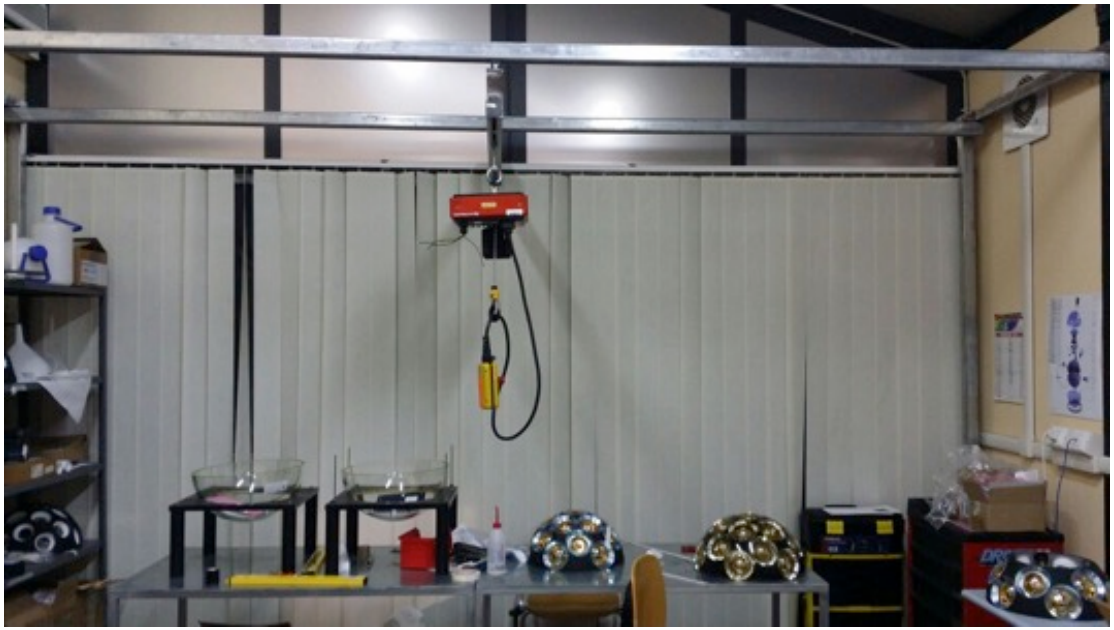
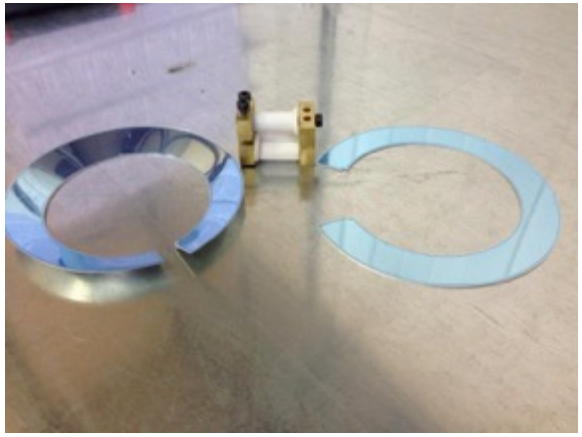
DOM production at Catania

INFN sez. Catania
E.Leonora, V.Giordano, S. Aiello

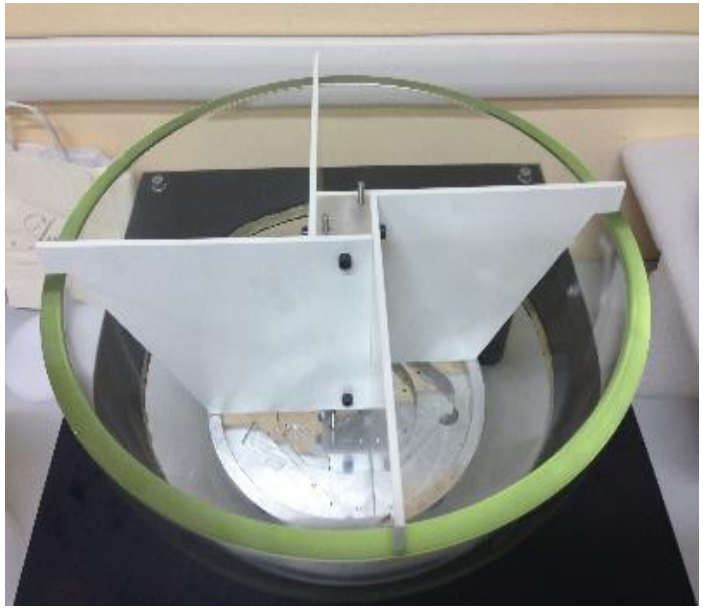
INFN-LNS site set for storage and DOM mass production

Space and laboratories at the test site of the Catania Harbour were setup for components' storage and DOM mass production



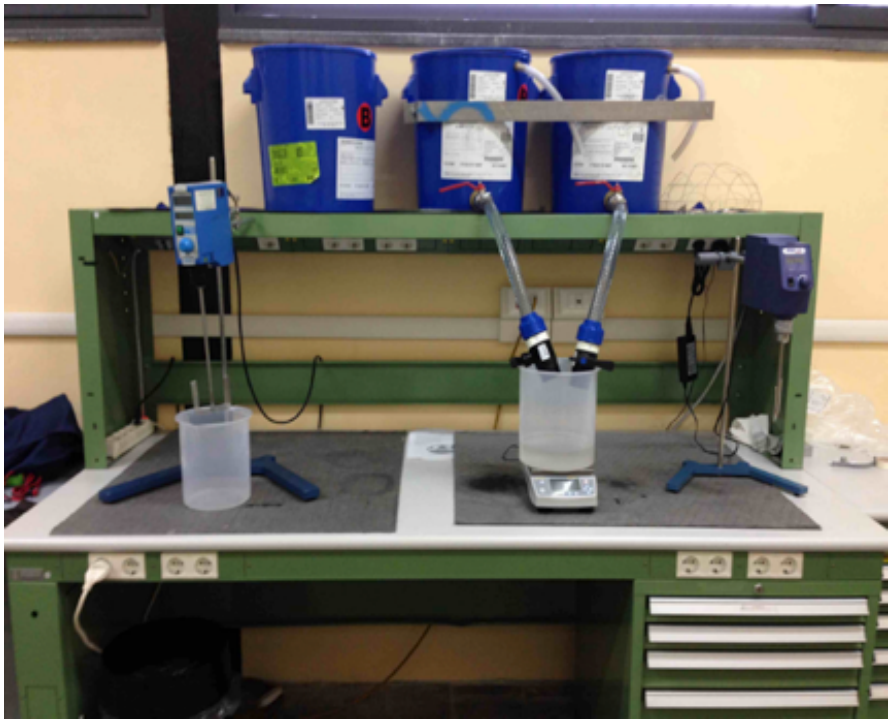


Many custom tools was built



emanuele.leonora@ct.infn.it

Tools for DOM mass integration



4 boxes with vacuum pumps for gel degassing

- Vacuum of 600 mBar in less than 2 minutes

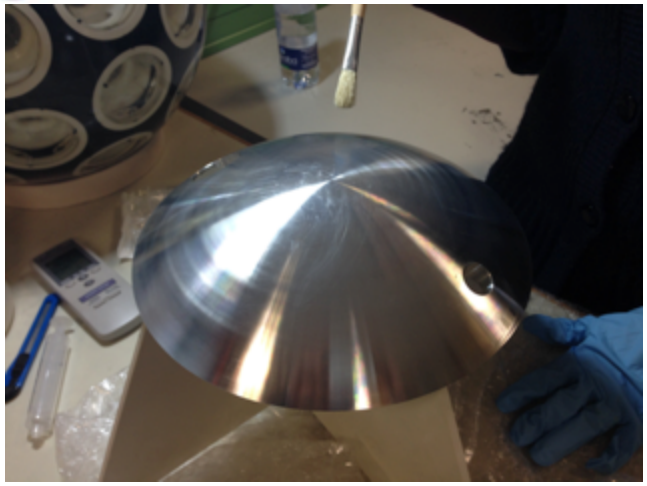
Bench for gel preparation:

