Preparation of Calorimeter beam test at CERN

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On behalf of CEPC Calorimeter working group

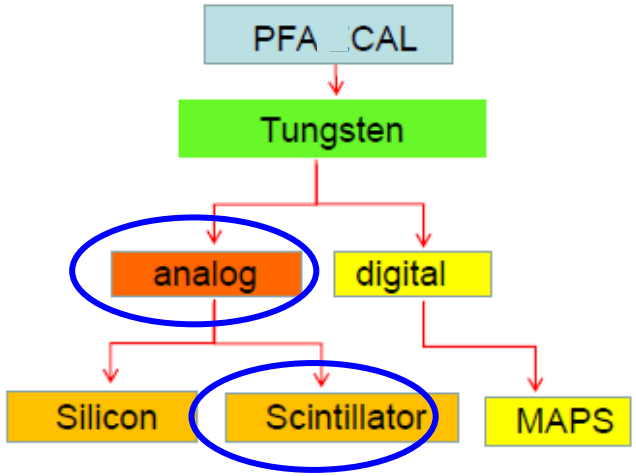
Outline

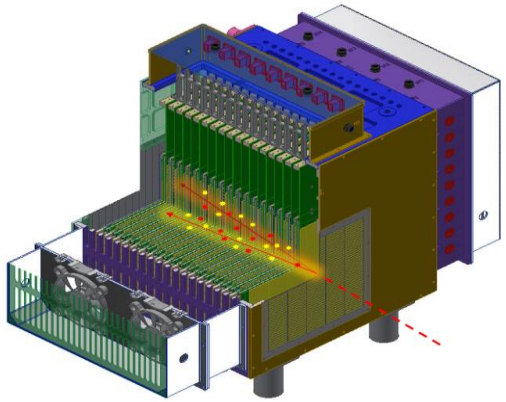
- CEPC PFA Calorimeter Brief Introduction
- Calorimeter Progress
  - AHCAL Progress
  - Mechanical progress
  - Sci-W ECAL Status
- Beam test in October
- Summary

PFA Calorimeter

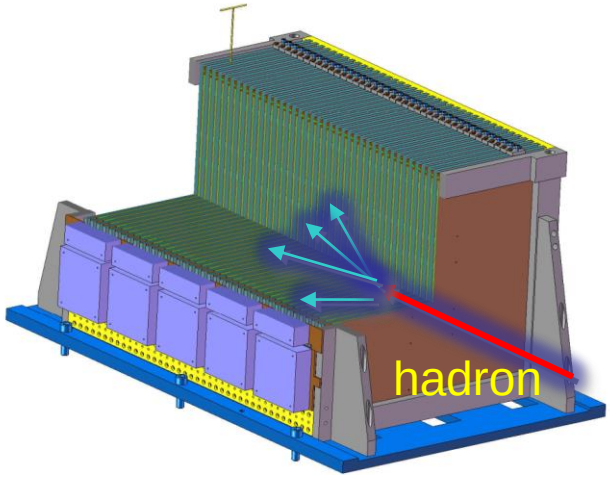
Sampling Calorimeter

Calo	Sampling No.	Absorber	Sensitive detector	Granularity	Electronics	Absorb length	Energy Resolution
Sci-W ECAL	30	W-Cu	PSD+SiPM	5mm×5mm	SP-2E	22 X_0	16%@ 1 GeV
AHCAL	40	Fe	PSD+SiPM	40mm×40mm	SP-2E	4.6 NIL	60%@ 1 GeV





