Progress and Status of Next-Generation Collider Projects in China: STCF, CEPC, and Beyond

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Outline

- Introduction
- Progress and Status
  - From BEPC to BEPCII to STCF — Tau-Charm Facilities
  - CEPC — Circular Electron-Positron Collider
  - EicC — Electron-Ion Collider in China
- Promotion strategies & Summary

Particle Physics & Collider Frontiers

New physics beyond the Standard Model

· The **Higgs boson as a discovery tool** — couplings, rare & exotic decays

· Precision electroweak observables, rare and forbidden decays

Completing the Standard Model

· **Non-perturbative QCD** in the transition and low-energy regions

· No theory of **quark (color) confinement** — how quarks and gluons form hadrons

These two frontiers define the physics case for China's collider programme: **CEPC** — Higgs precision → new physics; **STCF / BEPCII / EicC** — QCD and confinement in the tau-charm and low-energy regions.

High-energy frontier

· Higher energy → **direct discovery** of new particles: Higgs factories (CEPC, FCC-ee, ILC) → ~100 TeV pp

· **In this talk: CEPC**

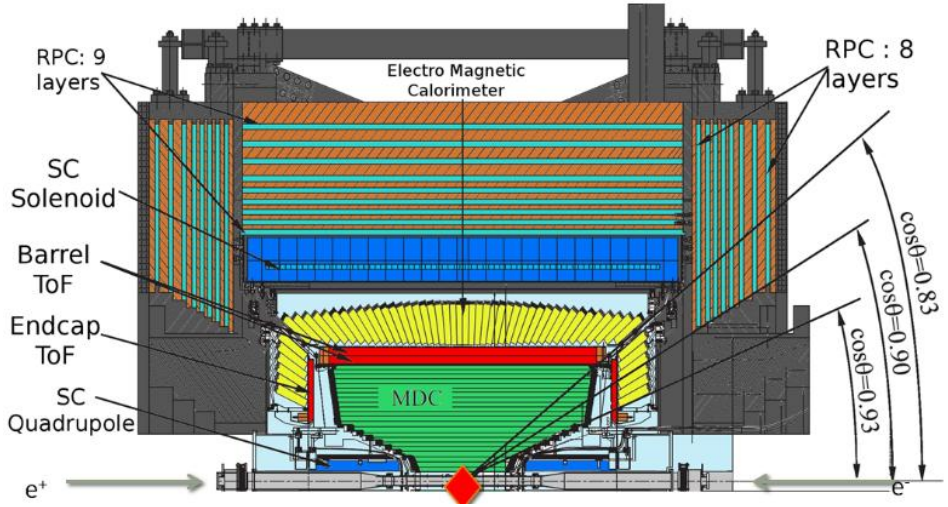
High-luminosity frontier

· Higher luminosity → **precision measurements** and rare processes: clean τ, charm, light-hadron samples

· **In this talk: BEPCII/U, STCF, EicC**

From BEPC/BES to BEPCII/BESIII

- **1988**: first collisions at BEPC — China's first large science facility
- Dual purpose: tau-charm physics + synchrotron radiation
- **2008**: upgrade to **BEPCII** — double ring, L = 1×10^{33} $cm^{-2}s^{-1}$ ($\times$100)
- **BESIII** operating since 2008; collaboration of ~700 members from 15 countries



The BESIII detector at the BEPCII interaction point

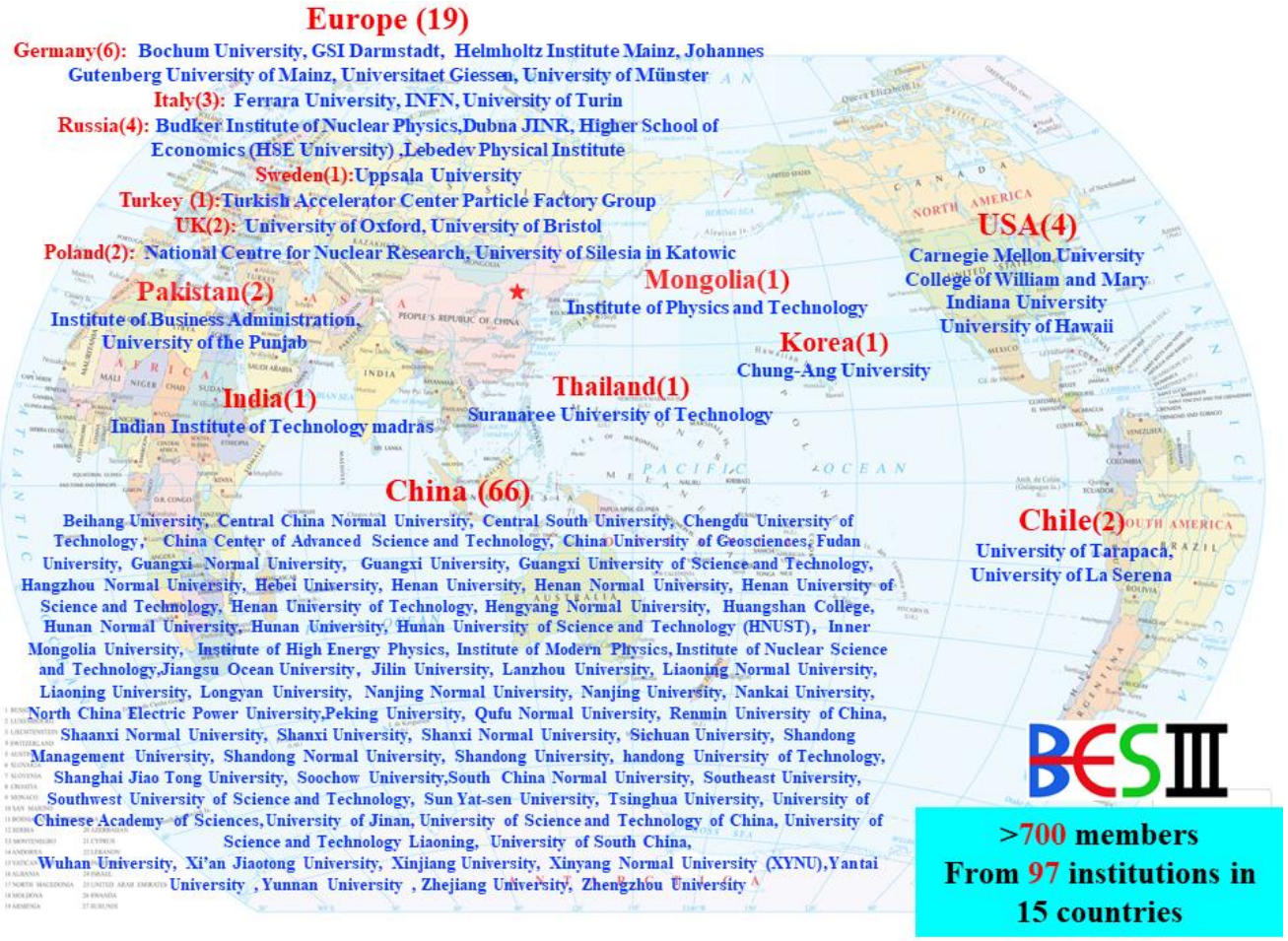
Some highlights:

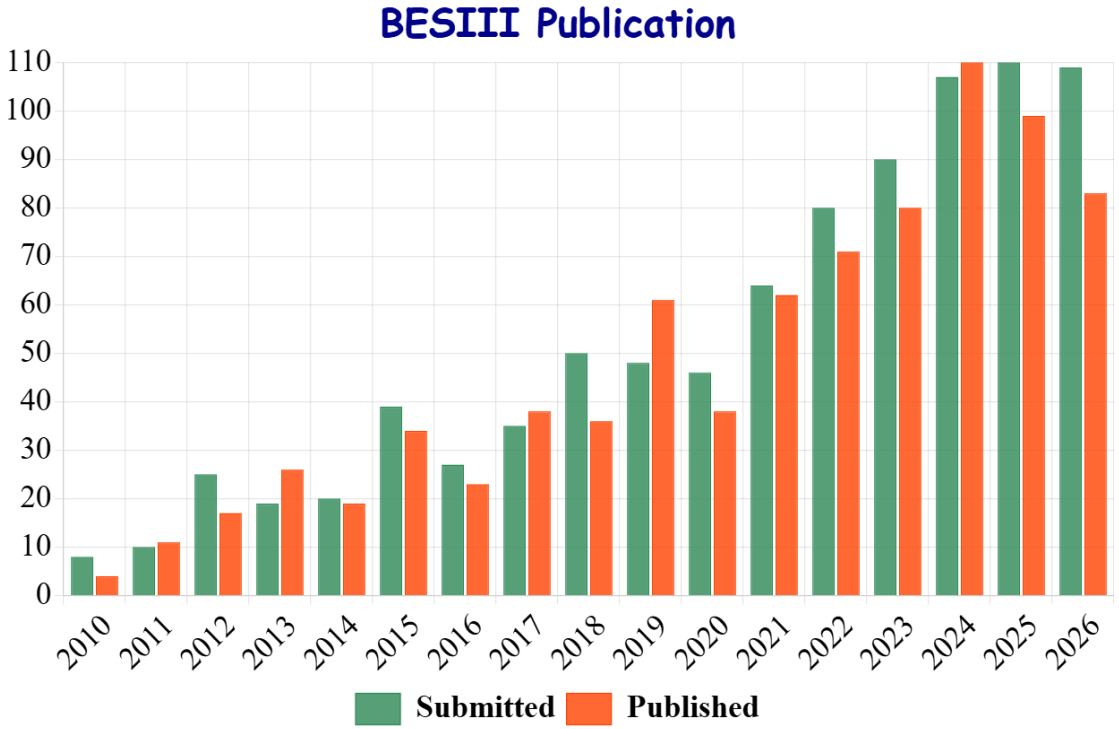
- τ Mass Measurement
- R-value Scans
- Discovery of X(1835) and glueball-like of light hadrons
- Discovery of Z_c and Z_{cs} series multiquark states
- Precision measurements of Λ_c productions and decays
- CKM, decay constants, and strong phase measurements
- Hyperon polarization and CPV measurement
- Precision measurement of nucleon structure
- 1^{-+} exotic states

Unique features of charm-dedicated machines:

- **Transition** region between perturbative and non-perturbative QCD
- **Threshold effects** of pair production of hadrons and τ leptons
- **Rich resonance** structures, **large production X-sec** for charmonium(-like) states and exotics

BEPCII/BESIII Collaboration





Up to date: 812 publications, ~1/5 PRL

Excellent in both quantity and quality

China's current flagship particle physics experiment.

