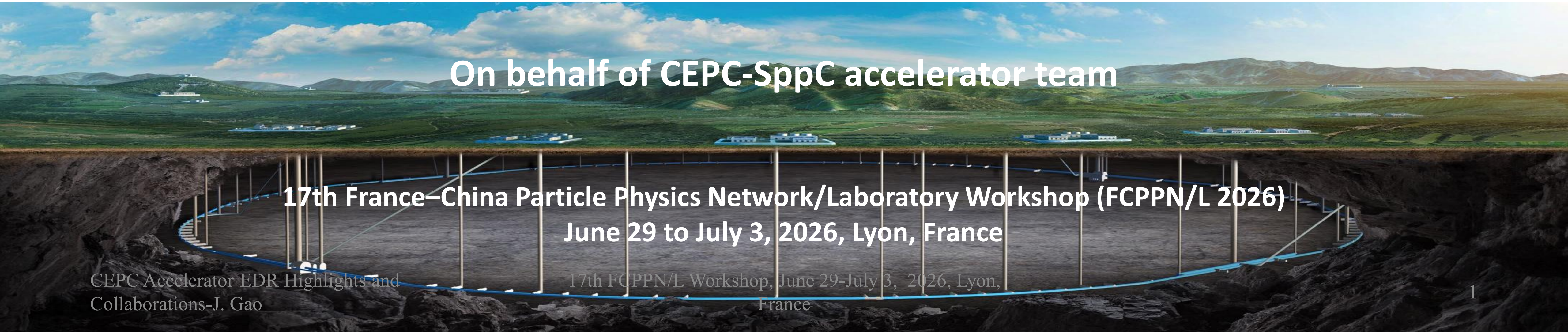
中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

CEPC

CEPC Accelerator EDR Highlights and Collaborations

J. Gao

IHEP



On behalf of CEPC-SppC accelerator team

17th France–China Particle Physics Network/Laboratory Workshop (FCPPN/L 2026)
June 29 to July 3, 2026, Lyon, France

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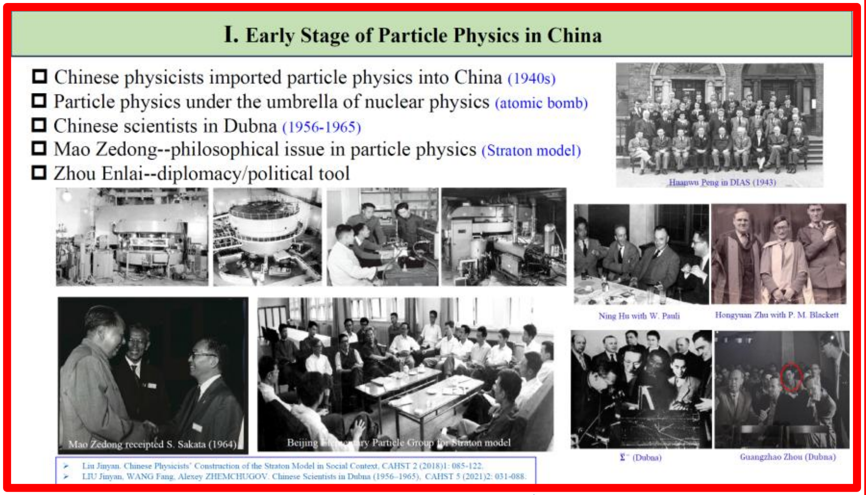
- **CEPC accelerator EDR progress highlights**
- **CEPC-SppC and FCC synergy and collaboration issues**
- **Summary**

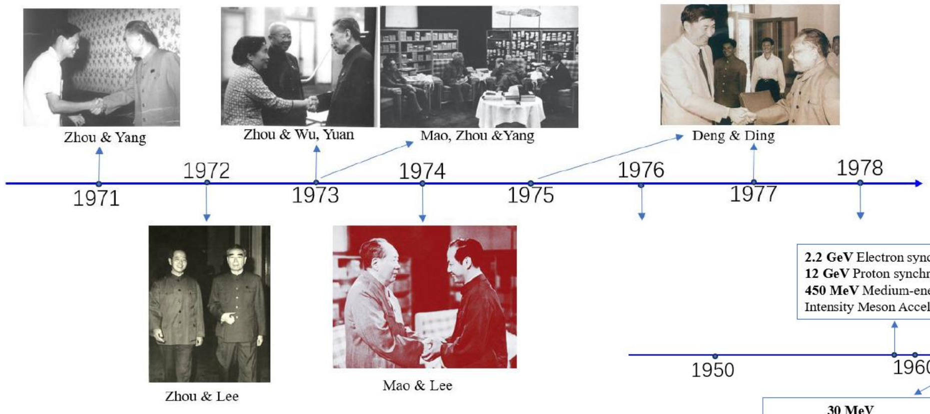
A Brief Recall of Physics and Particle Physics Histories in China

The first Chinese Ph.D degree on physics is
Dr. Fuji Li, from University of Bonn, Germany, in 1907

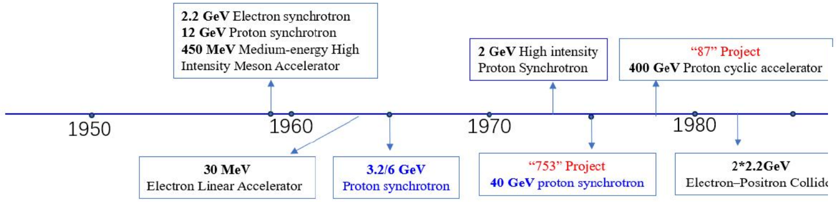


I. Early Stage of Particle Physics in China

- How to develop China's own particle physics
  A-bomb success; withdrew from JINR; career transition; accelerator design discussions
- China-US relationship thawed: CY Yang, TD Lee, CS Wu and Samuel Ting came back to China
  cultural revolution, bridge maker of the international cooperation
- Fulfill MAO Zedong and Zhou Enlai's last wish—Deng Xiaoping era



H. Kissinger visited China (July 1971)



BEPC

CEPC/SppC is a continuation of the history of particle physics in China as international projects

The Rise and Internationalization of Particle Physics in China

Liu Jinyan

Institute for the History of Natural Sciences, CAS
13 Nov. 2025 Geneva

The IRL FCPPL (France-China Particle Physics Laboratory) is finally born on June 12, 2026, signed at Paris, France https://fcppn.in2p3.fr/news/
A new milestone of Chinese particle physics international collaborations

4th International Symposium on the History of Particle Physics
Nov. 10-13, 2025, CERN https://indico.cern.ch/event/1480892/timetable/

M. Davier, "Minghan Ye and China–France collaboration in high-energy Physics", Int. J. Mod. Phys. A 40 (2025) 2545005, https://doi.org/10.1142/S0217751X25450058

The Classification of Electron Positron Circular Colliders

$$L_{\max}[\mathrm{cm}^{-2}\mathrm{s}^{-1}] = \frac{0.158 \times 10^{34}(1+r)}{\beta_y^*[\mathrm{mm}]} I_b[\mathrm{mA}] \sqrt{\frac{U_0[\mathrm{GeV}]}{N_{\mathrm{IP}}}}\, e^{\frac{\sqrt{\Phi p}}{3.22}} (1 + 0.000505 * \Phi p^2) \qquad \text{Eq. 1}$$

$$L_{\max}[\mathrm{cm}^{-2}\mathrm{s}^{-1}] = \frac{0.158 \times 10^{34}(1+r)}{\beta_y^*[\mathrm{mm}]} I_b[\mathrm{mA}] \sqrt{\frac{U_0[\mathrm{GeV}]}{N_{\mathrm{IP}}}}\, e^{\frac{\sqrt{\Phi p}}{3.22}} (1 + 0.000505 * \Phi p^2) F_{DA} \qquad \text{Eq. 2}$$

Φp is the Piwinski angle

$$F_{DA} = e^{\left(-\frac{A}{\beta_{y*}(mm)^2}\right)} = e^{-C\left(\frac{Da\_inj}{Accep\_inj}\right)^2}$$

Eq. 1 and Eq. 2 could be found in following reference:
J. Gao, "The CEPC Project Status", Nov. 2025, arXiv:2505.04663,
https://doi.org/10.48550/arXiv.2505.04663

I: Classical circular collider $\left(F_{DA} \sim 1, F_{DA} = e^{\left(-\frac{A}{\beta_{y*}(mm)^2}\right)}\right)$

Ada, VEP-I, VEPP-II, ACO, ADONE, SPEAR, PETRA, CESR, BEPC BEPCII, LEP-I,II, KEKB, PEP-II, VEPP-4, DAFNE(CW)

II: Advanced circular collider $\left(F_{DA} < 1, F_{DA} = e^{\left(-\frac{A}{\beta_{y*}(mm)^2}\right)}\right)$

SuperKEKB, CEPC, FCCee, LEP3, BEPCII-UP (CW), STCF, SCTF…

For Super KEK B: A=1.6mm^2 (off axis injection)
For Super KEK B: A=0.56mm^2 (on axis injection)

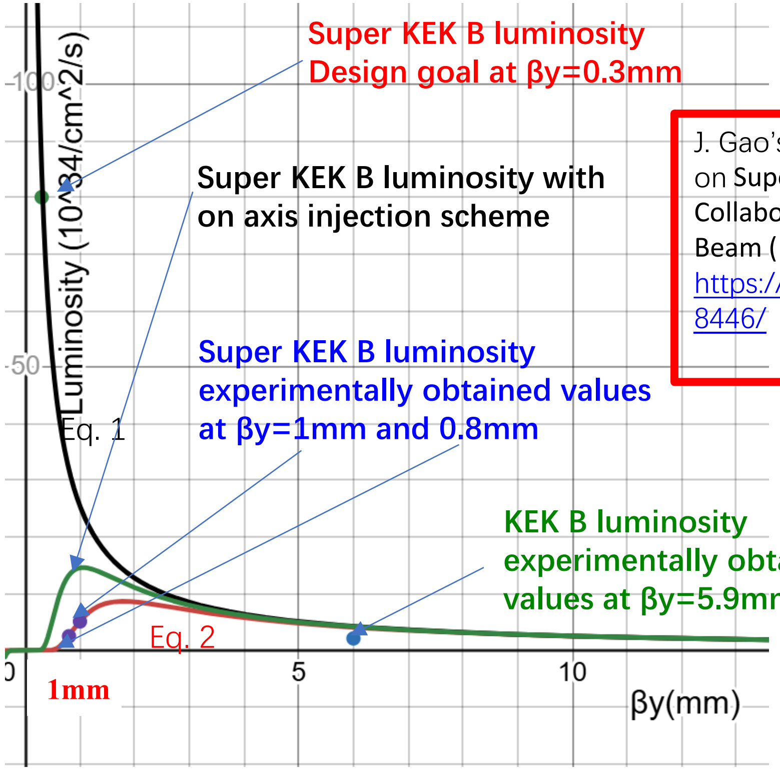


Figure 1: Super KEK B luminosities from the experiments and the analytical formulae Eq. 1 and Eq. 2

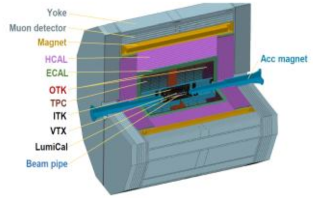
J. Gao's talk on Super KEK International Collaboration on Beam-Beam (ICMbb) Meeting
https://kds.kek.jp/event/58446/

SuperKEKB 24-Hour Operation Summary (live): https://www-linac.kek.jp/skekb/snapshot/dailysnap.html

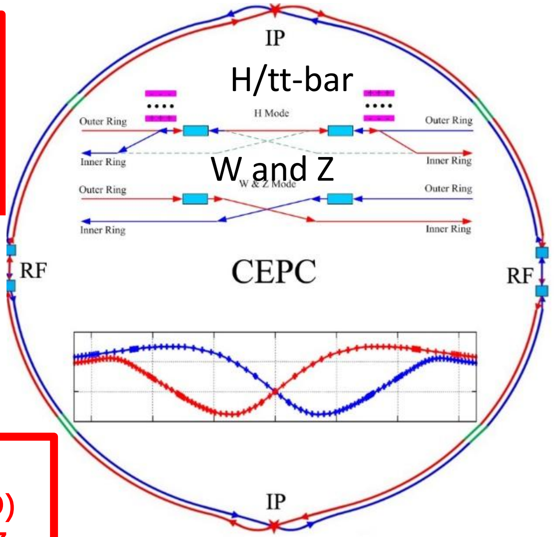
CEPC Higgs Factory and SppC Layout in TDR/EDR

CEPC as a Higgs Factory: H, W, Z, upgradable to ttbar, followed by a SppC (a Hadron collider) ~125TeV
30MW SR power per beam (upgradable to 50MW) , high energy gamma ray 100Kev~100MeV

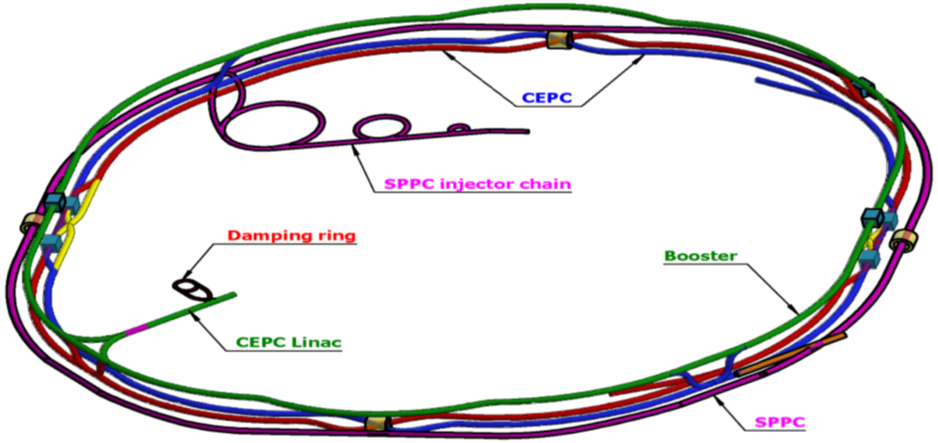
CEPC design has two detectors @H,W,Z and ttbar



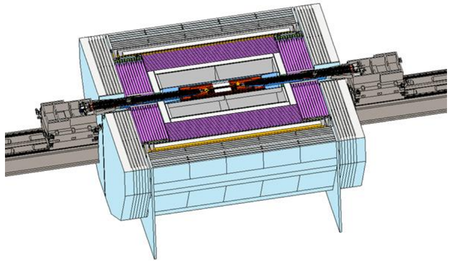
CEPC EDR cost of 38B RMB (~5B USD) @SR 30MW, H,W,Z
This cost EDR contains only one detector

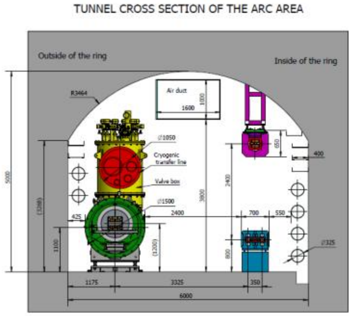


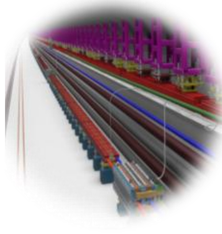
CEPC collider ring (100km)



CEPC booster ring (100km)

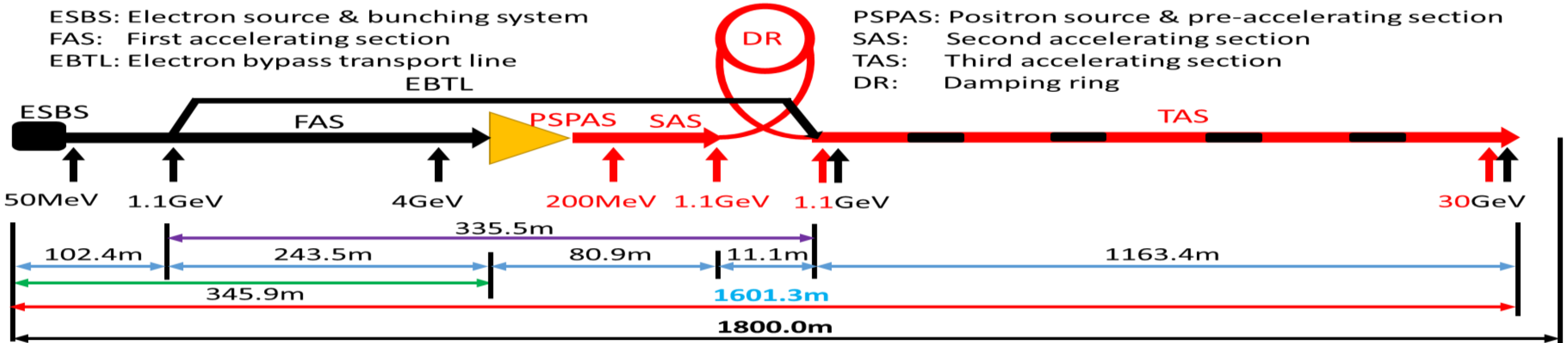


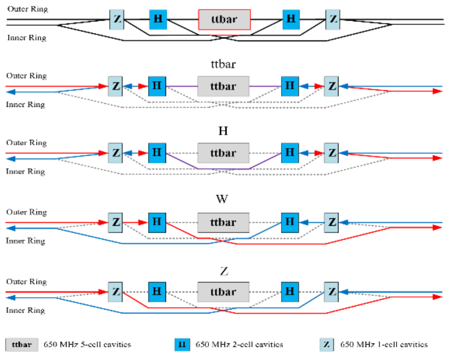




CEPC/SppC in the same tunnel

CEPC TDR S+C-band 30GeV linac injector





Z,W, Higgs and ttbar energies

J. Gao, D. Wang and Y.F. Wang*, Vision for high-energy frontier particle colliders in China, **Annual Review of Nuclear and Particle Science, Volume 75**, 2025, https://doi.org/10.1146/annurev-nucl-121423-101120

CEPC Accelerator System Parameters in TDR/EDR

Linac

Parameter	Symbol	Unit	Baseline
Energy	E_{e-}/E_{e+}	GeV	**30**
Repetition rate	f_{rep}	Hz	100
Bunch number per pulse			1 or 2
Bunch charge		nC	1.5 (3)
Energy spread	σ_E		1.5×10^{-3}
Emittance	ε_r	nm	6.5

Booster

		tt	*H*		*W*	*Z*	
		Off axis injection	Off axis injection	On axis injection	Off axis injection	Off axis injection	
Circumfer.	km	**99.955**					
Injection energy	GeV	**30**					
Extraction energy	GeV	**180**	**120**		**80**	**45.5**	
Bunch number		35	268	261+7	1297	3978	5967
Maximum bunch charge	nC	0.99	0.7	20.3	0.73	0.8	0.81
Beam current	mA	0.11	0.94	0.98	2.85	9.5	14.4
SR power	MW	0.93	0.94	1.66	0.94	0.323	0.49
Emittance	nm	2.83	1.26		0.56	0.19	
RF frequency	GHz	1.3					
RF voltage	GV	9.7	2.17		0.87	0.46	
Full injection from empty	h	0.1	0.14	0.16	0.27	1.8	0.8

Collider

	Higgs	Z	W	$t\bar{t}$
Number of IPs	2			
Circumference (km)	**99.955**			
SR power per beam (MW)	**30**			
Energy (GeV)	**120**	**45.5**	**80**	**180**
Bunch number	268	11934	1297	35
Emittance $\varepsilon_x/\varepsilon_y$ (nm/pm)	0.64/1.3	0.27/1.4	0.87/1.7	1.4/4.7
Beam size at IP σ_x/σ_y (um/nm)	14/36	6/35	13/42	39/113
Bunch length (natural/total) (mm)	2.3/4.1	2.5/8.7	2.5/4.9	2.2/2.9
Beam-beam parameters ξ_x/ξ_y	0.015/0.11	0.004/0.127	0.012/0.113	0.071/0.1
RF frequency (MHz)	650			
Luminosity per IP (10^{34} cm^{-2} s^{-1})	**5.0**	**115**	**16**	**0.5**
Luminosity per IP (10^{34} cm^{-2} s^{-1}) From J. Gao's formula below	**5**	**115**	**12**	**0.59**

