MiniBe-Be detector simulation

Cristian Heber Zepeda Fernández

Cátedra CONACyT, FCFM-BUAP

Outline:

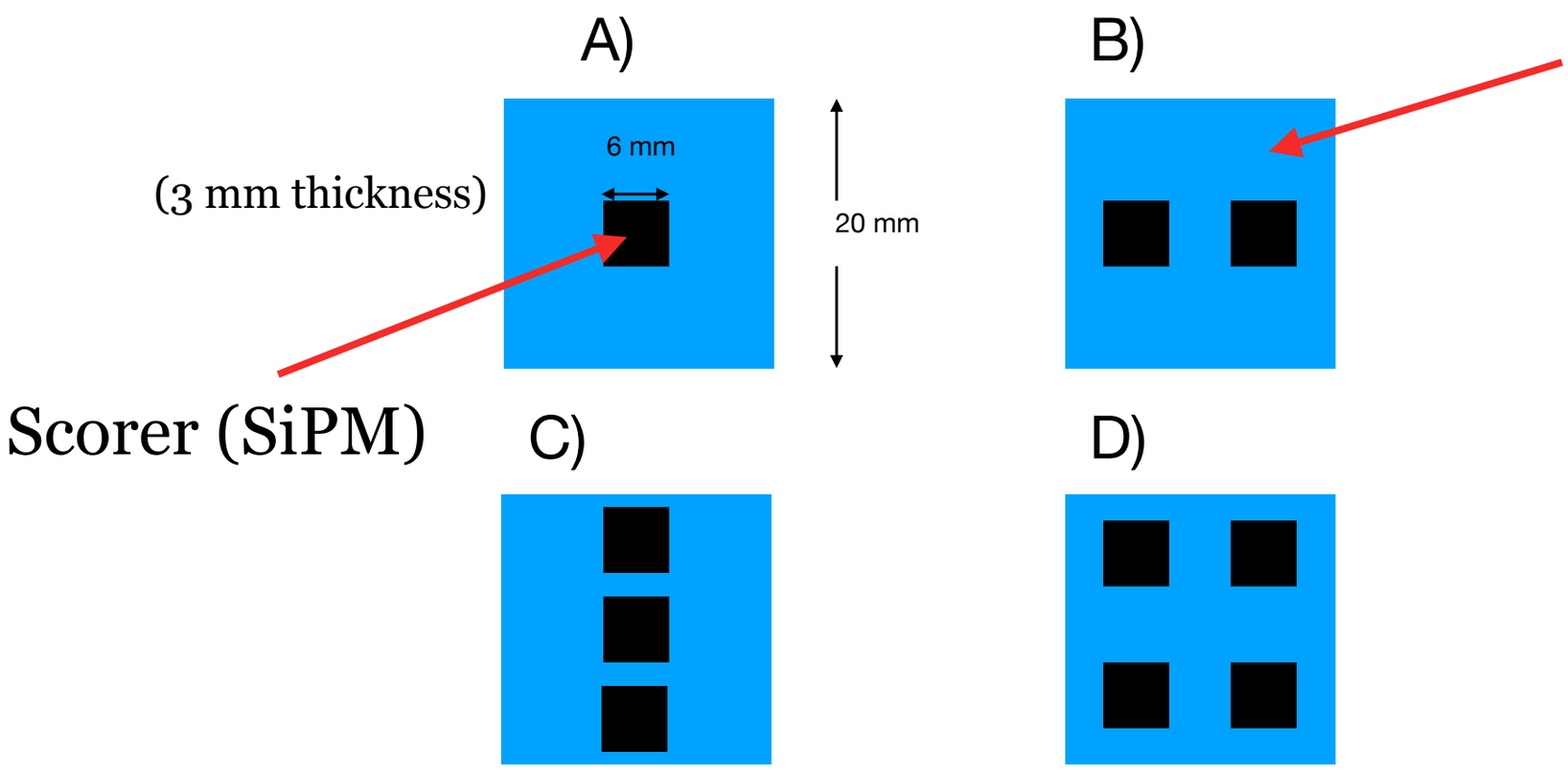
- MiniBe-Be cell intrinsic time resolution.
- MiniBe-Be simulation.
- Cosmic rays distribution seen by MiniBe-Be

Geant4 was used for all simulations

MiniBe-Be cell intrinsic time resolution.

arXiv:2007.11790v2 [physics.ins-det] *JINST: Acepted*

- Four configurations:



Scintillator BC404:

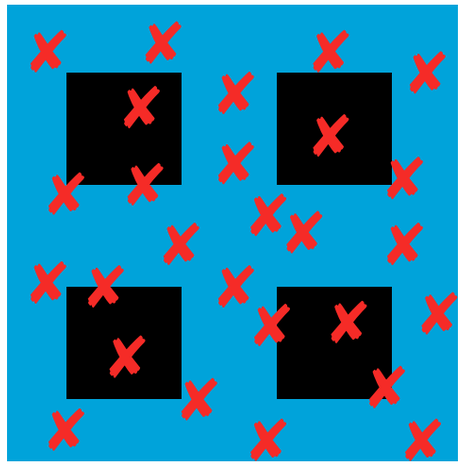
- All optical properties were considered.
- 95% reflective on the surface.
- 100% absorbent on SiPM surface

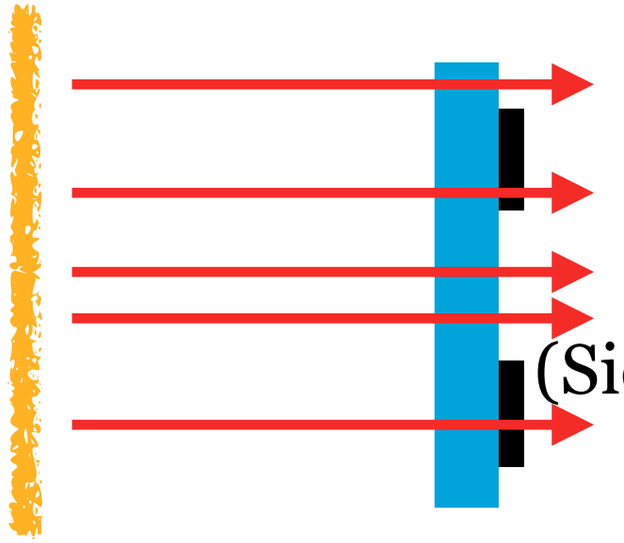
Choosing the configuration with lower intrinsic time resolution

MiniBe-Be cell intrinsic time resolution.

