

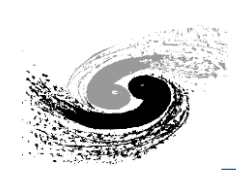
CEPC Accelerator EDR Highlights and Collaborations

J. Gao

IHEP

On behalf of CEPC-SppC accelerator team

第十二届中国 LHC 物理会议 (CLHCP2026)
Oct. 28 to Nov. 1, 2026, Wuhan, China



Contents

- **Introduction**
- **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**

The first Chinese Ph.D student in China, Dr. Zhongqi Ma,
in 1982 from IHEP

I. Early Stage of Particle Physics in China

- Chinese physicists imported particle physics into China (1940s)
- Particle physics under the umbrella of nuclear physics (atomic bomb)
- Chinese scientists in Dubna (1956-1965)
- Mao Zedong--philosophical issue in particle physics (Straton model)
- Zhou Enlai--diplomacy/political tool



Huawen Peng in DUBNA (1943)



Liu Jinyan, Chinese Physicists' Construction of the Straton Model in Social Context, CAIST 2 (2018): 085-122

1237 Series, WANG Peng, AILEY ZHANG, CHINESE SCIENTISTS IN DUBNA (1956-1965), CAIST 4 (2021): 931-988



Σ (Dubna)

Guangshun Zhou (Dubna)



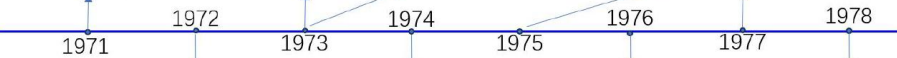
Zhou & Yang



Zhou & Wu, Yuan



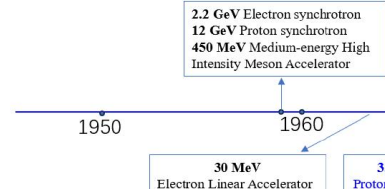
Mao, Zhou & Yang



Zhou & Lee



Mao & Lee



H. Kissinger visited China (July 1971)

BEPC

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

International collaboration on particle physics have always been a powerful engine to move forward

The Rise and Internationalization of
Particle Physics in China

Liu Jinyan

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

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>

Time: 1974
Machine: Brookhaven AGS & SLAC SPEAR
Country: USA

Time: 1968
Machine: SLAC
Discovered by SLAC team
Country: USA

Time: 1897
Machine: Cathode ray tube
Country: UK

Time: 1936
Machine: Cloud Chamber (Cosmic Rays)
Country: USA

Time: 1956
Machine: Savannah River Nuclear Reactor
Country: UK

Time: 1962
Machine: Alternating Gradient Synchrotron (AGS) with Spark Chamber
Country: USA

Time: 1995
Machine: Tevatron Collider (Fermilab)
Discovered by CDF & D0 collaborations
Country: USA

Time: 1979
Machine: PETRA Collider (DESY)
Discovered by TASSO
Country of Machine: Germany

Time: 1977
Machine: Fermilab Proton Accelerator
Country of machine: USA

Time: 1975
Machine: SPEAR Collider
Country: USA

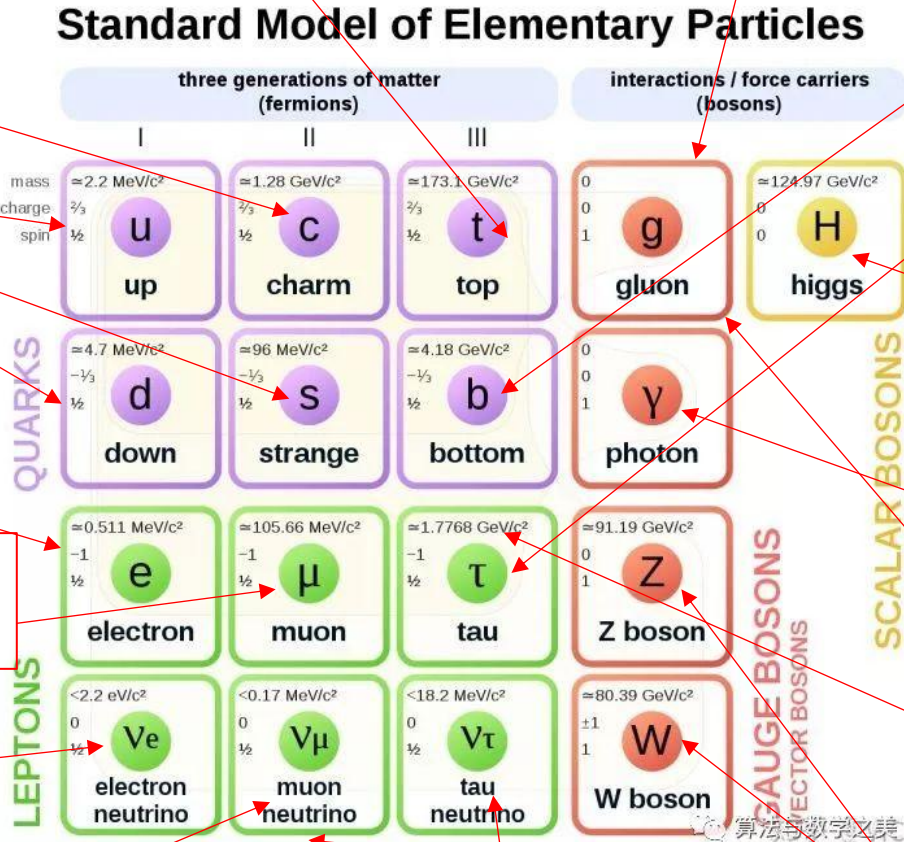
Time: 2012
Machine: Large Hadron Collider (LHC) at CERN
Discovered by ATLAS & CMS collaborations
Country: Switzerland

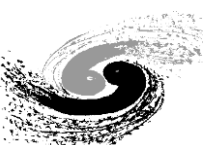
Time: 1905 (theory) / 1922 (exp.)
Machine: SLAC
Country: Germany/USA

Time: 1992
Machine: BEPC
Tau mass and R value precise measured by BES collaboration
Time: 2012 Neutrino oscillation angle θ_{13}
Experiment: Daya Bay
Time: 2026 glueball discovered, BEPCII
Country: China

Time: 1983
Machine: Super Proton Synchrotron (SPS) converted to proton-antiproton collider (CERN)
Discovered by UA1 & UA2
Country: Switzerland

Time: 2000
Machine: DONUT experiment at Fermilab
Discovered by DONUT collaboration
Country: USA



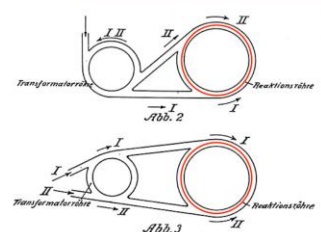
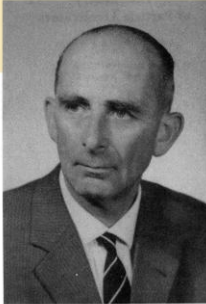


From the First e⁺e⁻ Circular Collider Ada to CEPC/FCCee



Rolf Wideröe 1902-1996

1943: secret patent of a 'nuclear mill' (published in 1953)



Rolf Wideröe

IL NUOVO CIMENTO Vol. XVIII, N. 6 16 Dicembre 1960

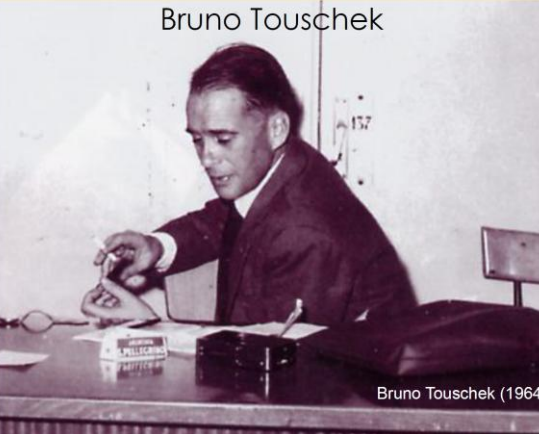
The Frascati Storage Ring.

C. BERNARDINI, G. F. CORAZZA, G. GIUGNO
Laboratori Nazionali del CNEN - Frascati

B. TOSCHEK
*Istituto di Fisica dell'Università - Roma
Istituto Nazionale di Fisica Nucleare - Sezione di Roma*

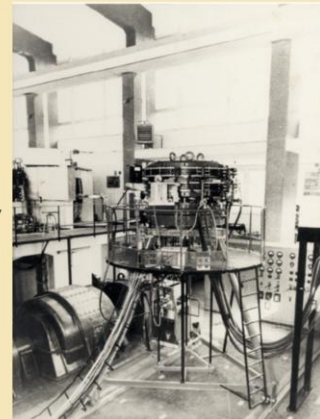
(ricevuto il 7 Novembre 1960)

Bruno Touschek



Bruno Touschek (1964)

AdA in the electron synchrotron hall in the Frascati Laboratory (1961-62)



Pierre Marin (1927-2002)



1966 photograph

The AdA collaboration in Orsay

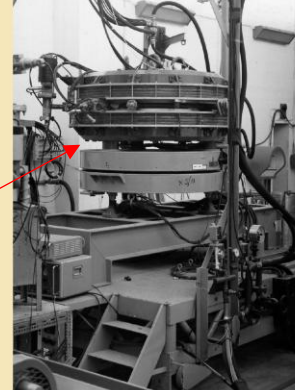
C. Bernardini, G. Corazza, G. Di Giugno, J. Haïssinski, P. Marin, R. Querzoli, B. Touschek

The Orsay linear accelerator wave guide



1962

AdA at LAL



Spring 1964: first observation ever of e⁺-e⁻ collisions in a storage ring

$e^+ + e^- \rightarrow e^+ + e^- + \gamma \text{ ray}$

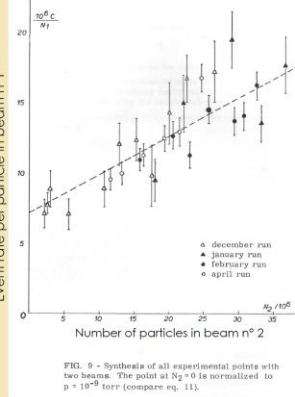
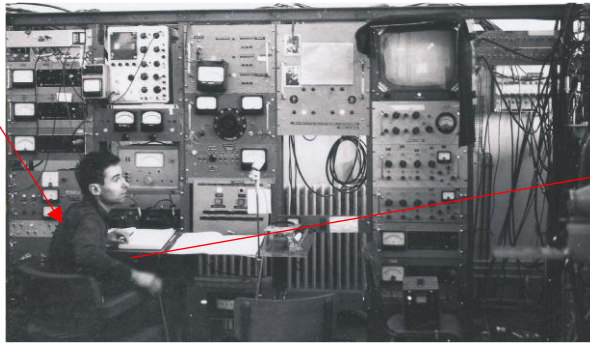
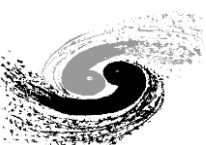


FIG. 9 - Synthesis of all experimental points with two beams. The point at $N_2 = 0$ is normalized to $p = 10^{-9}$ torr (compare eq. 11).





From BEPC, BEPCII, BEPCII-U to CEPC

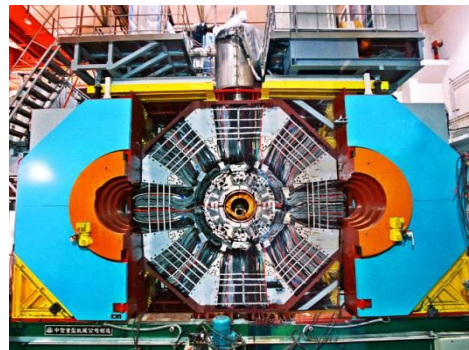
BEPC, the first collider in China, was completed in 1988 with luminosity $1 \times 10^{31} \text{cm}^{-2} \text{s}^{-1}$ @1.89GeV
BEPC II was completed in 2009

On April 5, 2016, BEPCII luminosity reached: $10 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$ @1.89GeV (reached the design value)

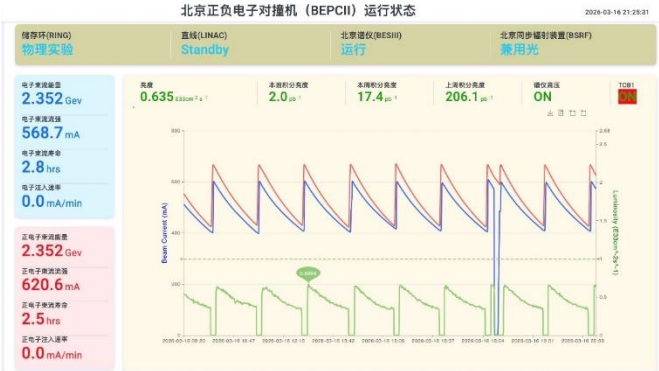
On May 7, 2026, BEPCII-U luminosity reached: $L = 1.112 \times 10^{33} \text{cm}^{-2} \text{s}^{-1}$ @2.35 GeV (reached the design value)

After BEPCII what is the next high energy collider?

The discovery of Higgs at LHC@CERN in July 4, 2012, the answer is clear, CEPC!



BEPCII-U in operation





In 60's, **Ada, VEP-I,**
VEPP-II, ACO...



J. Gao, "Review of Different Colliders",
International Journal of Modern Physics A,
(2021) 2142002 (25 pages).

The Classification of Electron Positron Circular Colliders

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

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

Φp is the Piwinski angle

$$F_{DA} = e^{\left(-\frac{A}{\beta_{y*}(\text{mm})^2}\right)} \\ = e^{-C\left(\frac{Da_{inj}}{Accep_{inj}}\right)^2}$$

Eq. 1 and Eq. 2 could be found in following reference: J. Gao, “The Status of the CEPC Project in EDR”, International Journal of Modern Physics A (2026) 2641001 (16 pages), <https://www.worldscientific.com/doi/10.1142/S0217751X26410010>

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

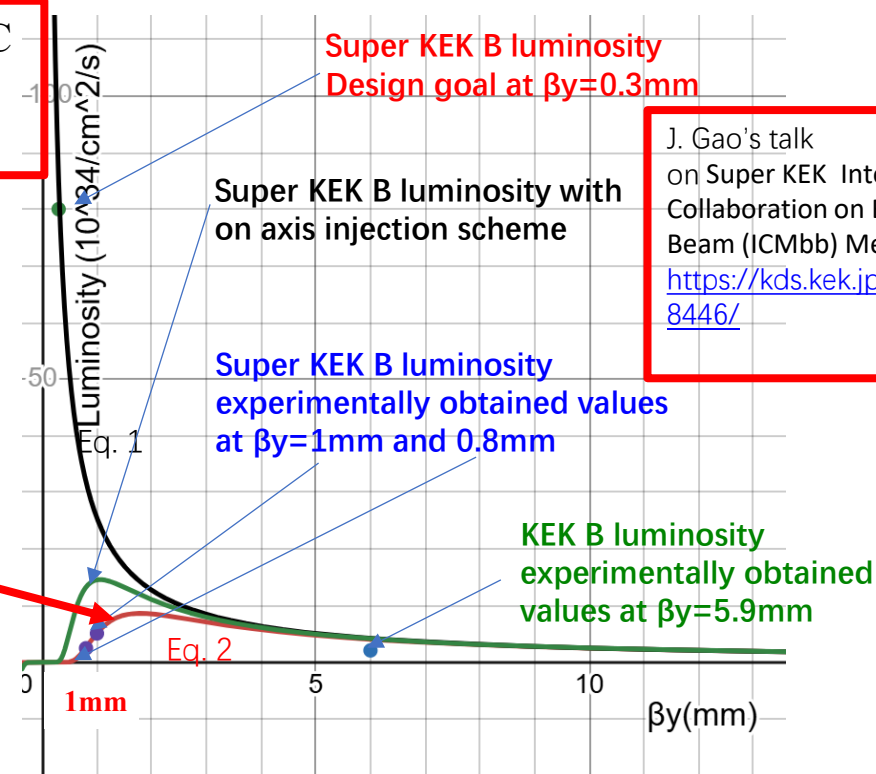
Ada, VEP-I, VEPP-II, ACO, ADONE, SPEAR, PETRA, CESR, BEPC BEPCII, LEP-I,II, KEKB, PEP-II, VEPP-4, DAFNE(CW)

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

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

For Super KEK B: $A=1.6\text{mm}^2$ (off axis injection)

For Super KEK B: $A=0.56\text{mm}^2$ (on axis injection)

