CEPC Reference Detector TDR Meeting (May. 7, 2024)

09:00 - 11:50 (Beijing Time)

Meeting agenda and minutes

- indico page: https://indico.ihep.ac.cn/event/22433/
- Participants
  - Present in the meeting room (M.B. 112)
    - Zhaoru Zhang, Jianchun Wang, Mingshui Chen, Wei Wei, Mingyi Dong, Qi Yan, Haoyu Shi, Huirong Qi, Huaqiao Zhang, Yunyun Fan, Xinchou Lou, Yong Liu, Miao He, Zhijun Liang, Weidong Li, Yifang Wang, Meng Wang, Gang Li, Quan Ji, Yiming Li, Zheng Wang, Feipeng Ning, Mengzhao Li, Shanzhen Chen, Jinyu Fu, Shaojin Hou, Tianchi Zhao
  - Online
    - Jinfei Wu, Shengsen Sun, Ling Zhao, Jinfan Chang, Ying Zhang, Tao Lin, Chengdong Fu, Shang Xia, Haijun Yang, Linghui Wu, Boping Chen, Suen Hou, Xin Shi, Hengne Li, Wenxing Fang, Zhan Li, Jingzhou Zhao, Fangyi Guo, Mei Zhao, Weiguo Lu, Yang Zhang, Weisong Duan, Xiongbo Yan, Chenguang Zhang, Ye Chen, Hengyu Wang, Zijun Xu, Xiaolong Wang, Jun Guo, Kaili Zhang, Jianbei Liu

Software: Weidong Li

- Status update
  - Release within this month: tracking and PID
  - Time-of-Flight
    - More discussions with CERN colleagues on EDM4HEP
  - Muon
    - Dummy output with simulation + reconstruction
  - Planning on calorimeter reconstruction
    - Current BMR 4.5% with the ECAL of long crystal bars: ongoing studies for further improvements
    - Issues in Arbor (similar issues also addressed in PandoraPFA)
- Discussions
  - Yifang: all available person power should be 100% devoted in the Arbor/Pandora (with the top priority)
  - Jianchun: new person power from universities: e.g. Hengne (SCNU) and Kun Liu (SJTU)

Tracker: Meng Wang

- Report "A request for decisions": slides
  - TPC vs DC
  - Outer track options
    - silicon pixel, silicon strip, LGAD

        - **Yifang: choose AC-LGAD as baseline**
- Discussions
    - Yifang: 2.9% (TPC) vs. 2.5-2.6% (DC)
        - Guang and Linghui: at 20 GeV; different gas compositions in TPC (argon) and DC (helium)
        - Huirong: neon would be tried, expected to be improved to 2.7%
    - Yifang: why ~24M CNY more budget with TPC than DC?
        - Meng and Huirong: TPC: more on HV system, alignment system and pre-assembly
        - Yifang: expects total TPC budget within 100M CNY
    - **Yifang: should reach an agreement on key items of the summarised table for the TPC/DC option comparison**
    - Jianchun: should provide sources or references on the cost of key items
    - Xinchou
        - **Invite accelerator colleagues to introduce experiences on engineering, technical and cost reviews**
        - Provide solid sources and references
        - Expect more iterations for the review
        - Convenor charge letter
    - Mingyi and Jianchun
        - **List key open questions, challenges to be addressed**
    - Yifang and Jianchun
        - **Add summary and recommendations in slides, and continue discussion in next week**
        - **Jianchun: Add two slides:**
            - **TOF issue at 1 GeV;**
            - **Explain in detail about outer layer Z direction precision ~ 18cm**
        - **Yifang: provide edncap design plan asap**
    - Xinchou
        - Set tones before the July informal detector review
    - Weidong
        - Suggest simulation studies on SET spacial resolution
        - Gang: fast and full simulation results (low and high momentum range)
    - Qi
        - Suggest 4 layers of silicon sensors, instead of 3 layers
        - Yifang: 3 layers of silicon sensors + TPC
            - SET: over-constraint of tracking, impact points for calorimeter
            - **Have further discussion about feasibility of adding 4th layer**
    - Wei
        - Clock distribution system: strongly depends on the decision whether the LGAD option is included in the reference detector or not

Mechanics: Quan Ji

- Status report: slides
    - TPC and Outer Tracker: interface discussions
- Discussions

    - Yifang: contact persons for each sub-detector group, one on electronics and the other on mechanics

Calorimeters

- Oral updates by Yong for Jianbei
    - Mechanics updates which reflect changes mentioned last Tuesday TDR meeting
        - ECAL outer diameter and gaps between ECAL/HCAL, and barrel/endcap
- Discussions
    - Yifang: 10mm carbon fiber too thick?
        - Shaojing: simulation studies show that 10mm is already close to the stability limit

Electronics: Wei Wei

- Status report: slides
    - Trigger scheme
- Discussions
    - Yifang: could vertex detector (1) survive after 10-year Higgs running and (2) be upgraded for high-lumi Z by changing back-end electronics modules but without changing detectors?
    - Jianchun
        - Sub-detector system can use "software trigger", except vertex detector?
        - Wei: Yes, the "software trigger" scheme will be more concise than conventional trigger scheme
    - Weidong: limit of digital data readout
        - Wei: 5-10 Gbps per optical fibre for the current design

Magnet: Feipeng Ning

- Oral status updates
    - Comparison magnet cooling schemes, simulation results expected in Jun. 10
    - Yoke design and considerations on stray field control
        - Referred to LEP detectors, less than 2T; lower than the yoke saturation point (3T at CEPC)
        - Updates to be reported next Meeting
- Discussions
    - Yifang and Weidong: Yao Zhang will perform further simulation studies on B-field mapping: e.g. translate B-field gradient into the tracking precision

Vertex: Zhijun Liang

- Oral update
    - Air cooling: could work for middle and outer layers; problems to the inner layer
    - Need to address the cooling issue of the inner layer