

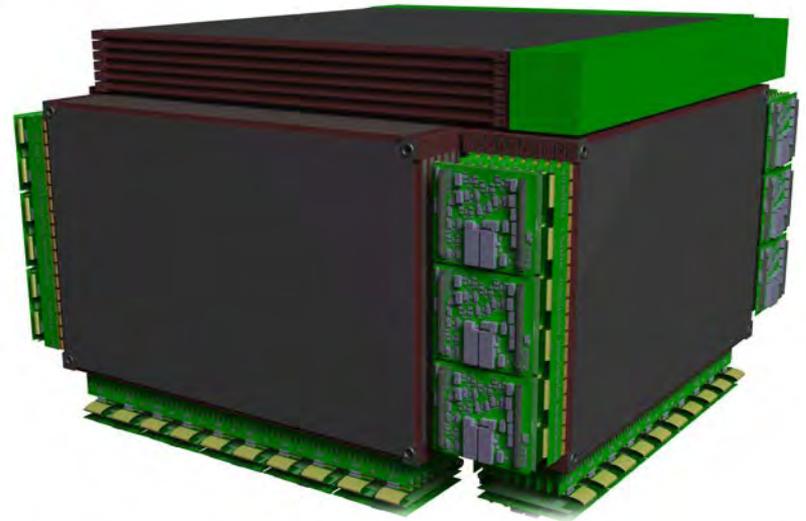
FIT Hardware Activities

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X. Wu

HERD 9th international WORKSHOP

23rd February 2021

