Updates on CGEM-IT Geometry: the cables

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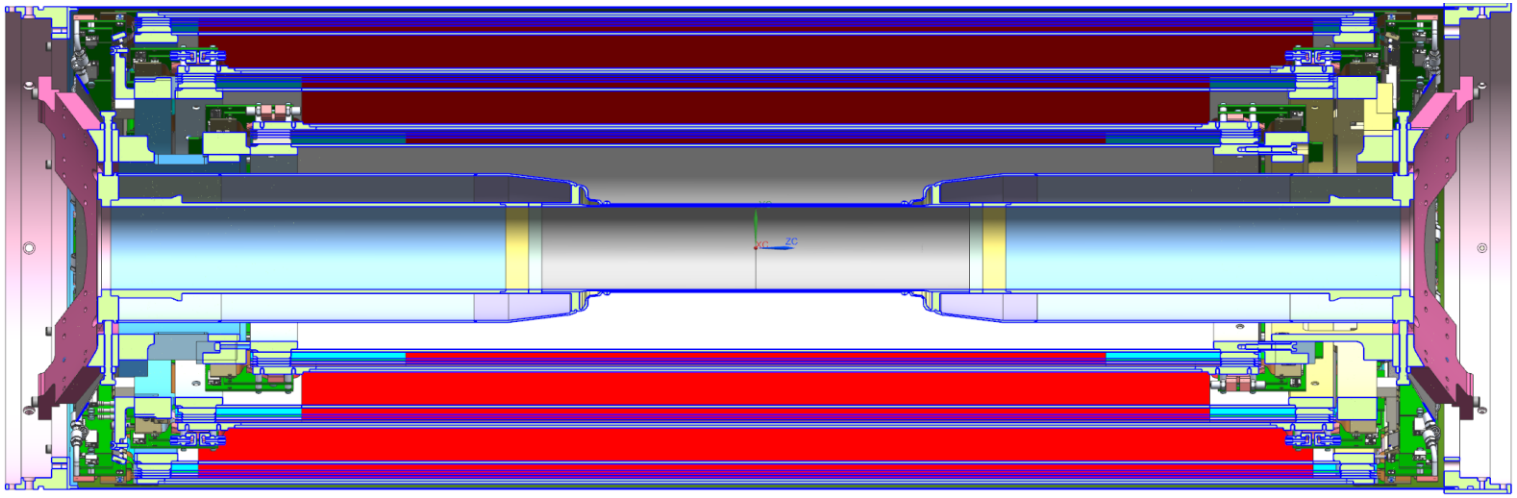
April, 29th 2019

West Side

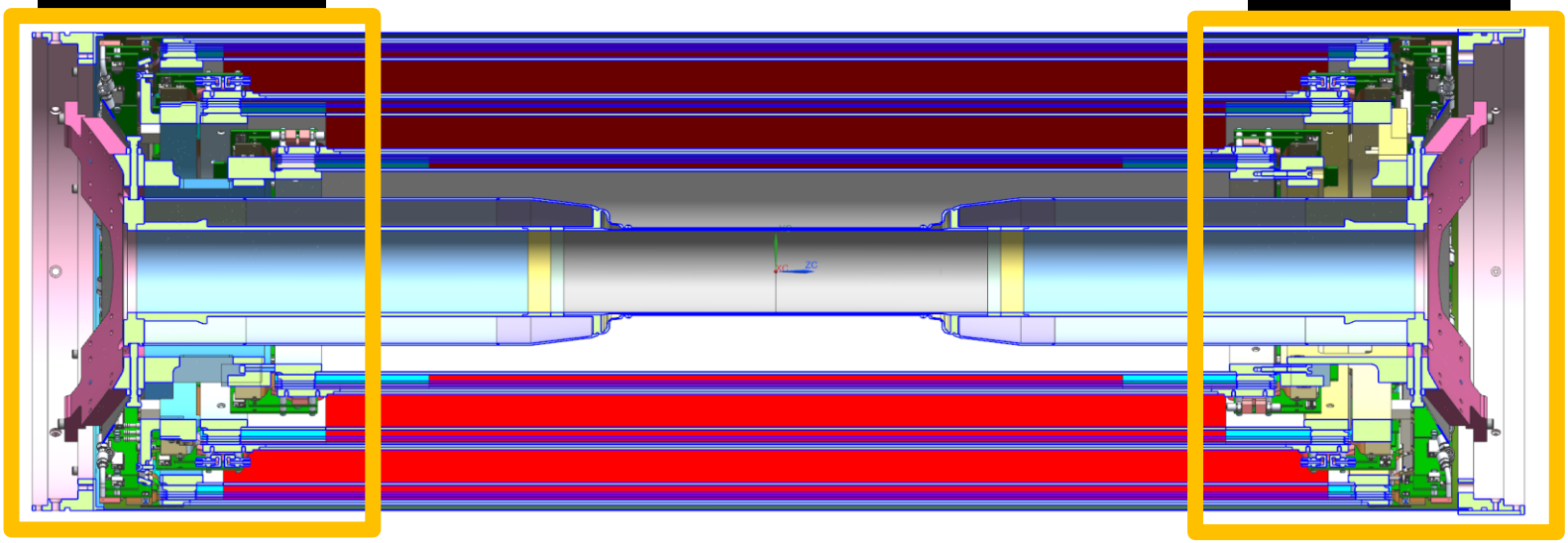
East Side

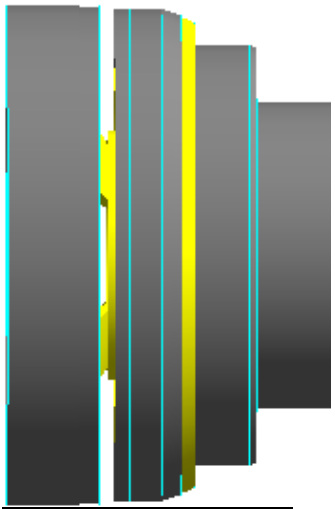


A SHORT RECAP

West Side

East Side





West Side

Materials

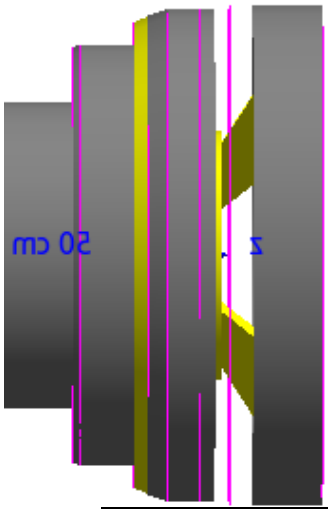
Grey → Aluminum

Yellow → Permaglas

Cables → copper + polyethilene

Cables – HV / LV/ signal

- container with an appropriate density
  - ratio copper/cover
  - fill factor
- solid volumes inside the container
- what remains is cables



