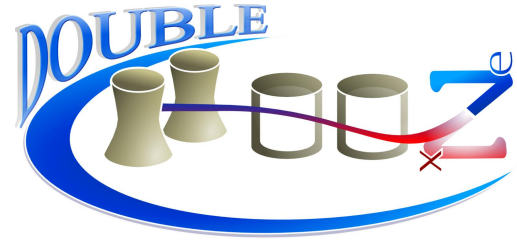
Double Chooz Near Detector Commissioning

Thiago S. Bezerra,

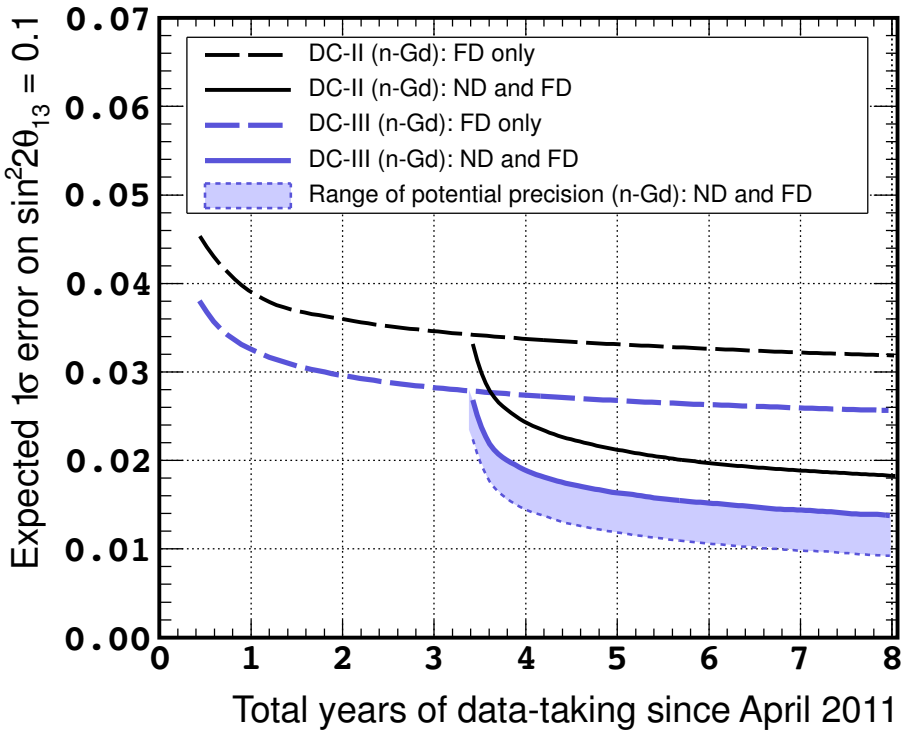
on behalf of Emmanuel Chauveau and the DC Collaboration



Neutrino Frontier Workshop — Fujiyoshida

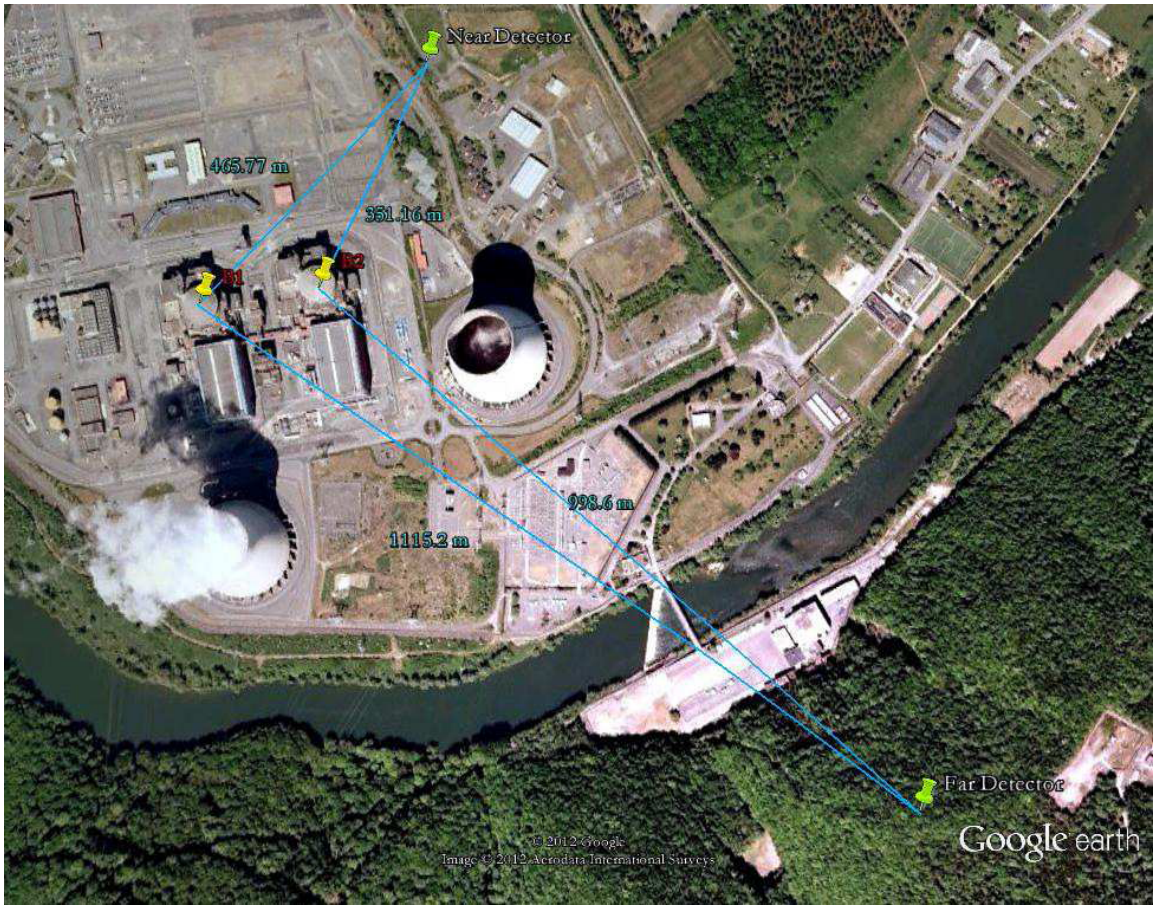
December 21$^{\underline{\text{st}}}$, 2014

Double Chooz Sensitivity on θ_{13}



- At the end of Far-only stage: $\delta(\sin^2 2\theta_{13}) \sim 0.030$
- With 6 months of Near+Far: $\delta(\sin^2 2\theta_{13}) \sim 0.015$
- Ultimately ($\sim$2017): $\delta(\sin^2 2\theta_{13}) \sim 0.010$

Double Chooz Detectors Baselines



Detector	Chooz B1	Chooz B2	Overburden [m.w.e.]
Far	1114.6 m	988.1 m	300
Near	466 m	351 m	120

Near Lab/Detector Time-line

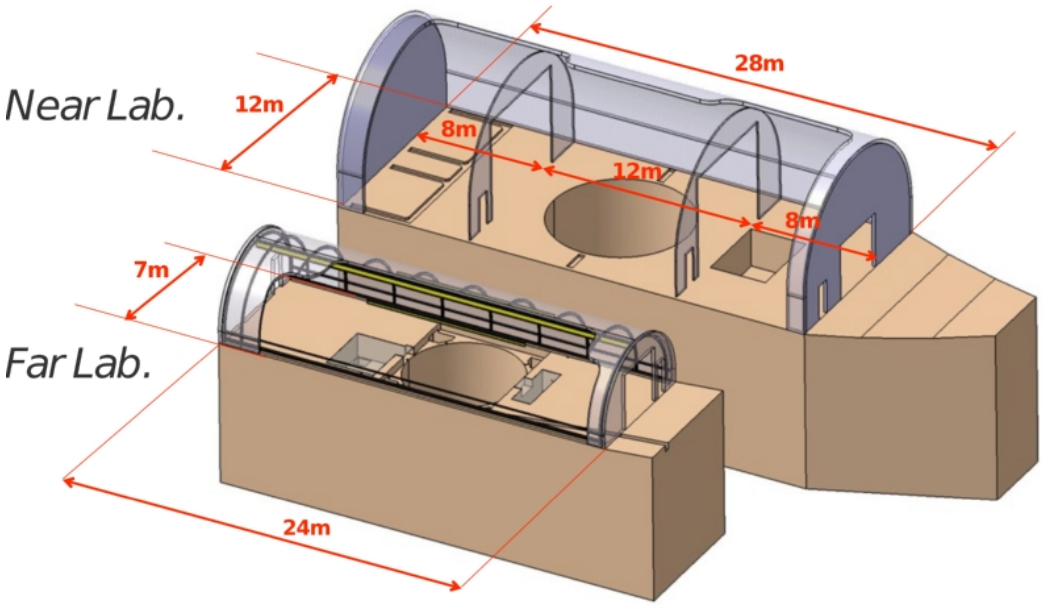
Tunnel and Lab Cave Digging

April 2011 $\sim$ May 2012

Lab Construction

May 2012 $\sim$ May 2013

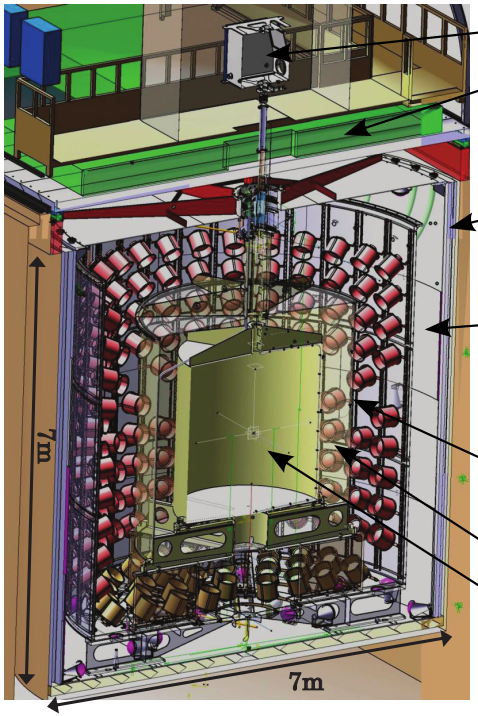
Double Chooz Near and Far Labs



- Larger lab divided into three sections (clean rooms)
  - Parallel work during detector construction
- Larger pit to afford a one meter thick water shield

Double Chooz Detectors

- - Far Detector - -



Calibration Glove Box

Outer veto (OV)

- **Plastic scintillator strip**
- Far: 6.4 x 12.8 m^2/ Near: 11.0 x 12.8 m^2

Stainless Stell Shield

Neutrino detector

Inner veto **(IV, 90 m^3 liquid scintillator)**

- 78 PMTs (8-inch, Hamamatsu R1408)

Inner detector (ID)

Buffer **(110 m^3 mineral oil)**

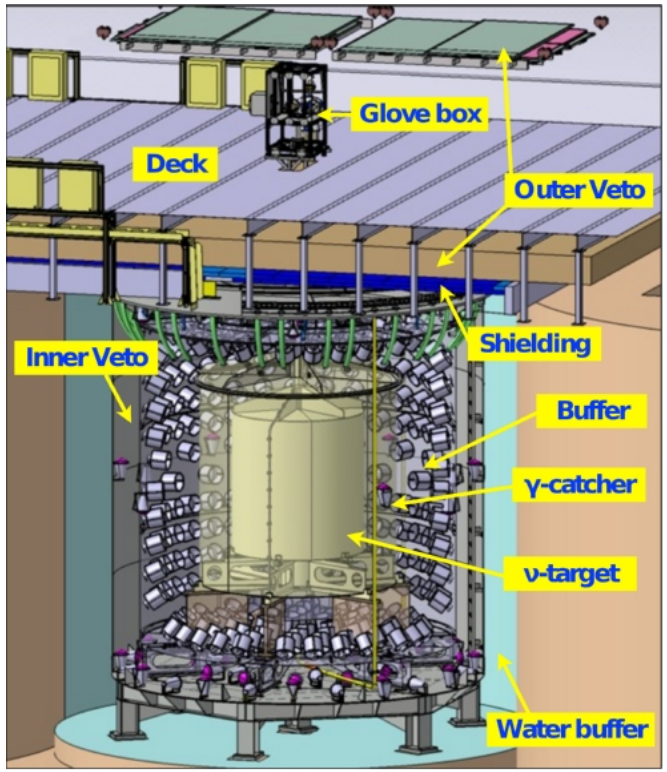
- 390 PMTs (10-inch, Hamamatsu R7081MOD)

