DUNE ND: ND-SAND KLOE Components PDR

ECAL Activities at LNF

22 July 2024

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KLOE-to-SAND Activities at LNF

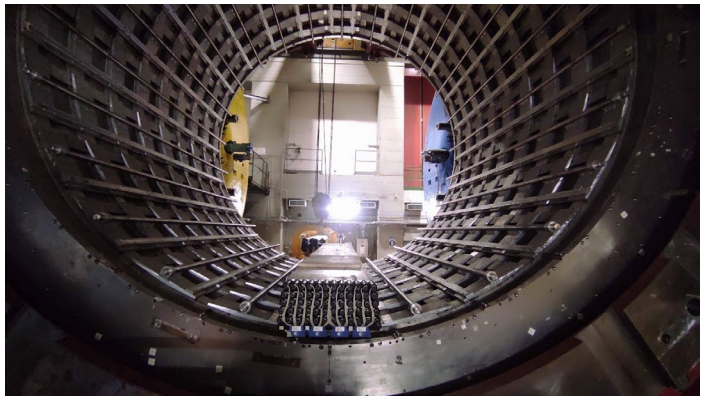
- ✓ Removal of all the cables and the FEE+HV racks
- ✓ Extraction of the Drift Chamber

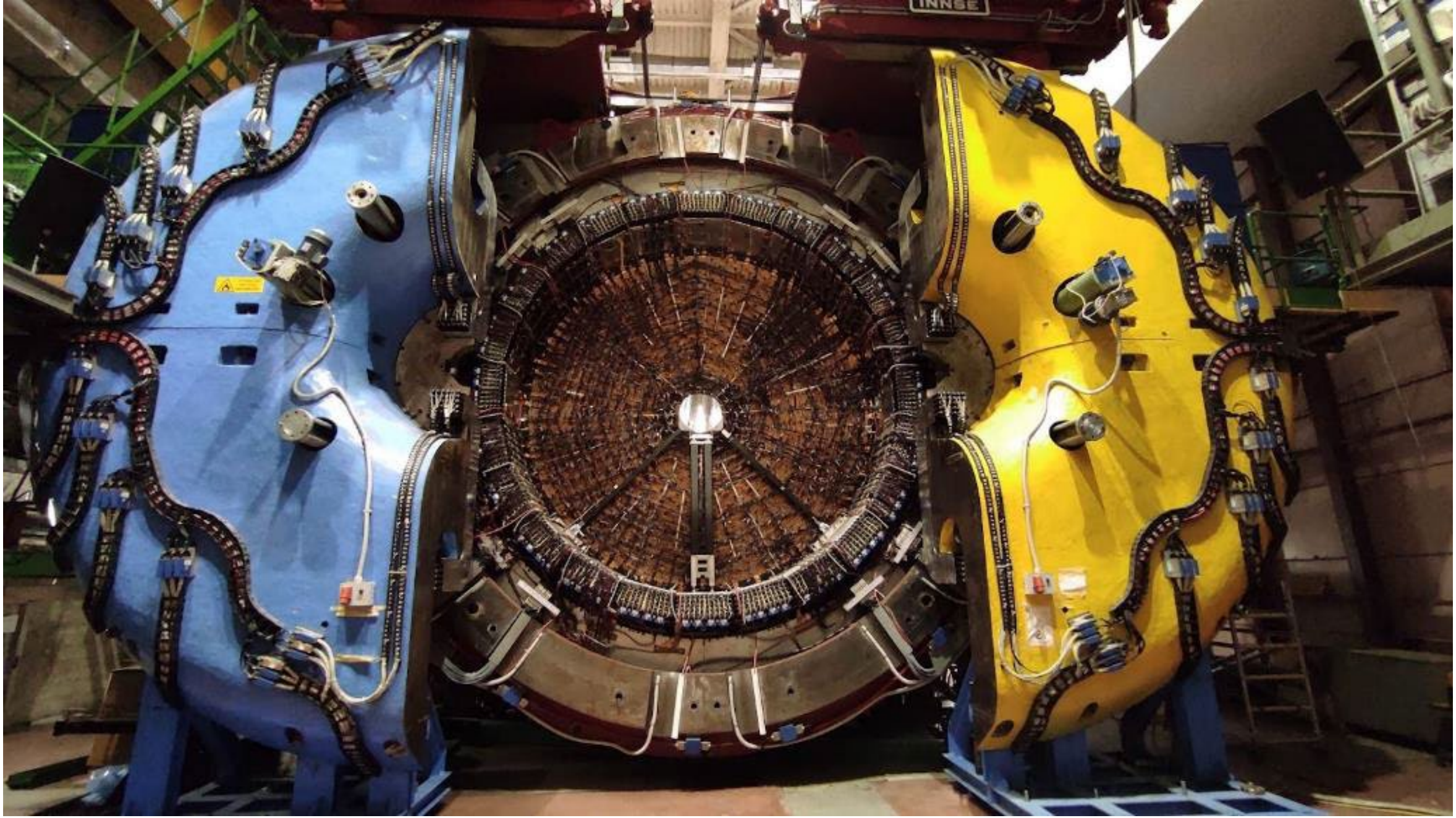
CALORIMETER

- ✓ Laser Tracker survey
- ✓ Extraction of Barrel (24 modules)
  - ✓ Variable height platform design and construction
  - ✓ Insertion/extraction machine refurbishment
  - ✓ Dismounting of PMTs
- Dismounting of 4 End-Caps
  - Tools refurbishment and construction
- Modules consolidation
- Operational test

MAGNET AND YOKE

- Installation of new Power Supply
- Colling and operational test
- Extraction of the Cryostat
- Dismounting of the Iron Yoke
- Packaging and Shipping





