

# Dismounting KLOE ECAL modules: proposal and plans.

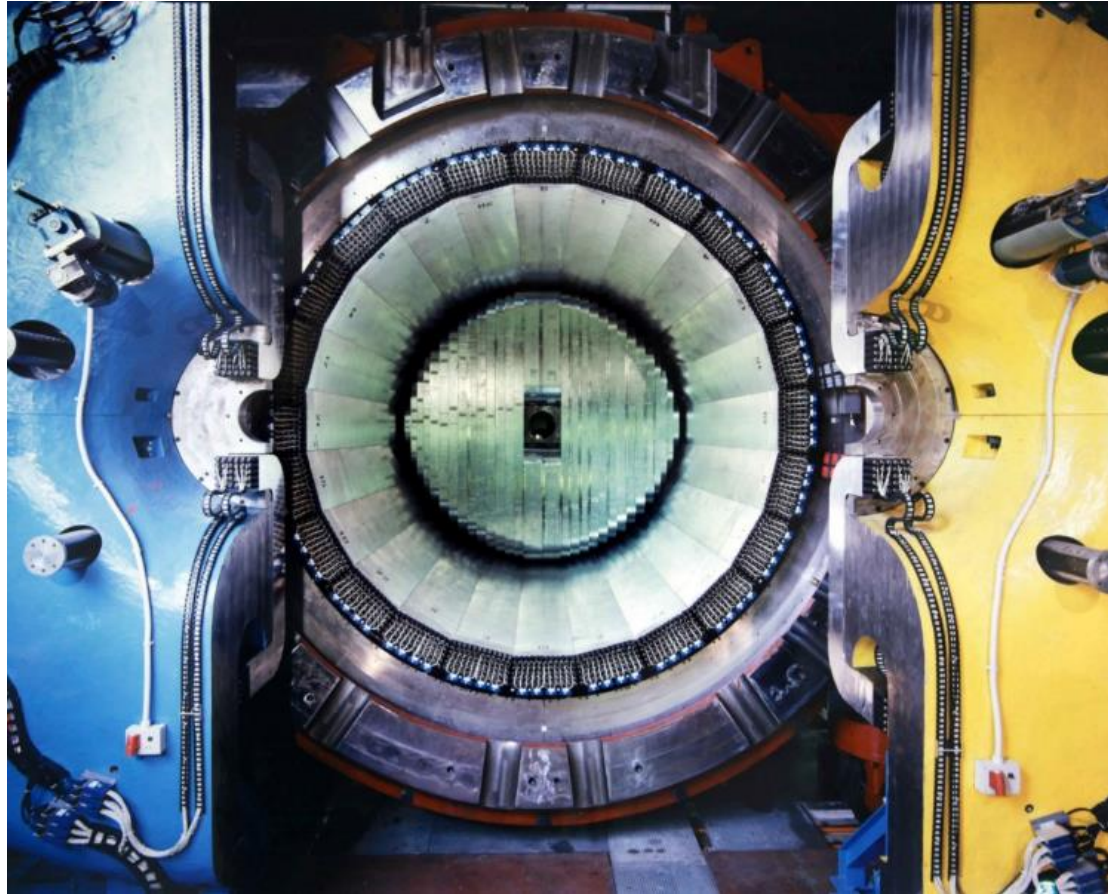
## Summary

- Mechanics components of the rail system.
- Mounting calorimeter process.
- Dismounting scenario.
- Conclusions.