Updates from 23rd July 2020



UNIVERSITÉ
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EPFL

New collaborator



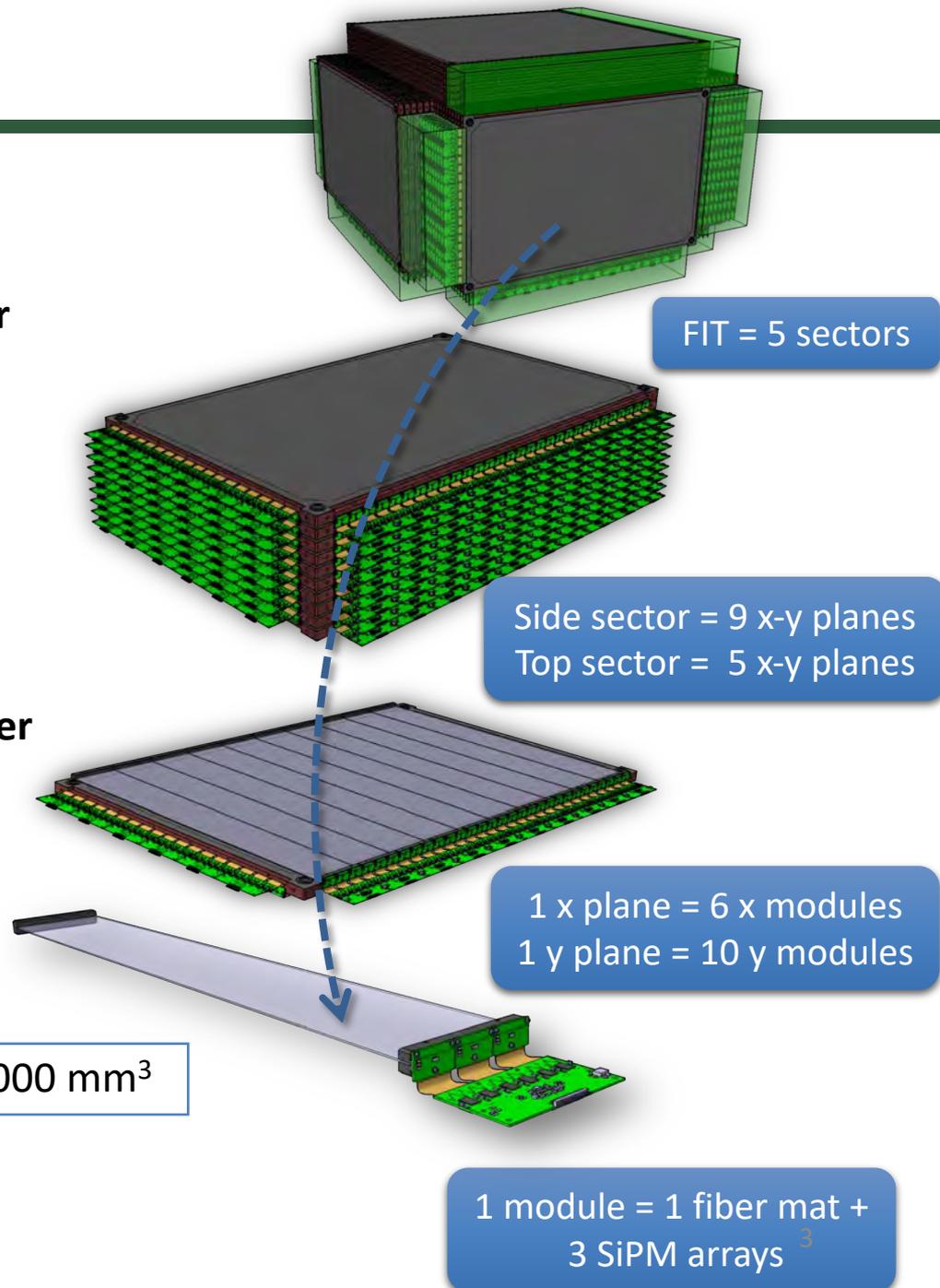
Jennifer FRIEDEN

