



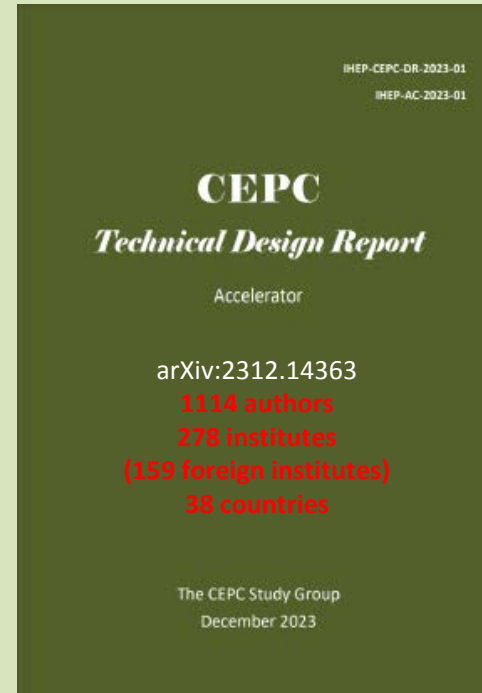
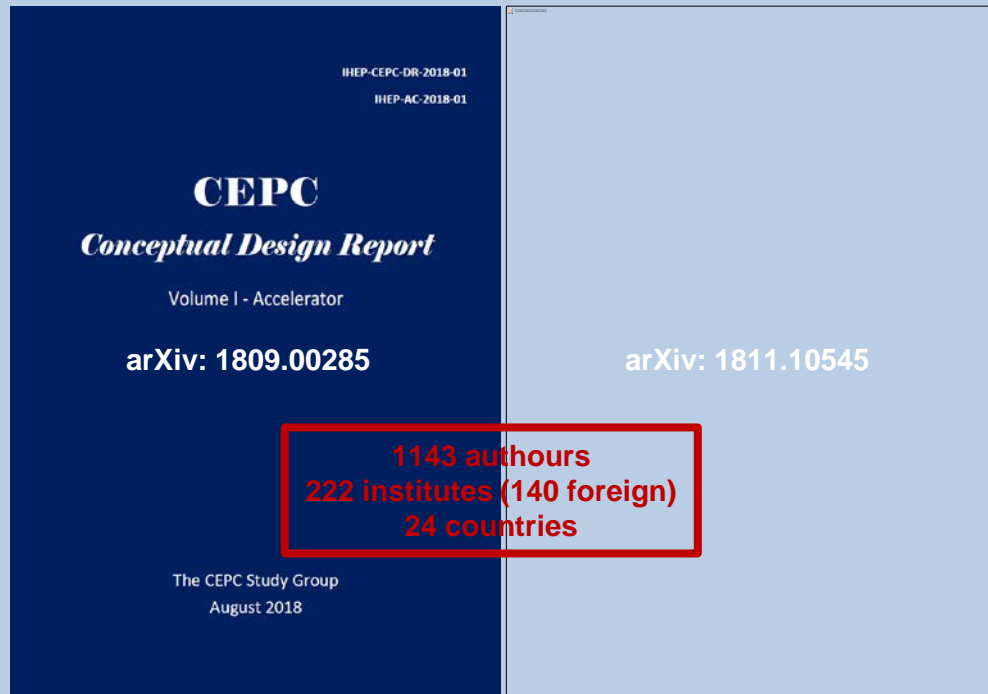
Update news of CEPC Detector Ref-TDR

Huirong Qi

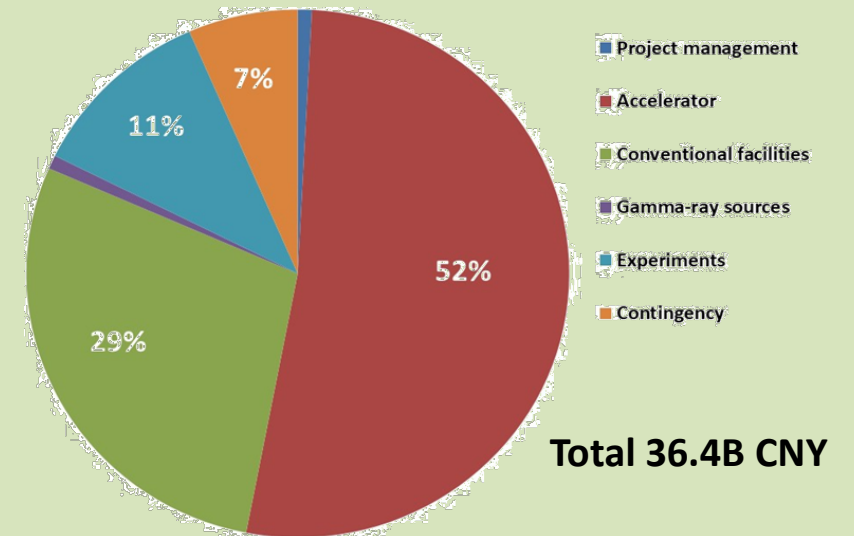
LCTPC WP meeting, 17, Oct.

