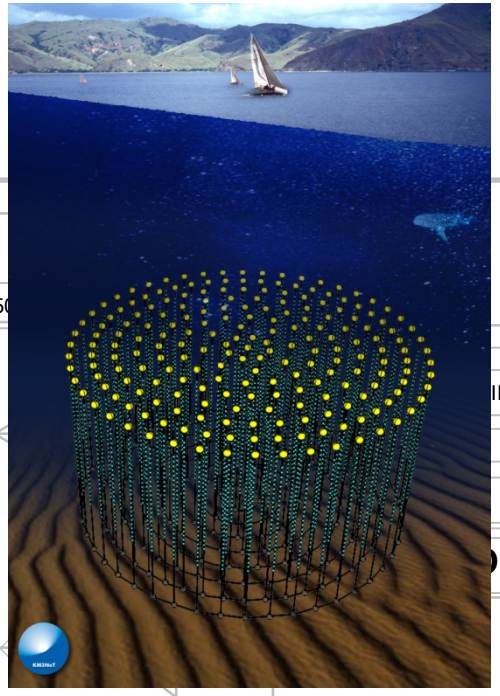
PPM-DOM.



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Nikhef
Amsterdam
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by Jan-Willem Schmelling on behalf of the optical team.

Contents.

An overview of the items showed during the DOM-ReX related to optics and integration.

- Optical network.
- BEOC
- DOM integration
- General conslusions
- Questions?

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Nikhef
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Contents.

For more information and the detailed presentations as given during the DOM-ReX meeting on the 18th of December 2012 at Nikhef see:

http://131.188.192.25/MaKaC/conferenceDisplay.py?confId=123

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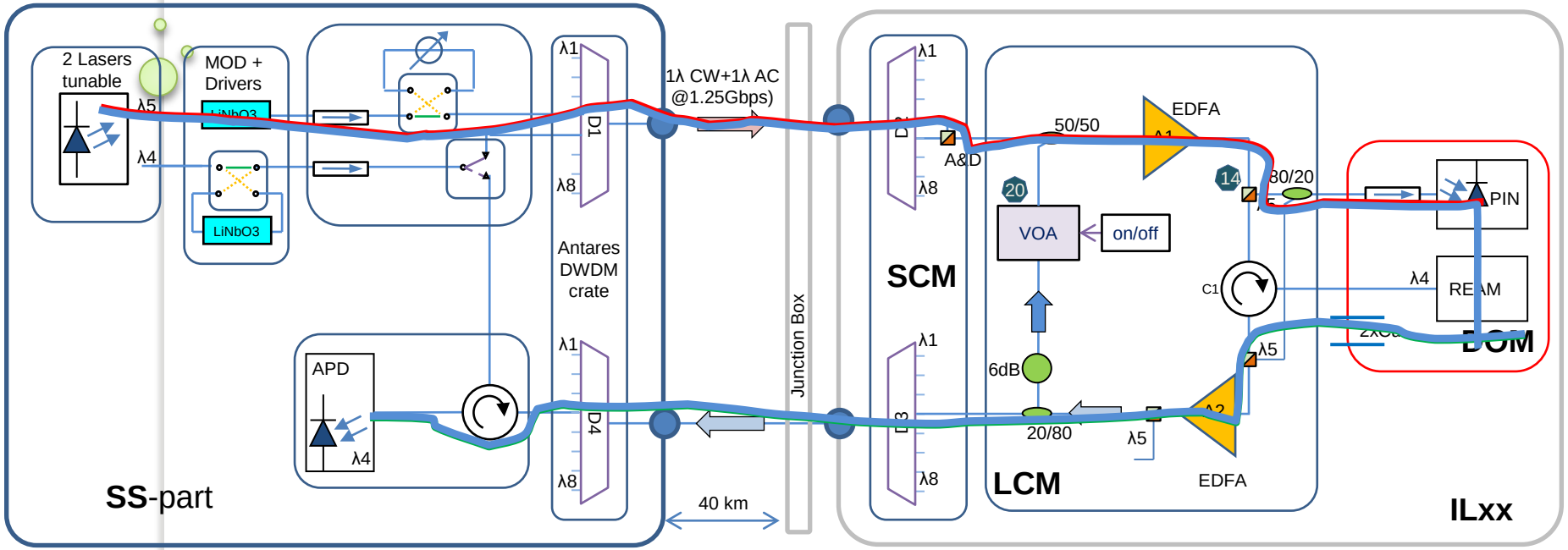
Optical network.



