

CEPC Reference Detector TDR Meeting (June 4, 2024)

09:00 - 11:00 (Beijing Time)

Meeting agenda and minutes

- indico page: <https://indico.ihep.ac.cn/event/22493/>
- Participants
 - Present in the meeting room (M.B. 112)
 - Jingbo Ye, Qi Yan, Wei Wei, Xinchou Lou, Zhaoru Zhang, Yong Liu, Miao He, Feipeng Ning, Zhijun Liang, Haoyu Shi, Quan Ji, Mingyi Dong, Zheng Wang, Gang Li, Huaqiao Zhang, Jinyu Fu
 - Online at ZOOM
 - Jianchun Wang (chair), Weidong Li, Meng Wang, Chengdong Fu, Manqi Ruan, Tao Lin, Shanzhen Chen, Yang Zhang, Ling Zhao, Zhan Li, Jinfan Chang, Fangyi Guo, Shang Xia, Jingzhou Zhao, Mei Zhao, Haijun Yang, Xin Shi, Boping Chen, Shaojing Hou, Baohua Qi, Fei Li, Suen Hou, Jinfei Wu, Lei Zhang, Mengzhao Li, Yatian Pei, Weiguo Lu, Weizheng Song, Xiaoting Li, Xiongbo Yan, Ye Chen, Boxiang Yu, Yubin Zhao, Yuekun Heng, Ying Zhang, Junsong Zhang

Software: Weidong Li

- Oral status report
 - Muon: finished implementation in CEPCSW, needs further validation
 - The Phoenix server was deployed for detector visualization. Now the cepec RefTDR detector can be displayed after converting cepec detector geometry to the format supported by Phoenix.
 - The tracking algorithm based on ACTS is being studied. The new progress is to generate a material map which can be used by track finding and track fitting. It has been planned to implement CEPC SIT geometry in ACTS and validate the ACTS tracking performance with VXD and SIT.

Mechanics: Quan Ji

- Status report: [slides](#)
- - Mechanics designs for magnet
 - "工作联系单": vertex detector
- Discussions
 - Jianchun: 20mm thickness for outer tracker get confirmed from tracker group?
 - Quan: changes can be applied accordingly afterwards
 - Jianchun: OTK gives a more confident design to mechanics asap; 20mm thickness not feasible

Electronics: Wei Wei

- Status report: [slides](#)

- MDI
 - Pair production estimate needs to be refined
 - Beam loss background seems too high
 - Requires to update to the TDRrd geometry for estimates of endcap backgrounds
- TOF
 - 100kHz/cm² in endcap -> challenging for electronics
- Discussions
 - Jianchun: Z resolution from primary vertex reconstruction?
 - Manqi: 10um along Z in CDR
 - Haijun: overlap of pair-production backgrounds in the long-bar crystal calorimeter, leading to degraded PFA performance?
 - Manqi: still concern about this, needs quantitative studies for better understanding

MDI: Haoyu Shi

- Status report
 - Back-induced backgrounds: optimal thresholds to speed up simulation, but still at the level of a few minutes per particle for beam-loss
 - Accelerator lattice needs to be adapted to CEPCSW for SR
 - LumiCal: implementation of LumiCal geometry
 - Interaction region design: cryo-modules
- Discussions
 - Manqi: di-photon backgrounds, quantitative comparisons with previous ILC results

Magnet: Feipeng Ning

- Status report: [slides](#)
 - Magnet support structure for ~260t weight of magnet
 - Cryogenic system of magnet: 2 weeks working time for 3 designs (+cost estimates) -> will formulate a review report
 - Ongoing work: LTS/HTS cables, ...

Vertex: Zhijun Liang

- Status report: [slides](#)
 - Beryllium beam pipe: length reduction from 29cm to 22.9cm -> further discussions with Quan Ji
 - Vertex cooling design update: to use thermal conductive glue for beam pipe
 - Vertex power dissipation distribution
 - Single-point resolution 5um (baseline) -> 3um
 - Vertex detector background data rate
- Discussions
 - Jianchun: radiation hardness tests of glue at CSNS
 - Wei: concerns about the beam pipe for Z-pole upgrade after 10 years Higgs, how to remove the thermal conductive glue from beam pipe

Tracker: Meng Wang

- Status report

- TDR tracker part: table of contents
- Endcap design optimisations with fixed barrel part
- Discussions
 - Jianchun: concerns for the inclined endcap disks, not suggest continue unless having a clearly validated solution
 - Haijun: extend the barrel layer at R=500mm?
 - Meng: the performance is not as good as endcap disks, as more material budget in barrel would impact the spatial resolution
- Status report of OTK based on AC-LGAD by Yunyun Fan: [slides](#)
 - Re-estimate of thickness: data concentration board
 - Optimisation of the barrel design: radius difference (ΔR) in the range of 58mm - 68 mm
 - 3D module of barrel OTK
 - Endcap designs (with double layers)
 - Constraints from TPC outer dimensions of mechanics
 - Quan: inter-connection between TPC and ECAL
- Discussion
 - Wei: concerns about the power consumption
 - Yunyun: with CO2 cooling
 - Wei: Electronics should be included in design discussion
 - Jingbo/Jianchun: mechanics design of OTK
 - Carbon-fiber cylinder with tiles of sensor+ASIC modules

Calorimeters: Yong Liu

- Status report: [slides](#)
 - CEPC calo R&D activities: well represented in CALOR2024 and Pisa Meeting 2024
 - Crucial and urgent task: estimates of beam backgrounds for the crystal calorimeter
 - Calo hardware taskforce will strengthen efforts of implementation calorimeters geometry in CEPCSW
 - Electronics designs for calorimeter options
 - Calorimeter TDR meeting plans to be shifted to 2:00 PM on Friday
 - To organise a mini-workshop and review of calorimeter options
- Discussions
 - Manqi and Jianchun: when will this mini-workshop and review happen? Yong: within June
 - Jianchun and Manqi suggested clarify the standards or criteria on the calorimeter option select for the reference detector and make all related colleagues and the review committee well know about the criteria