MiniBeBe Detector

Concept and Status

Alfredo Raya

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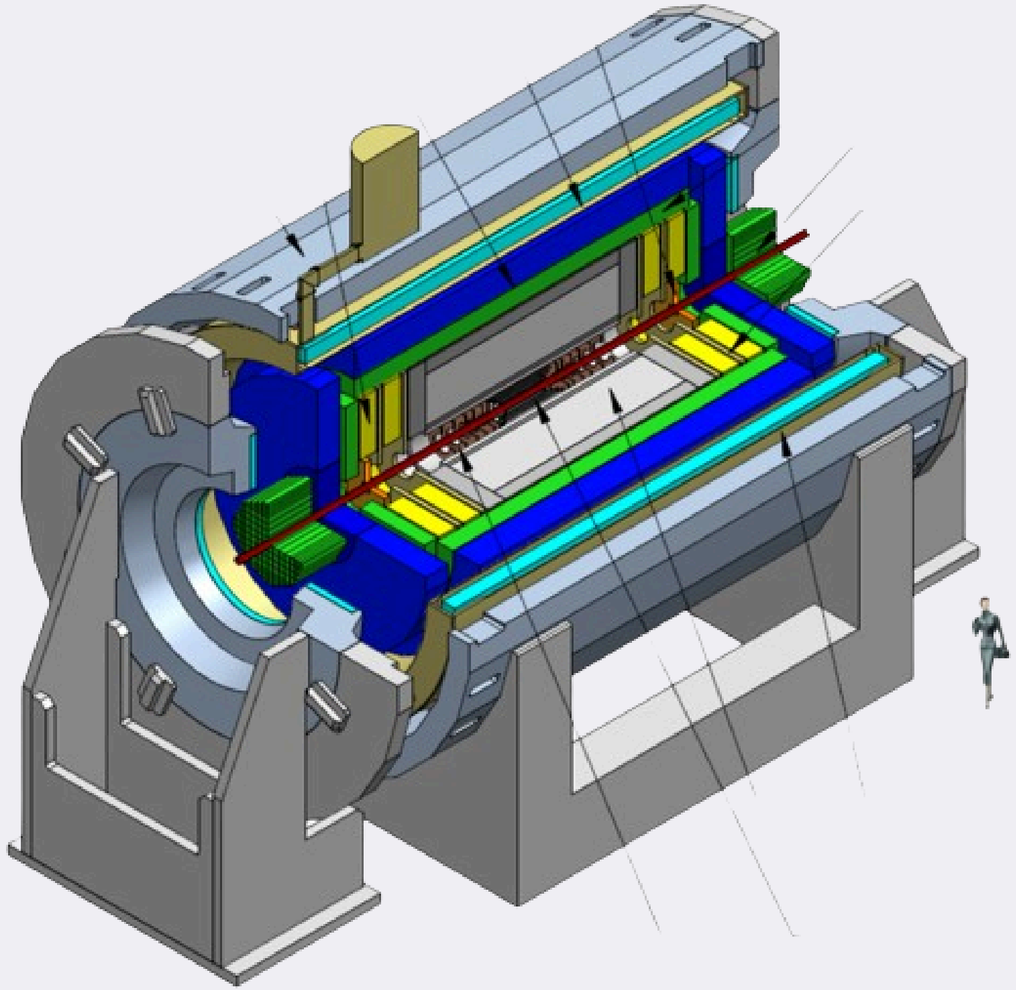
01

MiniBeBe

Current Concept

MPD

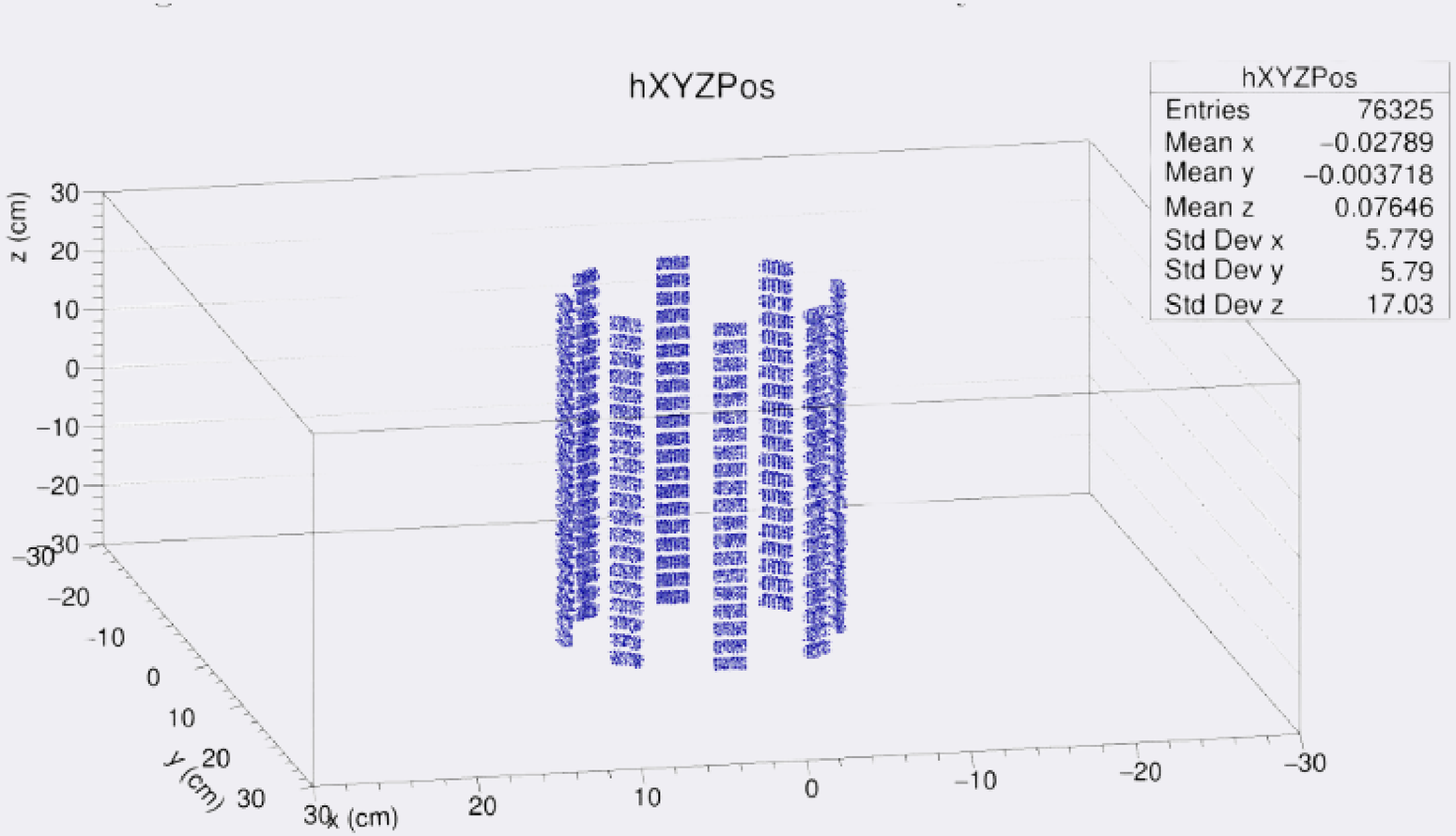


- Originally proposed as a wake up trigger for TOF
- Demanded efficient detection capabilities for low multiplicities p+p, p+A and A+A events
- Several adjustments in its design
- Adapted to the mechanical support of ITS
- Designed to be used only in Phase 0

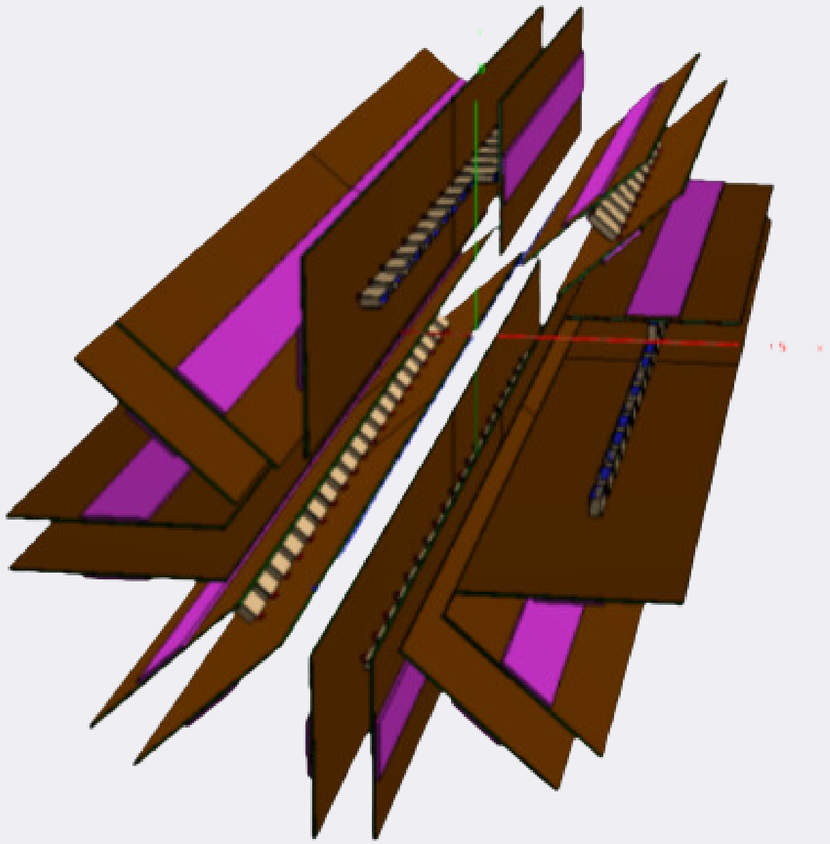
MiniBeBe

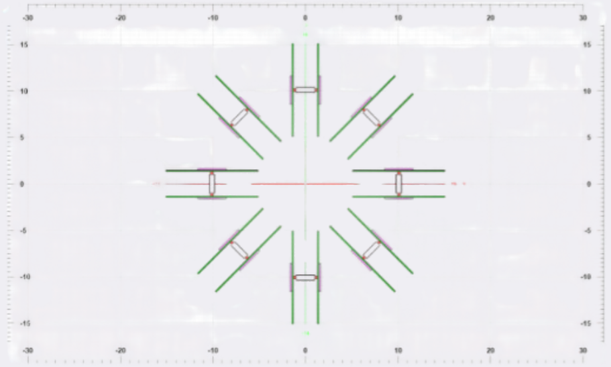
- 8 **H-shaped** rails
- Each module is formed by
  - A cuboid of **20 plastic scintillators** (EJ232, 20x20x5mm^3)
  - Each plastic surrounded by **two SiPM** (Hamamatsu Series 13, area 3.07x3.07mm^2) and electronics at each side
  - Fixed between the PCB and the Cold Plates
  - Electronic boards of 80-100mm width, ~100mm length
  - Cold Plates are the same of ITS
- Same space as ITS

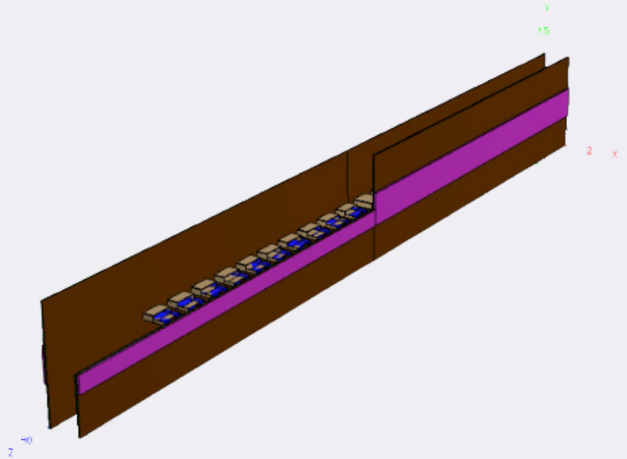
MiniBeBe


hXYZPos
hXYZPos
Entries 76325
Mean x −0.02789
Mean y −0.003718
Mean z 0.07646
Std Dev x 5.779
Std Dev y 5.79
Std Dev z 17.03
z (cm)
30
20
10
0
−10
−20
−30
y (cm)
x (cm)

