Towards V13 of FOOT Simulation

S.M. Valle, F. Gargano, G. Battistoni

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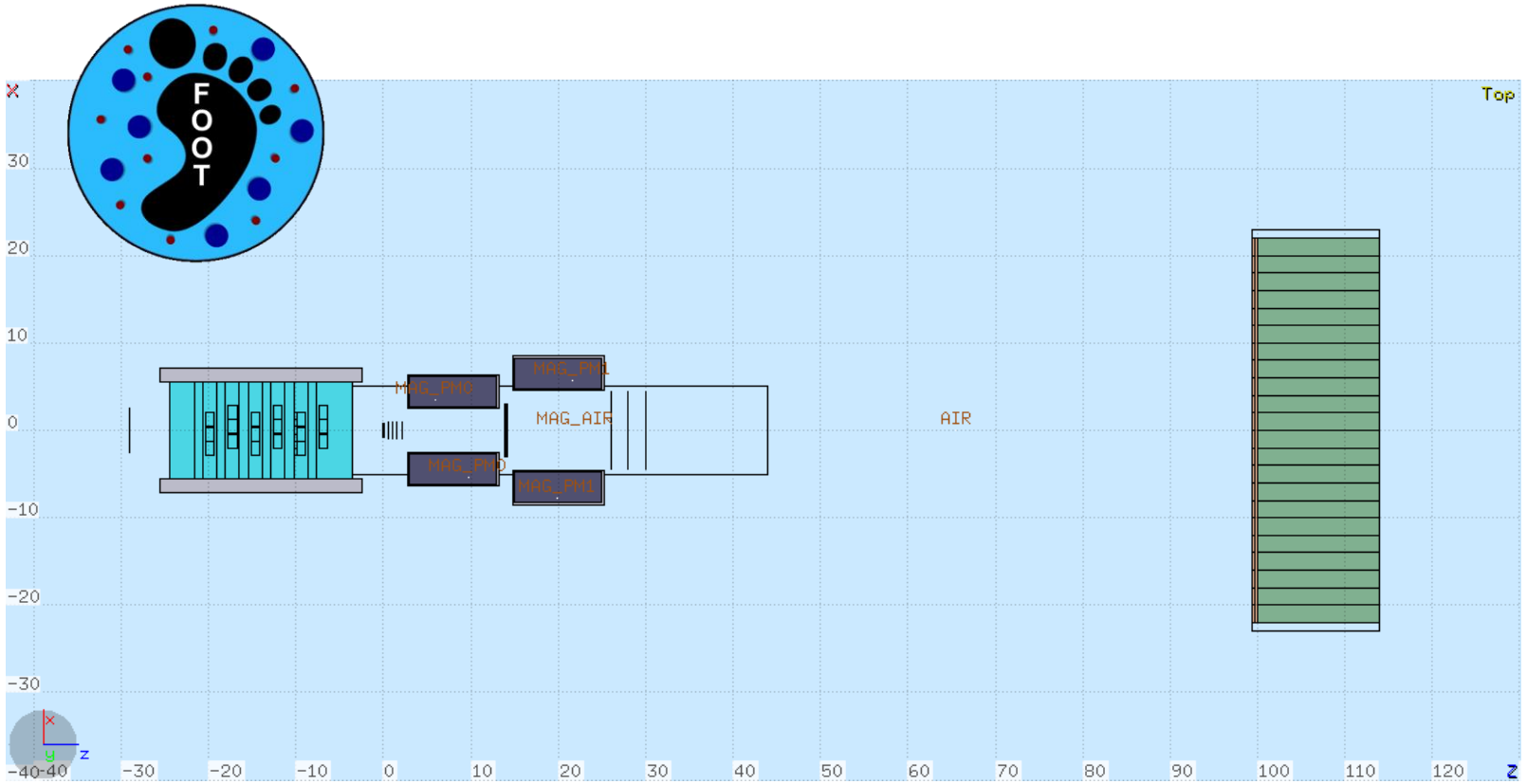
Once upon a time... there was V12.4