- 2 separated working places
- 2 mixer with n° turn/ minutes controlled

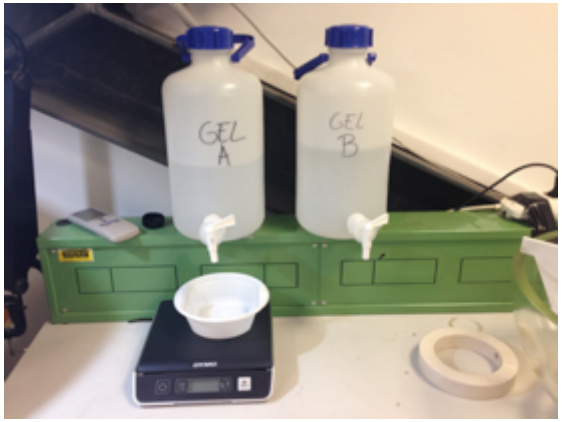
Plastic dessicator for degassing

emanuele.leonora@ct.infn.it

Main assembly phases: gluing of the mushroom

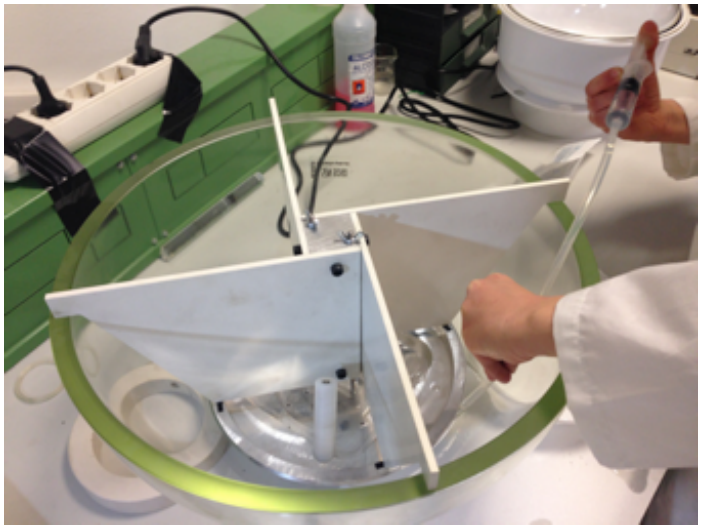


Primer on mushroom and inside the hemisphere

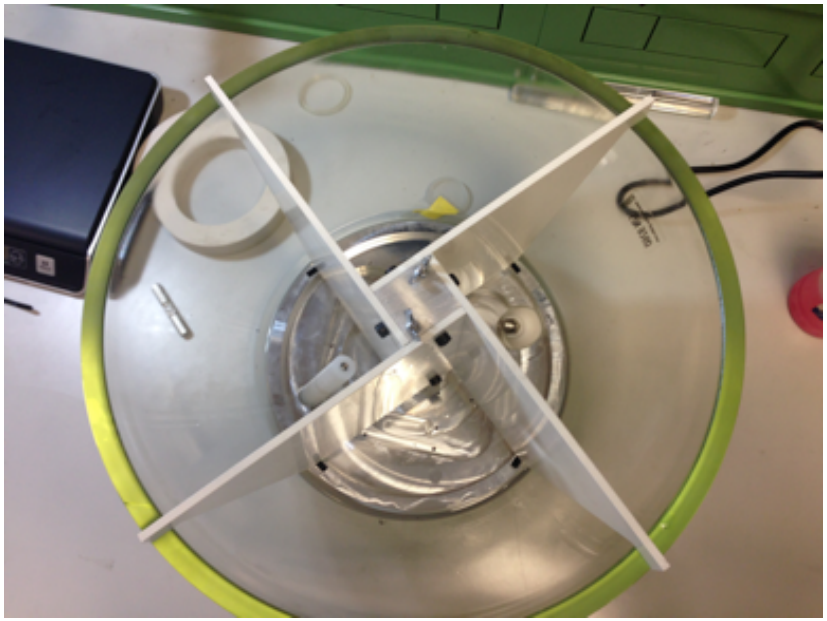


Gel preparation

Gel degassing



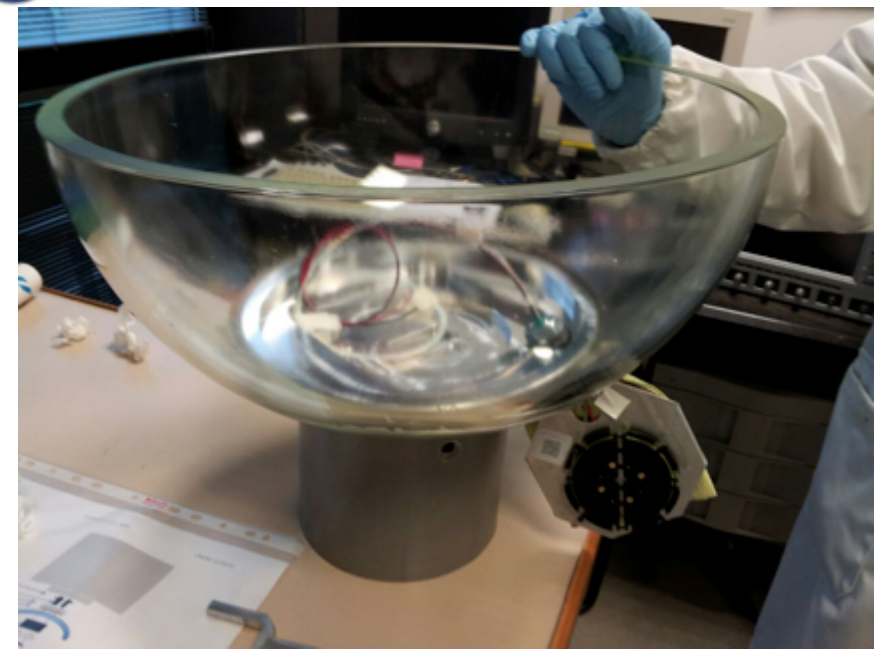
Pouring of the gel

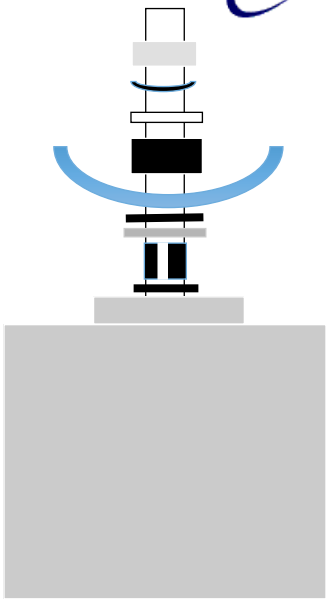


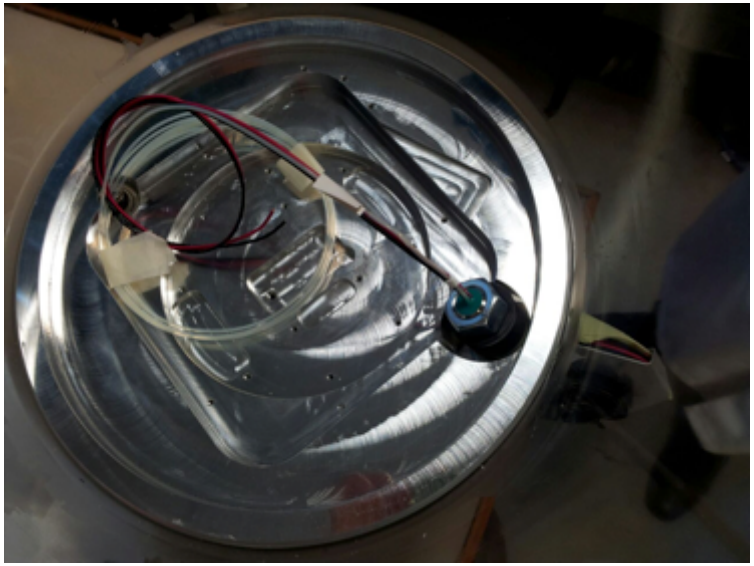
Polimerizaton of the gel

3 mushrooms were glued

Main assembly phases: mounting of the penetrator

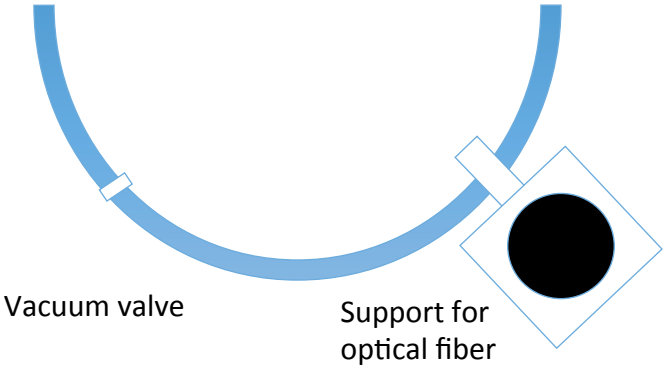




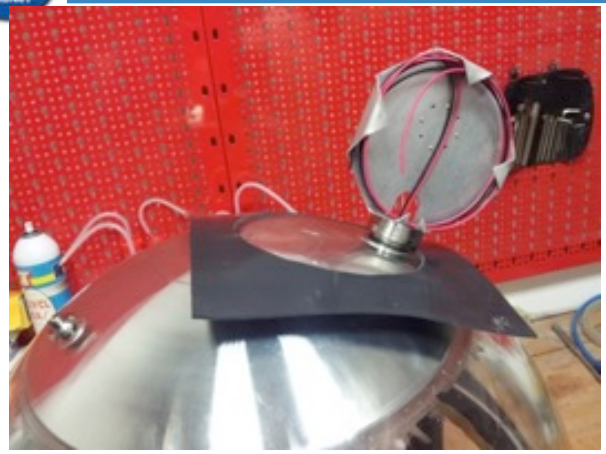


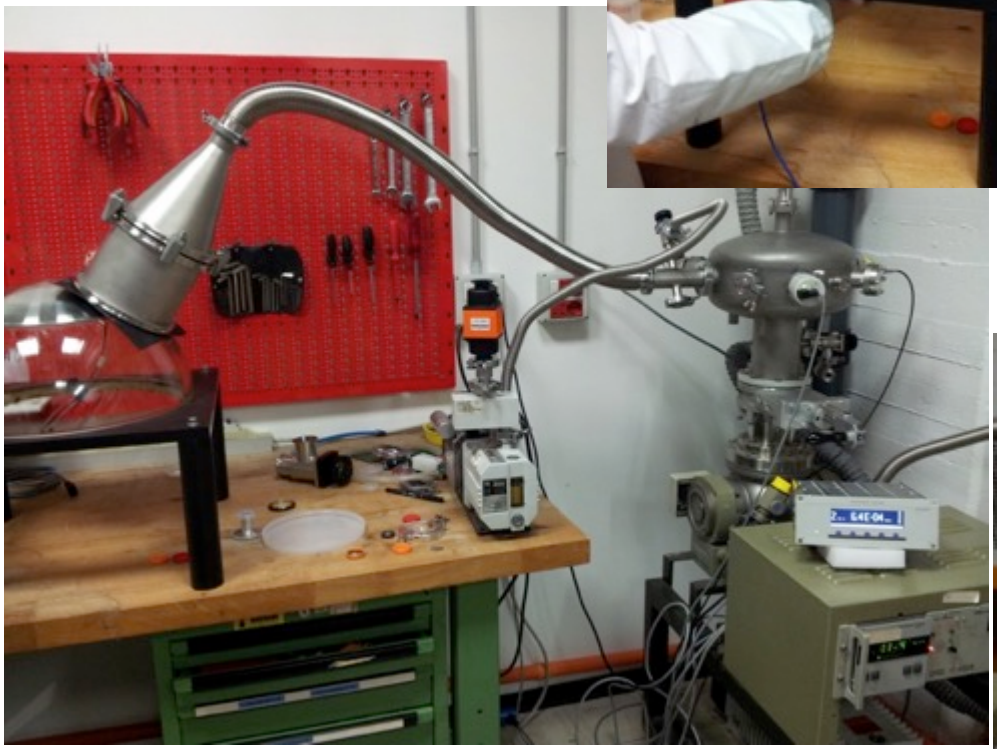
3 penetrators were mounted

Drawings for mounting the penetrator



Main assembly phases: Helium leak test for vacuum valve and penetrator (LNS)





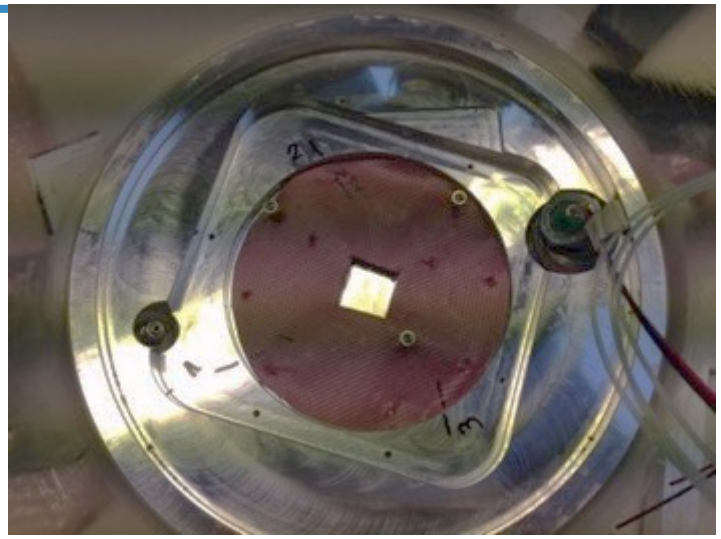
3 penetrators were tested

Helium leak rates tipically of about
$1x10^{-8}$ – $3x10^{-9}$ mBarl/s
<< than the required $5.5x10^{-6}$ mBarl/s

