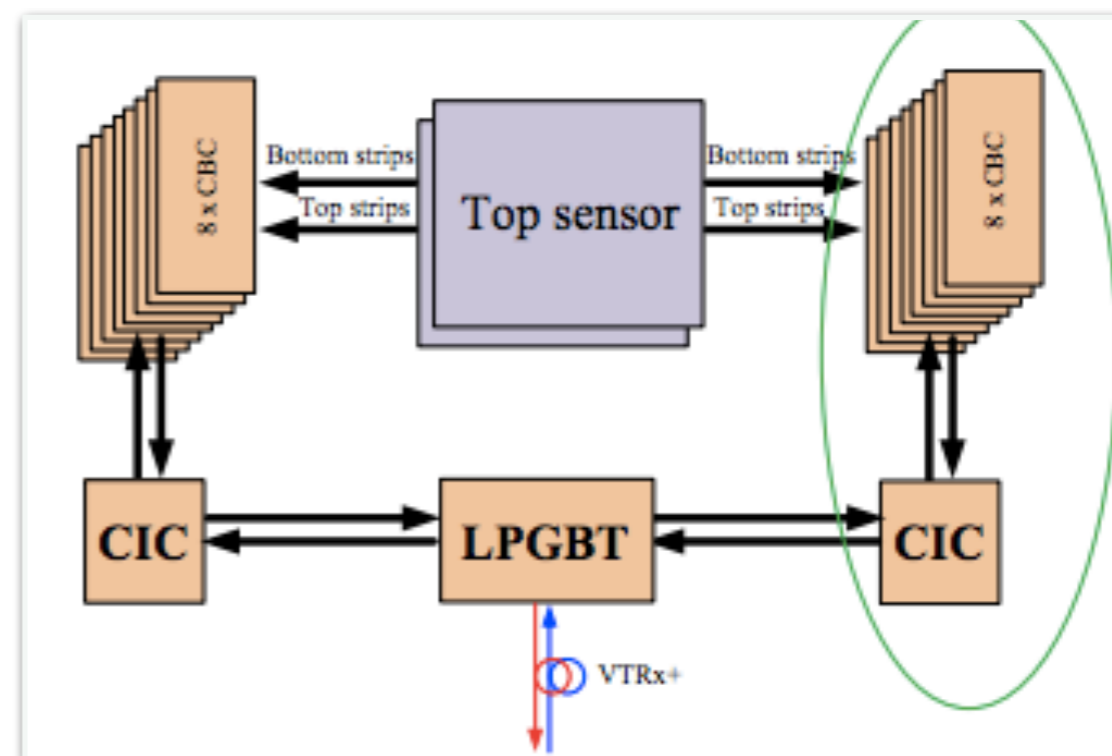
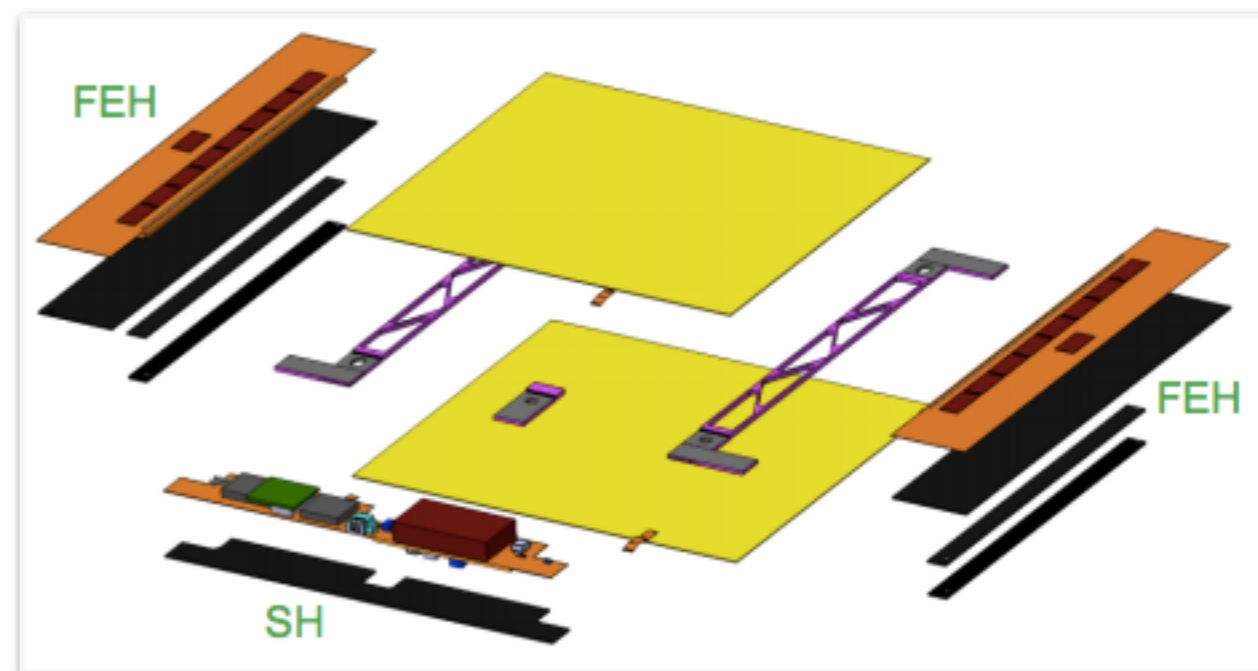