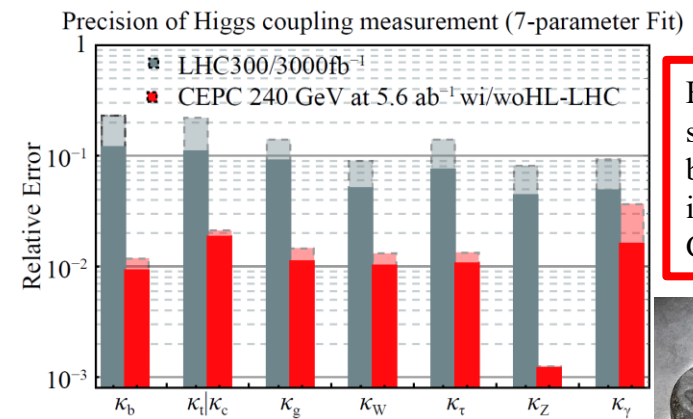


J. Gao's talk on Super KEK International Collaboration on Beam-Beam (ICMbb) Meeting <https://kds.kek.jp/event/58446/>

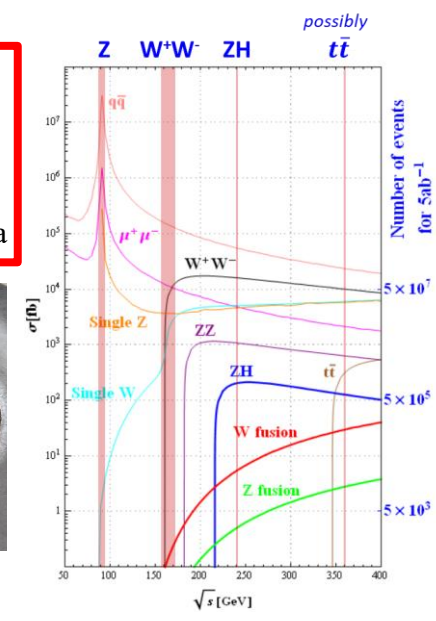
Figure 1: Super KEK B luminosities from the experiments and the analytical formulae Eq. 1 and Eq. 2

CEPC Physics Goals, Operation Plan and Goals in TDR/EDR

Operation mode		ZH	Z	W+W-	$t\bar{t}$
$\sqrt{s}$ [GeV]		~240	~91	~160	~360
Run Time [years]		10	2	1	5
30 MW	$L / IP [\times 10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	5.0	115	16	0.5
	$\int L dt [\text{ab}^{-1}, 2 \text{ IPs}]$	13	60	4.2	0.65
	Event yields [2 IPs]	2.6×10^6	2.5×10^{12}	1.3×10^8	4×10^5
50 MW	$L / IP [\times 10^{34} \text{ cm}^{-2}\text{s}^{-1}]$	8.3	192	26.7	0.8
	$\int L dt [\text{ab}^{-1}, 2 \text{ IPs}]$	21.6	100	6.9	1
	Event yields [2 IPs]	4.3×10^6	4.1×10^{12}	2.1×10^8	6×10^5



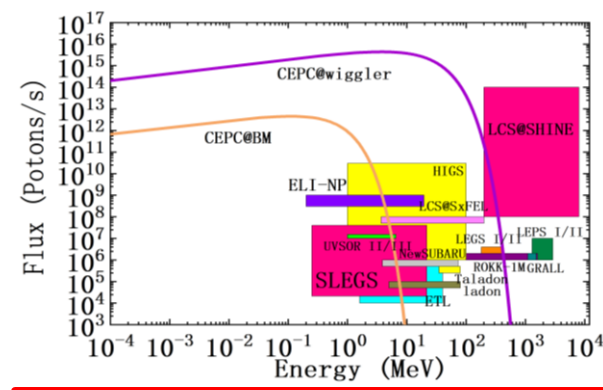
Higgs potential and the spontaneous symmetry breaking (618?~1878) in the Ghost city of Fengdu County of Chongqing, China



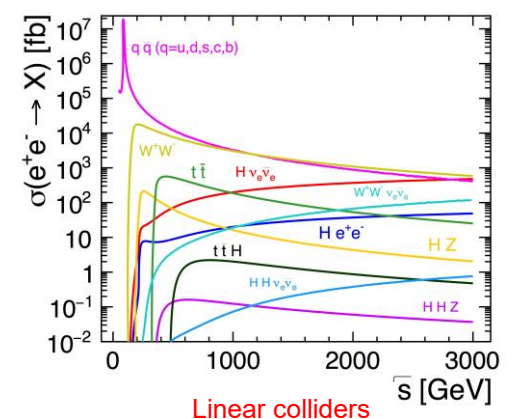
CEPC operation scenarios:
Higgs 10 years, Z-pole 2 years,
W 1 year, ttbar 5 years as upgrade

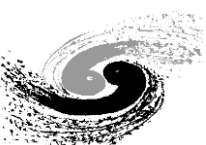
- * Higgs is the top priority for CEPC
- ** Detector solenoid field is 3 Tesla for all other energies.

CEPC physics white papers:
1: Higgs physics, Chinese Physics C Vol. 43, No. 4 (2019) 043002
<https://arxiv.org/pdf/1810.09037>
2: Flavor physics, https://arxiv.org/pdf/2412.19743 (2024)
3: Electroweak physics, to be published
4: New Physics Search at the CEPC: a General Perspective
<https://doi.org/10.48550/arXiv.2505.24810> (2025)
5: QCD, to be published



CEPC as high energy SR light source

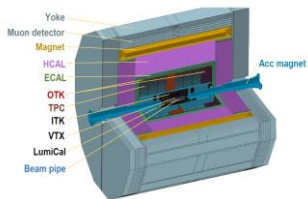




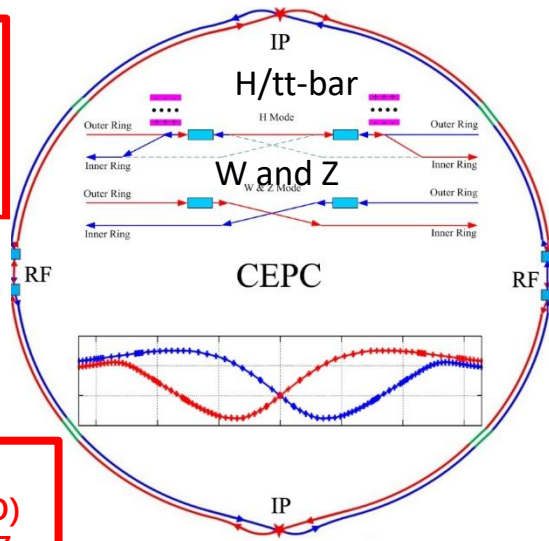
CEPC Higgs Factory and SppC Layout in TDR/EDR

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

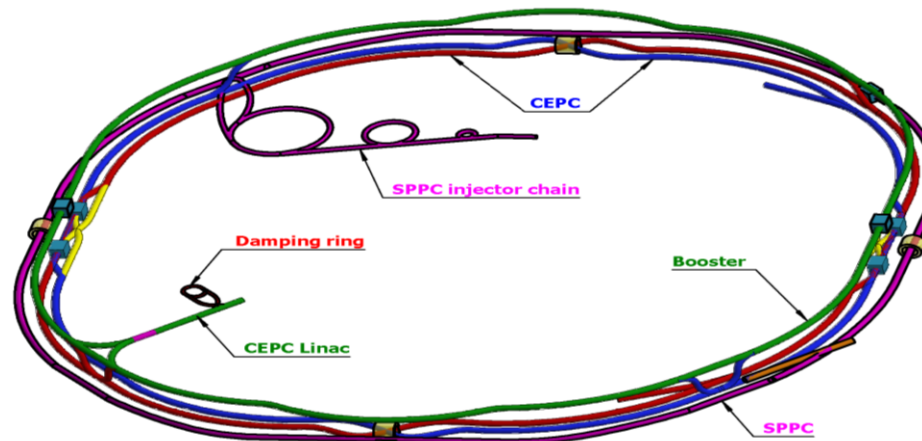
CEPC design has **two** detectors
@**H,W,Z** and
ttbar



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

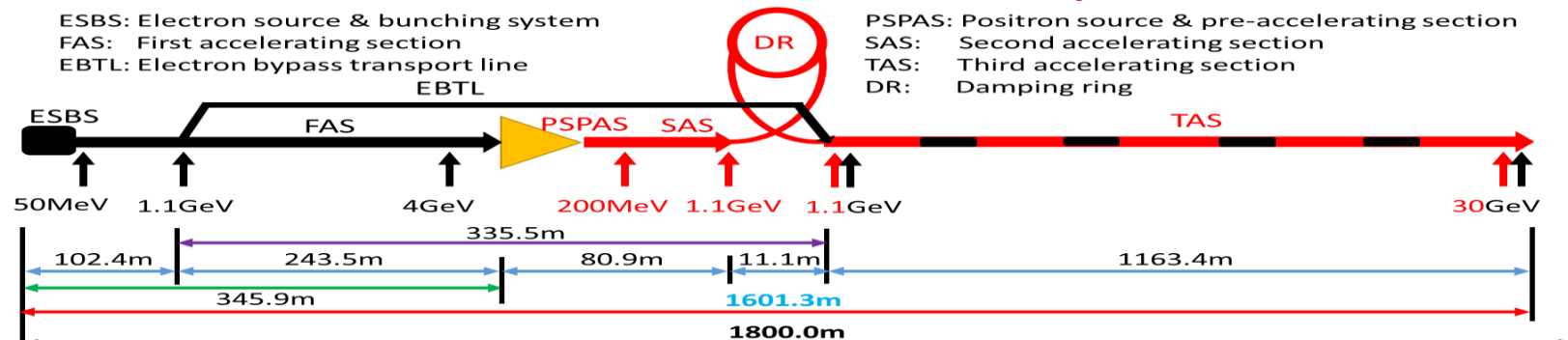
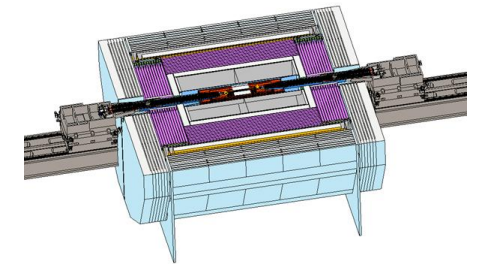


CEPC collider ring (100km)

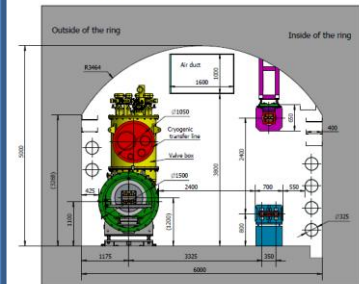
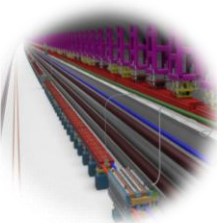


CEPC booster ring (100km)

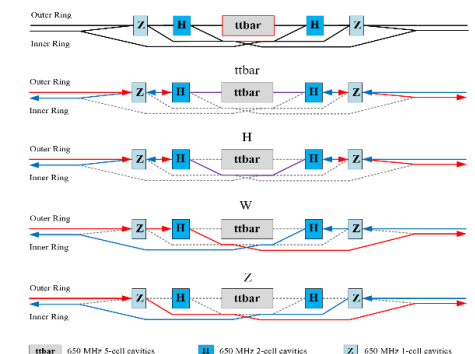
CEPC TDR S+C-band 30GeV linac injector



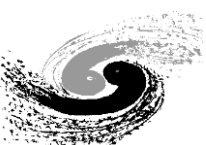
TUNNEL CROSS SECTION OF THE ARC AREA



CEPC/SppC in the same tunnel



Z,W, Higgs and ttbar energies



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

		$t\bar{t}$	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 ($10^{34} \text{ cm}^{-2} \text{ s}^{-1}$)	5.0	115	16	0.5
Luminosity per IP ($10^{34} \text{ cm}^{-2} \text{ s}^{-1}$) From J. Gao's formula below	5	115	12	0.59

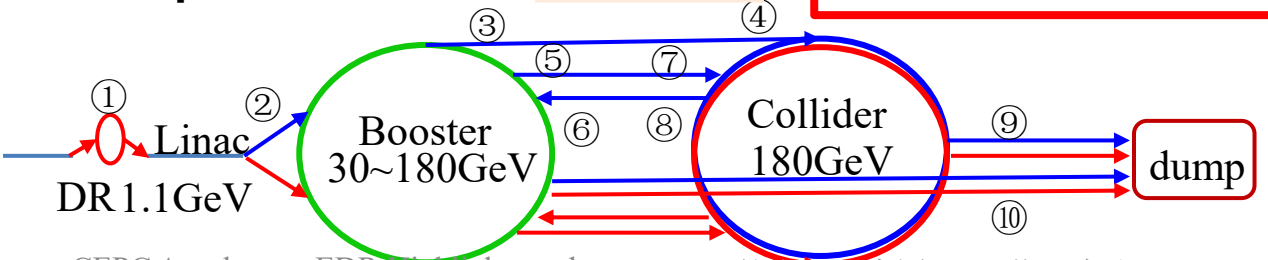
Running scenarios: Higgs 10 years, Z 2 years, W 1 year, ttbar 5 years

Transport lines

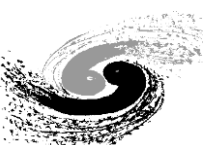
Factory of
4 Million Higgs
4 Trillion Z bosons
200 Million W+W pairs
600K $t\bar{t}$ pairs

$$L_{max} [cm^{-2} s^{-1}] = 0.158 \times 10^{34} \frac{(1+r)}{\beta_y [mm]} \sqrt{\frac{R[m]}{C_Y [mGeV^3] N_{IP}}} (P_b [MW] / E [GeV]^2) e^{\frac{\sqrt{\Phi_p}}{3.22}} (1 + 0.000505 \cdot \Phi_p^2) \quad (\text{J. Gao's formula})$$

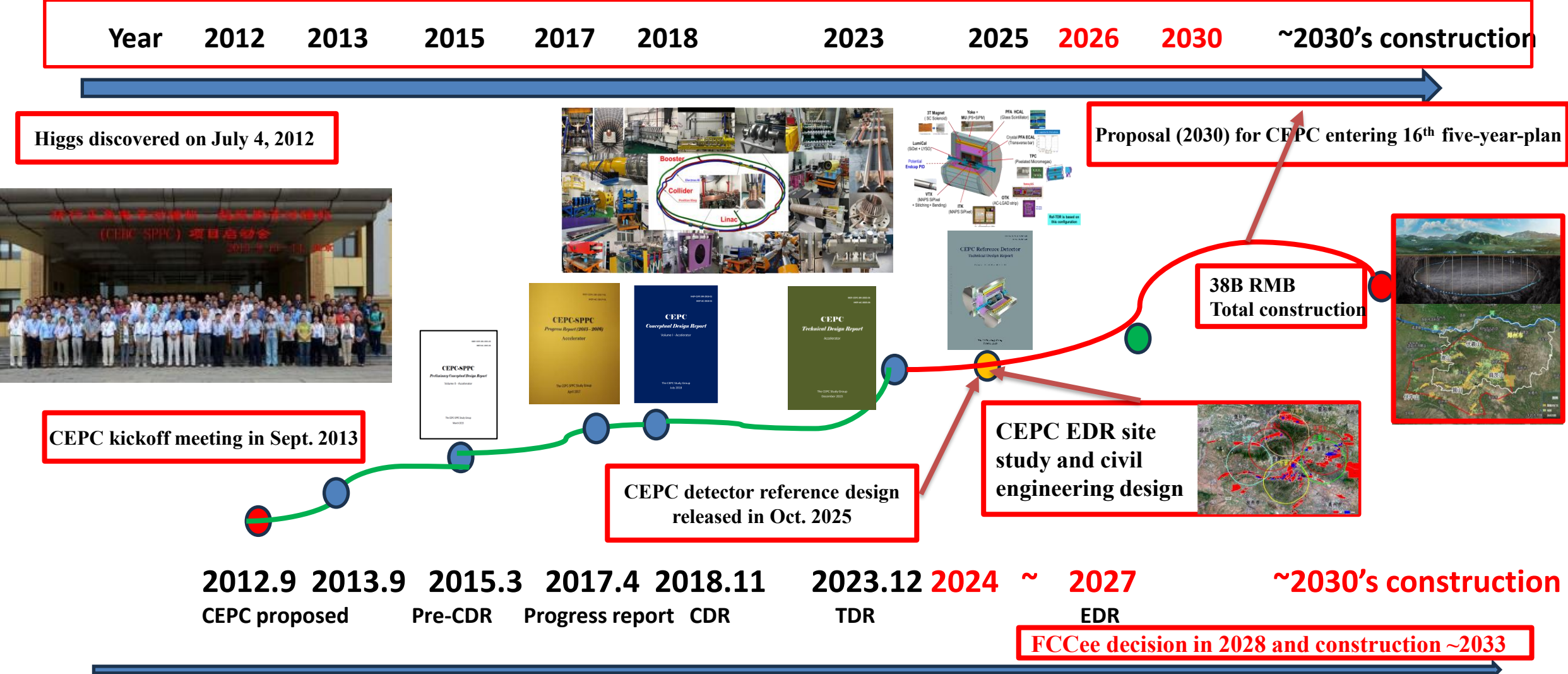
for isomagnetic machine with crab-waist collision



