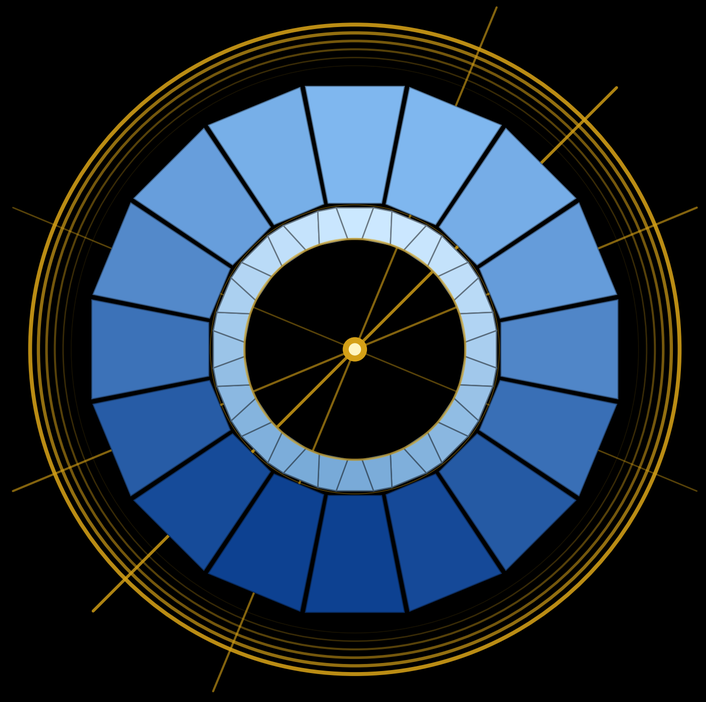
AGORA detector

Status and Plans



A paradigm change: the next 12 months are decisive

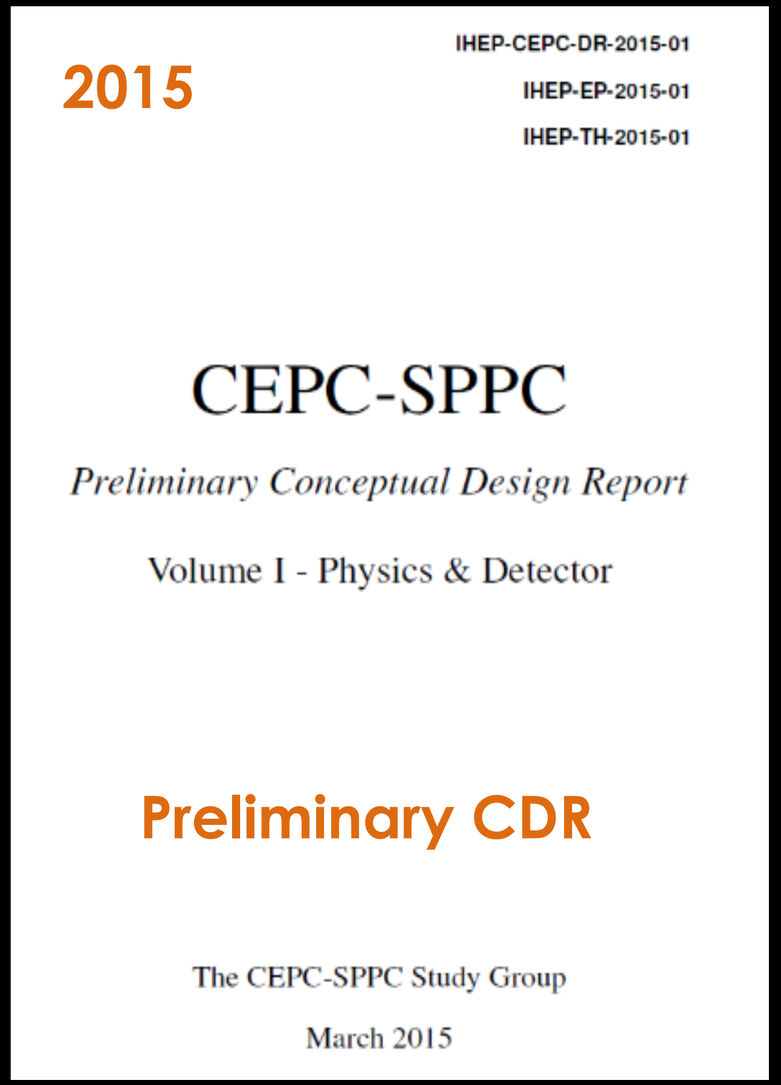
João Guimarães da Costa

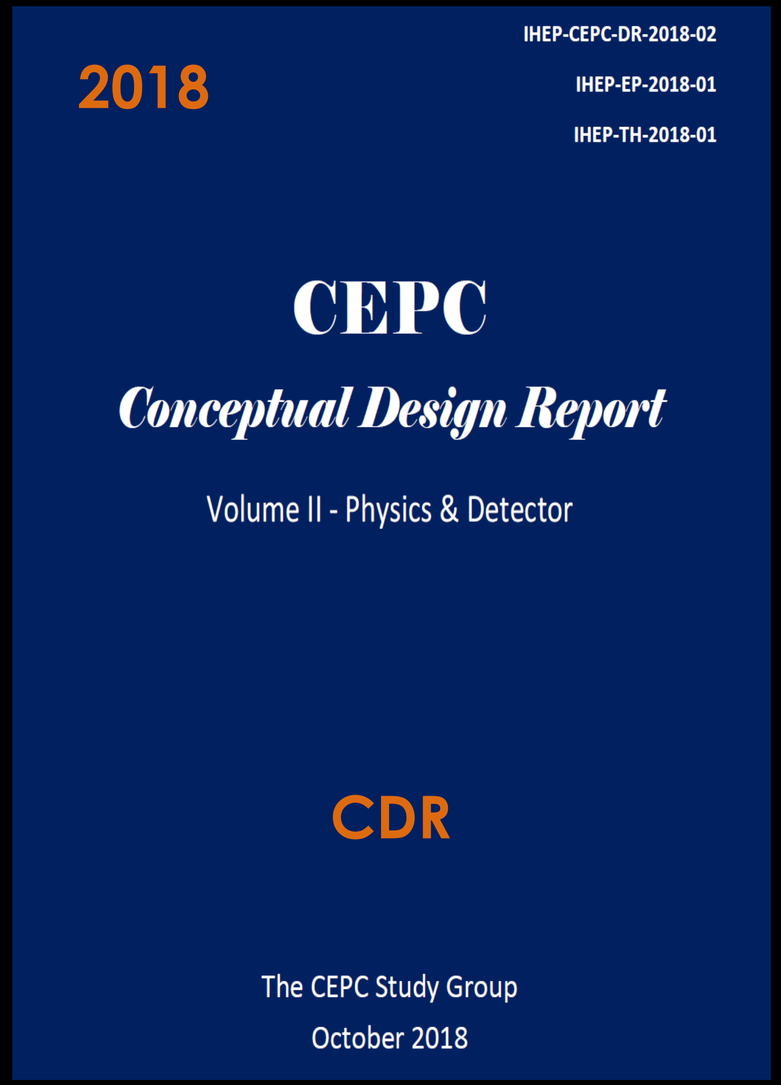
(on behalf of the AGORA Team)

中國科學院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

The 2026 CEPC International Workshop
Shanghai, 22-27 October, 2026

Steps Towards Reference Detector TDR



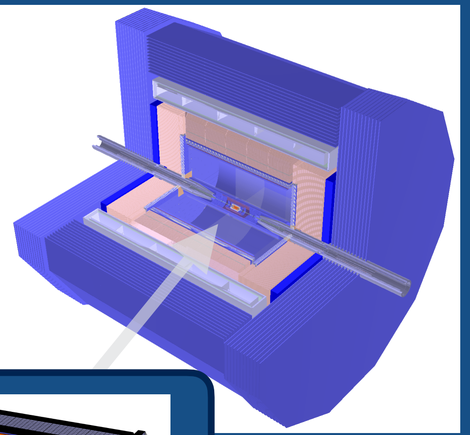


http://cepc.ihep.ac.cn

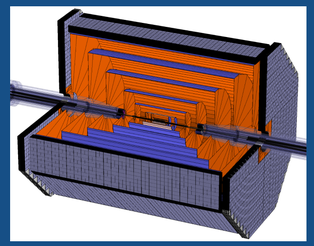
Particle Flow Approach

ILD-like

High magnetic field concept (3 Tesla)

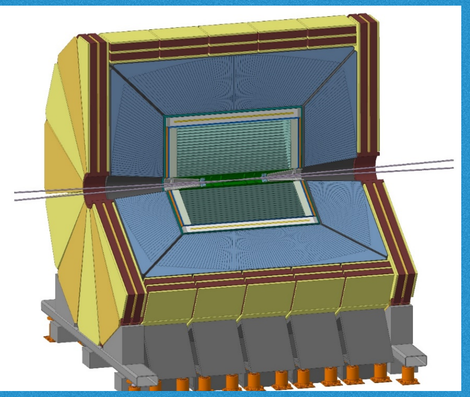


Full silicon tracker concept



IDEA Concept

Low magnetic field concept (2 Tesla)



also proposed for FCC-ee

The Reference Detector TDR



October 2025

2015

IHEP-CEPC-DR-2015-01
IHEP-EP-2015-01
IHEP-TH-2015-01

Preliminary CDR

The CEPC-SPPC Study Group

March 2015

2018

IHEP-CEPC-DR-2018-02
IHEP-EP-2018-01
IHEP-TH-2018-01

CDR

The CEPC Study Group

October 2018

A detector that could be constructed and commissioned by ~2037

Demonstrate readiness for construction of detector for baseline scenario

Timescale imposed technology choices

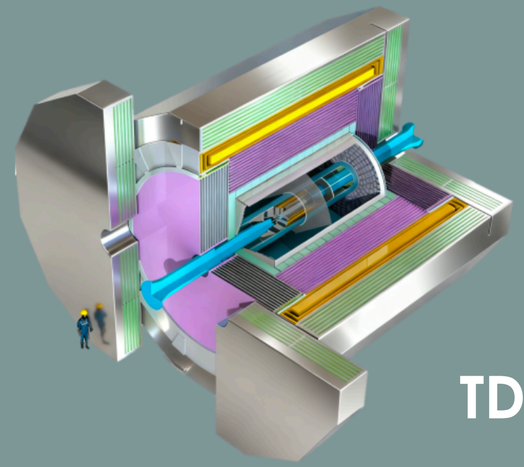
IHEP-CEPC-DR-2025-01
IHEP-EP-2025-01

CEPC Reference Detector

Technical Design Report

Version: v1.0.1 build: 2025-11-02 11:13:11+08:00

https://arxiv.org/abs/2510.05260



TDR

The CEPC Study Group
October, 2025

http://cepc.ihep.ac.cn

From CDR to Reference Detector TDR

	CDR	RefDet-TDR
Vertex	Inner radius of **16 mm**	Inner radius of 11 mm
	Material Budget: 0.15% * 6 + 0.14% (beampipe) = **1.05% X_0**	Material Budget: 0.06%*4 (inner) + 0.165%*2 (outer) + 0.2% (beampipe) = 0.77% X_0
Gaseous Tracker	TPC with **1 mm* 6 mm** readout, tracking 100 μm, dE/dx ~ 6%	TPC with 0.5 mm × 0.5 mm readout, tracking 100 μm, dN/dx ~ 3%
Inner tracker	Silicon microstrips, ~7 μm	Monolithic HV-CMOS pixel, 10 μm
ToF & Outer tracker	Silicon microstrips, ~7 μm	AC-LGAD, with 50 ps per MIP, 10 μm
ECAL	Si-W-ECAL: **17%**/√E ⊕ 1%	Crystal Bar-ECAL: 2%/√E ⊕ 1%
HCAL	RPC-Iron: **60%**/√E ⊕ 2%	Glass-Steel: 30%/√E ⊕ 6.5%

ILD-like

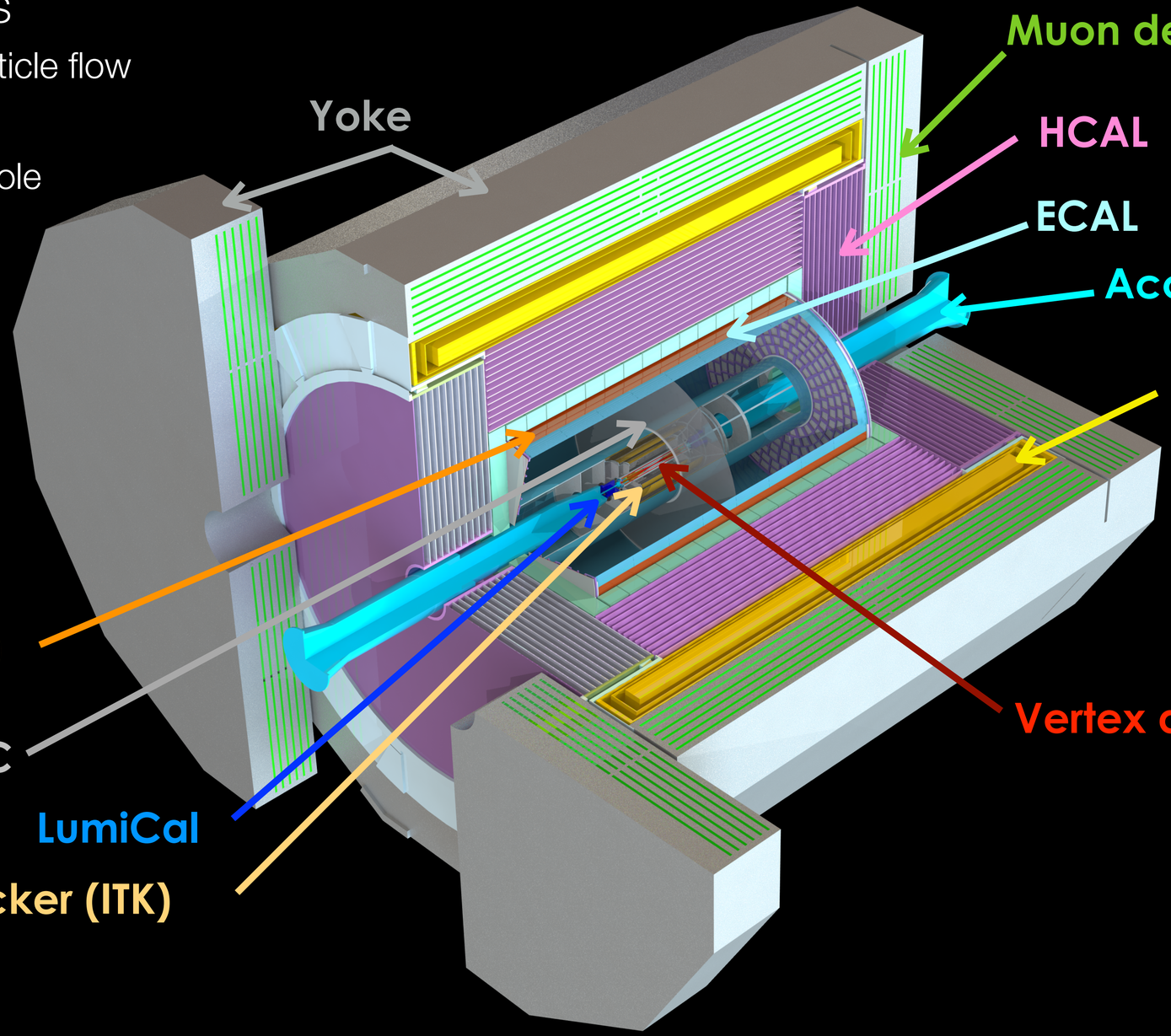
The Reference Detector

Vertex below 5 μm with stitched MAPS

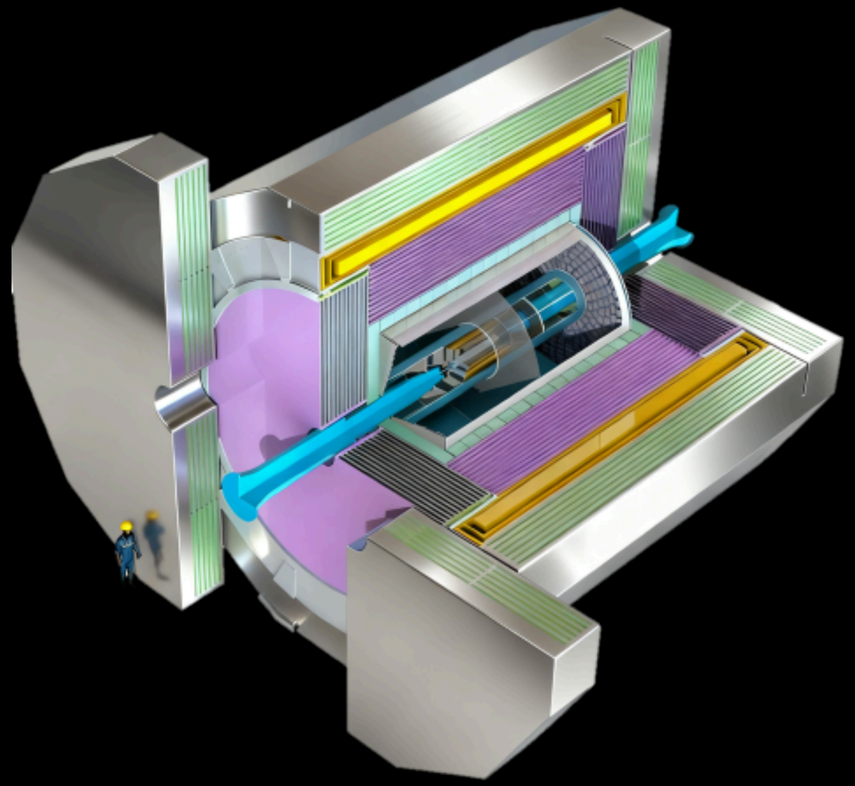
Calorimeter: BMR below 4% with particle flow

Outer tracker: 10 μm and 50 ps

Dual field: 3 T baseline, 2 T at the Z pole



AGORA: Advanced Glass Optimized Research Apparatus



AGORA

ADVANCED GLASS OPTIMIZED RESEARCH APPARATUS

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

AGORA: a detector concept for CEPC and FCC-ee

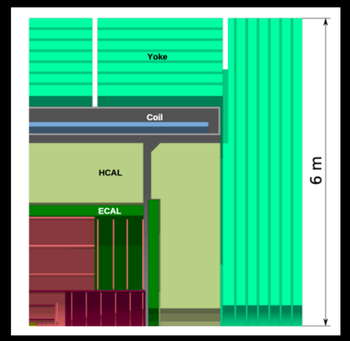
Proposed for both **CEPC** and **FCC-ee** with one detector philosophy

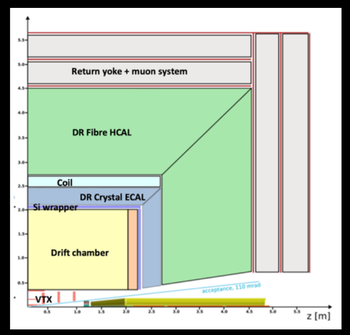
Accepted in **June 2026** at FCC Week in Helsinki
as one of six **FCC-ee** concepts

(together with ALFA)

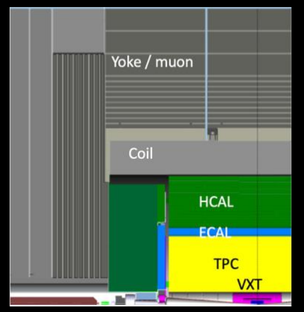
AGORA is an international collaboration, open to new partners

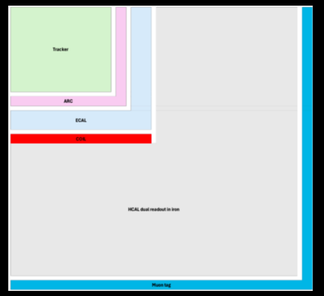
FCC-ee detector Concepts: A broad spectrum of complementary ideas

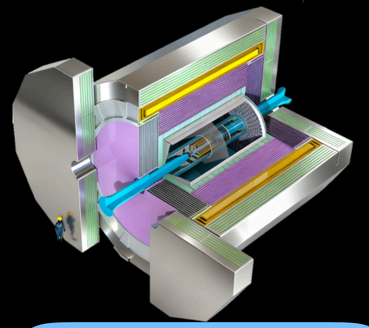












	CLD	IDEA	ALLEGRO	ILD	ALFA	AGORA
Vertex	Si	MAPS	MAPS	Si	MAPS	MAPS
Tracker	Full Si	Drift Chamber + Si strips	DCH / Straw / SciFi + Si	TPC + Si strips	All MAPS	TPC + Si strips
ECAL	Si-W highly granular	Crystals w. DR	Noble Liquid (LAr)	Si-W highly granular	Grainita (crystal grains)	Crystals
HCAL	Scint. sampling	Fibre DR	TileCal (steel/scint.)	Scint. or RPC	DR + steel	Glass scint. + steel
Muon	RPC in iron yoke	μRWELL	TBD	Scint. in iron yoke	TBD	Scint. in yoke
PID	RICH (option)	Tracker dN/dx (+ TOF)	Tracker dN/dx (+ TOF)	Tracker dN/dx (+ TOF)	Cherenkov ARC	Tracker dN/dx (+ TOF)
Coil B-field	Outside HCAL 2T	Inside HCAL 2T (3T HTS R&D)	Inside HCAL 2T	Outside HCAL 3.5 T → 2-3 T	Inside HCAL 3T	Outside HCAL 3T

