

# Cryogenic instrumentation installation activities inside the cryostat

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The cryogenics instrumentation WG

# Introduction

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- We are basically the last in installing stuff but the first in commissioning
- A number of activities to be done inside the cryostat
- Systems considered: Color code indicate level of activity (red: more, green: nothing)
  - Cameras and lighting
  - Temperature sensors on membrane, GPs and pipes
  - Dynamic T-Gradient monitor
  - Purity Monitors (?)
  - Static T-Gradient monitor

# Cameras and light emitting system

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E. Valencia, M. Kordosky  
William & Mary

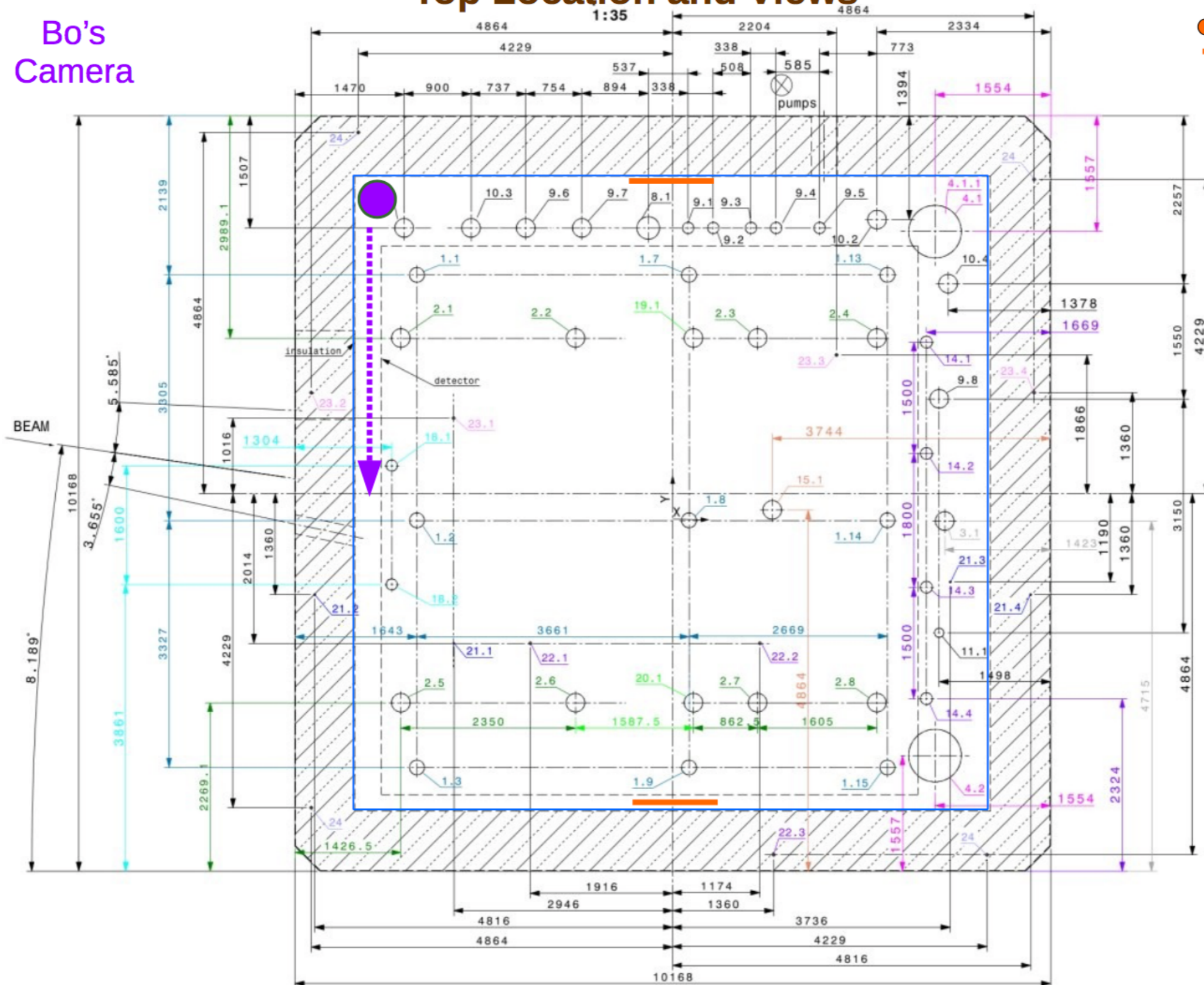


# Cameras and Lights

## Top Location and Views

● Bo's Camera

● LEDs



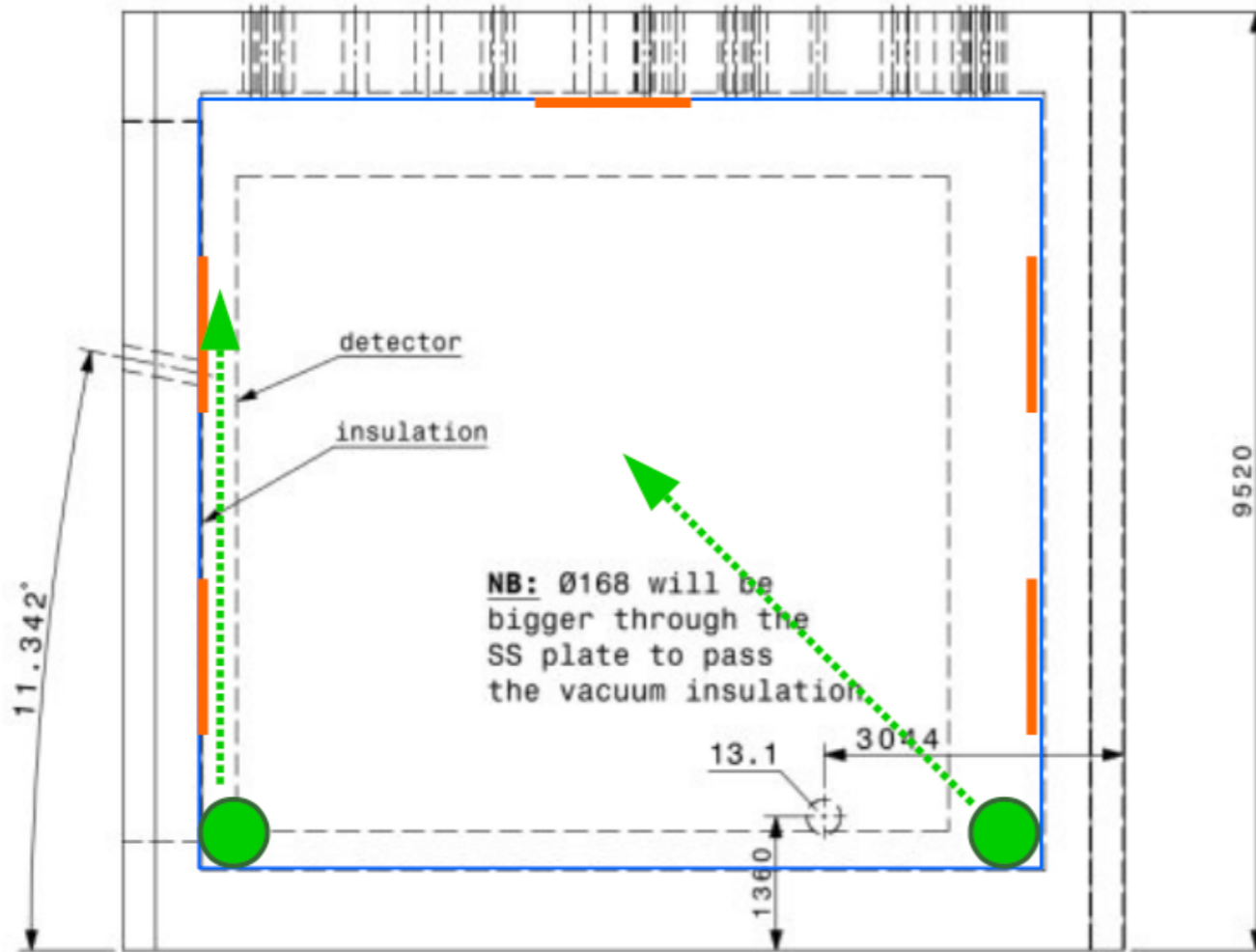
# Cameras and Lights

## Side Location and Views

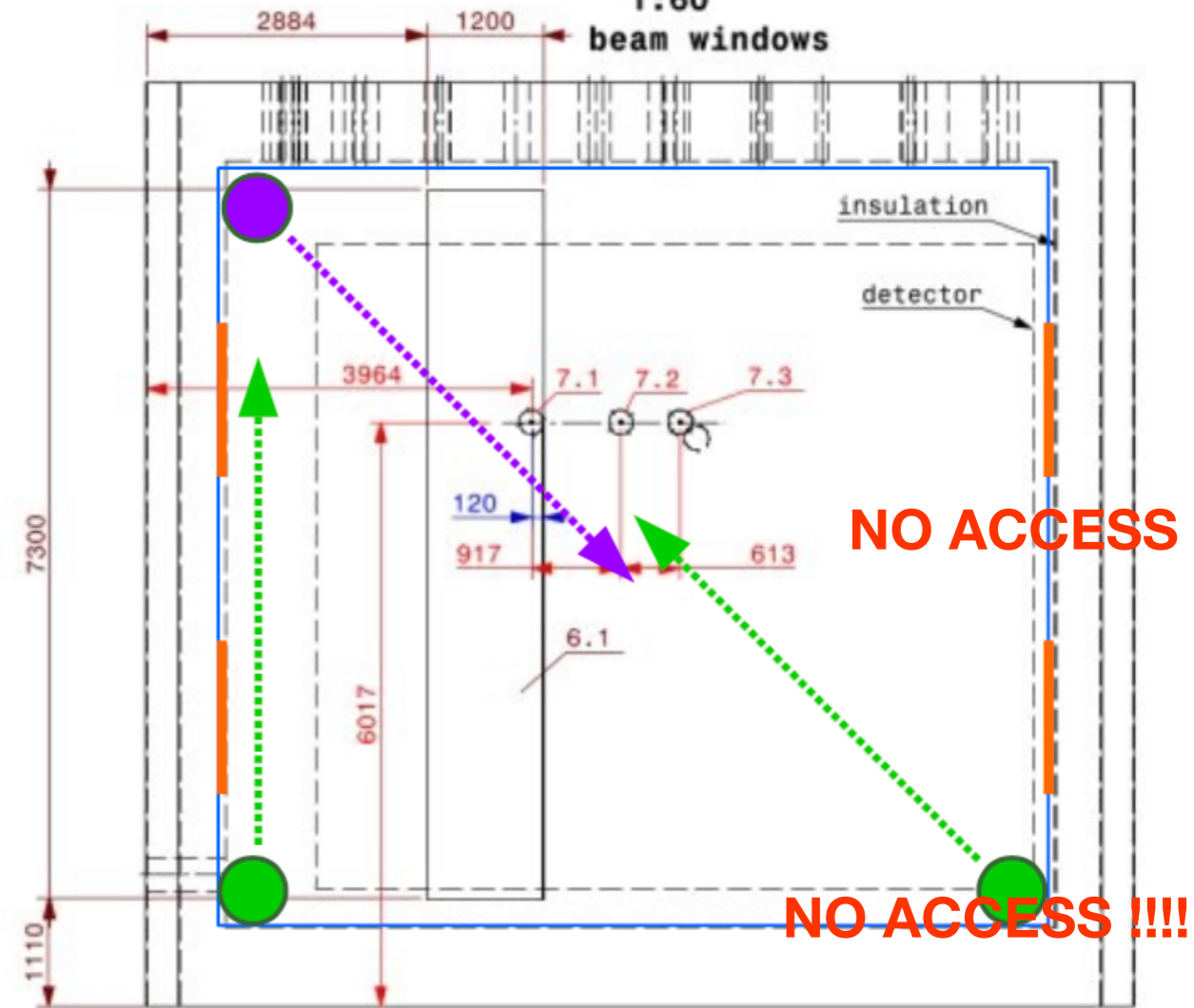
● Bo's Camera

● LEDs

Front view  
1:60  
technical construction, pumps



Left view  
1:60  
beam windows



# Schedule

## June

Jun 2018

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

➤ **1<sup>st</sup> Week at CERN**

➤

➤ **2<sup>nd</sup> Week at CERN**

- Assemble the cameras housings
- Fill vessels with Nitrogen
