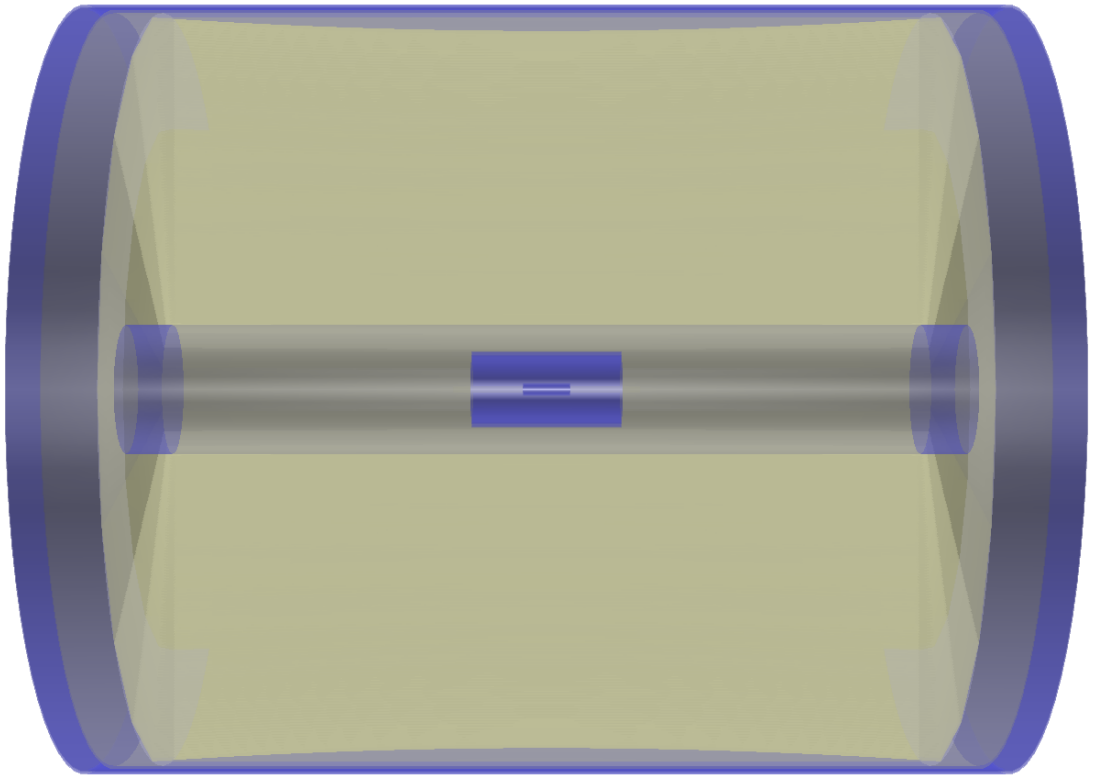
IDEA Detector Simulation Status



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IDEA (baseline) geometry simulation

Following dimensions reported by Mogens talks at FCC-Berlin

- **Pipe**: equivalent to 0.48% X_0 at radius of 15.6 mm (170 µm of Ti, *to avoid overlaps*)
- **SVX:** (for this study) 7 layers of Si:
  - radii: 17.0, 23.0, 31.0, 180.0, 200.0, 330.0, 340.0 mm;
  - lengths: 250, 250, 250, 800, 800, 1500, 1500 mm (coverage not checked);
  - thickness 0.28, 0.28, 0.28, 0.94, 0.94, 0.94, 0.94 mm
  - pixel 20 µm;
- **DCH**: (gas He 90% i-C_4H_{10} 10%)
  - radii: 345, 2000 mm:
  - length: 4000 mm;
  - Cell: 56448;
  - Layers: 112;
  - Cell size: 11.85 – 14.7 mm;
  - Stereo angle: 48 - 250 mrad.
- **PSHW**: 2 active layers (+ 2 Lead radiator layers):
  - radii: 2012, 2027 mm (2004, 2014);
  - Lengths: 4800, 4800 mm (4800, 4800);
  - thickness 0.94, 0.94 mm (6, 11)
  - pixel 70 µm;

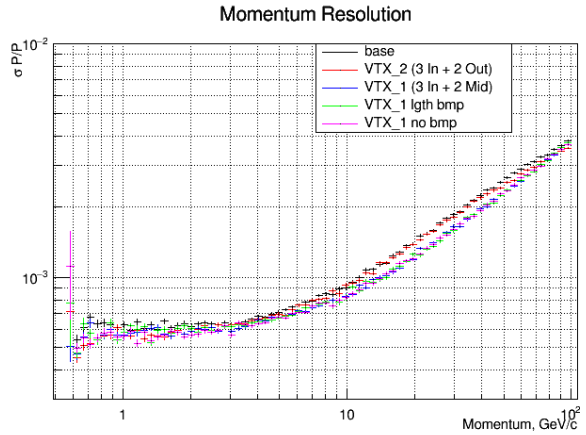
IDEA single track fitting (additional tests)

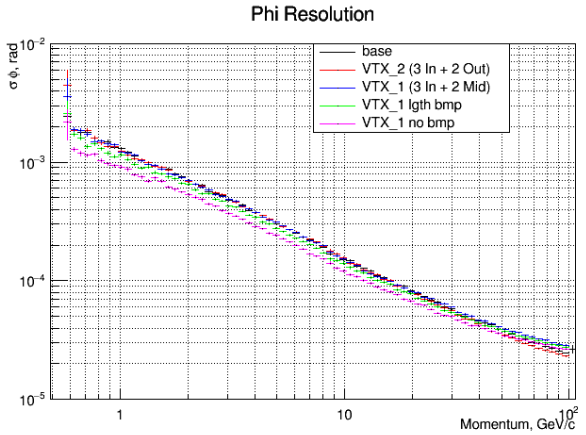
We perform a comparison of the following configuration:

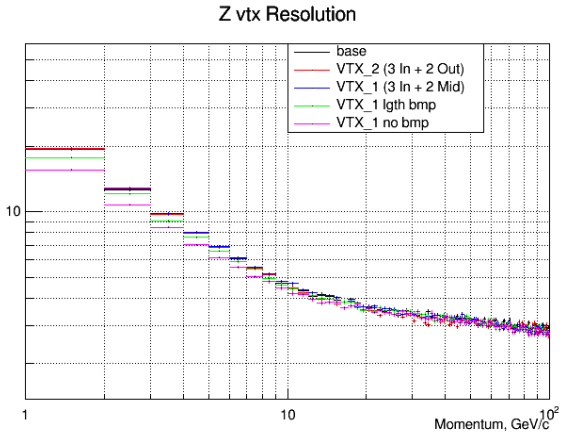
- Using a VTX made of the 3 inner layers and the 2 outers ones (VTX_2).
- Using a VTX made of the 3 inner layers and the 2 central ones (VTX_1).
- With VTX_1 use a thinner Beam Pipe (made of 1mm of Beryllium).
- With VTX_1 without Beam Pipe wall

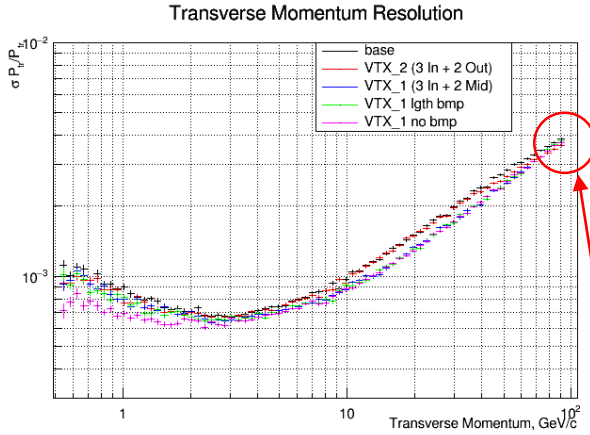
Moreover we performed a scan of the resolutions as a function of the theta angle for tracks of fixed momenta (1, 5, 10, 30, 100 GeV).

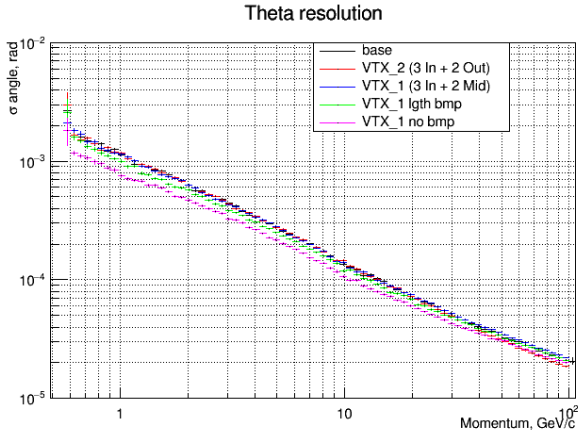
Resolutions (μ^- at fixed θ=65deg)

