# ECAL assembly,

constraints on the assembly hall

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Reference :

**Ecal integration studies**
**Barrel & endcaps**

Catherine Clerc, LLR-In2p3-Ecole polytechnique
Marc Anduze, LLR-In2p3-Ecole polytechnique
Denis Grondin, LPSC-Inp3 Grenoble
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# Reminder of sizes and weights in different models of the ECal

Baseline

| | | | | |
|---|---|---|---|---|
| Barrel | | | | |
| | Inner radius | 1843 | | |
| | Outer radius | 2028 | | |
| | Length | 4700 | | |
| | Weight | 75 t | | |
| | Stave # | 8 | | |
| | | | | |
| Staves | | # | Weight | Length |
| | | 8 | 9.5 t | 4700 |
| | | | | |
| Modules | | # | Weight | Width |
| | | 40 | 1.9 t fully equipped | 940 |
| Slabs | | # | Weight | Length |
| | | 3000 | from 10 to 15 kg | from 1350 to 1750 |
| Beam | | 8 | ~12 t | 5200 |
| Insertion tools | | | | 7500 |

## Path of assembly

Caveat: the numbers are very rough, just order of magnitude

We consider as unreasonable to import to the site staves already equipped

→ import and store structure modules, slabs

Barrel

Then
we will import 40 module structures with their encapsulation,
L, H, l = 2 x 1.3 x 0.6 $m^3$
they have to be checked by eye and stored 1.2 $m^2$ x 40 = 48 $m^2$ + 50$m^2$ passage
waiting to be assembled in staves.

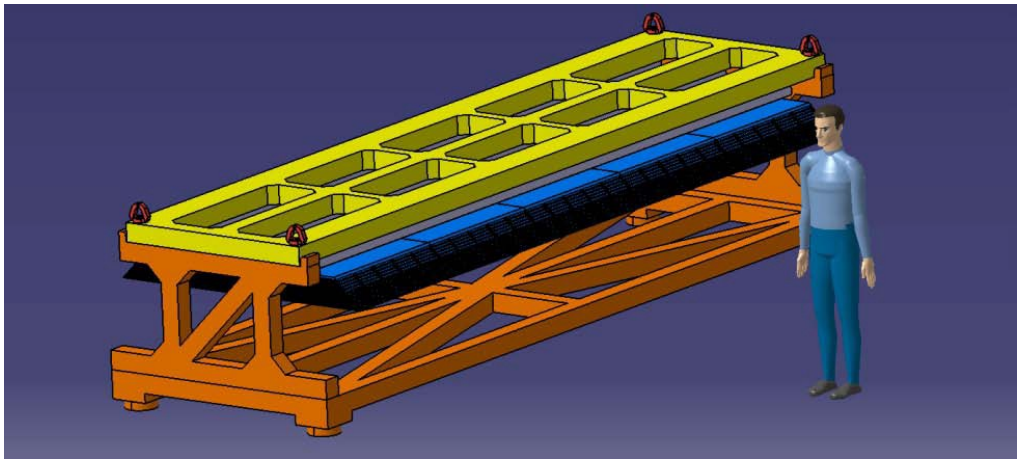
we will import the slabs, in their boxes, entirely equipped and checked
15 per alveolus gives: 15 x 5 x 40 = 3000 in about 200 boxes, 250kg each
boxes: L,H, l = 2 x 0.3 x 0.25 = 0.15 $m^3$ area: 0.5$m^2$ → 100 $m^2$
can probably be piled-up → 25 $m^2$ + access 3m wide for the tooling about 50$m^2$

they have to be tested (15 in parallel) for reception
waiting for mounting in the staves

testing space: 12 x 3 $m^2$

Total: 100 + 50 + 36 = 200 $m^2$

we consider assembling staves from 5 modules on a cradle
where
the slabs can be inserted
the cooling and cabling installed with the electronics up to close by patch panels
interference with HCal



The staves are then stored and fully tested
electronically and with cosmics (needs cooling and acquisition), calibration

They are ready for installation in the HCal
after completion of the test

space needed

For a stave assembly in 2 batches of 4 : 7x6 m² for 4 : 200 m²
per cradle , for storage and testing : 7x4 m² for 4 : 120 m²
may use the space left by the modules and slabs
but we have the empty encapsulations and boxes

Total 320 m² +200 → 500m²

Path of assembly

We consider that, in the assembly hall,
the central yoke ring has been mounted,
the coil installed,
the HCal inserted and fully equipped up to patch panels and surveyed.