PhD student
since February 15, 2021



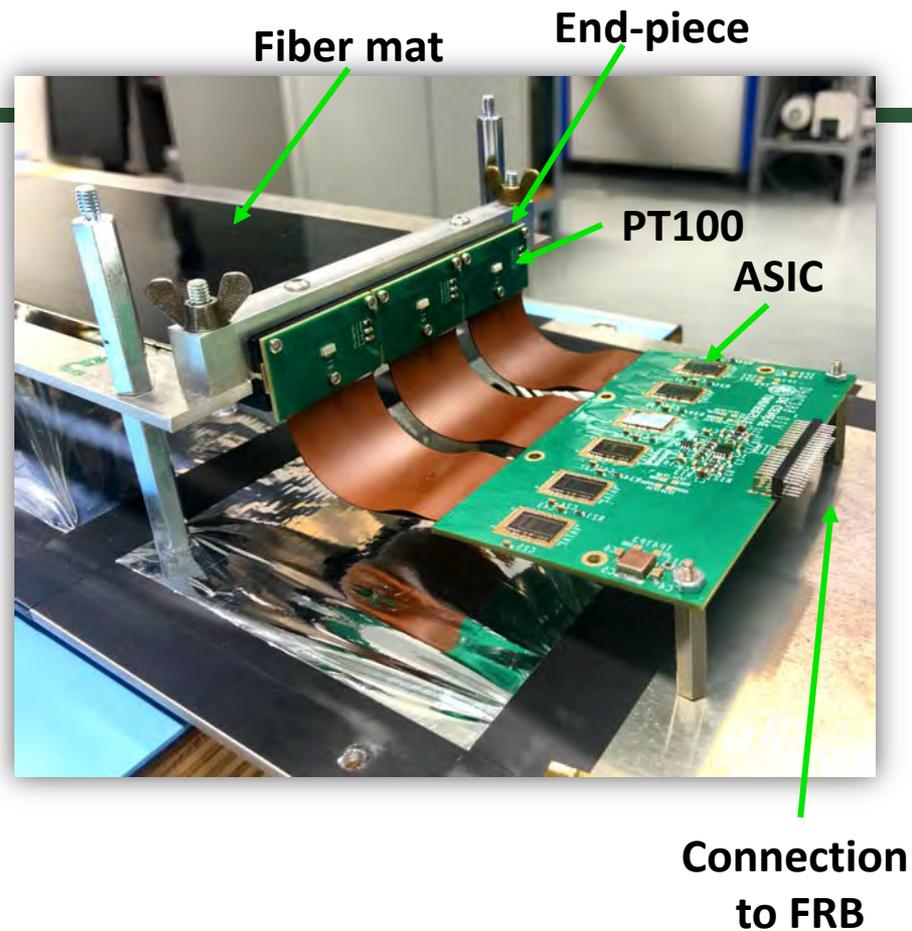
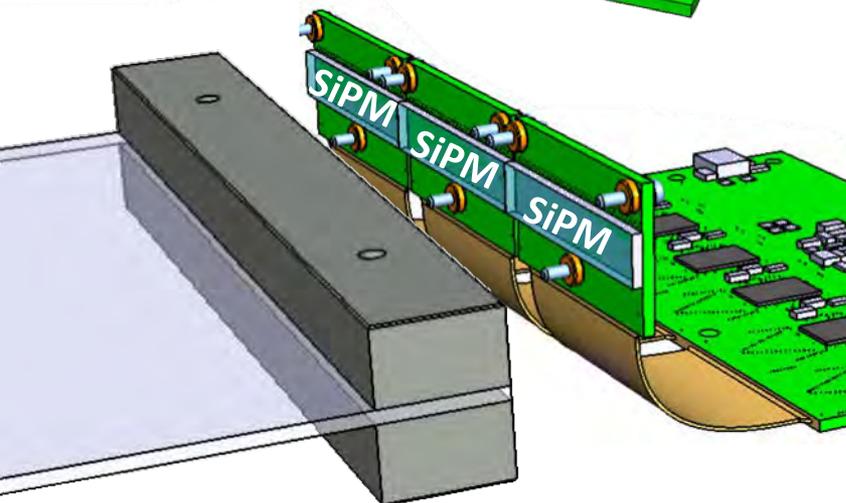
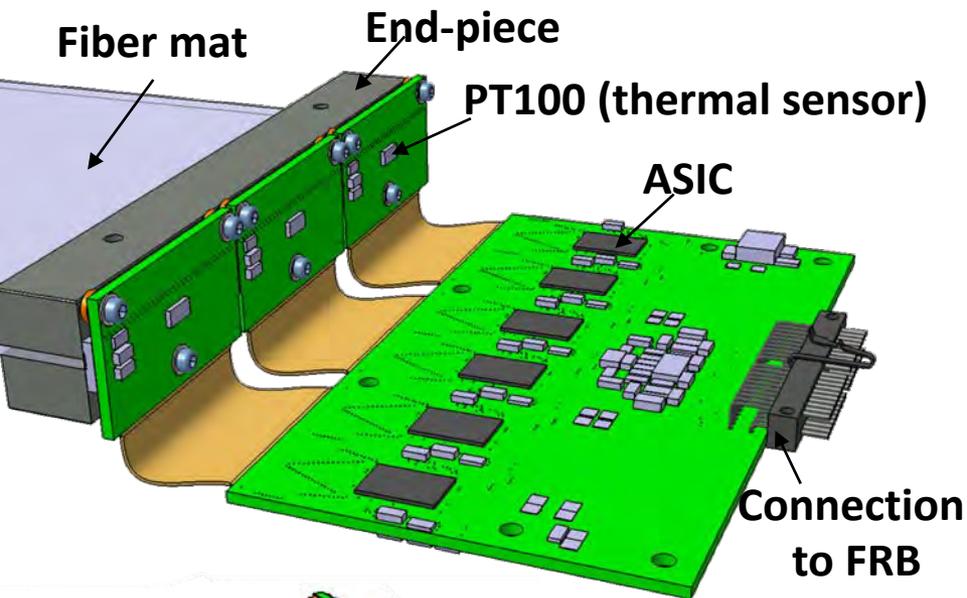
FIT: Fiber Tracker