γ catcher **(22.3 m^3 liquid scintillator)**

ν target **(10.3 m^3 liquid scintillator with Gd)**

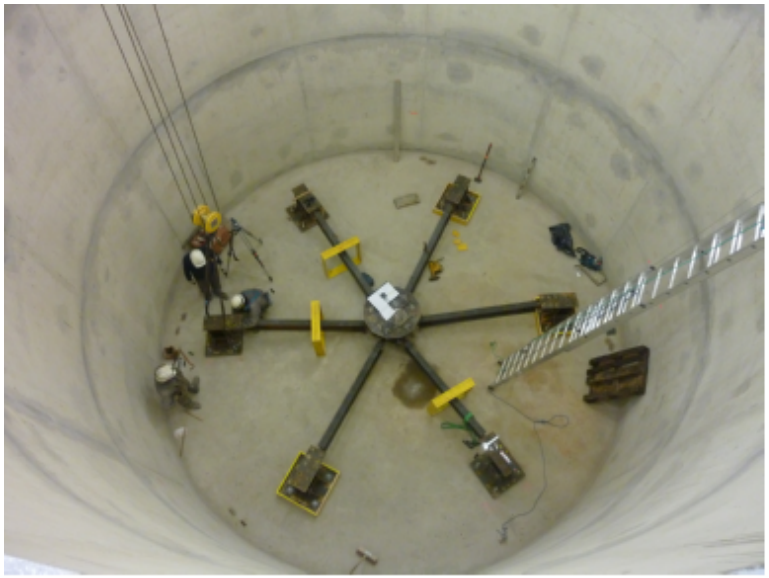
- **Number of protons = (6.738±0.020 x 10^{29})**

