Landscape for Detector/CALICE R&D: Chinese Perspective

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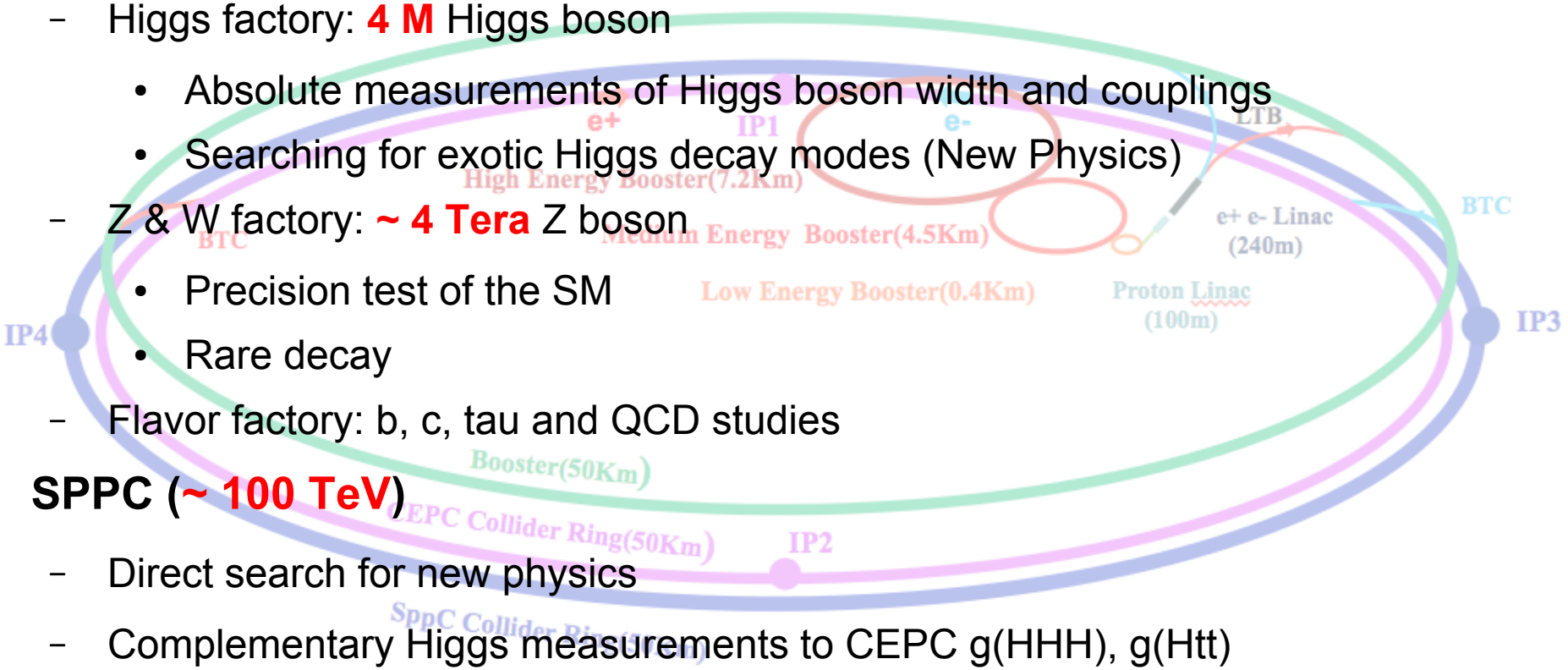
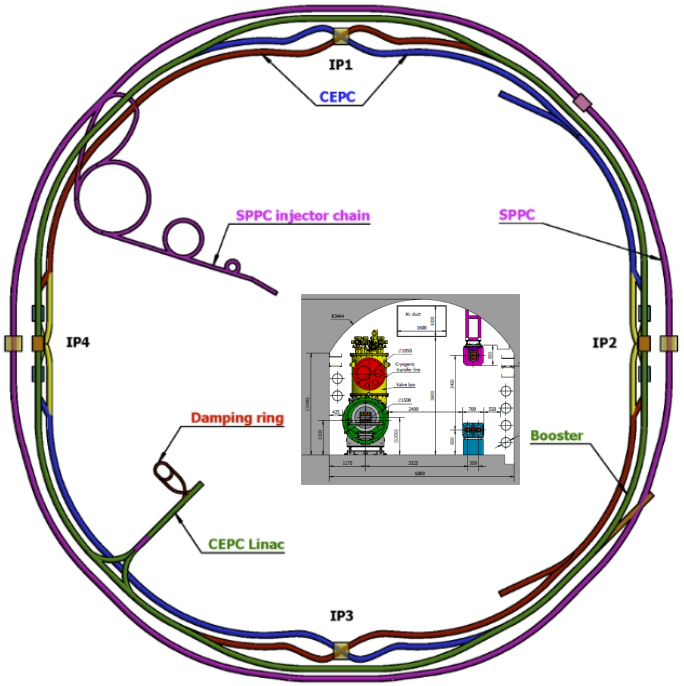
Key parameters of the CEPC-SPPC