- 4 identical **side sectors** + 1 **top sector**
 - 9 **x-y planes** in each side sector
 - 5 **x-y planes** in the top sector
- 6 **x modules** (106 cm fiber length) in each x plane
- 10 **y modules** (77 cm fiber length) in each y plane
- 1 **fiber mat** + 3 **silicon photomultiplier (SiPM) arrays**



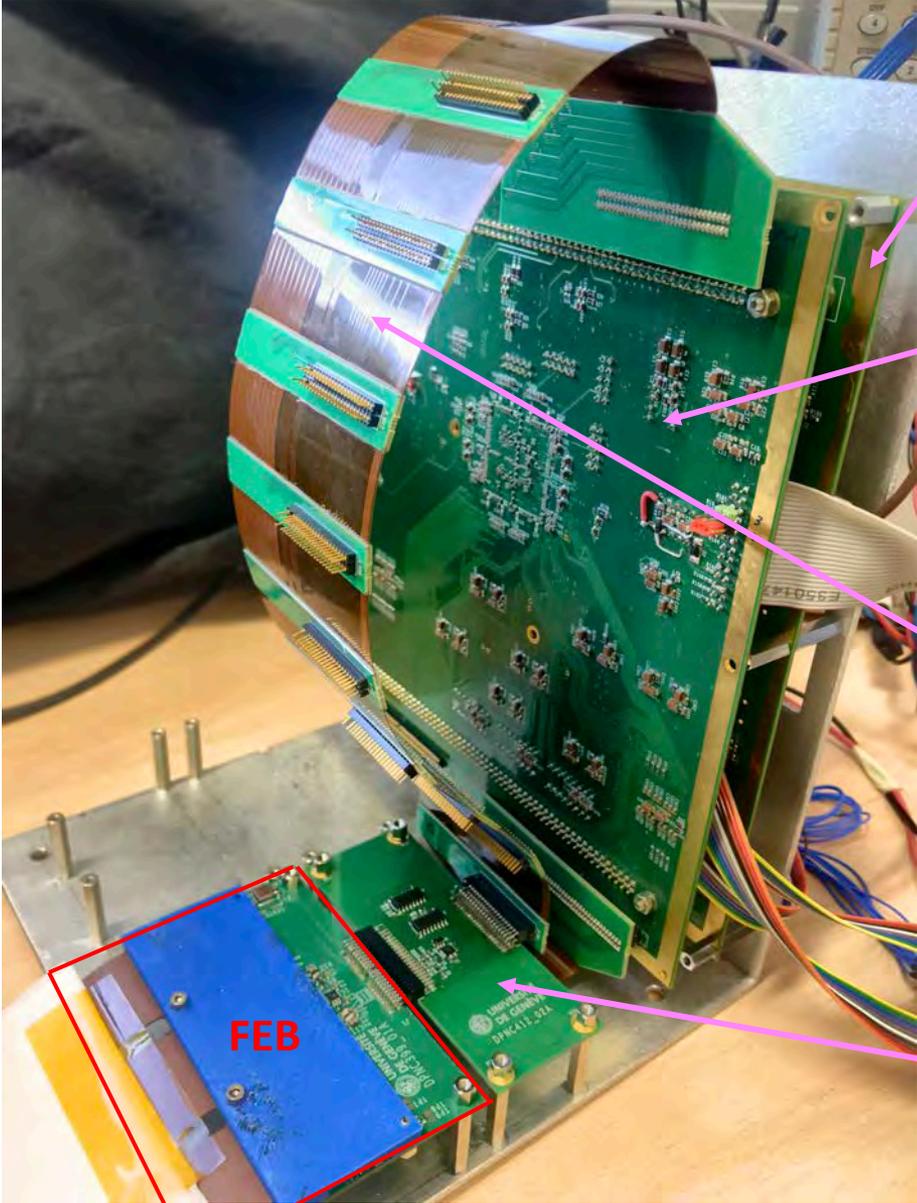
Overall dimensions: $\sim 1475 \times 1475 \times 1000 \text{ mm}^3$

Front-end board (FEB)



- The present design uses six **VATA64HDR16.2** ASICs → **BETA (β)** ASICs.
- Power consumption: **9 mW/ch** → **0.3 mW/ch**.

FIT read-out board (FRB)



FRB power board for the power supply distribution

FRB logic board for the DAQ and communication with higher levels of DAQ

Flex for interconnection with 9 FEBs

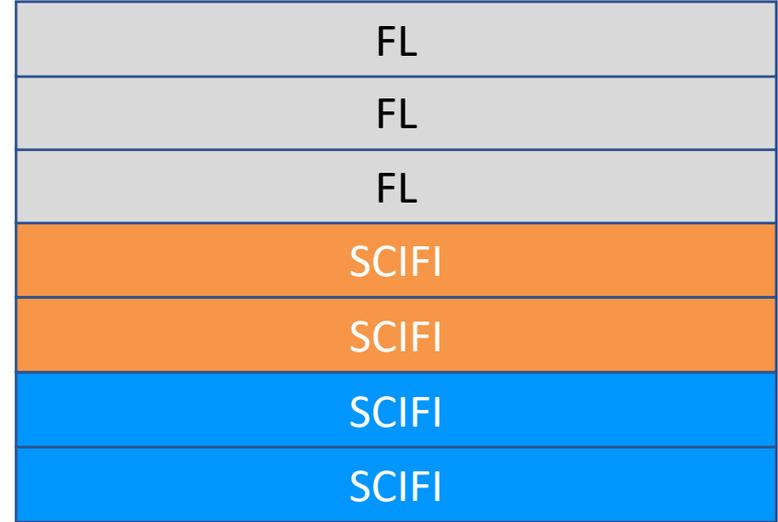
ADC board

FEB

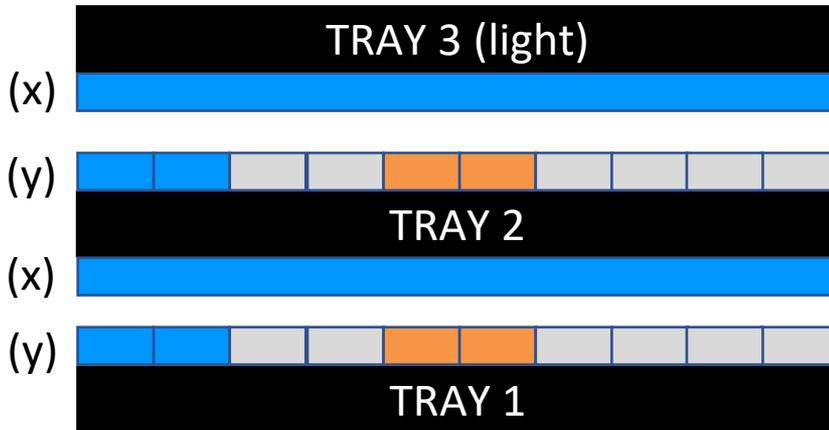
Closest goal: "Proto FIT"



