

Introductory remarks

João Guimarães da Costa

July 18, 2018



中国科学院高能物理研究所

*Institute of High Energy Physics
Chinese Academy of Sciences*

CDR Schedule

- CDR approved by Steering Group Committee on June 29:
 - **July 15:** full text available for editing (including physics and performance)

 - Charlie Young providing comments by July 23
 - **July 30:** final internal editing finished
 - IHEP vacation: July 30 - Aug 3
 - **Aug 30:** finish internal review
 - Please suggest names for people to participate at this internal review
 - Aug 12-24: Editing session at IHEP with international editors
 - Sept 1: international review
 - By Sept 30: release to public
- FCC-ee CDR to release final version to CERN Council meeting on September 24
 - They will keep things simple, mostly no full simulation

Organizational matters

- Email list: cepc-cdr-dp-editors@maillist.ihep.ac.cn
 - Include all editors listed last week. Let me know if people are missing.
- **Next CDR editorial meetings:**
 - Tomorrow, Thursday 9 pm
 - Overview of physics and performance chapters
 - Expect responsible editors to attend
 - Monday, 2 pm
 - Muon detector and magnet discussion
 - Wed, 3 pm
 - Plenary meeting at usual meeting time
 - Thu 26, 9 pm — to accommodate Chicago time? Charlie?
 - Update on physics chapter discussion

CDR Open Issues and Questions:

- Inputs from Rome workshop
 - Consider robustness of detectors in the design: TPC/silicon/wire chamber
 - TPC:
 - Check IBF studies with x-ray source
 - Clarify performance of TPC at 2 Tesla
 - ECAL:
 - Limitations on the photon resolution. Why is it so bad compared to LHC calorimeters?
 - Define impact on the detector performance if moving to scintillator strips + SiPM design
 - Muon detector:
 - Consider reducing number of muon detector layers
 - Establish performance criteria for the muon detector
 - MDI
 - Location of the lumical should be in front of beam pipe bellows

CDR Open Issues and Questions:

- Further open questions
 - Check readout time requirements for Vertex detector taking into account 25 ns running at Z pole
- Please provide questions regarding any issues you see with ANY of the sections. We should not wait for external reviewers to point out to us problems that we can solve ourselves.

General Editorial Issues

- Quoting of ILC
 - Should be done in a general statement early on, afterwards only when strictly necessary
- Comparisons with PreCDR or previous versions not necessary.
Keep it to the very minimum.
- Numbers need to be consistent across all sections of CDR
- **Each detector group should carefully examine the corresponding performance section for any issues**
 - Need to make sure we describe the same detector everywhere
 - **Detector groups please provide feedback to me that this has been done — Deadline Monday 23**

Current CDR Version

- Latest version in Git:
 - [https://indico.ihep.ac.cn/event/8589/contribution/11/
material/slides/0.pdf](https://indico.ihep.ac.cn/event/8589/contribution/11/material/slides/0.pdf)
 - About 240 pages of detector, physics and performance
 - 80 pages from “Overview of Physics Case for CEPC” from Liantao — including many references.

Conferences

- **International upcoming meetings of interest:**

- Higgs Hunting, Paris, France, Jul 23-25
 - <http://www.higgshunting.fr/>
- Recontres du Vietnam, Aug 5-11
 - <http://vietnam.in2p3.fr/2018/windows/index.html>
 - Abstracts due June 1st!
- Higgs Couplings 2018, Tokyo, November 26-30
 - <https://www.icepp.s.u-tokyo.ac.jp/hc2018/>

- **National upcoming meetings of interest:**

- 2018年基本粒子和相互作用协同创新中心年会暨牡丹江合作组工作会
 - Jinan, Shandong, Sept 15-16,
 - <https://indico.ihep.ac.cn/event/7856/>
- **International Workshop on the High Energy Circular Electron Positron Collider, Beijing, Nov 12-14**

CDR Editors

- General:
 - Charlie Young
 - Chris Tully
 - Joao, Yuanning, Shan
- MDI:
 - Zhu Hongbo
- Luminosity:
 - Suen, suen@sinica.edu.tw
 - Ivanka Bozovic, ibozovic@vin.bg.ac.rs
- VTX:
 - Ouyang Qun, ouyq@ihep.ac.cn
 - Lu Yunpeng, yplu@ihep.ac.cn
- Silicon Tracker:
 - Wang Meng, mwang@sdu.edu.cn
- Full Silicon Tracker:
 - Weiming Yao, weiming.yao@cern.ch
 - Fu Chengdong, fucd@ihep.ac.cn
- TPC Tracker:
 - Li Yulan, yulanli@mail.tsinghua.edu.cn
 - Qi Huirong, qihr@ihep.ac.cn
 - Deng Zhi, dengz@mail.tsinghua.edu.cn
- Drift Chamber:
 - Franco Grancagnolo, franco.grancagnolo@le.infn.it
- DAQ and readout:
 - Zhu Kejun, zhukj@ihep.ac.cn
 - Liu Zhen-an, liuza@ihep.ac.cn
- ECal:
 - Hu Tao, hut@ihep.ac.cn
 - Liu Jianbei, liujianb@ustc.edu.cn
- HCal:
 - Yang Haijun, haijun.yang@sjtu.edu.cn
- DR Cal:
 - Roberto Ferrari, roberto.ferrari@cern.ch
- Muon:
 - Li Liang, liangliphy@sjtu.edu.cn
 - Paolo Giacomelli, paolo.giacomelli@cern.ch
- Physics Analysis and Detector Optimization:
 - Ruan Manqi, ruanmq@ihep.ac.cn
 - Fang Yaquan, fangyq@ihep.ac.cn
 - Li Qiang, qliphy@gmail.com
 - Li Gang, li.gang@mail.ihep.ac.cn
 - Liang Zhijun (IHEP), zhijun.liang@cern.ch
 - Jianming Qian (Univ. Michigan), qianj@umich.edu
- Magnet:
 - Zhu Zian, zhuza@ihep.ac.cn
 - Zhao Wei, zhaow@ihep.ac.cn
 - Liu Xuyang, liuxuyang@ihep.ac.cn
 - Zhao Ling, zhaoling@ihep.ac.cn