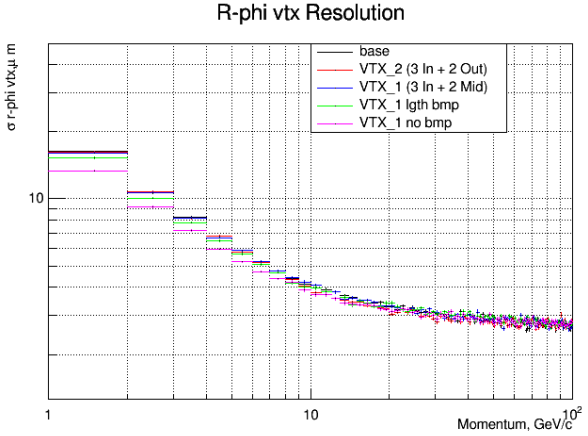






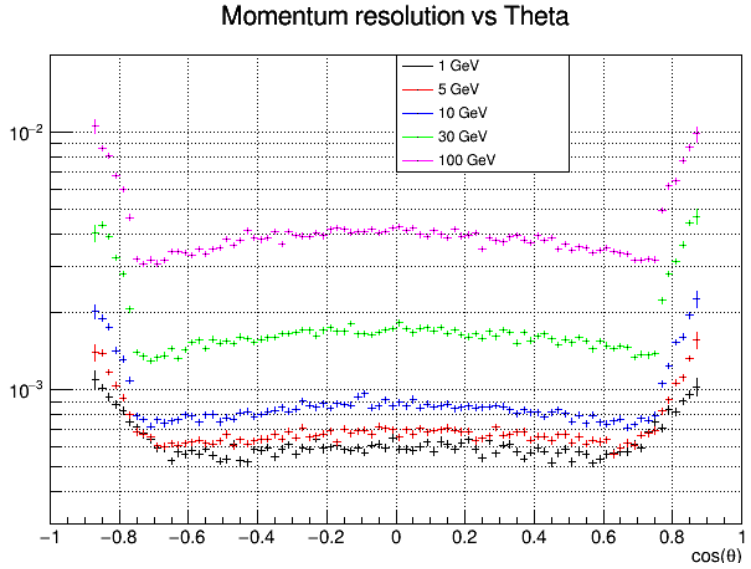


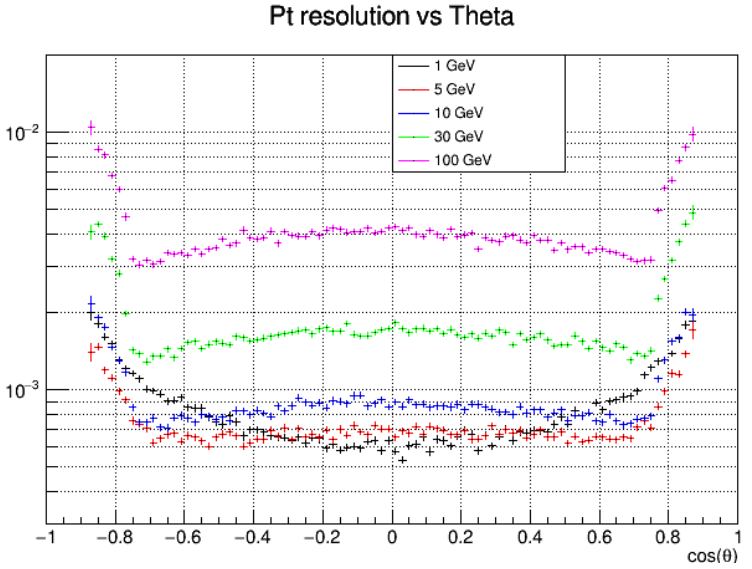


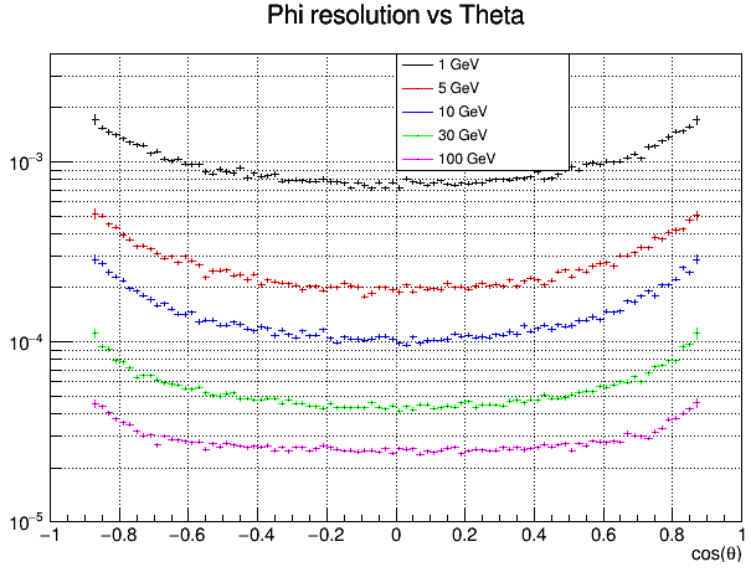


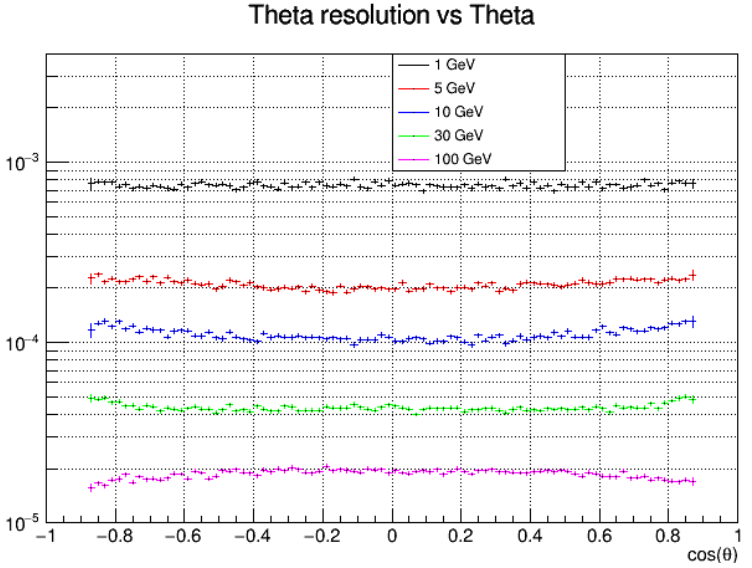
$\sigma pt/pt^2(100GeV) = 3\text{-}4 \times 10^{-5}$

Resolutions (μ^- as function of θ)

