国家重点研发计划·项目实施方案汇报

R&D and Verification of Key Technologies for High Energy CEPC

Internal Discussion

所属专项： 大科学装置前沿研究

项目负责人： João Guimarães da Costa

项目承担单位： 中国科学院 高能物理研究所

中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

Items for discussion

1. Review of Overview Meeting Outcome
2. Preparing the next-steps/documentation in the midterm review (Zhaoru)
3. Project Organizational Issues

Overview Meeting Outcome

Task 3: Calorimeter schedule needs to be accelerated

- How do we convince people that we will be able to deliver?

All tasks: Need to spend funds

- Produce a plan on how funds are going to be spent for the remainder of the project.

Midterm Review (MOST request):

1) The overall progress of the project, especially the completion of the medium-term goals, research and development tasks and assessment indicators, and the major adjustments occurred

2) The rationality and feasibility of the technical direction and route

3) The outstanding progress of the project, the level and innovation of the research results

4) Project integration organization implementation and coordinated promotion, project lead institute and leader in charge of the performance of their duties, personnel training and organization and management

5) Project funds allocation and implementation, accounting and standardization of fund use, personnel input, and support conditions

6) The main problems existing in the project implementation, including the problem in the project implementation plan execution, the implementation of technical route, the problem of changing external environment, such as policy, market problems, the problems existing in the project organization and management, coordination, personnel investment, fund management use and support security problems and so on

7) Feasibility and risk of the next project implementation plan.

Project Organization Issues

- **Meetings:**
  - Weekly or biweekly video conference meetings on various research topics
    - (e.g. international meeting on ASIC design every monday)
  - Bi-monthly short videoconference meetings on the global project
  - Satellite Meetings with International CEPC Workshops (e.g. Hong Kong, Oxford, ….)
    - Try to expand international collaboration

- **Documentation archiving:**
  - Indico: Meetings and minutes
    - Useful when we report to MOST. Other projects have long lists of meetings.
  - DocDB: Internal reports and technical reports archiving
  - Need a project webpage… (promised last year)

- **Project management:**
  - Common gantt software —> Integrated organization of project required by MOST

DocDB — Database for documents

http://cepcdoc.ihep.ac.cn/cgi-bin/DocDB/DocumentDatabase

username and password: ceps

Document Database

[DocDB Home] [New] [Search] [Last 20 Days] [List Authors] [List Topics] [List Events] [Help]

Instructions

Your Account

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DocDB Statistics

About DocDB

Create or change documents or other information

Search **for** (**Advanced**)

Show **CEPC DocDB-doc-#** **-v**

Show **documents modified in the last** 20 **days**

Calendar of events or **today's** events

List:

◊ Authors ◊ All documents

◊ Topics

◊ Groups

◊ Keywords

◊ Events

[DocDB Home] [New] [Search] [Last 20 Days] [List Authors] [List Topics] [List Events] [Help]

DocDB Version 8.7.21, contact *Document Database Administrators*
Execution time: 0 wallclock secs (0.23 usr + 0.02 sys = 0.25 CPU)

Project management organization

- **Risks and Response Measures**
  - There are some risks in the implementation of this project, but they can be effectively avoided by different kinds of methods:
    - Intermediate small-scale prototypes
    - Strengthening international communication/collaboration

  - **Examples:**
    - Precision of accelerator dipole magnet can be explored and achieved by means of small prototype
    - Technical limit of coating for bending vacuum box and Detector design errors can be effectively avoided through international communication and learning from the experience of others
    - Due to the installation accuracy of detector and the delay risk of calorimeter packaging process, automatic control system and automatic packaging scheme can be used to ensure the accuracy and progress.
    - Chip embargo/submission rules: problem can be managed by integrating into international collaboration (e.g. ATLAS)

Project management organization

- **Risks and Response Measures**
  - Information regarding the risks:
    - 1) Name and simple explanation
    - 2) Mitigation effort (what we will do to prevent the risk from happening)
    - 3) Response (what we will do in case the risk really realizes)
    - 4) When will the risk might realize
    - 5) Probability of the risk to happen
    - 6) Impact on the schedule (how many months would the project be delay if this risk happens
    - 7) Impact on the cost (I don't think MOST cares much about this one because they are not giving us more money....)
- **Retire risks**
  - When risks are not valid anymore, they can be retired

