Status update for building SiPM pulse shape

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Workflow for building SiPM pulse shape

Apply attenuation effect to the EcalBarrelScFiHits

— Receive the new attenuation function from Maria

Add up the attenuated hits for each SiPM

— Get the sector, layer, and grid information from cellID to separate each SiPM
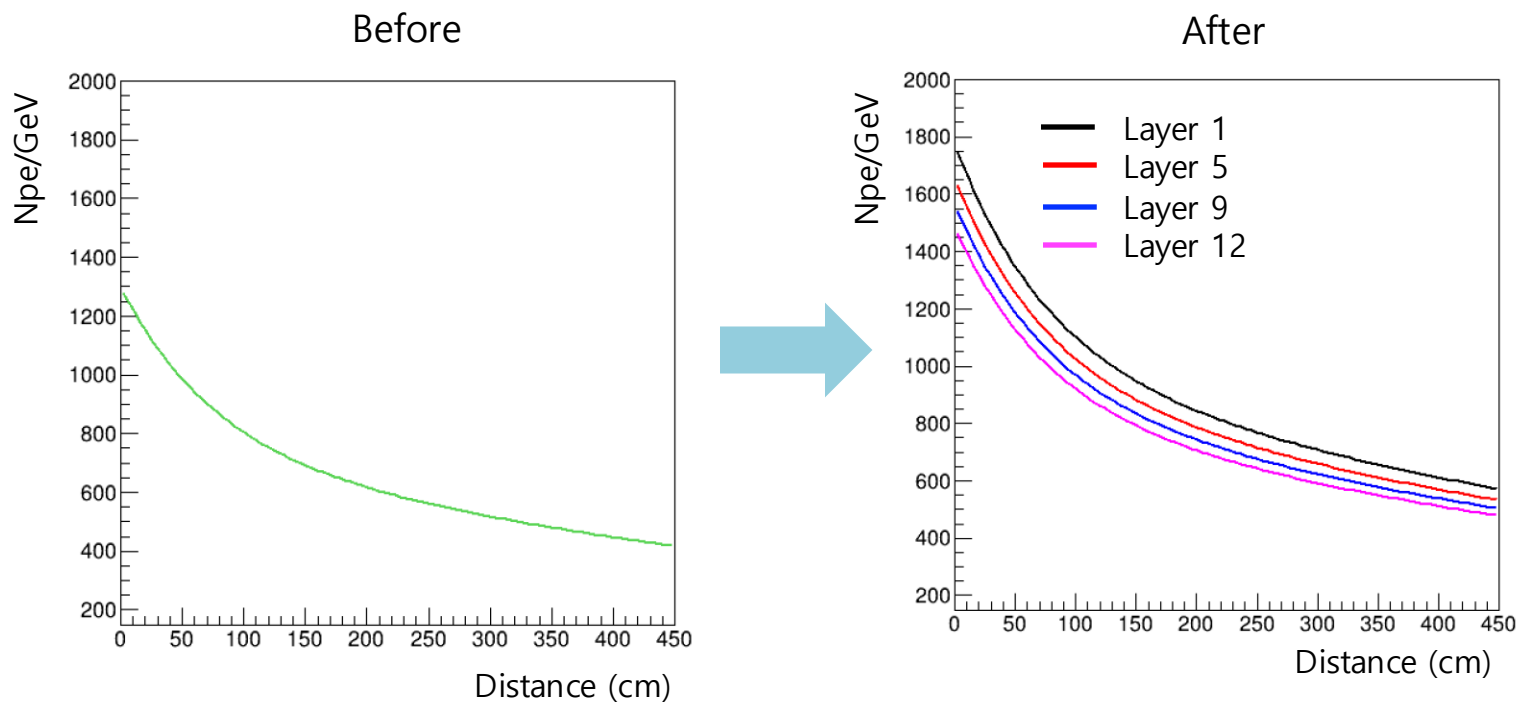
A Npe threshold application ($Npe_{th} = 5$)