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



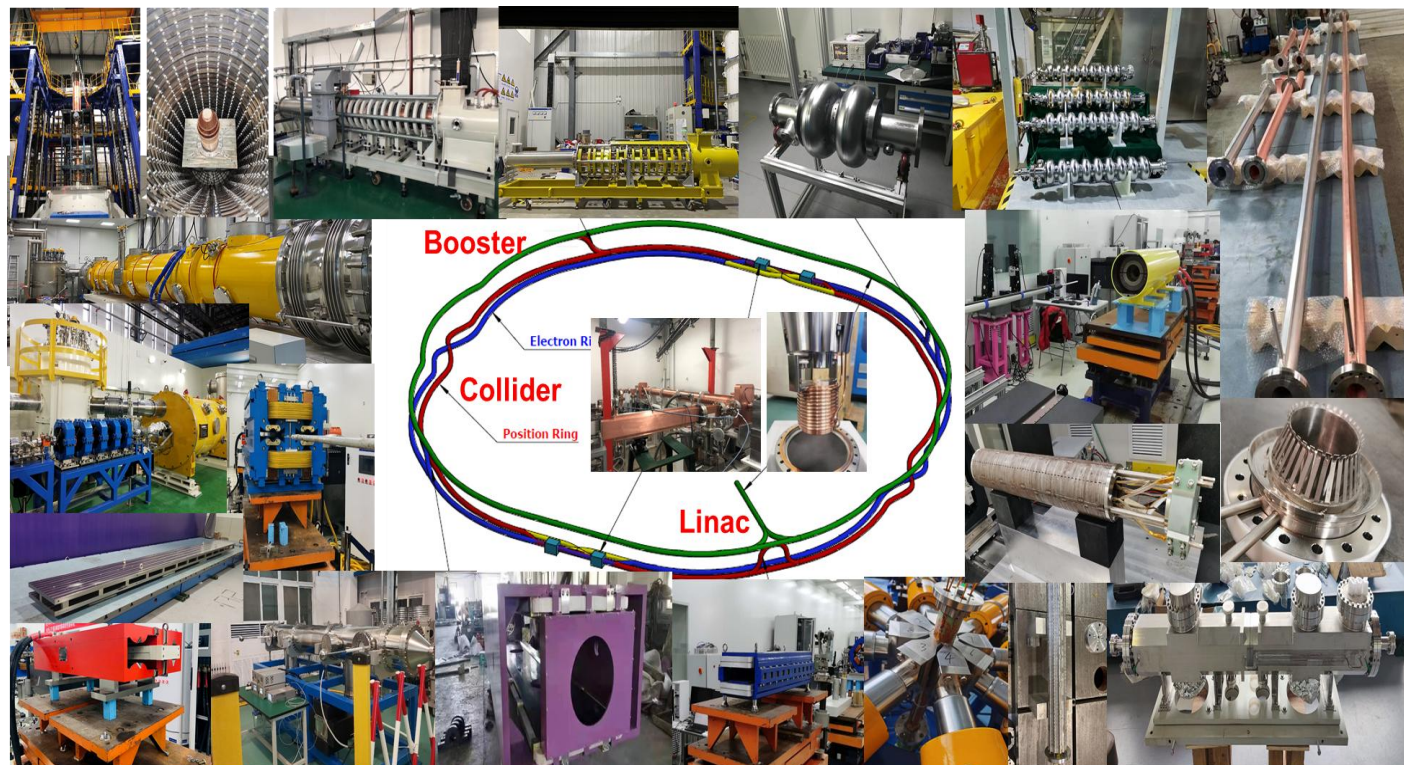
J. Gao, "The status of the CEPC project in EDR", IJMPA, (2026) 2641001 (16 pages) 2026, <https://doi.org/10.1142/S0217751X26410010>

CEPC Accelerator EDR Highlights and Collaborations-J. Gao

第十二届中国 LHC 物理会议 (CLHCP2026), Oct. 28-Nov. 1, 2026, Wuhan, China

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

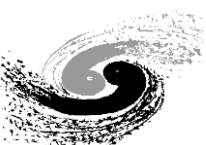
✓ Prototype Manufactured

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%

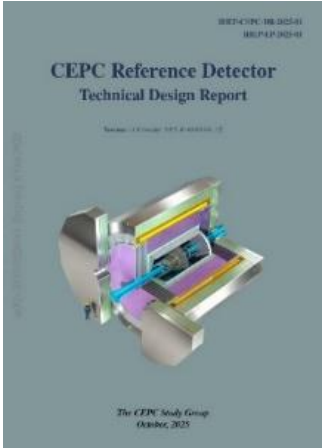
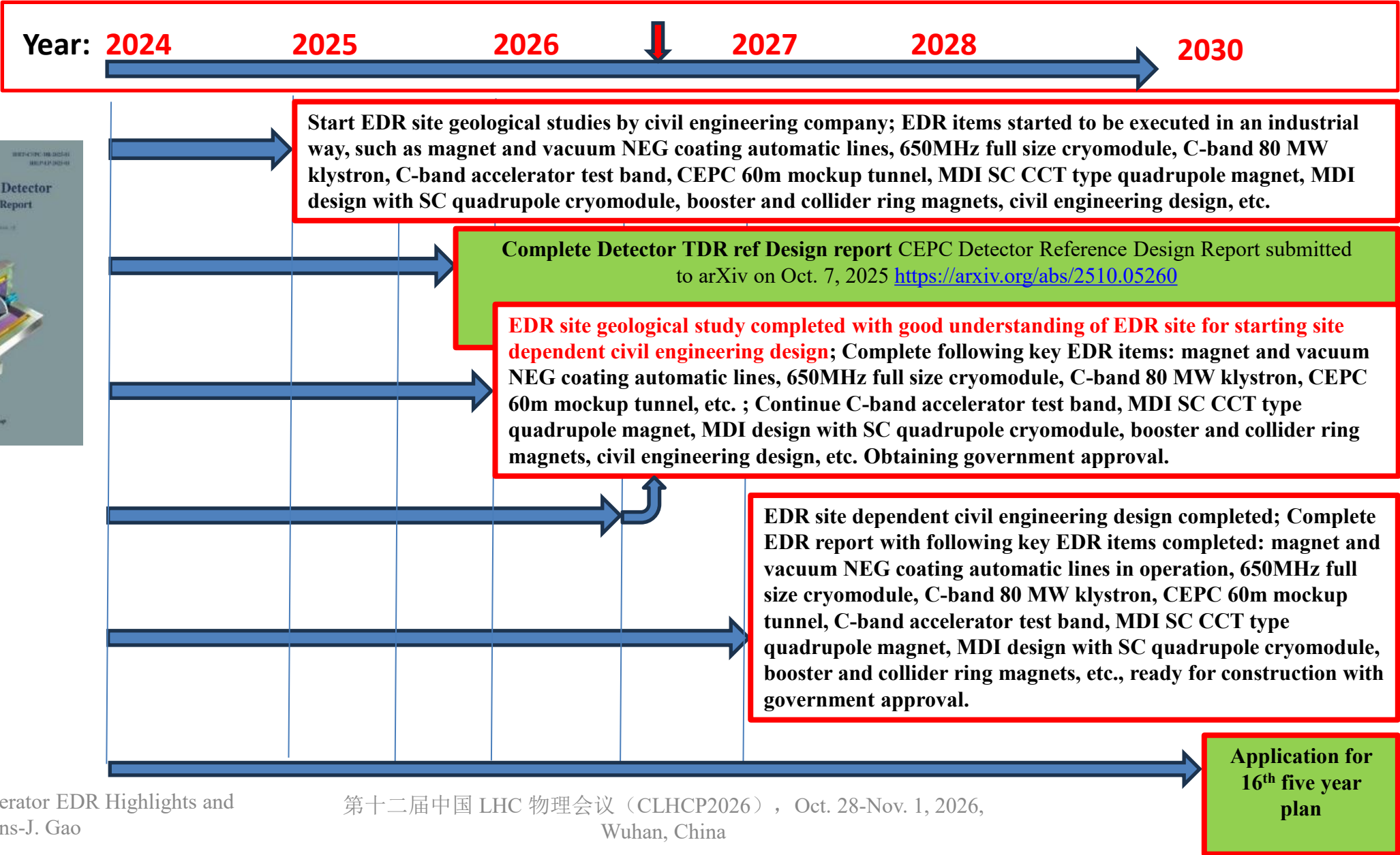


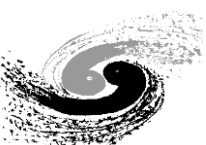
IHEP HEPS (4th generation light source at IHEP) 6 GeV, 36 nm·rad, has been completed in Oct. 2025

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>



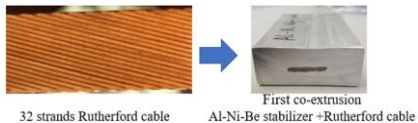
CEPC EDR Milestones and Check Points





CEPC Detector Reference TDR Completed → AGORA

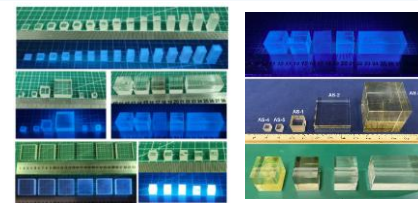
3T Magnet
(SC Solenoid)



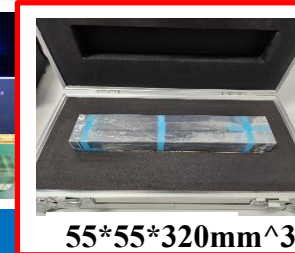
Yoke + MU (PS+SiPM)



PFA HCAL
(Glass Scintillator)

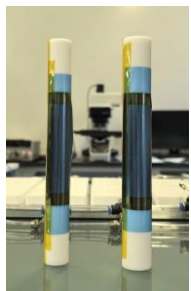
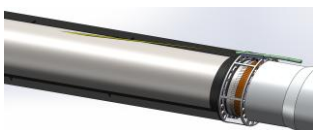


$\gamma - \gamma$ separation for 5 GeV photons

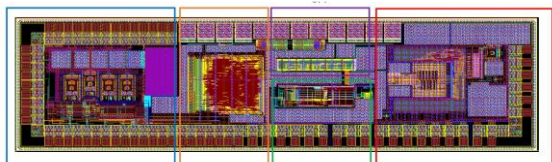


LumiCal
(SiDet + LYSO)

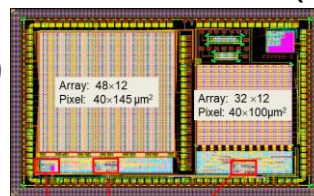
Potential Endcap PID



VTX
(MAPS SiPixel + Stitching + Bending)

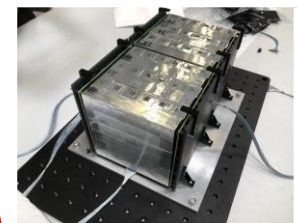
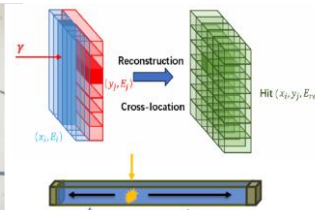


ITK
(MAPS SiPixel)

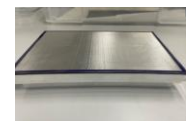


DLL LVDS driver/receiver up to 1.28Gb/s

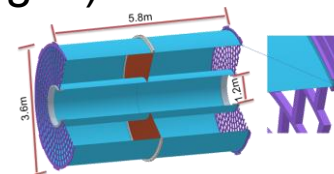
Crystal PFA ECAL
(Transverse bar)



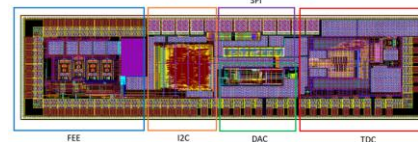
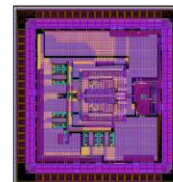
TPC (3T)
(Pixelated Micromegas)



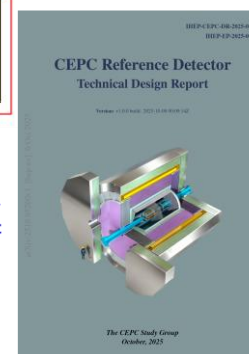
Readout ASIC



OTK
(AC-LGAD strip)



TDC delay line layout



CEPC Detector Reference Technical Design Report reviewed by IDRC in April and Sept. 2025, and submitted to arXiv on Oct. 6, 2025.
<https://arxiv.org/abs/2510.05260>

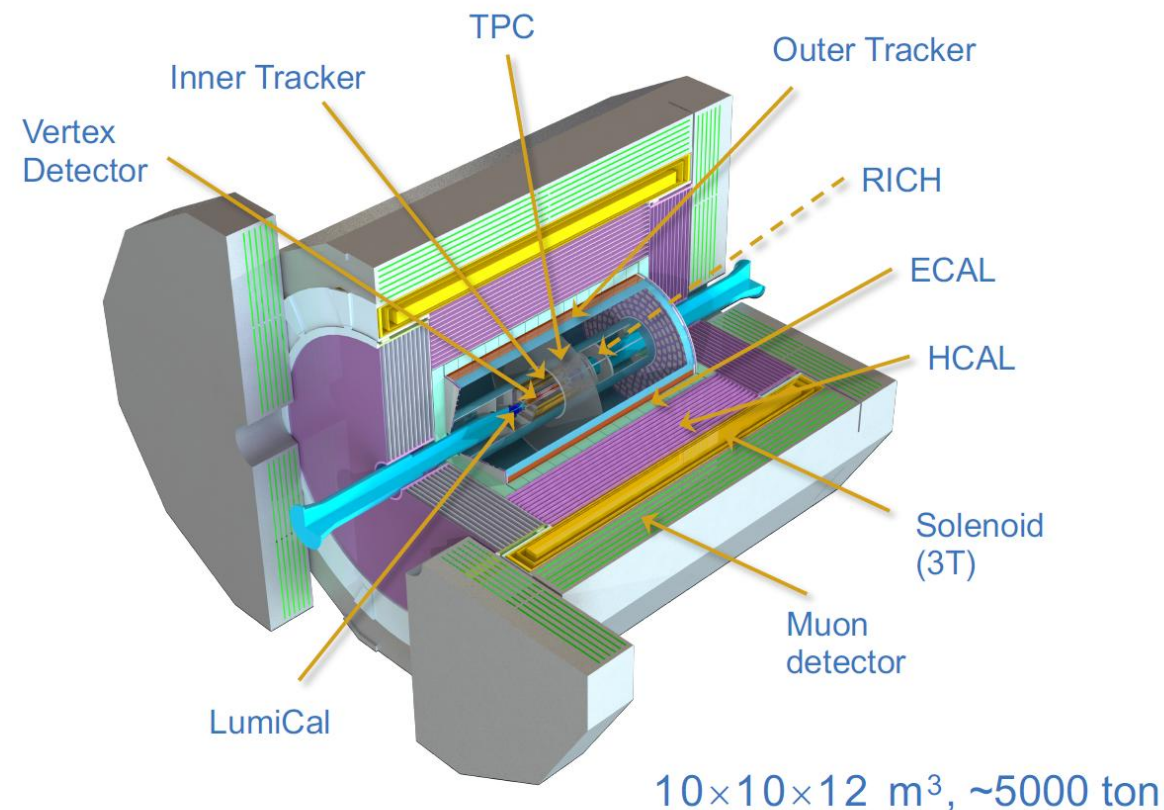
Ref-TDR is based on this configuration

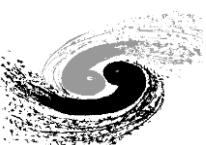
CEPC Detector AGORA Specifications

Baseline design - AGORA



Sub-system	Technology
VTX	MAPS + stitching
ITK	HV-MAPS in 55nm
TPC	0.5 x 0.5 mm ² readout, dN/dx PID
OTK	AC-LGAD with 50ps timing
RICH	Aerogel + SiPM
ECAL	Glass cubic $3\%/\sqrt{E} \oplus 1\%$
HCAL	Glass cubic $<15\%/\sqrt{E} \oplus 4\%$
Solenoid	SC solenoid 3T, 2T at Z-pole
Muon	Plastic Scintillator + SiPM
LumiCal	Silicon + LYSO





AGORA Detector CEPC/FCCee

FCC-ee physics, experiments and detectors (PED) in the Reference Design Phase: status, plans and opportunities for engagement

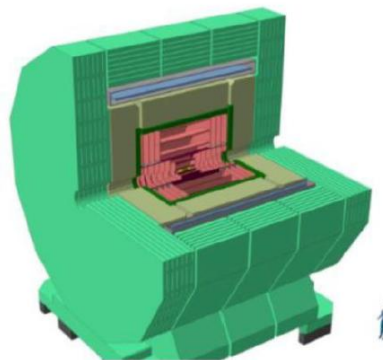
Guy Wilkinson

University of Oxford,

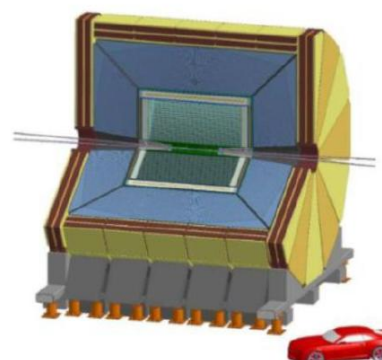
Fourth US FCC meeting, SLAC, Sept. 8-11, 2026
<https://indico.slac.stanford.edu/event/10213/timetable/#20260909.detailed>

Emerging detector concepts

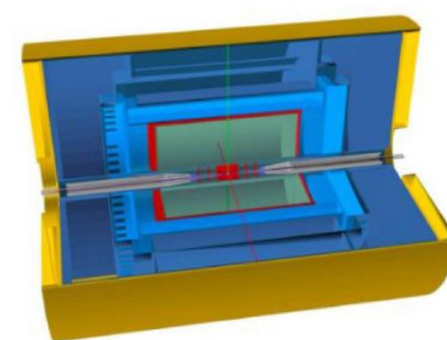
CLD



IDEA



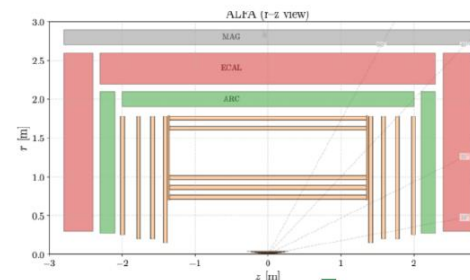
ALLEGRO



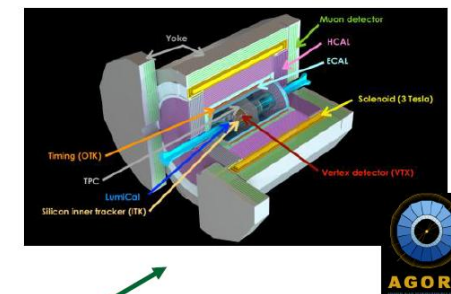
ILD (being ported from ILC)



ALFA

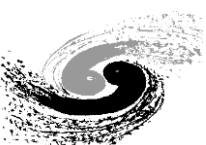


AGORA (being ported from CEPC)



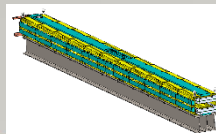
New additions

Not yet collaborations ! These will only form after project approval.