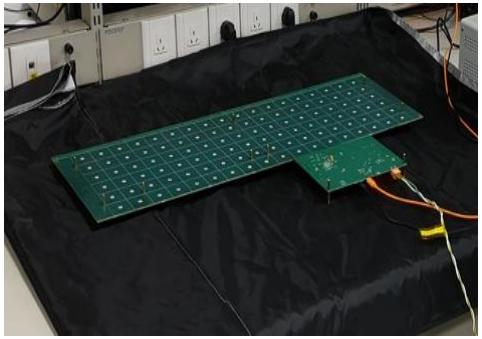
Sci-W ECAL



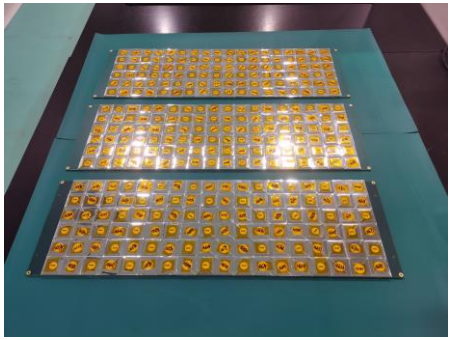
AHCAL

AHCAL Progress

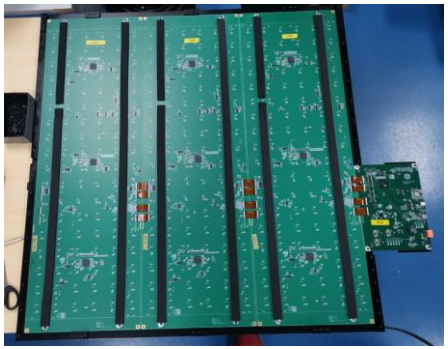
- 38 HBUs completed welding and sent back to USTC，7.21
- After 38 HBUs test completed, send to SIC for assembly，7.23
- The scintillator assembly of the 38 HBUs are completed and sent back to the USTC to test，7.31
- Complete 38 HBUs cassettes assembly，8.6



HBU welded electronics



Assembly scintillator

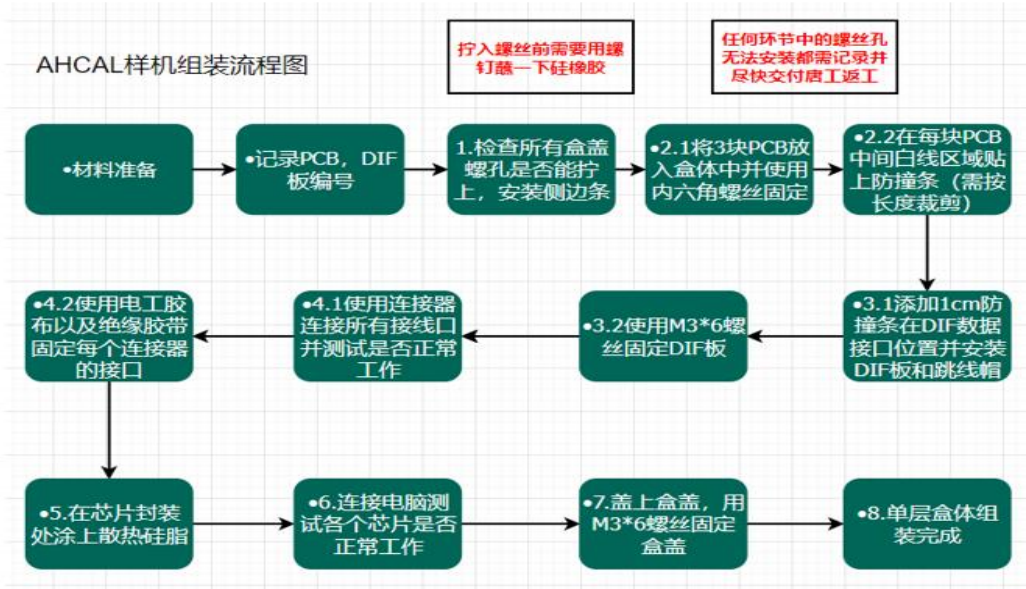


HBU assembled into cassette

HBU cassette

AHCAL Progress I

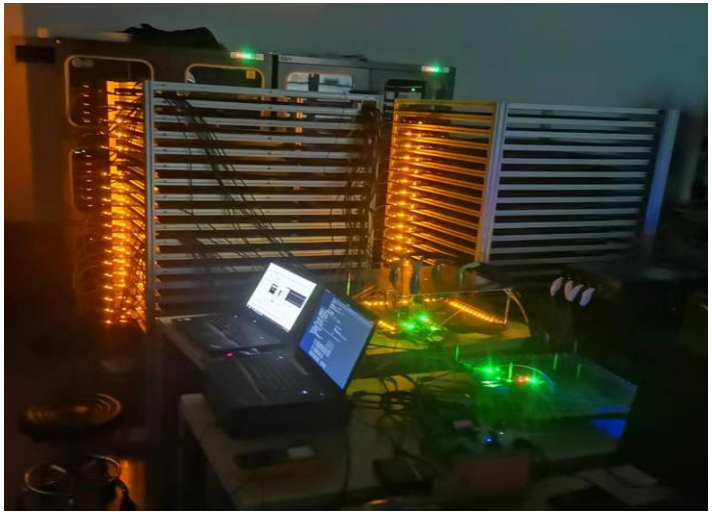
- HBU assembled to cassette
  - The assembly of HBU cassettes have a unified process flow
  - At present, all the 38 layer HBUs have been assembled