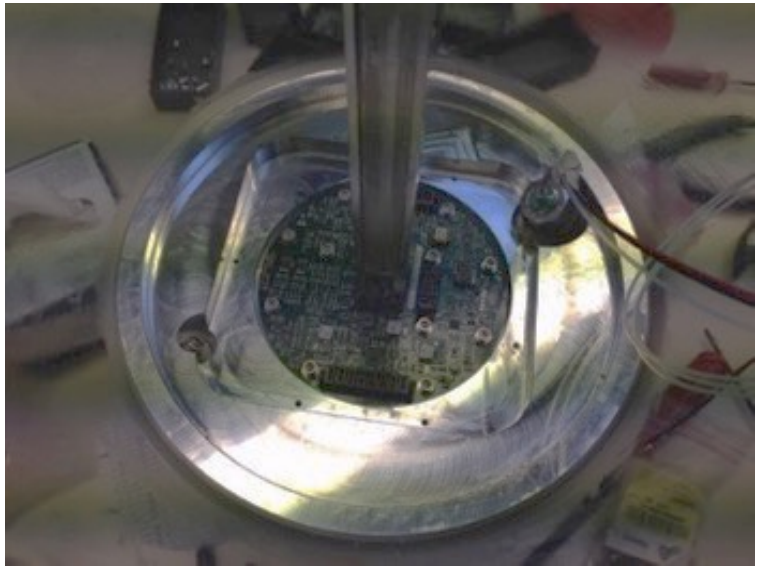
emanuele.leonora@ct.infn.it

Main assembly phases: power board

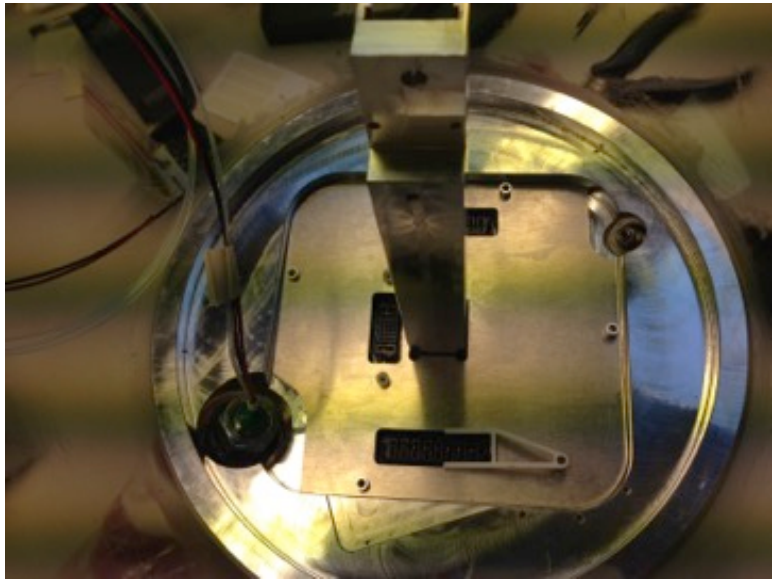
Top hemishere with mushroom



Gap filler



Cooling bar and power board

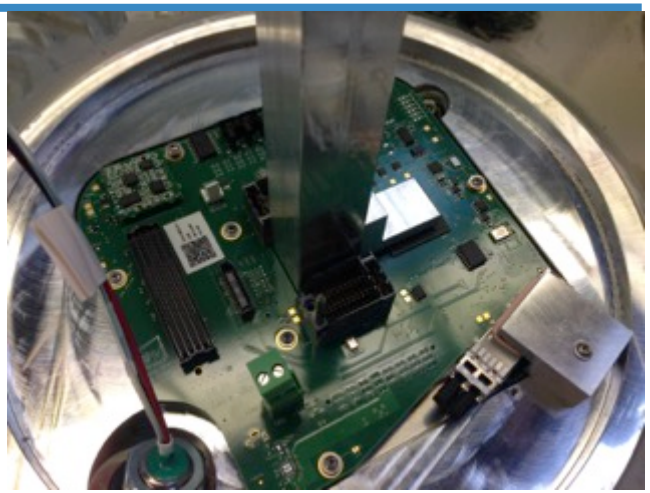


Faraday plate and spring holder

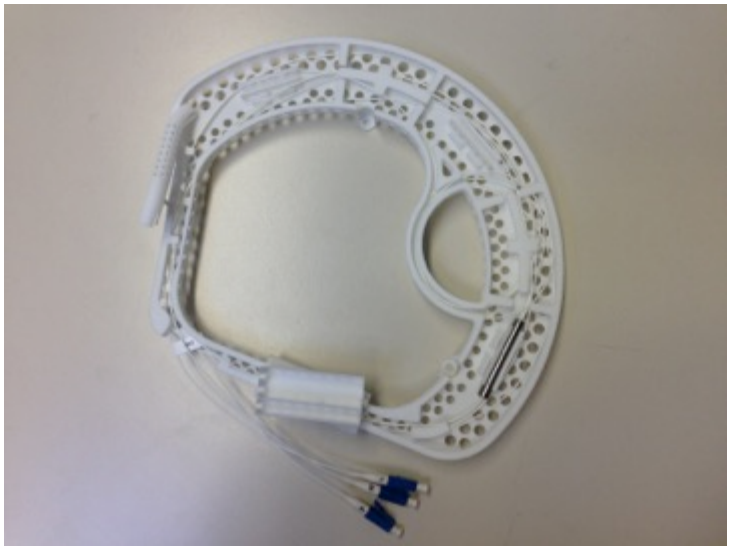
emanuele.leonora@ct.infn.it

Main assembly phases: CLB, SFP transceiver, add & drop filter, fiber routing

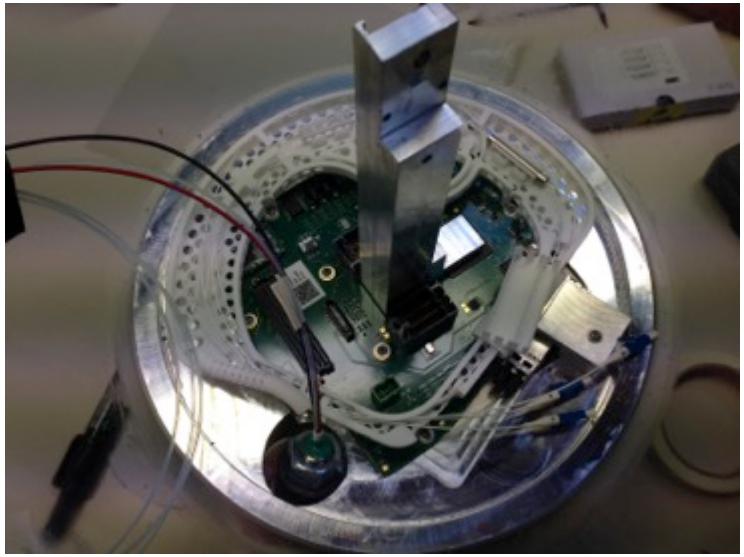
CLB



SFP transceiver and cooling blocks



Add & Drop filter routed into the fiber tray



Fiber tray mounted on the CLB

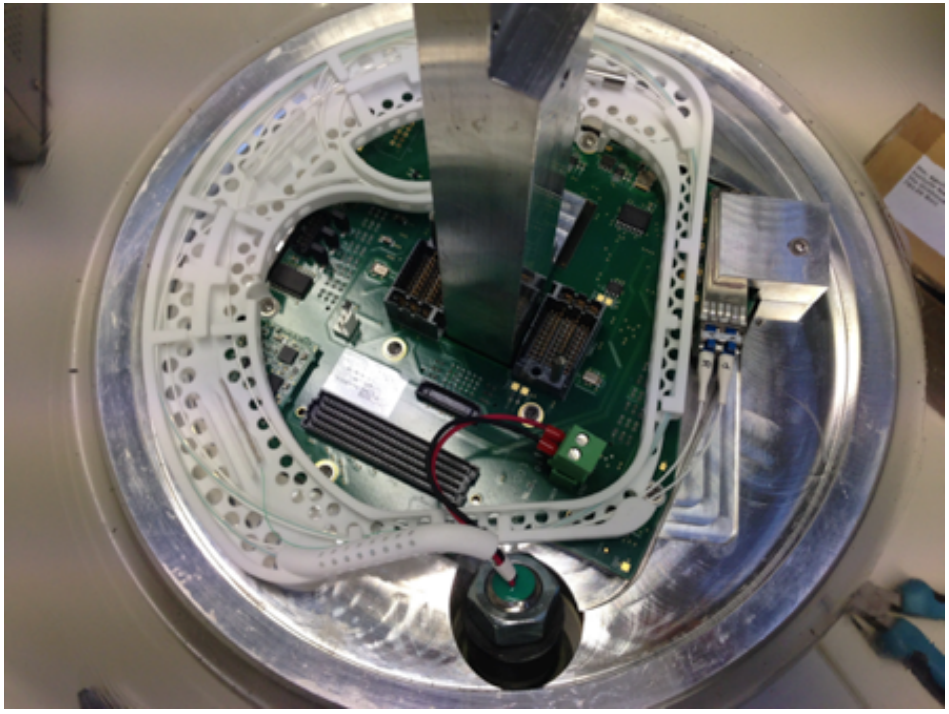
Main assembly phases: Fusion splicer

Stripper

Cleaver

Fusion splicer

Source and optical meter



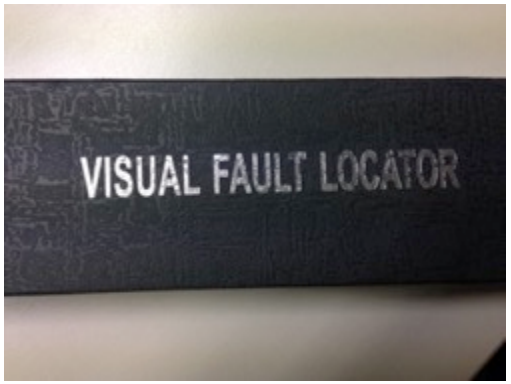
Final condition after the splice and test

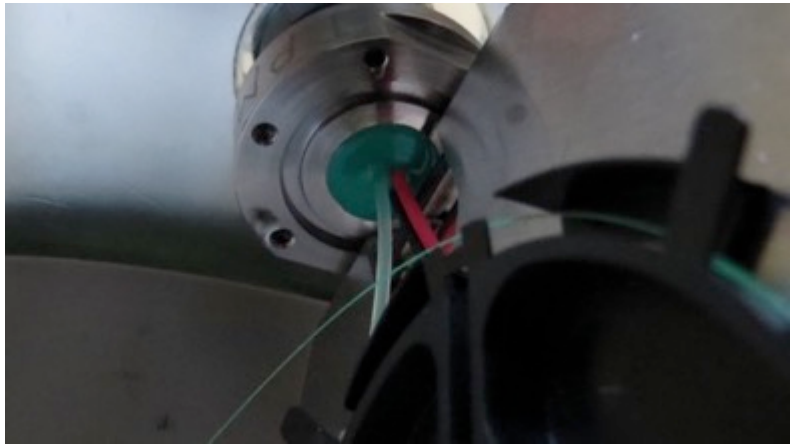
The two prepared top hemispheres:
electronics, SFP, add & drop and splice done

Main assembly phases: Fusion splice test

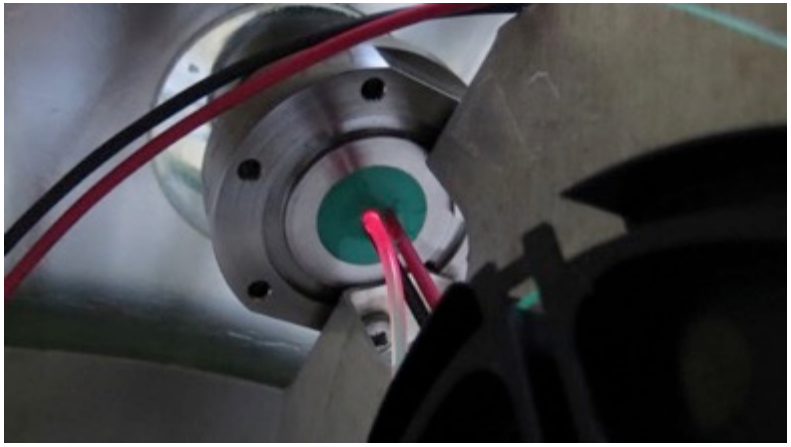
Optical splice tested following the procedure.
One of the two spliced fiber had an attenuation of about 6 dB

A visual fault locator was used, a red light source that injects light into an optical fibre to illuminate breaks → The optical fiber in the penetrator was broken