AGORA: a detector in evolution

	CDR	RefDet-TDR	AGORA
Vertex	Inner radius of **16 mm**	Inner radius of 11 mm	
	Material Budget: 0.15% * 6 + 0.14% (beampipe) = **1.05% X_0**	Material Budget: 0.06%*4 (inner) + 0.165%*2 (outer) + 0.2% (beampipe) = 0.77% X_0	
Gaseous Tracker	TPC with **1 mm* 6 mm** readout, tracking 100 μm, dE/dx ~ 6%	TPC with 0.5 mm × 0.5 mm readout, tracking 100 μm, dN/dx ~ 3%	
Inner tracker	Silicon microstrips, ~7 μm	Monolithic HV-CMOS pixel, 10 μm	
ToF & Outer tracker	Silicon microstrips, ~7 μm	AC-LGAD, with 50 ps per MIP, 10 μm	
Cherenkov	--	--	Aerogel + SiPM
ECAL	Si-W-ECAL: **17%**/√E ⊕ 1%	Crystal Bar-ECAL: 2%/√E ⊕ 1%	Glass cubic: 3%/√E ⊕ 1%
HCAL	RPC-Iron: **60%**/√E ⊕ 2%	Glass-Steel: 30%/√E ⊕ 6.5%	Glass cubic: <15%/√E ⊕ 4%

ILD-like
Latest

AGORA and the other five FCC-ee detector concepts

CLD, ILD, IDEA, ALLEGRO, ALFA and AGORA

Common thrust:

Silicon detectors, high-granularity calorimetry and particle flow

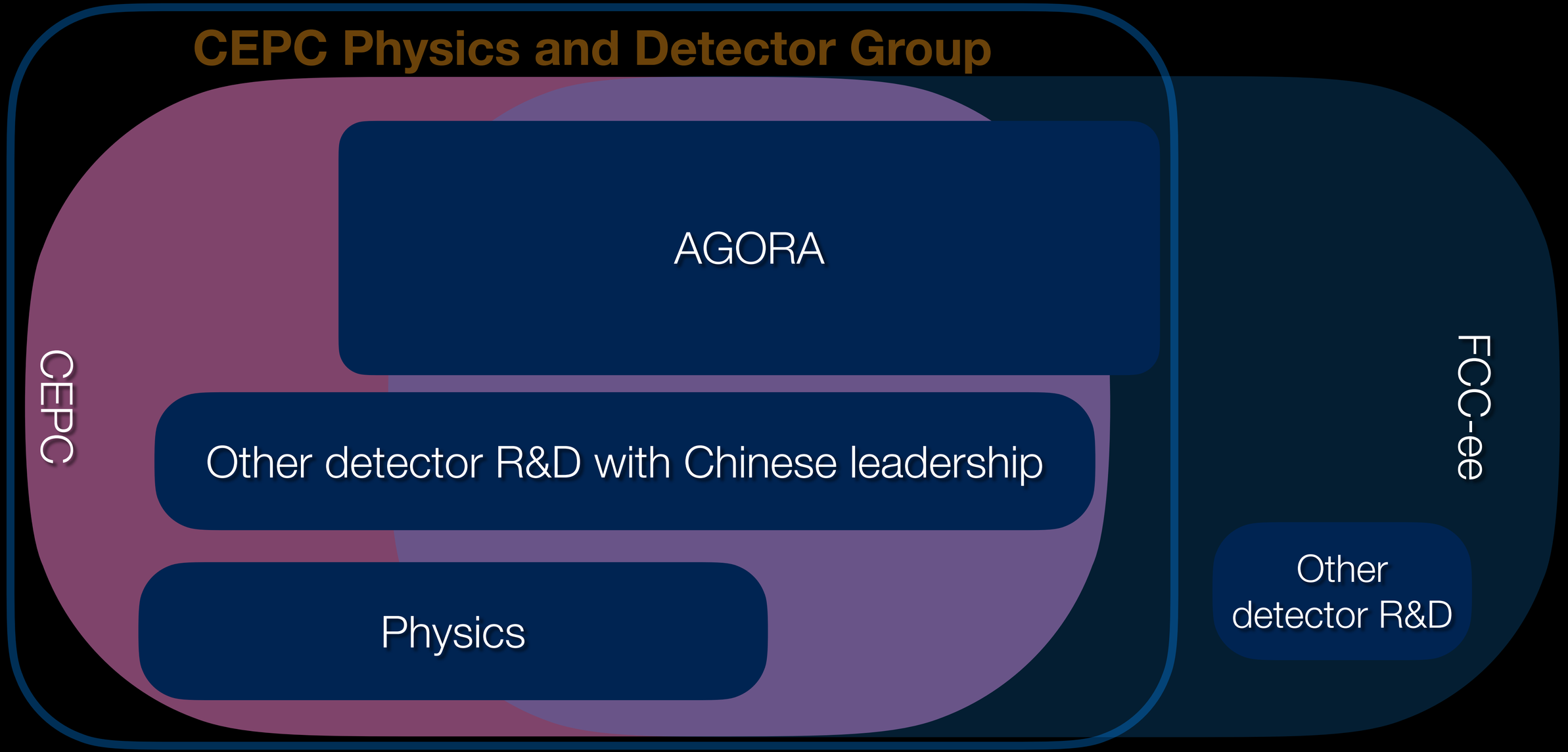
Common infrastructure:

Shared software, MDI and engineering standards

AGORA's distinct feature:

Glass scintillator in ECAL and HCAL

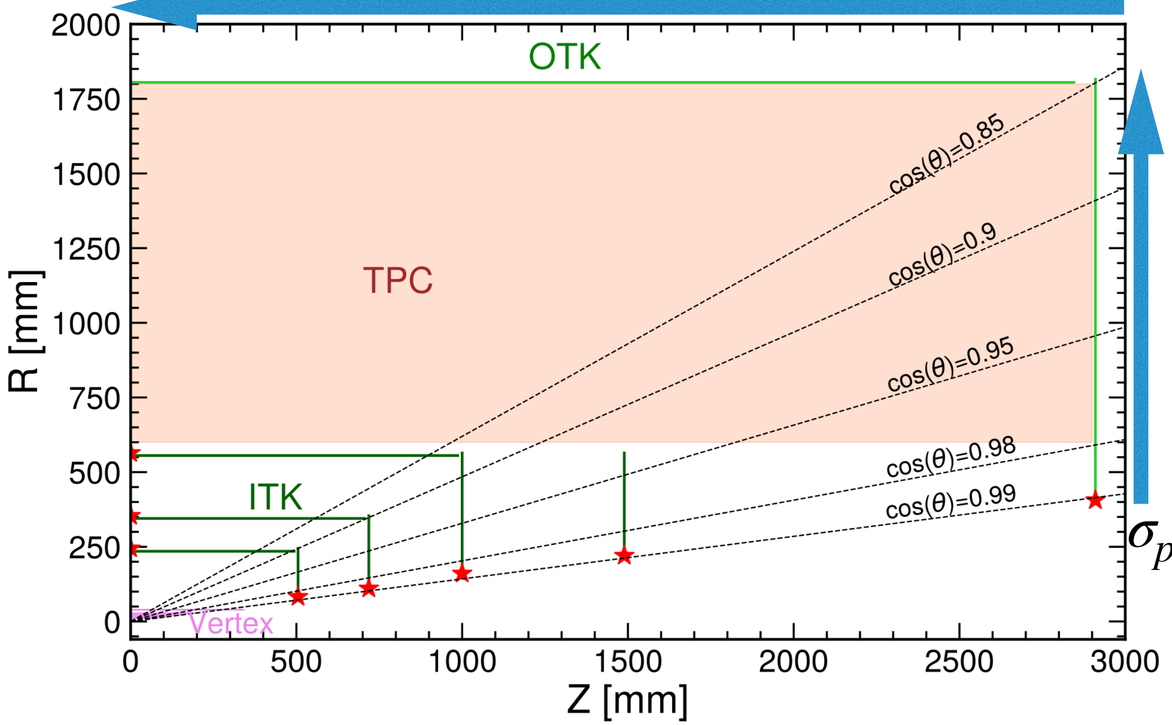
CEPC Physics and Detector Organization



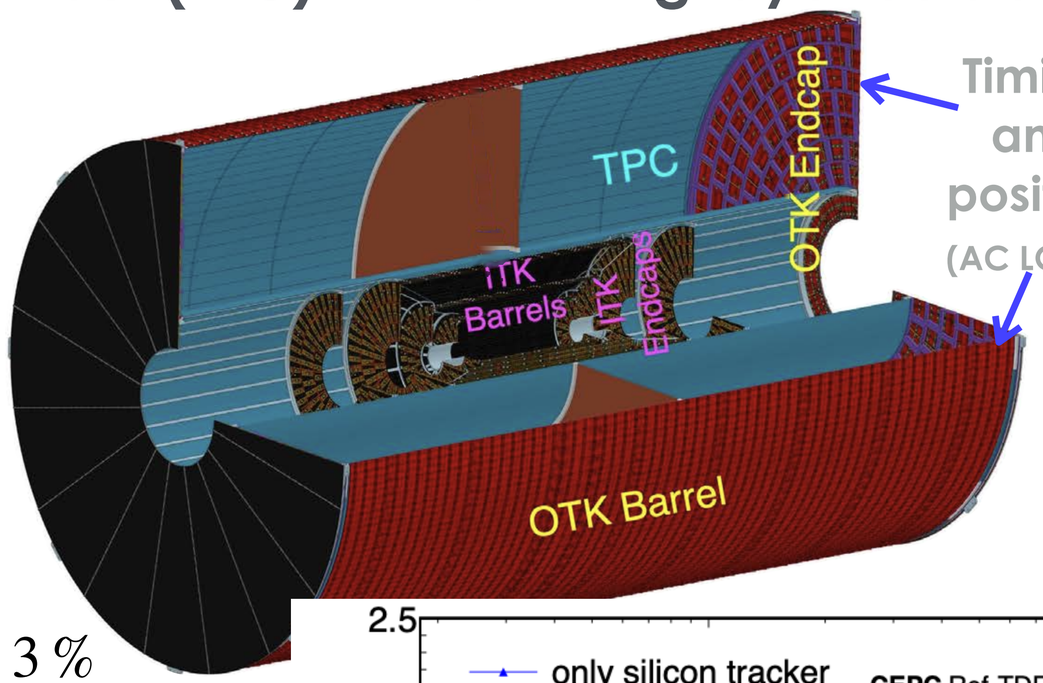
The Tracking System

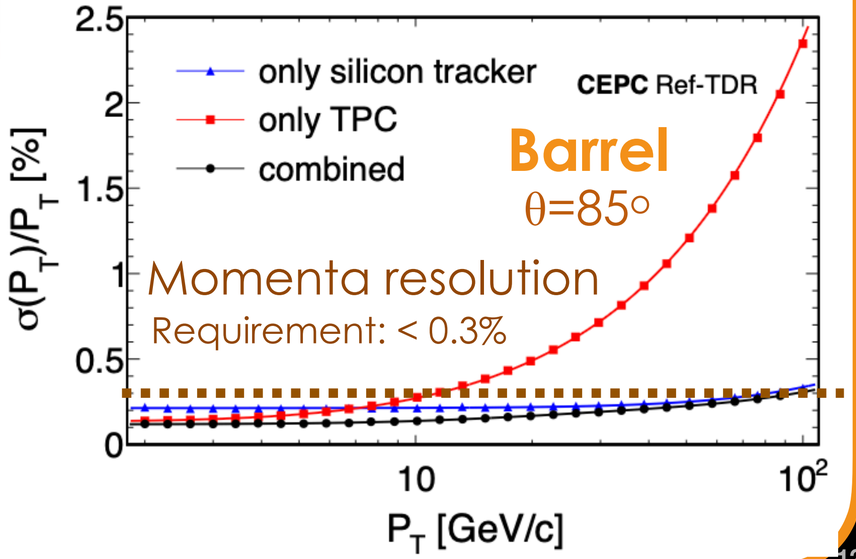
Silicon tracker inside a Time Projection Chamber (TPC) with a timing layer outside

$\sigma_{p_T}/p_T < 0.3\ \%$



$\sigma_{p_T}/p_T < 3\ \%$





Reconstruction efficiency >99% (p_T > 1 GeV/c)

The Vertex Detector

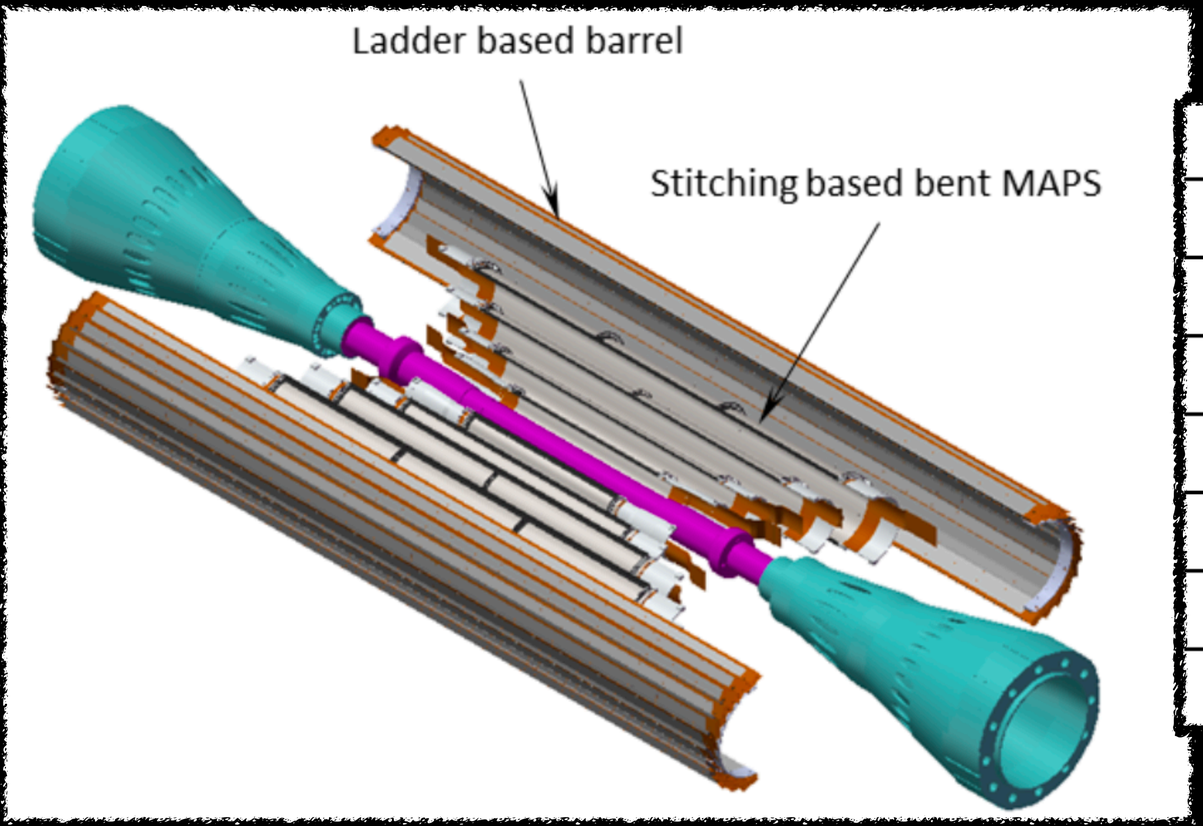
Four single layers of bent MAPS stitched sensors

+

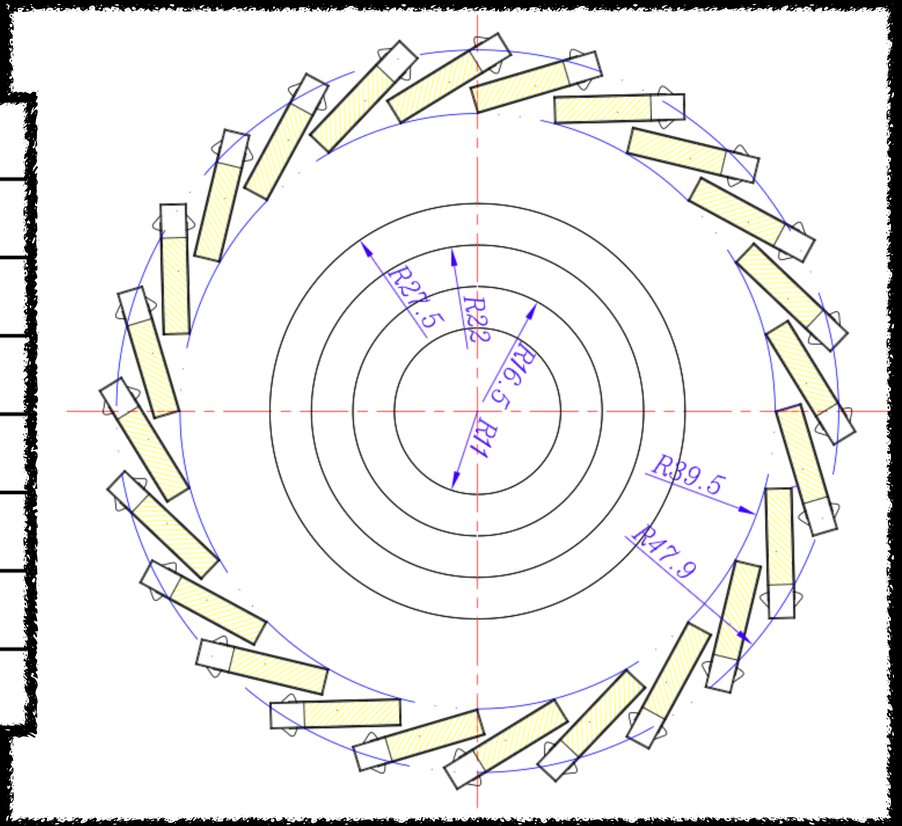
Two double-sided conventional ladders

Sitting on top of beam pipe: inner layer radius 11.1 mm

Spatial resolution	~5 µm / layer
Material budget	~0.8% X_0 / layer
Power consumption	< 40 mW/cm² (air cooled)
Angular coverage	|cosθ| < 0.99



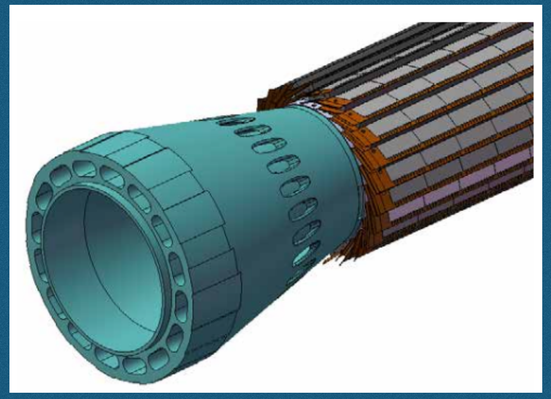
Items	R.L. (X0)
Beam pipe	0.454 %
Layer 1	0.067 %
Layer 2	0.059 %
Layer 3	0.058 %
Layer 4	0.061 %
Layer 5	0.280 %
Layer 6	0.280 %