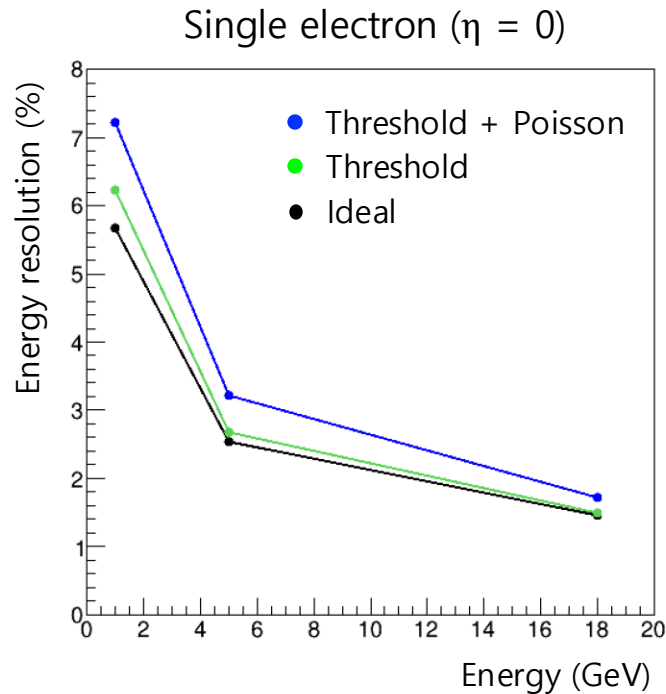Apply Poisson smearing

Build the SiPM pulse shape

— Make sure with Henry whether I correctly understood the pulse shape.

— Understand the correlation between the Npe and pulse shape

Layer-dependent attenuation

Before

After

Npe/GeV

Distance (cm)

Npe/GeV

Layer 1
Layer 5
Layer 9
Layer 12

Distance (cm)

- The attenuation function was changed to the recent layer-dependent one.

Energy resolution comparison

Single electron (η = 0)

Energy resolution (%)

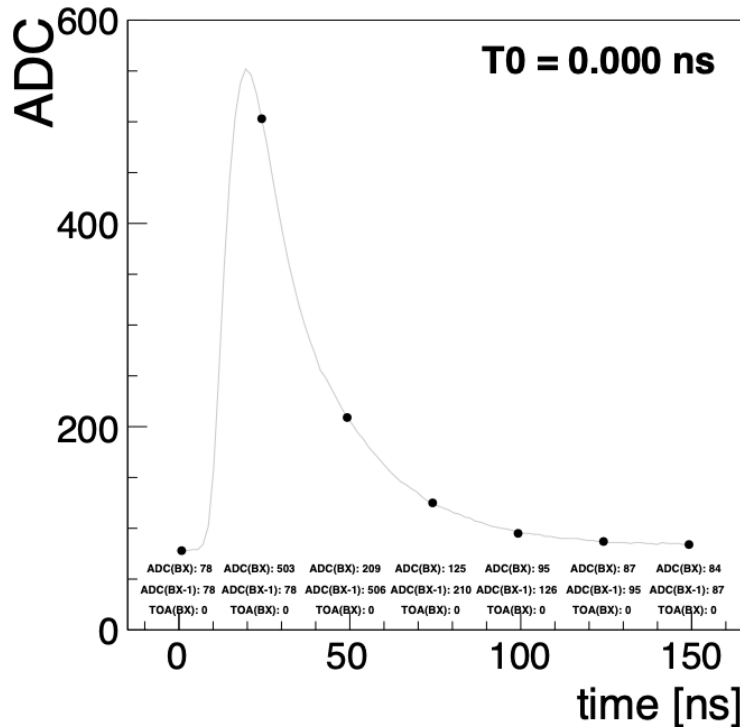Threshold + Poisson
Threshold
Ideal

Energy (GeV)

- The attenuation was corrected by energy-weighted z position.

- The resolution worseness increases as the energy decreases. It is expected to get ~1.5% and ~0.3% worse at 1 GeV and 18 GeV, respectively.

From Norbert's slides

How it would look in ePIC

What we will see in the signal with the 25ns sampling:

- This is real data, using the real shaper extracted from the ROC
- Each run was 5000 events:
  - Caveat = each point now is independent run
    - VHI10 problem, see slide 5
  - Then the ADC(BX), ADC(BX-1), TOA… etc means are extracted from 5000 measurements
  - This may result that the ADC(BX-1) != ADC(BX) - 25ns
- T0 = when the particle signal happened:
  - In EIC we expect ~10ns incident periods

- A pulse shape will be implemented and how well the quantities H2GCROC measures reproduce the pulse shape and how much it worsens the resolution will be studied.