- From MPDRoot: π^+ of 0.5 GeV.
- Random interaction

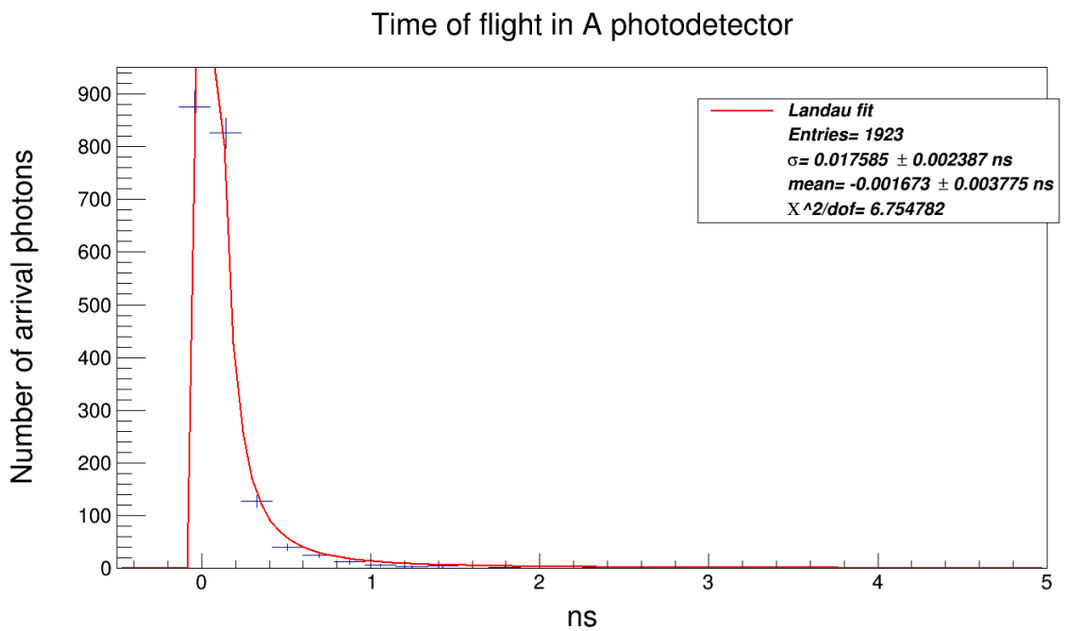
(Front view)





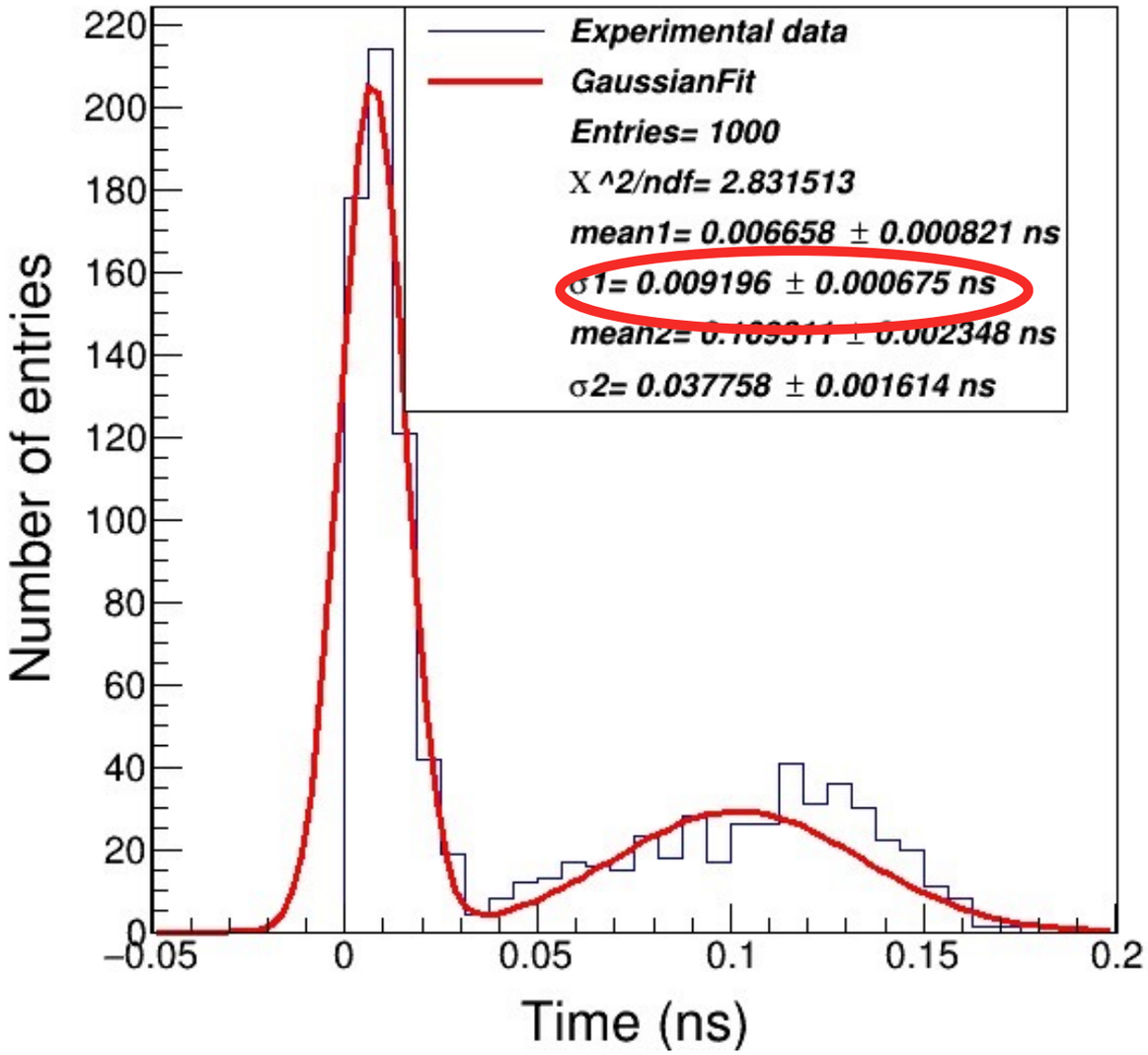
- **Each event: The minimum mean arrival time Landau distribution of each scorer was taken.**

*A. Alvarado et al. 2020 Nucl. Instrum. Meth. A **953** 163150.*



MiniBe-Be cell intrinsic time resolution.

- Minimum mean Gaussian distribution



Remarks

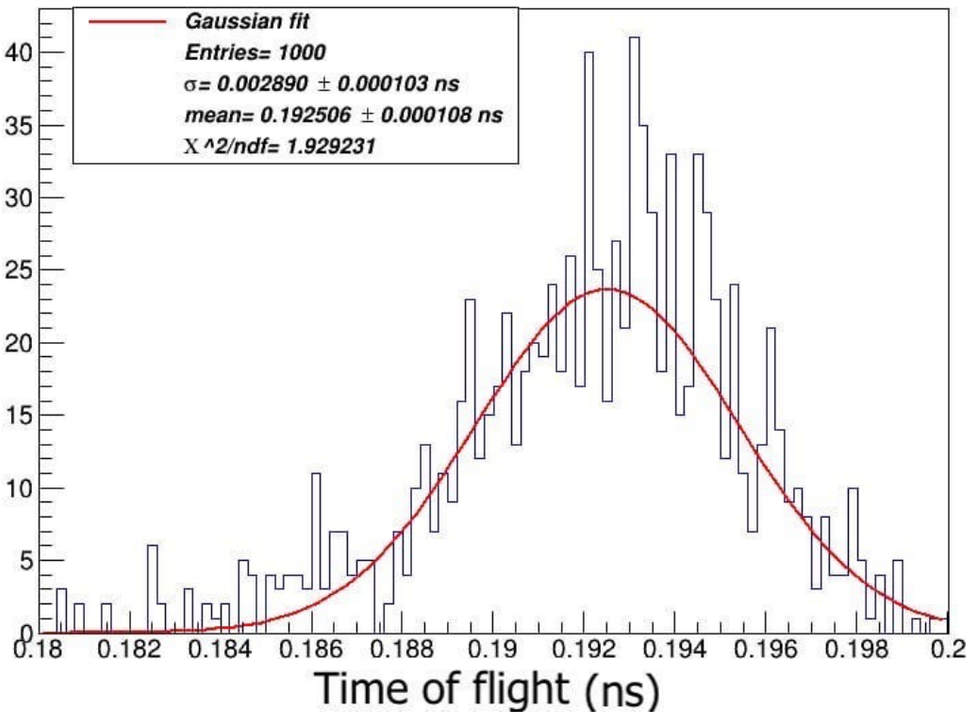
- Two Gaussians for all configurations.
- First Gaussian: Intrinsic time resolution around of 2 ps.