Time calibration path (DOM to shore and back)

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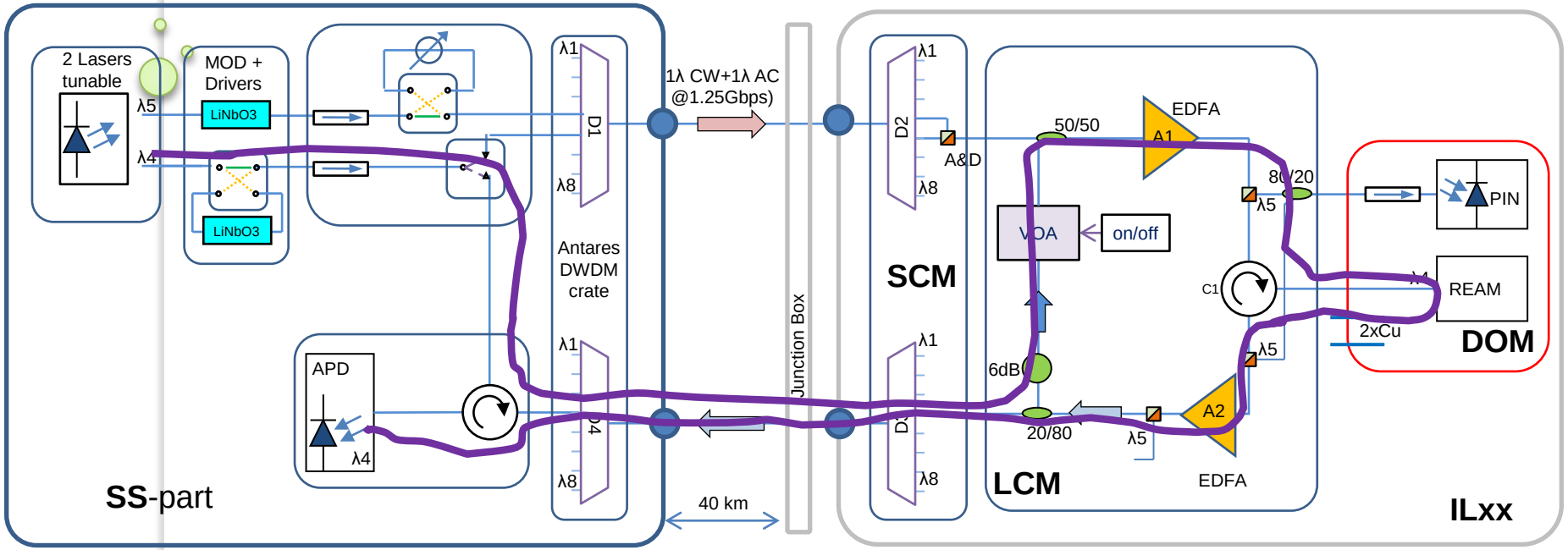
Optical network.



Time calibration: **optical pulse** > Lab test:

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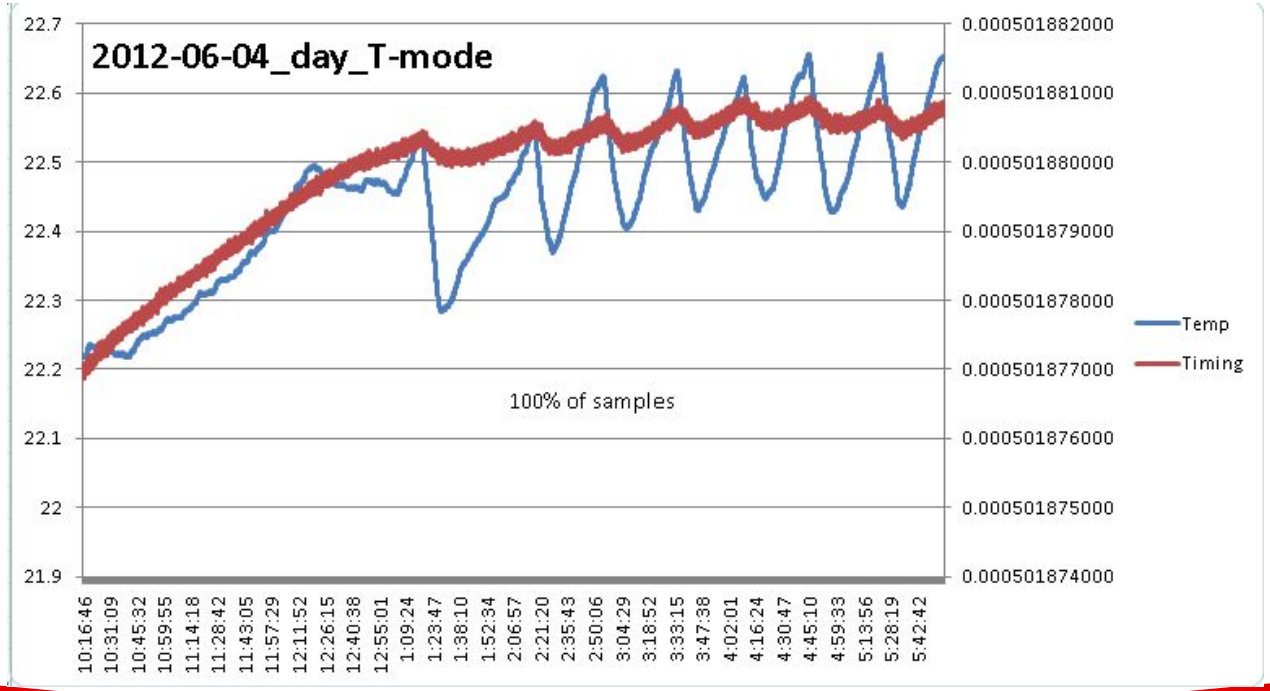
Lab test of optical time calibration.