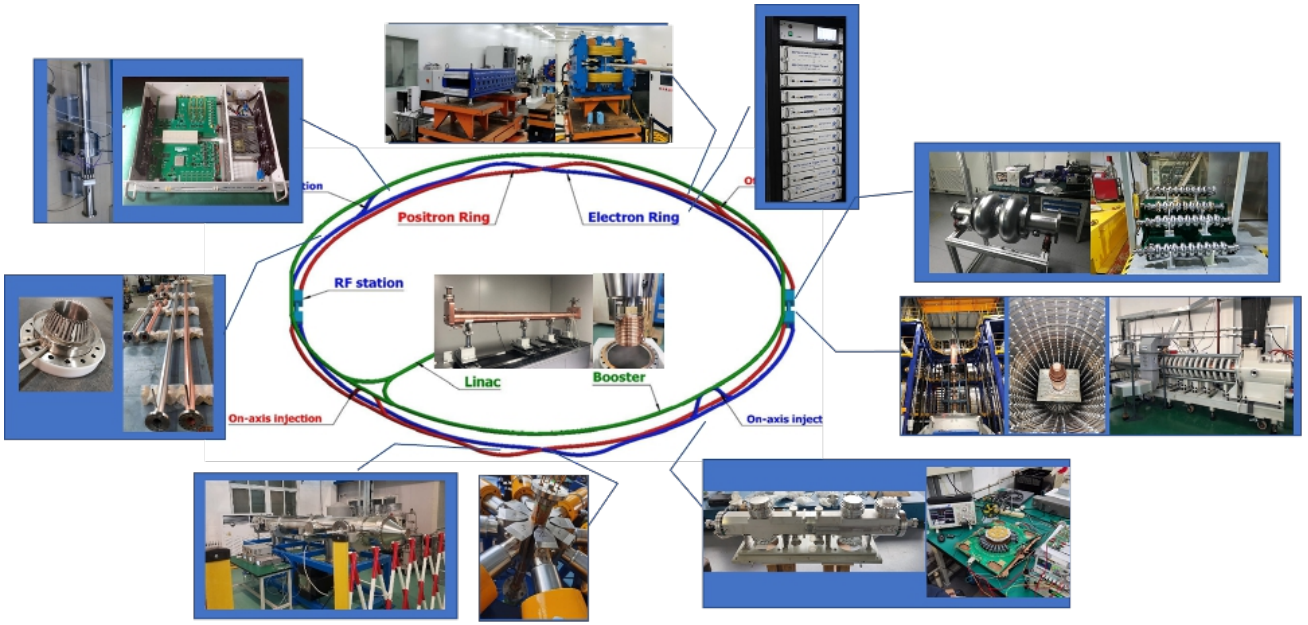
- **Tunnel ~ 100 km**
- **CEPC (90 – 240 GeV)**
  - Higgs factory: **4 M** Higgs boson
    - Absolute measurements of Higgs boson width and couplings
    - Searching for exotic Higgs decay modes (New Physics)
  - Z & W factory: **~ 4 Tera** Z boson
    - Precision test of the SM
    - Rare decay
  - Flavor factory: b, c, tau and QCD studies
- **SPPC (~ 100 TeV)**
  - Direct search for new physics
  - Complementary Higgs measurements to CEPC g(HHH), g(Htt)
  - ...
- **Heavy ion, e-p collision...**