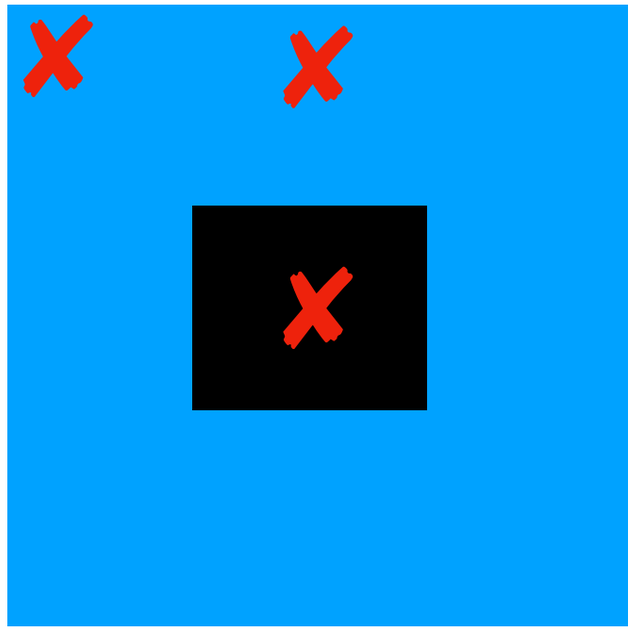
(See Javier´s talk for more detail)

MiniBe-Be cell intrinsic time resolution.

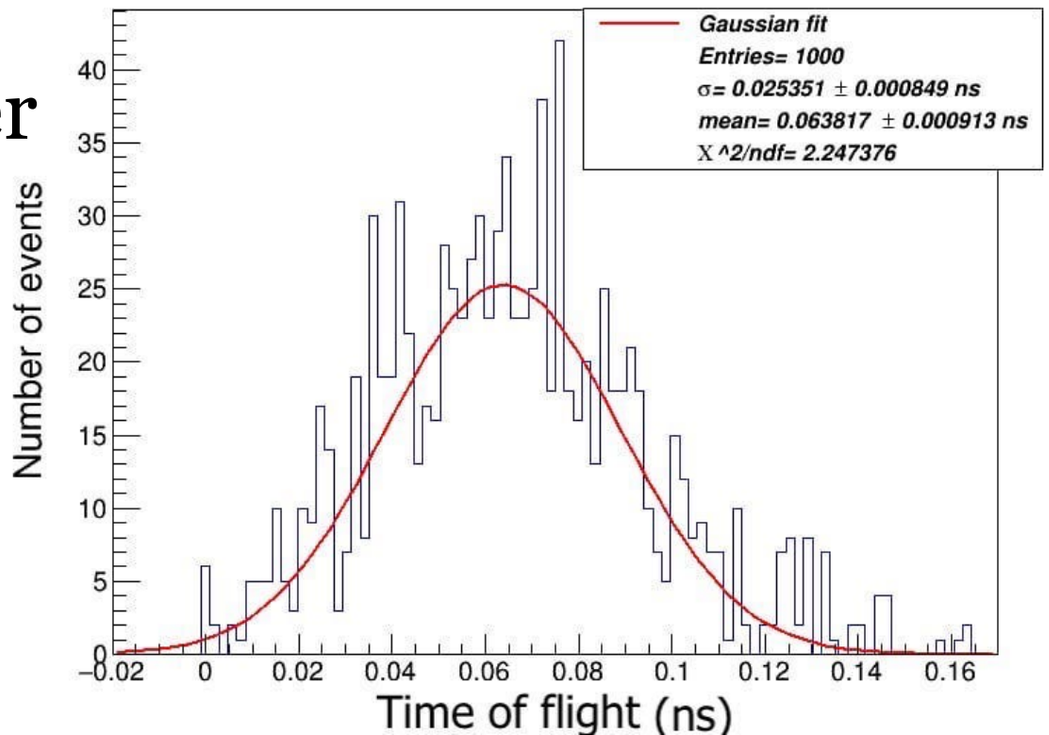
- Three interaction zones

Top

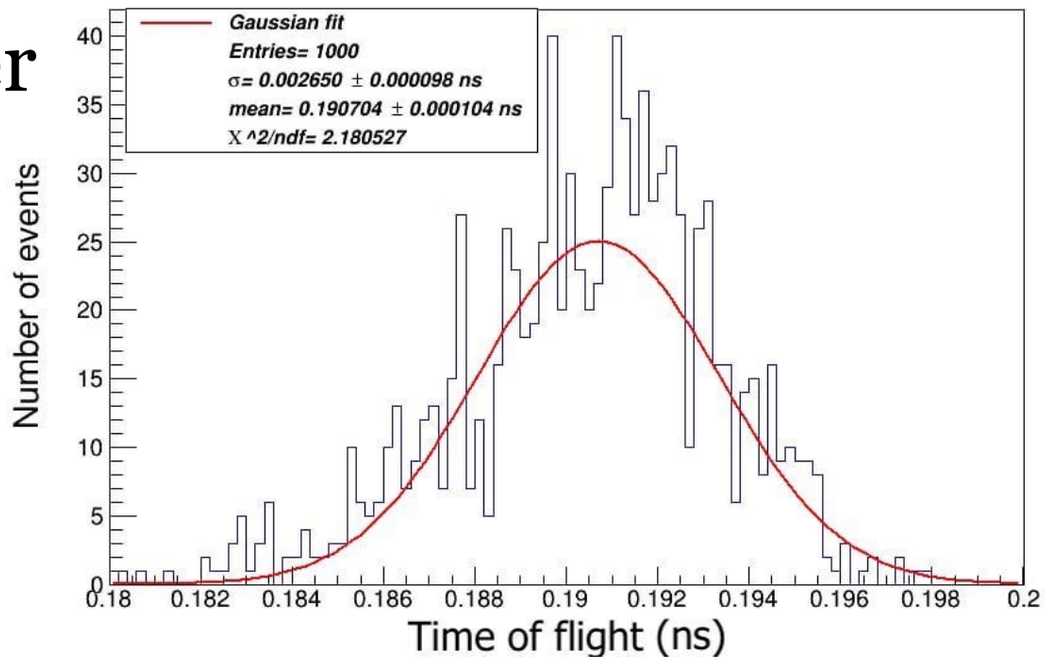




Center



Corner



MiniBe-Be cell intrinsic time resolution.

