

## Status of Water tank



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# Experiment GERDA – Water tank

- Construction Started on July 2007. First step: Assembly of WT bottom plate.
- Stop of activities July 2007 – April 2008 (for cryostat delivery and commissioning)
- WT construction restored at GERDA site on 30th April

**WT building procedures and description of main features**



- *Assembly of the plates*
- *Welding*
- *Welds cleaning procedures*
- *Some details*

**Bottom plate behaviour after cryostat loading/unloadig cycle**



- *Bottom plate flatness*
- *Welds visual inspection*
- *Tecnical report of WT designer*
- *Test of the sealing*

**Next steps:**



- *Roof closure*
- *WT final static test*
- *Cleaning*

Status at 30 July 2007

A view from above of the buildingsite





# Description of work – Assembly plates

30 April 2008

Cryostat surface covered against accidental impacts with a fireproof material (C0 Class) for safety.

Then assembly of the first (top) ring of the WT shell (thickness=5mm).

WT shell: 5 rings (4 x 2 m + 1 x 0.3 m):  
total lateral height of 8.30 m

Total lateral surface: ~ 260 m<sup>2</sup>

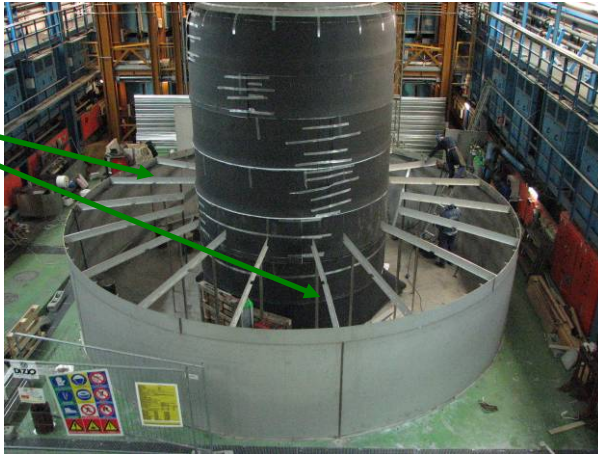


# Assembly of WT shell: 1st

After assembly of the first ring the roof frame structure has been assembled and roof plates welded

