



復旦大學

Status of Muon Detector R&D

XIAOLONGWANG

FOR MUON GROUP

FUDAN UNIVERSITY

REF TDR MEETING, 06/25/2024

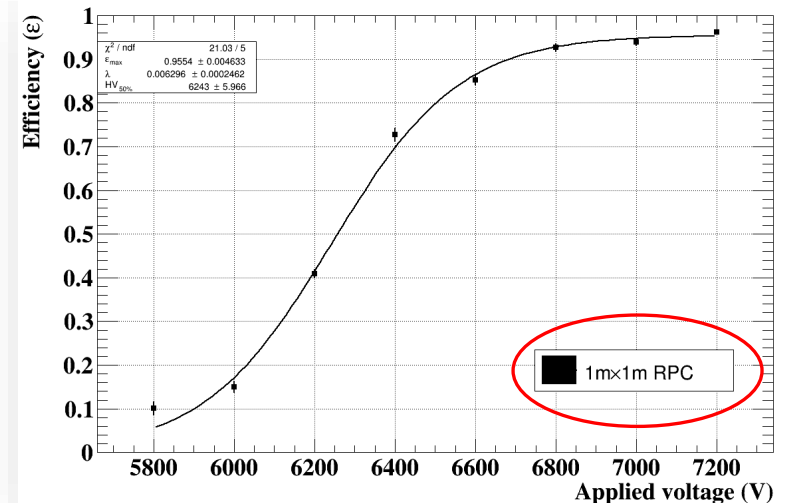
Activities

Scintillator strips:

- Manufacture of scintillator: Ongoing
- Purchasing fibre: not yet, but we still have some
- Mechanics: design almost ready
- Simulation and software: manpower enhanced; still some bugs, but going to be fixed soon
- FEE: ready
- BEE: ??

RPC:

- Testing ongoing.
- Still have some manpower problem



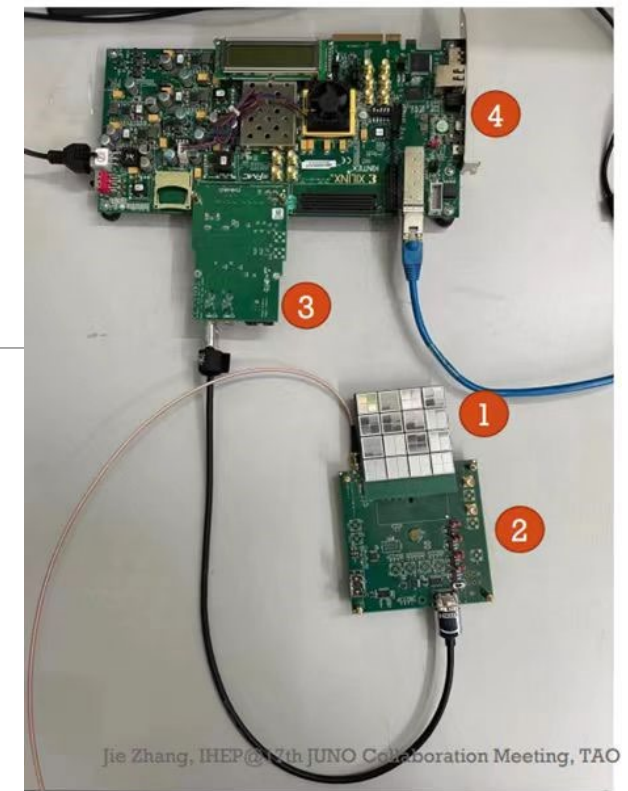
Problems

Problem 1: budget

We need budget for purchasing materials: scintillator, SiPMs, fibres, electronics.

Problem 2: BEE/DAQ

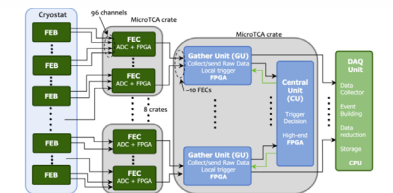
- Option A: purchase CAEN modules
- Option B: try the (backup) design for JUNO-TAO?