During lab test it has shown that the optical time calibration:

- In principle works very well!
- Is sensitive for reflections (for example wet mateable connectors).
- Has a low average optical power (small pulse width).
- Components show un-expected behavior (reflections).
- A long fiber length can measure temperature very accurately. ☺



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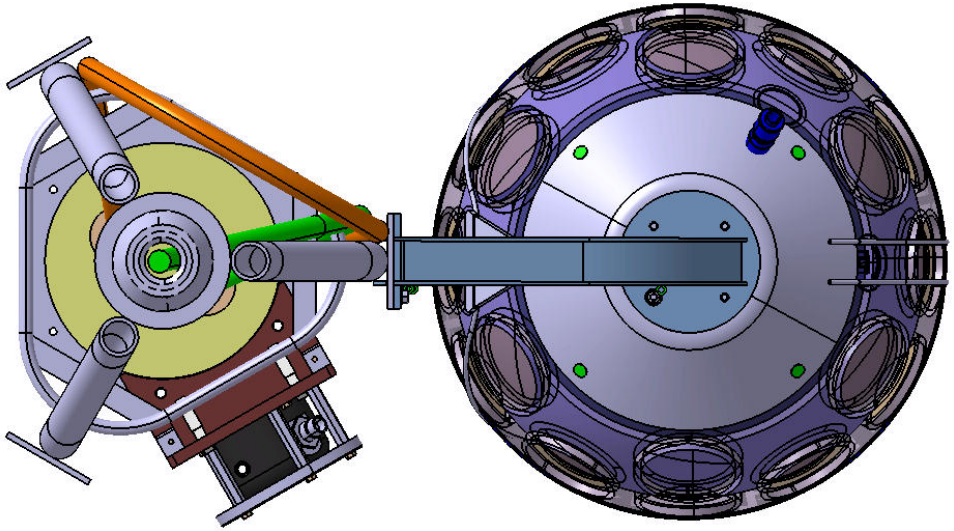
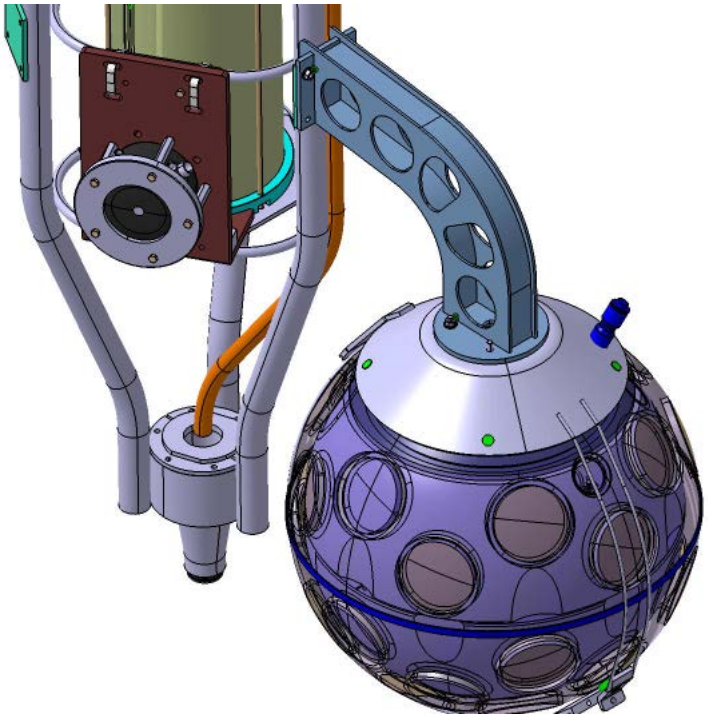
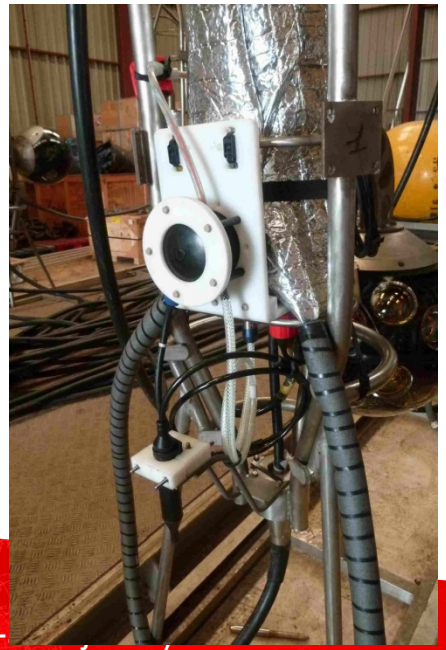
BEOC.







