Orsay/Paris, Sep.18, 2026



From Kick-off to TDR



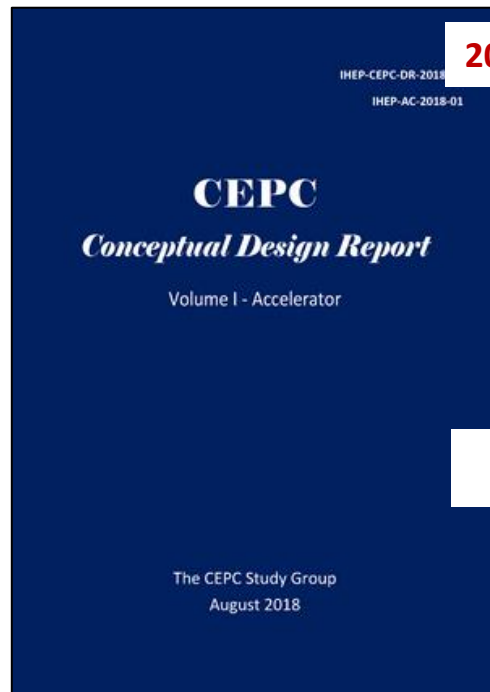
2015



CEPC physics white papers:

1. Higgs physics, arxiv:1810.09037
Chin. Phys. C 43(2019) 043002
2. Flavor physics, arxiv:2412.19743
3. New Physics Search arXiv.2505.24810
4. Electroweak physics, to be published
5. QCD, to be published

2018

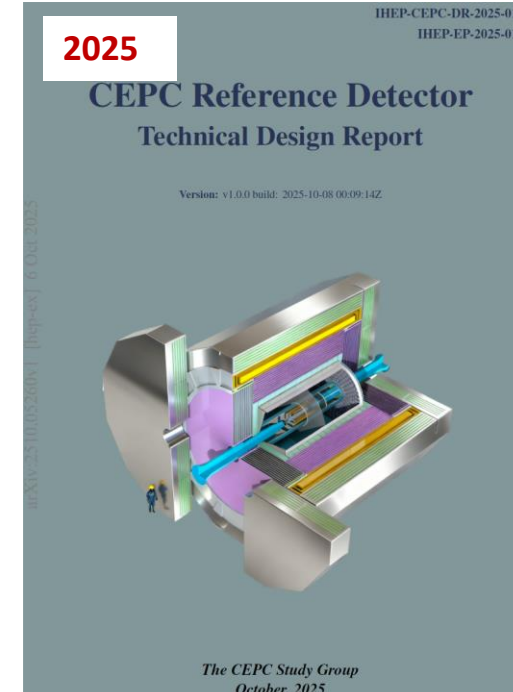


<http://cepc.ihep.ac.cn>

2023



2025



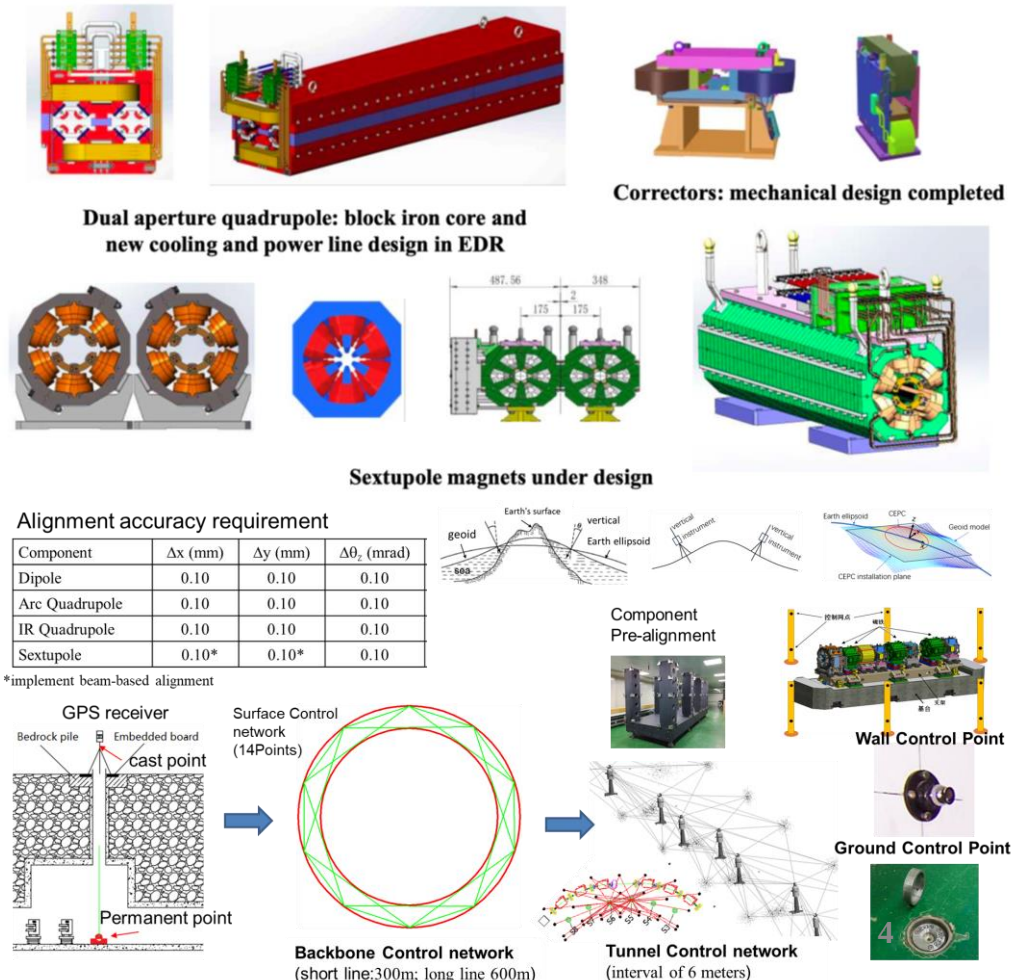
CEPC was not put into the 15th 5-yrs (2026-2030) plan

- A sad news but we will not stop pursuing HEP
- An IB meeting at the last annual CEPC workshop held in Guangzhou concluded the following:
 - Continue CEPC while looking forward to be a major partner of FCC
 - Identify common interests and technologies, find a new way of collaboration
 - In contact with CERN/FCC
 - AGORA listed as one of the FCC detector concept
 - already in DRD
 - If FCC construction is not officially approved before 2030, we will propose again to the Chinese government
 - Continue to explore the pp collider (~ 100 TeV) by working on Iron-based HTC superconducting materials (IBS) and magnet
 - Only IBS has potential to contribute significantly to the society: new, metal, cheap
 - Working for the high energy linear e^+e^- collider (1-10 TeV) and applications
 - Established a PWFA test facility based on BEPCII
 - Start to work on technologies, and applications for table-top light sources, injectors, FEL, etc.

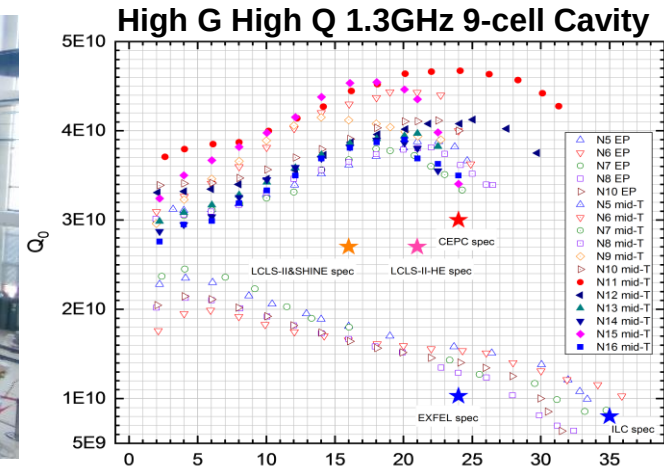
Continue Accelerator EDR

EDR tasks start with 35 WGs aiming for issues like further R&D of new technologies, mass production, mockup for installation, etc.

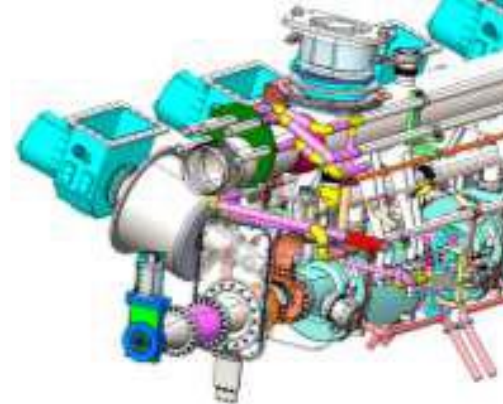
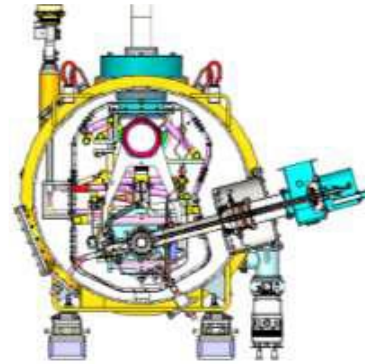
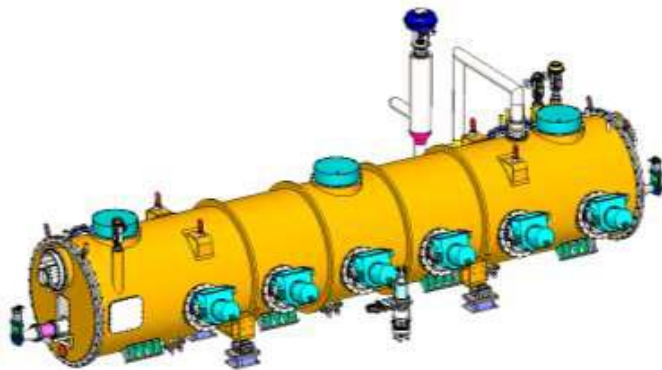
- A full cryomodule containing six 650 MHz 2-cell cavities
- Higher efficiency klystrons
- Automatic production for NEG coated vacuum chambers
- Automatic production for magnets
- More prototypes of magnets
- C-band LINAC test band
- CCT type SC quadrupole magnet for final focusing
- MDI design and background studies
- Control and timing
- Alignment and installation plan
- Mockup for installation
-



EDR Example 1: SRF Cavities and Modules



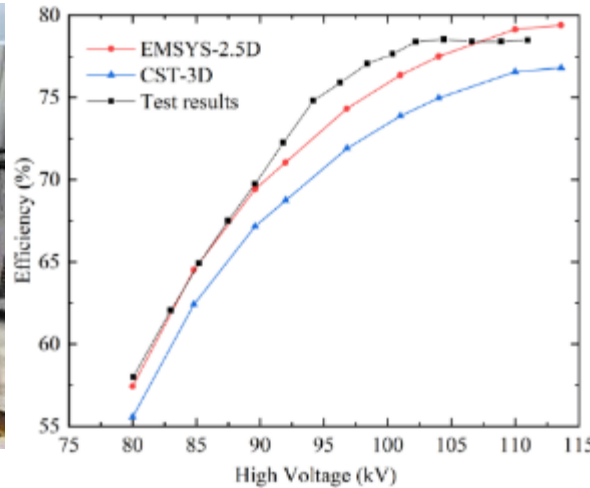
In TDR phase: successfully completed a 650MHz 2*cell short module and an 1.3GHz full module