East Side

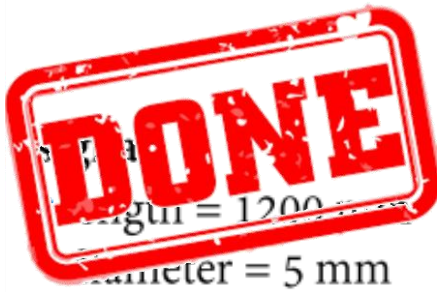
GEANT4

Cable density *(last update)*

Cables have been weighted (Ilaria)

HV
- length = 1170 mm
- diameter = 4 mm
- mass = 51.5 g

LV
- length = 1000 mm
- diameter = 4 mm
- mass = 25.1 g

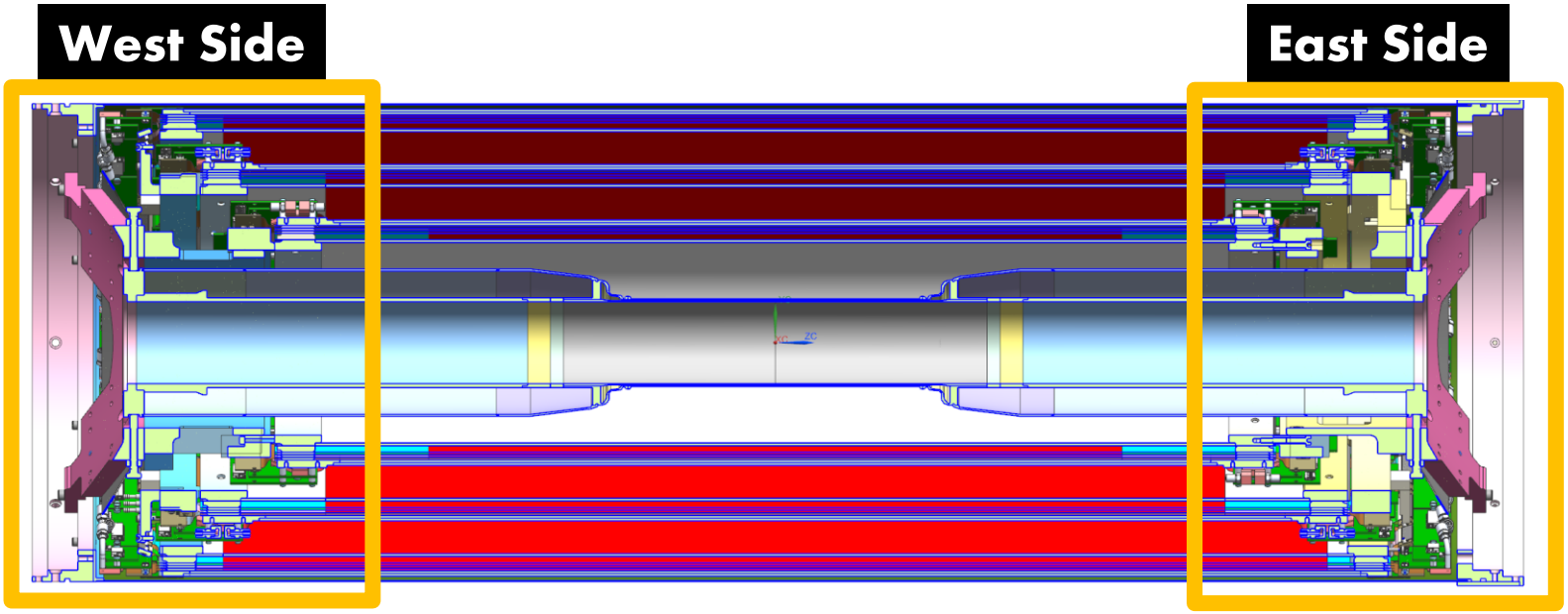


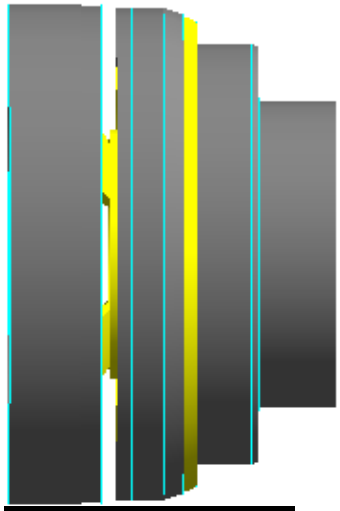
- ength = 1200
- ameter = 5 mm
- mass = 47.3.5 g

$$density_{CABLE} = mass / volume$$

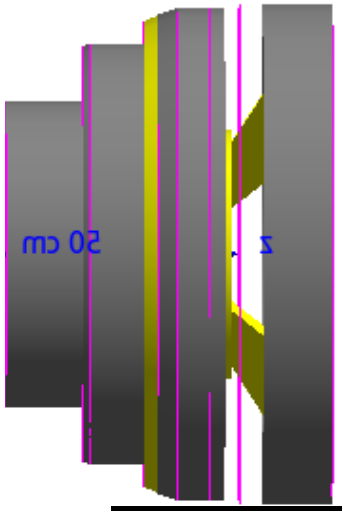
A Fill Factor must be taken into account, for:
- the available volume
- the number of cables