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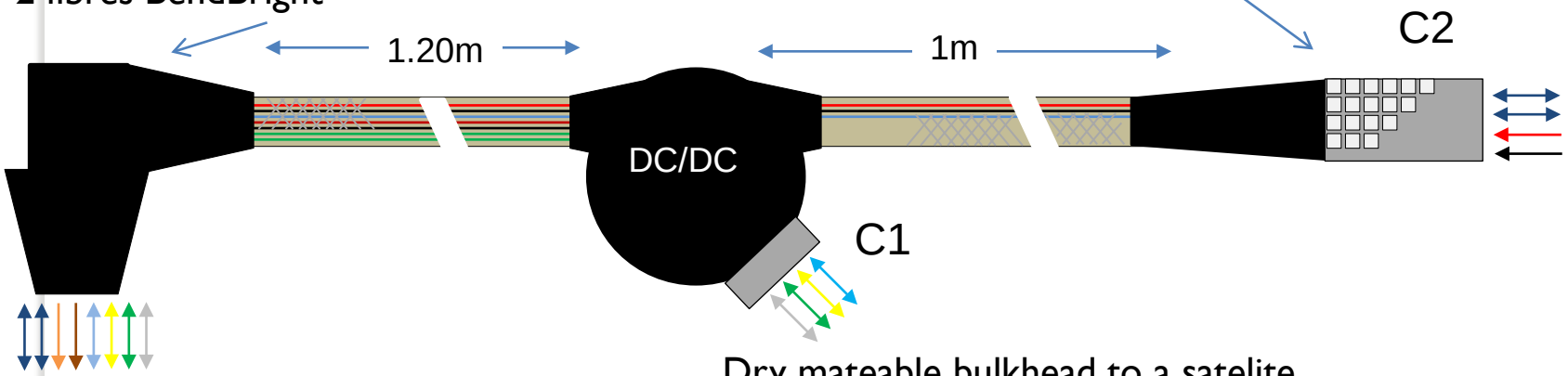
BEOC.

Penetrator into Optical Module
6 electrical wires (1xpower, 2xUTP)
2 fibres BendBright

Dry mateable connector to LCM
2 electrical wires (1 x power)
2 fibres BendBright



Dry mateable bulkhead to a satelite
4 electrical wires (2xUTP)

PBOF = Pressure Balanced Oil Filled over pressure test 60 kPa

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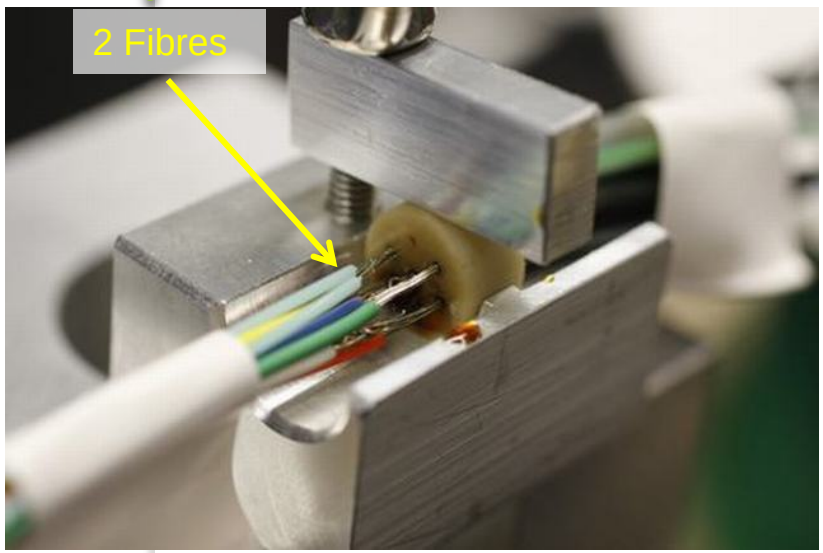
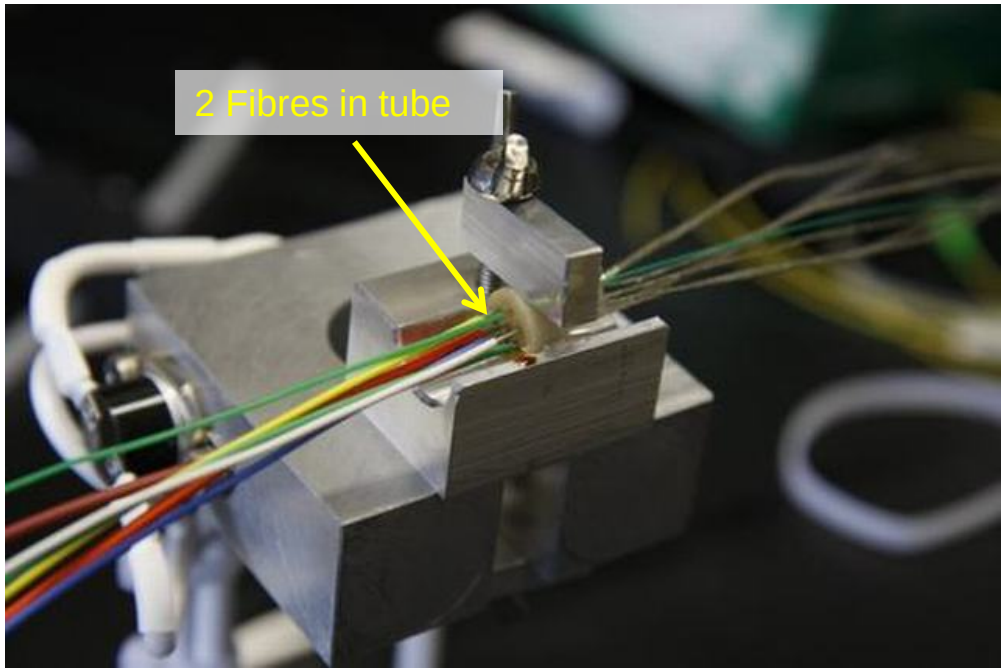
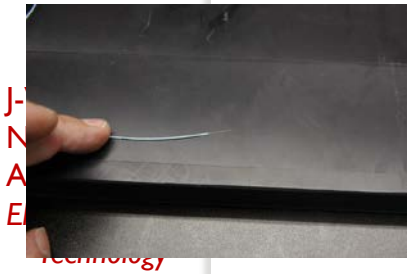
BEOC: Penetrator gluing of the pressure barrier



