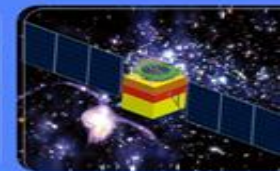


# The Status of the HCAL

2024-12-03

[WWW.IHEP.CAS.CN](http://WWW.IHEP.CAS.CN)

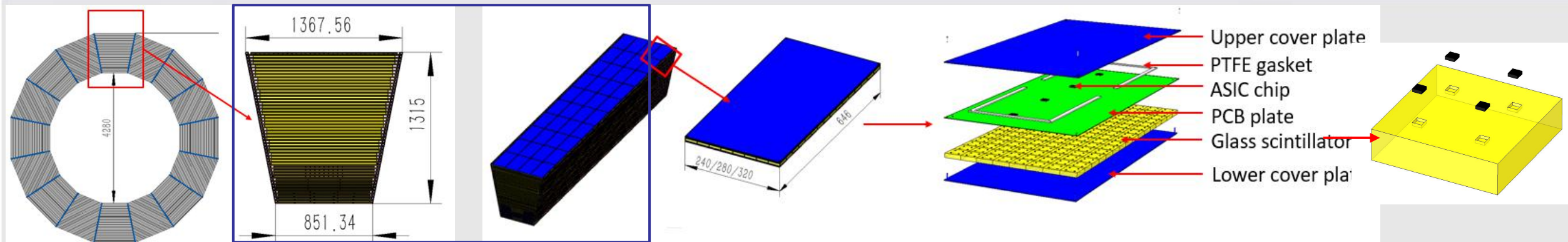


Qian Sen, on behalf of the HCAL Group

[qians@ihep.ac.cn](mailto:qians@ihep.ac.cn)

# Current status of the GS-HCAL Mechanics

--by Yatian Pei



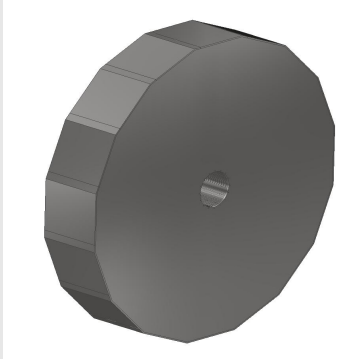
- Each element contains about 128(320mm in width)/112(280mm in width)/96 cells(240mm in width)

|                 | Box quantities/w edge | Glass quantities/wedge |                  | Box quantities/w edge | Glass quantities/wedge |
|-----------------|-----------------------|------------------------|------------------|-----------------------|------------------------|
| 1st ~3rd layer  | 30/layer              | 3200/layer             | 26th ~29th layer | 40/layer              | 4320/layer             |
| 4th ~7th layer  | 30/layer              | 3360/layer             | 30th ~33rd layer | 40/layer              | 4480/layer             |
| 8th~10th layer  | 30/layer              | 3520/layer             | 34th~36th layer  | 40/layer              | 4640/layer             |
| 11th~14th layer | 30/layer              | 3680/layer             | 37th~40th layer  | 40/layer              | 4800/layer             |
| 15th~18th layer | 30/layer              | 3840/layer             | 41st~44th layer  | 40/layer              | 4960/layer             |
| 19th~22nd layer | 40/layer              | 4000/layer             | 45th~48th layer  | 40/layer              | 5120/layer             |
| 23rd~25th layer | 40/layer              | 4160/layer             | Total            | 1740                  | 200800                 |

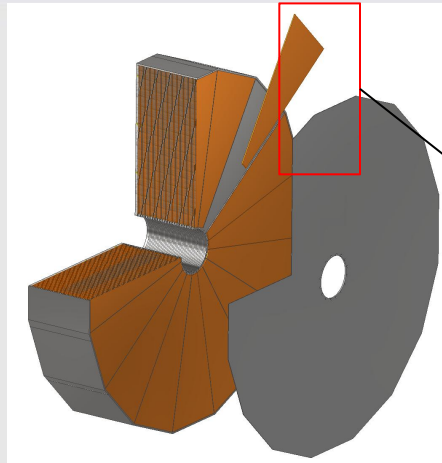
- There are 27840 boxes in total, 3212800 glass scintillator