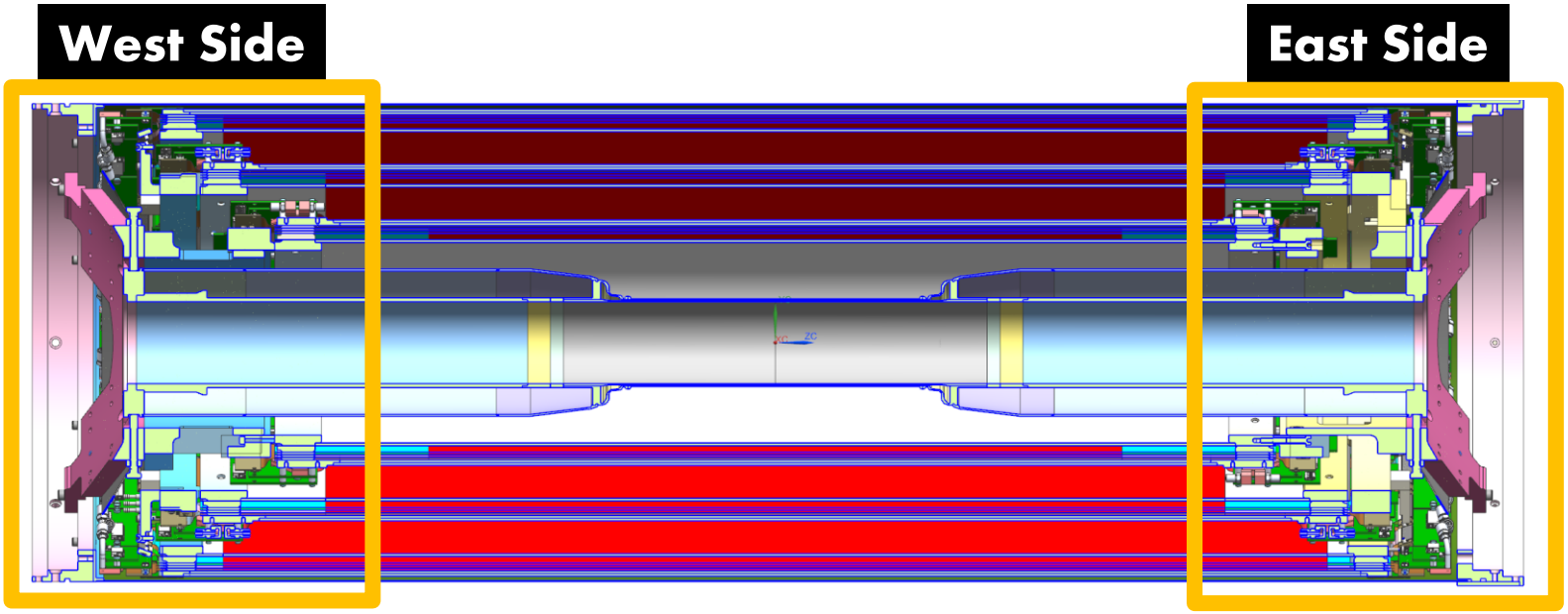
$$\mathbf{density} = density_{CABLE} \times FF + density_{AIR} \times (1\text{-}FF)$$