CEPC CDR and TDR

CDR Released (2018.11)



Accelerator TDR Released (2023.12.25)



TDR of a reference detector by 2025.06

To demonstrate the readiness and feasibility of detector technologies

Aim for domestic endorsement

Ideal Timeline of CEPC

Completion of Accelerator TDR

Completion of Accelerator EDR

TDR of a Ref-Detector @ June 30, 2025

International Collaborations

CEPC Project Timeline

2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037

Accelerator
Technical Design Report (TDR)

15th FY

16th FY

Accelerator
Engineering Design Report (EDR)
R&D of a series of key technologies
Prepare for mass production of devices through CIPC

Accelerator
Civil engineering, campus construction

Accelerator
Construction and installation of accelerator

Detector
New detector system design & Technical Design Report (TDR)

Detector
Detector construction, installation & joint commissioning with accelerator

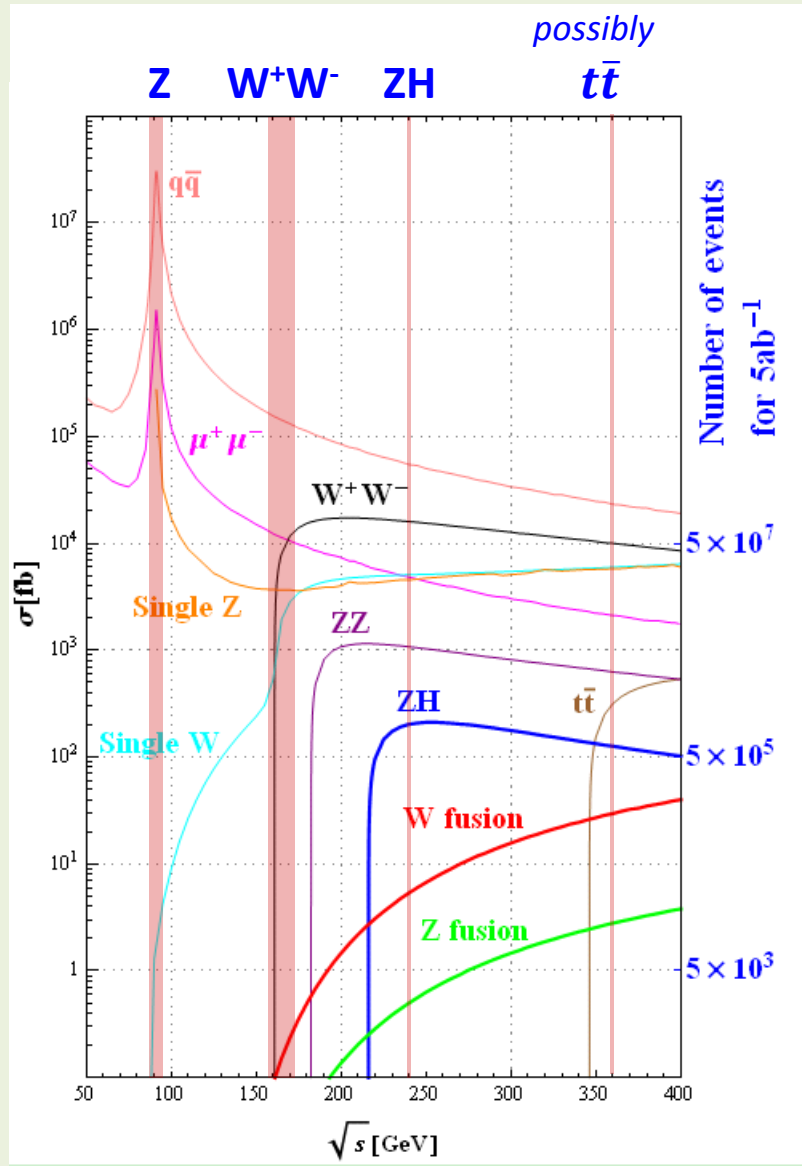
Detector
Experiments operation

International Cooperation

Further strengthen international cooperation in the field of Physics, detector and collider design