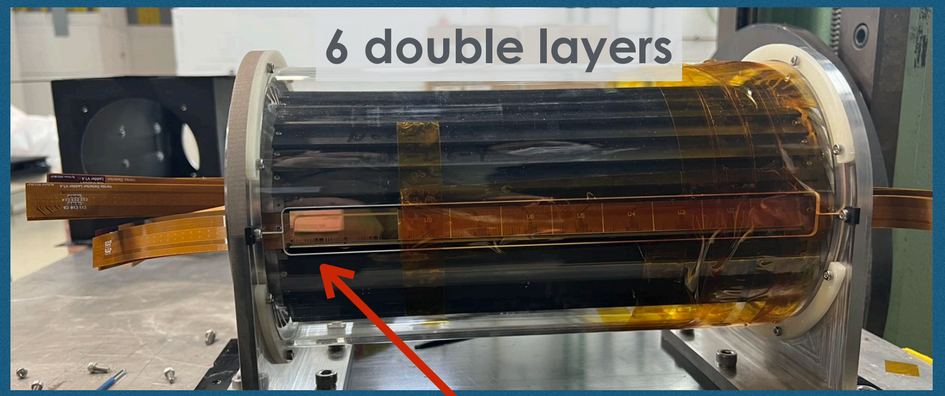


Vertex Detector R&D

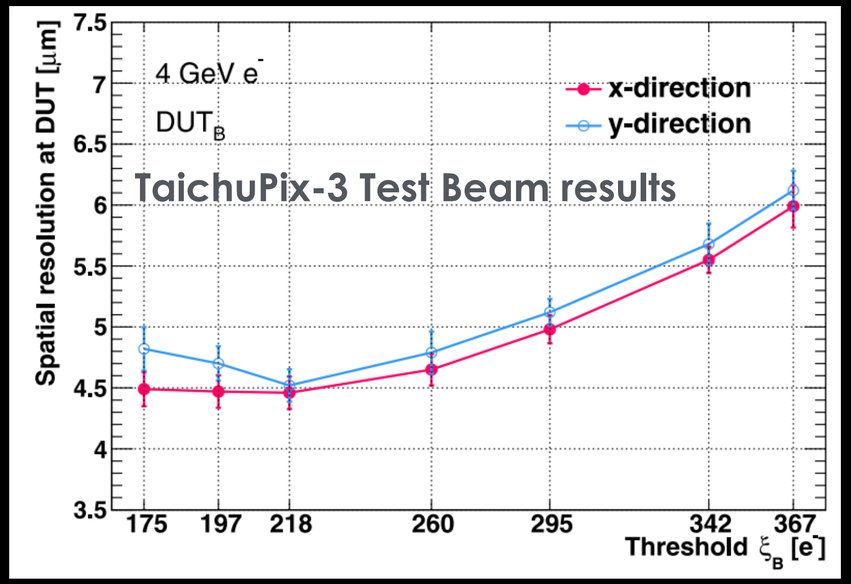
12-mm curvature reached



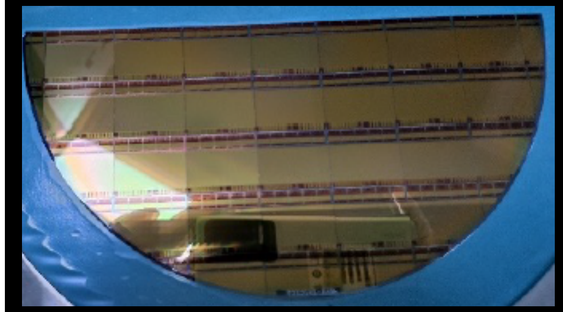




Prototype of standard vertex (no bent layers)



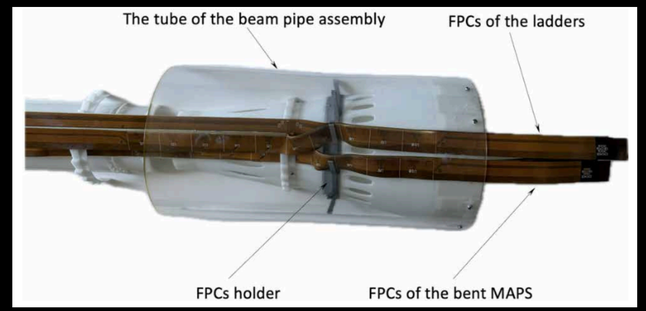
	Status	CEPC final goal
CMOS chip technology	Full-size chip with TJ 180 nm CIS	Baseline: TPSCo 65 nm MAPS Exploring: HC90L 90 nm MAPS



TaichuPix-3 ASIC on wafer

(15.9 × 25.7 mm)

- **Thermal mockup**: air cooling & vibration studies underway



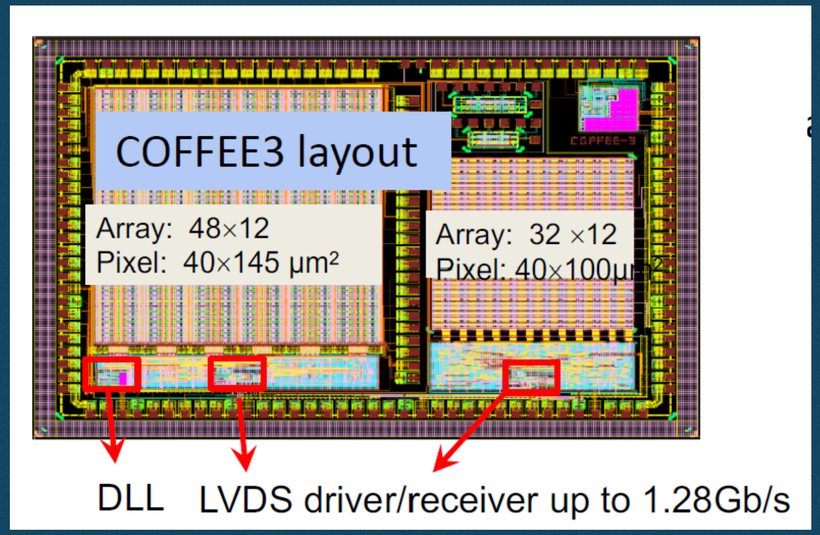
The Inner Silicon Tracker (ITK)

Monolithic HV-CMOS pixel sensors fabricated using a 55 nm CMOS process

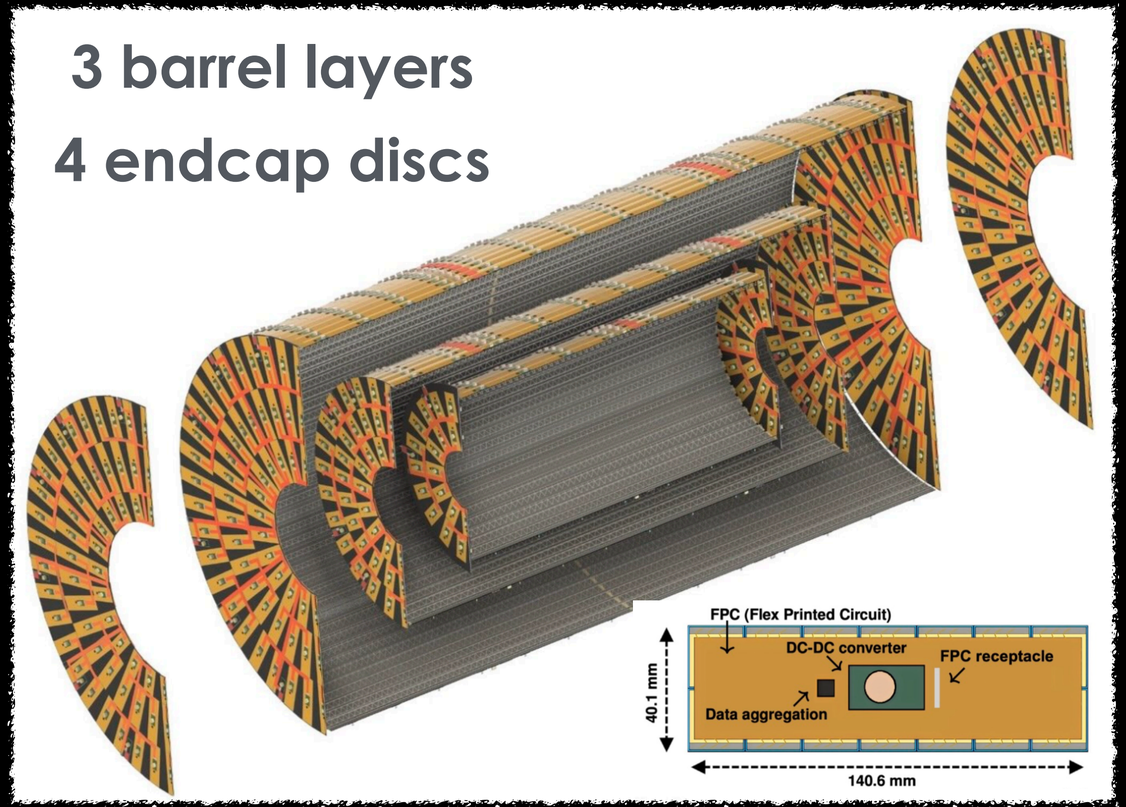
Sensor R&D

Challenging to find proper vendors in China

- **COFFEE**: SMIC 55-nm
  - Low-resistivity wafer
  - Within DRD3: irradiation at FNAL, test beam at CERN



- **CHiR**:
  - New foundry
  - High-resistivity wafer
  - First MPW available this month
  - Full size sensor around 2027



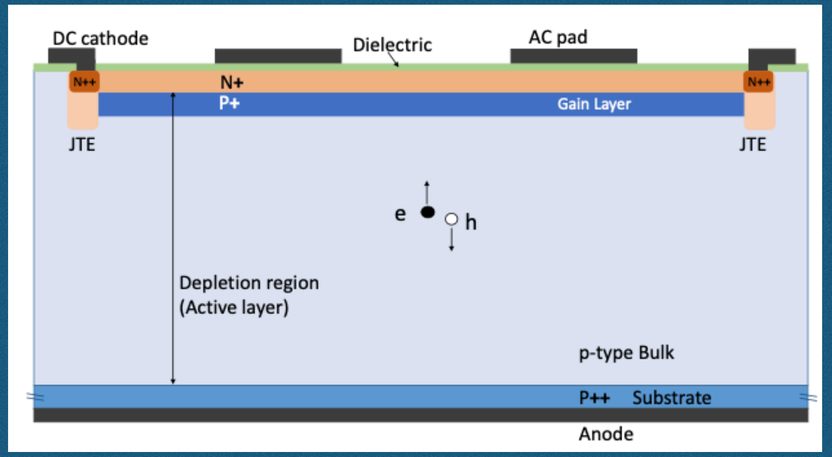
Lightweight design R&D

- Serial powering
- Module demonstrator being built with DRD3
- Wireless transmission

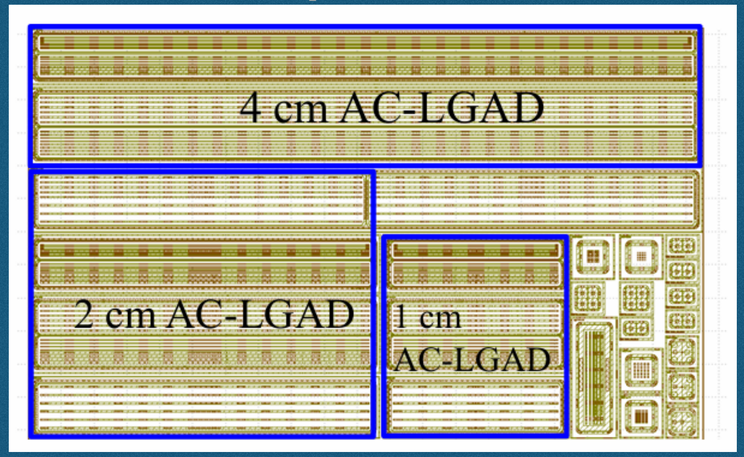
The Outer Tracker (OTK) - Timing Layer

Building on R&D for HGTD -- the ATLAS Timing Detector

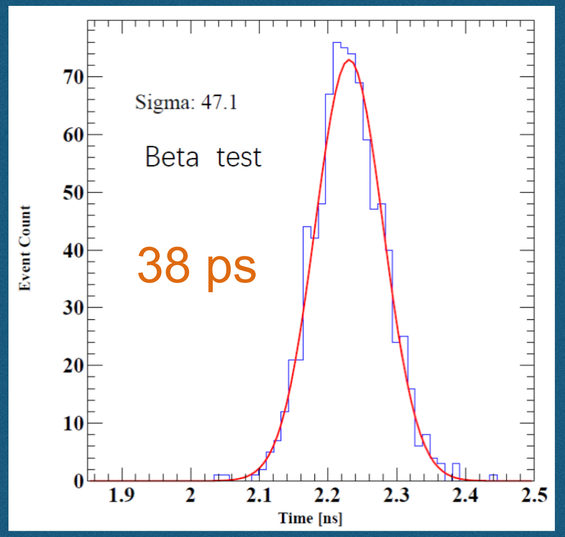
AC-LGAD sensor development:

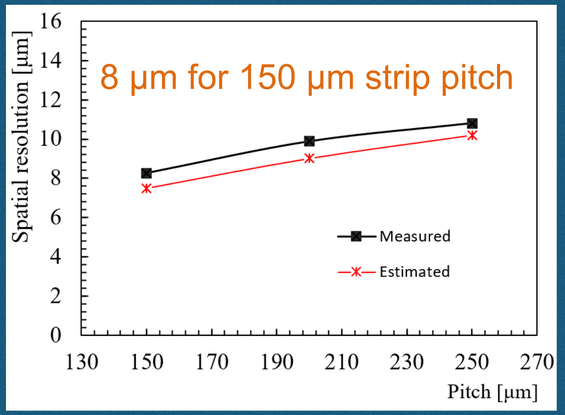


LGAD v1 tape-out available



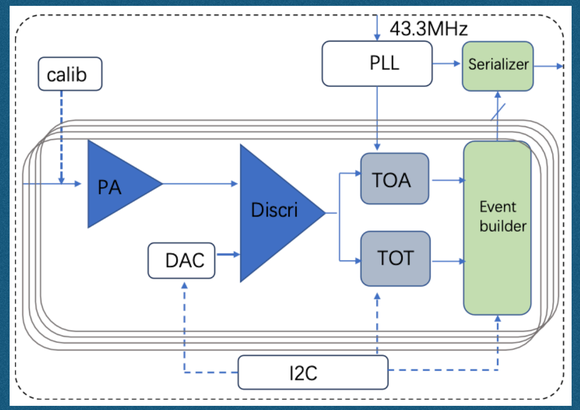
AC-LGAD test performance

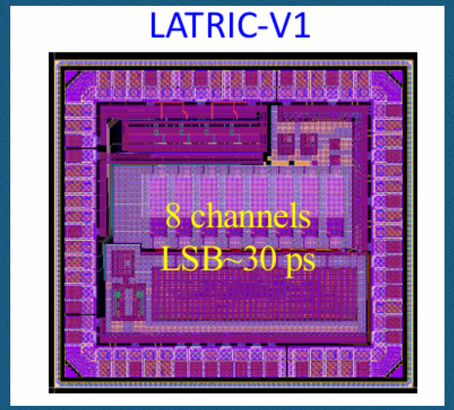




LATRIC: LGAD Readout Chip

(LGAD Timing and Readout Integrated Chip)

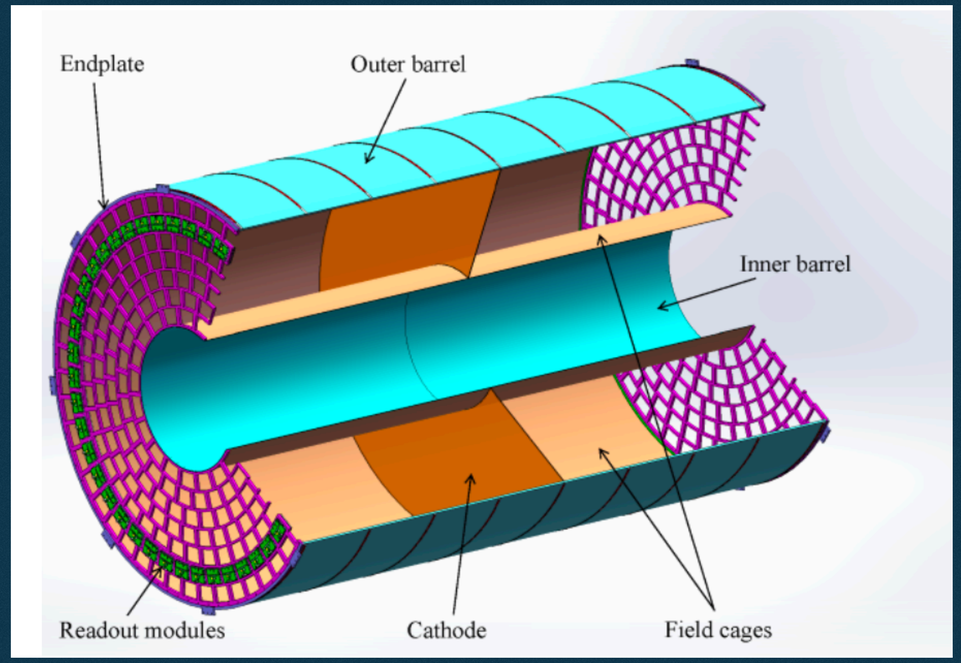




New 8-channel LATRIC-V1 under preliminary tests (~30 ps measured)

The Time Projection Chamber (TPC)

Detailed mechanical design:



Length: 5.8 meter
Inner radius: 600 mm
Cathode potential: 63 kV

Material budget of barrel
TPC outer wall: 0.69%
TPC inner wall: 0.45%

High granularity readout
Pad size: 500 μm × 500 μm

On-going studies and plan:

- **Space-charge distortions** with different IBF suppression methods, beam-induced background, and ***high-luminosity Z mode***
  - Double-mesh MicroMegas being investigated
- Optimization of the **readout granularity**
- Low-noise low-power **readout ASIC** (TEPIXv1 validation completed) → to be used in a testbeam
- Continue construction of prototypes including a full drift length prototype

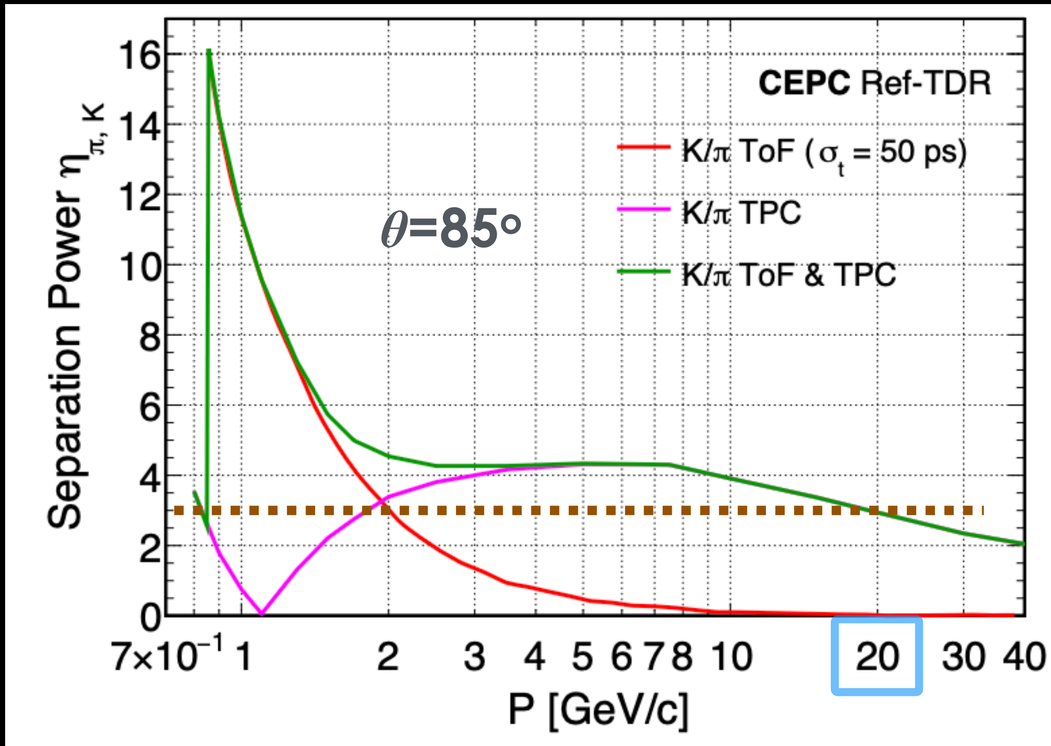


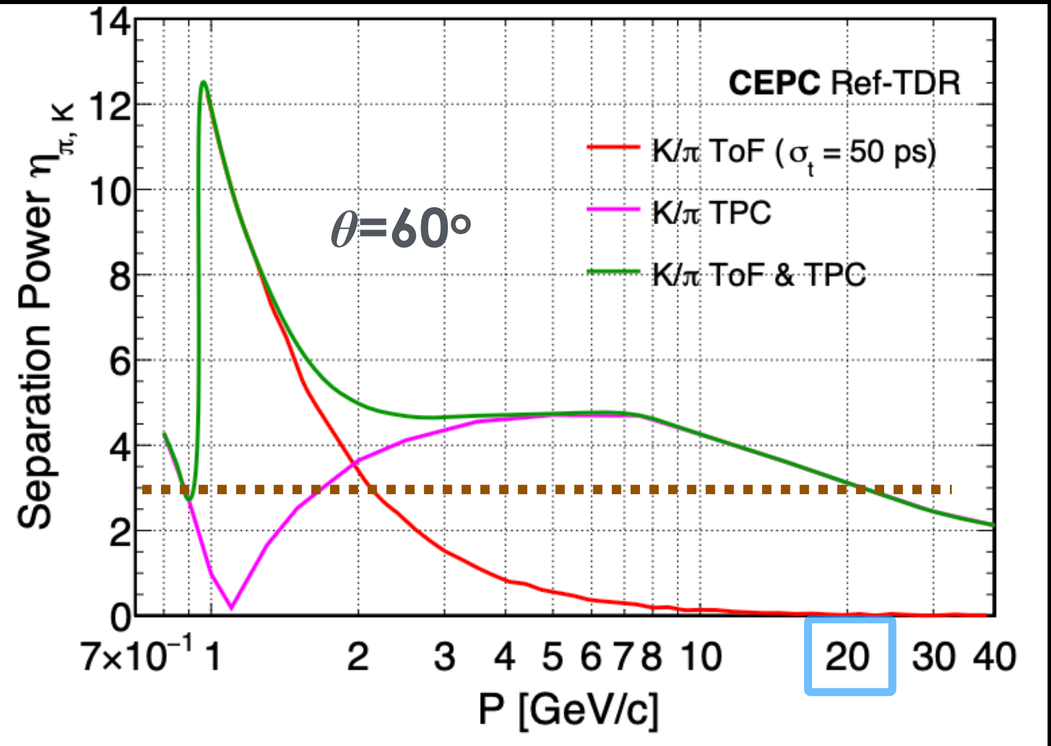
TEPIX:
Low-power readout ASIC
(<100 mW/cm²)