- Configure software
- Test Room temperature
  - RTD
  - Heater
  - Cables
- Cold test with the new housings
- Calibrate the power vs temperature for heaters

Fermilab

CERN

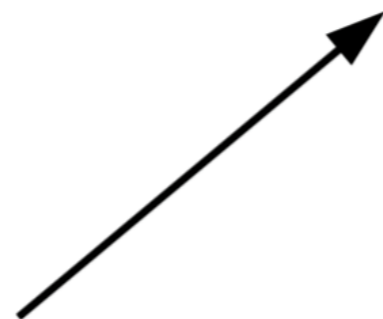
Me

# Schedule June

## INSIDE CRYOSTAT

Jun 2018

Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
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- › **3<sup>rd</sup> Week at CERN**
  - › Attach Supports
  - › Inside Cryostat Installation
    - › Cables
    - › Lights
    - › Cameras
  - › Outside Cryostat Installation
    - › Cables
    - › Power supply
  - › Test Full Systems
  - › Request safety review and approval
  - › Address recommendations
  - › Almost ready to be commissioned

Fermilab

CERN

Me



# Schedule June

Jun 2018

Su	Mo	Tu	We	Th	Fr	Sa
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- **4<sup>th</sup> Week at CERN (Tentative)**
  - Contingency week
  - Fix some issues
  - Write "Owner Manual" for Cryocameras and Lighting System
  - Improvements in the software.

Fermilab

CERN

Me

# Other temperature sensors

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IFIC-Valencia

# Fixing of broken cables at port 9.1

*Due to an accident, the cables from the roof sensor and one of the wall sensors broke their connections and will have to be redone after TCO closing*