Sign formal agreements, establish at least two international experiment collaborations, finalize details of international contributions in accelerator

CEPC Operation Plan



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
	$\int L dt$ [ab^{-1} , 2 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
	$\int L dt$ [ab^{-1} , 2 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

CEPC accelerator TDR (Xiv:2312.14363)

While aiming to meet the needs of the whole energy range, emphasize more on the Higgs operation mode.

ILD meeting before 3rd ECFA

ILD models for a circular collider

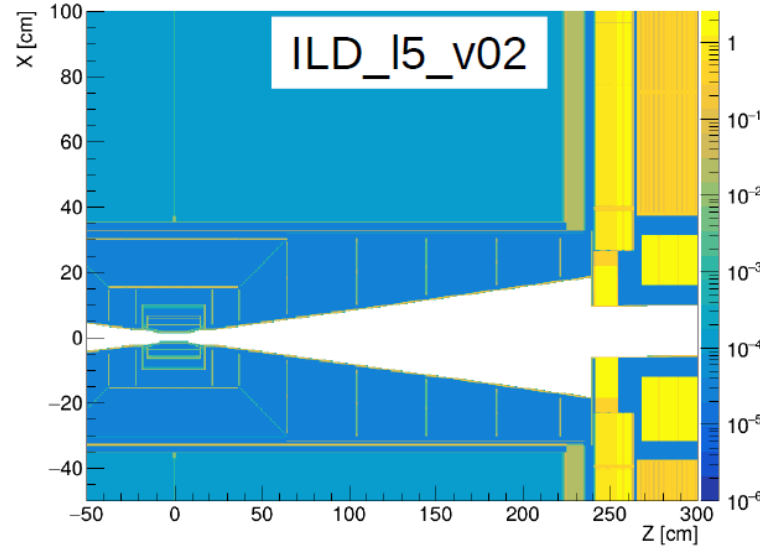


<https://agenda.linearcollider.org/event/10442/contributions/55467/attachments/39965/63230/models.pdf>



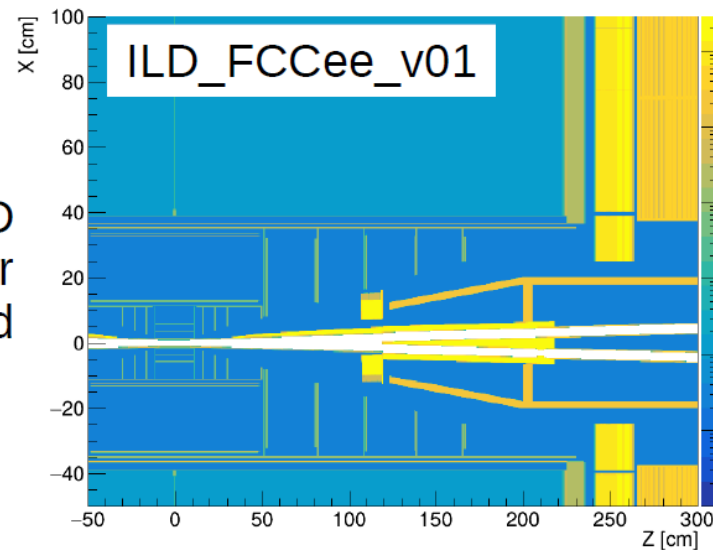
Daniel Jeans, KEK @ ILD meeting, October 2024