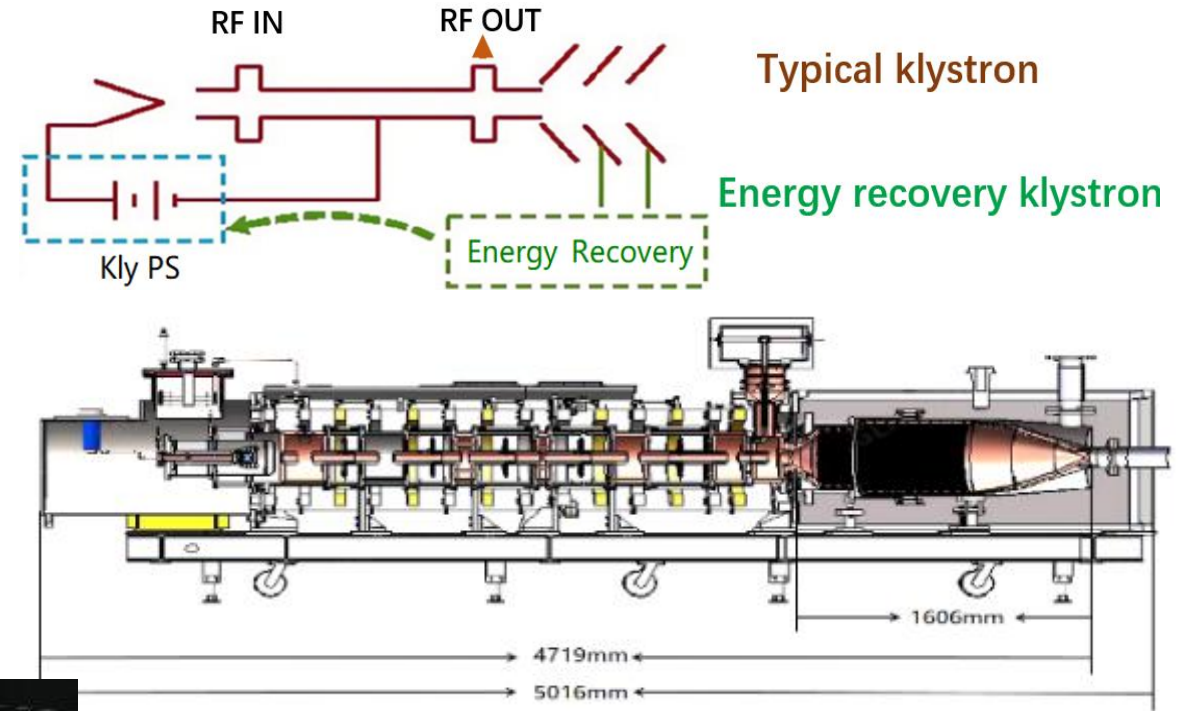
In EDR: a full 11 m-long module with six 650 MHz 2-cell cavities

Status: construction in progress

EDR Example 2: Higher Efficiency Klystrons



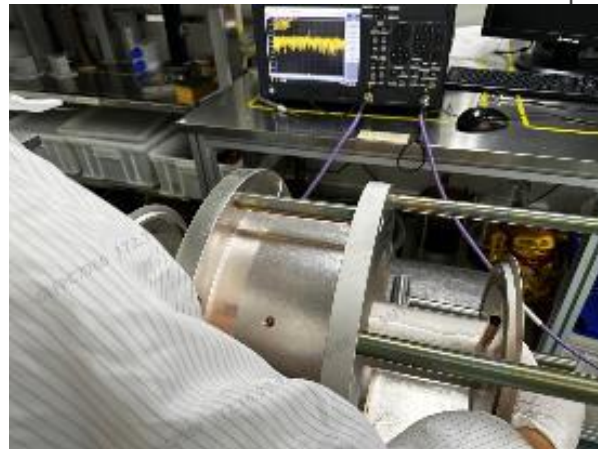
In TDR phase: CW 800 kW klystron reached effi. of ~78%



Cavity components



Cavity cold test

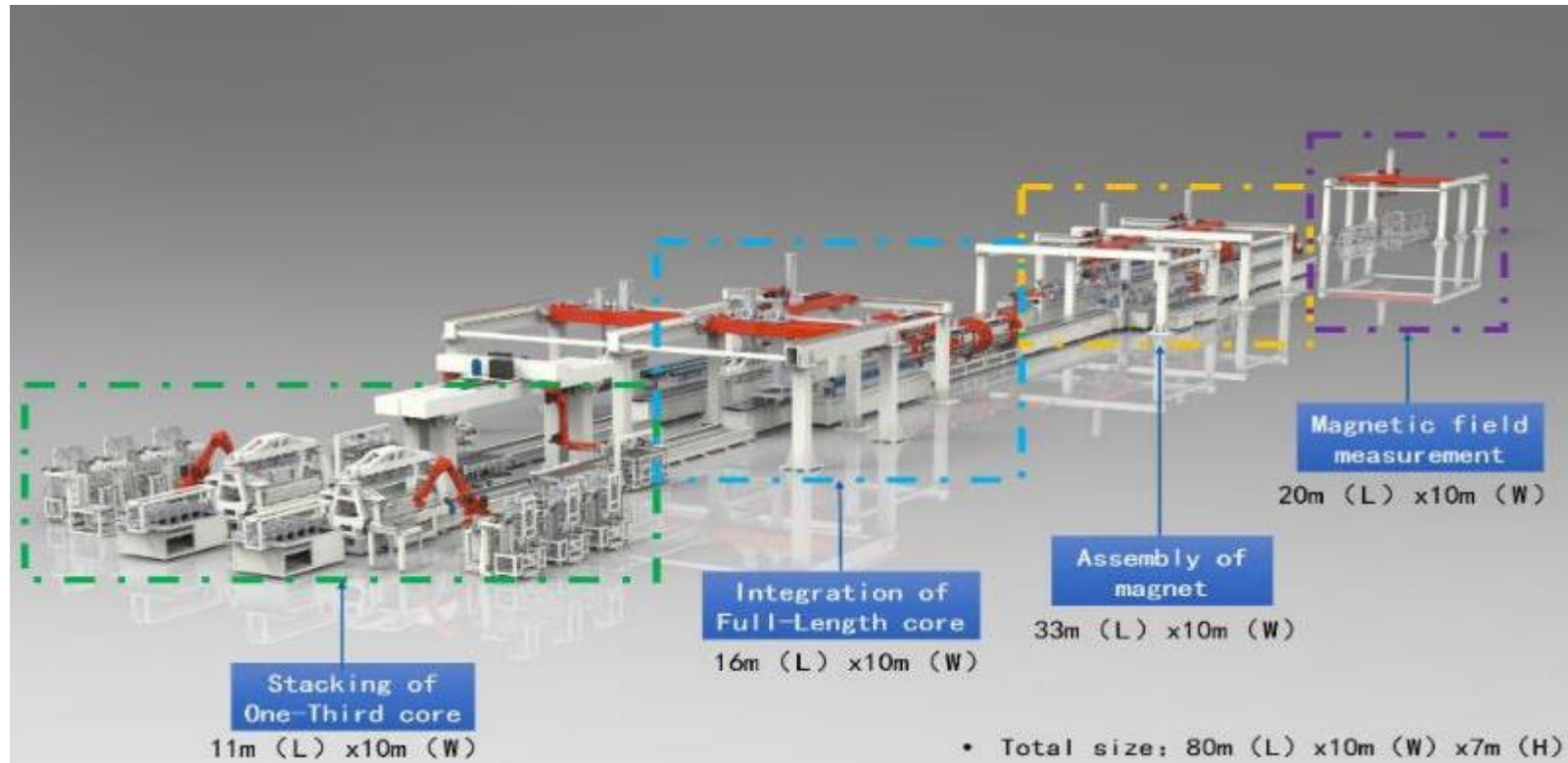


Parameter	Value
Frequency	650 MHz
Beam Voltage	113 kV
Output power	800 kW CW
Efficiency	≥85%

In EDR: An Energy Recovery Klystron (ERK) to be tested next year

EDR Example 3: Automatic Production for Magnets

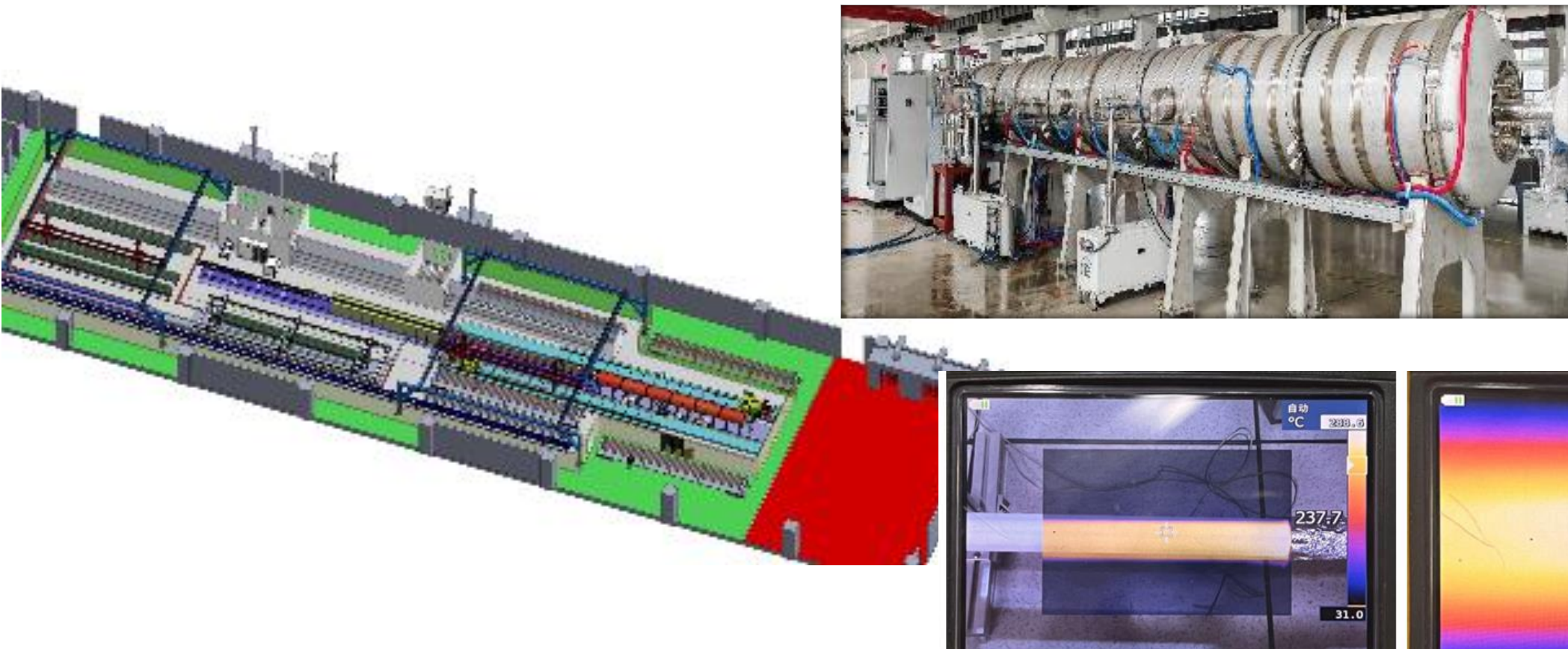
- Starting from booster dipole magnet: ~15000 magnets needed
- Can work 24h/day, 7days/week, may reduce the cost by ~30-50%