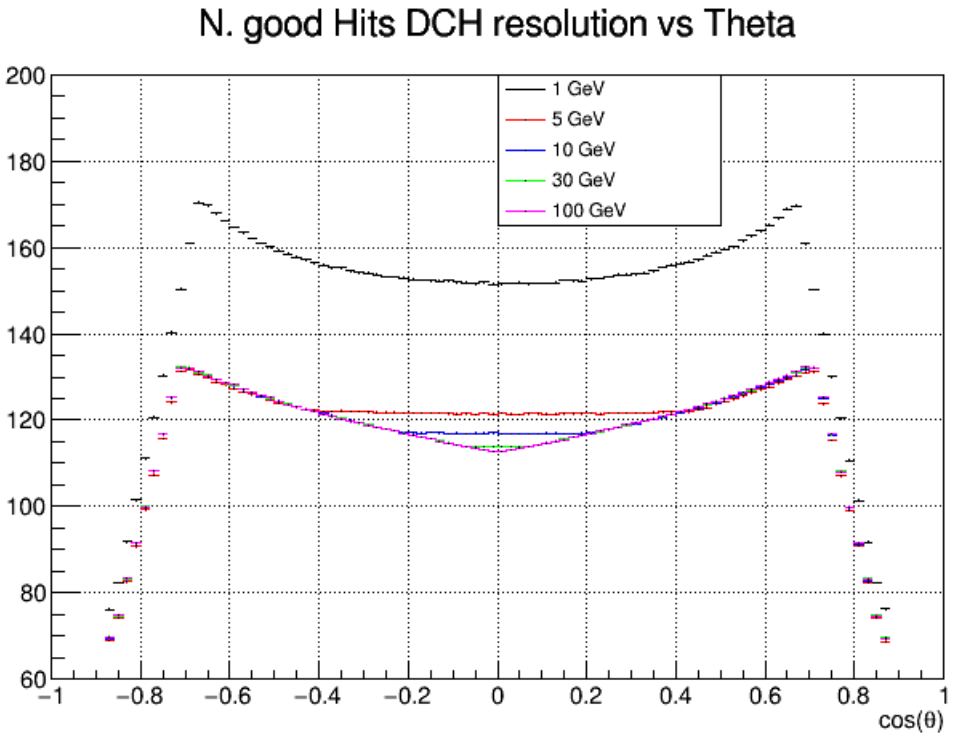


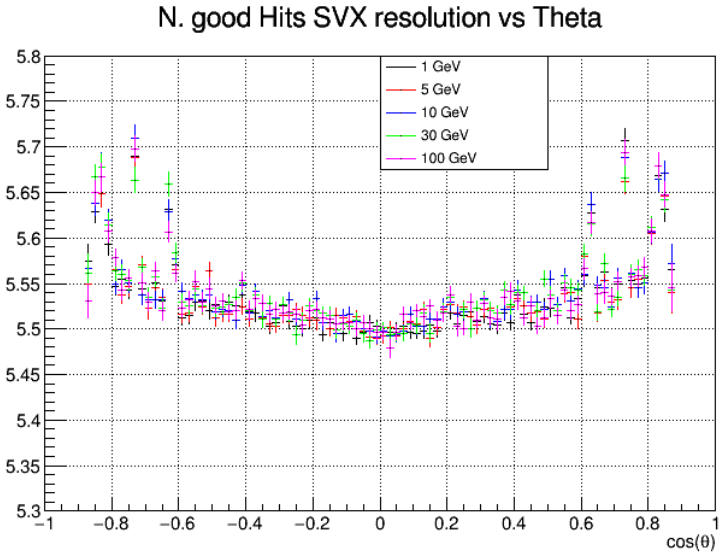


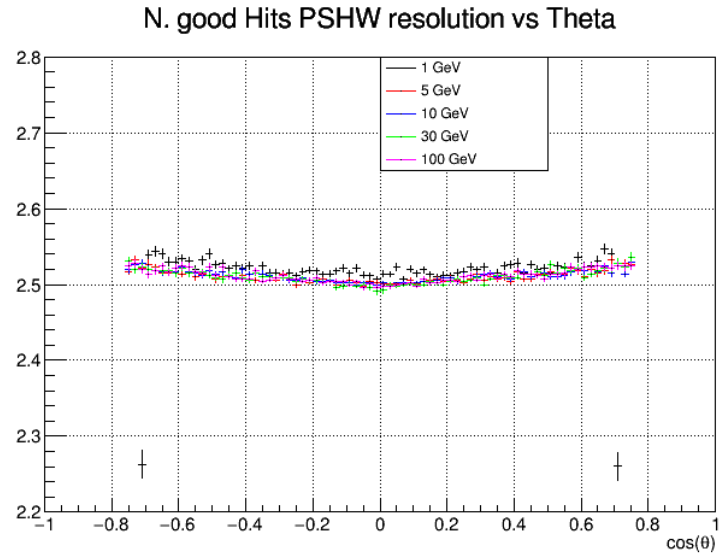




Resolutions (μ^- as function of θ)







Works in progress

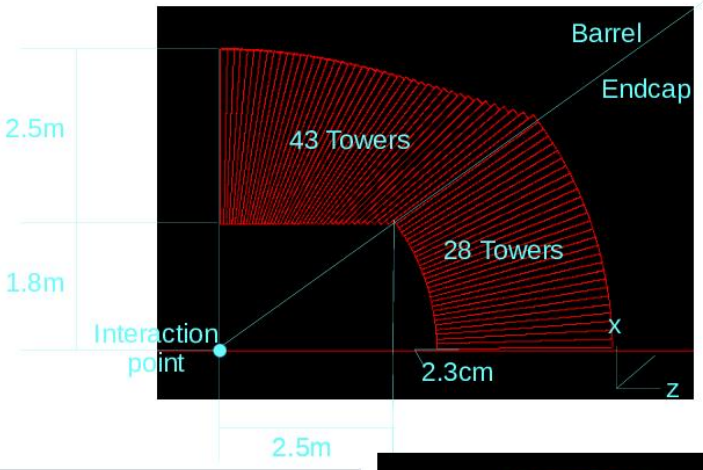
- Integration of the CDCH simulation inside the FCCsw:
  - Niloufar Alipour Tehrani is performing the integration;
  - She started by inserting a simplified DCH geometry in FCCsw;
  - We are discussing how to proceed now.
- Integration of the DR calorimeter inside the actual IDEA full simulation tools:
  - We got the 4pi DR calorimeter geometry from CEPC collaboration;
  - The integration should finish during this week;
  - We will merge the simulation of the Pavia group on a DR calorimeter prototype with the 4pi one got from CEPC.
- The CEPC collaboration is started to integrate the CDCH simulation inside their framework (ILCSoft + Mokka)
  - Xu Yin is performing the integration;
  - He succeeded to import the CDCH geometry in Mokka;
  - Currently we are performing a validation of the CDCH simulation in Mokka.
  - Hit production, track fitting and track reconstruction integration is not started yet.
- *DCH prototype in preparation for test beam on second half of September*

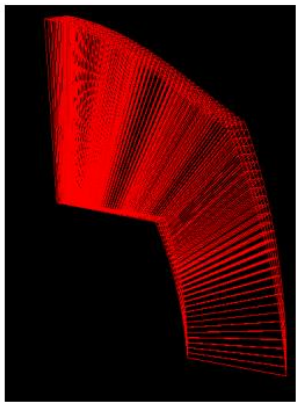
Integration of the DR calorimeter inside the actual IDEA full simulation tools

Mokka DR calo geometry:
autor FU ChengDong

I'm working on the porting of the DR 4pi geometry inside the IDEA sim tool.

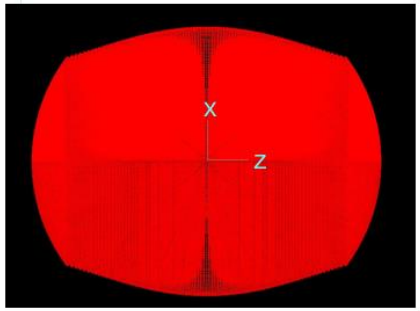
Lorenzo Pezzotti (INFN Pavia) is working on the merging of the Sensitive Detector of the prototype simulation and of the Mokka DR code.

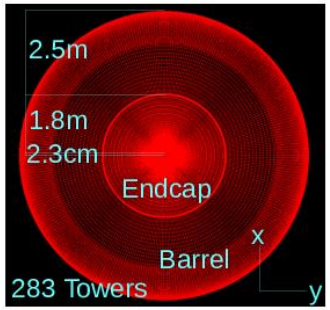




Inner Radius = 1.8 m
Outer Radius = 1.8+2.5 m
Length of the tower = 2.5 m
One tower covers ~1.23 deg.

