Overview of SciFi Power & Cabling

A. Pellegrino on behalf of SciFi group, 19-2-2015

o **introduction**

o **FE Power requirements & cabling**

o **SiPM bias**

o **data fibers**

Introduction to SciFi Talks

o Overview of SciFi Reports:

    o power, electronics, cables [*this talk*, A. Pellegrino, Session I]

    o cooling, pipes, etc. [B. Verlaat, Session II]

    o dismantling, integration, installation [R. Walet, Session III]

Before going into those details, in this 1st talk a short intro

    o **LHCb SciFi Overview**

    o **SciFi tracking stations**

    o **C-Frames**

    o **Modules**
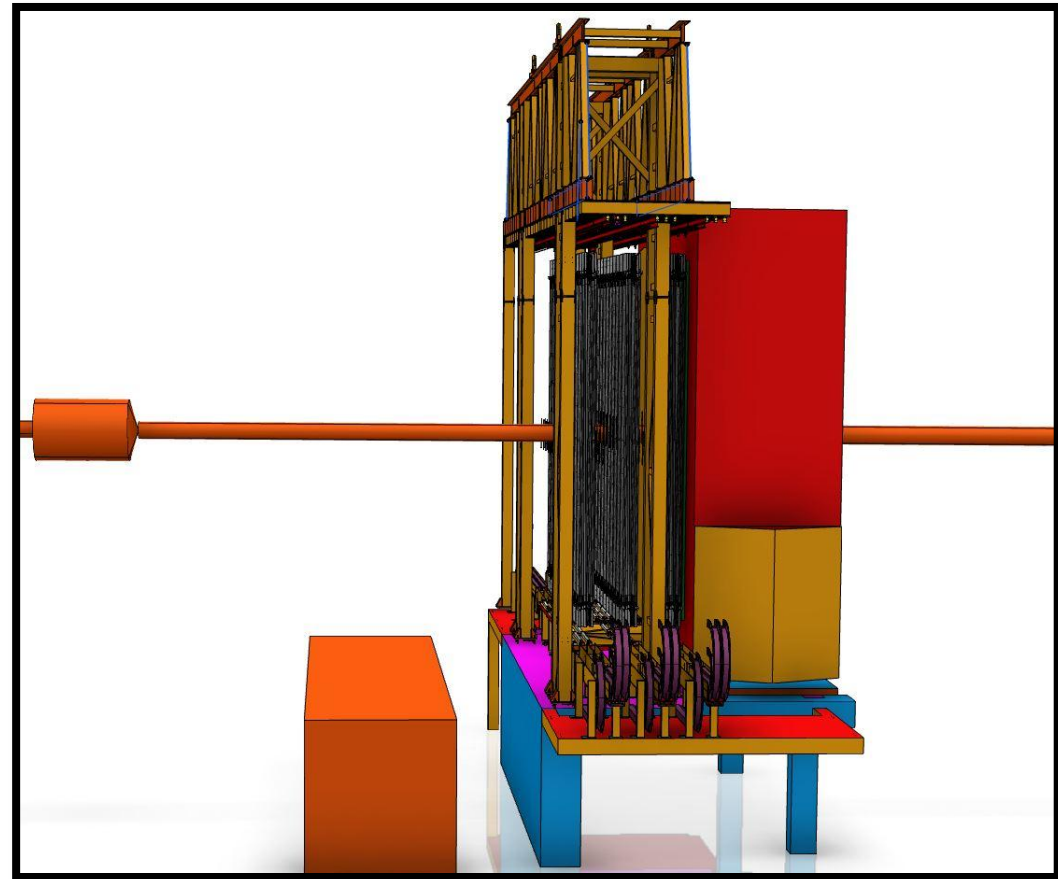
    o **Read-out Box**
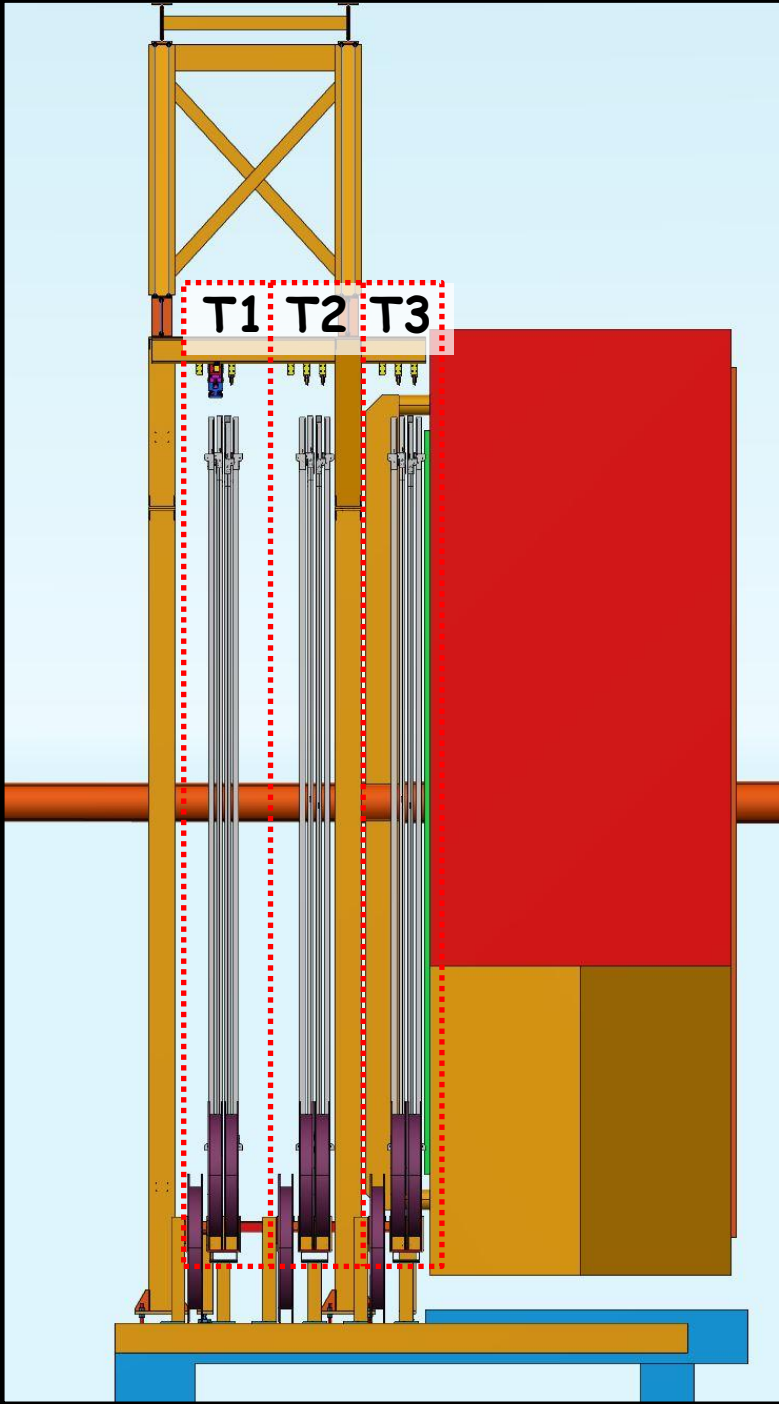
SciFi Overview