The first workstation for stacking the magnet core has been produced. Commissioning successful: a magnet core is successfully completed. The full production line will be commissioned soon

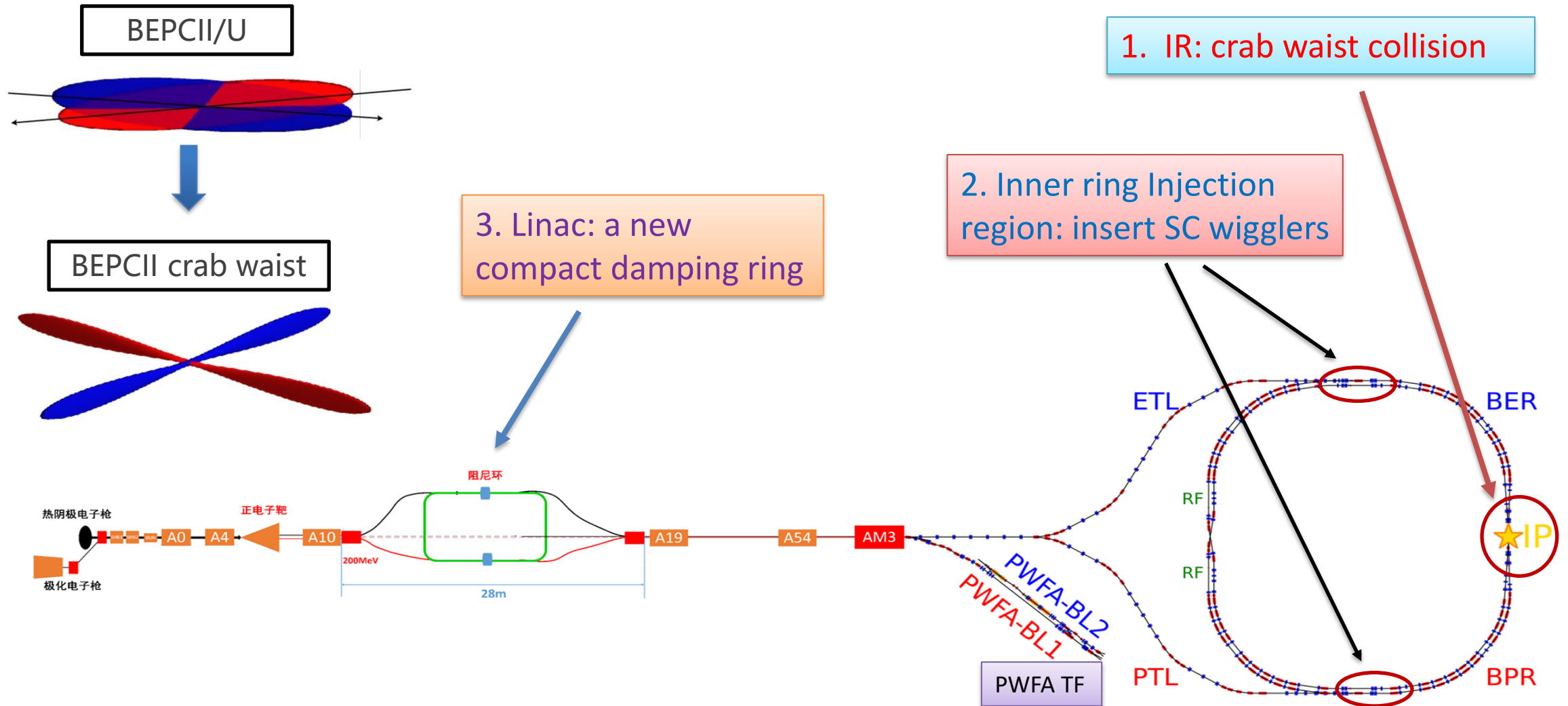
EDR Example 4: Automatic Production for NEG Coated Vacuum Chamber

- A total of 200 km needed
- Can work 24h/day, 7days/week, may reduce the cost by ~30-50%
- ◆ Key challenges: automatic sealing of CF flanges, coating under extreme conditions at a length-to-diameter ratio of ~200, and heating-layer implementation.



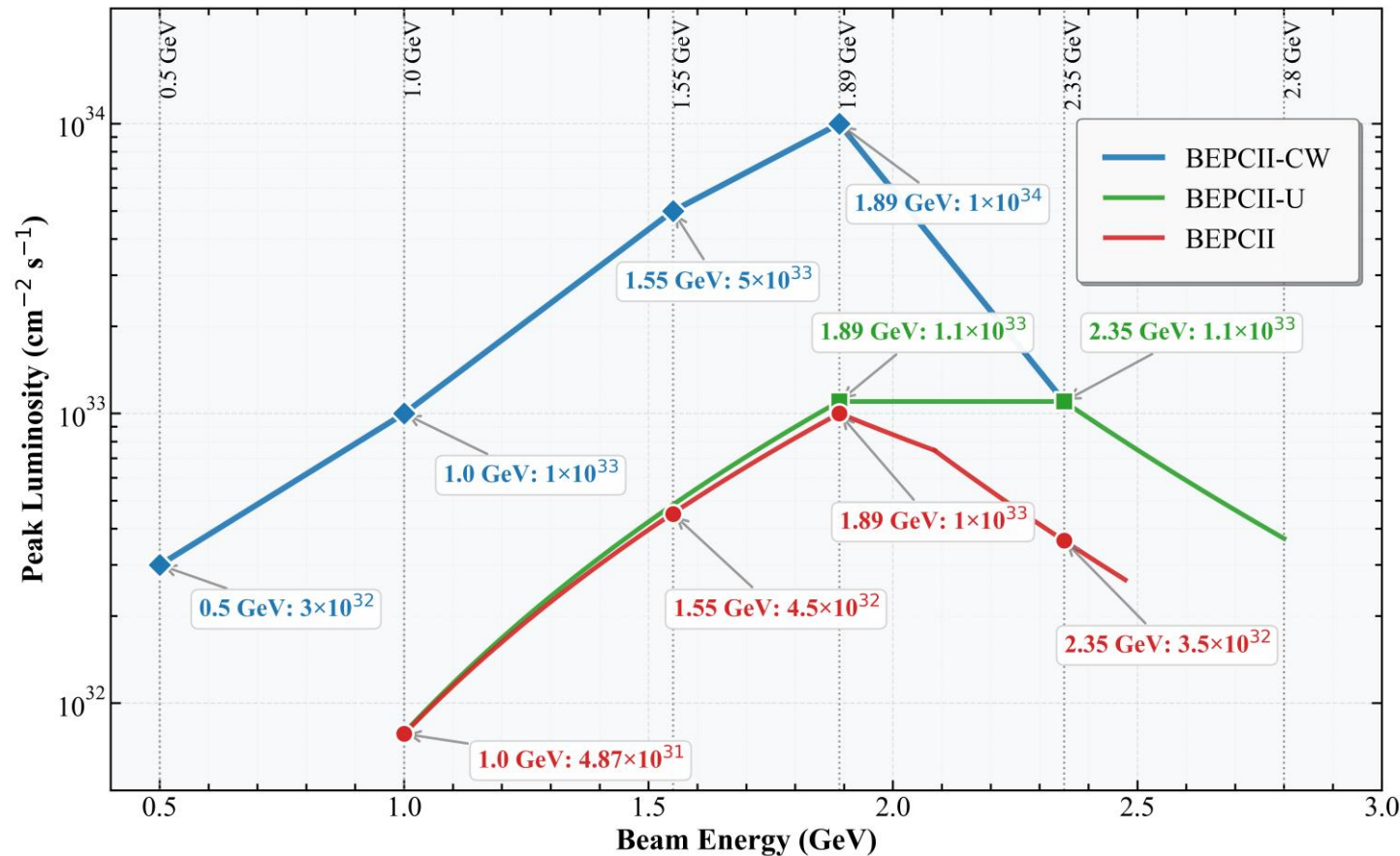
Assembly and commissioning completed, undergoing system-level commissioning ⁸

New: Testing the Crab Waist Scheme at BEPCII



New BEPCII Luminosity

BEPCII-CW Luminosity vs BEPCII-U & BEPCII

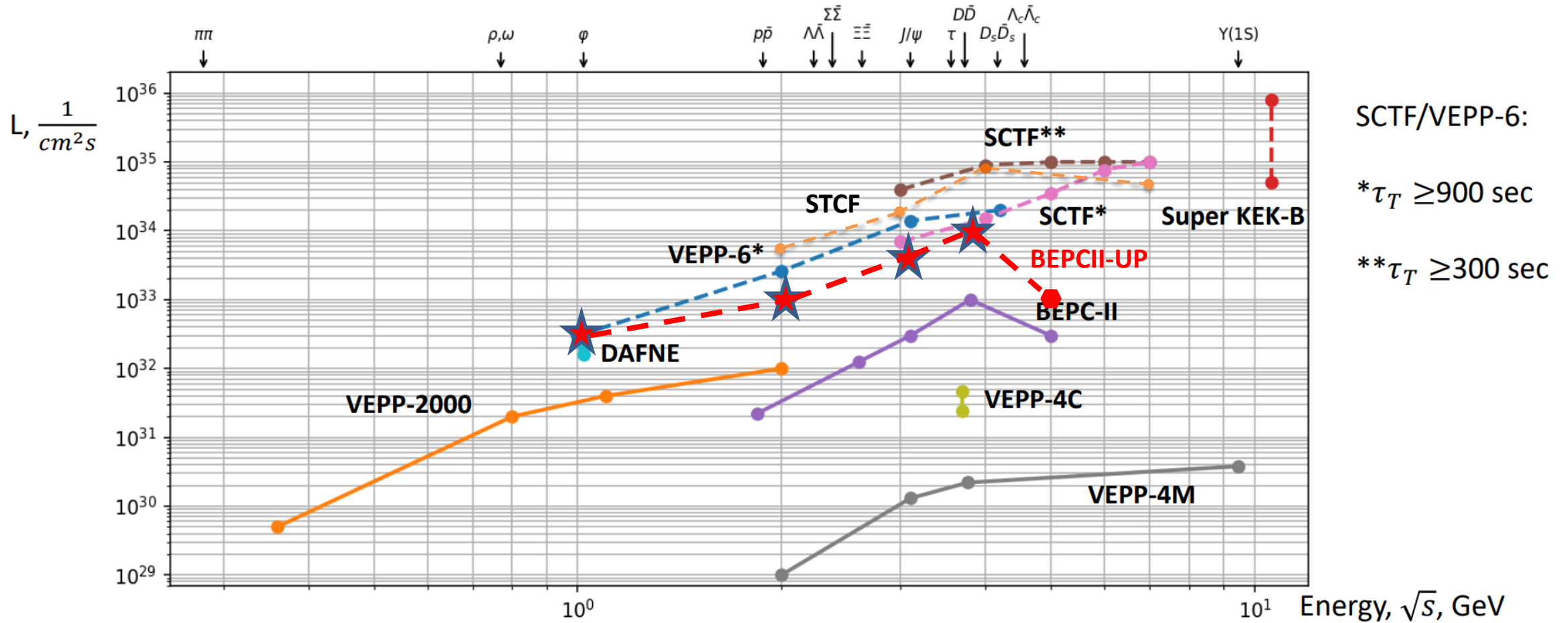


Main physics topics after upgrades:

- XYZ and charmed baryons
- Precise R-value scan in 0.5-2.0 GeV
- More J/ψ events for glueballs
- Charmonium physics at ψ' and $\psi(3770)$

- Luminosity can increase by $\times 10$ below 1.89 GeV.
- Operation below 1 GeV is enabled.

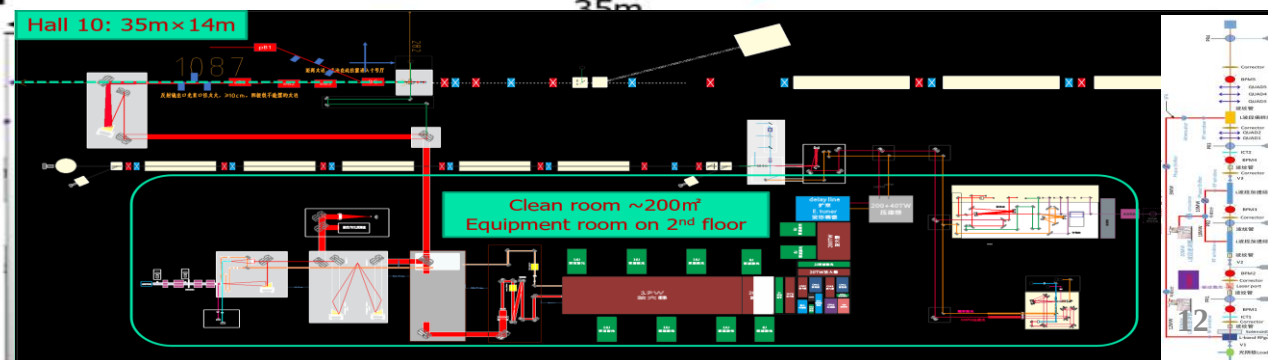
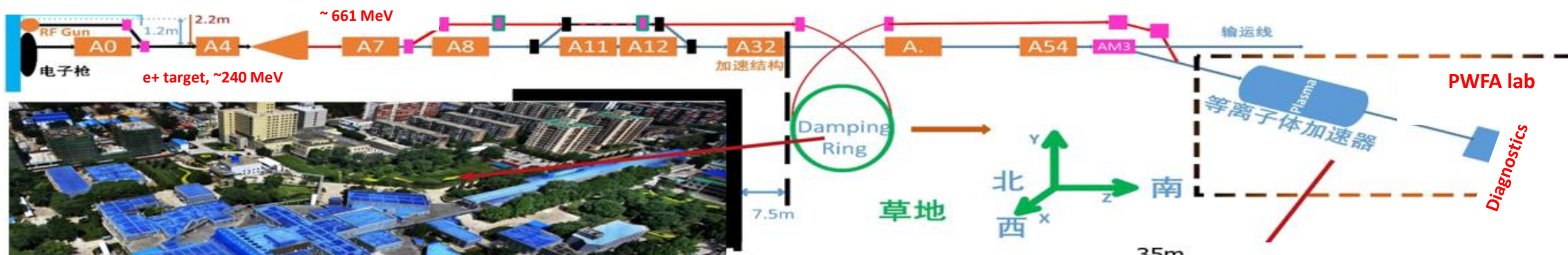
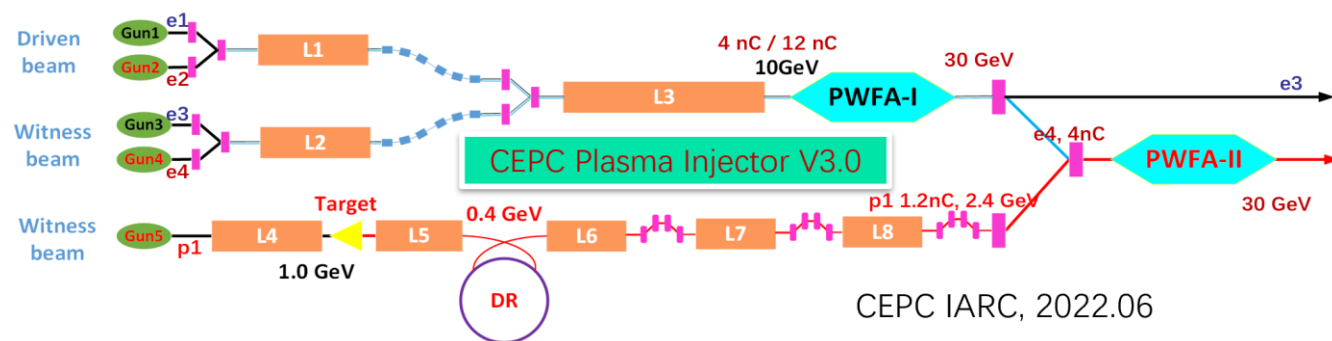
Landscape of Tau-Charm Factories



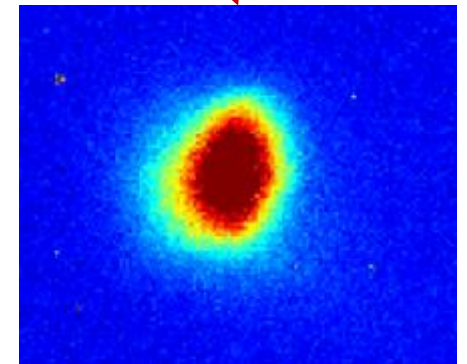
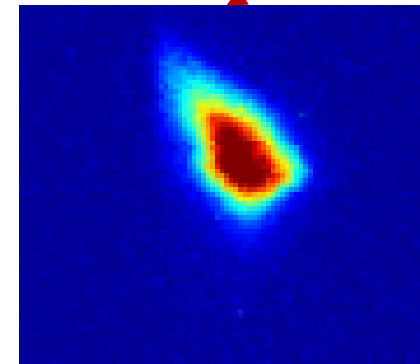
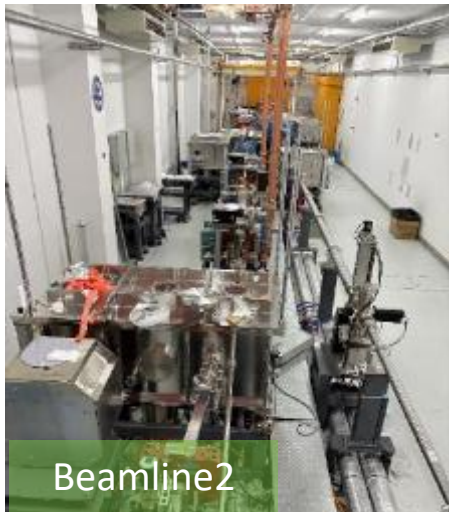
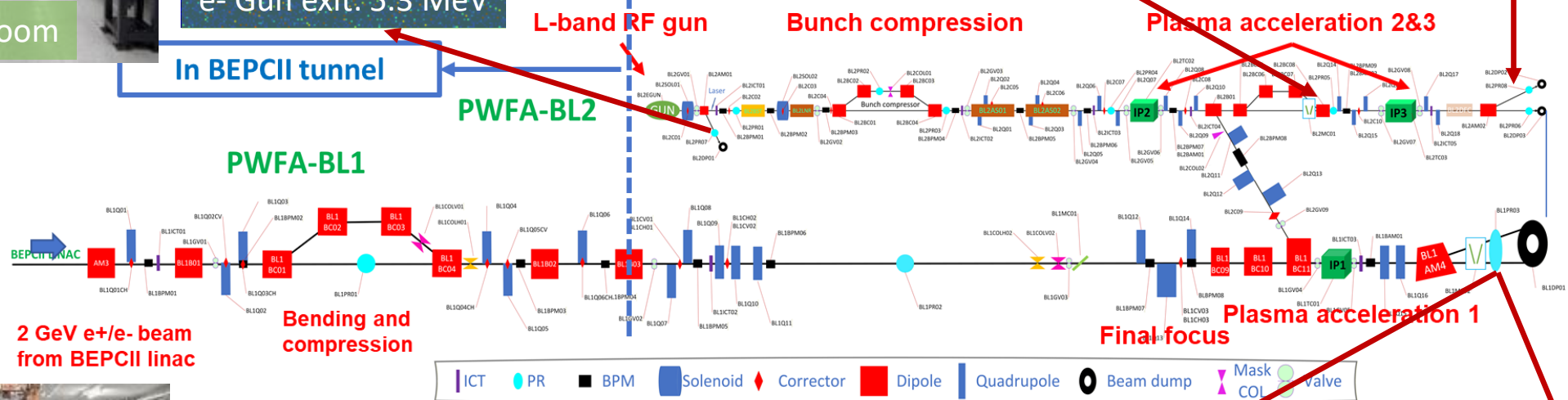
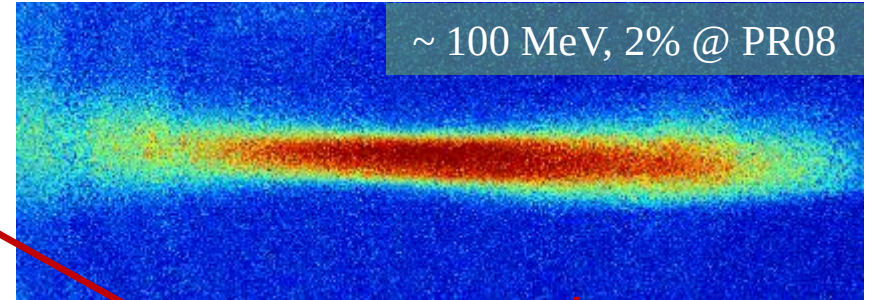
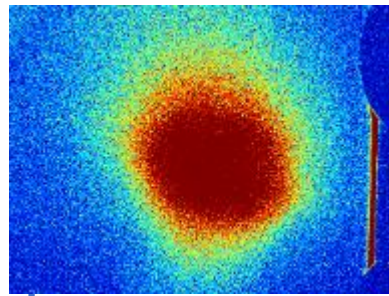
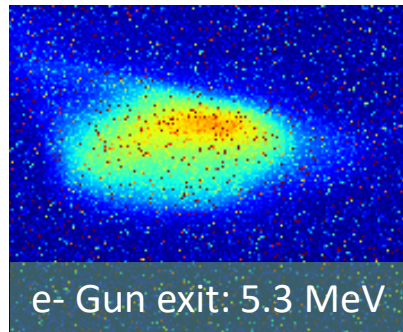
Ref: Ivan Logashenko @FTCF2025 (November 24, 2025)