CEPC Booster Magnet Automatic Production Line in EDR

4 booster magnets fabricated per day



~15000 dipole magnets in the CEPC booster



The 1/3 magnet assembly line arrived @IHEP on Oct. 10, 2026



Stacking of 1/3

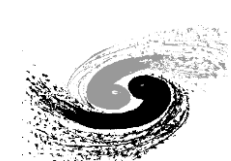
Production of

Assembly of the

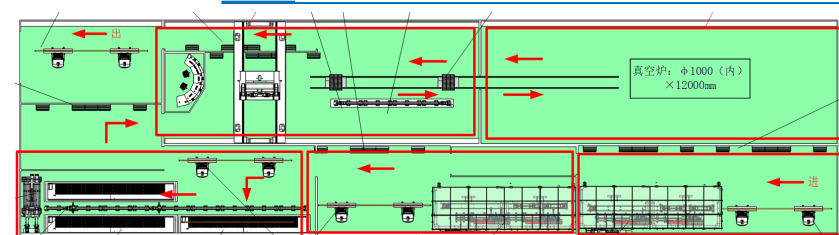
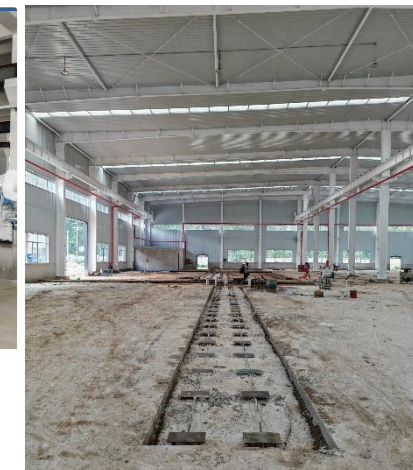
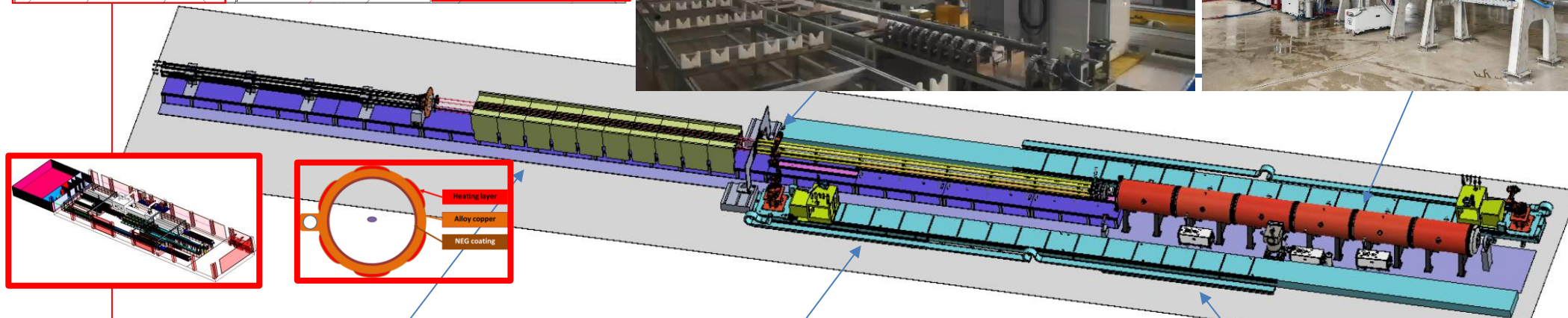
First Magnet Core from Production Line



Status: 1/3 completed, fully completed by November 2027

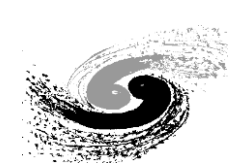


CEPC NEG Coated Vacuum Chamber (200km) Automatic Production Line in EDR



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

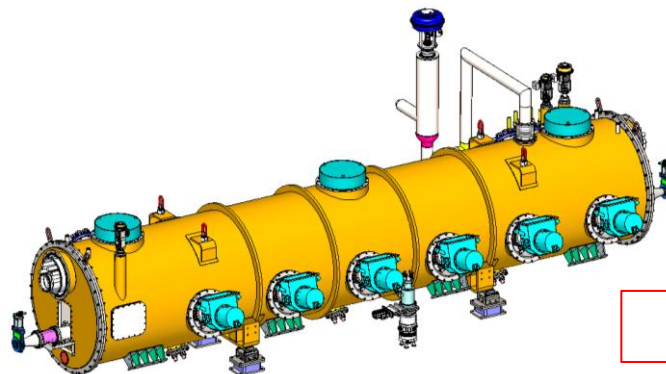
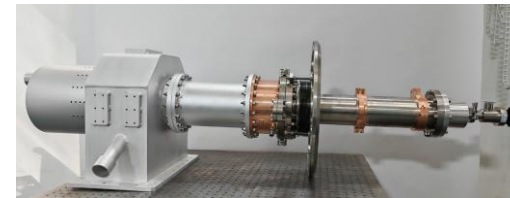
Status: under construction, to be completed and tested in 2026



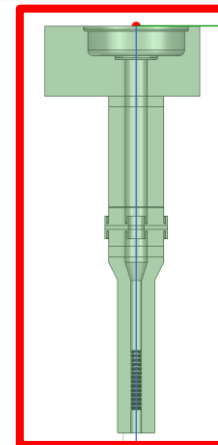
CEPC 650MHz SRF Development in EDR



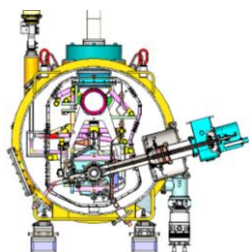
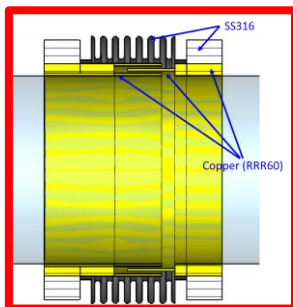
CEPC collider ring 650MHz 2*cell short test module has been completed in TDR phase



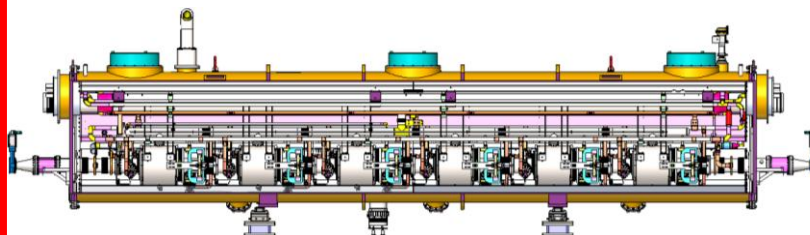
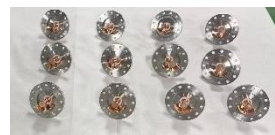
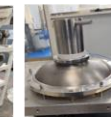
Old lower CW power coupler



New 300kW CW high power coupler design in the 650 cryomodule

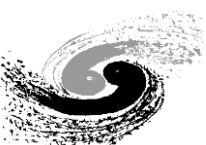


High power below design in the 650 cryomodule



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 is under development in EDR**

Status: to be completed in 2027



CEPC High Efficiency and High Power Klystrons

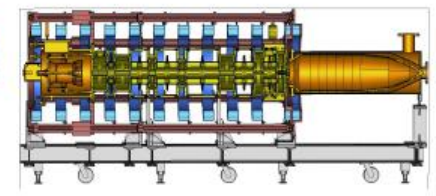
Klystron R&D



Klystron No. 1
Efficiency 65%
(2020)



Klystron No. 2
Efficiency 77%
(2021)

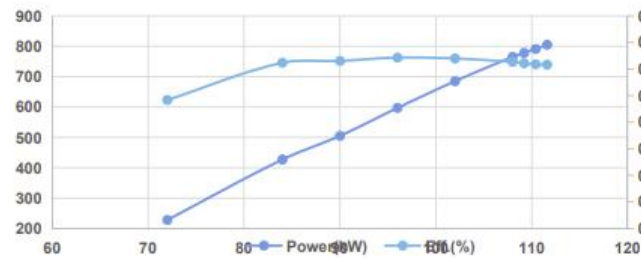
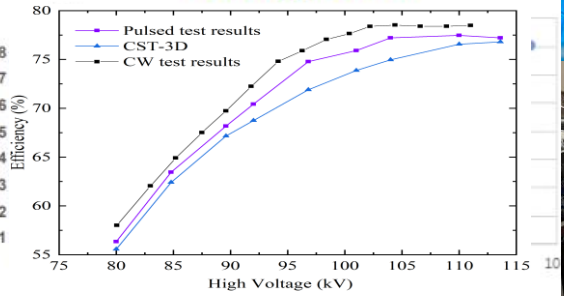


Klystron No. 3 (MBI)
Efficiency 80.5%
To be completed in 2026

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

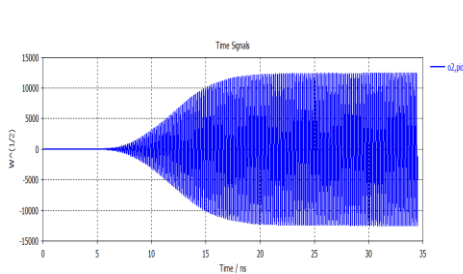
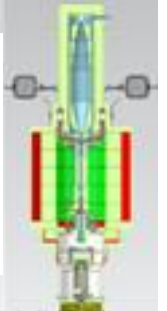
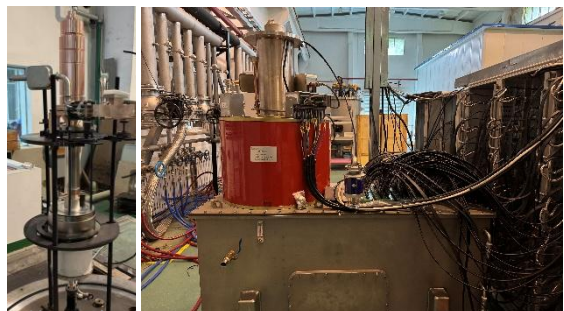
78.5% @ 803kW CW in 2024

High Voltage vs. Power & Efficiency

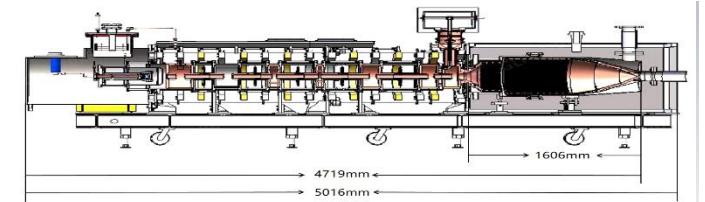
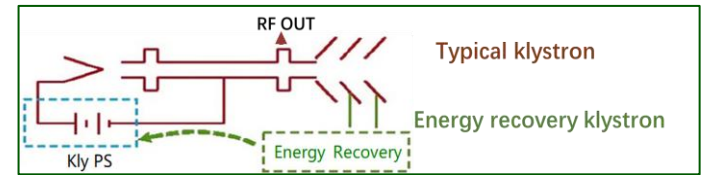


CEPC collider ring 650MHz klystron development in TDR/EDR phase

Parameters	Value
Frequency	5712 MHz
Output Power	80MW
Drive power	350W
Gain	54 dB
Efficiency	47%
3dB bandwidth	±10MHz
Beam voltage	420 kV
Beam current	403 A
Focusing field	~0.27 T maximum



CEPC 650Mhz Energy Recovery Klystron

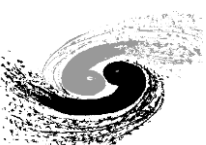


Parameter	Value
Operating frequency	650 MHz
Beam Voltage	113 kV
Efficiency	77.5%
Output power	800 kW
Beam perveance	0.25 μ P
Beam current	9.5A
Efficiency (one-stage depressed collector)	85%



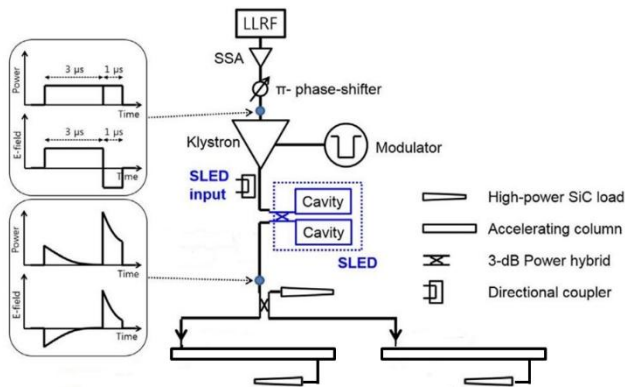
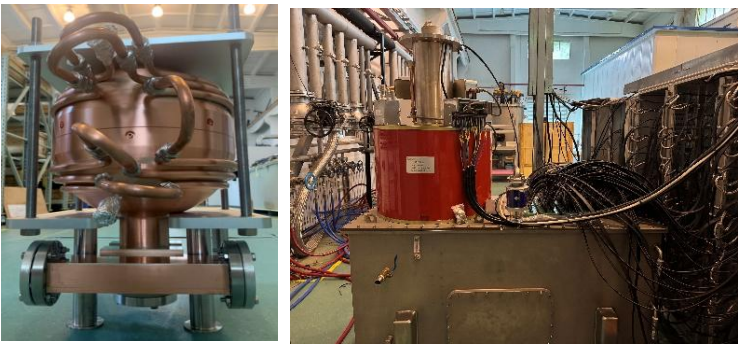
CEPC 650Mhz Energy Recovery Klystron to be completed by end of 2026

CEPC Linac C band 5720MHz 80MW Klystron fabrication completed and under test in September in 2026

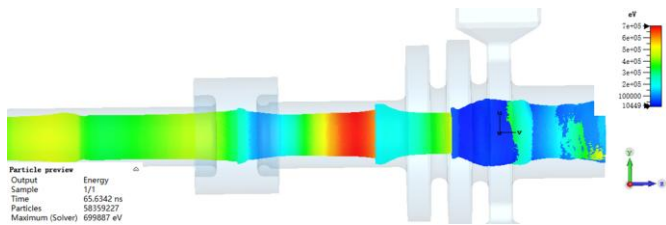


CEPC C-Band Linac Test Bench in EDR

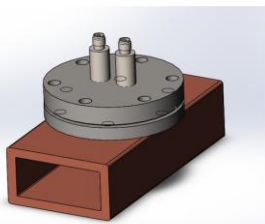
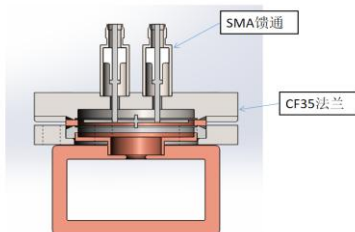
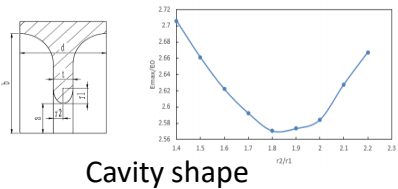
- CEPC EDR will establish the **C-band test bench** and test the components. With pulsed compressor, waveguides, directional couplers, loads, bend and straight waveguides, etc. **as a basic unit of CEPC C-band linac**
- The C-band test band is equipped with a CEPC 5720MHz 80MW power source
- The CEPC C-band test band will be completed in 2026



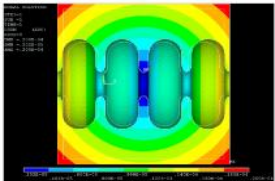
CEPC 80MW C-band linac test band completed in 2026



