



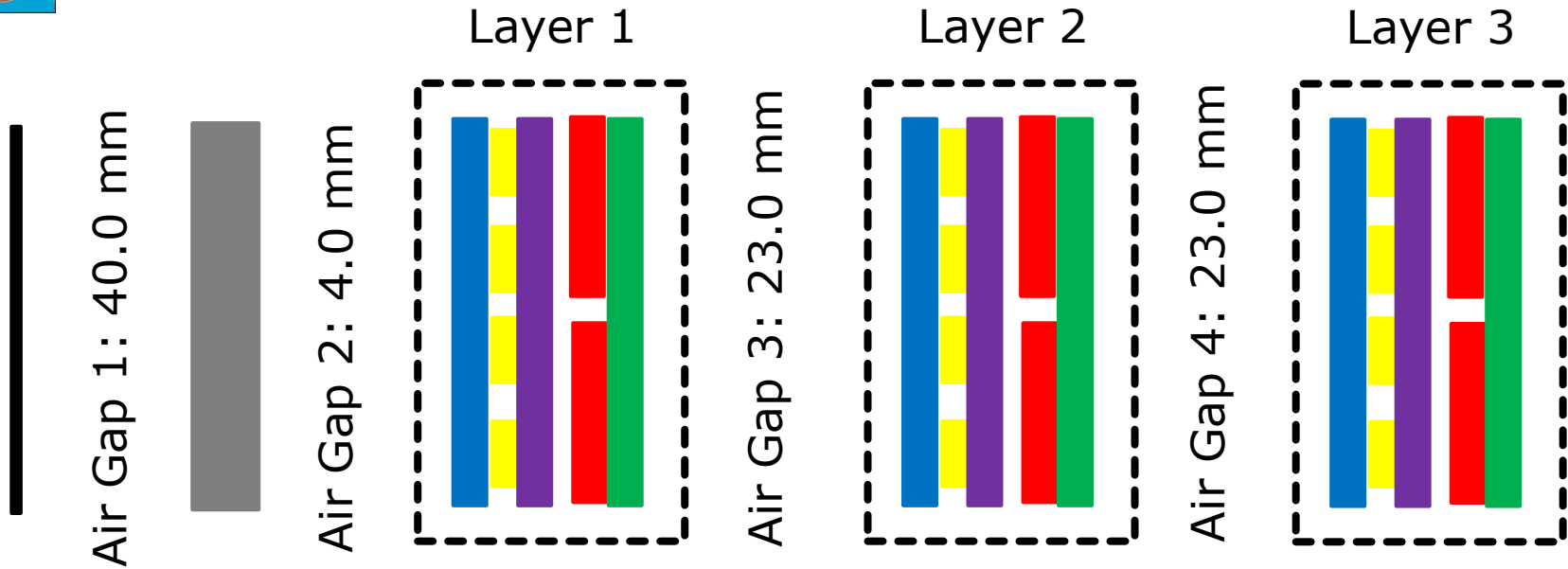
Testing Digitization

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Debugging with SiWECAL_B84_I0_A0