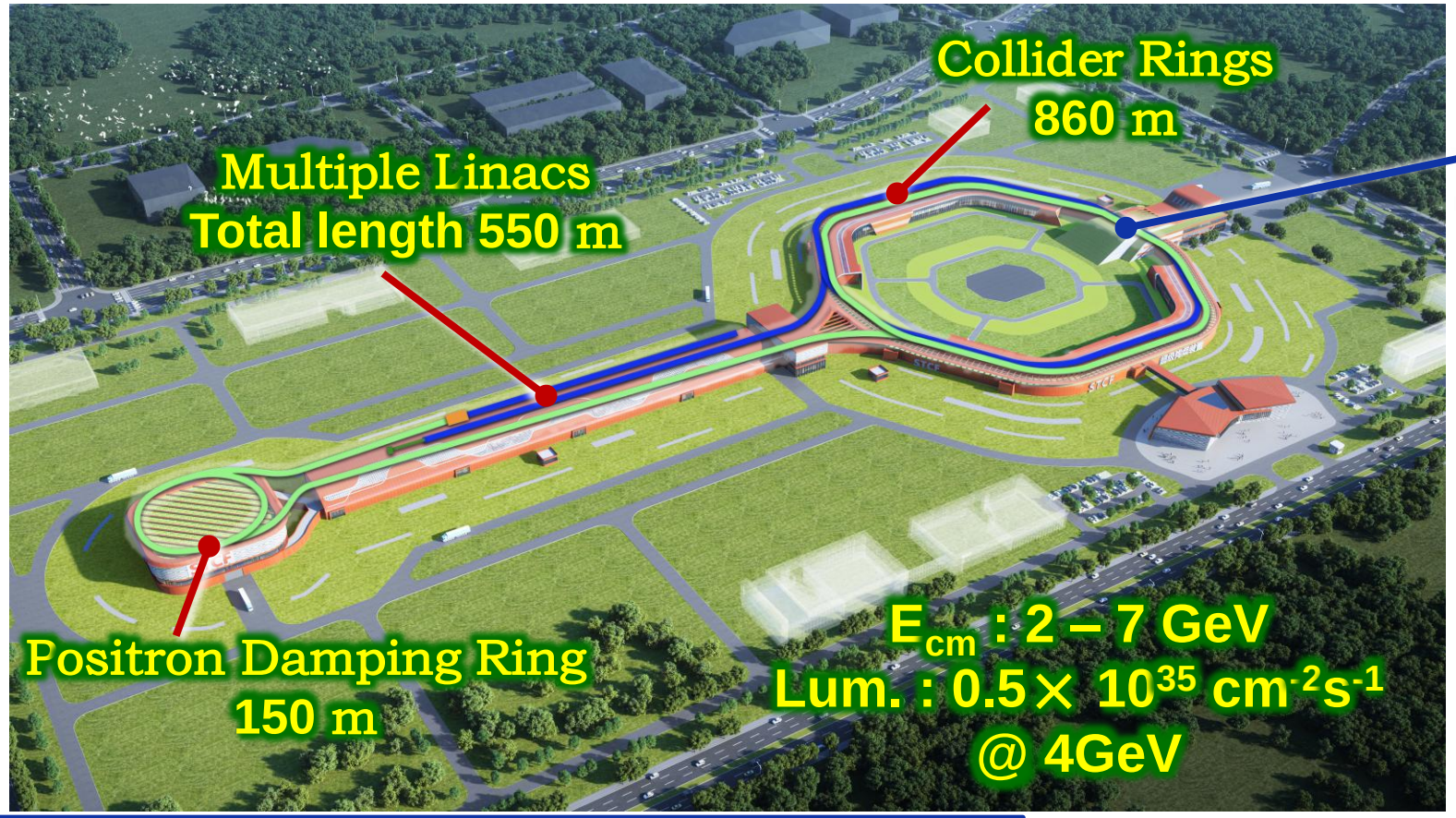
Physics in the tau-charm region: attractive and vibrant.

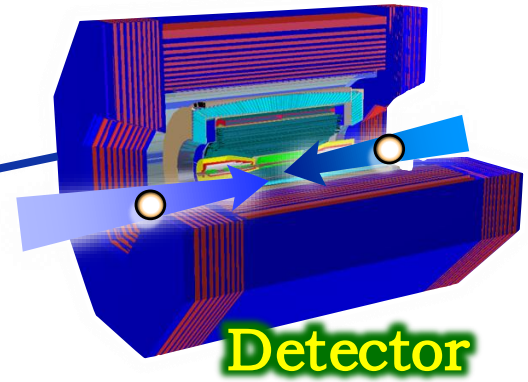
Tau-Charm Facility in China

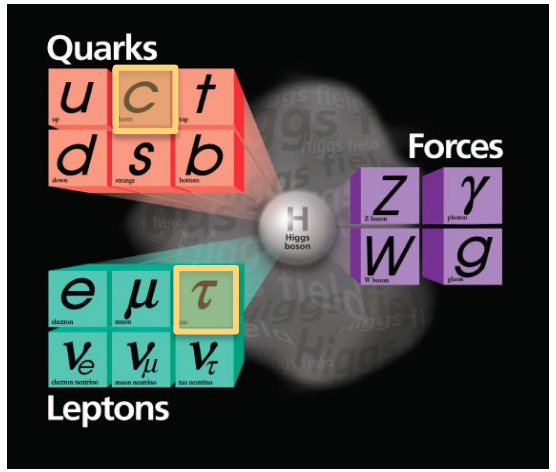
- BEPCII/BESIII has run 18 years, and are **playing a leading role** in tau-charm physics area.
- Limited by length of storage ring, **no space and potential** for major upgrade.
- Physics study **limited by the Statistics** (luminosity), **collision energy up to 4.9 (5.6) GeV** ……
- Many of the **physics can be covered by ISR** at SuperKEKB/Belle II

A Super Tau-Charm Facility (STCF) is the nature extension and a viable option for a post-BEPCII HEP project in China

Super Tau-Charm Facility (STCF)







STCF, a flagship collider at the **precision frontier,** can produce a huge number of clean tau leptons and hadrons, allowing full exploration of the unique physics potential in the tau-charm energy region: QCD, hadron physics, flavor physics …

Building upon China's great success and well-established international position in tau-charm physics with Beijing Electron-Positron Collider (BEPC)

Scientific Questions and Objectives

Symmetry breaking in fundamental interactions

Origin of matter-antimatter imbalance

Discovering CP violation in hyperons

Mystery of color confinement in particle physics

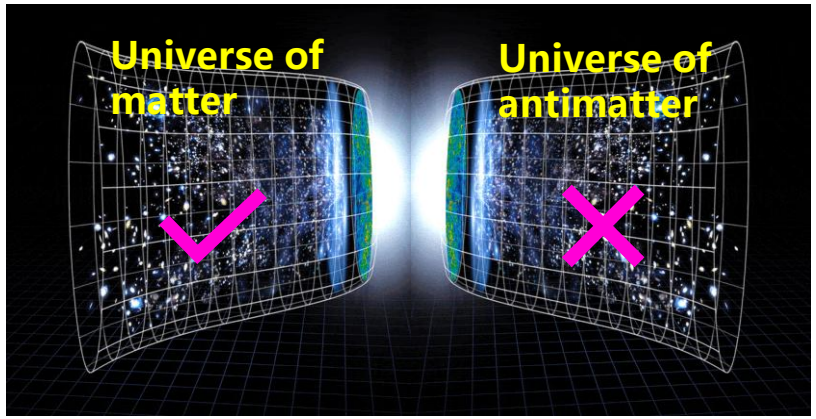
Exotic states, structure of nucleons, fragmentation

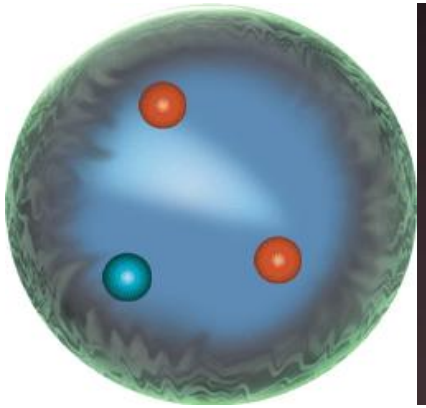
Exploring how quarks and gluons form hadrons

Precision measurement of fundamental parameters

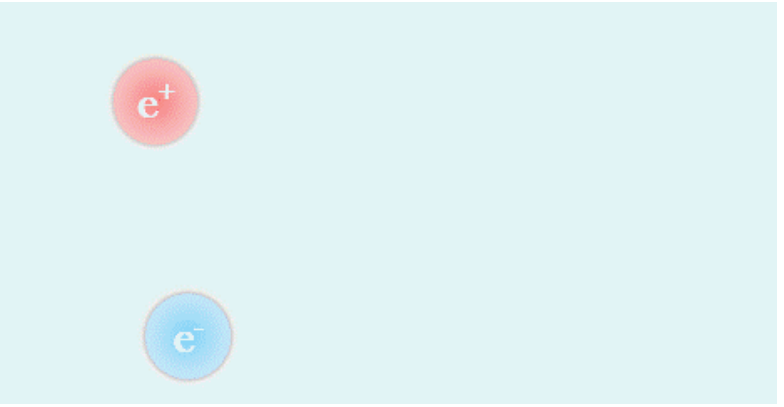
Examining the Standard Model

Searching for new physics









With orders of magnitude more statistics, the physics goals go beyond those of BESIII.

STCF Conceptual Design Studies

Physics & Detector CDR



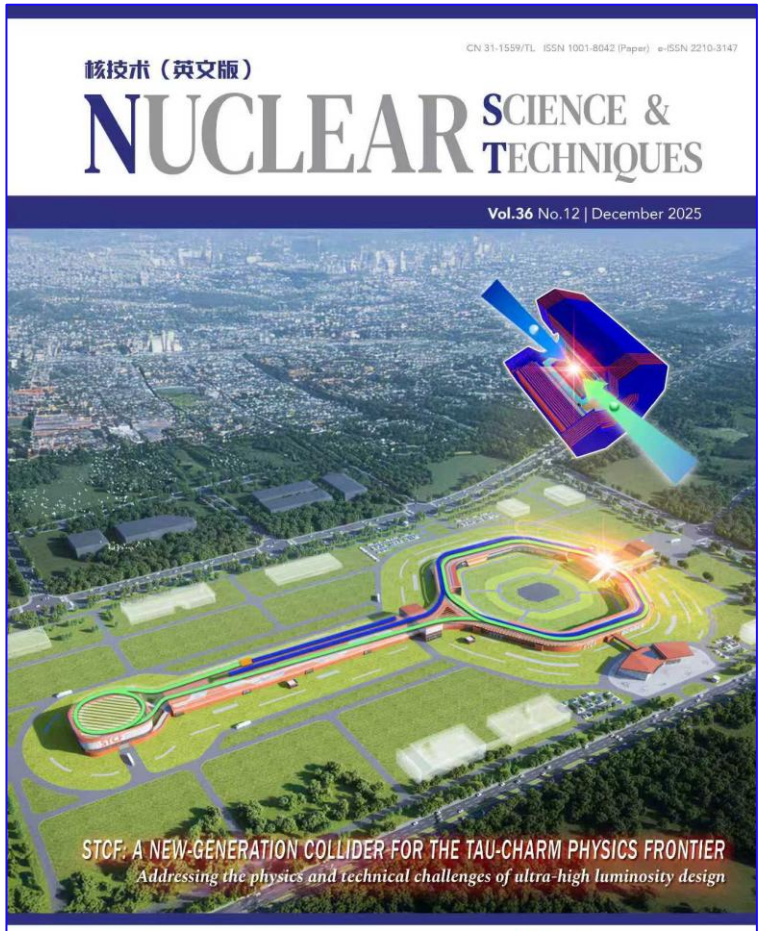
FRONTIERS OF PHYSICS
REPORT
Volume 19 / Issue 1 / 14701 / 2024