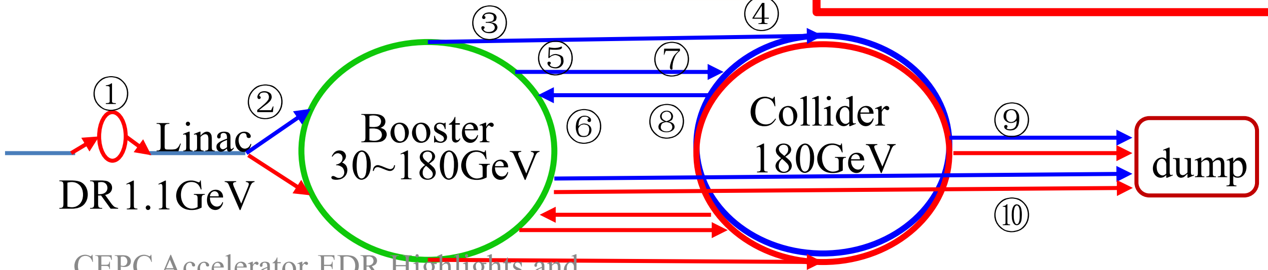
Running scenarios: Higgs 10 years, Z 2 years, W 1 year, ttbar 5 years

$$L_{max}\,[cm^{-2}\ s^{-1}] = 0.158\times10^{34}\,\frac{(1+r)}{\beta_y[\mathrm{mm}]}\sqrt{\frac{R[m]}{C_\gamma[mGeV^3]N_{IP}}}\,(P_b[\mathrm{MW}]/E[GeV]^2)\,e^{\frac{\sqrt{\Phi_p}}{3.22}}\,(1+0.000505*\Phi_p^2)$$ (J. Gao's formula)

for isomagnetic machine with crab-waist collision

Factory of
4 Million Higgs
4 Trillion Z bosons
200 Million W+W- pairs
600K $t\bar{t}$ pairs

Transport lines



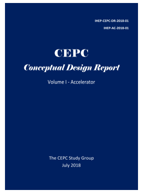
CEPC Technical Design Report (TDR) includes:
1) CEPC Accelerator TDR released on Dec. 25, 2023
2) CEPC Detector ref-TDR (reference design) has been completed and reviewed by IDRC and released in 2025. Submitted to RDTM in 2026

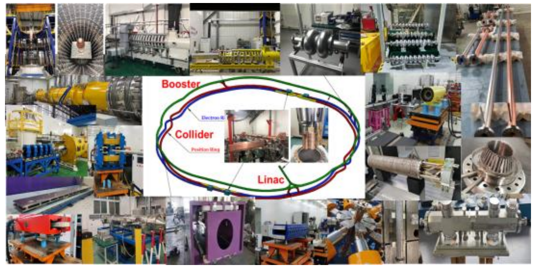
CEPC Milestones and Timeline

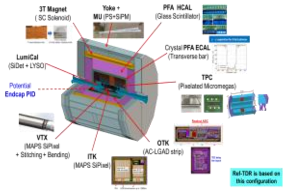
Year 2012 2013 2015 2017 2018 2023 2025 2026 2030 ~2030's construction

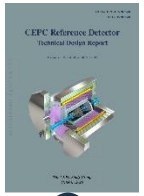
Higgs discovered on July 4, 2012

CEPC kickoff meeting in Sept. 2013





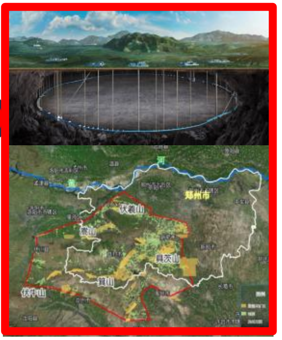




CEPC detector reference design released in Oct. 2025

Proposal (2030) for CEPC entering 16th five-year-plan

38B RMB
Total construction



CEPC EDR site study and civil engineering design

2012.9 2013.9 2015.3 2017.4 2018.11 2023.12 2024 ~ 2027 ~2030's construction

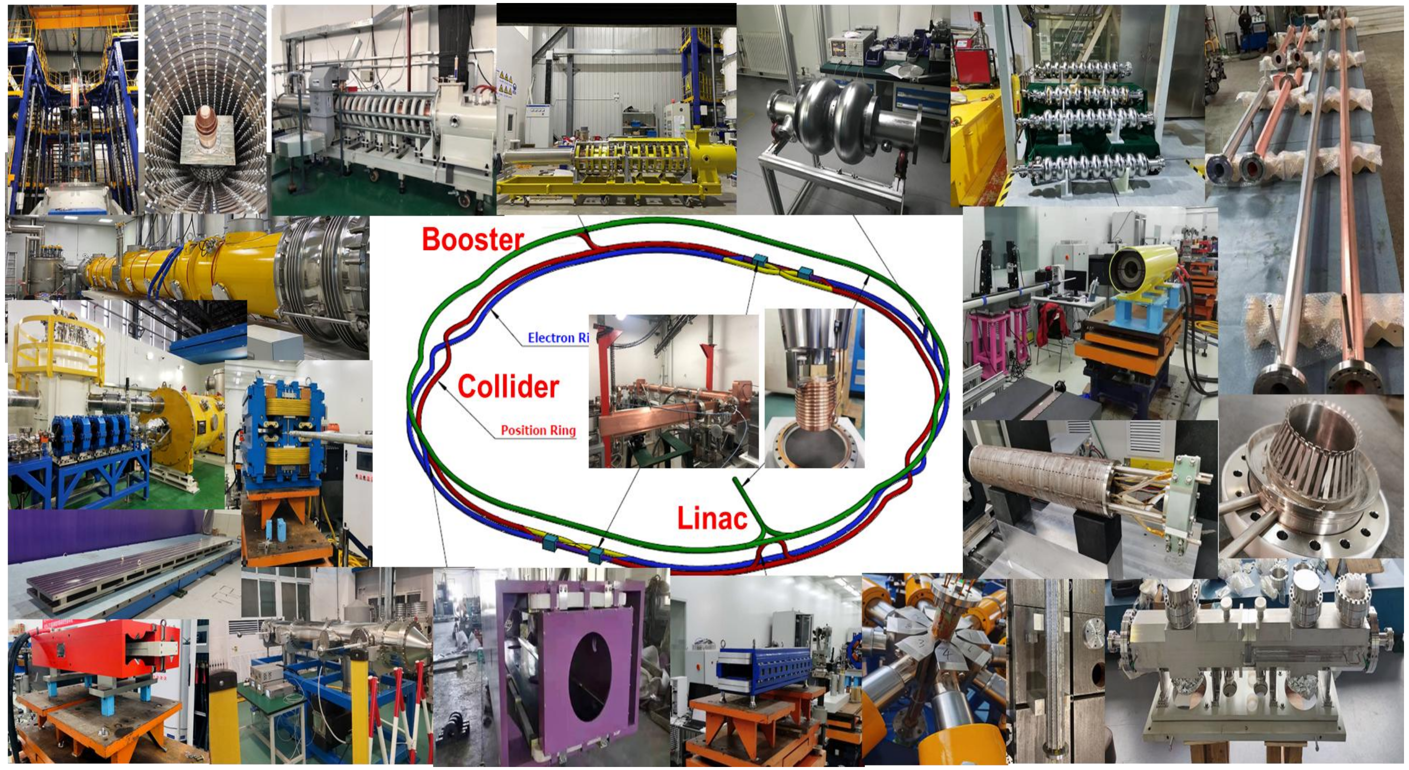
CEPC proposed | Pre-CDR | Progress report | CDR | TDR | EDR

FCCee decision in 2028 and construction ~2033

J. Gao, "The CEPC Project Status", Nov. 2025, arXiv:2505.04663, https://doi.org/10.48550/arXiv.2505.04663

The European Strategy for Particle Physics: 2026 Update Recommendations by the European Strategy Group(CERN-ESU-2025-002, Dec.2025) https://cds.cern.ch/record/2950671

CEPC Accelerator TDR Completed in 2023



✓ **Specification Met**

✓ **Prototype Manufactured**

Accelerator	Fraction
✓ Magnets	27.3%
✓ Vacuum	18.3%
√ RF power source	9.1%
✓ Mechanics	7.6%
✓ Magnet power supplies	7.0%
✓ SC RF	7.1%
✓ Cryogenics	6.5%
✓ Linac and sources	5.5%
✓ Instrumentation	5.3%
✓ Control	2.4%
✓ Survey and alignment	2.4%
✓ Radiation protection	1.0%
✓ SC magnets	0.4%
✓ Damping ring	0.2%

IHEP HEPS (4th generation light source at IHEP) 6 GeV, 36 nm·rad, has been completed in Oct. 2025

CEPC Accelerator TDR was published in Radiation Detection Technology and Methods (RDTM) on June 3, 2024:
DOI: 10.1007/s41605-024-00463-y https://doi.org/10.1007/s41605-024-00463-y

CEPC EDR Milestones and Check Points

Year: 2024 2025 2026 2027 2028 2030

Start EDR site geological studies by civil engineering company; EDR items started to be executed in an industrial way, such as magnet and vacuum NEG coating automatic lines, 650MHz full size cryomodule, C-band 80 MW klystron, C-band accelerator test band, CEPC 60m mockup tunnel, MDI SC CCT type quadrupole magnet, MDI design with SC quadrupole cryomodule, booster and collider ring magnets, civil engineering design, etc.

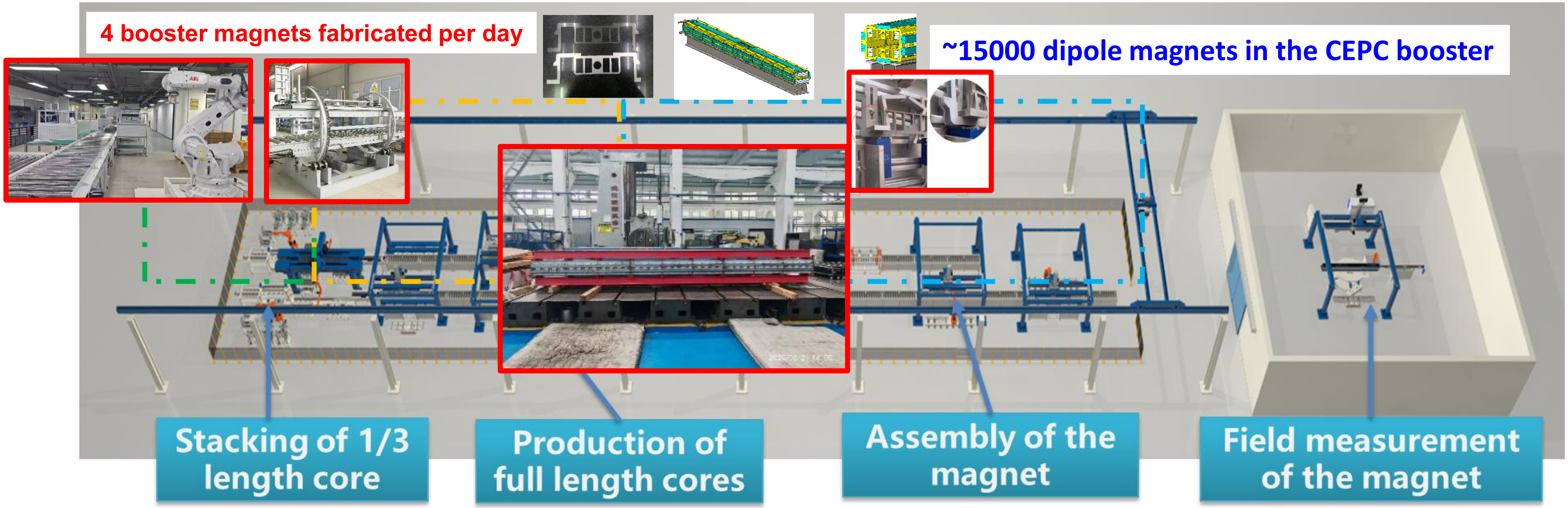
Complete Detector TDR ref Design report

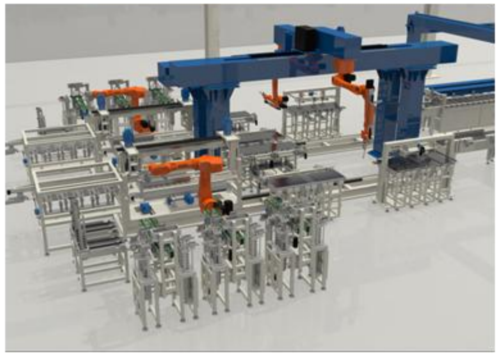
EDR site geological study completed with good understanding of EDR site for starting site dependent civil engineering design; Complete following key EDR items: magnet and vacuum NEG coating automatic lines, 650MHz full size cryomodule, C-band 80 MW klystron, CEPC 60m mockup tunnel, etc. ; Continue C-band accelerator test band, MDI SC CCT type quadrupole magnet, MDI design with SC quadrupole cryomodule, booster and collider ring magnets, civil engineering design, etc. Obtaining government approval.

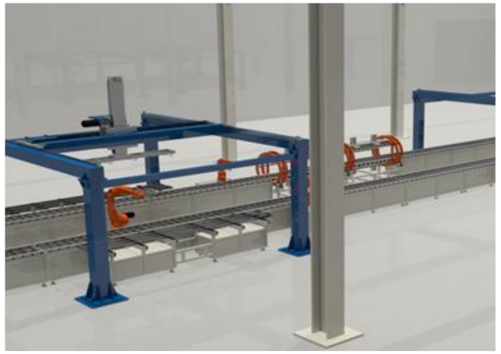
EDR site dependent civil engineering design completed; Complete EDR report with following key EDR items completed: magnet and vacuum NEG coating automatic lines in operation, 650MHz full size cryomodule, C-band 80 MW klystron, CEPC 60m mockup tunnel, C-band accelerator test band, MDI SC CCT type quadrupole magnet, MDI design with SC quadrupole cryomodule, booster and collider ring magnets, etc., ready for construction with government approval.

Application for 16th five year plan

CEPC Booster Magnet Automatic Production Line in EDR

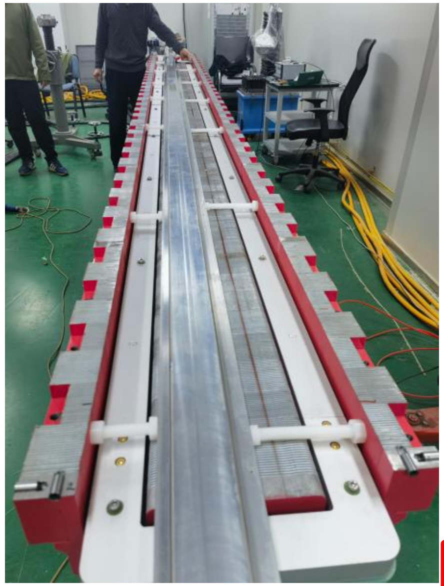


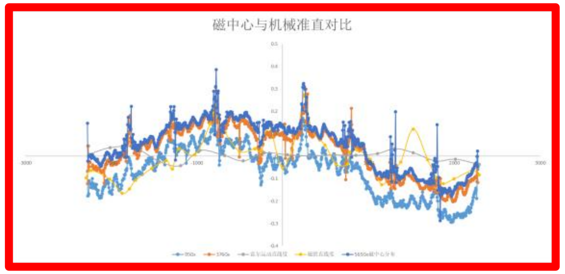




Status： under construction, to be completed by June 2026

CEPC Booster Production Line and Combined Dipole+Sextupole Booster Magnet

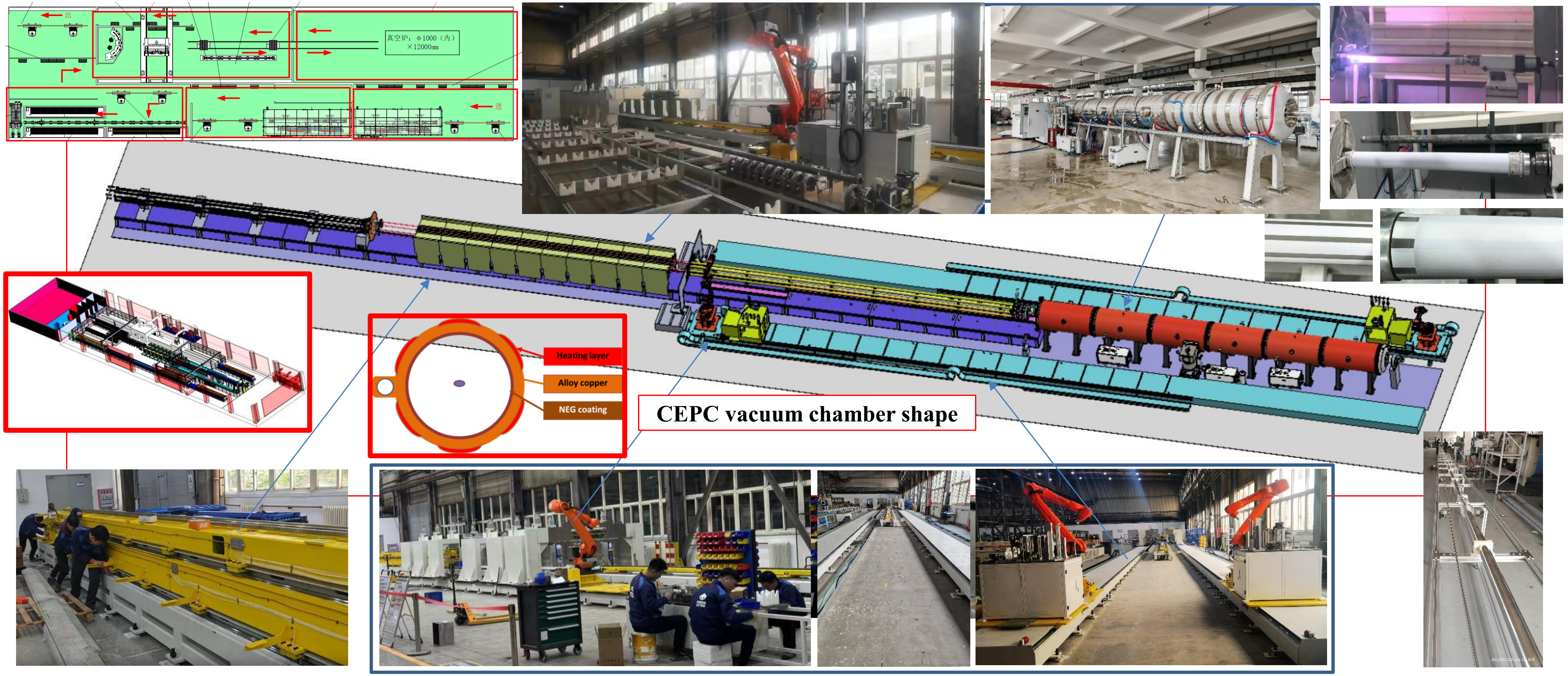




The CEPC booster dipole automatic production line will be completed by **June 2026**

The fabrication of the booster Dipole+sextupole magnet has been completed and are under field and alignment measurement verfications

CEPC NEG Coated Vacuum Chamber (200km)
Automatic Production Line in EDR

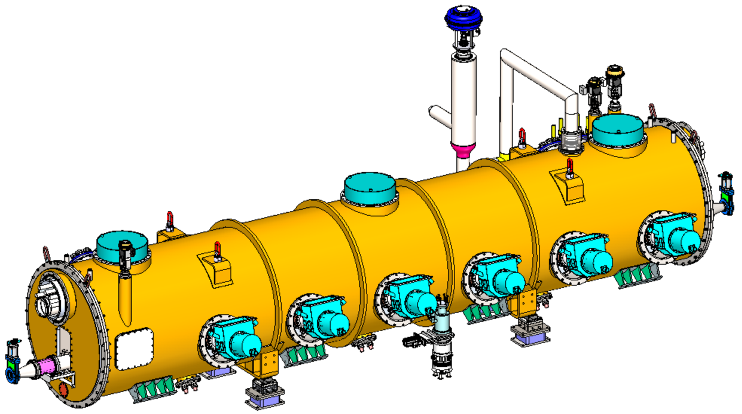
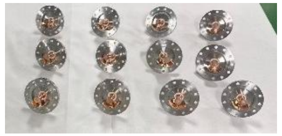


- The main components of vacuum oven for NEG coating have been manufactured and under are now being assembled.