5 [m]
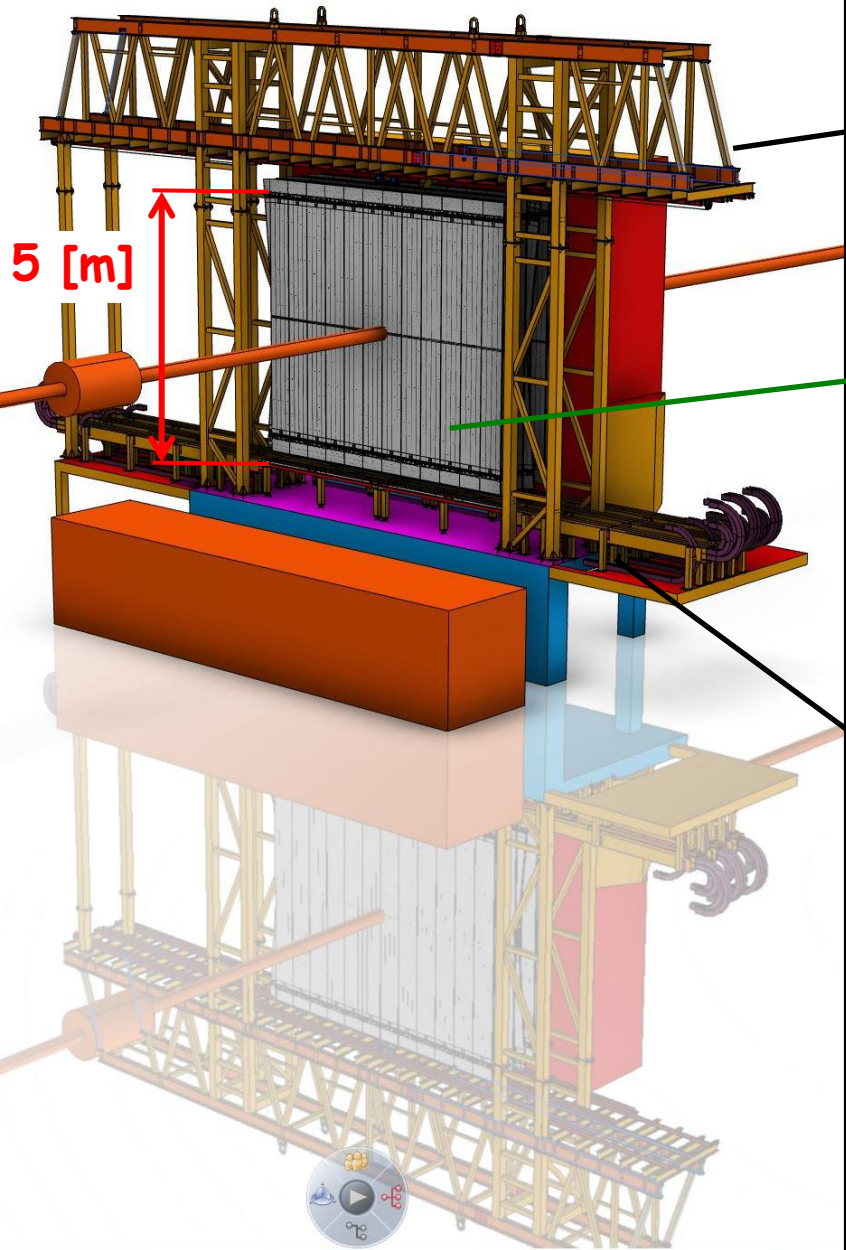
RE-USE:Bridge

○NEW
- ○ C-Frames
- ○ Detector
- ○ Cable tray
- ○ Etc.