# FE hybrid cold test system status

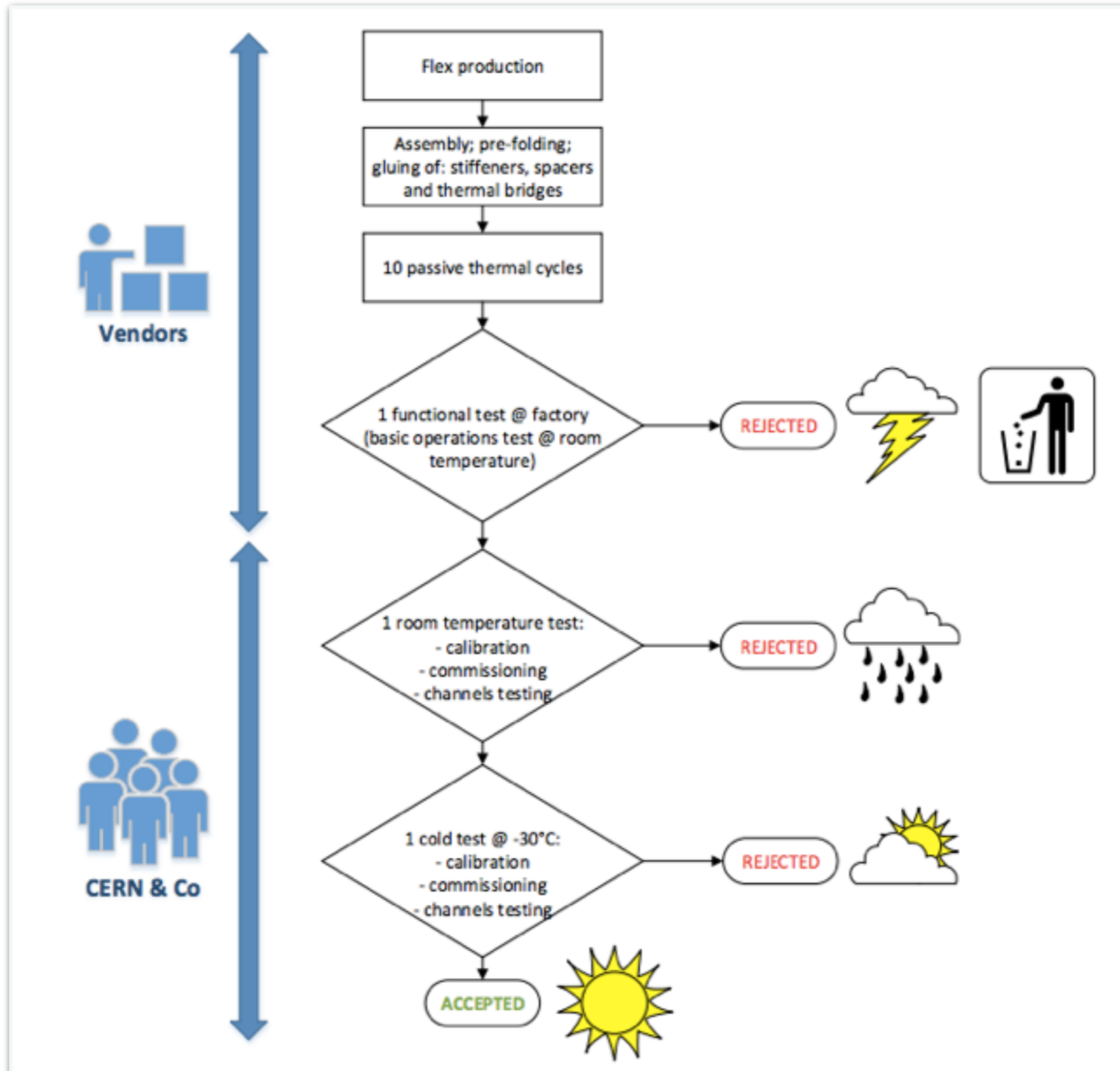