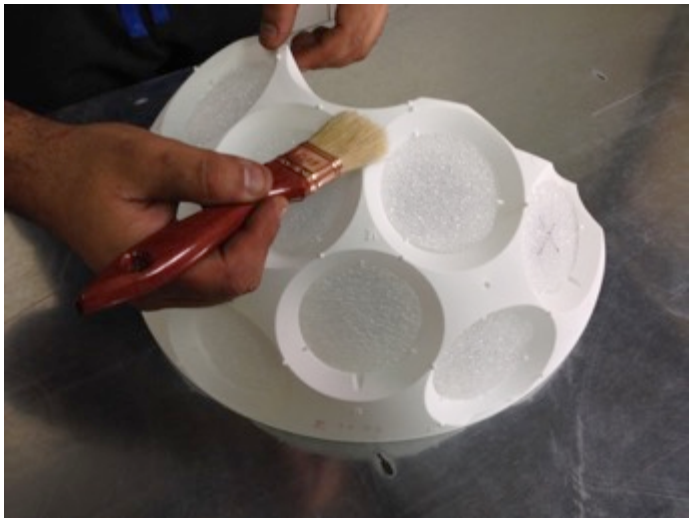
Penetrator that works correctly



Penetrator that doesn't work

The broken penetrator was replaced, and and NCR was opened

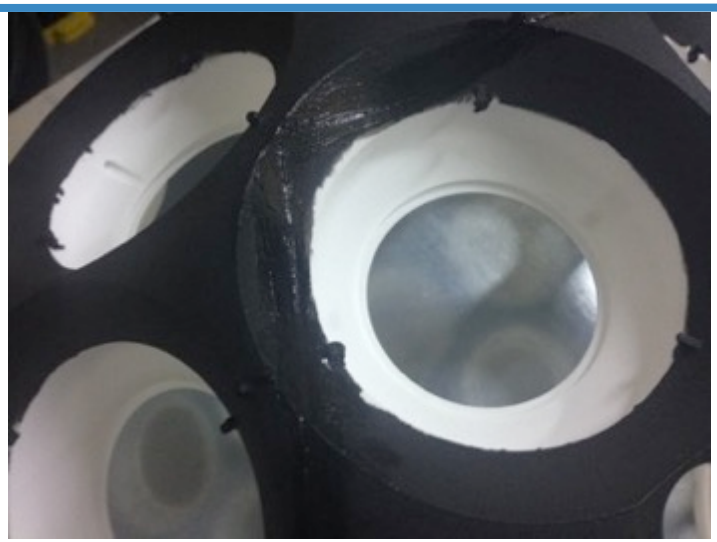
Main assembly phases: painting of the PMT structures



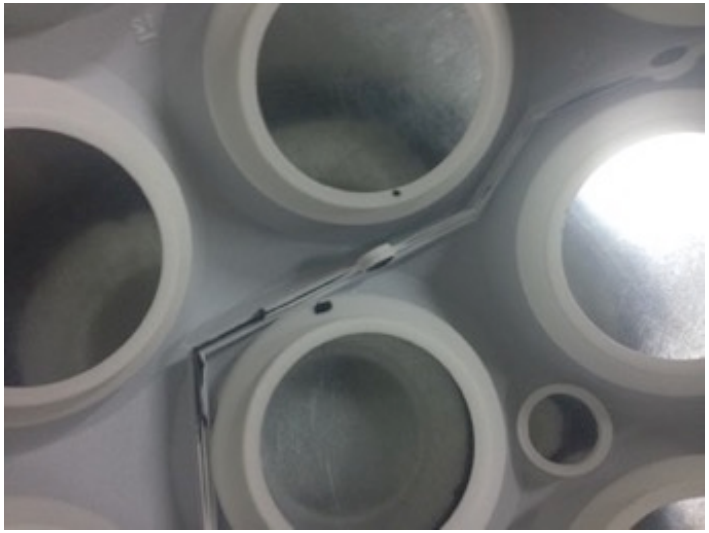
- Thoroughly cleaned by brush
- Painted (so far by brush, spray in future…?)
- Dried for at least 7 days at ambient temperature in clean ambient

Main assembly phases: joining of the two parts by means of neutral black silicone

Neutral black silicone on one part



The space between the two parts was also externally filled



The two parts joined by silicone and clips

Final product

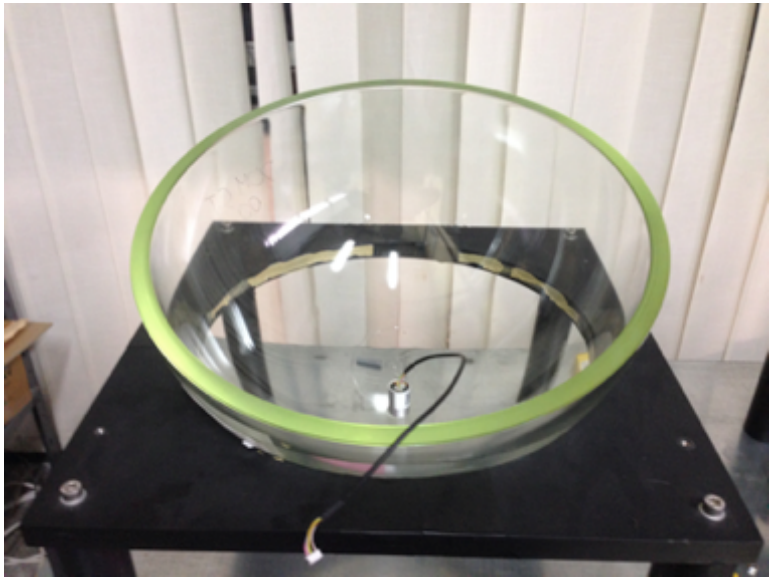
Main assembly phases: gluing of the piezo sensor

Digital weight meter to prepare the glue

Bi-component glue

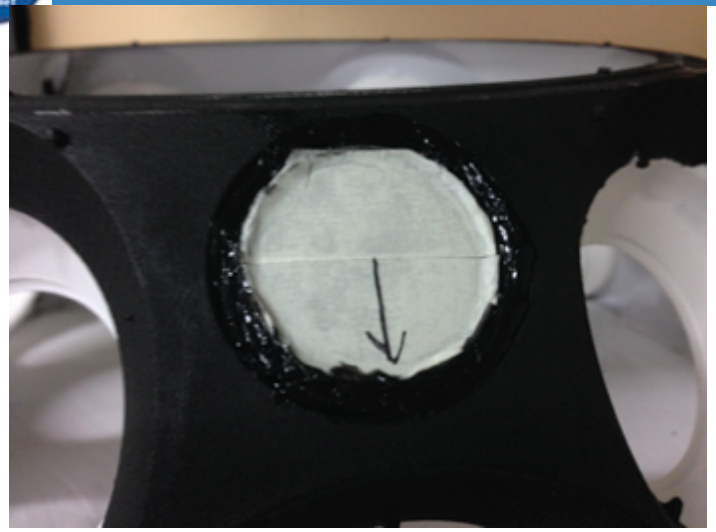
Few drops of glue on the piezo surface

Use of the structure to mark the place



Hardening of the glue. The hemisphere was non levelled to avoid piezo sliding

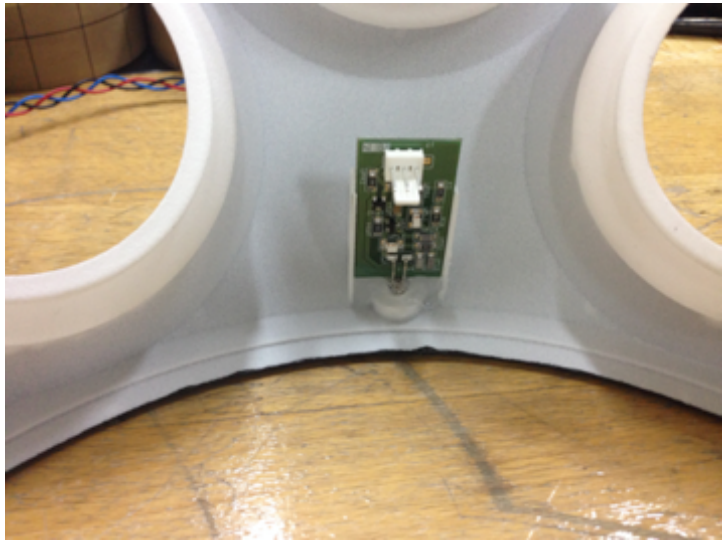
Main assembly phases: gluing of the manometer and nano beacon



The manometer glued by black silicone and covered by tape

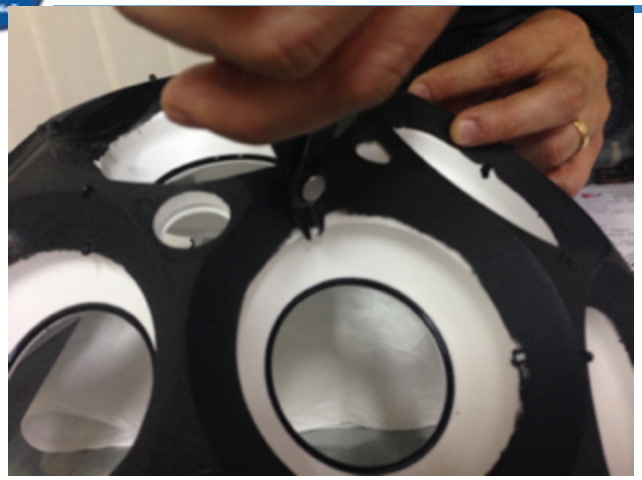
The manometer after the silicone drying and the removing of the tape

The nano beacon externally levelled with the structure

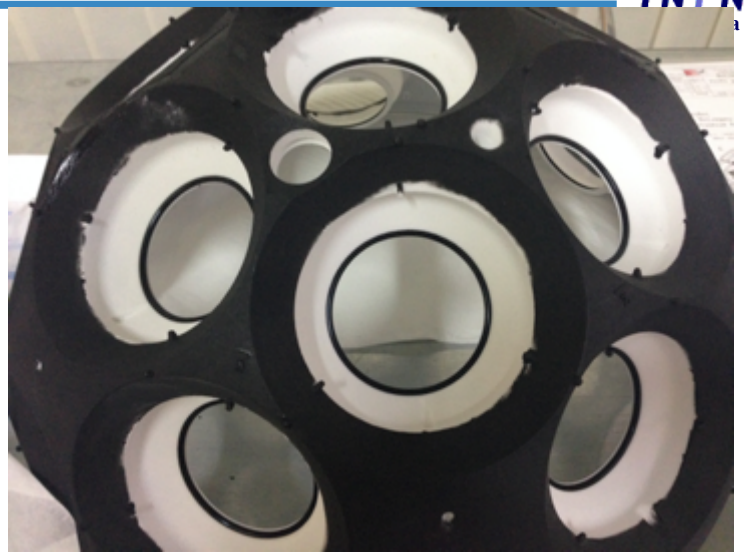


The nano beacon inserted into the structure and glued by transparent silicone

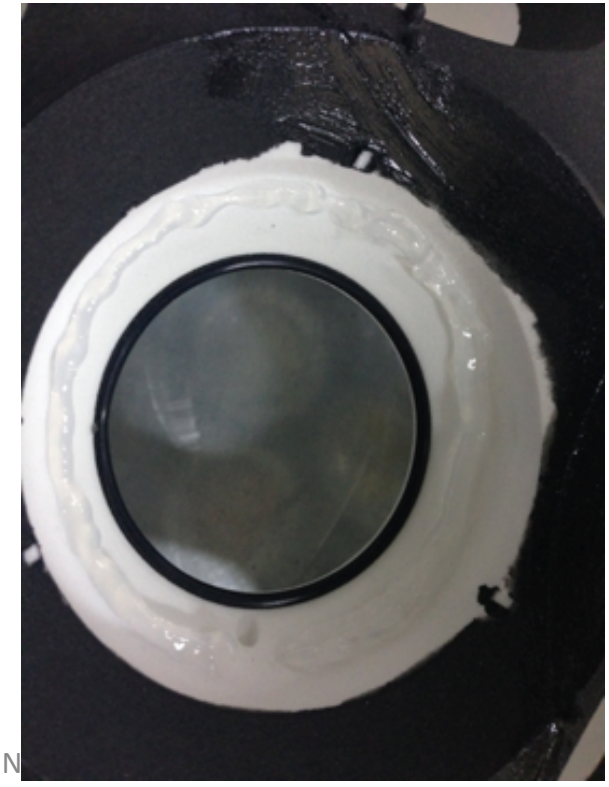
Main assembly phases: mountig of the PMTs to built 1 complete DOM