Front Wall Fe: 3.3 mm

Plexiglas: 18.0 mm

PCB: 1.6 mm

SKIROC (PVC) 4x4:
Thickness: 1.1 mm
Width/height: 17 mm

Aluminium: 25.0 mm

Will correct this to 3.0 mm

W: 8.4 * 3.504 mm

Si 2x2:
Thickness: 0.325 mm
Width/height: 88.48 mm
Gap: 0.1 mm

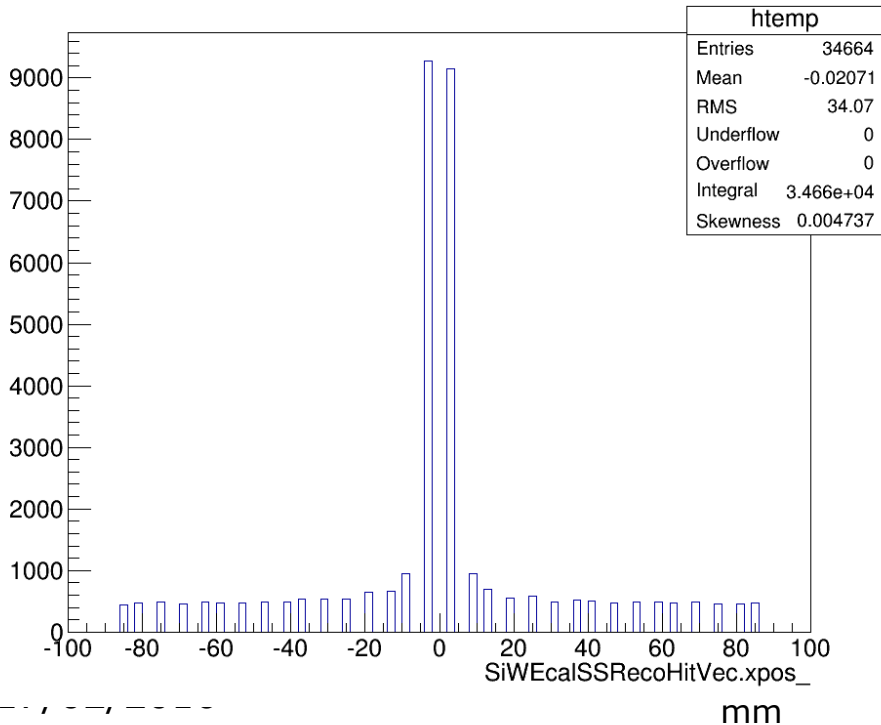
Only one air gap in layers for the glue dots: 0.2 mm

17/02/2016

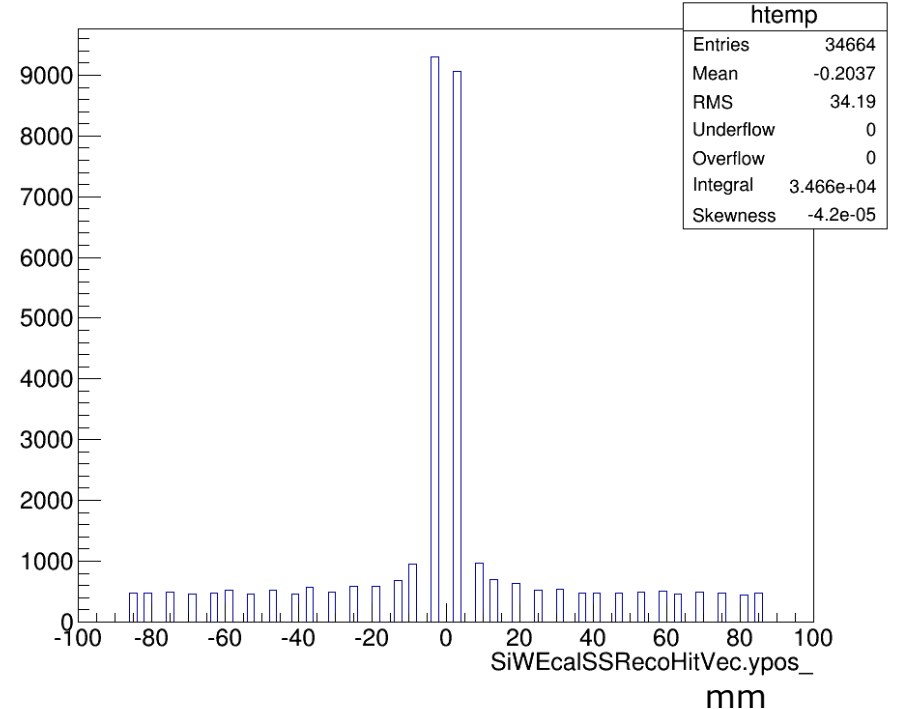
Reconstructed cells position

- ❑ We are expecting at x and y dimensions 32 bins since we have 2x2 sensors with 16x16 pixels each.
- ❑ Checked bin center: For example
 first bin at 2.865 mm = Gap + cellsize/2
 second bin at 8.395 mm = Gap + cellsize/2 + cellsize