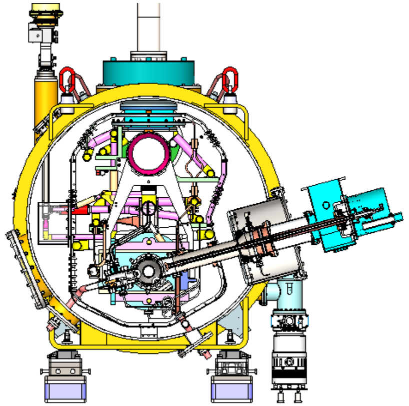
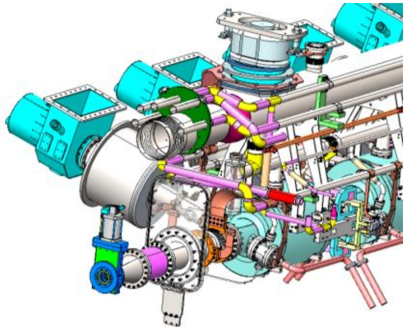
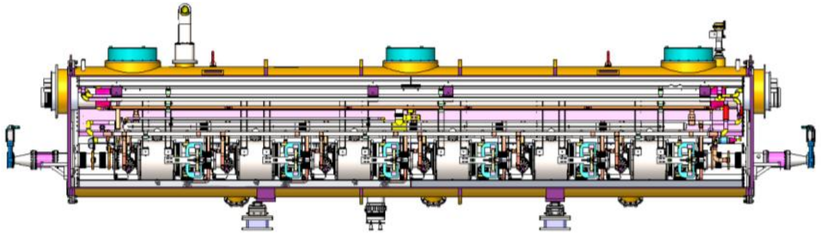
Status：under construction, to be completed by June 2026

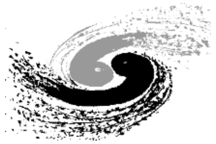
CEPC 650MHz SRF Development in EDR



CEPC collider ring 650MHz 2*cell short test module has been completed in TDR phase



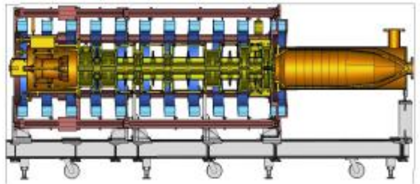
The collider Higgs mode for 30 MW SR power per beam will use 32 units of 11 m-long collider cryomodules will contain six 650 MHz 2-cell cavities, and therefore, a full size 650 MHz cryomodule will be developed in EDR

Status： construction started, to be completed in 2027

CEPC High Efficiency and High Power Klystrons

Klystron R&D

Klystron No. 2
Efficiency 77%
(2021)



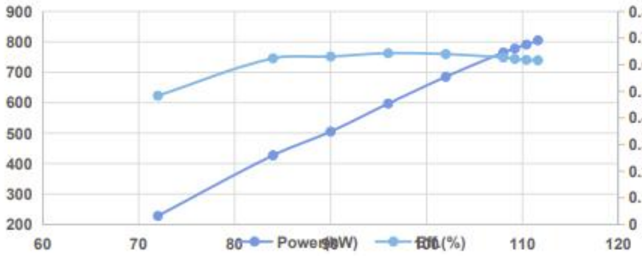
Klystron No. 1
Efficiency 65%
(2020)

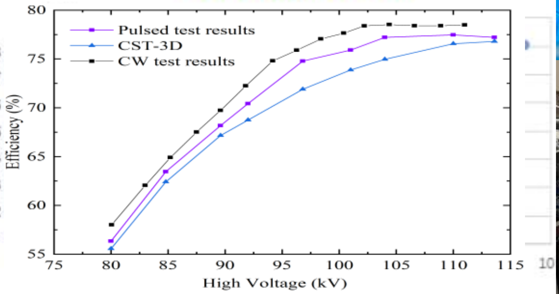
Klystron No. 3 （MBK
Efficiency 80.5%

To be completed in 2026

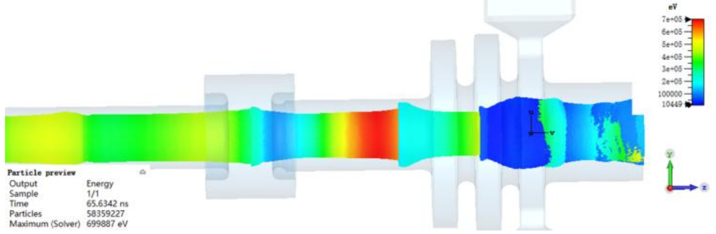
Pulsed RF Mode (30% duty factor, 60ms/5Hz)

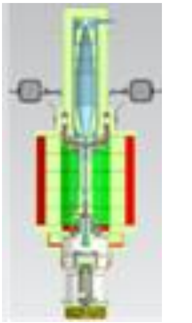
78.5%@803kW CW in 2024

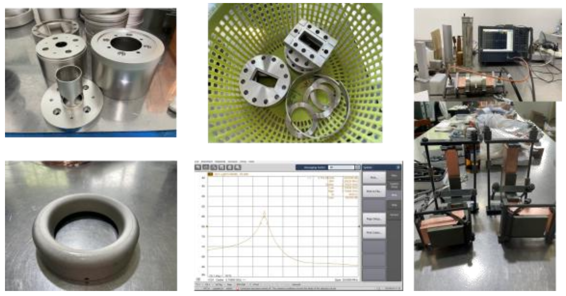




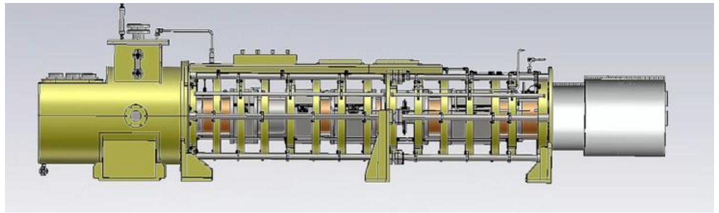
CEPC collider ring 650MHz klystron development in TDR/EDR phase

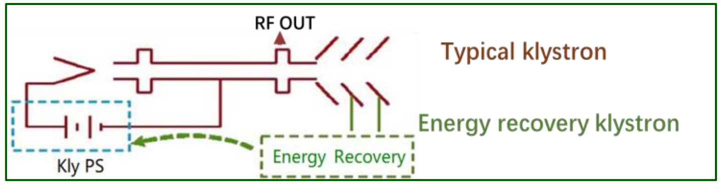






CEPC 650Mhz Energy Recovery Klystron





Parameter	Value
Operating frequency	650 MHz
Beam Voltage	113 kV
Efficiency	77.5%
Output power	800 kW
Beam perveance	0.25 μP
Beam current	9.5A
Efficiency (one-stage depressed collector)	85%

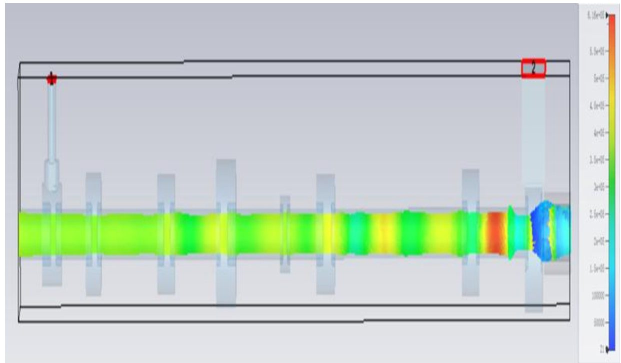
CEPC 650Mhz Energy Recovery Klystron to be tested in Sept. in 2026

Linac C band 5720MHz 80MW Klystron design completed
to be completed in 2026

A Full Frequency Spectrum Klystron Development

CEPC Linac S band high efficiency klystron（2860MHz/80MW/100Hz/4us/55%）

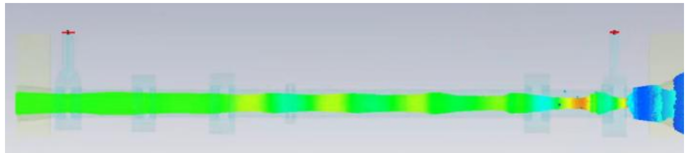
to be tested in 2026



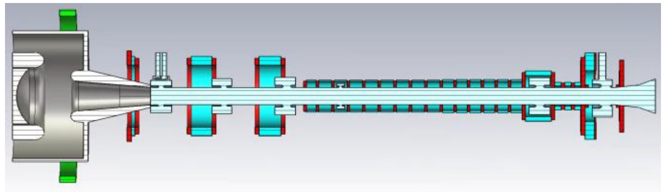
S band PPM klystron（2856MHz/50MW/53%）

Fabrication starts in 2026

S-band 50MW PPM Klystron	Design Specifications
Beam Voltage	350kV
Beam Current	272A
Frequency	2856MHz
Tube Radius	13.8mm
Beam Radius	9mm
Output Power	50MW
Efficiency	53%



Beam dynamic

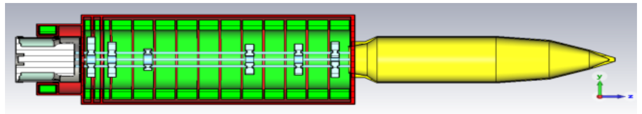


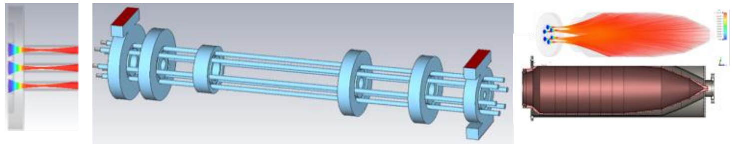
Klystron structure

L-Ban long pulsed klystron（1.3GHz/10MW/1.5ms/10Hz

to be completed by the end of 2026

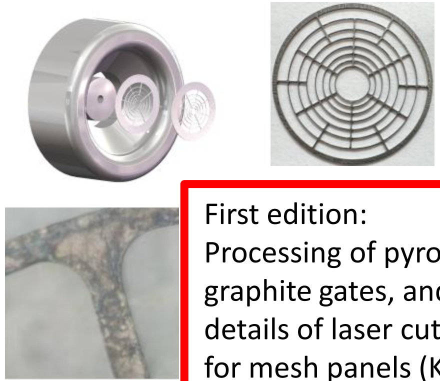
Parameters	Value
Freq.(GHz)	1.3
H.V.(kV)	115
Current(A)	21×6
Beam No.	6
Rep. Rate(Hz)	10
Pulse Width(ms)	1.5
Power(MW)	≥10
Eff.	≥65%





CEPC 650MHZ MB Tristron R&D, to be completed in 2028

The maturation of pyrolytic graphite manufacturing technology, the refinement of gate cooling methods and advances in brazing techniques have made it possible to produce high-efficiency, high-power Tristrons.

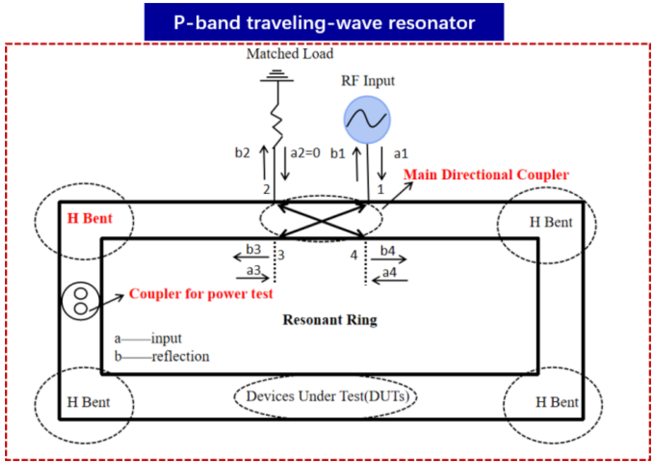


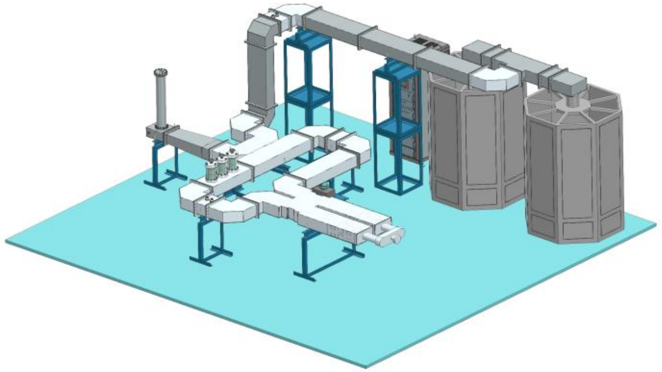
First edition: Processing of pyrolytic graphite gates, and the details of laser cutting for mesh panels (Key technology of Tristrons). The first Tristron to be completed in 2028

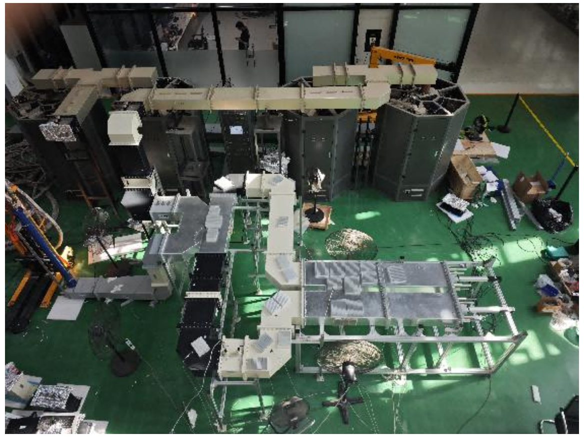
CEPC P-Band Resonant Ring (Rf window testing)

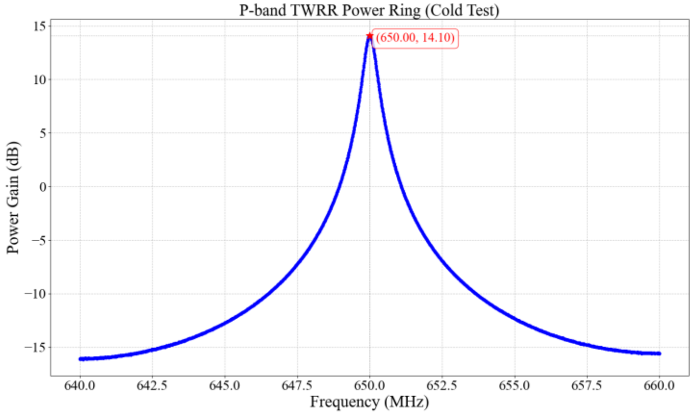
Table 1 Design value of P-band TWRR

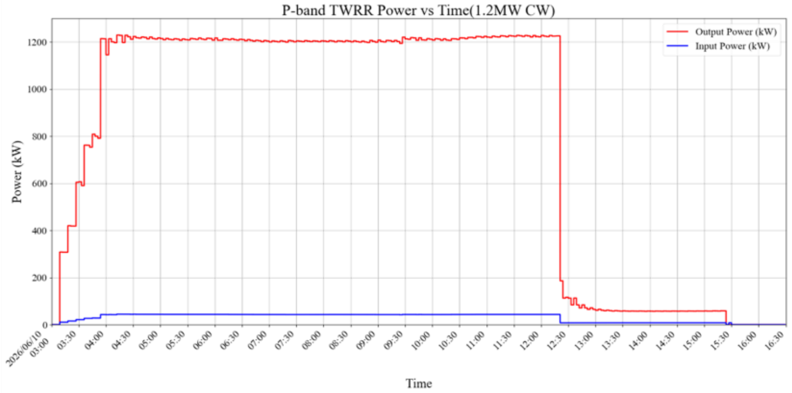
Waveguide	WR1500
Length of the ring/m	9.28
Coupling coeficeent/dB	–10.2
Attunation/dB	-0.10
Power Gain(theoretical value)/dB	14.14
Power Gain(cold test)/dB	14.10











CEPC Cool Copper C-Band Linac Technology R&D

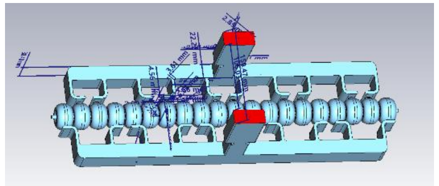
- CEPC is exploring the Cool Copper **C-band linac** technology (5712MHz is the test facility frequency)
- Two types of structures have been studied, type I and type II

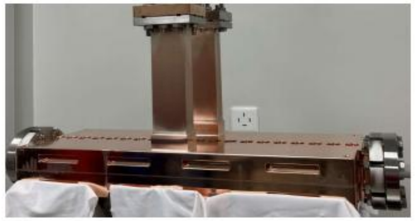
Type I has reached 128.5MV/m, Q0=31387 with input power of 32.45MW on Nov. 24, 2025 (Iris diameter 5.25mm).

Type II will reach 144MV/m with 80MW input

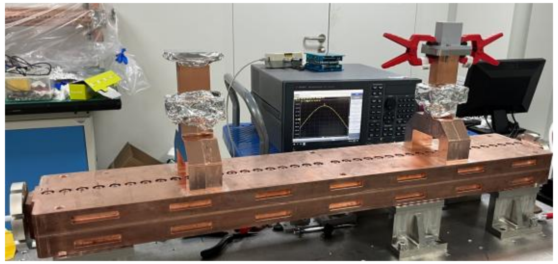
（Iris diameter 10.49mm）

Parameters	Value
Fre (MHz)@77K	5712
Mode	Pi
Cavity numbers	20
Shunt impedance per meter(MΩ/m)@77K	303
E_s/E_0	2.42
Q_0@77K	31905



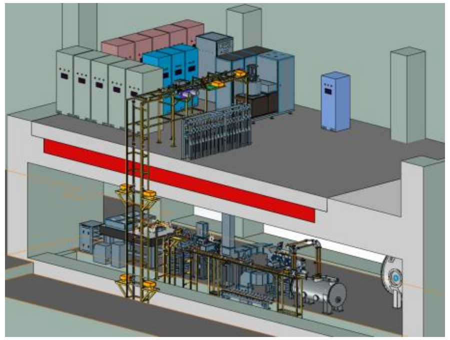


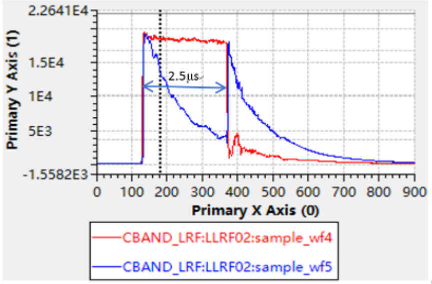
Type I: Aperture diameter 5mm, Length 0.5m

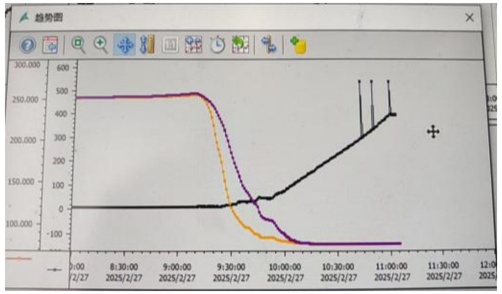


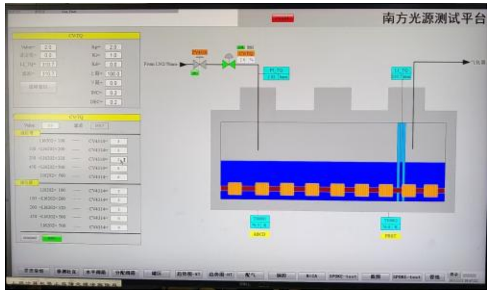
Type II: Aperture diameter 10mm, Length 1m under measurement and power test in Nov. 2026

This cool coper C-band type-II structure has the potential to be applied to CEPC injector when necessary (also for FEL)









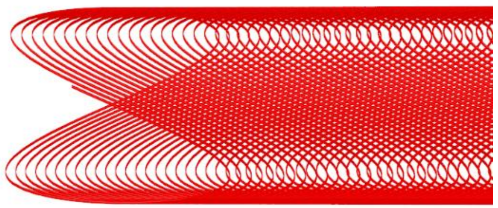
Crucial Parameters	Symbol	Values	Units
Temperature	T	77	K
Resonant Frequency	f_0	5.712	GHz
Working Mode	-	π	-
No. of Cavities	n	40	-
Total Length	L	1.17	m
Gradient @ 64MW	G	128.6	MV/m
Gradient vs Power ratio @64MW	$G/\sqrt{P_{in}}$	16.1	MV/m/$\sqrt{MW}$
Aperture	2a	10.487	mm
Diameter	2b	39.24	mm
Nose Distance	d	18.7	mm
Cell Length	p	26.24	mm
Copper Conductivity	σ_{77K}	45.47 x 10^7	S/m
Q factor(with Coupler)	Q_0	31536	-
Shunt Impedance	R_s	259	MΩ/m
E_s/E_0	E_s/E_0	1.96	-
Frequency Sensitivity	f_s	300	kHz/μm
Coupling Strength	β	1.007	-
Modified Poynting Vector @ 128MV/m	S_c	4.5	W/μm^2
Pulse Heating @128MV/m	ΔT	48.6	K
$H_{coupler}/H_{cavity}$	-	1.15	-

Design parameters of SC quadrupoles with CCT coil

● Design parameters of Q1a, Q1b, Q2 magnet with iron-free CCT coil @ Higgs

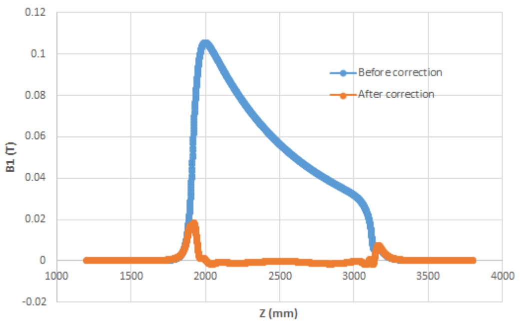
	Q1a	Q1b	Q2
Field gradient (T/m)	142.3	85.4	96.7
Magnetic length (m)	1.21	1.21	1.5
Excitation current (A)	780 (Traditional) 730 (Direct winding)	640	760
Conductor diameter (HTS or LTS, mm)	0.7	0.8	0.8
Current density (A/mm^2)	2030 / 1900	1270	1510
Maximum dipole field in aperture (Gs)	226	124	127
Stored energy (KJ)	16.7	15.2	36.1
Peak field in coil (T)	4.3	3.8	4.2
Integrated field harmonics	$<2\times10^{-4}$		
(Single aperture) Coil inner radius (mm)	20	26	31
(Single aperture) Coil outer radius (mm)	30.5	39	44
Magnet mechanical length (m)	1.23	1.23	1.53
Net weight (kg)	25	32	43
Total weight of Q1a, Q1b, Q2 (kg)	100		
For comparison, old net weight with iron option (kg)	Q1a: 93, Q1b:124, Q2: 235 Total weight of Q1a, Q1b, Q2: 452		