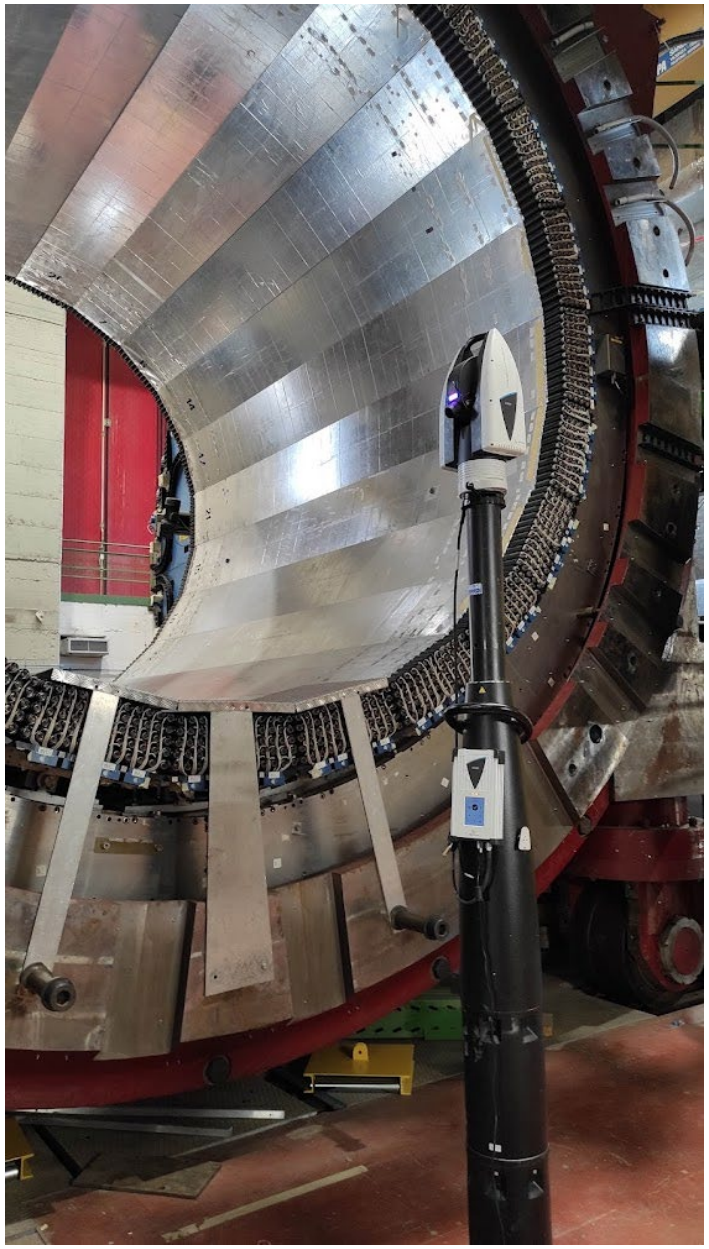
KLOE Drift Chamber Extraction

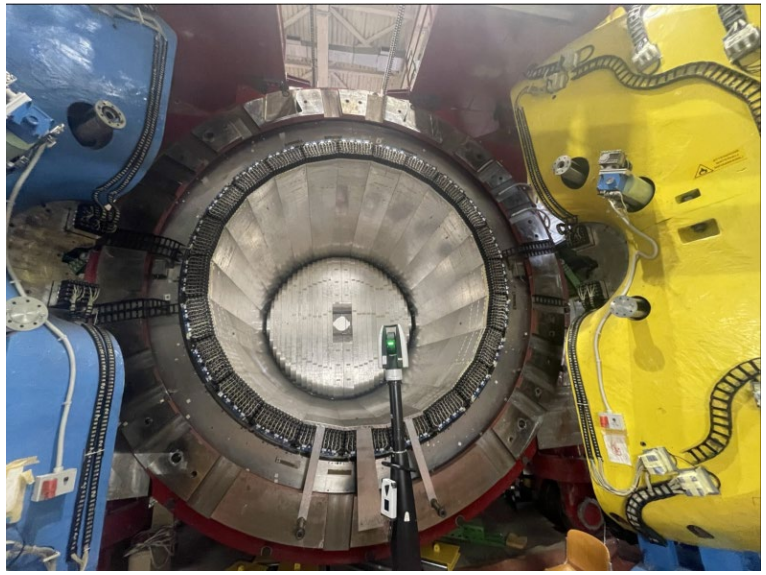
January 2023

Disconnection of all cables

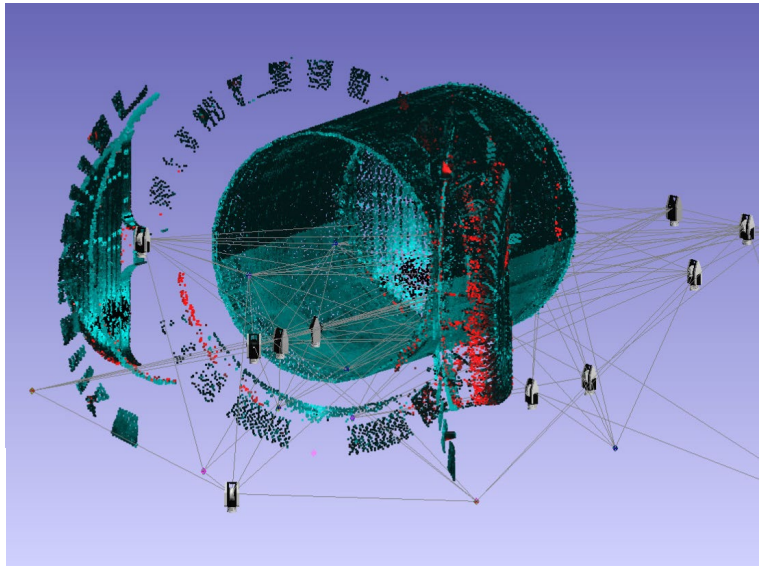
Extraction of KLOE Drift Chamber
(4 m diameter – 3.7 m length)