# Dismounting KLOE ECAL modules: proposal and plans.

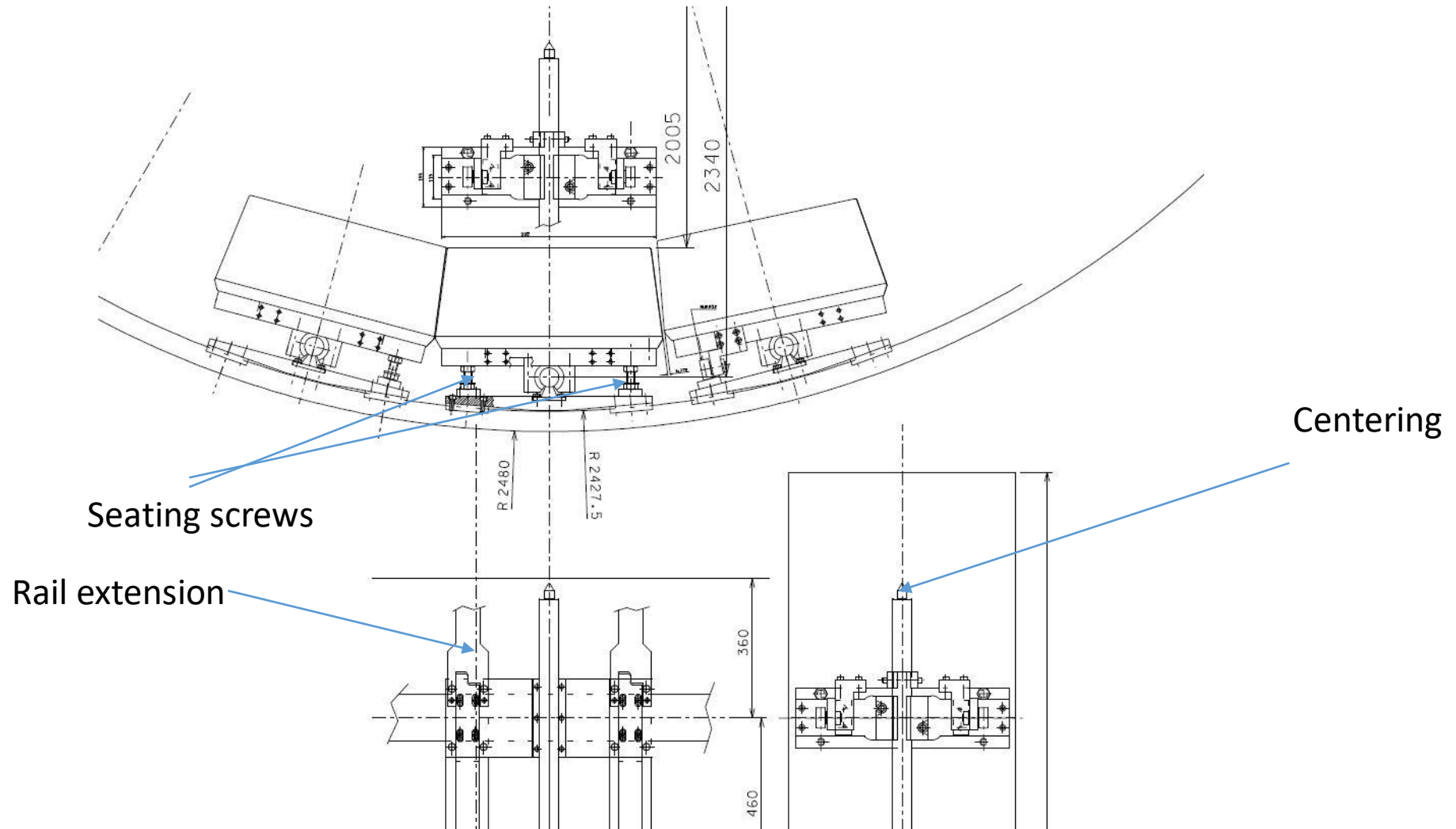
Installation period 1997

Modules number 24  
Modules mass 3500 kg

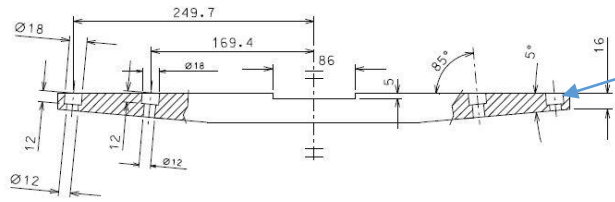


# Barrel modules connection to the yoke structure.

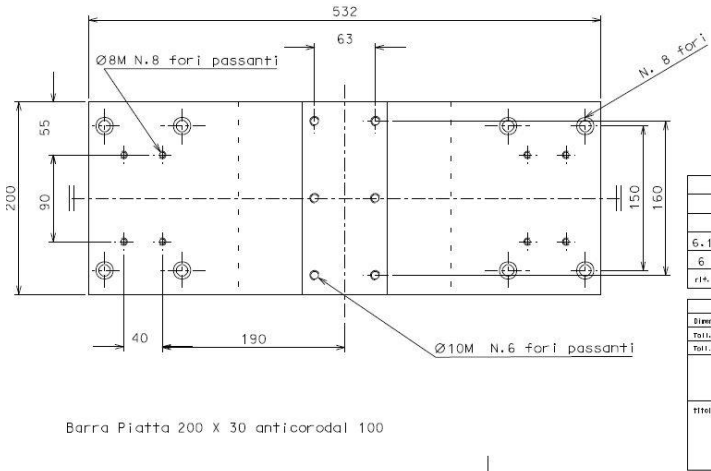
Given the space available and the given load we adopted a mechanical solution simple to be implemented.



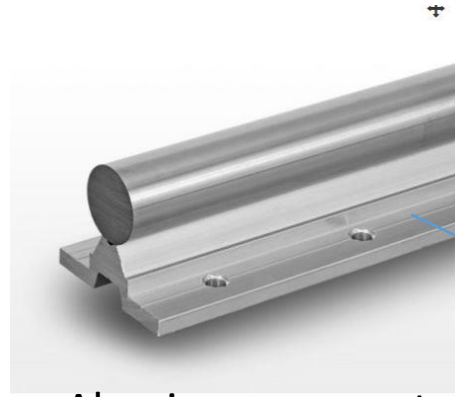
# Steel shaft and cross pieces.