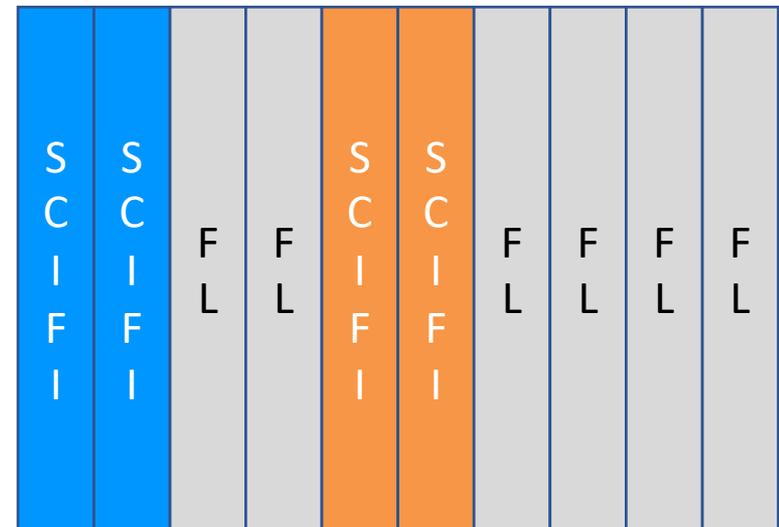
(x)
4/7



SCIFI = scintillating fiber
FL = fishing line



(y)
4/10



- 3 support trays
- 8 short SCIFI mats + 8 long SCIFI mats
- 12 short FL mats + 6 long FL mats

All trays and all mats ready

Dry assembly of mats on the tray



TRAY:
0.6 mm (Trays 1-2) or 0.3 mm (Tray 3)
sheets of carbon fiber reinforced
polymer (CFRP)
&
20 mm thick core of aluminum
honeycomb

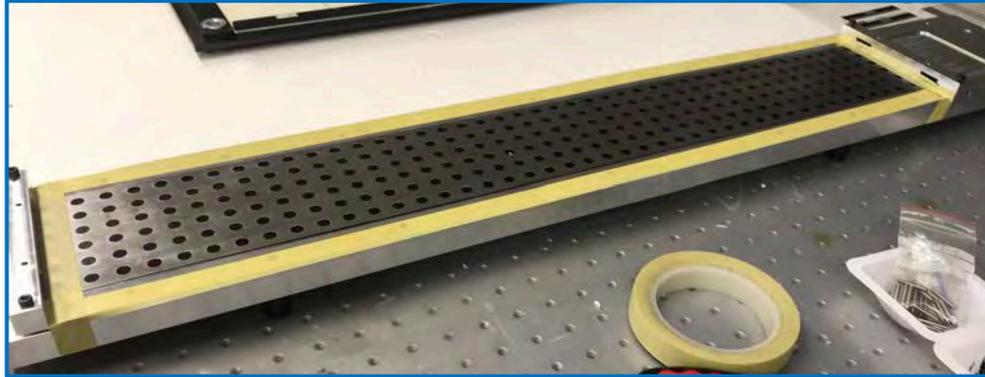
Trays 1-2: 4.1 kg; Tray 3: 3.5 kg.

- ✓ Smart Hammer Tests (SHTs) on the trays
- ✓ Post curing & Thermal cycling on the trays
- ✓ SHTs

- ✓ Mat polishing
- ✓ Fiber test with LEDs
- ✓ **Gluing of mats on the trays**
- ✓ Metrology and SHTs on equipped trays
- ✓ Thermal cycling of equipped trays
- ✓ Metrology