14/03/2017

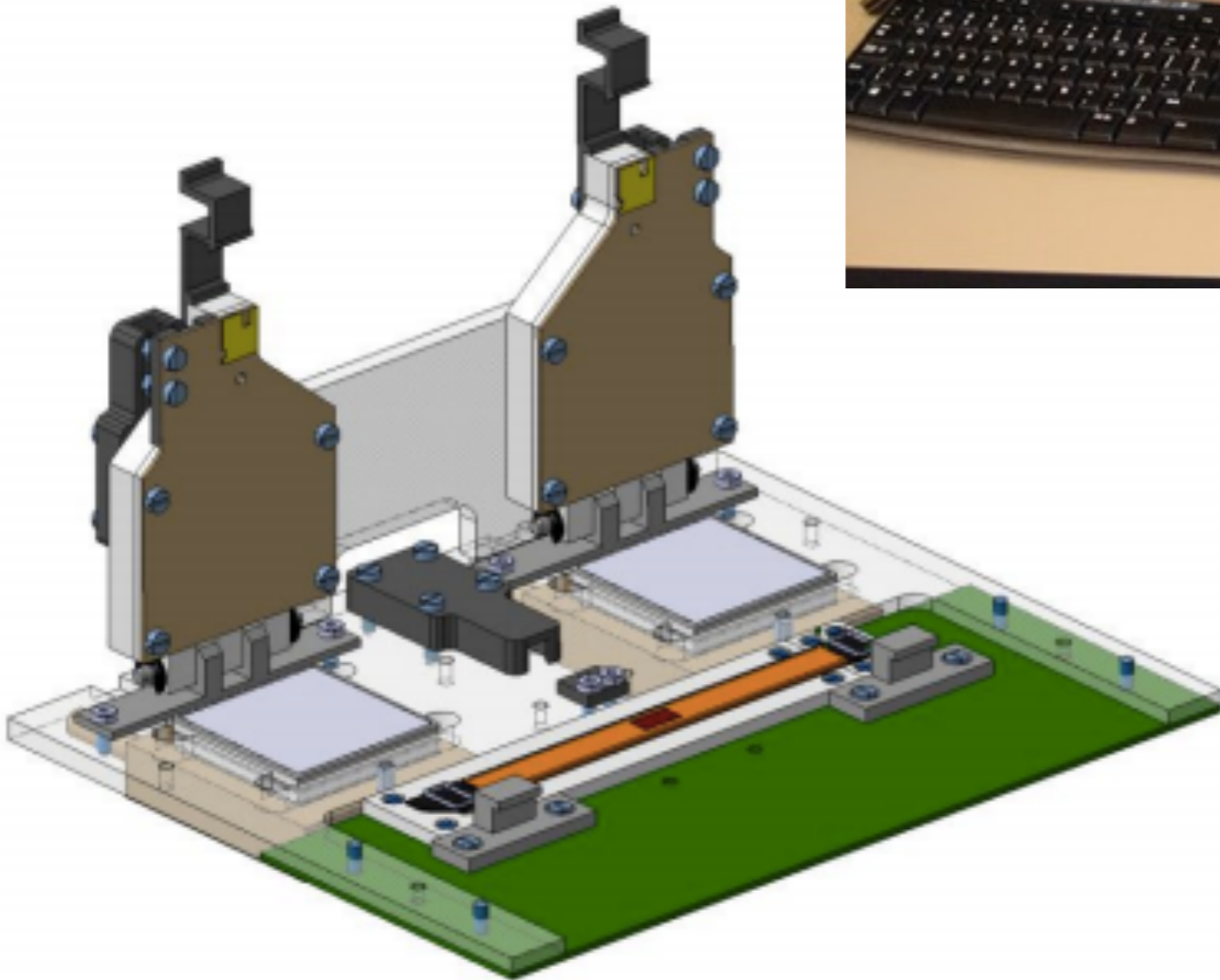