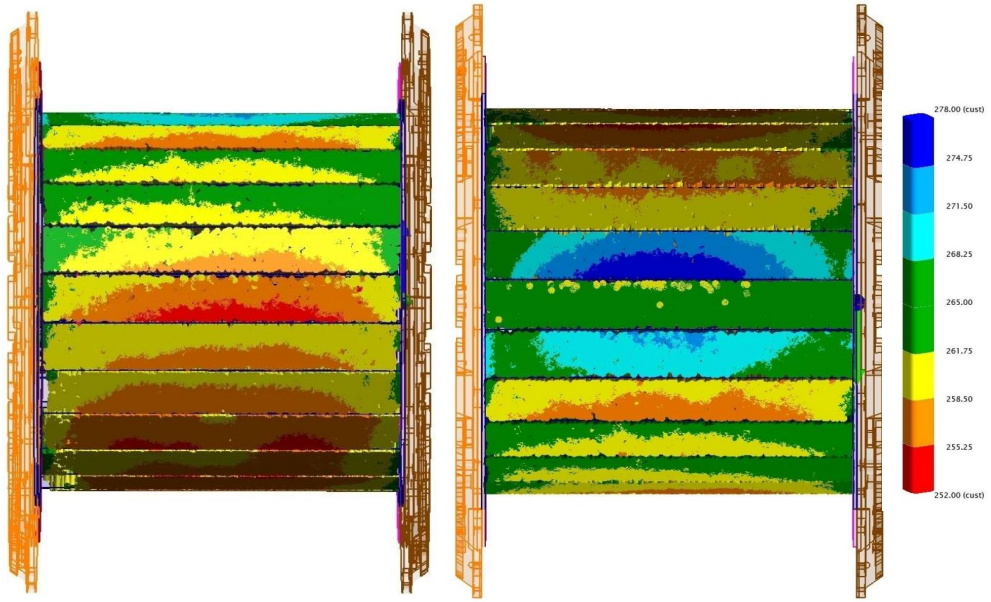
ECAL Position Survey





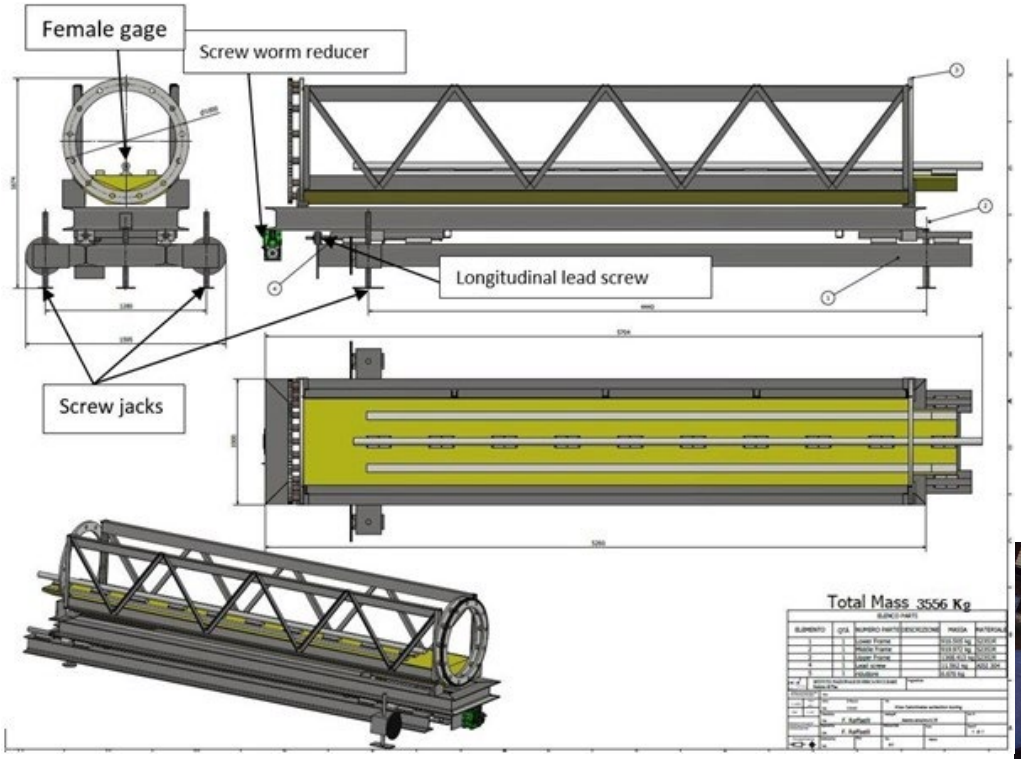
The whole surface of ECAL (EndCaps included) has been laser scanned to obtain a 10mm pitch matrix of points





Analysis of total thickness of barrel modules shows difference of ~ 5 mm

Barrel Modules Extraction Machine

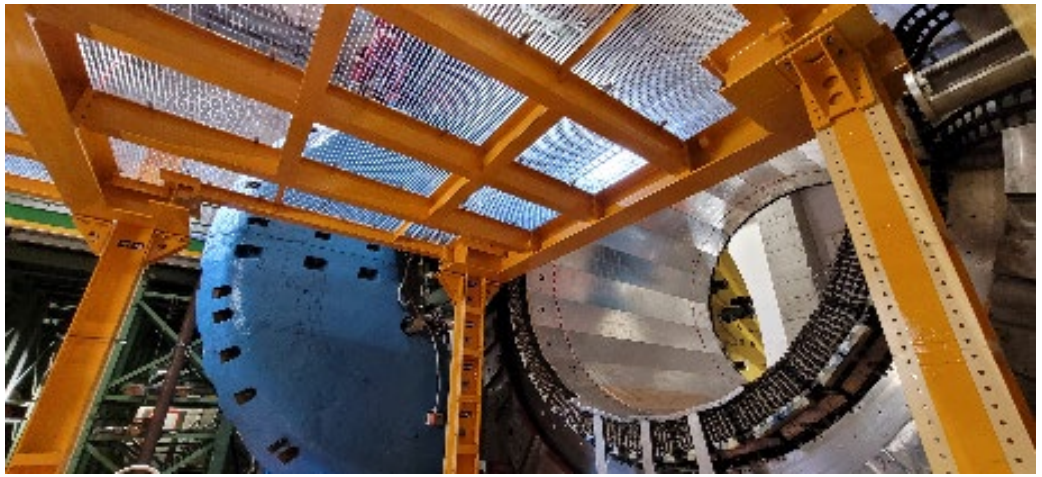


Completely refurbished machine
(new bearings, screws, moving parts)

Upper frame with 3D movement + rotation
on a fixed support base

3500 kg weight (same as Barrel Module)

Barrel Modules Extraction Platform



Customarily designed platform (no market availability)

6 cm pitch height adjustment of upper deck along 4 columns

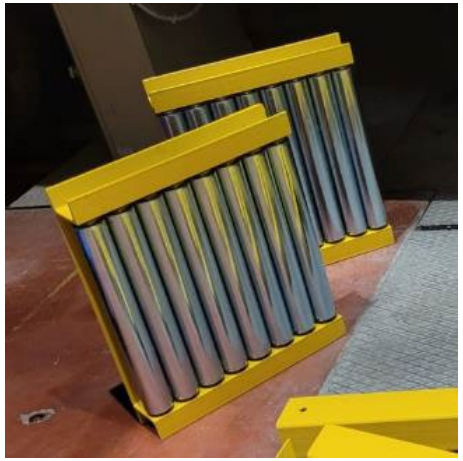
Dimensions suitable to support weight of extraction tool + barrel module (7000 kg)