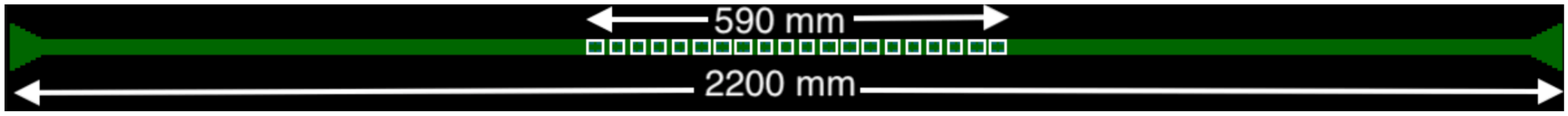
Conclusions

- Time resolution is sensitive to interaction point.
- Time resolution is in 2-26 ps. Same results for the other configurations!!! (arXiv:2007.11790v2 [physics.ins-det]) due to the dimensions (see Javier´s talk)
- The mean photon arrival time:
  - 1 Scorer: 60-192 ps
  - •
  - •
  - •
  - 4 Scorers: 30-60 ps

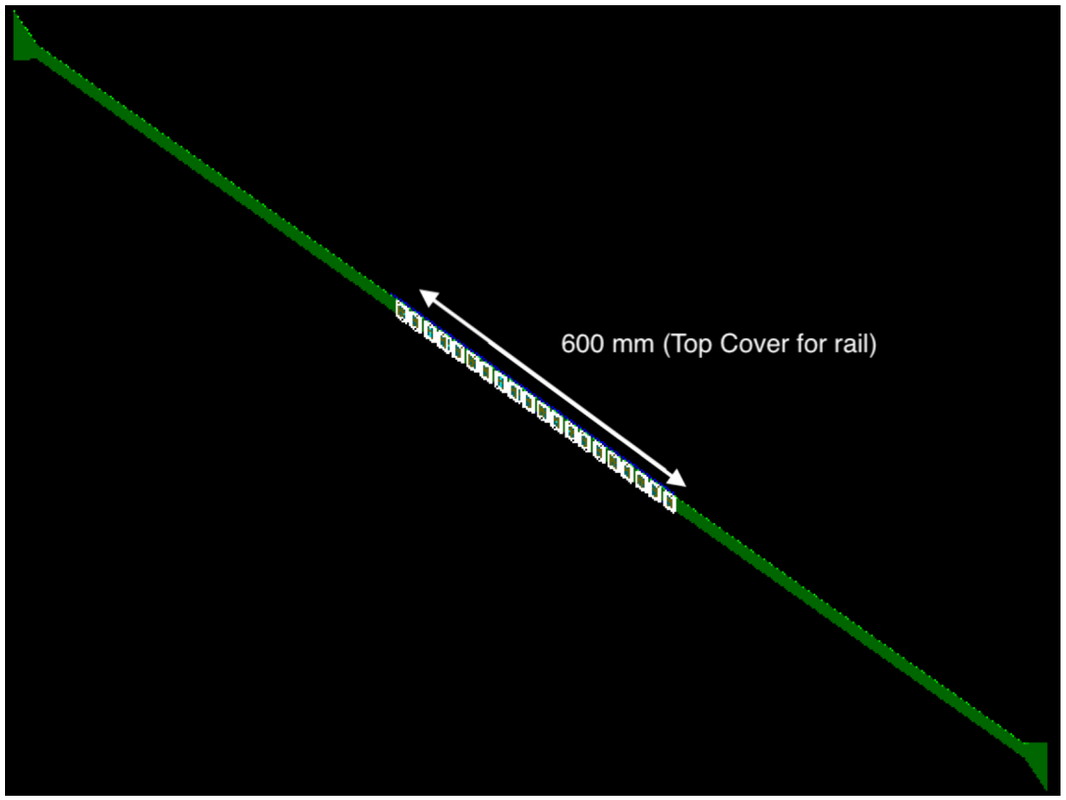
Configuration for miniBeBe

MiniBe-Be simulation.

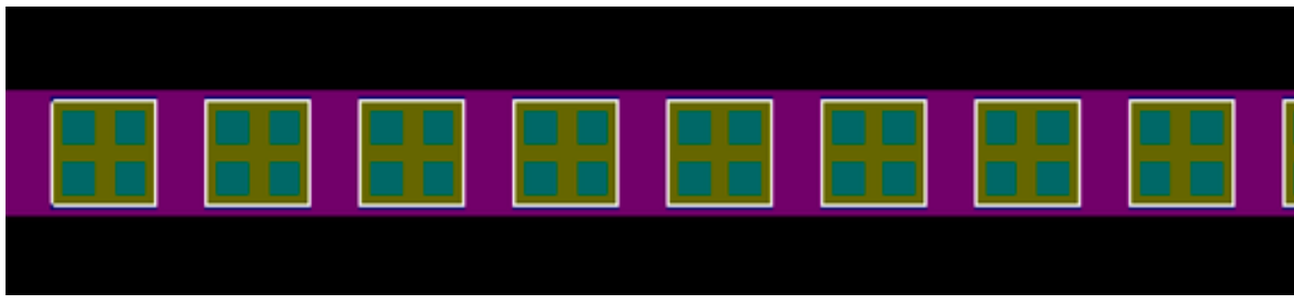
A Strip of MiniBe-Be:



A rotated view

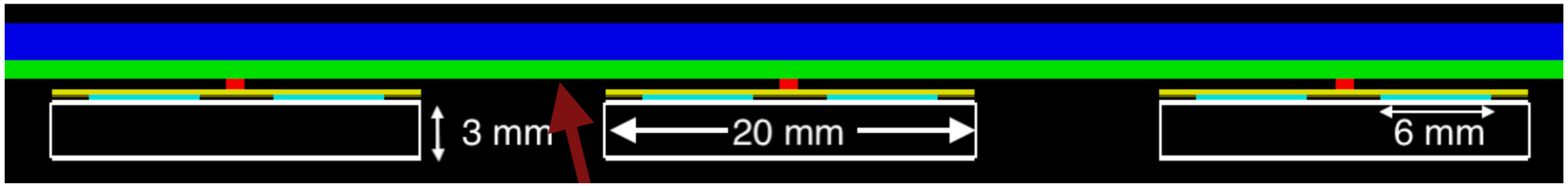


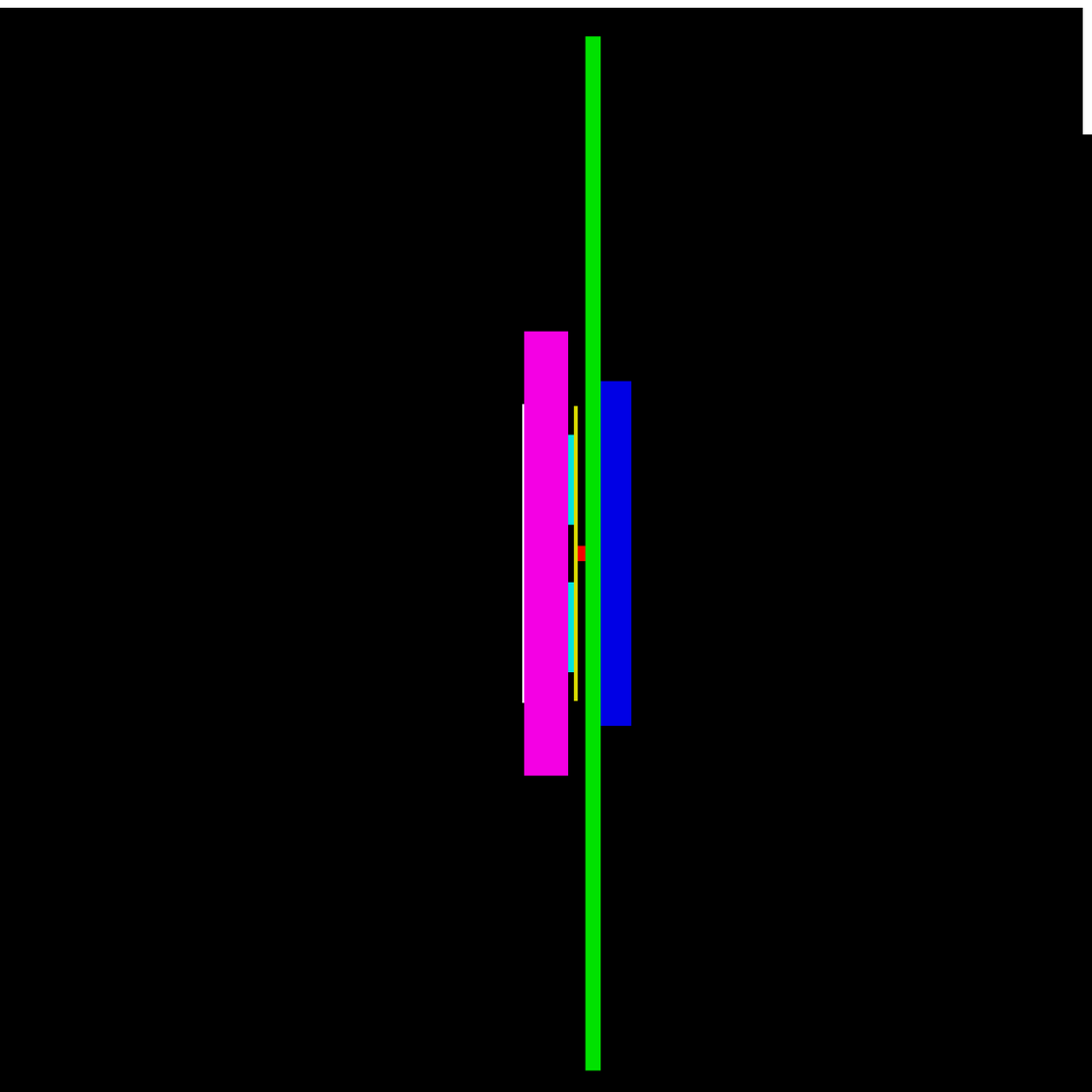
Zoom front view (section)



MiniBe-Be simulation.

Top view (without the Sensor rail)





Side view (with support)

*Scintillator (BC404)

*Glass (SiPM)

*Bakelite (SFED)

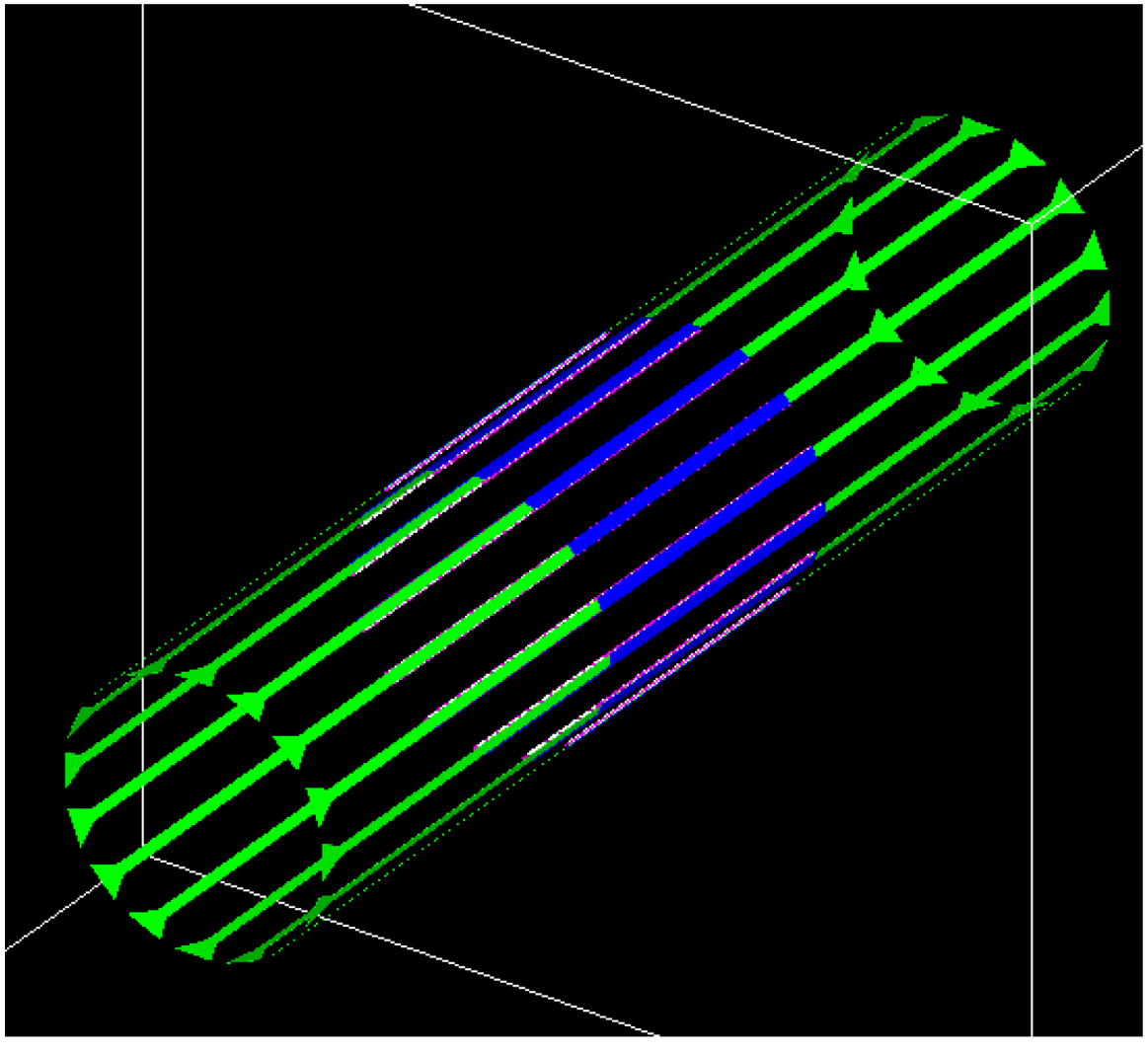
*PVC (conector)

*Bakelite (strip)