Direct winding CCT coil is preferred for CEPC



IHEP fabricated CEPC CCT coil prototype with direct winding, inner diameter 40mm, 600mm long, **to be vertical tested by June 2026**

Q1a Direct winding CCT coil
Preliminary design
Round 0.7mm conductor, canted angle: 24 deg
8 layers CCT quadrupole coil. The inner radius of the coil is 20mm
Excitation current: 730A @4.2K (2K is also under study)
3D calculation in OPERA-3D
Radius of single aperture <31mm

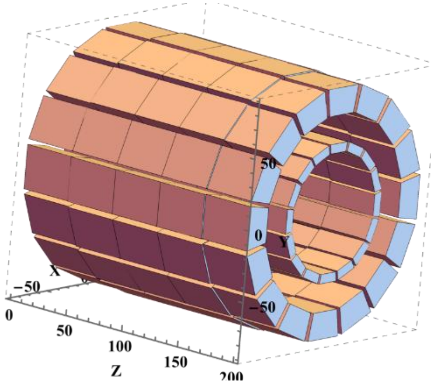


Q1b Q2 Direct winding CCT coil
Round 0.8mm conductor, canted angle: 24 deg
8 layers CCT quadrupole coil.
After correction, local dipole field decreases to less than 150Gs (Higgs)
Calculated integrated field harmonics are smaller than 2×10^{-4}

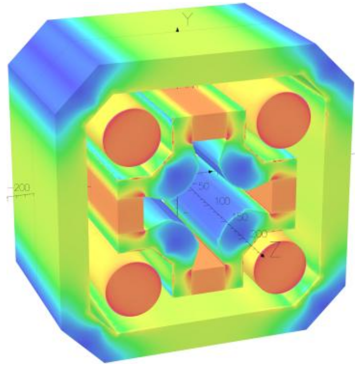
CEPC Collider Ring Adjustable Permanent Quadrupole Magnets Development

To save the electric power from quadrupoles of collider ring

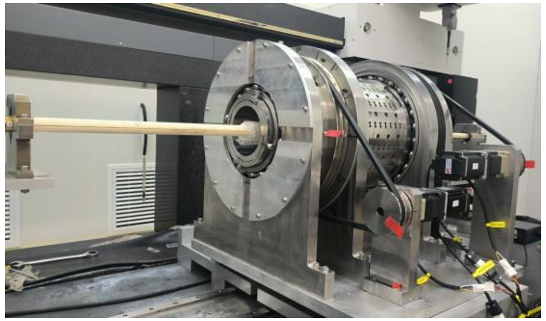
Quadrupole magnet aperture	Φ	mm	≥66
Effective magnet length	L_{eff}	mm	≥200
Max. gradient	G_{max}	T/m	≥10.6
Gradient adjustable range		T/m	1.8 ~ 10.6
Gradient adjust precision	ΔG	T/m	≤0.002
Rings' rotation precison	Δθ	mrad	≤0.08
Good field radius	GFR	mm	12
High order magnet component量 @G_{max}	B_n/B_2	10^{-4}	＜5

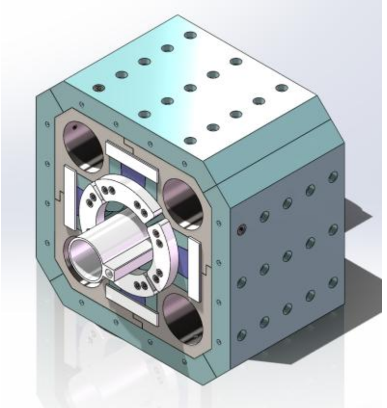


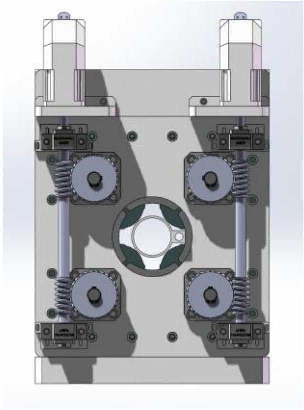
Type 1: Halbach double-ring all-permanent magnet



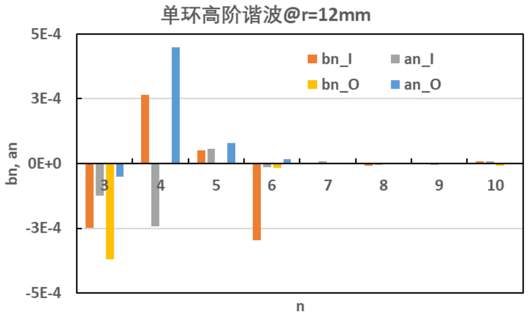
Type 2: Hybrid

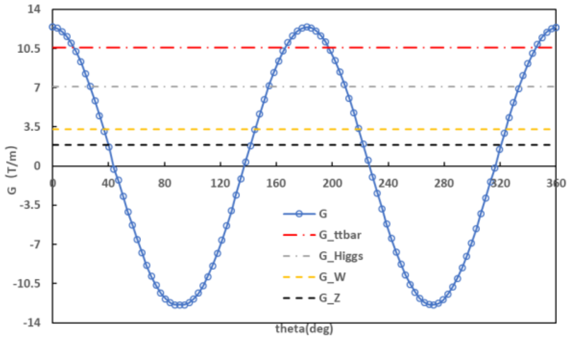




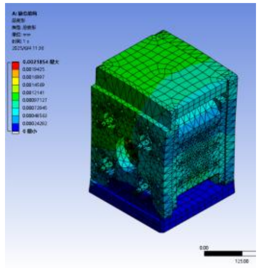


Type 1: Halbach double-ring all-permanent magnet experimental results:
Two ring high order magnetic components less than 0.05%, and adjustable range reached the 4 energy modes

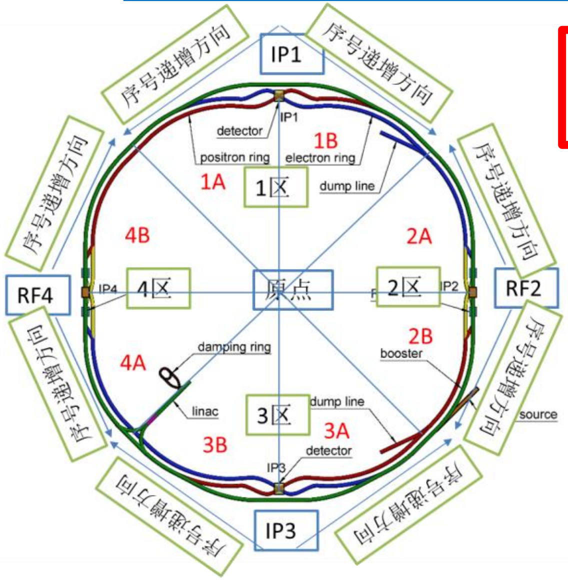




Type 2: Hybrid adjustable quadrupole is under design



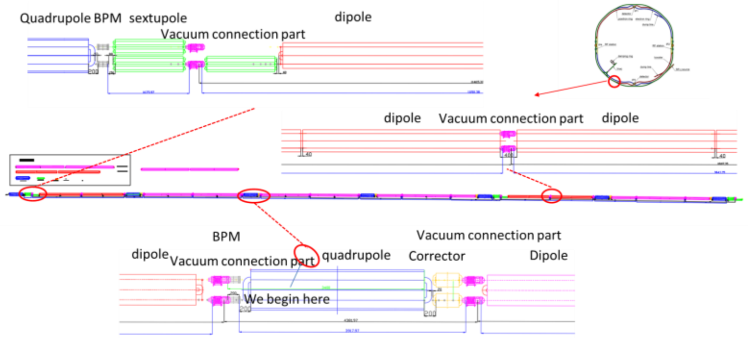
CEPC Accelerator EDR: Survey and Mechanical 2D/3D Design

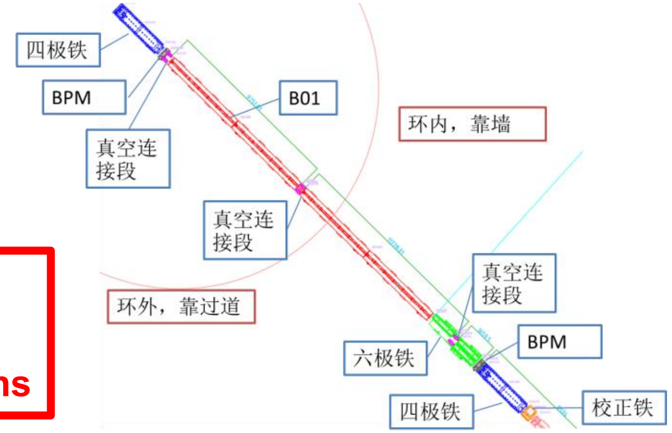


CEPC Facility components' naming sysem established

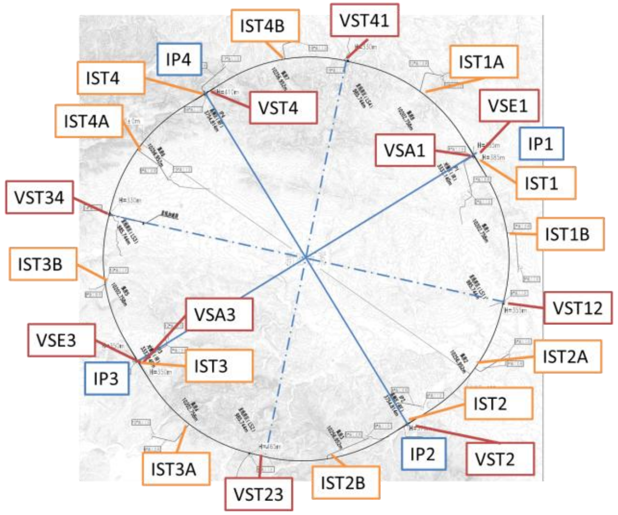
2D/3D linkage design for CEPC accelerator survey:

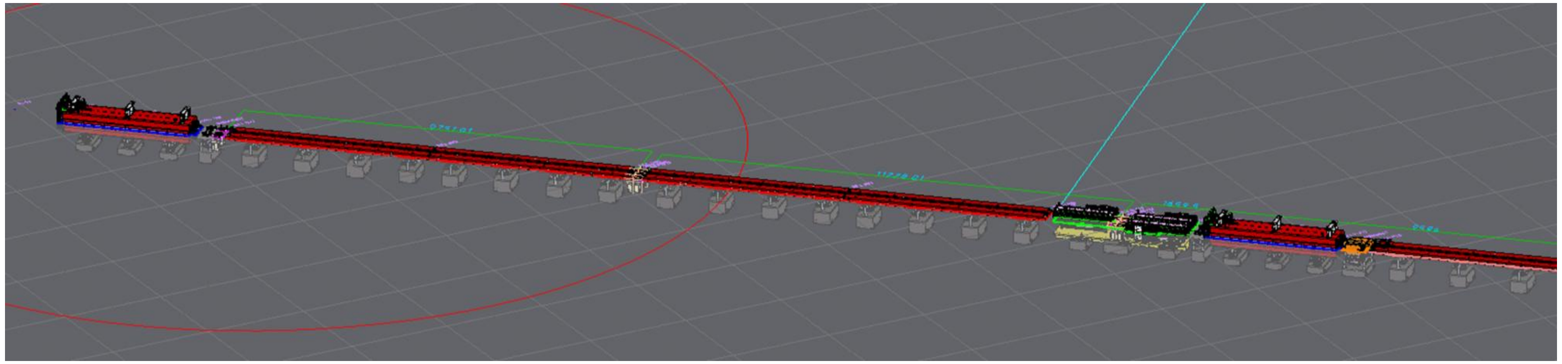
- If the 3D model is changed or replaced, the 2D model will be updated.
- If the 2D model is replaced or its location is changed, the 3D model will be updated.





CEPC accelerator survey and mechanical design has been ~90% completed with components right positions and right dimensions

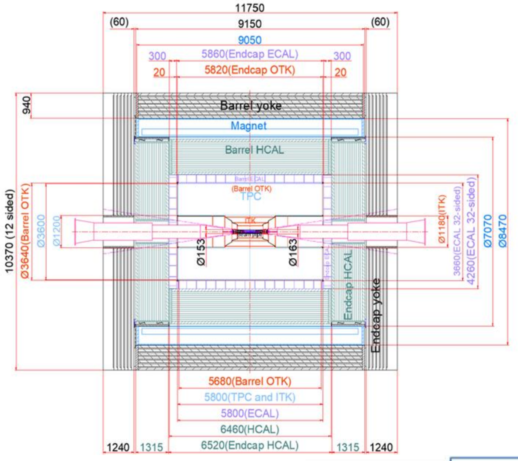


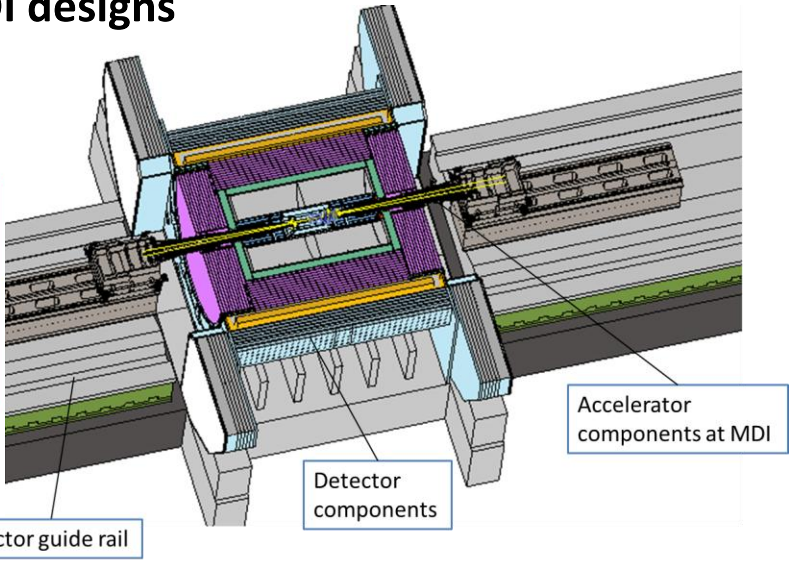


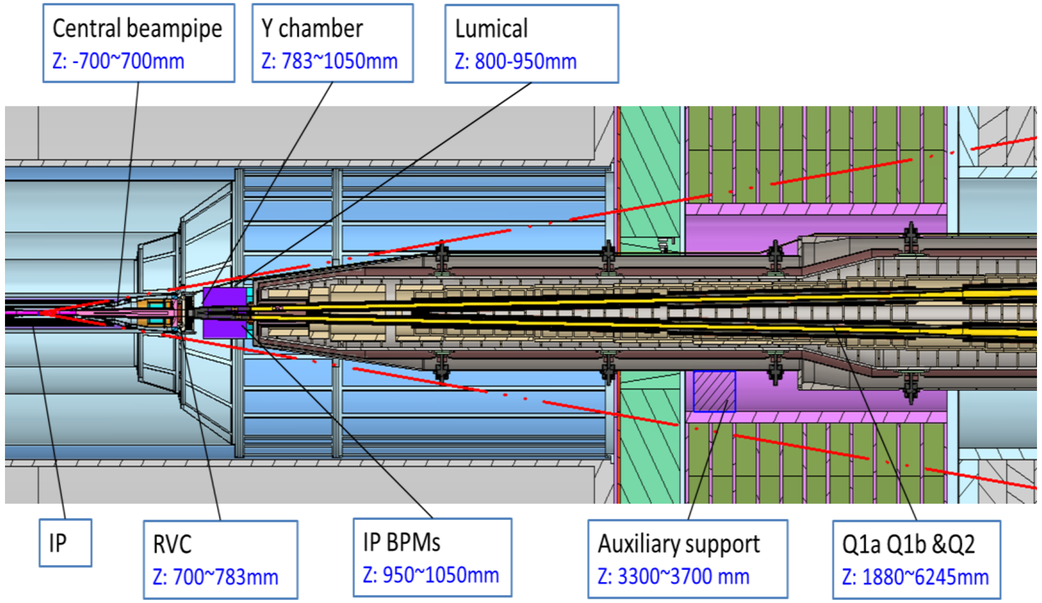
CEPC 10 vertical shafts and 12 horizontal access tunnel distribution

CEPC MDI EDR Activities

CEPC MDI designs

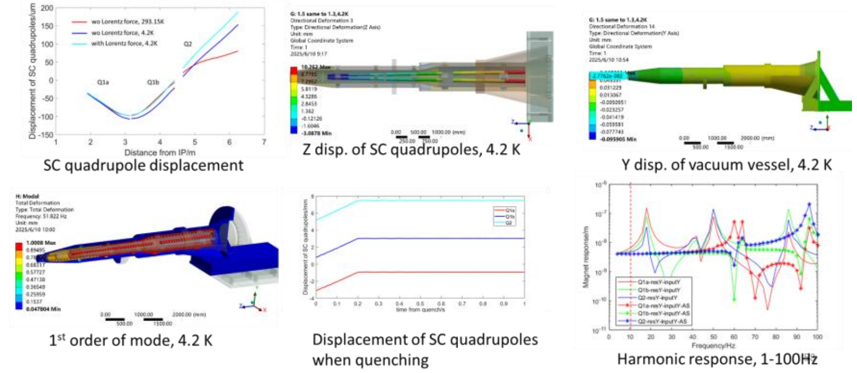






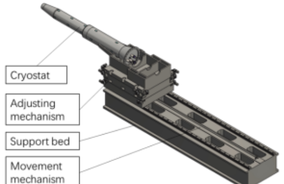
CEPC MDI mechanics progress-mechanical analyses

- Simulation results, with Lorentz force and gravity

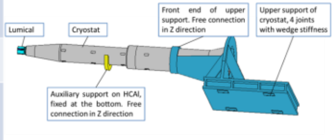


CEPC MDI Mechanical Analyses

- Mechanics and vibration analyses
  - **Static structure**: max. deformation and displacement change with/wo Lorentz force
  - **Vibration analyses**: natural frequency & harmonic response
  - **Structure optimization**



Designed model



Analyses model

	Related requirements	Response now*
Position accuracy (X/Y) of SC quadrupoles ≤100μm	Adjusting resolution≤5μm Adjusting accuracy≤30μm	≤5μm ≤30μm from HEPS experience
	Max. def. and disp. change, < 50μm	FEA, <40μm
Small vibration, 1-100Hz RMS ≤4nm	High natural frequency	FEA, ~50Hz and 1 (same level to HEPS, and arc section of CEPC)
	Low amplification factor	

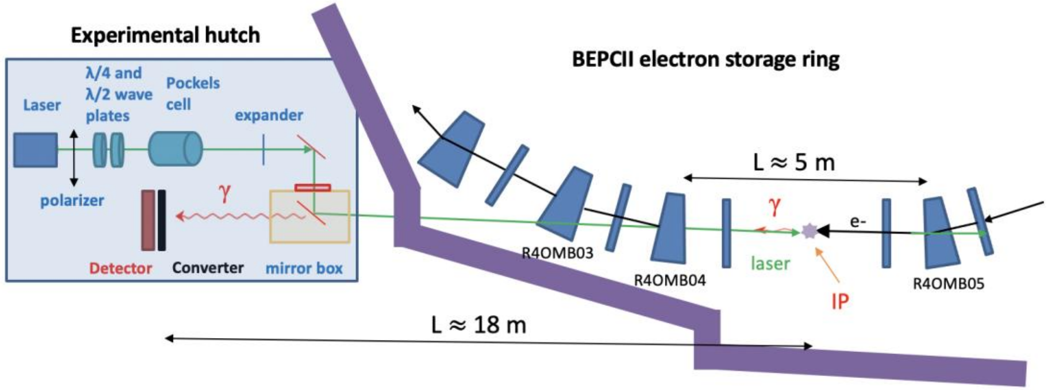
* The response now only considers the mechanics aspect.