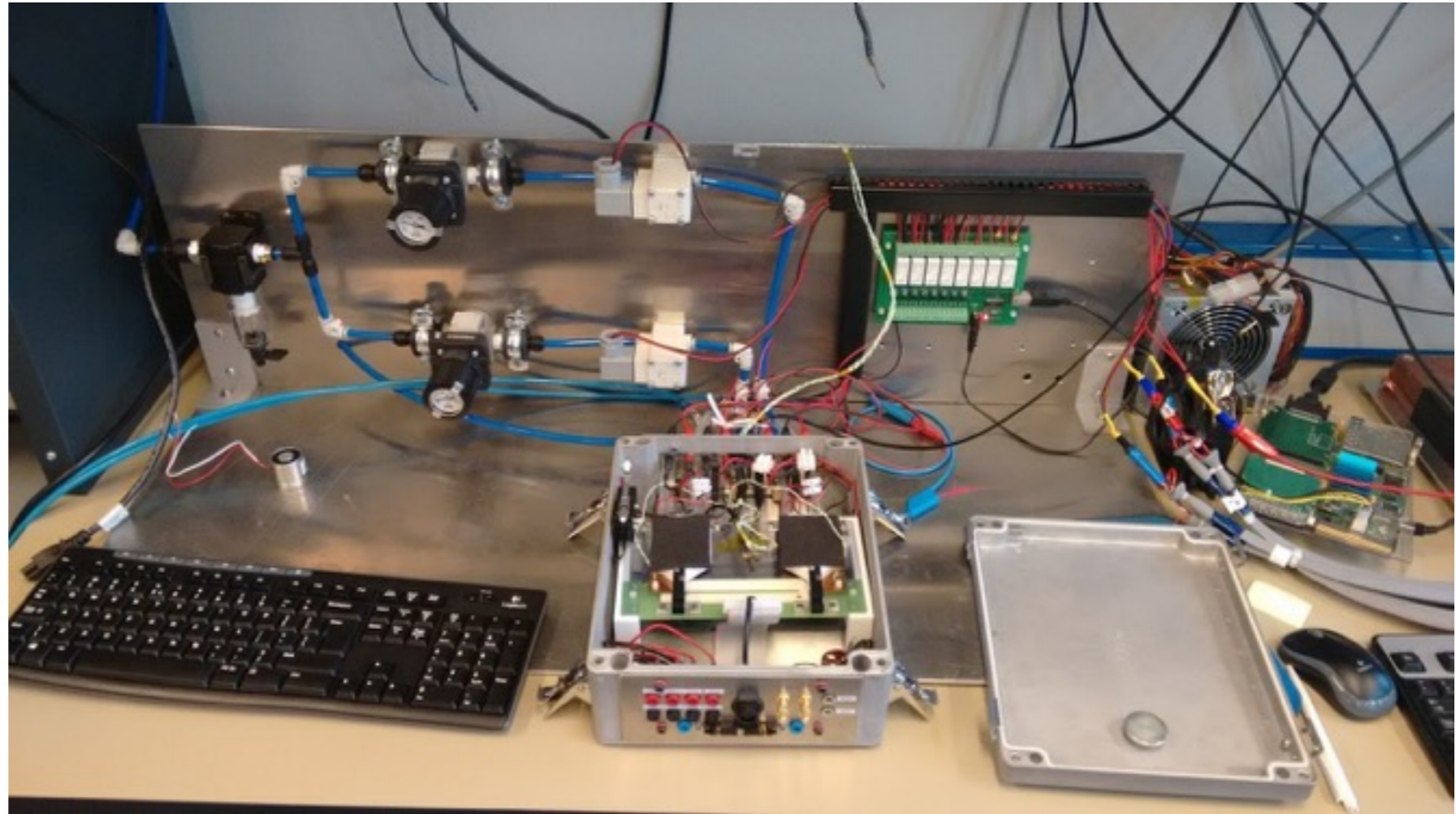
Jarne De Clercq, Jelena Luetic, Pascal Vanlaer