Cross pieces  
Aluminum alloy

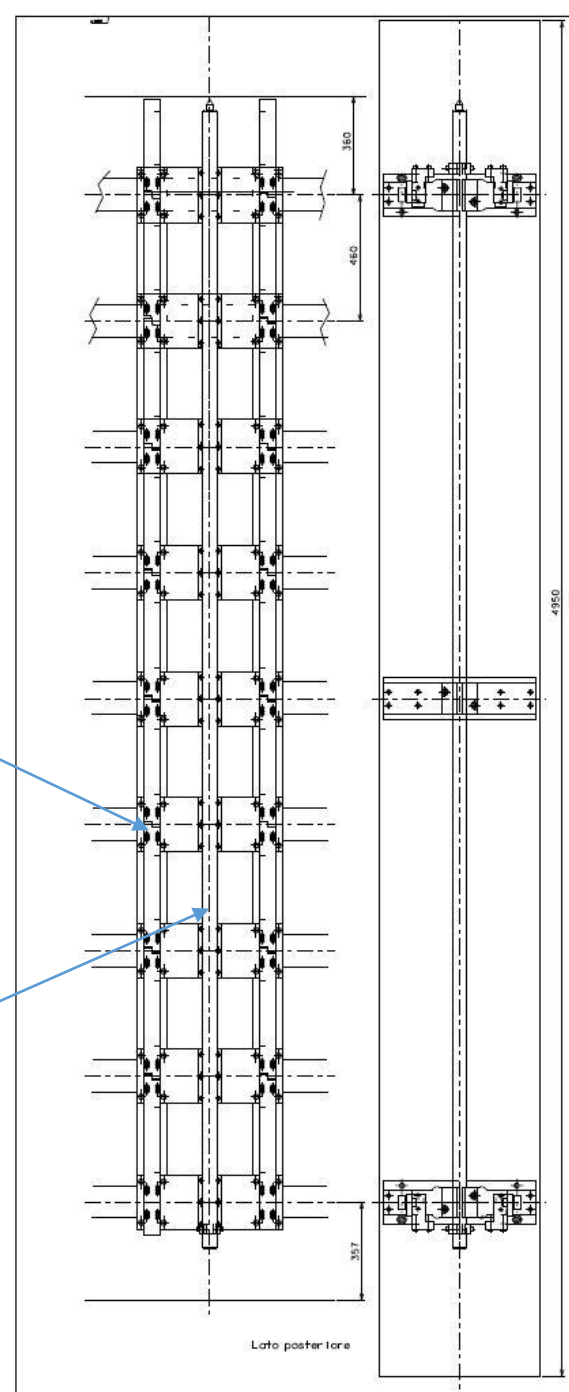


Barra Piatta 200 X 30 anticorodal 100



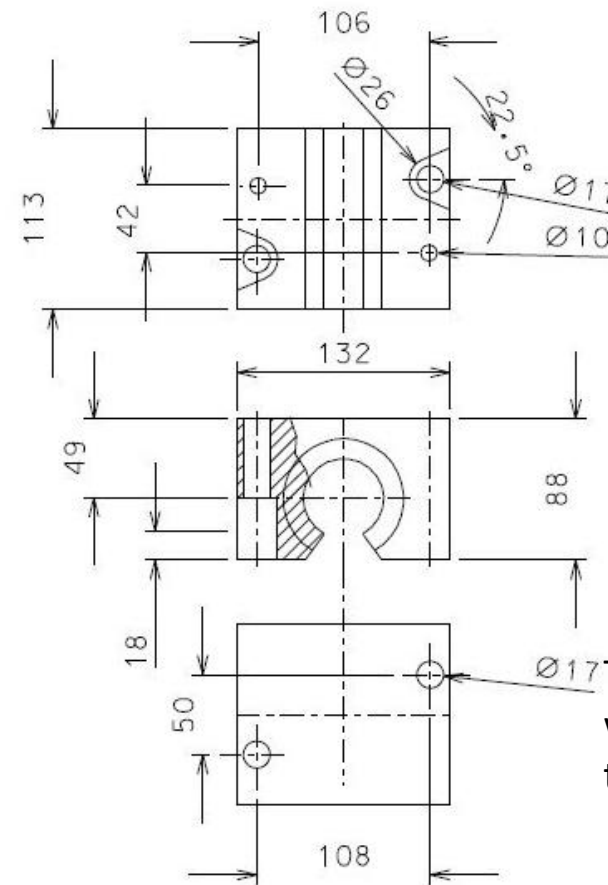
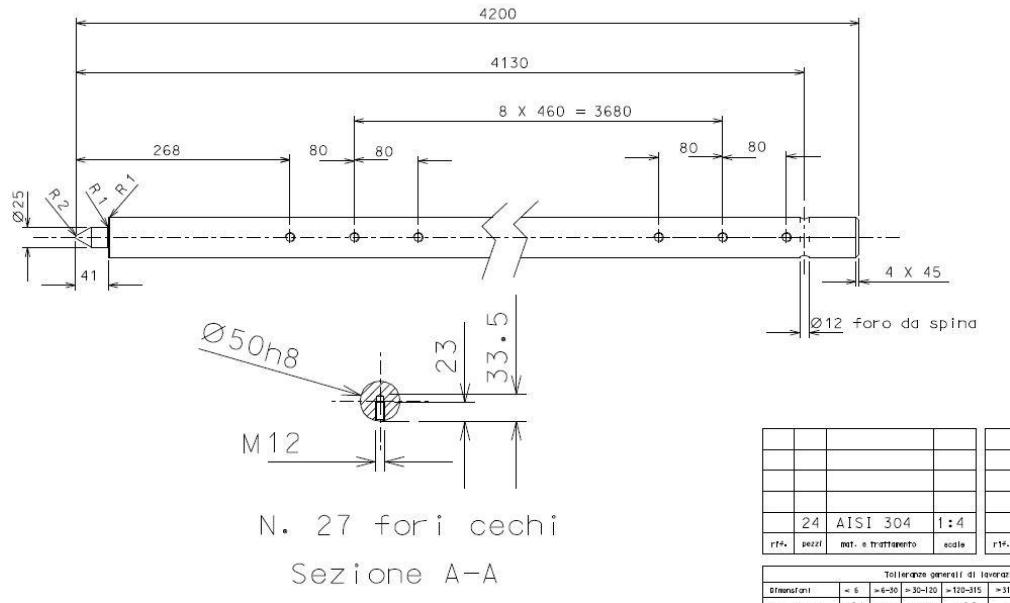
Aluminum support