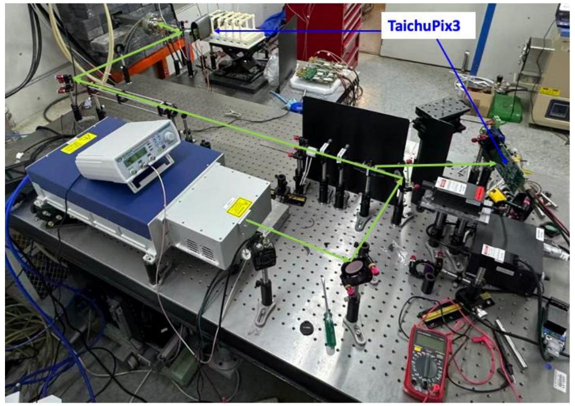
	Ground motion requirements, RMS, 1-100 Hz displacement integral
MDI	≤4 nm
Arc and straight section, and RF section in Collider	≤24 nm
Linac	≤50 nm

CEPC Polarization in Preparation Study

-Compton Polarimeter at BEPCII-U

- A laser-Compton polarimeter has been implemented in BEPCII electron storage ring
- Laser-electron collision signal has been observed
- Measurement of electron beam polarization is under way

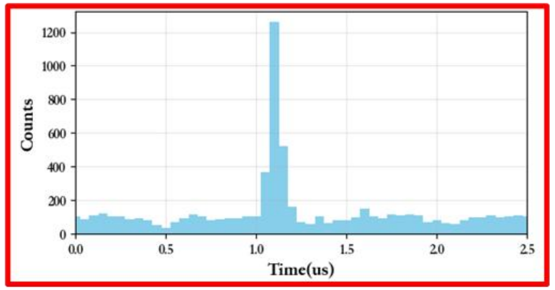




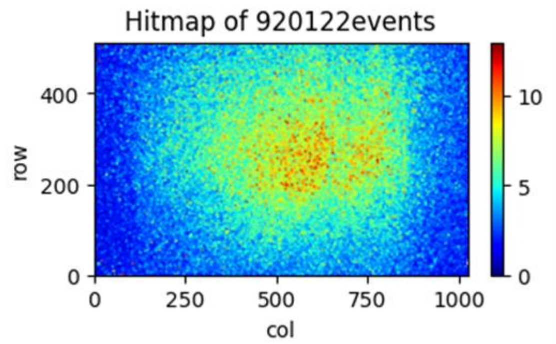
Key parameters

Location	beamline and experimental hall of 4W2 wiggler
Laser	532nm, 4.5 kHz, 2 mJ, 1 ns, flippable circular polarization
Observable	Vertical asymmetry of backscattered γ (up to 180 MeV)
Detector	lead preshower + silicon pixel detector
Signal	backscattered γ ~ 20kHz/mA/W
Background	bremsstruhlung γ ~ 1kHz/mA

Laser-signal causality observed



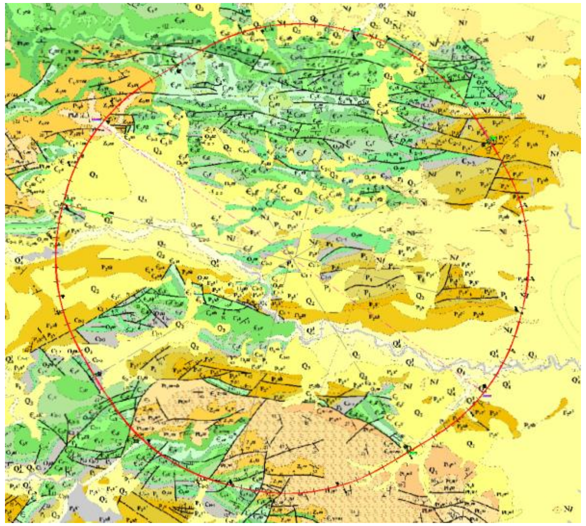
Signal on the Silicon pixel detector

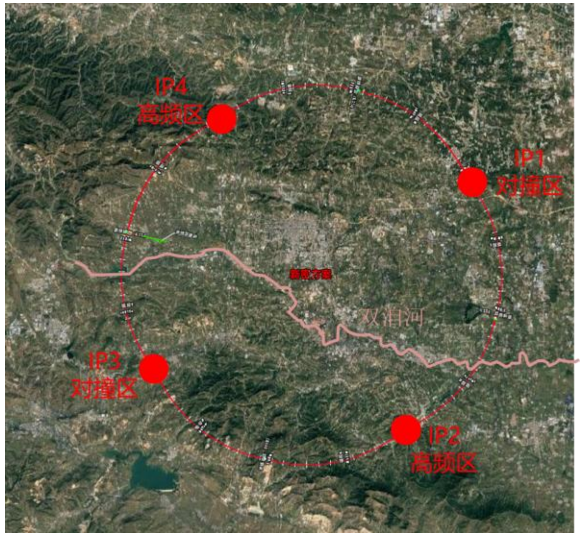


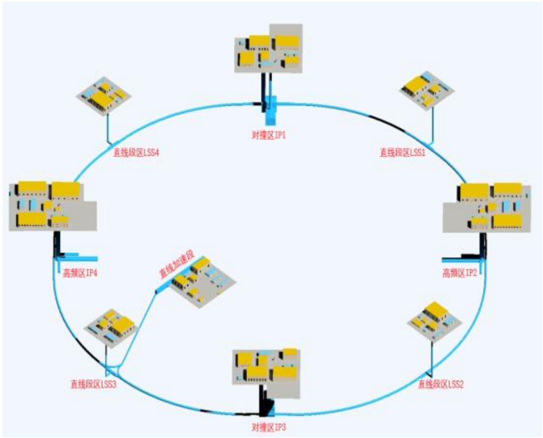
MBE system in Acken

Polarized electron cathode chip (diameter ~5cm) has been fabricated in **June 2025**:
Polarization of 85%, for 1ns laser (780nm) pulse length, several nC polarized electron charge will be obtained with the expected cathode lifetime ~6 months.
The experimentally measured polarization is about 75%,
And the quantum efficiency is around 0.7%

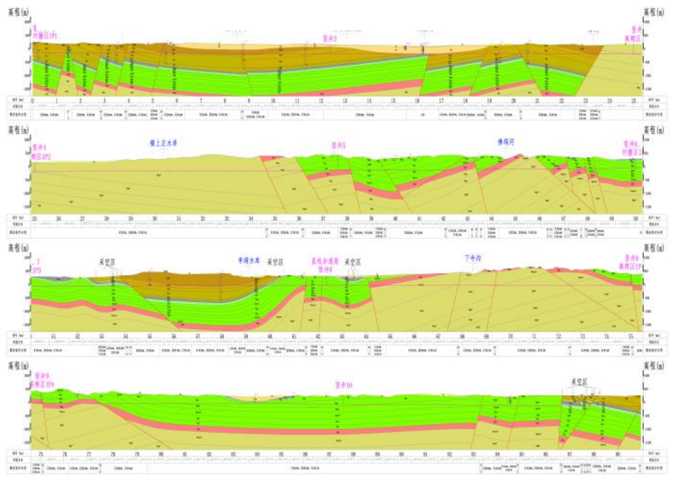
CEPC EDR Site Geological Study Status

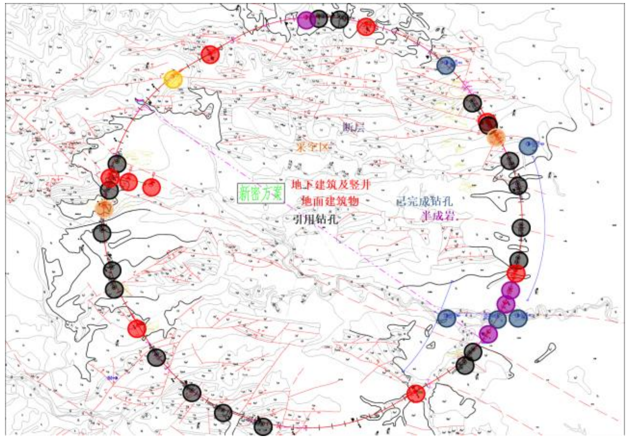




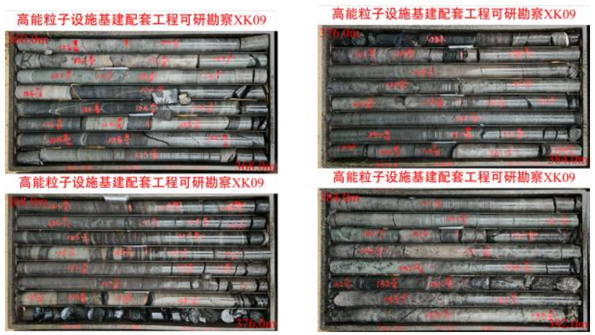


9 surface location building total surface：150k m^2；Total land surface occupied：475k m^2





After careful geological studies and comparisons, CEPC EDR site was proposed in June 2025 by a review, and the geological study results require that CEPC be built about 300m underground

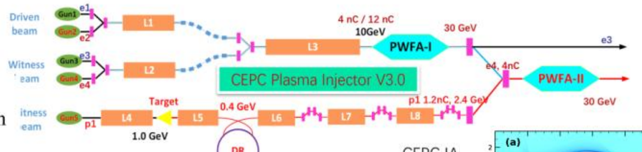


The geological investigation studies on CEPC EDR site has been completed and reviewed on June 4-5, 2026

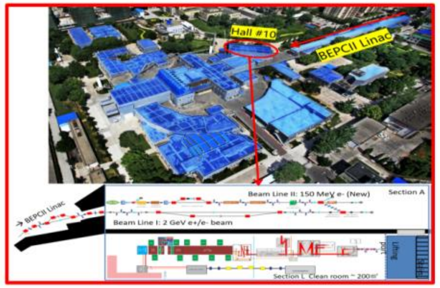
BEPCII-based PWFA Test Facility Development Status

CEPC Plasma Injector (alternative option) and TF Plan

CEPC plasma injector scheme:
From 10 GeV → 30 GeV → **TR ≥ 2**



Simulation results show that it works on paper with reasonable error tolerances for both electron and positron beams injected to the booster

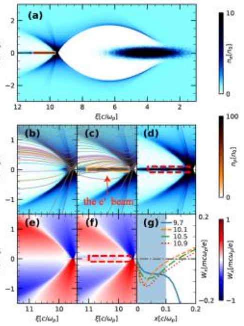


CEPC IA

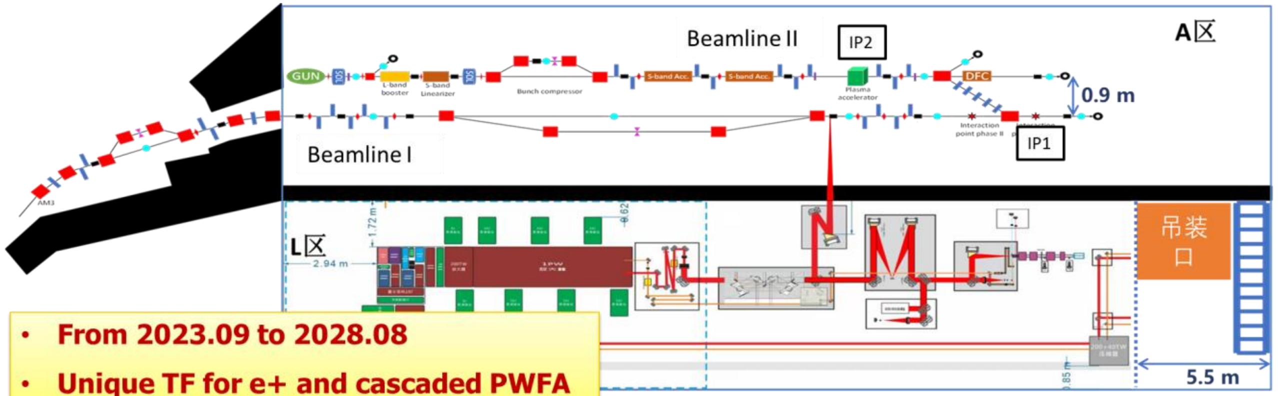
Phase I（Year0-Year2）
1. Re-design and install transport beamline, optimize the e- / e+ beam quality
2. Clean room and high power installation200TW
3. Beam instrumentation
4. RF Gun platform
5. Commissioning

Phase II

- Positron and electron acceleration
- Cascading acceleration
- Future linear collider technologies
- High energy beam for detector R&D (possible application)



PWFA/LWFA TF based on BEPC-II Linac and HPL has been founded by CAS 90M RMB in Sept. 2023
Under development in the experimental hall #10 of BEPC-II



- **From 2023.09 to 2028.08**
- **Unique TF for e+ and cascaded PWFA**

Beam quality → Beamline I

Parameters	Unit	BL-I e- (AM3)	BL-I e- (IP1)	BL-I e+ (AM3)	BL-I e+ (IP1)	BL-I e- (IP1, block)	BL-I e+ (IP1, block)
Energy	GeV	2	2	2	2	2	2
Charge	pC	2000	2000	100	100	9.4	0.2
bunch length	ps	10	1	10	1	~1	~1
Geo. emittance	mm·mrad	0.1/0.1	0.1/0.1	0.4/0.4	0.4/0.4	0.011/0.005	0.04/0.02
RMS beam size	μm	-	150/150	-	300/300	30/40	54/76

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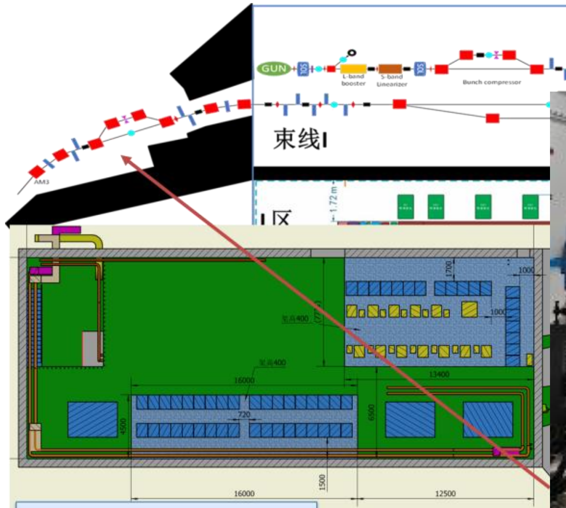
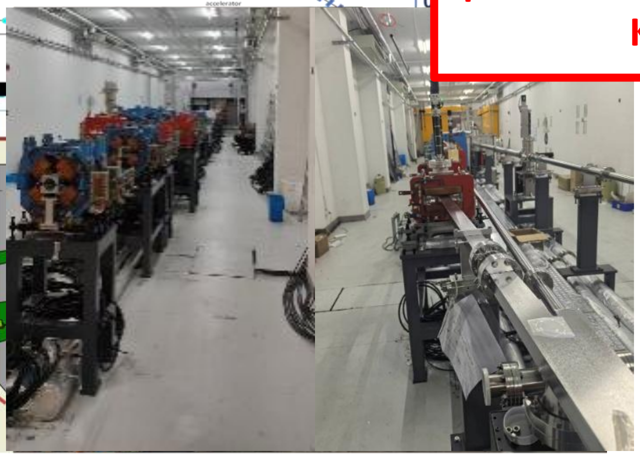
Goals: demonstration of acceleration of positron and electron beams with staging in next few years
Key technology for future linear colliders

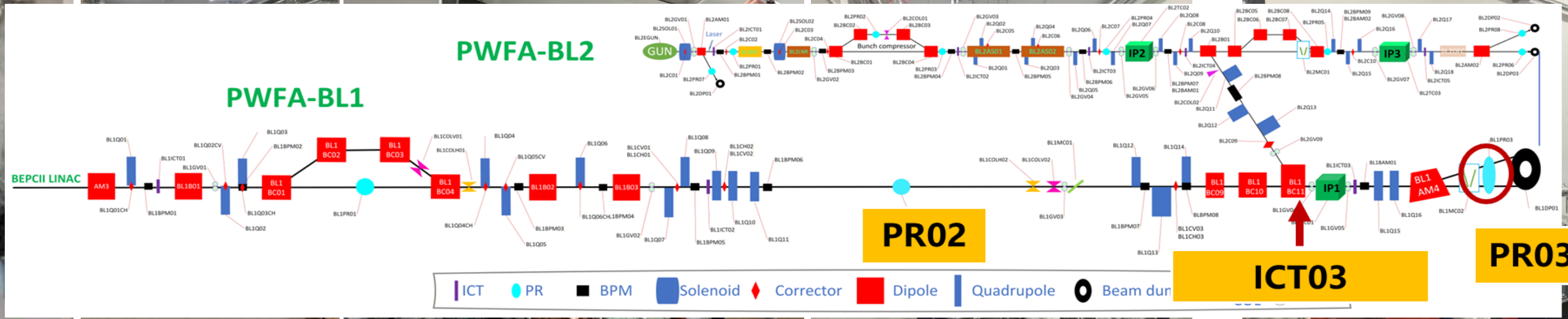


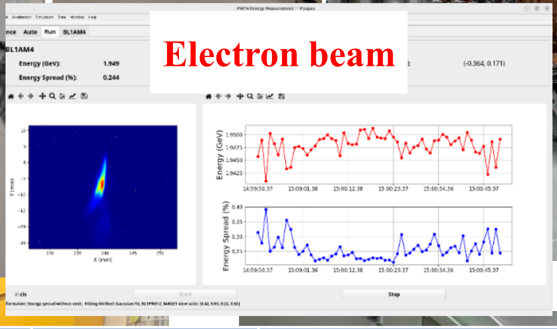
PWFA LAB: 35 m × 14 m × 2

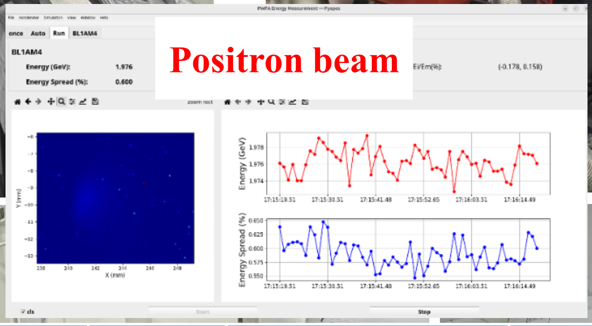


Dazhang Li, Wei Lu and Jie Gao, Research highlights on plasma-based acceleration at IHEP, AAPPS Bulletin (2025) 35:3, https://doi.org/10.1007/s43673-025-00143-z

BEPCII-based PWFA Test Facility – PWFA-BL1 Commissioning







Parameters	Unit	Design	Measurement
Energy	GeV	2	1.95
Energy spread	%	0.1（slice)	0.24（Total)
Bunch charge	nC	2	>2
Emittance	µm	0.1	0.14(H)/0.08(V)@PR02 OTR（5月28日)
			0.45(H)/0.29(V)@PR03 OTR（5月29日)

PWFA-BL 1 from BEPCII

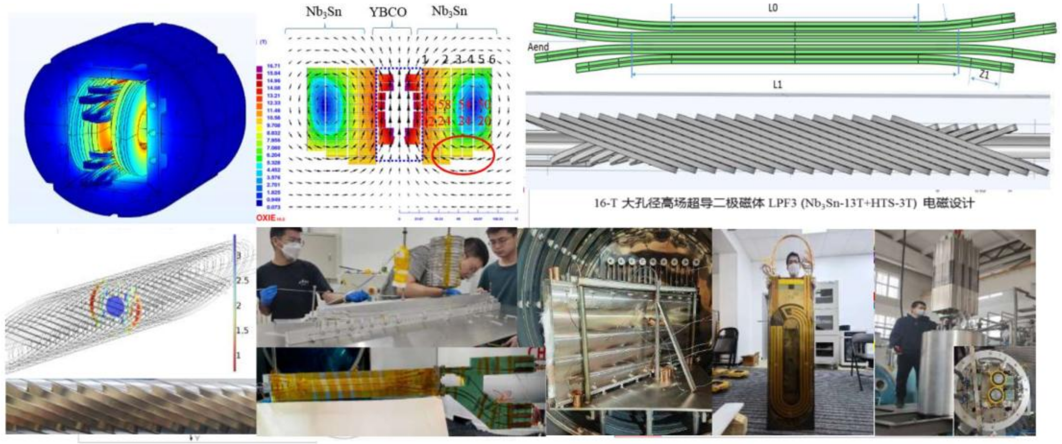
Parameters	Unit	Design	Measurement
Energy	GeV	2	1.98
Energy spread	%	0.1（slice)	0.6（total)
Bunch charge	pC	50	~80
Emittance	µm	0.4	0.29(H)/0.2(V)@PR02