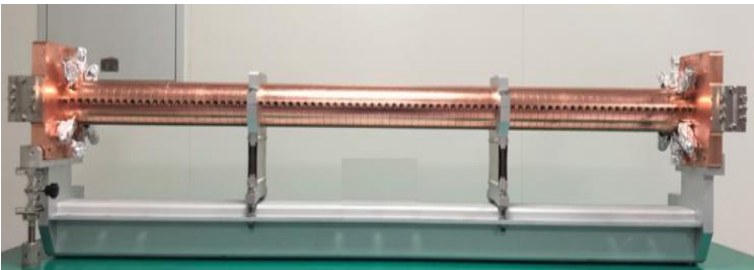
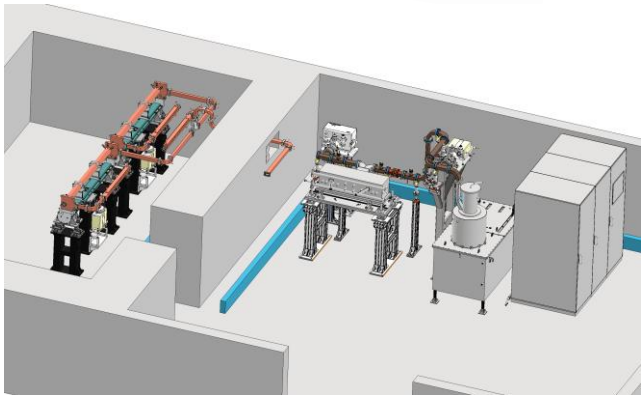
C band 5720MHz 80MW Klystron design completed, and fabrication will be completed in 2025



Cavity shape



The deformation caused by temperature variation



CEPC C-band linac test band will be completed in 2026

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)

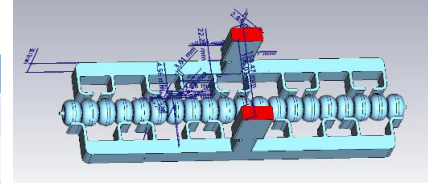
Two types of structures have been studied, type I and type II

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

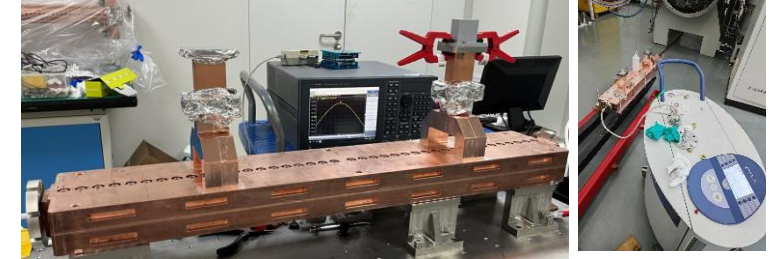
Type II will reach 144MV/m with 80MW input

(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

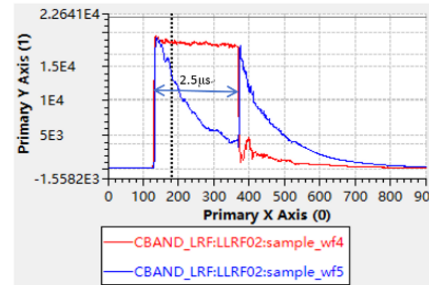
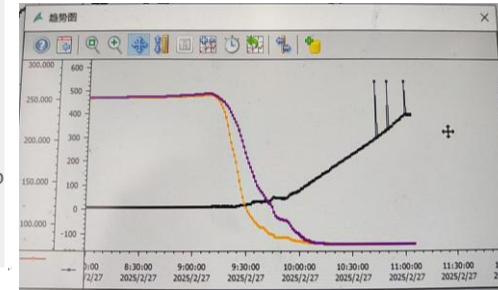
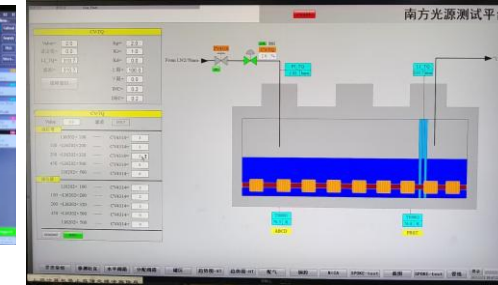


Type I: Aperture diameter 5mm, Length 0.5m

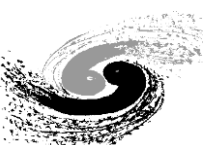


Type II: Aperture diameter 10mm, Length 1m under measurement and power test in Nov. 2026

This cool copper 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}	45.47×10^7	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	-

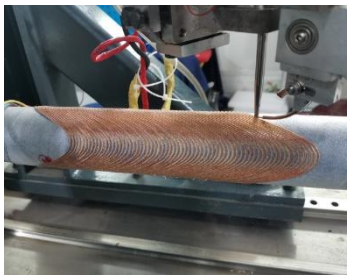


Design parameters of SC quadrupoles with CCT coil

- 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 × 10 ⁻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		

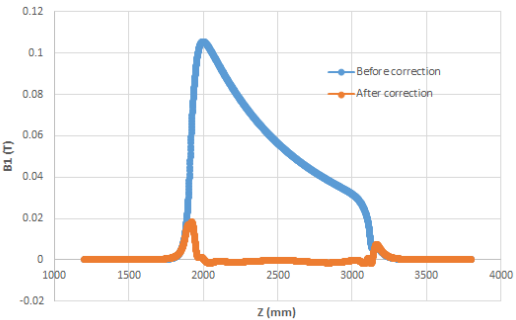
Direct winding CCT coil is preferred for CEPC



IHEP fabricated CEPC CCT coil prototype with direct winding, inner diameter 40mm, 600mm long, **vertical tested in August 2026**, **Experimental results analysis is on going**

Q1a Direct winding CCT coil

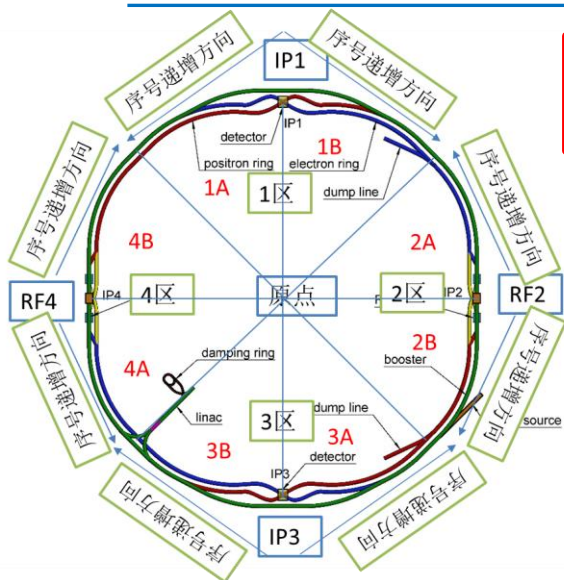
Preliminary design
Round 0.7mm conductor, canted angle: 24 deg
8 layers CCT quadrupole coil. The inner radius of the coil is 20mm
Excitation current: 730A @4.2K (2K is also under study)
3D calculation in OPERA-3D
Radius of single aperture <31mm



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

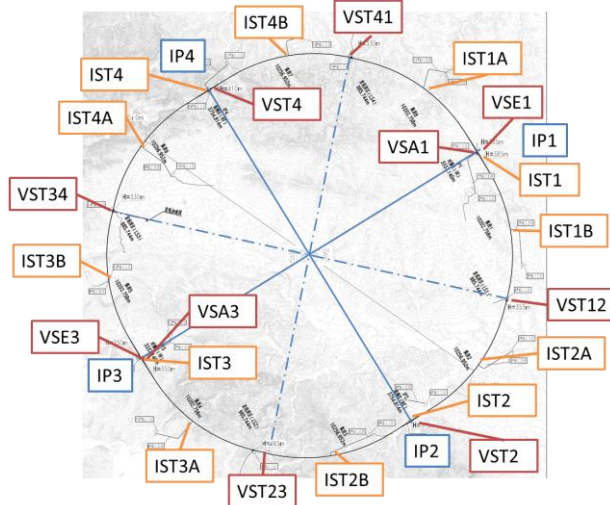


CEPC Facility components' naming system established

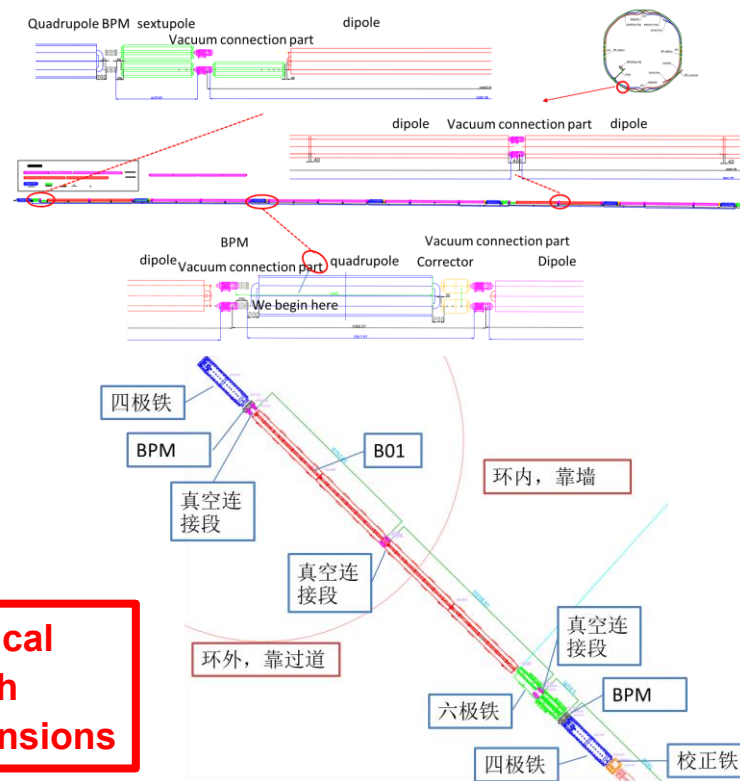
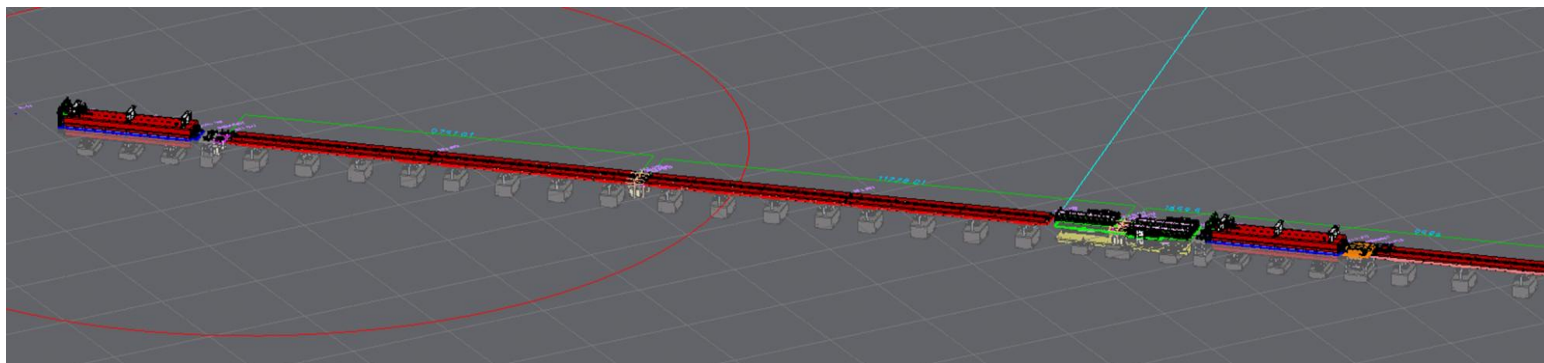
2D/3D linkage design for CEPC accelerator survey:

- 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



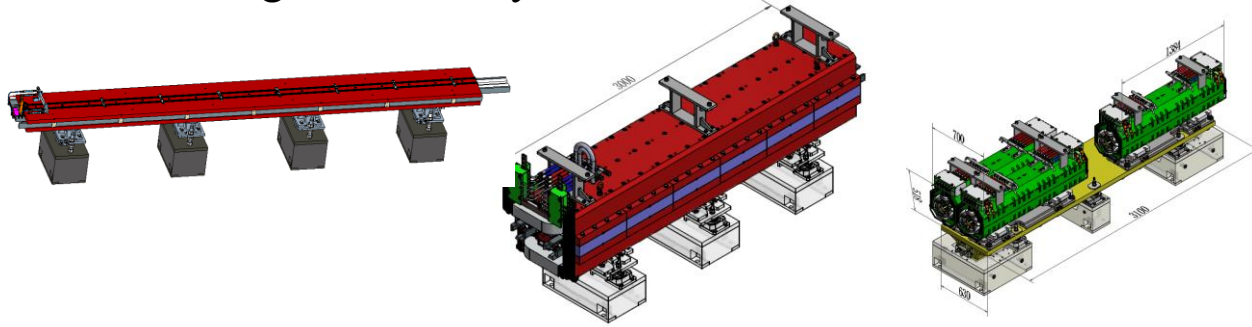
CEPC 10 vertical shafts and 12 horizontal access tunnel distribution



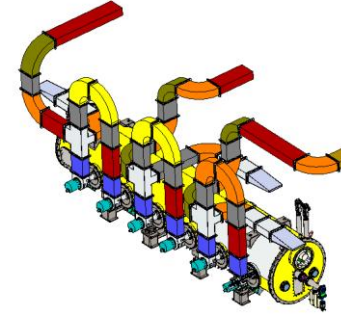
CEPC Accelerator Components Types in Survey

The complete components designs in the CEPC accelerator survey with dimensions, positions and name tags

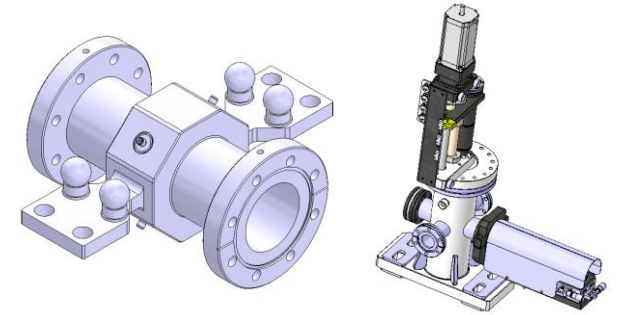
Magnet assembly in collider



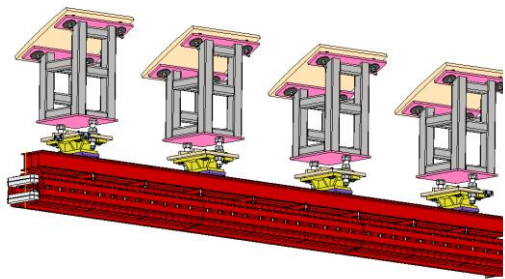
RF module in Collider



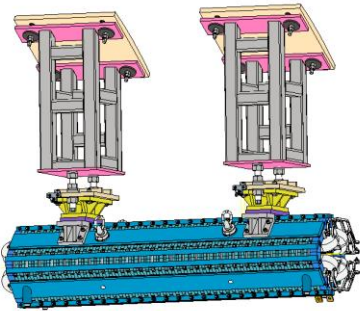
Some instruments



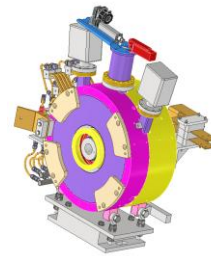
Magnet assembly in Booster



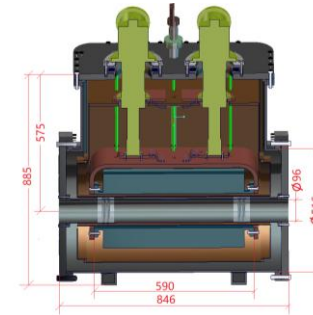
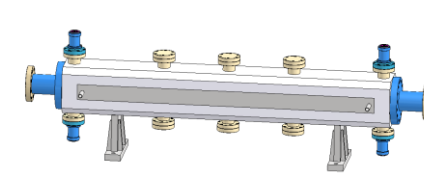
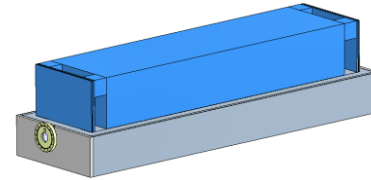
PT & AMD for Linac