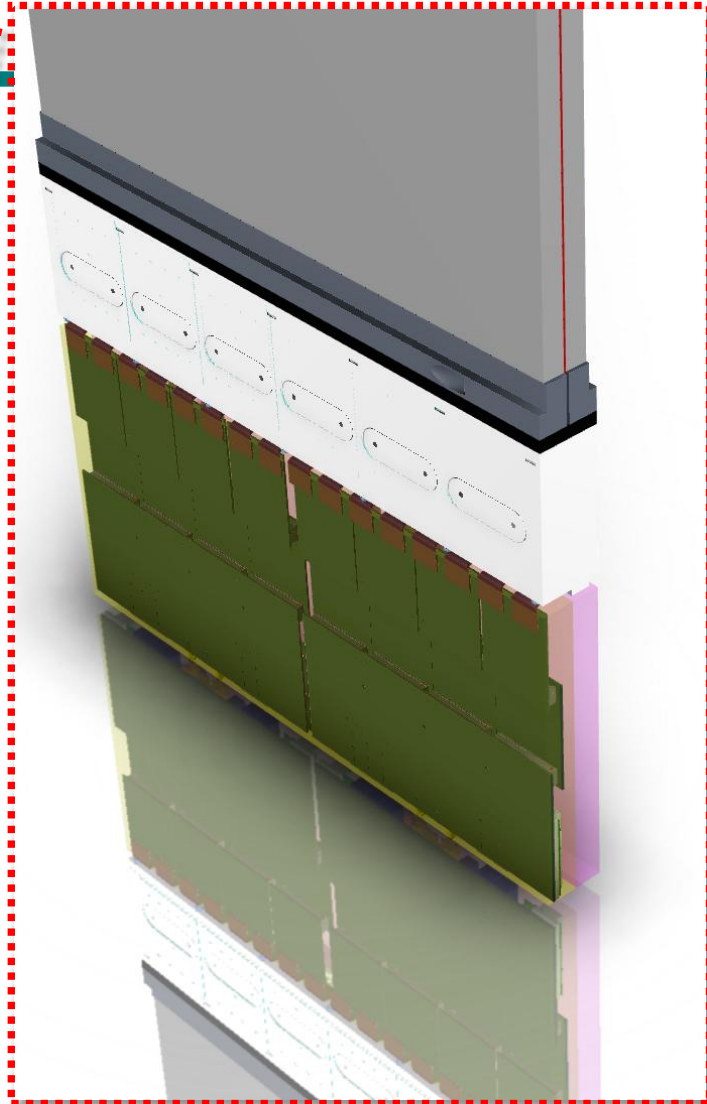RE-USE: Table

T1 T2 T3

3 tracking stations T1, T2, T3

C-Frames
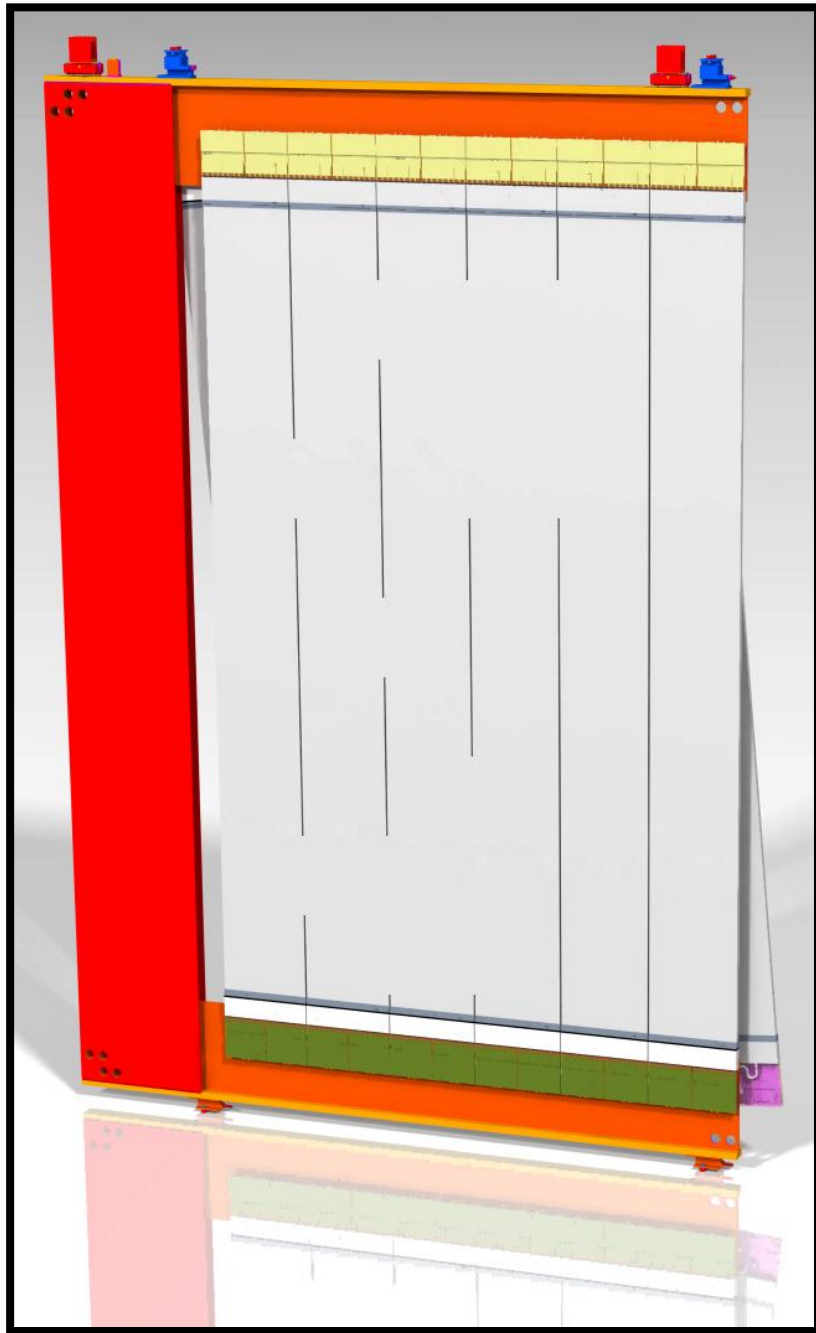
12 C-Frames

(4 C-frames per station, 2 per side A/C)

12 modules per C-Frames

**Every module contains
two Read-out Boxes (ROB)**

Readout Box (ROB)