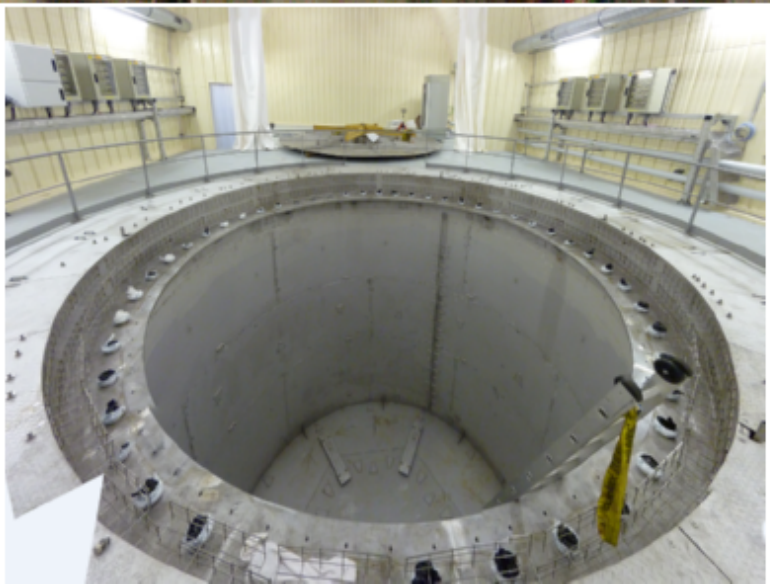
- - Near Detector - -



Inner Veto Vessel

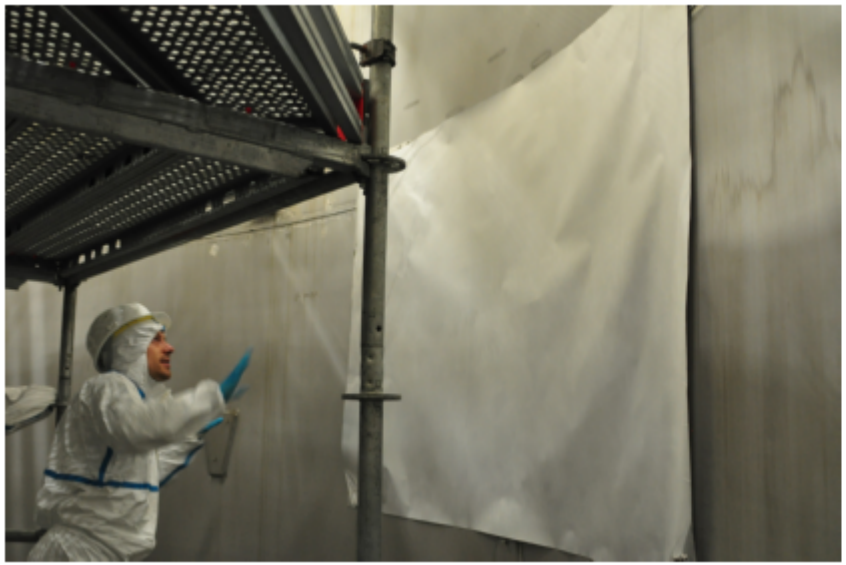
June and July 2013

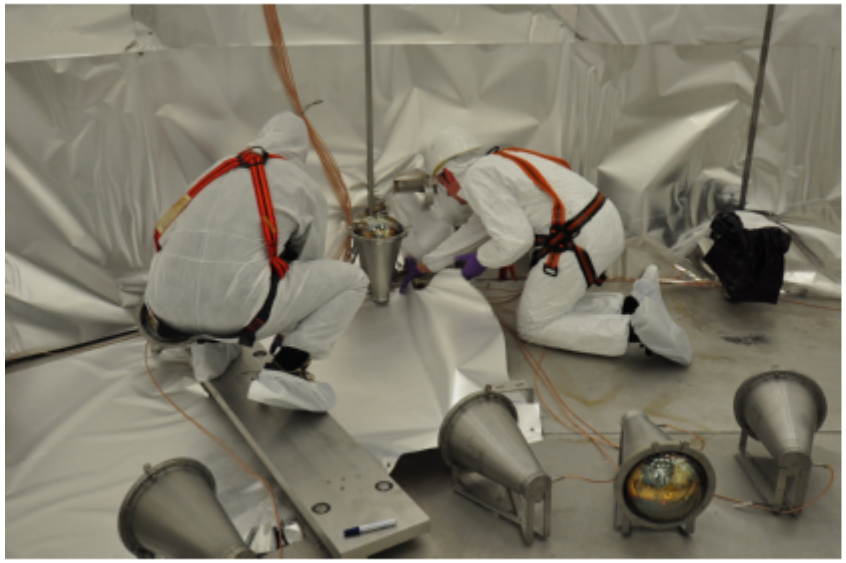


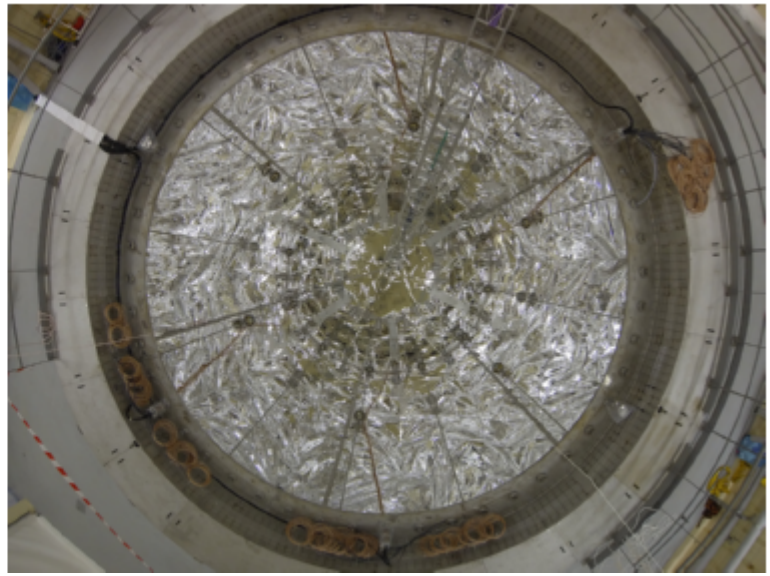


Inner Veto

August $\sim$ October 2013

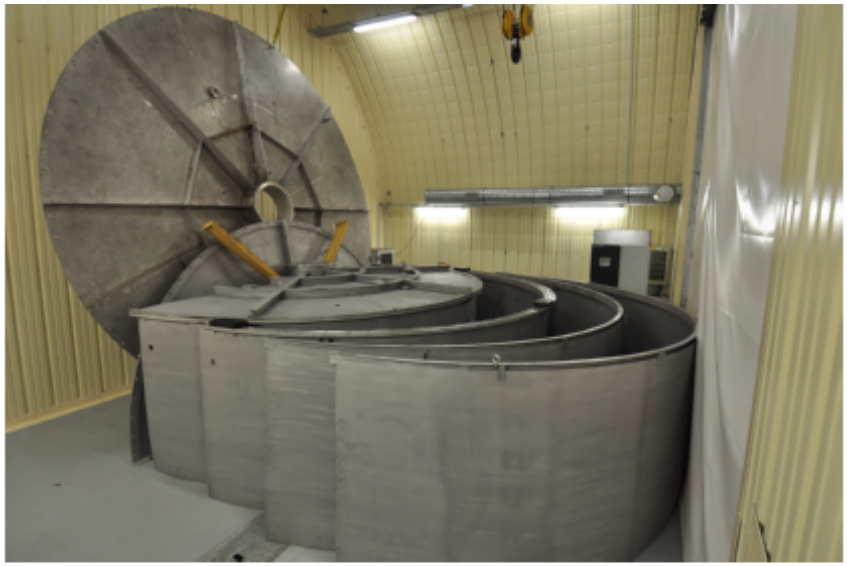


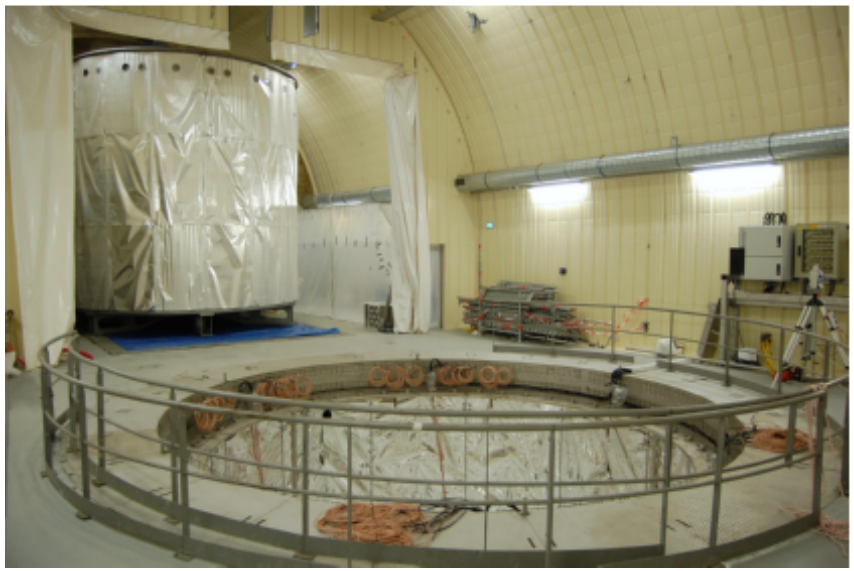




Buffer Installation

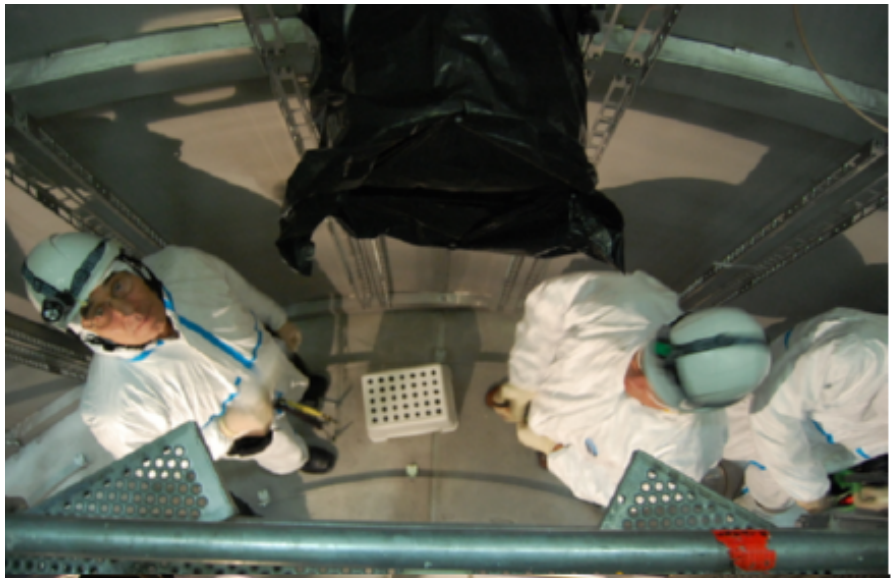
September $\sim$ November 2013