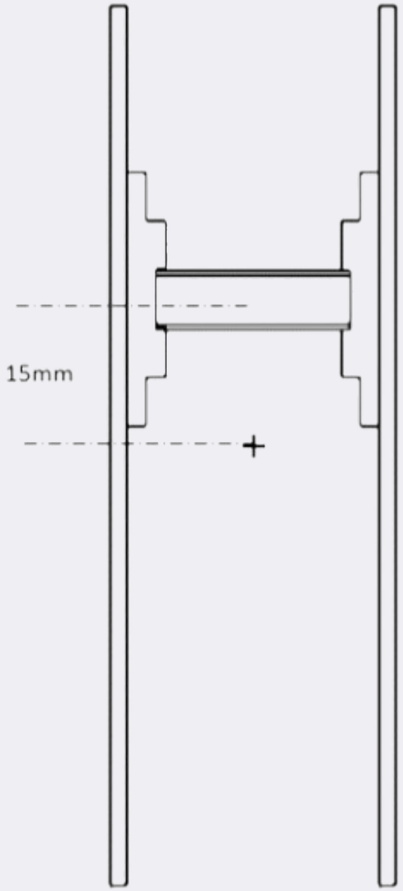
MiniBeBe

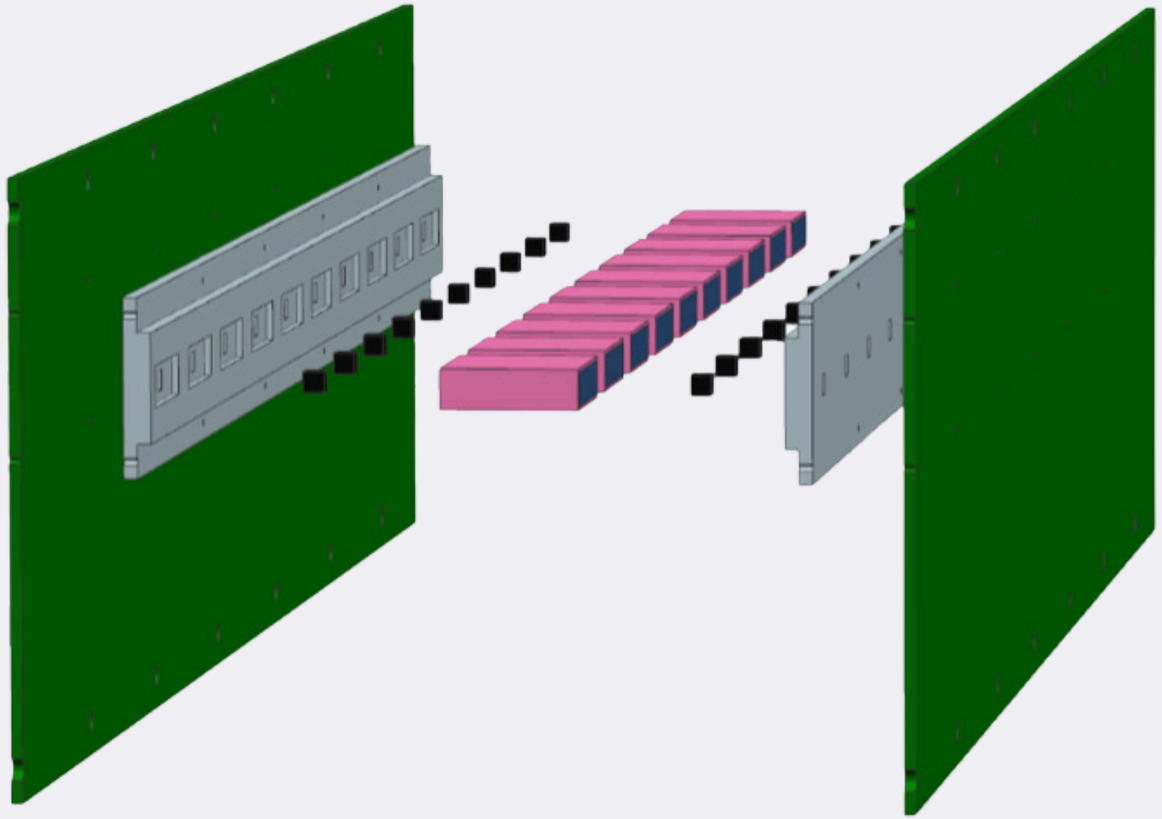






MiniBeBe





02

Mechanics

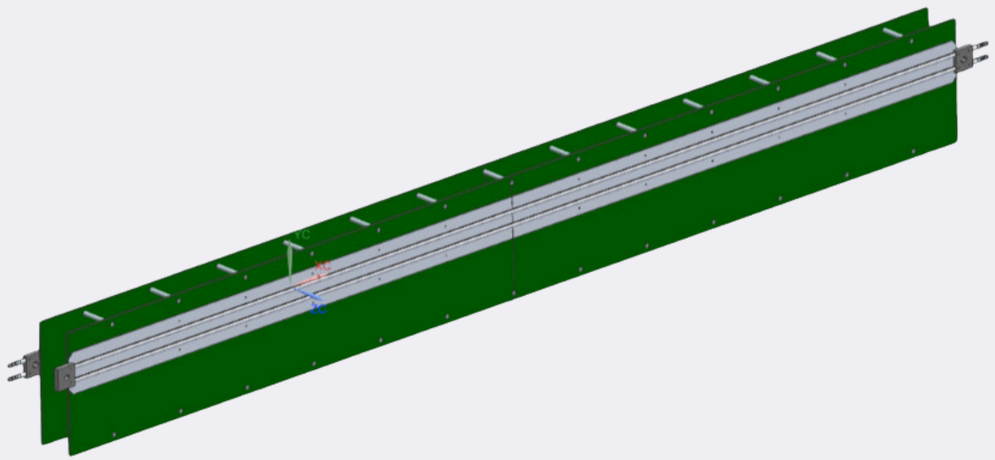
Plug & Play MPD-ITS Mechanical Support

Restrictions

- Adapt to the ITS detector general housing
- Not to use magnetic materials
- Avoid the creation of shadow
- Minimal material budget
- Maximal number of modules

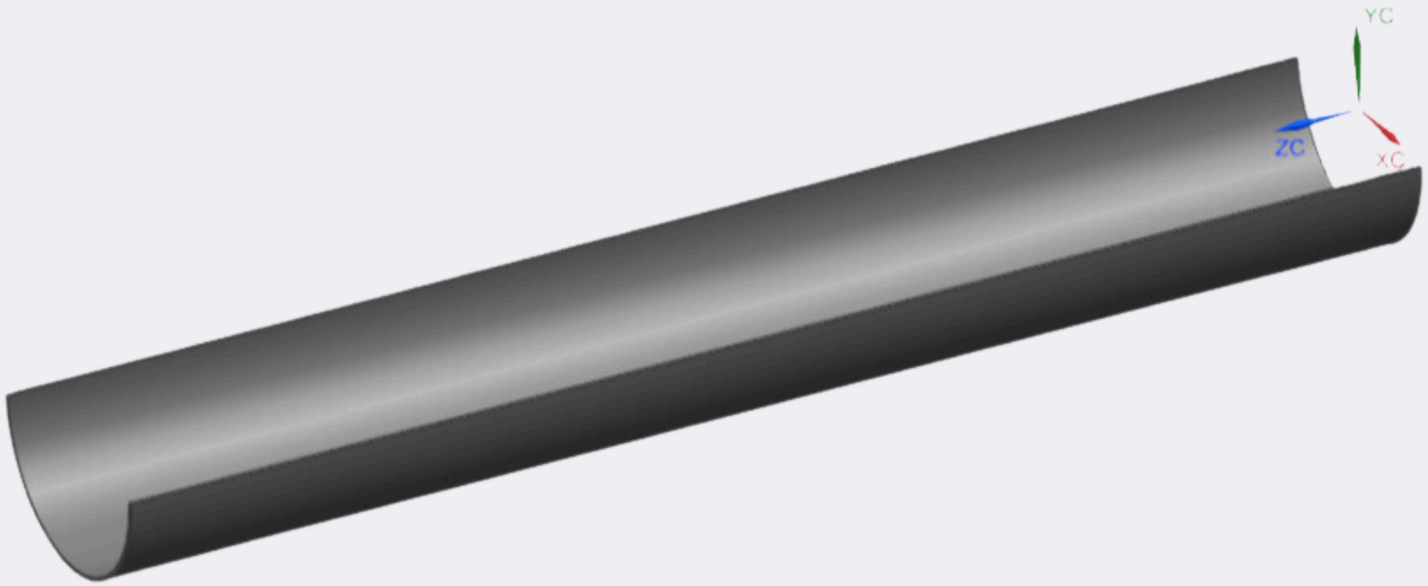
Design

- Housing at 312mm
- Maximum 8 modules, 8-10mm width
- Same cooling system as ITS



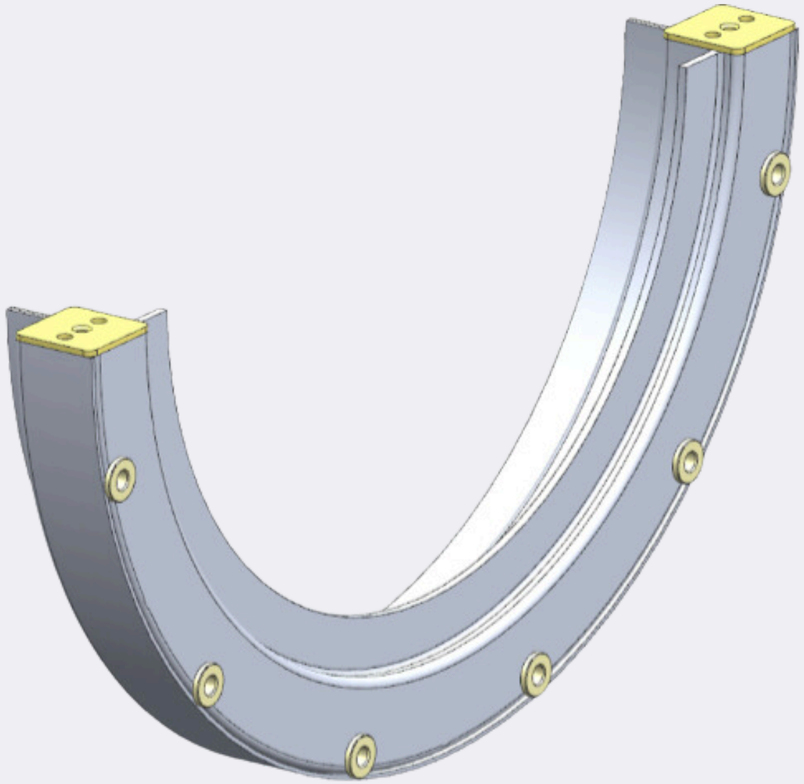
Design

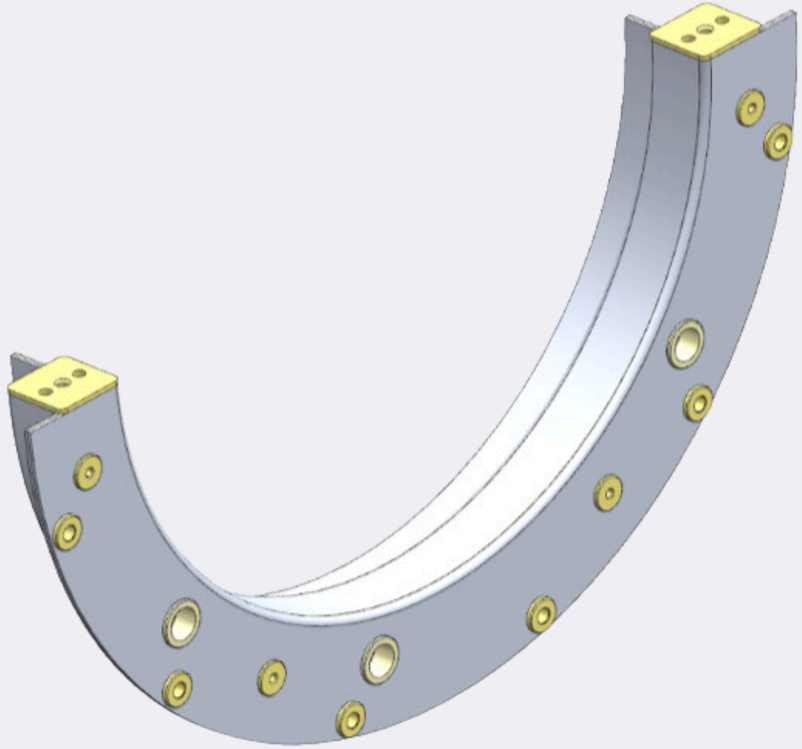
- Plug & Play with ITS
- Housing in the 3rd and 4th layers of ITS
- 312mm in diameter, 161mm in length



Design

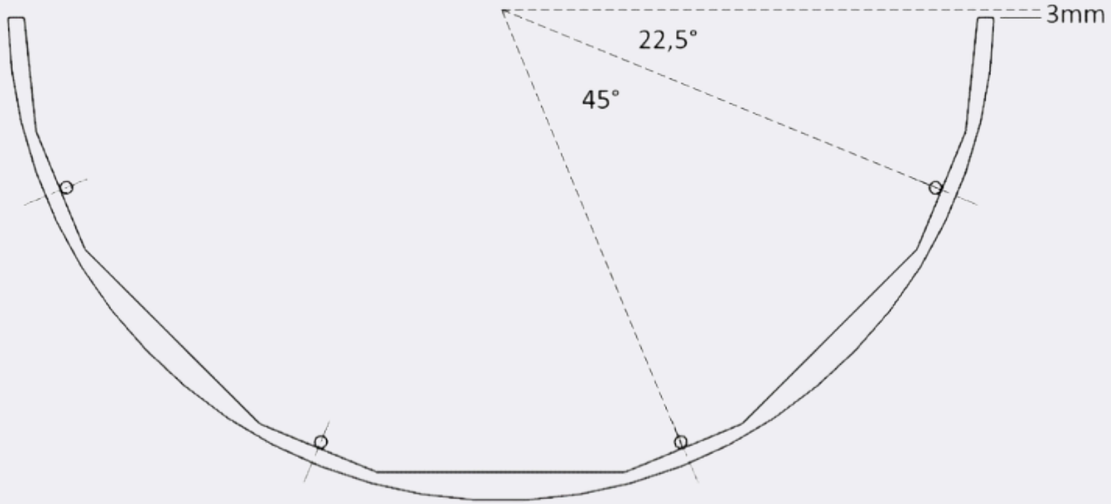
- Flanges of the 4th layer of ITS were redesigned
- Bushings of 9.3mm