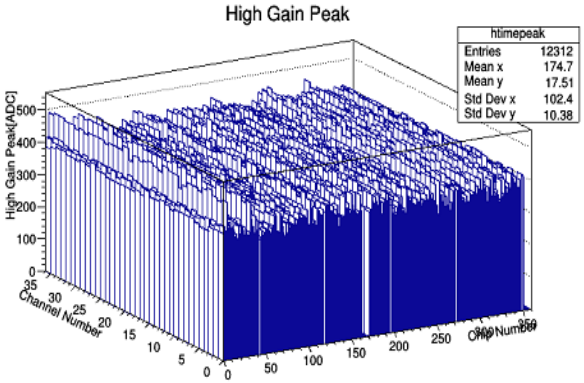


AHCAL Progress II

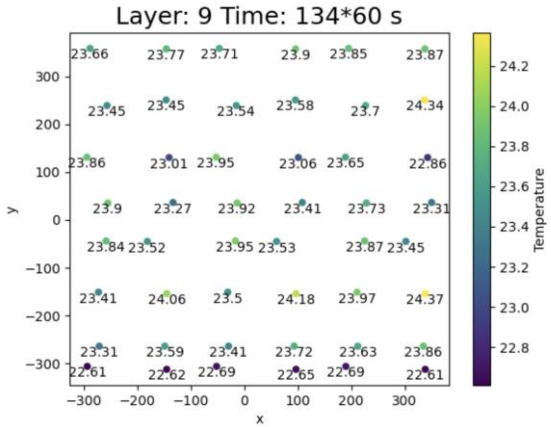
◆Cosmic Ray Test

- ◆ The 38 layers were divided into two groups to independently carry out cosmic ray testing
- ◆ The preliminary results show that the whole system could work very well
- ◆ Also, the temperature monitors show that the HBU temperature is about 2 ^{o}C higher than room, and they are very stable