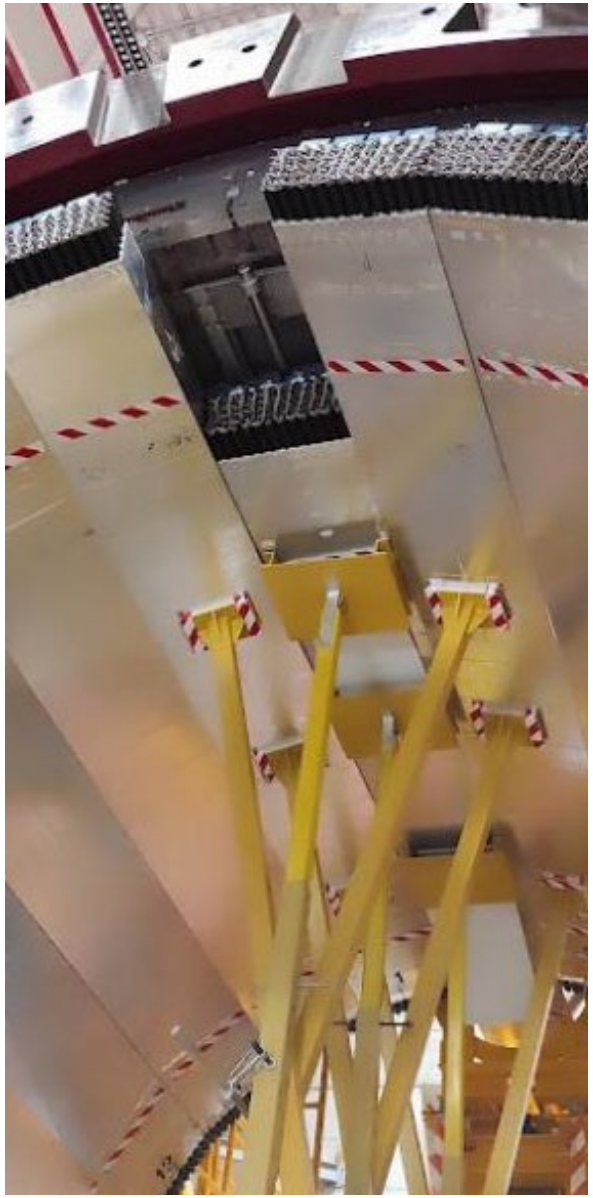
Barrel Module Extraction Preparation

6 support poles placed under 3 upmost modules to sustain the extraction

Neighboring poles fixed

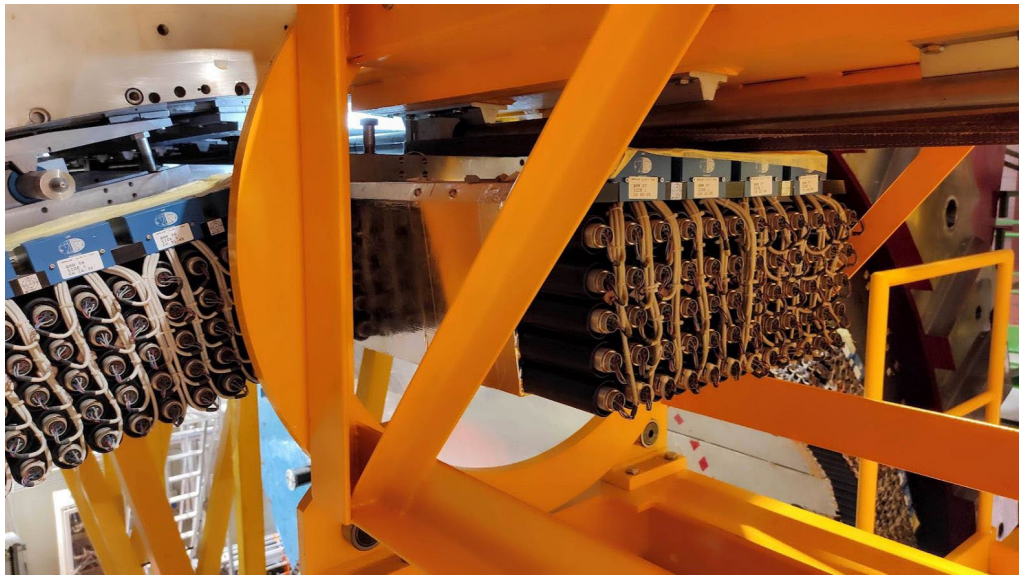
Central pole has rolls on heads to allow module sliding