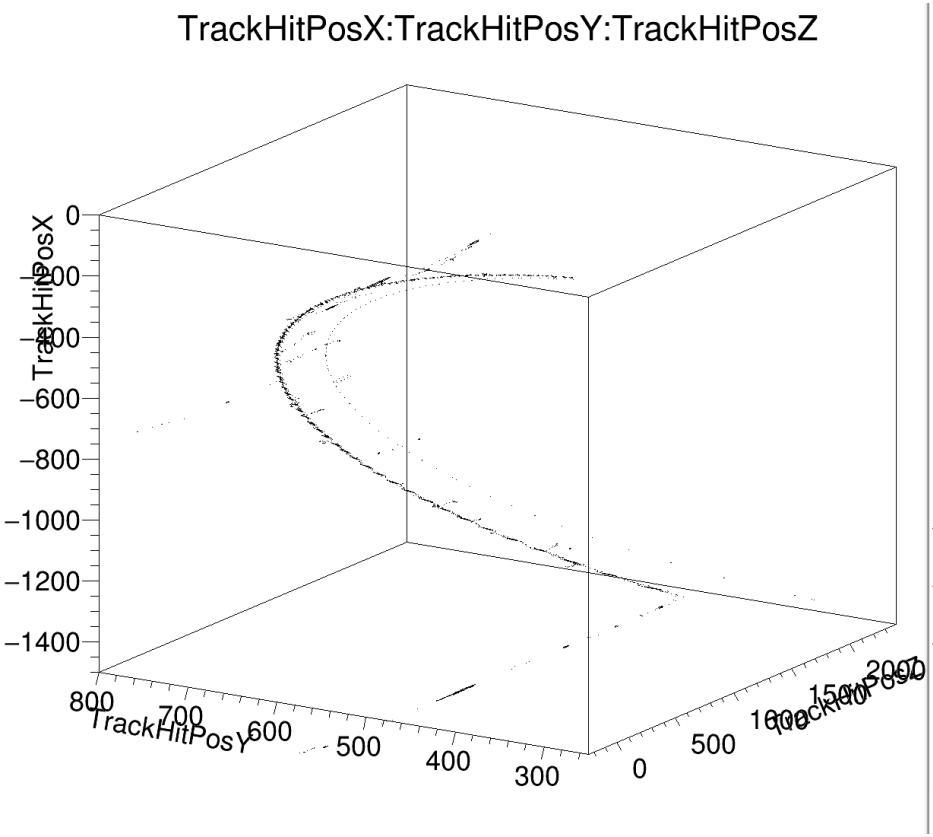
All towers indicate the interaction point



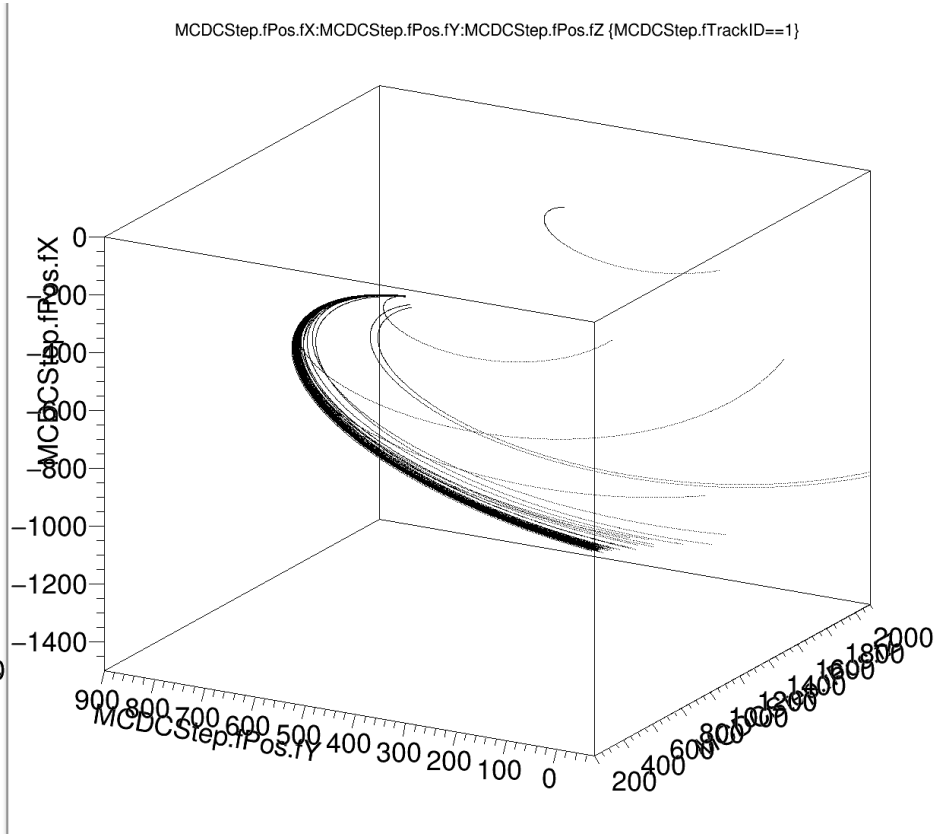


CDCH Mokka simulation validation status

Mokka

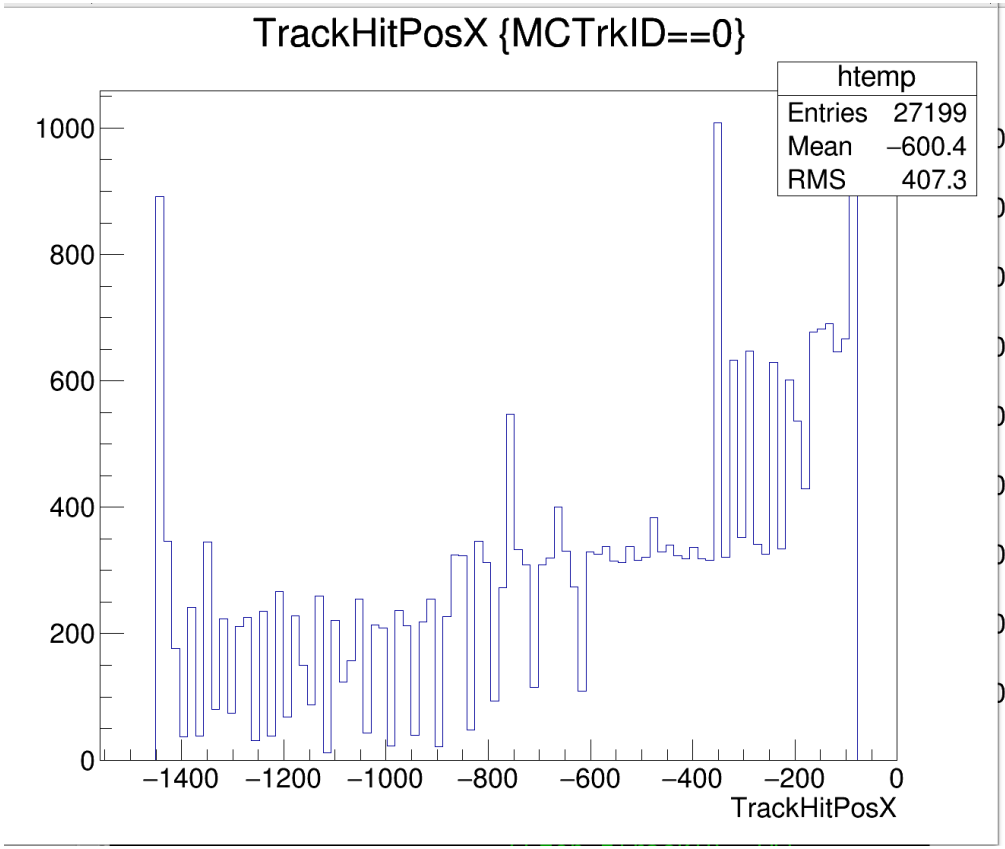


IDEA sim tool
(delta ray removed)