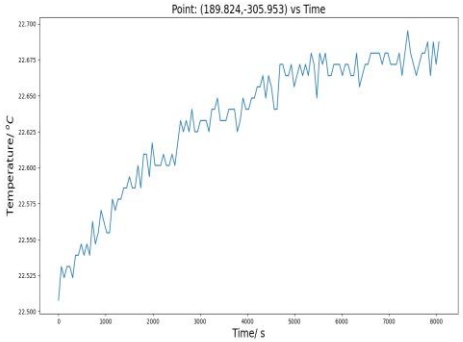




pedestal



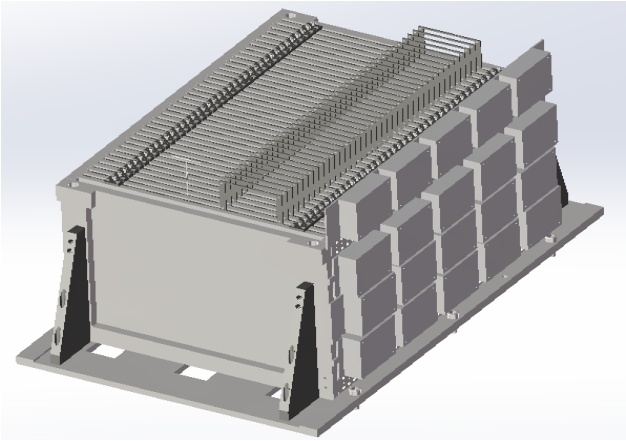
Temperature in one layer

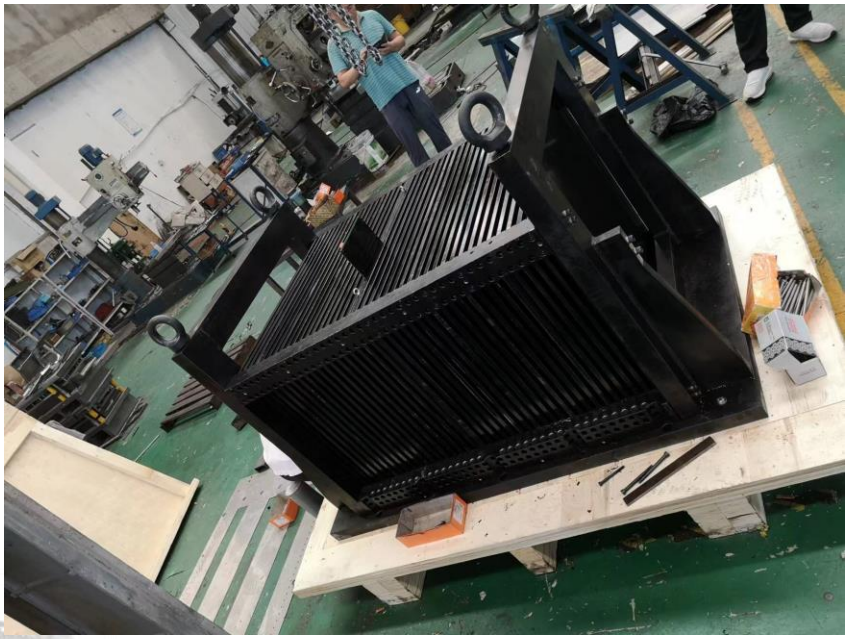


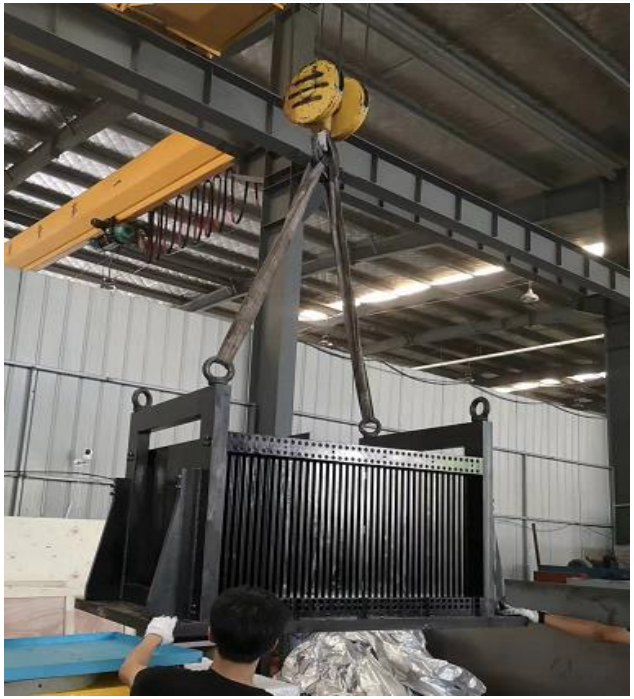
Temperature stability

AHCAL Progress III

- The AHCAL structure
  - It has 39 iron absorbers
  - The gap between two neighbor iron plates is 14.5 mm, and the HBU cassette could be inserted in it







Mechanical Progress

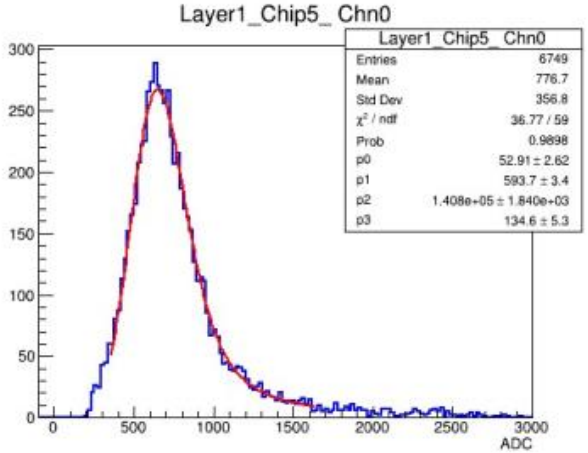
- The displacement platform for calorimeter beam testing
  - The platform can place AHCAL and Sci-W ECAL at the same time
  - The horizontal movement distance is ±20 cm, and the up and down movement distance is ±15 cm