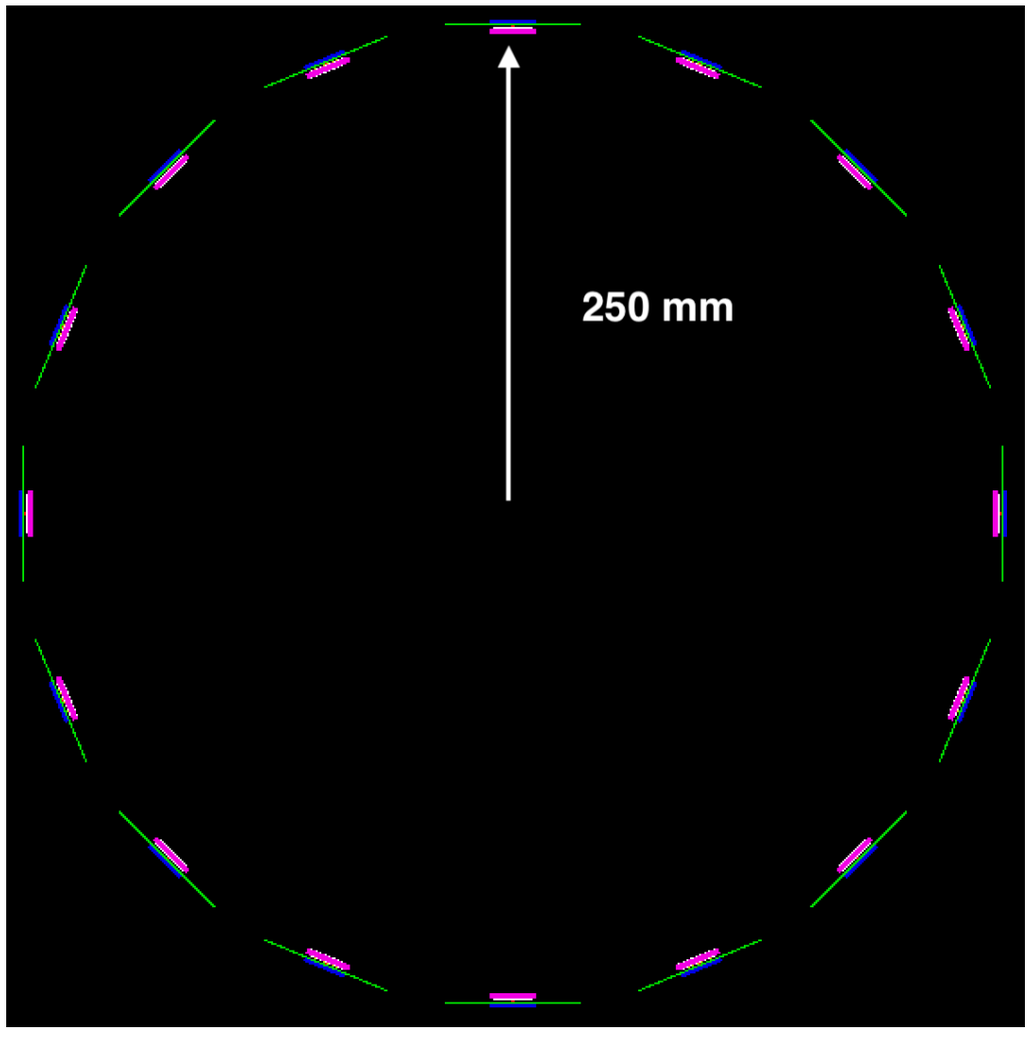
*Carbon Fiber (Top Cover)

*Carbon Fiber (Sensor rail)

MiniBe-Be simulation.