# Current status of the GS-HCAL **Mechanics**

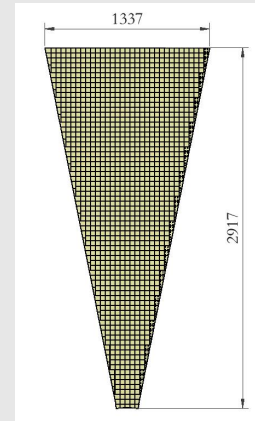
--by Junsong Zhang



➤ Endcap-Detector

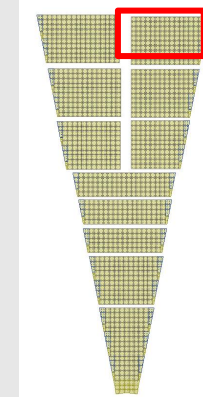


➤ Endcap Prototype

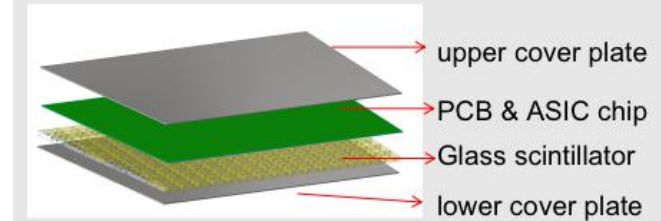


➤ Endcap-module

11 types Box