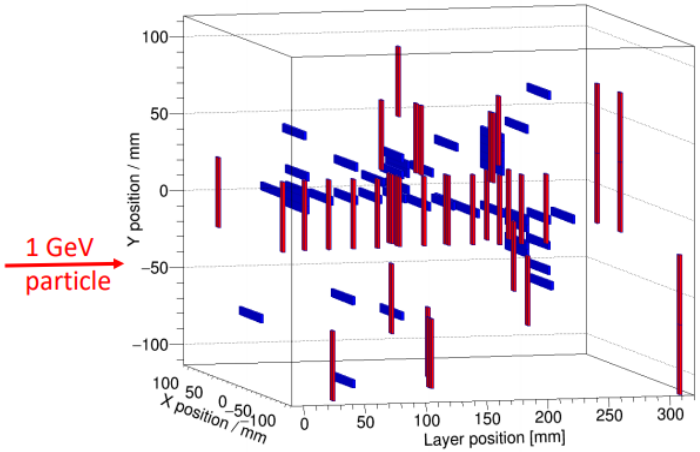
platform

AHCAL on this platform

Sci-W ECAL

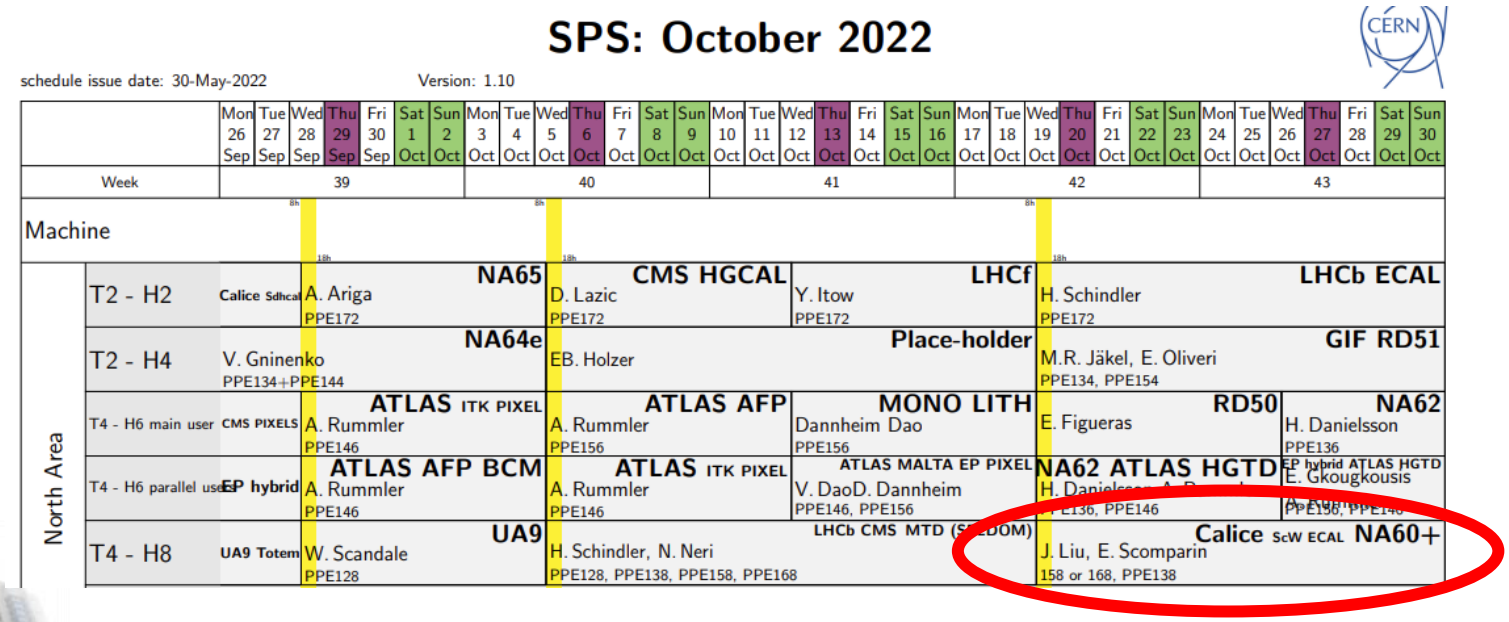
- Sci-W ECAL has been developed two years ago
- It has been verified by long-term cosmic ray test in laboratory
- and has been tested in IHEP in October 2020
- Its performance is stable.