First attempt



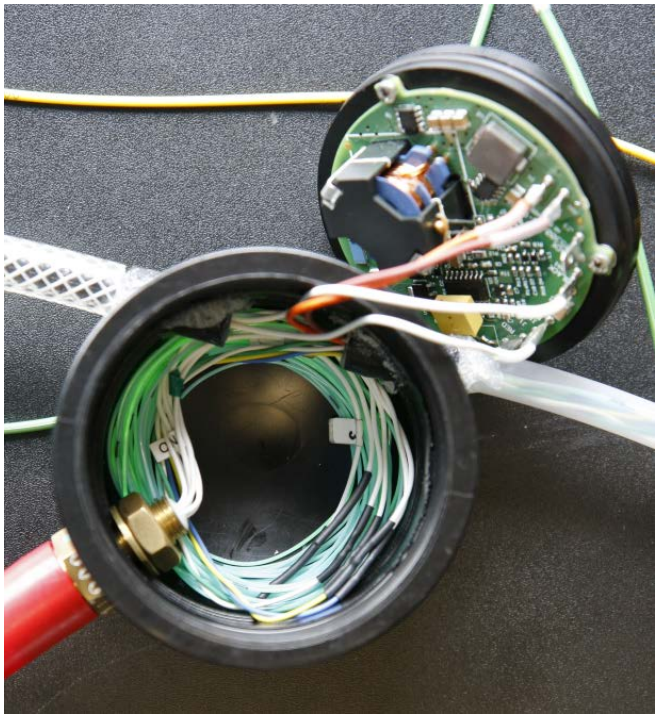
Solution: use 2 BendBright fibres.
The coating can be chemically stripped so there is minimal damage to the fibre.



Tight buffered fibres (SEACON standard type of fibre) are very fragile when stripped down and glued.
This is caused by scratches due to mechanical stripping of the tight buffer.

Problems with breakout Box (BOB).

Close up of glue connection with "one second" glue.



Final BOB. Glued with 3M DP8010 2-component glue

Gluing of the tubes to the BOB was not easy. Both the BOB and tubes are made from polyethylene (PE). This is very hard to glue.

First attempt with primer and "one second" glue.
This failed a dry pressure test at 3 bar. Adding extra glue did not make it leak tight.

3M DP8010 2-component glue did work very good. Despite the strange appearance on the outside.

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The completed BEOC.

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BEOC connected to the DOM.

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BEOC: Main problems encountered

- After the DOM had been closed the fast fuse inside the BEOC DC/DC converter blew during tests. This resulted in:
  - The BOB had to be drained of oil and opened.
  - The fuse is now short circuited by a wire to prevent this from happening in the future.
- Because the 400V supply from the SPM itself has a limiter, shorting of the fuse should no problem in-situ.

