

Minutes: CEPC Reference Detector TDR Meeting in Dec 10, 2024

Participants Present in the meeting room (M.B. 122): Jianchun Wang, Xinchou Lou, Boping Chen, Joao Guimaraes da Costa, Gang Li, Haoyu Shi, Qi Yan, Wei Wei, Huirong Qi, Quan Ji, Zheng Wang, Yiming Li, Sen Qian, Zhijun Liang, Feipeng Ning, Yong Liu, Miao He, Weidong Li

Online at ZOOM: XiaoLong Wang, Jinfan Chang, Fangyi Guo, Haijun Yang, Hengne Li, Jingbo Ye, Jingzhou ZHAO, Jinyu Fu, Jinfei Wu, Kaili Zhang, Lei Zhang, Mangi Ruan, Mei Zhao, Mingshui Chen, Suen Hou, Shengsen Sun, Tao Lin, Tianchi Zhao, Wei Wei, Weidong Li, Xiaolu Ji, Xiaoting Li, Xiongbo Yan, Yunyun Fan, Zhang Ying, Zhao Ling, Zijun Xu

General:

Team: Overleaf compilation speed is slow, please try to eliminate errors as much as possible.

Jianchun: put completed percentage at title of every chapters

MDI - Haoyu:

Yifang: try to have international collaborators join in and better perform them editing.

Silicon – Qi Yan:

- Silicon Tracker Power Cabling Scheme
 - Jingbo: What is the transmission of power delivery efficiency? The current 9A~48V is too high.
 - Jianchun: I'm a little concerned for all the DC converter at the front end, need simulation for that.
 - Weiwei: should consider the global reliability for what is the scheme.
- TDR writing ~ 60 pages

Vertex - Zhijun:

- submitted proposal to DRD3 for vertex chip
- TDR ~ 30 pages
- Jianchun: invite international collaborator to edit/review TDR

TPC - Huirong:

- TDR ~ 43 pages
- update of international cooperation editing group
- cost section: only show simplified version
- total power consumption: 8 kW

ECAL - Yong:

- Higgs mode (346 ns/BX): Max. crystal hit rates (due to BIB): ~50 kHz (barrel) and ~400 kHz (endcap)
- Low-Lumi Z (69 ns/BX: Max. crystal hit rates (due to BIB): ~800 kHz (barrel) and ~1.4 MHz (endcap)
- The first layer in endcap: BIB leads to a high hit rate

- Crystals near beam pipe with the hit rate of $\sim 1\text{MHz}$ for all layers
- Backend of endcap discs: the beam loss background will only affect the crystals near the beam pipe
- Jianchun: For IDEA crystal solution, do you have more information on that?
 - Yong: the design basically is a very different from what we have, they stressed a lot on the deal readout capability.

HCAL - Sen:

- TDR ~ 60 pages
- 2 talks in CEPC days

Muon - Xiaolong:

Report about the design of Muon detector

- Jianchun: suggest to firstly talk about global picture of requirement and design
- Joao: why need 6 layers? It's asked in IDRC report.
- Jianchun: what's the efficiency of
- Zheng: the amount of micro-coaxial cable?
 - Xiaolong: only 200 channels in one module.

Magnet - Feipeng:

- Draft_0 about 47 pages is finished

Electronics – Wei Wei:

- Discussion on possible solution for High-Z ECAL FEE: short length waveform sampling + SARADC + digital processing, need to calculate power and data rate
- Discussion on HCAL&ECAL power dissipation on cable
- Discussion on electronics sockets
- Summary table for electronics room @Higgs
- Summary table for data
- TDR $\sim 90\%$ @71 pages
- Jianchun: description of SiPM basic principle will be included in ECAL, and other parts are slightly different.
- Xiaolong: Signal cables, coaxial cables are too expensive, is there any alternative?
 - Wei: Twisted pair cables (for digital signals).

TDAQ - Jingzhou:

- TDR $\sim 60\%$
- Trigger strategy on High Lumi-Z

Software - Weidong:

- Performance studies with software release tdr24.12.0
 - All identified tracking issues have been fixed
 - A BMR of approximately 3.8% in the ECAL barrel has been achieved

- Calorimeter: the reconstruction algorithm for end-cap (on-going)
- OTK: detector simulation with updated geometry (on-going)
- Simulation of silicon detectors: simplified passive material (on-going)
- Implementation of background piling-up (on-going)
- Event display with Phoenix
 - The event data in the EDM4hep format can be read and displayed by the tool and the first version will be released soon
- The writing of Chapter 13 is ongoing: JINR has agreed to join us and contribute to the computing sections

Mechanics:

- Pipeline path design: need more discussion
- axial dimension adjustment may need
- Quan: Propose having a CEPC day or workshop with a specific session for mechanics. Suggest that mechanical engineers strengthen their English skills for academic communication (with funding support).
 - Jianchun/Xinchou: Support the idea, and suggest Quan continue to promote it. Recommend entering the DRD to discuss our matters.

Performance - Mingshui:

- Vertex Performance: Package for vertex fit migrated, good performance seen in preliminary studies
- Jet Performance: Significantly improved w.r.t. previous version, BMR now reaches $\sim 3.8\%$, though Barrel only
- PID Performance: first look at PID @ $Z \rightarrow q\bar{q}$

AOB:

- Gang will help Joao for chapter 1
- Chapter 2: global picture from Quan is needed
- Xinchou: write section in TDR to introduce your team, for review committee, 发改委, funding agency, including previous work, R&D, publication and conference talks.
- Jianchun: continue developing international cooperators