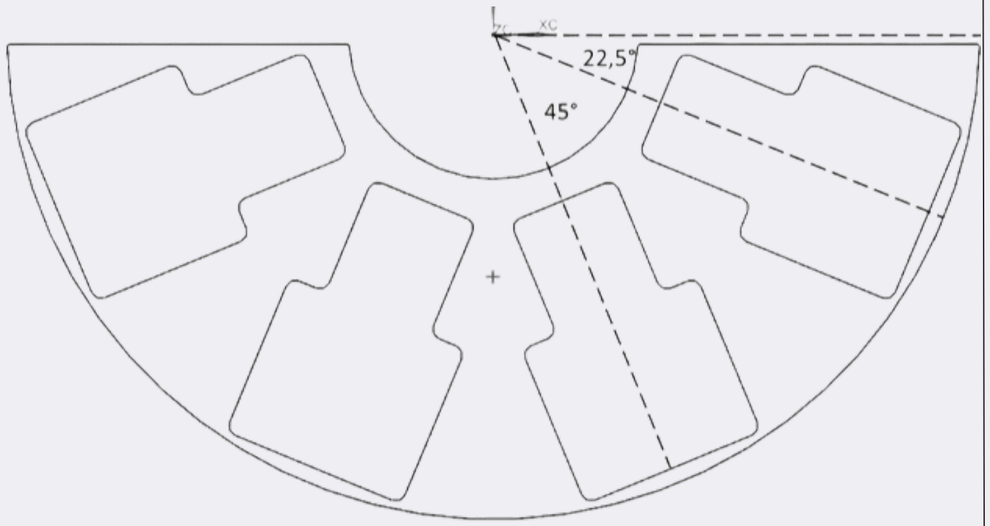




Design

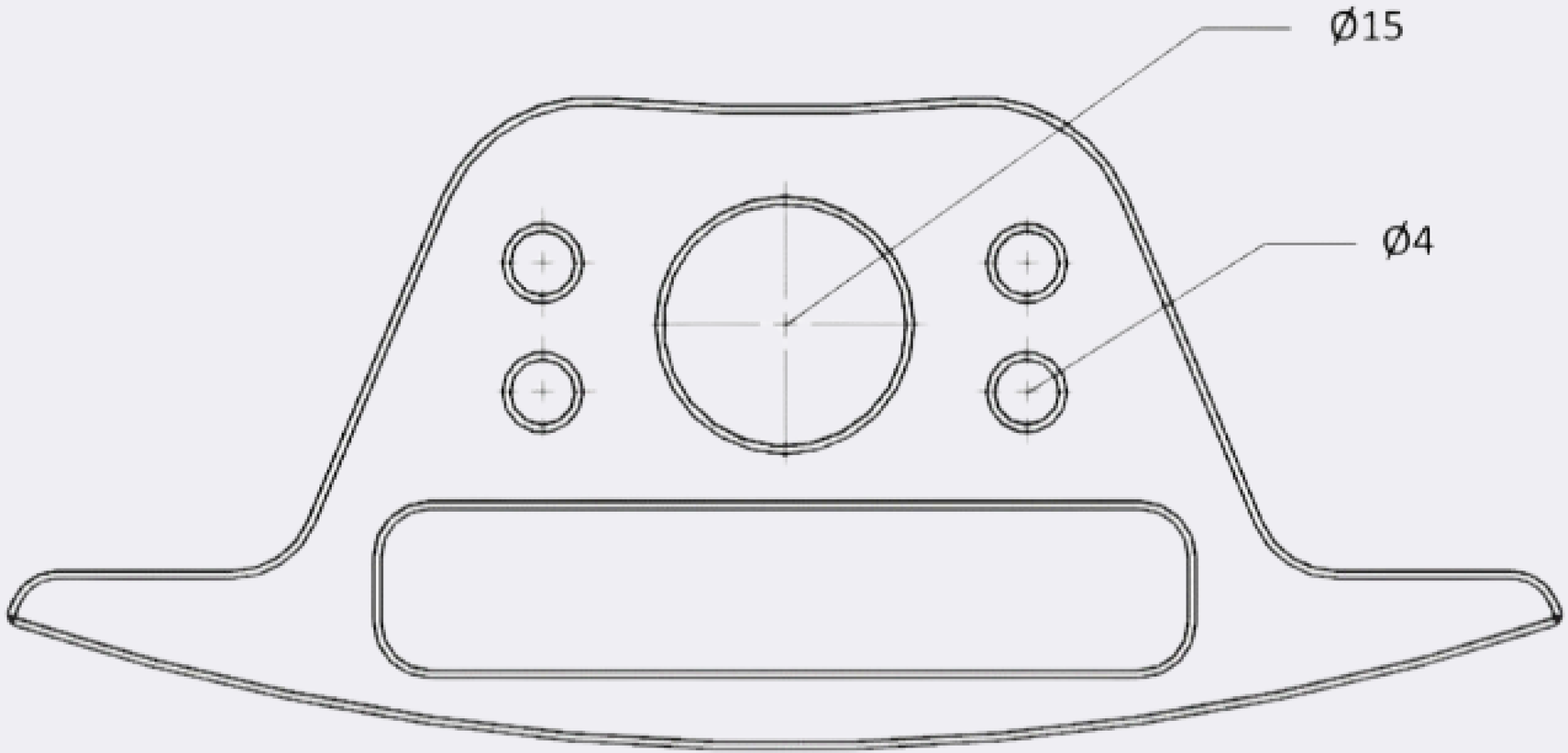
- Electronic modules fixed with flanges





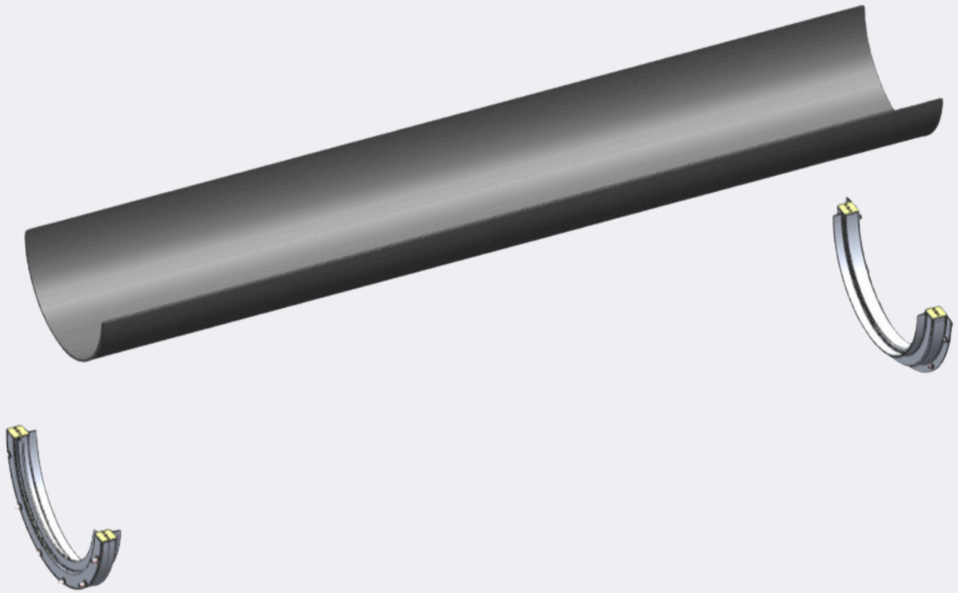
Design

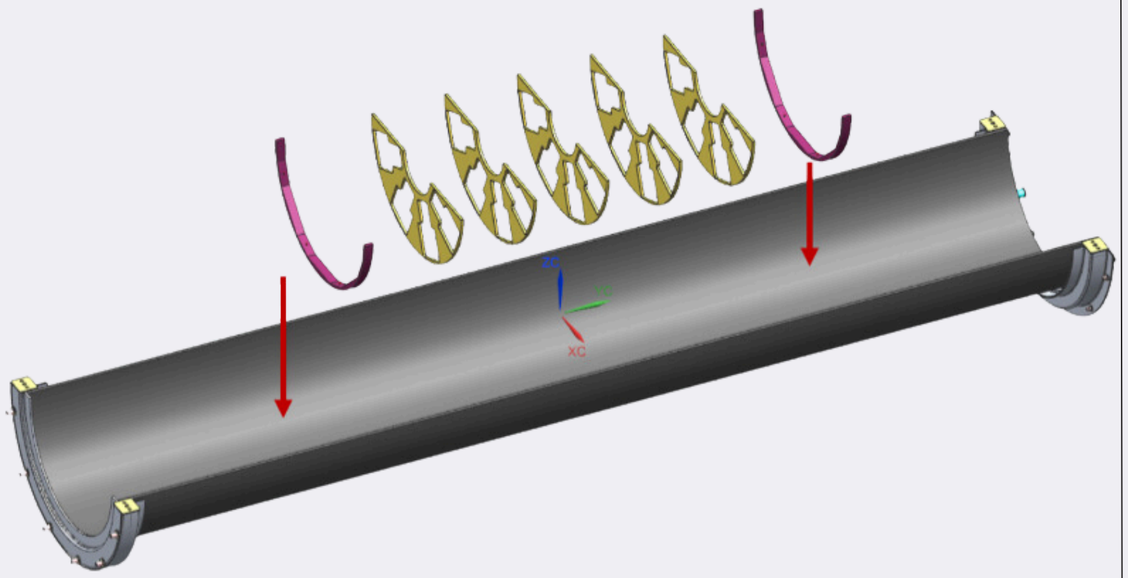
- Supports fit the cooling system



Design

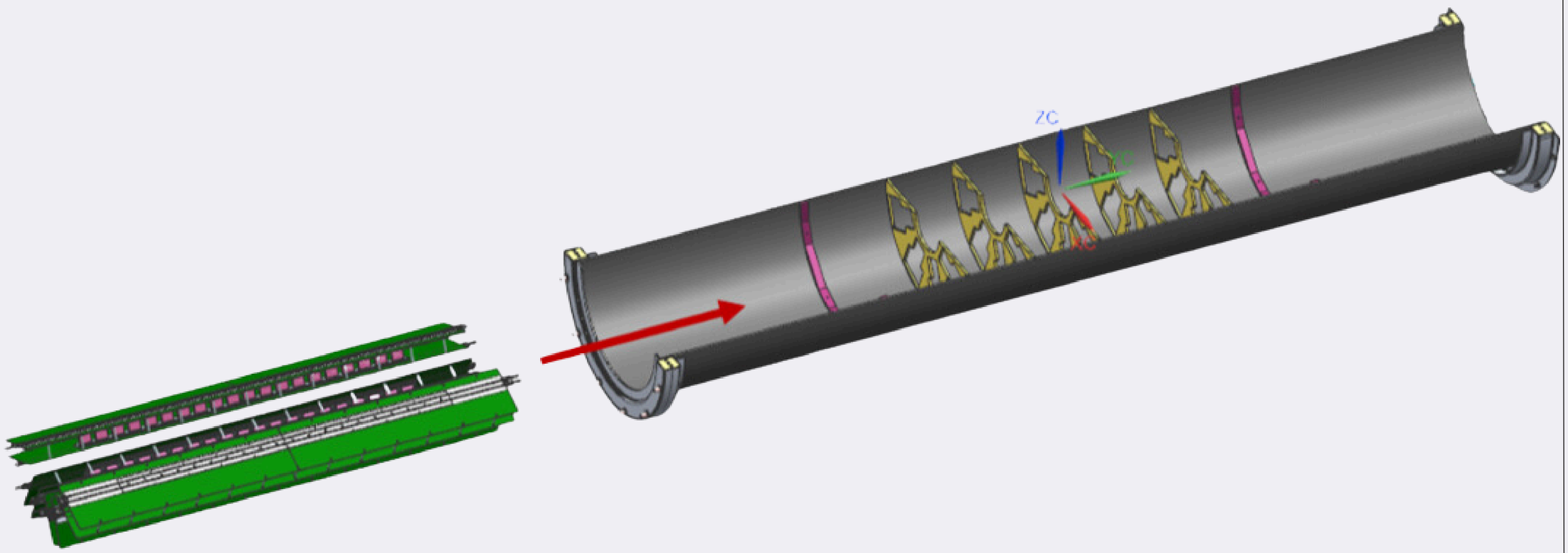
- Assembling





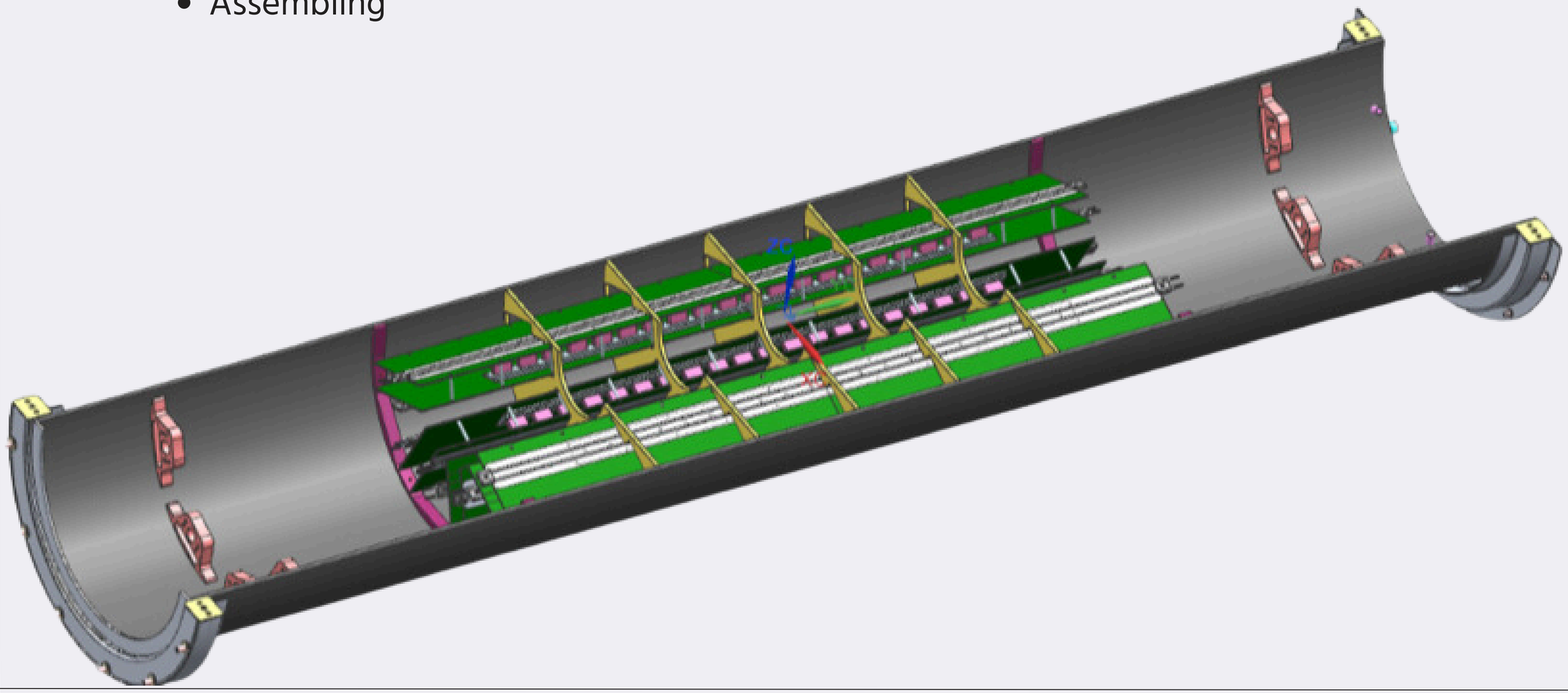
Design

- Assembling