Cutting of the pins for the PMTs



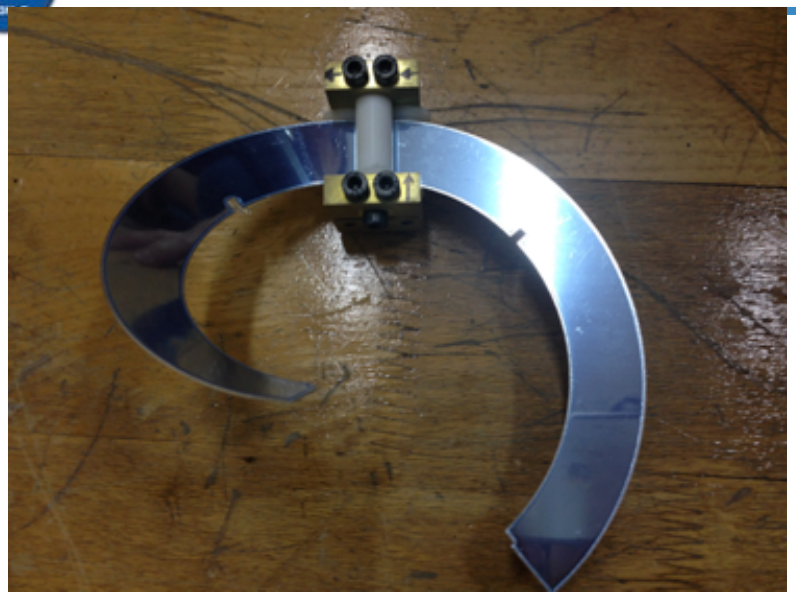
Mounting of the O-rings



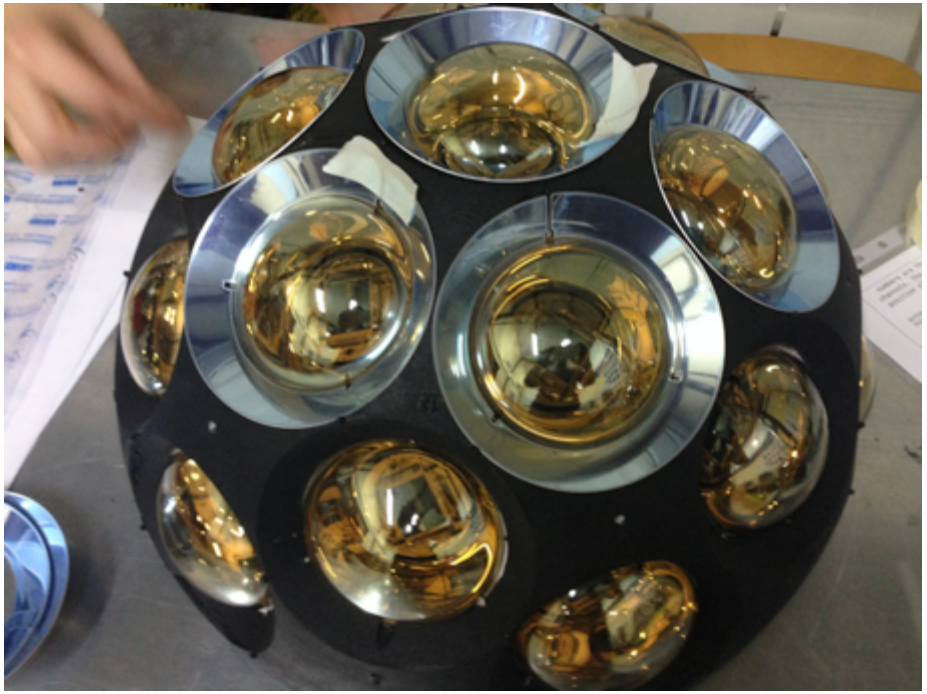
Transparent neutral silicone was applied on the structure

Installing of the PMT respecting tails orientation

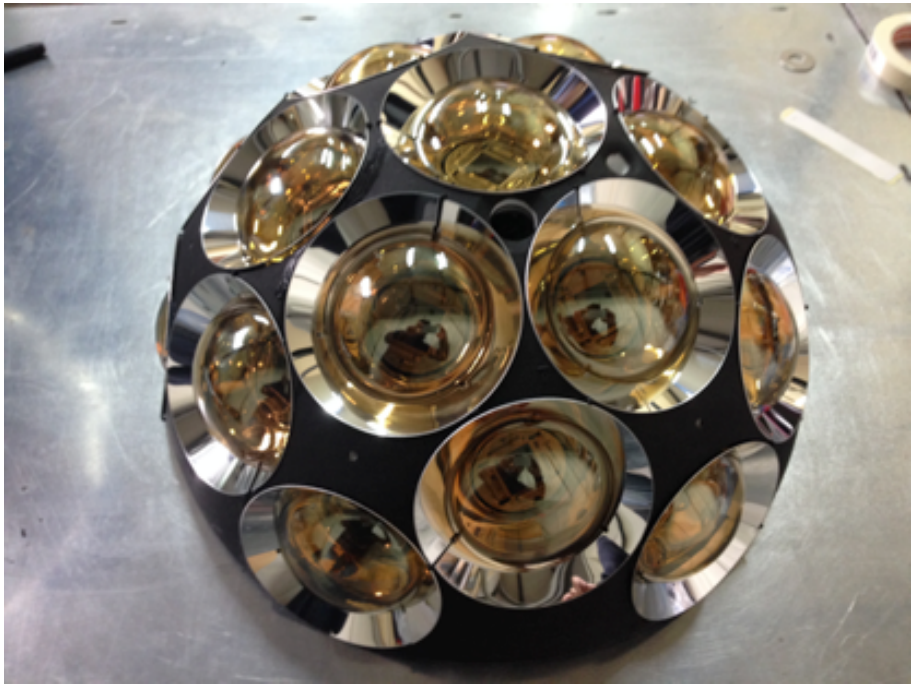
Main assembly phases: mounting of the deflector rings



Shaping of the deflector rings by means of the press (designed by NIKHEF, thanks to ECAP for technical plots)



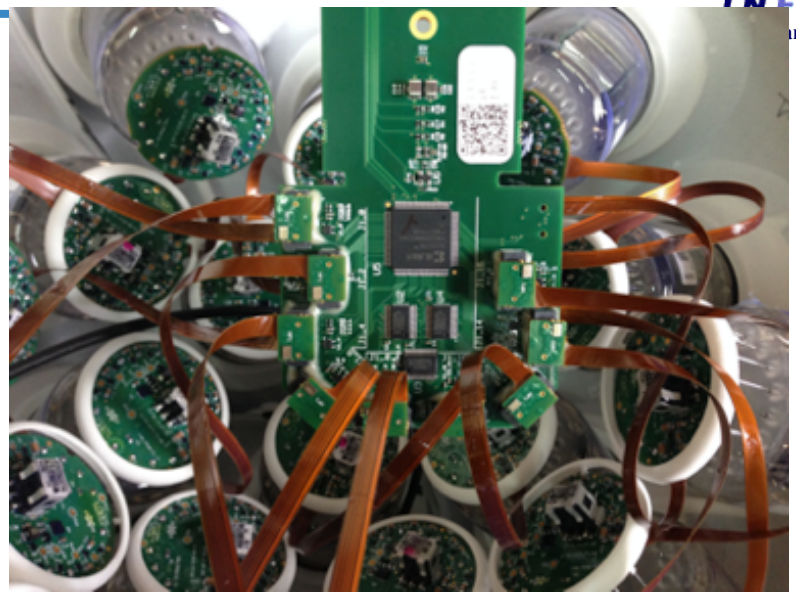
Positioning of the rings in the notches on the support structure



Removig of the foils

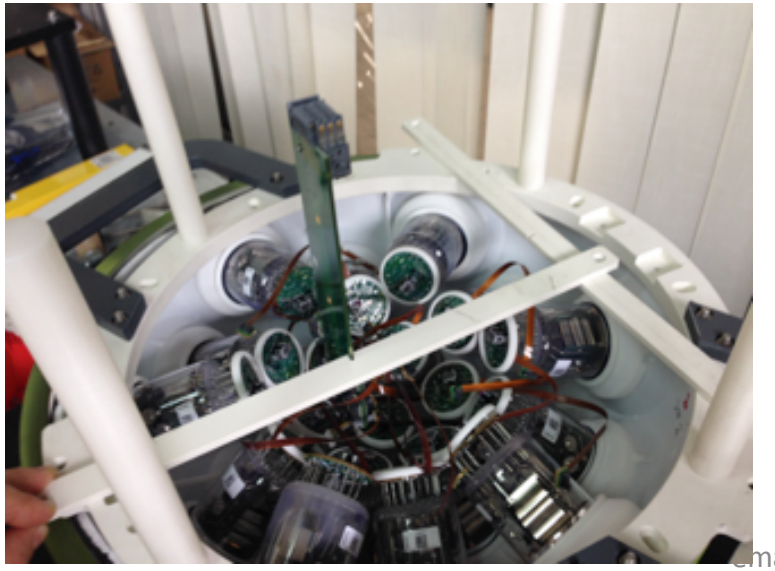
Main assembly phases: connection in the octopus board

Mounting of the HV fence even by a drop of glue



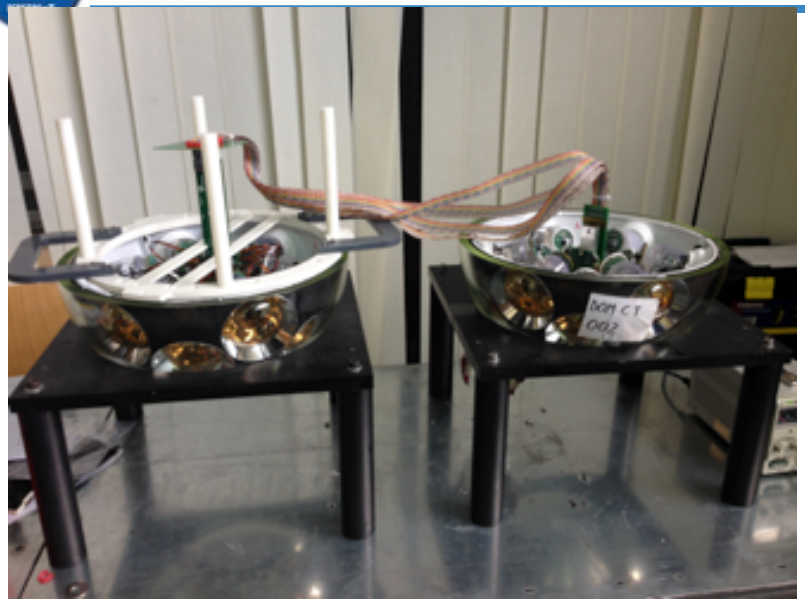
View of the large Octopus board connectors