R&D for Future: Plasma accelerator as the CEPC Injector

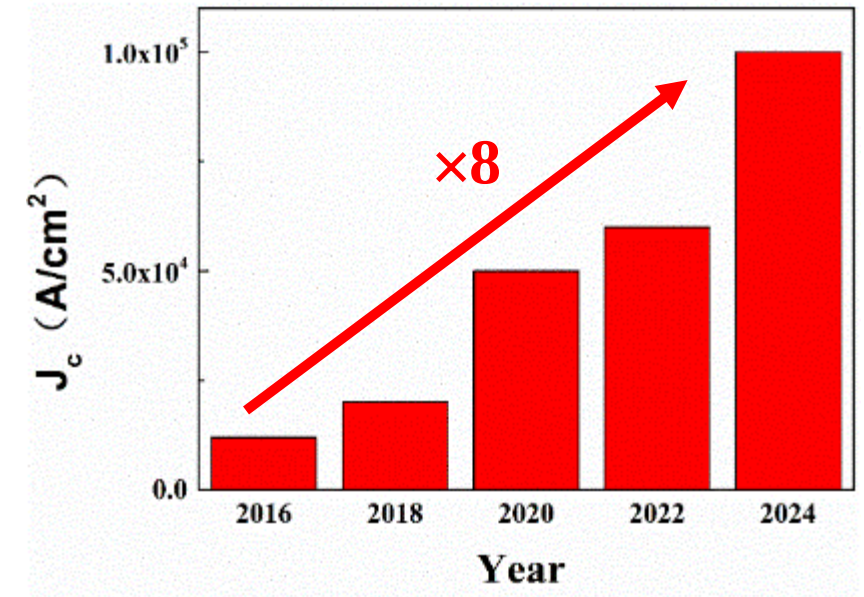
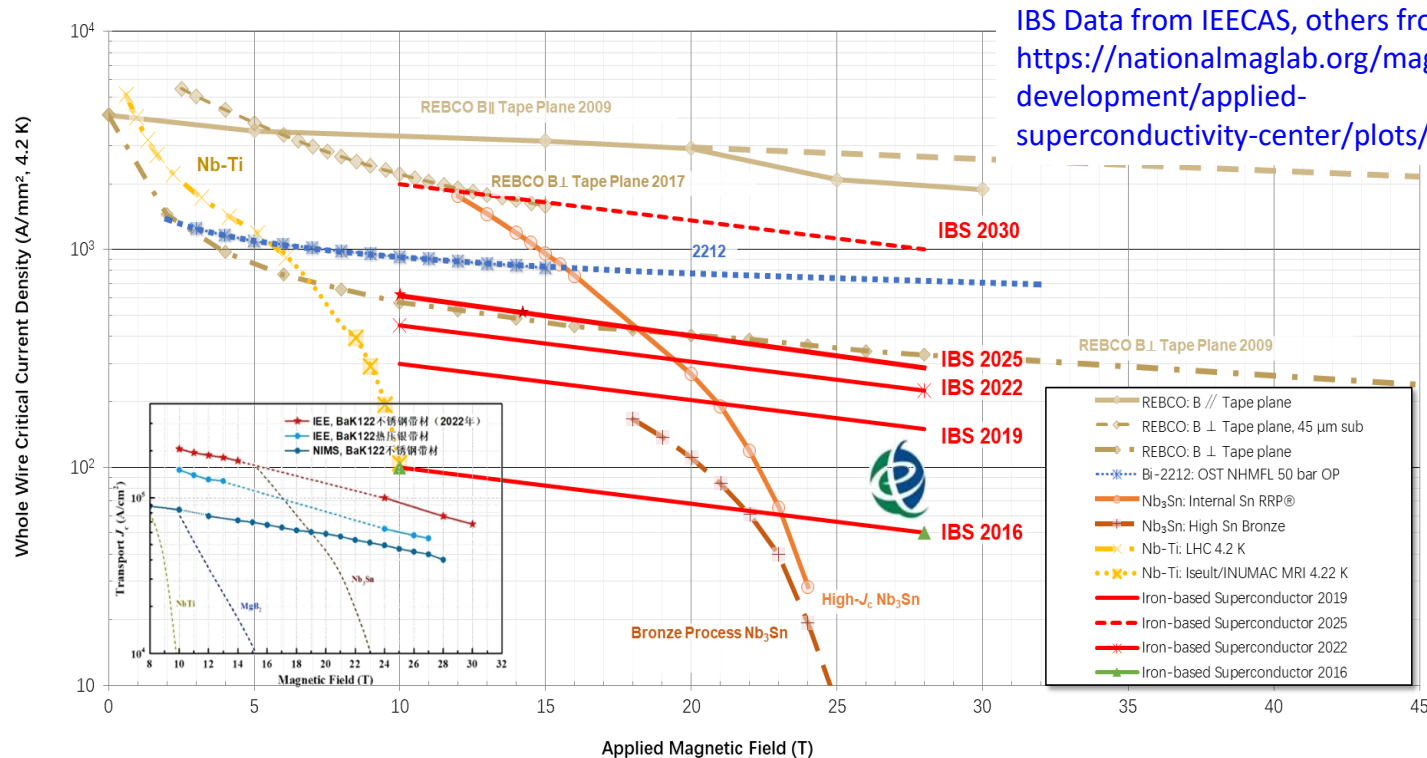
- Conceptual design based on simulation
- For experimental proof and prototyping, a test facility based on the BEPCII LINAC is under construction:
 - Cascading, positron acceleration,...
 - Technology: electron gun, laser, ...



Progress: Beam Commissioning



R&D for Further Future: Iron-Based HTS Magnet



Plan

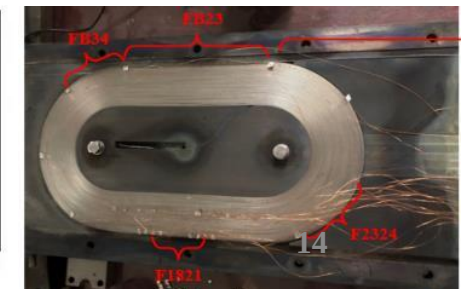
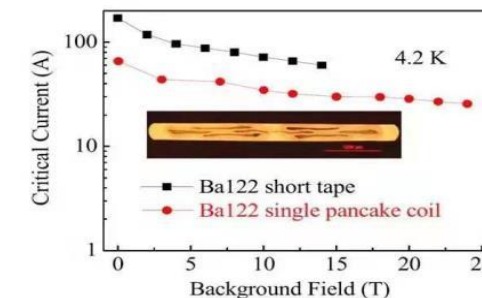
- Continue to improve J_c by $\times \sim 4$
- Mid-scale cable production
- Test magnet

Advantages:

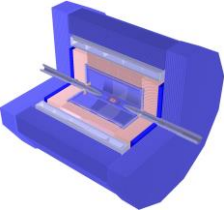
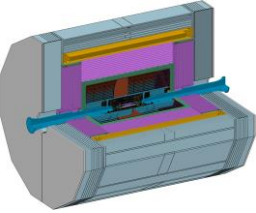
- “Metal”, isotropic, ...
- Cheap: material($Ba_{0.6}K_{0.4}Fe_2As_2$) and production(PIT, steel tube)

Status:

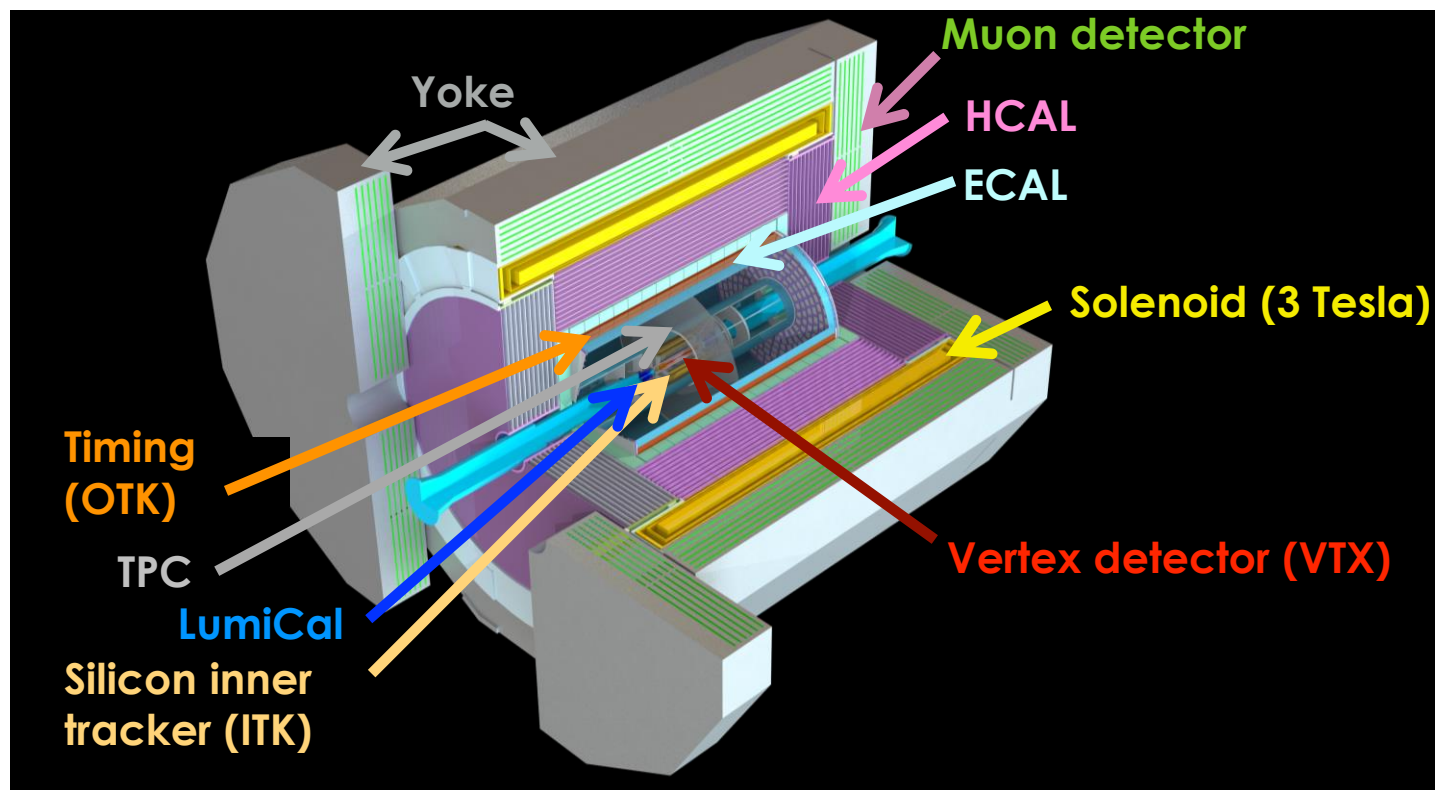
- Cable length >1000m with good J_c
- Small-scale cable production techniques understood
- Test coil successful