Beam view

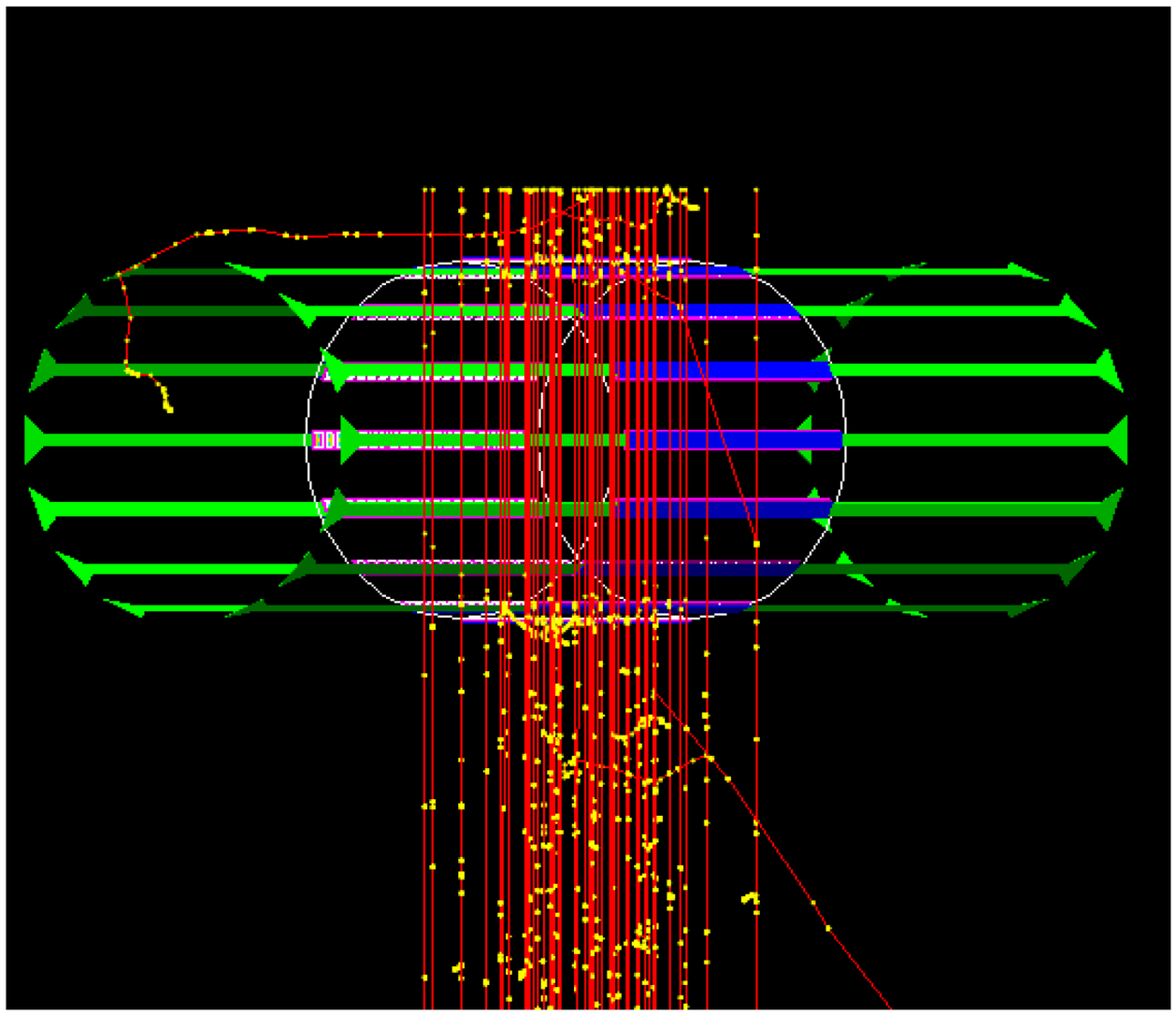


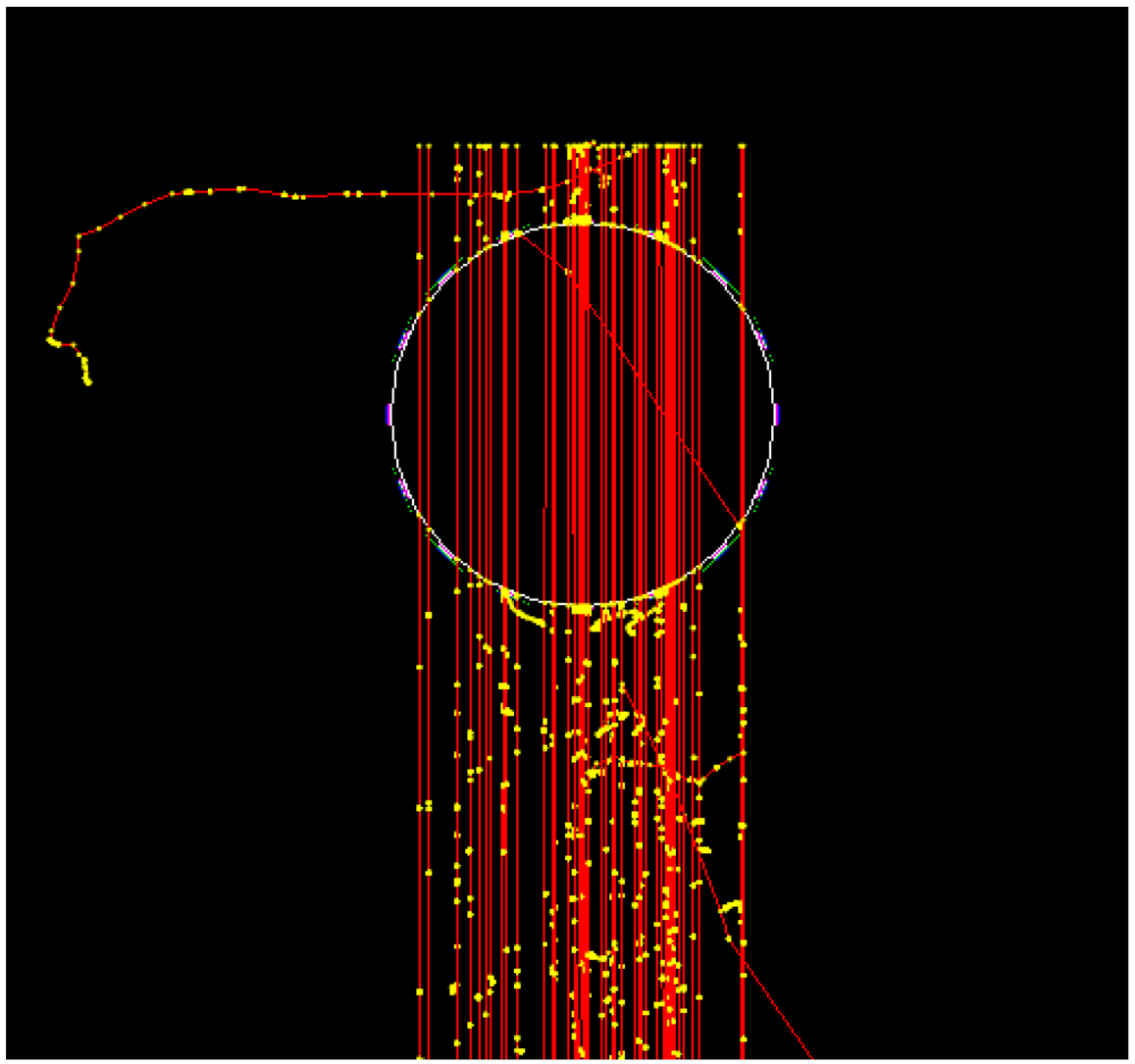
MiniBe-Be simulation.