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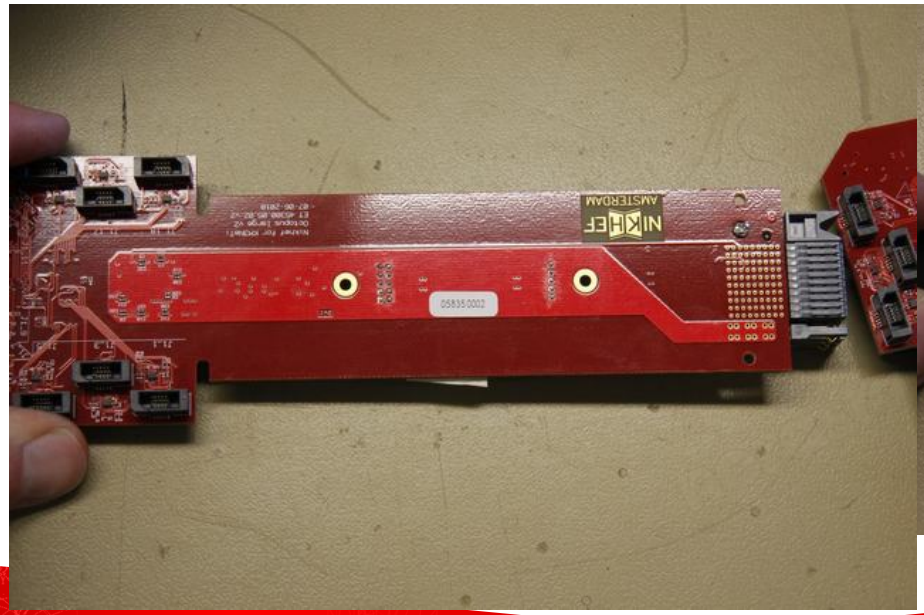
DOM electronics integration.

Integration of the electronics:

- Various problems due to mechanical misalignment.
- Power board: no problems
- CLB: various mounting problems for different reasons. CLB is important ref.
- FPGA: cooling major issue, problem to produce a good thermal contact.
- Instrumentation: positioning /mounting needs improvement
- Octopus board: sliding parts causing a short circuit.
- PMT numbering: a consistent way throughout the collaboration is needed.



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DOM optics integration.

Integration of the optics inside the DOM:

- PIN diode fiber: too close to heat shield
- REAM: mounting no problem
- Fiber routing inside the DOM: more support
- Penetrator connection: troublesome as a result of the assembly order.
  Penetrator fixed to the glass at the last possible moment, risk of damage during handling/DOM test.

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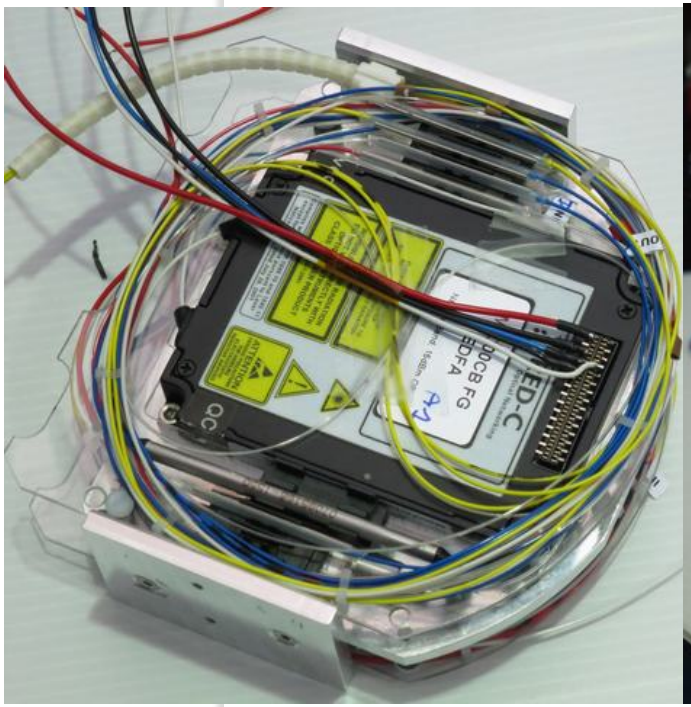
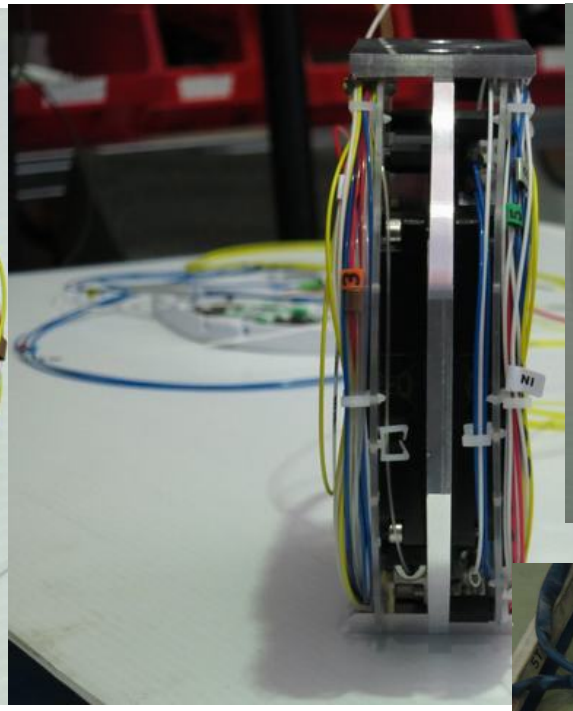
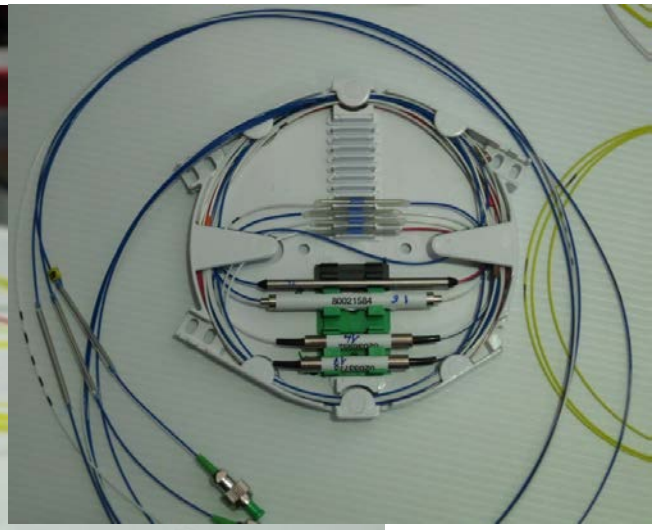
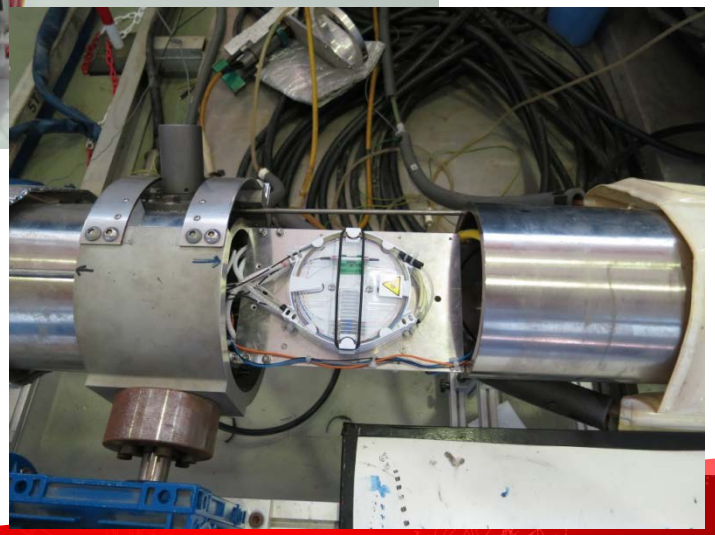
Optical parts integration in LCM.