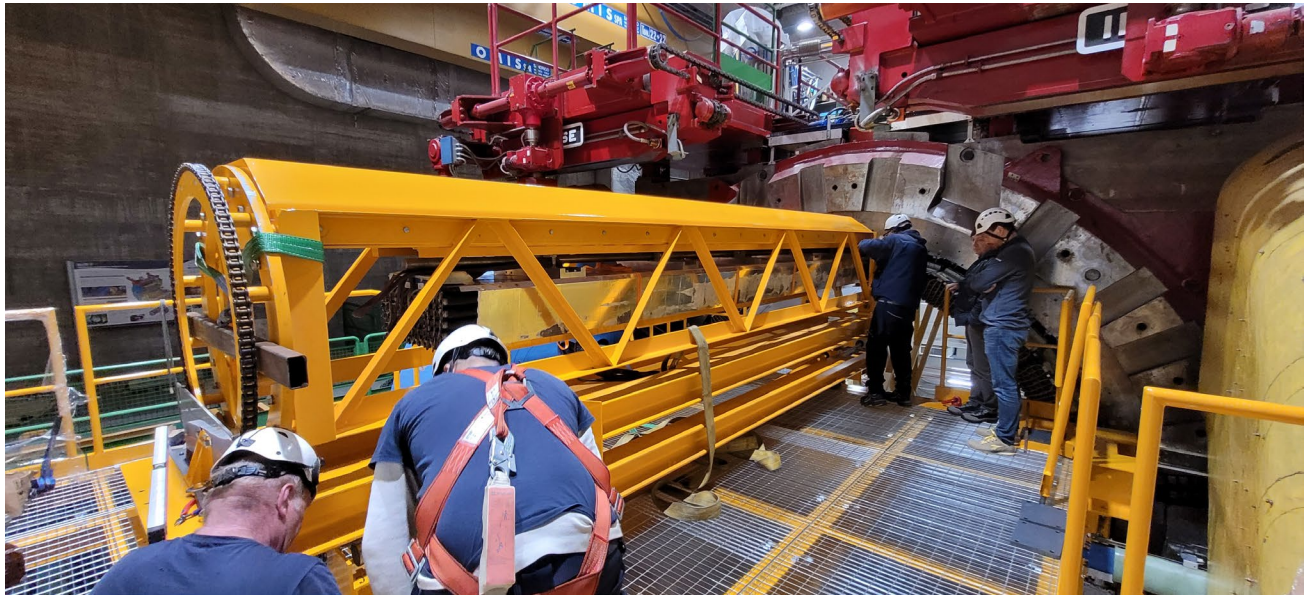


Barrel Module Extraction

Positioning and precise aligning of extraction machine



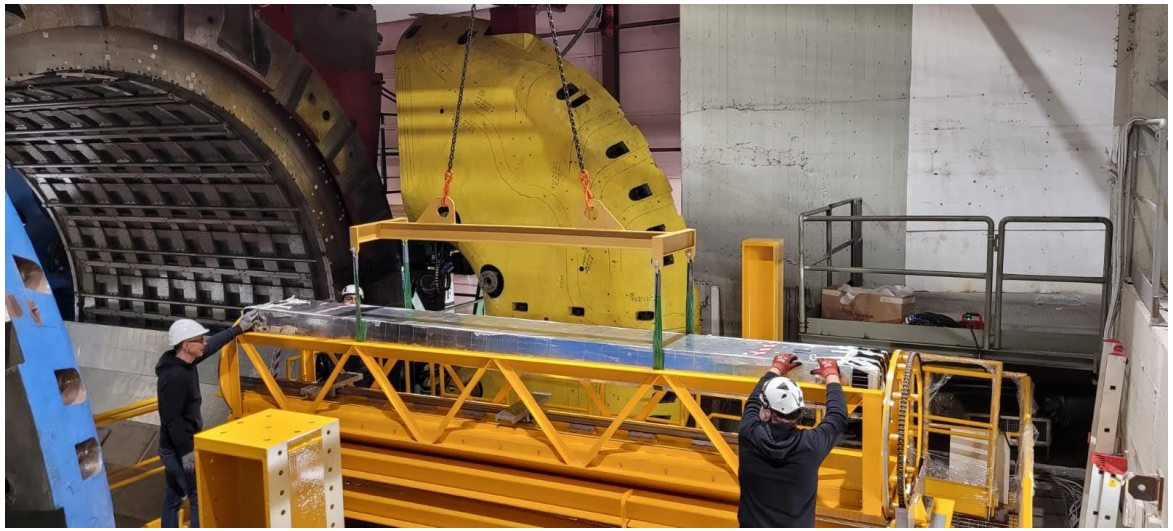
Pull of module with Tilford winch



first module nearly completely extracted in the machine upper frame

First Barrel Module Extraction Celebration Pic

Storage of Modules after Extraction

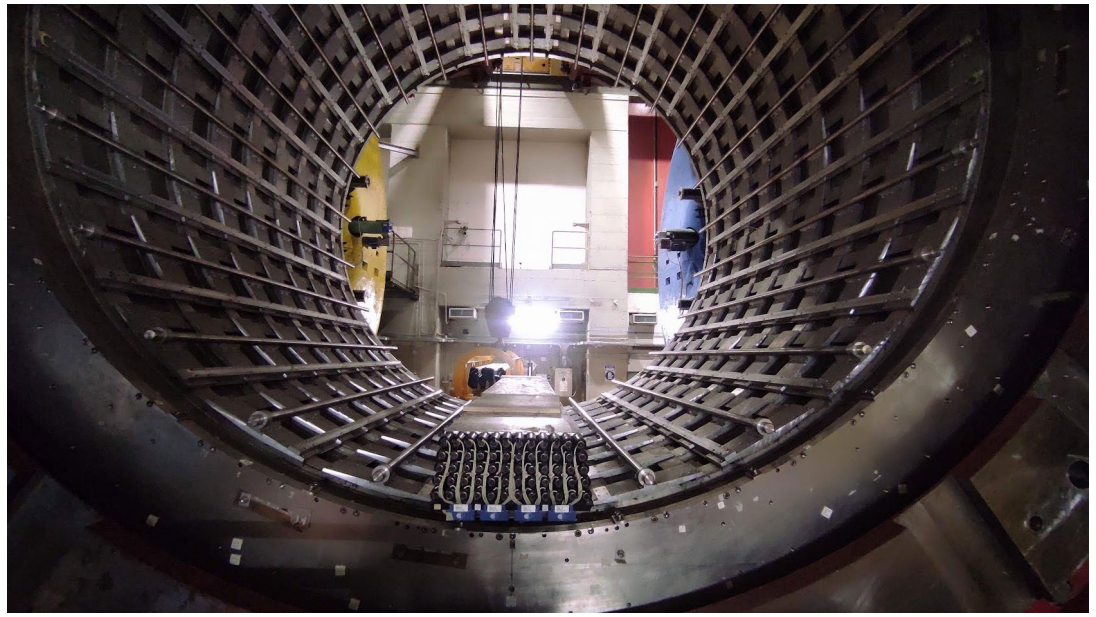


Module is lifted from the extraction machine with a beam

Module is placed on a support designed for handling and transport and stored in refurbishing/test area