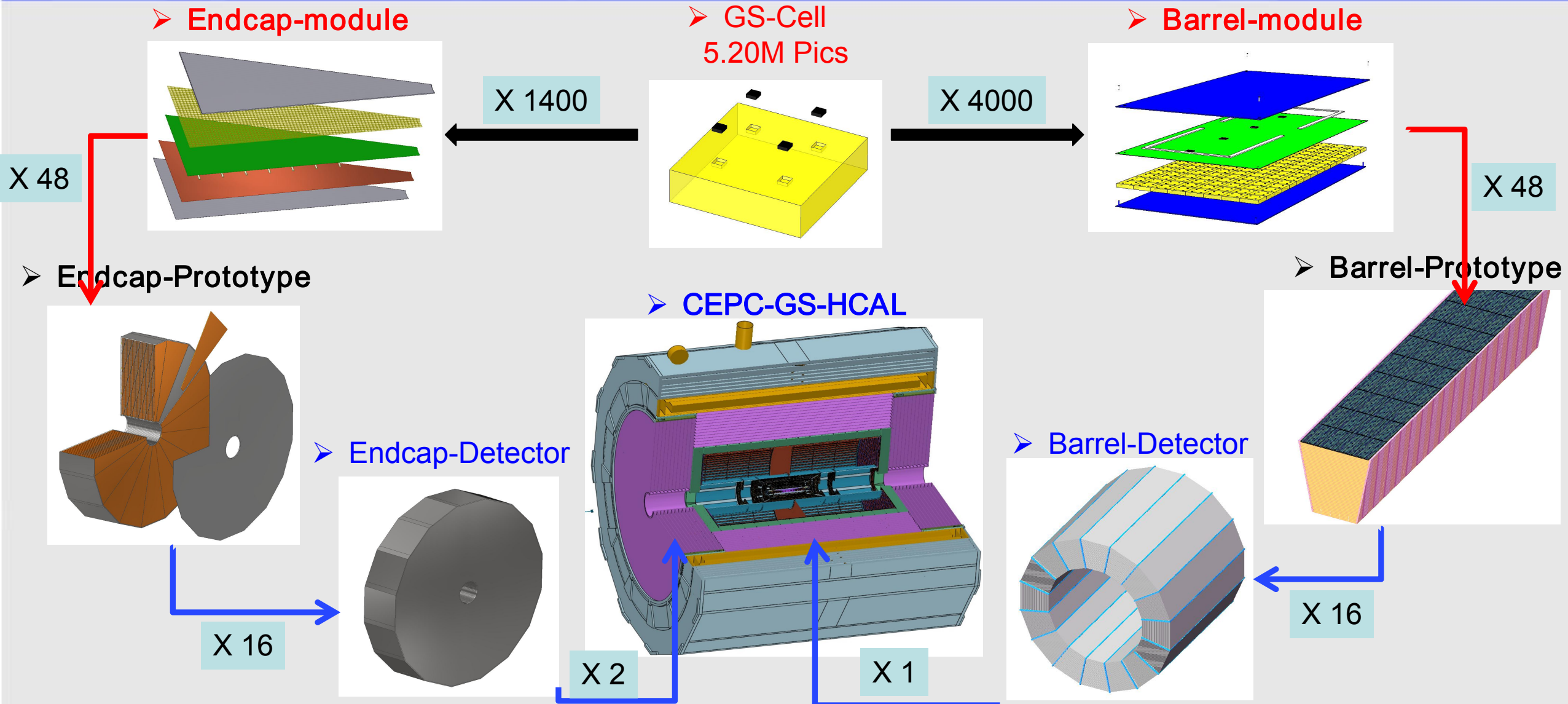
➤ Endcap Box



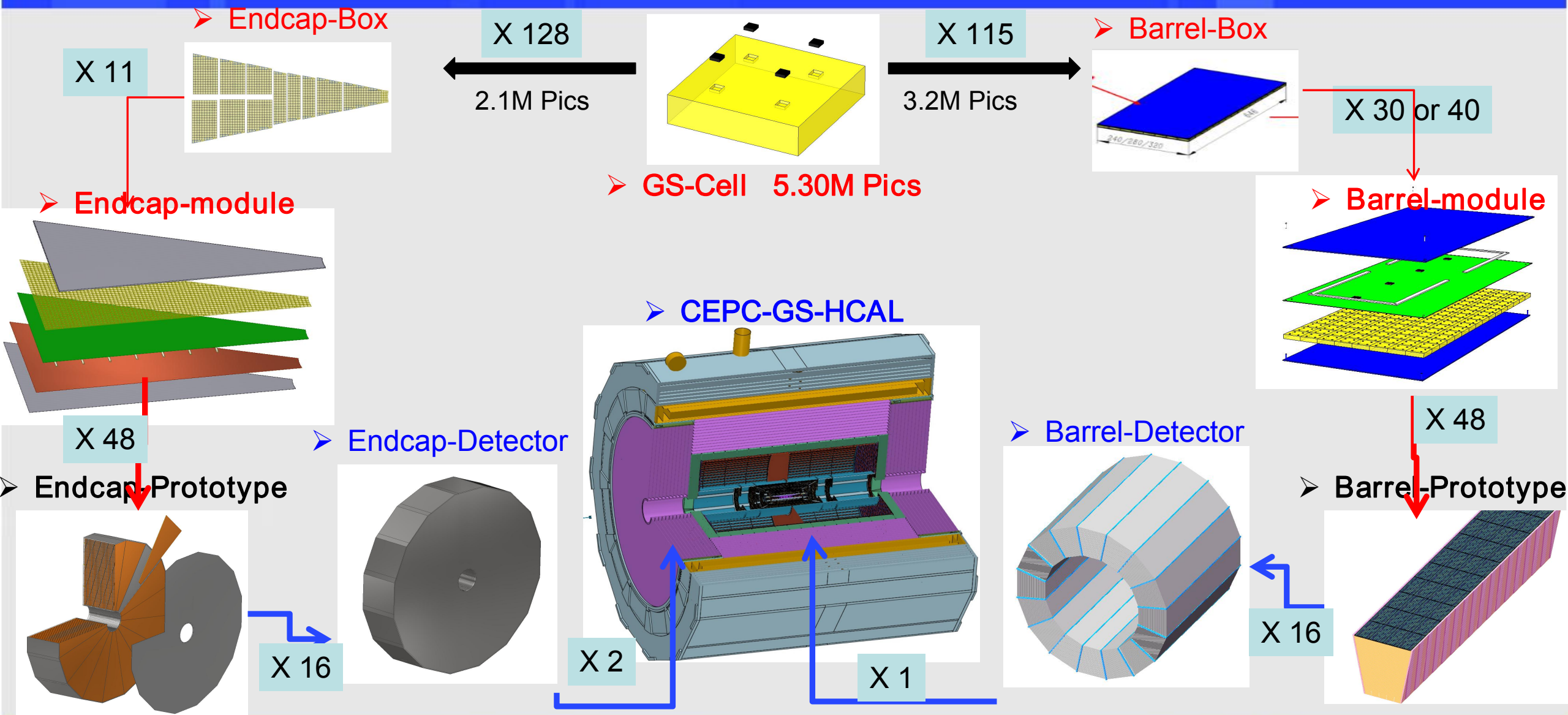
| Detector | Prototype | Module | Box  | Glass quantities |
|----------|-----------|--------|------|------------------|
| X 2      | X 16      | X 48   | X 11 | X 128            |