07 May 2008

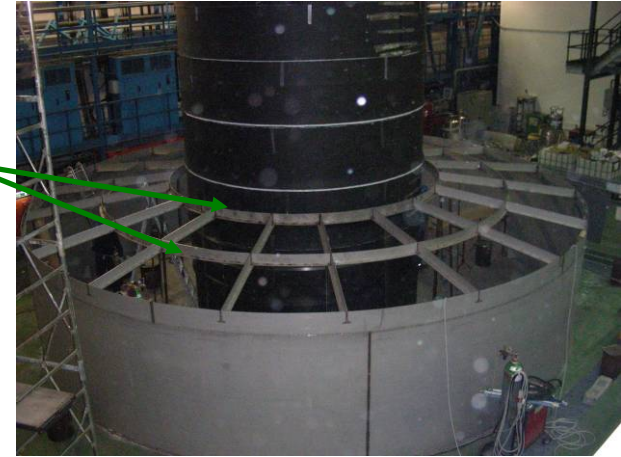
Insertion of  
radials elements



1

09 May 2008

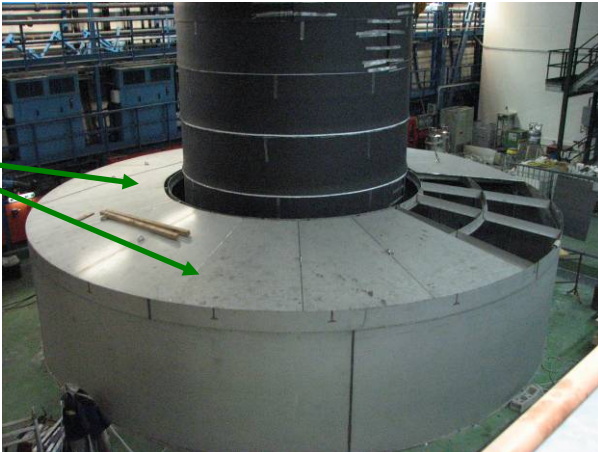
Insertion of  
circular  
elements



2

10 May 2008

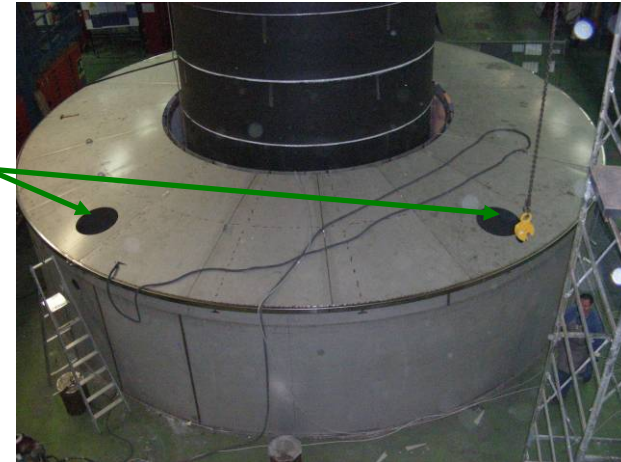
Insertion of  
roof's plates



3

13 May  
2008

Preparation  
of roof  
plates for  
flanges  
installation



4



# Assembly of WT shell: 2nd

After the roof, the water tank has been lifted with the crane and three more rings were assembled.

20 May 2008

2° ring  
(thickness=6mm)



1

23 May 2008

3° ring  
(thickness=6mm)



2

26 May 2008

A view from  
above  
(3° ring)



3

28 May 2008

4° ring  
(thickness=7mm)



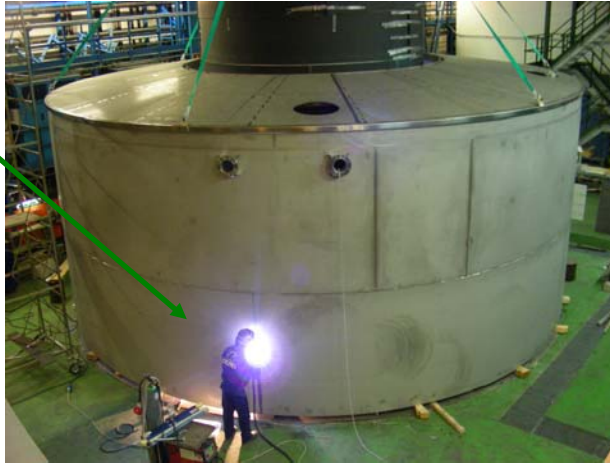
4

# Description of work – Type of welds and cleaning

The TIG's (Tungsten Inert Gas) welds have been done both internally (once) and externally (twice).

20 May 2008

Vertical and external welds



29 May 2008

Orizzontal and internal welds



The cleaning has been done in two way: mechanical, using grinder and chemical, using acid pickling.

15 May 2008

Grinding of the welds



21 May 2008

Pickling of external welds

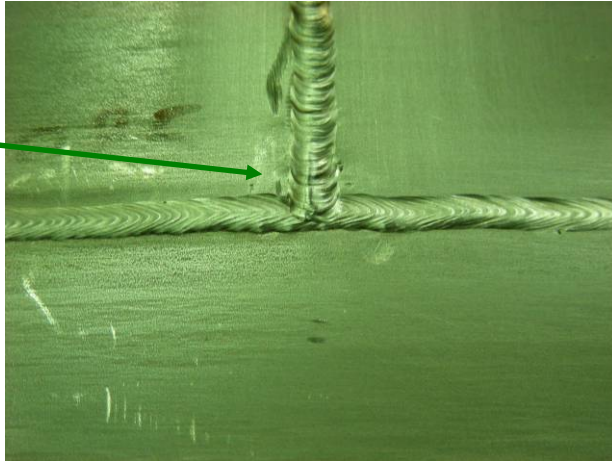


# Description of work – Some details

PMTs anchorages have been welded at WT inner surface at floor level as far as the WT grew up.