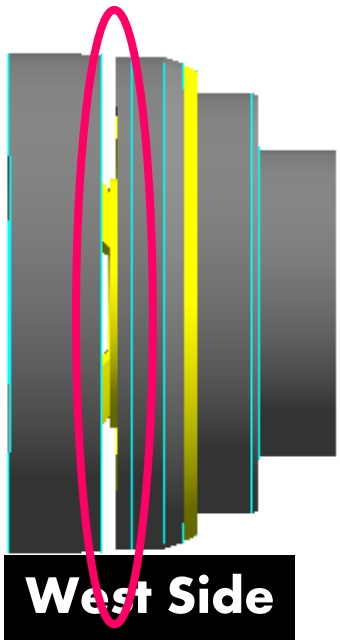




east and west passive elements
are identical
beside the *new west ring*



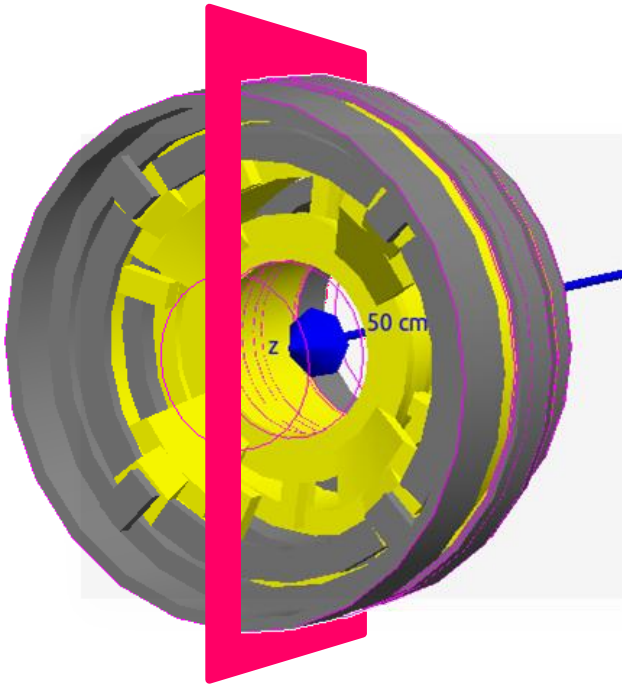




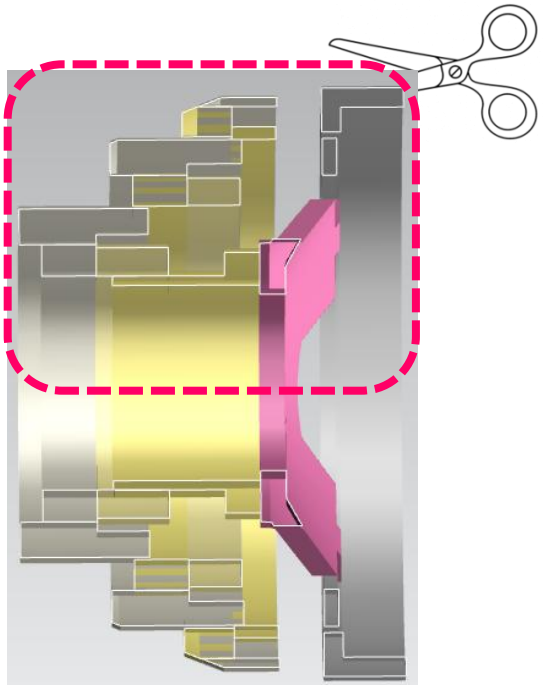
GEANT4

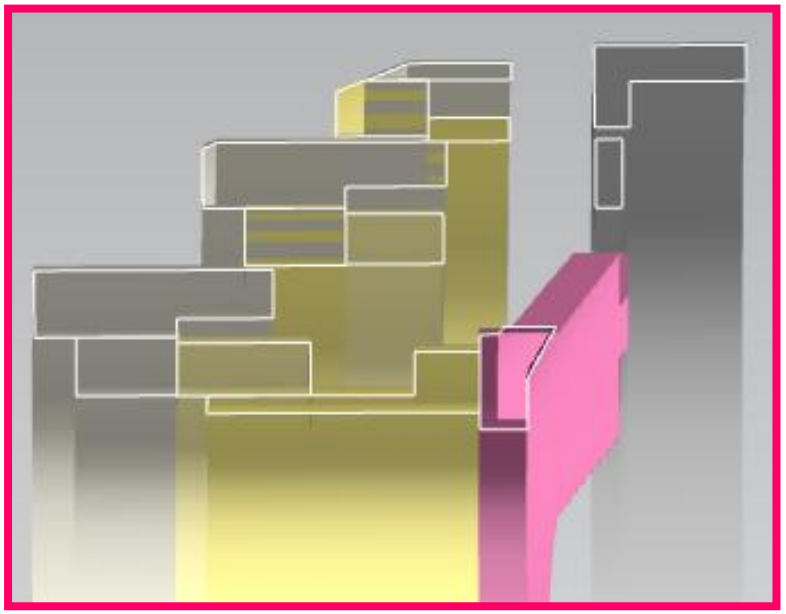
east and west passive elements
are identical
beside the *new west ring*

so I believe that it is safe to evaluate the
available volume only for EAST side
and use the same value for the WEST