Central shaft  
AISI 304



# Mechanics components of the rail system.

- Bearing and shaft are made from a non magnetic materials.
- Given the space available and the given loads we choose a stainless steel shaft 50 mm Diameter H8 with a linear plain bearing from Pacific Bearing.



The original housing was modified in according to this drawing



# Bearing self alignment.

## Self-Alignment Feature

Simplicity bearings are available with a standard straight O.D. or a crowned self-aligning O.D.

FL – (Standard):

- Straight O.D.
- Standard pillow blocks have the self-aligning capability designed into the block using standard "FL" bearings for the final assembly

FLA – (Self-aligning O.D.):

- Has a crown on the O.D. allowing the bearing to re-align itself in binding situations
- Specifically designed to easily retrofit straight bore housings
- The bearing will allow 1/2° of misalignment capability from centerline (1° overall)
- O-rings are used on either side of the crown to cushion and eliminate clatter in operation

## Pillow Blocks

- Made of aluminum alloy
- Pillow blocks are interchangeable with industry standard ball bearing pillow blocks
- Critical centerline dimensions hold accuracy within  $\pm 0.001^\circ$  on inch sizes and  $\pm 0.015$  mm on metric sizes

## FINISHES:

- Clear anodized finish (Standard)

Standard pillow blocks have built-in self-alignment in all directions:

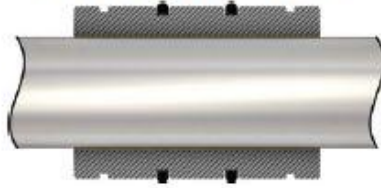
- Standard pillow blocks have 1/2° misalignment from centerline
- This feature is built into the housing with a spherical radius at the midpoint of the block
- This self-aligning capability will allow for some shaft deflection and misalignment

Rigid or straight bore housings are available:

- This does not allow for any self-alignment and provides a very rigid assembly
- They are typically used in single shaft applications

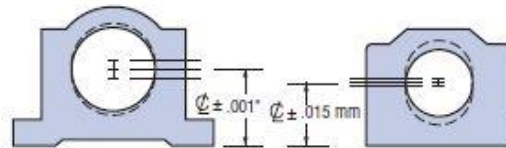
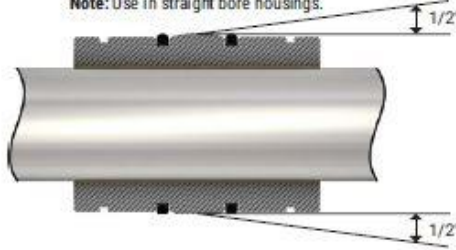
### Standard FL – Straight O.D.

Note: Standard pillow blocks use FL bearings with self-alignment built into the I.D. of the block.

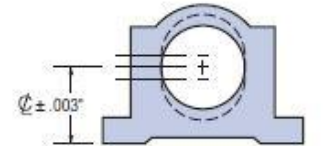


### Self-Aligning FLA – Spherical O.D.

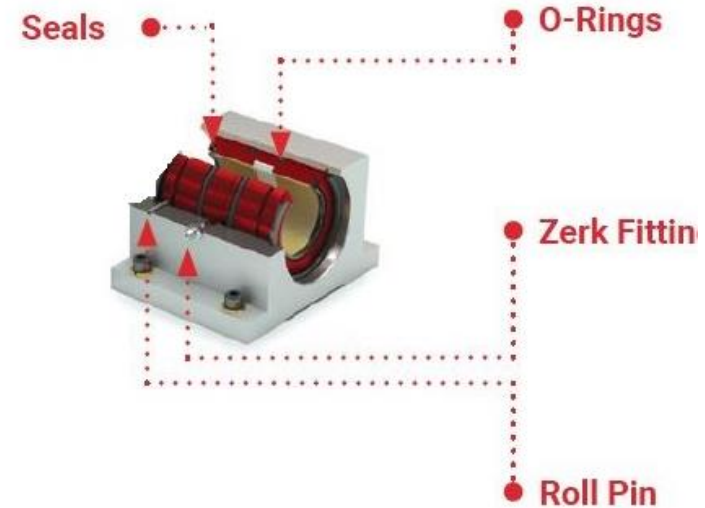
Note: Use in straight bore housings.