Good tracking (σ~100 μm) and PID (dN/dx ~3%)

Particle identification Performance

K, pion separation using TPC-only, OTK-only and TPC+OTK measurements

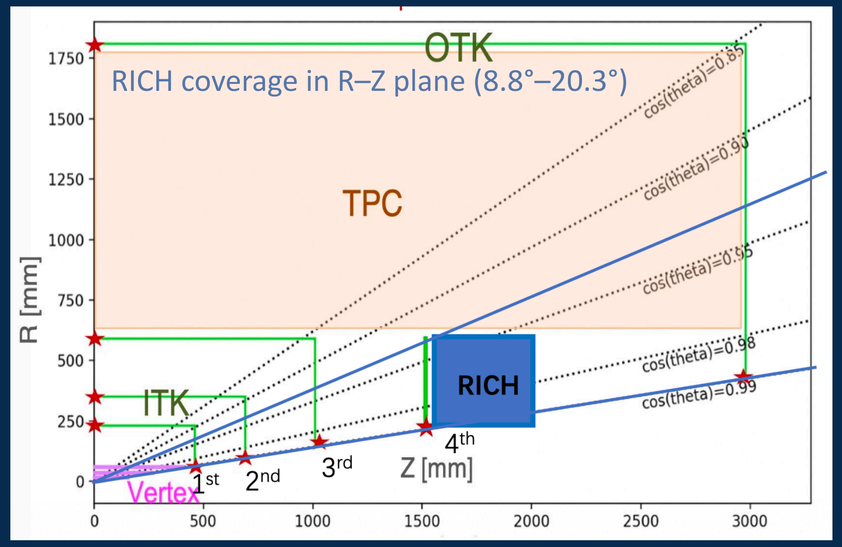




Separation power larger than 3 up to 20 GeV in the barrel region

The Cherenkov Detector (RICH) - a new addition

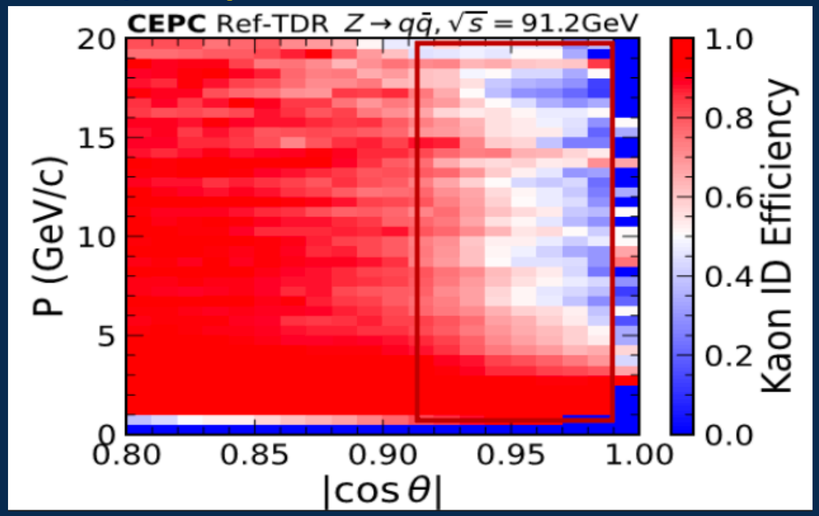
Ring-Imaging Cherenkov (RICH) in the forward region



Final location under study

Interplay with TPC inner radius

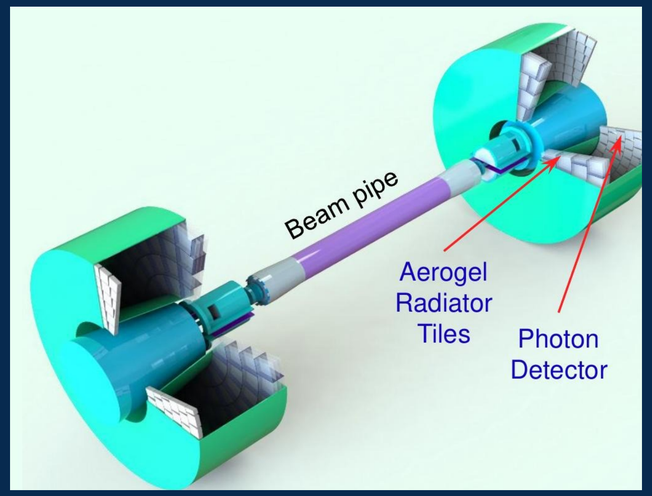
K/π separation of current detector

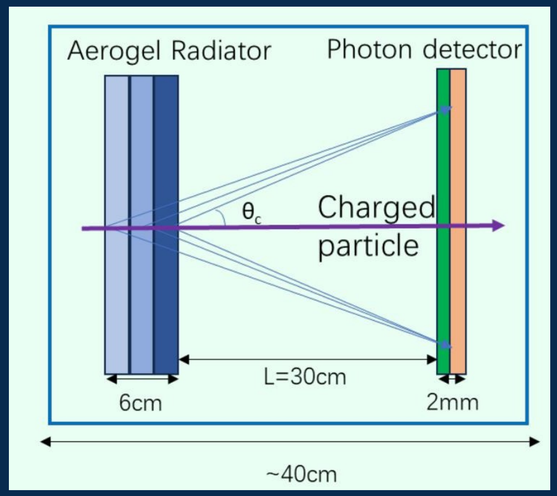


Design Concept

- Proximity-focusing design with **silica aerogel** radiator
- **SiPM** as photo-sensor (active R&D)
- L = 30 cm, radiator 6 cm

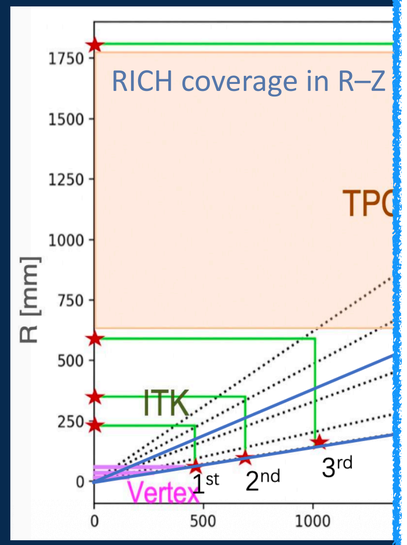
Collaborating with BINP; Widely open for collaboration

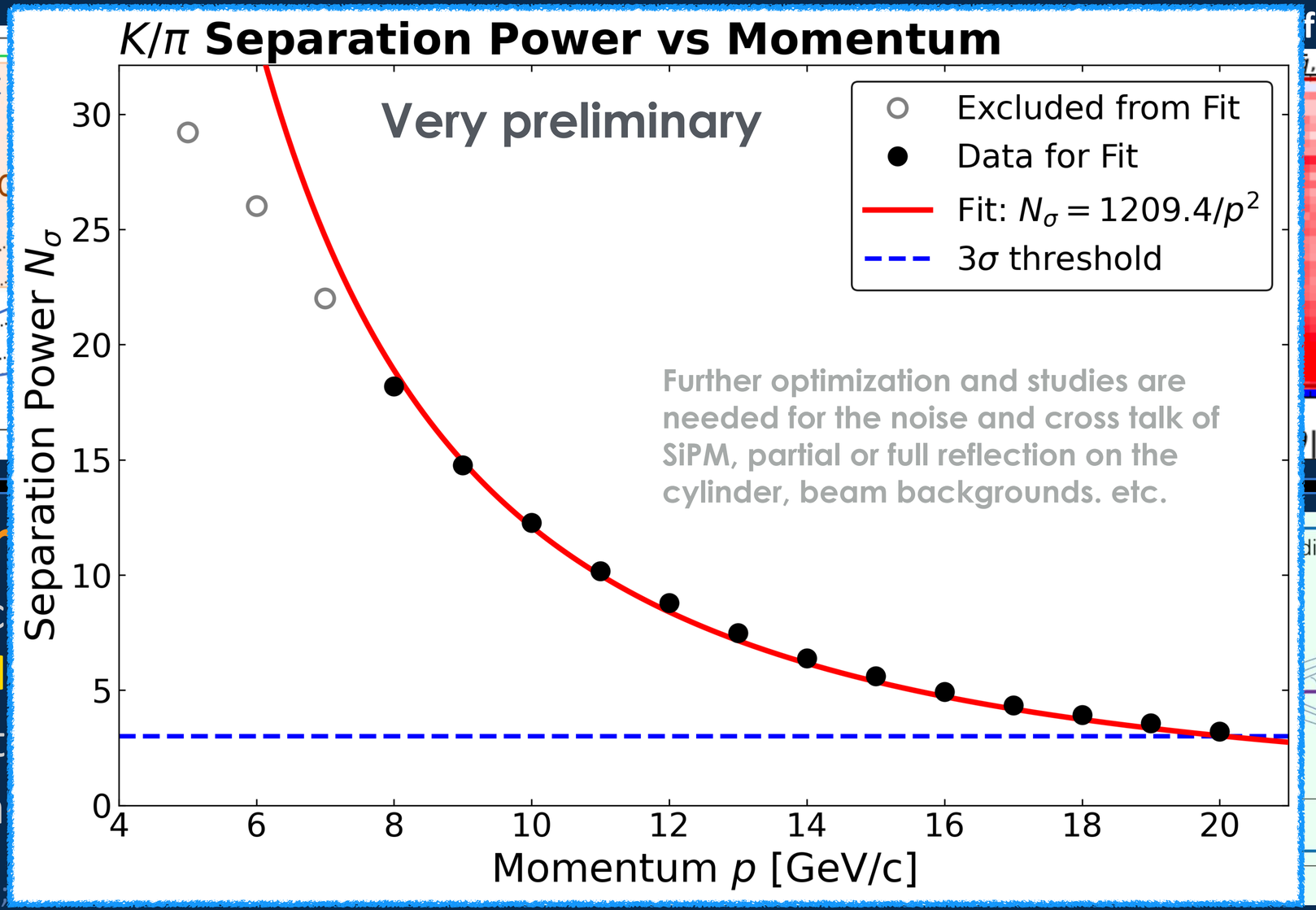




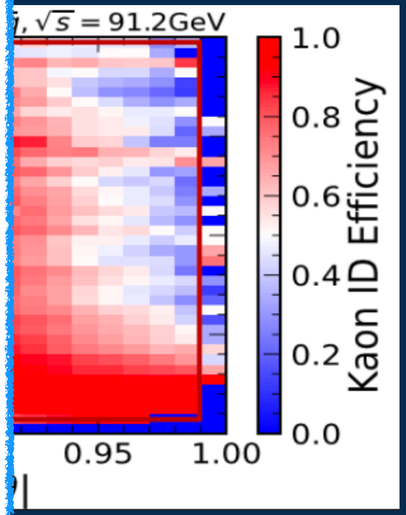
The Cherenkov Detector (RICH) - a new addition

Ring-Imaging Cherenkov (RICH) in the forward region





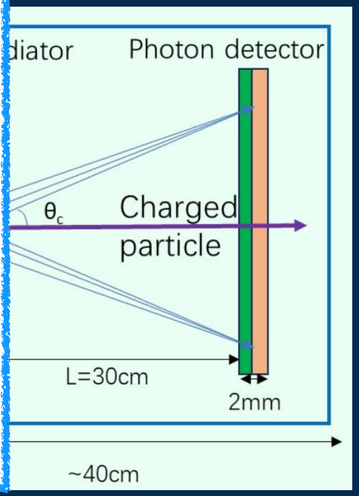
f current detector



Desig

- Proximity-foc
  silica aerogel
- **SiPM** as phot
- L = 30 cm, ra

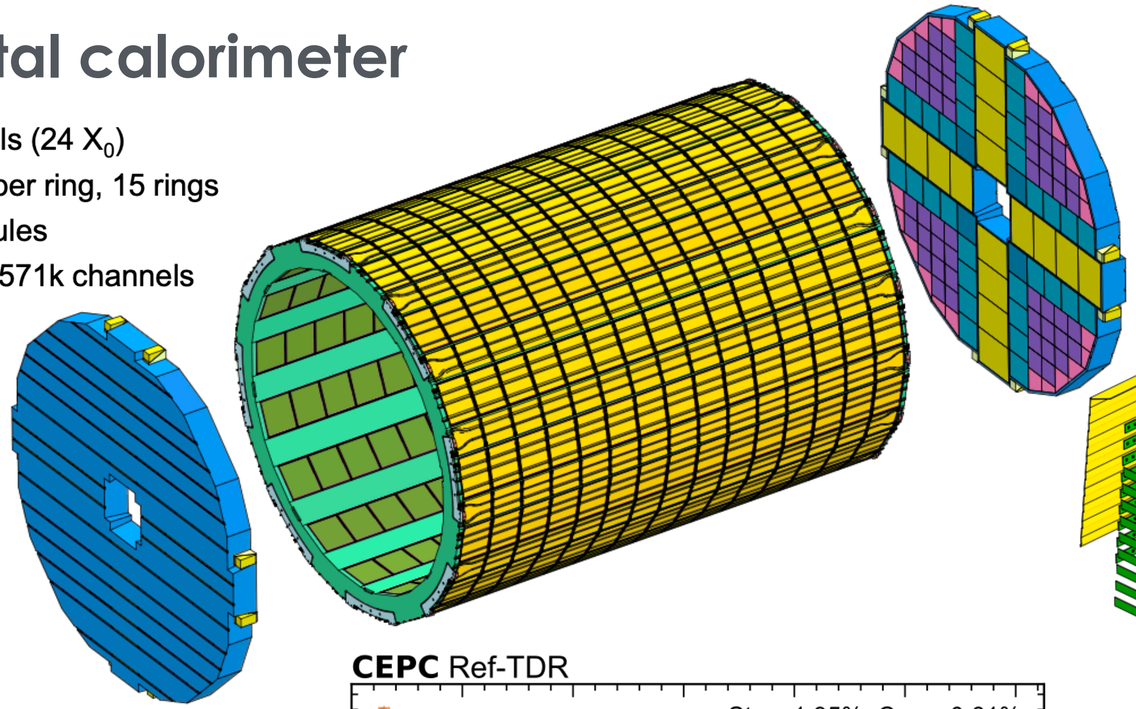
Collaborating with BINP;

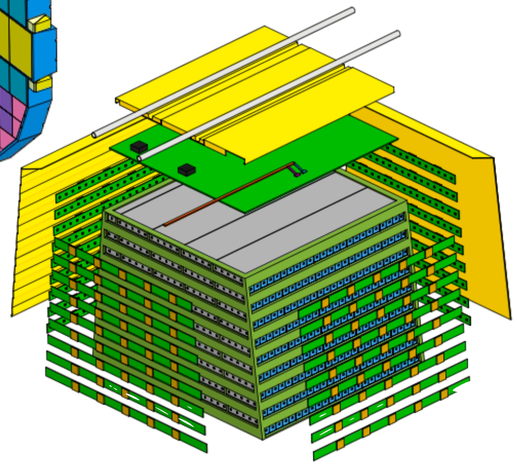


A crystal electromagnetic calorimeter

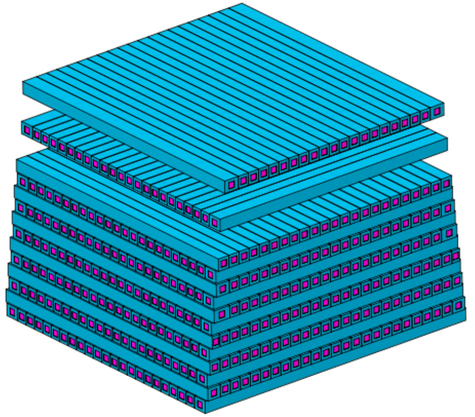
BGO Crystal calorimeter

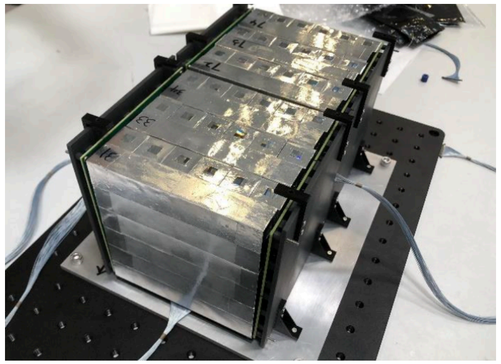
- 18 layers of crystals (24 X_0)
- Barrel: 32 towers per ring, 15 rings
- Endcap: 224 modules
- Total: 24m^3 BGO, 571k channels

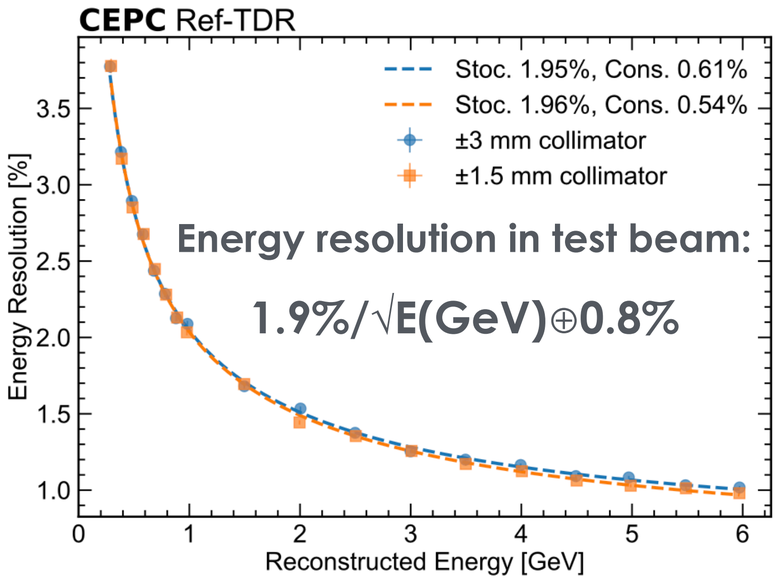


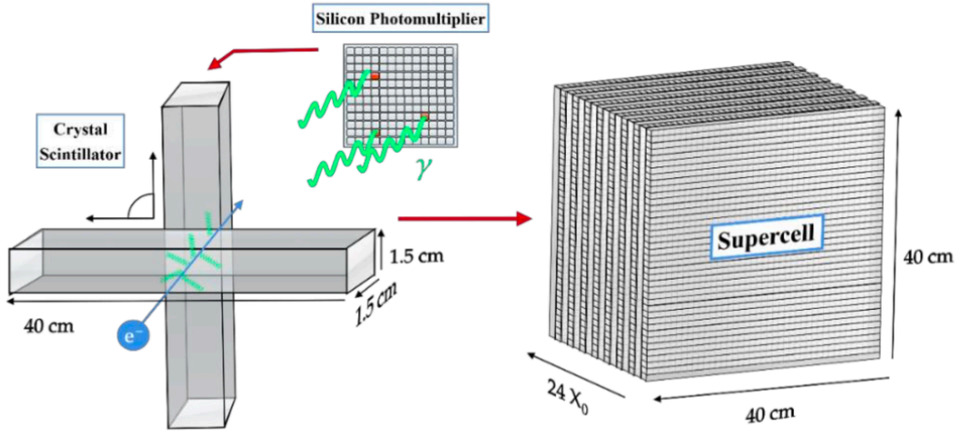


3×3 mm² SiPM at each end







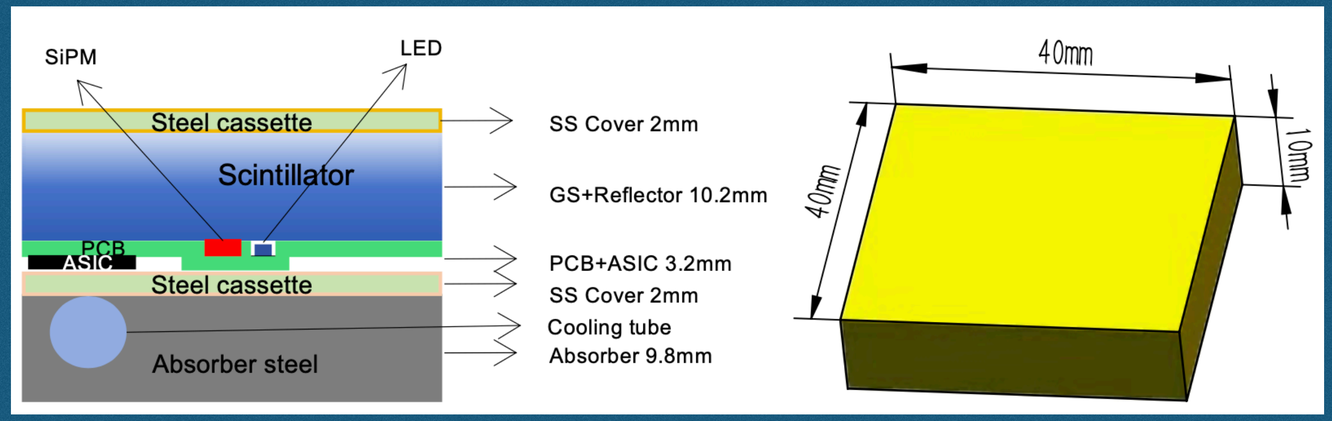


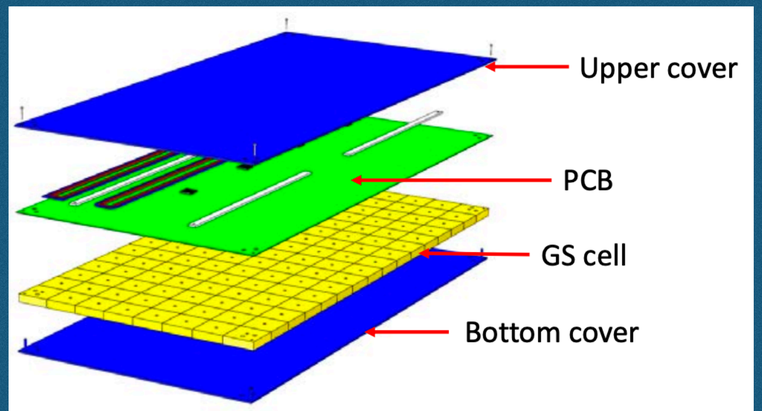
Crystal cross section of **1.5×1.5 cm²** selected