Connection of the PMT tails to large Octopus board

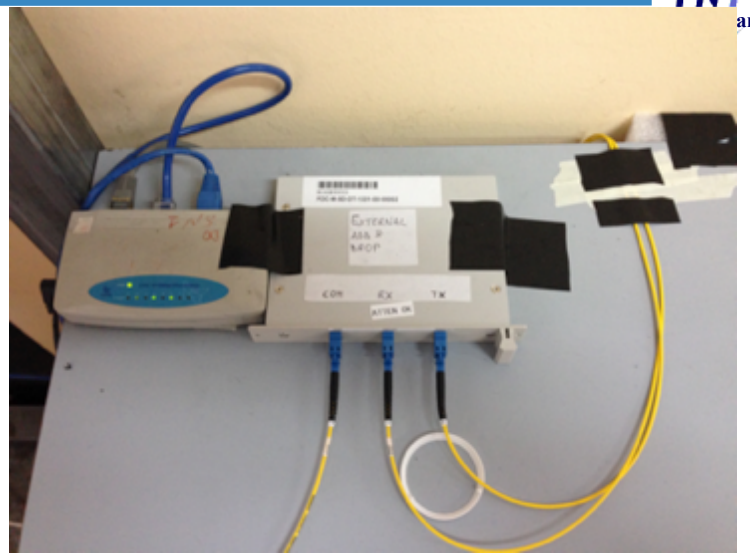


Connection of PMTs to the small Octopus board

Main assembly phases: functionality test by means of leiden cable and PC



Leiden cable connecting large Oct. Board to CLB



The external add & drop connecting the CLB to the PC

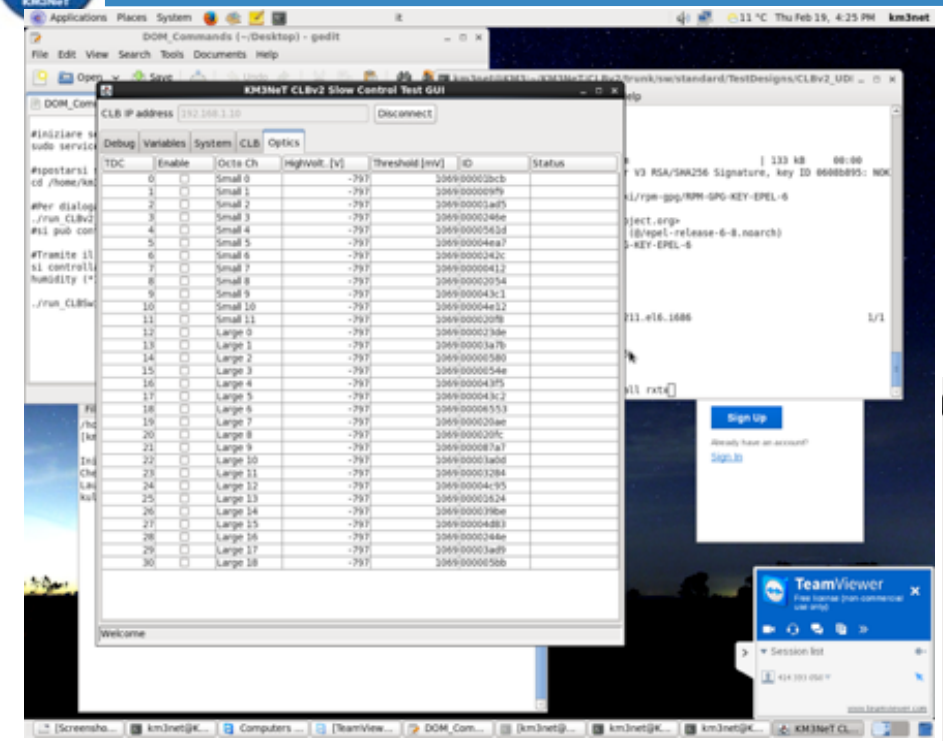
DOM test bench (with operator…)

Result of the functionality test:
The small octopus board mounted didn't work.

It was replaced with a correct one

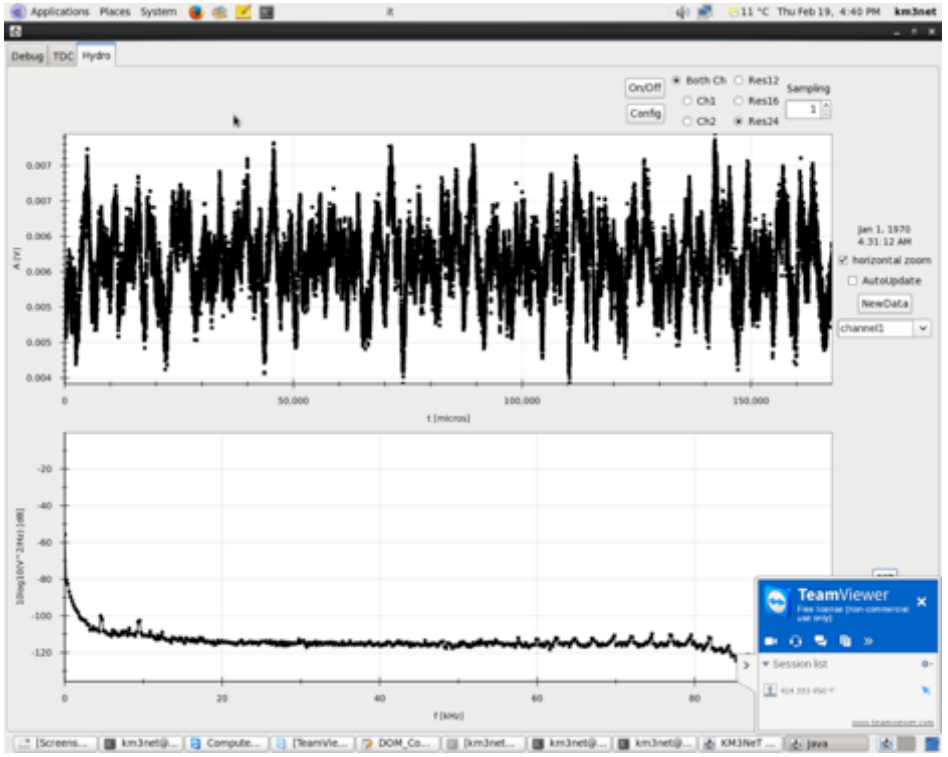
(an NCR was opened…)

Main assembly phases: functionality test of the two assembled halves



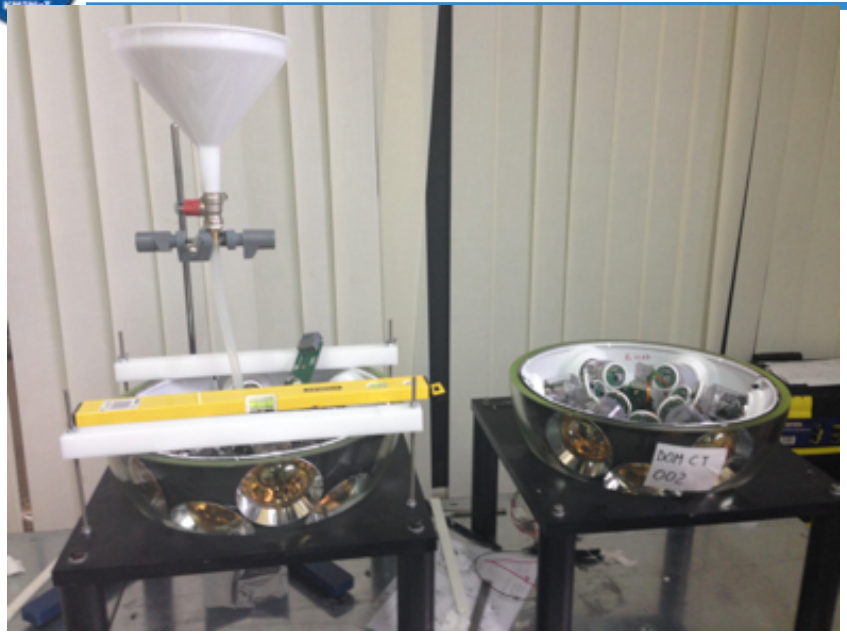
- Connection with CLB
- Temperature
- Humidity
- ID from each PMTs

Functionality test of the piezo sensors

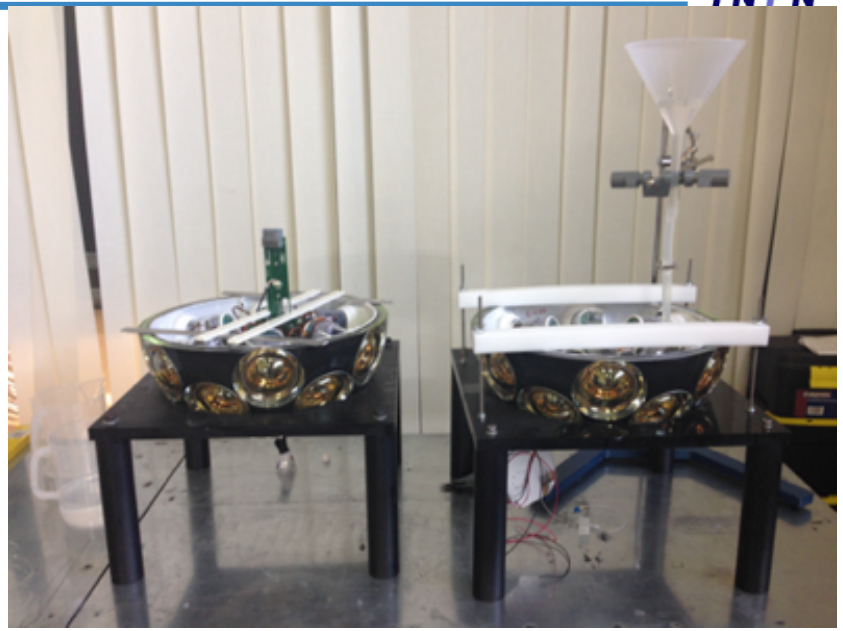


emanuele.leonora@ct.infn.it

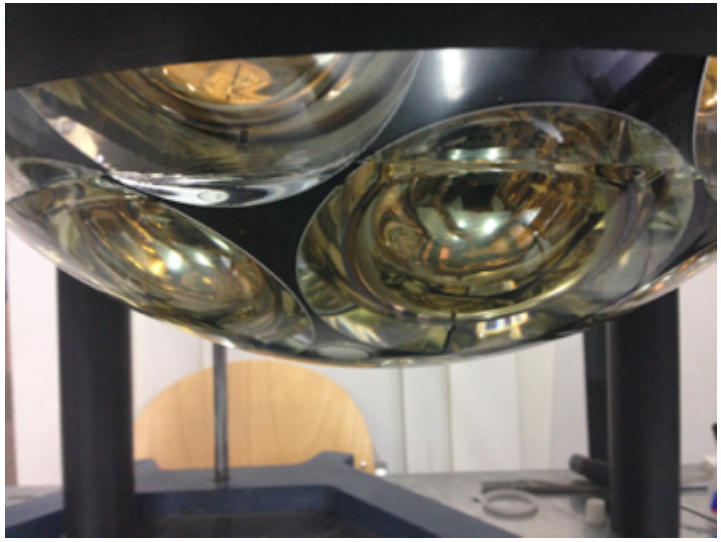
Main assembly phases: pouring of the gel