- Fiber test with LEDs
- Tray assembly

Gluing of mats on the trays



Gluing mask for SHORT MATS

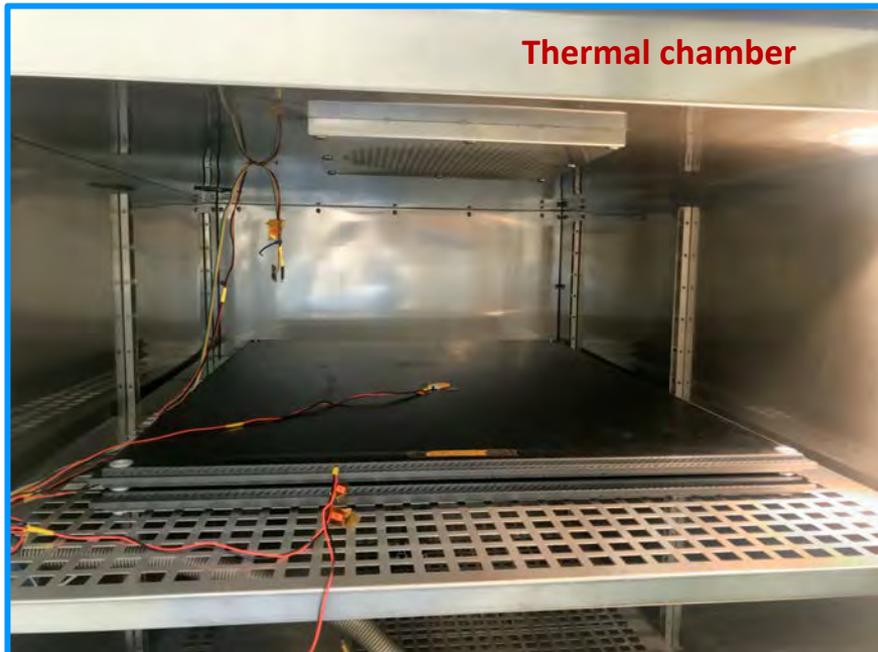


TRAY 2: drying of the two last SCIFI mats

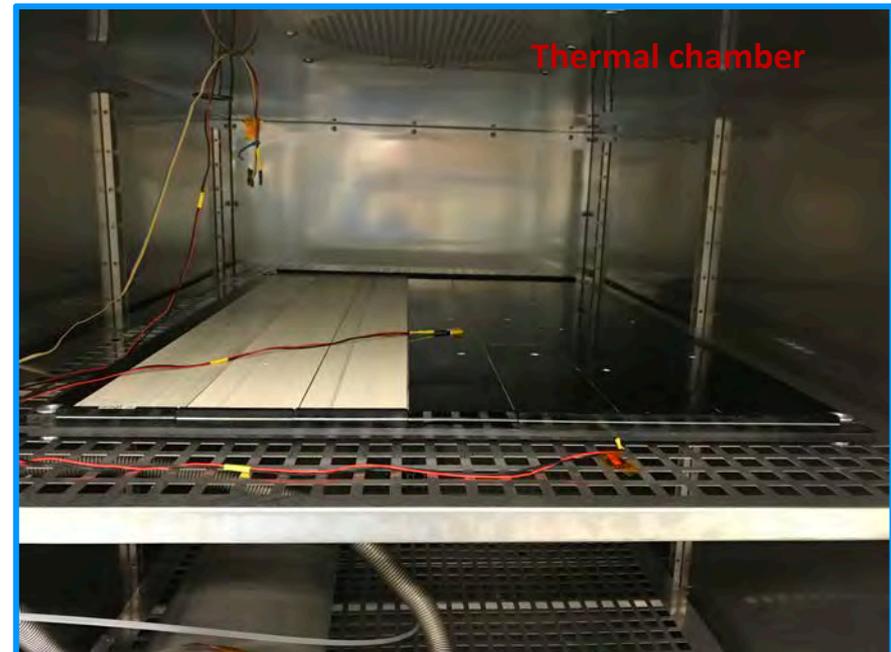
Thermal cycling

Setup at the University of Geneva:

- **Thermal chamber**
 - Post curing: 24 hours at 60 °C;
 - 5 cycles between 50 °C and -10 °C;
 - 5 cycles between 60 °C and -30 °C (not for TRAY 3).



TRAY 2&3: post curing



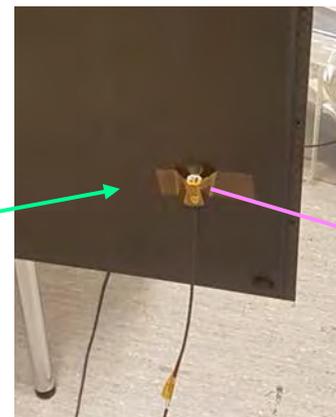
EQUIPPED TRAY 3: cycles

Smart hammer test



First eigenfrequencies (Tray 1 @Corner)

First measurement (Hz)	After cycling (5 cycles 50 C, - 10 C) (Hz)	After curing (24 h at 60 C) (Hz)	After 2nd cycling (5 cycles 60 C, - 30 C) (Hz)	Equipped (Hz)
116	114	114	114	101
158	157	157	157	141
274	270	270	269	239
351	348	348	348	304



Accelerometer

Corner

Vibration & thermal-vacuum tests in Bern (CH)



