

# Minutes: CEPC Reference Detector TDR Meeting in Sep 24, 2024

## Meeting agenda and minutes

- indico page: <https://indico.ihep.ac.cn/event/23680/>
- Participants Present in the meeting room (M.B. 122): Yifang Wang, Jianchun Wang, Mingshui Chen, Manqi Ruan, Zhaoru Zhang, Weidong Li, Miao He, Yong Liu, Feipeng Ning, Jingbo Ye, Sen Qian, Yunyun Fan, Yiming Li, Fei Li, Huirong Qi, Gang Li, Shaojing Hou, Xiaolu Ji, Shengsen Sun, Jinfan Chang, Xiongbo Yan, Linghui Wu, Haoyu Shi
- Online at ZOOM: Hou Suen, Haijun Yang, Hengne Li, Huaqiao Zhang, Jingzhou ZHAO, Kaili Zhang, Mingyi Dong, Shanzhen Chen, Sun Shengsen, Tao Lin, Wu Linghui, XiaoLong Wang, Xinchou Lou, Zhang Ying, Zhao Ling, Zheng Wang, Zhijun Liang, Jun Hu, Xiaolu Ji

## General: Jianchun

- Jianchun: Mingshui replace Manqi for performance group
- Yifang: well prepare the budget table and proposal for Henan funding, making sure the spends are within budget
- Yifang: prepare talks for IDRC review, and have rehearsal after National Day holiday, making sure speakers available to attend IDRC review in person
- Yifang: The talks should include TDR outline, or drafts

## Electronics – clock issue: Wei Wei/Jingbo Ye

- Jianchun: bunch spacing for 4 operation modes need to be synchronized, otherwise electronics cannot work for 4 modes
- Yifang: Have a talk on CEPC day, discussing with accelerator people, and finalizing clock issue

## Vertex: Zhijun Liang

- stitching+ladder layout is in software, ready for performance study and layout
  - Yifang: study of dead zone should be presented
  - Jianchun: Yifang's comment should be implemented immediately
- cable space
- stitching: ~ 11mm radius
- Quotation for engineering run
  - Yifang: need to directly talk to TowerJazz, Shanghai Xinwei
  - Xinchou: what's the size of engineering run?
    - ◆ Yifang: suggest to firstly produce middle layer, to prove stitching feasibility, then further optimize radius

## Tracker: Qi Yan

### Status report:

- OTK barrel new design: two options
- OTK endcap with trapezoid sensor

- OTK power and readout design soon
- comparison for strips and pixel

Discussion:

- Yifang: Provide dead zone analysis both for barrel and endcap
- Yifang: Reliability in optical converters in the central parts of barrel modules: what to do with damages -> Jingbo: quite reliable for optical modules used in LHC
- Yunyun/Jingbo: Design of electronics needs further optimization, space of DCDC in current design is not sufficient
- Yifang: latest design has much difference with the version shown to Daniela, making sure well explained in review talk, making sure parameters values are all correct
- Jianchun: ITK needs comparison of strip and pixel
  - Yifang: get combined PID performance comparison for strip and pixel before IDRC review
  - Yifang: tracker group should compare two **integrated** designs for strip and pixel, instead of comparing piece by piece.

#### **TPC: Huirong Qi**

- Updated gaseous detector part in TDR
- Preparation for Beam test

#### **ECAL: Yong Liu**

Status:

- ECAL electronics
  - Finished a first estimate of the number of cables (power, optical fibres)
  - Will be released as soon as the internal review is completed (in electronics group)
- ECAL mechanics
  - Dedicated meeting on carbon fiber structures; updated design on barrel modules
- Beam-induced backgrounds
  - 50MW Higgs (355ns): mean and max. hit rates of barrel modules
- Software
  - Endcap module geometry (ongoing); brief summary on energy digitiser in simulation
  - Crystal calorimeter prototype: performance studies with beamtest data
- Updates on digitisation, data analysis; meeting with CERN beamline physicists

Discussion:

- Yifang: emphasis in review talk that even though the measured resolution is 3%, by removing beam test impact, the intrinsic resolution can reach 1.5%

#### **ECAL mechanics: Shaojing Hou**

Status:

- Optimized Design of ECAL Barrel Module
- Manufacturer Survey - Verification of Structural Process Feasibility

Discussion:

- Yifang:

- for module assembly, instead of 32 parts installed separately, consider 2 barrel modules (up/downwards trapezoid) for one-go assembly
- support structure is needed between crystals
- optimize the connection of SiPM and crystal, Air coupling has instability
- ECAL mechanics study should speed up, need to report every week

#### **HCAL: Sen Qian**

- Yifang: use 5p.e. as threshold to test glass performance
- Yifang: report HCAL mechanics progress at CEPC day

#### **Muon: Xiaolong Wang**

- Yifang:
  - we care more about system level design and reliability, including module design, structure design, and electronics design. Finish the design asap.
  - Only mention baseline readout design in TDR
  - HNHEP funding is only used for TDR related study

#### **Magnet: Feipeng Ning**

- Physical design of the magnet
- Superconducting cable LTS and HTS, summary of the latest work and the next work arrangement

#### **Electronics: Wei Wei**

- Electronics space requirement: similar scale with CMS, about 320 crates

#### **TDAQ: Fei Li**

- Event rate: Higgs 240GeV(30MW/50MW)~ 5Hz/8Hz; Z pole 91GeV(30MW/50MW)~ 50kHz/82kHz
- trigger structure - 3 levels

#### **Software: Weidong Li**

- Updated detector geometry in latest software release.
- Modified package names to adhere to new convention.
- Identified issues: event reconstruction in ECAL takes 120 seconds per event, memory leakage.
- Simulation jobs exceed memory limit at 4.5GB each, requiring multi-threaded simulation.
- Discussed China-JINR workshop on software and computing for future HEP experiments at Baikal.
- JINR to contribute to CEPC in physics, calorimeter detector, software, and computing.

#### **Mechanics: Quan Ji**

- Pre-installation point scheme and underground experimental room
- work contact form
- Interface of the Beampipe and Vertex
  - Yifang: no need to use beryllium for the part without particle going through

- Yifang: The mechanical engineer works with the detector and the design proposed by the mechanical engineer and the sub-detector must be approved by the chief engineer.

**Performance: Mingshui**

- Mingshui: Suggest to firstly generate small scale samples (500-1000 events) to test codes and get results
- Yifang: well prepare what results can be included in review talk