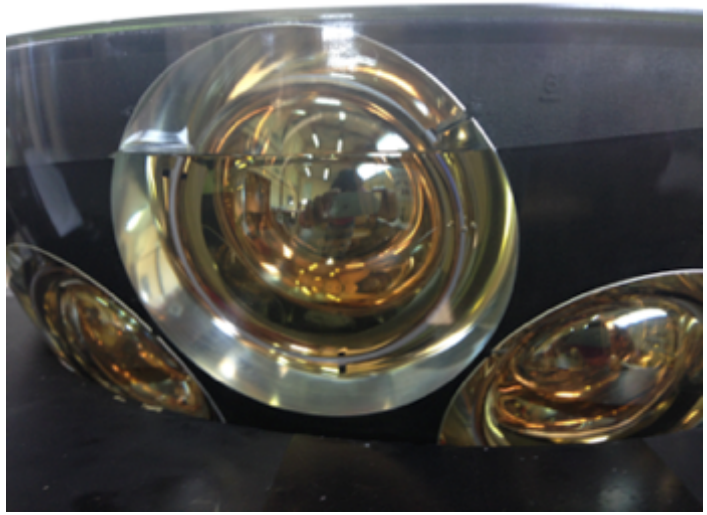
Pouring of the gel into the bottom



Pouring of the gel into the top



Flowing of the gel during the pouring



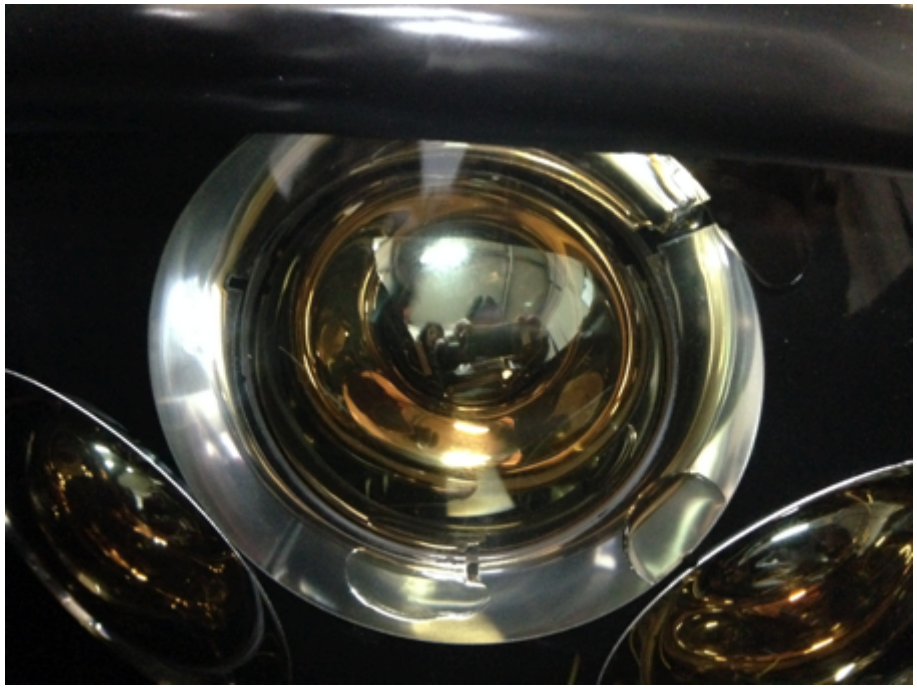
Flowing of the gel during the pouring

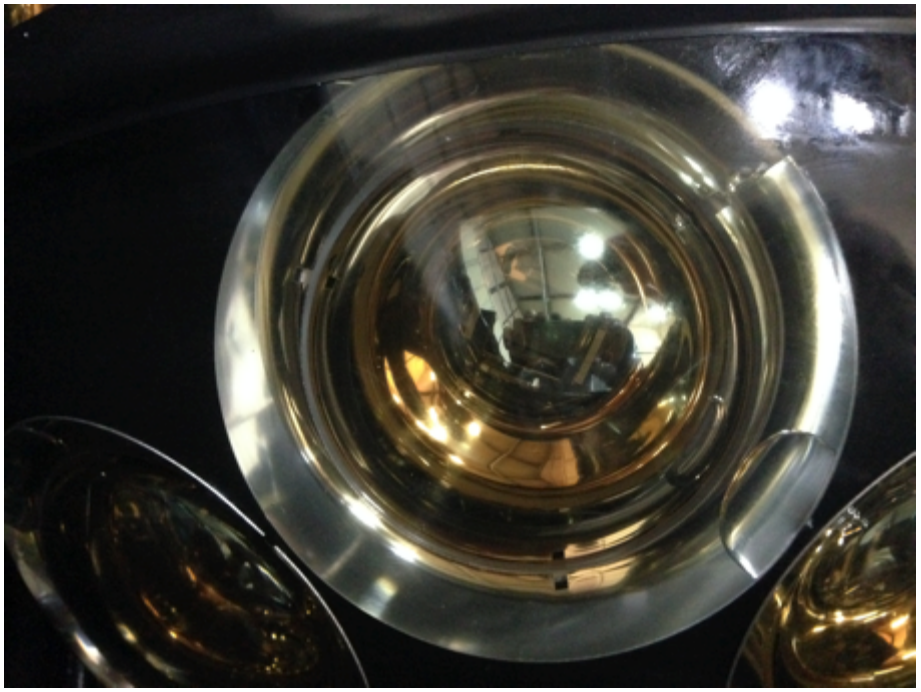
Main assembly phases: closure of the DOM and sealing

First Catania DOM closed and sealed

Test on gel detachments

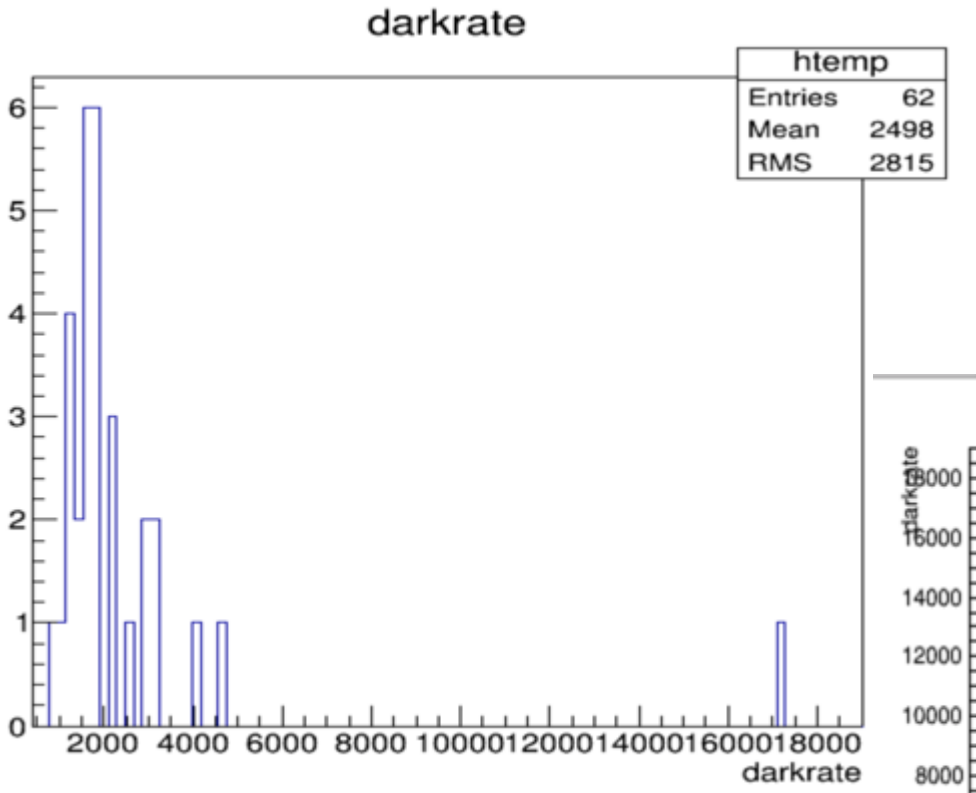
Gel detachments after some few days of closure underpressure @ 200 mBar

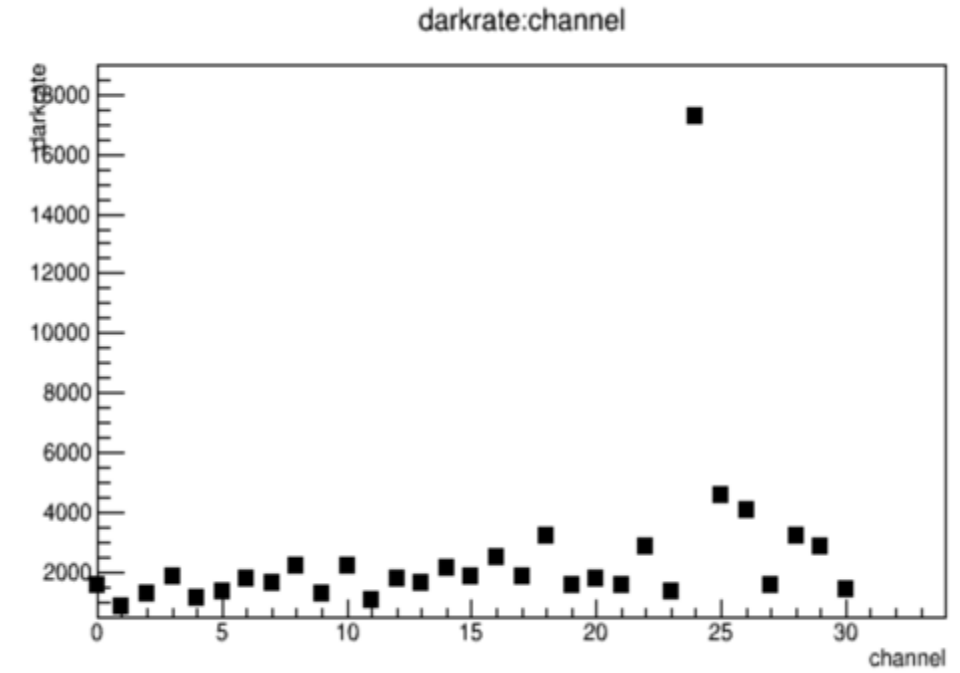




An air re-entry in the DOM removed after few days the detachments

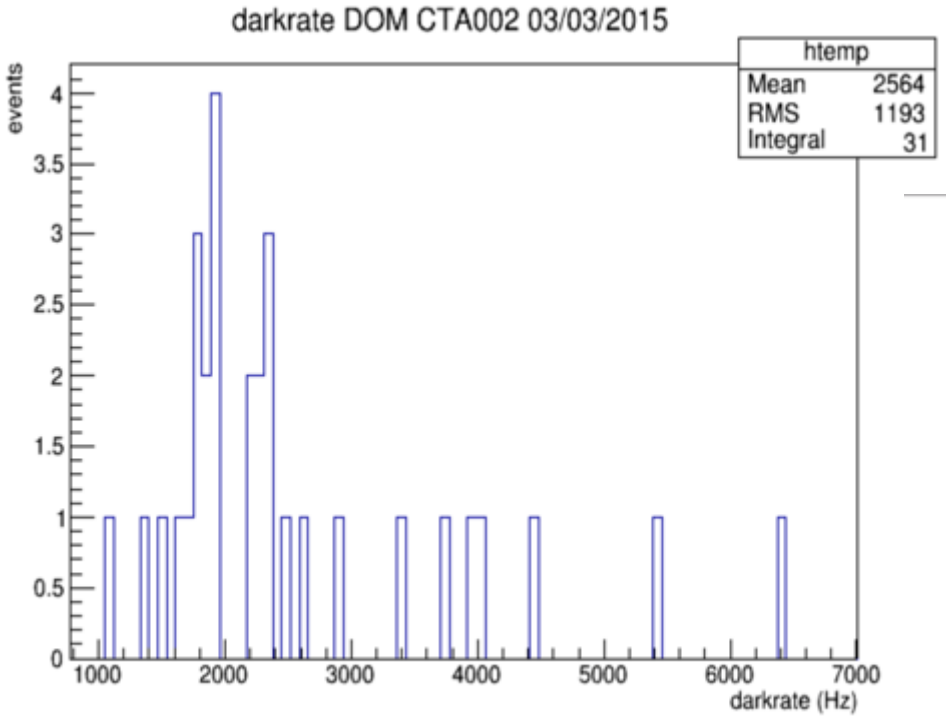
Test and measurements in dark box : DC rates



