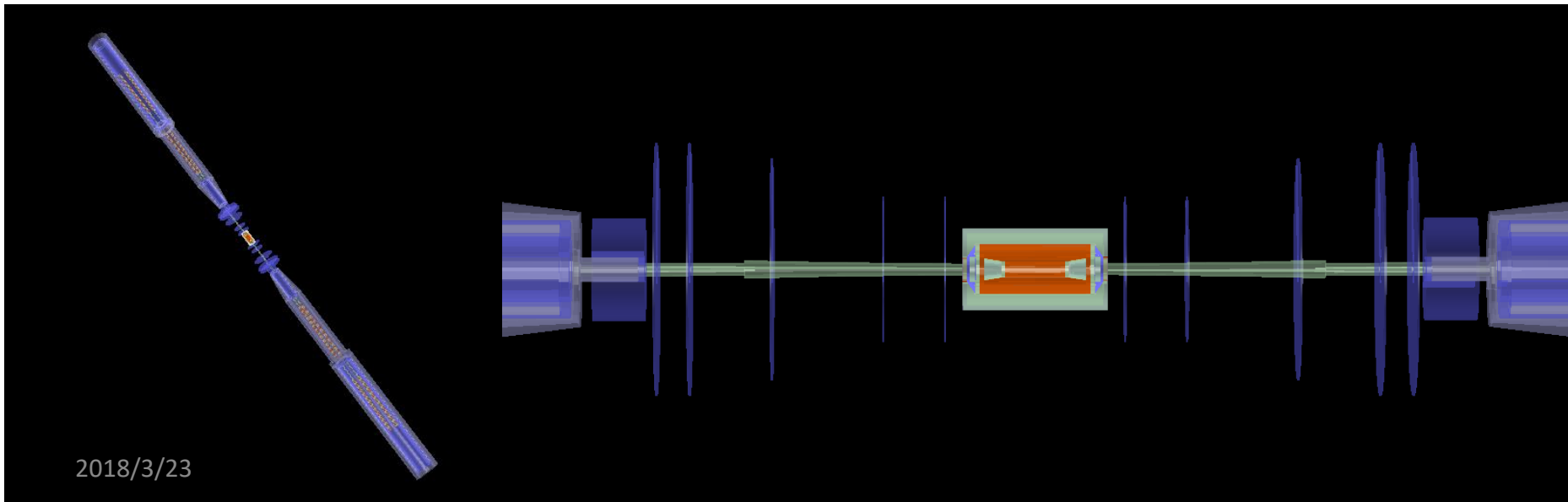


A simulation for affect from up stream material

Yang Liu; Zhu Kai

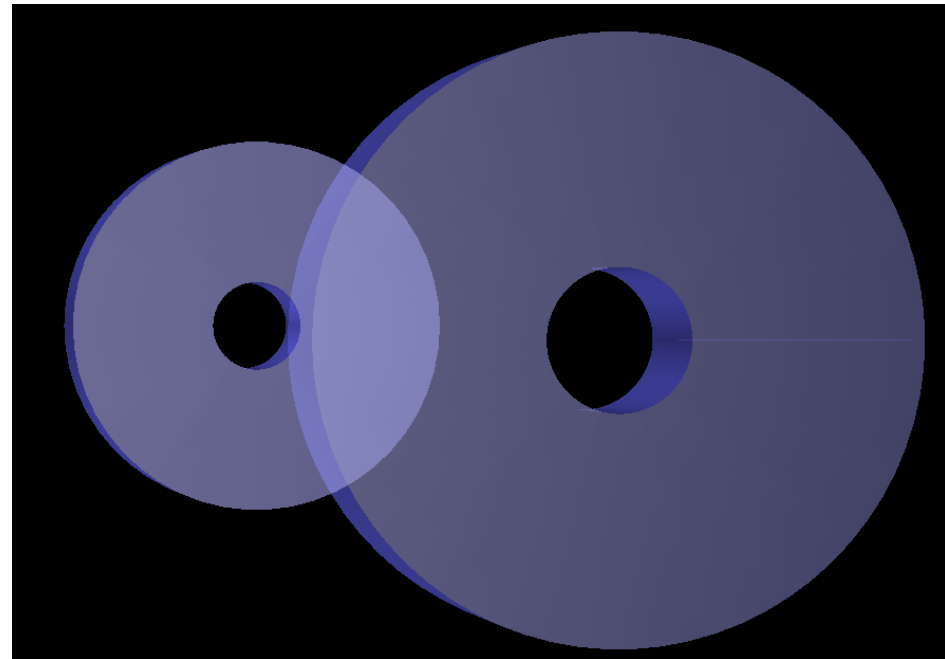
2018 -03-22

- Software: Mokka (Geant4 based)
- Geometry
 - vxd07 (vertex detector)
 - ftd (ftd for cepc double pipe)
 - tube (tube for cepc double pipe)
 - LumiCal (luminosity calorimeter for cepc without angle)
 - mask (Forward mask for cepc double pipe)



Parameters of LumiCal

- Inner_radius = 32.26 mm
- Outer_radius = 98.80 mm
- Inner_z = 951.90 mm
- $\theta_{inner} = 33.982$ mrad
- $\theta_{outter} = 103.42$ mrad