Supports can be stacked up to 5

Barrel Extraction Progress

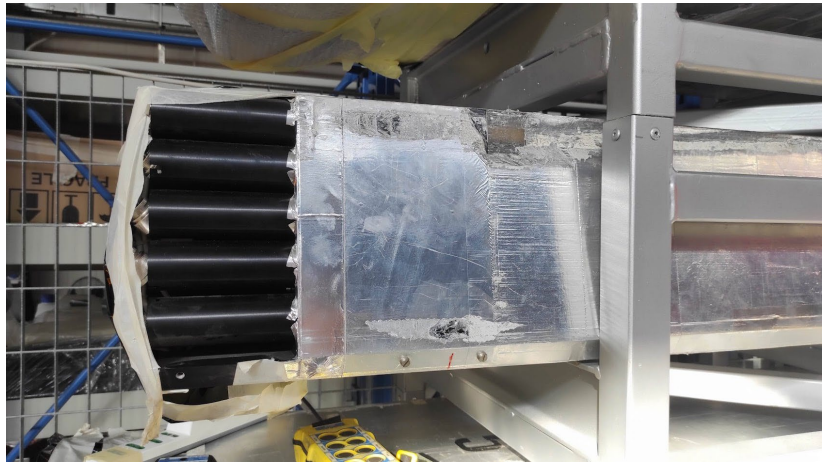


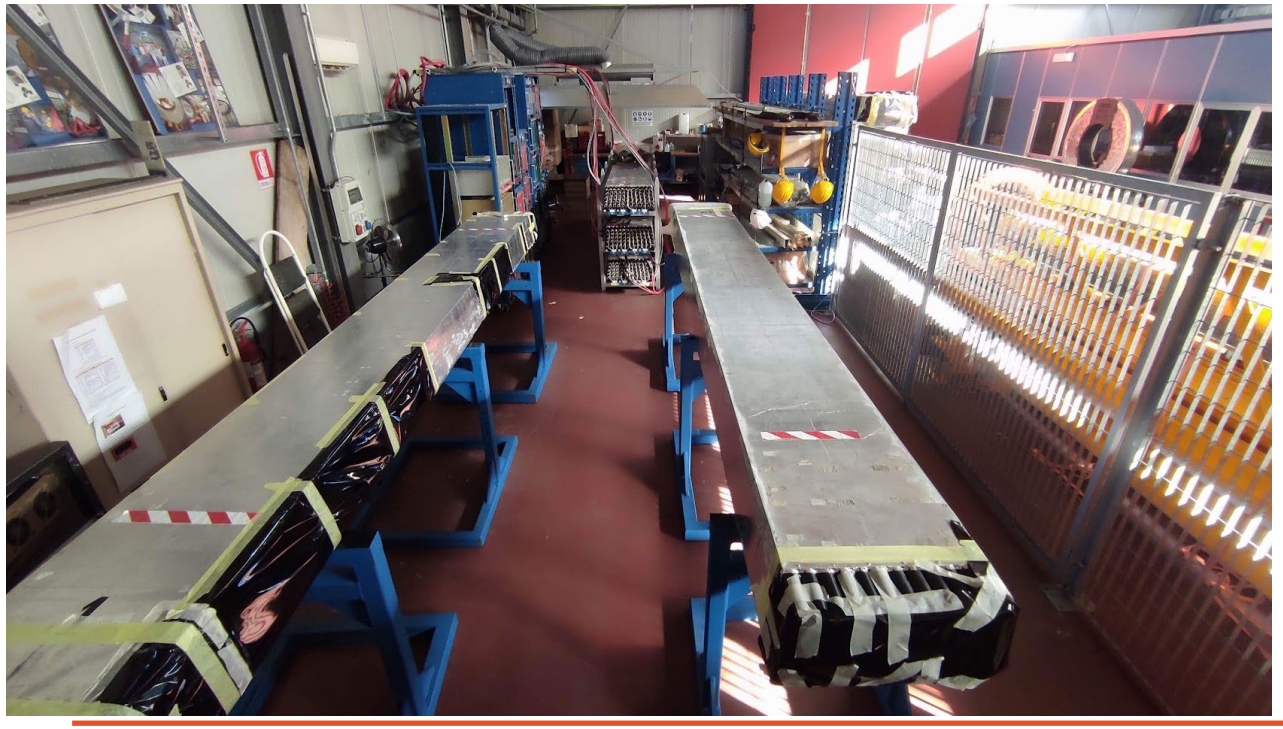
All 24 modules of the Barrel have been extracted with an average rate of 0.4 − 0.5 d^{-1} from February to May 2024

Refurbishing and Test of Modules

Work on barrel modules

- Reinforce modules delaminated
- Fix and repair small damages
- Wrap with new tape
- Test light tightness
- Test PMTs
- Operational test of whole module





Refurbishing of Modules

6 new PMT support plates will be machined as new

2 light-guides unstuck
in 1 module
have been polished and glued

Refurbishing of Modules

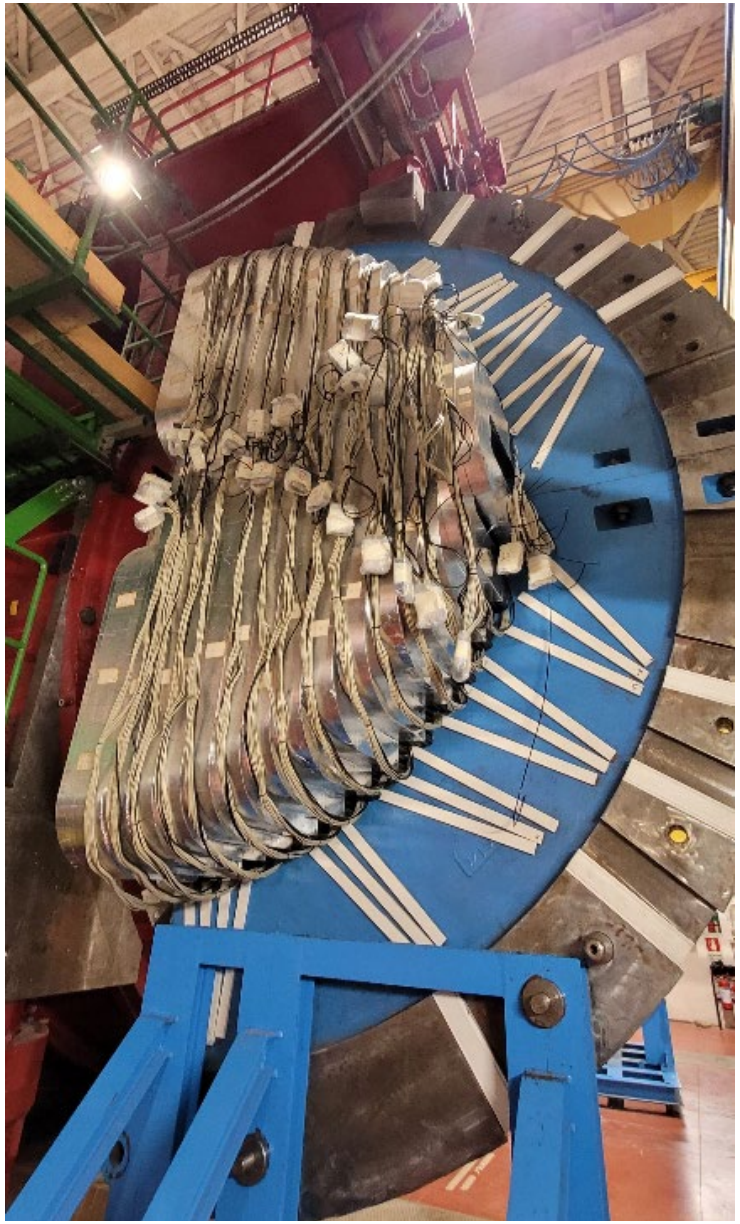
3 topmost modules have delamination of ~ 10 mm

Other 4 show much minor delamination ~ 1 mm

No damage of fibres is evident (modules worked with full efficiency)

Delaminated modules will be glued after test of epoxy adhesives on Lead-fibres mock-up