Jie Zhang, IHEP@12th JUNO Collaboration Meeting, TAO

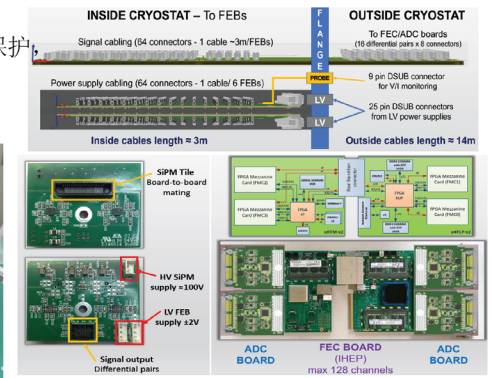
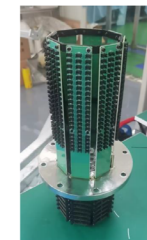
2. SiPM 电子学 (by INFN, ROMA-TRE-U)

- 最终方案: SiPM+FEB+FEC+(GU+CU)+TDAQ (CD)
- 2chs/单元, 共8048chs, 噪声<0.1 p.e.; 时间分辨<1ns.
- ADC: 250MHz/12bit, 2Vpp, 动态范围:1 - 180 p.e./ch
- 数据率: FEC→TDAQ: ~70 Gbps, TDAQ→Disk: ~100 Mbps
- 约100套FEB完成模型实验。全部FEB和ADC板7月前完成(更换低放射性器件和连接器)。FEB表面涂环氧胶保护。
- 线缆:罐内差分模拟读出, 1.5 ~ 3.5 m三种长度, PTFE保护, 外部线缆长度~14m。
- 除了部分芯片和器件, 大部分均为国产。