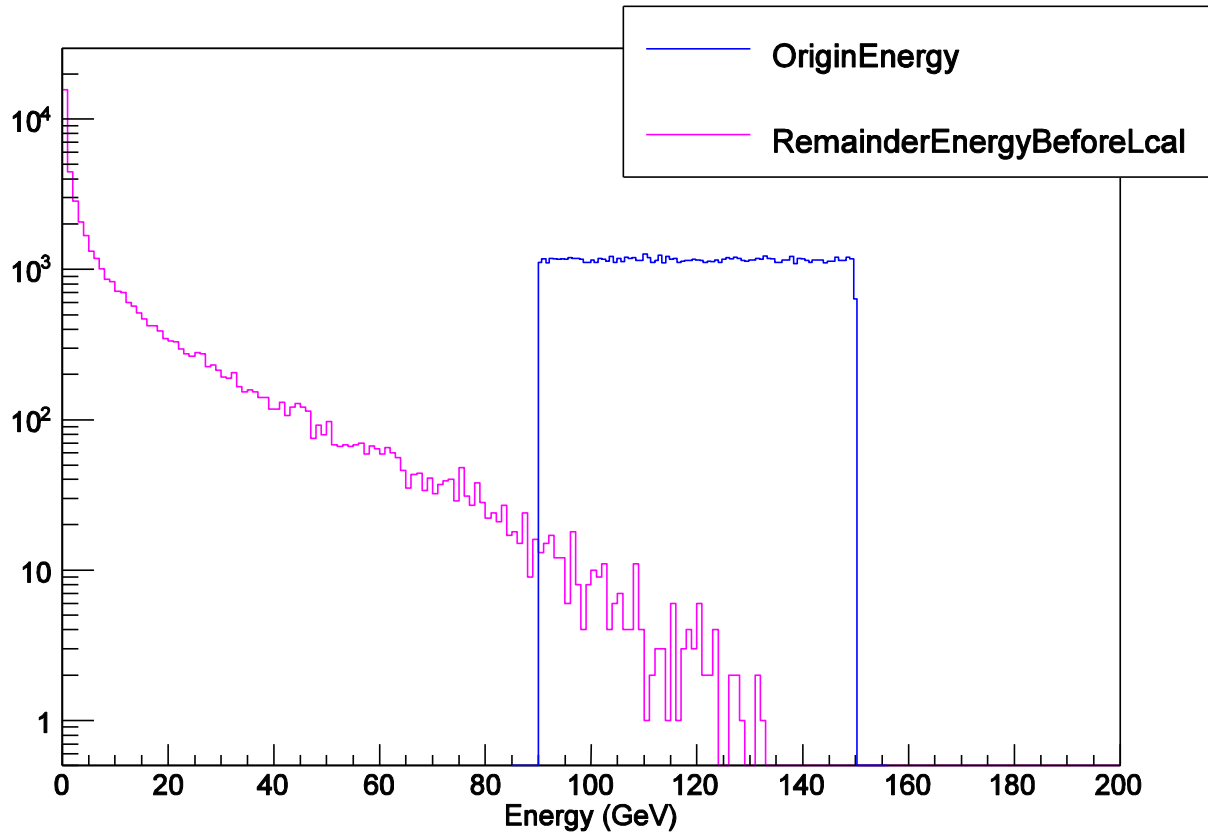


Primary particle generation

- Use particle gun to generate an e^+
- The direction is $(0,0,1)$ with phi smearing 180 degree and theta smearing 8 deg($\sim 140\text{mrad}$).
- The energy is set to 120 GeV with smearing 20 GeV.
- (All smearing mode is set to uniform)

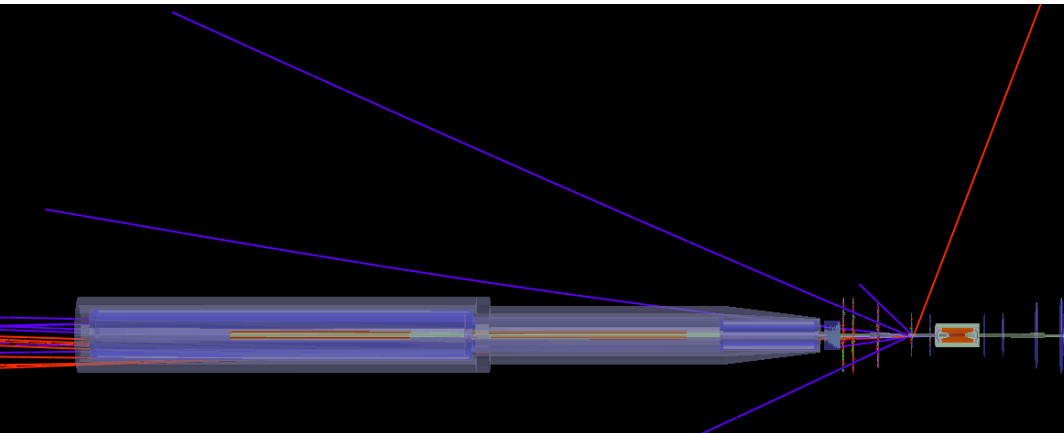
100K events have been simulated in total.

