

Minutes: CEPC Reference Detector TDR Meeting in Nov 26, 2024

Participants Present in the meeting room (M.B. 122): Yifang Wang, Xinchou Lou, Jianchun Wang, Tianchi Zhao, Huaqiao Zhang, Mingyi Dong, Huirong Qi, Qi Yan, Boping Chen, Xiaolu Ji, Yunyun Fan, Hengne Li, Guang Zhao, Zheng Wang, Fei Li, Wei Wei, Jingfei Wu, Sen Qian, Shengsen Sun, Linghui Wu, Quan Ji, Haoyu Shi, Mingshui Chen, Jingbo Ye, Fangyi Guo, Zhijun Liang, Feipeng Ning, Yong Liu, Weidong Li, Zhaoru Zhang

Remote: Gang Li, Haijun Yang, Jingzhou Zhao, Jinyu Fu, Kaili Zhang, Lei Zhang (NJU), Mei Zhao (IHEP), Miao He, Suen.Hou, Wei Wei, Xin Shi, Xiongbo Yan, Zhang Ying, Xiaolu Ji

MDI - Haoyu:

- Yifang: Background estimation is the key issue, any updates?
 - Haoyu: All the backgrounds for Higgs will be ready in next week; Low lumi Z needs double check with accelerator; High lumi Z has results for 2T
 - Yifang: simply scale from high lumi to low lumi, no need to re-generate all the samples
- Provide all the results to detectors asap, and can be updated later if needed

Vertex - Zhijun:

- Progress in international cooperation
- Detector design
 - - Physics Layout(50%)
 - - Stitching design (1stdraft ready)
 - - Mechanics(in progress, ~ 1 week)

Tracker - Qi:

- Yifang: Need to double check whether further optimization is needed for PID performance. The impact of the number of layers and layer position in endcap region.
- Tianchi:
 - suggest to add one more layer for endcap region;
 - Qi: multi-scattering will be dominant which may degree resolution
 - need to further check the plot of OTK separation power
 - Yifang: suggest to check by scaling BES results
 - Jianchun/Qi: offline discussion is needed
- Qi: the simulation of CO₂ cooling is still in process
- Qi: thickness of OTK ~1.4cm, <2cm, efficiency>99%
 - Yifang: make sure 2cm gap between TPC and OTK cannot be overused.

- Yifang: when will you finish the TDR editing?
 - Qi: within 2 weeks

TPC - Huirong:

- Yifang: Make sure OTK is bonded on TPC and the space between TPC and OTK is fully used
 - Huirong: 3.6m is maxim of diameter, which included French area.
- Yifang: whether the temperature of all the detector can be compromised to a unified value? Temperature control for OTK may cause more material budget and space.
 - Yifang: all the detectors need careful validation of working temperature, and performance comparison of w/o temperature control. It needs to be clearly explained in TDR
- Jianchun: need simulation study of optimization of pixel size of pixelated readout, and feasibility of using TPC as a part of endcap detector
 - Huirong: will study it. 500 micron will be baseline design in TDR, but will also mention the study of 350 or 300 micron.
- Yifang: For low lumi Z, the TPC resolution distortion is significant. need to consider whether need to change inner radius of TPC from 600mm to 800mm
- Yifang: we need to do calibration at Z run, same operation condition with Higgs is needed (3T)
 - Jianchun/ Haoyu: will double check with accelerator people

ECAL - Yong:

- Yifang: any updates for SiPM readout? since ECAL, HCAL and Muon will use same SiPM.
 - Yifang: front-end electronics needs to be described in detail in sub-detector chapter, and referring more information to electronics chapter
 - Wei: SiPM MPW will started in Apr 2025, high priority

HCAL - Sen:

- Yifang: 45 pages is not enough. Module design has many innovations, which need to describe the design in details and validate why it's the best design.
- Yifang: need to study the reliability of 4 to 1 readout design, balance the performance and cost..

Muon - Hengne:

Yifang/Jianchun: more care about engineering, detector full design, electronics and

mechanics design, performance estimation... Report the progress in next week.

Magnet - Feipeng:

Yifang: need further optimization of thickness ~ 700mm

Electronics - Wei:

Wei: will finish first version of TDR by end of the month

Tainchi: Need further optimization of OTK total power, current number is too large

TDAQ - Fei:

- Fei: missing detector requirement, shared table in overleaf, to be filled by sub-detectors
- Yifang:
 - All the design in TDR need to meet to the requirement of operation for the first 10 years, including low lumi Z.
 - The front-end electronics of calorimeter need meet to the requirement of high lumi Z, only need to upgrade back-end electronics
 - All the sub-detectors need to clarify it in TDR
 - Jianchun: prepare a table to summarize which sub-detectors can meet only for Higgs + low lumi Z, and which can also meet for high lumi Z

Software - Weidong:

- Yifang: computing requirement
 - Weidong: still calculating the number of events, duration for getting one events, size of events, then will show distribution of number of server vs years
- Xinchou: mention the prospective and feasibility study for AI machine learning in TDR

Mechanics - Quan:

Yifang: TDR editing: get first version before Dec 10

Jianchun: firstly writing structure and texts, data and plots can be updated later

Performance - Mingshui:

AOB - Jianchun:

- Chapter 1: Gang helps Joao
- Chapter 2: Mingyi helps Haijun
 - Haijun: need the plot of full detector geometry, a table of key parameters of sub-detectors