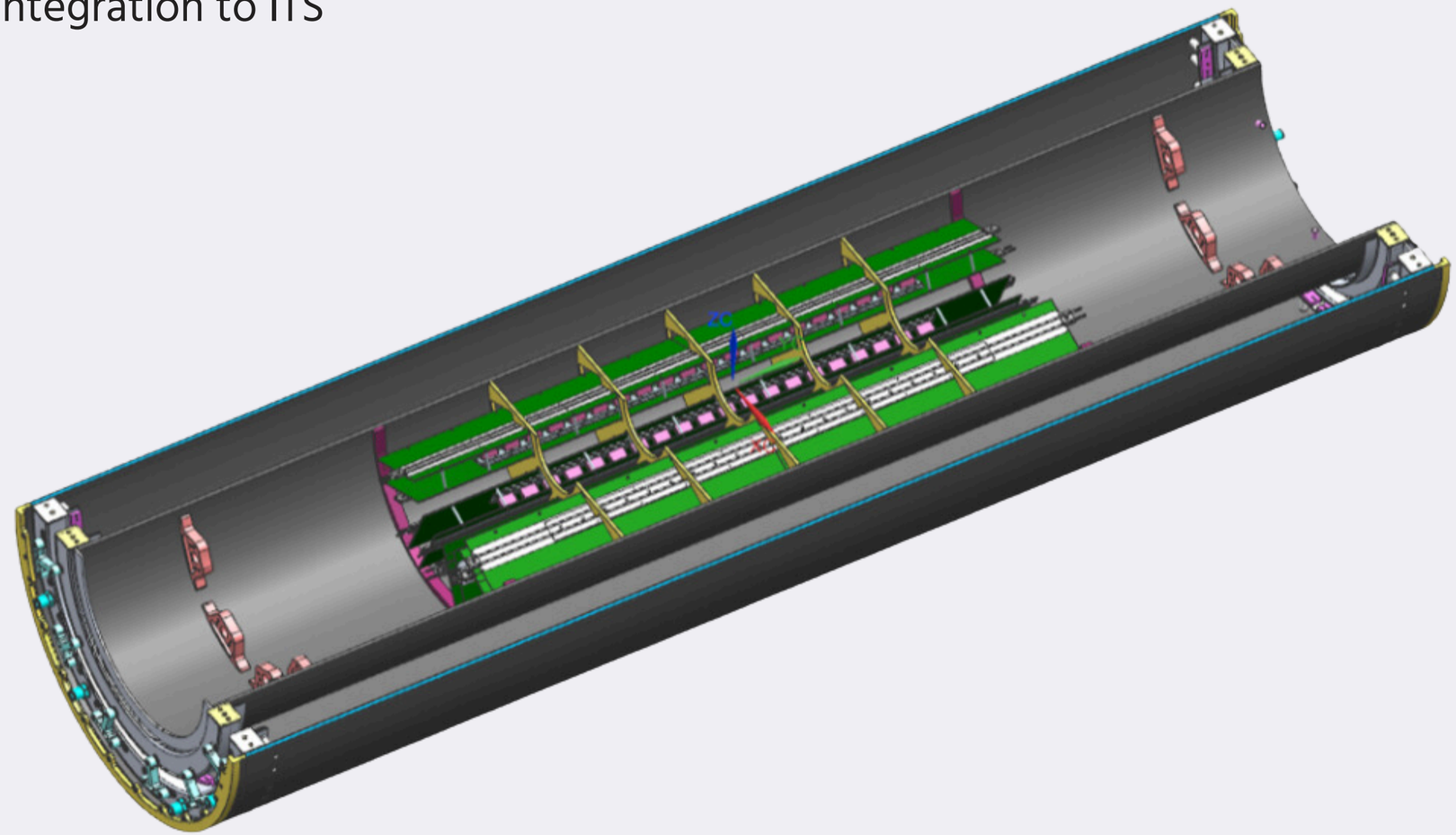
Design

- Assembling



Design

- Integration to ITS



03

Simulations

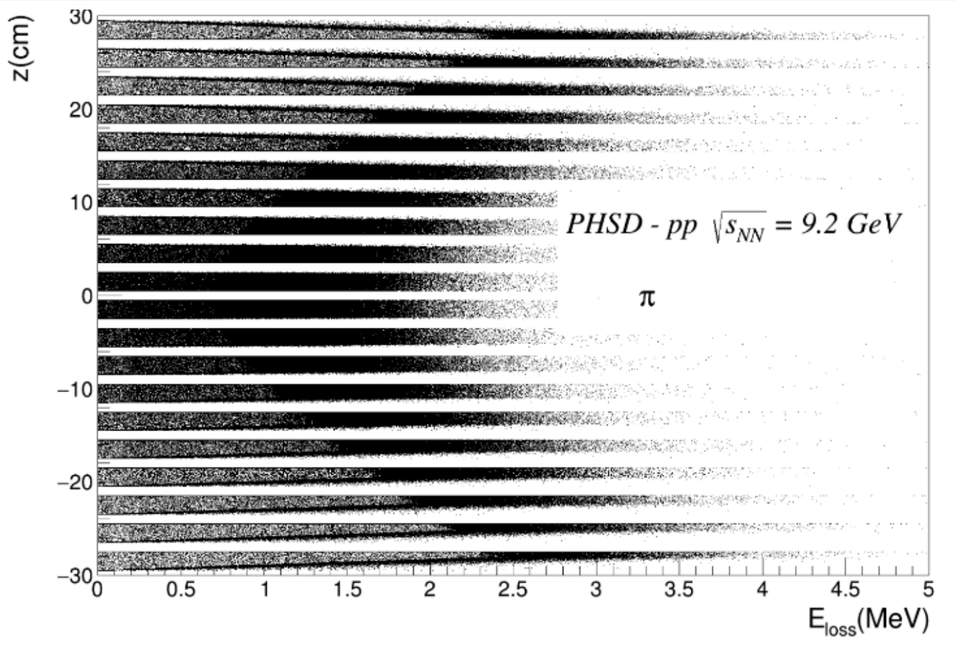
Efficiency of MiniBeBe as a trigger

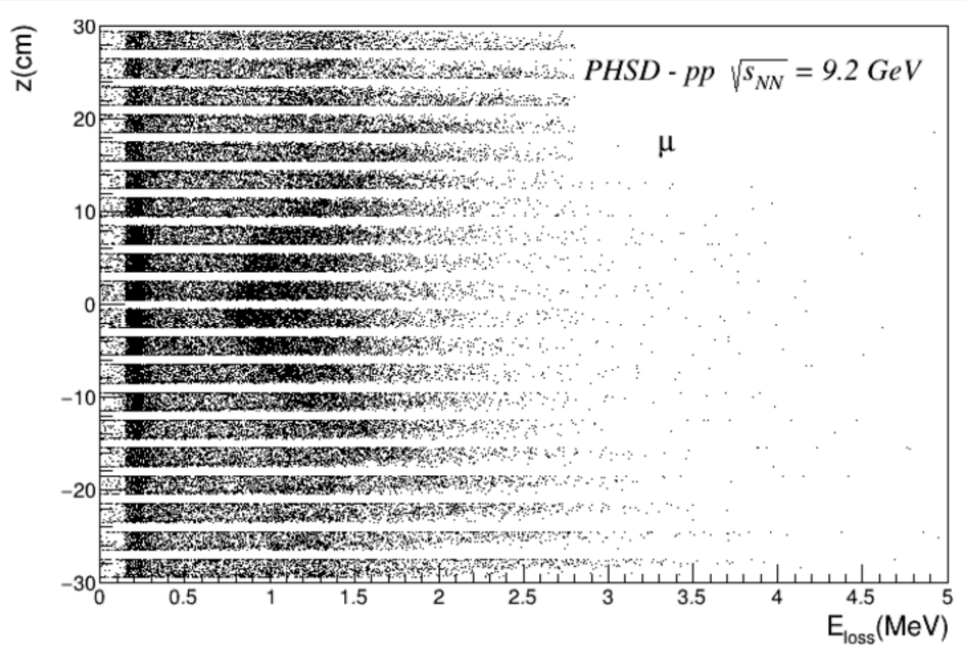
Simulations

- MPDRoot
- 5M pp collisions @ $\sqrt{s} = 9.2$GeV with PHSD generator
- 1M BiBi collisions for comparison
- Smearing of primary vertex $\sqrt{\sigma_z} = 50cm$
- Maximal number of modules