The Hadronic Calorimeter

GS-HCAL: a glass scintillator calorimeter

Single layer structure





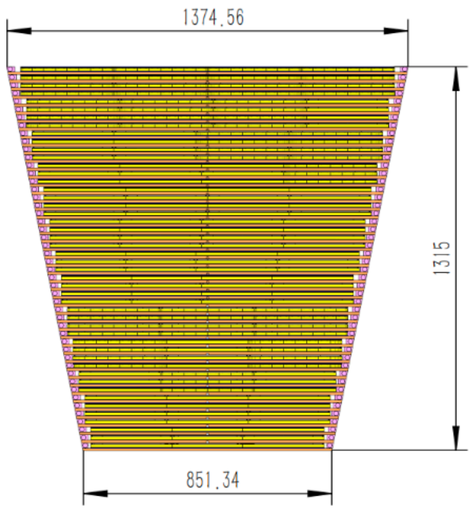
4 x 4 x 1 cm^3 glass tiles interspersed with steel plates

48 layers stacked per module

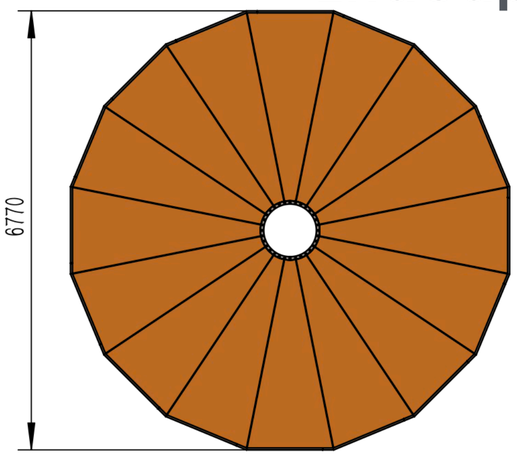
955 tons

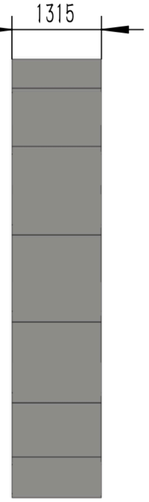
Barrel

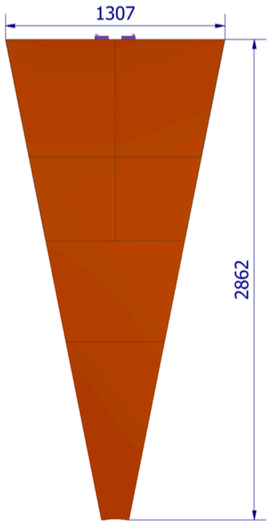




Endcap





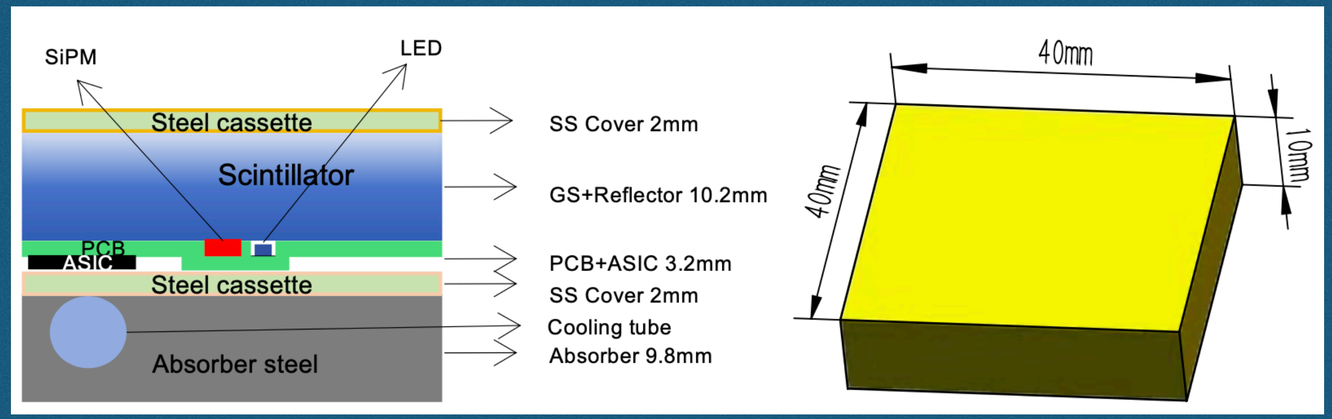


362 tons/endcap

The Hadronic Calorimeter

GS-HCAL: a glass scintillator calorimeter

Single layer structure

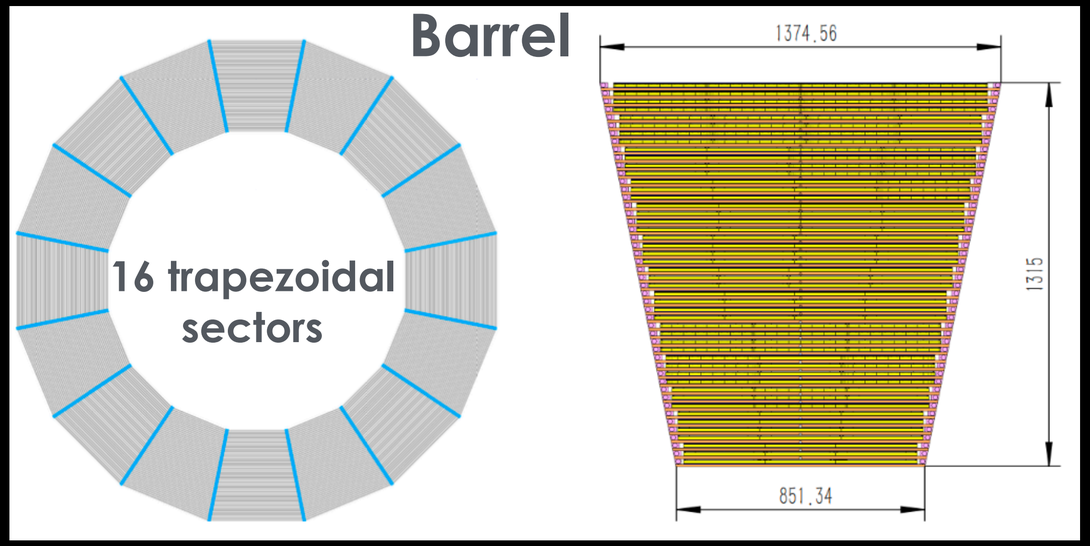


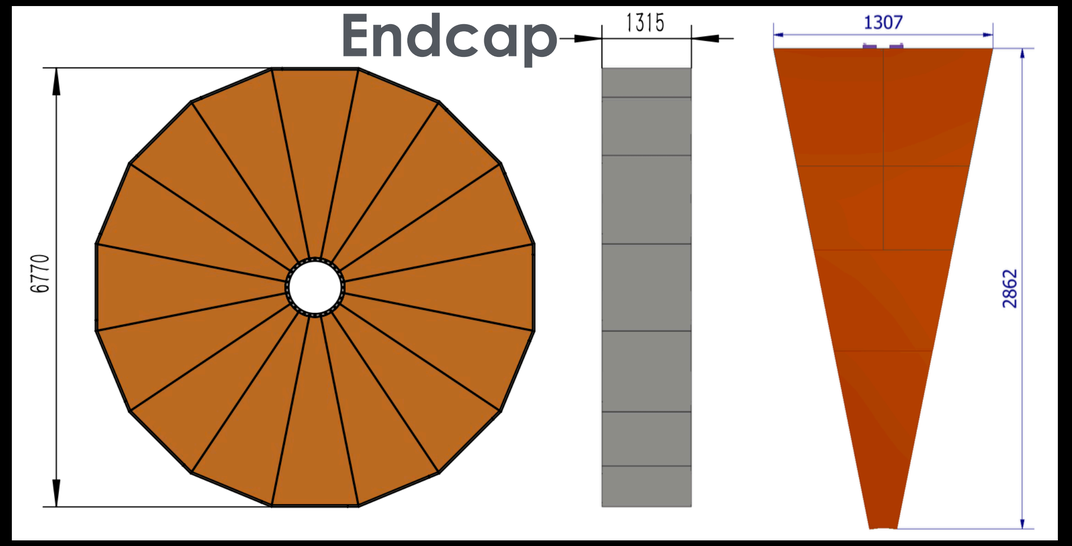
85 m³ glass scintillator
high sampling ratio (~30%)
good energy resolution ~30%/√E

4 x 4 x 1 cm³ glass tiles interspersed with steel plates

48 layers stacked per module

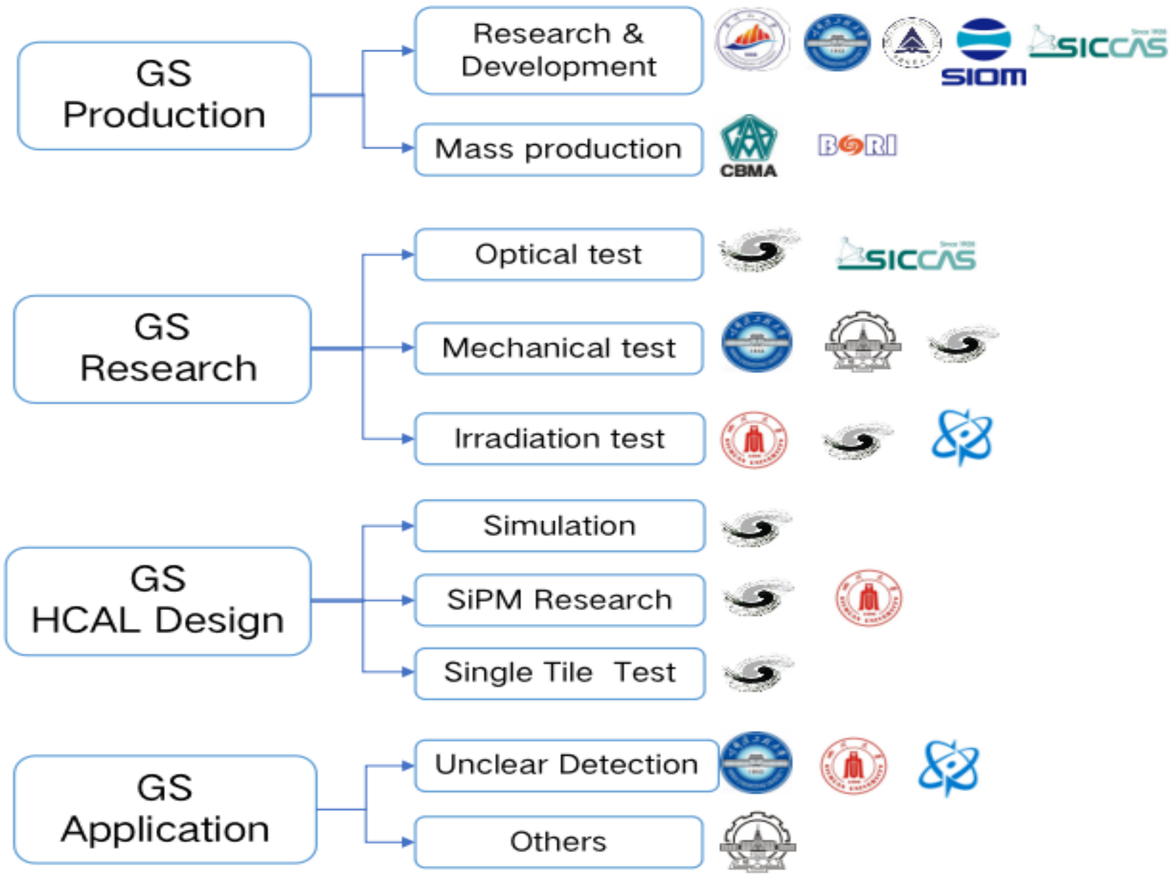
955 tons





362 tons/endcap

Glass Scintillator Collaboration



Institute of High Energy Physics, CAS
中国科学院高能物理研究所

Jinggangshan University
井冈山大学

Beijing Glass Research Institute
北京玻璃研究院

China Building Materials Academy
中国建筑材料研究院

China Jiliang University
中国计量大学

Harbin Engineering University
哈尔滨工程大学

Harbin Institute of Technology
哈尔滨工业大学

Sichuan University
四川大学

Shanghai Institute of Ceramics, CAS
中国科学院上海硅酸盐研究所

Shanghai Institute of Optics and Fine Mechanics,
中国科学院上海光学精密机械研究所

CNNC Beijing Unclear Instrument Factory
中核（北京）核仪器有限责任公司

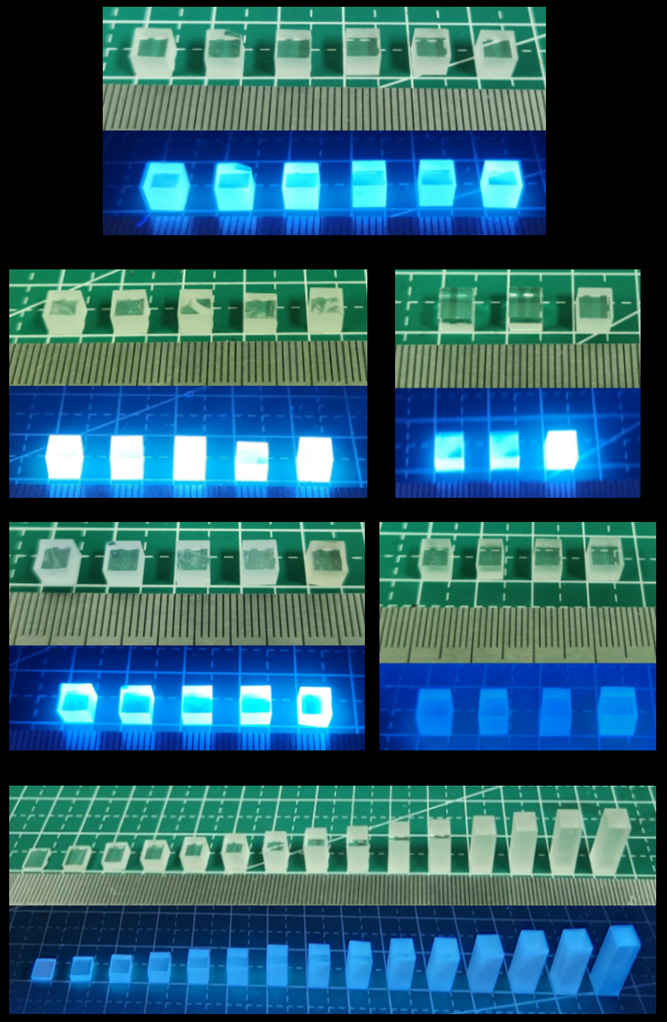
Glass Scintillator Collaboration

闪烁玻璃合作组
Glass Scintillator Collaboration

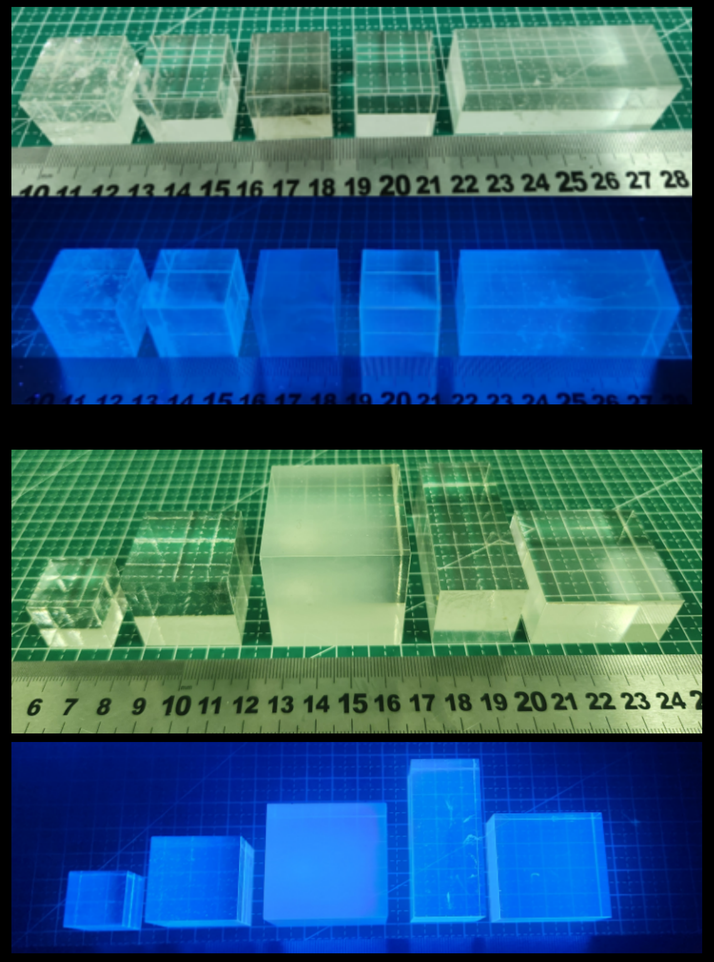
- New recipes, samples, theory: universities, research institutions, industry labs
- Testing and users
- Oct. 2021: 6 groups · Mar. 2022: 8 groups · Mar. 2023: 11 groups · Oct. 2024: 13 groups

Large Number of Samples (>2000 pics)