SiWEcalSSRecoHitVec.xpos_

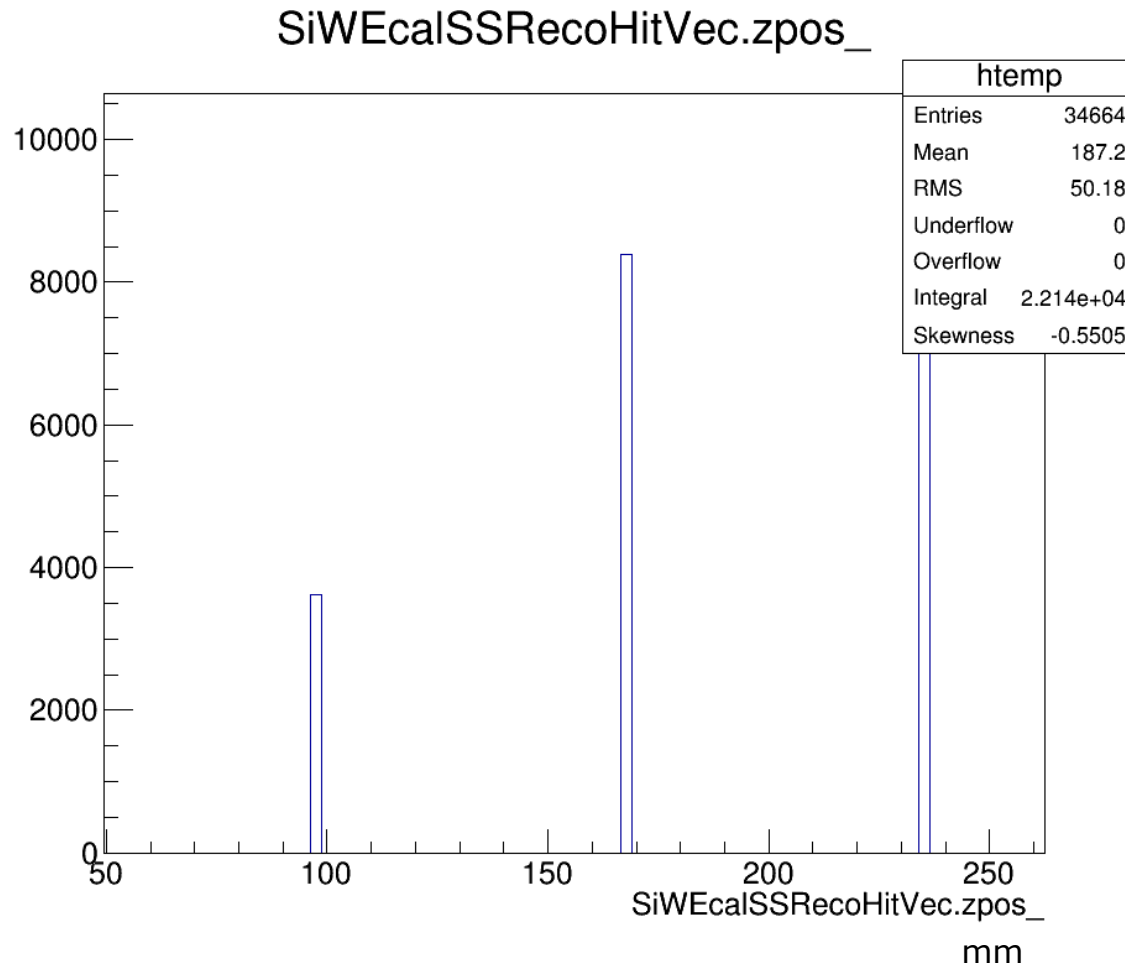


SiWEcalSSRecoHitVec.ypos_



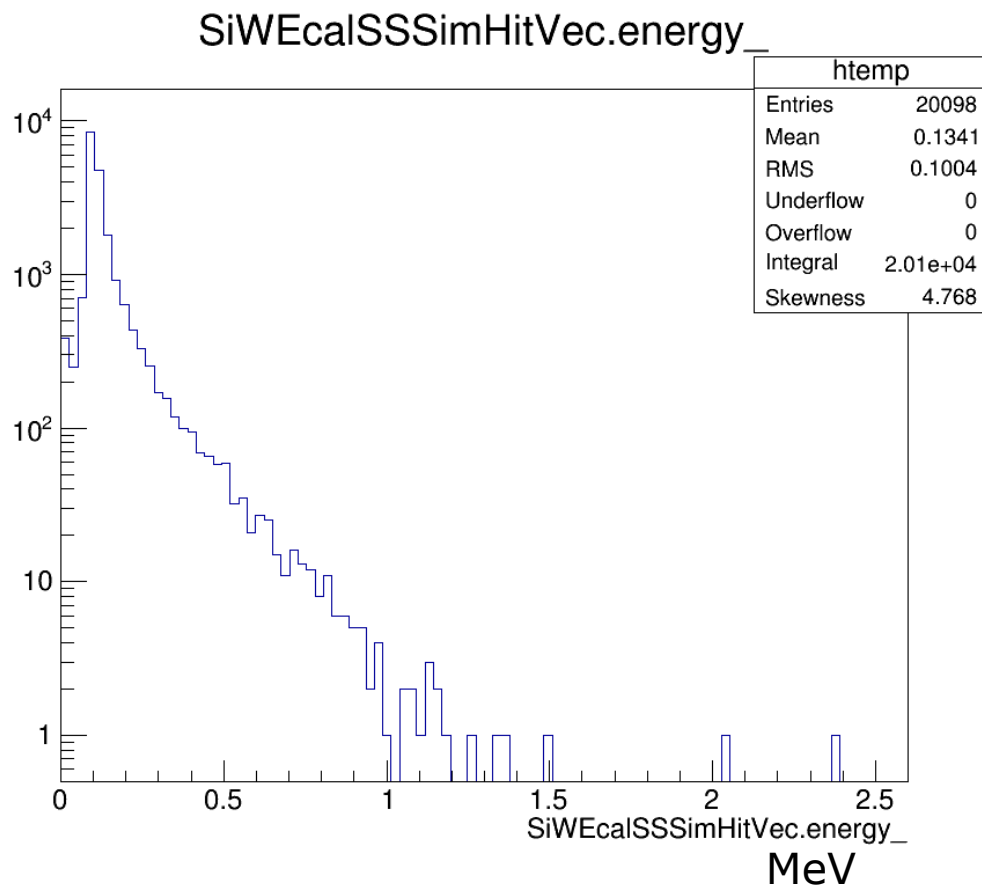
Z position

- z position is calculated using an energy weighting with all the hits in