ILD meeting before 3rd ECFA

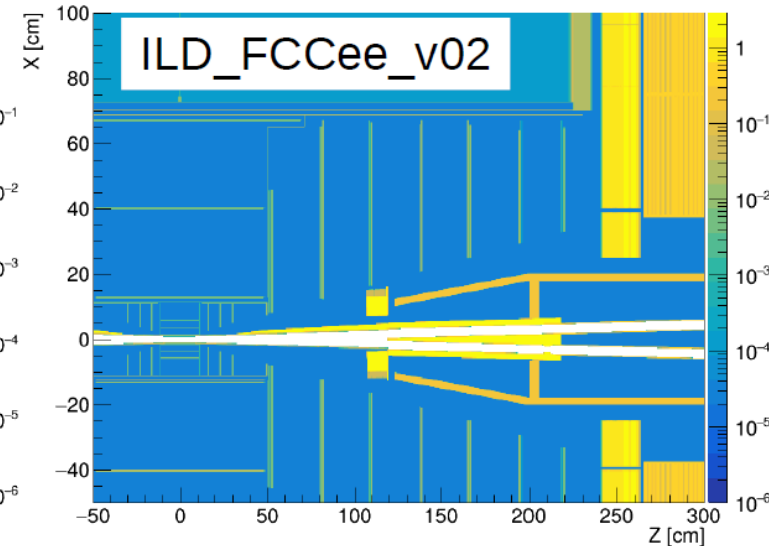


TPC (almost) unchanged

TPC inner radius increases ~40 cm

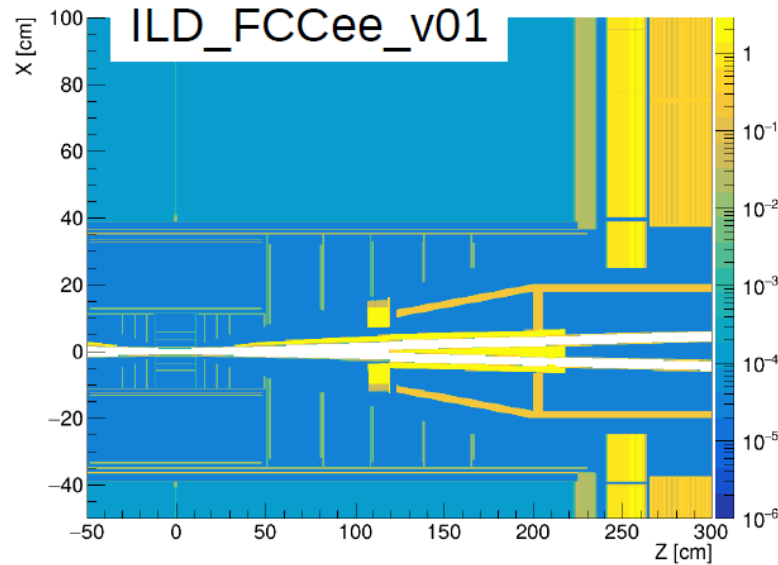


CLD inner tracker squeezed

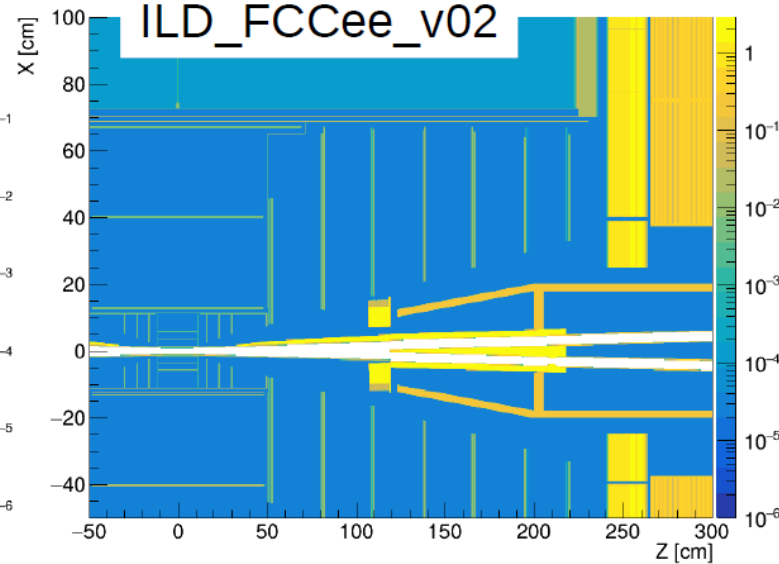


CLD inner tracker unchanged

ILD meeting before 3rd ECFA



better TPC coverage
→ better dEdx



better forward tracking (?)