INDUSTRY STANDARD



INDUSTRY STANDARD

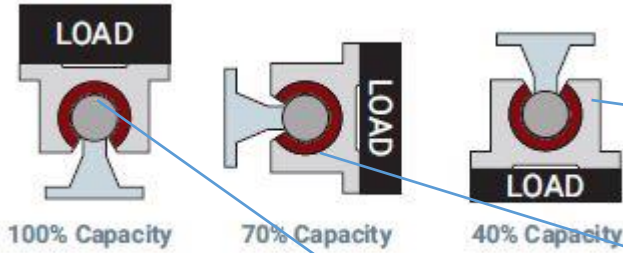


Bearing PMN50

# Sticking and degradation of the elastomers

Load capacity for different position

The total considered mass of one calorimeter unit is 3569 Kg



Possible phenomena of sticking and elastomer degradation depend on the position of the modules.

Different loads are acting for the different Position during the insertion and in the final Configuration.

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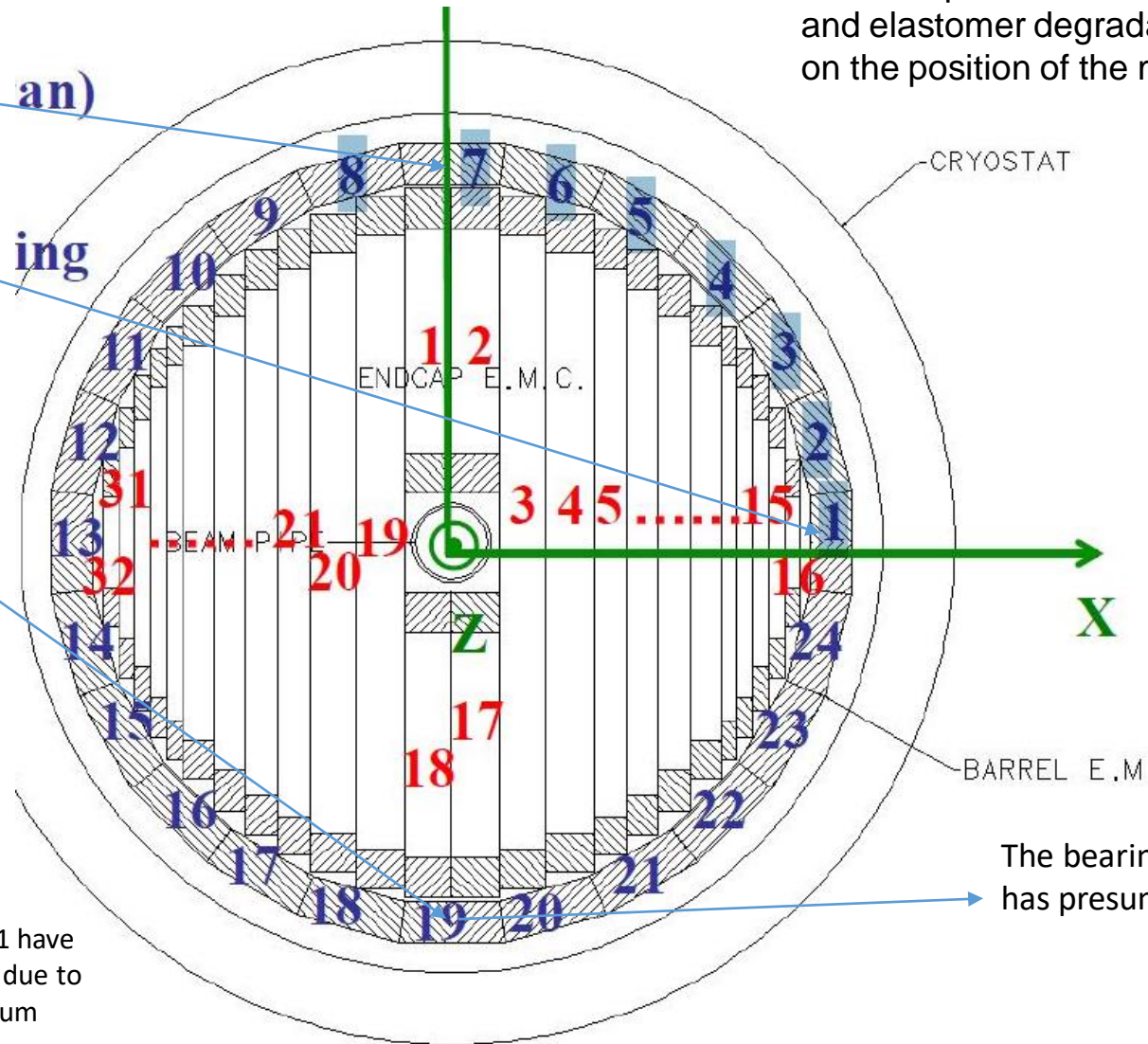
- Combinazione conica di taglio a torsione