STCF conceptual design report (Volume 1): Physics & detector

M. Achasov[3], X. C. Ai[82], R. Aliberti[38], Q. An[63,72], X. Z. Bai[63,72], Y. Bai[62], O. Bakina[39], A. Barnyakov[3,50], V. Blinov[3,50,51], V. Bobrovnikov[3,51], D. Bodrov[23,60], A. Bogomyagkov[3], A. Bondar[3], I. Boyko[39], Z. H. Bu[73], F. M. Cai[20], H. Cai[77], J. J. Cao[20], Q. H. Cao[54], X. Cao[33], Z. Cao[63,72], Q. Chang[20], K. T. Chao[54], D. Y. Chen[62], H. Chen[81], H. X. Chen[62], J. F. Chen[58], K. Chen[6], L. L. Chen[20], P. Chen[78], S. L. Chen[6], S. M. Chen[66], S. Chen[69], S. P. Chen[69], W. Chen[64], X. Chen[74], X. F. Chen[58], X. R. Chen[33], Y. Chen[32], Y. Q. Chen[36], H. Y. Cheng[34], J. Cheng[48], S. Cheng[28], T. G. Cheng[2], J. P. Dai[80], L. Y. Dai[28], X. C. Dai[54], D. Dedovich[39], A. Denig[19,38], I. Denisenko[59], J. M. Dias[4], D. Z. Ding[58], L. Y. Dong[32], W. H. Dong[63,72], V. Druzhinin[3], D. S. Du[63,72], Y. J. Du[77], Z. G. Du[41], L. M. Duan[33], D. Epifanov[3], Y. L. Fan[77], S. S. Fang[32], Z. J. Fang[63,72], G. Fedotovich[3], C. Q. Feng[63,72], X. Feng[54], Y. T. Feng[63,72], J. L. Fu[69], J. Gao[59], P. S. Ge[73], C. Q. Geng[15], L. S. Geng[2], A. Gilman[71], L. Gong[43], T. Gong[21], B. Gou[33], W. Gradl[38], J. L. Gu[63,72], A. Guevara[4], L. C. Gui[26], A. Q. Guo[33], F. K. Guo[4,69,2], J. C. Guo[63,72], J. Guo[59], Y. P. Guo[11], Z. H. Guo[16], A. Guskov[39], K. L. Han[69], L. Han[63,72], M. Han[63,72], X. Q. Hao[20], J. B. He[69], S. Q. He[63,72], X. G. He[59], Y. L. He[20], Z. B. He[33], Z. X. Heng[20], B. L. Hou[63,72], T. J. Hou[74], Y. R. Hou[69], C. Y. Hu[74], H. M. Hu[32], K. Hu[57], R. J. Hu[33], X. H. Hu[9], Y. C. Hu[49], J. Hua[61], G. S. Huang[63,72], J. S. Huang[47], M. Huang[69], Q. Y. Huang[69], W. Q. Huang[69], X. T. Huang[57], X. J. Huang[33], Y. B. Huang[14], Y. S. Huang[64], N. Hüsken[38], V. Ivanov[3], Q. P. Ji[20], J. J. Jia[77], S. Jia[62], Z. K. Jia[63,72], H. B. Jiang[77], J. Jiang[57], S. Z. Jiang[14], J. B. Jiao[57], Z. Jiao[24], H. J. Jing[69], X. L. Kang[8], X. S. Kang[43], B. C. Ke[82], M. Kenzie[5], A. Khoukaz[76], I. Koop[3,50,51], E. Kravchenko[3,51], A. Kuzmin[3], Y. Lei[60], E. Levichev[3], C. H. Li[42], C. Li[55], D. Y. Li[33], F. Li[63,72], G. Li[55], G. Li[15], H. B. Li[32,69], H. Li[63,72], H. N. Li[61], H. J. Li[20], H. L. Li[27], J. M. Li[63,72], J. Li[32], L. Li[56], L. Li[59], L. Y. Li[63,72], N. Li[64], P. R. Li[41], R. H. Li[20], S. Li[59], T. Li[57], W. J. Li[20], X. Li[33], X. H. Li[74], X. Q. Li[6], X. H. Li[63,72], Y. Li[79], Y. Y. Li[72], Z. J. Li[33], H. Liang[63,72], J. H. Liang[61], Y. T. Liang[33], G. R. Liao[13], L. Z. Liao[25], Y. Liao[61], C. X. Lin[69], D. X. Lin[33], X. S. Lin[63,72], B. J. Liu[32], C. W. Liu[15], D. Liu[63,72], F. Liu[6], G. M. Liu[61], H. B. Liu[14], J. Liu[54], J. J. Liu[74], J. B. Liu[63,72], K. Liu[41], K. Y. Liu[43], K. Liu[59], L. Liu[63,72], Q. Liu[69], S. B. Liu[63,72], T. Liu[11], X. Liu[41], Y. W. Liu[63,72], Y. Liu[82], Y. L. Liu[63,72], Z. Q. Liu[57], Z. Y. Liu[41], Z. W. Liu[45], I. Logashenko[3], Y. Long[63,72], C. G. Lu[33], J. X. Lu[2], N. Lu[63,72], Q. F. Lü[26], Y. Lu[7], Y. Lu[69], Z. Lu[62], P. Lukin[3], F. J. Luo[74], T. Luo[11], X. F. Luo[6], H. J. Lyu[24], X. R. Lyu[69], J. P. Ma[35], P. Ma[33], Y. Ma[15], Y. M. Ma[33], F. Maas[19,38], S. Malde[71], D. Matvienko[3], Z. X. Meng[70], R. Mitchell[29], A. Nefediev[40], Y. Nefedov[39], S. L. Olsen[22,53], Q. Ouyang[32,63], P. Pakhlov[23], G. Pakhlova[23,52], X. Pan[60], Y. Pan[62], E. Passemar[29,65,67], Y. P. Pei[63,72], H. P. Peng[63,72], L. Peng[27], X. Y. Peng[8], X. J. Peng[41], K. Peters[12], S. Pivovarov[3], E. Pyata[3], B. B. Qi[63,72], Y. Q. Qi[63,72], W. B. Qian[69], Y. Qian[33], C. F. Qiao[69], J. J. Qin[74], J. J. Qin[63,72], L. Q. Qin[13], X. S. Qin[57], T. L. Qiu[33], J. Rademacker[68], C. F. Redmer[38], H. Y. Sang[63,72], M. Saur[54], W. Shan[26], X. Y. Shan[63,72], L. L. Shang[20], M. Shao[63,72], L. Shekhtman[3], C. P. Shen[11], J. M. Shen[28], Z. T. Shen[63,72], H. C. Shi[63,72], X. D. Shi[63,72], B. Shwartz[3], A. Sokolov[3], J. J. Song[20], W. M. Song[36], Y. Song[63,72], Y. X. Song[10], A. Sukharev[3,51], J. F. Sun[20], L. Sun[77], X. M. Sun[6], Y. J. Sun[63,72], Z. P. Sun[33], J. Tang[64], S. S. Tang[63,72], Z. B. Tang[63,72], C. H. Tian[63,72], J. S. Tian[78], Y. Tian[33], Y. Tikhonov[3], K. Todyshev[3,51], T. Uglov[52], V. Vorobyev[3], B. D. Wan[15], B. L. Wang[69], B. Wang[63,72], D. Y. Wang[54], G. Y. Wang[21], G. L. Wang[17], H. L. Wang[61], J. Wang[49], J. H. Wang[63,72], J. C. Wang[63,72], M. L. Wang[32], R. Wang[63,72], R. Wang[35], S. B. Wang[59], W. Wang[59], W. P. Wang[63,72], X. C. Wang[20], X. D. Wang[74], X. L. Wang[63,72], X. L. Wang[20], X. P. Wang[2], X. F. Wang[41],

82 institutions, 453 authors

Accelerator CDR



114 institutions, 460 authors

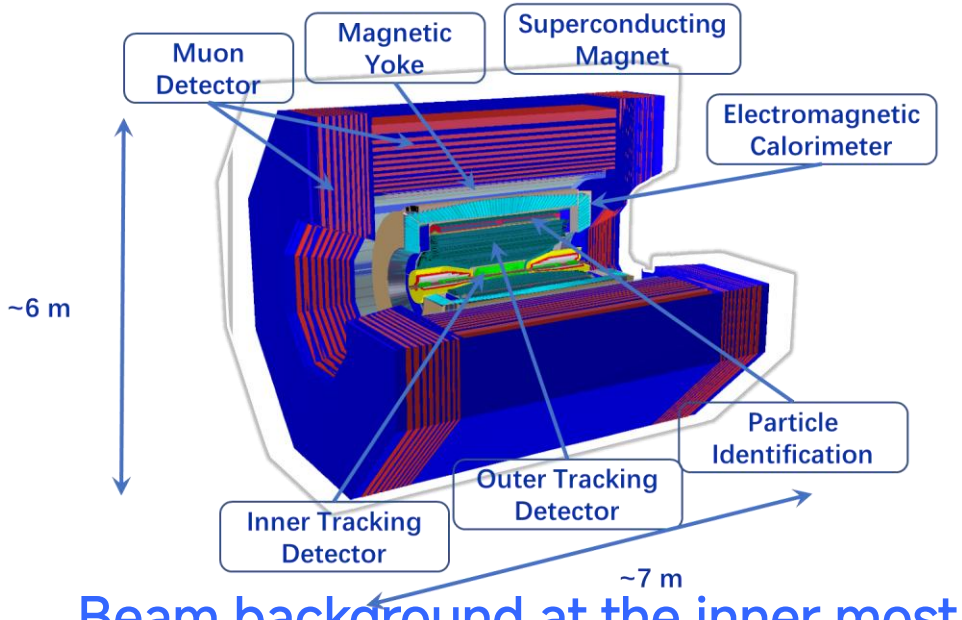
Requirements for STCF Detector

- Highly efficient and precise reconstruction of exclusive final states produced in 2–7 GeV e^+e^- collisions

  High tracking efficiency (>90% @ 0.1 GeV/c) and high momentum resolution for low-p (<1 GeV/c) charged particles, precise measurement of low-energy (<1 GeV) photons.

  → low mass tracking and PID detectors

  Excellent PID: π/K and μ/π separation in full momentum range (up to 3.5 GeV)



Process	Physics Interest	Optimized Subdetector	Requirements
$\tau \to K_s\pi\nu_\tau$, $J/\psi \to \Lambda\bar{\Lambda}$, $D_{(s)}$ tag	CPV in the τ sector, CPV in the hyperon sector, Charm physics	ITK+MDC	acceptance: 93% of 4π; trk. effi.: > 99% at p_T > 0.3 GeV/c; > 90% at p_T = 0.1 GeV/c σ_p/p = 0.5%, $\sigma_{\gamma\phi}$ = 130 μm at 1 GeV/c
$e^+e^- \to KK + X$, $D_{(s)}$ decays	Fragmentation function, CKM matrix, LQCD etc.	PID	π/K and K/π misidentification rate < 2% PID efficiency of hadrons > 97% at p < 2 GeV/c
$\tau \to \mu\mu\mu$, $\tau \to \gamma\mu$, $D_s \to \mu\nu$	cLFV decay of τ, CKM matrix, LQCD etc.	PID+MUD	μ/π suppression power over 30 at p < 2 GeV/c, μ efficiency over 95% at p = 1 GeV/c
$\tau \to \gamma\mu$, $\psi(3686) \to \gamma\eta(2S)$	cLFV decay of τ, Charmonium transition	EMC	$\sigma_E/E \approx 2.5\%$ at E = 1 GeV $\sigma_{\text{pos}} \approx 5$ mm at E = 1 GeV
$e^+e^- \to n\bar{n}$, $D_0 \to K_L\pi^+\pi^-$	Nucleon structure Unity of CKM triangle	EMC+MUD	$\sigma_T = \frac{300}{\sqrt{p^3(\text{GeV}^3)}}$ ps

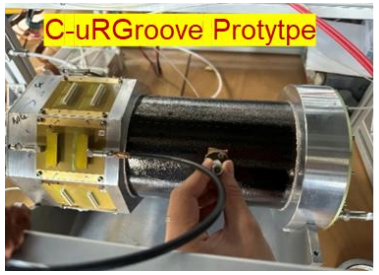
Beam background at the inner most layer : ~1 Mrad/y, ~1×10^{11} 1MeV n-eq/cm^2/y, ~1 MHz/cm^2

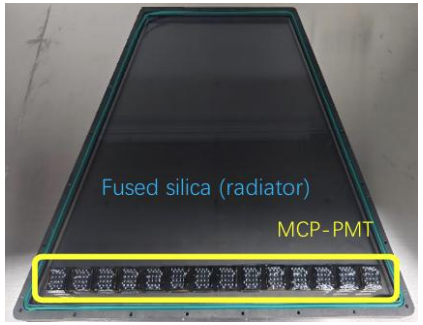
The radiation tolerance must be sufficiently high!

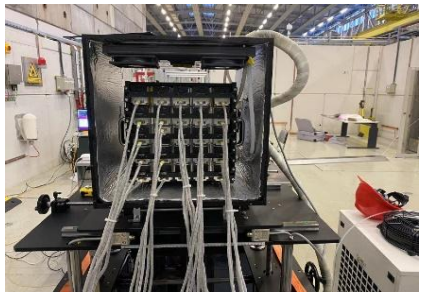
STCF Detector R&D Highlights

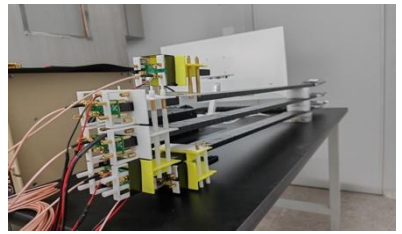
- **μRGroove**: 0.23%X_0/layer — best cylindrical MPGD; CERN beam test σx<130 μm
- **MAPS**: 180/130/90 nm chips beam-tested at CERN
- **MDC**: full-length small-cell prototype + FPGA waveform electronics
- **PID**: BTOF prototype beam-tested; DTOF π/K >4σ @2 GeV/c
- **EMC**: pCsI prototype — σE/E ~ 2.1%, σt ~ 280 ps @1 GeV
- **Muon**: 2.4 m scintillator units; glass-RPC prototype

Combined beam tests — two campaigns at CERN PS T9 (Aug & Oct 2025): ITK, RICH, DTOF, EMC, clock, trigger and DAQ operated together. DTOF σt ~25 ps · EMC σE/E ~2.1%.