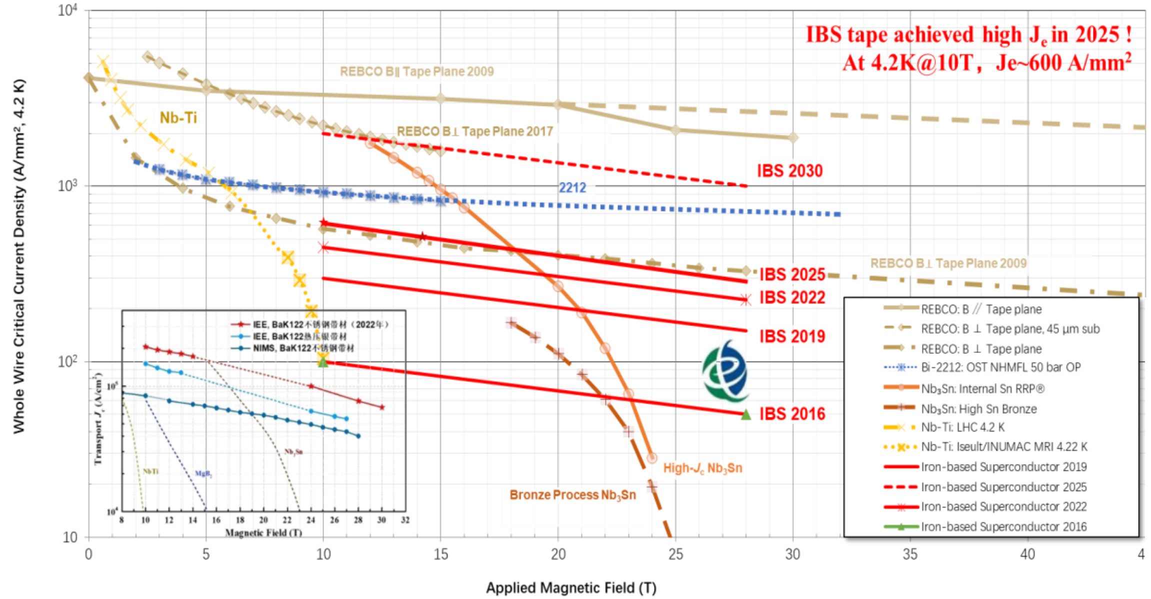
PWFA-BL 2 from L-Band RF gun

PWFA-BL 1 from BEPCII had the first beam in **April 2026, and the first plasma experiment will start in Sept. 2026**

Advanced High Field SC Magnet (IBS) Development

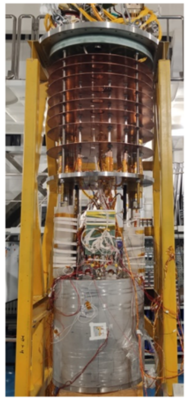
Highest Quench Field Reached in 2024: over 14T @4.2K



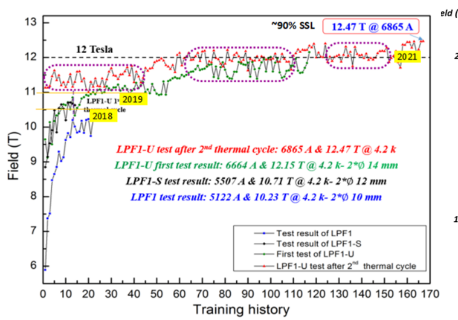


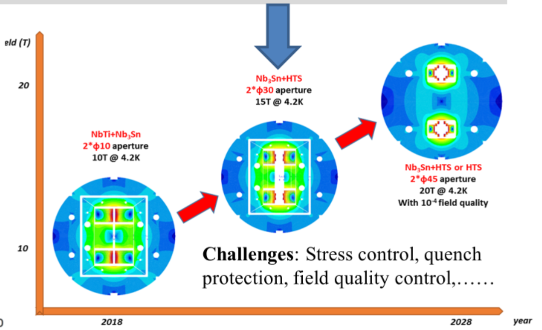
SppC HF Magnet Development

SppC 16 T Model Dipole: Nb_3Sn 12~13 T + HTS 3~4 T;
14T has been reached, more test in 2024

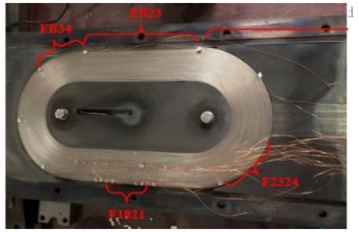


Picture of LPF1-U

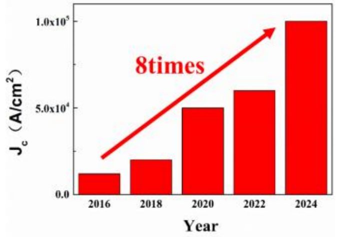


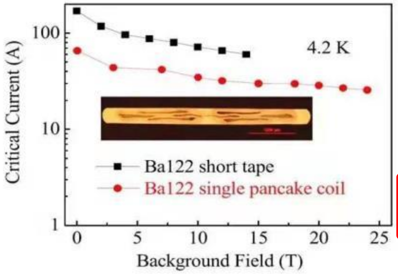


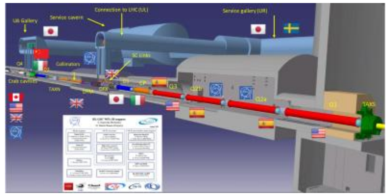
Dual aperture superconducting dipoles achieve 12T@4.2 K and 14T@4.2K entirely fabricated in China. The next step is reaching 16-20T



- First short coil with 40%Jc@24T
- First long coil with 80%Jc@10T



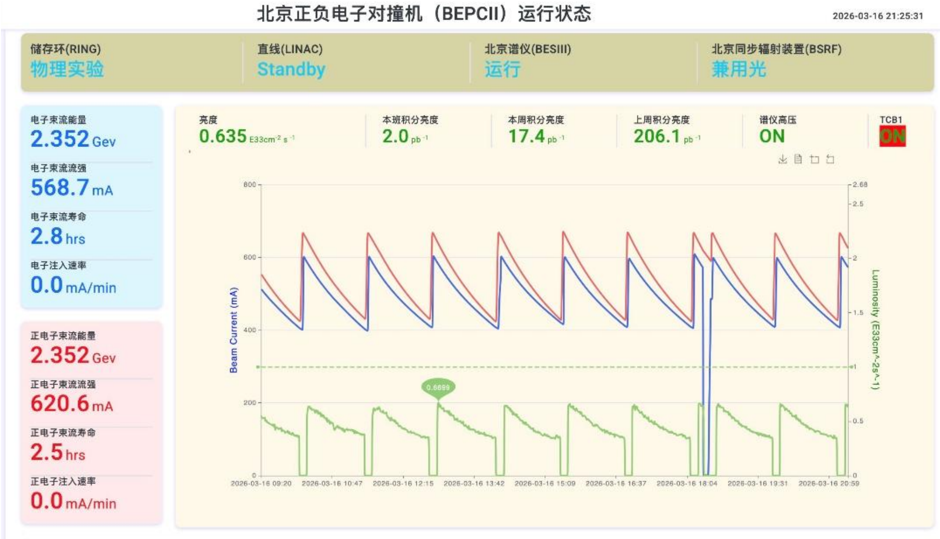




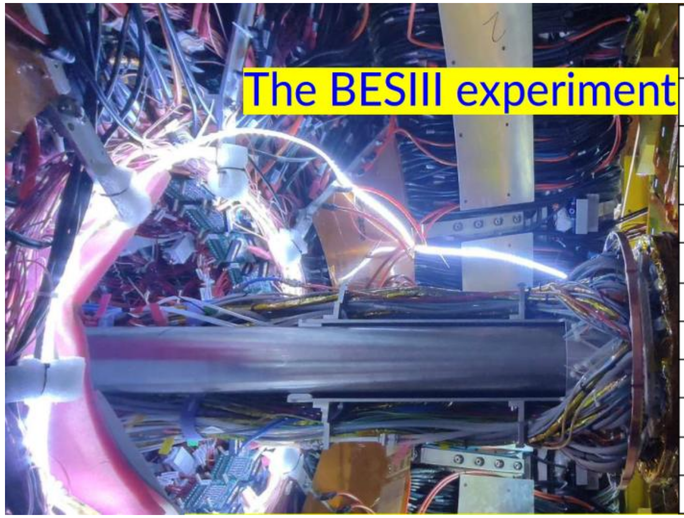
All HL-LHC CCT magnets have been delivered to CERN in early 2026

According to the progresses from 2016-2025, it is expected that the IBS could reach the technical requirements for SppC/FCChh around 2035

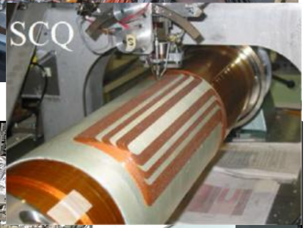
BEPCII-U in Operation

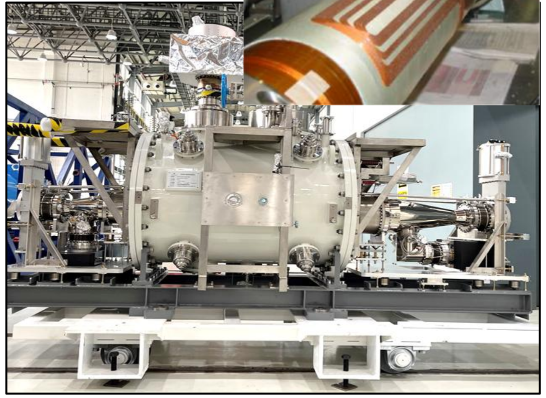


BEPCII-U L= 1.112×10^33 cm^-2s^-1@2.35 GeV



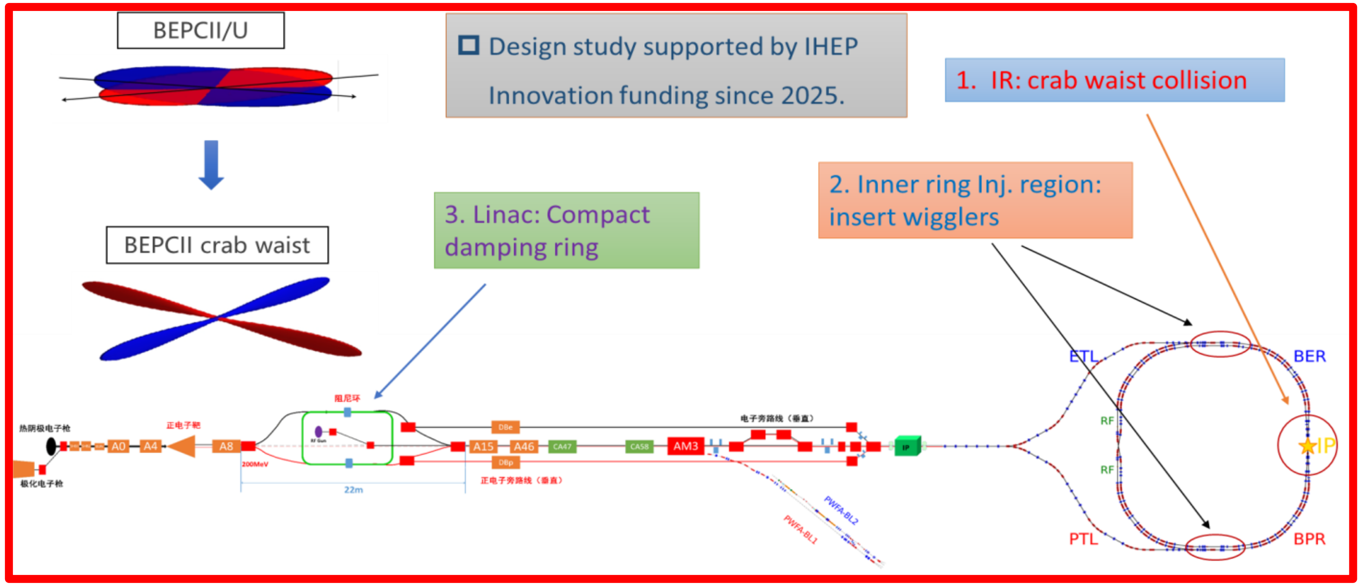
	BEPCII @ 2.35GeV	BEPCII-U @ 2.35GeV	BEPCII-U @ 2.8GeV
L $[10^{32}\,cm^{-2}s^{-1}]$	**3.5**	**11**	**3.7**
β_y^* [cm]	**1.5**	**1.35**	**3.0**
Beam current [mA]	400	900	450
SR Power [kW]	**110**	**250**	**250**
$\xi_{y,lum}$	0.029	0.033	0.043
Emittance [nmrad]	**147**	**152**	**200**
Couping [%]	**0.53**	**0.35**	**0.5**
Bucket Height	0.0069	0.011	0.009
$\sigma_{z,0}$ [cm]	1.54	1.07	1.4
σ_z [cm]	**1.69**	**1.22**	**1.6**
RF Voltage [MV]	**1.6**	**3.3**	**3.3**

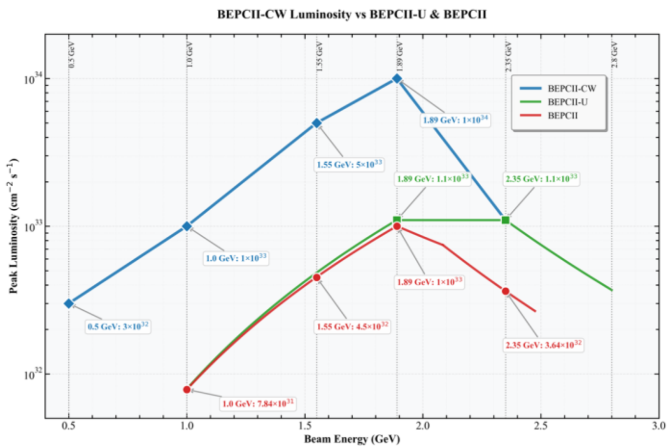




J. Gao, “BEPCII and CEPC”, Proceedings of eeFACT 2025, arXiv:2505.02401, https://doi.org/10.48550/arXiv.2505.02401

BEPCII-UP (CW) Feasibility Study (New activities)





- The specifications at each energy are very preliminary.
- Parameters and lattice design need to be carefully optimized for each energy.
- Accelerator design is focusing on 1.89 GeV firstly.

- Luminosity may increase by ×10 below 1.89GeV,.
- Operation below 1GeV is enabled

	BEPCII (L_0=1E33cm^{-2}s^{-1})	BEPCII-CW (10×L_0)
Circumference [m]	237	
Peak luminosity [$10^{33}cm^{-2}s^{-1}$]	1	10.9
β_x^*/β_y^* [m]	1/0.0135	0.15/0.005
Total current [mA]	910	1500
Bunch current [mA]	8.3	12.5
Bunch number	110	120
Beam-beam para. $\xi_x/\xi_{y,lum}$	0.029/0.04	0.01/0.088
Emittance [nmrad]	120/0.6	55/0.193
Damping time [ms]	24.7/24.7/12.3	13.9/14.6/7.45
Coupling facter [%]	0.5	0.35
Longitudinal tune ν_s	0.032	0.040
Natural energy spread [%]	0.05	0.082
Natural bunch length $\sigma_{z,0}$ [mm]	11.5	13.3
Bunch length σ_z [mm]	13.5	16
Half crossing angle [mrad]	11	18.1
Piwinski angle	0.47	3.19
Working point	7.509/5.575	8.550/7.576

BEPCII UP will not only extend the physics reach of BESIII, but also serve as a prototype for CEPC with CW scheme

	BEPCII-crab waist-3.6T (1.55GeV)	BEPCII-crab waist-3.6T (1.0GeV)	BEPCII-crab waist-3.6T (0.5GeV)
RF voltage [MV]	1.5	1.1	1.0
SR power/beam [kW]	107.4 (43.1 in arc)	19.5 (4.5 in arc)	1.4 (0.1 in arc)
Total current [mA]	795	464	160
Peak luminosity [10^{32}cm^{-2}s^{-1}]	50	11	3
β_x^*/β_y^* [m]	0.15/0.005	0.15/0.005	0.15/0.005
Bunch current [mA]	6.6	3.9	0.9
Bunch number	120	120	180
Beam-beam para.$\xi_x/\xi_{y,lum}$	0.006/0.102	0.005/0.089	0.006/0.09
Emittance [nmrad]	27/0.095	12.5/0.1	3.3/0.052
Damping time [ms]	18/18/9	37.7/37.7/19	93/93/47
Coupling factor [%]	0.35	0.8	1.6
Longitudinal tune ν_s	0.032	0.044	0.059
Bucket Height [%]	0.35	0.8	1.6
Natural energy spread [%]	0.086	0.076	0.014
Natural bunch length $\sigma_{z,0}$ [cm]	1.77	1.8	1.1
Bunch length σ_z [cm]	1.86	1.9	1.2
Half crossing angle [mrad]	18.1	18.1	18.1
Piwinski angle	5.3	7.9	9.8

CEPC Industrial Preparation

Large-scale Cryogenic Refrigeration & Liquefaction Equipment 中科富海 (CIPC member)

First 18kW@4.5K helium refrigerator fabricated in in China passes inspection

-It was developed by the Institute of TIPC,CAS, and integrated and manufactured by Fullcryo.

-The super large horizontal cold box with a length of 28m and a diameter of 4.2m achieves ultra-high vacuum and extremely low leakage.

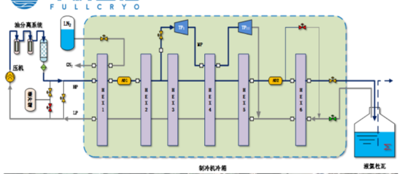
-The horizontal cold box at megawatt-level is the largest of its kind in China and even in the world.

-The horizontal cold box system has exceeded the set targets.

-On-site testing: 1. The airtightness test of each internal channel revealed a pressure drop of 0, surpassing the target value of 0.02 bar. 2. The overall leakage rate is 9.1×10^{-10} Pa.m³/s, surpassing the target value of 1×10^{-7} Pa.m³/s.

-Expected Goals: Achieving 3 operational mode adjustments: the cooling capacity ≥ 18kW@4.5K; the cooling capacity in the superfluid helium temperature range ≥4kW@2K.

中科富海 FULLCRYO



北京中科富海低温科技有限公司
Beijing Sinoscience Fullcryo Technology CO., Ltd. (CIPC member)

CEPC cryogenic system need four 14kW@4K cryogenic refrigerators
SppC needs 18kW@4.5K helium refrigerator as well

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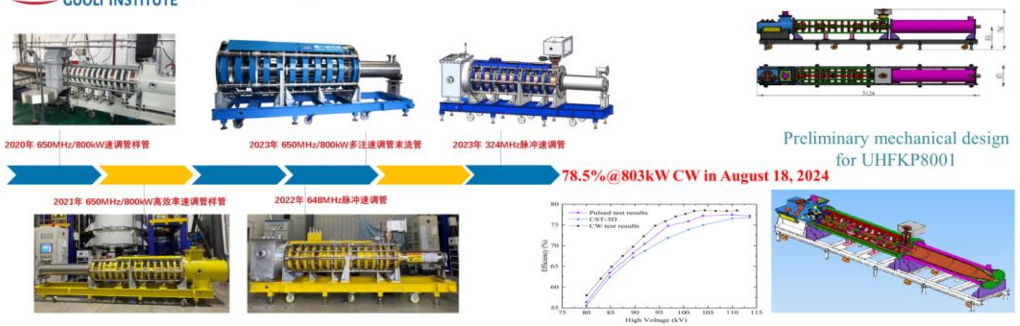
CEPC 650MHz 800kW CW High Efficiency Klystrons

国力研究院 GUOLI INSTITUTE (CIPC member)



Kunshan National Research Institute has successively developed **650MHz/800KW klystron sample tubes, 650MHz/800KW high-efficiency klystron sample tubes, 648MHz pulse klystron tubes, 650MHz/800KW multi-injection klystron beam tubes**, and the latest 324MHz pulse klystron tubes Electro vacuum products for 50 years. Provide high power thyristor of GL1536A in batches for BEPCII in 2012.

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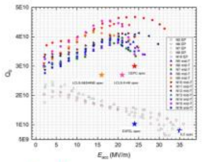
HE-RACING Technology and OTIC on SRF Technologies (CIPC members)

高能锐新 HE-RACING TECHNOLOGY (CIPC member)



1.3GHz cryomodule assembly

东方钽业 OTIC (CIPC member)

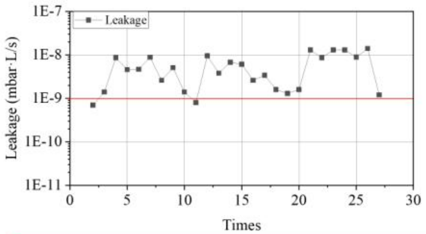
2011 DESY - XFEL
RRR300 Nb: 8 tons, 30% of the project
2012 Michigan State University - FRIB
RRR250 Nb: 8.5 tons, 70% of the project

The key industries also available for ILC and LCF:
SC materials, 1.3GHz SC cavities, 1.3 Cryomodules
China's production potential >500 1.3GHz cavities/year and ~100 1.3 cryomodule cold masses/year

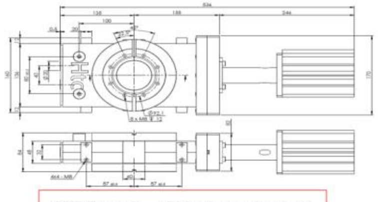
RF Shielding all Metal Gate Vacuum Valve

日扬科技 HIGHLIGHT TECH CORP.