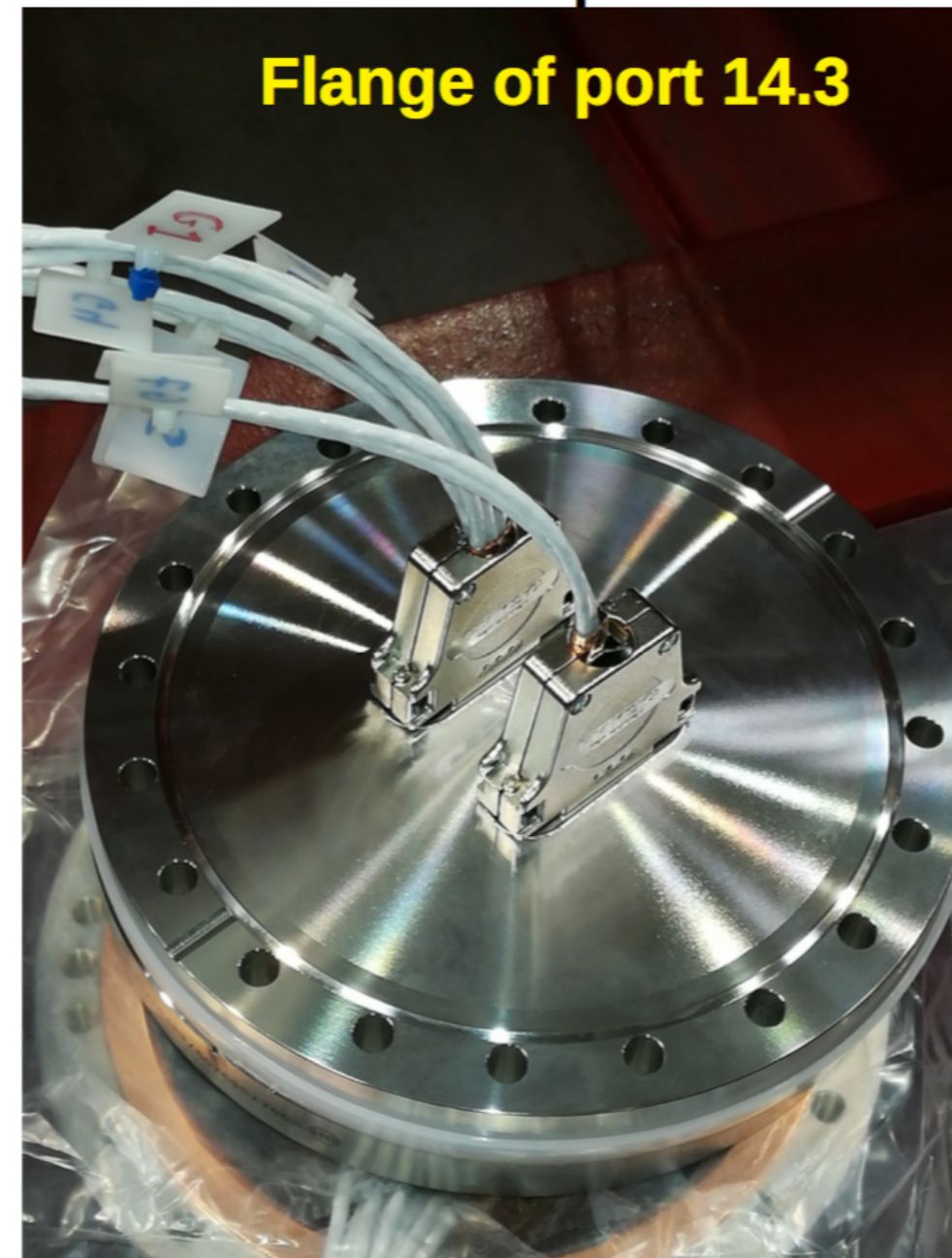
*In the accident, all cables at port 9.1 fell down before connected to the flange due to a broken cable-tie*

- The cable of the **wall sensor** is hanging from the latest cable-support. It should not be too difficult to pick it up from the top of the cryostat with help of someone else inside the cryostat to guide the fishing (as soon as possible)