Remainder Energy of Primary particle before LumiCal



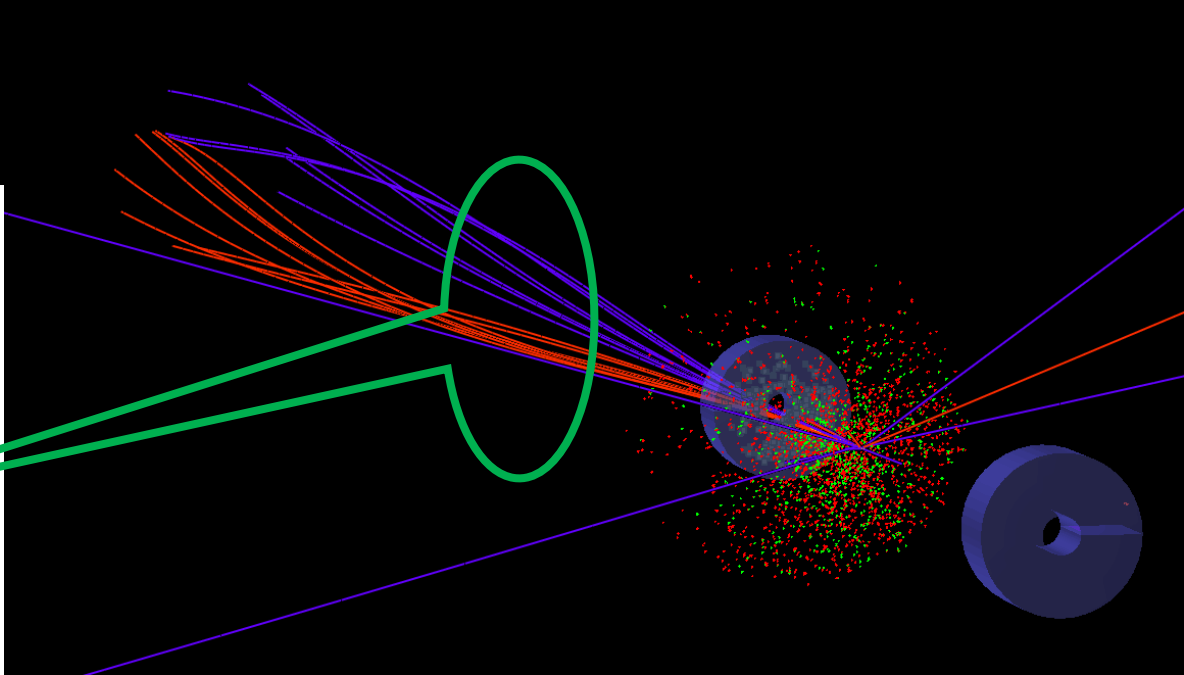
This plot shows that the primary particle will lost most of its energy before entering LumiCal.