$M = .3 \times 11666.6 = 3500 \text{ N} \times \text{m}$

$M = F_1 \cdot .151 + F_2 \cdot .252$

$F_2 = F_1 \cdot \frac{.259}{.151} = 1.7 F_1$

Bearing position 13 and 1 have Shear and traction loads due to the momentum equilibrium

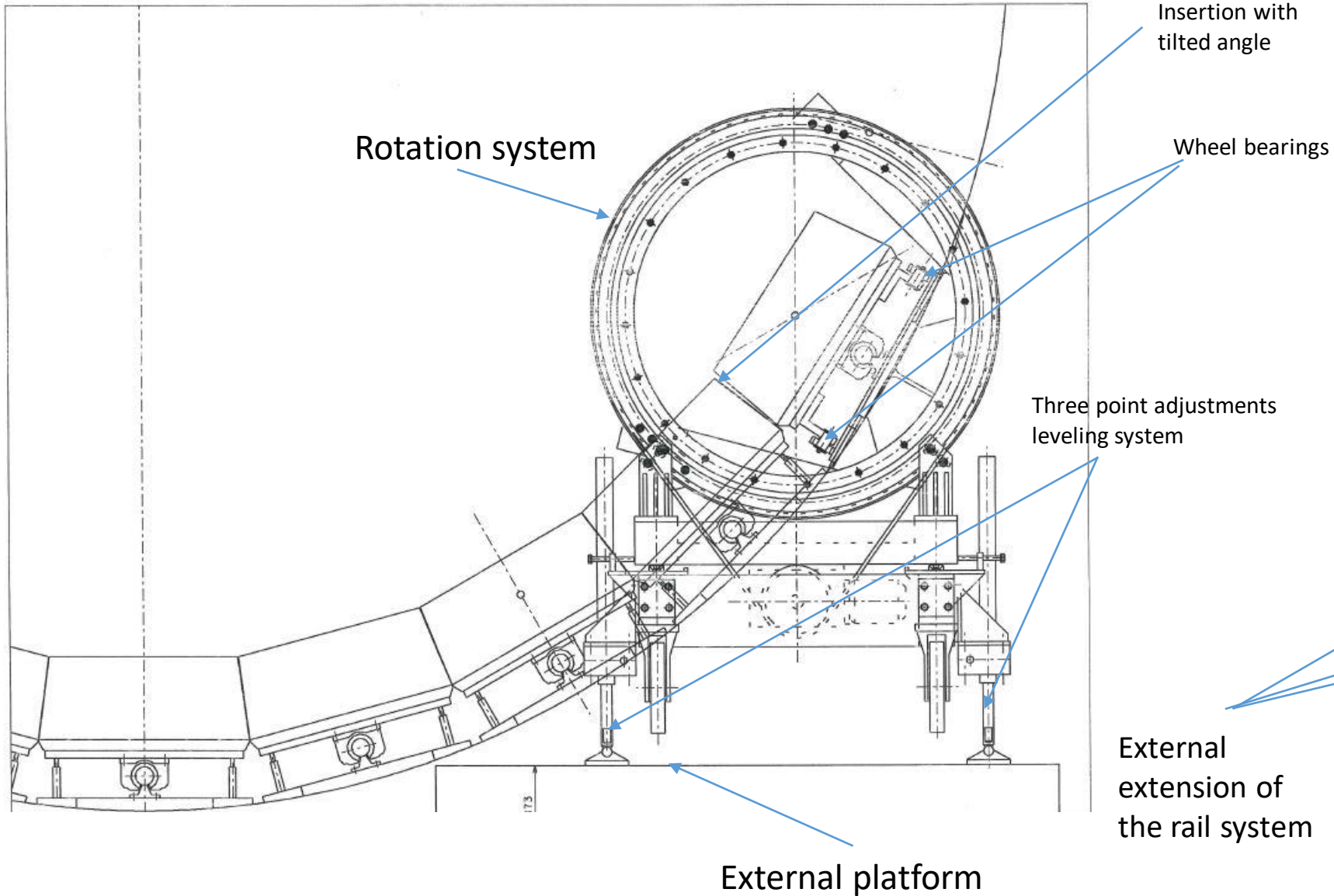


The bearing of number 19 has presumably no load.