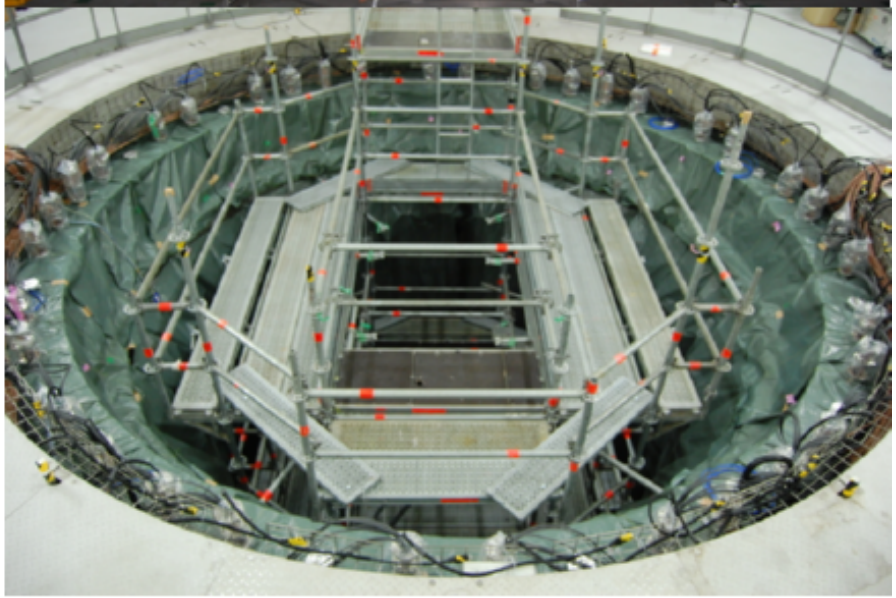




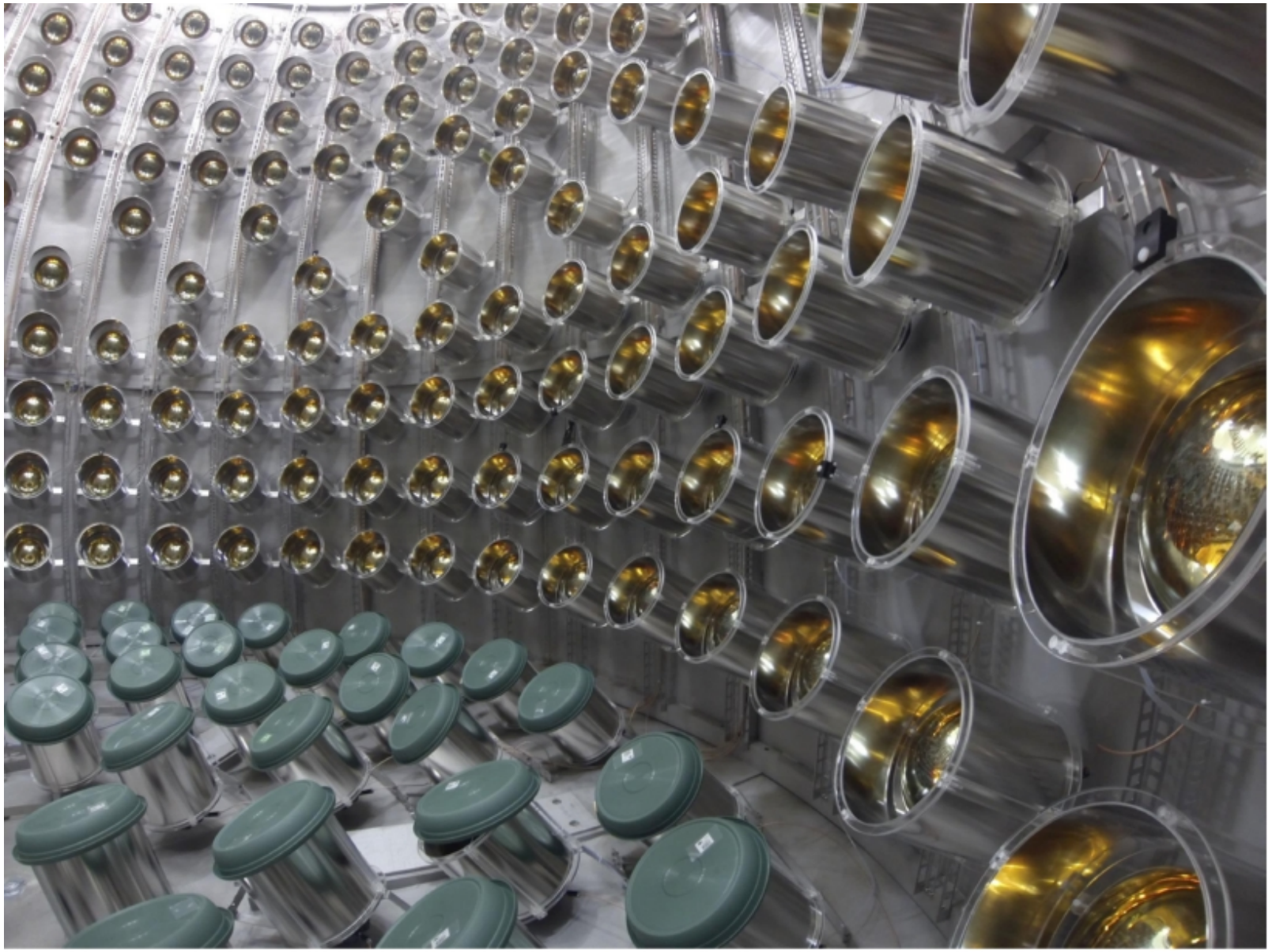
Buffer PMTs: Bottom and Wall

October and November 2013

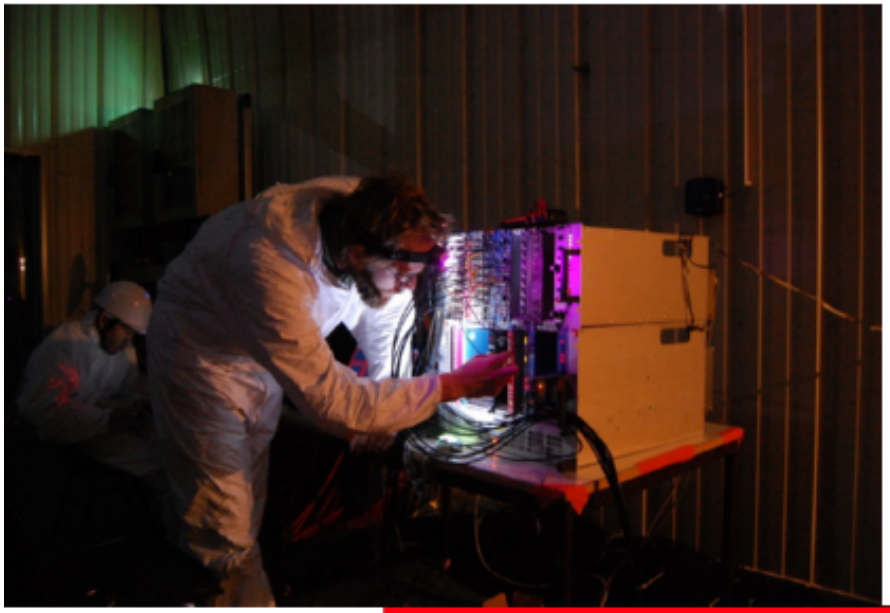


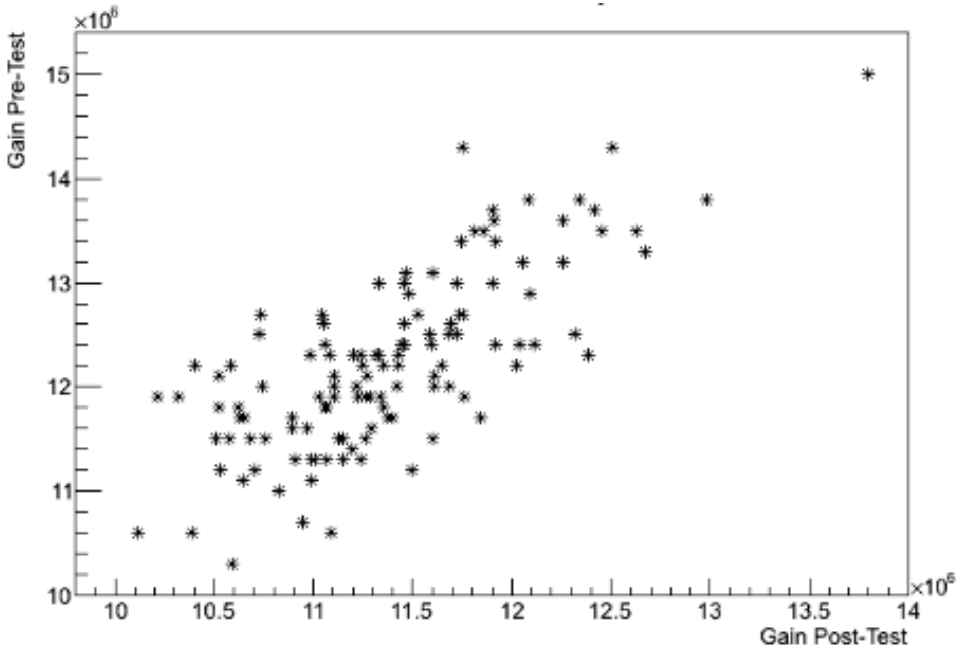


Buffer PMTs: Bottom and Wall

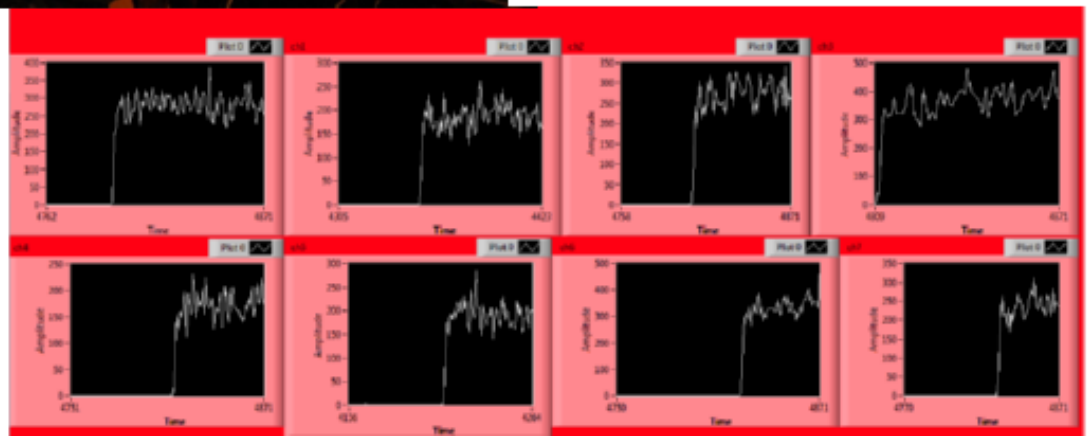


Buffer PMTs Post-Test



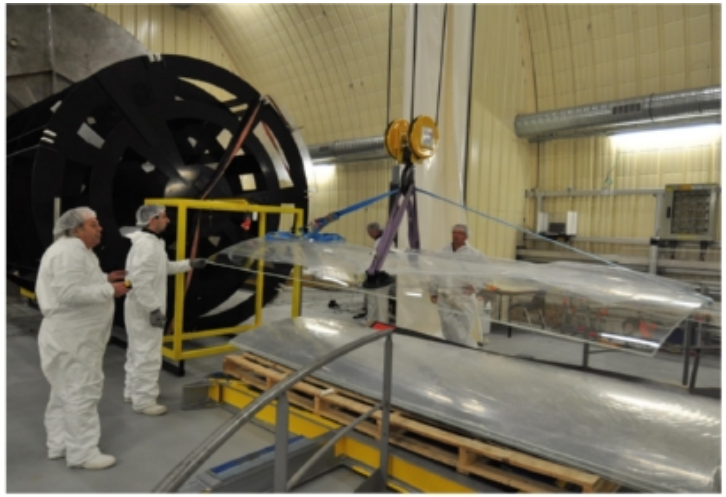
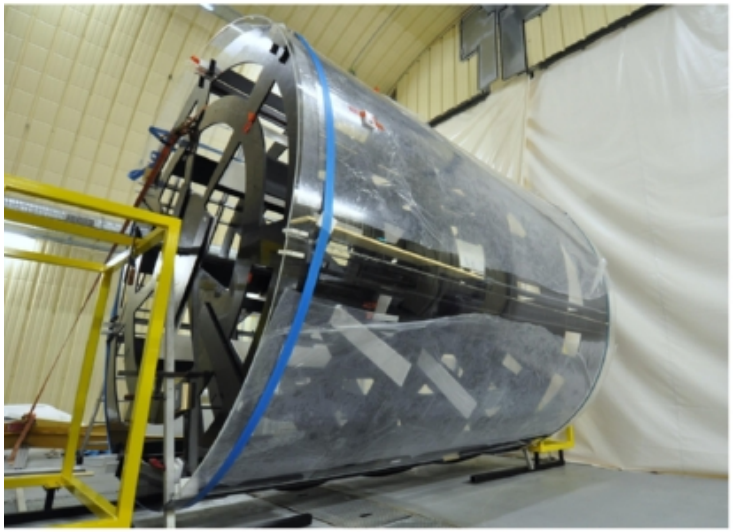
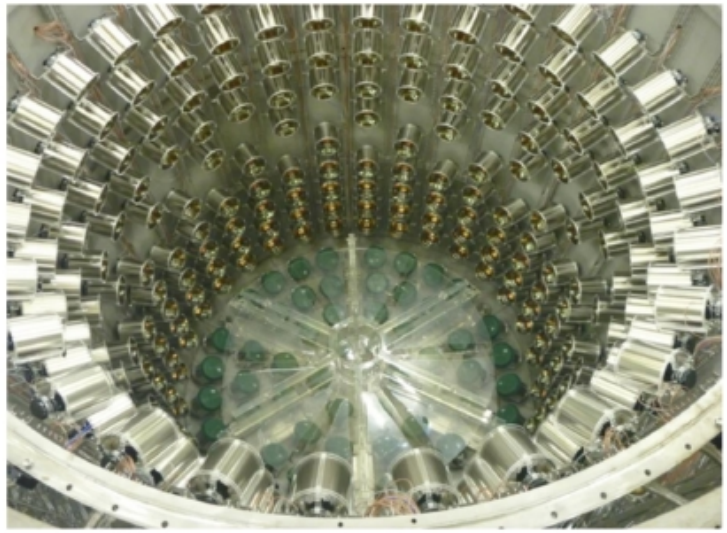