Simulations

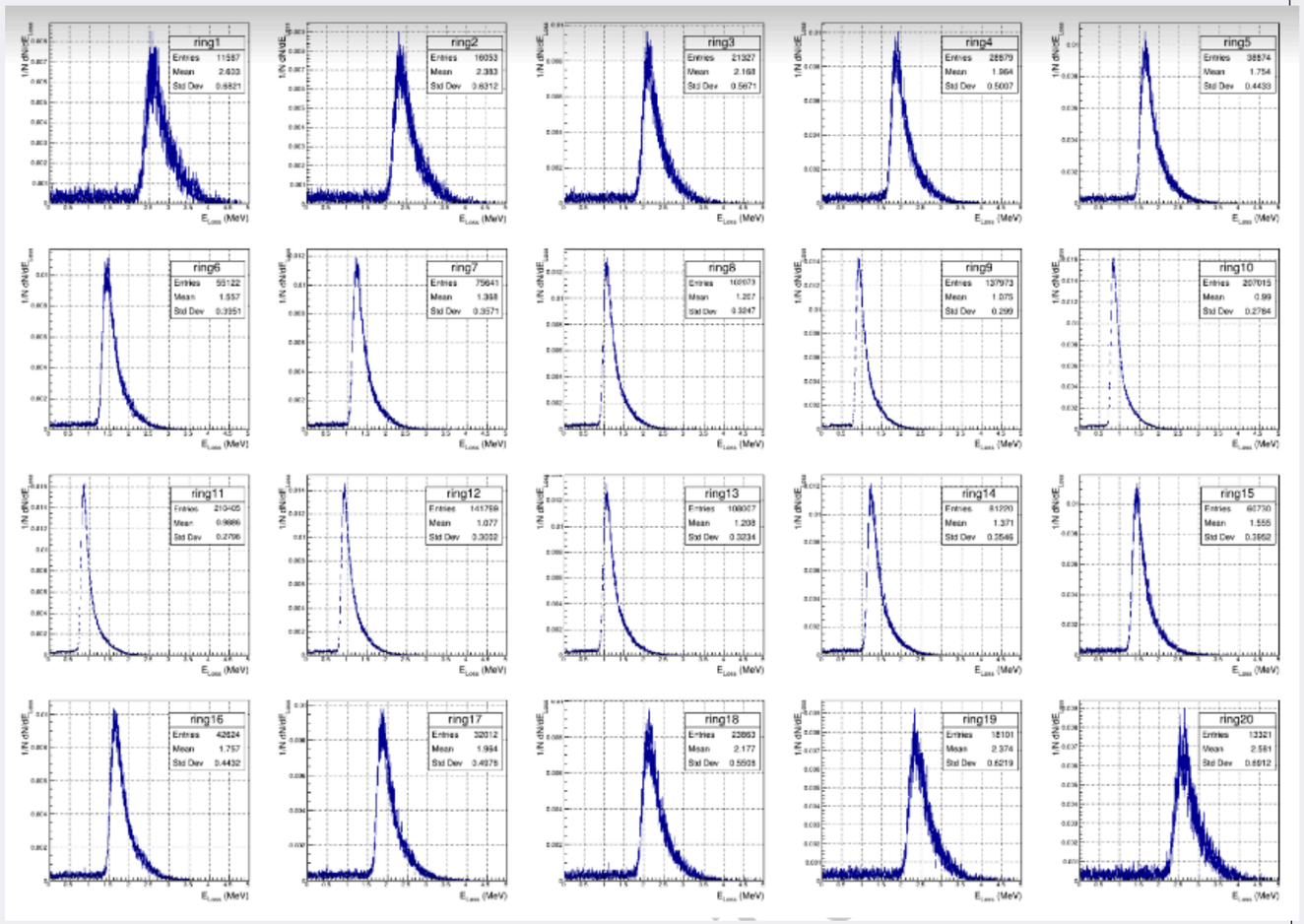
- Without smearing





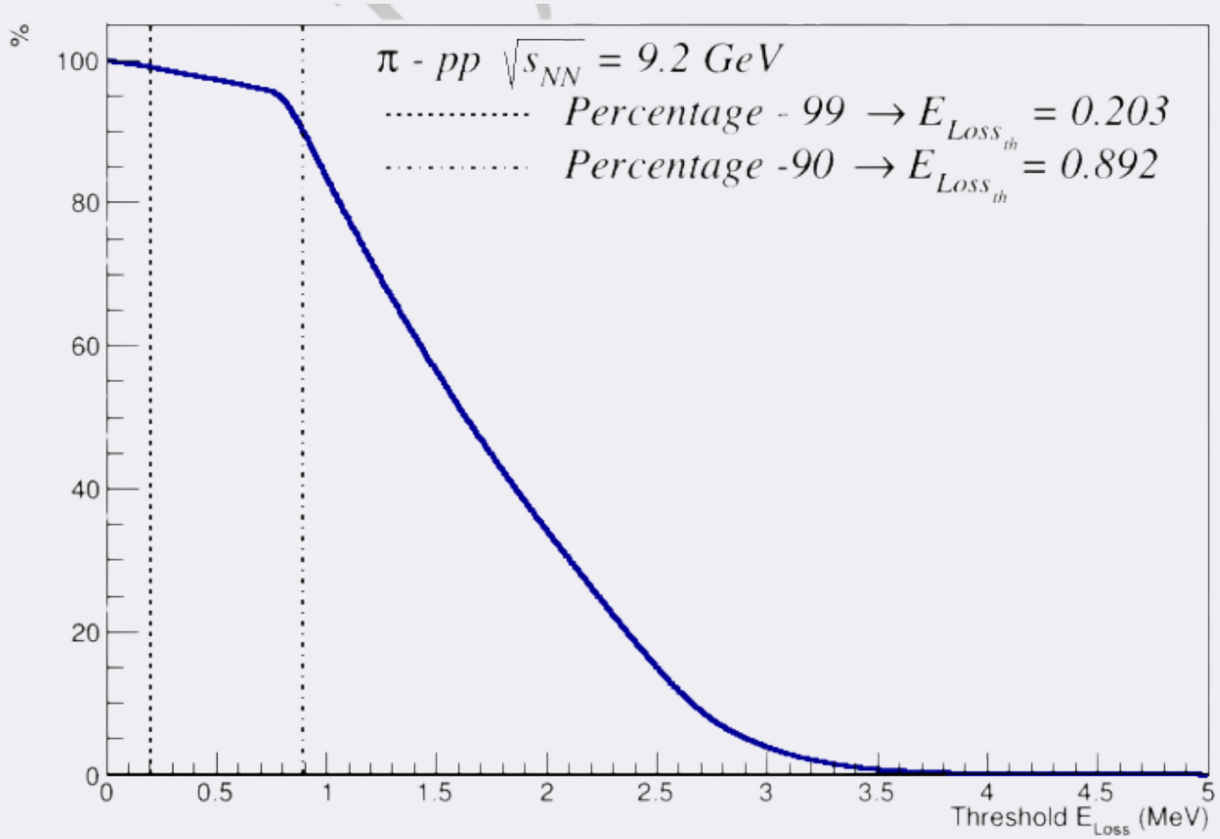
Simulations

- Without smearing
- Energy deposition of pions at each ring.



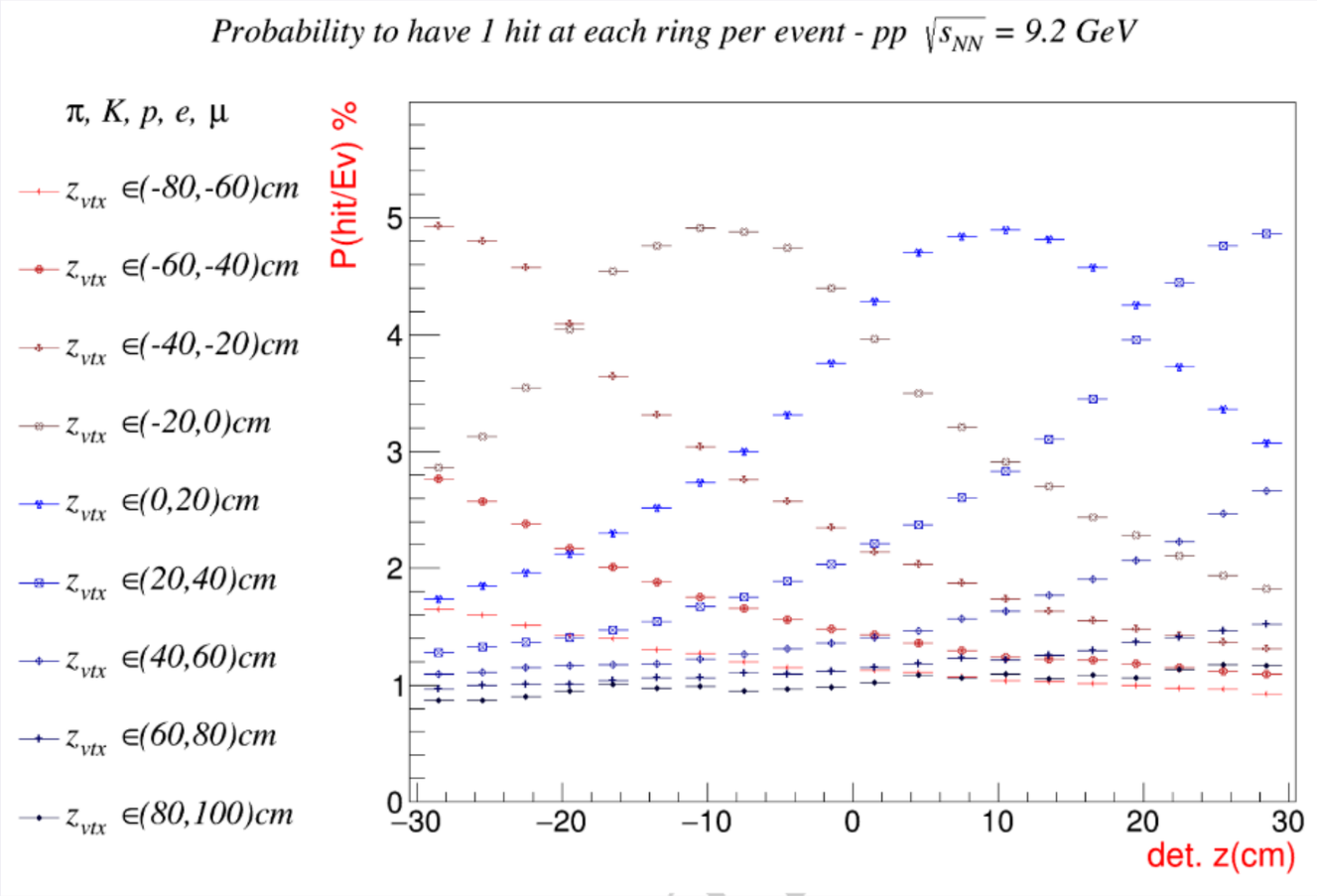
Simulations

- Without smearing
- Threshold Energy to detect a pion with 99(90)% efficiency



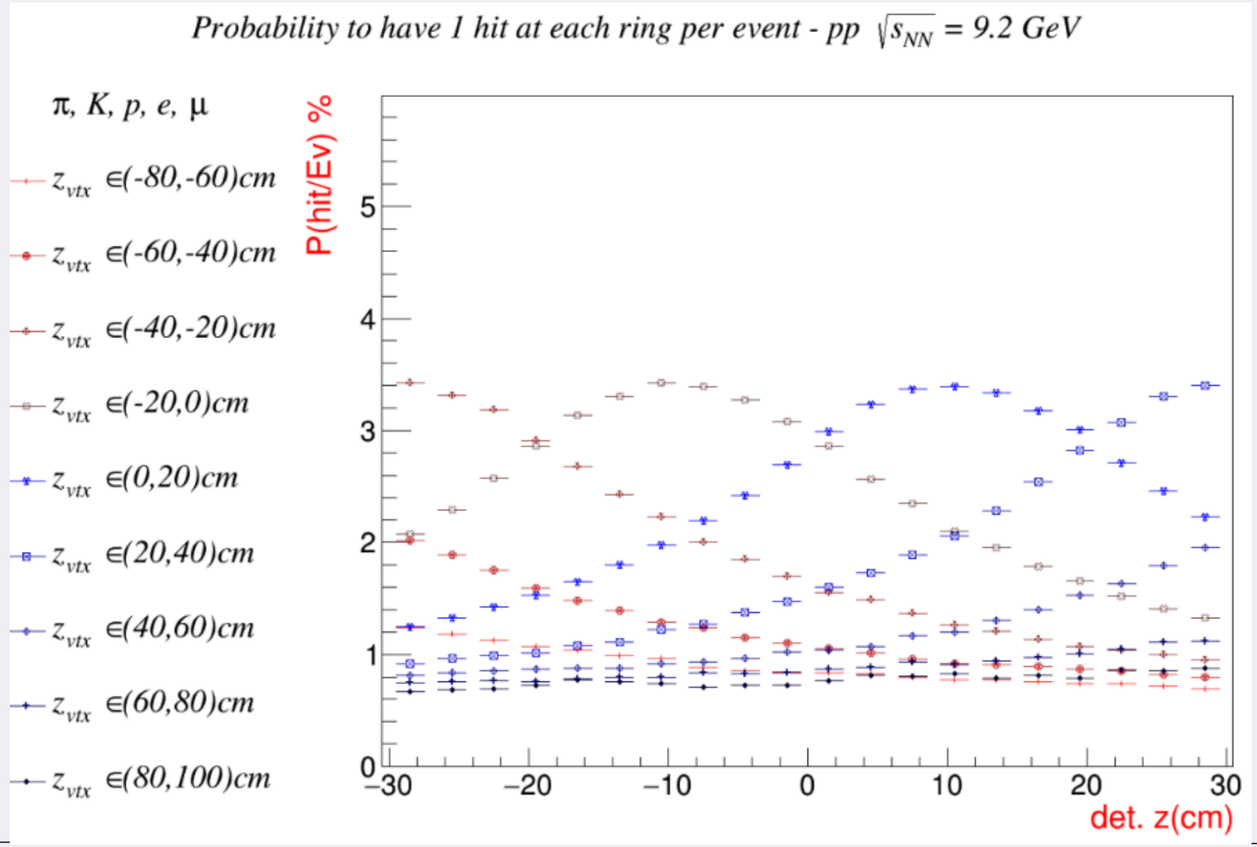
Simulations

- Applying the cut of energy $E_{th} > 2.03 MeV$



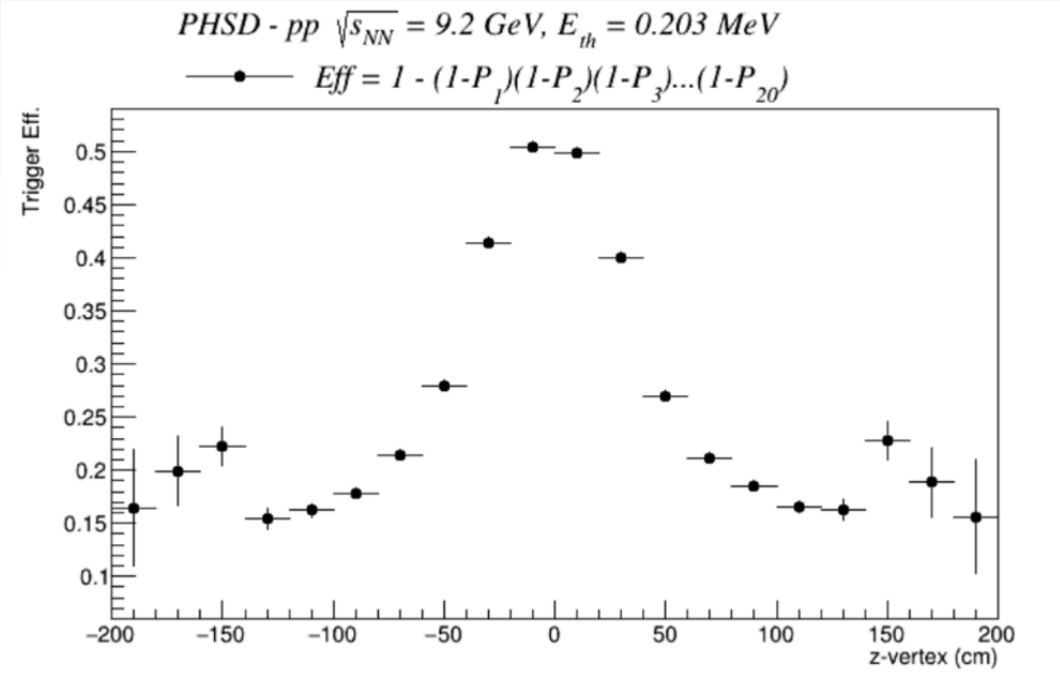
Simulations

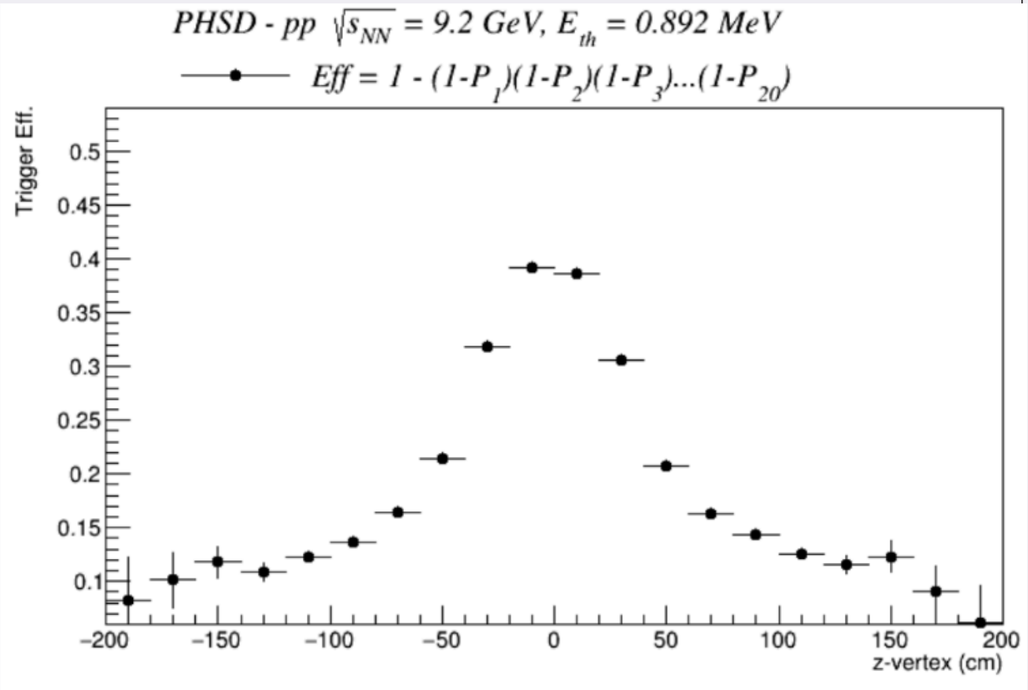
- Applying the cut of energy $E_{th} > 0.892 MeV$



