

CEPC Detector TDR Meeting (Feb. 20, 2024)

09:00 - 11:50 (Beijing Time)

Meeting agenda and minutes

- indico page: <https://indico.ihep.ac.cn/event/21588/>
- Participants
 - Present in the meeting room:
 - Xin Shi, Mingshui Chen, Jingbo Ye, Huaqiao Zhang, Manqi Ruan, Zhijun Liang, Zhaoru Zhang, Miao He, Yong Liu, Feipeng, Ning, Haoyu Shi, Yiming Li, Mingyi Dong, Gang Li, Huirong Qi, Quan Ji, Shengsen Sun, Jinyu Fu, Joao Guimaraes da Costa, Shaojing Hou, Wei Wei, Yuexin Wang, Weidong Li, Shanzhen Chen, Yaquan Fang, Chengdong Fu
 - Online
 - Jianchun Wang, Meng Wang, Fangyi Guo, Guang Zhao, Fei Li, Haijun Yang, Hongyu Zhang, Suen Hou, Jing D, Jingzhou Zhao, Kun Liu, Chunxiu Liu, Tao Lin, Xiaolong Wang, Xiaomei Zhang, Xinchou Lou, Yang Zhang, Yao Zhang, Junsong Zhang, Yunyun Fan, Ling Zhao, Zhen-an Liu, Zheng Wang, Jinfei Wu
- Minutes: Yong Liu, Zhaoru Zhang

News: Jianchun Wang

- Future conferences related to the CEPC
 - A list (Excel table) of conferences uploaded
 - **Open call for ALL to update this table: with latest information/plan on abstracts that have and will be submitted**

Software: Weidong Li

- Summary of the software meeting in Feb. 19
 - Target for releasing the first version of CEPCSW in June 2024
 - Tasks for the software contact person in each sub-detector group: to collect requirements and realize related software
- Discussions
 - Manqi: propose to arrange an L2 or L3 manager for reconstruction
 - Weidong: prefer **flat management** structure

Electronics: Wei Wei

- One-page talk for progress summary by Wei
 - Silicon strip: a mature option as a baseline option
 - Magnet/mechanics
 - Magnet leakage requirements: to be determined
 - Major impacts to DC-DC converters in power modules

- TPC vs. DC
 - Cost estimates for comparison
 - To be discussed in the TDAQ Weekly Meeting within this week
- Discussions
 - Jianchun: an action item on cost estimates for comparing pixel and strip options (Xin, Yiming)
 - Jingbo: test feasibility of choosing power source from industry
 - Jianchun: considering Jingbo's suggestion, to use 80 MeV proton beam from CSNS (Dongguan) for flux study

Mechanics: Quan Ji

- A brief summary of the meeting in Feb. 19
 - Kick-off discussions with all mechanics engineers of sub-detectors
 - Topics: task sharing, mechanics framework, timeline
- Discussions
 - Jianchun: R/Z ratio -> all sub-detectors need to converge soon to a first value
 - Mechanic people should attend sub-detector meetings for better and in-depth understanding
 - Suen: suggest to add *MDI cryostat* into the detector mechanics design
 - Yiming: gas-based tracker (TPC/DC) **inner radius fixed to 0.6m** according to the decision in the Feb. 6 TDR meeting
 - Jingbo: boundary (and gaps needed) first defined by each sub-detector -> collect information and send to Quan Ji for discussions
 - Sub-detector cabling and services (power, cooling) should stay within the boundary
 - Requirement of interface region between sub-detector should collected to Mechanic
 - Software to simulate performance and physics impacts
 - Weidong: **suggest versioning control for global and sub-detector mechanics designs**

Physics: Manqi Ruan

- Brief status summary by Manqi
 - Performance requirements for sub-detectors: well defined
 - BMR, jet origin ID
 - Requirements specific to each sub-detector
 - Benchmarks: to demonstrate the physics reach
 - Add B-physics after discussions with Liantao Wang
 - Extra info
 - Arbor already implemented in CEPCSW, can run but needs further debugging
 - Document on physics/detector performance requirements
- Discussions on the document on equirements
 - Meng: performance group should bring up requirements
 - Jianchun: consider which benchmarks could reflect sub-detector performance, not only use benchmarks for global study
 - Weidong: naming of performance parameters should be consistent with other experiments

- Manqi: to circulate this document for further feedback/discussions

MDI: Haoyu Shi

- Update of background estimates
 - A first version comes out (without any safety factor): can be used by the vertex detector (the first vertex layer at R=12mm; beam pipe R=10mm)
 - Critical issue: estimate of synchrotron radiation
- Discussions
 - Suen: **experiences of LEP/LEP-II -> could be used for scaling for comparisons**
 - Suen: **consider background impacts for forward region electronics (TPC and ECAL)**
 - Jianchun: **sub-detectors provide detailed list of requirements to Haoyu for MC sample production**, e.g. the position information with highest hit density
 - Jianchun: Ask Haoyu to simulate hit rate, neutron flux (1 MeV neutron equivalent), TID, high energy hadron flux with the threshold of 20 MeV

Magnet: Feipeng Ning

- Brief status summary
 - Feasibility studies (ongoing) on mechanics and cryostat for the thin magnet (150mm thick) option
 - Results expected to come out in March, also with risk estimates

Vertex: Zhijun Liang

- Baseline decided: CMOS option
- Brief summary on vertex mechanics
 - cos(theta) coverage
 - Endcap interference with beam pipe support tube
 - Plan: final background input from MDI (Feb.); electronics and geometry (Mar.)
- Discussions
 - Joao: **angle coverage should be at the level of the detector now being developed now**
 - Jingbo: **to check and think about the state-of-art design**
 - Suen: coverage should be at ~100 mrad

Tracker: Meng Wang

- Brief summary of discussions
 - Results from Gang, electronics costs, option selection (TPC/DC)
- Discussions
 - Jianchun: **selection of strip or pixel options has the most impact on cost estimate, while the major issue for TPC is whether it can run at Z-pole**
 - Jianchun: **get asap the results for Z-direction resolution with 2.5cm long strips (single-layer) without stereo**. Check whether this design can meet physics requirements. It is critical for cost estimate and consideration of double-layer design option

Calorimetry

- Yong reported the status for Jianbei: a brief summary of offline discussions in Feb. 19

- Calo-option selection discussions before/in Feb. 23
- To arrange weekly calorimetry meetings for TDR
 - Ongoing coordination, including all related persons on calorimetry, electronics, software and mechanics

Muon: Xiaolong Wang

- A talk on the (plastic) scintillator-SiPM option: Xiaolong
 - Cost estimates: total 9M CNY (experiences from Belle2 KLM)
 - First simulation established for barrel and endcap (long scintillator strips)
 - 5 layers, 26k channels; $\sim 356\text{-m}^3$ yoke iron, 2.8 kton
- A talk on the RPC option: Jun Guo
 - Estimate based on ATLAS RPC (Bakelite)
 - Rough estimate of the total RPC area for CEPC
- Discussions
 - Weidong: ATLAS aims for high-momentum measurements -> designs/considerations still apply for CEPC?
 - Haijun/Jianchun: When comparing cost and performance of different options, one of these factors should be selected as a constant, while the other is compared, which ensures results that are convincing.
 - Wei: will come up with a template of conventions and formulae of cost estimates for electronics and TDAQ (in Feb. 22)