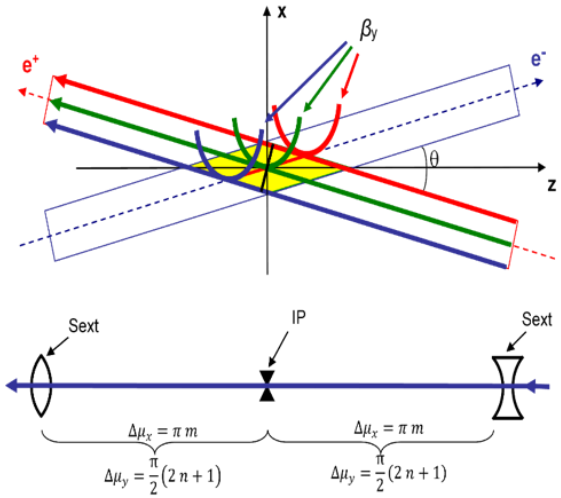





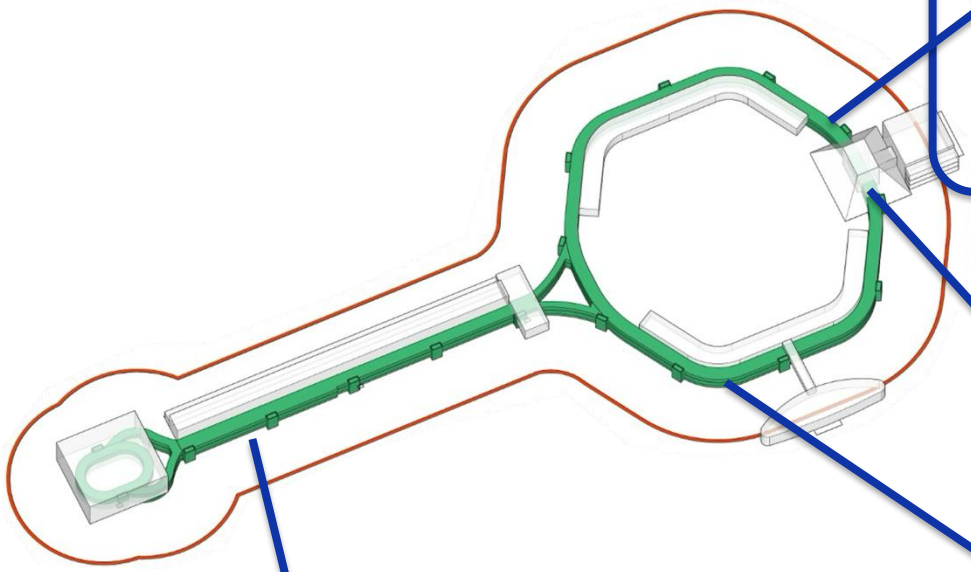
Challenges of STCF Accelerator

- **Ultra-high luminosity in the tau charm energy region, high-quality beam, stable operation**
- **Characterized by extremely small bunch size, high beam current, strong nonlinearity and collective effects**



$$L = \frac{\gamma n_b I_b}{2 e r_e \beta_y^*} \xi_y H$$

Large Piwinski angle + Crab Waist



Collider Ring and IR Physics Design
IP beam size (Y) nm scale, Crab-Waist, nonlinear compensation extremely difficult

IR Technologies
SC magnets, MDI

Injection into CR (small DA)
high I_b and low ε e+/e- sources

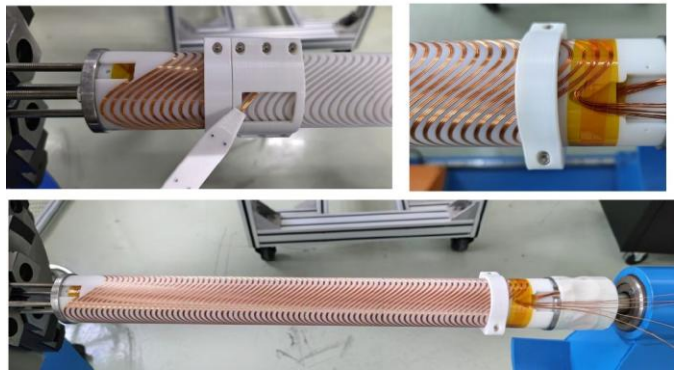
Other key technologies
Ring RF, beam instrumentation and control, beam injection…

SuperKEKB in Japan is using the Large Piwinski angle + Crab Waist scheme to boost luminosity — a highly challenging approach.

STCF Accelerator R&D

IR SC Magnets

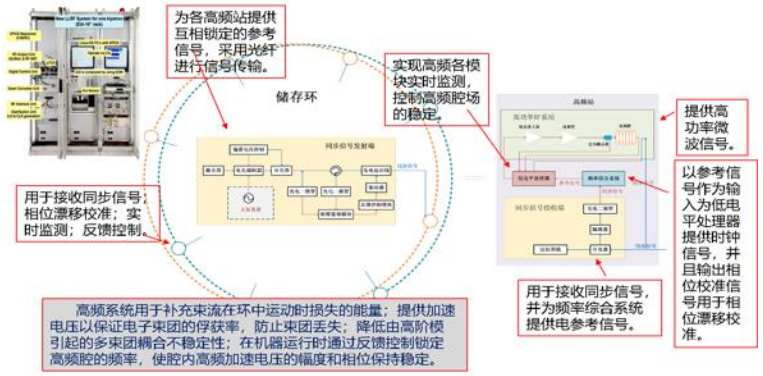
Very constrained Space，50T/m, CCT technology



Room-temperature RF cavity



Low-level RF control system



Bunch by bunch 3D beam position measurement

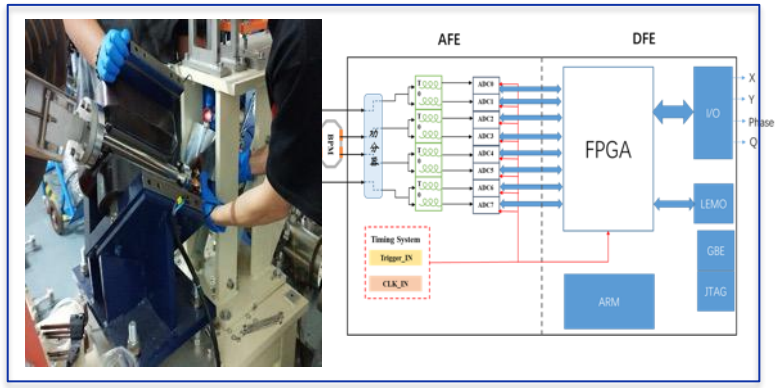
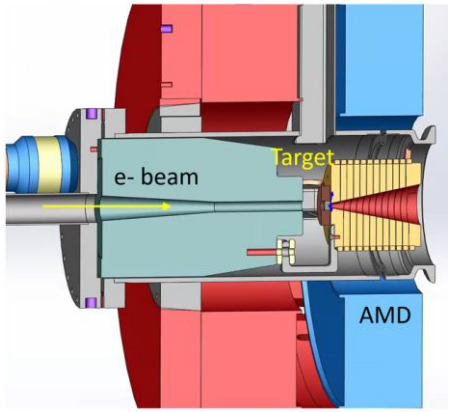
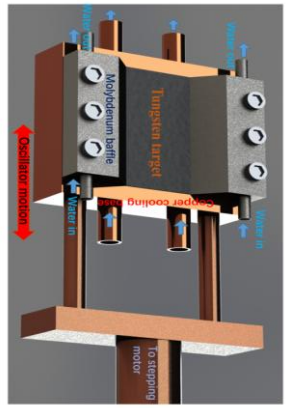


Photo-cathode electron gun



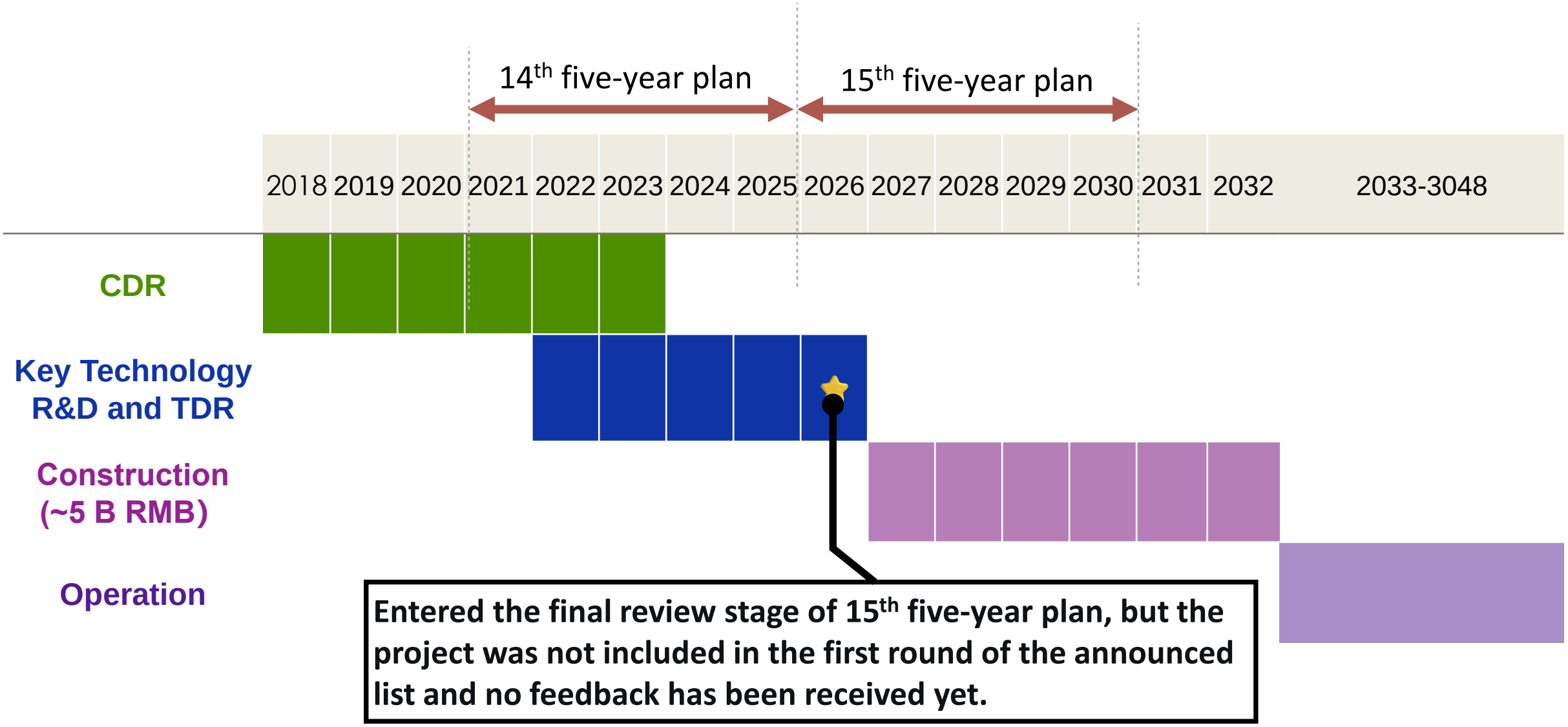
Positron source





Accelerator colleagues have worked extremely hard, investing great effort in the R&D of the relevant components.

STCF Project Schedule



Next Steps and Strategy for STCF

Despite the difficulties, the roadmap remains clear: STCF is moving toward approval in the 15th Five-Year Plan.