# Fixing of broken cables at port 9.1

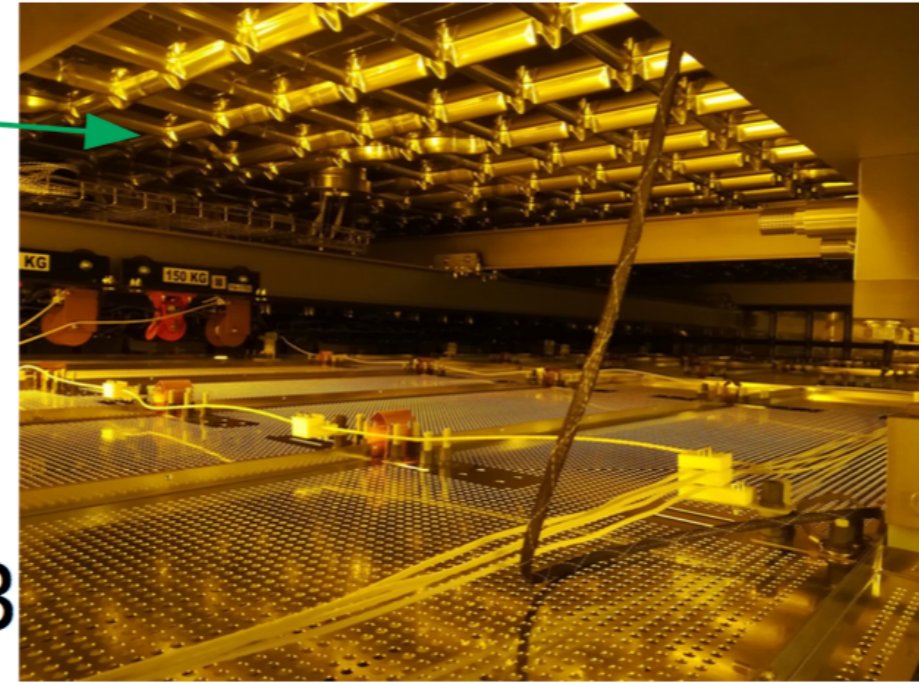
- As for the cable broken at the glued **roof sensor**, it is difficult to judge if we can reach it when the scaffolding is closer to the Gar pipe (looks quite difficult)
  - The alternative to soldering the cable to the sensor could be to install another roof sensor beneath port 14.3 (Ground plane RTDs)
    - Easy access
    - Room for connecting the cables to the 14.3 flange
    - Backup sensor will be ready during next week in case we have to go for this alternative
    - We will make a decision about this probably next week



# Ground plane and bottom RTDs

Ground planes RTDs:

1. Install ground plane RTDs when the scaffolding is in front of each third of the field cages (FC) before being deployed
2. Fine-tune the cables (already routed and connected to the flange)
  - It will take around 1 hours for each 1/3



During TPC deployment RTDs on pipes and membrane floor:

1. Remove 1/3 false floor
2. Rearrange cables attached to pipes
3. Connect 1 or 2 precision RTDs to connectors on pipes
4. Epoxy 1 or 2 standard RTDs to floor, using tape while curing the epoxy and removing it the day after
5. Clean floor
6. Deploy FC
  - It will take around 3-4 hours for each 1/3

# Static T-Gradient Monitor

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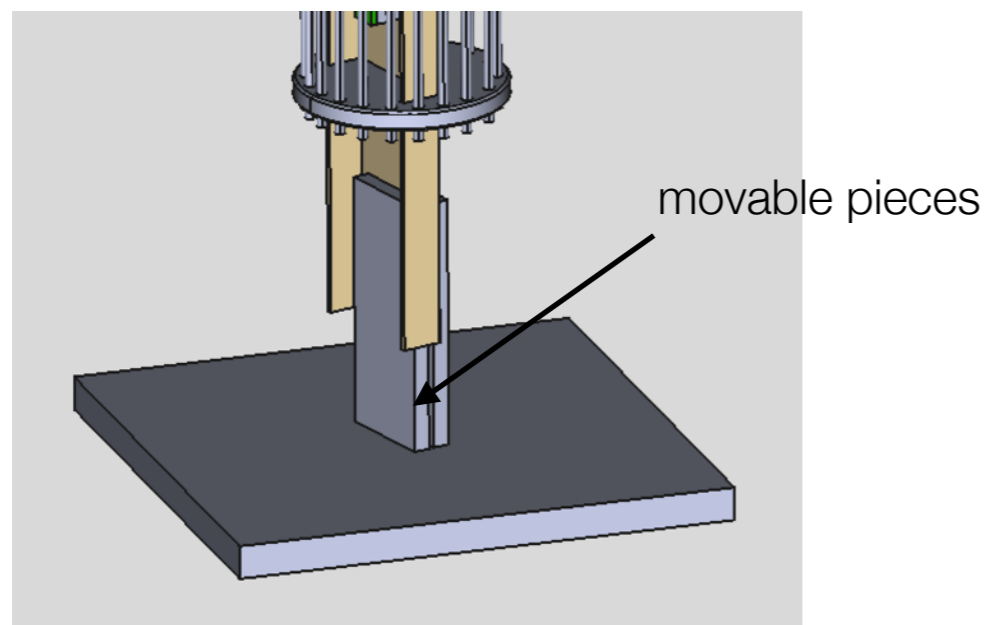
M. Antonova, A. Cervera, P. Fernández, M. García, A. Izmaylov, M. Sorel, P. Novella, P. Bernabeu, J.V. Civera, P. León