EDFA's mounted on cooling plate, together with a part of the optics

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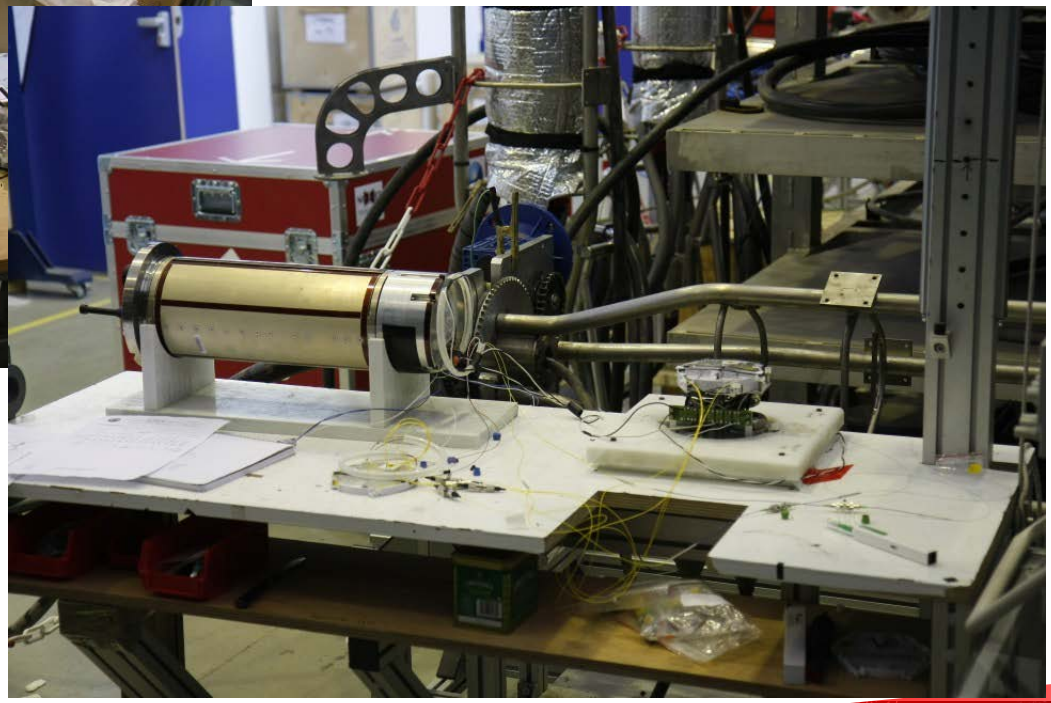
Optical parts integration in LCM.