Detector: From Ideas to the Reference Detector

	ILD-like CDR 	New concept RefDet-TDR 
VTX	Inner radius of 16 mm	Inner radius of 11 mm
	Material Budget: $0.15\% \cdot 6 + 0.14\%(\text{beampipe}) =$ 1.05% X0	Material Budget: $0.06\% \cdot 4(\text{inner}) + 0.165\% \cdot 2(\text{outer}) + 0.2\%(\text{beampipe}) =$ 0.77% X0
Gaseous Tracker	TPC with 1 mm* 6 mm readout, tracking 100 um, dE/dx ~ 6%	TPC with 0.5 mm* 0.5 mm readout tracking 100 um, dN/dx ~ 3%
ToF & Outer tracker	-	AC-LGAD, with 50 ps per MIP, 10 um
ECAL	Si-W-ECAL: 17%/√E ⊕ 1%	Crystal Bar-ECAL: 1.3%/√E ⊕ 0.7%
HCAL	RPC-Iron: 60%/√E ⊕ 2%	Glass-Steel: 30%/√E ⊕ 6.5%

AGORA: Advanced Glass Optimized Research Apparatus

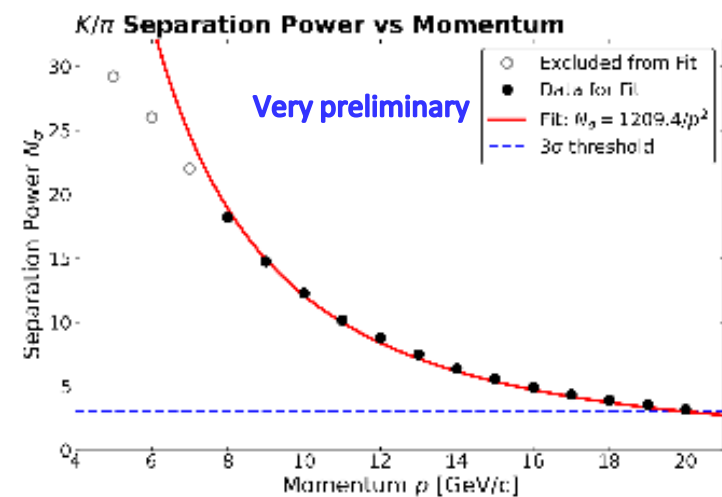
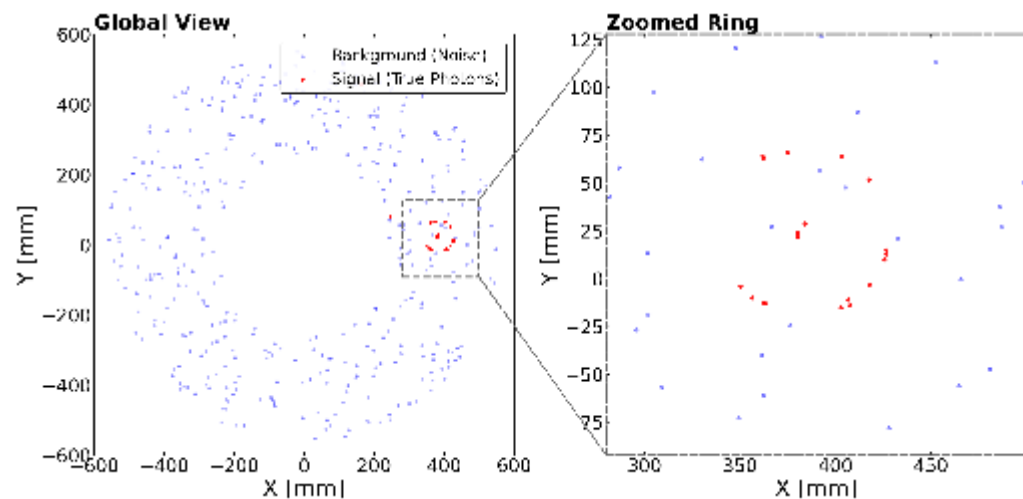
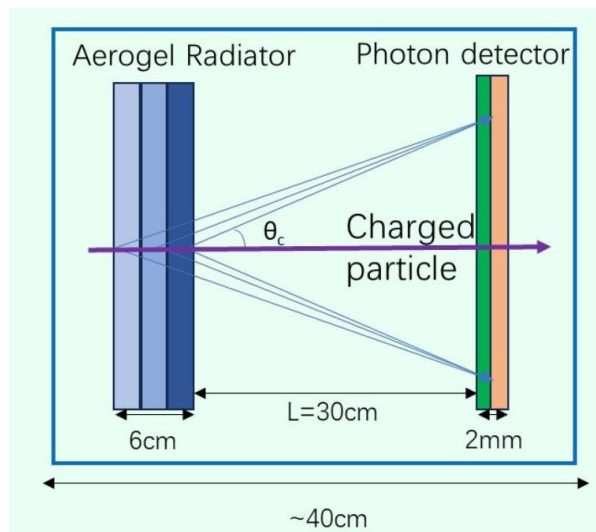
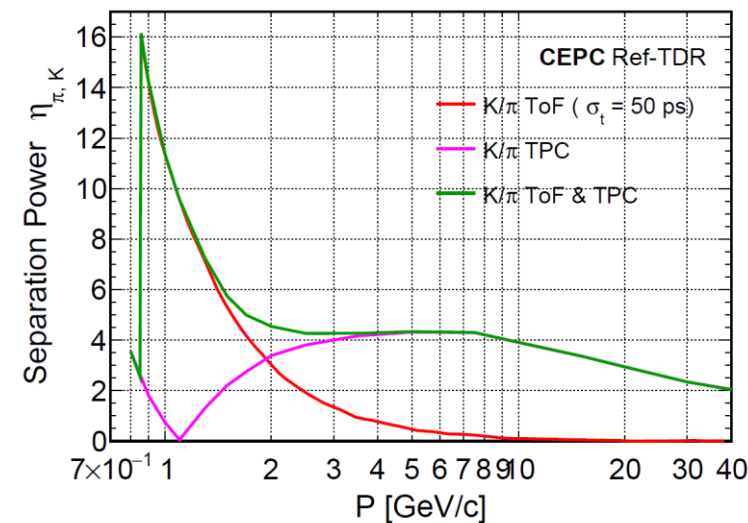
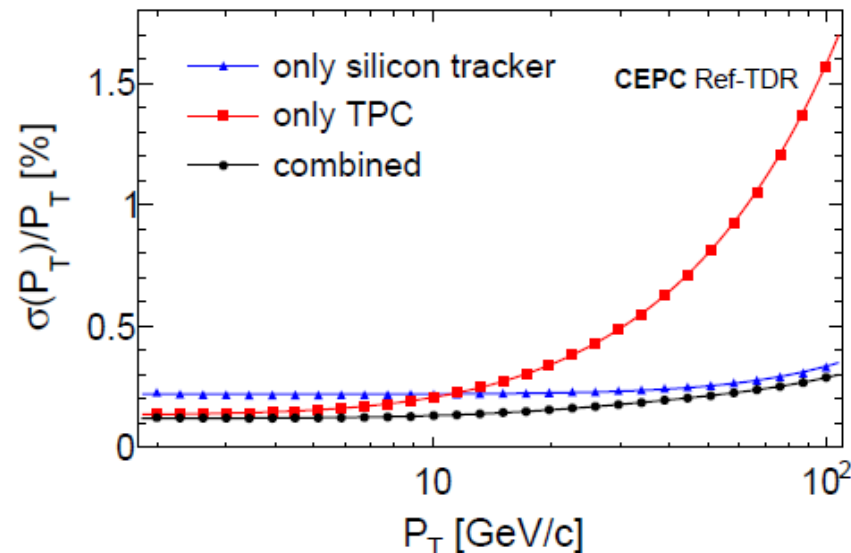
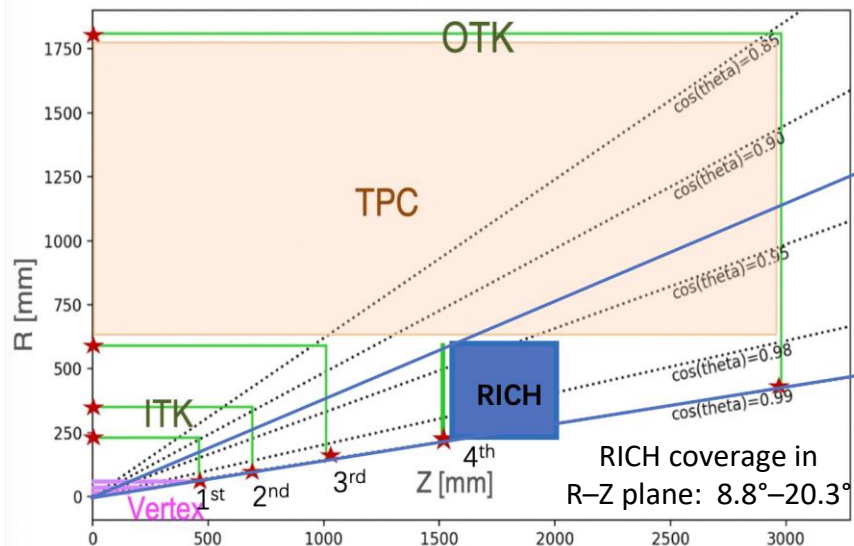


- The name **AGORA** emphasizes the glass calorimeter at the heart of the detector.
- The acronym **AGORA** derives from ancient Greek, referring to a central public square in city-states as the heart of the city's political, commercial, and social life.
- It now means "gathering place" or "assembly", symbolize here the international collaboration that we expect to flourish.