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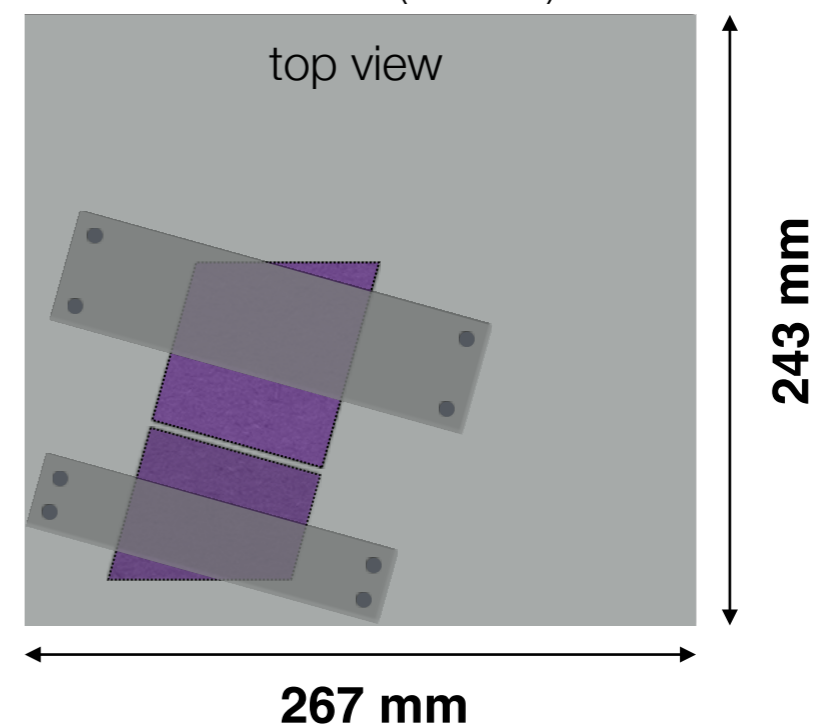
# Operations inside the cryostat I

- Only work at the bottom (~1 h 30')
- Install bottom piece (6 kg) and adjust it to T-gradient U-Profile with two movable vertical pieces
  - 1 cm clearance in flat part between corrugations
- This operation should not take more than 30'