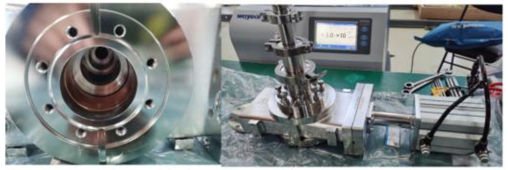
- Two prototypes of RF shielding All metal gate valve have been developed, and the leakage of one of them have been tested.
- The delivery inspection leakage test results for two valves, conducted by the manufacturer, were found to be < 1×10^{9} mbar ·L/s (30 times open and closed).
- The difference of leakage by IHEP & manufacture will be checked and retested in next.



- Tested by IHEP
- Expectation leakage < 1×10^{-9} mbar ·L/s



CEPC needs ~1700 all metal valves



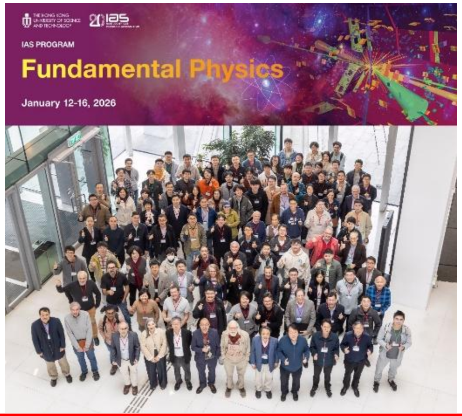
CEPC International Collaboration

The 2024 HKUST IAS Mini workshop and conference were held from Jan. 18-19, and Jan. 22-25, 2024, respectively.
https://indico.cern.ch/event/1335278/timetable/?view=standard

The 2025 HKUST IAS fundamental physics conference: Jan. 14-17, 2025, Hong Kong
https://indico.cern.ch/event/1454867/overview

CEPC Workshop EU Edition (Barcelona, Spain) June 16-19, 2025
https://indico.ifae.es/event/2054/overview

The 2026 HKUST IAS fundamental physics conference: Jan. 12-16, 2026, Hong Kong
https://indico.global/event/15407/overview



CEPC Workshop EU, April 7-10, 2026, Lisbon, Portugal
https://indico.cern.ch/event/1598929/

The 2023 International Workshop on Circular Electron Positron Collider, EU Edition, University of Edinburgh, July 3-6, 2023

https://indico.ph.ed.ac.uk/event/259/overview

The 2024 international workshop on the high energy Circular Electron Positron Collider (CEPC) was held from Oct. 23-27, 2024, Hangzhou, China
https://indico.ihep.ac.cn/event/22089/

The 2025 international workshop on the high energy Circular Electron Positron Collider (CEPC) was held from Nov. 6-10, 2025, Guangzhou, China
https://indico.ihep.ac.cn/event/25300/

CEPC2026 workshop will be held in Shanghai Oct.22-26, 2026
https://indico.ihep.ac.cn/event/cepc2026

The 2023 international workshop on the high energy Circular Electron Positron Collider (CEPC)
https://indico.ihep.ac.cn/event/19316/

The 2024 international workshop of CEPC EU-Edition were held in Marseille, France, April 8-11, 2024.
https://indico.in2p3.fr/event/20053/overview

FCPPNL, Bordeaux, France, June 10-14, 2024
https://indico.in2p3.fr/event/20434/overview

FCPPNL, Qingdao, China, July 21-25, 2025
https://indico.ihep.ac.cn/event/25400/

FCPPNL, Lyon, France, June 29-July 3, 2026
https://indico.in2p3.fr/event/38713/

CEPC-SppC and FCC Synergy and Collaboration Issues

After he European Strategy for Particle Physics: 2026 Update - Recommendations by the European Strategy Group (CERN-ESU-2025-002, Dec.2025) https://cds.cern.ch/record/2950671 ,
the CERN Council decided to update the European Strategy for Particle Physics
https://home.cern/the-cern-council-decided-to-update-the-european-strategy-for-particle-physics/ (May 22, 2026)

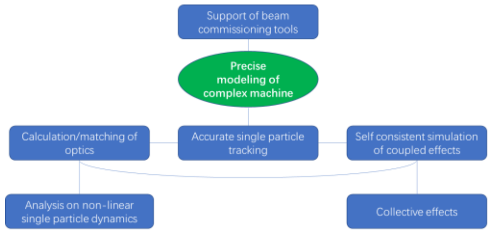
CEPC and FCCee timelines are becoming quite similar:
-CEPC plan to submit the proposal to Chinese government in
2029 for the 16^{th} five-year plan (2030-2025) and if approved to start the construction during 2030~2035
(in relation with FCCee decision)
-FCCee will be decided in 2028

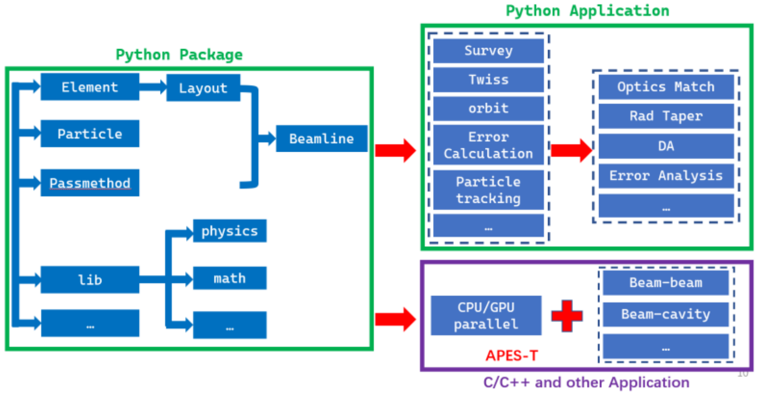
It is important to have at least one Higgs factory as soon as possible for the HEP community worldwide , and Collaborations/Synergy/Contributions between CEPC-SppC/FCC, with common issues could be a subject of discussion

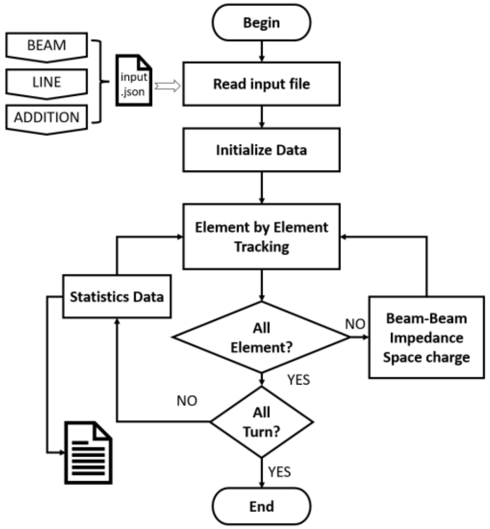
In terms of China-European collaboration in accelerator fields, IHEP is invited to join
GEAR-NG (Global Exchange Accelerator Research - Next Generation) program (2027-2030)
centered in the technologies of next generation Higgs Factories.

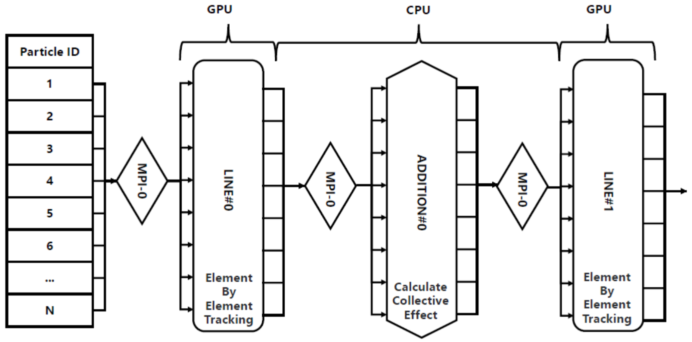
CEPC and FCC Accelerator Codes and Designs

Accelerator Physics Emulation Studio （APES）

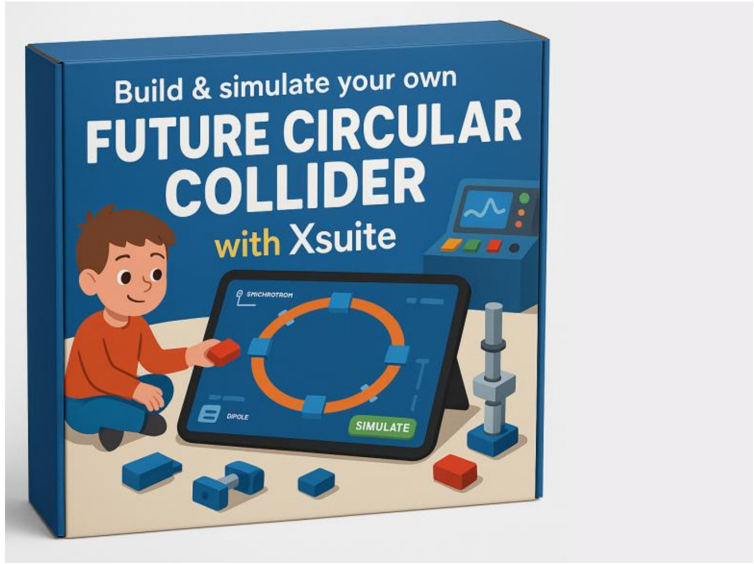








FCC design with Xsuite



G. Iadarola

tutorials in form of Jupyter notebooks

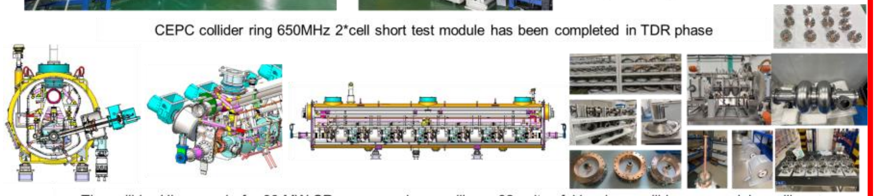
CEPC and FCCee SRF in Synergy

IHEP PAPS SRF Infrastructure in Huairou, Beijing

Accelerator key technology R&D and Testing platform:
- SRF cavity and module
- High precision magnet
- Vacuum assembly & coating
- High efficiency Klystron
- Mechanics and alignment
- Beam test facility

CEPC 650MHz SRF Development in EDR

CEPC collider ring 650MHz 2*cell short test module has been completed in TDR phase



The collider Higgs mode for 30 MW SR power per beam will use 32 units of 11 m-long collider cryomodules will contain six 650 MHz 2-cell cavities, and therefore, a full size 650 MHz cryomodule will be developed in EDR

Status： construction started, to be completed in 2027

Please see parallel talk by Peng Sha

Superconducting RF Systems at IHEP

BEPCII-U and HEPS 500 MHz Cavity and Cryomodule

- One 500 MHz cavities for BEPCII-U and two 500 MHz third hormonic cavities for HEPS.
- Prevent cavity buckling by thicker Nb sheet (2.5 mm to 3.7 mm), deep drawing instead of spinning, adding stiffening rings.
- First CM assembly complete soon.

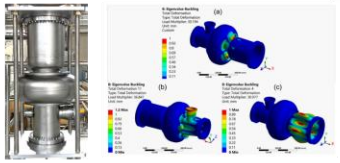
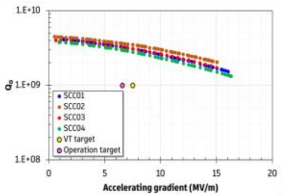
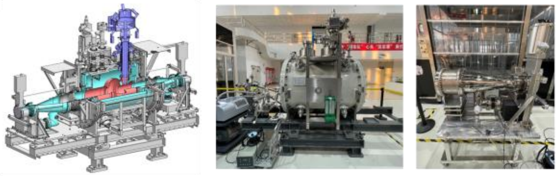


TABLE V
BUCKLING PERFORMANCE OF THE CAVITY UNDER TWO DIFFERENT BOUNDARIES

	Conditions	Φ (Bare)	Φ (Stiff.)	Φ_{cr}
Cell (LBP side)	BPs fixed	29.3	83.7	16.1
	LBP LF	10.5	30.2	
Cell (SBP side)	BPs fixed	29.4	85.1	16.1
	LBP LF	12.8	36.9	
LBP tube	BPs fixed	33.2	33.2	2.5
	LBP LF	17.2	31.0	

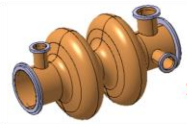
"BPs fixed" stands for both beam pipes are fixed. "LBP LF" stands for the cavity LBP side is free to move longitudinally while the SBP side is fixed. "Bare" stands for bare cavity without any stiffening rings, and "Stiff." stands for cavities with one pair of stiffening rings added on the cell.



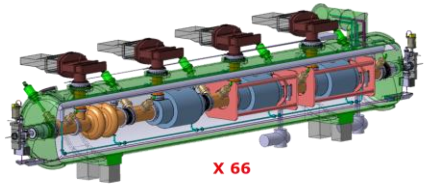


500 MHz KEKB-type single-cell SC cavity module

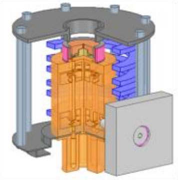
FCCee 400 MHz system – collider Z, W, ZH



X 264



X 66



X 264

Superconducting elliptical cavity
- 400 MHz, 2-cell
- 1.5 m. long
- Electropolished and seamless RF surface
- Niobium thin film with HiPIMS

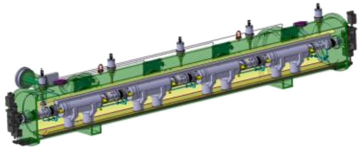
Cryomodule
- Segmented design, 4 cavities
- Vertical FPC, HOM damping and extraction
- Frequency tuning system
- Thermal and magnetic shielding

Multibeam Tristron
- **400 MHz**
- 46 kV
- 500 kW, CW
- ~ 90% efficiency

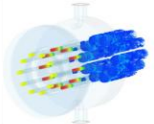
I. Syratchev

FCCee 800 MHz system – for tt̄ collider and booster

X (408 + 448)



X (102 + 112)



Multibeam Tristron X 408
- 800 MHz
- 250 kW, CW

Superconducting elliptical cavity
- 800 MHz, 6-cell
- Nb_3Sn if R&D is successful

Cryomodule
- Segmented design, 4 cavities, 2 K
- Operation at 4.5 K if R&D successful

Solid State Amplifier (SSA) X 448
- 800 MHz
- 10-15 kW pulsed

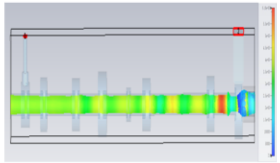
A. Butterworth

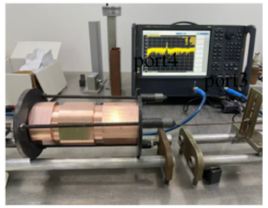
CEPC and FCCee Klystrons in Synergy

A Full Frequency Spectrum Klystron Development

16

CEPC Linac S band high efficiency klystron
（2860MHz/80MW/100Hz/4us/55%）
to be tested in 2026

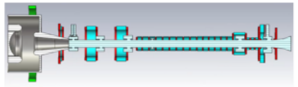




S band PPM klystron
（2856MHz/50MW/53%）
Fabrication starts in 2026

S-band 50MW PPM Klystron	Design Specifications
Beam Voltage	350kV
Beam Current	272A
Frequency	2856MHz
Tube Radius	13.8mm
Beam Radius	9mm
Output Power	50MW
Efficiency	53%

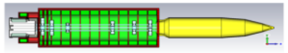
Beam dynamic

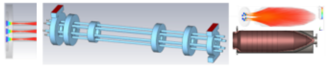


Klystron structure

L-Ban long pulsed klystron
（1.3GHz/10MW/1.5ms/10Hz
to be completed by the end of 2026

Parameters	Value
Freq.(GHz)	1.3
H.V.(kV)	115
Current(A)	21×6
Beam No.	6
Rep. Rate(Hz)	10
Pulse Width(ms)	1.5
Power(MW)	≥10
Eff.	≥65%





CEPC 650MHZ MB Tristron R&D, to be completed in 2028

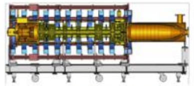
The maturation of pyrolytic graphite manufacturing technology, the refinement of gate cooling methods and advances in brazing techniques have made it possible to produce high-efficiency, high-power Tristrons.

First edition: Processing of pyrolytic graphite gates, and the details of laser cutting for mesh panels (Key technology of Tristrons). The first Tristron to be completed in 2028

CEPC High Efficiency and High Power Klystrons

Klystron R&D

Klystron No. 2
Efficiency 77%
(2021)



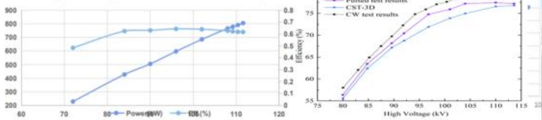
Klystron No. 1
Efficiency 65%
(2020)

Pulsed RF Mode (30% duty factor, 60ms/5Hz)

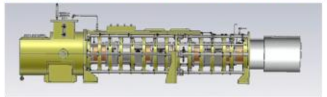
78.5%@803kW CW in 2024

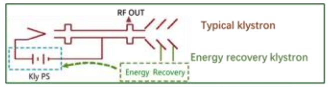
Klystron No. 3 （MBK）
Efficiency 80.5%
To be completed in 2026

High Voltage vs. Power&Efficency



CEPC 650Mhz Energy Recovery Klystron

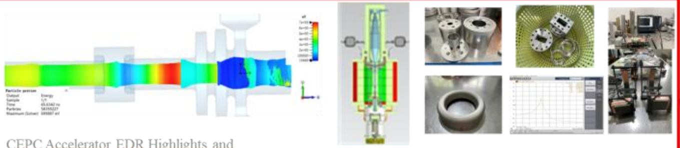




Parameter	Value
Operating frequency	650 MHz
Beam Voltage	113 kV
Efficiency	77.5%
Output power	800 kW
Beam perveance	0.25 μP
Beam current	9.5A
Efficiency (one-stage depressed collector)	85%

CEPC 650Mhz Energy Recovery Klystron to be tested in Sept. in 2026

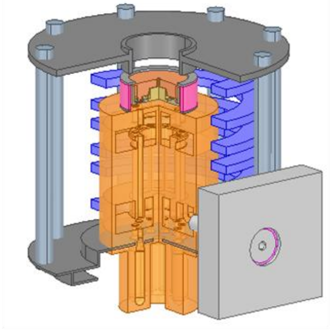
CEPC collider ring 650MHz klystron development in TDR/EDR phase



Linac C band 5720MHz 80MW Klystron design completed
to be completed in 2026

CEPC Accelerator EDR Highlights and Collaborations-J. Gao

CEPC Workshop EU 2026, April. 7-10, 2026, Lisbon, Portugal

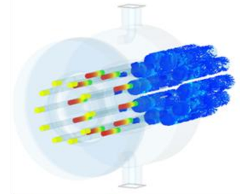


X 264

Multibeam Tristron

- **400 MHz**
- 46 kV
- 500 kW, CW
- ~ 90% efficiency

I. Syratchev



Multibeam Tristron

- 800 MHz
- 250 kW, CW

X 408

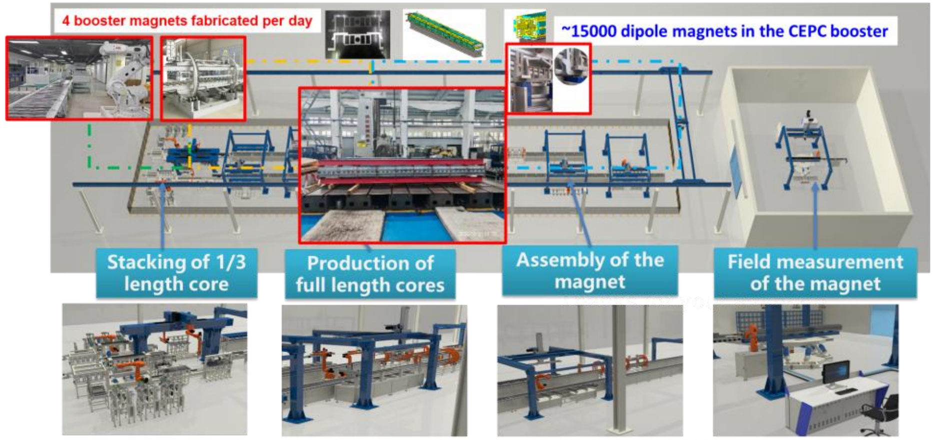
Solid State Amplifier (SSA)

X 448

- 800 MHz
- 10-15 kW pulsed

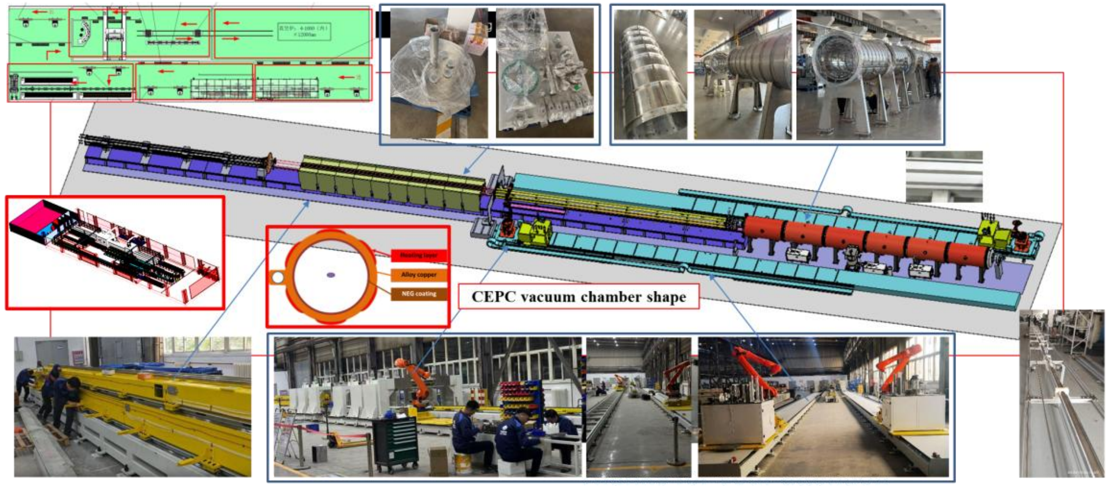
CEPC Booster dipole magnet and Vacuum NEG Automatic Production Line in synergy with FCCee Booster Magnets and Vacuum Chambers

CEPC Booster Magnet Automatic Production Line in EDR



Status： under construction, to be completed by May 2026

CEPC NEG Coated Vacuum Chamber (200km)
Automatic Production Line in EDR



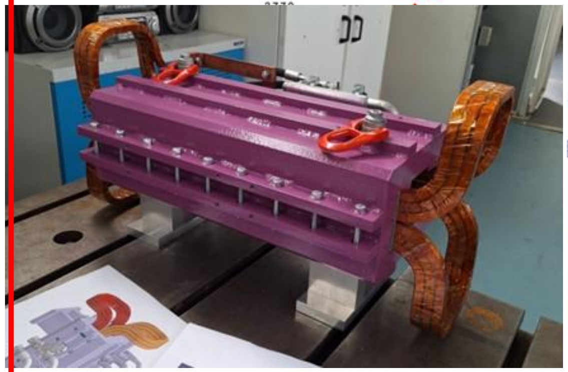
- The main components of vacuum oven for NEG coating have been manufactured and under are now being assembled.