低放射性PCB(<0.25Bq/kg) 制作FEB

后端电子学架构详见9日电子学会张杰报告。

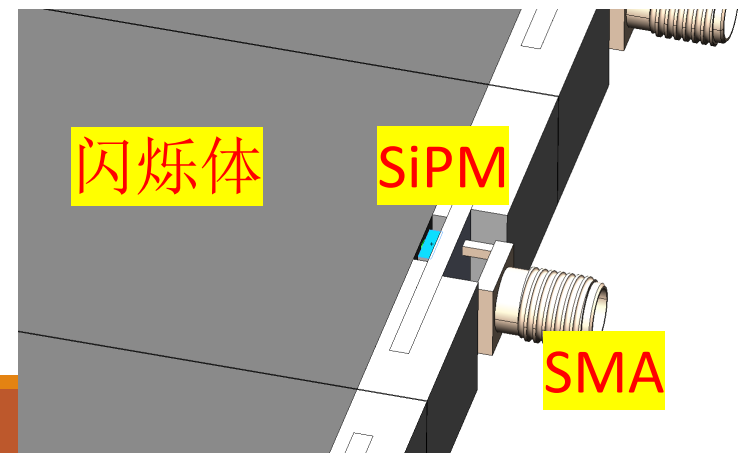
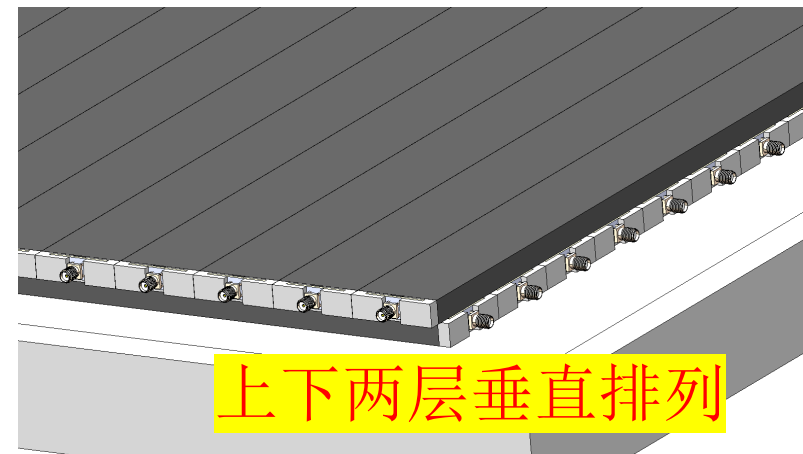
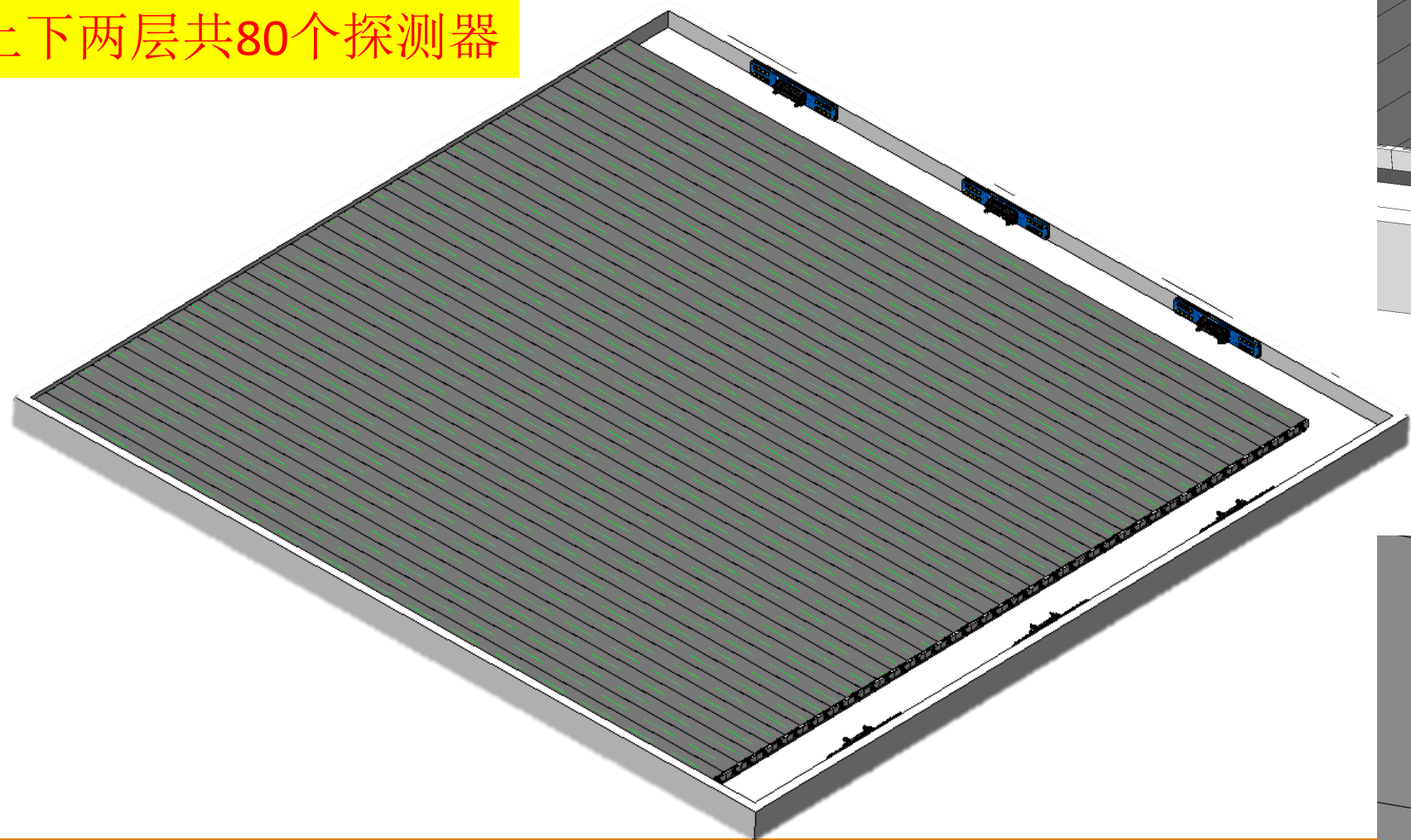