Simulations

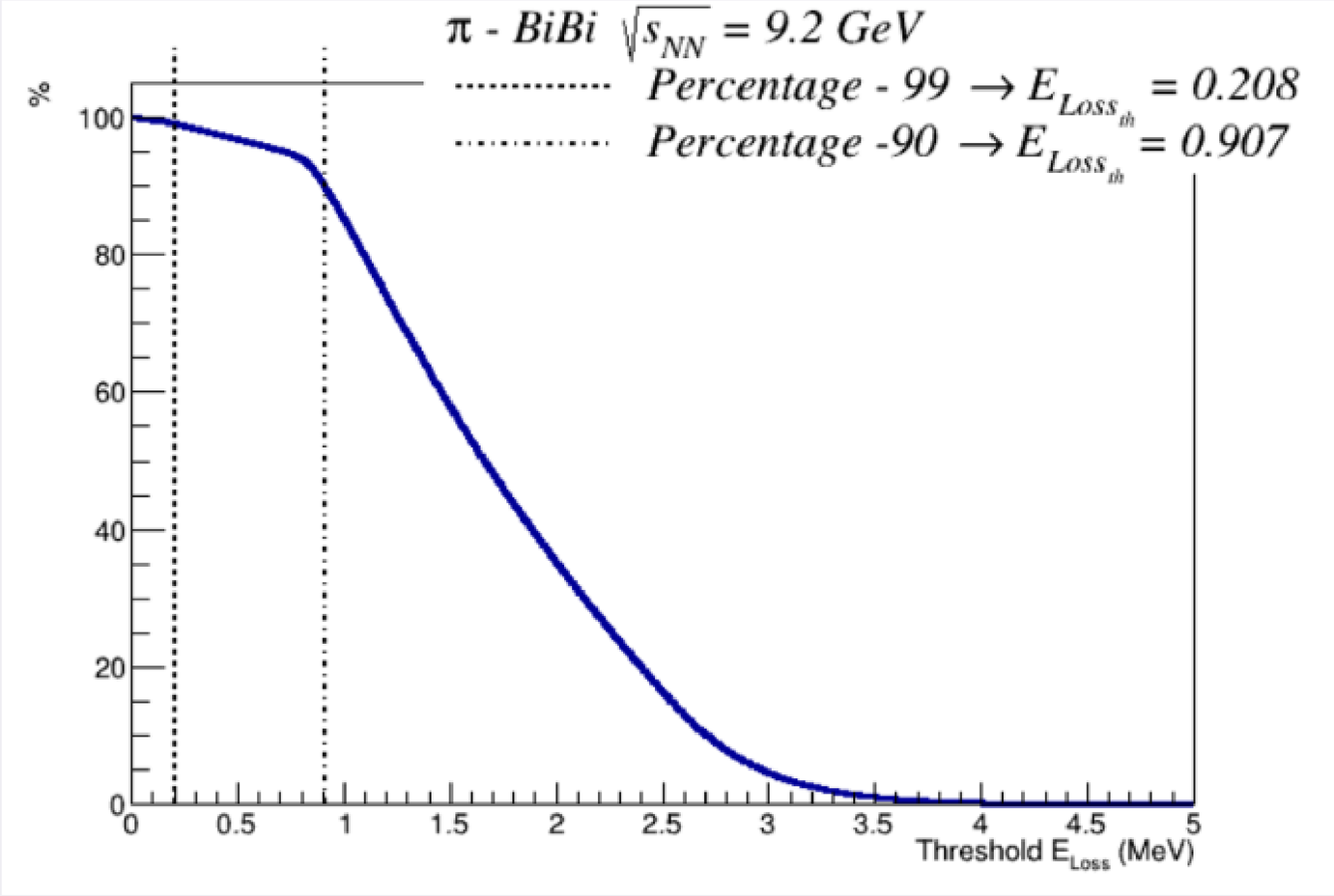
- Trigger Efficiency as function of the position of PV