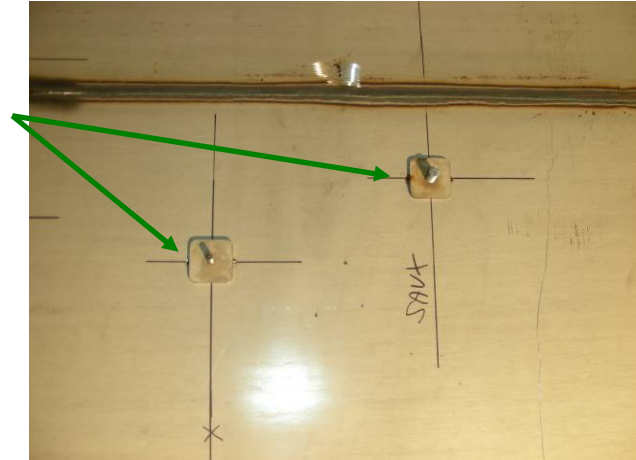
22 May 2008

A detail of  
welds: T  
cross



16 May 2008

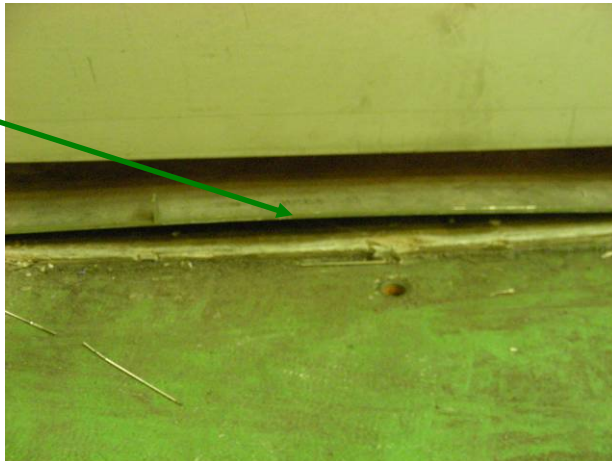
PMTs  
anchorages



The WT bottom plate un-flatness disappear after assembly of the 4° ring (full load).

22 May 2008

The un-  
flatness of  
the bottom  
plate: no load



03 June 2008

The bottom  
plate external  
circle after load  
is applied.