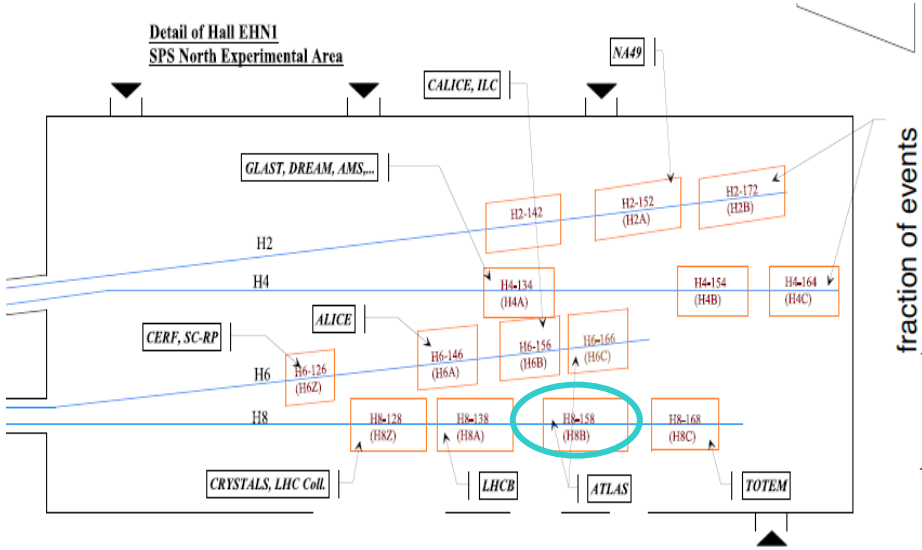


Beam test

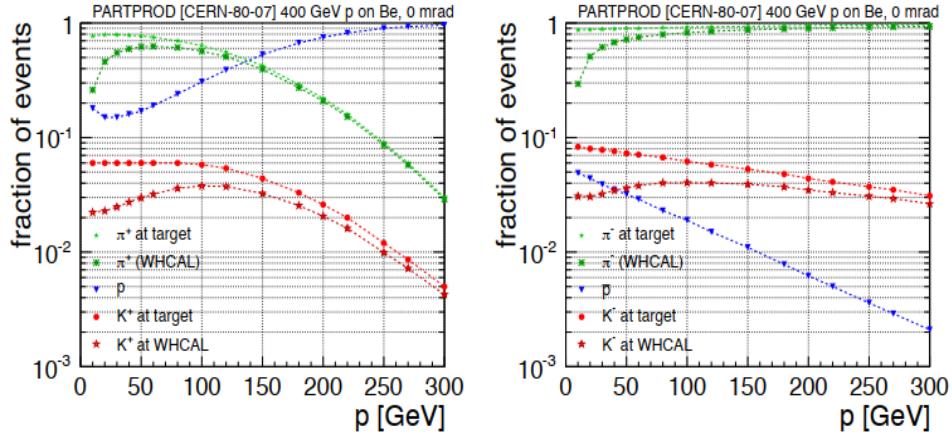
- In mid October, there will be two weeks of high-energy particle beam testing at H8 of SPS
  - The H8 beam line is a high-energy, high-resolution secondary beam line.
  - The maximum momentum that can be transported in the experiments is 400 GeV/c protons
  - or secondary mixed hadron beams within the range 10-360 GeV/c.
  - the electron beams with variable purity (10 – 99 %) are also possible. The maximum Δp/p acceptance of the line is 1.5%.