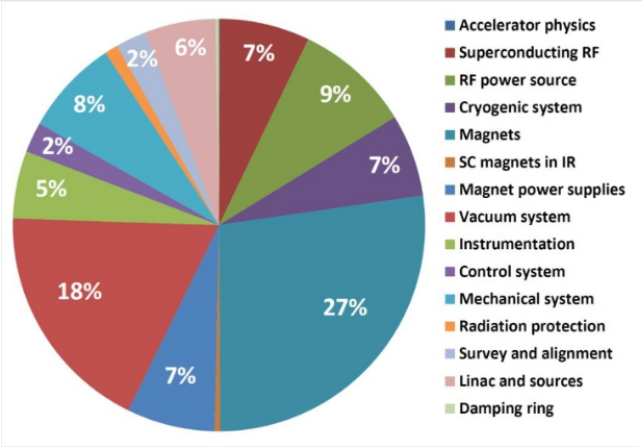


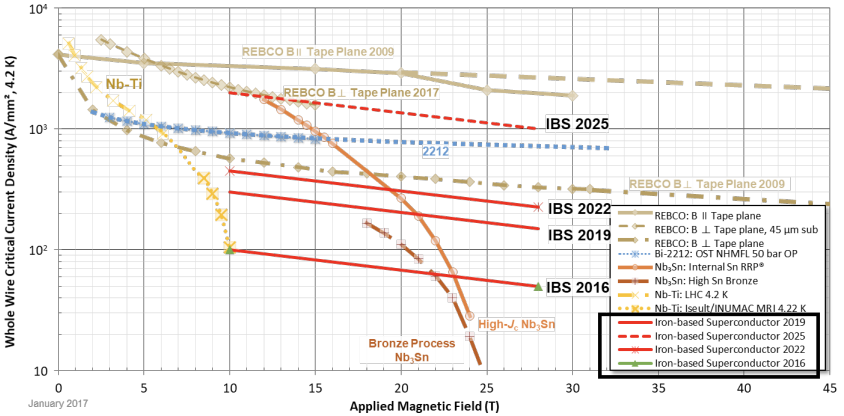
Complementary

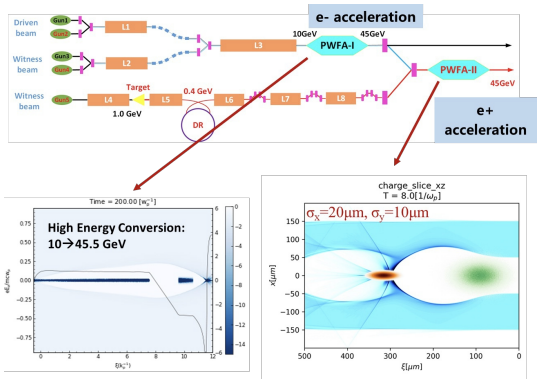
Accelerator at 2023











TDR review: HK June 2023

1 Executive Summary

Five years after the completion of the CDR, the draft TDR for the CEPC accelerator has been prepared. The TDR will be completed taking into account the feedback from this Committee. The key technologies for CEPC have been developed. Prototypes meeting or exceeding the specifications are available. The CEPC team is on track to launch an engineering-design effort. After a site has been selected, the construction of the CEPC could start in 2027 or 2028. The Committee endorses this plan.

The Committee wishes to congratulate the CEPC team on the excellent progress. The Committee is impressed by the amount and quality of the work performed and presented.

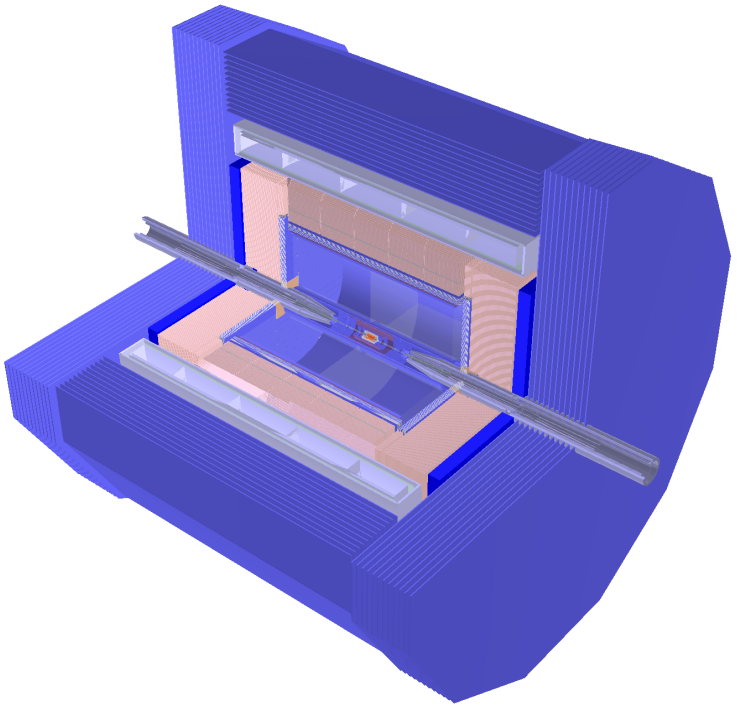
The next section provides answers to the different charge questions, the following sections contain comments and recommendations related to the individual presentations.