CDR → Ref-detector TDR → AGORA

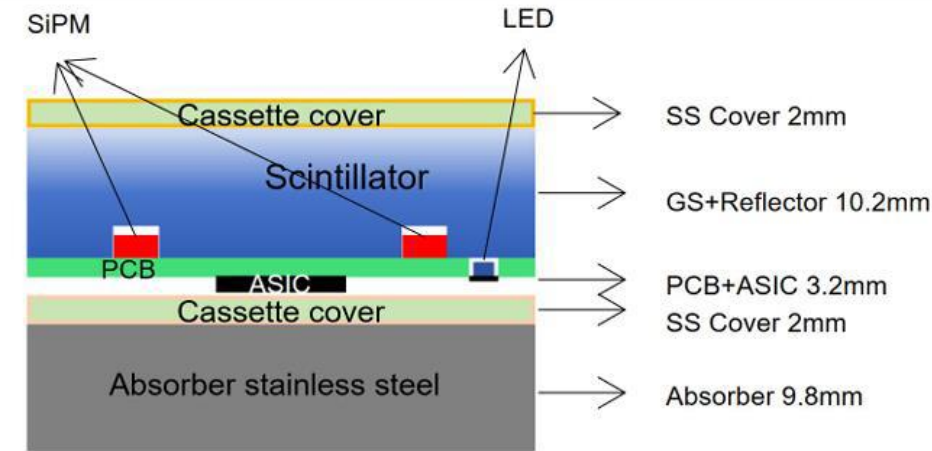
	ILD-like CDR	New concept RefDet-TDR	Newer concept AGORA
VTX	Inner radius of 16 mm	Inner radius of 11 mm	
	Material: 0.15%*6+ 0.14%(beampipe)= 1.05% X0	Material: 0.06%*4(inner)+ 0.165%*2(outer)+0.2%(beampipe)= 0.77% X0	
ITK	Monolithic HV-CMOS pixel, 10 um		
Gaseous Tracker	TPC with 1 mm* 6 mm readout, tracking 100 um, dE/dx ~ 6%	TPC with 0.5 mm* 0.5 mm readout, tracking 100 um, dN/dx ~ 3%	
ToF & OTK	-	AC-LGAD, 50 ps per MIP, 10 um	
Cerenkov	-	-	Aerogel + SiPM
ECAL	Si-W-ECAL: 17%/VE ⊕ 1%	BGO Crystal: 1.3%/VE ⊕ 0.7%	Glass cubic: 3%/VE ⊕ 1%
HCAL	RPC-Iron: 60%/VE ⊕ 2%	Glass-Steel: 30%/VE ⊕ 6.5%	Glass cubic: <15%/VE ⊕ 4%

The Tracker and the Cherenkov Detector (RICH)

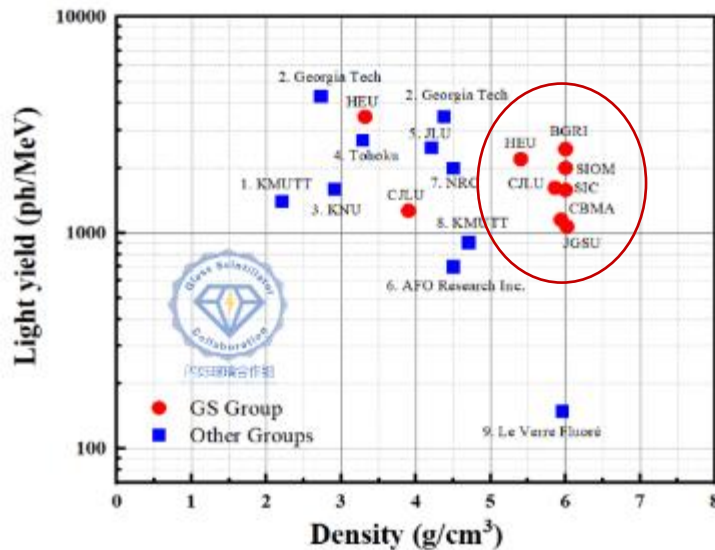


Hadron Calorimeter

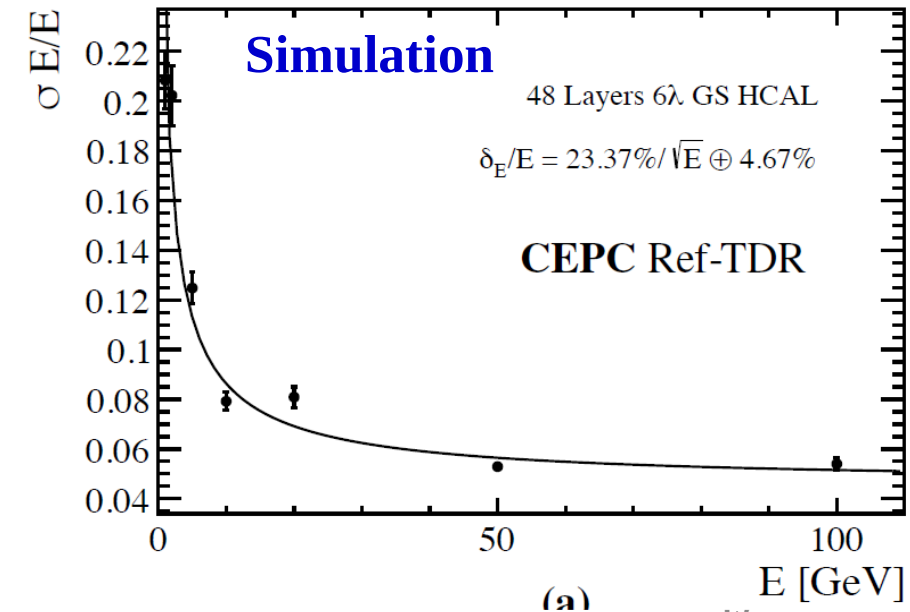
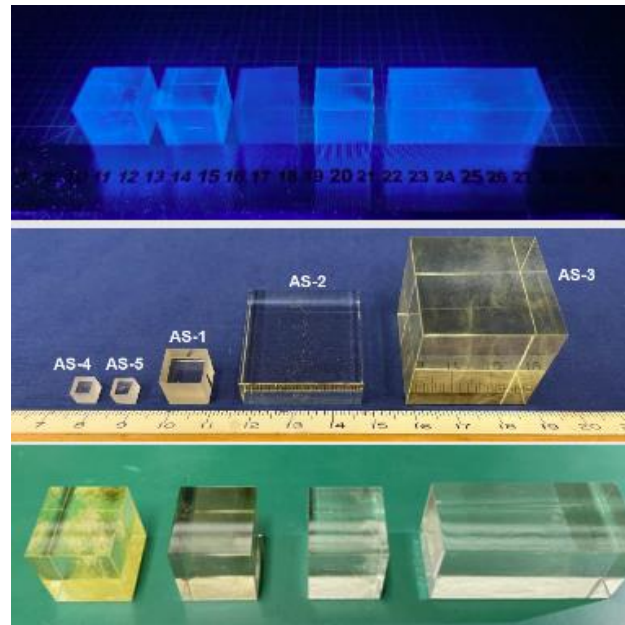
- High density glass scintillator for HCAL: much higher sampling ratio($\sim 30\%$) but difficult to make it big
- Use small glass cubic: 3D shower reconstruction, good for PFA
- Glass R&D for high density and high light yield:
 - Novel Gadolinium Fluoro-Oxide glass
 - Density: $\sim 6\text{g/cm}^3$
 - Light yield: $\sim 1500\text{ ph/MeV}$
 - Decay time: 600 ns
 - Cost: $< 1\$/\text{cc}$



Glass Size: $40*40*10\text{ mm}^3$

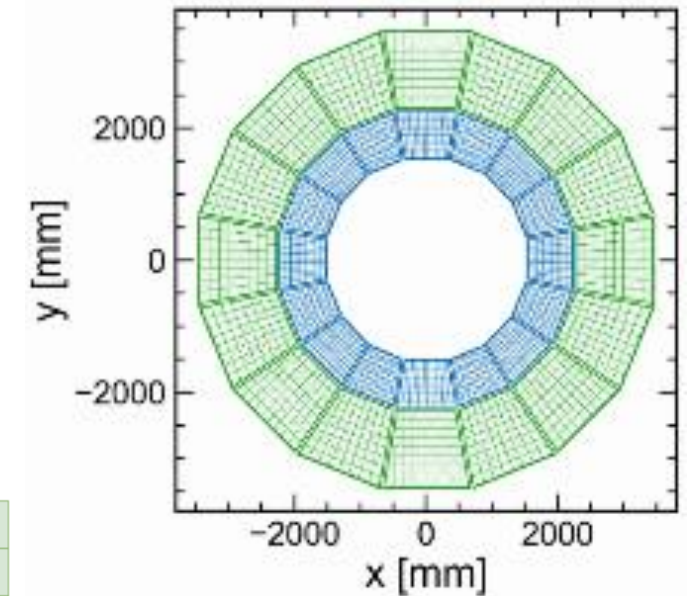
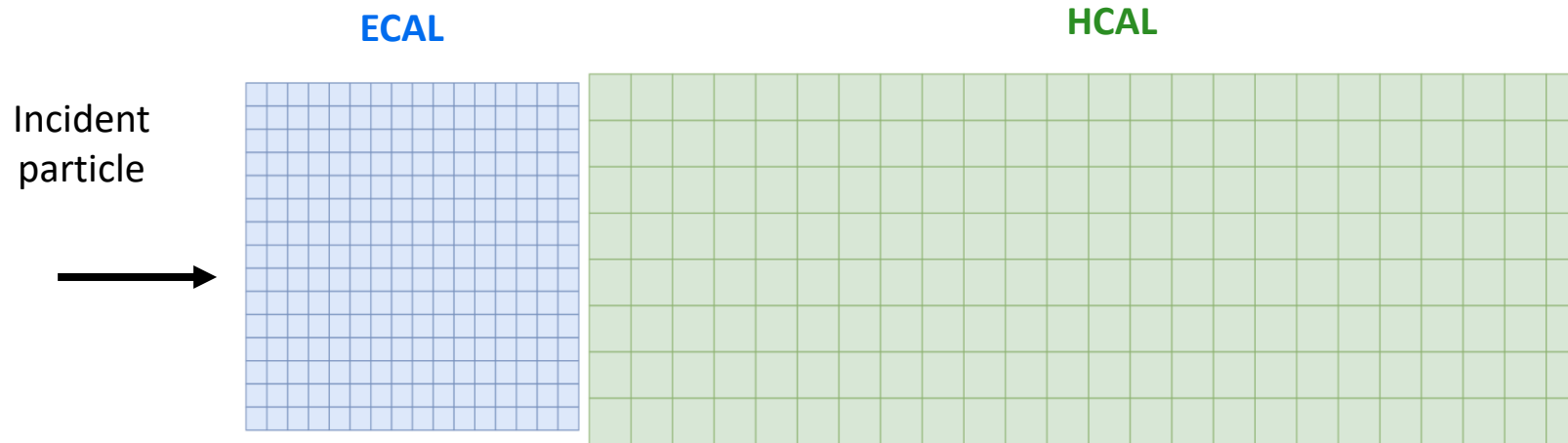


Light yield of Glass scintillators



Next Step Beyond TDR: Full Absorption EM+H Calorimeter ?