Installed PMT Dark Rate

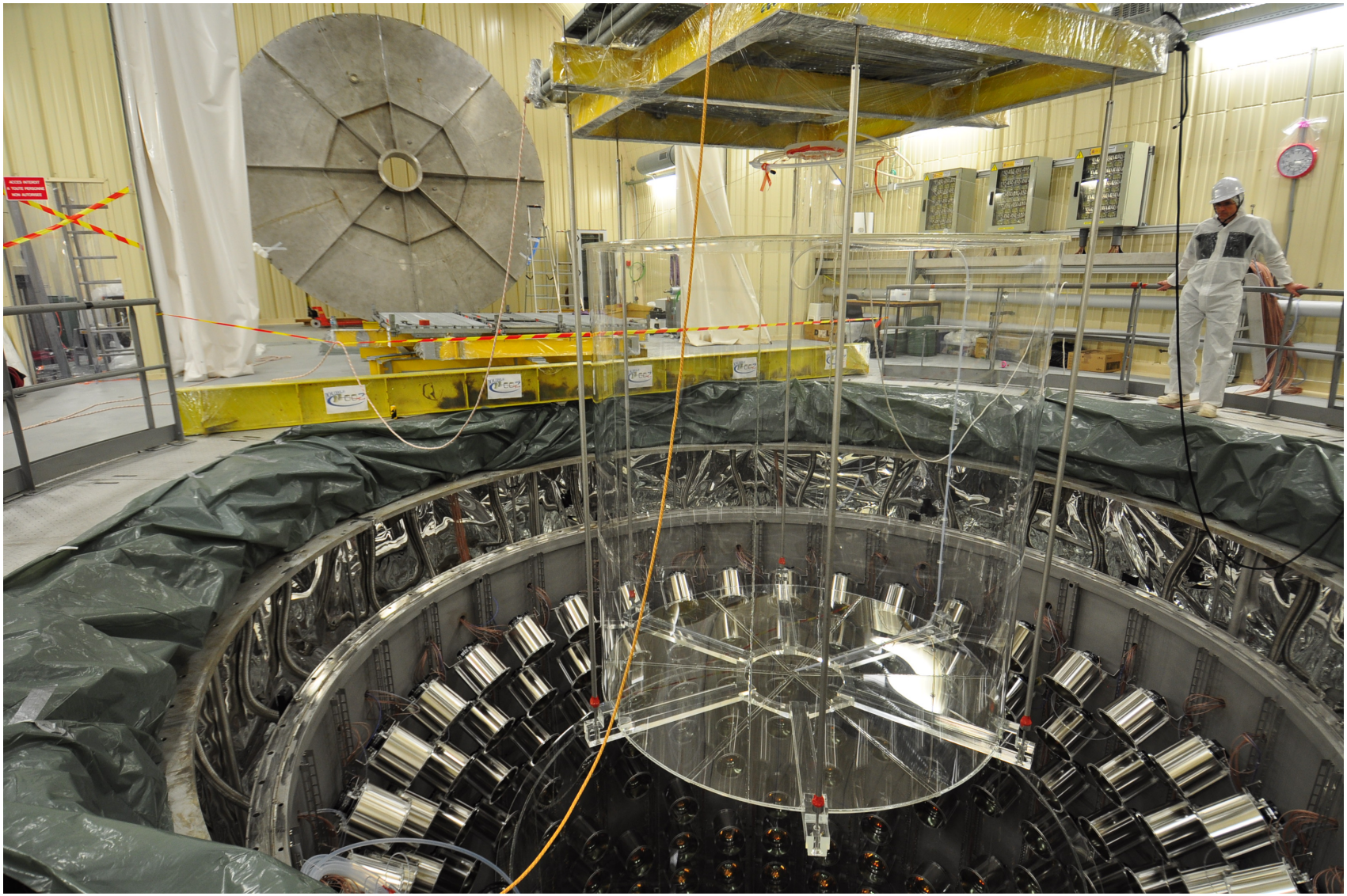


Gamma Catcher

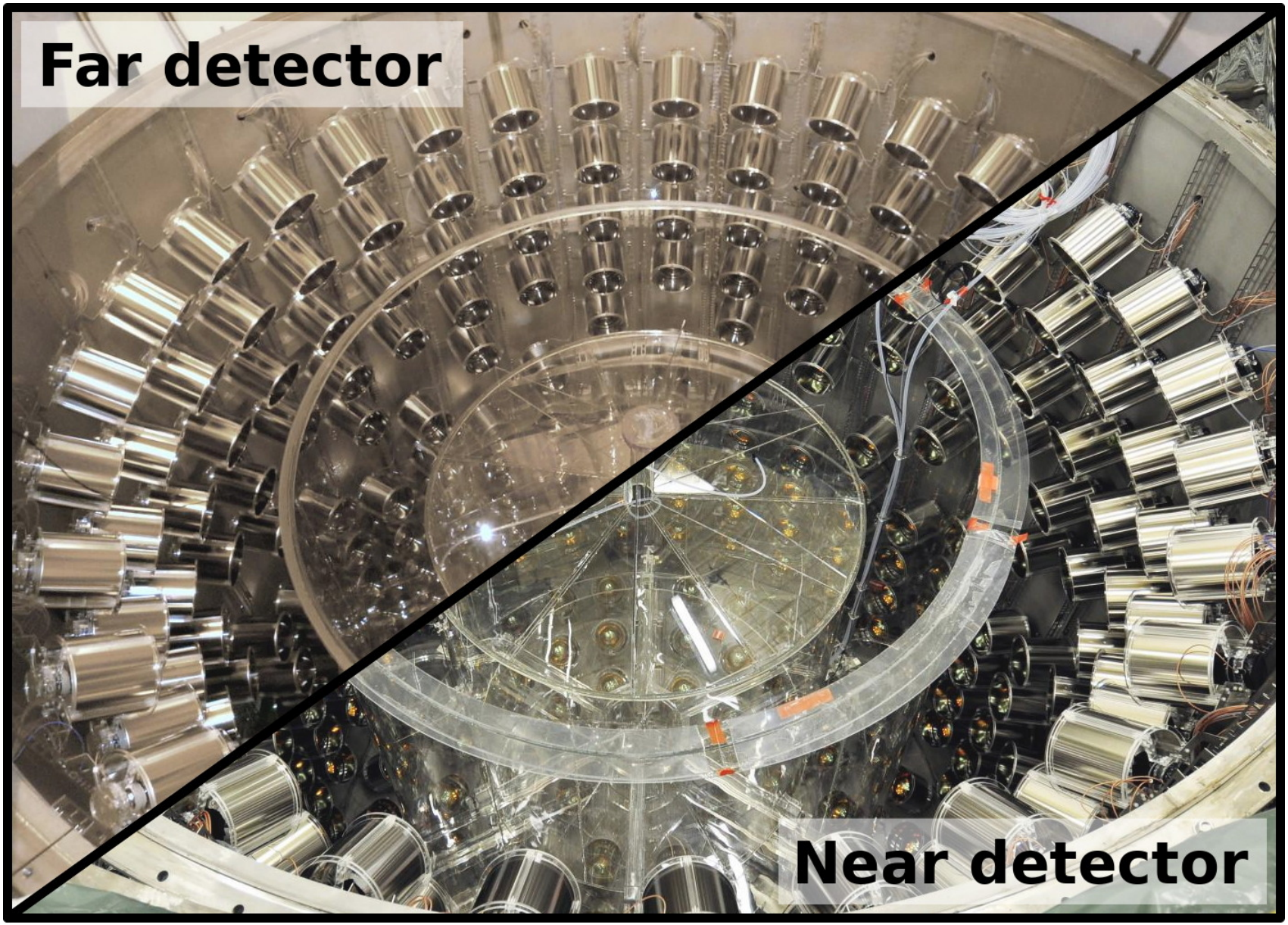
February $\sim$ May 2014

Neutrino Target Integration



Double Chooz Detectors

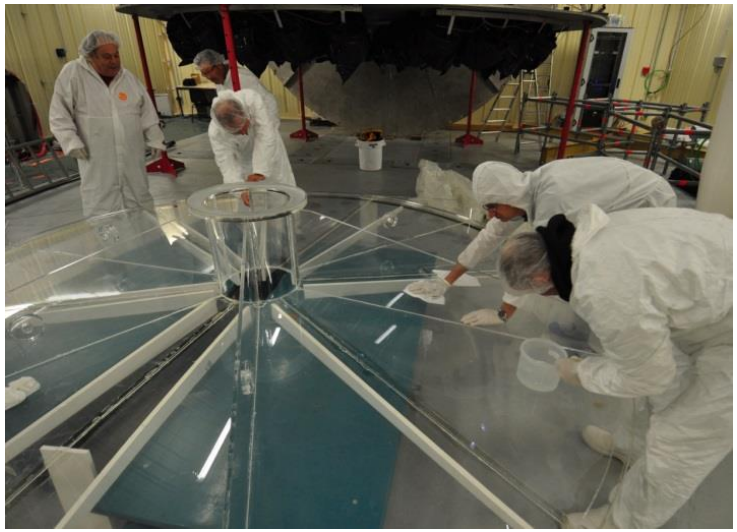


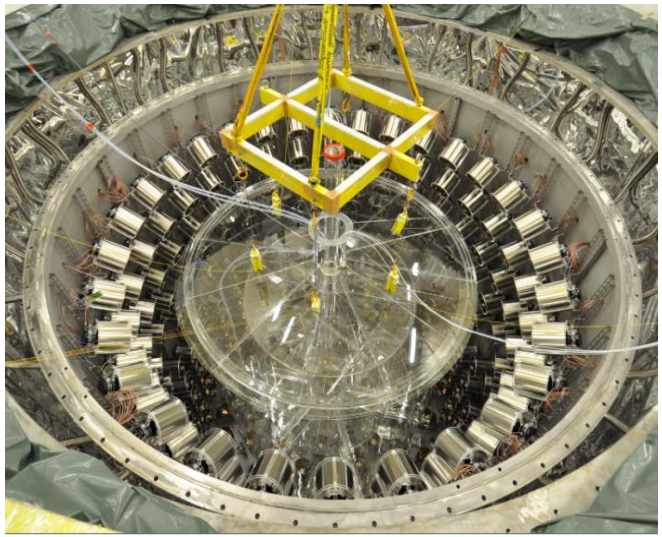
Buffer Lid PMT Installation

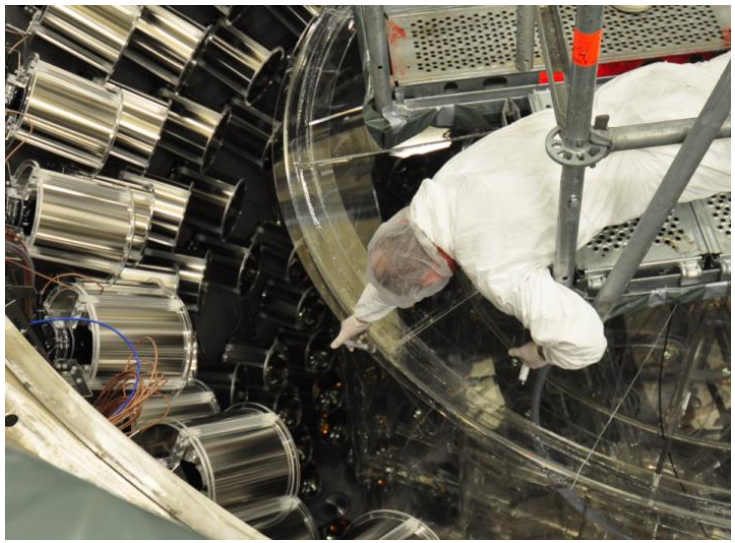


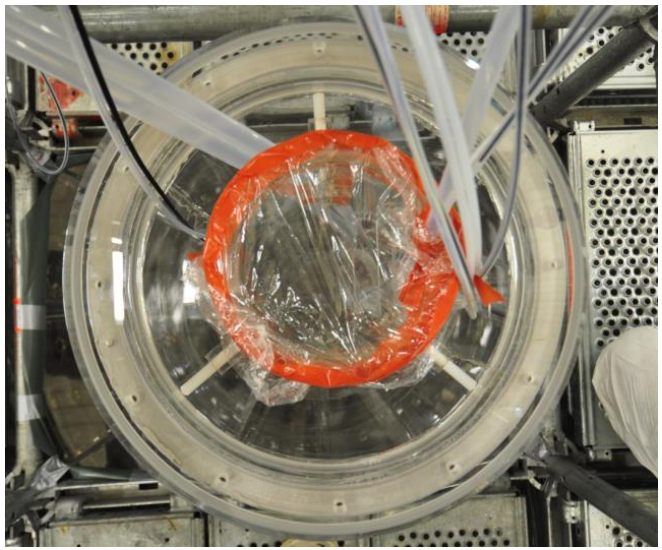

Gamma Catcher Lid Gluing