End-Caps Dismounting Tools



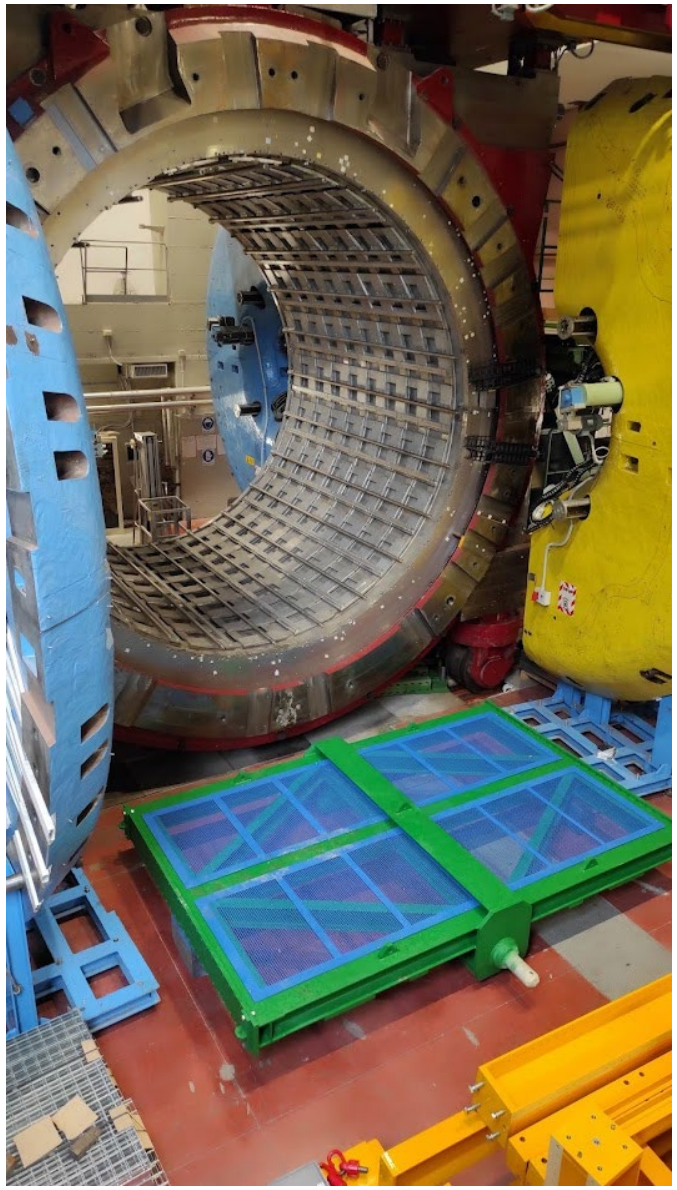
Each of the 4 ECAL EndCaps is made by 32 C-shaped modules of different length
EndCaps will be dismounted as-they-are (only the smallest C-module is removed)

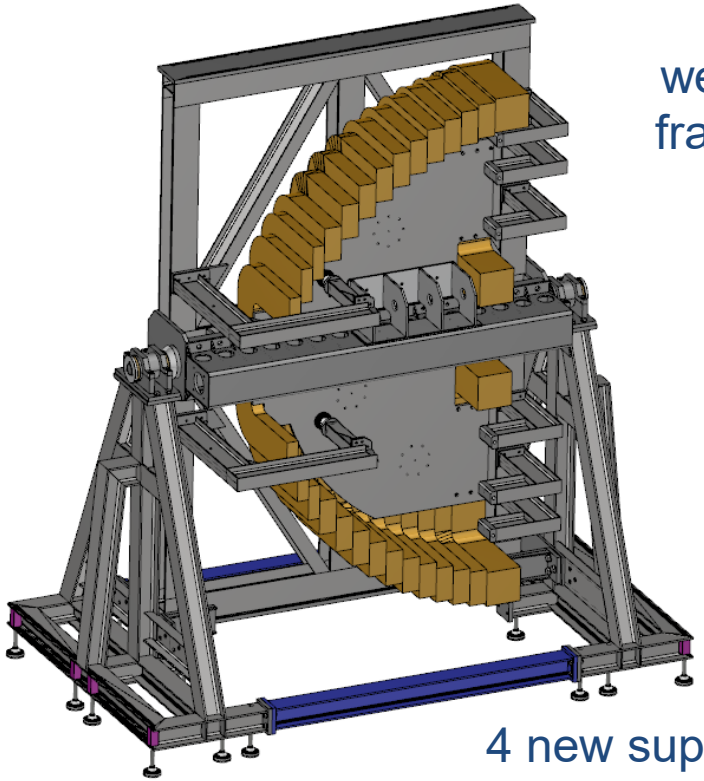
Dismounting Tools prepared:
1 rotating-frame to remove EndCap from iron
and place it in horizontal position
4 support-frames for handling, working and transportation

weight of 1
EndCap: 10 t

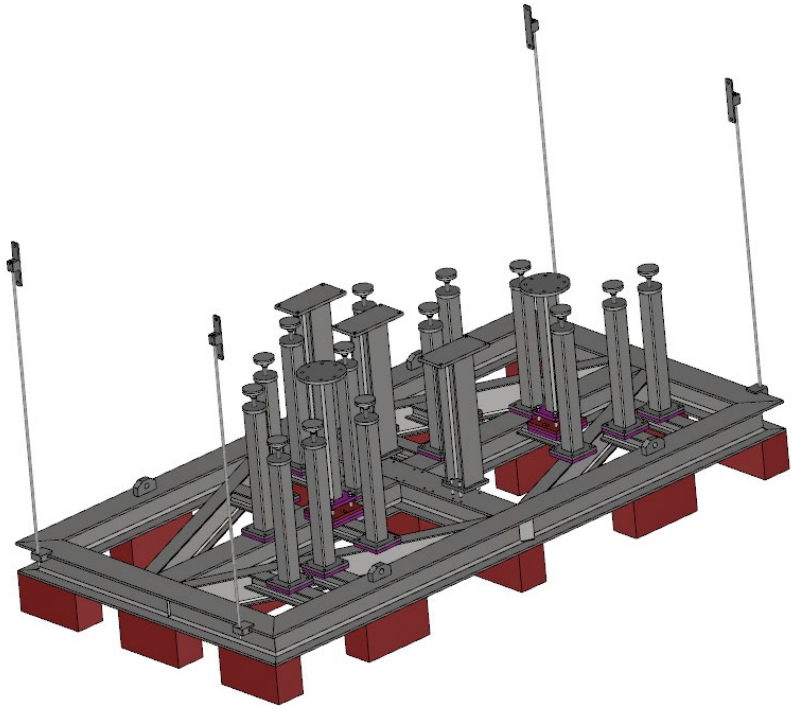
End-Caps Dismounting

Fully refurbished rotation-frame





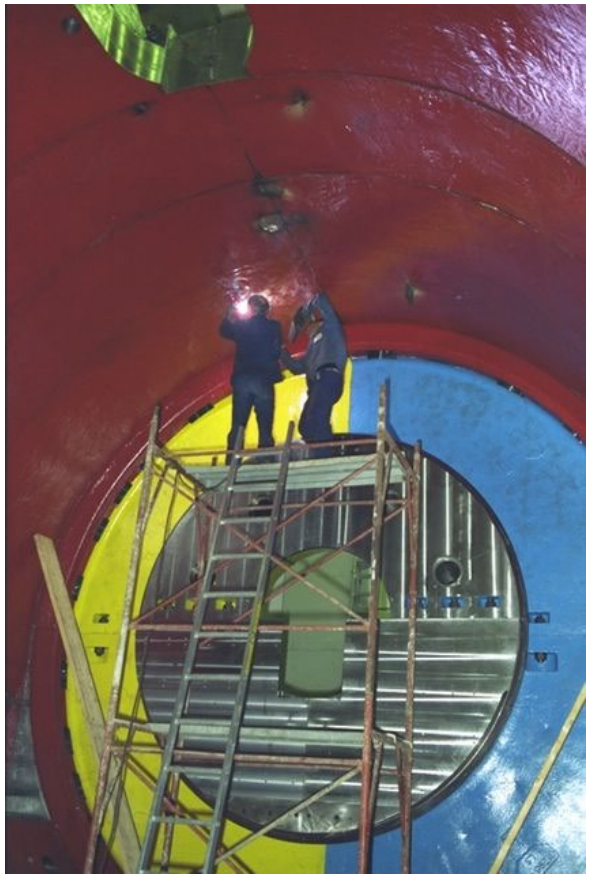
weight of 1 frame: 2.5 t



4 new support-frames with support pillars

Iron Yoke Dismounting

Iron Yoke is made by 34 parts
the heaviest is 20t for a total of 700t



Activities at FNAL

ECAL will go post-delivery validation test: 300 m^2 area
with 10 t crane needed (Barrel + EndCaps + Mechanical tools)

Needed storage/test area for magnet and iron
(5.80 m diameter – 4.4 m length – 40 t weight) (D0 hall ?)