An Event Display



Same event with all sub detector visible and only LumiCal visible

We find that the primary track will generate lots secondary tracks



Energy lost along trajectory

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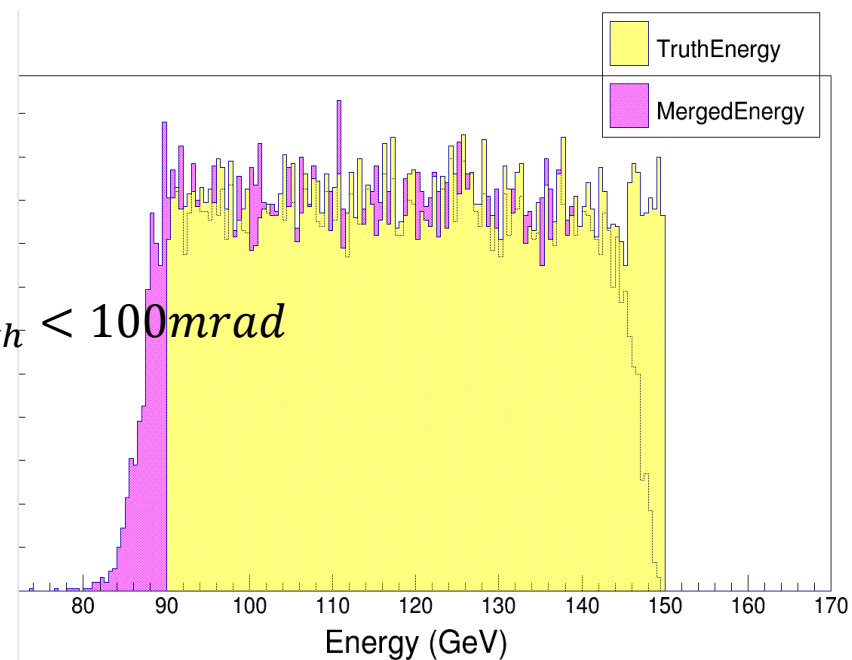
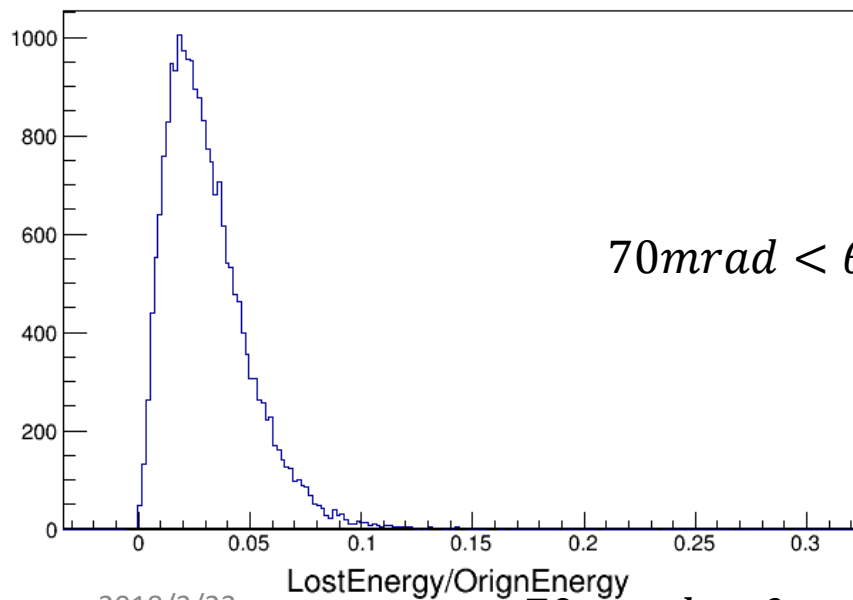
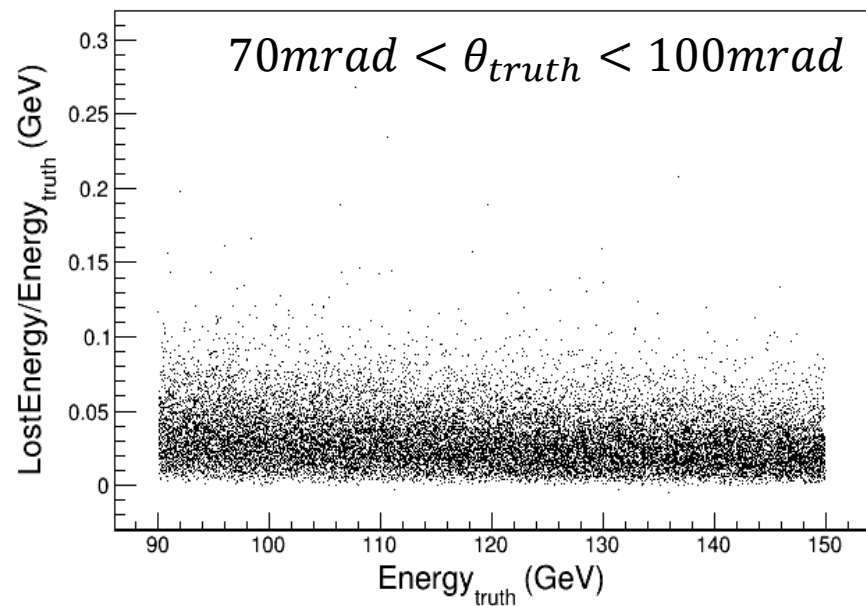
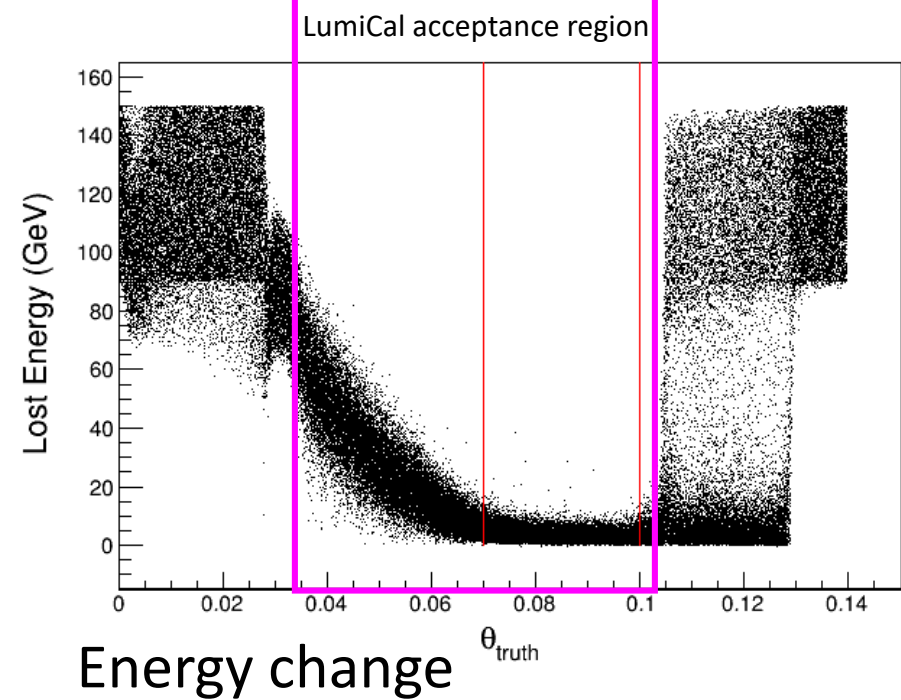
The current track energy is 154814 MeV. Track leaves tube_Be_pipe and goes into tube_Cu_tube_pipe0
The current track energy is 154814 MeV. Track leaves tube_Cu_tube_pipe0 and goes into tube_Cu_tube_pipe0_wall
The current track energy is 93372.7 MeV. Track leaves tube_Cu_tube_pipe0_wall and goes into tube_Cu_cons_pipe1_wall
The current track energy is 74914.6 MeV. Track leaves tube_Cu_cons_pipe1_wall and goes into WorldLogical
The current track energy is 74914.5 MeV. Track leaves WorldLogical and goes into FTDPetalSensitiveLogical