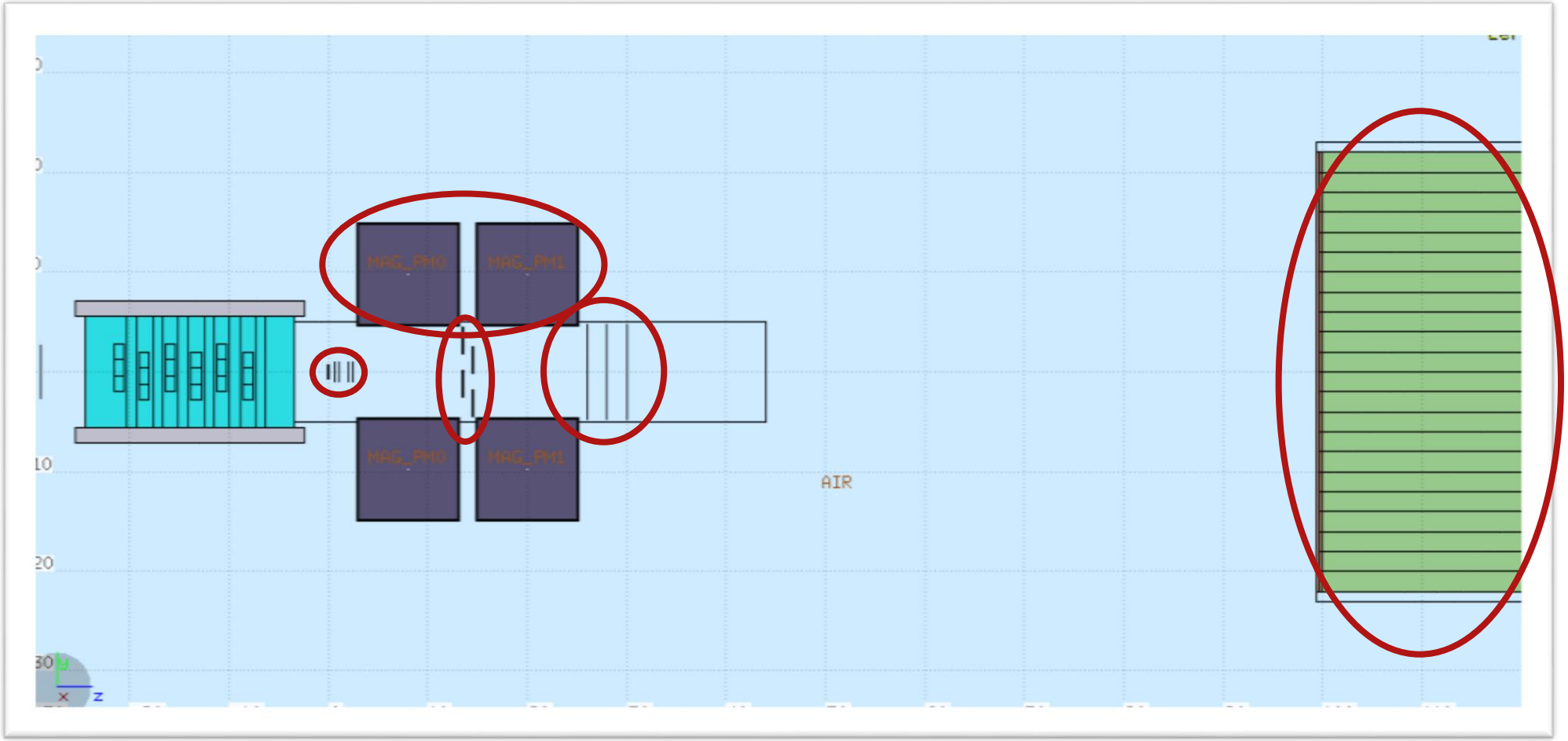


Several simulations with high statistics available on Tier3 server :