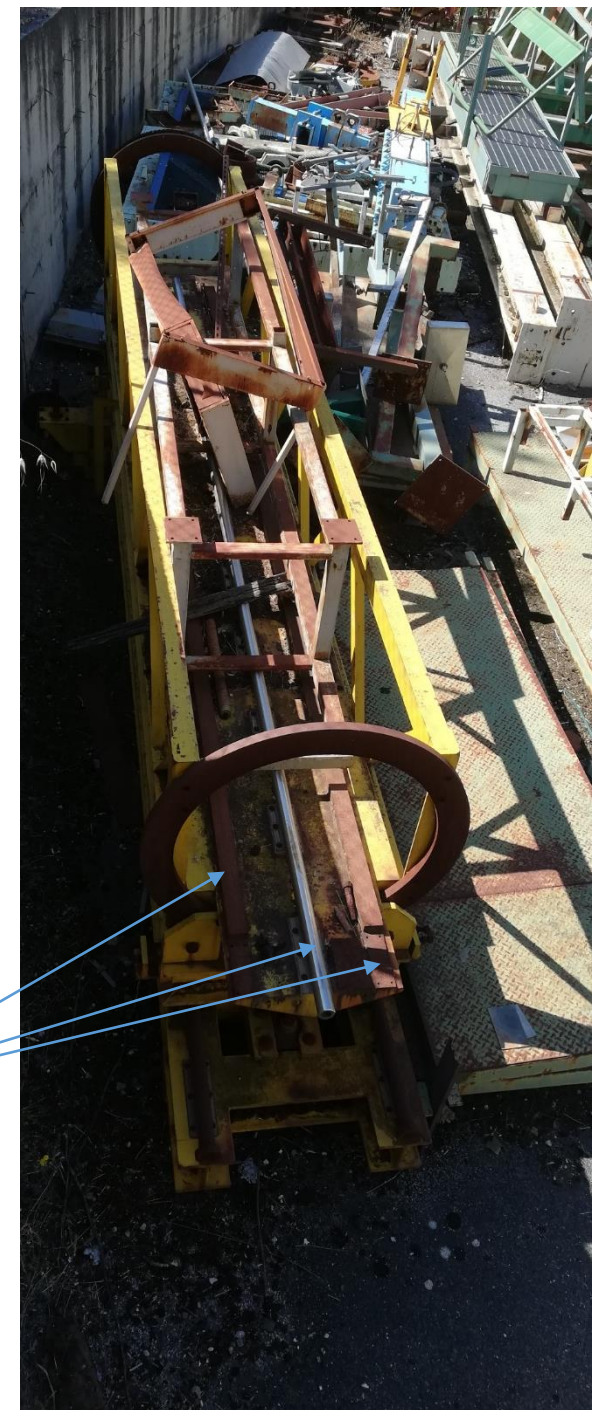


# Dismounting process for a barrel module

Extract the module from the Kloe to take it out module with a lifting bar.



We can think to reuse the same tooling







# Dismounting.

- Hypothesis 1: The mechanics have a level of degradation, in 24 years of operations, that allow the use of the preexistence tooling.
- Hypothesis 2: The tooling needs to be upgraded to take in account the degradation the of the sliding system.

I think we need to be prepared to face Hypothesis 2.

The reason is that in 24 years,

glue joints and elastomer material loaded and exposed to radiation cannot be considered reliable.

It will be difficult to check and requalify the system.

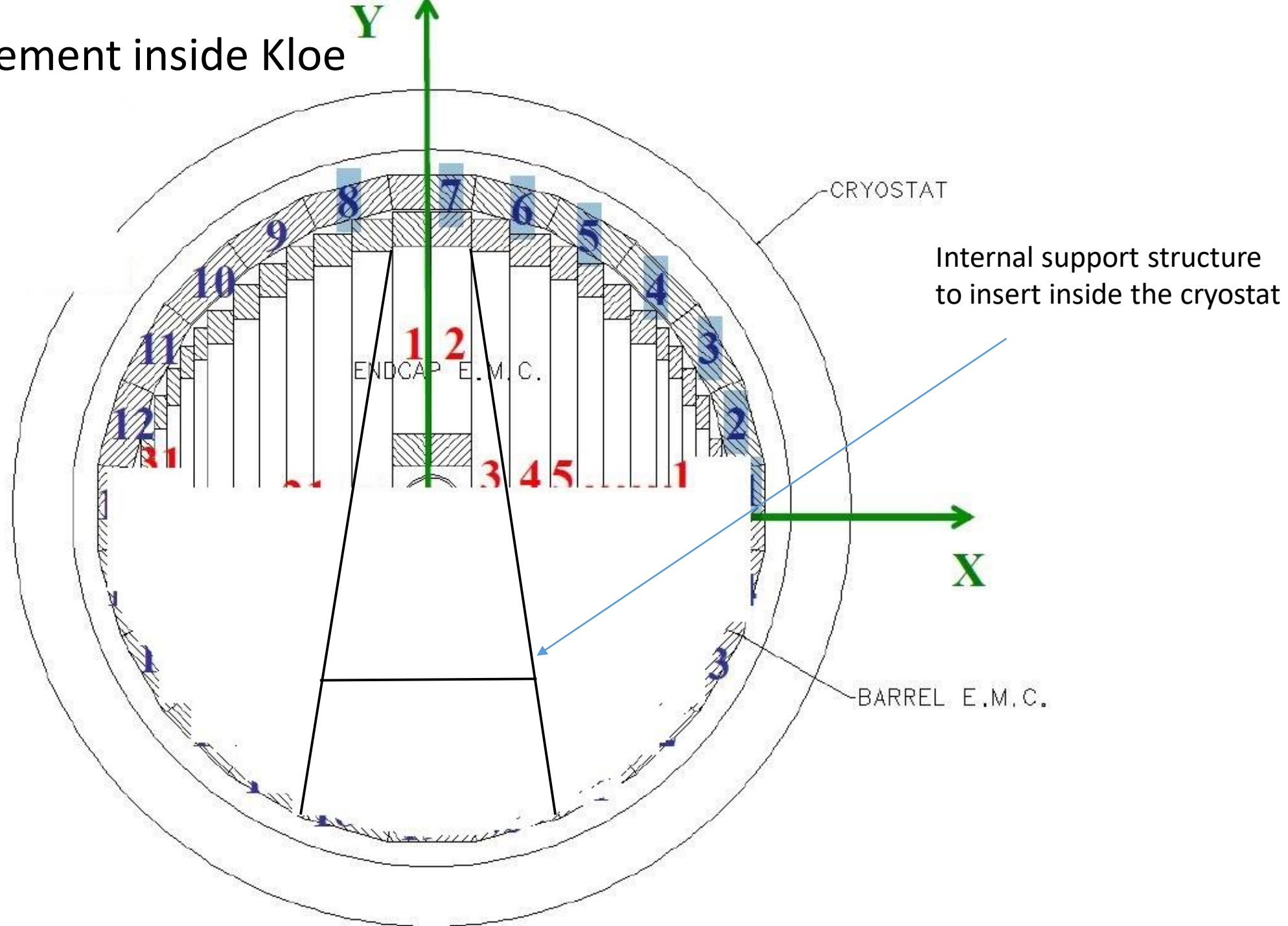
We need to restore the preexistent tooling and to upgrade it.