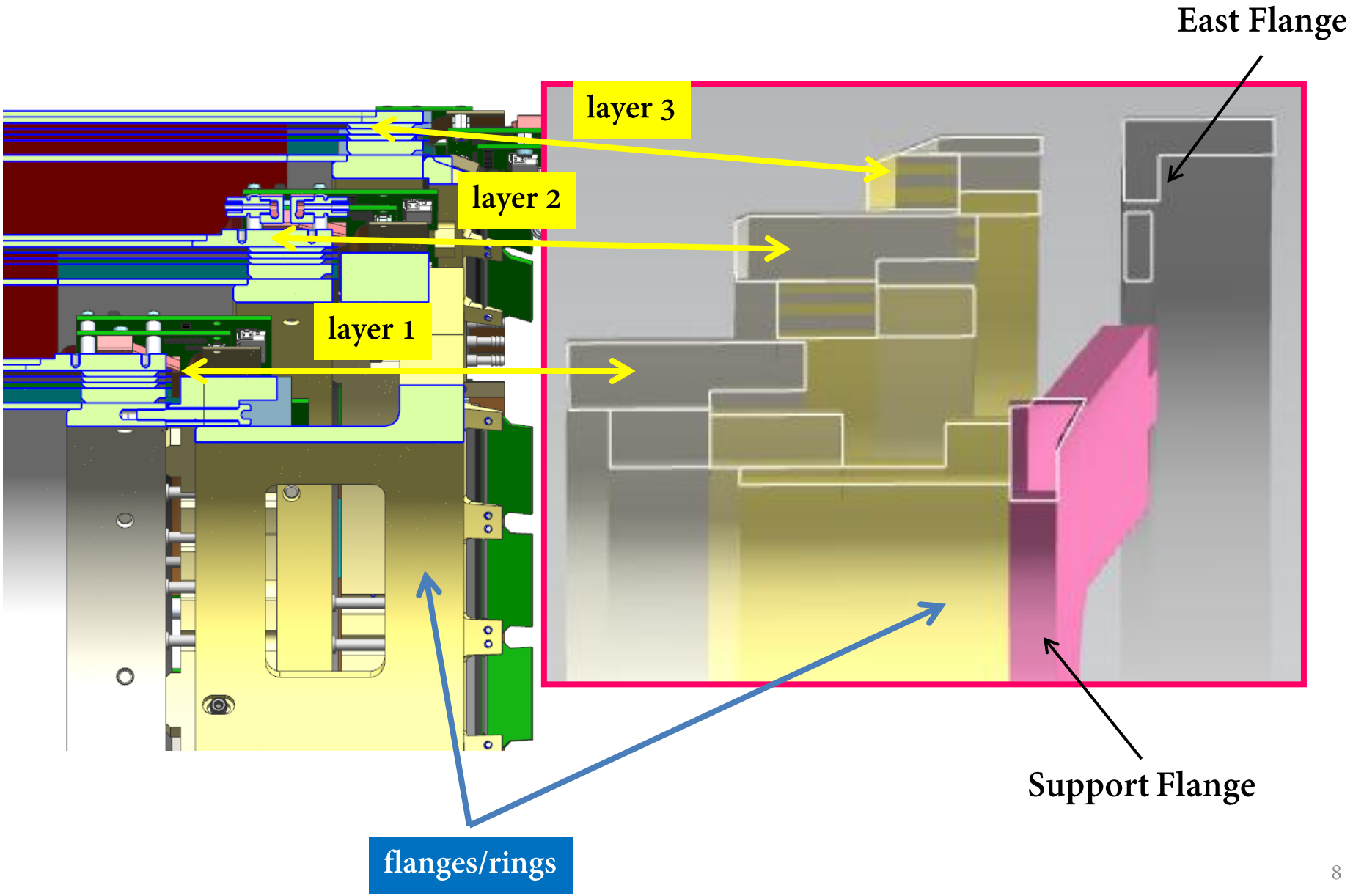
Slice and look from the side





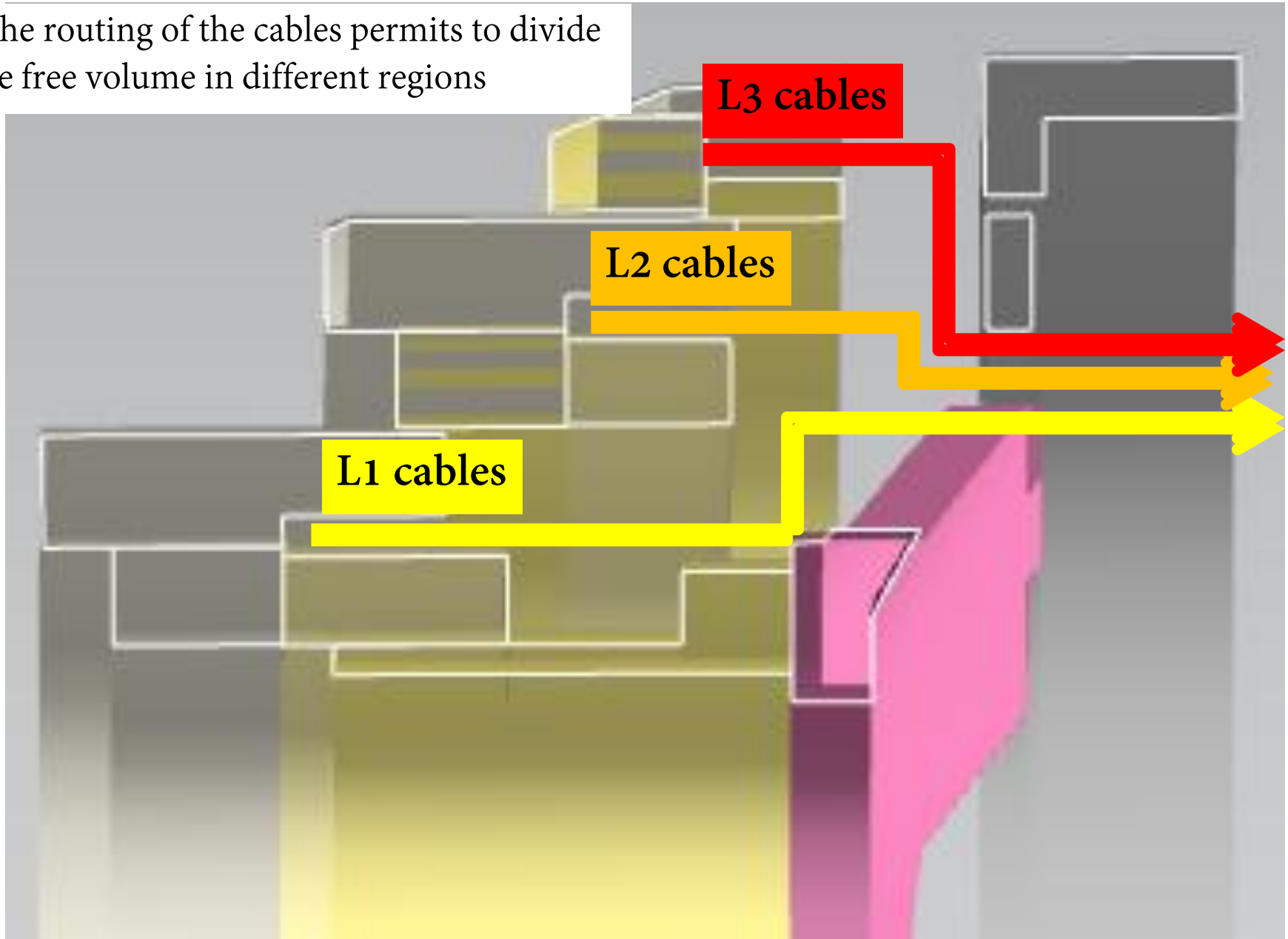
Cut on the dotted line

Correspondence CAD – GEANT4



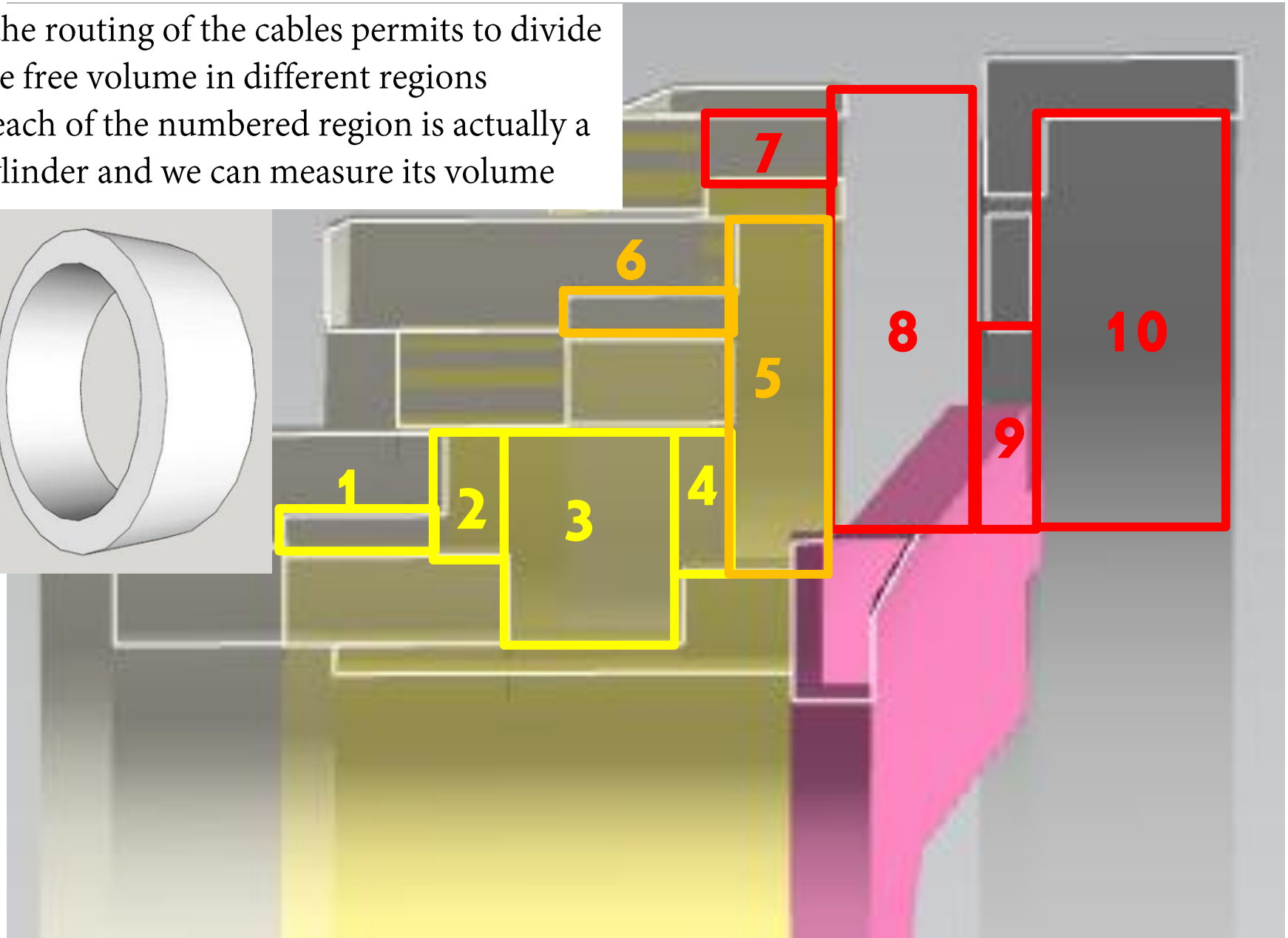
Volume available for the cables

• the routing of the cables permits to divide the free volume in different regions



Volume available for the cables