layer as $\frac{\sum E_i * z_i}{\sum E_i}$ where z_i the z position of the hit i coming from simulation. However, for 325 μm it makes little difference.



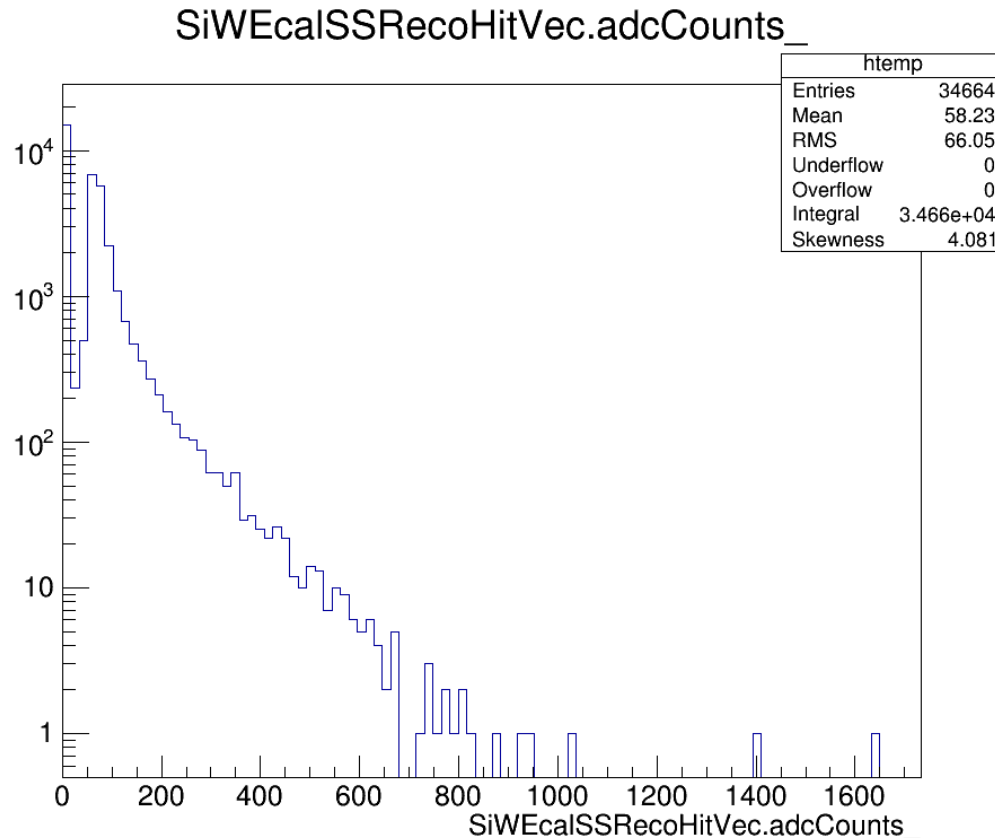
Simulated hit energy (MeV)