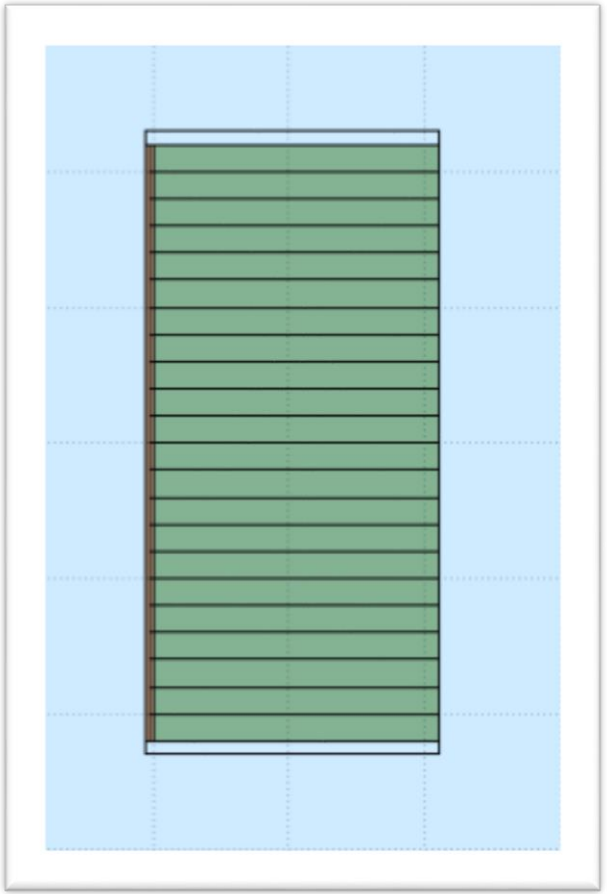
- Beams: C, O
  Recently added: He
- Targets: C, C_2H_4
- Energies: 200, 350 and 700 MeV/n

(see the Twiki page of the available simulation files)

V13: what's new?



Calorimeter



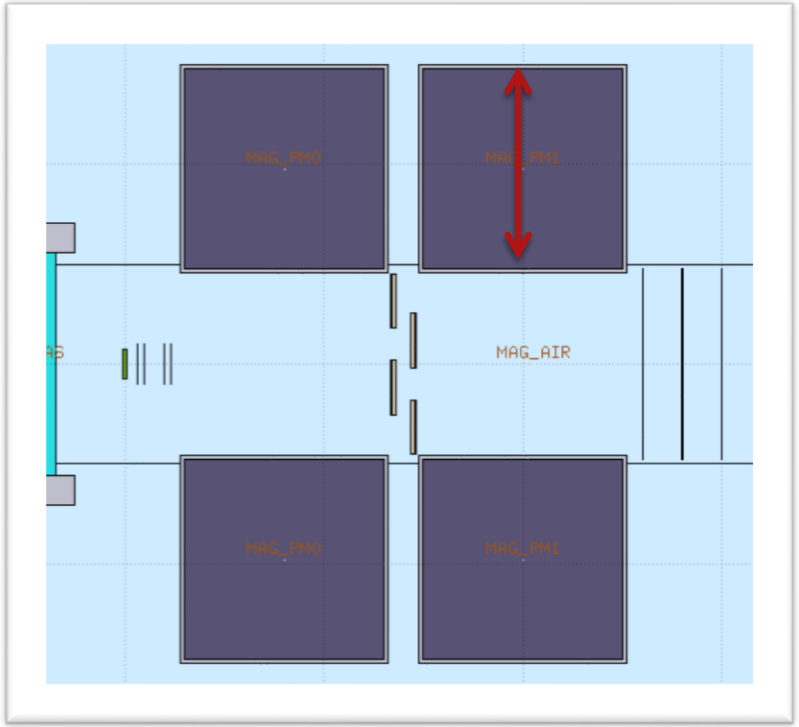
DONE

- Calorimeter BGO crystals have been **lengthened from 14 to 21 cm** since, hopefully, we will inherit ~21 cm long crystals from L3 experiment at LEP

TO DO

- Will they be **parallelepipeds or truncated pyramids**?
- Calorimeter is currently positioned 1 m downstream of the target, but this **distance** can still be optimized