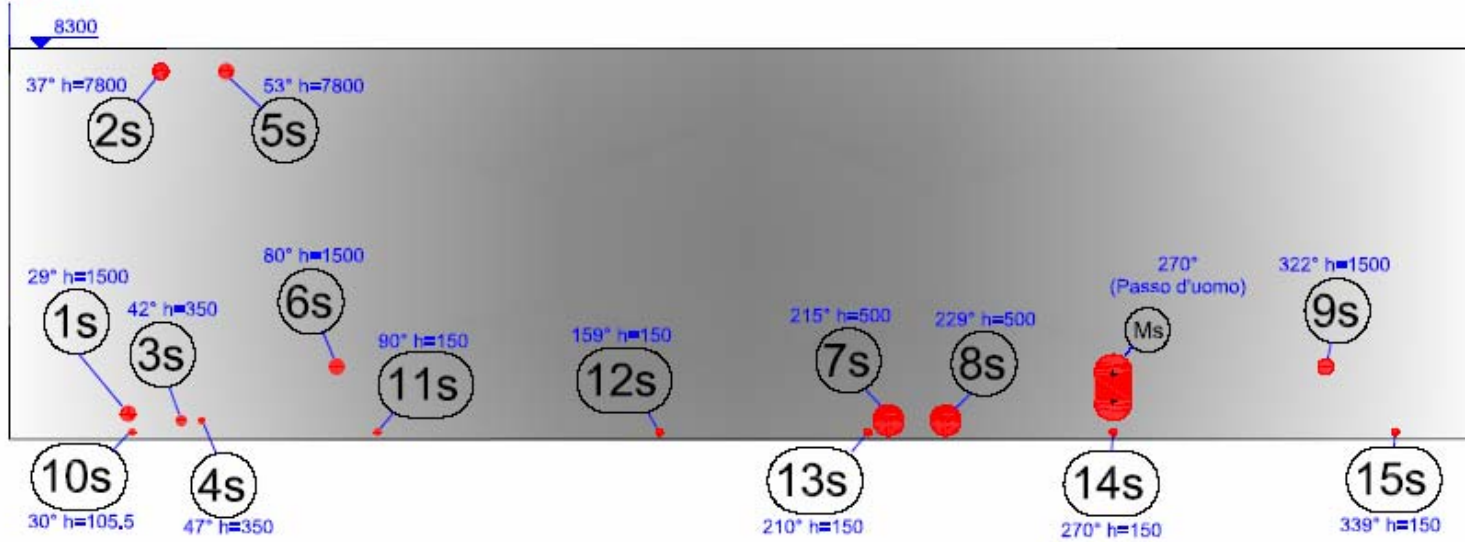




# Description of working – Details flanges

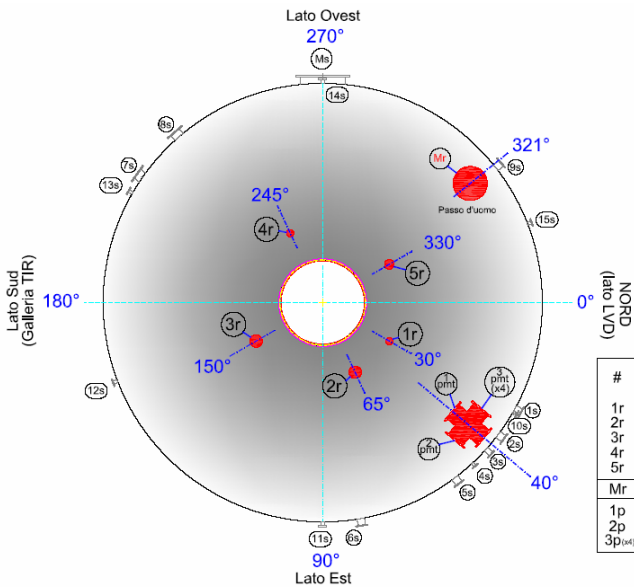
360°/0,00° →

View of the lateral surface



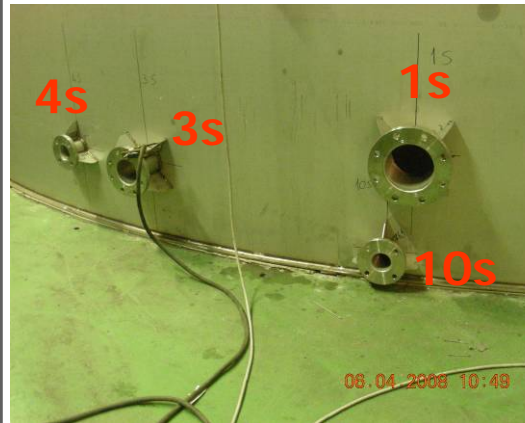
#	DN (mm)
1s	150
2s	150
3s	100
4s	50
5s	150
6s	150
7s	300
8s	300
9s	150
10s	65
11s	65
12s	65
13s	65
14s	65
15s	65
Ms	800 x 1400

View from above



#	DN (mm)
1r	50
2r	150
3r	150
4r	50
5r	100
Mr	600
1p	300
2p	600
3p(ø4)	400

Flanges Type UNI EN 1092-1 (or equivalent)  
PN=10



# The issue of the bottom plate flatness

- Cryostat installation showed clearly that the WT bottom plate (BP) was not flat at the radial distance corresponding to the cryostat support ( $R = 2.1$  m) in correspondance to the BP welds.
- After cryostat installation the cryostat-anchorages bolts were tighten (cryostat empty), and after cryostat filling (14 t Cu + 60 t LN) it was necessary to tight them further more to compensate for the bottom plate assessment.
- Structural analysis of the actual situation re-done