- Because of the success of GFO glass, we may use it for EM calorimeter
 - Light Yield > 2000 ph/MeV
 - Density ~ 6 g/cm³
 - Decay time < 500 ns
 - Attenuation length > 10 -20 cm
- Money saved allow us to build a full absorption HCAL

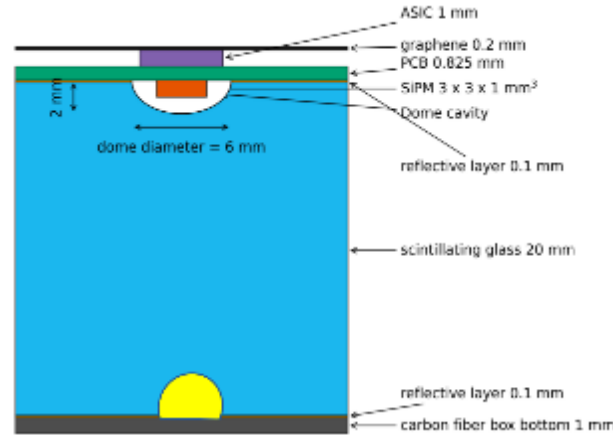


Goal: ECAL $\sigma/E \sim 3\%/\sqrt{E}$, HCAL $\sigma/E < 15\%/\sqrt{E}$, and a lot more Info. for AI

Performance from Simulation

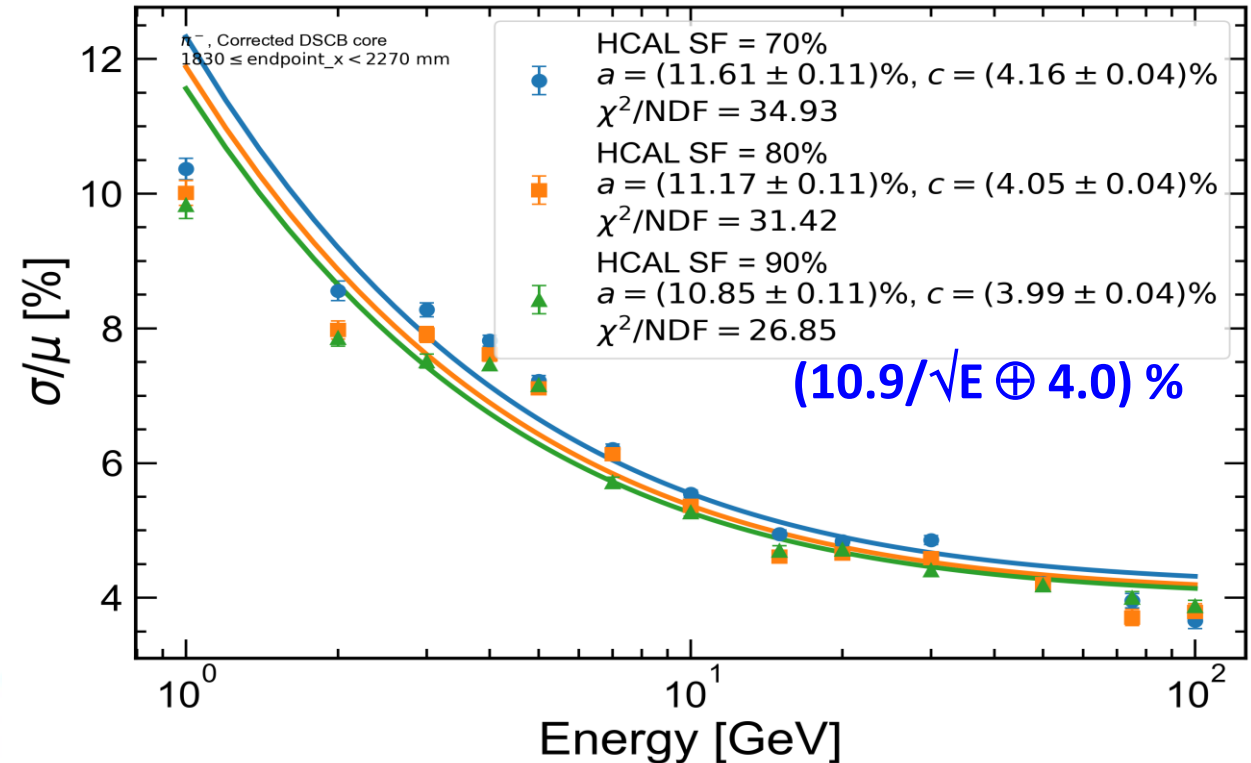
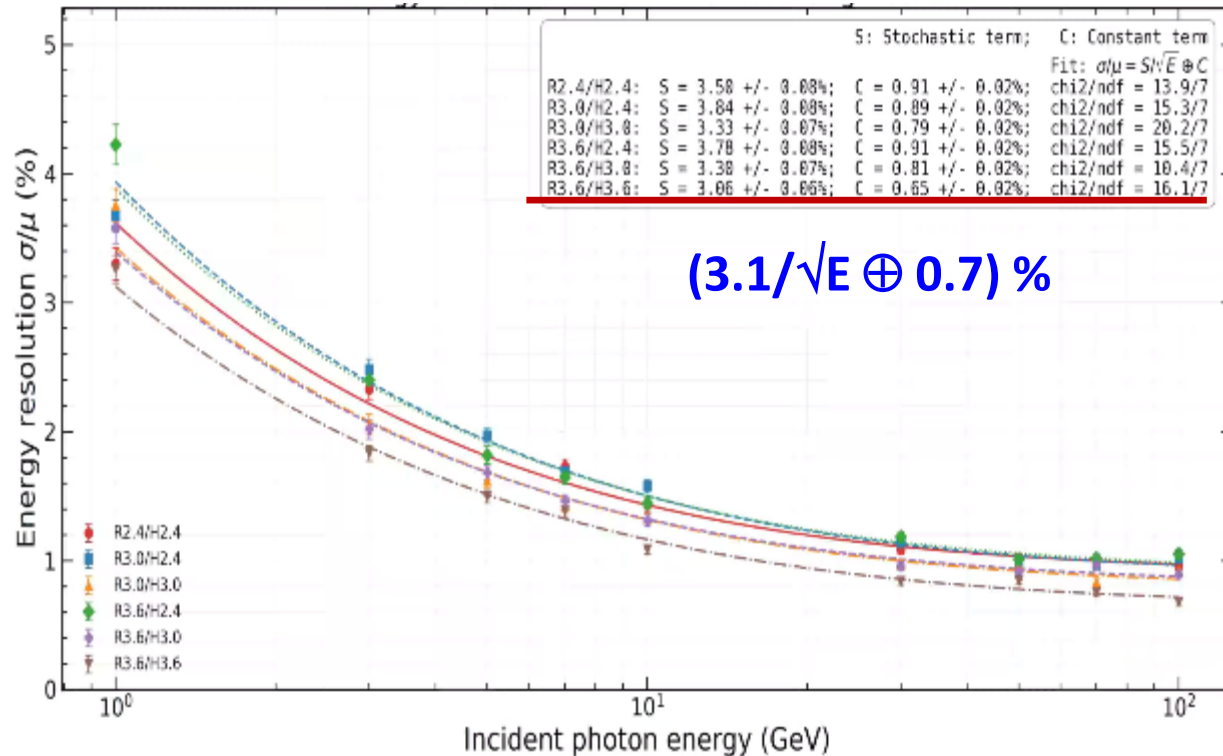
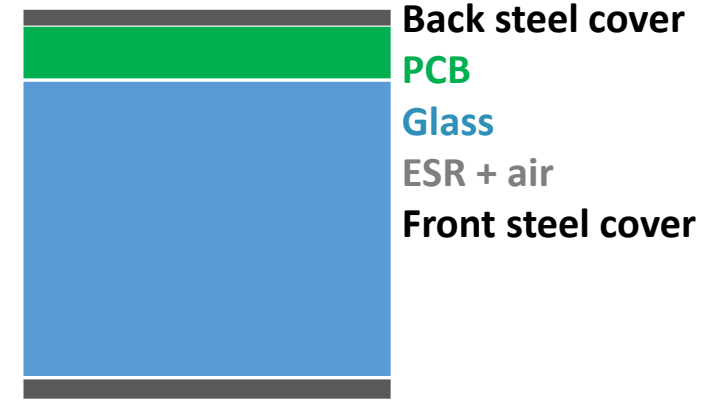
ECAL

one 3×3 mm² SiPM in a dome shaped air housing for improving uniformity



HCAL

Similar scheme will be tried for HCAL



Future Plan for the Glass Calorimeter

- Optimize structure design: mechanics, modules, cells, SiPM, electronics, cables, cooling, etc.
- Optimize Glass cells: size, shape, wrapping, glueing, ...
- Glass R&D: attenuation length, uniformity, light yield, decay time, production yield, cost
- Performance study: readout electronics, PSD for E/H correction, calibration, ...
- Prototyping: EM 2027, HCAL 2028

Summary

- Despite difficulties, we will continue to pursue High Energy Physics: road map is clear for us
- Accelerator design, R&D and EDR in progress, in exchange with FCC
- As an innovative concept, AGORA has been listed as a concept for FCC_ee: Glass scintillator is a very promising material, although a lot more R&D are needed
- Looking forward to (more) collaborations !

AGORA - FCC-ee/CEPC Detector Concept

- **Website:** <https://agora.web.cern.ch>
- **Email list:** fcc-ped-detectorconcepts-agora@cern.ch
 - Subscribe at: <https://groups-portal.web.cern.ch/group/fcc-ped-detectorconcepts-agora/details>
- The AGORA seed: CEPC Reference Detector **TDR**:
 - <https://arxiv.org/abs/2510.05260>
- AGORA Weekly **Plenary Meeting**:
 - Wednesday at 9 am, CERN time
 - <https://indico.cern.ch/category/21753/>
- CEPC Yearly **Workshops**:
 - International Workshop, Shanghai, 22-26 October 2026: <https://indico.ihep.ac.cn/event/28911/>
 - European Edition Workshop, Belgrade, Serbia, June 8-11, 2027
 - (Last year's workshop, Lisbon, Portugal, April 2026: <https://indico.cern.ch/event/1598929/>)
- **Contact**:
 - Team leader: João Guimarães da Costa (guimaraes@ihep.ac.cn)
 - Deputies: Jianchun Wang (jwang@ihep.ac.cn) , Miao He(hem@ihep.ac.cn) , and Haijun Yang (haijun.yang@sjtu.edu.cn)