Magnets



DONE

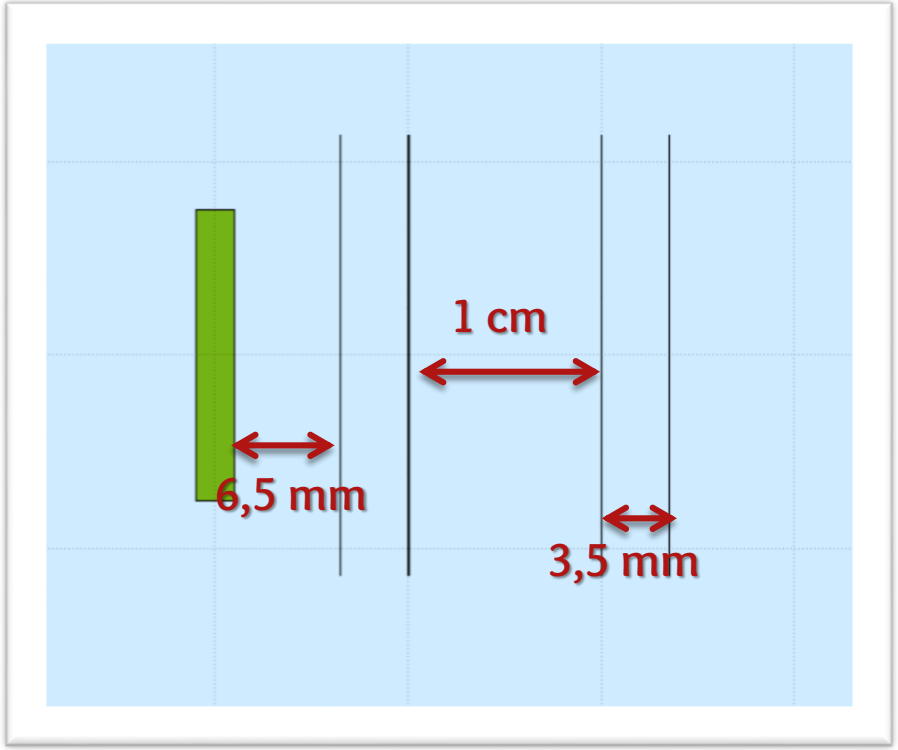
- The construction of **two identical magnets** is cheaper, so in V13 both magnets have an angular acceptance of 10°
- The magnets **thickness** (in red) has been enlarged to a more realistic value

TO DO

- Overall final **dimensions** have still to be defined. In particular, the length in *z* has to be decided (compromise btw cost and *B dl*)
- **Magnetic map** is still approximated (when there will be a ~ finalized geometry we will ask for a realistic one)

Thanks to Eleuterio

Vertex

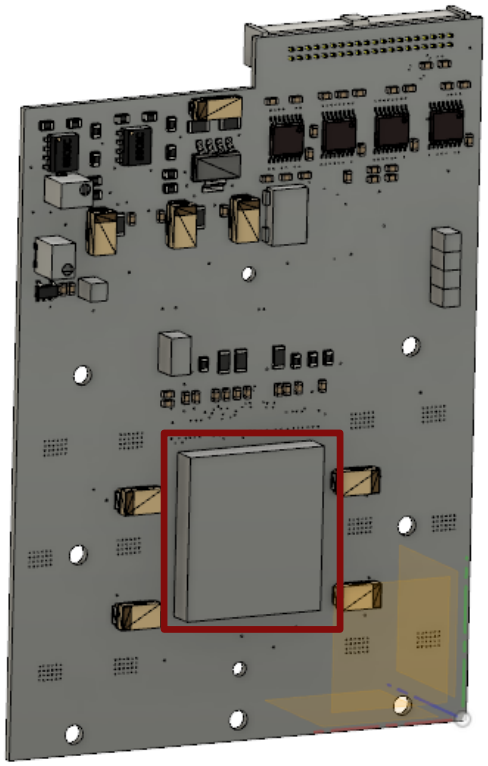


DONE

- Due to readout reasons, the vertex layers have been **coupled** and distances btw them have been modified as depicted in figure