Risk Register

Risk Register

															calc	calc			calc	calc		
																			Risk Impacts			
Comments	Date Registered	Date Retired	Submitter	ID	Type	Owner	Subproject	WBS	Risk Document	Title	Description	Notes on risk mitigation	Response	Likely Fiscal Year of risk event	Cost impact excl. burn rate (kCHF)	Schedule impact on activity (months)	Total float (working days)	Probability	Cost Impact (kCHF)	Schedule Impact on CP (months)	Scope Impact	Performance
	3/11/20		J. Lange	R1-01	Threat	J. Lange, H. Sadrozinski, S. Grinstein	1	1.1	Yes	**Higher sensor cost**	Higher sensor cost for various reasons (selection of more expensive vendor, change in specs, etc)	Qualify multiple vendors to choose during tender; try to increase quality and yield during prototyping; consider relaxed quality requirements to reduce costs	1) Accept and shift funds from another WBS item 2) or reduce coverage	2022	500	0	51	0.10	500	0.0	Medium	Low
										1. SUMMARY (Accelerator)												
	4/13/20		Laurent Serin	R2-01	Threat	Bengt Lund-Jensen, Nathalie Seguin-Moreau	2	2.1	Yes	**The yield of the ASIC is smaller than 80 %**	The yield of the ASIC is smaller than 80 %	No mitigation as it depends from the foundry	Re-order additional wafers	2024	85		22	0.05	85	0.0	Negligible	Negligible
	4/13/20		Laurent Serin	R2-02	Threat	Bengt Lund-Jensen, Nathalie Seguin-Moreau	2	2.1	Yes	**The time to test a wafer (1/2 day with < 5mn per ASIC)), not yet demonstrated, has been under-estimated.**	The time to test a wafer (1/2 day with < 5mn per ASIC)), not yet demonstrated, has been under-estimated.	Identify the needed minimal tests per ASIC and optimize the software/firmware	Add a third probe station site to compensate the extra time needed	2024	0		22	0.10	0	0.9	Negligible	Negligible
										2 SUMMARY (Vertex Prototype)												
	2/27/24		JuanAn Garcia	R3-01	Threat	Juan Garcia Pascual, Jonas Strandberg	3	3.1		**Bad clock distribution during pre-production**	Unknown or noise induced jitter sources with an irreducible clock jitter >30 ps will compromise the time resolution of the detector.	Measure the jitter performance at different points (FELIX, lpGBT, flex and ASIC) during pre-production in a dedicated test-bench. Thanks to the High Precision Timing group at CERN, the flex jitter has been already measured in a prototype with a contribution	The design of different components like PEB and flex to be revisited during pre-production stage	2022	10		110	0.20	10	0.0	Negligible	Medium
	2/27/24		JuanAn Garcia	R3-02	Threat	Juan Garcia Pascual, Jonas Strandberg	3	3.2		**Bad clock distribution during production**	Unknown or noise induced jitter sources with an irreducible clock jitter >30 ps will compromise the time resolution of the detector.	This risk should be already mitigated by R3-01 in which the contribution of the jitter performace of the different items (FELIX, lpGBT, flex and ASIC) are measured during pre-production and proper actions will be taken in case that the jitter doesn't met	The design of different components like PEB and flex to be redone after pre-production stage	2024	100		110	0.10	100	2.7	Medium	Medium
										3 SUMMARY (Calorimeter Prototype)												

Risk Register (cont)