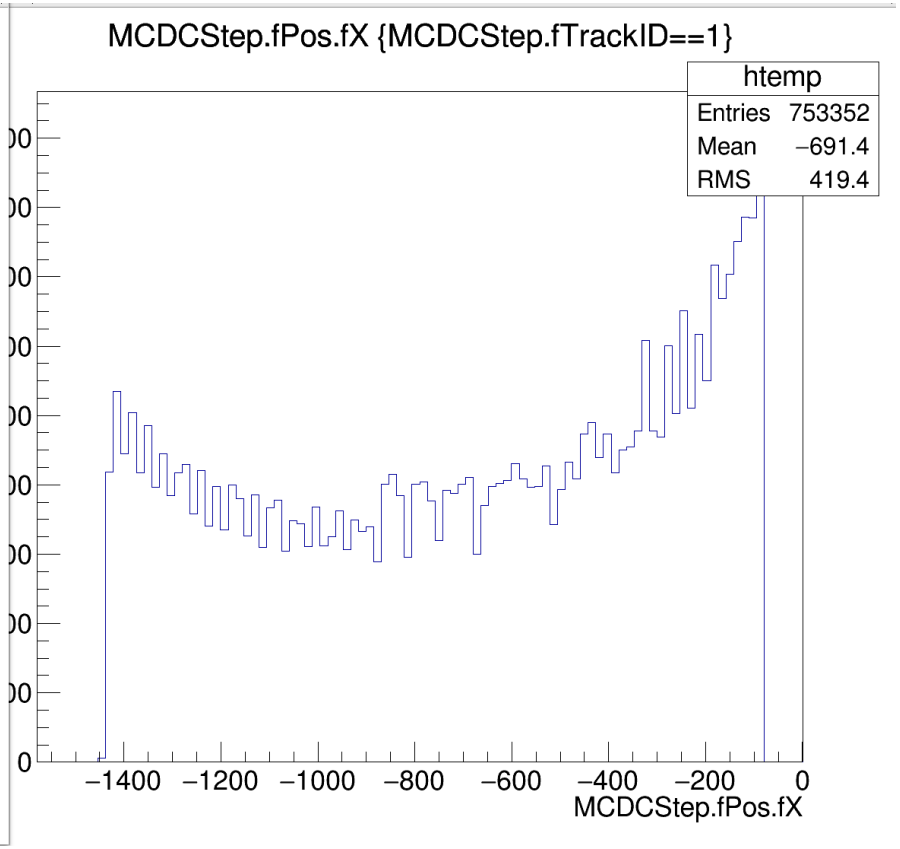


CDCH Mokka simulation validation status

Mokka

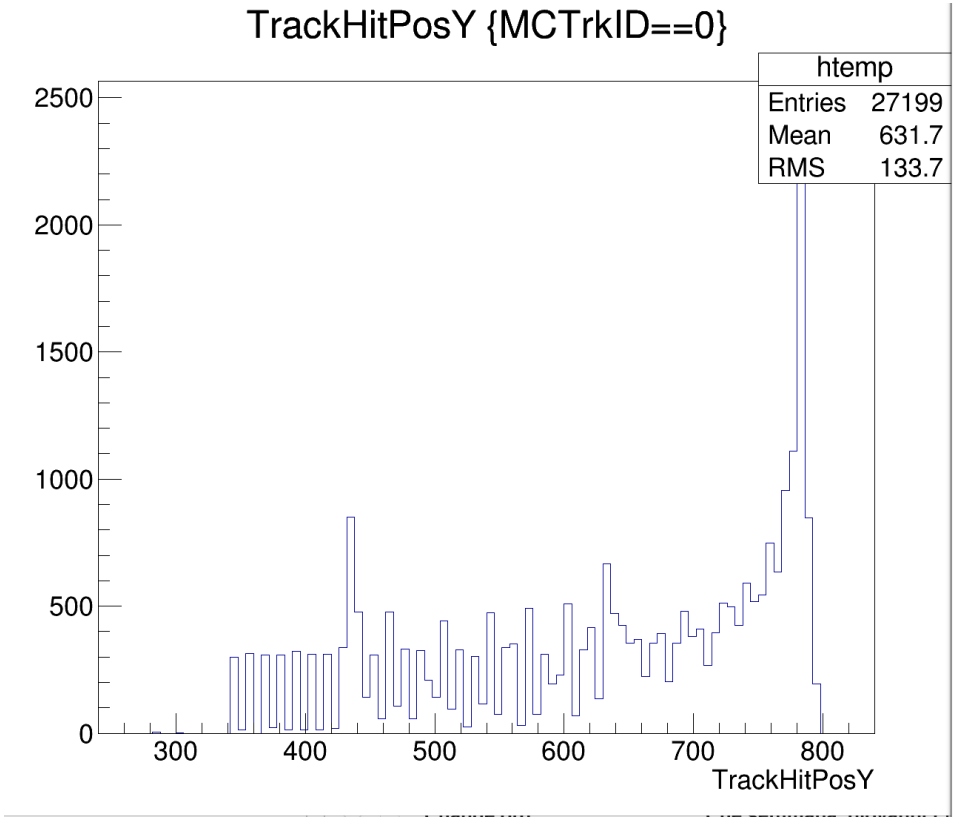


IDEA sim tool
(delta ray removed)