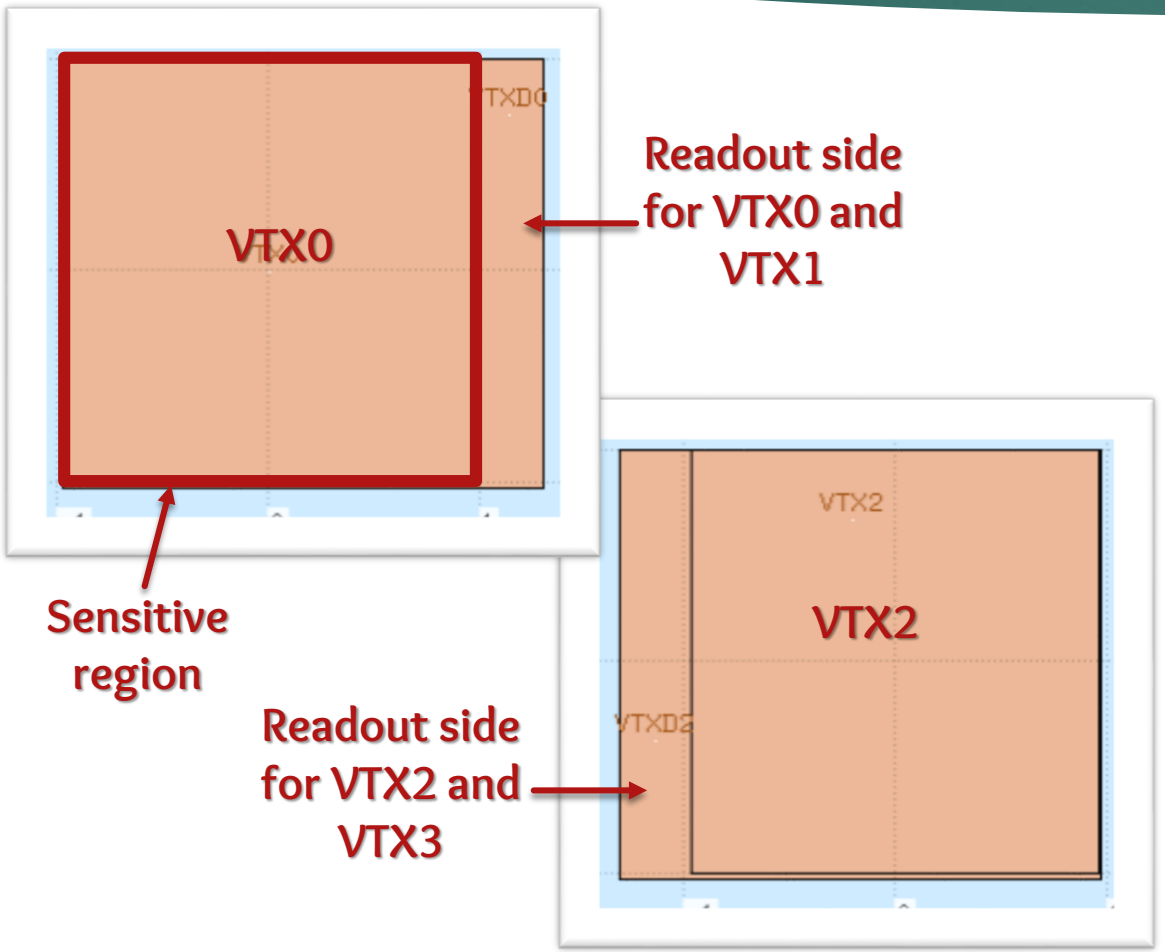
TO DO

- **Distance** from the target still has to be optimized
- Introduce the **electronic boards** that will surround the sensors