- **Leverage USTC's influence to win stronger support from CAS, Anhui Province, Hefei City and Anhui enterprises**
- **Strengthen industry ties in R&D and internationalization; actively seek industrial sponsorship**
- **Hefei is growing into a science city backed by multiple high-tech industries，like ChangXin Memory Technologies (CXMT)…**

CEPC: From Kick-off to TDR

- 100-km e^+e^- **Higgs factory** (240 GeV); also W/Z, top; upgradeable to ~100 TeV pp
- 2013 kick-off → 2018 CDR → **2023 TDR** → now EDR
- Site: cepc.ihep.ac.cn

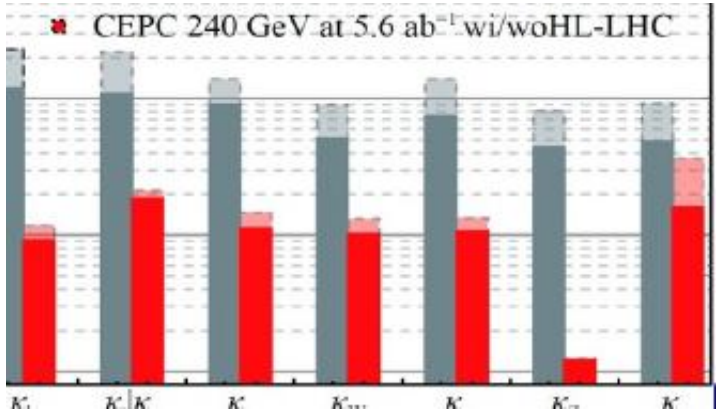
- **Physics white papers**
  1. **Higgs — arXiv:1810.09037**
     Chin. Phys. C 43(2019) 043002
  2. **Flavor — arXiv:2412.19743**
  3. **New physics — arXiv:2505.24810**
  4. **Electroweak — to be published**
  5. **QCD — to be published**



A decade of design study: complete accelerator + detector designs, broad international collaboration.

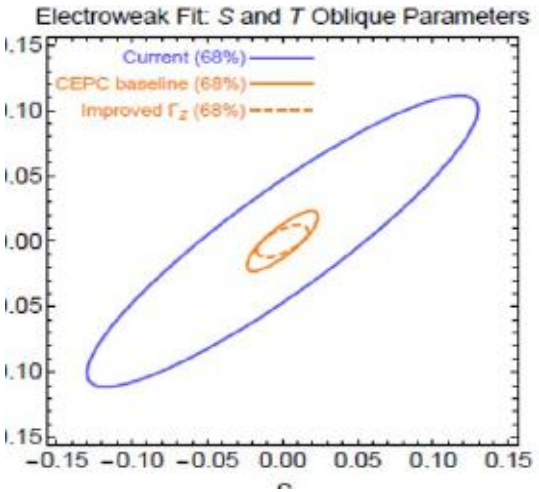
CEPC Physics Program: Precision & Discovery

Higgs coupling precision can improve by an order of magnitude



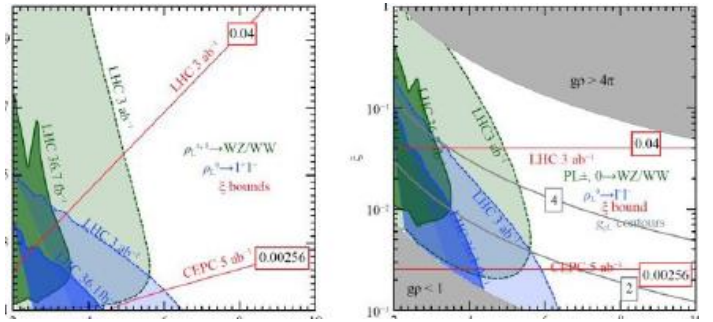
Chinese Phys. C 43 (2019) 043002, 7-parameter fit

EW measurements improve by a large factor

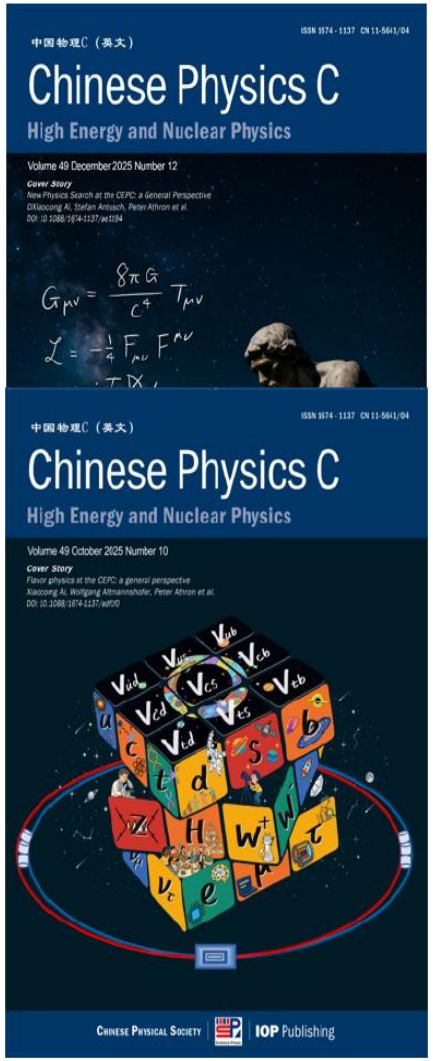


Electroweak fit: S & T oblique parameters

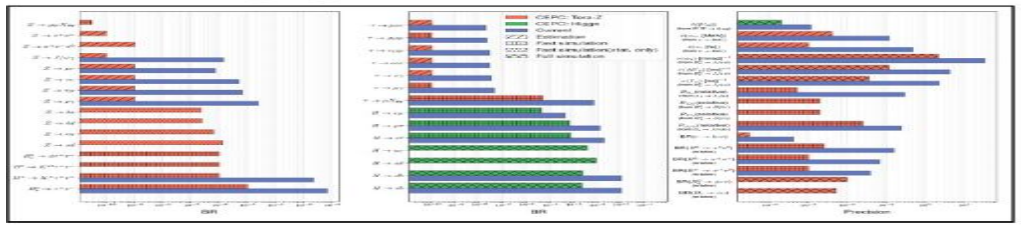
Direct & indirect probe of new physics up to 10 TeV, an order of magnitude beyond HL-LHC



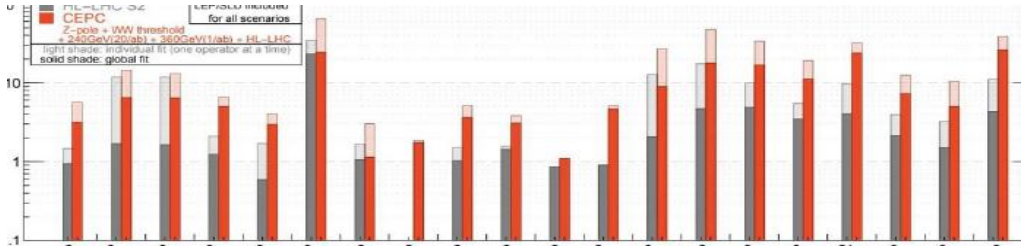
95% CL reach, ξ bounds (WZ/WW, tt̄)



Rich flavor physics — arXiv:2412.19743 (white paper)

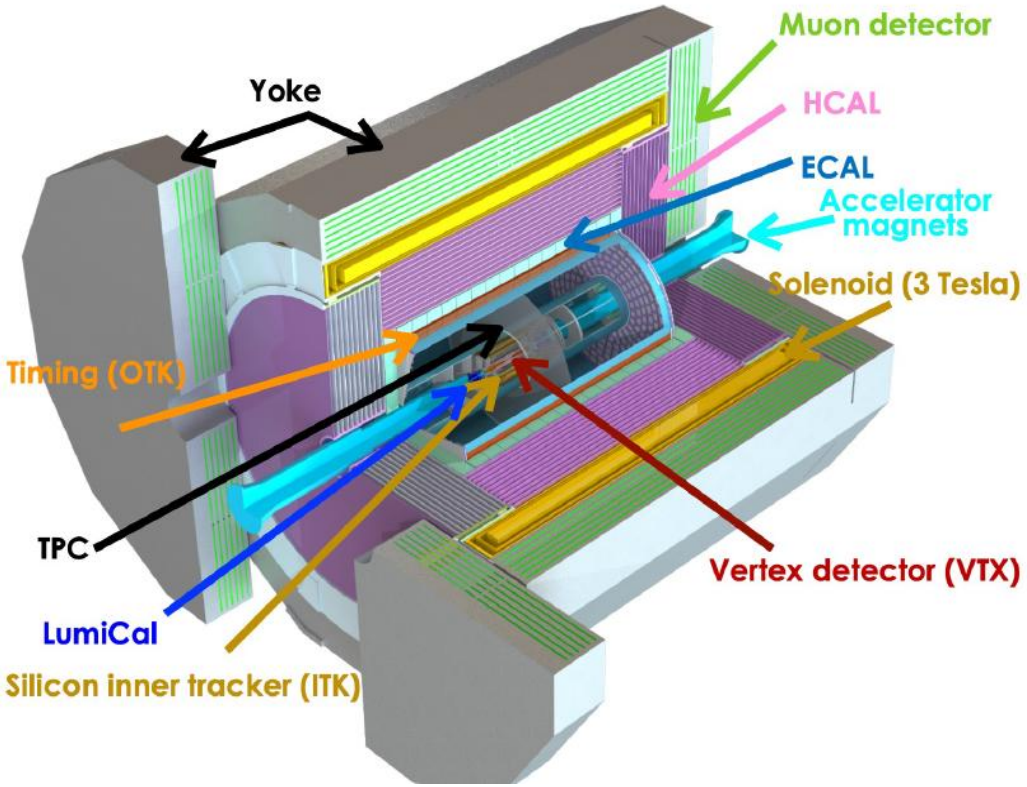


95% CL reach from SMEFT fit



❖ **Hundreds of journal / arXiv papers — CEPC can reveal new physics at ~10 TeV or higher**

The Reference Detector

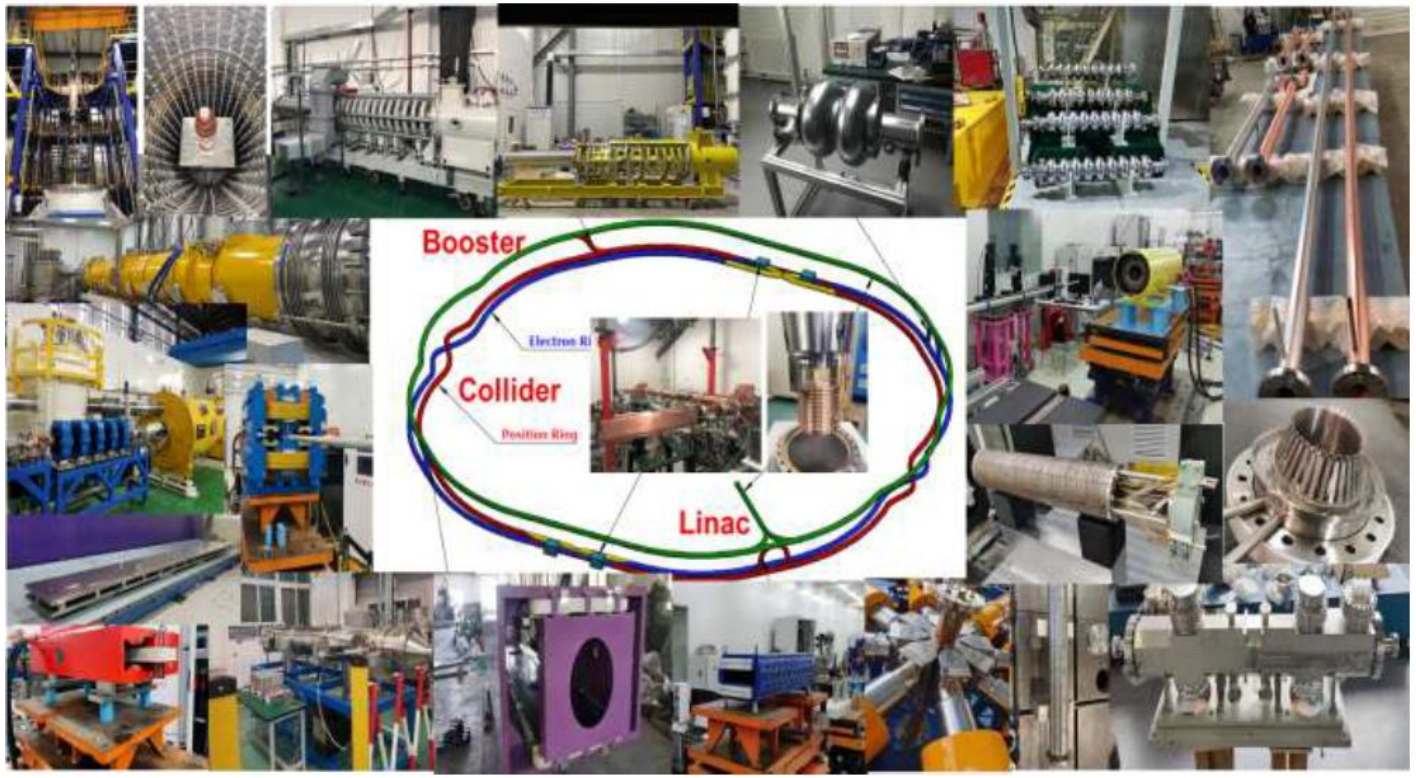


Main goal of CEPC Reference Detector TDR

Demonstrate **readiness for construction** of the baseline-scenario detector — a detector that could be built and commissioned **within a decade**