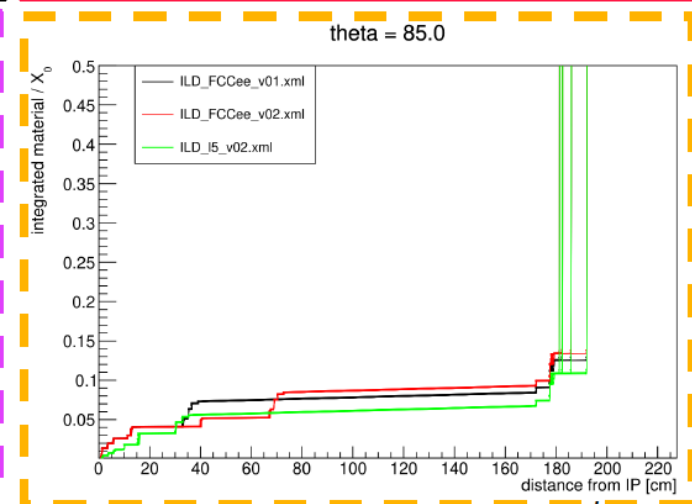
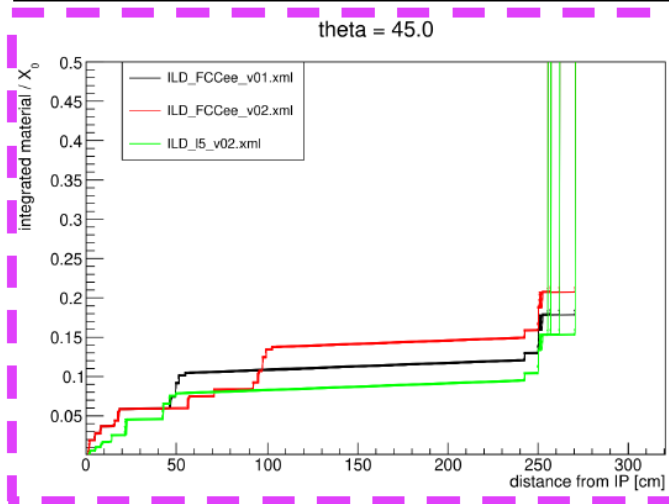
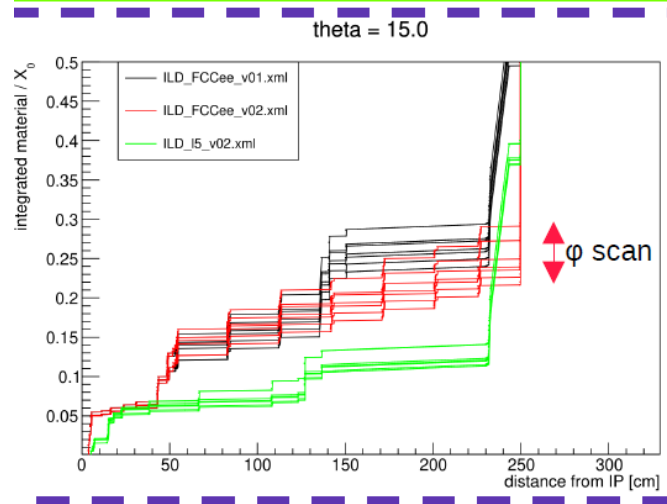
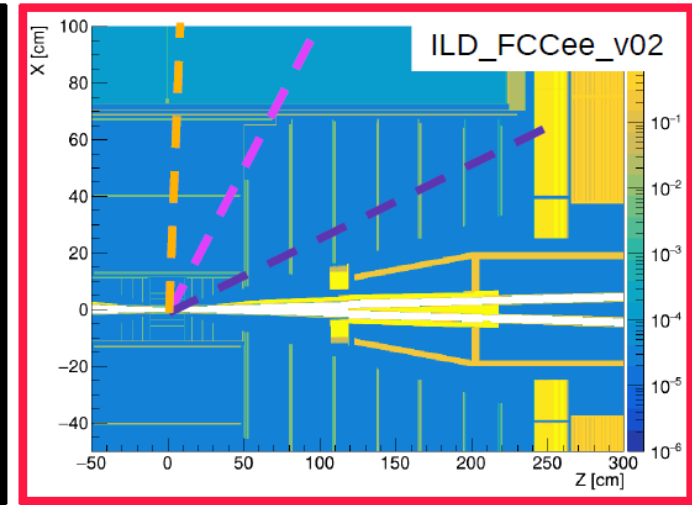
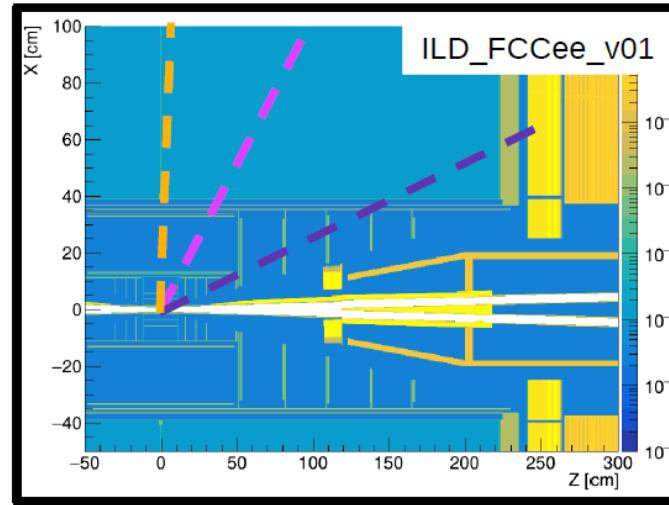
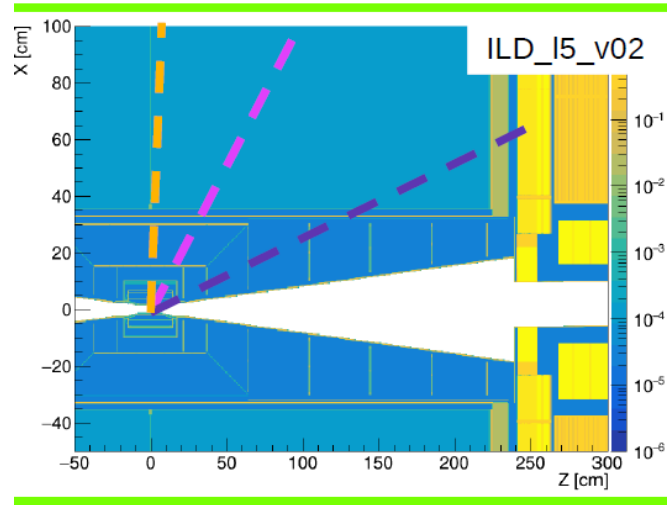
TPC avoids more severe
beamsstrahlung bg.
@ smaller radius