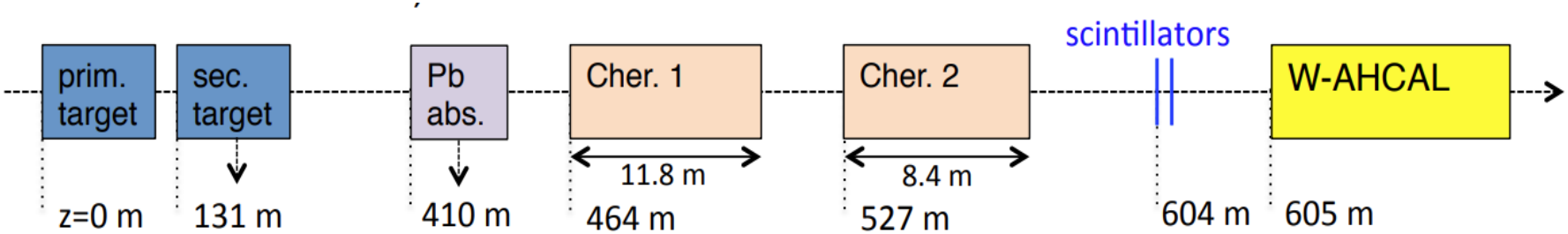
H8 Beam Line



We are here



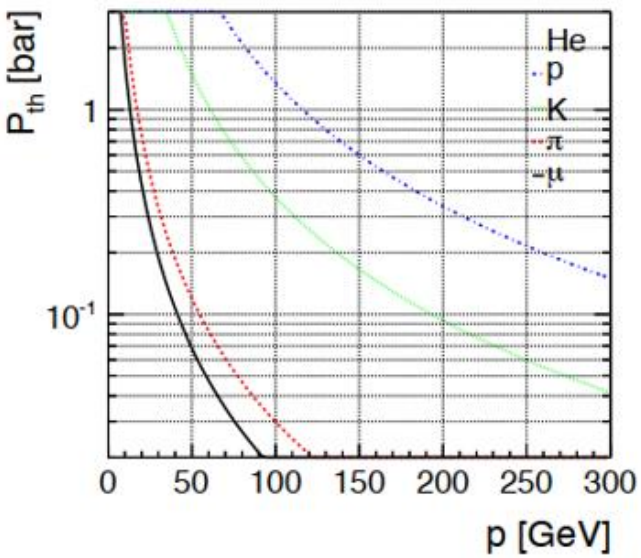
The secondary particles in the beam

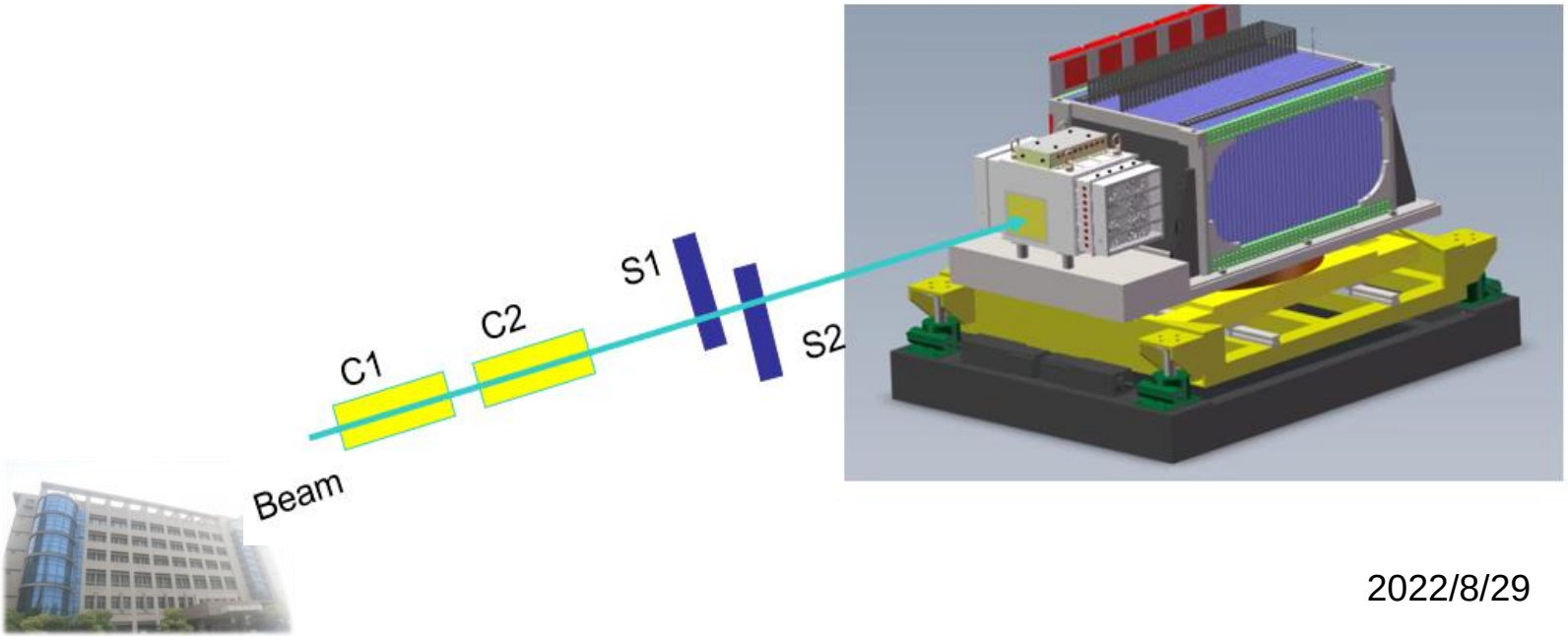


Optional

Cherenkov Detector in H8

- Cherenkov Detector for PID
  - In order to select pure particles
  - Threshold pressures for the production of Cherenkov light from protons, kaons, pions and muons in Helium (right) at T=20°C





Beam test

- Goal of the beam test
  - Energy response to high energy particle, linearity, resolution..
  - Shower shape in calorimeter
  - …

AHCAL

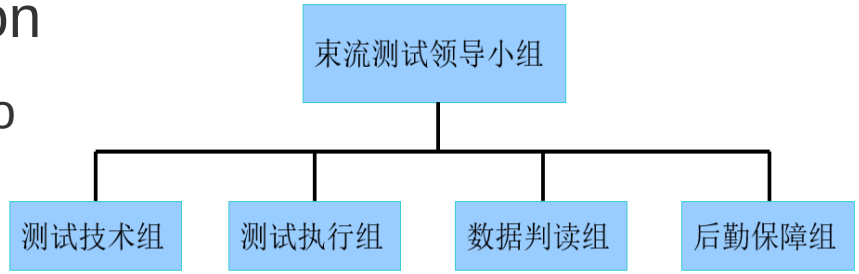
Content	Description	beam
Energy linearity, resolution	Response to pions	Pion-（10-100 GeV/c）
Energy reference calibration （dE/dx）	Minimum ionization particles	Muon/Pi (50 GeV/c)

Sci-W ECAL

Content	Description	beam
Energy linearity, resolution	Response to $e^{\pm}$	positron（10-100 GeV/c）
Energy reference calibration （dE/dx）	Minimum ionization particles	Muon/Pi (50 GeV/c)

Beam test

- The organization and labor division
  - At least 16 person will go to CERN to participate in the beam test