- This is the energy distribution of the hits in MeV for a **muon of 15 GeV**.
- For the conversion of simulated hit energy from MeV to MIPs the theoretical value was used: **0.087 MeV/MIP**. The value from simulation was 0.095 MeV/MIP.



Reconstructed hit energy (ADC)

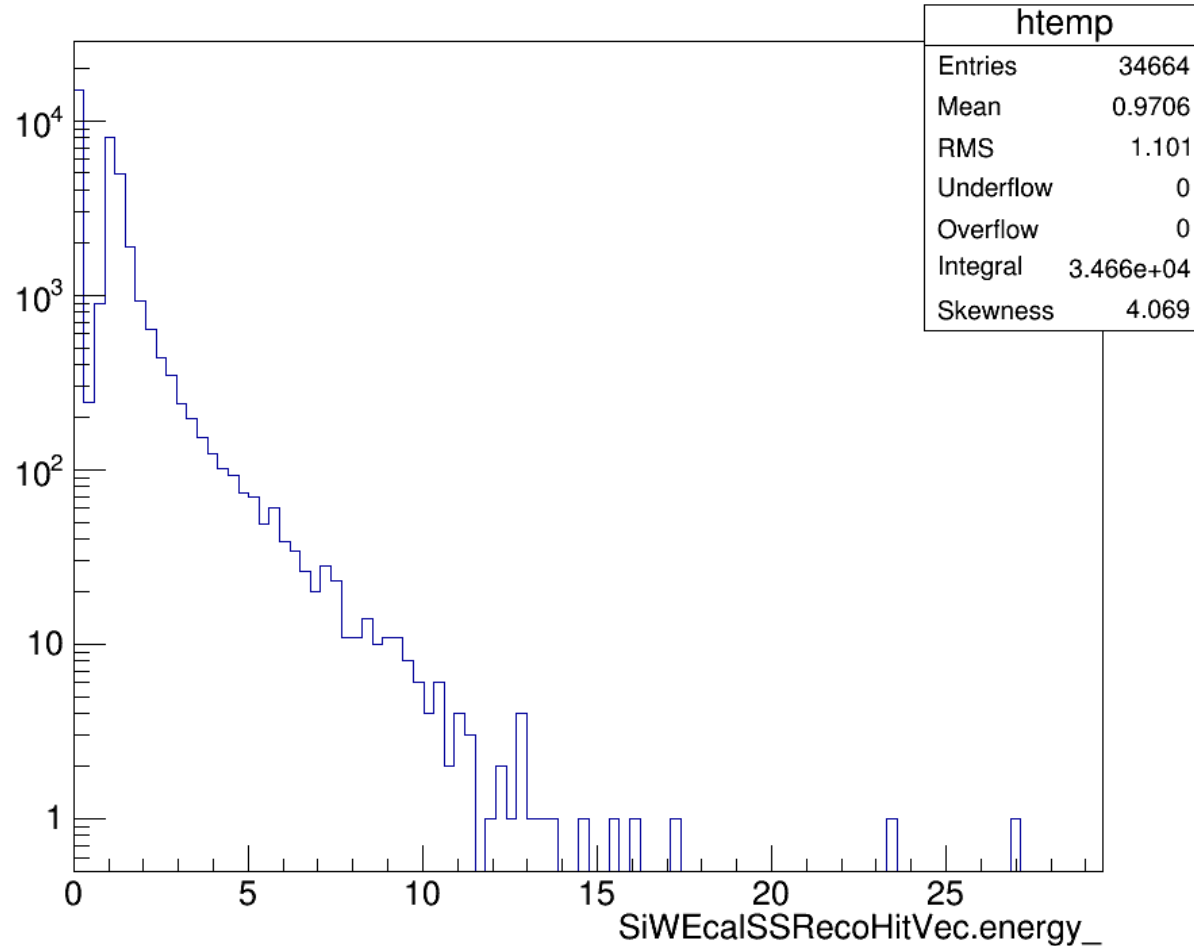
- ❑ The energy distribution of the hits in ADC for a **muon of 15 GeV**. Since we used **MIPToADC = 60** we see as expected a peak around 60 ADC channels.
- ❑ Also, it is visible that no energy is above **2000 ADC** since this is the limit we set. A threshold of 10 ADC is applied to avoid the huge number of entries in the first few bins due to noise added to empty cells.
- ❑ The first bin is bigger than 10 ADC that's why there is a peak there.