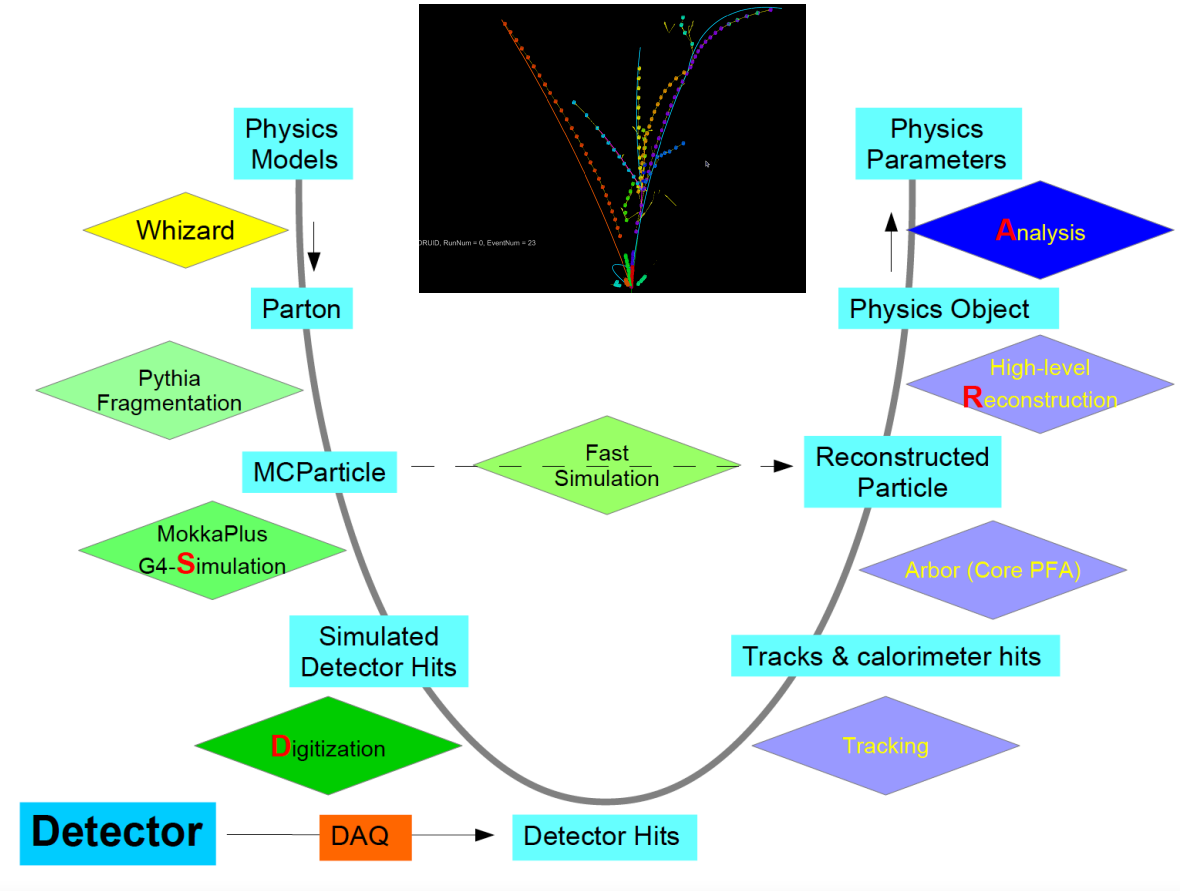
Platform for key technology R&D

Accelerator key technology R&D platform was established:

- SRF cavity and module
- High precision magnet
- Vacuum assembly & coating
- High efficiency Klystron
- Mechanics and alignment
- Beam test facility

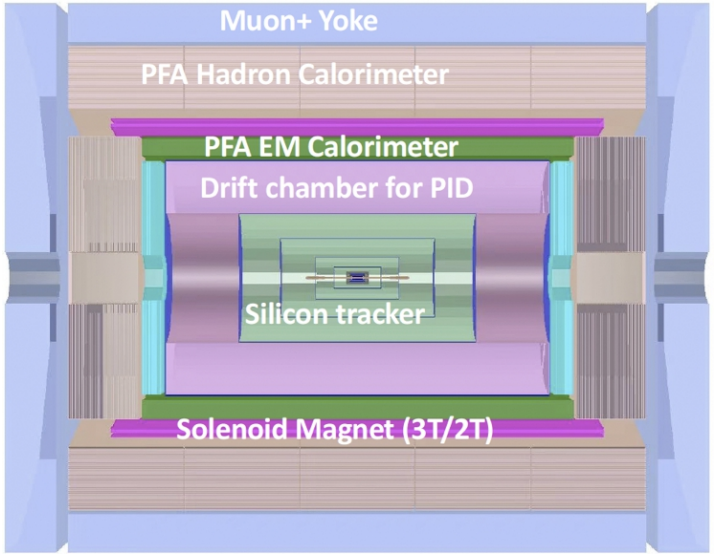
Detector & Reconstruction

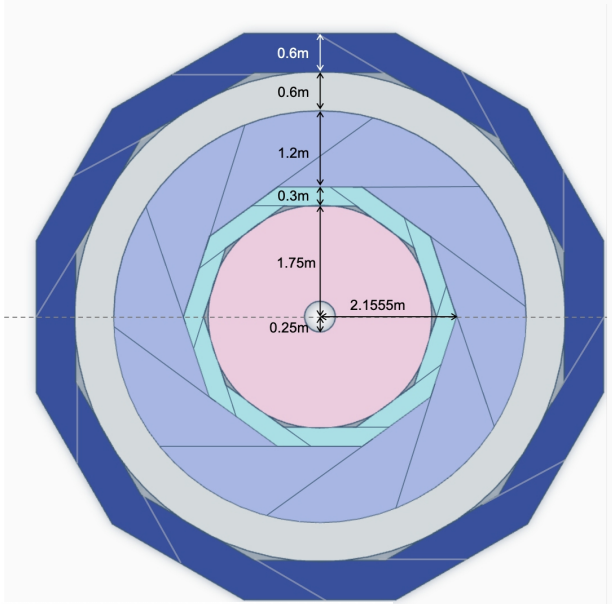


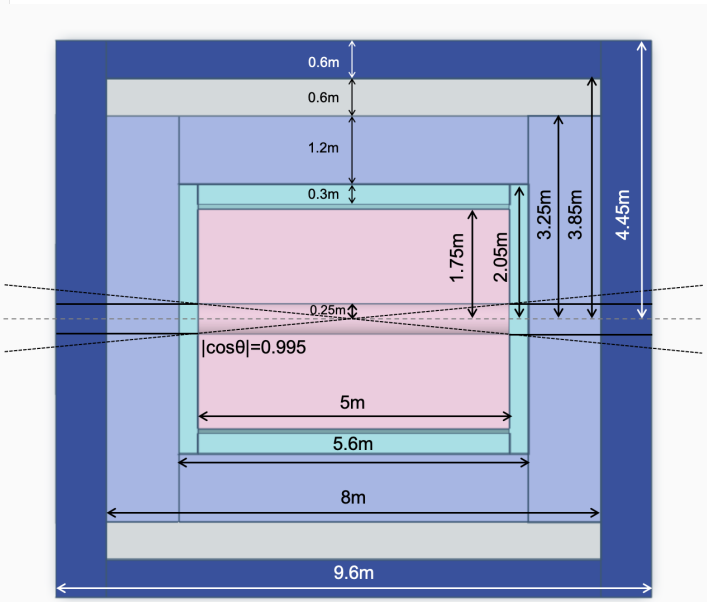


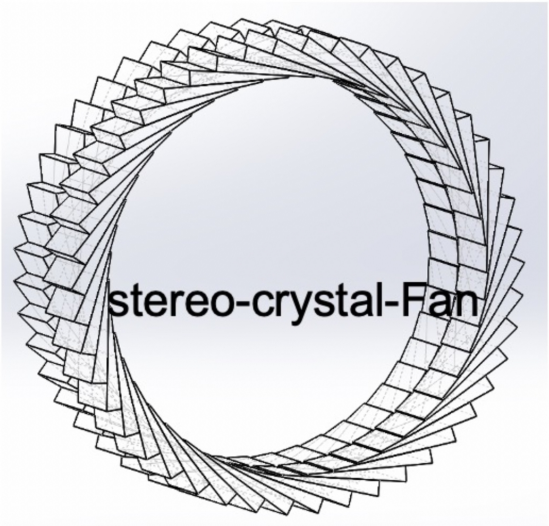
Starting from the ilcsoft & rewriting all the PFA/high-level reconstruction algorithms.