● There are 16896 boxes in total, 2,155,929 glass scintillator ,

# the Conceptual Detector Design of GS-HCAL



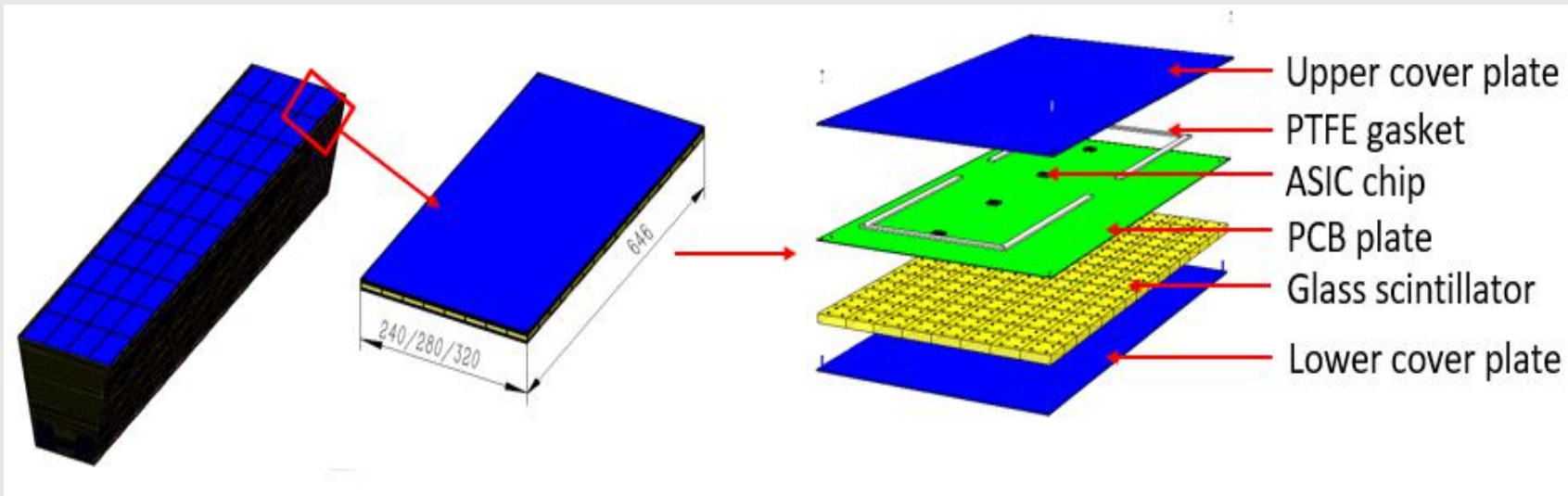
# the Conceptual Detector Design of GS-HCAL



# Current status of the GS-HCAL **Detector+SiPM**

--by Boxiang Yu, Yuguang Xie

- The bias voltage for the SiPMs in GS-AHCAL is applied as a uniform base bias through a PCB-Box.
- All the SiPM in the same Box will using the same power supply!



Glass Cell: 5.3M

SiPM: 5.3X4 ?

Box: 45K

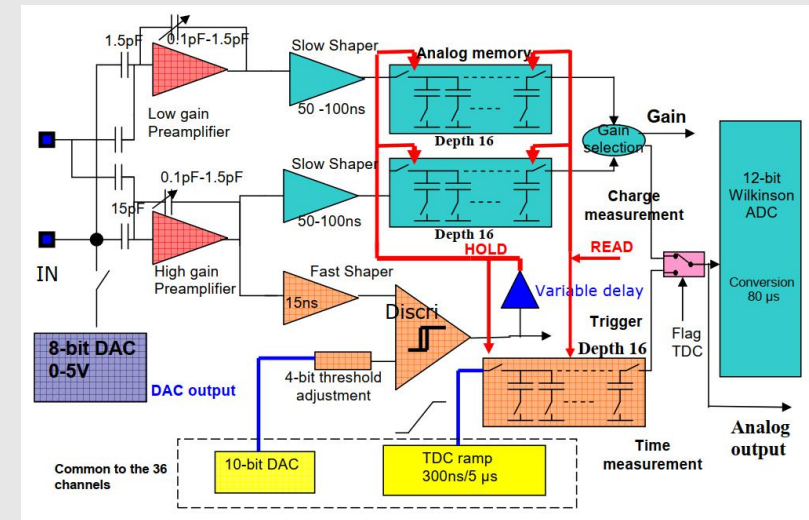
Power supply: 45K

- Endcap Part: There are 16896 boxes in total, 2,155,929 glass scintillator ,
- Barrel Part: There are 27840 boxes in total, 3,212,800 glass scintillator