Muons cosmic rays

Vacuum inside MiniBe-Be

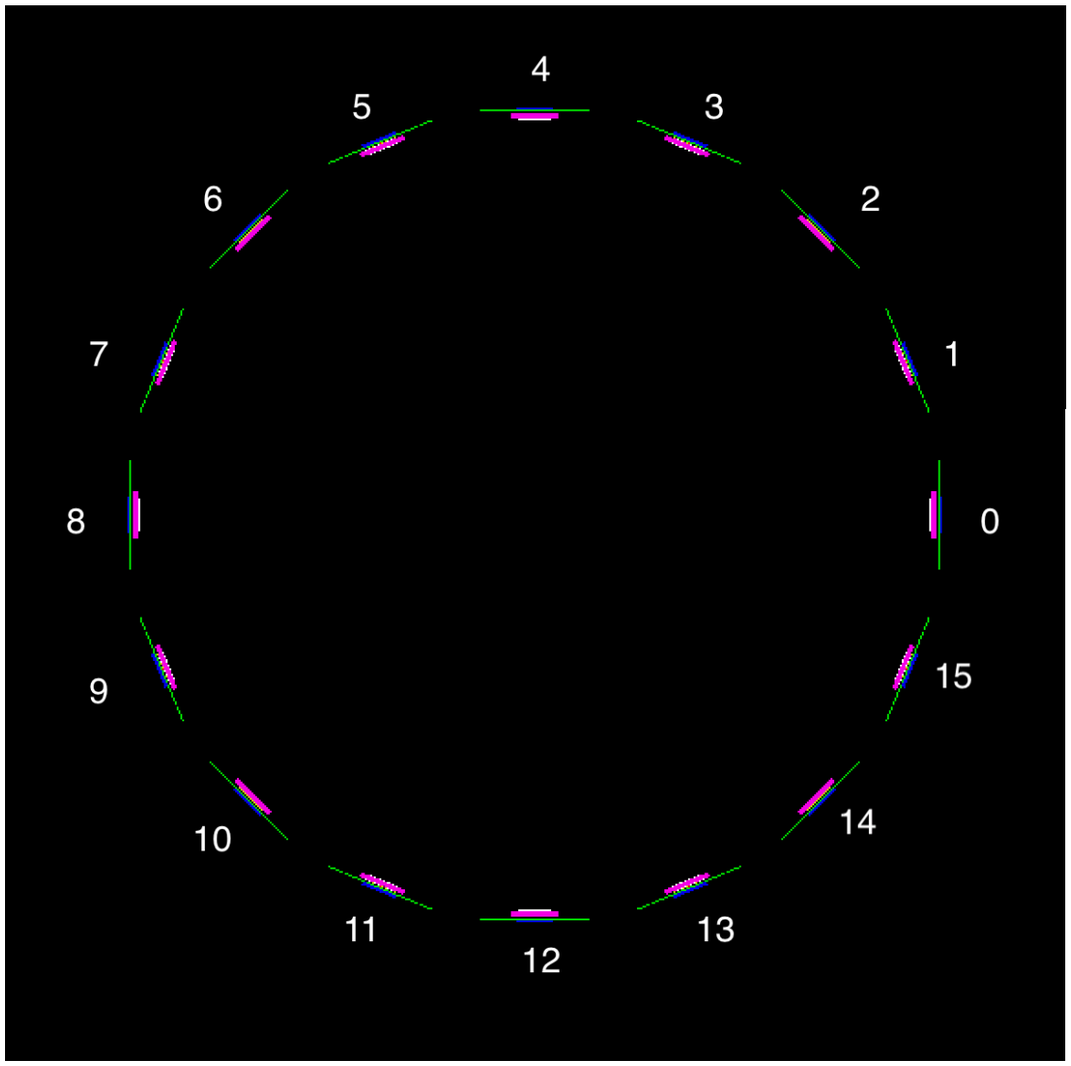
Simulation for 50 muons

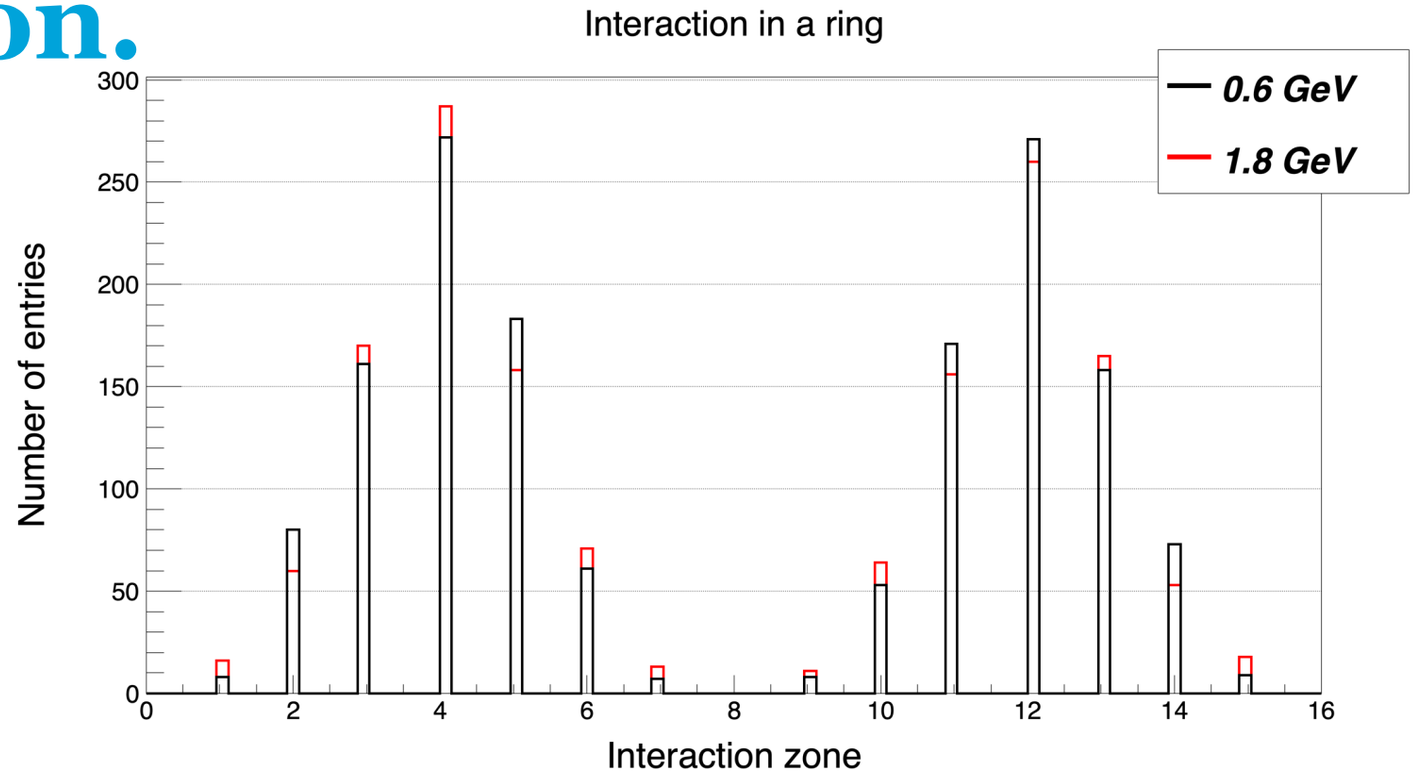


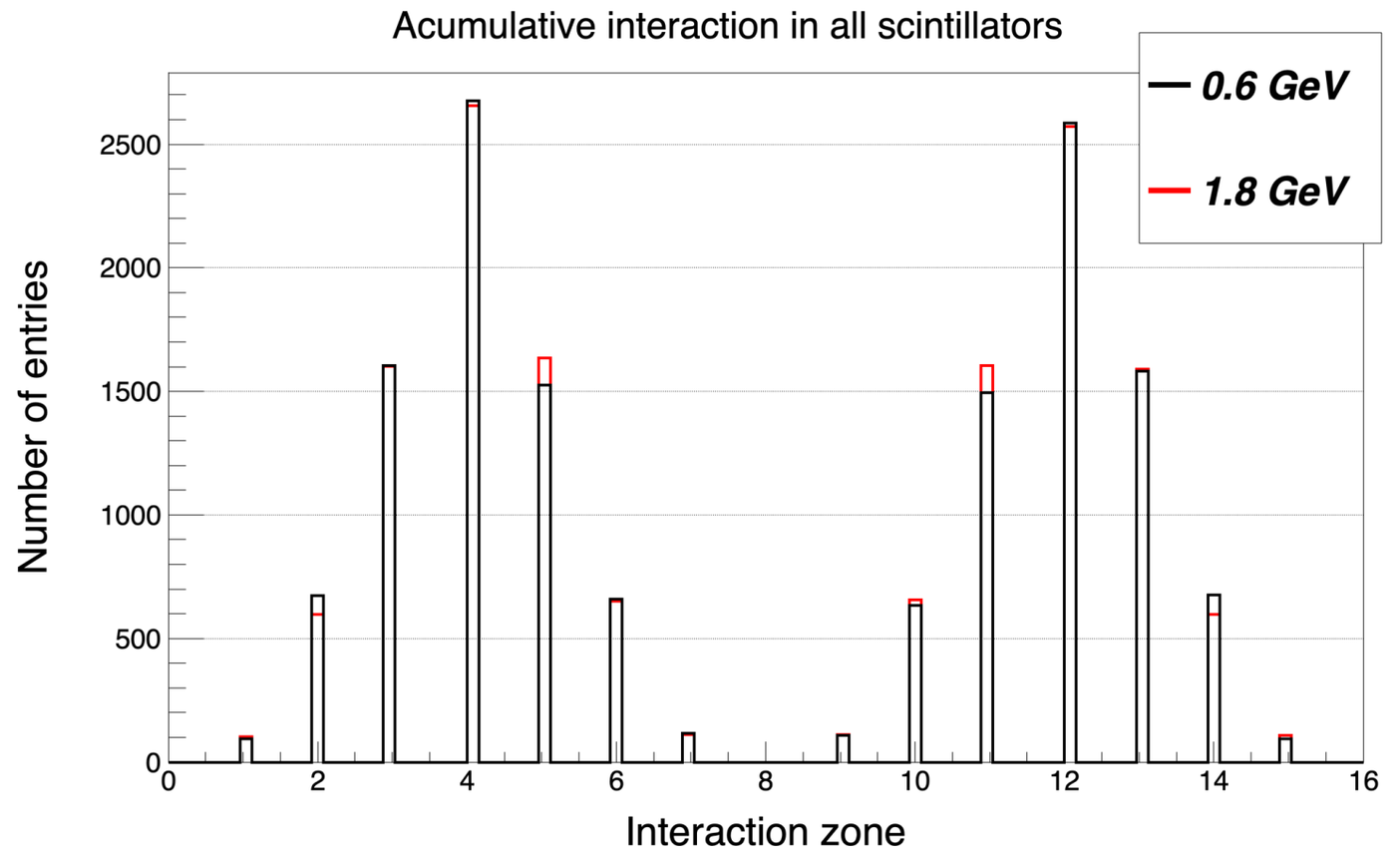


MiniBe-Be simulation.

Simulation for 10,000 muons







Remarks

- Working in the experimental measurement.

  * Time resolution of a cell.
  * The construction of MiniBe-Be.

- The code will be implemented in MPDRoot.

Backup

Cosmic rays simulation with air inside miniBeBe