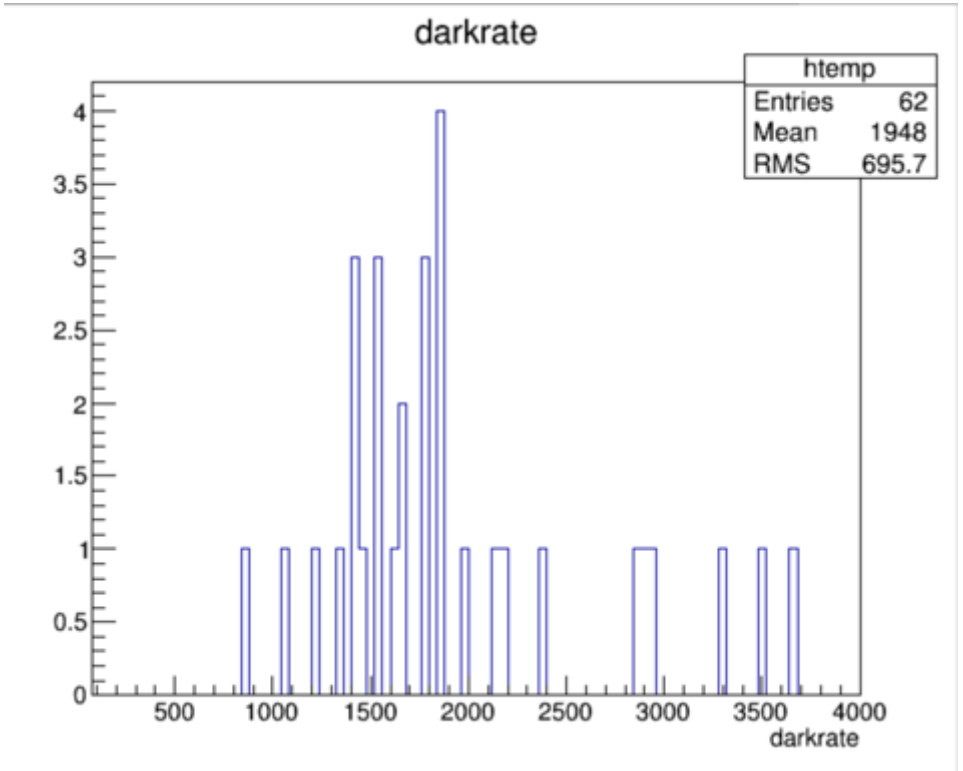


DC rates after two hours of power on

Test and measurements in dark box : DC rates

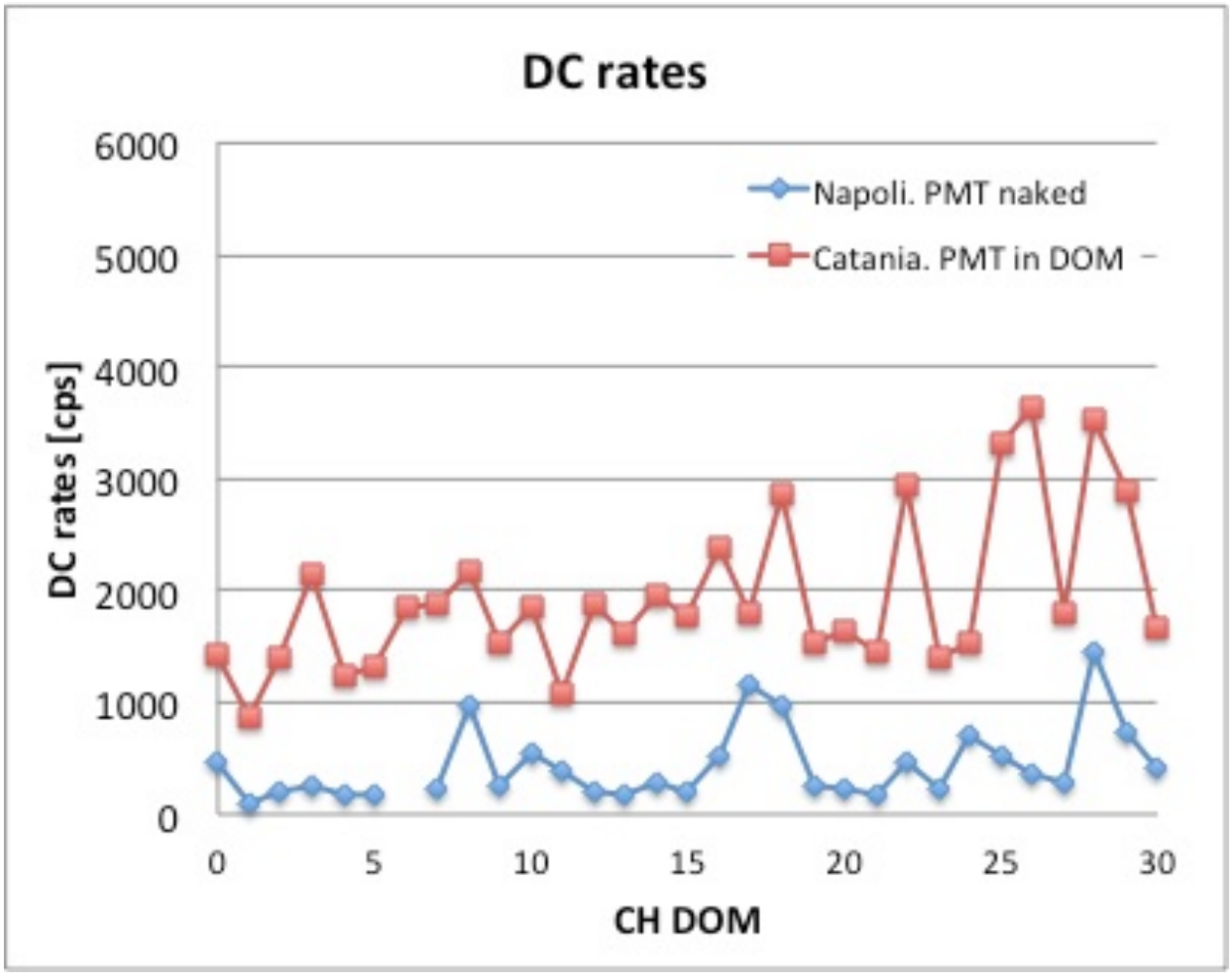


After 20 hours of power on



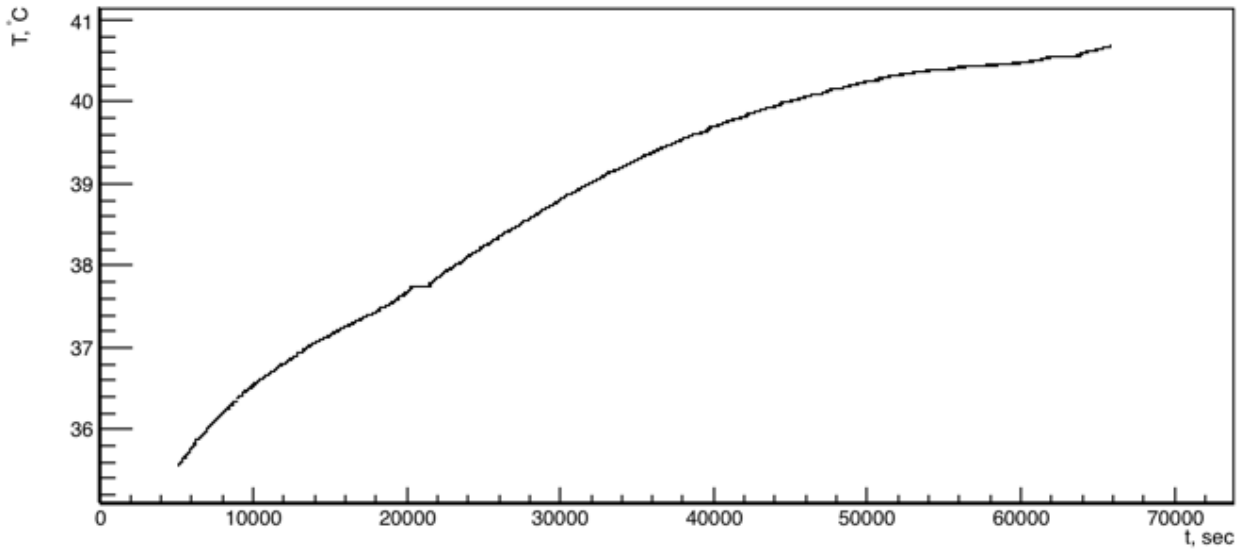
After 11 days of power on

conparison between assembled PMT and naked PMT measurements

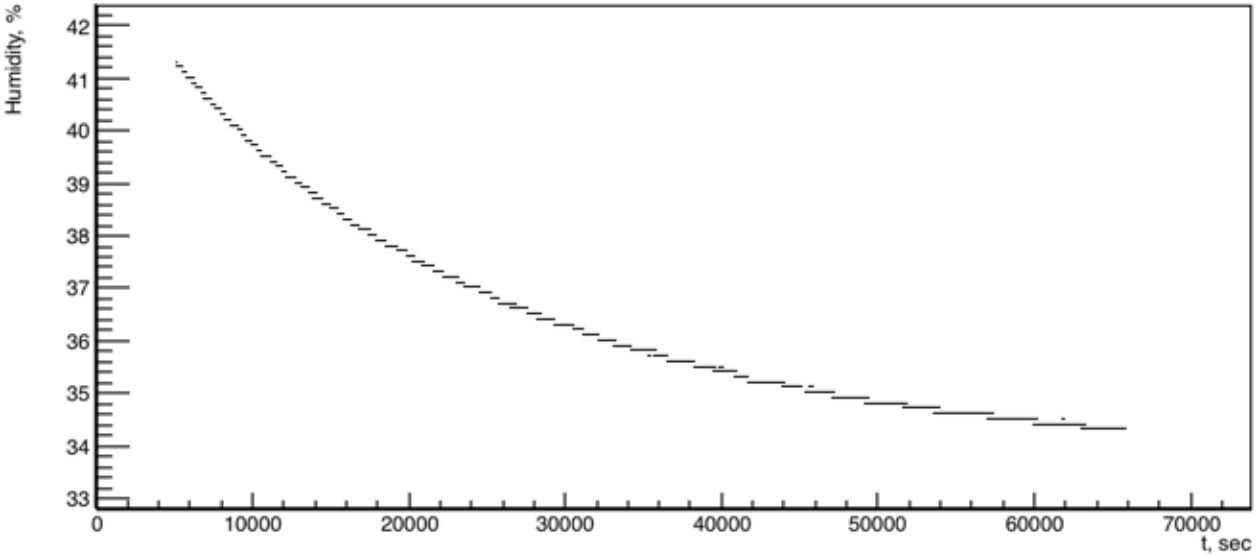


emanuele.leonora@ct.infn.it

Temperature and humidity



DOM temperature



DOM Humidity