# Un-flatness mapping

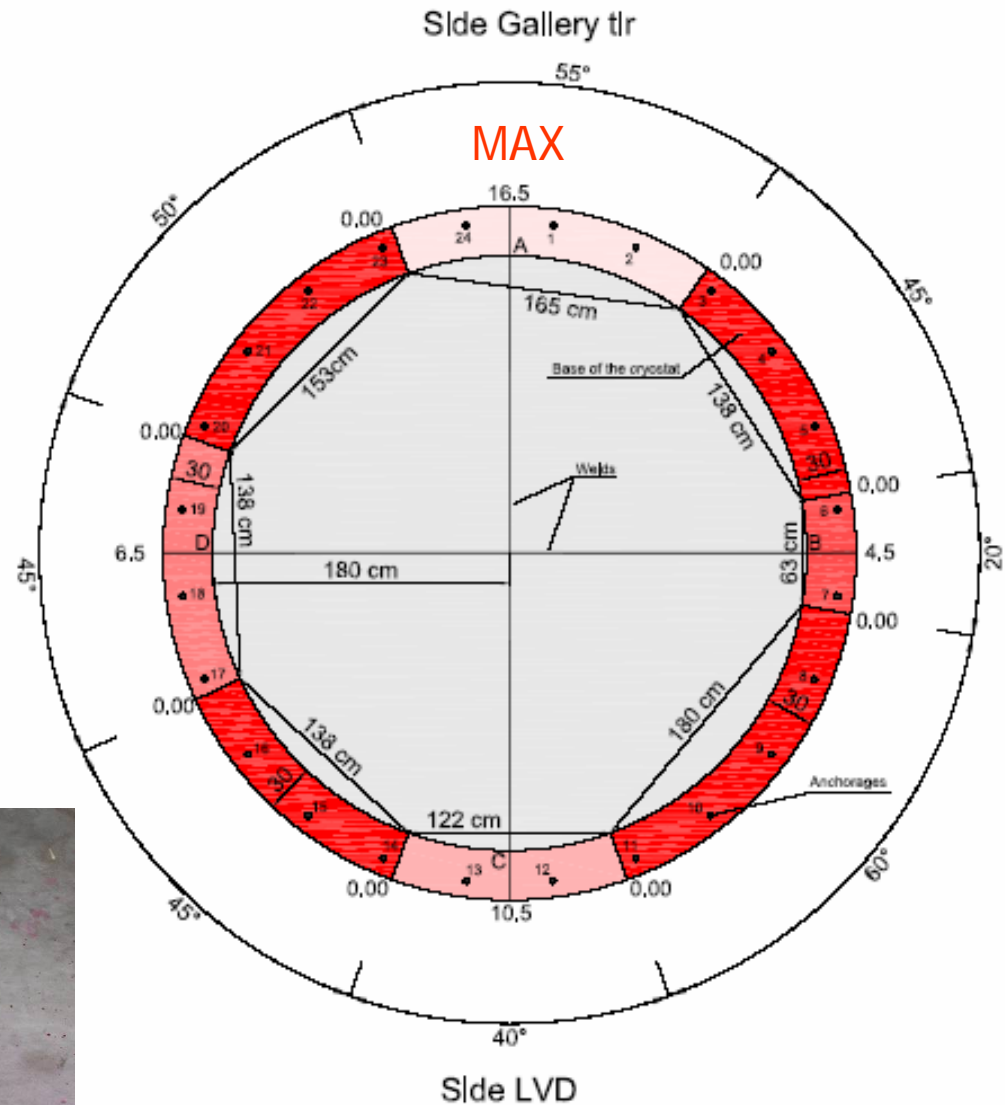
The unflatness has been quantified by mapping with the purpose of long term monitoring of the BP assessment:

- max 16.5 mm
- min 4.5 mm

Question:

Do assessment cause stress on anchorages and BP welds?

→ Visual inspection of all the welds + sealing test to be performed after WT shell construction



Status of BP welds before the installation of cryostat



# Sealing Test of (WT-BP + cryostat anchorages welds)

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- To check sealing of BP welds 80 m<sup>3</sup> of H<sub>2</sub>O has been inserted in the WT (water column height ~ 1 m).
- The test started Saturday 7th June and the H<sub>2</sub>O will stay in WT for three days.
- Check that there is no water on floor coming from below the BP.
- Measure the decrease of the water column level. Sensitivity of test: 8 l/h assuming  $\Delta h \sim 5$  mm in 2 days.