Reconstructed hit energy (MIPs)

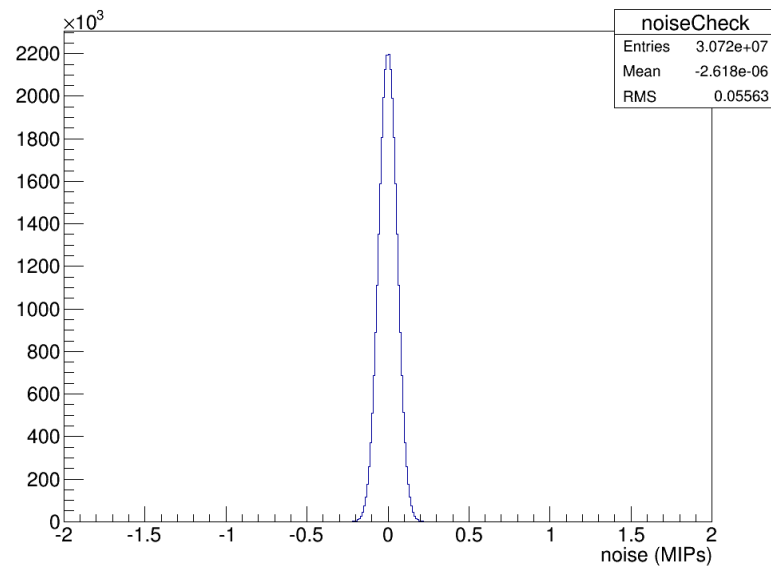
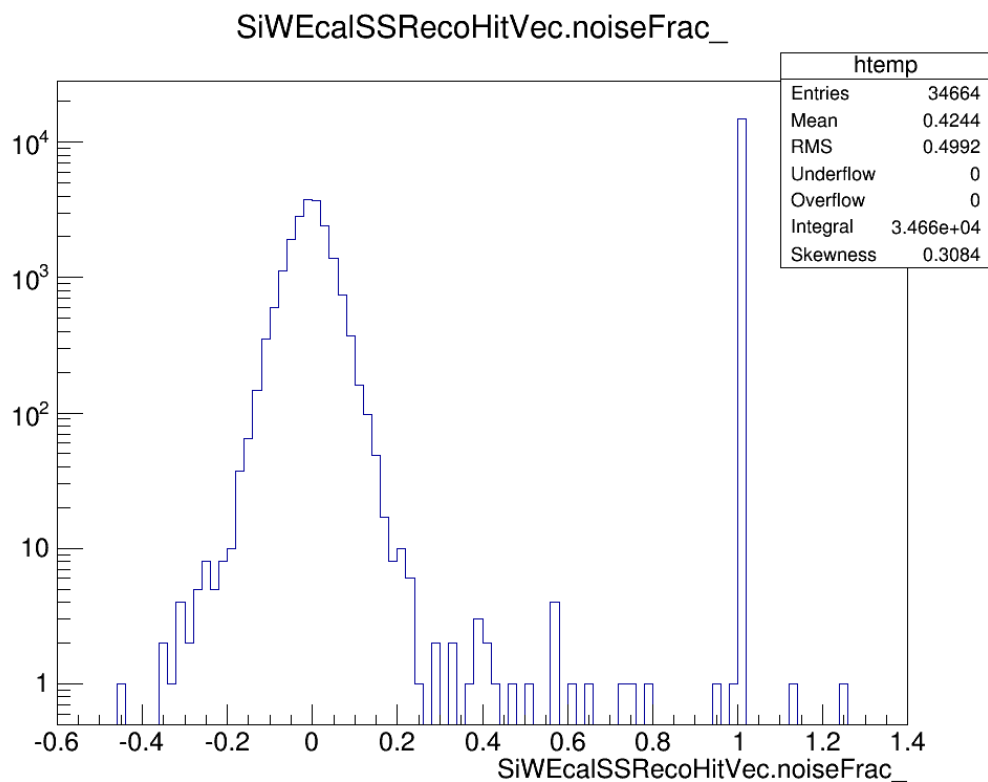
- The energy distribution of the hits in MIPs for a muon of 15 GeV. Peak is around 1 MIP as expected. Same threshold is applied here.

