Task Force meeting

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Slides outline

- The first part of these slides is the material presented on February 8th
- The second part contains comments and outcomes of the meeting

Goal

- Outline the testing procedure on **(v)PDUs** and **cables** during assembly in CR2

- Presenting collected ideas and receiving feedback to understand if we are heading in the right direction, potential challenges, and better ideas

Cables

Cables are produced in coils, and should be wrapped in a kind of double-helix cable spiral wrap. One of the two helices can be removed to avoid having a closed sheath.

All the cables are tested by the use of a TDR (old cable version tested in Genova last week) to ensure that both cable and connectors requirements are satisfied after production.

Once mounted on the OPs, no need to use a TDR technique: a simpler cable tester may be enough. This allows to test all the 16 cables (8 twisted pairs), verifying continuity, pin-to-pin correspondence between the cable ends (cable swapping) and short circuits with neighbours pins.

- An adapter is needed (DS20k cable <-> cable tester)
- Small and battery powered: easy to use in case of scaffoldings
- Quick test

(v)PDUs: tests

Once the cables are in place and tested, (v)PDUs can be mounted and tested, connecting to the free end of the cable.

(v)PDUs will be tested at room temperature and the plan is to avoid using dark boxes (confined space, scaffoldings, fragile components).

Switching off the light, is remaining light still a problem? Is CR2 enough dark?

(v)PDUs: tests

After collecting information from NOA, UK and Naples, the proposed tests are:

- **ON/OFF** steering module
- **I-V curve** (1:1 comparison with reference in database, details TBD)
- **Noise power spectrum** (1:1 comparison with reference in database for the whole (v)PDU and for the single quadrants/tiles, details TBD)
- **Mapping:** test the (v)PDUs one by one
- **Signal:** are the previous test enough to say that the (v)PDU is correctly working? Do we need to look at the signal? (Remember: room T, light noise, need to add a laser source, ...)

(v)PDUs: hardware

Testing will be done both in CR2 on scaffoldings and in Hall C in the cryostat: need of portable hardware (HV, LV, oscilloscope, PC). Different options:

1. Few portable boxes (power supply, oscilloscope + PC): all instruments at hand but modularity
2. A box with oscilloscope + PC and power supply in a ground rack: long power cable, any issues?
3. All the hardware on a ground rack and cable ends on the scaffoldings: any issues?

(v)PDUs: software

A LabVIEW PDU testing application will be soon developed to test PDUs once produced in NOA: very similar tests, we can exploit the same software.

If the hardware used in CR2 is different from the one used in CR3, just update the drivers in the LabVIEW application. Considering that mounting in CR2 happens after NOA production, the use of the same hardware looks feasible:

- LV: Keysight E3649 Power Supply Unit
- HV: Keithley 2450 Source Meter Unit
- Oscilloscope: Teledyne HDO6104

(v)PDUs: testing procedure

- OPs are mounted in vertical

- Test the (v)PDUs one by one, then row by row or group by group from top to bottom. Once tested, protect the (v)PDUs by the use of an acrylic covering

- Estimated time required to test a single (v)PDU: to be added by Thursday

Outcomes and comments

- After production, where and how are cables stored before mounting in CR2?
- Cable weight is 30 g/m
- Cables are already labeled when produced
- Is there a cable tester that allows to also check a signal transmission (beyond the tests listed in slide 4)? → Matteo will take care of this
- We may use a plastic cover over the PDUs to reduce impinging light while testing on the OPs
- To answer the questions in slide 5, we can analyse the behaviour of a PDU produced in NOA, bringing it in CR2 and checking the darkness of the room

Outcomes and comments

- Martin: we want to limit HV current to 100 uA. This requires a very low light level above BD. We can run the I-V test until the current limit is reached and check if we collect enough information about BD
- Add a table with all the tests and their purpose, requirements and specifications → Matteo will take care of this
- Add PDU ID test
- The list of tests will be updated by Matteo following the chronological order: before we test the low voltage part, after we test the IV curve of each PDU
- Check HV, LV and ID before going on with the other tests. In addition, to avoid frying the circuits, we may check that powering connectors are in their proper place by looking at the resistance on the different line
- Hardware: option 3) is preferred, possibly using the chimney flange and the final power supply and readout of DS20k (spare flanges are then needed)

Outcomes and comments

- NOA hardware can be exploited to further analyse those PDUs that are not passing the proposed tests
- Time required to test a single PDU: 30 minutes (Martin), but can be reduced down to 5 mins decreasing the number of points measured in the I-V curve test
- Issue: we do not test the final external cables and PDUs are not tested at cold with the full chain