Thanks to Eleuterio

Vertex

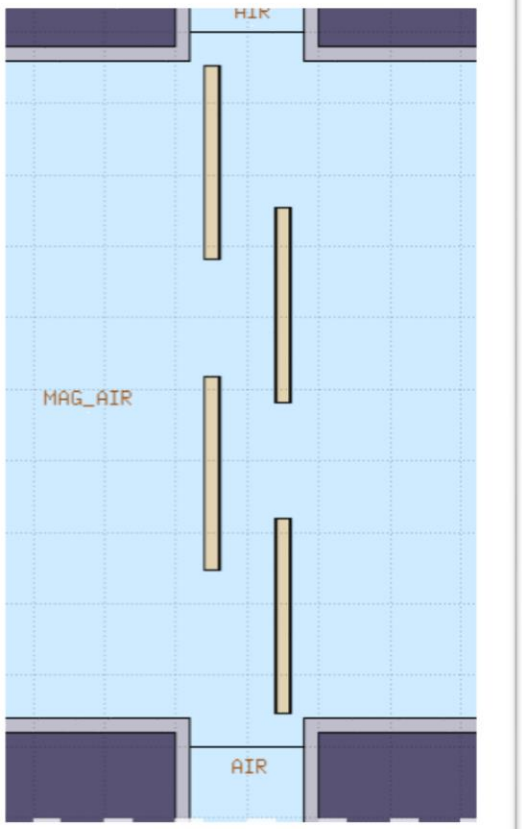


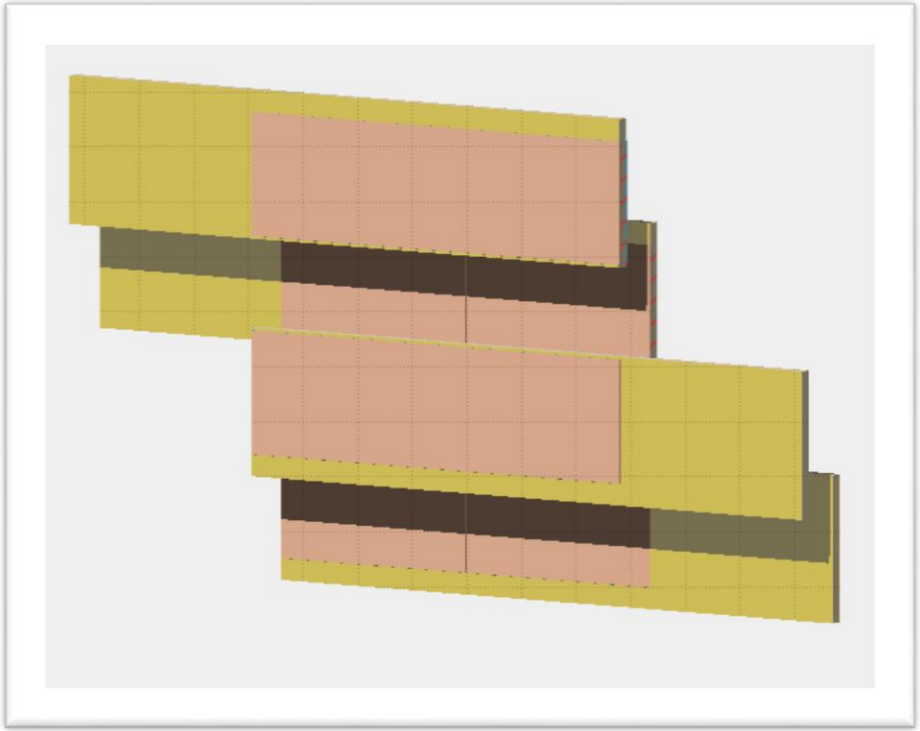
DONE

- Real MIMOSA28 geometry has been implemented:
  - Total area: 20,22 x 22,71 mm^2
  - Active area: ~19,21 x 19,87
  - Pixel pitch: 20,7 µm
  - 928 rows x 960 columns
  - Thickness: 50 µm
- The two planes in the same couple will be read from the same side, while the others from the opposite
- Improved management of **simulated hits** in pixels

Thanks to Eleuterio

Inner Tracker





DONE

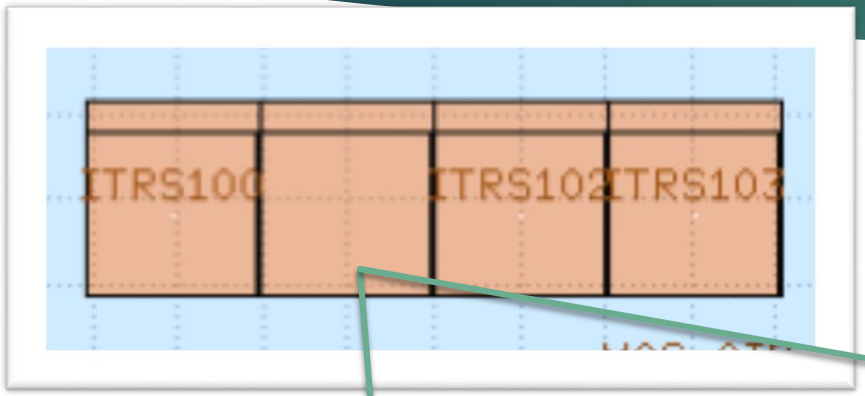
- The Inner Tracker has been **split in 4**: the **PLUME geometry** has been implemented, along with real MIMOSA28 geometry (see Vertex)