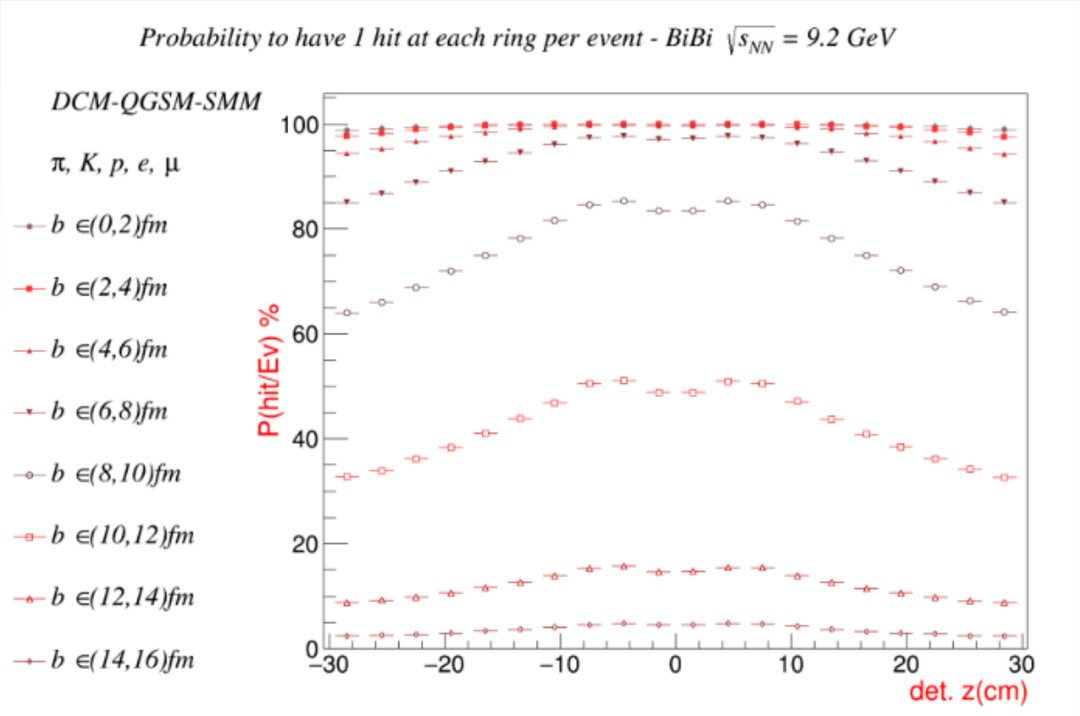
Simulations

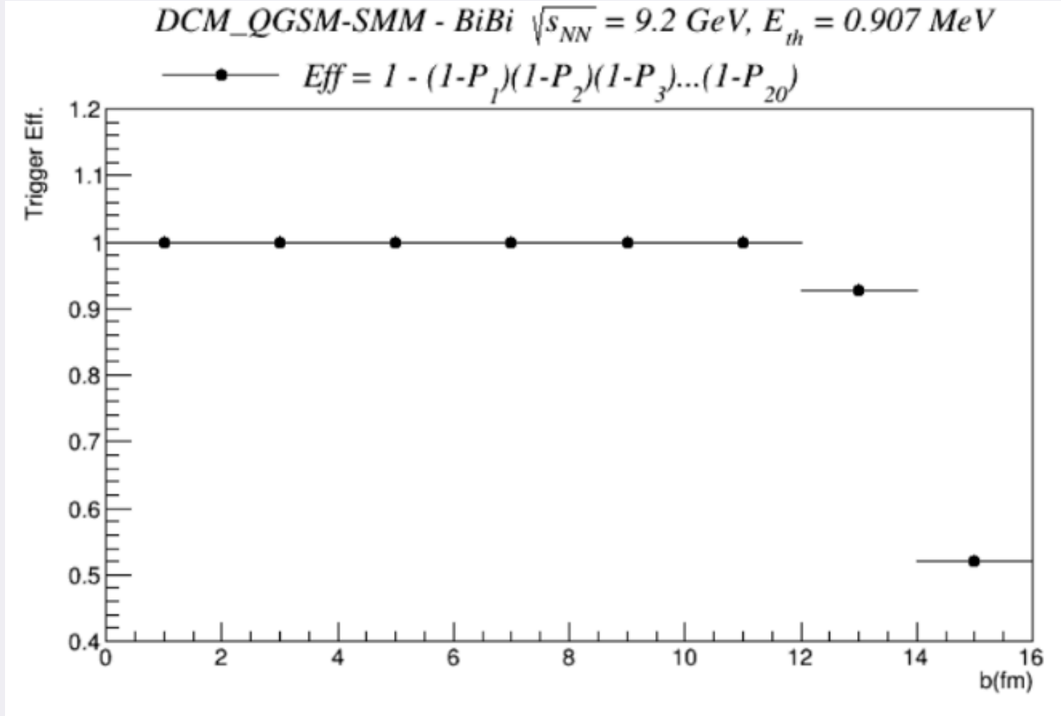
- For Bi Bi collisions



Simulations

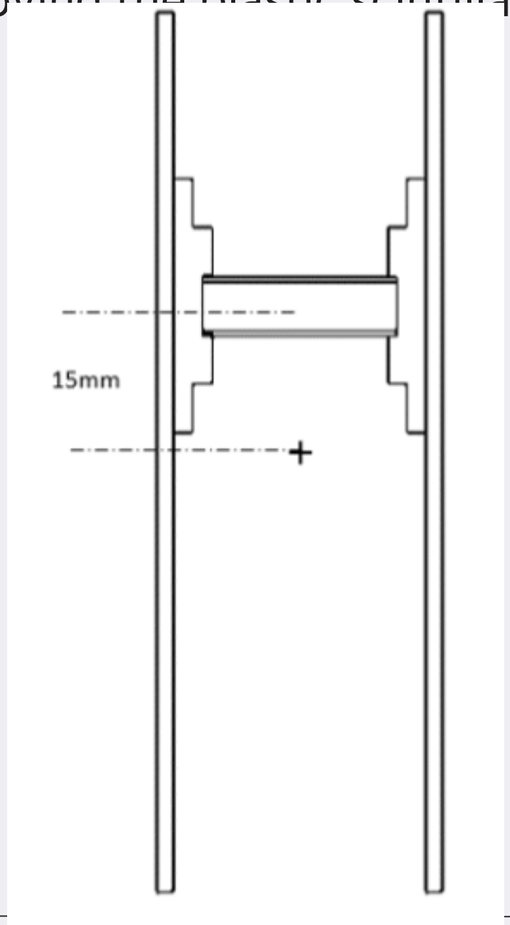
- For Bi Bi Collisions

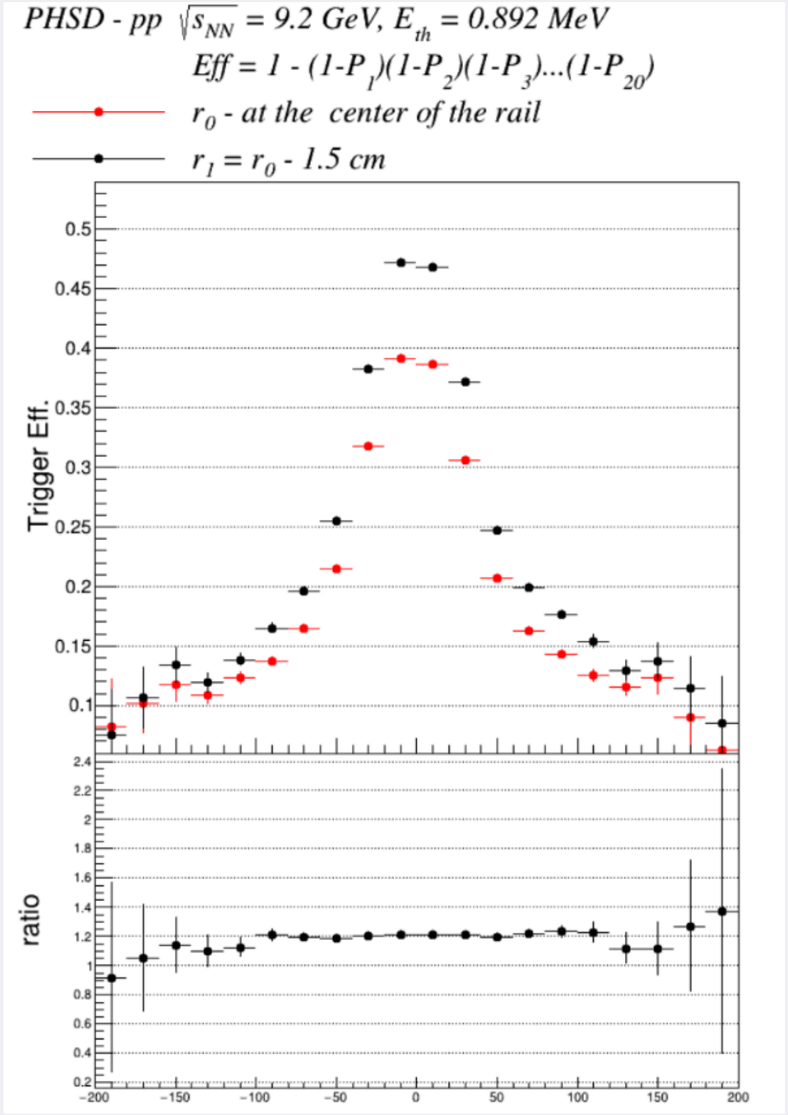




Simulations

- Moving the plastic scintillator



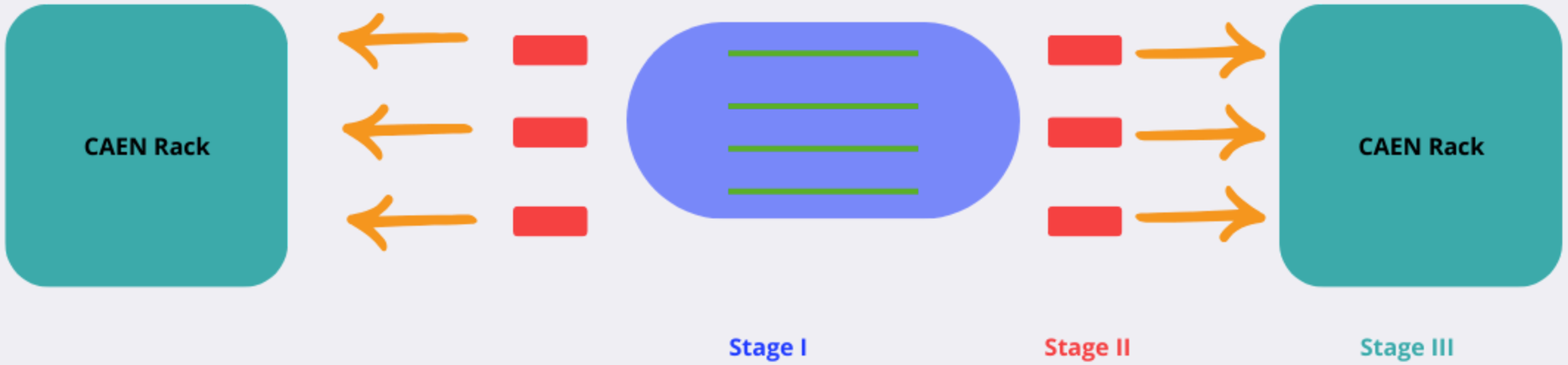


04

Electronics

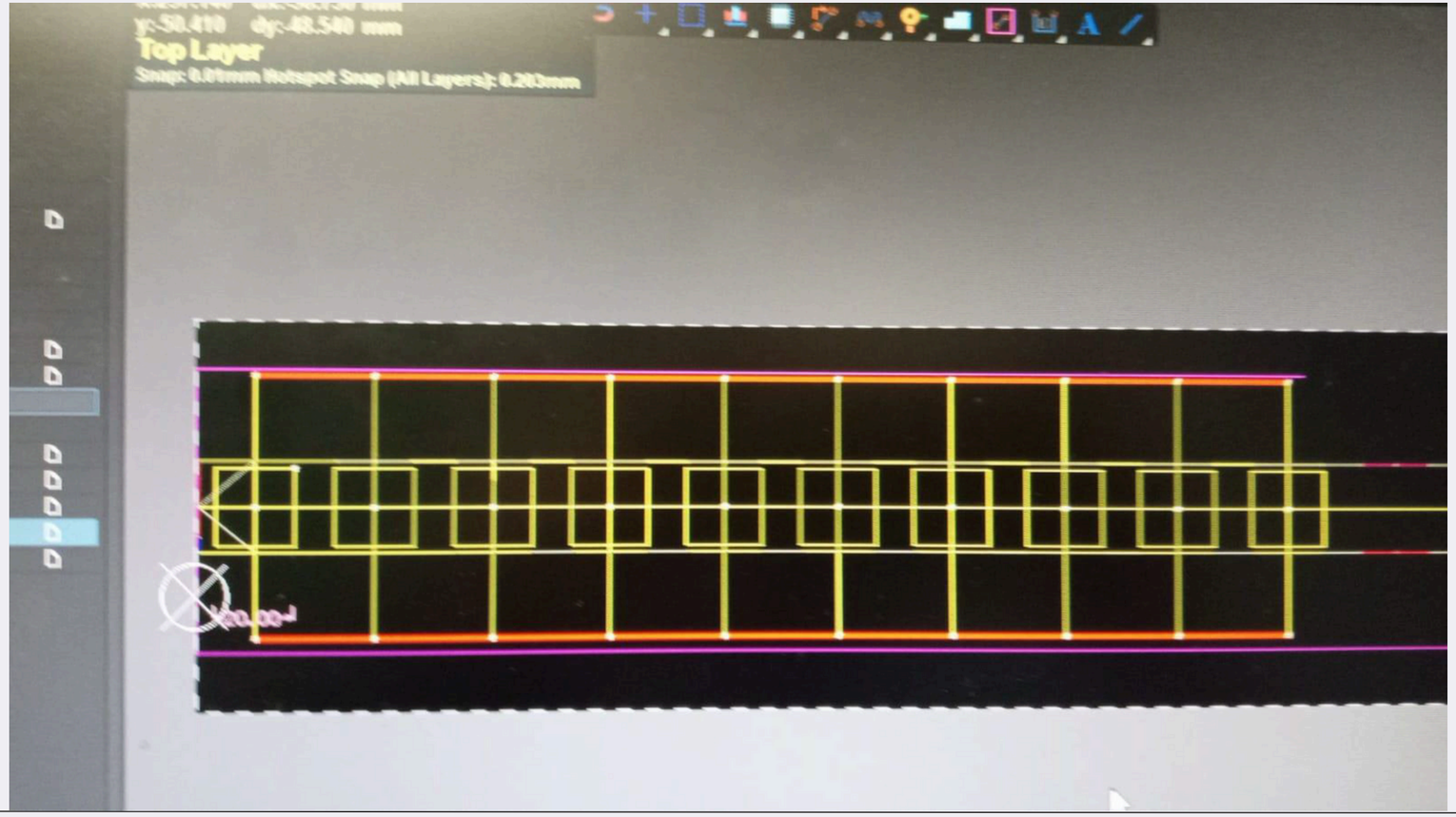
Design of Electronics of Mini BeBe


Electronics
Stage I
Front-End
Stage II
Signal Admin
Stage III


CAEN Rack
CAEN Rack
Stage I
Stage II
Stage III

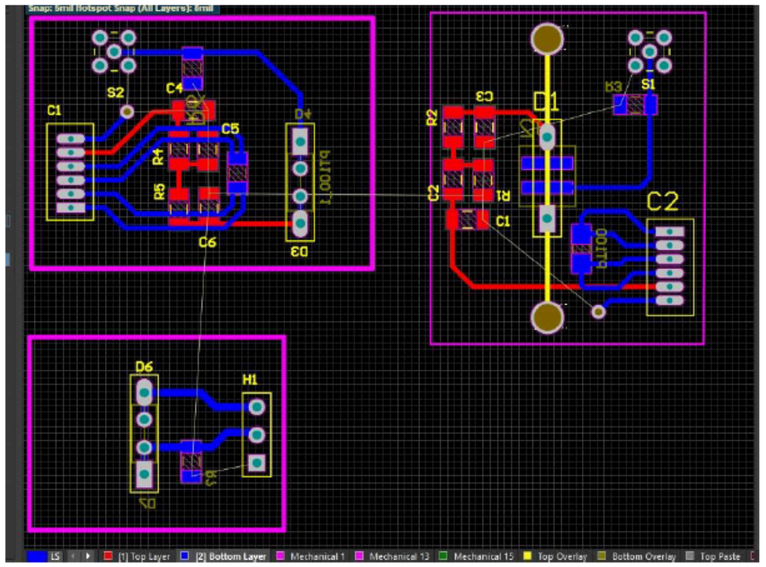
Electronic Boards

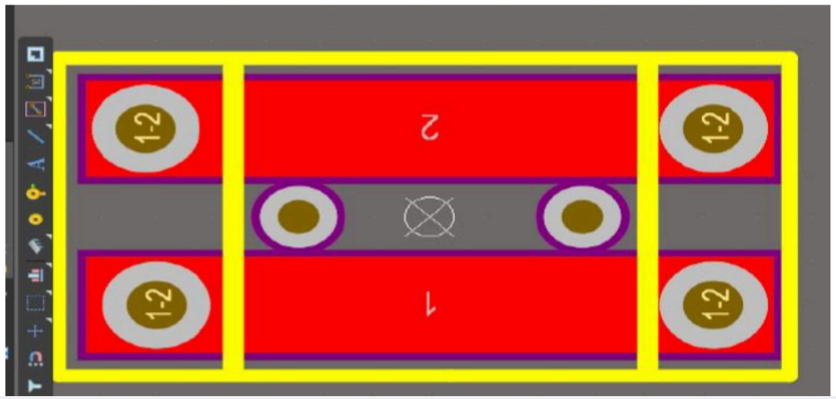
- Blueprints

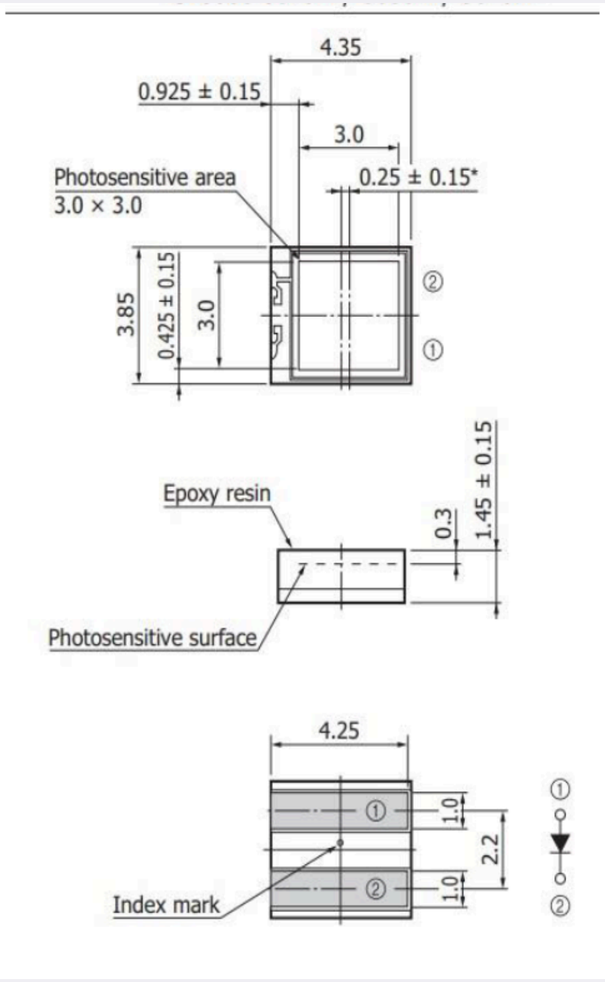


Electronic Boards

- Blueprints

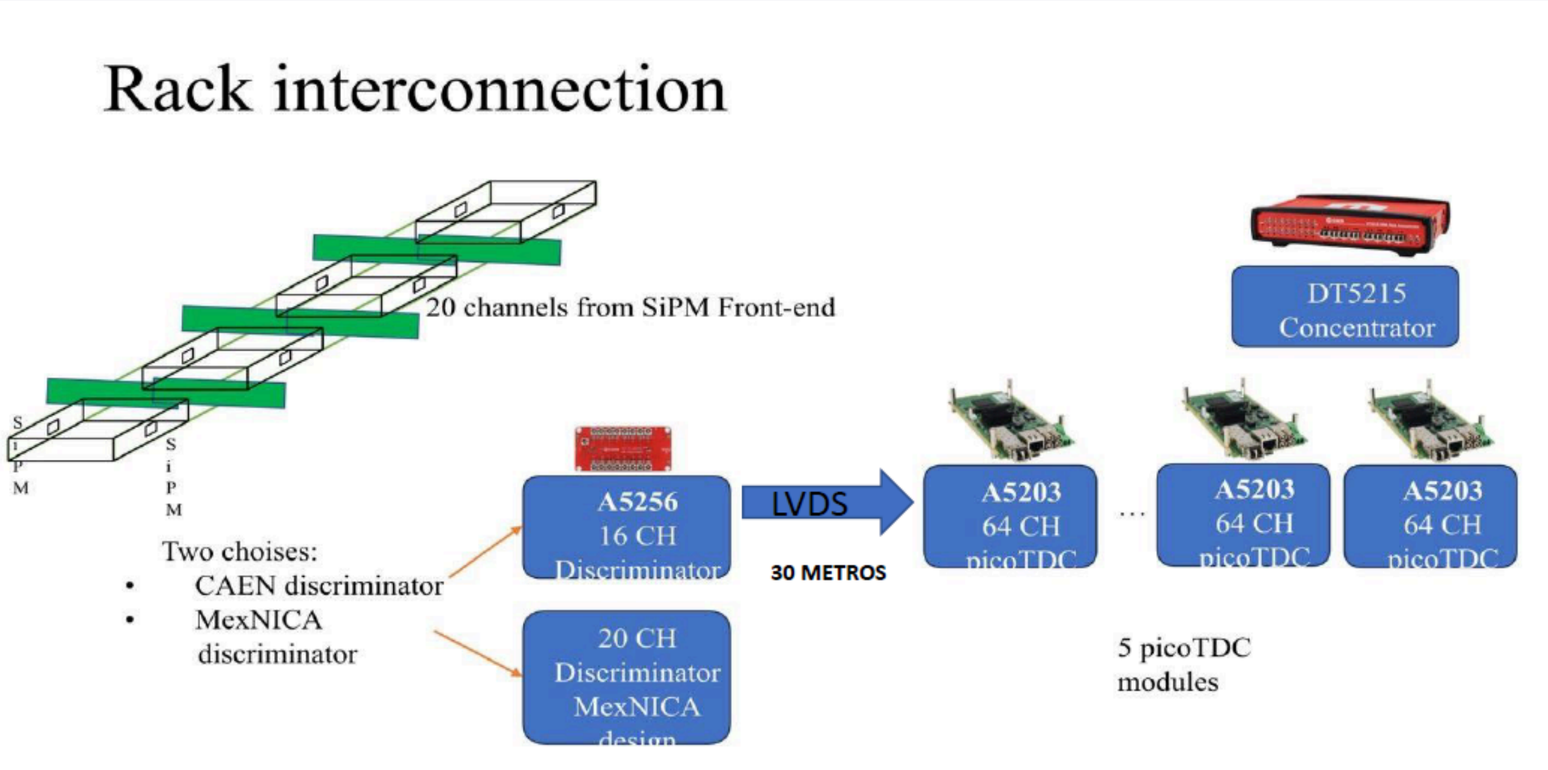






Electronic Boards

- CAEN Modules
- Optic fiber connections
- PS per cell proper design
- Access for maintenance