End of April

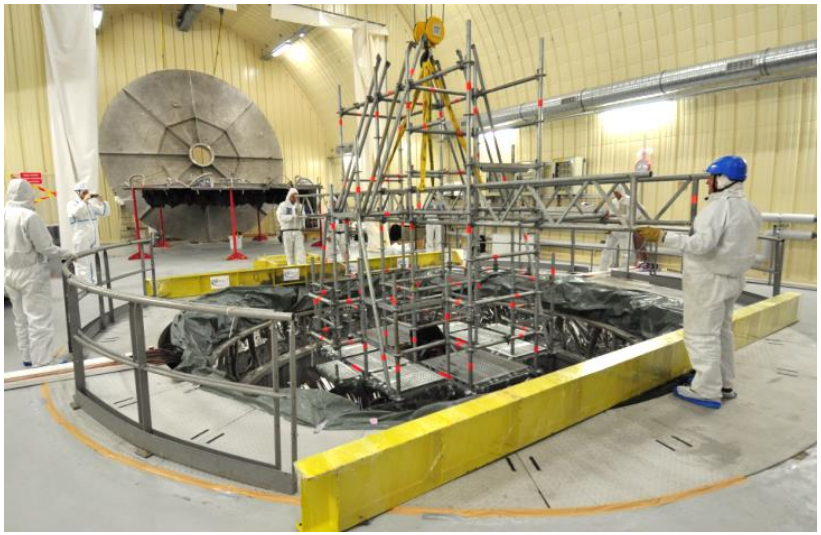


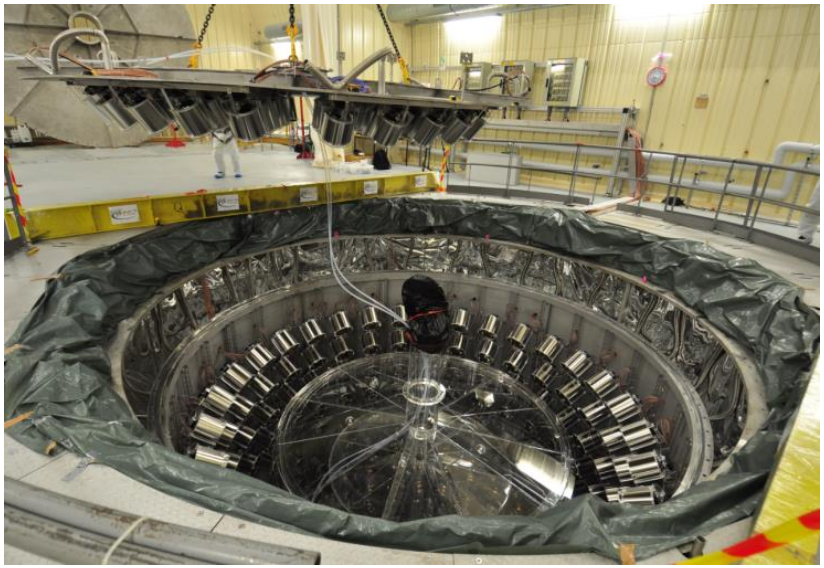


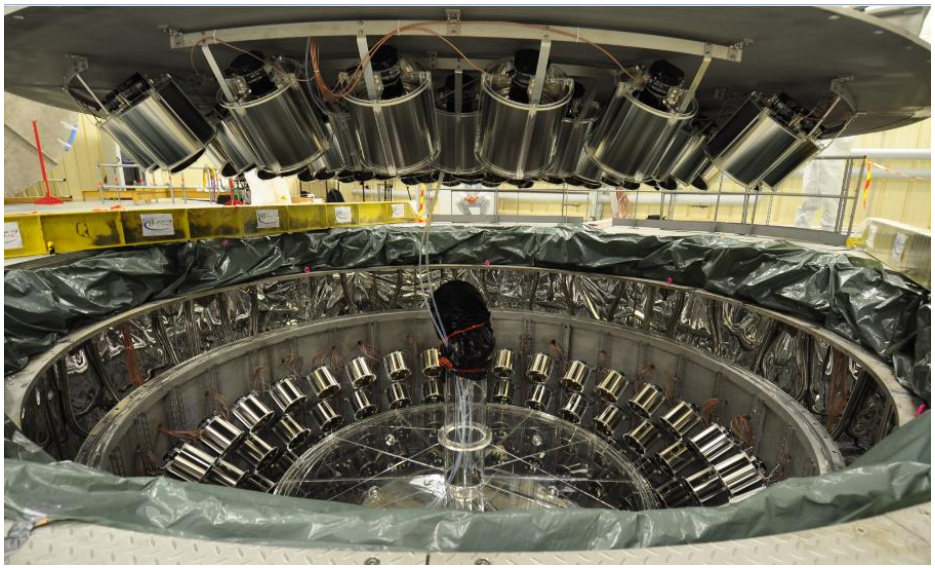




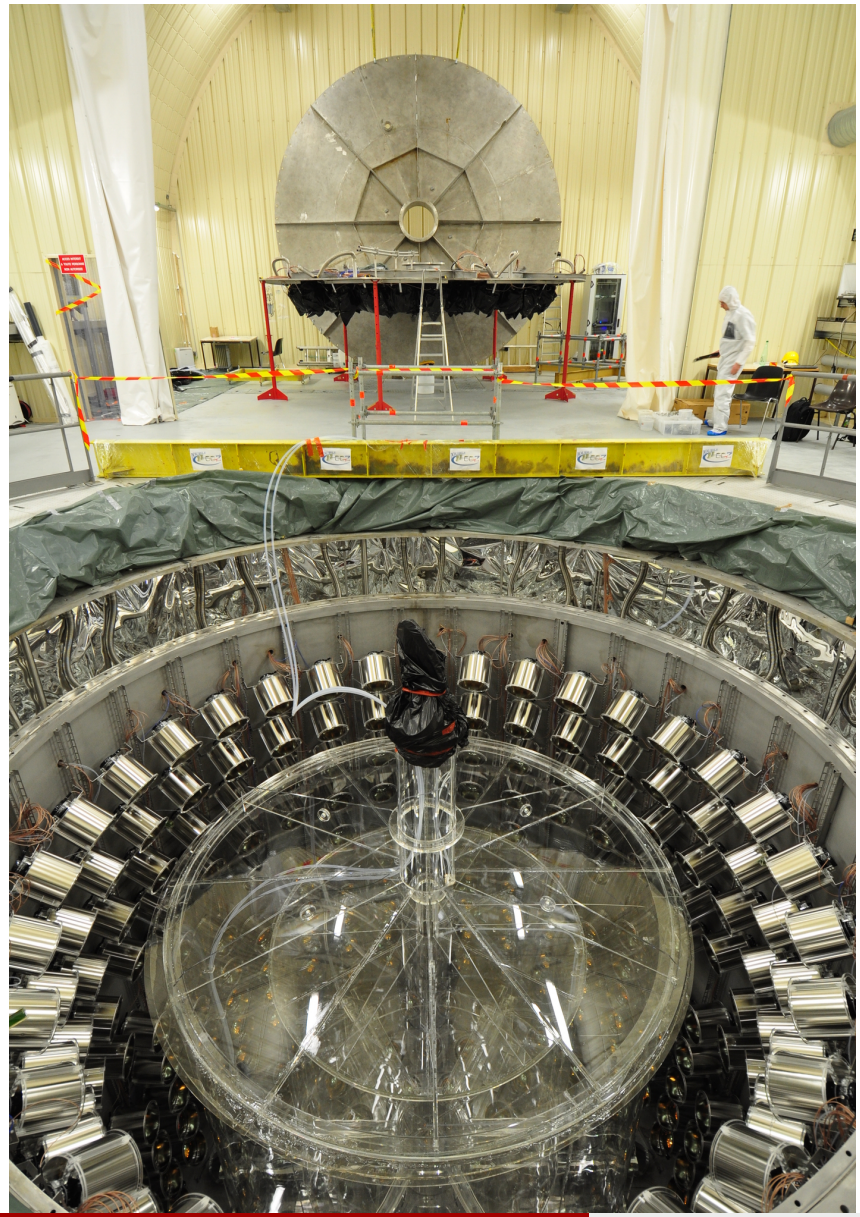
Closing the Buffer

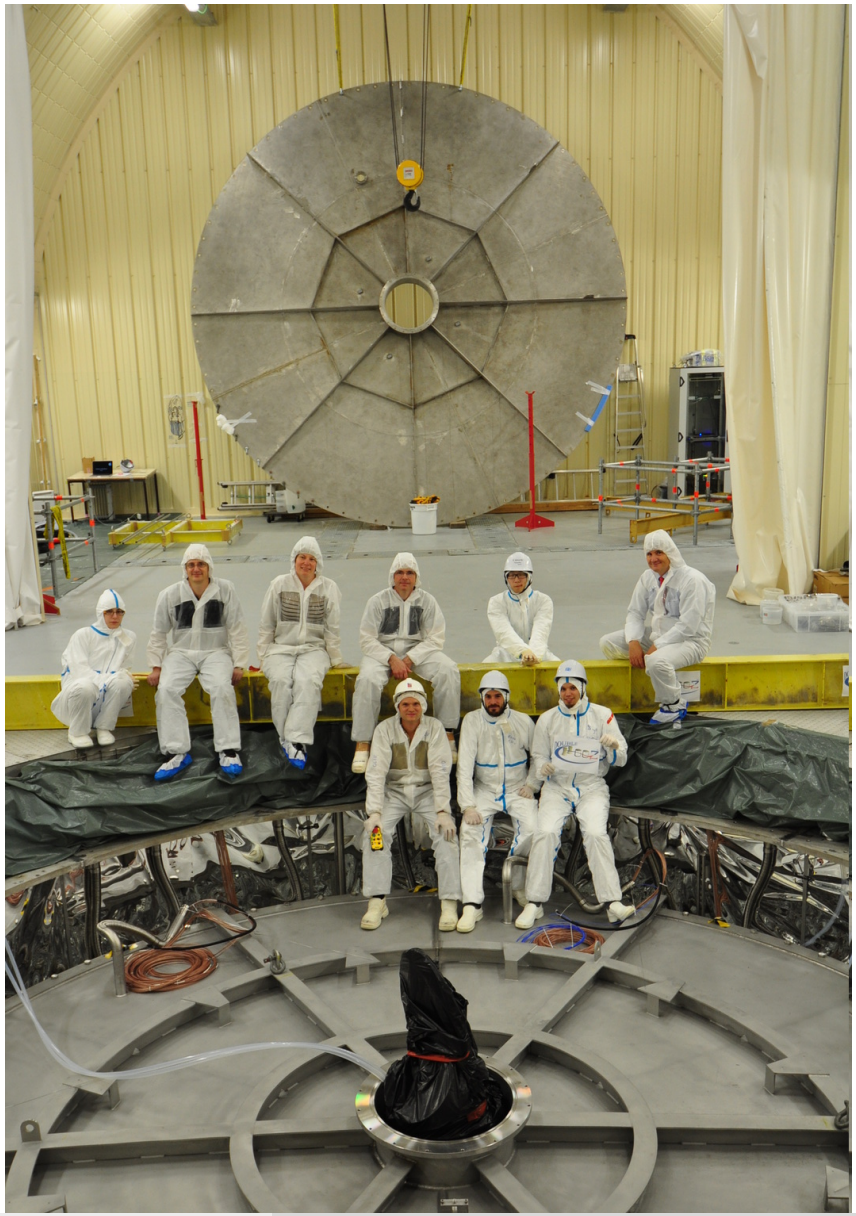






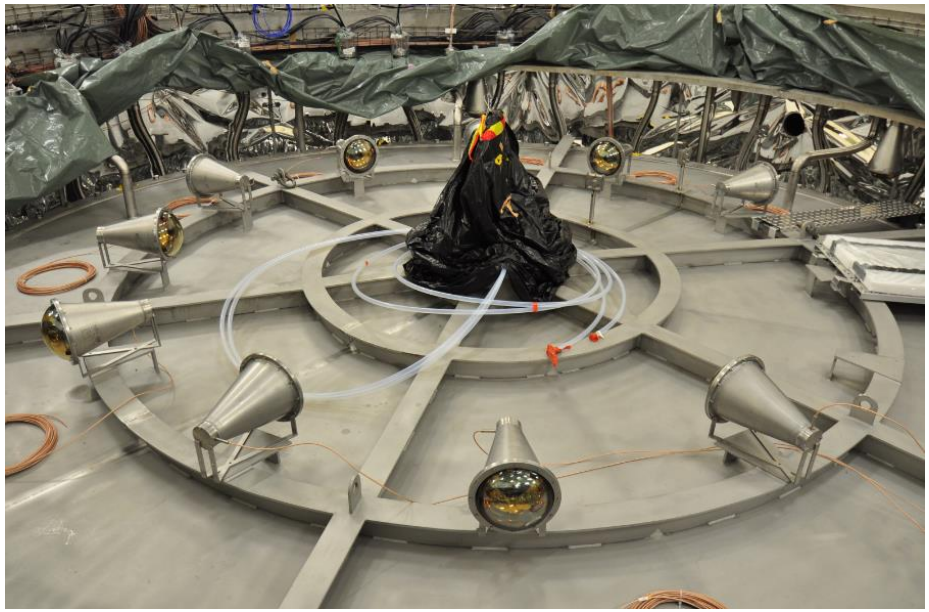
Closing the Buffer





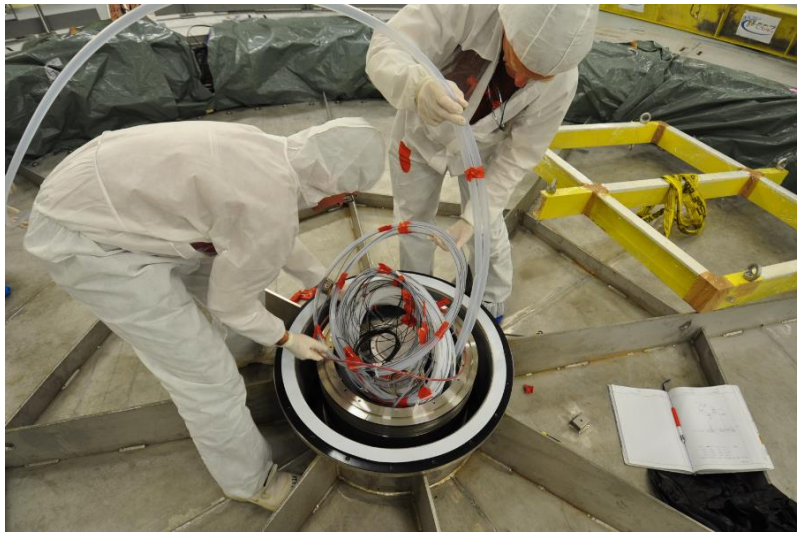
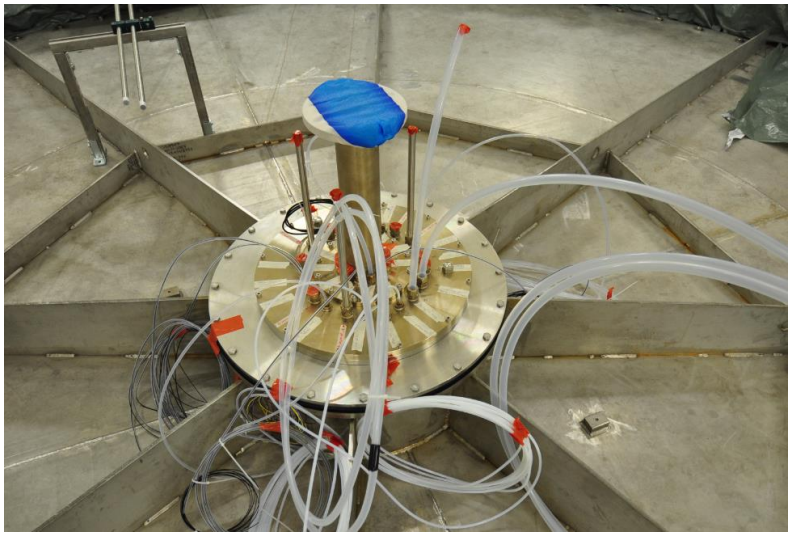
IV top ring and buffer-over PMTs