two ROB's per module

FE Electronics

Coldbox

Module- panel

FE Electronics

Coldbox topcover

Coldbox Enclosure

Module- panel
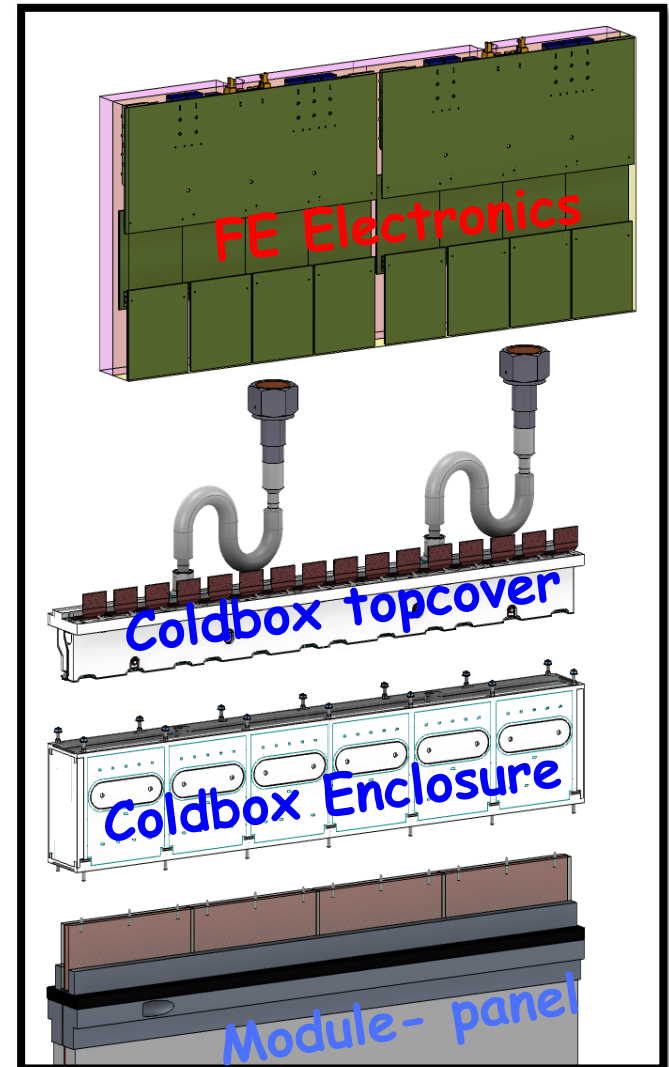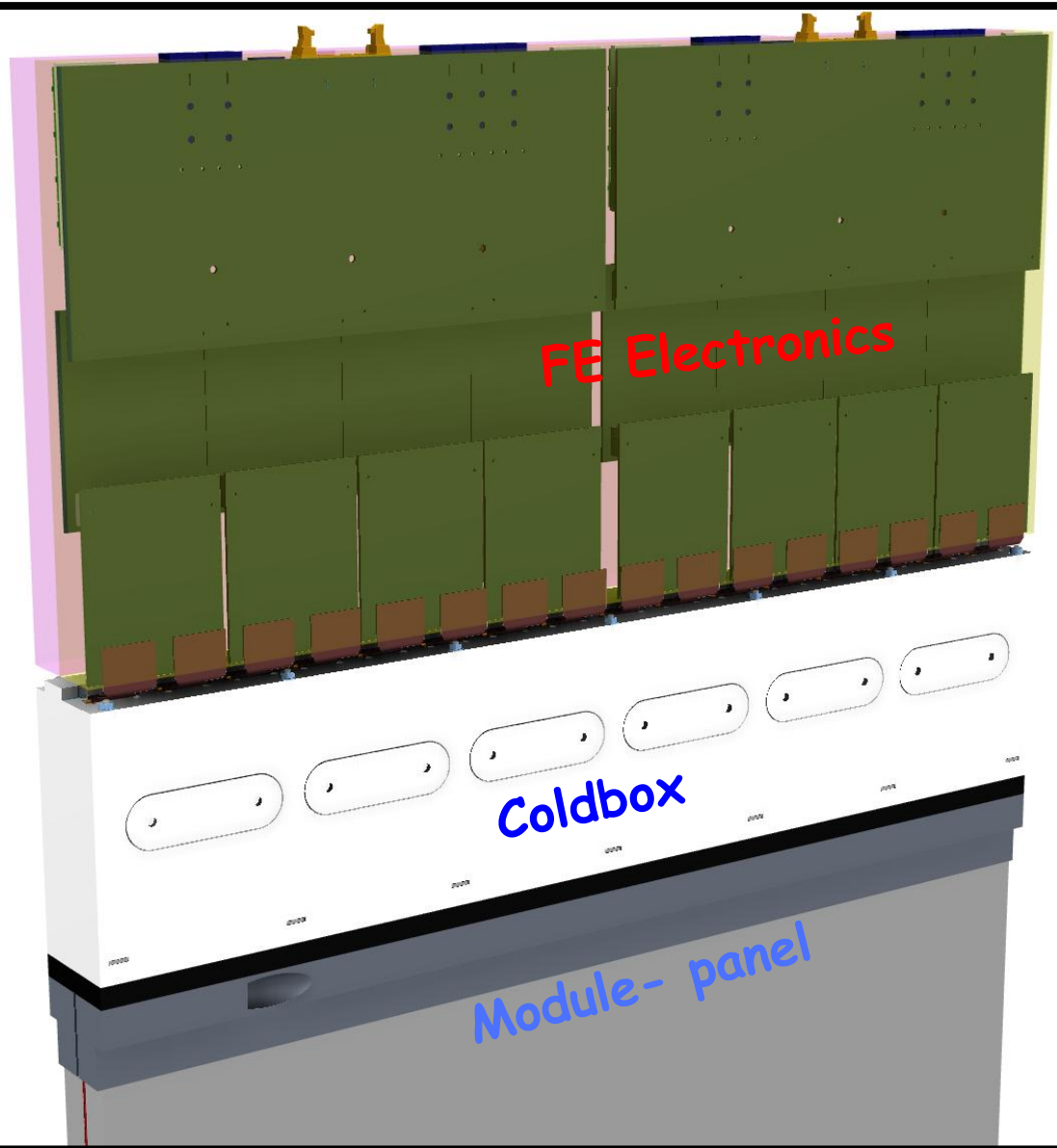
To give you an idea...

- o **Module**
  - **Interfaces/boundaries defined and agreed upon**
  - **work on tooling and prototypes (EDR in June)**
- o **Read-out Box**
  - **Prototype design ready**
  - **Industry contacted, collecting quoted offers**
  - **Detailed test plan being worked on**
  - **FE electronics prototype ready by June**

We concentrated on this until now

- o **Cooling**
  - **Serial vs Parallel cooling analyzed**
  - **Parallel cooling preferred**
  - **New calculations and system design in progress**
- o **Cabling**
  - **overview presented at this workshop**
- o **Infrastructure**
  - **started working on C-Frame and infrastructure design**