Risk Register

Comments	Date Registered	Date Retired	Submitter	ID	Type	Owner	Subproject	WBS	Risk Document	Title	Likely Fiscal Year of risk event	Cost impact excl. burn rate (kCHF)	Schedule impact on activity (months)	Total float (working days)	Probability	Risk Impacts: Cost Impact (kCHF)	Risk Impacts: Schedule Impact on CP (months)	Risk Impacts: Scope Impact	Risk Impacts: Performance	Notes on probability and impact	Risk Rank: Cost Risk Rank	Risk Rank: Schedule Risk Rank	Risk Rank: Scope Risk Rank	Risk Rank: Performance	Risk Rank: Risk Rank	Cost Impact (kCHF): Optimistic	Cost Impact (kCHF): Most likely	Cost Impact (kCHF): Pessimistic	Schedule Impact: Optimistic	Schedule Impact: Most likely	Schedule Impact: Pessimistic	Schedule Impact: Optimistic	Schedule Impact: Most likely	Schedule Impact: Pessimistic
												calc	calc			calc	calc																calc	calc	calc
																Risk Impacts					Risk Rank					Cost Impact (kCHF)			Schedule Impact			Schedule Impact		
	3/11/20		J. Lange	R1-01	Threat	J. Lange, H. Sadrozinski, S. Grinstein	1	1.1	Yes	Higher sensor cost	2022	500	0	51	0.10	500	0.0	Medium	Low	1) Higher cost, no impact on schedule 2) no impact on cost and schedule, but on performance	High	Low	Medium	Low	High	300	500	800	0	0	0	-2.55	-2.55	-2.55
										1. SUMMARY (Accelerator)																								
	4/13/20		Laurent Serin	R2-01	Threat	Bengt Lund-Jensen, Nathalie Seguin-Moreau	2	2.1	Yes	The yield of the ASIC is smaller than 80 %	2024	85		22	0.05	85	0.0	Negligible	Negligible	For 70 % yield, 75 additional wafers are needed. The cost will be 85 kCHF corresponding to a total ASIC cost increase by 8 %. The production of these new wafers can be done while testing other wafers. Their test would increase the overall testing period by 3.5 weeks.	Low	Low	Low	Low	Low	0	85	100	0	0.8	1	-1.1	-0.3	-0.1
	4/13/20		Laurent Serin	R2-02	Threat	Bengt Lund-Jensen, Nathalie Seguin-Moreau	2	2.1	Yes	The time to test a wafer (1/2 day with < 5mn per ASIC)), not yet demonstrated, has been under-estimated.	2024	0		22	0.10	0	0.9	Negligible	Negligible	Negligible impact on cost (testing boards). Could impact the schedule by up to 2 months.	Low	Low	Low	Low	Low	0	0	0	0	2	3	-1.1	0.9	1.9
										2 SUMMARY (Vertex Prototype)																								
	2/27/24		JuanAn Garcia	R3-01	Threat	Juan Garcia Pascual, Jonas Strandberg	3	3.1		Bad clock distribution during pre-production	2022	10		110	0.20	10	0.0	Negligible	Medium	Scope impact negligible because the contingency is absorbed by individual FAs. Impact on performance is medium as it affects time resolution.	Low	Low	Low	Medium	Medium	5	10	20	1	4	8	-4.5	-1.5	2.5
	2/27/24		JuanAn Garcia	R3-02	Threat	Juan Garcia Pascual, Jonas Strandberg	3	3.2		Bad clock distribution during production	2024	100		110	0.10	100	2.7	Medium	Medium	Scope impact medium because this can impact on the overall schedule of HGTD since the design of different items like PEB or FLEX have to be revisited	Medium	Low	Medium	Medium	Medium	50	100	200	4	8	14	-1.5	2.5	8.5
										3 SUMMARY (Calorimeter Prototype)																								

Rank					
High	1	0	0	0	1
Medium	1	0	2	2	2
Low	4	6	4	4	3
Total	6	6	6	6	6

Project Organization Issues

- Communication and Inspection Mechanisms
  - **Exchange mechanism:**
    - Weekly or biweekly video conference meetings on various research topics
      - (e.g. international meeting on ASIC design on monday)
    - Monthly videoconference meetings on the global project
    - Integration in the CEPC Study Group activities and workshops
  - **Documentation archiving:**
    - Indico: Meetings and minutes
    - DocDB: Internal reports and technical reports archiving
    - Establish a project webpage
  - **Special meetings** will also be held regularly to discuss the completion of the project and conduct academic exchanges (e.g. hold satellite meetings at CEPC international workshops to stimulate interaction with international partners)

Assessment Indicators of Science and Technology Report

序号	Report type	数量	提交时间	公开类别及时限
1	Annual technical progress report	1	2019 年 6 月	公开
2	Annual technical progress report	1	中期检查前	公开
3	Annual technical progress report	1	2021 年 6 月	公开
4	Annual technical progress report	1	2022 年 6 月	公开
5	Annual technical progress report	1	结题验收前	公开
6	High Energy Circular Collider Detector Design Report	1	2021 年 4 月	公开
7	High Energy Circular Collider Detectors Test Report (task 2+3)	1	2023 年 4 月	公开
8	High Energy Circular Electron-Positron Collider Key Technology Design and Test Report	1	2023 年 4 月	公开

Project Organization Issues: Funding Issues

- Check slides from MOST on Indico page
  - https://indico.ihep.ac.cn/event/9111/other-view?view=standard
- Need to spend the money
- Cannot use funds for other projects!

Project management organization

- MOST Project Responsibility Expert
  - Zhao Hongwei (Institute of Modern Physics, CAS)
  - Wang Qiuliang (Institute of Electrical Engineering, CAS)
  - Xu HongJie (Shanghai Institute of Application Physics, CAS)
- Expert Team (8 people)
  - Xu Nu (Institute of Modern Physics, CAS)
  - Tang Chuanxiang (Tsinghua University)
  - Lv Junguang (Institute of High Energy Physics, CAS)
  - Li Jin (Institute of High Energy Physics, CAS)
  - Gao Yuanning (Peking University)
  - Youjin Yuan (Institute of Modern Physics, CAS)
  - Hu Guo Chaoying (IN2P3-CNRS-University of Strasbourg, IPHC)
  - Zhentang Zhao (Shanghai Institute of Applied Physics, CAS)