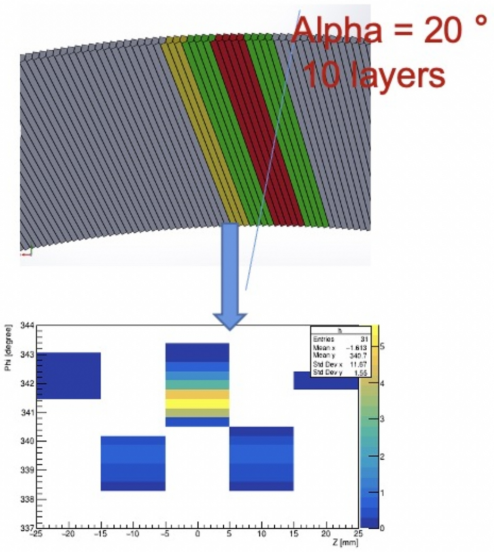
Detector study

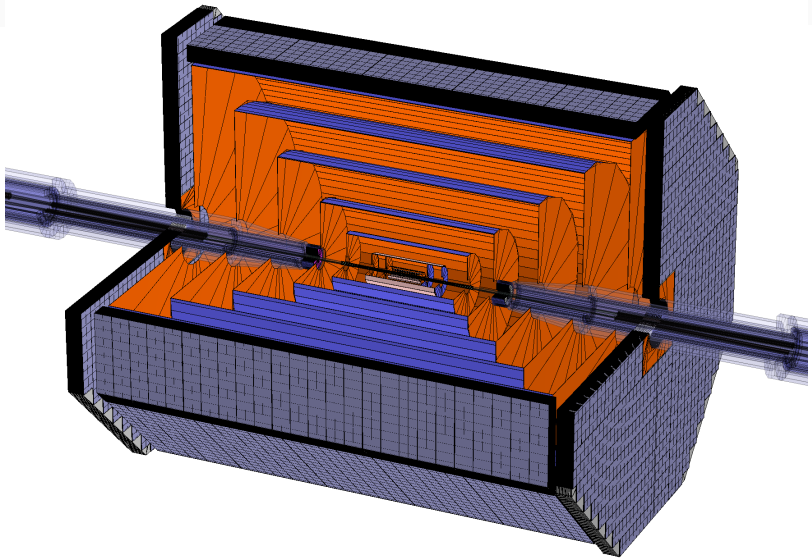






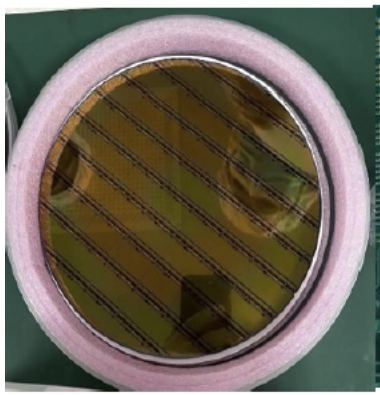


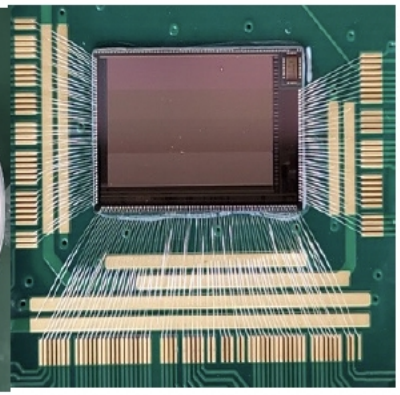


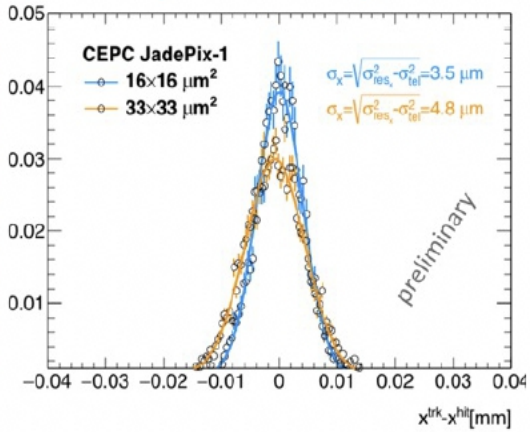


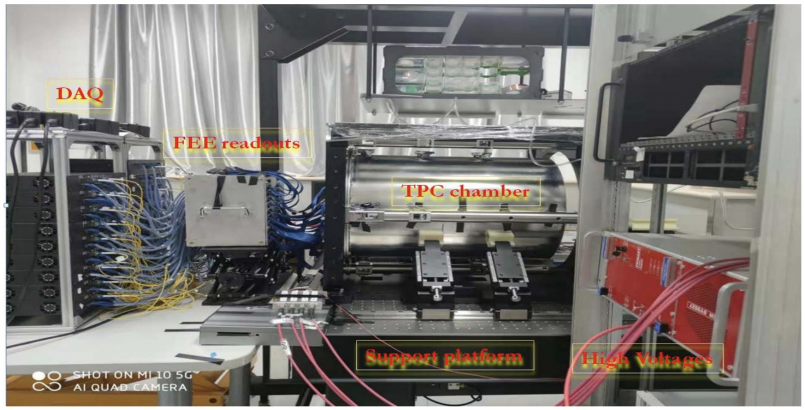
Detector study

Vertex detector R & D (3- 5 μm reso.)