Starting working on this
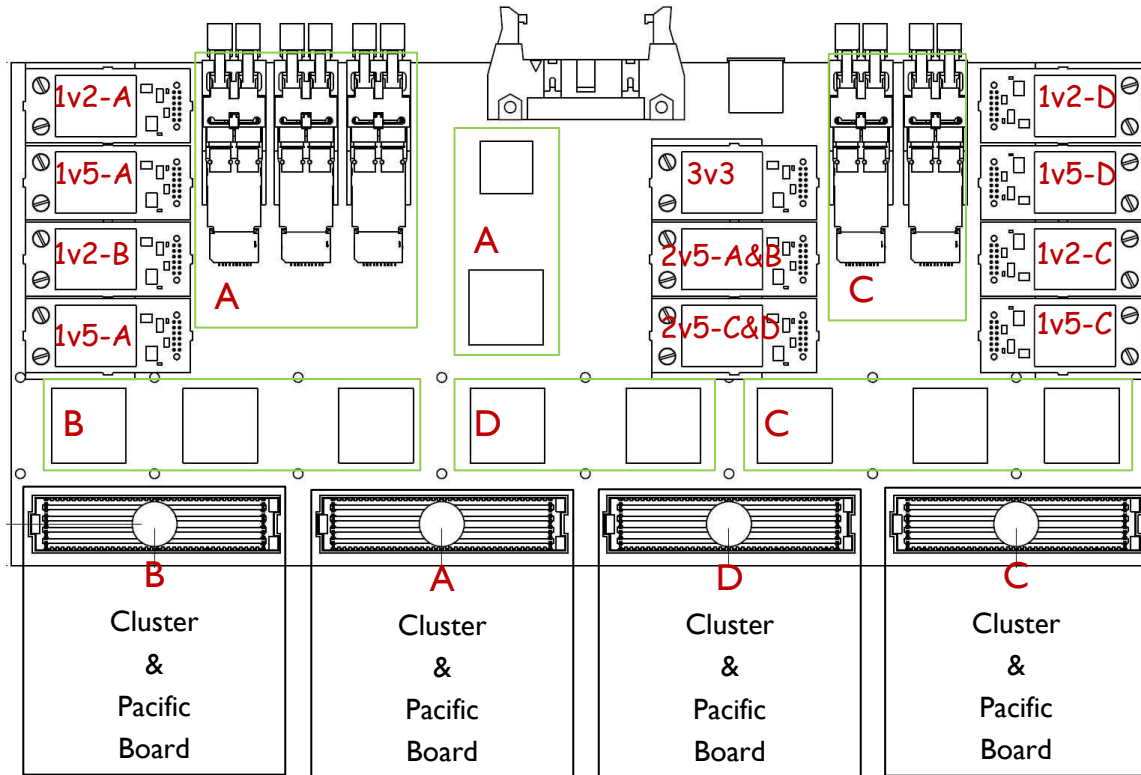
Power & Cabling

o **Overview of SciFi Reports:**

> o power, electronics, cables [*this talk*, A. Pellegrino, Session I]

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FE Bias

Several DC-DCs on FE

**power consumption per ROB estimated ~90 W
with 10% safety factor : ~100W**

(details on Wilco's presentation 8 Dec 2014)