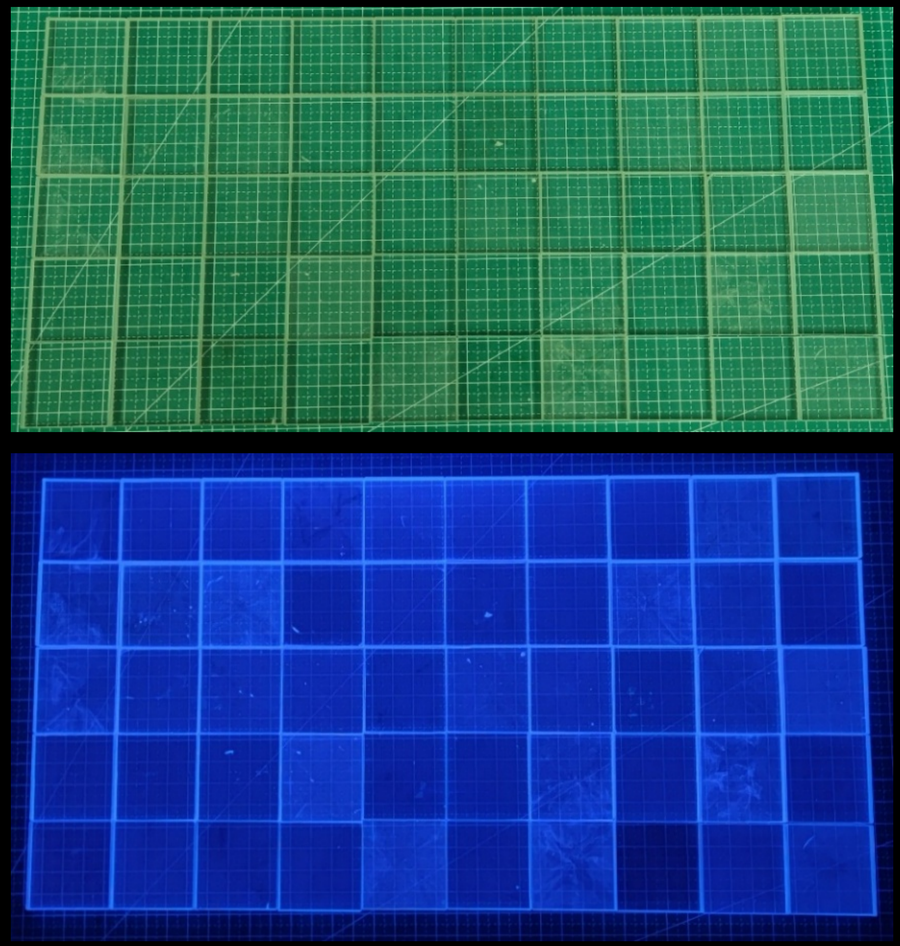
$5 \times 5 \times 5$ mm^3



20 ~ 60 mm



$40 \times 40 \times 10$ mm^3

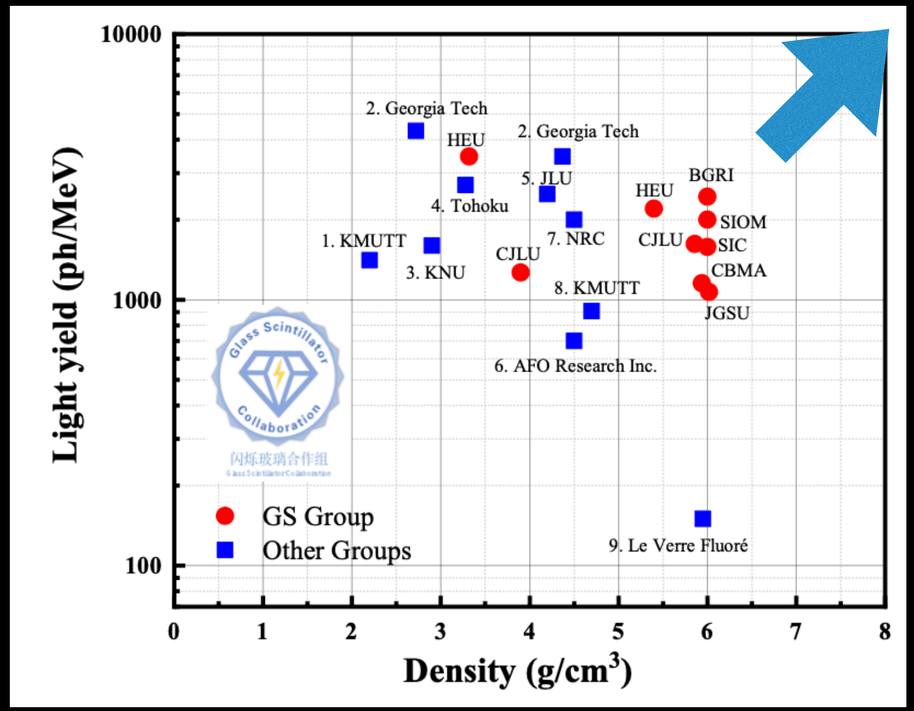


The Hadronic Calorimeter: Glass Scintillation

Goal is high light yield, large density and lower attenuation length

Using Gadolinium Fluoro-Oxide (GFO) glass with Ce^{3+} doping

Key parameters	GFO glass	BGO	DSB Glass
Density (g/cm^3)	6.0	7.13	4.2
Melting point (℃)	1250	1050	1550
Radiation length (cm)	1.59	1.12	2.62
Molière radius (cm)	2.49	2.23	3.33
Nuclear interaction length (cm)	24.2	22.7	31.8
Z_{eff}	56.6	71.5	49.7
dE/dx (MeV/cm)	8.0	8.99	5.9
Emission peak (nm)	400	480	430
Refractive index	1.74	2.15	
Light yield (ph/MeV)	~ 1500	7500	2500
Energy resolution (% at 662 keV)	~ 23	9.5	
Scintillation decay time (ns)	~ 60, 500	60, 300	90, 400

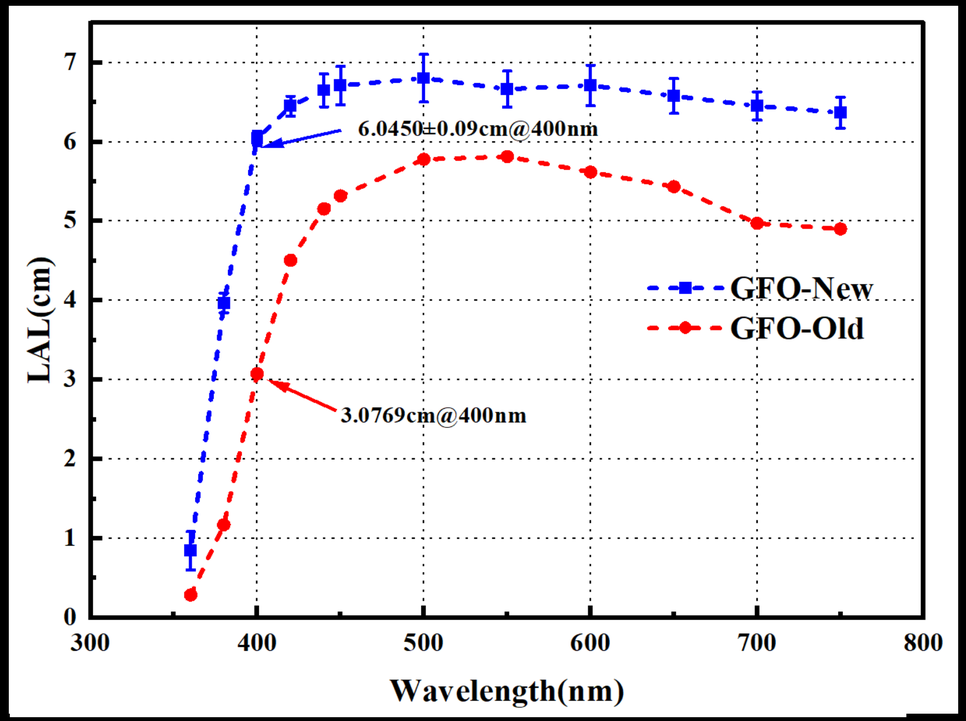


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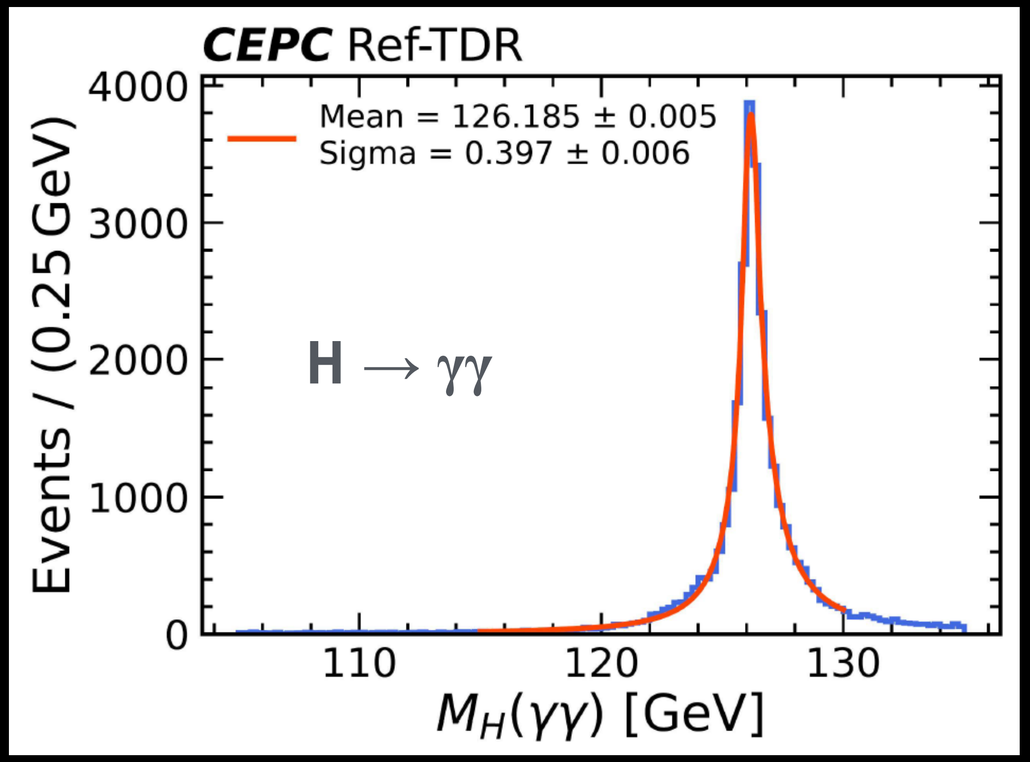
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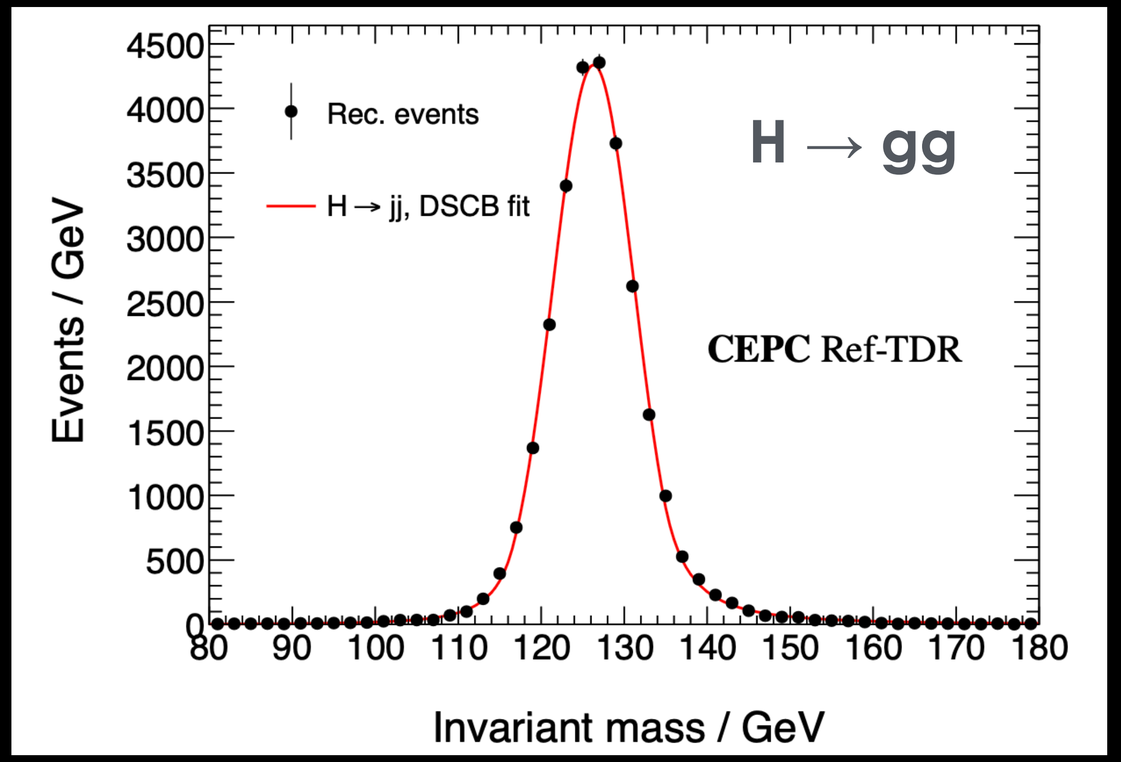
6.04 ± 0.09 cm @ 400 nm

The Calorimeter Performance on Higgs

PFA detector performance on simulation events (includes tracker, ECAL, HCAL)



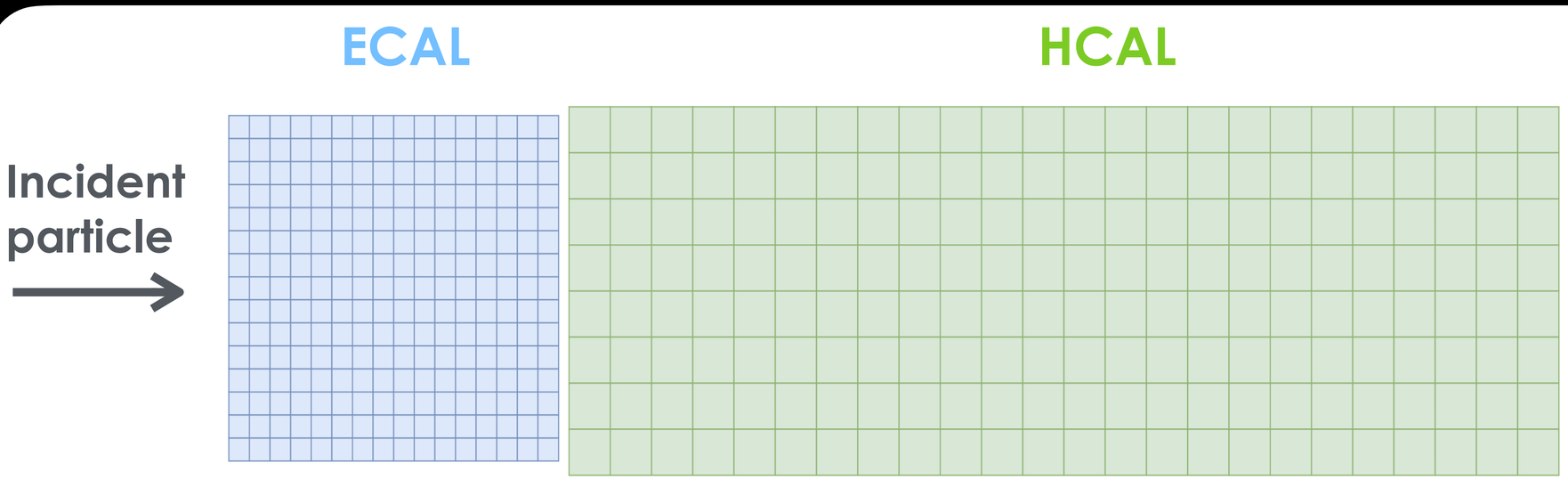
Higgs boson invariant mass resolution (BMR) = 0.31%

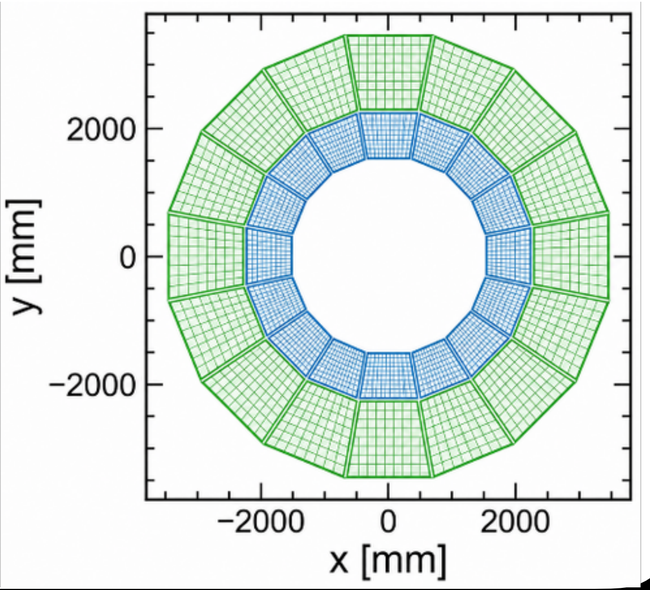


Higgs boson invariant mass resolution (BMR) = 3.88%

Next Step: Full Absorption EM+HAD Calorimeter

- Best possible EM calorimeter is **crystals**, but too expensive
- Success of **GFO** glass → might be useable for EM calorimeter
  - **Light yield** > 2000 ph/MeV
  - **Density** ~ 6 g/cm³
  - **Decay time** < 500 ns
  - **Attenuation length** > 30 cm
- Money saved allow to build a **total absorption HCAL**





Goal: EM resolution ~3%/√E, HCAL ~15%/√E

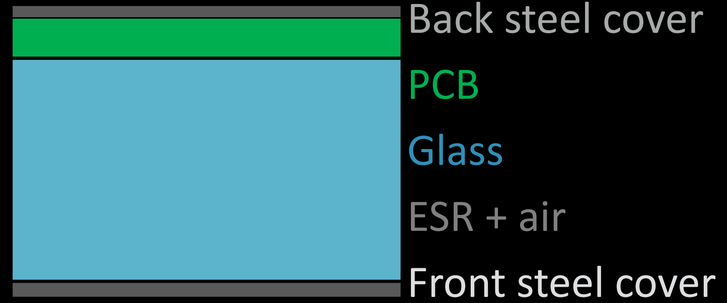
Next Step: Full Absorption EM+HAD Calorimeter

ECAL: 16 layers, each cubic is approximately 2×2×2 cm³, ~20 X_0, ~1.4 λ

HCAL: Replace the steel absorber by glass with 4×4×4 cm³ cells, 5 λ

Parameter	2025.09	2026 ECAL	2026 HCAL
Dimension (mm³)	40×40×10	20×20×20	40×40×40
Density (g/cm³)	> 6.0	6.0	—
Transmittance (% @ 400 nm)	76	> 80	—
Emission peak (nm)	390	~400	—
Light yield (ph/MeV)	1408	2000	1000
Energy resolution (% @ 662 keV)	28.7	< 25	—
Decay time (ns)	72.4 / 547.8	< 500	—
Attenuation length (cm @ 400 nm)	6.05	> 10–20	—

Almost full homogenous HCAL cells



Preliminary

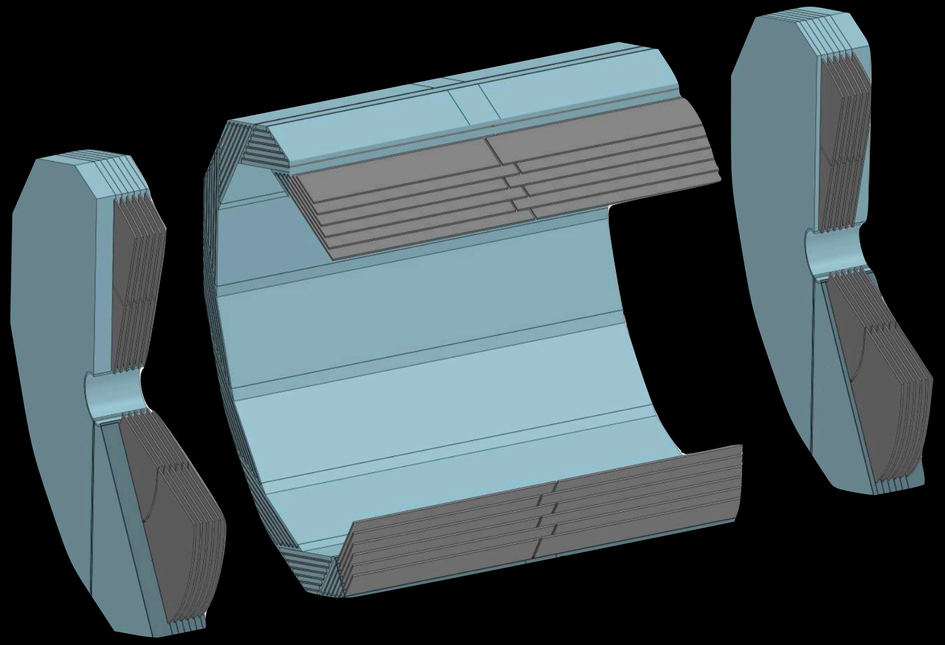
HCAL resolution

~ 11%/√E ⊕ 4%

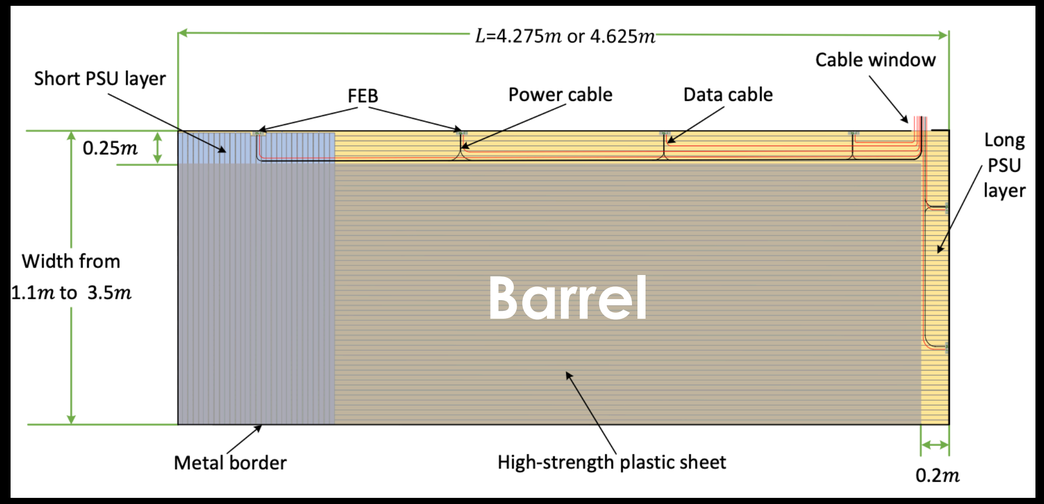
Preliminary ECAL resolution ~ 2%/√E (depending on SiPM number)