The current track energy is 74914.4 MeV. Track leaves FTDPetalSensitiveLogical and goes into FTDPetalSupport
The current track energy is 74913.9 MeV. Track leaves FTDPetalSupport and goes into FTDPetalSensitiveLogical
The current track energy is 74913.8 MeV. Track leaves FTDPetalSensitiveLogical and goes into FTDAirDiskLogical
The current track energy is 74913.8 MeV. Track leaves FTDAirDiskLogical and goes into FTDPetalSensitiveLogical
The current track energy is 74913.8 MeV. Track leaves FTDPetalSensitiveLogical and goes into FTDPetalSupport
The current track energy is 74913.3 MeV. Track leaves FTDPetalSupport and goes into FTDPetalSensitiveLogical
The current track energy is 74913.2 MeV. Track leaves FTDPetalSensitiveLogical and goes into WorldLogical
The current track energy is 74913.2 MeV. Track leaves WorldLogical and goes into FTDAirDiskLogical
The current track energy is 74913.2 MeV. Track leaves FTDAirDiskLogical and goes into FTDPetalSensitiveLogical
The current track energy is 74913.1 MeV. Track leaves FTDPetalSensitiveLogical and goes into FTDPetalAirLogical
The current track energy is 74913.1 MeV. Track leaves FTDPetalAirLogical and goes into FTDPetalSensitiveLogical
The current track energy is 74913 MeV. Track leaves FTDPetalSensitiveLogical and goes into WorldLogical
The current track energy is 74913 MeV. Track leaves WorldLogical and goes into FTDAirDiskLogical
The current track energy is 74913 MeV. Track leaves FTDAirDiskLogical and goes into FTDPetalSensitiveLogical
The current track energy is 44021.9 MeV. Track leaves FTDPetalSensitiveLogical and goes into FTDPetalAirLogical
The current track energy is 44021.9 MeV. Track leaves FTDPetalAirLogical and goes into FTDPetalSensitiveLogical
The current track energy is 44021.9 MeV. Track leaves FTDPetalSensitiveLogical and goes into WorldLogical
NEXT GOES INTO LUMICAL
The current track energy is 44021.8 MeV. Track leaves WorldLogical and goes into LogicFan1
The current track energy is 44021.8 MeV. Track leaves LogicFan1 and goes into logAirGap2

