

Discussions of The Detector & Software

Jianchun Wang
Yangzhou Workshop
April 14-17, 2021



Calorimeters + Muon

MDI, Mech., Magnet, Lumin, Ebeam

Session I, April 14, Wednesday (Lei Zhang, Qun Ouyang)			Session II, April 15, Thursday (Haijun Yang, Huaqiao Zhang)			Session III, April 15, Thursday (Kai Yi, Linghui Wu)			Session IV, April 16, Friday (Peilian Liu, Hongbo Zhu)			Session V, April 16, Friday (Weidong Li, Xingtao Huang)		
13:30	Progress and planning of the Vertex detector	Zhijun Liang	8:30	Status and planning of ECAL R&D	Yunlong Zhang	13:30	Progress and planning of the TPC	Huirong Qi	8:30	Progress and planning of MDI	Hongbo Zhu	13:30	The status of CEPCSW software framework	Jiaheng Zou
14:00	Progress of the TaichuPix chip	Wei Wei	9:00	Progress of the crystal ECAL	Yong Liu	14:00	Front end ASIC and readout electronics for TPC	Zhi Deng	9:00	Status of beam background study	Haoyu Shi	14:00	The simulation software for the CEPC experiment	Tao Lin
14:30	Progress of the JadePix chip	Yunpeng Lu	9:30	Reconstruction algorithm for ECAL	Shengsen Sun	14:30	Charge particle ID	Mingyi Dong	9:30	Beam pipe, overall mechanics and integration	Quan Ji	14:30	Automated validation system for CEPC	Teng Li
15:00	Wireless readout and control	Jun Hu	10:00	break (30')		15:00	Drift chamber dN/dX simulation and reconstruction	Guang Zhao	10:00	break (30')		15:00	Jet tagging algorithm	Gang Li
15:30	break (30')		10:30	Progress of the CEPC AHCAL	Yukun Shi	15:30	break (30')		10:30	Status and plan of the LumiCal	Suen Hou	15:30	break (30')	
16:00	Progress and planning of the Silicon Tracker	Harald Fox	11:00	Progress of the CEPC SDCAL	Qiuping Shen	16:00	Tracking software for the Drift Chamber	Yao Zhang	10:30	Status and plan of the LumiCal	Suen Hou	16:00	Integration of Pandora to CEPCSW	Wenxing Fang
16:30	HV-CMOS sensor design and test	Jaap Velthuis	11:30	The CEPC muon detector	Xiaolong Wang	16:30	Simulation of PID with cluster counting technique	Federica Cuna	11:00	Solenoid magnet	Feipeng Ning	16:30	Status of ACTS integration to CEPCSW	Jin Zhang
17:00	Tracking for Silicon Tracker at CEPC	Chengdong Fu				17:00	Physics impact of the PID	Shanzhen Chen	11:30	Beam energy measurement	Yongsheng Huang	17:00	Data Management with Rucio and Xcache	Xiaomei Zhang
17:30	Plan of the TDAQ	Zhenan Liu				17:30	Optimization of the tracking system	Xin Shi						

Si Vertex / Tracker + TDAQ

TPC, Drift chamber, PID

Software



- ❖ Silicon Vertex & Tracker, TDAQ (Lei Zhang, Qun Ouyang)
 - CMOS detector pixel size vs power consumption, reduce the segmentation in Z direction. A note to summarize different options.
- ❖ Calorimeter & Muon (Haijun Yang, Huaqiao Zhang)
 - Studies of the crystal ECAL prove that it is a very promising solution.
 - Study replacement of scintillator with scintillation glass in the (Scint.+SiPM) PFA HCAL. To organize a mini-workshop.
 - Combine the PFA ECAL & HCAL in a beam test.
 - The Muon detector design needs more physics input. Studies to optimize or validate the number of layers.
- ❖ TPC, DC, & optimization (Kai Yi, Linghui Wu)
 - Use log likelihood to combine 2 or more PID detectors
 - Optimize the length and radius of DC, study endcap coverage
 - Optimizations using physics output, with different detectors combined, and more realistic material.
 - Task sharing between the IDEA DC tracker & DC PID.
- ❖ MDI, Mech., Magnet, Lumin, Ebeam (Peilian Liu, Hongbo Zhu)
 - Finalize the CDR implementation; to move forward with the HL designs, HOM, beam pipe diameter reducing from 28 to 20 mm.
 - Radiation level mapping will be provided to sub-detectors.
- ❖ Software (Xingtao Huang, Weidong Li)
 - More contributions from off-site groups.
 - Priority of Key4HEP.
 - CEPCSW is more or less ready for a broader use in physics studies. Validations are needed. Gradual migration to this CEPC-wide standard software.
 - Trigger efficiency to be considered in physics studies. Need someone to lead the effort.

Updated to include
Inputs from the discussion



- 1) Which detectors and sub-systems should be included?
- 2) What are the competitive technologies? Some comparisons may be necessary.
- 3) What are the major technical challenges, and projections to the time of detector construction?
- 4) What have already been achieved so far? What do we expect in a few months?
- 5) Refine our selection of physics benchmarks to aid the detector design.
- 6) A comment from Xinchou: consider a more general luminosity and beam condition, so that the detector may be implemented at a different collider.



- ❖ Introduction (2 p)
- ❖ Physics requirements (3 p)
 - Consistent with the current CDR with further understanding, e.g. flavor physics
- ❖ General detector description (4 p)
- ❖ MDI, mechanical and magnet system
 - Beam pipe, radiation background (3 p)
 - Mechanical and cooling (2p)
 - Magnet system (2 p)
- ❖ Tracking system
 - Silicon pixel vertex (6 p)
 - FST of HV-CMOS (5 p)
 - PIDs (4 p)
 - Tracking optimization (3 p)
- ❖ Calorimeter and LumiCal
 - ECAL: crystal bar ECAL (6 p)
 - HCAL: glass or scint (5 p)
 - Luminosity, beam energy (2 p)
- ❖ Muon: scintillator bar and other options (2 p)
- ❖ TDAQ and software
 - Trigger strategy (2 p)
 - Wireless readout (2 p)
 - Software: emphasize more on our own, but refer and acknowledge other packages (4 p)
- ❖ Physics performance: (10 p)
 - Especially those associated with the new sub-detectors in the 4th concept.
- ❖ Summary and roadmap (2 p)

Current total ~ 69 pages



- ❖ During the workshop, quite a few had suggested that we need to name the 4th conceptual detector, maybe also create a logo.
- ❖ Maybe we should have a contest on this:
 - 1) A small committee to manage it: **Yaquan**, Shanzhen, ...
 - 2) Submit your ideas (name, background, ...) to the committee.
 - 3) The committee chooses candidates.
 - 4) Vote by all eligible colleagues.
 - 5) Prize: ?

May the Odds be Ever in Your Favor !