Beam tube and Ecal ring

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Few points on the beam tube

What to expect from the low P?

The size of the outgoing pipe at the Bcal level what constrains the radius?.

Beam tube: minimise the conversion/interaction probability

Use Be! $L_{rad} \simeq L_{int}$

Be: a safety problem?

At first order conversion probability = volume of Be

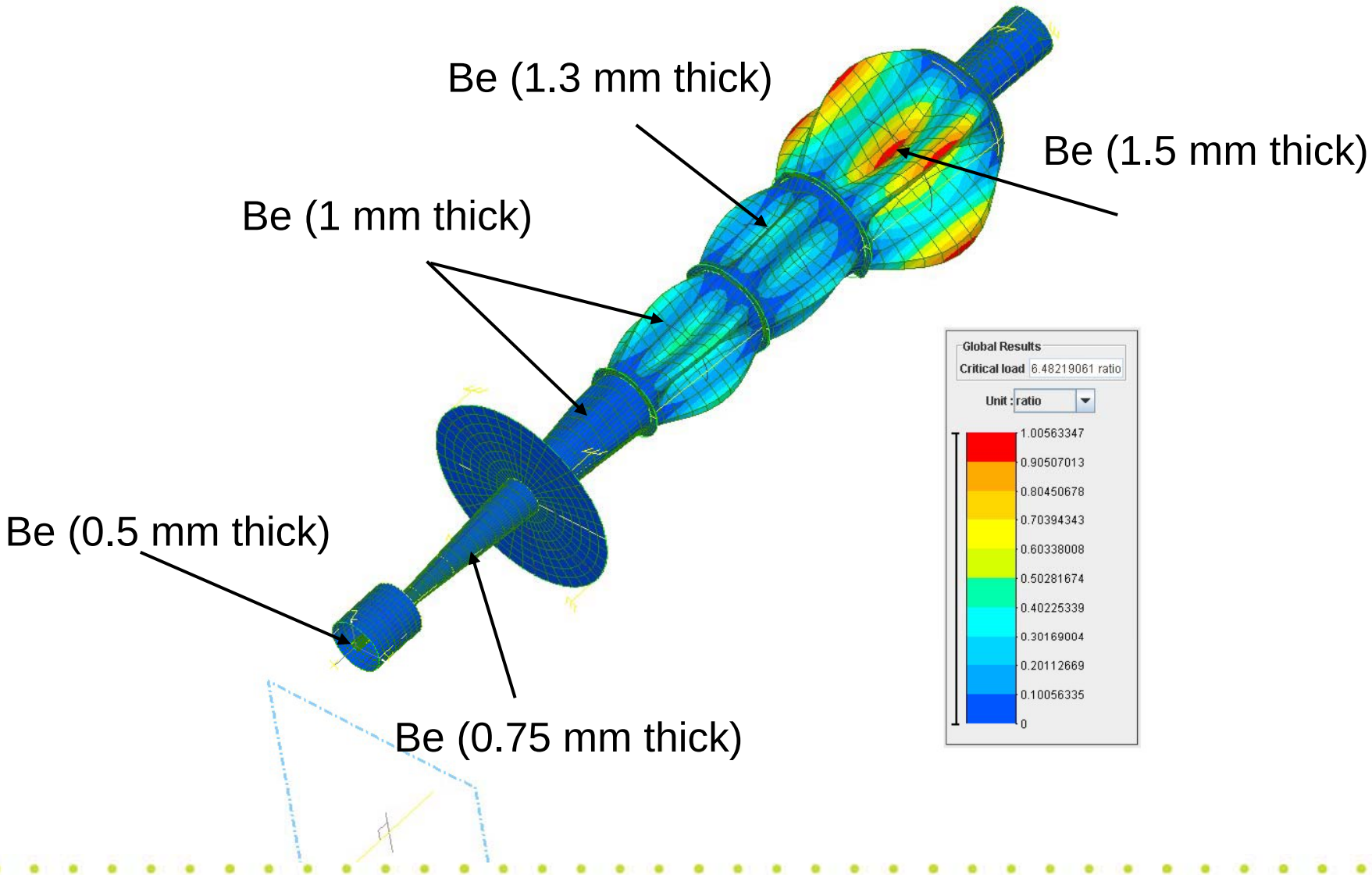
Non linearity induces a preference for projective geometry:
better to reduce the angular domain than the amount of material