- the routing of the cables permits to divide the free volume in different regions
- each of the numbered region is actually a cylinder and we can measure its volume



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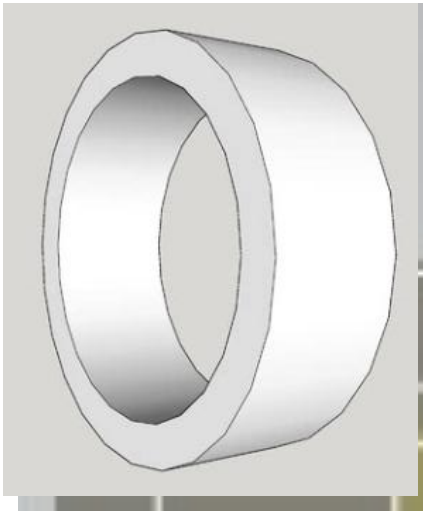


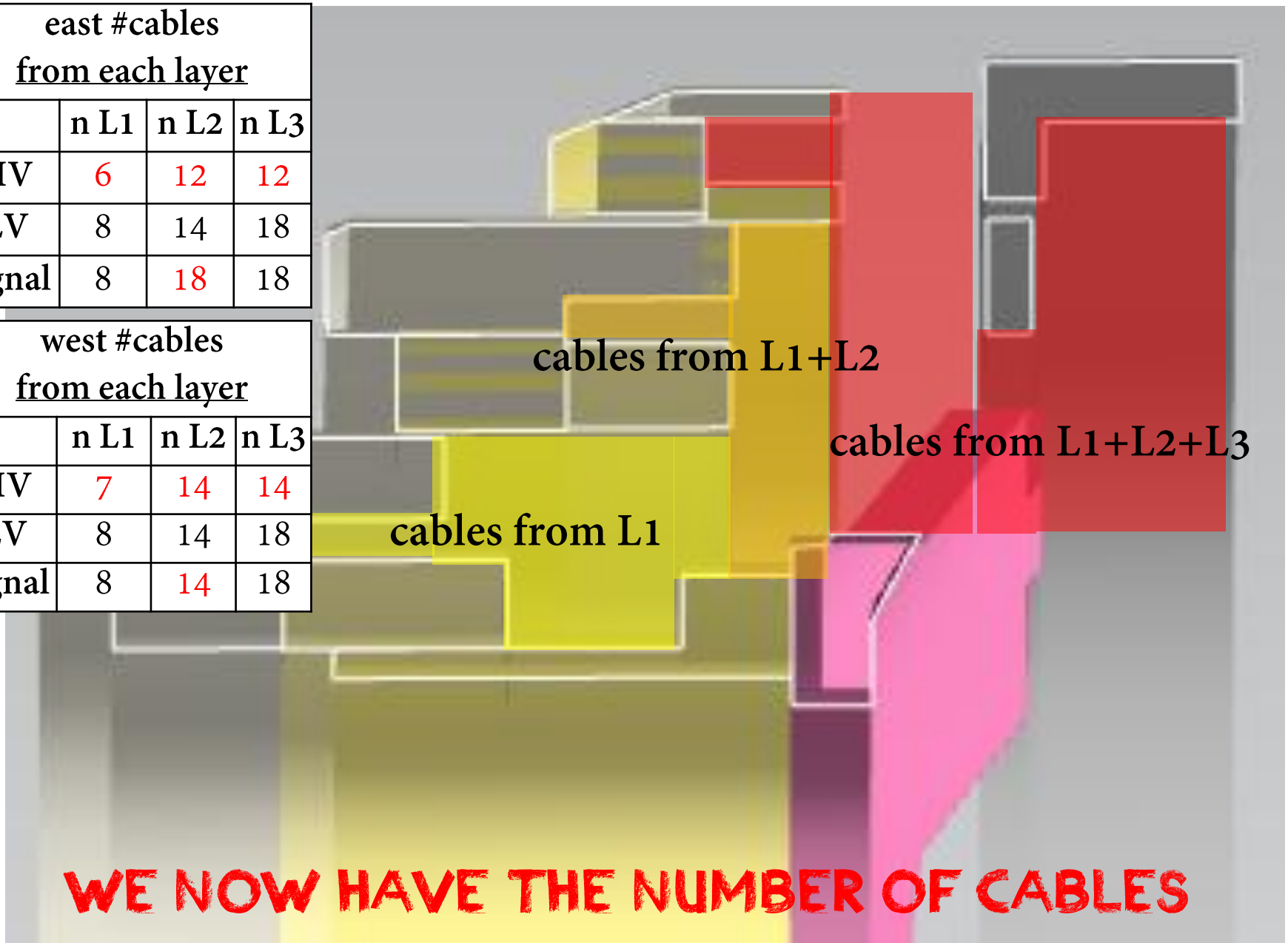
- There are also some brackets whose volume can be calculated and then subtracted from the available space for the cables