OLD 3D model

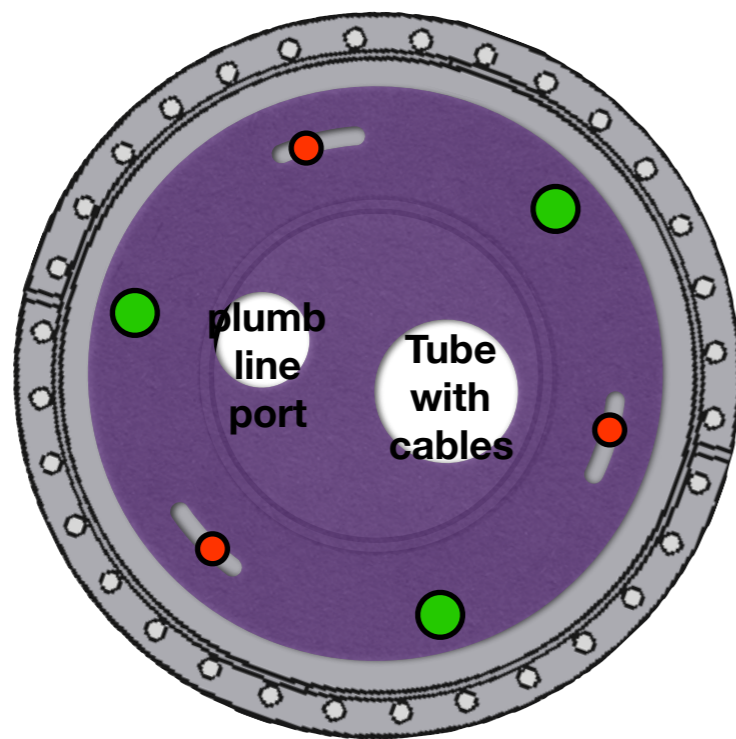


new model (not 3D)



# Operations inside the cryostat II

- Deploy a plumb line from the top flange (dedicated port)
- Adjust verticality with movable bottom piece
- This operation should not take more than 1 hour





# Purity monitors

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Jianming Bian (UCI), Andrew Renshaw (UH), Stephen Pordes (FNAL), Ilsoo Seong (UCI)Hawaii

# PrM Schedule

- Test 3 purity monitor assembly at UCI - Done
- Shipping – shipped out: 5/10,
- Arrive at Geneva: 5/18, Receive at CERN 5/24?
- Prepare tools, bench: 5/14 – 5/30
- Ultrasonic clean (CERN892): (5/25-5/28)
- PrM mechanical cold test (CERN182): (5/29-5/31)
- Repeat UCI vacuum test in Dewar: (6/3-6/6)
- Long supporting rod lifting mechanical test : 6/1-6/7
- Assemble PrMs on long supporting rods : 6/8-6/13
- Test PrMs in long tube : 6/13-6/17
- Install PC/digitizers: 6/13-6/17
- Insert PrM assembly: 6/18-6/31
- Install Xenon light source and PrM FEB on the rack close to port 10.3 (6/25-6/31)
- Interface with slow control: (5/14-6/31)
- Gas running (during cryogenic commissioning)
- LAr running (during cryogenic commissioning)
- Noise to other system study, PrM running schedule/trigger: (during detector activation/engineer running)

## Note:

Purity monitors need to be covered by plastic bags in the cryostat if the date inserting purity monitor assembly is long before gas purging ( $\geq 2$  days), since the photo cathodes could be degraded when exposed in air without protection for a long time.

If we need to do so, we request to access cryostat and remove the bags before closing the cryostat.

# Dynamic T-Gradient Monitor

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J. Maricic  
Hawaii

Cary Kendziora, Brianne Hackett, Alex Dvornikov, Radovan Milincic, Leah McCabe

# Activities Inside Cryostat

- *Roberto Acciarri: “Just to be more precise, we are mostly interested in the activities you'll perform INSIDE the cryostat: what you have to do, when you were planning to do it, how long it will take, you have to work at the floor level or at heights, etc”*
- à *We do not need to be on the floor or at the heights inside the cryostat*
- à *Main interaction with the inside is the installation of the dynamic temperature profiler, but this does not require human presence inside the cryostat*

# Schedule of Installation Inside Cryostat and Crane Use Time

Alignment guide	5/21- 5/26	1	<p>We may not need this, as alignment guide is likely light enough that it can be carried up by two people.</p>
Rods and motor drive	5/22 - 5/27	5 to 6	<p>Mount the two parts of the carrier rod with cantilever system; insert the first half in the port, secure it in place with a pin; lay the second piece horizontally on the top of the cryostat, detach one end, and attach only the top end, lift slowly, and when in position, remove the stop pin and insert the entire system. Secure the full carrier rod in place with the pin, detach the hook and attach the motor assembly to the hook. Lift the motor assembly with the crane, lower it and attach the rod to motor assembly, setting the cables in their final position. Detach the motor drive from the crane.</p>