No additional space is needed for ECal (probably)

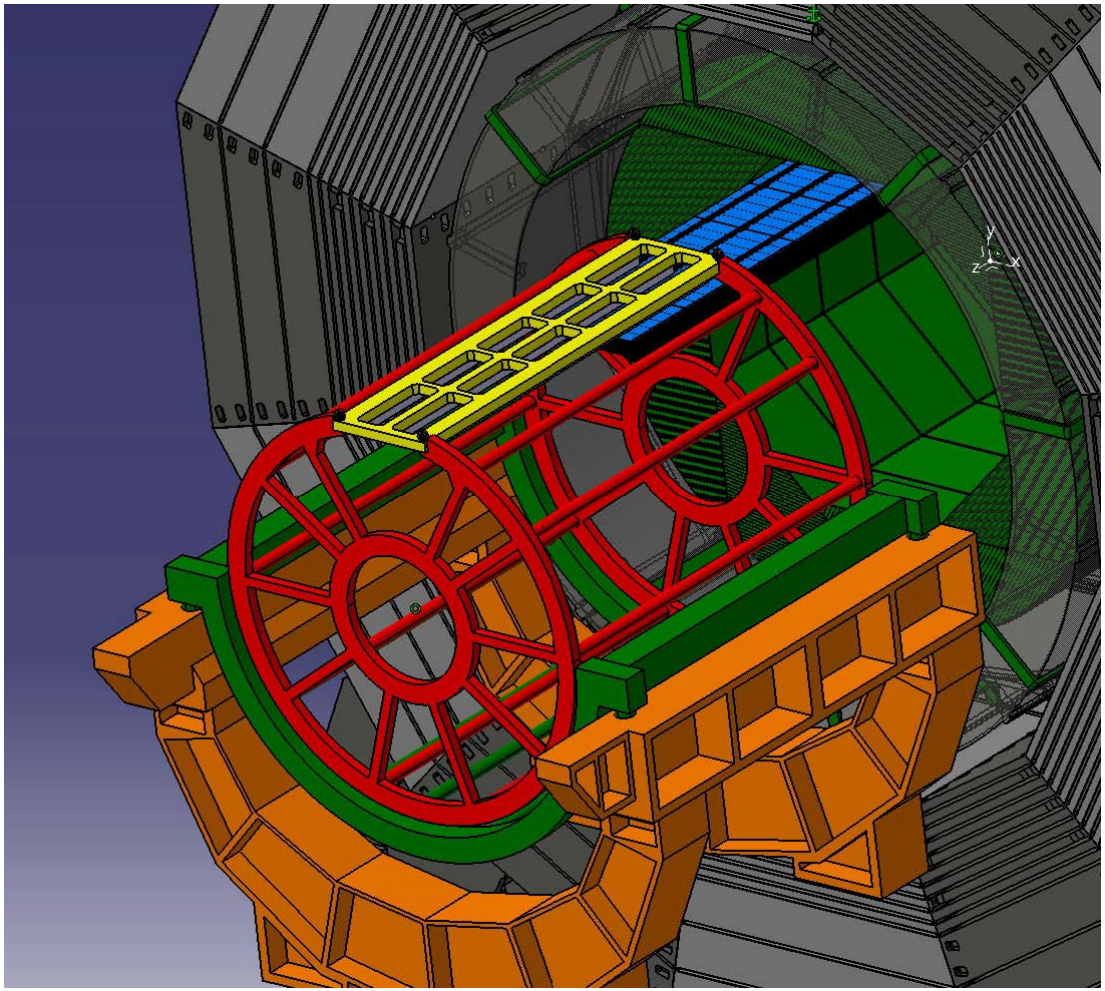
First the female rails have to be mounted on the HCal

Each stave is then inserted following a technique used in Aleph and in CMS
the stave beam is put on a wheel to be presented in front of the Hcal slot and then drawn in.
It is still not decided if the cables and services run all on one side.
Services are connected to the patch panels.
Tests can then be run as soon DAQ is ready. A precise survey can be done, in particular if the SET hangs from the ECal

Then this ensemble is lowered down in the cavern

alternatively all this could be done in the cavern

Space for assembling the tooling



Path of assembly

This was for the barrel in the baseline model

A similar task has been done for the end caps

but the HCal end cap structure and assembly is less known by me (at least).

Here too the module structures (24 only but bigger)
and the slabs are independently imported
have to be checked and stored

Should take almost the same area as for the barrel

The Hcal end caps should have been assembled as a full disk
for the ECal to be installed.
An horizontal mounting could be considered.

Clearly a similar estimate has to be provided by the HCals with a description of their assembly procedure.

Somewhat similar for the other (smaller) models

If the assembly is done not at the pit but on the ILC campus
a specific transportation system has to be conceived

Where to dispose of the encapsulations and boxes, to be discarded?

What about the dismantling?

## Conclusions

We need for ECal about 2 x 500m²

The ECAL assembly detailed design implies
- to know grossly the assembly procedure of the yoke, coil and HCal,
- to have solved some interface problems with the HCal, like the impossible tilt

It would be much better to have chosen a common mechanical structure for the HCal. When can the processus of choice start?

But who should care?

Part of the MDI/integration meeting in KEK
should be dedicated to this assembly hall question

# End