Shaker Ling 2016 vertical



Horizontal with TGT 7100 30H slip table

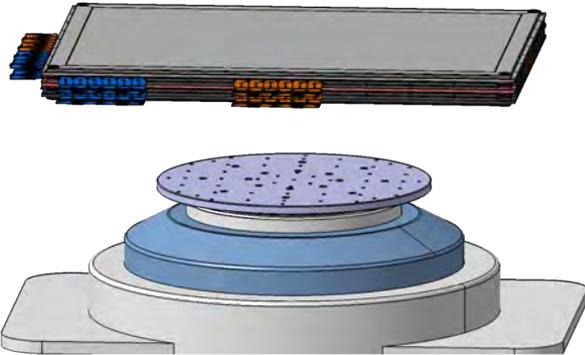


Cheops thermal vacuum test facility

University of Bern
Physics institute
Space research & planetology
Sidlerstrasse 5, 3012 Bern



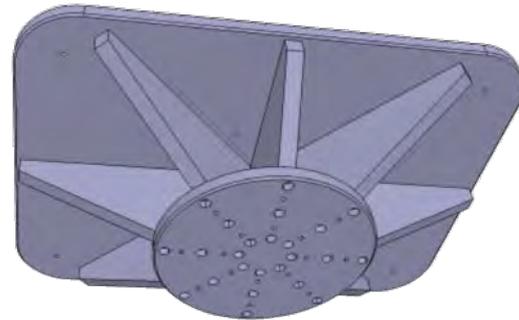
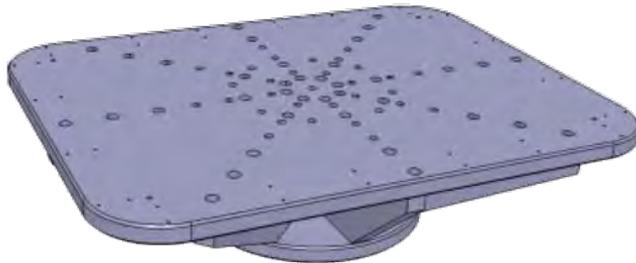
Vibration & thermal-vacuum tests in Bern (CH)



Head expander for shakers

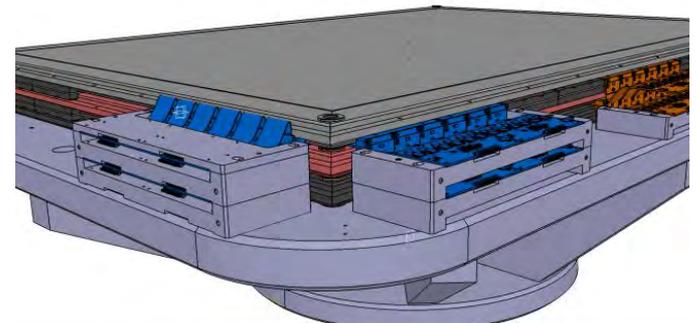
- Design ready
- Waiting for quotations

DONE!



DONE!

We also need a **FEB+FRB support system** and a **light tight system** for tests.



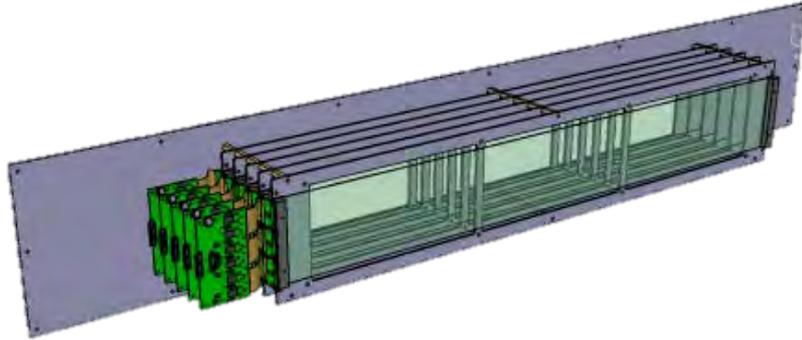
Vibration & thermal-vacuum tests in Bern (CH)