SiWEcalSSRecoHitVec.energy_



Noise and noise fraction

- ❑ Noise added: $\sigma = 1/18 \text{ MIP} = 0.0556 \text{ MIP}$
- ❑ Noise fraction: $(\text{RecoE-SimE})/\text{SimE}$.
The peak at 1 is due to the empty cells.





Conclusions/Questions



- Checked digitization implementation choosing a specific detector configuration. (See backup for Geant visualization.)
- Reconstructed cell position seems to be correct. Simulated and reconstructed hit energy distribution peak and range is according to expected.
- What are exactly the parameters from the Geant simulation side to deliver so that to check them against data?
- For the digitization we followed the procedure: "MeVtoMIP"x"MIPtoADC".



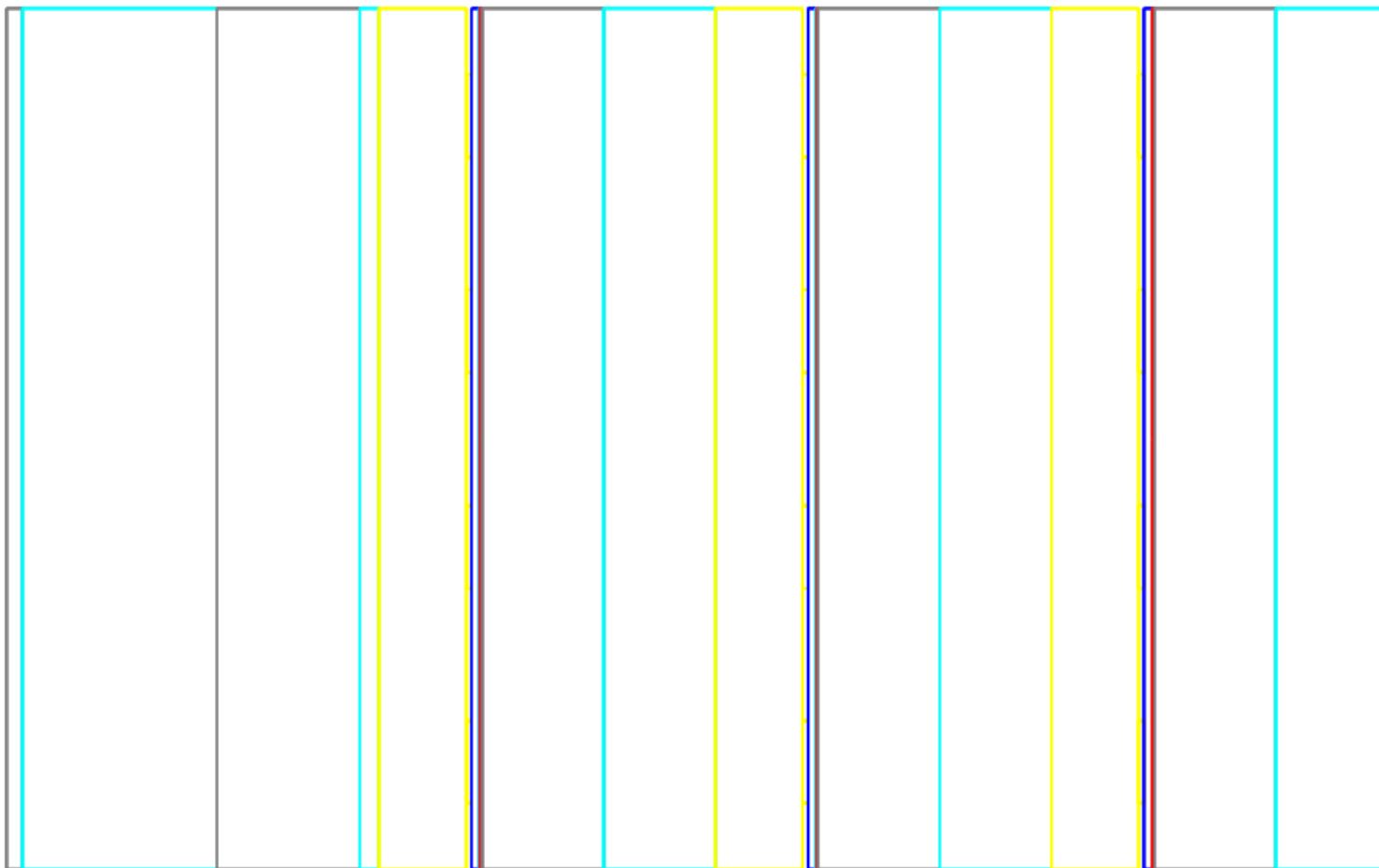
Back up



Geant visualization of SiWECAL_B84_I0_A0 detector configuration

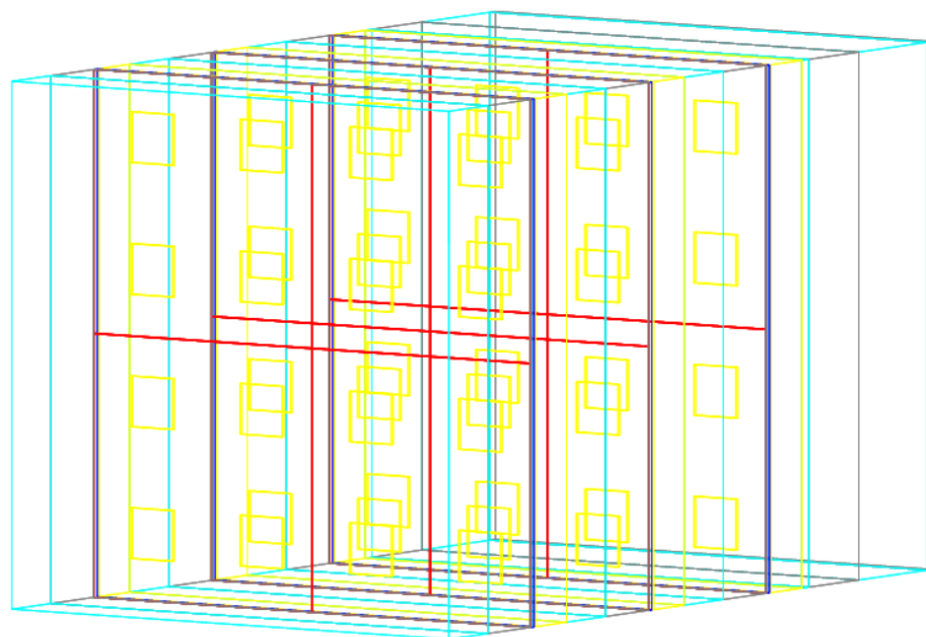


Side View: Colors are different from the sketch. For example Plexiglas is yellow now. Not clearly visible SKIROC, PCB, Air gap, Silicon sensors after plexiglass.



Geant visualization of SiWECAL_B84_I0_A0 detector configuration

Angle View



Zoom for the gap between Si sensor pads.