- **Ultra-low-mass vertex detector**: four layers of large-area stitched sensors, innermost radius reaching **11 mm**, plus a double-layer ladder structure
- **Silicon tracker + TPC**: precision tracking and PID
  - **ITK**: monolithic HV-CMOS pixel sensors, 3 barrel layers + 4 disk layers per endcap
  - **TPC**: high-granularity readout (500×500 μm²) for good tracking and PID
  - **OTK**: one barrel layer + two endcap disk layers, based on AC-LGAD for **timing and position**
- **PFA-oriented calorimetry**: high-granularity homogeneous crystal ECAL and novel glass scintillator HCAL
  - ECAL: 18 layers (~24 X_0) of BGO bars (1.5×1.5×40 cm³), orthogonal in every two adjacent layers
  - HCAL: 48 layers of glass scintillator tiles (4×4×1 cm³) interspersed with steel plates, ~6 λ_I
- **Superconducting solenoid**: 3 T magnetic field
- **Muon detectors** in the return yoke
- **LumiCal**: an AC-LGAD silicon wafer layer plus a LYSO-crystal calorimeter

CEPC Accelerator TDR Completed in 2023





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

CEPC Accelerator TDR published in *Radiation Detection Technology and Methods* (June 3, 2024).
DOI: 10.1007/s41605-024-00463-y

✓ **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%

CEPC Accelerator EDR: Highlights

EDR in **35 working groups**: new technologies, mass production, installation mockups, MDI, controls, …

SRF cavities & modules

Full **11 m module** with six 650 MHz 2-cell cavities — construction in progress

High-efficiency klystrons

800 kW CW at 78%; **energy-recovery klystron** (≥85%) to be tested next year

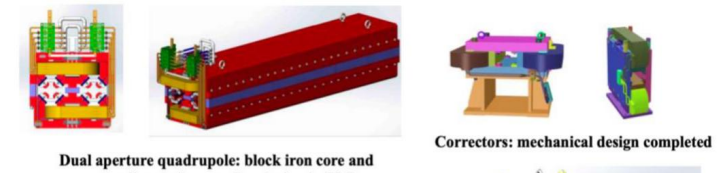
Automatic magnet production

~15,000 dipoles; 24/7 line cuts cost by **30–50%**; first workstation commissioned

NEG-coated vacuum chambers

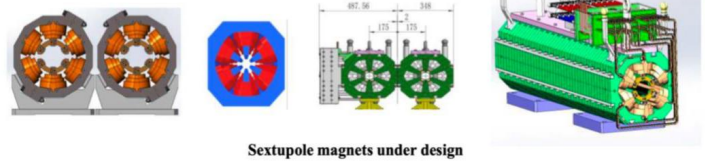
200 km needed; automatic line in system-level commissioning

Also: C-band linac test stand · CCT final-focus quadrupole · MDI & backgrounds · control & timing · alignment & installation



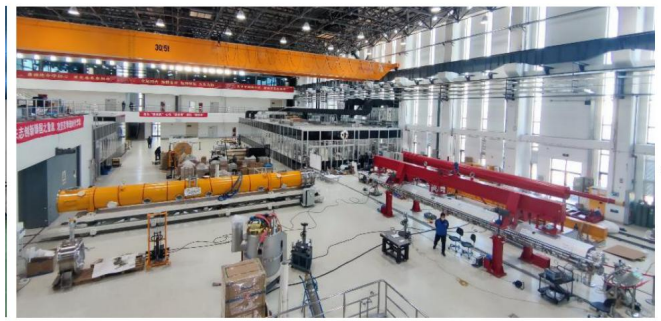
Dual aperture quadrupole: block iron core and new cooling and power line design in EDR

Correctors: mechanical design completed



Sextupole magnets under design





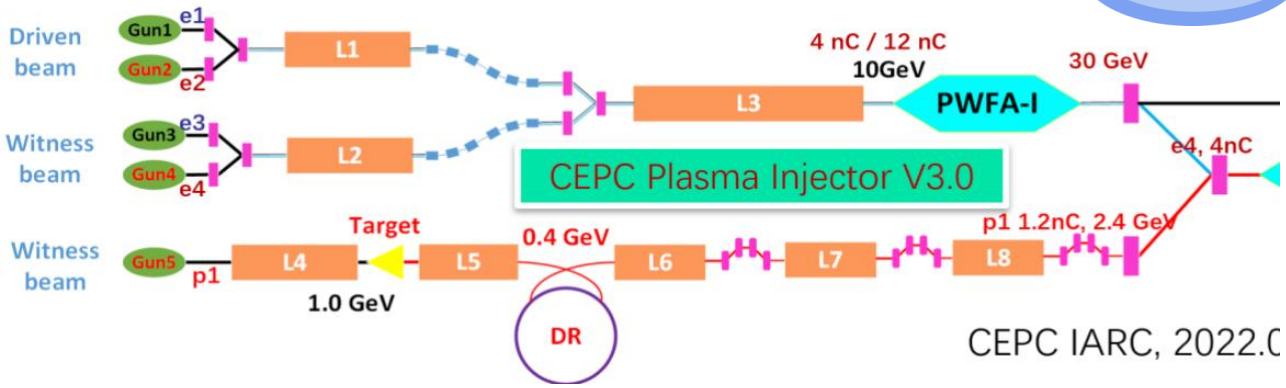
R&D for Future: Plasma Accelerator as the CEPC Injector

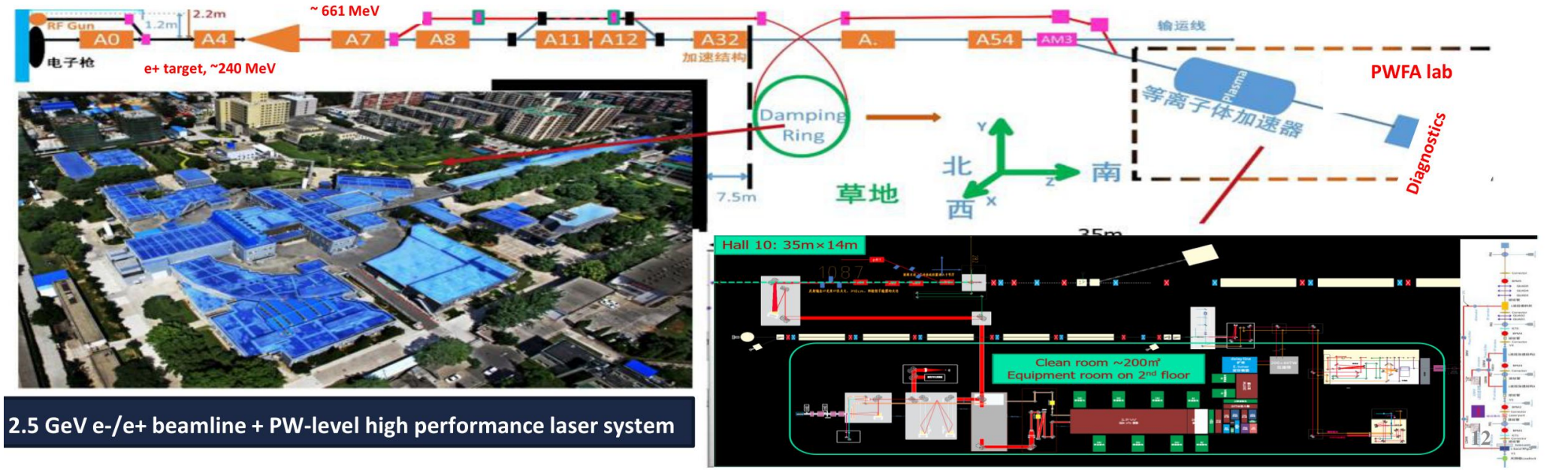
➢ **Conceptual design based on simulation**

➢ **For experimental proof and prototyping, a test facility based on the BEPCII LINAC is under construction:**

· **Cascading, positron acceleration, …**

· **Technology: electron gun, laser, …**





2.5 GeV e-/e+ beamline + PW-level high performance laser system

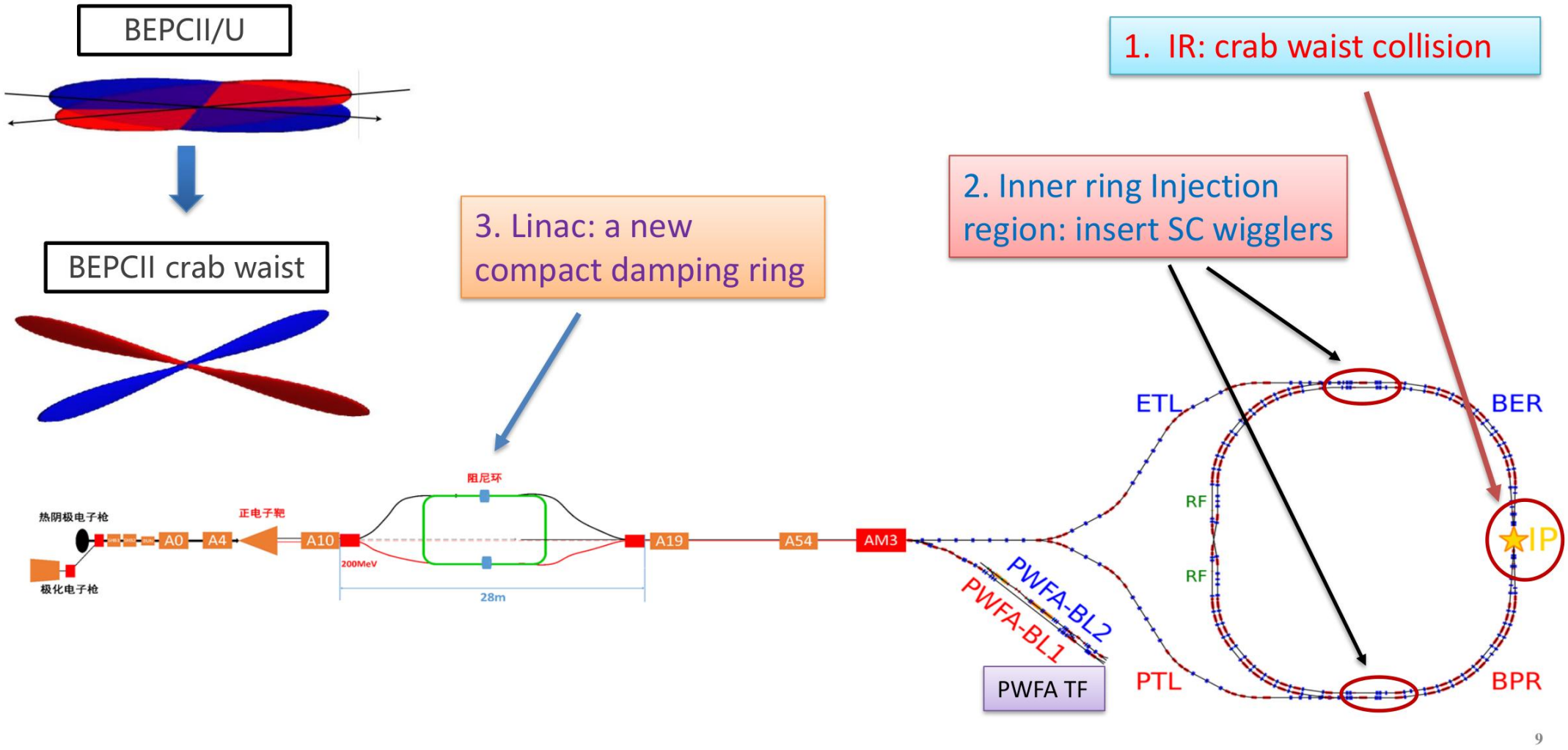
Novel acceleration principles are used in the CEPC injector; the main challenge is improving beam quality.