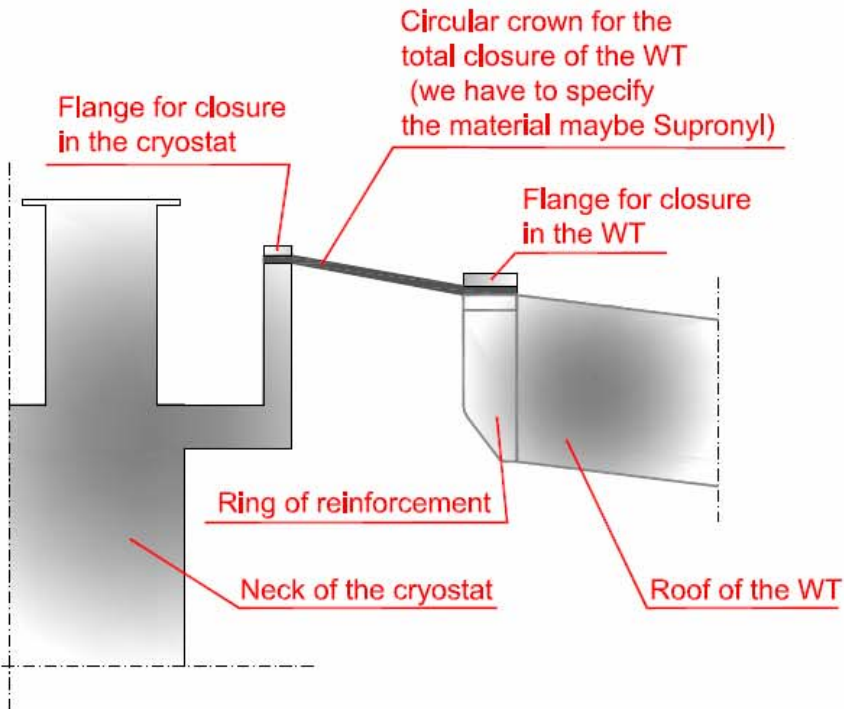


- After three days, if no leak the WT construction will proceed (completion of the roof), otherwise the cryostat will be lifted and critical welds treated.
- Water will be discharged in hall A safety's tank (and eventually re-used for the final static test)

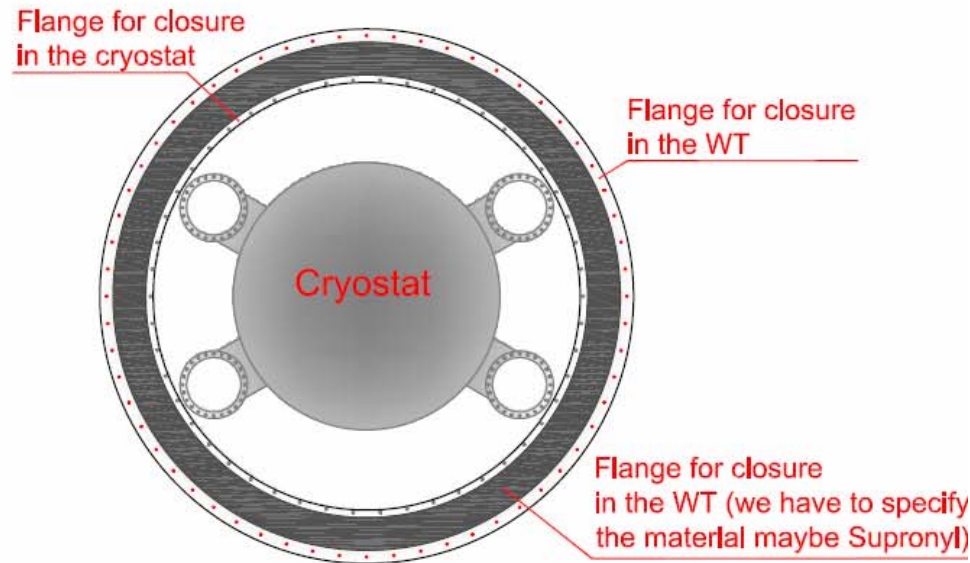
# Next step: completion of WT roof

- For the closure of the WT we'll use two flanges: one on the reinforcement's ring of the WT and the second one on to the top of the cryostat.
- Between the two flanges we use a circular corona of material that ensure air and Rn tightness (maybe the Supronyl).

Vertical section



View from above



# Future development – Testing - cleaning

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- The final Water Tank cleaning will be performed with the water coming from Borexino water plant
- For this cleaning we have 2 different options:
  - ) “heavy” cleaning and treatment of the surface in “Borexino style”: pickling and passivation + power washer and detergent (+ rinsing)
  - ) “soft” cleaning with high (medium) pressure of high temperature water vapour.

## **Open points (need discussion in integration session):**

Which level of cleanliness must be guaranteed during PMTs installation?

Should we vent WT with filtered air?

A new cleaning is need after the PMTs installation?





# Chronoprogram: WT and building

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- If WT-BP sealing OK next week , 16 June 2008, WT construction completed.
- Static test of WT: end of June.
- If everything OK: close the work site of the WT.
- First week of July: start the works for the control-room.
- The works for the control-room will go on for three weeks.
- The closure of the works is expected for the end July or after the summer holiday.