- Front-end hybrids for phase II tracker modules are complex objects: high routing density and folding
- ~14000 modules, ~28000 FE hybrids of 10 different variations
- In order to guarantee a high module yield also a high component yield is required.
- Testing at tracker conditions:  $T = -30^{\circ}\text{C}$  at cooling points + low humidity
- Testing in production environment, should be fast
- Prototype system was designed and build at CERN by Tomasz Gadek



# In production





- Power consumption
- Reading and writing from all CBC registers
- Calibrate the CBC
- Occupancy measurement
- Shorts finding

# Recent changes

- Mainly on the software side:
  - added a GUI for monitoring cold box and running of the test
  - GUI interfaces with DB
  - DB can be accessed via web interface
- Most recent update: [https://indico.cern.ch/event/613723/contributions/2474074/attachments/1416740/2170407/FEH\\_test\\_system\\_23\\_02\\_2017\\_cmstkele.pdf](https://indico.cern.ch/event/613723/contributions/2474074/attachments/1416740/2170407/FEH_test_system_23_02_2017_cmstkele.pdf)

1. Main interface for user: test  
IDLE/RUNNING/SUCCESSFUL/FAILED

2. hybrid ID

3. Summary of the performed test

4. Database status: CONNECTED/ DISCONNECTED

5. Input of hybrid code

6. Push buttons to start and stop test

7. Box monitoring: state, T, dew point

8. Electrical configuration and control parameters

cern.ch/prototypeFEHtesting/db

## Web interface to the DB

### Prototype FEH test results

Output of the test results during front-end hybrid prototyping phase.

Search... Submit

Row	Hybrid serial number	Date	Time	Hybrid type	Passed test	Exit code	Test results
1	25FE18LFFFBBBA	2017-02-03	16:42:45	25FE18L	1	0	Results...
2	25FE18L111222	2017-02-03	16:36:26	25FE18L	1	0	Results...
3	error	2017-02-03	16:32:36	errorL	1	0	Results...
4	25FE18LAAABBB	2017-02-03	16:31:53	25FE18L	1	0	Results...
5	25FE18R122445	2017-02-03	12:08:37	25FE18R	1	0	Results...
6	25FE40RAAABBB	2017-02-03	11:53:25	25FE40R	1	0	Results...
7	PSMOCKU123456	2017-02-03	11:50:51	PSMOCKU	1	0	Results...
8	25FE18L122557	2017-02-03	11:48:09	25FE18L	0	1	Results...
9	25FE18RABCBBA	2017-02-03	11:01:11	25FE18R	1	0	Results...
10	25FE18LABCCBA	2017-02-03	10:59:29	25FE18L	0	1	Results...
11	25FE40L111222	2017-02-02	17:12:58	25FE40L	0	1	Results...
12	25FE18L111444	2017-02-02	17:10:29	25FE18L	0	1	Results...
13	25FE18L555444	2017-02-02	14:14:46	25FE18L	1	0	Results...
14	PSMOCKU444555	2017-02-02	13:57:23	PSMOCKU	1	0	Results...
15	25FE18L147585	2017-02-02	13:56:19	25FE18L	1	0	Results...

Show 15 entries.

## 1. Dry air supply:

- We don't have a central compressed/dry air supply in the lab
- Start tests with nitrogen bottle

## 2. Cooling:

- Use relic chiller from petal production
- Has good specifications

## 3. Electrical connections:

- PCB for electrical connection to the hybrid is not ready yet
- Expected to be submitted: first week of April\*
- First test of box will be done with PS-MCK hybrid\*

([https://indico.cern.ch/event/613723/contributions/2474061/attachments/1416835/2169902/Schedule\\_February\\_2017.pdf](https://indico.cern.ch/event/613723/contributions/2474061/attachments/1416835/2169902/Schedule_February_2017.pdf))



# Status and short term plan

- DAQ system: present, GLIB based
- Many parts were ordered. About half have arrived for duplicating dry air and cooling part
- Still waiting for other parts to arrive
- Environmental monitoring (thermocouples + humidity sensors) was set-up
- Can use old box + sensors + nitrogen to get familiar with the system + check the potential of nitrogen for drying
- Mount peltiers and check if we can reach  $-30^{\circ}\text{C}$





# Open questions

- What are the T specs of the phase II tracker?
  - FE hybrid test system designed for  $-30^{\circ}\text{C}$  at cooling contacts
  - New phase II specs: cooling at  $-35$  or even  $-40^{\circ}\text{C}$ ?
  - Current system with peltiers is very challenging to reach  $-35^{\circ}\text{C}$ .
  - Open question:
    - Initial idea was to duplicate
    - Question now if we want to put more R&D effort into this...:
      - Use cooling liquid directly to cool?
      - Look into other dry air sources (nitrogen, ...)
      - Injecting cold dry air?

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# Chiller specs

Operating T: -25°C to 40°C

T (°C)	Cooling power (kW)
15	1.2
0	1
-10	0.7
-15	0.4