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- This slide shows an example of how does one track lose energy within Geant4 simulation. Most of the energy lost in the Cu_tube_pipe0_wall.

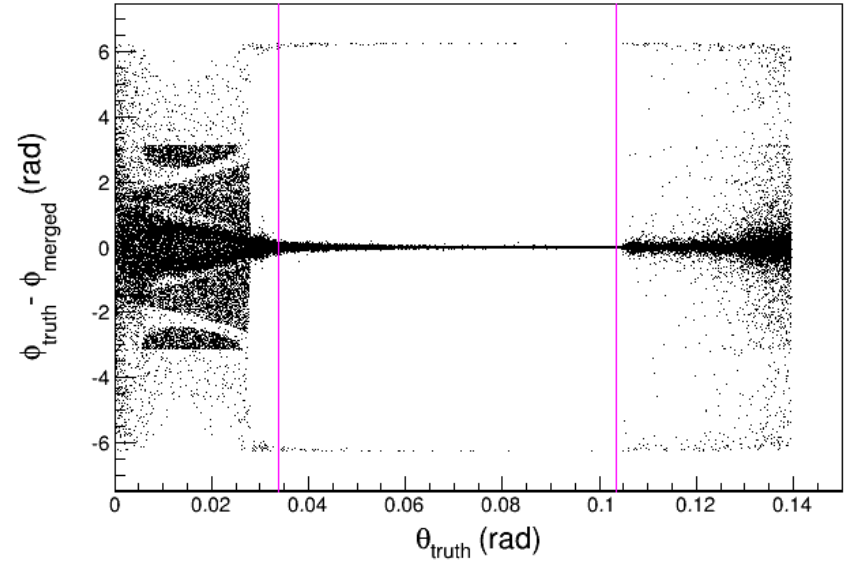
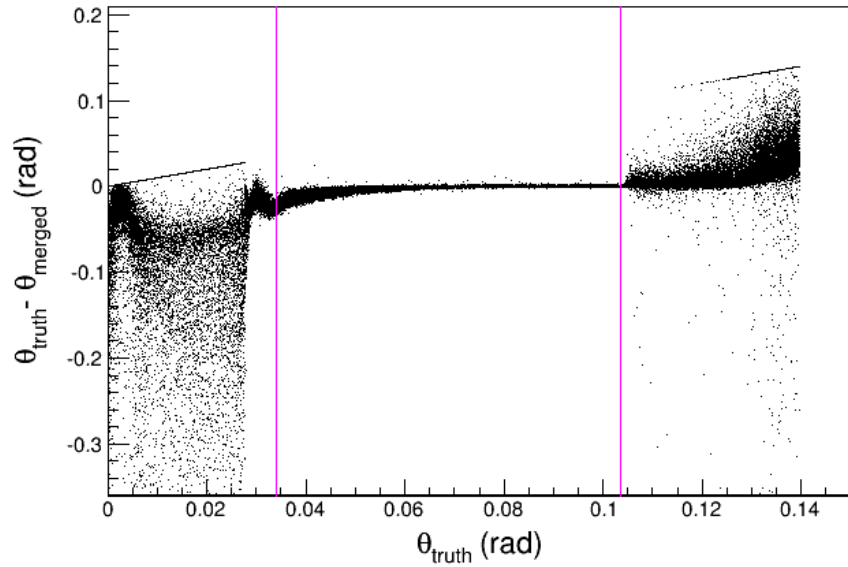
Four-momentum Merge

- The primary particle will lost most of its energy but generates many secondary particles in the sub detector before LumiCal. So we try to sum up the total four- momentum of tracks which finally go to LumiCal. The four-momentum is chosen at the steppoint before the track goes into LumiCal.