Next Steps and Strategies for CEPC promotion

- CEPC was not put into the 15th 5-yrs (2026–2030) plan
- An IB meeting at the last annual CEPC workshop (Guangzhou) concluded:
  - Continue CEPC while looking forward to being a major partner of FCC
    - Identify common interests and technologies; find a new way of collaboration
      - In contact with CERN/FCC;
      - AGORA listed as one of the FCC detector concepts;
      - already in DRD
    - If FCC construction is not officially approved before 2030, we will propose again to the Chinese government
  - Continue to explore the pp collider (~100 TeV) via iron-based HTC superconducting materials (IBS) and magnets
    - Only IBS has the potential to contribute significantly to society: new, metal, cheap
  - Work on the high-energy linear e^+e^- collider (1–10 TeV) and applications
    - A PWFA test facility based on BEPCII has been established
    - Start work on technologies and applications for table-top light sources, injectors, FEL, etc.

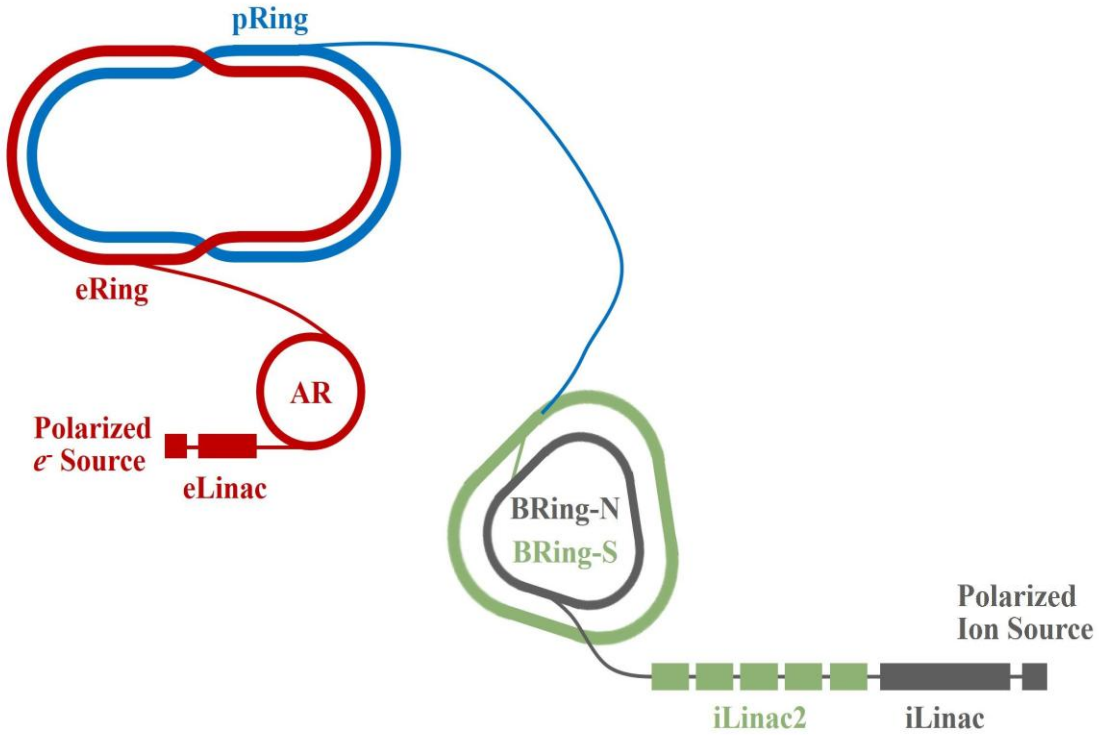
See Yifang Wang's plenary report at Higgs Hunting 2026, Orsay (Paris), France

New: Testing the Crab-Waist Scheme at BEPCII (original)



Building a Large Piwinski angle + Crab Waist test platform at BEPCII to validate key technologies for the BEPCII luminosity upgrade, STCF, and CEPC.

EicC: Electron-Ion Collider in China



- Proposed by the Chinese **nuclear physics** community; CDR 2021
- Polarized e–p/ions: $E_{cm} \approx 16.7$ GeV, $L \sim 2 \times 10^{33}$ cm^{-2}s^{-1}
- Based on **HIAF** (Huizhou) + a new electron ring
- Science: sea quarks & gluons, 3D nucleon structure, gluon saturation

Status: pre-research / R&D phase; complementary to the US EIC.

Strategy for Collider Physics Projects in China &Summary

Despite difficulties, the roadmap is clear — Collider Physics in China continues

- **On Existing Facilities**
  - **BEPCII(U)/BESIII, Belle II and LHC experiments for high-visibility physics output**
  - **Actively participate in LHC detector upgrades**
  - **Push forward the BEPCII luminosity upgrade**
- **Continue promoting STCF and CEPC under a multi-win logic for both Chinese and international particle physics**
  - **Actively engage in FCC international collaboration**
- **Nuclear Physics Synergy: Jointly promote EicC with the nuclear physics community**

Thanks for your attention!

Backup Slides

China's Strategy for Collider Physics Development

Guiding logic — win-win for China and the world: keep pushing **STCF** and **CEPC**, and actively join the international collaboration on **FCC**.

▪ STCF — toward approval in the 15th FYP

· Leverage USTC's influence to win stronger support from CAS, Anhui Province, Hefei City and Anhui enterprises

· Strengthen industry ties in R&D and internationalization; actively seek industrial sponsorship

· Hefei is growing into a science city backed by multiple high-tech industries

▪ CEPC — dual track with FCC

· **Re-proposal if FCC is not approved before 2030**; continue CEPC while looking forward to being a major partner of FCC

· Keep exploring the ~100 TeV pp collider via iron-based HTS (IBS) materials and magnets

· Work on high-energy linear e^+e^- colliders (1–10 TeV) and their applications

▪ **EicC**: push forward jointly with the nuclear physics community

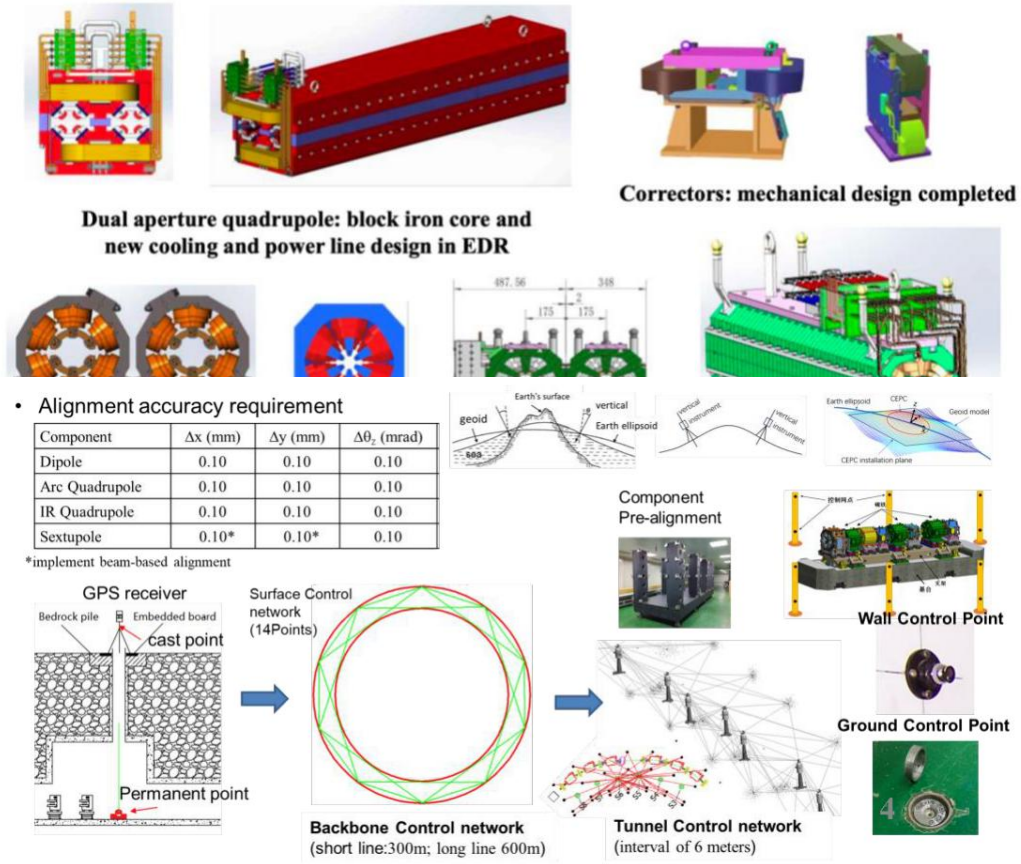
▪ **Existing facilities**: deliver visible physics with BEPCII(U)/BESIII，Belle II and LHC; join LHC upgrades; push the BEPCII luminosity upgrade

Near-term goal: STCF approval in the 15th Five-Year Plan; CEPC kept technically ready for a decision once the FCC path is clear.

Continue Accelerator EDR

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

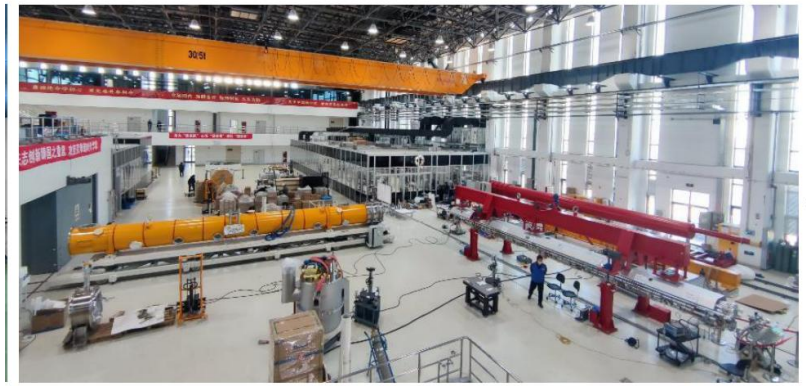
- A full cryomodule containing six 650 MHz 2-cell cavities
- Higher efficiency klystrons
- Automatic production for NEG coated vacuum chambers
- Automatic production for magnets
- More prototypes of magnets
- C-band LINAC test band
- CCT type SC quadrupole magnet for final focusing
- MDI design and background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

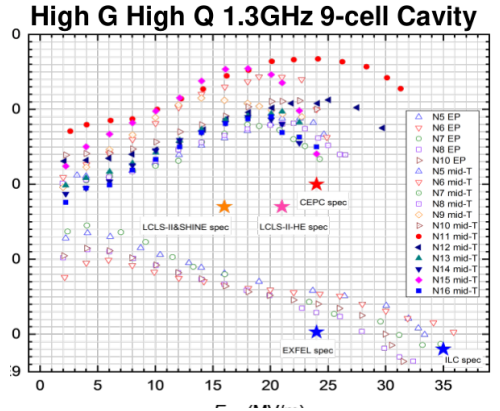


Source: Yifang Wang's plenary report at Higgs Hunting 2026, Orsay (Paris), France