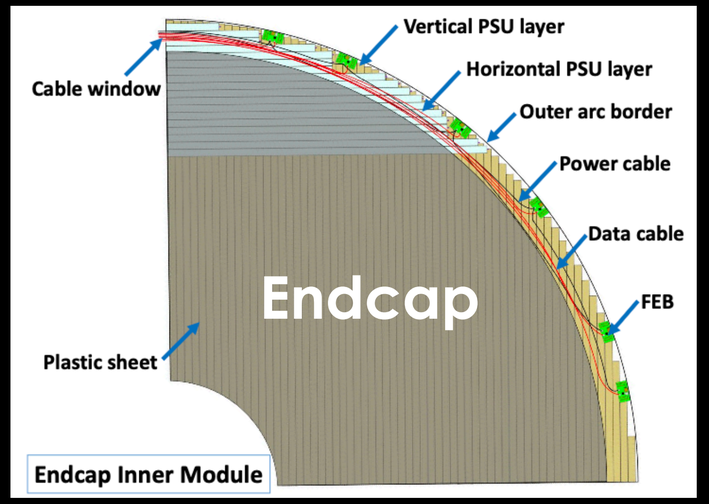
The Muon Detector

6 layers of plastic scintillator strips embedded in the iron Yoke



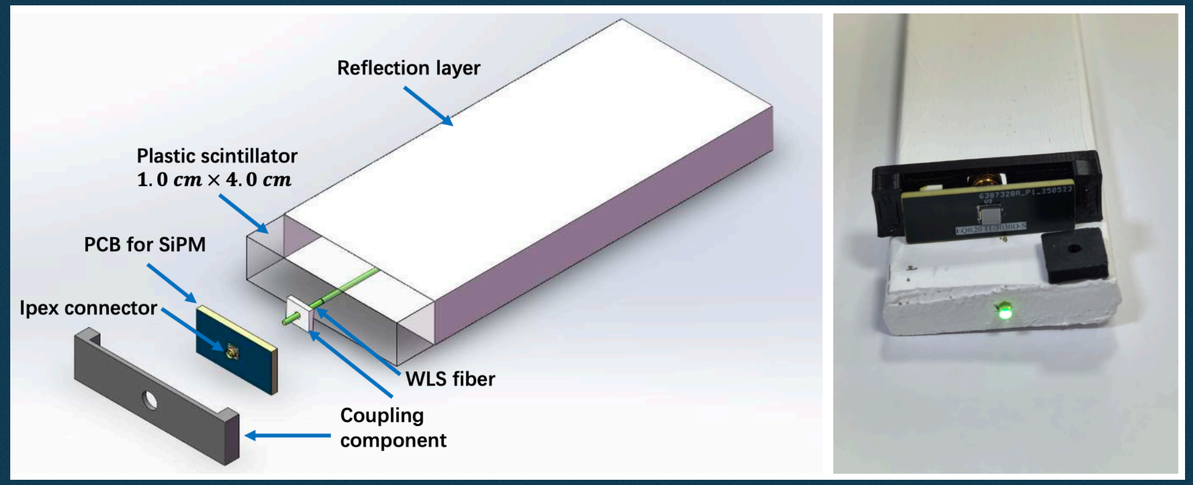
- Solid angle coverage: > 98% × 4π
- μ identification efficiency: > 95%
- $\pi \rightarrow \mu$ fake rate: <1%
- Spatial resolution: ~1 cm
- Time resolution: ~1 ns
- Rate capability: 50 Hz/cm^2





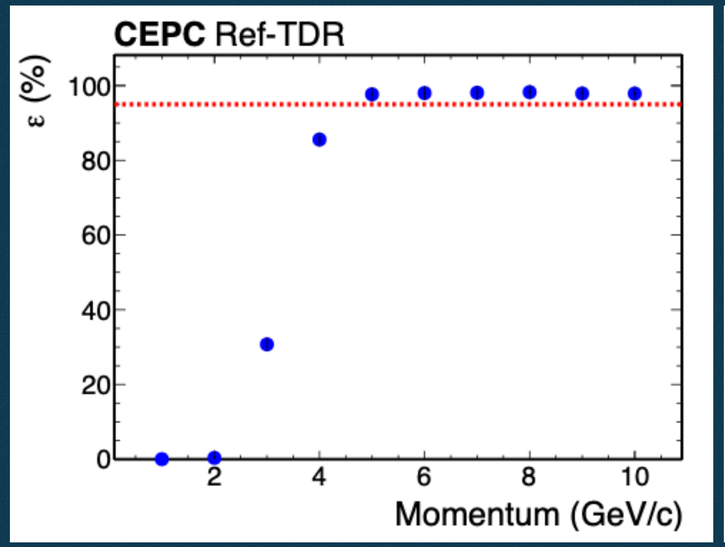
The Muon Detector

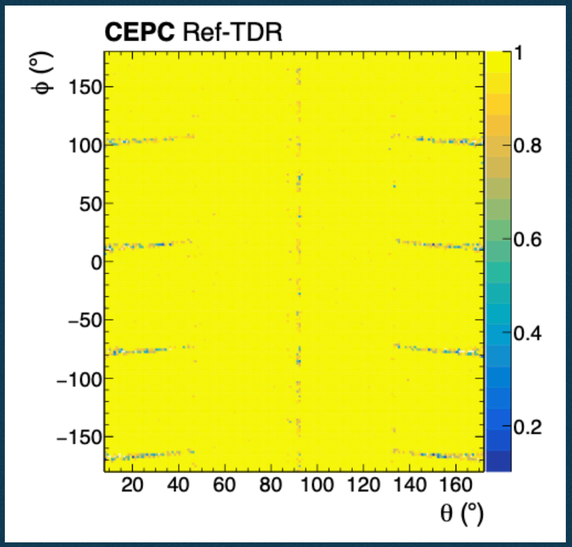
Extensive R&D on SiPM and long plastic scintillator strips with WLS fibers



5 meter strips with >90% efficiency

Standalone muon detector efficiency ~98% for muons above 4.5 GeV/c

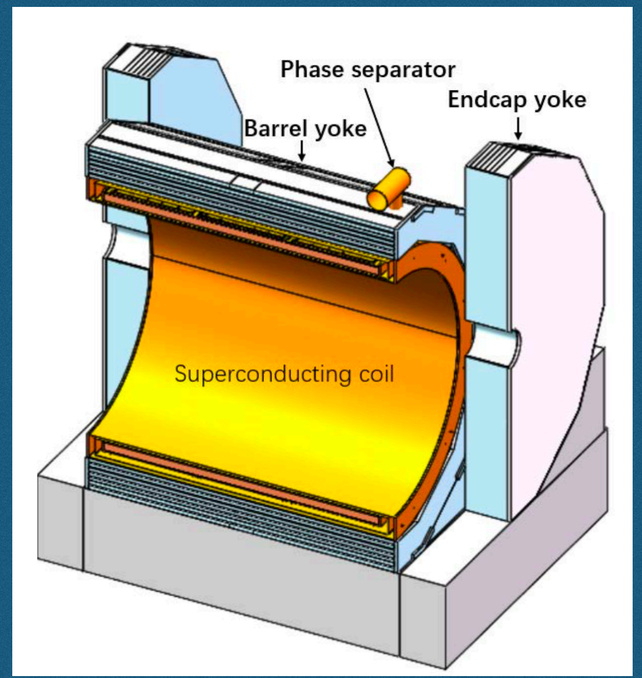




Recent meeting with FCC colleagues, the AGORA muon detector is far advanced in terms of engineering and studies

The Magnet System: Superconducting Solenoid

LTS: Low-temperature SC



Coil ϕ_{inner} = 7.3 m

Coil ϕ_{outer} = 7.92 m

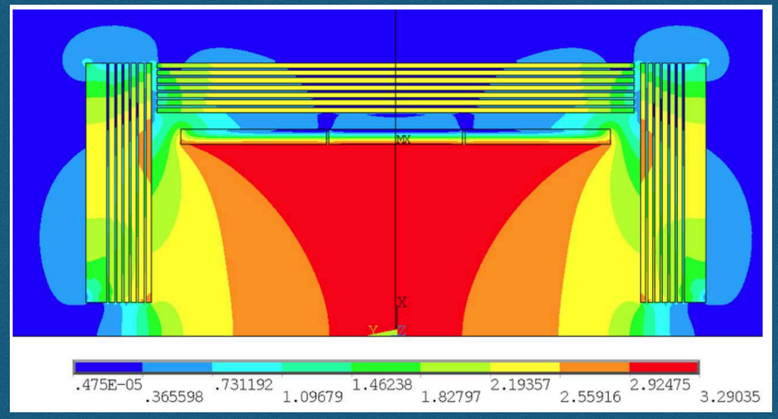
Coil length = 8.15 m

Operational conditions:

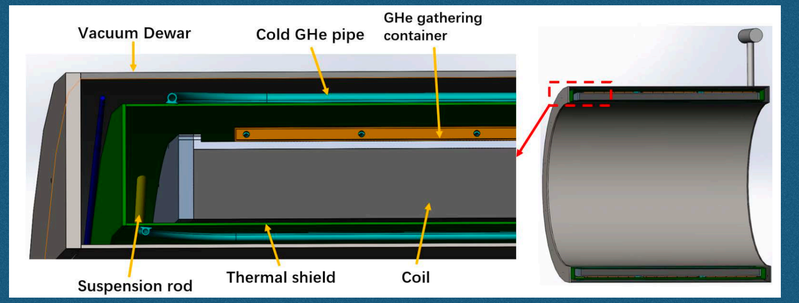
Central magnetic field: 3 T
Temperature: 4.5 K
Current: 17 kA

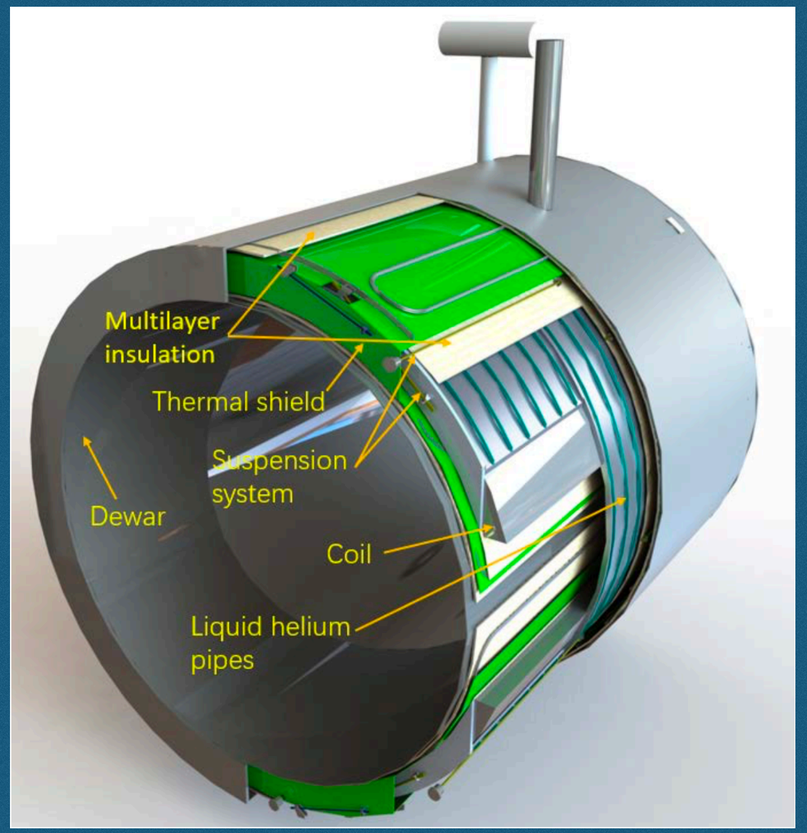
Magnetic field uniformity

~7% as required by TPC



Detailed mechanical design

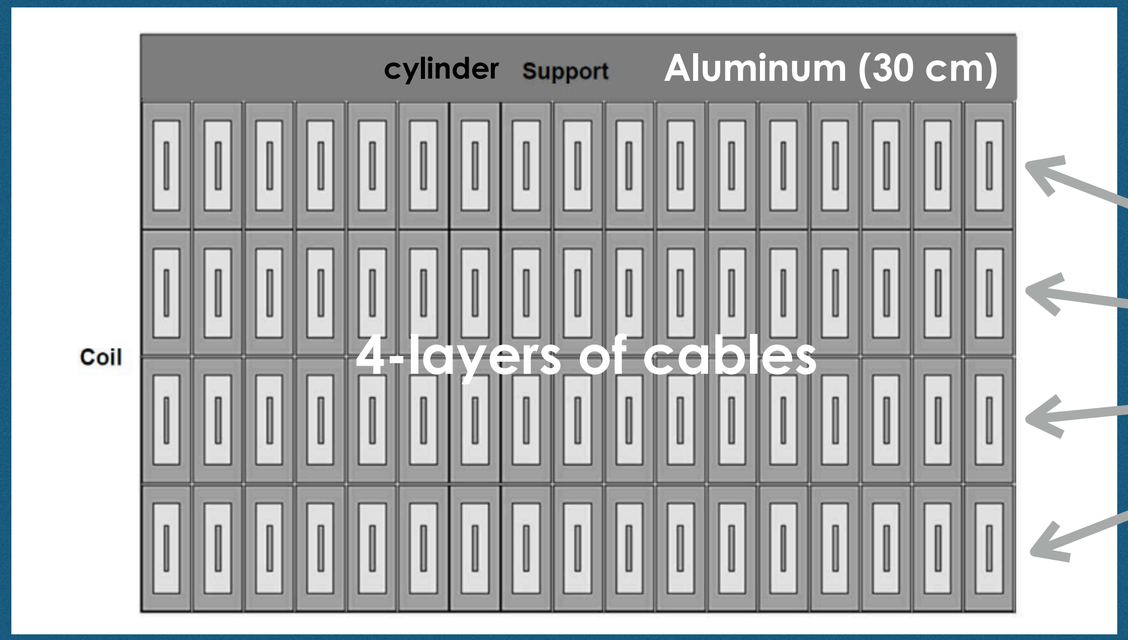


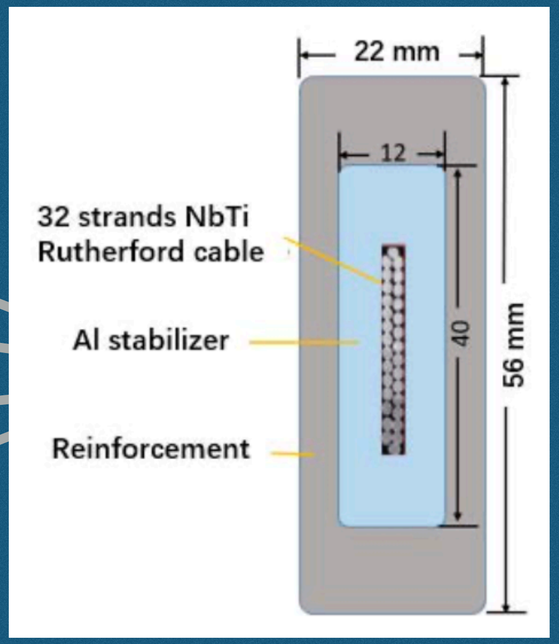


The Magnet System: Superconducting Solenoid

Aluminum Stabilized Superconducting Cable

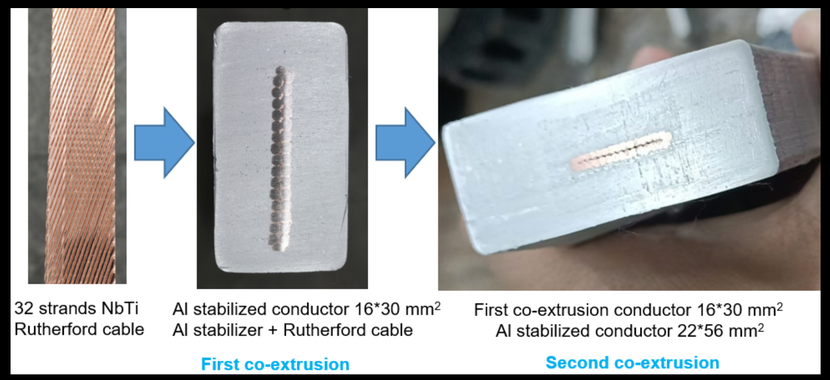
Aim to produce a thin solenoid puts pressure on the design of superconducting cable

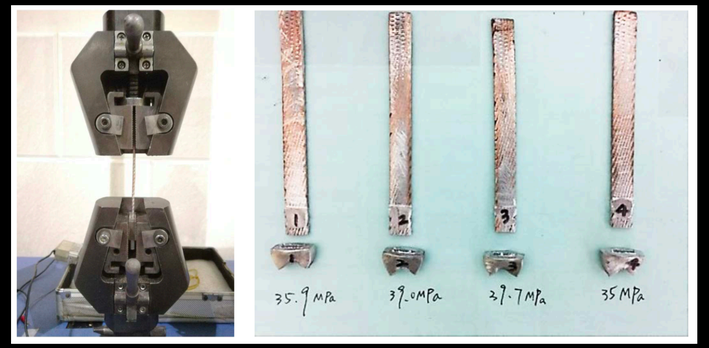




Requires
double extrusion cables
for sufficient strength to
survive stress energized
under cold