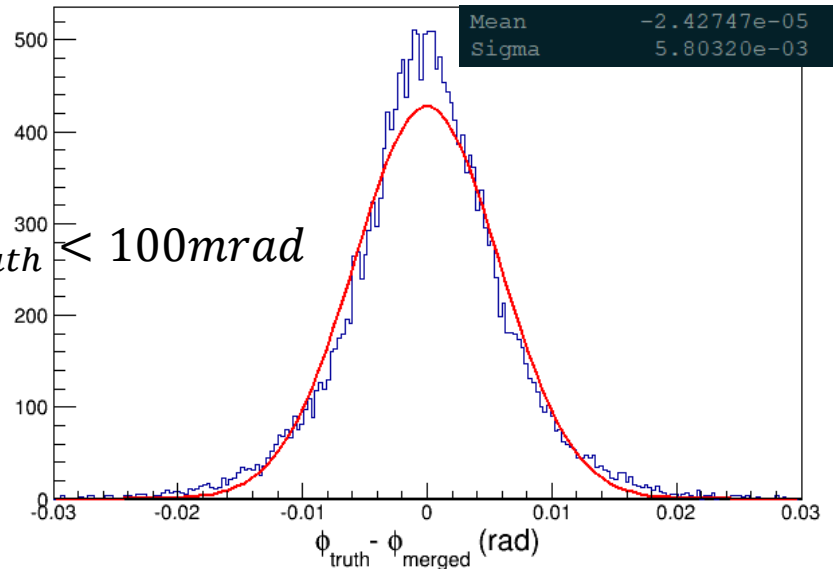
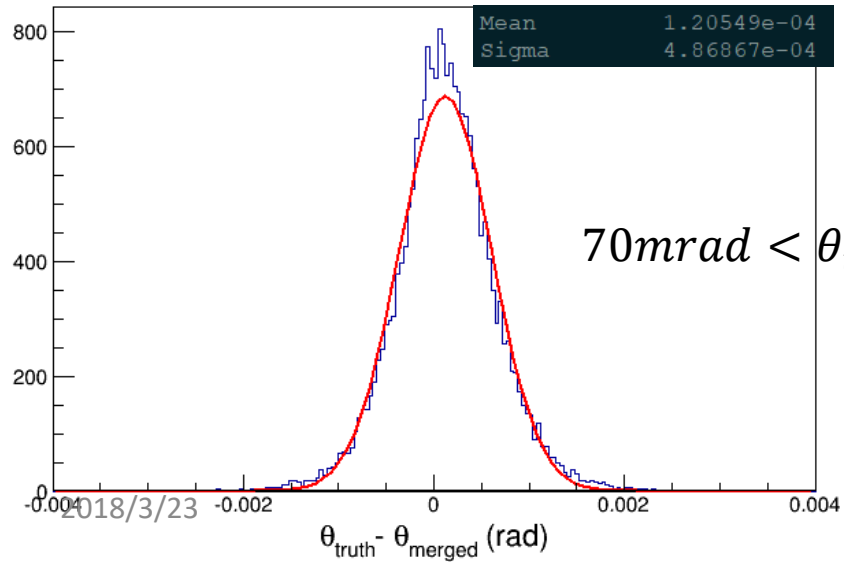


2018/3/23

 $70\text{mrad} < \theta_{\text{truth}} < 100\text{mrad}$



Direction change



Summary

- The primary particle will lose most of its energy in upstream materials and generate a bunch of secondary tracks.
- The Merged four-momentum of secondary tracks when they enter LumiCal will hold the most energy (>90%) of primary particle and change the incoming direction slightly.
- The upstream material will cause an energy deposition smaller than 10% and a direction smearing.

PDG_ID of Secondary particles