Power → FE

6 FE

Shielding Wall

LV distr box
1 Maraton → 2 FEs

24 × 10mm² per quadrant (0.13V drop)
SCEM 04.08.61.305.2

12 × 35mm² per C-Frame

12 × 35mm² per C-Frame
SCEM 04.08.61.370.3

12 rectifiers

12 power boxes, 6 per side

1 FE : ≈ 90 W

1 Maraton ch. → 2 FEs

200 W including power loss (~67% of max)

4 cables [2×(0,6V)] per FE

Total

144 channels V : ~30 kW

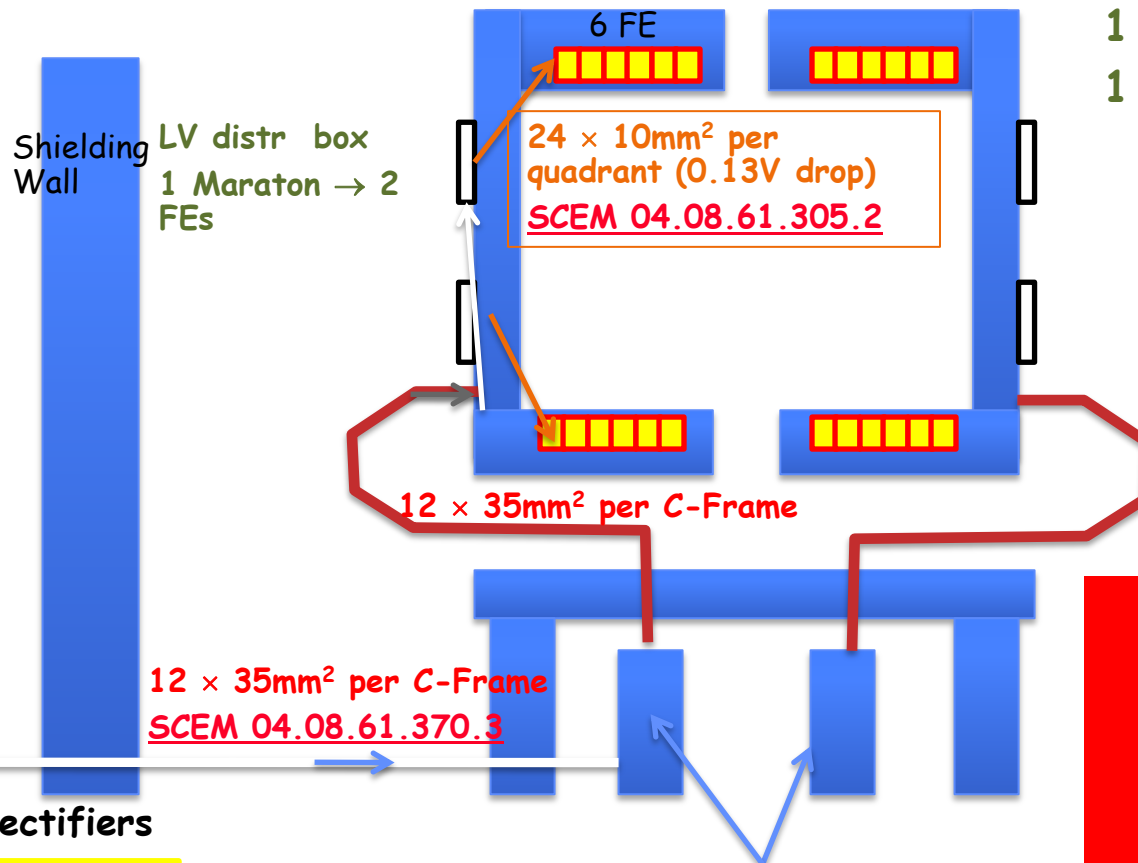12 Maraton's

Comparison with OT

# of Maraton's : 6 → 12

2× volume of cables in rolling ducts
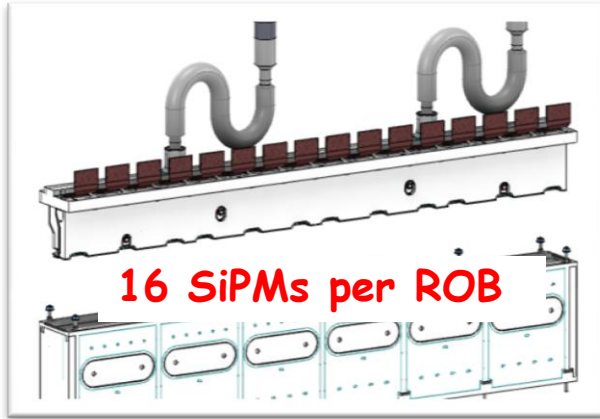
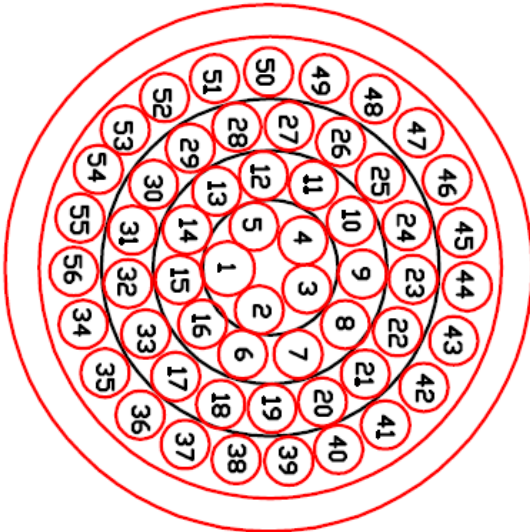2.7× volume of cables from distribution box to FEs

10

Power → SiPM

Caen A1539P Module, DB25 Multipin

16 SiPMs per ROB

supply-to-C-Frame will probably go via multi-wire common-shield cables e.g. SCEM 04.31.52.100.5 - CABLE HT 56X0.14MM2 3KV

4 SiPMs per channel

~55 V × 10 mA

1152 channels + spares

(OT: 224 ch., 8×A1733BPLC, 3 mA)

