CEPC MOST2 Project Annual Review Internal Session on Task 3 Status and Progress Overview Validation of the Imaging Hadronic Calorimeter Technology

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> 北京,高能所 2021年4月21日

The CEPC AHCAL Prototype

The core of task 3: Development of a full-size AHCAL prototype



- Transverse size: 72×72cm², Cell size: 40mm
- 40 layers (plus 5 extra layers for backup): 20mm steel +3mm scintillator + 2mm PCB for each layer
- Number of channels: ~13000

Where We Are ?

识号	任务名称	2018 2019 2020 2021 2022 2023
1	成像型强子量能器技术验证	
2	1) 量能器原型机物理设计	
3	1.1) 量能器关键参数的选取和优化	Design and
4	1,2)量能器性能模拟研究	simulation
5	2) 灵敏探测器的研制	simulation
6	21) 原材料 奥件采购	
7	2.2)灵敏单元结构的设计和优化	
8	2.3)闪烁单元生产工艺的研究	Scintillator ti
9	2.4)闪烁单元批量生产	
10	2.5) 闪烁单元包装工艺的研究	production.
11	2.6)闪烁单元批量包装	
12	2.7闪烁单元批量测试装置制作	wrapping and
13	2.8) 闪烁单元批量测试	
14	2.9)单层灵敏探测器工艺摸索	
15	3) 读出电子学和数据获取系统	
16	3.1)原材料、电子元器件的采购	
17	3.2)前端读出板和数据接口板的设计和开发	
18	3.3)SPIROC芯片功能测试板开发	Frontend read
19	3.4)前端读出板和数据接口板的批量制作与测试	hourd product
20	3.5)测试用数据获取板的开发与制作	
21	3.6)数据获取板的开发与制作	
22	4) SiPM性能监测和刻度系统的研究	
23	4.1)基于LED的监测系统的开发	
24	4.2) 基于光纤的监测刻度系统的研究	
25	5) 机械设计和制作	Mechanical
26	5.1)探测器灵敏层结构	
27	5.2) 原型机吸收体和支撑结构	
28	5.3) 束流测试平台	nlatforms
29	5.4) 宇宙线测试平台	
30	6)量能器原型机系统集成	absorber stat
31	6.1)探测器灵敏层的组装和测试	
32	6.2) 整体样机的集成	
33	7) 量能器原型机测试和性能研究	
34	7.1)数据分析软件的开发和准备	
35	7.2) 原型机宇宙线测试及质量检验	
36	7.3) 原型机束流测试前期准备和运输	
37	7.4) 原型机束流测试及样机运回	
38	7.5)测试数据分析及原型机性能研究	
39	 (8) 项目总结 	
40		

Scintillator Tiles

- 10144 scintillator tiles have been produced, wrapped and tested for light yield.
- 9700 tiles (~95%) passed quality control (light yield within $\pm 10\%$ of nominal)
- The latest batches are suffering low light yield. We are working through the issue and expect to make available the remaining ~5000 good tiles (our goal 15000 good tiles) required for the prototype construction in the next two months.



Readout Electronics

- The Omega group found a new packaging company for the SPIROC chips. As a result, they has resumed supply of the chips and are ramping up the capacity.
- We have ordered 400 chips with Omega and expect to receive them before this summer





New chips received in Nov. 2020

Readout Electronics

- The design of the front-end readout board (HBU) will be finalized by August.
- The mass production (45 layers) of HBUs will be launched in September and expect to finish by the end of 2021.



Mechanical Work

- Structure design of the prototype is ongoing
 - Sensitive layers (to be finished by June)
 - Absorber stack (to be finished by October)



- Design and manufacturing of support structures for the prototype hasn't started yet. But we aim to get everything done by February 2022 (a lot of work and challenge)
 - mechanical structure for moving and rotating the prototype
 - Support platforms for cosmic ray test and beam test

Summary



Design and simulation

Finished

Tile production

Mostly done. 5000 tiles remain to be produced. To be Finished in next 2 months

Readout electronics

Design validated. Mass production to launch in October and finish by the end of this year



Mechanical structures and platforms