WE NOW HAVE THE AVAILABLE VOLUME

Number of cables in the regions

east #cables from each layer			
	n L1	n L2	n L3
HV	6	12	12
LV	8	14	18
signal	8	18	18

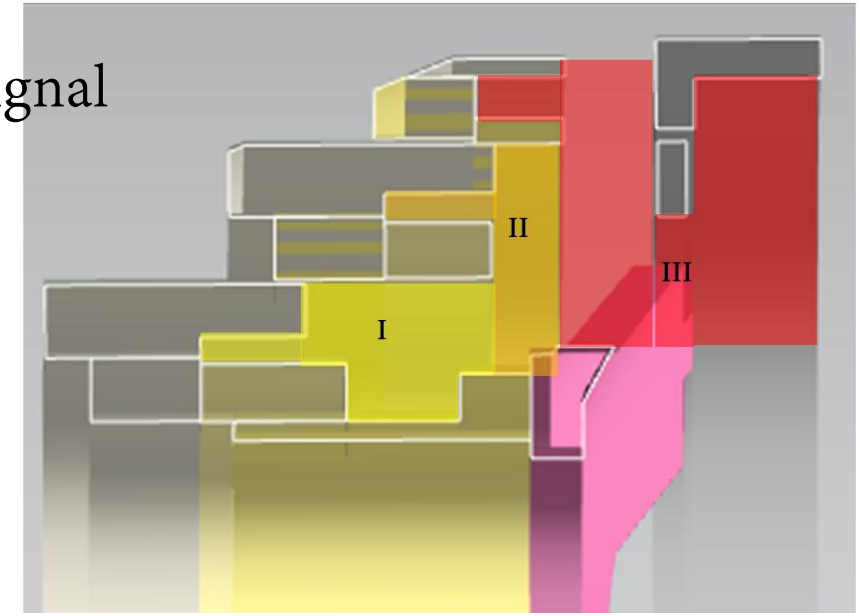
west #cables from each layer			
	n L1	n L2	n L3
HV	7	14	14
LV	8	14	18
signal	8	14	18



Calculation of the fill factor

Compute the fill factor:

- for each kind of cable, k = HV, LV, signal
- for each region j = I, II, III



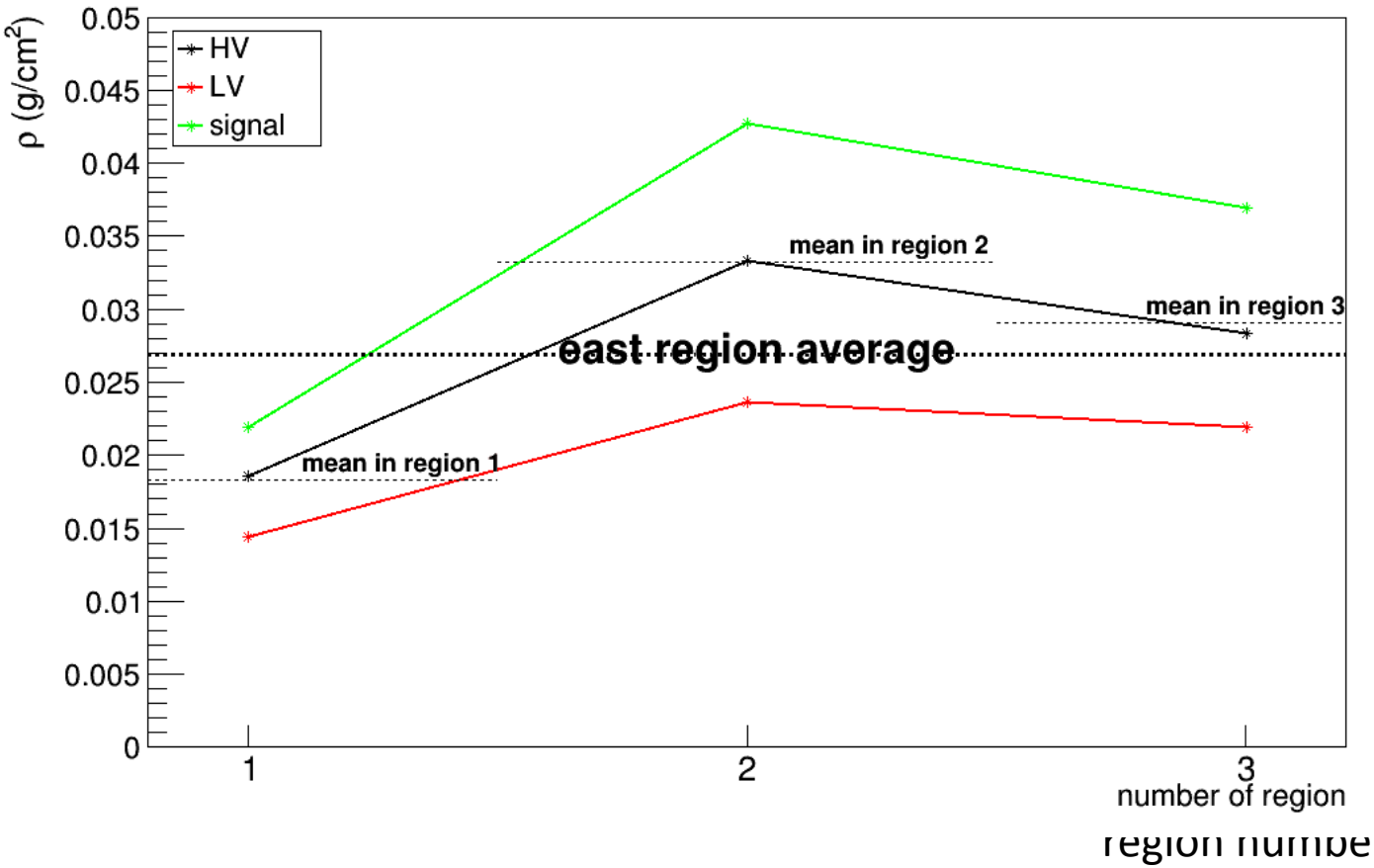
$$ff_{j,k} = \left(\sum_{i=0}^{j} N_{i,k} \right) \times \frac{V_{i,k}}{V_j}$$