jumpers to exclude faulty groups of 64 ch

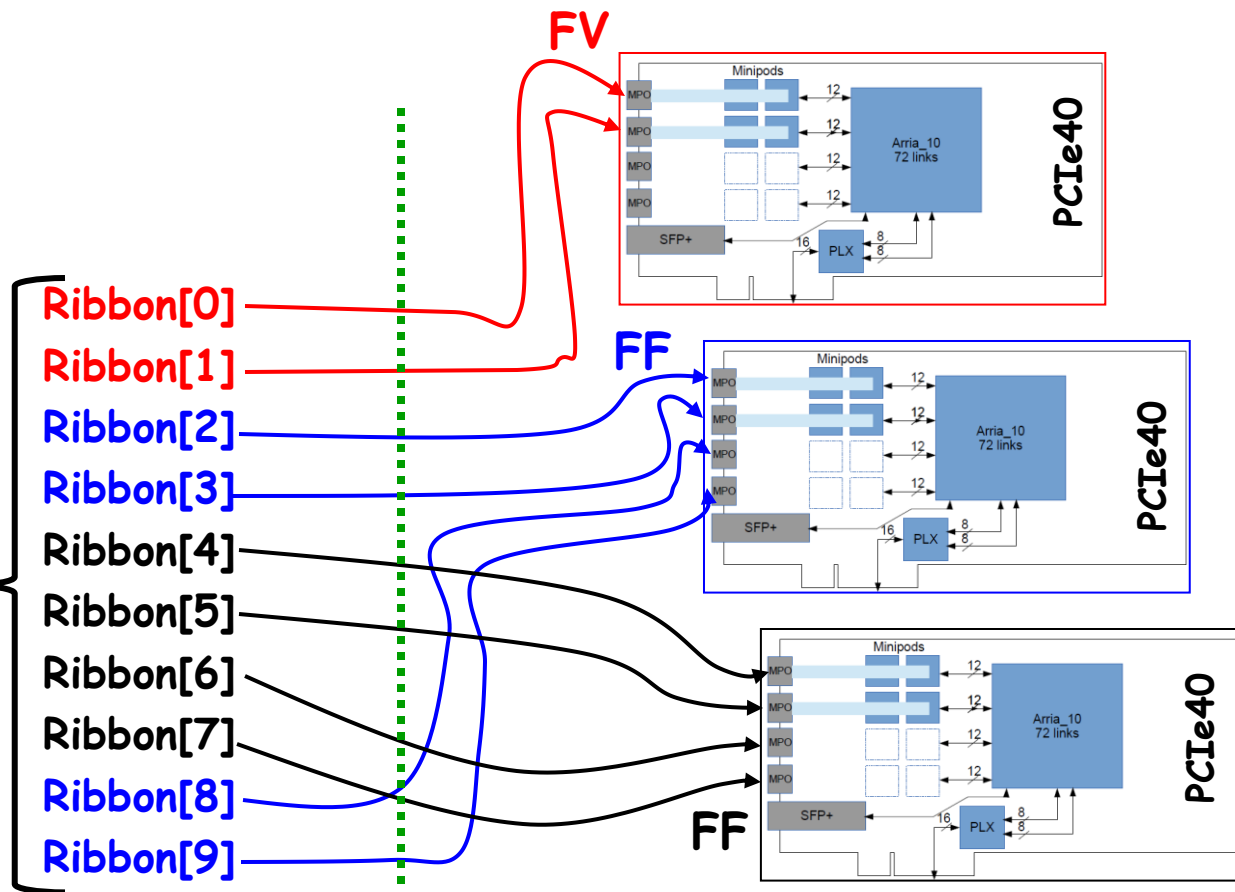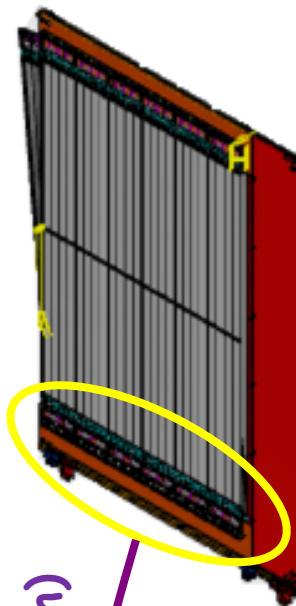*(OT: 1→8 patch, can exclude 32ch groups)*

Data Fibers

still under discussion, but it could look something like this *(neglecting control fibers)*

- **40 ribbons per C-Frames (10 per quadrant)**
- **240 ribbons per side A/C**
- **# of trunks depends on patching and spares (max 48)**

10 ribbons per quadrant (min. 2 spares per ribbon)

FV

Ribbon[0]
Ribbon[1]
Ribbon[2]
Ribbon[3]
Ribbon[4]
Ribbon[5]
Ribbon[6]
Ribbon[7]
Ribbon[8]
Ribbon[9]

FF

FF

Minipods
MPO
MPO
MPO
MPO
SFP+
PLX
Arria_10 72 links
PCIe40

Patch Panels

○ **_OT_**

▪ *data and control fibers patched 3 times:*
  - *at C-Frame, under the bunker, in counting room*

▪ *HV cables only patched in counting house and C-Frame*
  - *patch panel 1→8 in counting room (with manual jumpers)*

▪ *LV only patched at C-Frame (power supply under bunker)*

○ **for SciFi we naively expect**

▪ **data and ctrl fibers patched 3 times:**
  - **at C-Frame, under the bunker, in counting room**

▪ **SiPM bias distribution to be defined**
  - **patch panel 1→4 (with jumpers)**

▪ **LV only patched at C-Frame (power supply under bunker)**

Outlook & Open Issues

- *wrt OT: more cables to FE, more cables to SiPMs, more data fibers*

- **implications for SciFi C-Frames**
  - **more and/or larger rolling ducts**
  - **larger patch panels on C-Frame**

- **larger amount of long-distance cables**
- **larger amount of racks in D3**
- **define patch panels under the bunker**
- **define patch panels in counting room**

- **define time scale of long-distance wrt rolling ducts filling**

- **cable database?**
  - **ready to use before/during cable installation?**