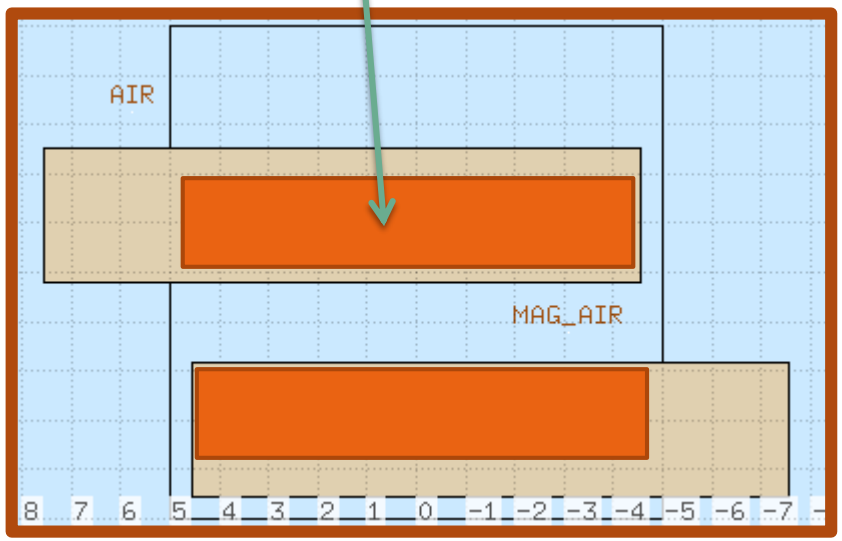
TO DO

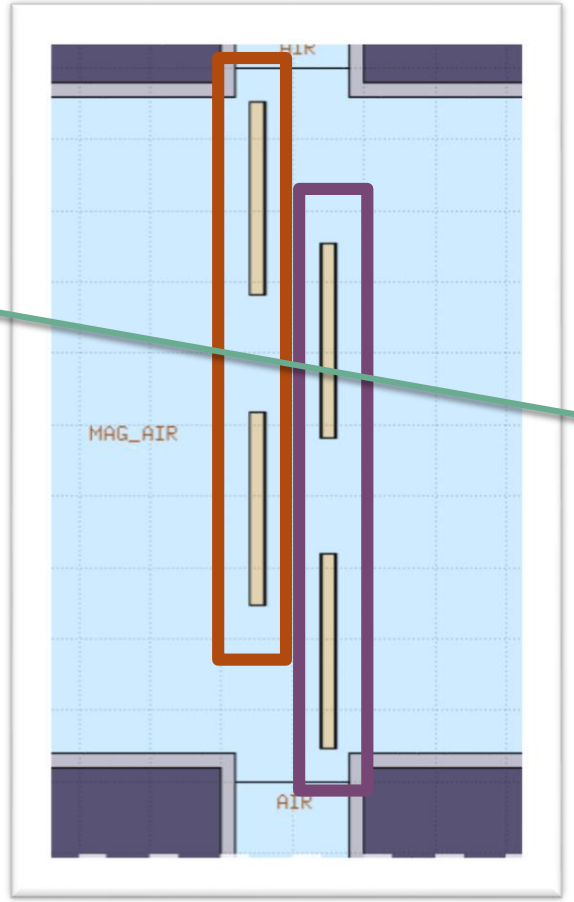
- **Distances** btw PLUMEs (in *z* and *y*) have to be optimized

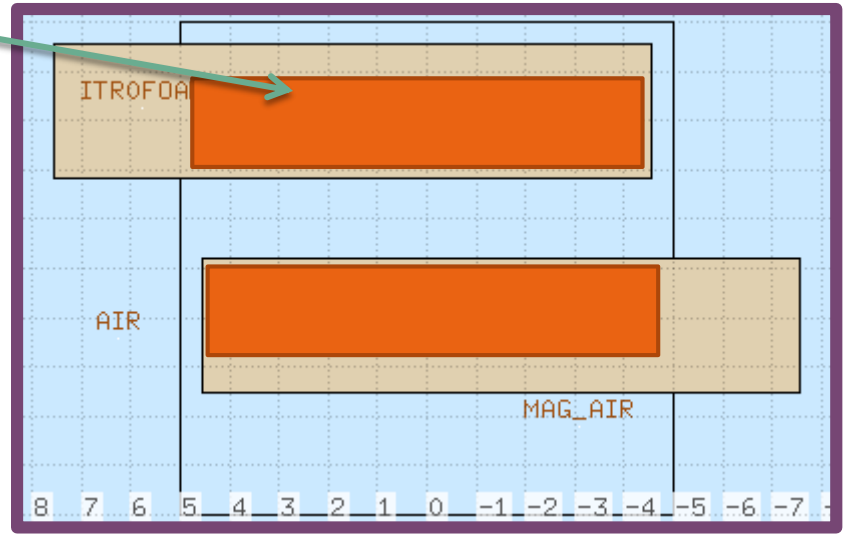
Thanks to Eleuterio

Inner Tracker









Microstrip Detector

Thanks to Leonello

V13.0

- 2 Si planes (50μm÷70μm thick)
- Kapton foil (30μm thick)
- Distance btw layers = 2 cm
- LGAD system
- Strip dim = (125x125)μm^2

For each view :