Chapter 8: Readout and DAQ Chapter

- Editors:
 - Zhu Kejun, zhukj@ihep.ac.cn
 - Liu Zhen-an, liuza@ihep.ac.cn
- Please provide information to them as needed
- Proposed outline:
 - Overview of detectors and readout scheme
 - Provide a few examples of general readout of main sub detectors (e.g. pixel, TPC, calorimeter) (1 page)
 - Table with overview: e.g. number of channels, occupancy, data volume, cell size,...
 - Power scheme and delivery
 - DAQ and trigger system(?)
- Keep in mind the operation at Z pole
 - Need to identify shortfalls to fix them in the CDR



Outline of CDR

Acknowledgments	iii
1 Executive Summary	1
1.1 The CEPC-SPPC Study Group and the CDR	1
1.2 The Case for the CEPC-SppC in China	1
1.3 The Science in the CDR	1
1.4 The Accelerator and the Experiment	1
1.5 Detector Research and Development	1
2 Overview of the Physics Case for CEPC	3
2.1 First theory subsection	3

Ouline

3	Experimental conditions and detector concepts	5
3.1	Experimental conditions	5
3.1.1	Higgs Operation	5
3.1.2	Z pole Operation	8
3.1.3	W threshold scan	9
3.2	Physics Requirements	9
3.2.1	Multiplicity	9
3.2.2	Tracking	9
3.2.3	Lepton	11
3.2.4	Particle identification	12
3.2.5	Photons	12
3.2.6	Jets and Missing energy	14
3.2.7	Flavor Tagging	15
3.3	Detector concepts	15
3.3.1	The baseline detector concept	15

Ouline

3.3.2	Full silicon detector concept	19
3.3.3	An alternative low magnetic field detector concept	19
3.4	The IDEA detector	20
3.5	Conclusions	21
4	Tracking system	23
4.1	Vertex tracker detector	23
4.1.1	Performance Requirements and Detector Challenges	23
4.1.2	Baseline design	24
4.1.3	Detector performance studies	24
4.1.4	Beam-induced Background in the Vertex Detector	27
4.1.5	Sensor Technology Options	27
4.1.6	Mechanics and Integration	29
4.1.7	Critical R&D	31
4.1.8	Future R&D	31
4.1.9	Summary	32

Outline

4.2	Silicon tracker detector	32
4.2.1	Baseline design	33
4.2.2	Sensor technologies	35
4.2.3	Front-End electronics	35
4.2.4	Powering and cooling	36
4.2.5	Mechanics and integration	36
4.2.6	Tracking performance	36
4.2.7	Critical R&D	39
4.3	TPC tracker detector	39
4.3.1	Principle of Time Projection Chamber	40
4.3.2	Baseline design and technology challenges	42
4.3.3	Simulation and estimation for the key issues	49
4.3.4	Feasibility study of TPC detector module and future work	51
4.3.5	Conclusion	54
4.4	Full-silicon tracker detector	54
4.4.1	Full silicon tracker layout	55
4.4.2	Toy simulation	55
4.4.3	Detector simulation and reconstruction	57
4.4.4	Tracking performance	60
4.4.5	Conclusion	61
4.5	Drift chamber tracker detector	62
4.5.1	Introduction	62
4.5.2	Overview	65
4.5.3	Expected performance	65
4.5.4	Tracking system simulation results	66

Outline

4.2	Silicon tracker detector	32
4.2.1	Baseline design	33
4.2.2	Sensor technologies	35
4.2.3	Front-End electronics	35
4.2.4	Powering and cooling	36
4.2.5	Mechanics and integration	36
4.2.6	Tracking performance	36
4.2.7	Critical R&D	39
4.3	TPC tracker detector	39
4.3.1	Principle of Time Projection Chamber	40
4.3.2	Baseline design and technology challenges	42
4.3.3	Simulation and estimation for the key issues	49
4.3.4	Feasibility study of TPC detector module and future work	51
4.3.5	Conclusion	54
4.4	Full-silicon tracker detector	54
4.4.1	Full silicon tracker layout	55
4.4.2	Toy simulation	55
4.4.3	Detector simulation and reconstruction	57
4.4.4	Tracking performance	60
4.4.5	Conclusion	61
4.5	Drift chamber tracker detector	62
4.5.1	Introduction	62
4.5.2	Overview	65
4.5.3	Expected performance	65
4.5.4	Tracking system simulation results	66