

CACTUS VD

Photosensor meeting
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Introduction

- A first overview about CACTUS Facility for Vertical Drift
- Situation
- How many facilities?
- Design
- Manufacture
- Software
- Massive tests: some preliminary considerations
- Conclusions

Situation

- The expected production for FD2-VD is 107520 SiPM mounted in flexi of 20 SiPM each (the device to be tested is the board denoted as “flexes”, not the single SiPM)

Realistic View



Realistic View



- That is 5376 flexes plus approximately 5% of spares (269 flexes)
- Therefore, it is reasonable to think of a number close to 5800 flex
- We rounded up generously because in our opinion there are always preliminary tests on pre-series to be done and some waste to predict worst case
- HD situation (for a comparison): to get an idea of the present situation, and to be able to make a comparison, the FD1-HD situation is as follows: 288000 SiPMs are installed in boards of 6 SiPM each, for a total of 48000 "SiPM boards". Also in this case, approximately 5% of spares must be added to these values (total of 300000 SiPMs to be tested for HD)

Number of facility (to be discussed)

- For the VD, 2 CACTUS 2s could be the best choice
- we are over 3000 flexes per station to test (yet another rounding up)
- It is important to provide 2 stations even if the work could be probably carried out by a single facility
- A malfunction could block the tests for a long time without a second facility (possible delay)

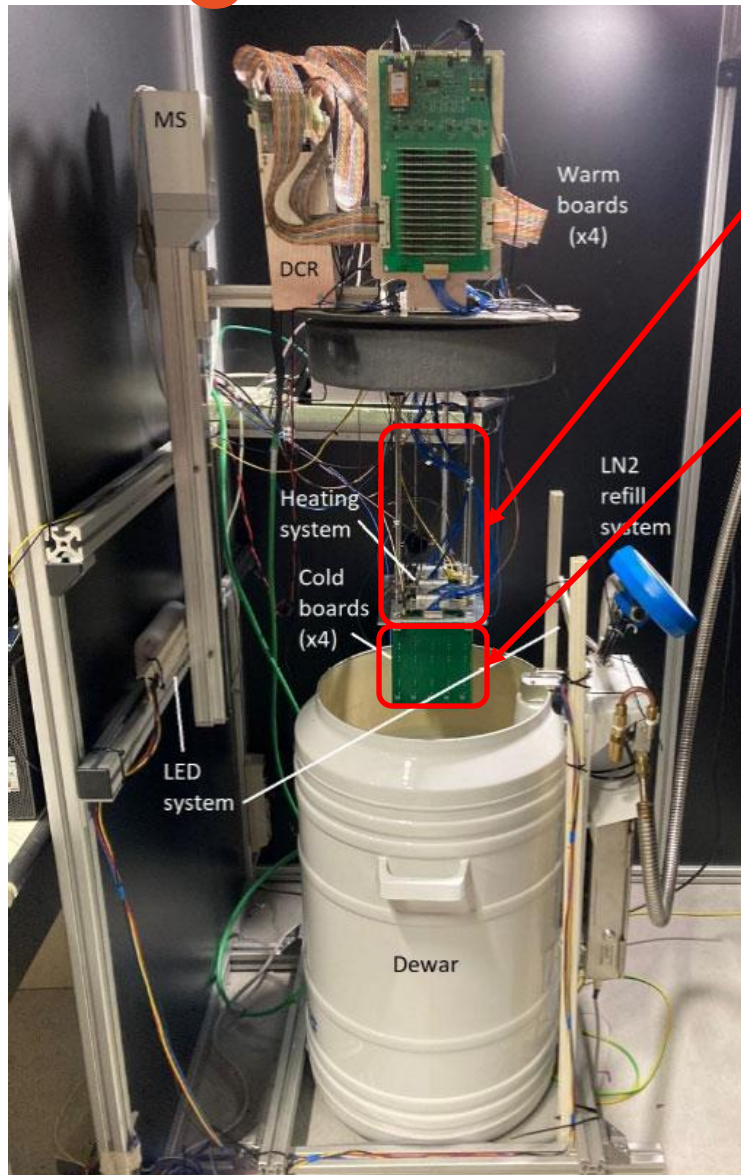
Pros @2 facility:

- greater testing speed
- greater resilience in the presence of failures

Cons @2 facility:

- higher costs
- two sites are needed

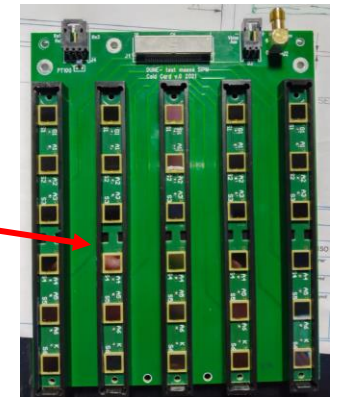
Design and manufacturing - 1



- It is possible to almost entirely replicate the current structure except for the boards anchoring the system which, being different, will have to be redesigned
- The boards that currently house the SiPMs for HD and which in the VD will have to house the Flexi boards will have to be redesigned and manufactured

Open questions:

- Will the black frames be necessary or useful?
→ maybe 3D printer?

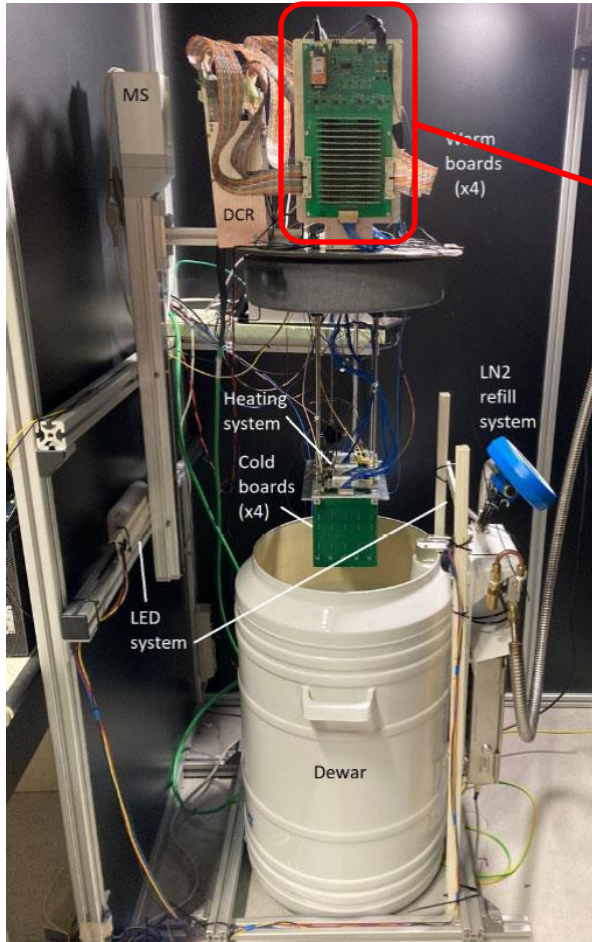


Actual version

- A different number of Flexes for each board could be useful (now there are 5 SiPM boards for each board) to interface effectively with the motherboards (maybe 6?) → Ferrara

Design and manufacturing - 2

- Actual situation for the 4 Motherboards: We are trying to understand if they are reusable (Ferrara)



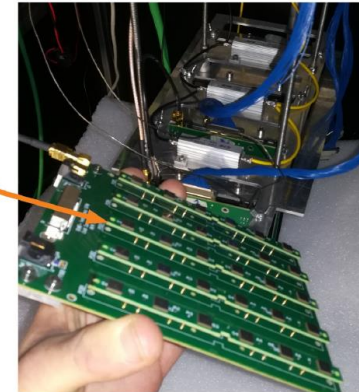
Cactus electronic

Motherboards + front-end cards:

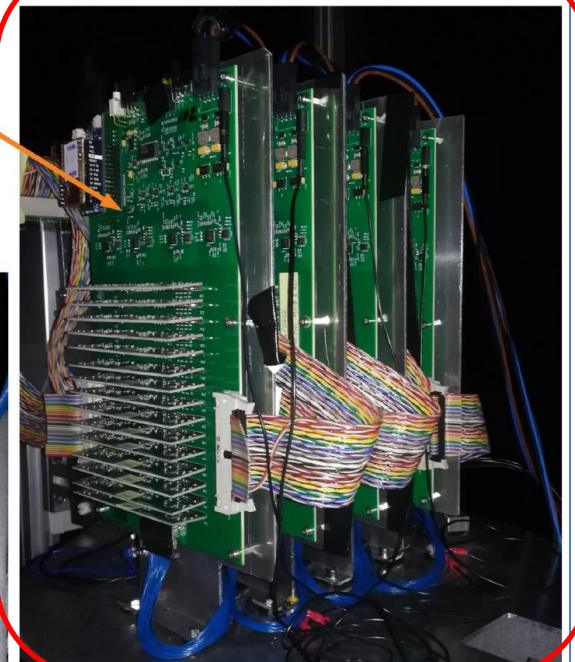
- 4 motherboards;
- 15 front-end cards/motherboard;
- 120 independent channels;
- Current measured/digitalization;
- Signals acquisition;
- Supply power.

Cold boards:

- 4 boards;
- 5 arrays/board;
- 120 SiPM;
- Temperature monitor;
- Bias voltage.



Motherboards & cold cards



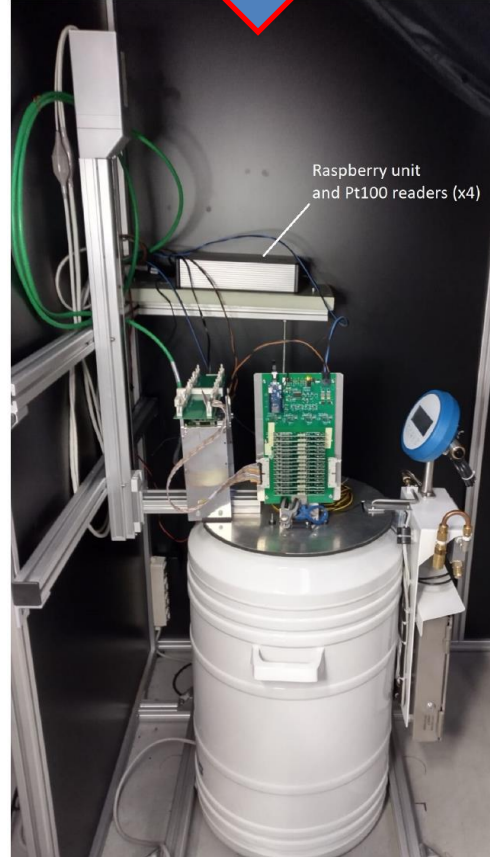
Presentation of Marco Guaresi

Design and manufacturing - 3

Mechanical parts would also seem suitable for the VD



Other parts would also seem suitable for the VD (Dewar)



Design and manufacturing - 3

Mechanical parts would also seem suitable for the VD



Other parts would also seem suitable for the VD (Dewar)



Attention:

When it is said that some parts are suitable for reuse it means that they can probably be purchased as they are.

However, it is probably not possible to reuse the same components because it is not possible to wait until the end of the tests on the SiPMs for HD to build the new CACTUS for VD.

Software



- Software should be largely reusable (LabVIEW)
- However, some changes will be necessary (Milano Bicocca can help)

Tests

- We tried to make a very simplified calculation based on the experience at UNIMIB
- 2 measurement cycles per day and each time they test 20 SIPM boards
- Actual tests are probably more complicated because in current SIPM boards you can access every single SIPM, which is not possible on Flex cards
- On the other hand, there will be a previous phase to be done almost manually to verify that one of the SIPMs is not damaged (ON/OFF test)
 - Procedure definition: ongoing
- From simple (and rudimentary) calculations we estimated approximately 130 days of work for the tests
- Considering the abundant rounding seen above, we arrive at 150 days to be divided between two stations
- Since the second station will not be ready until a later time, the division between different CACTUS VD will probably not be equal

Conclusions

- Cactus 2 can be designed and manufactured
- Cactus 1 can be used as a good starting point
- The workpower required for massive testing does not appear prohibitive