# Preliminary steps.

- Restore the actual tooling introducing additional supports.
- A new pulling structure can be developed to apply the force close to the bearings.
- An external platform is required.
- We need to verify in situ the access and the available space.
- Better to start from the bottom where the bearing load is lower..
- Having some free space on the bottom it's possible to insert a structure to support the calorimeter modules on both sides.

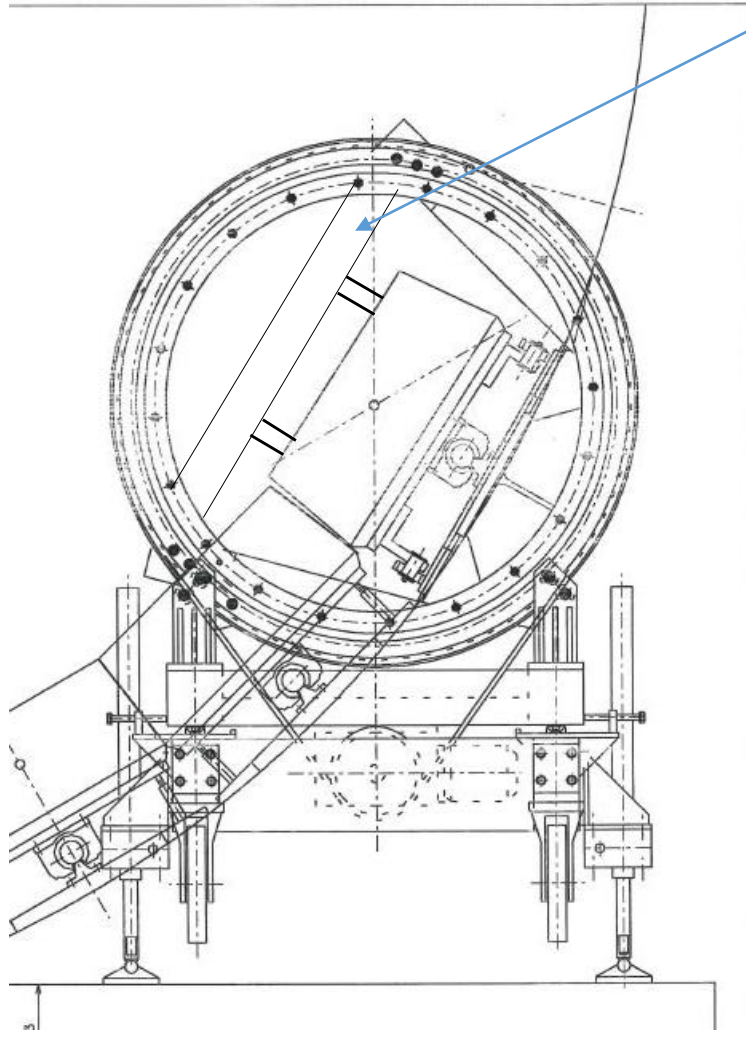


# Modules movement inside Kloe



# Preliminary proposal steps for outside of Kloe.

Removable top structure with roiling elements elastically mounted.



Used for the top modules

# Conclusions.

- We have presented some preliminary analysis of the dismount of the barrel calorimeter modules.
- The procedures and the necessary tools need to be discussed and implemented in situ.
- Access to the area, space for disposal, as well as additional equipment like lifting bar and crane must be agreed with Frascati personnel.
- A more effective work can start from the as built drawings after a local inspection.
- Cables and services are not considered in details but they can play an important role.