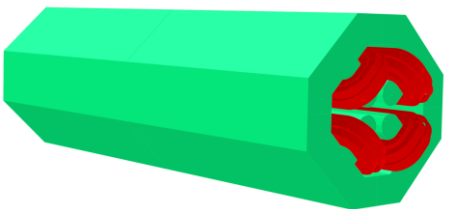
IR region SC sextupole cryomodule



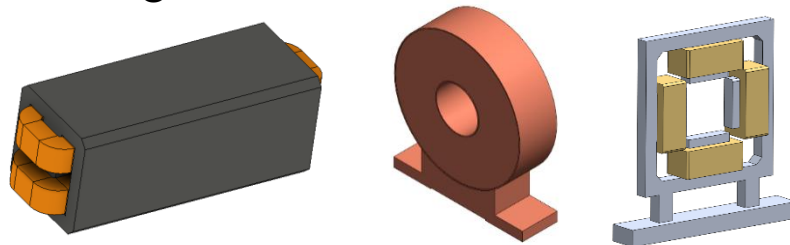
INJ & EXT magnets



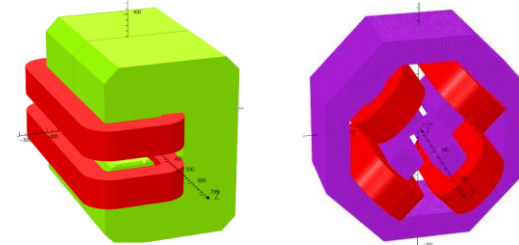
QRFB in collider



Magnets for Linac



Magnets for damping ring



Quadrupoles in TL



线圈宽度: 17mm
线圈厚度: 62mm



线圈宽度: 19mm
线圈厚度: 52mm

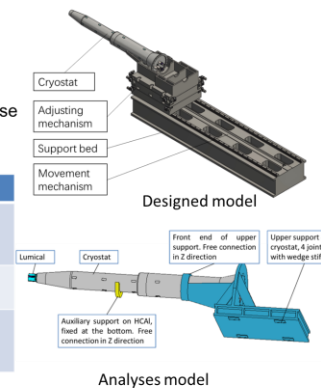


CEPC MDI mechanics progress-mechanical analyses



- Mechanics and vibration analyses

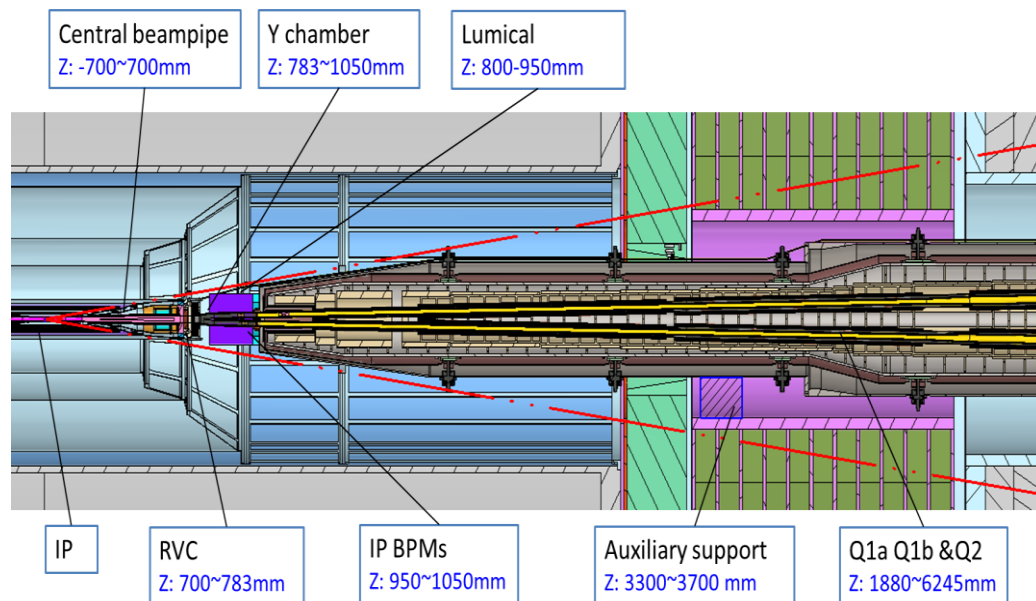
- **Static structure:** max. deformation and displacement change with/wo Lorentz force
- **Vibration analyses:** natural frequency & harmonic response
- **Structure optimization**

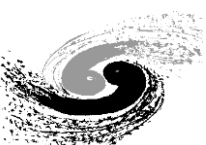


	Related requirements	Response now*
Position accuracy (X/Y) of SC quadrupoles $\leq 100\mu\text{m}$	Adjusting resolution $\leq 5\mu\text{m}$ Adjusting accuracy $\leq 30\mu\text{m}$	$\leq 5\mu\text{m}$ $\leq 30\mu\text{m}$ from HEPS experience
	Max. def. and disp. change, $< 50\mu\text{m}$	FEA, $< 40\mu\text{m}$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

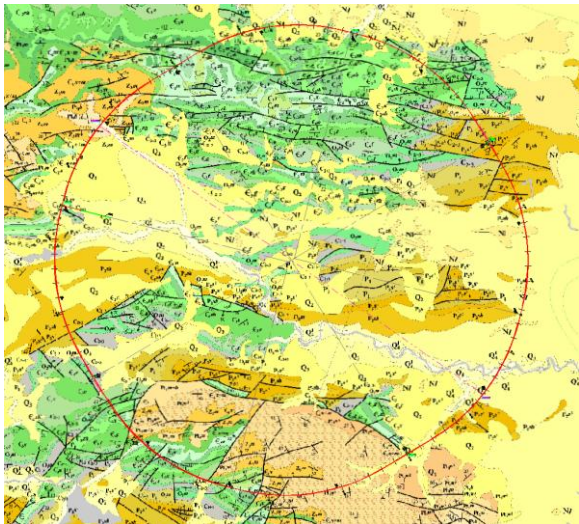
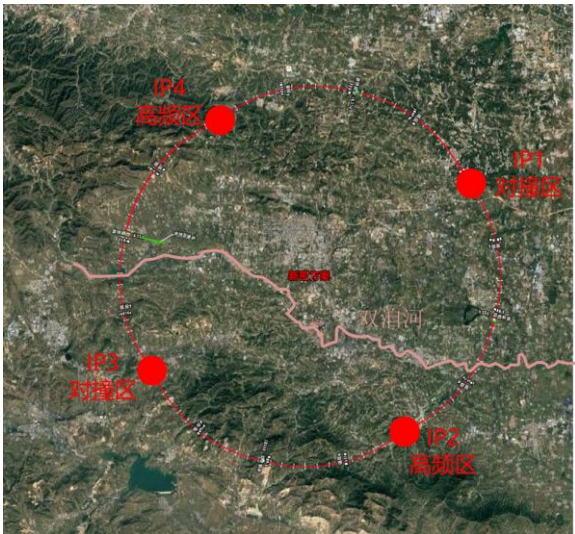
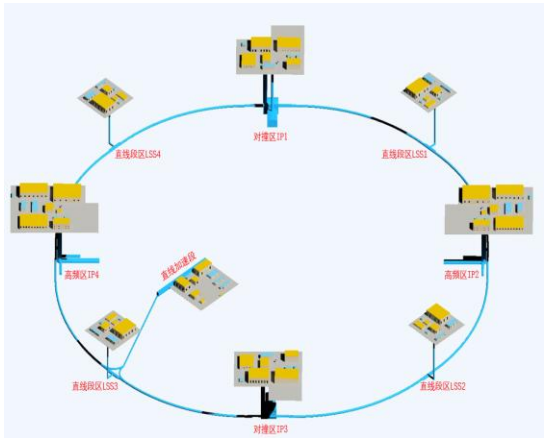
* The response now only considers the mechanics aspect.

	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

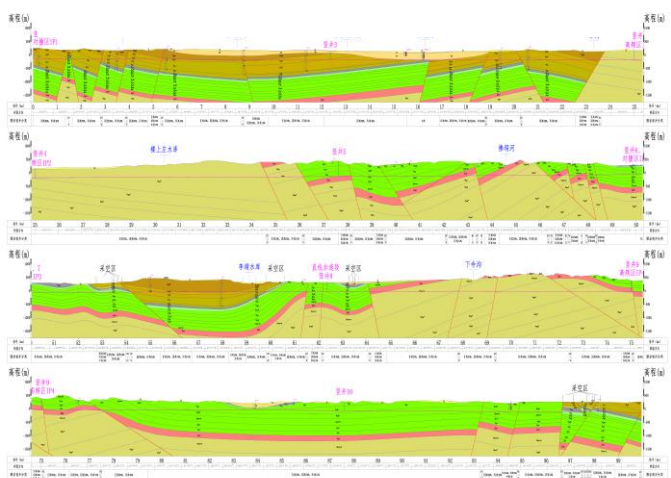




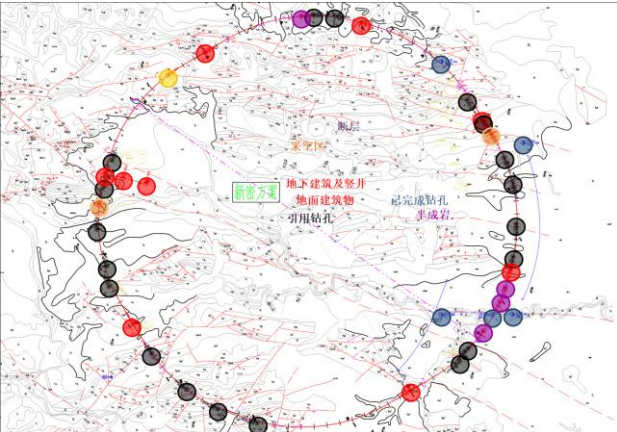
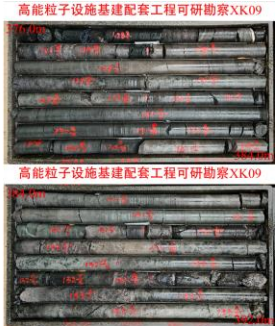
CEPC EDR Site Geological Study Status



9 surface location building total surface: 150k m²; Total land surface occupied: 475k m²

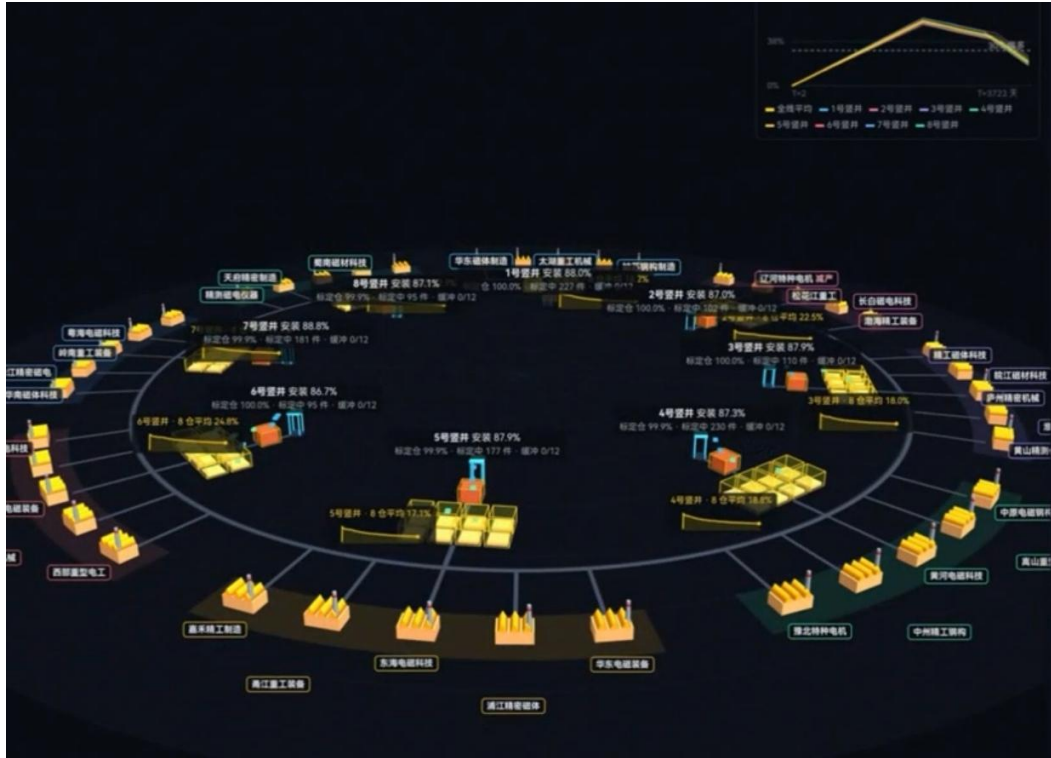


After careful geological studies and comparisons, CEPC EDR site was proposed in June 2025 by a review, and the geological study results require that CEPC be built about 300m underground



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

CEPC Production, Warehouse, Transportation, and Installation Logistic Implementation Program in EDR



A CEPC production, warehouse storage, transportation, and installation logistic implementation program has been developed in EDR phase

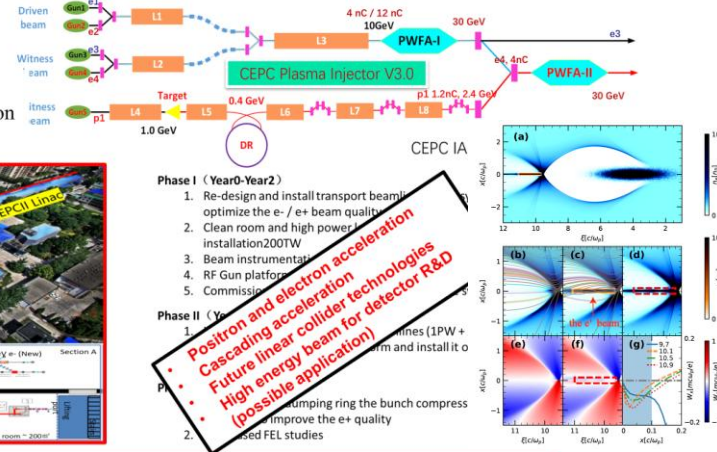
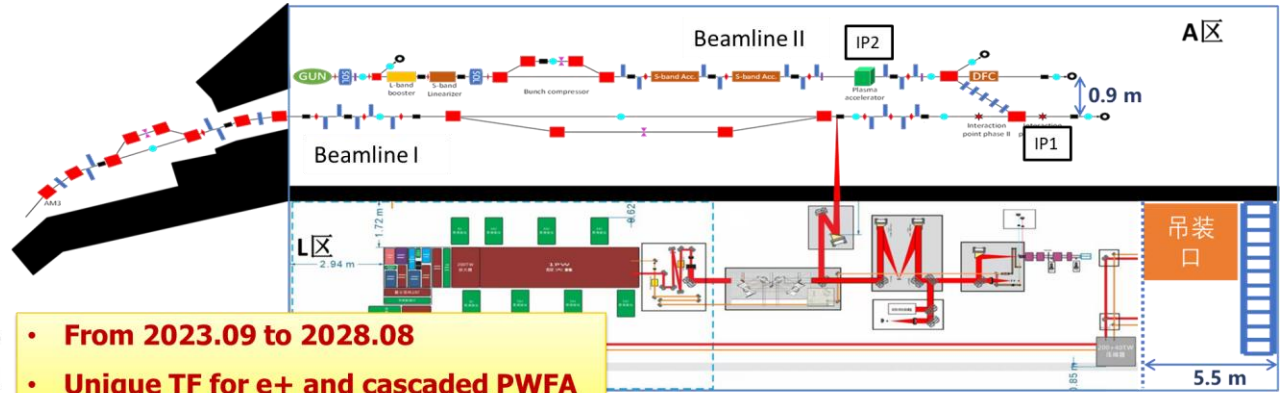
BEPCII-based PWFA Test Facility Development Status

CEPC Plasma Injector (alternative option) and TF Plan

CEPC plasma injector scheme:

From 10 GeV $\rightarrow$ 30 GeV $\rightarrow$ $TR \geq 2$

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



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

Beam quality



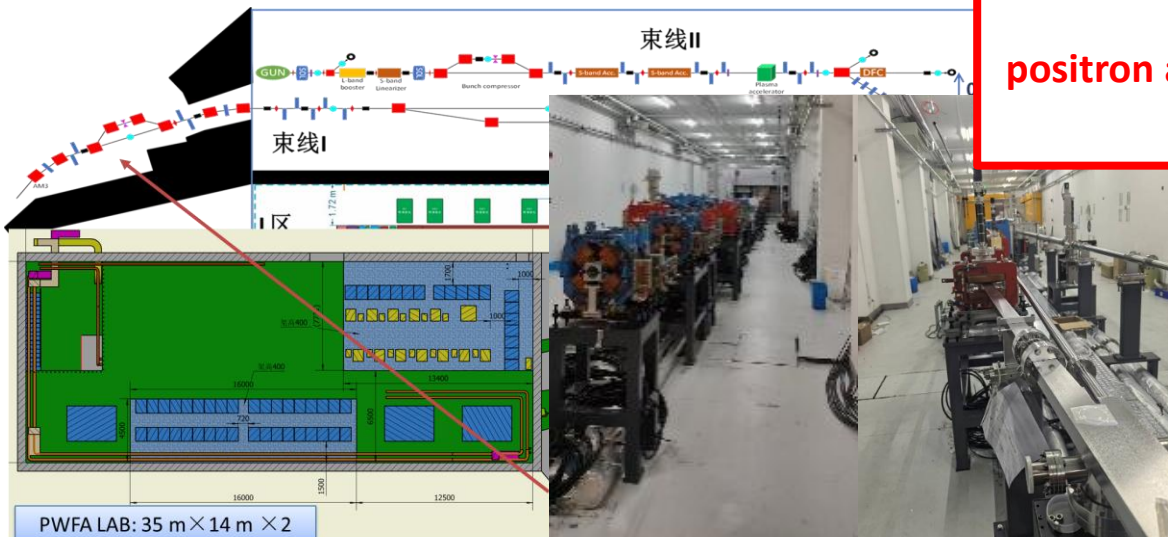
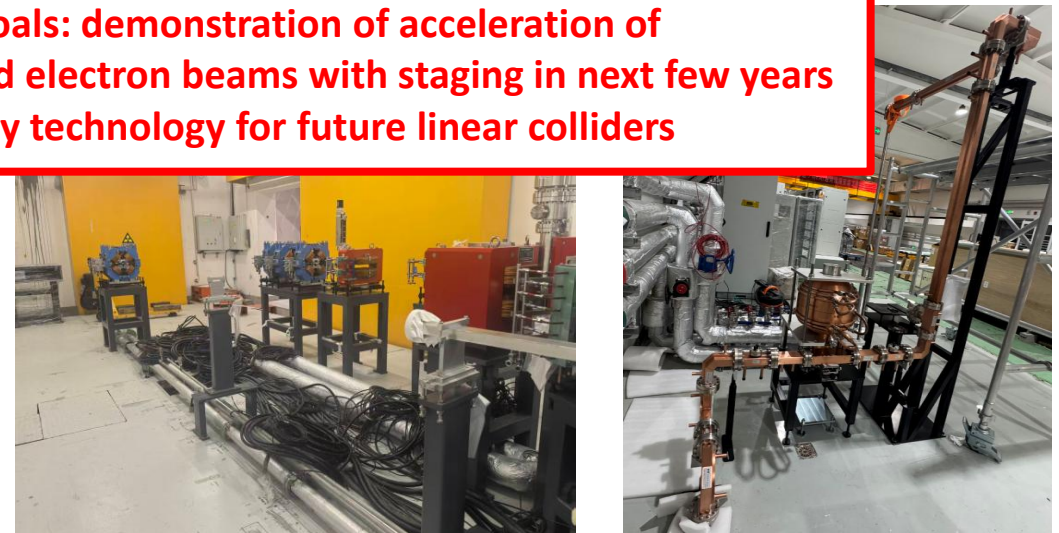
Beamline I