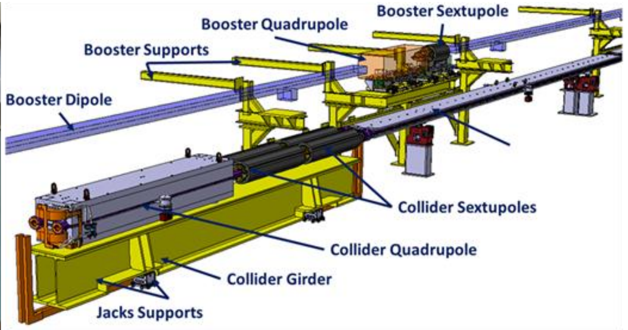
Status： under construction, to be completed by June 2026

FCC-ee booster

full energy booster, ramping from 20 GeV to 46 GeV – 182.5 GeV; injection ~several times per minute to keep collider beam currents constant; booster intensity ~1% of collider; full RF voltage as in collider

Booster

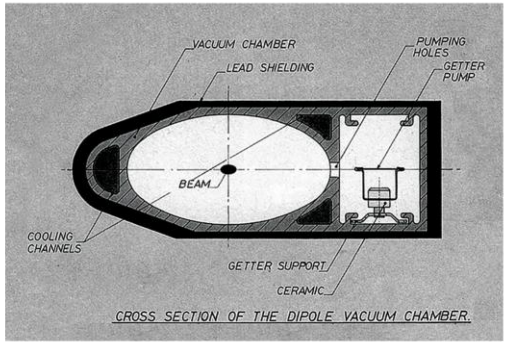




FCCee Booster dipole low-field cycling magnet

LEP3 rpund shape vacuum chamber

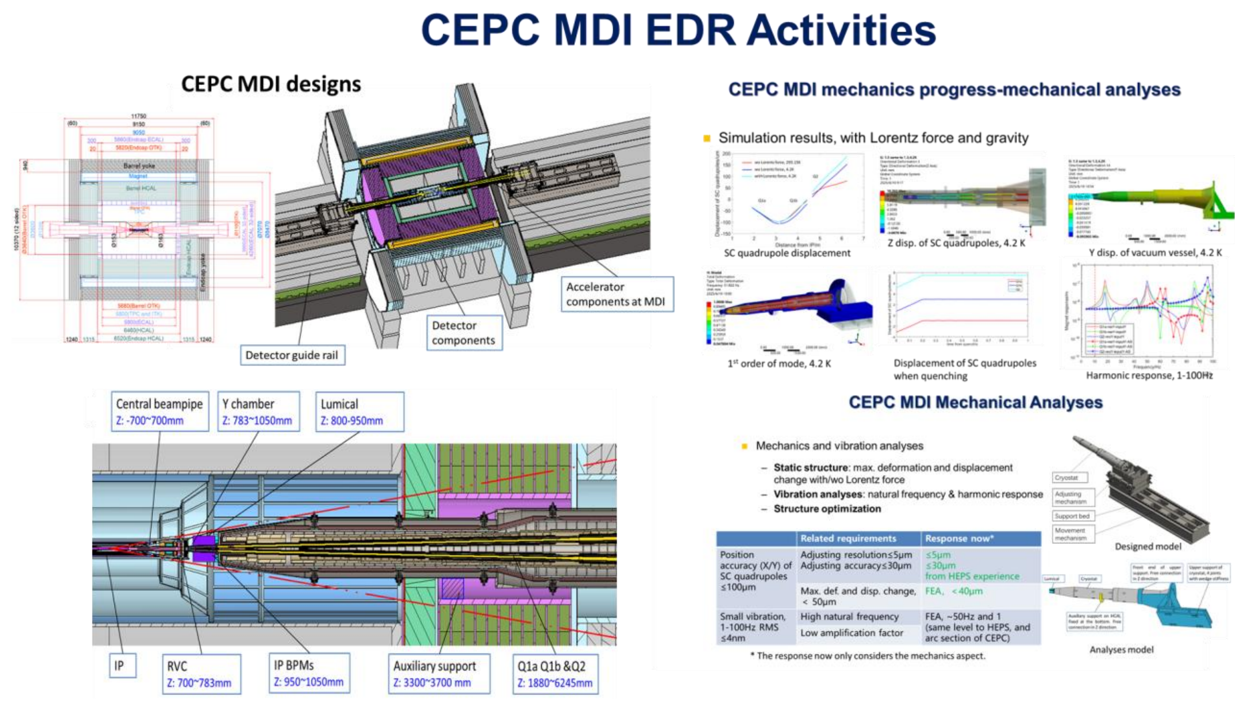
LEP2 vacuum chamber – extruded Aluminium



- Oval shape is bad for impedance
- Beam sizes were larger at LEP2
- Artist's impression of LEP3 beam pipe:

M. Koratzinos

CEPC FCCee MDI in Synergy



FCCee Machine-Detector Interface

Key topics:

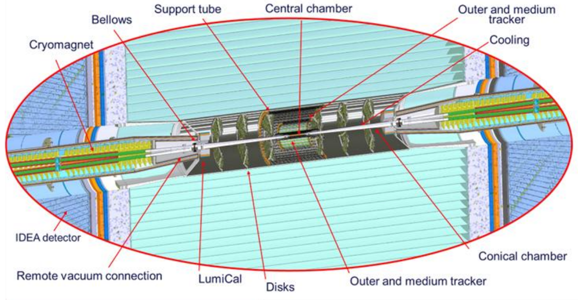
SC IR magnet system & cryostat design

3D integration

IR mock-up at INFN-LNF

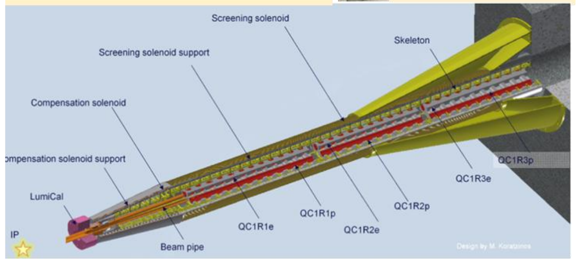
Machine		FCCee	CEPC	ILC	SuperKEKB
Crossing-angle	mrad	30	33	14	83
L*	m	2.2	1.9	3.5	0.935
Vertical β_y^* at IP	mm	0.7-1.6	0.9-2.7	0.4	0.3
Detector soln field	T	2/3	3	3.5/5	1.5
Detector stay clear	mrad	100	118/141	90	350/436
Two beam ΔX at L*	mm	66	62.7	49	77.6
He temperature	K	1.9	4.2	4.5	4.5

M. Koratzinos, PSI



M. Boscolo, F. Palla, INFN

J. Seeman, A. Novokhatski, SLAC
B. Parker, Vikas Teotia, BNL
P. Tavares, CERN

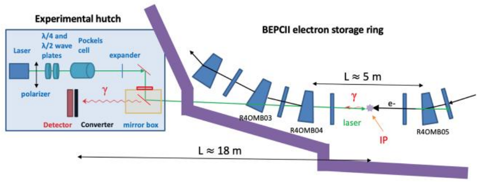


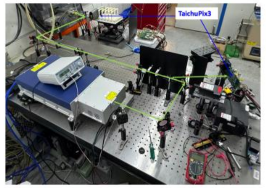
CEPC and FCCee Polarization in Synergy

CEPC Polarization in Preparation Study

-Compton Polarimeter at BEPCII-U

- A laser-Compton polarimeter has been implemented in BEPCII electron storage ring
- Laser-electron collision signal has been observed
- Measurement of electron beam polarization is under way

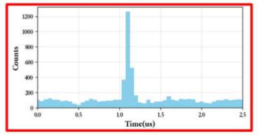




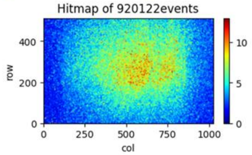
Key parameters

Location	beamline and experimental hall of 4W2 wiggler
Laser	532nm, 4.5 kHz, 2 mJ, 1 ns, flippable circular polarization
Observable	Vertical asymmetry of backscattered γ (up to 180 MeV)
Detector	lead preshower + silicon pixel detector
Signal	backscattered γ ~ 20kHz/mA/W
Background	bremsstruhlung γ ~ 1kHz/mA

Laser-signal causality observed



Signal on the Silicon pixel detector



MBE system in Acken

Polarized electron cathode chip (diameter ~5cm) has been fabricated in **June 2025**:
Polarization of 85%, for 1ns laser (780nm) pulse length, several nC polarized electron charge will be obtained with the expected cathode lifetime ~6 months.
The experimentally measured polarization is about 75%,
And the quantum efficiency is around 0.7%

EPFL

CHART Swiss Accelerator Research and Technology

FUTURE CIRCULAR COLLIDER

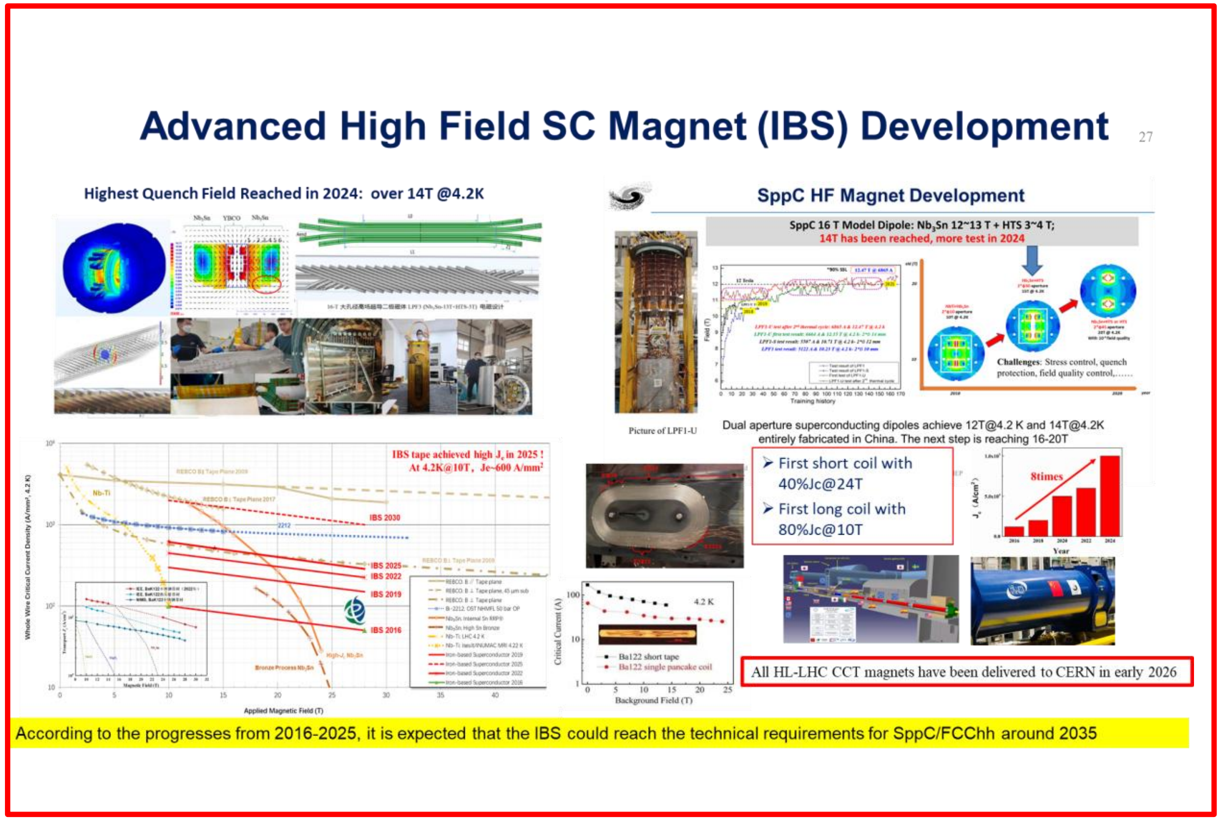
FCC-ee Beam Polarization Studies —— Status and Challenges

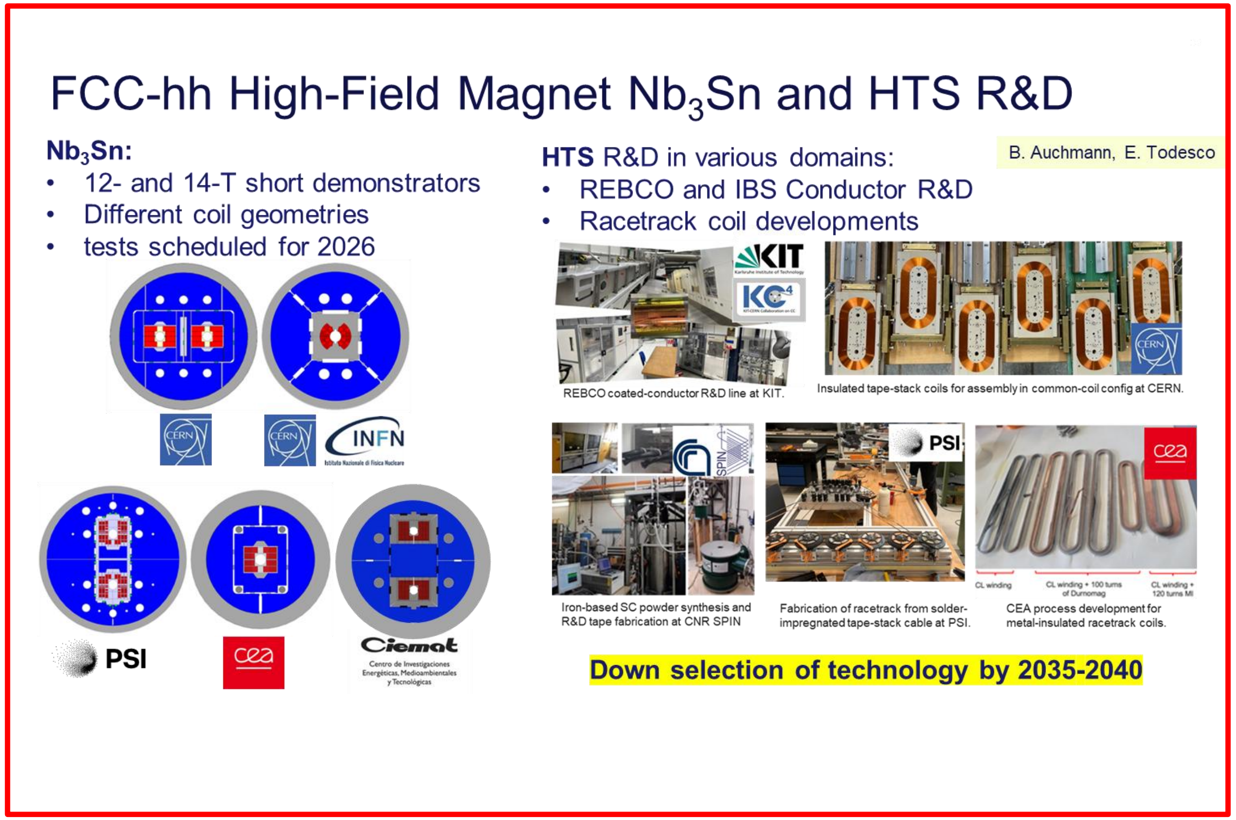
Yi Wu, Jorg Wenninger, Léon Van Riesen-Haupt, Tatiana Pieloni, Mike Seidel

Acknowledgements to Zhe Duan, Desmond Barber, David Sagan, Alain Blondel, Frank Zimmermann
and FCC-ee EPOL and optics tuning working groups

Work supported by the Swiss Accelerator Research and Technology (CHART)

SppC and FCChh High Field SC Dipole Magnets in Synergy and Beyond





There are 8 CEPC accelerator and MDI talks in FCC week 2026, June 8-12, 2026, Finland

https://indico.cern.ch/event/1552126/timetable/

Join mini workshops between CEPC and FCC, such as "**Electro-Magnetic Separator Study**", is under preparation

Summary

- CEPC is continuing to complete EDR based on the completed TDRs and prepare for the application of 16th five-year plan in 2030
- Many key technology developments will be completed in 2026, such as booster magnet and vacuum chamber NEG coating lines, various klystrons, SC quadrupole, etc.
- The geological study has been completed on CEPC EDR site
- Plasma accelerator test facility based on BEPCII injection linac has first beam in April 2026 under commissioning with electron and positron beams
- BEPCII-UP scheme serves as a prototype of CEPC and training/collaboration platforms
- There are big potentials in the synergy and collaboration between CEPC and FCC
- There are 8 CEPC accelerator and MDI talks in FCC week 2026, June8-12, 2026, Finland
- International efforts towards Higgs factories are common endeavors of human beings, and the final goals should be and could be reached with persistence, endurance, supports and collaborations.

CEPC in Synergy with other Accelerator Projects in China

Project name	Machine type	Location	Cost (B RMB）	Completion time
CEPC	Higgs factory Upto ttar energy	Led by IHEP, China	**36.4 (where accelerator 19)**	Around 2035 (starting time around 2027)
BEPCII-U	e+e-collider 2.8GeV/beam	IHEP (Beijing)	**0.15**	2025
HEPS	4^{th} generation light source of 6GeV	IHEP (Huanrou)	**5**	2025
SAPS	4th generation light source of 3.5GeV	IHEP (Dongguan)	**3**	2031 (in R&D, to be approved)
HALF	4th generation light source of 2.2GeV	USTC (Hefei)	**2.8**	2028
SHINE	Hard XFEL of 8GeV	Shanghai-Tech Univ., SARI and SIOM of CAS (Shanghai)	**10**	2027
S3XFEL	S3XFEL of 2.5GeV	Shenzhen IASF	**11.4**	2031
DALS	FEL of 1GeV	Dalian DICP	**-**	(in R&D, to be approved,)
HIAF	High Intensity heavy ion Accelerator Facility	IMP, Huizhou	**2.8**	2025
CIADS	Nuclear waste transmutation	IMP, Huizhou	**4**	2027
CSNS-II	Spallation Neutron source proton injector of 300MeV	IHEP, Dongguan	**2.9**	2029

The total cost of the accelerator projects completed or under construction:39B RMB more than CEPC cost of 36.4B RMB
Experienced human resources, technologies, supporting industries, management, and international collaborations, etc. have made significant progresses in supporting to host a world-wide flagship project as CEPC in China

CEPC Host Lab IHEP and its Large Science Facilities