First half of May

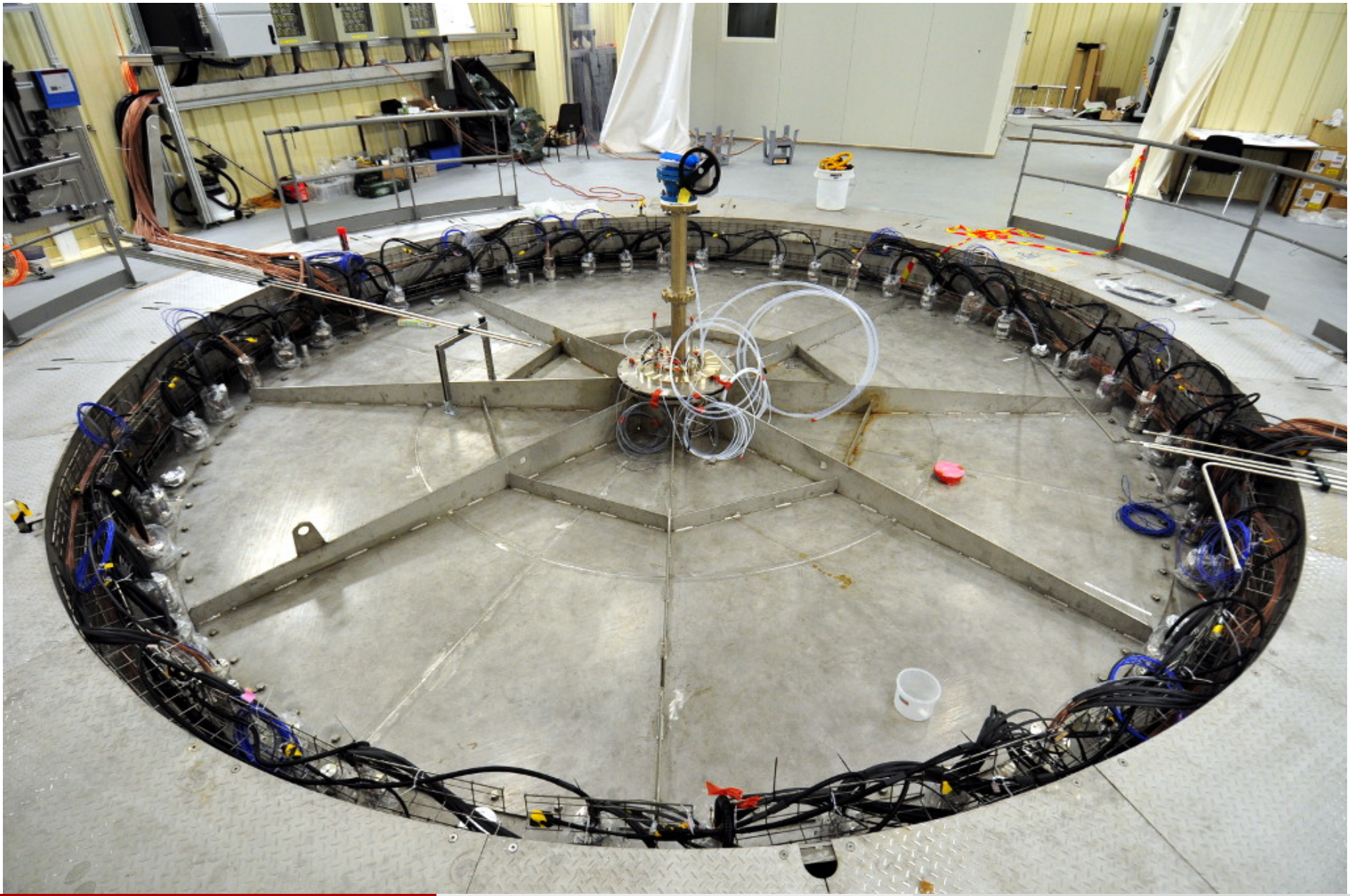


Chimney upper part mounting

First half of June

Closed IV with Chimney



Filling systems installation

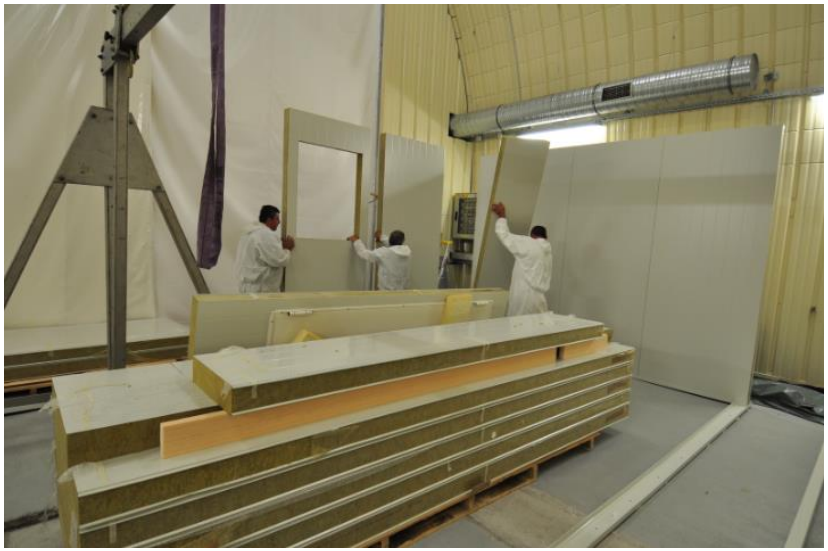
June and July 2014





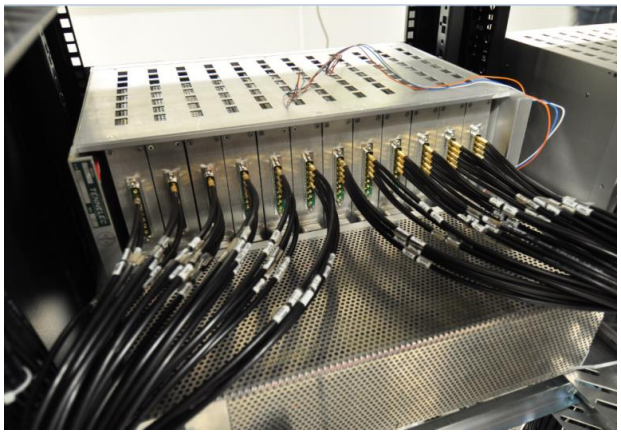
E-hut mounting

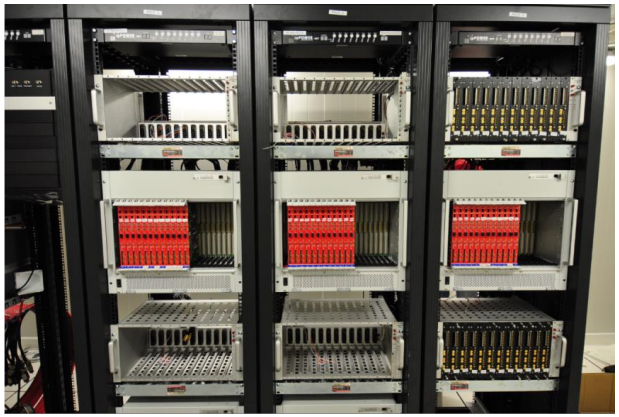
First half of June

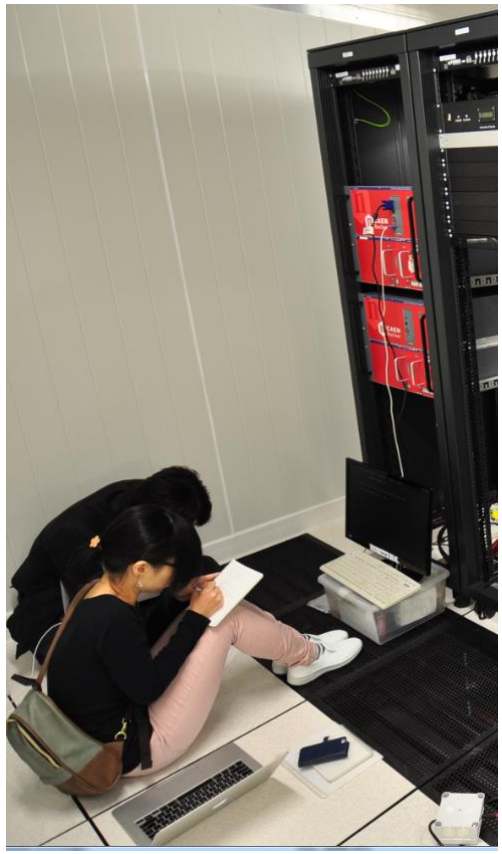


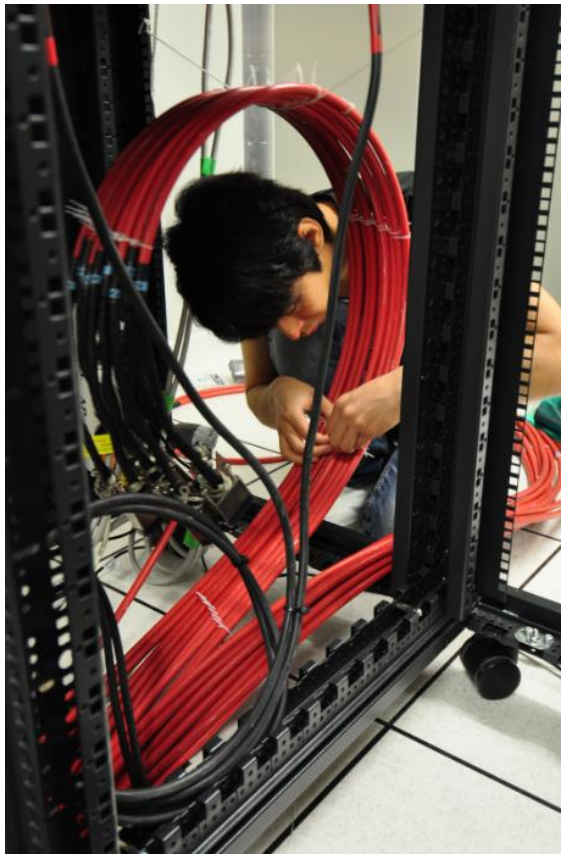
Electronics Mounting at eHut

End of July

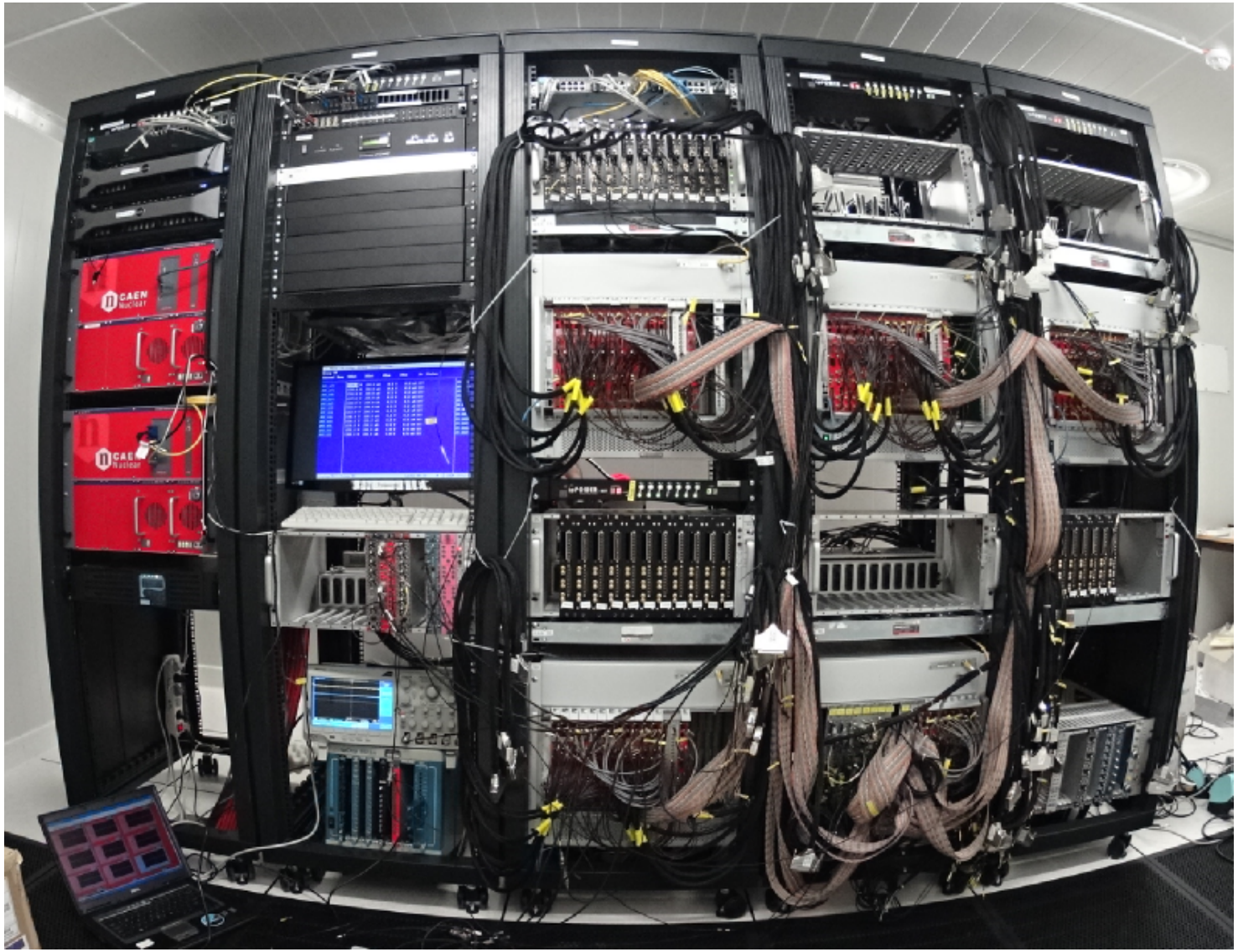




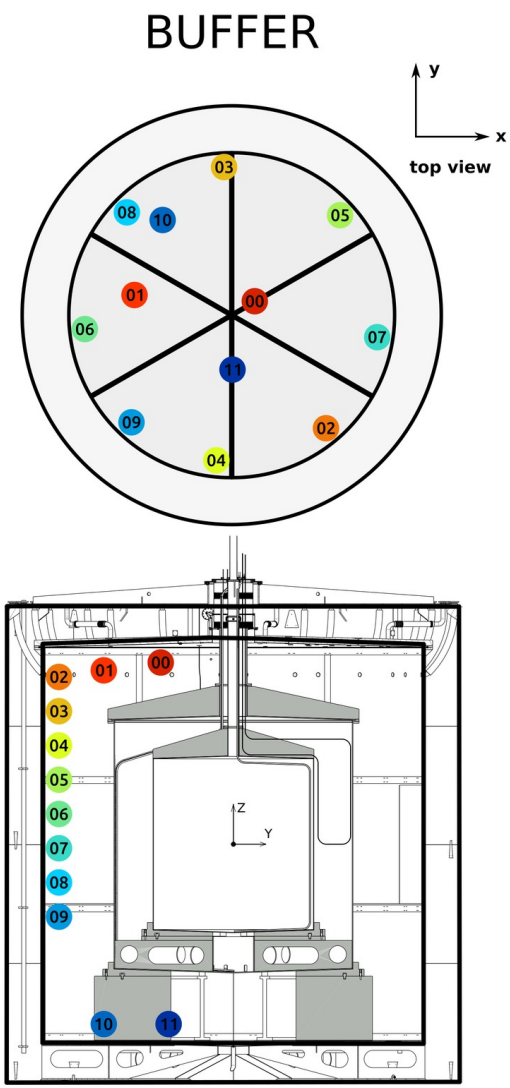


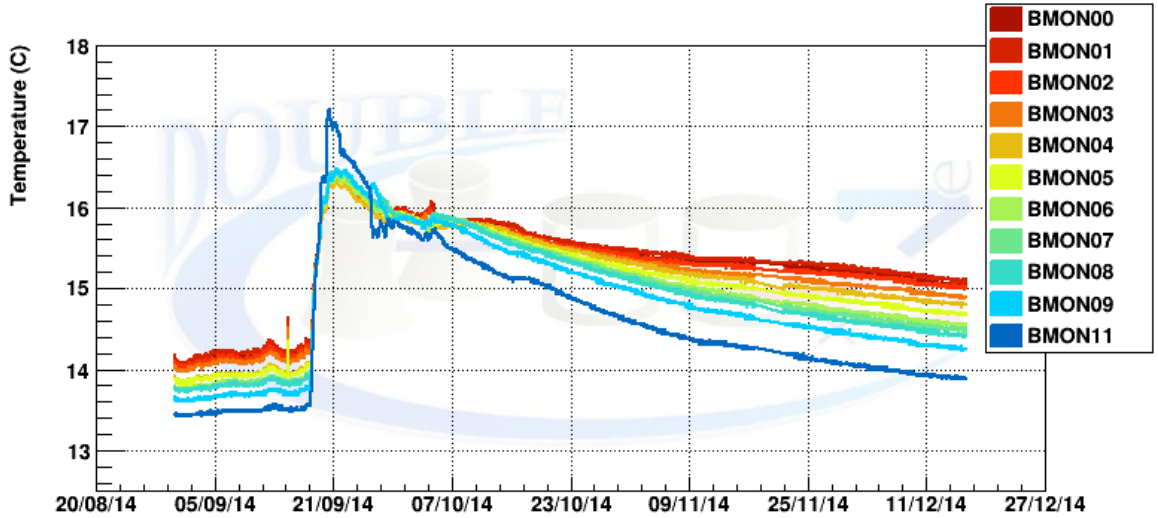


eHut now

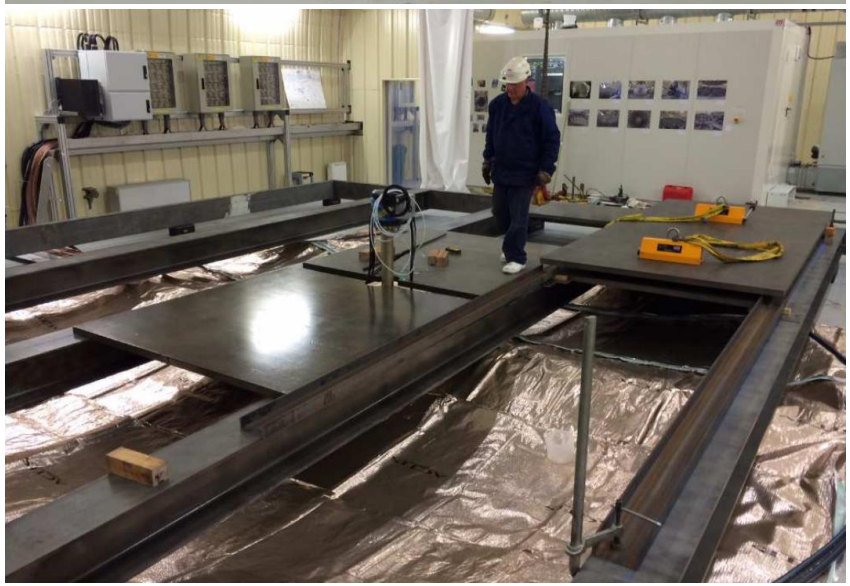


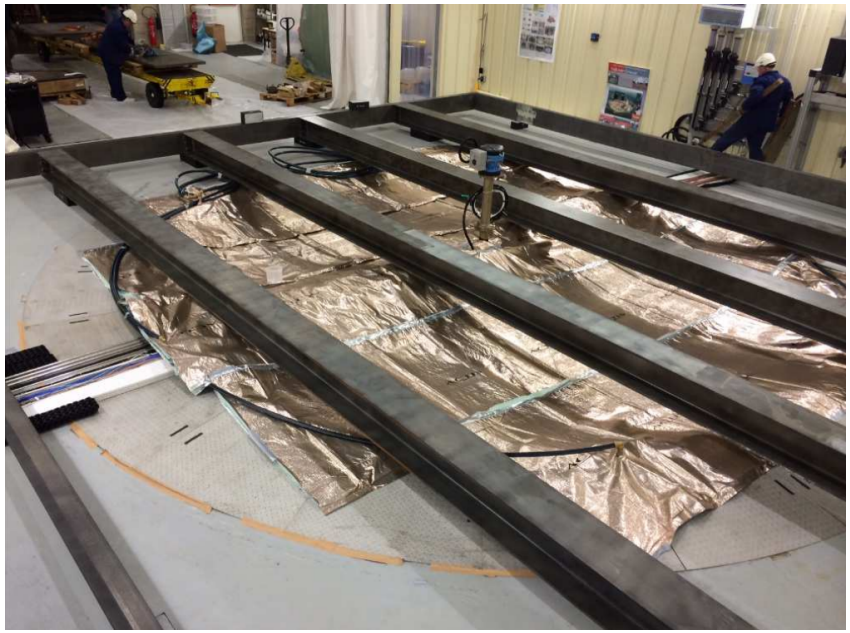
Filling


BUFFER
y
x
top view
03
08
10
05
01
00
06
07
11
09
02
04
02
01
00
03
04
05
06
07
08
09
Z
Y
10
11