- Dead spaces (1 mm thick)
- Active Si regions (1.5 cm thick)

Fig. 1

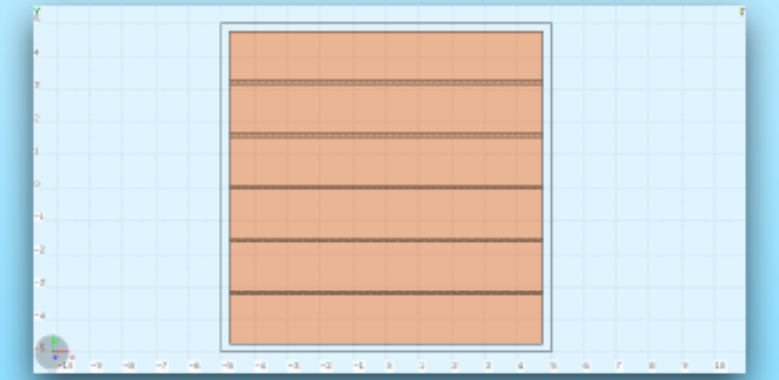
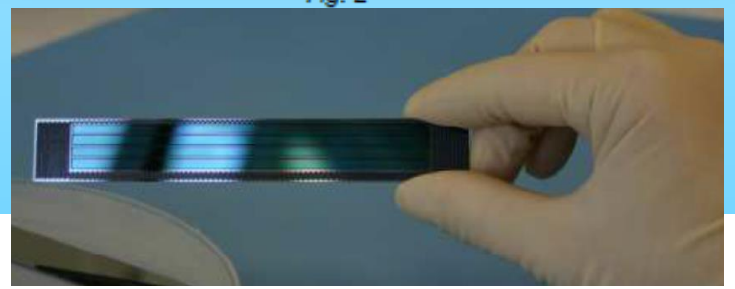


Fig. 2



V13.1

- 1 single Si plane (150μm thick)
- No Kapton foil
- No dead spaces
- Strip dim = (125x125)μm^2
- Distance btw layers = 2 cm
- No LGAD system

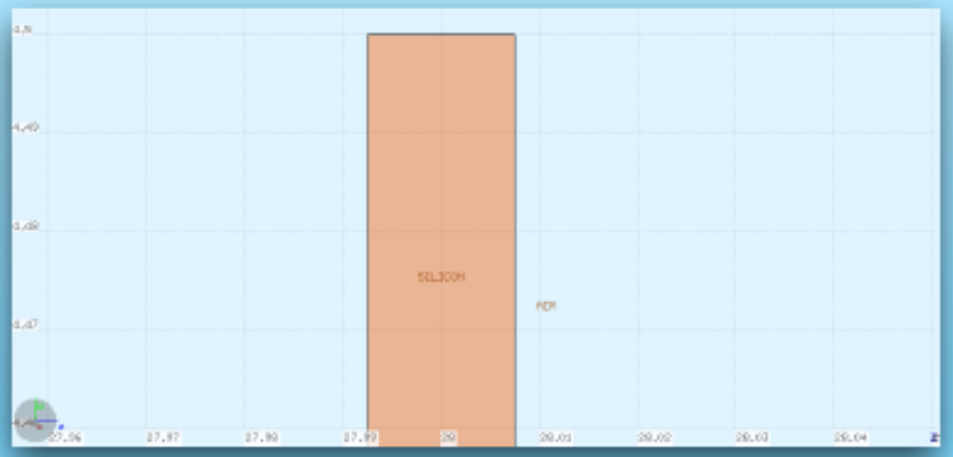


Fig. 3

Future works

- **Simulation of FOOT V13** is not yet available on Tier3, but we are going to produce them as soon as also the FLUKA routines needed to run the simulation will be finished
- We are currently working to **integrate the geometry software in the reconstruction framework**
- Still, a lot of **parameters have to be optimized and defined** in order to be correctly reproduced in simulation:
  - Distance from target of Vertex, Calorimeter, ecc.
  - Distances btw the PLUMEs and btw the Microstrip Detector layers
  - Layout of the Microstrip Detector
  - Dimensions of the magnets
  - Calorimeter shape and dimensions
- Provide the **final magnetic map**
- Moreover, in the reconstruction stage, we have to introduce:
  - **Clustering** in Inner Tracker and calorimeter
  - Dependence of the scintillator luminous response on the **hit position**

Thank you