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

33

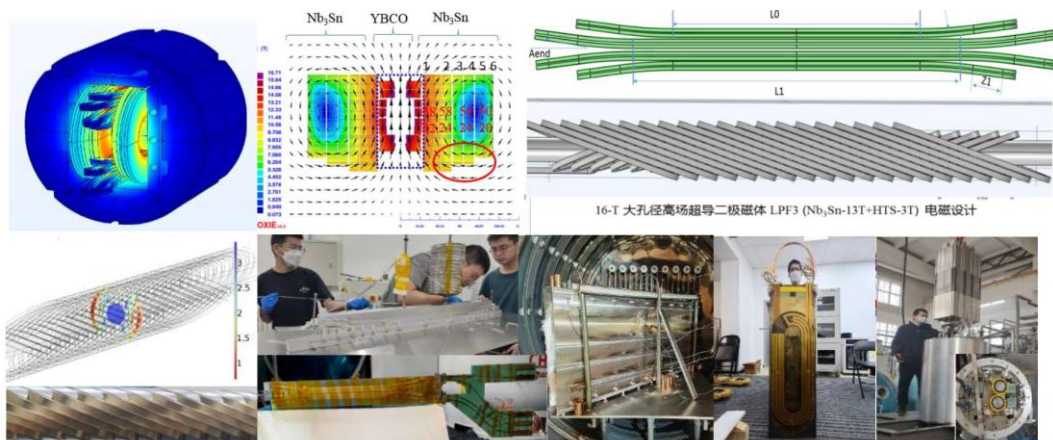
PWFA/LWFA TF based on BEPC-II Linac and HPL has been founded by CAS 90M RMB in Sept. 2023
Under development in the experimental hall #10 of BEPC-II

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



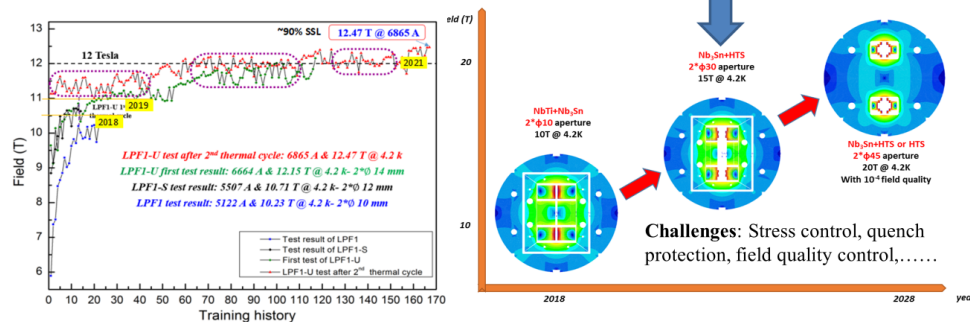
Advanced High Field SC Magnet (IBS) Development

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



SppC HF Magnet Development

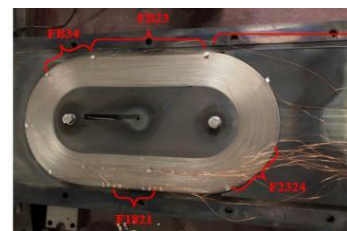
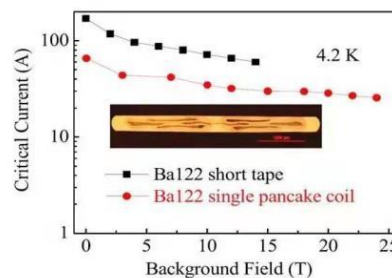
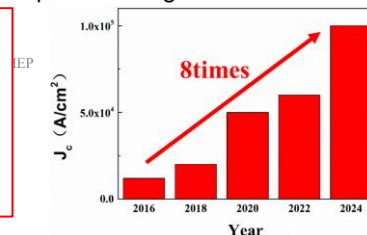
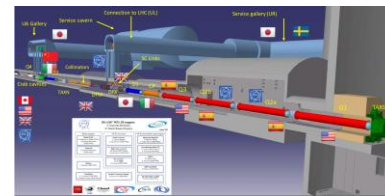
SppC 16 T Model Dipole: Nb₃Sn 12~13 T + HTS 3~4 T;
14T has been reached, more test in 2024



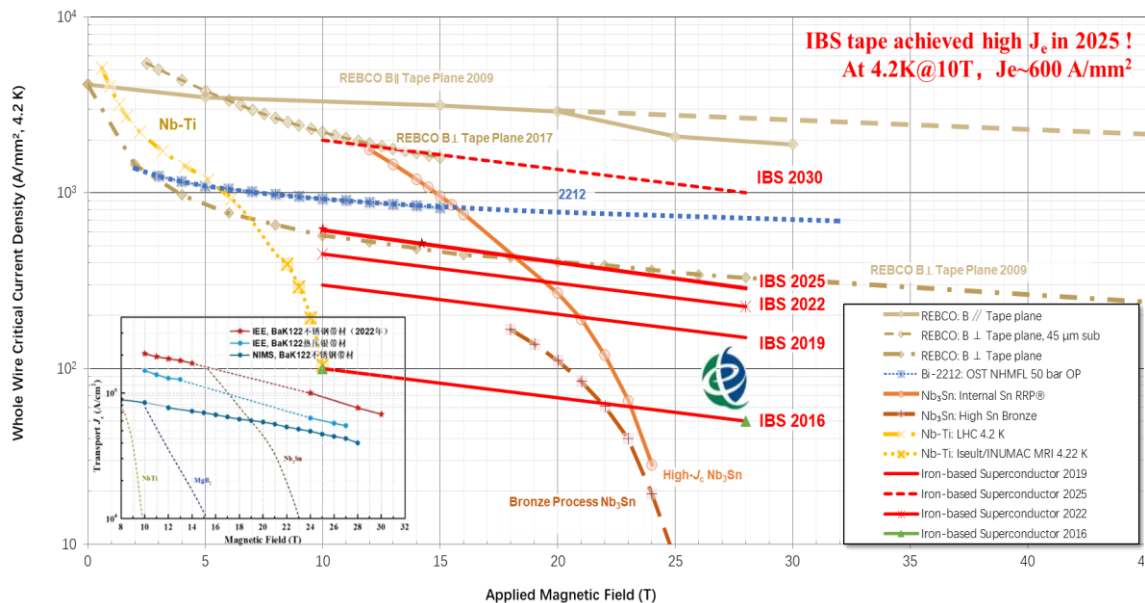
Picture of LPF1-U

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

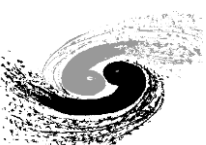
- First short coil with 40%J_c@24T
- First long coil with 80%J_c@10T



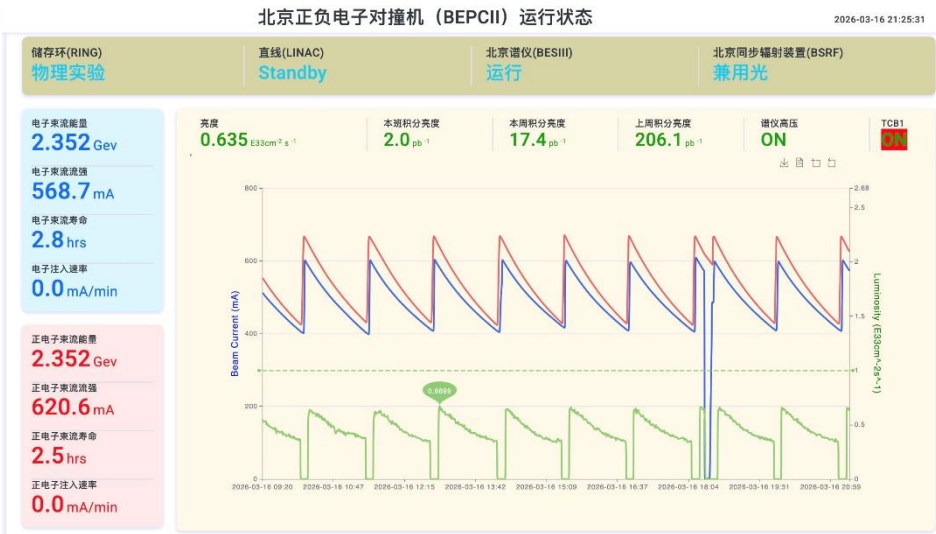
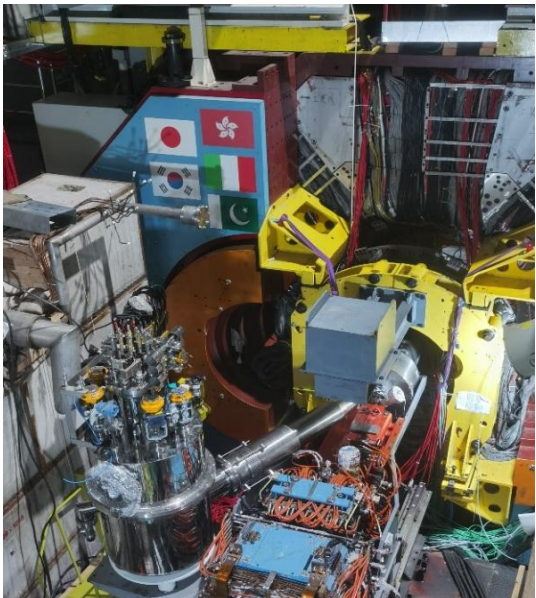
All HL-LHC CCT magnets have been delivered to CERN in early 2026



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



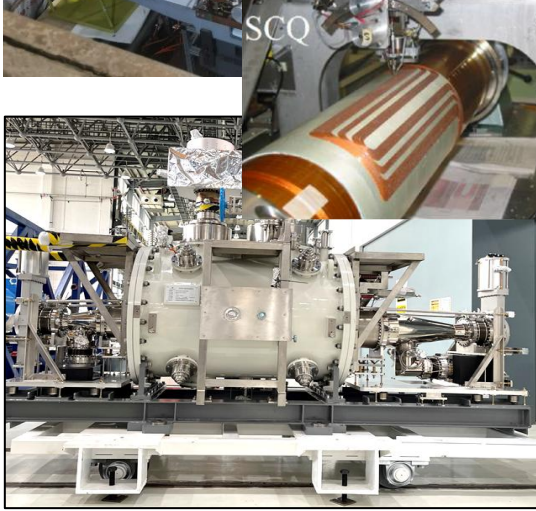
BEPCII-U Reached Design Goal and in Operation

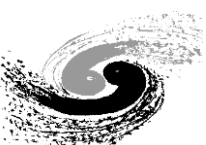


BEPCII-U $L = 1.112 \times 10^{33} \text{ cm}^{-2}\text{s}^{-1}$ @ 2.35 GeV



	BEPCII @ 2.35GeV	BEPCII-U @ 2.35GeV	BEPCII-U @ 2.8GeV
L [$10^{32} \text{ cm}^{-2}\text{s}^{-1}$]	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
$\xi_{y,\text{lum}}$	0.029	0.033	0.043
Emittance [nmrad]	147	152	200
Coupling [%]	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

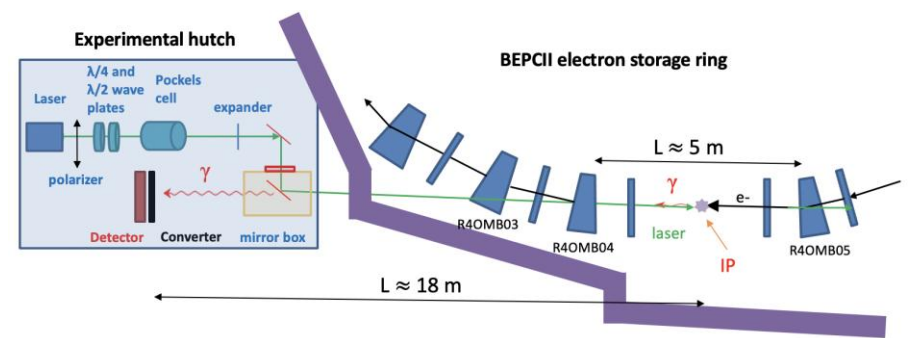




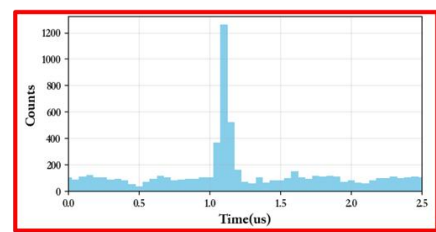
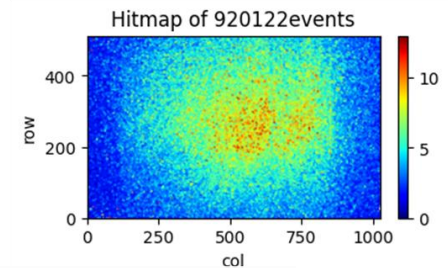
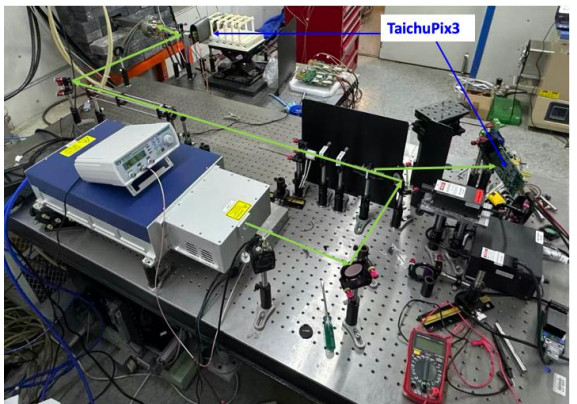
CEPC Polarization in Preparation Study

-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



Laser-signal causality observed Signal on the Silicon pixel detector

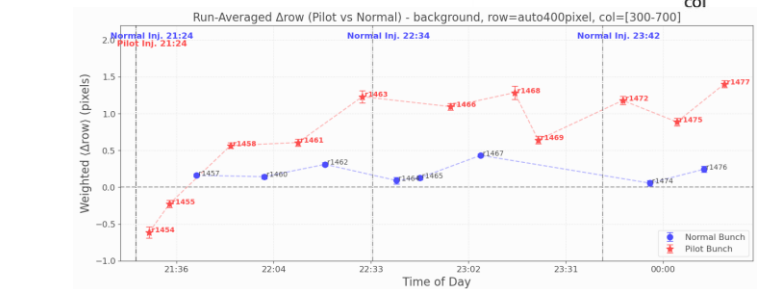


Key parameters

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 $\sim$ 20kHz/mA/W
Background	bremsstrahlung γ $\sim$ 1kHz/mA



Parameter	Valery Tyukin @ JGU Mainz	Wei Liu @ Chongqing University
Beam polarization	80%~82%, slightly higher or comparable to SVT SL wafer	—
Activation method	Yo-Yo method, Cs + NF ₃	Yo-Yo method, Cs + O ₂
Quantum efficiency	0.1% @ 780 nm	0.7% @ 785 nm