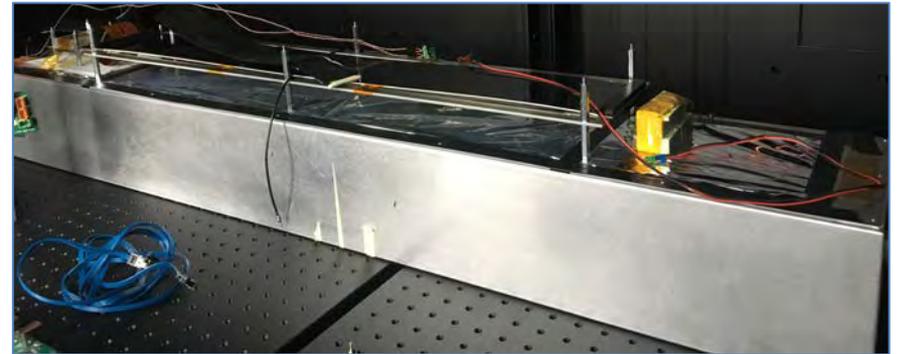
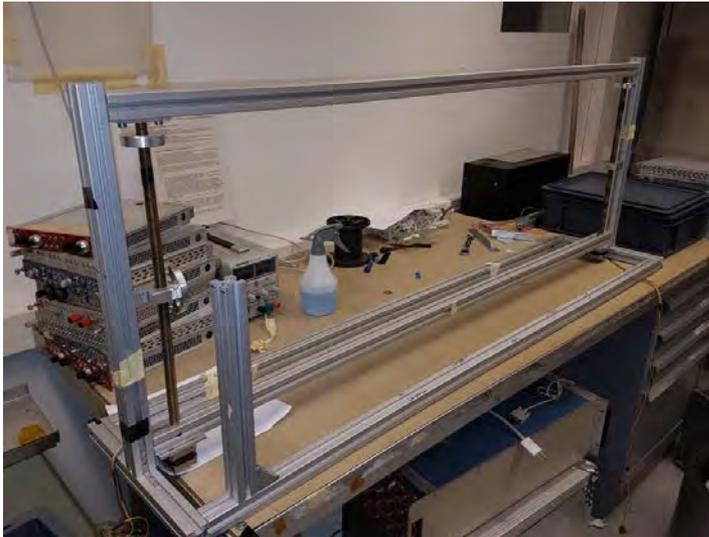
**Head expander
already shaken
in Bern**



Set up at next beam test

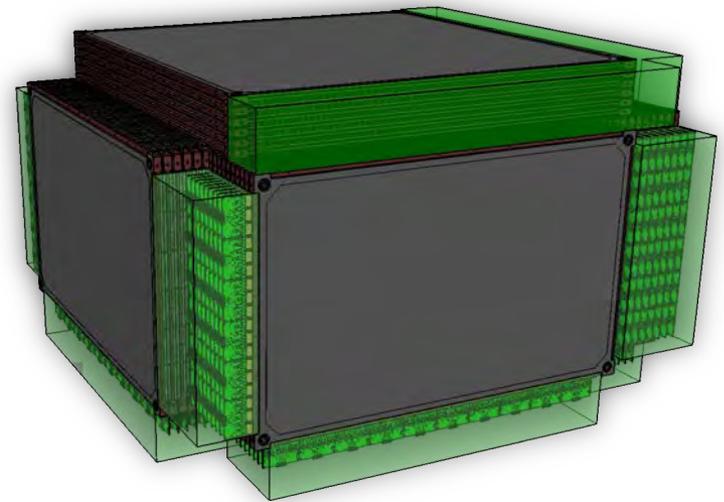


- 5 MATS, 25 mm stacked up
- Objective: To reconstruct tracks along one dimension



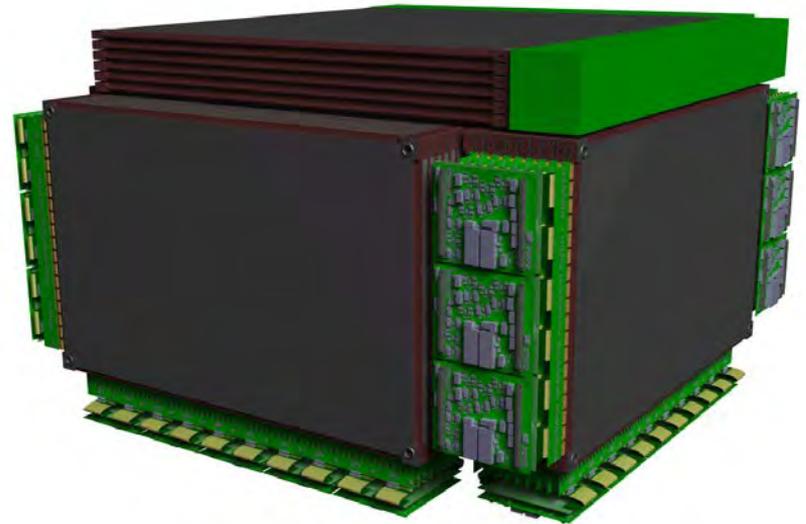
Summary and outlook

- “Proto FIT” (3 support trays with 2 x-y planes partially equipped) activities are ongoing.
 - FRB is under test, interface and functionality are being improved.
- Vibration and thermal-vacuum tests in Bern will be performed not before second half of March.
- SiPM activity: irradiation and tests @EPFL (labo of LHCb).



Thank you!!

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