OPCIONES
-caen
-FRONT END

https://www.caen.it/products/a5255/
https://www.caen.it/products/a5256/
https://www.caen.it/products/dt5203/

Electronic Boards

- CAEN modules

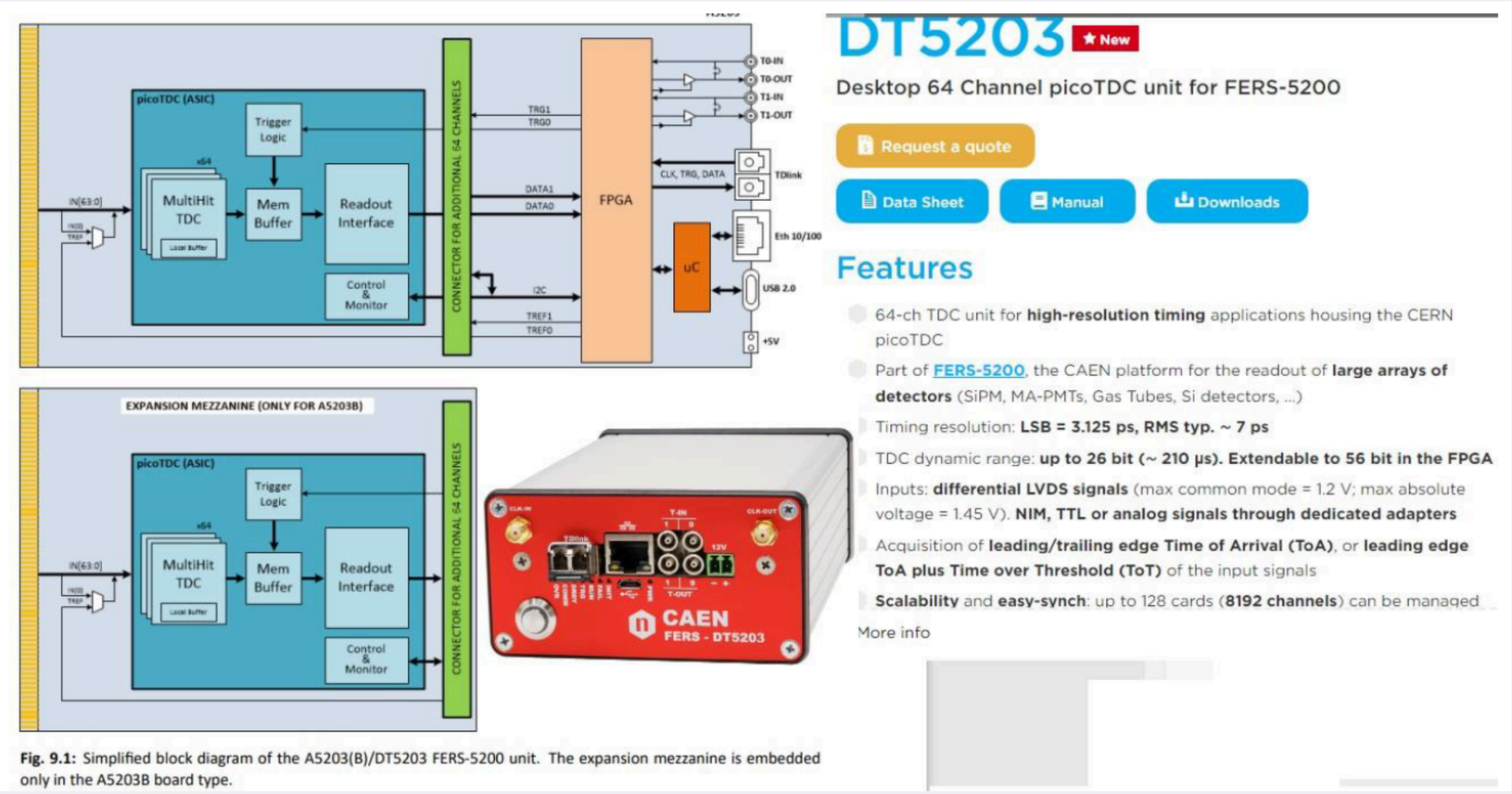
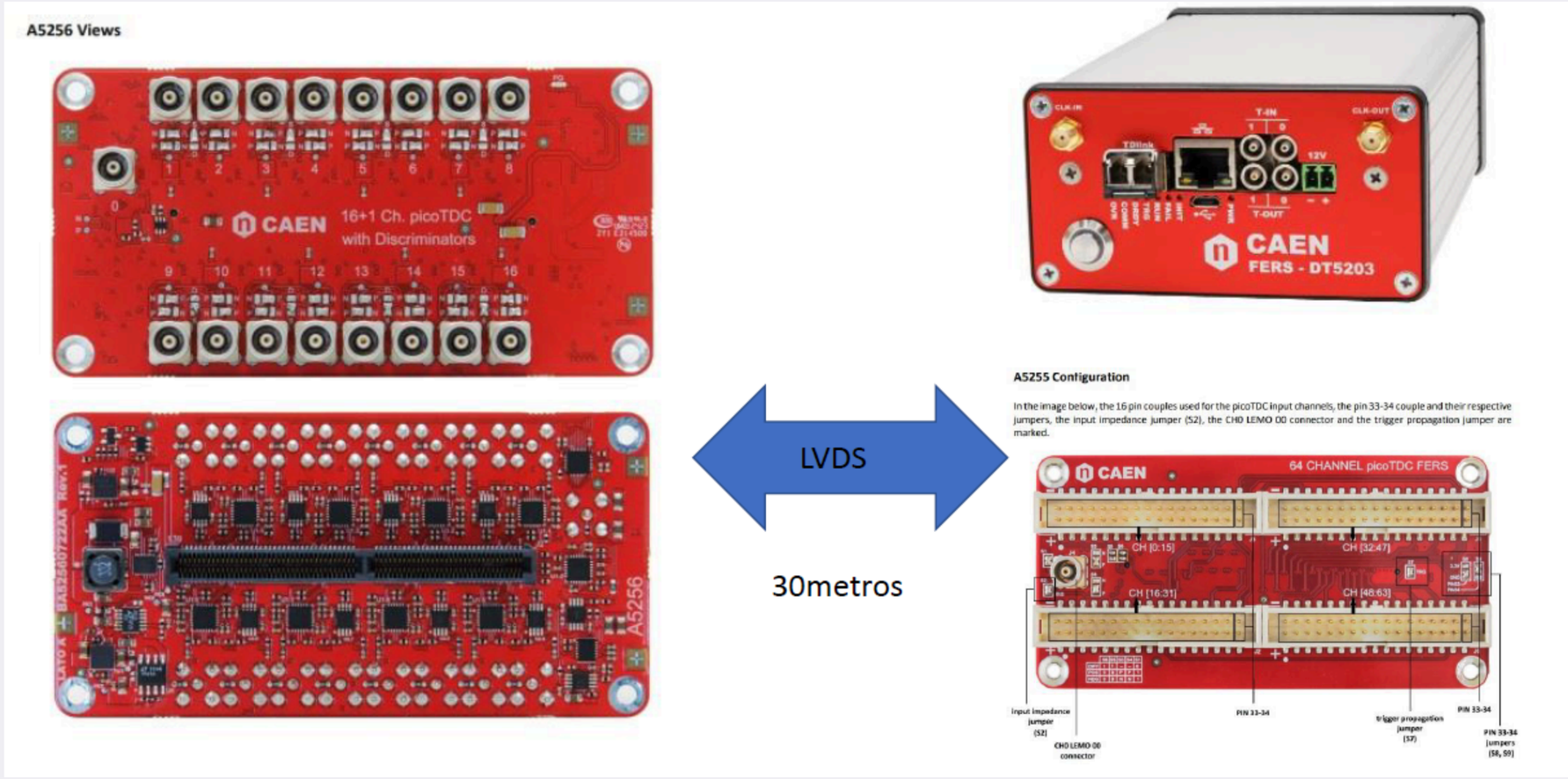


Fig. 9.1: Simplified block diagram of the A5203(B)/DT5203 FERS-5200 unit. The expansion mezzanine is embedded only in the A5203B board type.

Electronic Boards

- CAEN Modules

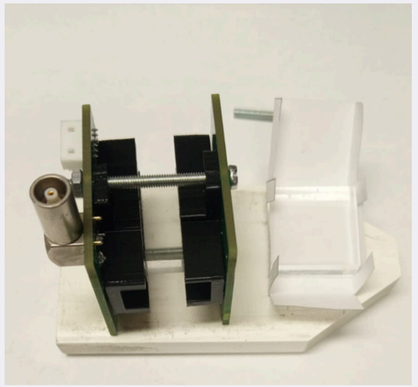


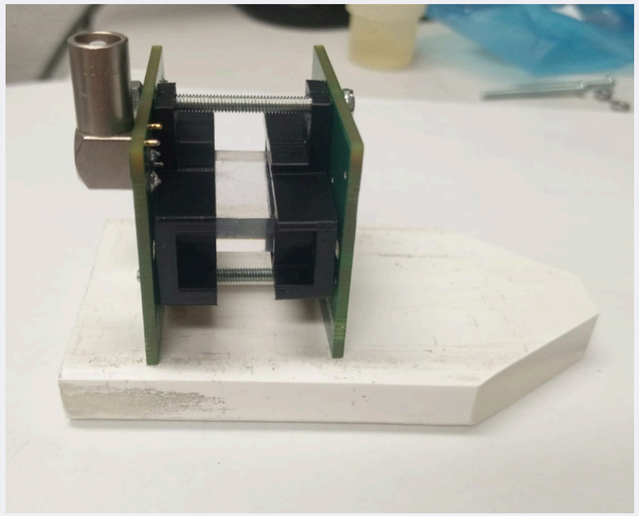
Electronic Boards

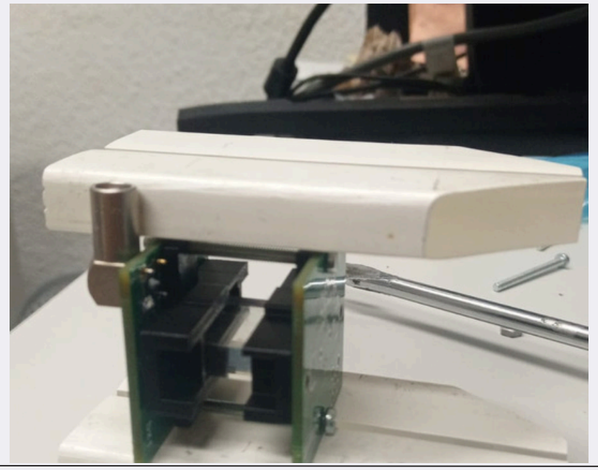
- Cables and connectors

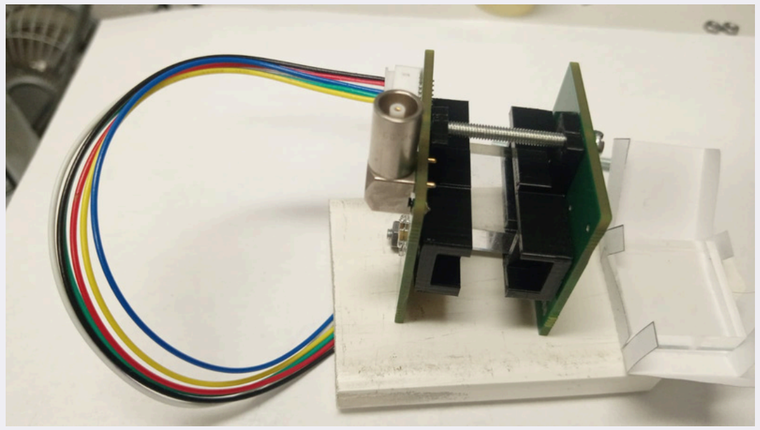
Electronic Boards

- H-Cells









- 4-5 Months for electronic design
- Test and adjustments
- 1 year to complete the project
- Collaboration aproval
- Construction and Instalation *in situ*
- Ready for phase 0

Thanks!

¡Gracias!