# SiPM bias voltage control

- The ASIC chip has a regulation capability of  $\pm 0.5\text{V}$  for the bias voltage, which is less than the  $5\text{V}$  regulation capability of SPIROC2E. This limitation is due to the ASIC chip being powered at  $1.2\text{V}$ . However, experimental tests have shown that using  $\pm 0.5\text{V}$  regulation for the SiPMs is feasible.
- In the utilization of SiPMs, they will also be categorized, with those having similar bias voltages being grouped together in one Box.

**SPIROC2E-ASIC**  
**bias voltage module**



# Current status of the GS-HCAL TDR

## Chapter 8 Hadron calorimeter--V2.0: 45P+10P -->

- 8.1 Physics Requirements of HCAL (Ruanmanqi, Yanghaijun) --2P
- 8.2 Design of the GS-HCAL (Lihengne, Guofangyi) --10P 80%--60%
- 8.3 The Glass Scintillator (Renjing, Huazhehao) --10P 80%--70%
- 8.4 The SiPM (Xieyuguang, Hanjifeng) --8P 80%
- 8.5 The Electronics & DAQ (Changjinfan, Lifei)--1P--2P
- 8.6 The Mechanics (Peiyantian, Shangbofeng) --10P 80%
- 8.7 The Detector Layout (Yuboxiang, Zhangyonglong) --5P 80%
- 8.8 The Backup Design --10P (ready! )
  - 8.8.1 Semi-Digital HCAL based on RPC (SDHCAL) (Yanghaijun) -5
  - 8.8.2 Analogue HCAL based on plastic scintillator (PS-HCAL) (Liu Jianbei) -5

# Backup

# The Manpower of the HCAL

## ■ 1. The PS-HCAL

- Jianbei Liu, Haijun Yang, Boxiang Yu, Yunlong Zhang, .....,

## ■ 2. The GS-HCAL : Sen Qian (IHEP)

- Sub-system: 2 Conveners + others
- Physics: Manqi Ruan(IHEP), Haijun Yang(SJU),
- Software: Sengsen Sun(IHEP);
- Design: Fangyi Guo(IHEP), Hengne Li(SCNU),
- Glass Scintillator: Sen Qian(IHEP), Jing Ren(HEU), the GS collaboration Group
- SiPM: Yuguang Xie(IHEP), Jifeng Han(SCU),
- Electronics: Jingfan Chang(IHEP),
- DAQ: Chen Boping(IHEP),
- Mechanics: Yatian Pei(IHEP), Junsong Zhang
- Detector: Boxiang Yu(IHEP), Yunlong Zhang (USTC),

# The Manpower of the subsystem of GSHCAL

**Physics:** Manqi Ruan(IHEP), Haijun Yang (SJTU) ,

**Software:** Sengsen Sun(IHEP);

**Design:** Fangyi Guo(IHEP), Hengne Li(SCNU), Qingming Zhang(XJTU), Weizheng Song(IHEP), Peng Hu(261)

Dejing Du(IHEP), Hongbing Diao(SUTC), Jiyuan Chen(SJTU), .....

--to design the GS-HCAL detector based on the CEPCSW;

**Glass Scintillator:** Sen Qian(IHEP), Jing Ren(HEU), the GS collaboration Group;

--R&D of the GS for CEPC-HCAL, a special group independent of CEPC;

**SiPM:** Yuguang Xie(IHEP), Jifeng Han(SCU), Guang Luo(SYSU),

--to do the research of SiPM for CEPC-HCAL, the electronics of SiPM for the GS performance test;

**Electronics:** Jingfan Chang(IHEP),

--to design the ASIC and FEE for CEPC-HCAL; the power supply, the cables and so on;

**DAQ:** Chen Boping(IHEP),

**Mechanics:** Yatian Pei(IHEP), Junsong Zhang(IHEP), Shang Bofeng(ZZU)

--to design the Mechanics of the GS-CEPC-HCAL; also the cell, the module, the cooling system;

**Detector:** Boxiang Yu(IHEP), Yunlong Zhang (USTC)

--to study the module of the GS-HCAL with GS and SiPM, the cosmic ray test, the beam test;