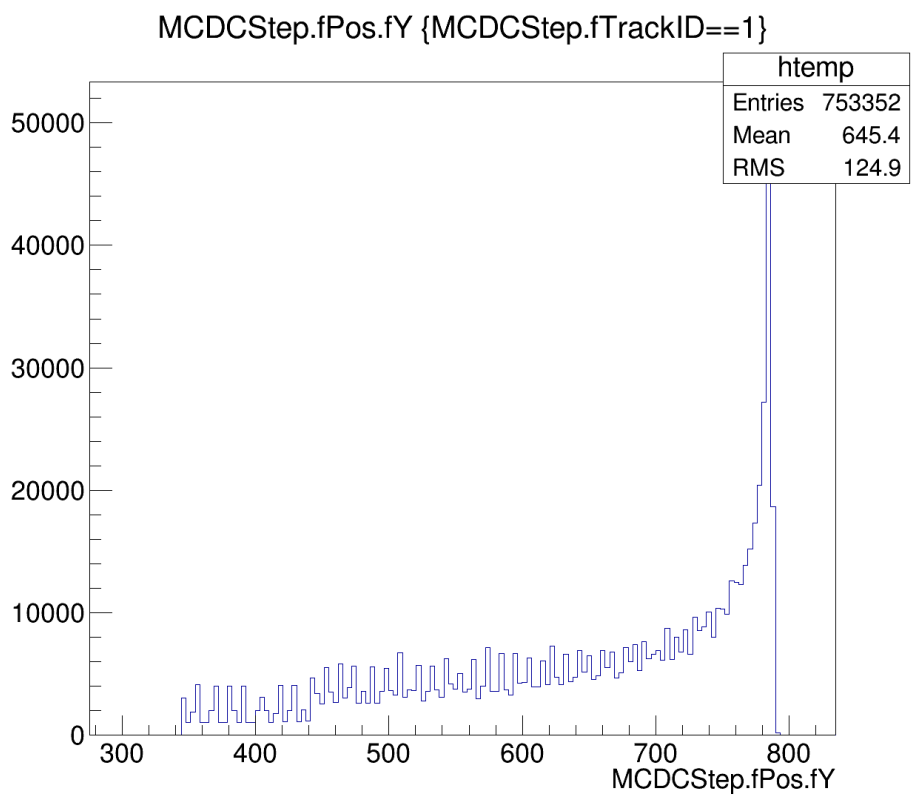
CDCH Mokka simulation validation status

Mokka



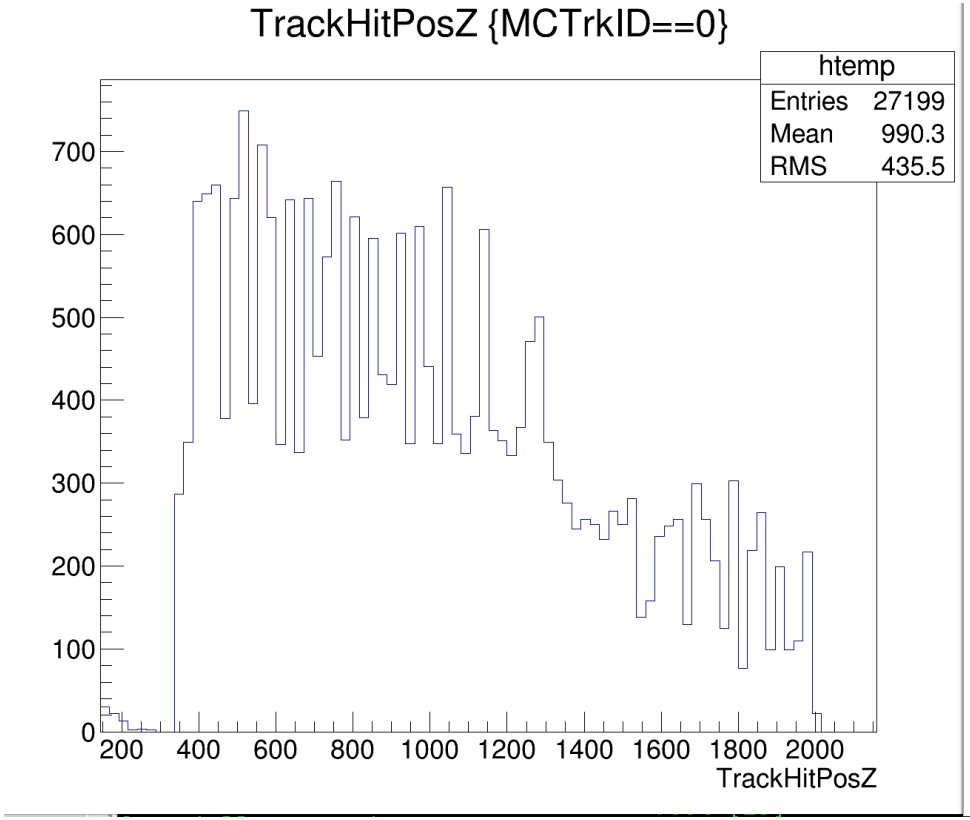
IDEA sim tool

(delta ray removed)