But problem of reinteraction (shower),
less important for hadronic interaction
which is the most dangerous contribution

Anyway, minimise the mass of Be!

We have studied a smooth cone 2mm thick
with a cupola shape in front of Lumical OK!
But the use of ring reinforcements makes it better:

Beam tube simulations (buckling)



We also look at a more innovative design
to reduce drastically the material mass.

Status of the Ecal ring design M. A:

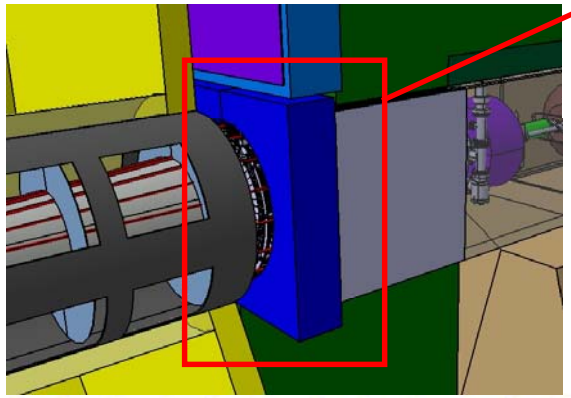
The space left between ring and end cap too small
10mm ⇢ 15mm

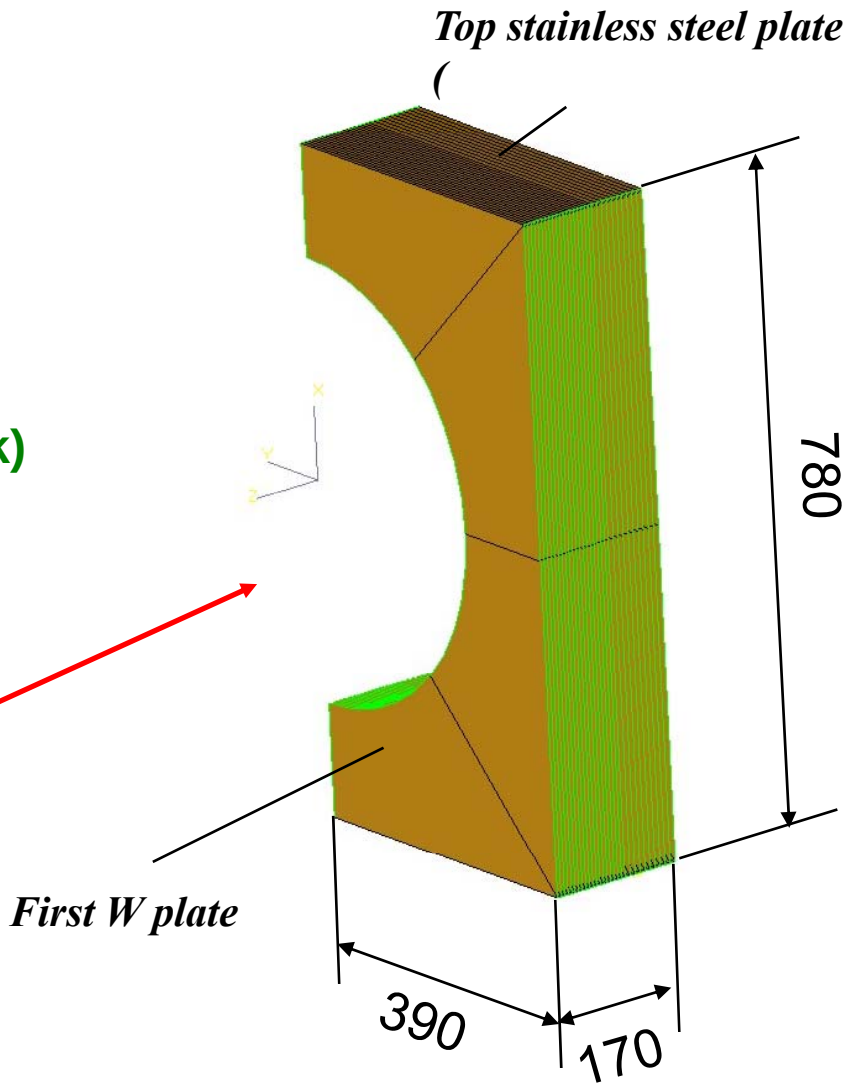
The space between Lcal and ring to be revisited (65)
with the Lumical. Less material, less hole.
But what about hanging the forward structure M. J.
and getting the cables through?