where

- $N_{i,k}$ = # cables of type k, in region i
- $V_{i,k}$ = volume of cable of type l, in region I

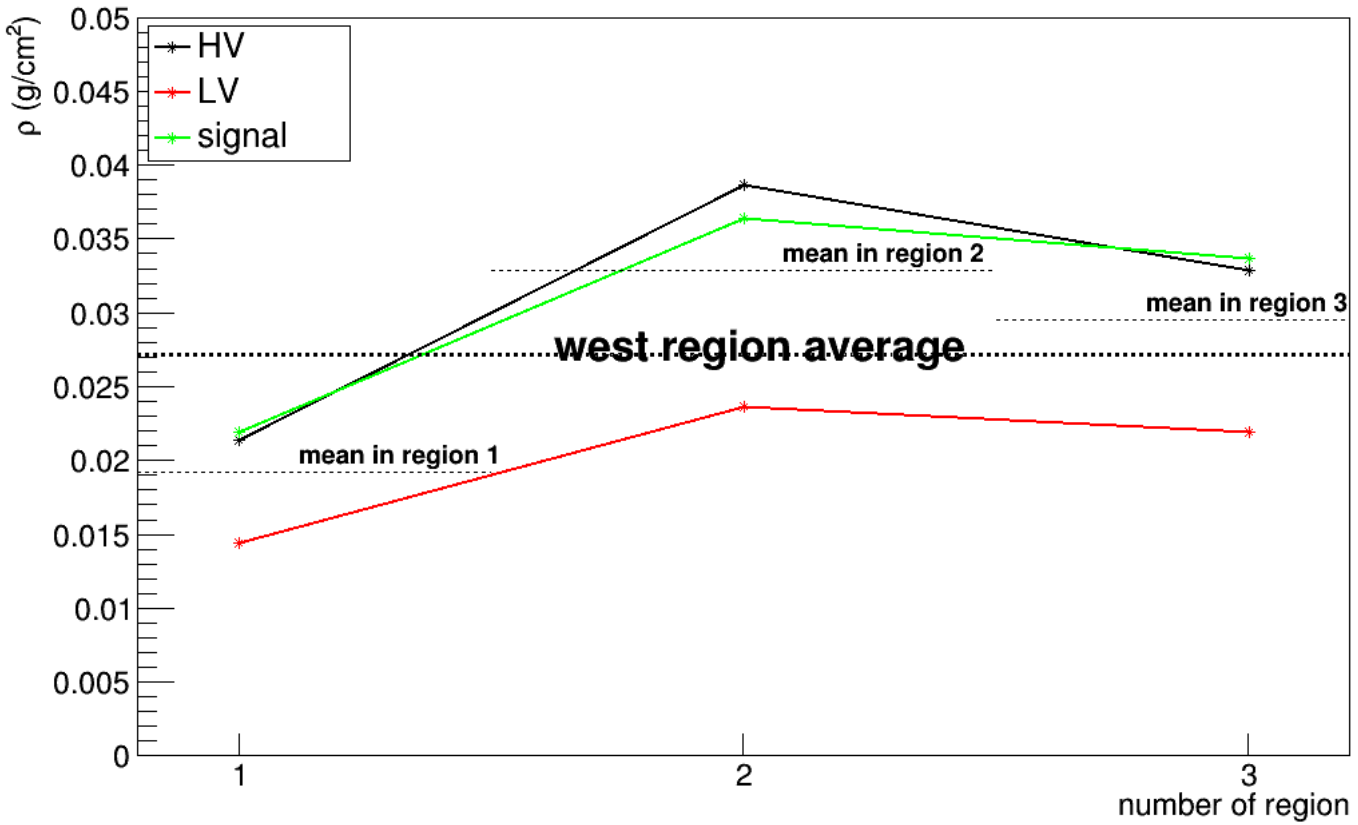
- then apply $\mathbf{density} = \text{density}_{\text{CABLE}} \times \text{FF} + \text{density}_{\text{AIR}} \times (1\text{-FF})$

Average density - east



- the **three colored graphs** show the density of each kind of cable in each region
- **the short dotted lines** (*mean in region j*) show the average density of the cables in each region
- the **bold dotted line** (*mean density*) shows the average of all the densities, which I would use in the code

Average density - west



- the **three colored graphs** show the density of each kind of cable in each region
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Conclusions

- We want to see the **average effect** on the detectors which are *after* the CGEM-IT

…THEN…

- It looks reasonable to:
  - use **a mean density in the whole volume** occupied by the cables
  - use **the same mean density for east and west** cables

THANK YOU FOR THE ATTENTION