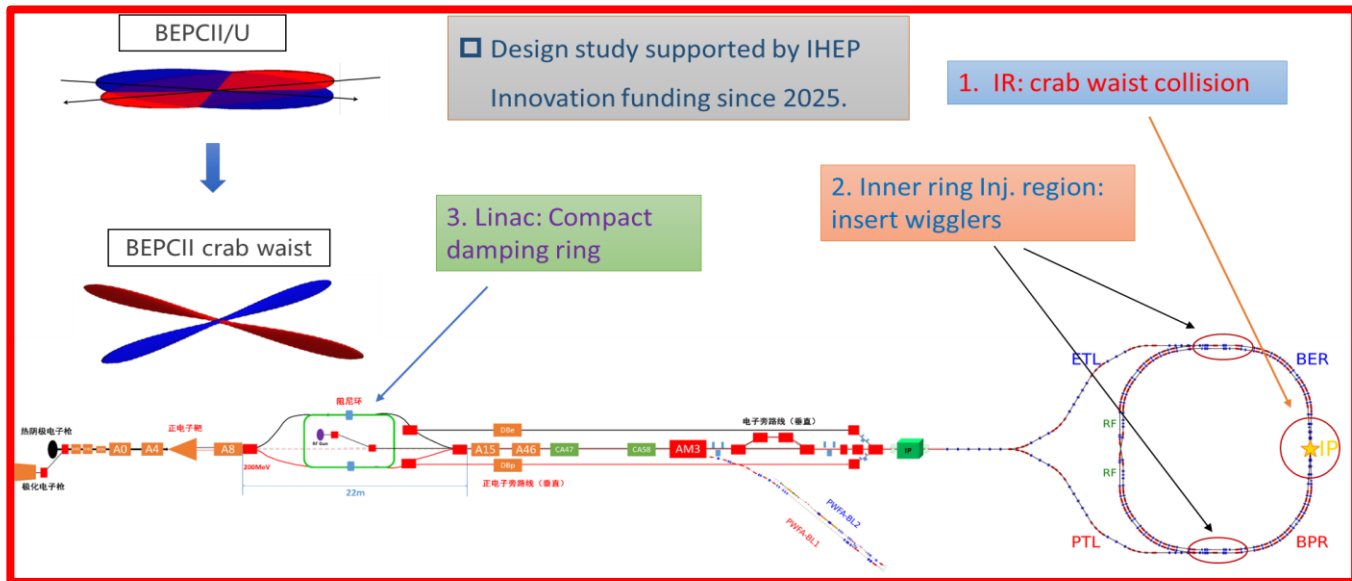
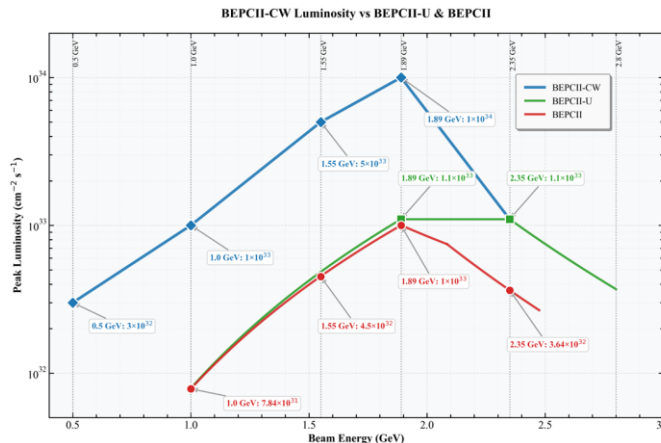


MBE system in Acken

BEPCII-U electron polarization measurement is under way

Polarized electron cathode chip (diameter ~5cm) has been fabricated in **June 2025**, and **tested in 2026**. 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 82%. And the quantum efficiency is around 0.7%(785nm)

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 ($L_0=1\text{E}33\text{cm}^2\text{s}^{-1}$)	BEPCII-CW ($10\times L_0$)
Circumference [m]	237	
Peak luminosity [$10^{33}\text{cm}^{-2}\text{s}^{-1}$]	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. $\xi_x/\xi_{y,\text{lum}}$	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 factor [%]	0.5	0.35
Longitudinal tune ν_s	0.032	0.040
Natural energy spread [%]	0.05	0.082
Natural bunch length $\sigma_{x,0}$ [mm]	11.5	13.3
Bunch length σ_x [mm]	13.5	16
Half crossing angle [mrad]	11	18.1
Piwiński 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 with damping ring, SC wigglers, SC quadrupoles

	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 [$10^{32}\text{cm}^{-2}\text{s}^{-1}$]	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. $\xi_x/\xi_{y,\text{lum}}$	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 $\sigma_{x,0}$ [cm]	1.77	1.8	1.1
Bunch length σ_x [cm]	1.86	1.9	1.2
Half crossing angle [mrad]	18.1	18.1	18.1
Piwiński angle	5.3	7.9	9.8

CEPC Host Lab **IHEP** and its Large Science Facilities



HERD on Chinese Space Station

HXMT

Insight Hard X-ray Modulation Telescope

GECAM

Gravitational wave EM Counterpart All-sky Monitor

Huairou Campus

HEPS High Energy Photon Source

YBJ (retired)

International Cosmic Ray Observatory

IHEP, Beijing Campus

BEPC Beijing Electron-Positron Collider

CEPC-SppC

Jinan Campus

AliCPT

Ali CMB Polarization Telescope

HUNT, underwater
in south China Sea

LHAASO

Large High-Altitude Air Shower Observatory

Daya Bay (retired)

Daya Bay reactor Neutrino Experiment

JUNO

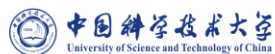
Jiangmen Underground Neutrino Observatory

Dongguan Campus

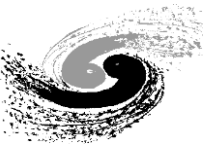
CSNS China Spallation Neutron Source

CEPC Collaborations in China

CEPC IB Members



上海交通大学 Shanghai Jiaotong University (SJTU)
中国科学技术大学 (USTC)
四川大学 Sichuan University
中国原子能科学研究院 China institute of atomic energy
中国科学院近代物理研究所 Institute of Modern Physics
中国科学院高能物理研究所 IHEP
哈尔滨工业大学 Harbin Institute of Technology
华北电力大学 North China Electric Power University
中国科学院空天信息创新研究院 The Aerospace Information Research Institute
中国科学院近代物理研究所
复旦大学 Fudan University
中国科学院大学 University of Chinese Academy of Sciences
浙江大学 Zhejiang University
深圳技术大学 Shenzhen Technology University
南开大学 Nankai University
南华大学 University of South China
山西大学 Shanxi University
北京大学 Peking University
西北有色金属研究院 Northwest Institute for Non-ferrous Metal Research
国科大杭州高等研究院的英文名称是 National University of Science and Technology Hangzhou Advanced Research Institute
东南大学 Southeast University
山东大学 Shandong University
武汉大学 Wuhan University
清华大学 Tsinghua University
南京大学 Nanjing University
广西大学 Guangxi University
华东理工大学 ECUST (East China University of Science and Technology)
香港科技大学 The Hong Kong University of Science and Technology, HKUST
台湾中央研究院 Academia Sinica
华中师范大学 Central China Normal University; Huazhong Normal University; CCNU



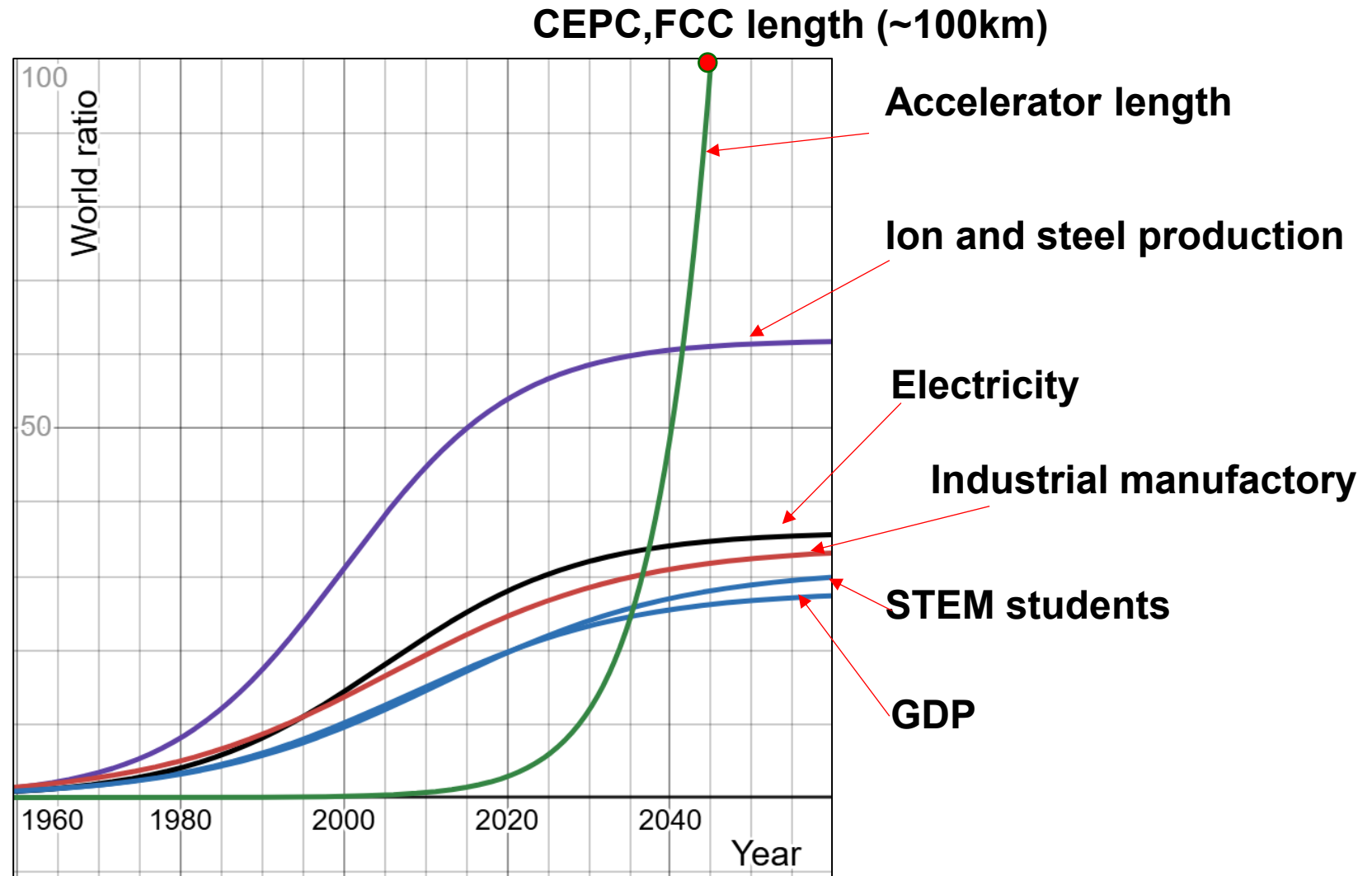
CEPC in Synergy with other Accelerator Projects in China

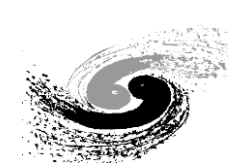
Project name	Machine type	Location	Cost (B RMB)	Completion time
CEPC	Higgs factory Upto ttar energy	Led by IHEP, China	36.4 (where accelerator 19)	~2045
BEPCII-U	e+e-collider 2.8GeV/beam	IHEP (Beijing)	0.15	2025
HEPS	4 th generation light source of 6GeV	IHEP (Huanrou)	5	2025
SAPS	4th generation light 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

The Potentials for CEPC to be Realized

China has the economical, technological, Industrial, human resource, and energy potentials to host an international Higgs factory or participate FCC collaboration





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

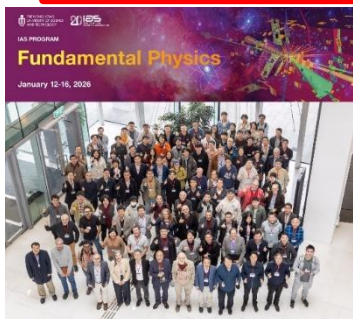
<https://indico.cern.ch/event/1454867/overview>

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/>

IAS Program on Fundamental Physics,
January 18-22, 2027, IAS, HKUST

CEPC Accelerator EDR Highlights and
Collaborations-J. Gao

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 is held in Shanghai Oct.22-26, 2026

<https://indico.ihep.ac.cn/event/cepc2026>



<https://indico.cern.ch/event/1720390/overview>

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>

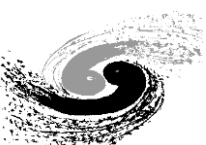
FCPPNL, Qingdao, China, July 21-25, 2025

<https://indico.ihep.ac.cn/event/25400/>

FCPPNL, Lyon, France, June 29-July 3, 2026

<https://indico.in2p3.fr/event/38713/>

第十二届中国 LHC 物理会议 (CLHCP2026), Oct. 28-Nov. 1, 2026,
Wuhan, China



CEPC-SppC and FCC Synergy and Collaboration Issues

After 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> , 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 16th 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

Collaborations with Super KEK B is very important for CEPC
Understand SuperKEK B is the basis to understand future advanced e⁺e⁻ circular colliders (**Type-II in page 7**)

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

CEPC participated the FCC public debate on Sept. 18, 2026, and Prof. Y.F. Wang stated CEPC status and CEPC/FCC relation and collaboration issues



<https://www.debatpublic.fr/projet-accelereur-particules/lequipe-du-debat-interroge-les-porteurs-du-projet-chinois-de>

CEPC and FCCee SRF Technology in Synergy(example)

IHEP PAPS SRF Infrastructure in Huairou, Beijing



CEPC 650MHz SRF Development in EDR



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

Light Sources & FELs

BSRF, HEPS, CW FEL, ERL



166 MHz (HEPS)
World's first very low freq
β=1 module



1.3 GHz (FEL, CEPC, ILC)
World's first mid-T high Q module

HEP Colliders

BEPCII&U, CEPC, ILC



500 MHz (BEPC-II&U, HEPS)
In-house-made, long-term operation
in large scientific facility



650 MHz (CEPC, ADS, CSNS)
World's first 650 MHz cryomodule

High Intensity Proton Linacs

ADS, CSNS-II, v factory



325 MHz (ADS)
World's first spoke cavity linac



324 MHz (CSNS-II)
China's first double-spoke module

- One 500 MHz cavities for BEPCII-U and two 500 MHz third harmonic 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.

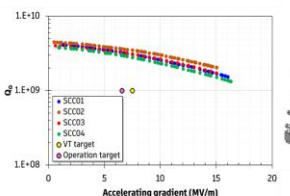
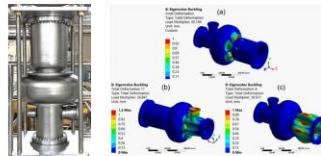


TABLE V
BUCKLING PERFORMANCE OF THE CAVITY UNDER TWO DIFFERENT BACKGROUNDS

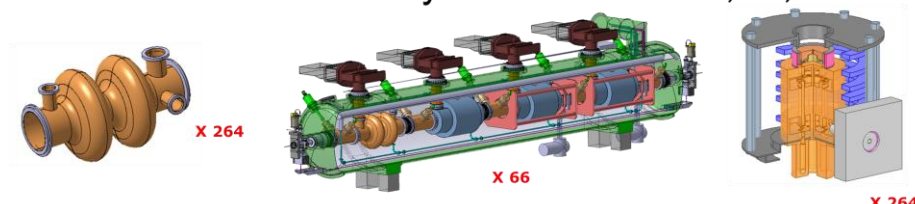
Conditions	Φ ₁ (Base)	Φ ₁ (Soft)	Φ ₁₂
"CGR" (LRP cavity)	18.1	18.1	18.1
"LRP" (LRP cavity)	18.1	18.1	18.1
"CGR" (LRP cavity)	18.1	18.1	18.1
"LRP" (LRP cavity)	18.1	18.1	18.1
"LRP" (LRP cavity)	18.1	18.1	18.1

"BP" stands for both beam pipes are fixed. "LRP" stands for the cavity LRP side is fixed to some longitudinally while the SRP side is fixed. "Base" stands for base cavity without any stiffening rings, and "Soft" 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



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

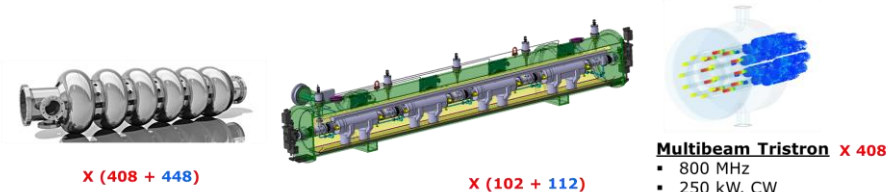
Multibeam Tristron

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

I. Syratchev

600MHz, 650MHz and 1.3GHz for FCCee?

FCCee 800 MHz system – for $t\bar{t}$ collider and booster



Superconducting elliptical cavity

- 800 MHz, 6-cell
- Nb₃Sn if R&D is successful

Cryomodule

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

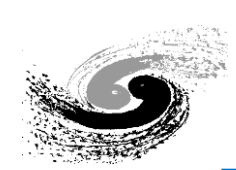
- Multibeam Tristron X 408
- 800 MHz
- 250 kW, CW



Solid State Amplifier (SSA)

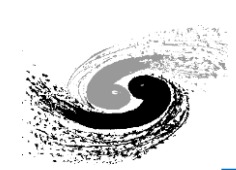
- 800 MHz
- 10-15 kW pulsed

A. Butterworth



Summary

- CEPC is continuing to complete EDR based on the completed TDRs according to the EDR plan and prepare for the application of 16th five-year plan in 2030
- Many EDR key technology developments will be completed in 2027, 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 in 2026, civil engineering and implementation have been carried out
- Plasma accelerator technology under developing at IHEP will serve also a longer term path to high energy range, and the PWFA test facility has been in commissioning since April 2026
- BEPCII-UP scheme (under studies) serves also as a prototype of CEPC (CW + damping ring) for training/collaboration platforms
- There are big potentials in the synergy and collaboration between CEPC and FCC
- China has a big potential to host a future Higgs factor, such as CEPC
- 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.



Acknowledgements

Thanks go to CEPC-SppC team's hard works, international and CIPC collaborations

Special thanks to CEPC IB (all the Universities and Institutes) , SC, IAC, IARC and IDRC committee's advices, suggestions and supports

Thanks for your attention