momentum resolution ?

tracking efficiency ? at low pT, with backgrounds ?

ILD meeting before 3rd ECFA

material budget



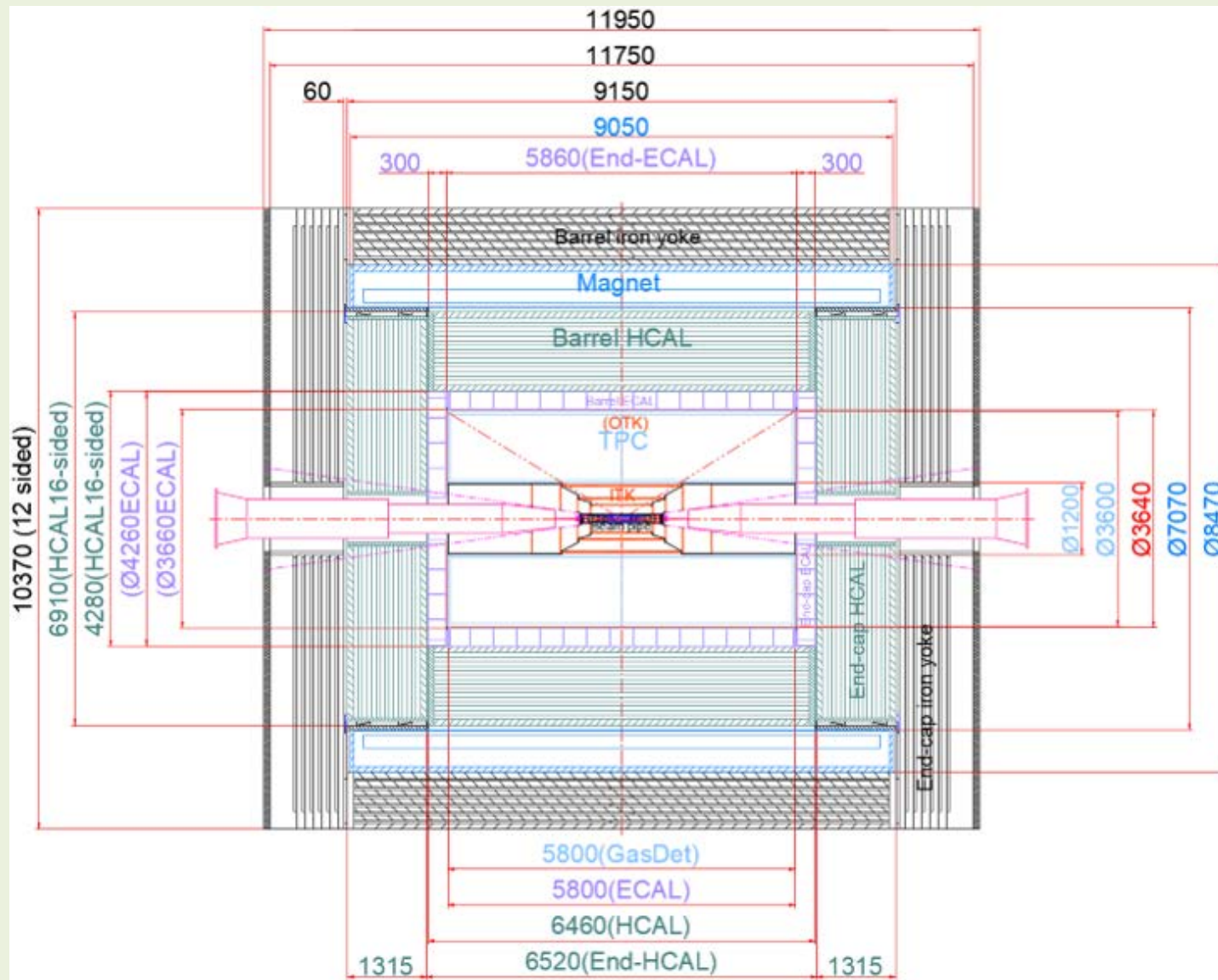
more material in CLD-tracker: effect on momentum resolution, b/c-tagging ?