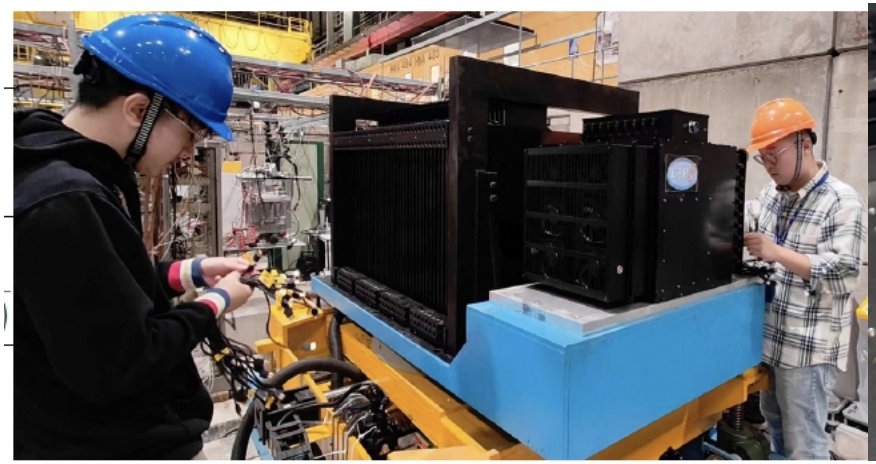




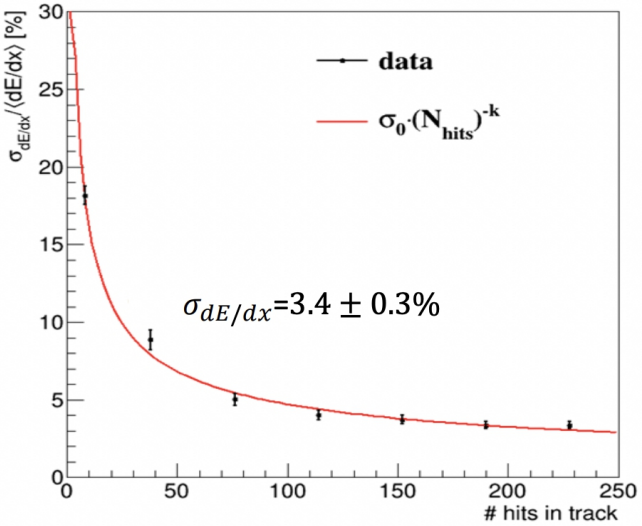


TPC prototype integrated with 266nm UV laser tracks

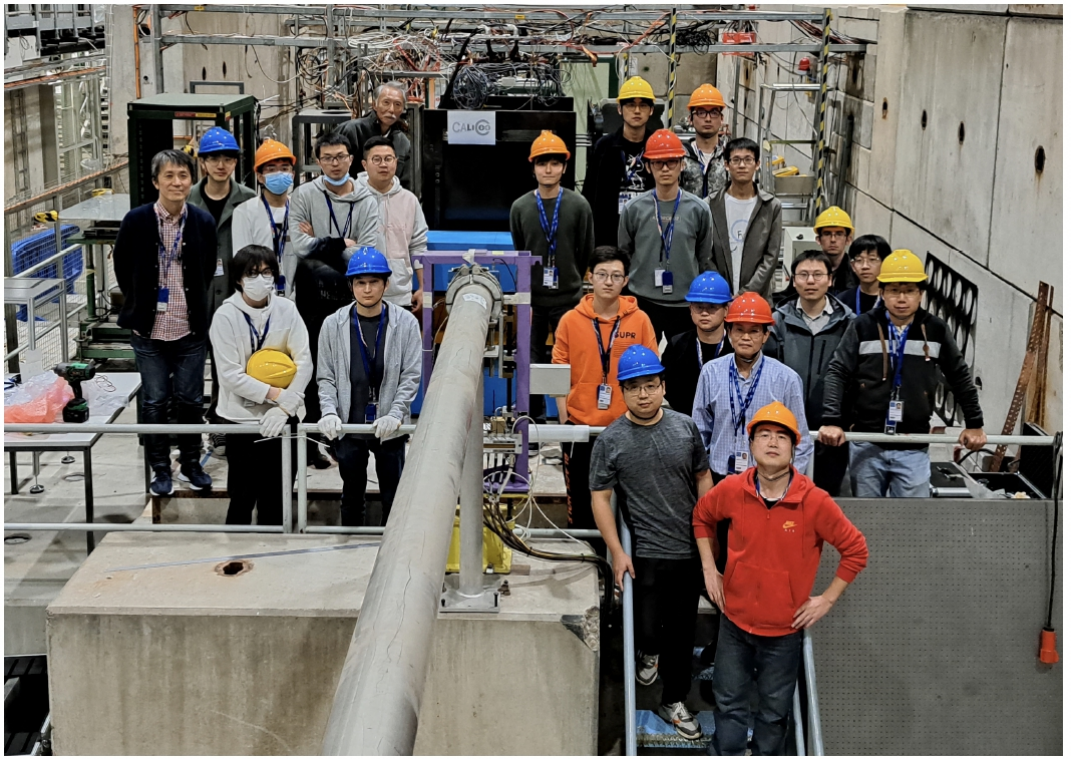
PFA scintillator-W ECAL



4D crystal ECAL



CEPC Calo Prototypes



- Successful operation... active team..., and support from CALICE

Summary

- Endeavor of 11 years: CEPC is ~technologically ready for construction
- Tremendous physics program leads to very demanding detector requirements and many open questions, need to be addressed by dedicated studies & intensive R&D
  - Requirement from Physics, especially New Physics – Flavor Physics – anomaly...
  - Understand and control of the beam induced background
  - Extremely high event rate: overlap of events in time
    - space-time clustering of PFA, associate final state particles with the correct vertex...
  - Opportunities provides by new tools, AI...
  - New ideas...
- Need to overcome the difficulties: manpower & funding resource, and to seek for potential applications...
- International collaboration of CALICE is a great success. We highly appreciate the CALICE efforts. There are strong will of the domestic Chinese team to further participate CALICE/DRD (a preliminary survey shows that more than 30 PIs would like to join DRD efforts)
- We hope to continue the trend, to build stronger collaboration, to make finer instrumentation, and to bring sooner the electron positron Higgs factories into reality...