名称	人员	备注
领导小组	刘建北、杨海军、刘勇	
技术组	张云龙、沈仲弢、杨海军、刘勇	
执行组	石禹坤、王家轩、周安顺、刘豪、李兴华、胡鹏、吴琪	
数据判读组	石禹坤、王家轩、王震、宋思远、车逾之、齐宝华	
后勤保障组	张云龙、沈仲弢、王兴华、杨海军、刘勇、曾辉、王利敏	

Beam test schedule

序号	内容	时间	备注
1	ATA办理	8.1 – 9.10	
2	探测器及平台联测	9.1-9.5	
2	探测器打包	9.6-9.9	
3	探测器运输	9.10-9.30	
4	第一批人员到CERN	10.1-10.2	
5	探测器接收、安装、测试	10.3 – 10.18	
6	第二批人员到CERN	10.10	
7	探测器安装到束流区并完成调试	10.19-10.20	
8	探测器muon测试	10.20	
9	探测器pion束流测试	10.21-10.27	
10	探测器电子束测试	10.28-10.31	
11	AHCAL单独高计数率测试	11.1	
11	探测器吊出测试区	11.2	
12	探测器打包	11. 3 – 11.4	
13	人员回国	11.5	

Others

- Cargo transportation
- Personnel travel
- accommodation

…

去 CERN 参加束流测试的航班信息

10月01日 北京---法兰克福—日内瓦
1. CA931 SA01OCT PEKFRA 12:55起飞--- 17:20到达

2. LH5768 SA01OCT FRAGVA 21:00起飞---- 22:05到达

票价： 9430含税

航班稳定

10月08日 浦东—赫尔辛基—日内瓦
1. HO1607 SA08OCT PVGHEL 01:20起飞---- 06:20到达 浦东T2飞赫尔辛基T2
2. AY1531 SA08OCT HELGVA 08:05起飞---- 10:05到达 赫尔辛基T2飞日内瓦

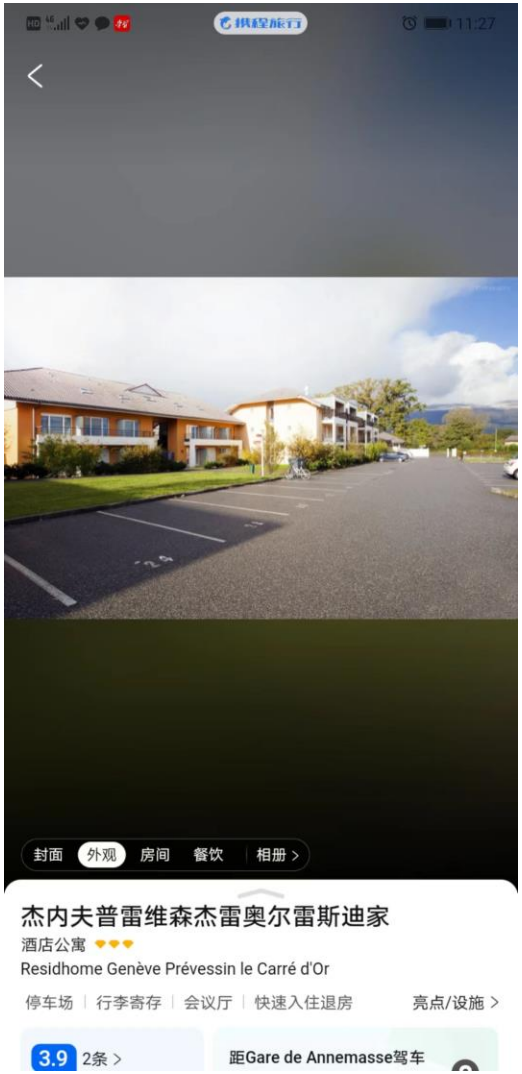
TO:

船期： 起运港： SHANGHAI 目的港： 瑞士

船名/航次： 提单号：

箱量： LCL 毛重： 6000 体积： 4.3

费用	货币	金额	备注
空运费	RMB	32/KG AMS/FRA转	航班13467 5-6天左右
送货费	CHF	1450	
ATA目的港清关	RMB	代理在确认中	
枕木吊车	RMB	实际报销	
报关费	RMB	1000	



Summary

- At present, AHCAL prototype is currently in beam test status
  - All sensitive layers have been assembled and can work normally
  - The whole system has been verified by cosmic ray test
  - The structure has been processed, and the test platform is ready
- Sci-W ECAL also ready for beam testing
- SPS H8 beam line could provide high energy hadrons and electrons, and can carry out performance tests on AHCAL and Sci-W ECAL
- The beam test opportunity is rare, and we will go all out ^_^

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THANKS

backup