ILD meeting before 3rd ECFA

future improvements for “circular” models

- WIP: get track reconstruction working
now we get separate tracks from the
inner silicon (“Conformal Tracking”) and TPC (“Clupatra”)
need to be combined, + SET, ...
- review of tracker material budget ?
- implement other hardware changes (eg cooling infrastructure)
needed to maintain ILD’s degree of “realism”
- pixel TPC

Geometry and Mechanical Support



Subsystem	Supported By
Barrel Yoke	Base
Magnet	Barrel Yoke
Barrel HCAL	Barrel Yoke
Barrel ECAL	Barrel HCAL
TPC+ Barrel OTK	Barrel ECAL
ITK	TPC
Beampipe+VTX+LumiCal	ITK
Endcap Yoke	Base
Endcap HCAL	Barrel HCAL
Endcap ECAL+OTK	Barrel HCAL

Document Preparation of Ref-TDR

- ❑ The ref-TDR has 16 chapters, which may be re-structured later.
- ❑ Each chapter has a responsible team, including members from domestic and international institutes.

Reports will
be reviewed
on 21,Oct.

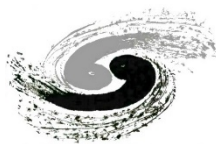
- 1) Physics Goal and Requirements
- 2) Concept Introduction
- 3) MDI and Luminosity Detectors
- 4) Vertex Detector
- 5) Silicon Trackers
- 6) Gaseous Trackers
- 7) Electromagnetic Calorimeter
- 8) Hadron Calorimeter
- 9) Muon Detector
- 10) Superconducting Solenoid Magnet
- 11) General Electronics
- 12) Trigger and Data Acquisition
- 13) Software and Computing
- 14) Mechanics and Integration
- 15) Physics Performance
- 16) Overall Cost and Project Timeline

Ref-TDR Timeline

Date	Actions and/or Expectations
Jan 1, 2024	Start the ref-TDR process by comparing different technologies
Jul 1, 2024	Baseline technologies are chosen; start to write TDR and address key issues
Aug 7, 2024	Report to the IDRC chair Prof Daniela Bortoletto
Oct 21-23, 2024	Review of ref-TDR progress by the IDRC
Oct 23-30, 2024	Discuss the ref-TDR at the CEPC workshop, report progresses to the CEPC IAC
~ January 2025	The first draft of the ref-TDR is ready for internal reviews
~ April 2025	Finish international reviews
Jun 30, 2025	The ref-TDR is ready



**Thank you for
your support to CEPC!**



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