ECAL-ring: model description

HALF MODEL (symmetric):

- ⇨ **Same absorbers sampling than barrel and Endcaps ECAL :**
  - **20 W layers of 2.1 mm thick**
  - **10 W layers of 4.2 mm thick**
- ⇨ **Assembled using top & bottom stainless steel plates (10 mm thick)**
- ⇨ **Global dimensions & weight :**
  780x390x170 mm ; 350 kg
- ⇨ **Gap of detection layer : 3 mm**
- ⇨ **Fastened on LHCAL plate**

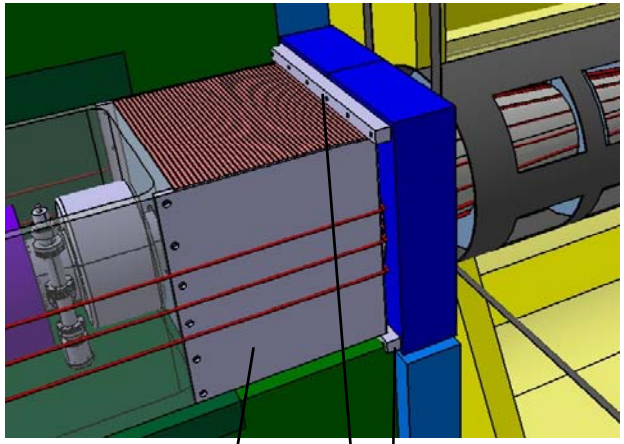


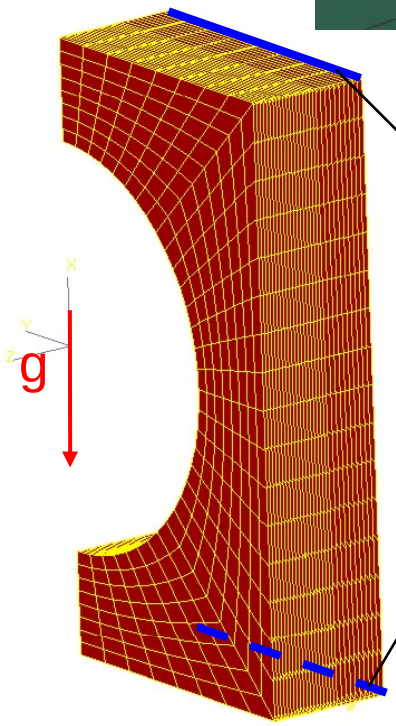


FEM model

HALF MODEL (symmetric):

- ⇨ **Loads : its weight (acceleration)**
- ⇨ **Boundary conditions : 2 lines of clamp (fastening zone)**
- ⇨ **model based on shell behaviour**
- ⇨ **Number of nodes : ~9000**