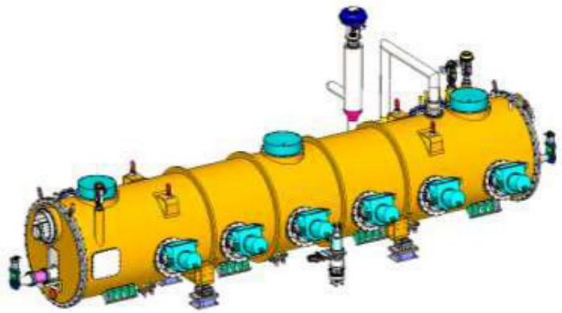
EDR Example 1: SRF Cavities and Modules

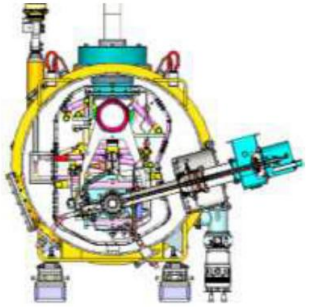


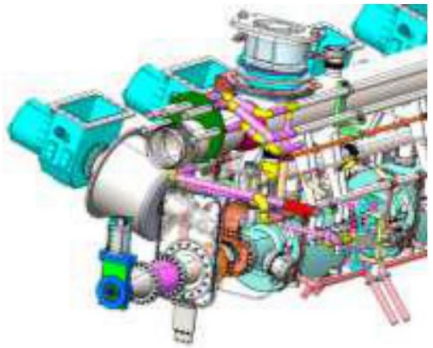




In TDR phase: successfully completed a 650 MHz 2-cell short module and a 1.3 GHz full module





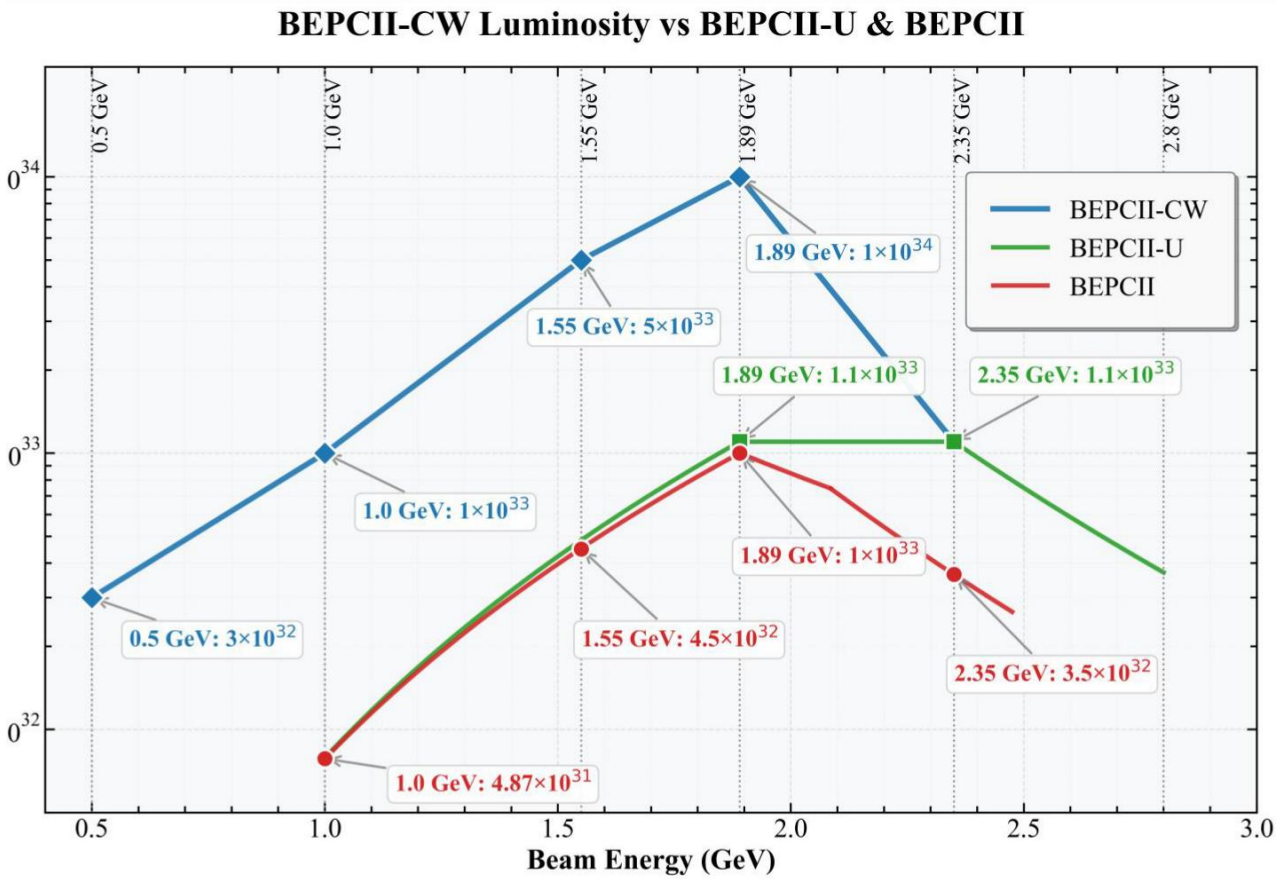




In EDR: a full 11 m-long module with six 650 MHz 2-cell cavities

Status: construction in progress

New BEPCII Luminosity



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

Main physics topics after upgrades:

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

CDR → Ref-detector TDR → AGORA

	CDR (ILD-like)	RefDet-TDR (new concept)	AGORA (newer concept)
VTX	Inner radius of 16 mm	Inner radius of **11 mm**	
VTX material	0.15%×6 + 0.14% (beampipe) = **1.05% X_0**	0.06%×4 (inner) + 0.165%×2 (outer) + 0.2% (beampipe) = **0.77% X_0**	
ITK	Monolithic HV-CMOS pixel, 10 μm		
Gaseous Tracker	TPC with **1 mm × 6 mm** readout, tracking 100 μm, dE/dx ~ 6%	TPC with **0.5 mm × 0.5 mm** readout, tracking 100 μm, **dN/dx ~ 3%**	
ToF & OTK	–	AC-LGAD, **50 ps** per MIP, 10 μm	
Cerenkov	–	–	Aerogel + SiPM
ECAL	Si-W-ECAL: **17%/√E ⊕ 1%**	BGO crystal: **1.3%/√E ⊕ 0.7%**	Glass cubic: **3%/√E ⊕ 1%**
HCAL	RPC-Iron: **60%/√E ⊕ 2%**	Glass-Steel: **30%/√E ⊕ 6.5%**	Glass cubic: **<15%/√E ⊕ 4%**

Source: Yifang Wang's plenary report at Higgs Hunting 2026, Orsay (Paris), France

Future Plan for the Glass Calorimeter

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

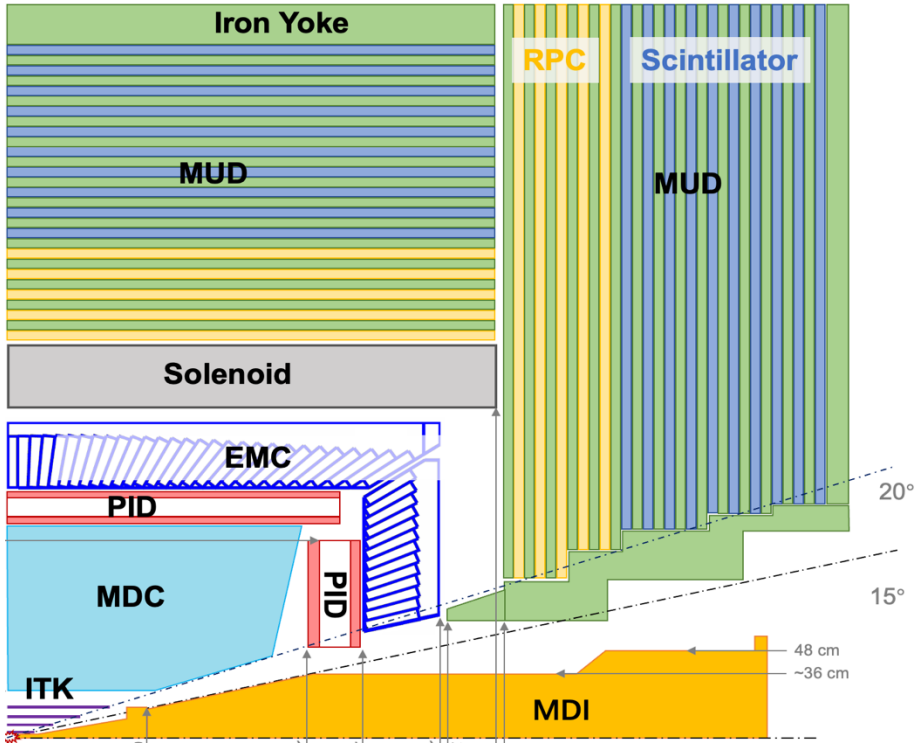
Source: Yifang Wang's plenary report at Higgs Hunting 2026, Orsay (Paris), France

Summary of the Higgs Hunting 2026 Report

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

Source: Yifang Wang's plenary report at Higgs Hunting 2026, Orsay (Paris), France

STCF Detector Design



Main Performance requirements

Tracking: eff>90%@0.1GeV, σ_p/p~0.5%@1GeV

Energy meas.: 25MeV–3.5GeV, σ_E/E ~ 2.5% @ 1 GeV

Hadron ID: π/K ~4σ @ 2 GeV, ~3σ @ 3 GeV

Muon ID: eff. >95%, mis-rate <3.3% @1 GeV

Inner Tracker (4 layers)

- MPGD: cylindrical μRGroove, σ_x ~100 μm
- Silicon: low-mass MAPS, <0.3%X_0/layer

Main Drift Chamber (σ_p/p~0.5% @ 1GeV)

- Small cells with helium-based gas, σ_x <130 μm

PID System (π/K ~4σ @ 2GeV, <0.3X_0)

- Barrel: DIRC-like TOF - BTOF (σ_t~30 ps)
- Endcap: RICH (<4 mrad), ASHIPH, DTOF

EMC

- pCsI + APD + waveform readout: (σ_E/E~2.5%, σ_x~5 mm @ 1GeV & ~1 MHz/crystal)

Solenoid: 1 T

Muon Detector (eff. >95%, mis-rate <3.3% @1GeV)

- inner 5 layers: glass RPC, > 300 Hz/cm^2
- outer 10 layers: scintillator strip + SiPM, ~2.4 m

AGORA: The Glass Calorimeter Concept



HCAL cell — 3D shower reconstruction, suited for PFA + AI

Novel gadolinium fluoro-oxide glass

· Density ~6 g/cm³ · light yield ~1500 ph/MeV · cost < 1 $/cc

· Simulation: ECAL 3.1%/√E ⊕ 0.7% · HCAL 10.9%/√E ⊕ 4.0%

Next steps

· Structure & glass R&D: attenuation, uniformity, cost

· Prototyping: EM 2027, HCAL 2028

Beyond TDR: full-absorption EM+H glass calorimeter — 3%/√E (EM), <15%/√E (hadronic), rich input for AI

R&D for the Further Future: PWFA and Iron-Based HTS

▪ PWFA test facility at BEPCII

· Plasma accelerator as a candidate **CEPC injector**

· 2.5 GeV e^-/e^+ beamline + PW-class laser, under construction

· Commissioning: 5.3 MeV gun exit, 5.6 nC; ~100 MeV @2% at PR08

· Applications: table-top light sources, injectors, FELs

▪ Iron-based HTS (IBS) magnets

· For a ~100 TeV pp collider

· Metallic, isotropic, cheap — $(Ba,K)Fe_2As_2$ in steel tubes

· J_c improved ×8; another ~×4 planned

· Cable >1000 m with good J_c; test coil successful

IBS is the only HTS route with clear potential for large societal spin-off beyond accelerators.