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DOM integration @ CPPM.

Shore station equipment:

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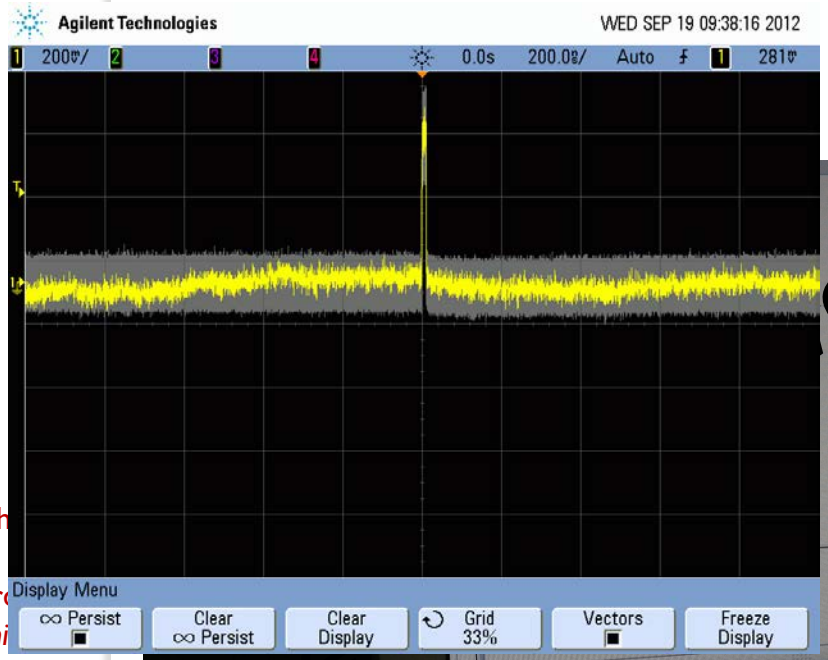
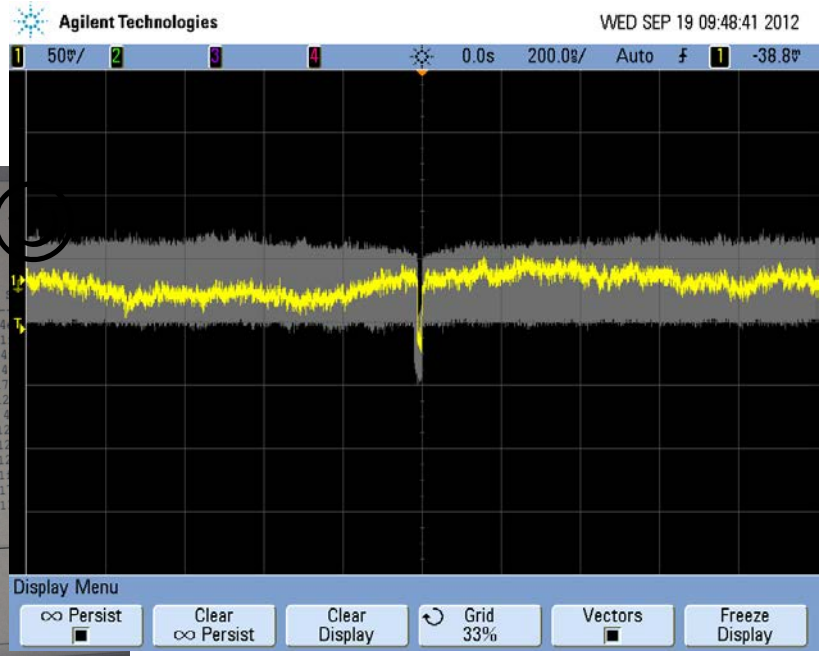
DOM integration @ CPPM, results.

- Normal communication no problem.
- Problems with optical timing calibration.
  - Optical margin NOT sufficient for time calibration, receiver sensitivity low.
- EDFA slow control not available (would provide more flexibility).
- Shore station receiver.





General conclusions:

- Optical network is working. However little has been learned for KM3NeT phase 1.
- The DOM integration was successful.
- Optical time calibration needs a different/modified approach compared to the lab as it worked in the lab setup, but not in-situ.
- During DOM/BEOC assembly a lot of mechanical inconsistencies showed up.
- Designs are different from KM3NeT phase-1
- The mezzanine board approach works very well in a prototype manner.
- The electronics are well tested but their mounting needs to be improved

Bottom line: we have **learned** a lot

but…….. We have **realized** a lot

There's also still a lot **to be done**!

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Nikhef
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A more detailed overview of the PPM-DOM can be found on:

http://131.188.192.25/MaKaC/conferenceDisplay.py?confId=123

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The END.

- Questions?

J-W Schmelling
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