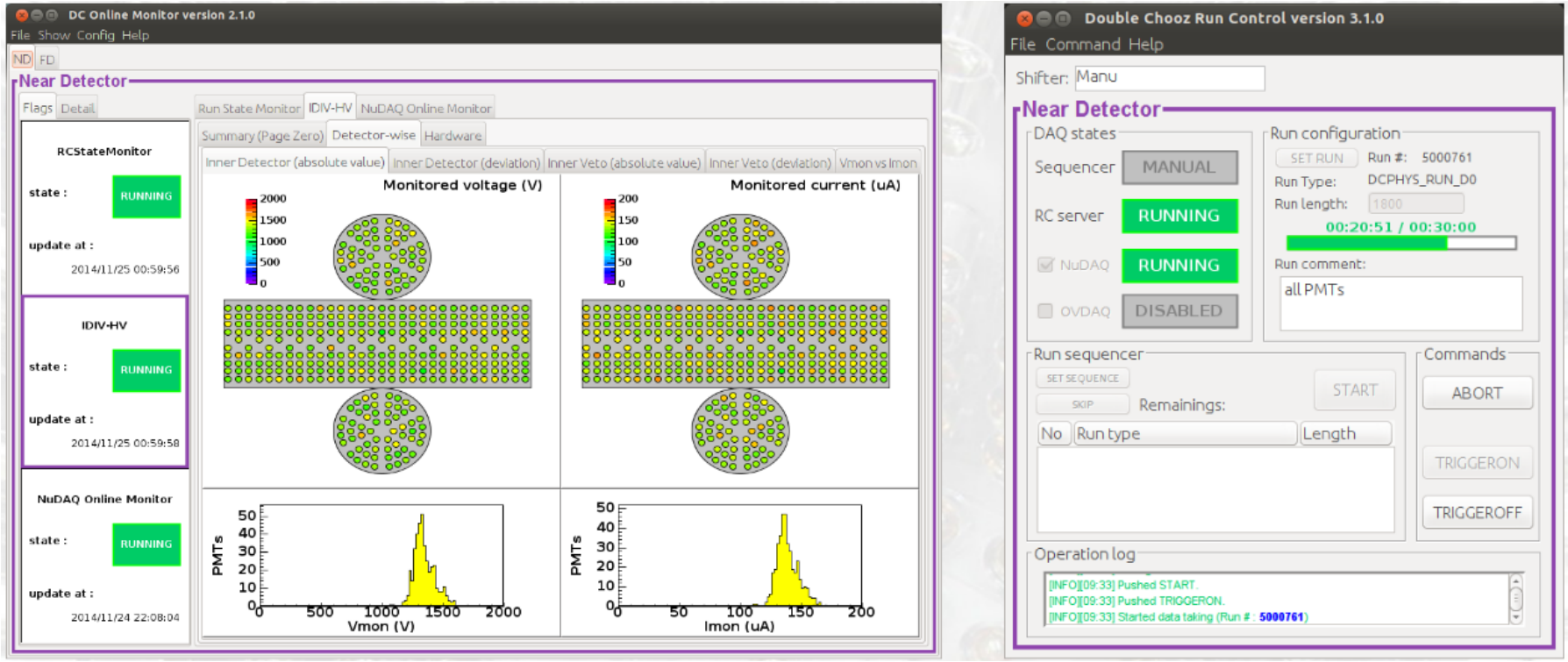

Temperature (C)
18
17
16
15
14
13
20/08/14
05/09/14
21/09/14
07/10/14
23/10/14
09/11/14
25/11/14
11/12/14
27/12/14
BMON00
BMON01
BMON02
BMON03
BMON04
BMON05
BMON06
BMON07
BMON08
BMON09
BMON11

Shielding



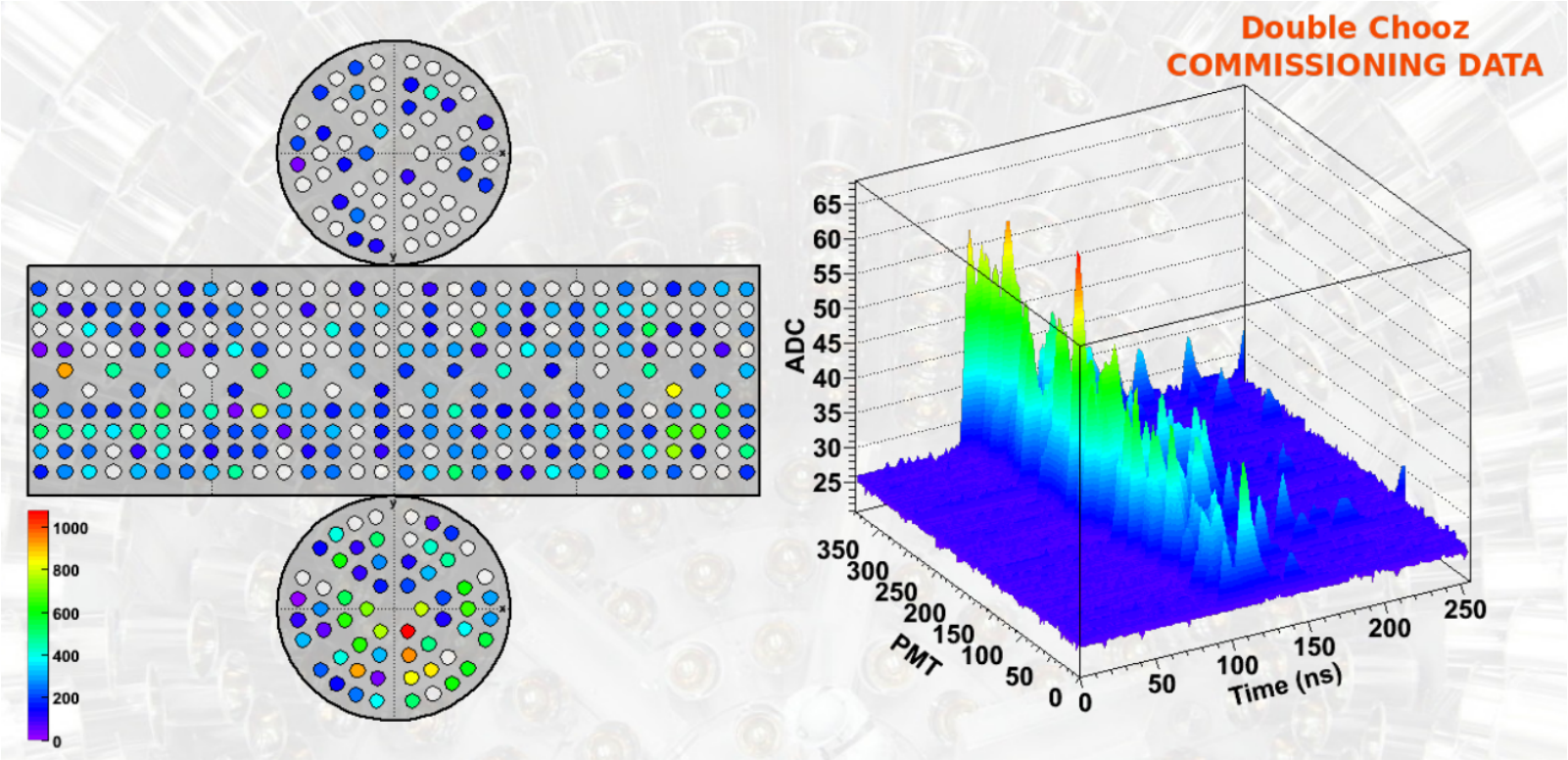


Near Detector Commissioning Status



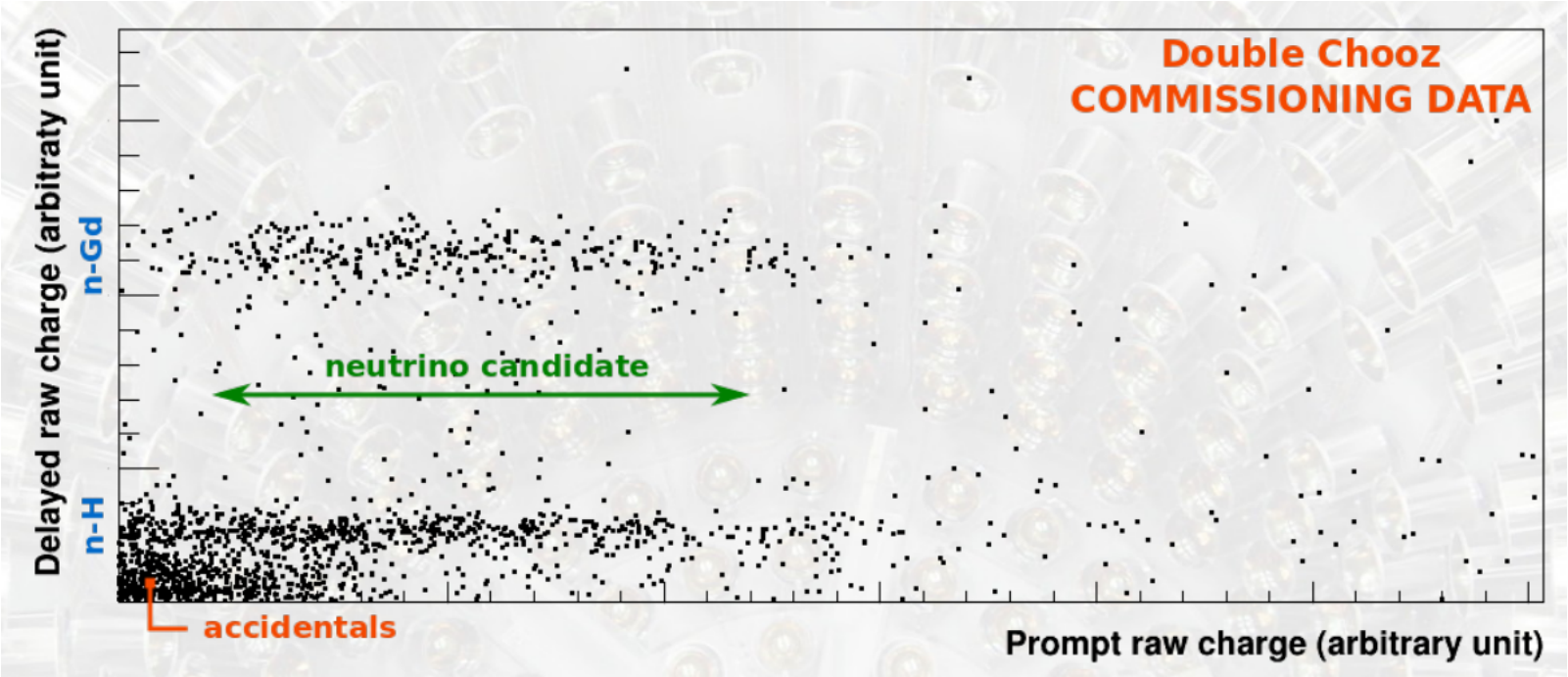
- Detector is alive (ON) and stable for few weeks now
- Start training shifter to handle 2 detectors with new GUIs
- Working on data reduction scheme by DAQ
  - replace waveforms by reduced data for muon events tagged by trigger
- Preparation of an automated data reconstruction

Observation of First "Near" $\bar{\nu}_e$



- First neutrinos candidates were seen!
  - basic selection: muon veto, Δt, isolation window

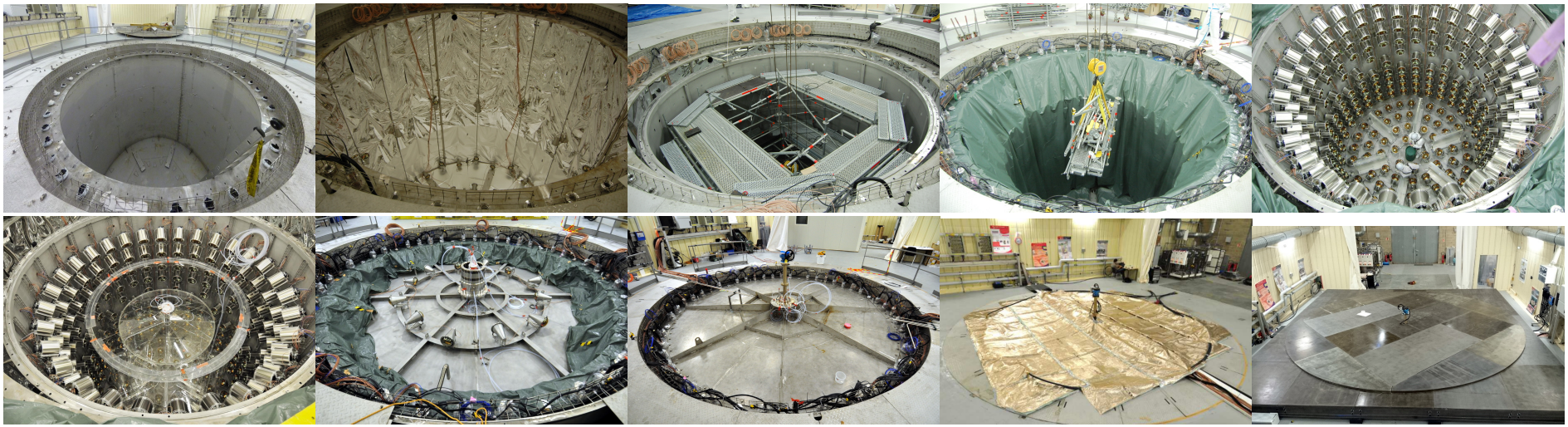
Observation of First "Near" $\bar{\nu}_e$



- First neutrinos candidates were seen!
  - basic selection: muon veto, Δt, isolation window
- Clear and clean IBD signal
  - no calibration + no advanced reconstruction!

Summary

- Double Chooz near detector operational;
- Data taking is expected to start within the next weeks;
- Sensitivity on θ_{13} will reach the 10% level.



Thank you!