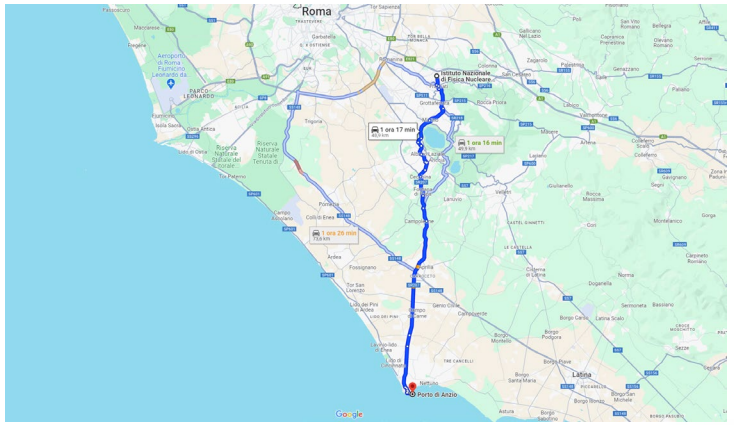
SAND will be assembled in reverse order of dismantling:

1. Assembly of 34 pieces of iron yoke
2. Insertion of magnet
3. Installing of ECAL (EndCaps and Barrel)

Shipping Plan

ECAL and Iron Yoke parts fit into standard container
Magnet needs an Exceptional Transport
Shipping program:

- road (Frascati – Anzio)
- ship (Anzio – USA)
- road (USA – Fermilab)



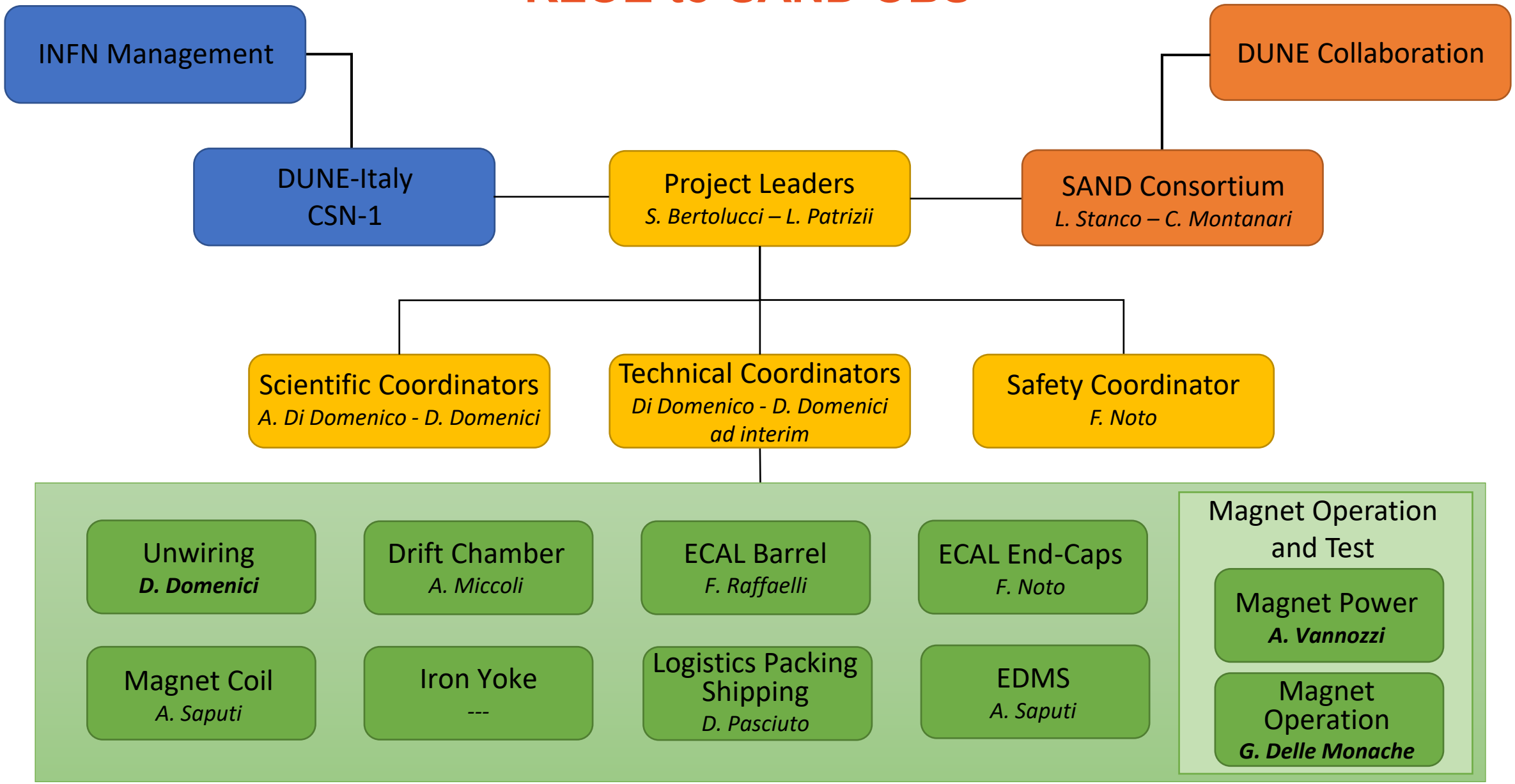
Everything will travel by ship to USA
Anzio is the suitable harbor closer to Frascati
(same place where magnet arrived from Oxford)

We contacted a company leader in mechanics as general contractor for the whole shipping. They can:

- design and realize the needed packaging
- plan the transport
- subcontract a transportation company
- manage the bureaucratic part

In 2024 we'll start with the project of the boxes for ECAL according to our requirements (e.g. maximum acceleration and temperature range allowed during the trip)

KLOE-to-SAND OBS



KLOE-to-SAND Project Time Schedule