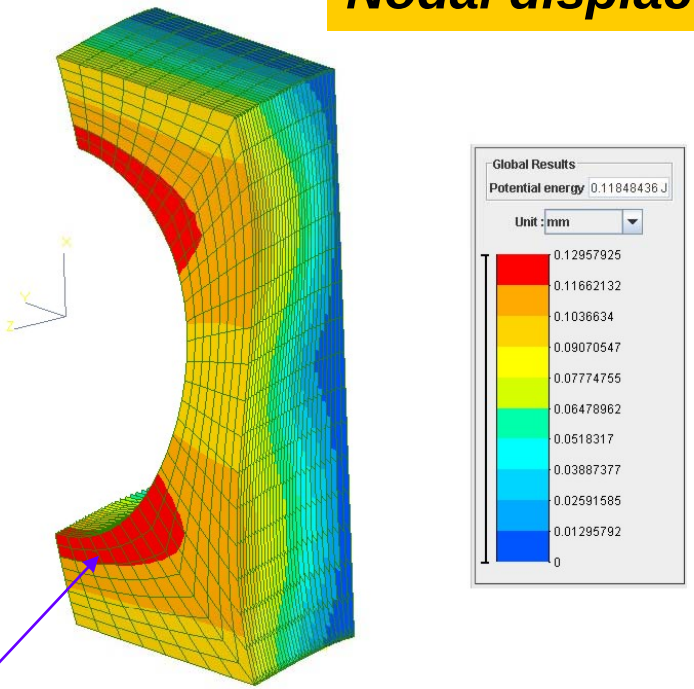


LHCAL

Fastening zones

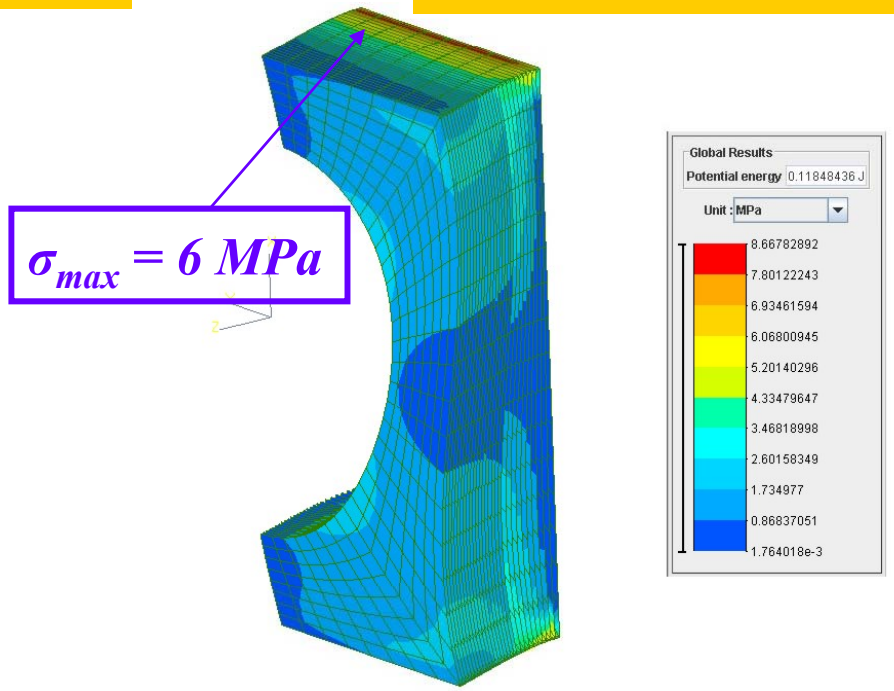
First Results

Nodal displacements



$e_{max} = 0.13\ mm$

Von Mises stresses



$\sigma_{max} = 6\ MPa$

⇨ **Concept works well**

⇨ **Real design going on according to simulations**

⇨ **Description in the LoI ECAL Part**