CDCH Mokka simulation validation status

Mokka



IDEA sim tool
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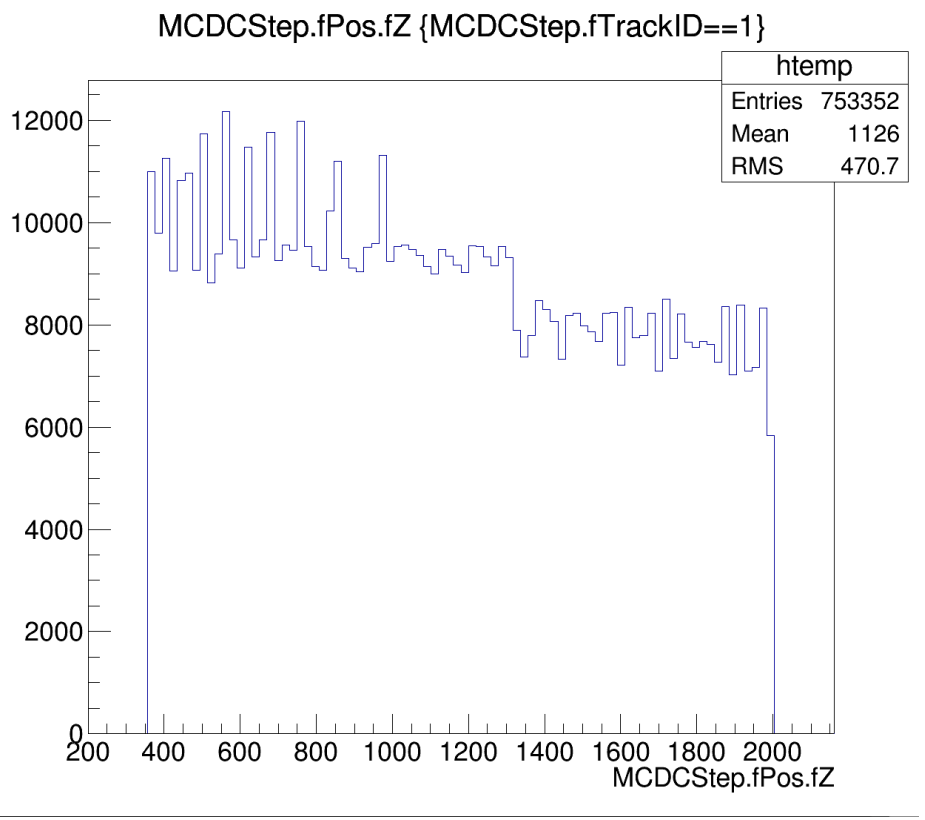
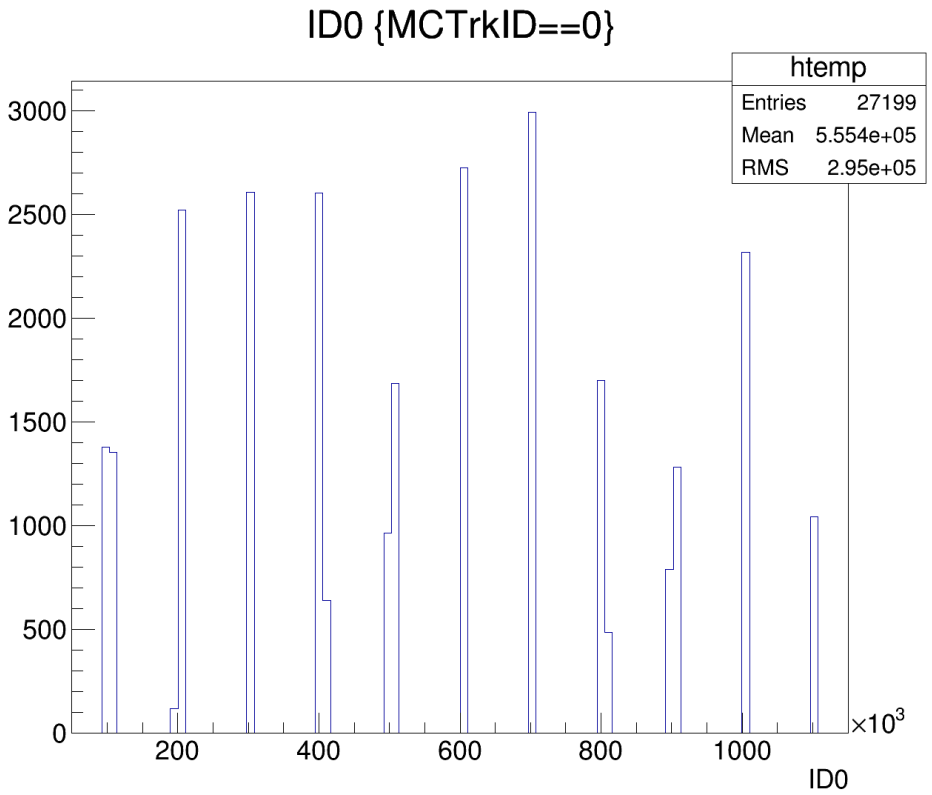
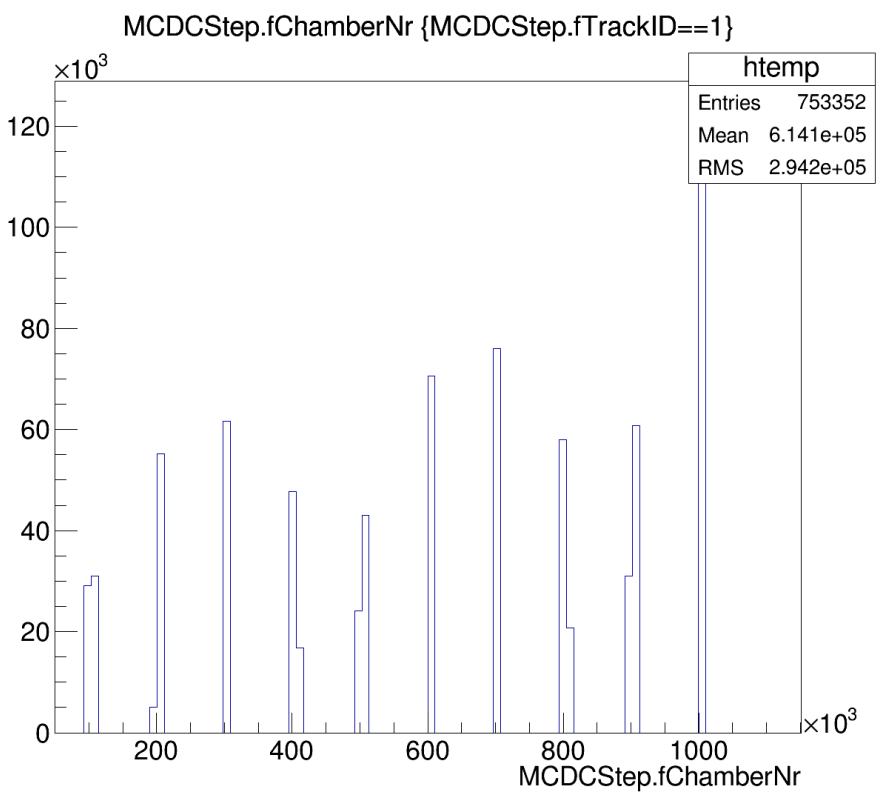


CDCH Mokka simulation validation status

Mokka



IDEA sim tool
(delta ray removed)



CDCH Mokka simulation validation status

The validation of the two CDCH simulation is still on going:

- Points coordinates distributions are statistically compatible;
- Cell Ids distributions are statistically compatible;
- Some differences occur on the number of Points and on the number of secondary particles produced;
- Some differences are visible in the shapes of the tracks, in Mokka seems equal event by event, there are smaller fluctuation.

Possible reasons could be:

- Physics list used;
- Step point limiters;
- Random number generators.

DCH prototype

- Axial drift chamber, 144 channels;
- We are finalizing the instrumentation;
- We have to test the full system with cosmic rays before the test beam.