backup

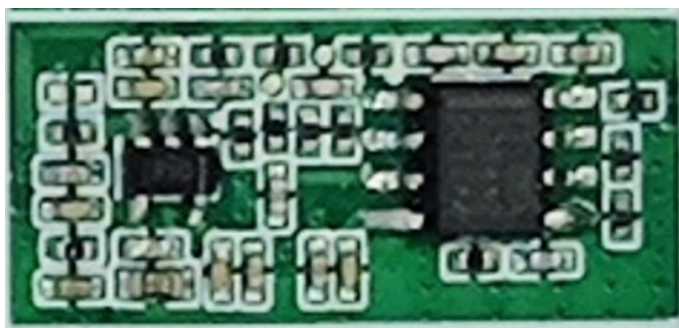
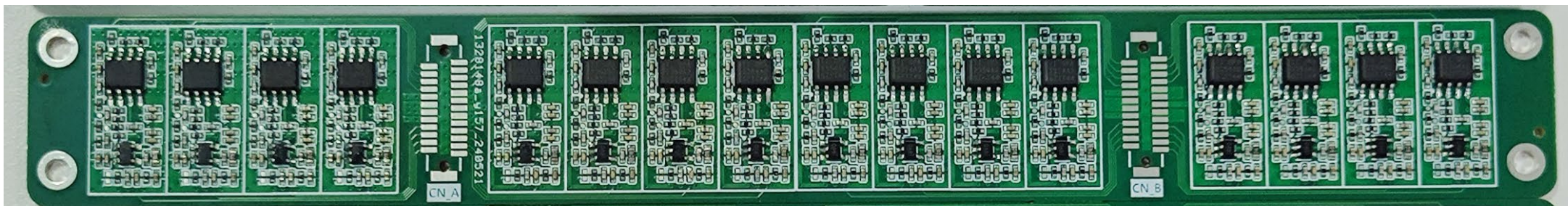


CEPC缪子探测器原型机

每层包含40条闪烁体
上下两层共80个探测器



前放的改进：尽量国产器件



德州仪器

 TEXAS INSTRUMENTS

OPA354+OPA2354 : 12¥ /ch

思瑞浦(国产)

 3PEAK

TPH2501+TPH2502 : 4¥ /ch

 TEXAS INSTRUMENTS

1 Features

- Unity-Gain Bandwidth: 250 MHz
- Wide Bandwidth: 100-MHz GBW
- High Slew Rate: 150 V/ μ s
- Low Noise: 6.5 nV/ $\sqrt{\text{Hz}}$
- Rail-to-Rail I/O
- High Output Current: > 100 mA
- Excellent Video Performance:
 - Differential Gain: 0.02%, Differential Phase: 0.09°
 - 0.1-dB Gain Flatness: 40 MHz
- Low Input Bias Current: 3 pA
- Quiescent Current: 4.9 mA
- Thermal Shutdown
- Supply Range: 2.5 V to 5.5 V
- *Micro*SIZE and PowerPAD™ Packages

 3PEAK

Features

- Unity-Gain Bandwidth: 250MHz
- Gain Bandwidth Product: 120MHz
- High Slew Rate: 180V/ μ s
- Offset Voltage: 500 μ V Max.
- Low Noise: 6.5nV/ $\sqrt{\text{Hz}}$
- Rail-to-Rail Input and Output
- High Output Current: > 100mA
- Excellent Video Performance:
 - Diff Gain: 0.02%, Diff Phase: 0.3°
 - 0.1dB Gain Flatness: 25MHz
- Low Input Bias Current: 0.3pA
- Thermal Shutdown
- Supply Range: 2.5V to 5.5V
- Operating Temperature Range: -40°C to 125°C