Complex cable
under development





5-m dummy cable
(copper not SC)
produced and tested

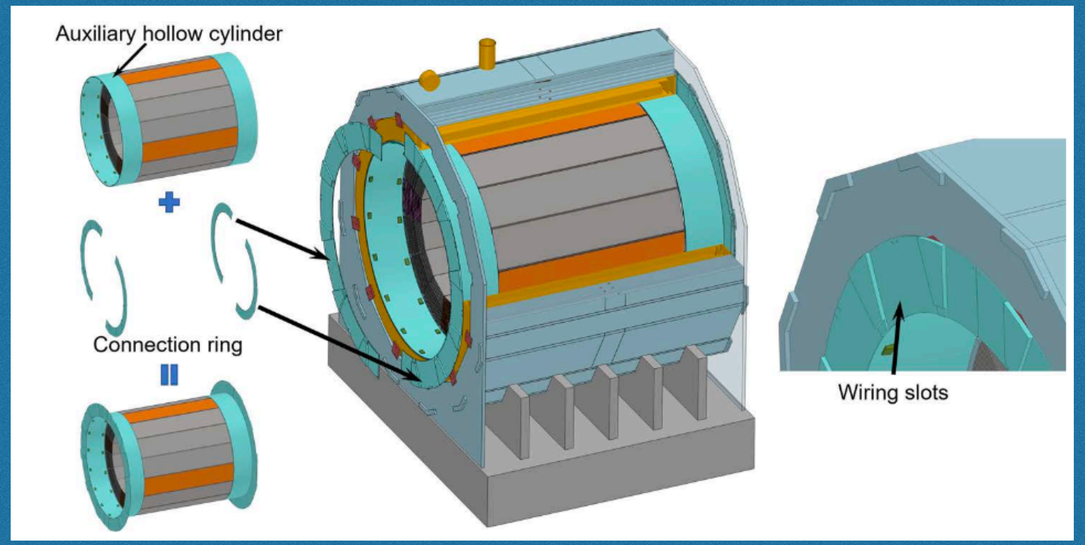
Common infrastructure

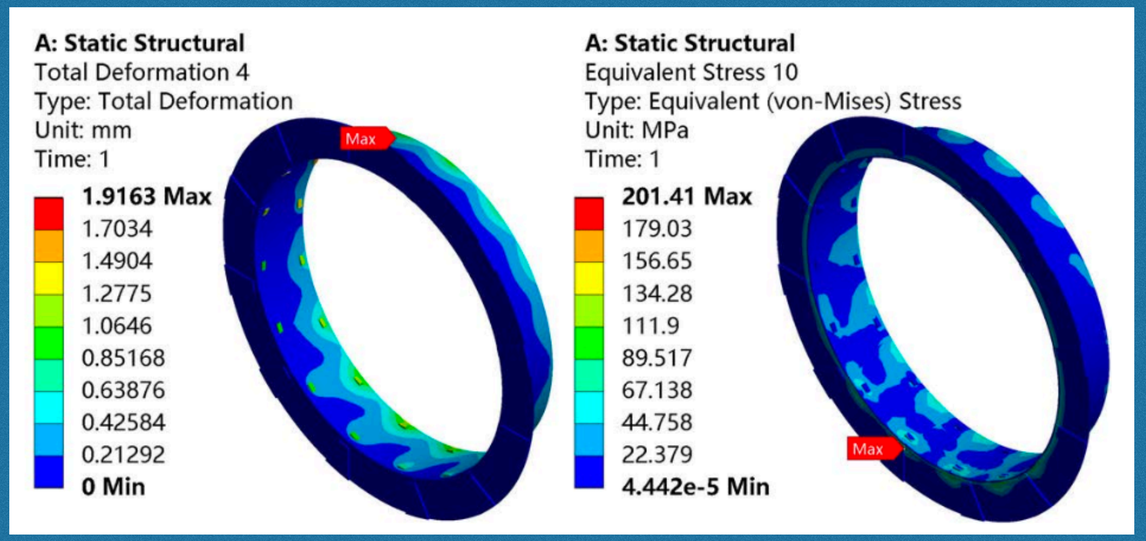
Common between sub detectors, but even between concepts

Mechanics and Integration

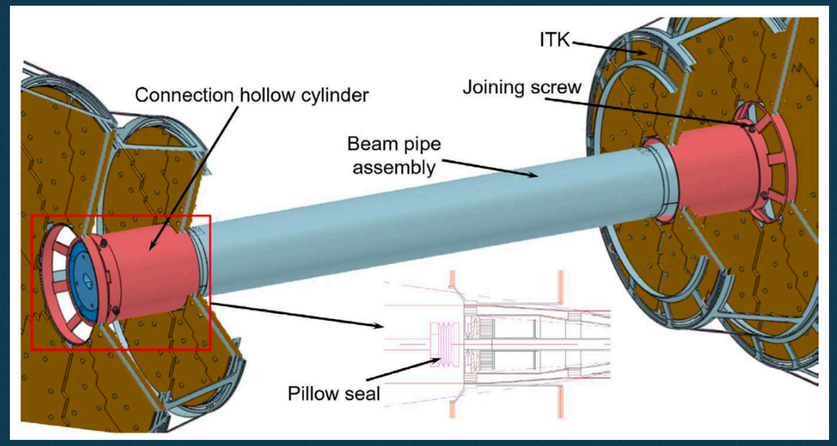
Sub-detector interconnections and installation studied in detail but requires more R&D

Example: Connection structure of the barrel HCAL.





Connection of ITK to beam pipe

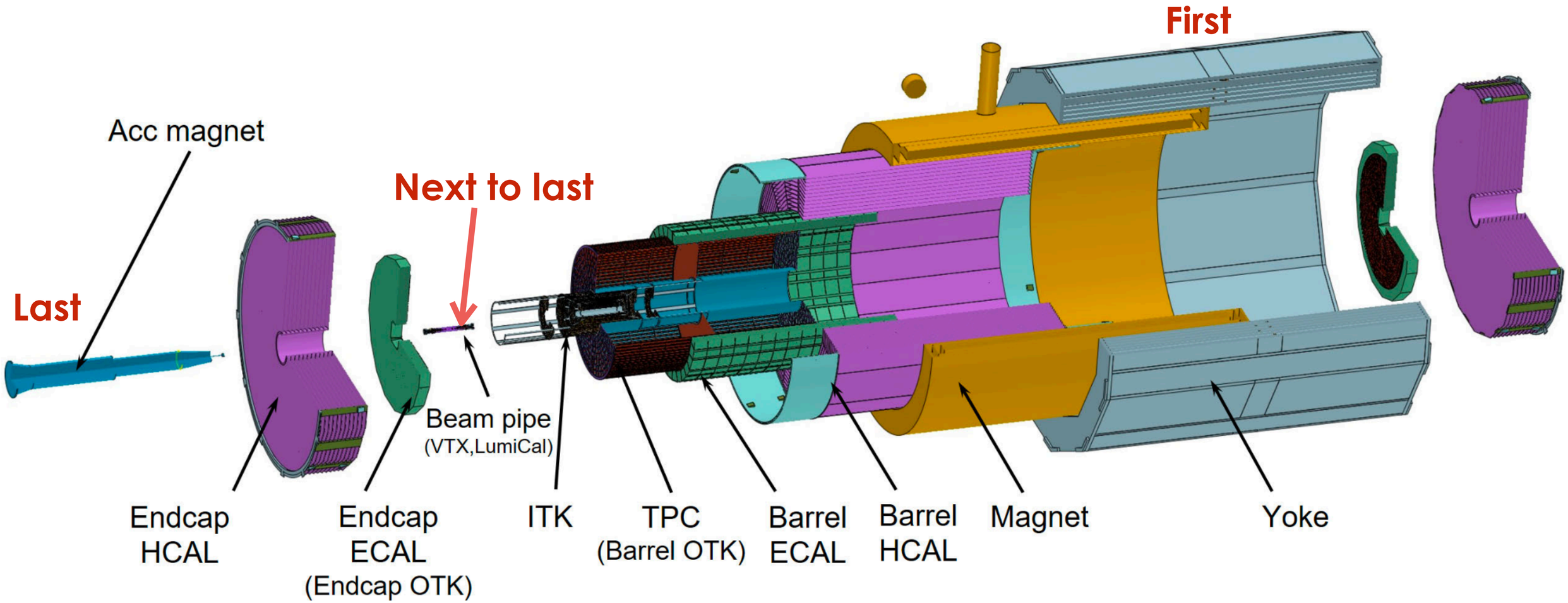


Some key R&D in progress:

- Beam pipe structure cooling & key manufacturing processes
- VTX structure optimization & process development
- CO_2 cooling research for CEPC detectors
- Ultra-low mass heat transfer device technologies

Mechanics and Integration

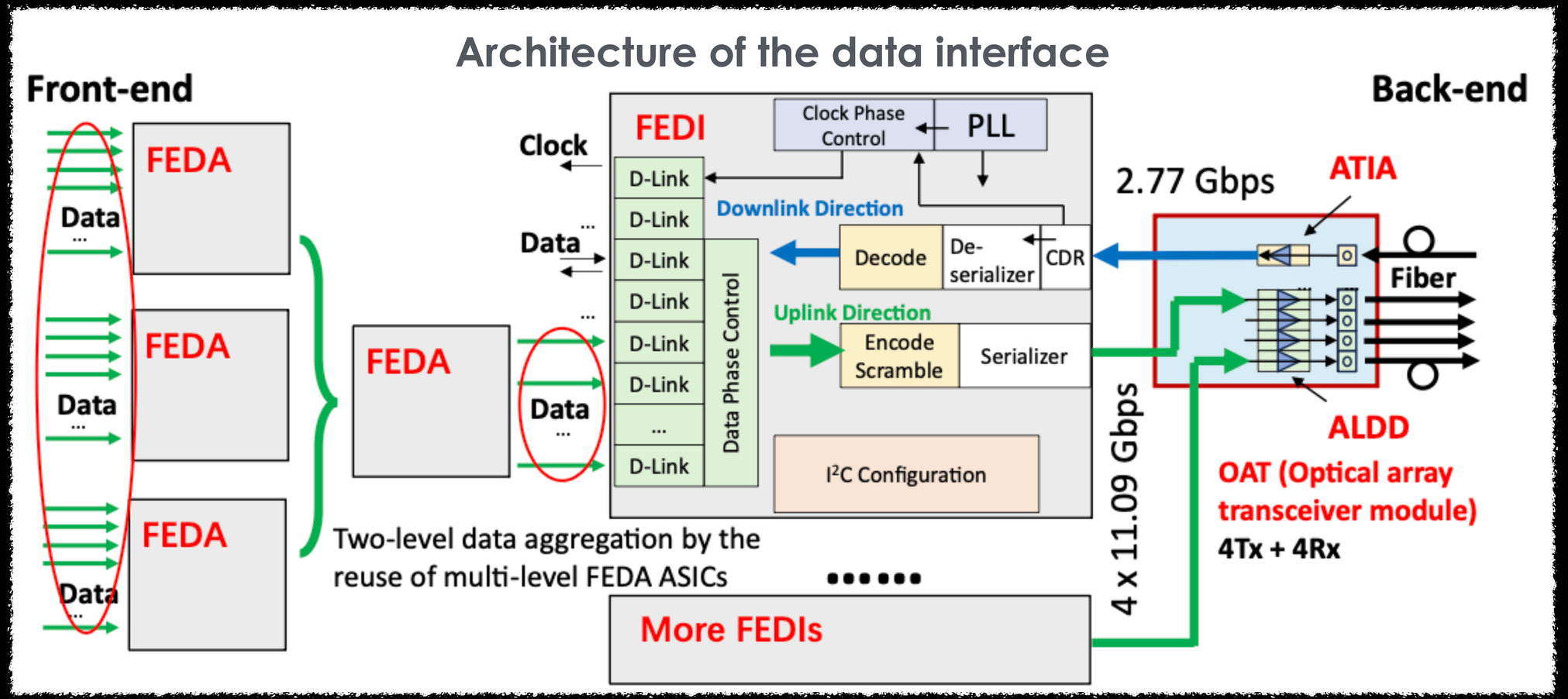
Installation will proceed from outside inwards



Planning to collaborate with FCC with share experience in integration

Common Electronics

Significant effort put into defining common electronics infrastructure



Framework similar to CERN's

CEPC clock 43.33 MHz

Likely not major modifications required for FCC-ee

The data interface has a custom Optical Array Transceiver (OAT), and ASICs including: the Front-End Data Aggregator (FEDA), Front-End Data Interface(FEDI), Array Laser Diode Driver (ALDD), and Array Transimpedance Amplifier (ATIA)

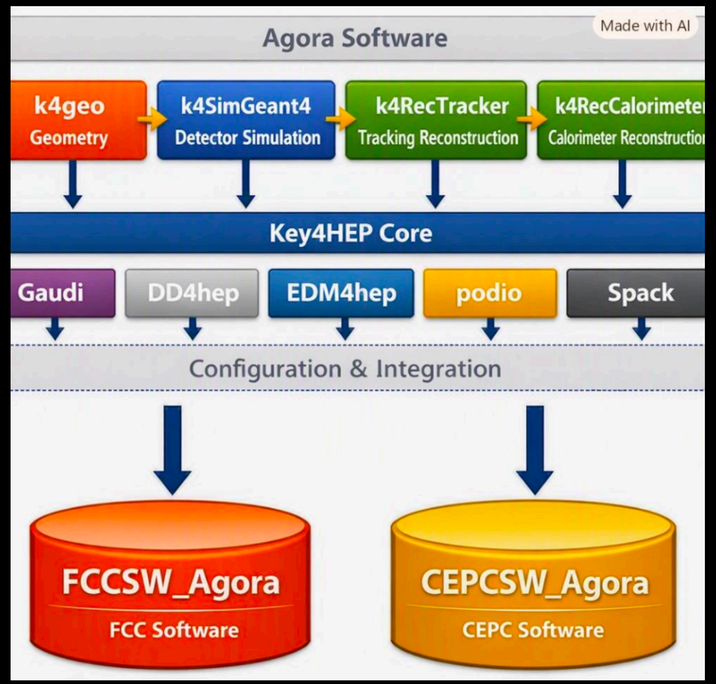
CEPC Software and Computing

- CEPC is one of the pioneers in integrating with **Key4HEP**
  - **Key4HEP**: Unified software stack developed for future collider experiments such as CEPC, CLIC, FCC, and ILC
  - CEPCSW based on **Gaudi** framework and **EDM4hep** event data model

- CEPC TDR reference detector software was implemented in Key4HEP (frozen version)
  - Requires conversion into the latest Key4HEP version
  - Integration into **FCC-ee Software Stack**

A plan has been developed to integrate the software

This is an essential requirement to be able to expand the team further and demonstrate the detector performance in comparison with other FCC detector concepts



CEPC Operation Scenarios and the FCC

Baseline Scenario (TDR) — SR Power: 30 / 12.1 MW

Mode	√s (GeV)	SR Pwr (MW)	L/IP ($\times10^{34}$ $cm^{-2}s^{-1}$)	Run (yr)	∫L dt (ab^{-1},1IP)	Event Yields
H	240	30	5	15	10	2.0×10^{6}
Z	91	12.1	26	4	13	5.6×10^{11}
W^+W^-	155 - 170	30	16	1	1.2	1.0×10^{7}

Ultimate Scenario (Upgrade) — SR Power: 50 MW

Mode	√s (GeV)	L/IP ($\times10^{34}$ $cm^{-2}s^{-1}$)	∫L/yr (ab^{-1})	Run (yr)	∫L (ab^{-1},2IP)	Event Yields
H	240	8.3	2.2	10	21.6	4.3×10^{6}
Z	91	192	50	2	100	4.1×10^{12}
W+W-	155 - 170	26.7	6.9	1	6.9	5.5×10^{7}
ttbar	360	0.8	0.2	5	1.0	0.6×10^{6}

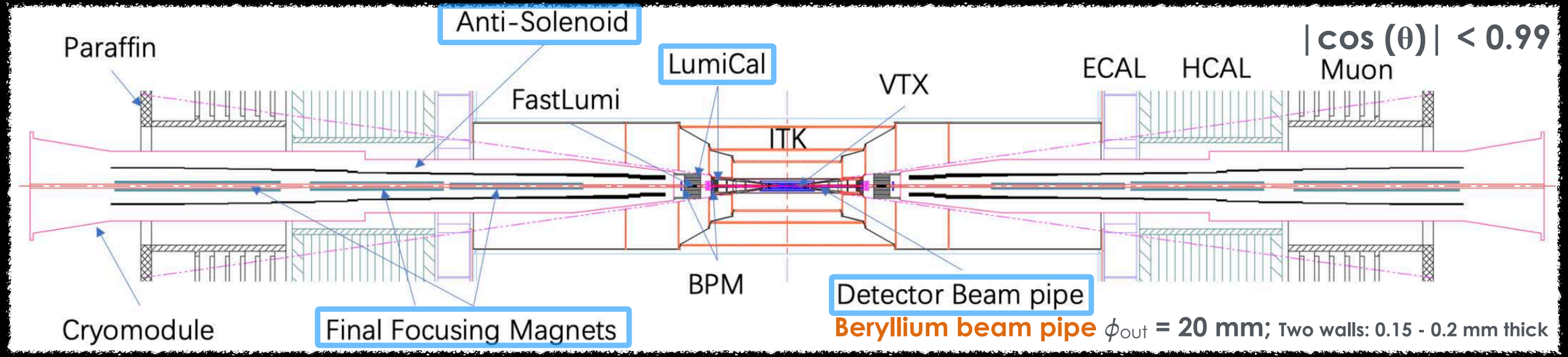
Some detector components needs further studies to guarantee optimal performance at the higher rate of upgraded CEPC or FCC plan A

Main concern: Gas tracker -- TPC, increase inner radius further (?) or other options

The main target for the near future

Interaction Region: Machine Detector Interface

The most challenging component of the project → to be adapted to FCC



Beryllium beam pipe ϕ_{out} **= 20 mm;** Two walls: 0.15 - 0.2 mm thick

Water coolant; Paraffin is considered as an alternative option

MDI Study

- Optimization of the **Interaction Region** layout
- **Beampipe**: manufacture studies; Validation of cooling: simulation, mockup;
- Vibration impact on beam orbit
- **Alignment** and **integration** strategies

Beam induced backgrounds

- Validate and improve the **simulation tools**, cross-check with **BEPC II**
- Optimize **mitigation methods** and assess the impacts on physics performance

Luminosity measurement

- Compare **detection technologies** (Si, SiC, Diamond)
- Study **prototype** detector (SiC, LYSSO)

MDI — Crossing Angle and Stay-Clear Boundary

Parameter	FCC-ee	CEPC	Source
Full crossing angle	30 mrad	33 mrad	FCC CDR / CEPC TDR
Half crossing angle	15 mrad	16.5 mrad	—
Boundary / stay-clear angle	**100 mrad**	**8.1° ≈ 141 mrad**	CEPC TDR, detector requirement
Radial space at s = 1.5 m	150 mm	**212 mm**	$R \approx s \cdot \tan\theta$
Radial space at s = 2.0 m	200 mm	**283 mm**	—
Ratio	1.00	**1.41**	—

CEPC MDI accelerator components closer to the IP:

+41%
more radial space at any given distance from the IP

141 vs 100 mrad
stay-clear cone (CEPC vs FCC-ee)

1.41
radial-space ratio (CEPC / FCC-ee)

MDI — Longitudinal Layout

Parameter	FCC-ee	CEPC
L*	2.2 m	1.9 m
MDI region extent	~20 m	±7 m
Screening solenoid/anti-solenoid start	≥ 1.55 m (at 100 mrad)	~1.13 m
Cryostat start	~1.4 m from IP	~1.05 m from IP
Beam pipe separation	Remote vacuum connection, two independent beam pipes	Double-ring, shared interaction region

~350 mm
CEPC's cryostat can start closer to the IP

±7 m vs ~20 m
MDI region: CEPC vs FCC-ee

KEY Point

FCC's smaller MDI cone pushes the cryostat to start further from the IP

AGORA at FCC: detector must be adapted to this fundamental geometric constraint

Polarization — FCC to start studies on full polarization

Electron Yukawa measurement needs full polarized beams

CEPC's has for long considered longitudinal polarization

WHY NOW?

- The electron Yukawa can only be probed in a dedicated run at 125 GeV.
- Monochromatization alone reaches only about 2.3 sigma.
- Longitudinal polarization yields ~4× significance gain

- FCC is now considering adopting polarized beams.
- Positron polarization is the remaining challenge.

AGORA team:

- Will participate in the FCC-ee efforts

Target:

- Kick-off **workshop** on "Polarization for the e+e- -> Higgs" on Nov 2
- https://indico.cern.ch/event/1738276/

Active R&D and collaborative efforts

- **Active R&D continues in many fronts (not only on the detector elements mentioned in this talk)**
  - International collaboration exists in most sub-detectors, but all activities have plenty of space and are eager for extra manpower
    - Vertex detector, Silicon trackers, TPC, Drift chamber, Calorimeters, Muon detector
  - One main goal is to adapt the concept to the challenges posed by the higher event rates
- **Active member of the ECFA DRD program**

Sub-system	DRD	Sub-system	DRD	Sub-system	DRD
Pixel Vertex Detector	3	Electromagnetic Calorimeter	6	Superconducting Solenoid	
Inner Silicon Tracker	3	Hadron Calorimeter	4, 6	Mechanical and Integration	8
Outer Silicon Tracker	3	Machine Detector Interface	8	General Electronics	**7**
Gas Tracker (TPC / DC)	1	Luminosity Calorimeter		Trigger and DAQ	**7**
Muon Detector	1 (RPC)	Fast Luminosity Monitor	3	Offline Software	Key4hep

- **Looking forward to extensive collaboration with FCC-ee Physics, Experiments, and Detector group, not only in AGORA but across the full program**

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 -- the 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/
- Next CEPC **Workshop**:
  - European Edition Workshop, Belgrade, Serbia, June 8-11, 2027
    - (Last year's workshop, Lisbon, Portugal, April 2026: https://indico.cern.ch/event/1598929/)
- **Contacts**:
  - Team leader: João Guimarães da Costa
  - Deputies: Jianchun Wang, Miao He, and Haijun Yang



Final remarks

AGORA: Advanced Glass Optimized Research Apparatus

One concept for both CEPC and FCC-ee

The Detector is innovative and challenging, with much interesting R&D to be pursued

Glass calorimetry is a special signature

In near future: focus will be into consolidating the designs, integrating within FCC framework

Goal: be ready to submit AGORA EoI for FCC-ee detector by 2028 Q1

Seeking partners and looking forward to expand the collaboration in all areas

Plan to contribute broadly to other aspects, supporting the horizontal collaboration on the detector R&D until the eventual FCC-ee project approval

The end