



# HiDRa Simulation updates

Andrea Pareti - 17/05/23

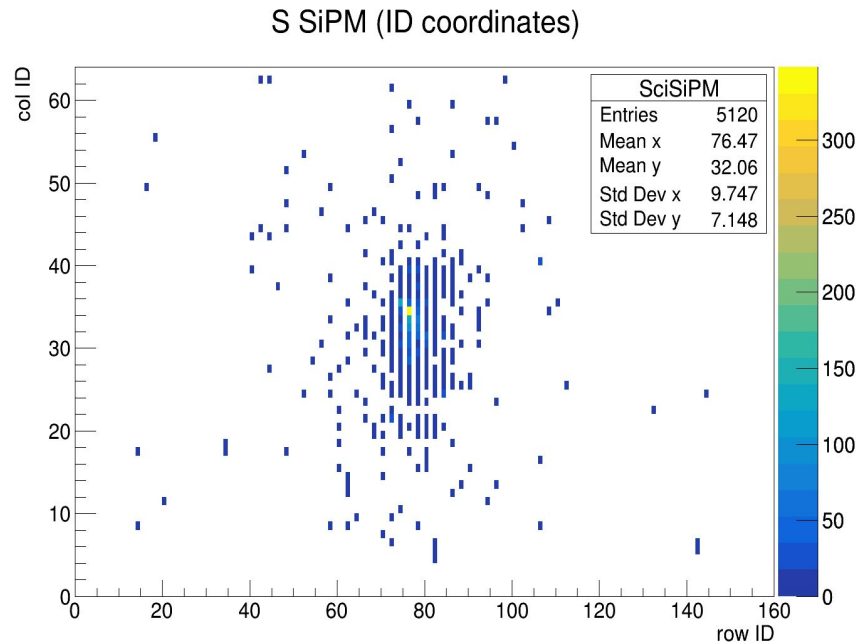


# Spatial Resolution

- Extract content of each SiPM (in photoelectrons)
- From the SiPM ID number recover its position inside the module
- Transform ID coordinates into millimeters (conversion function needs to be checked)
- Find Center of Gravity of each event:

$$\bigcirc \frac{\sum_{SiPM} (x_{SiPM} \cdot E_{SiPM})}{E_{event}}$$

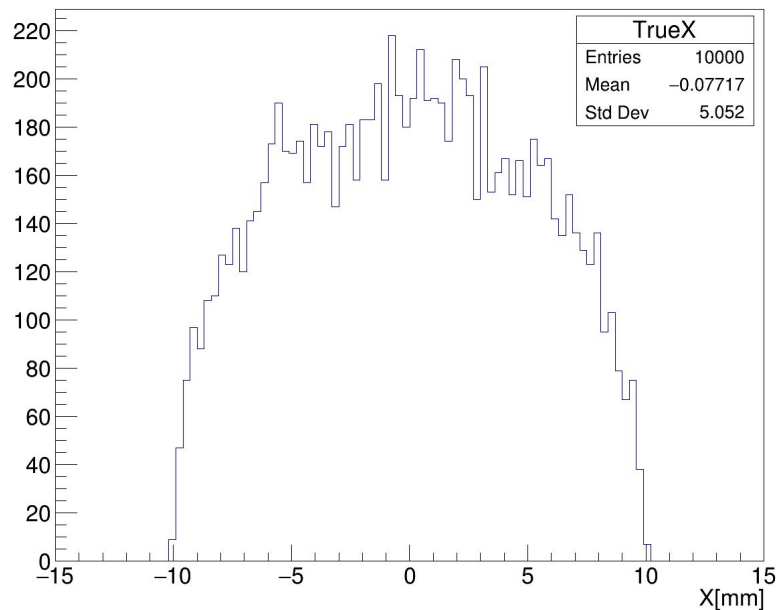
One electromagnetic shower inside the 10 SiPM modules  
(Only S fibers here)



# Spatial Resolution

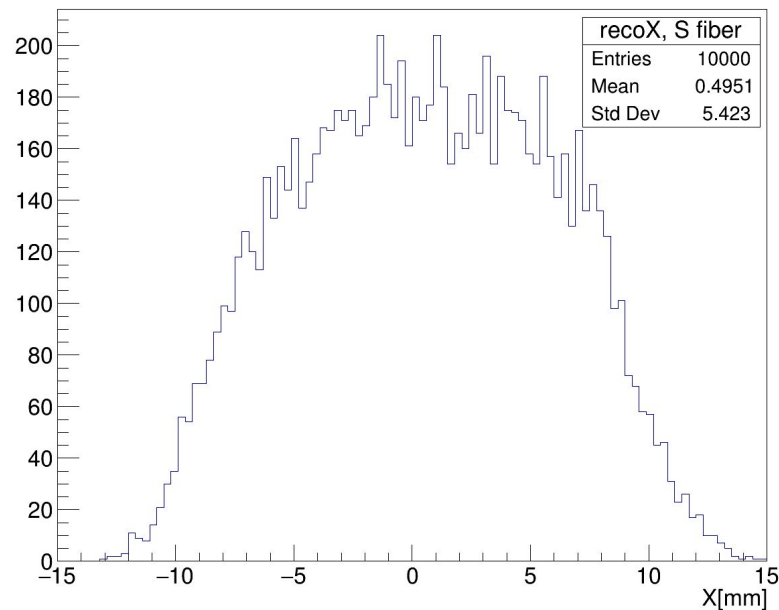
Simulated beam: 1cm diameter, tilted by 2.5 degrees in both X and Y directions

TrueX



Reconstructed center of gravity  
Shower maximum is at  $Z > 0$  → beam inclination should be taken into account as next study

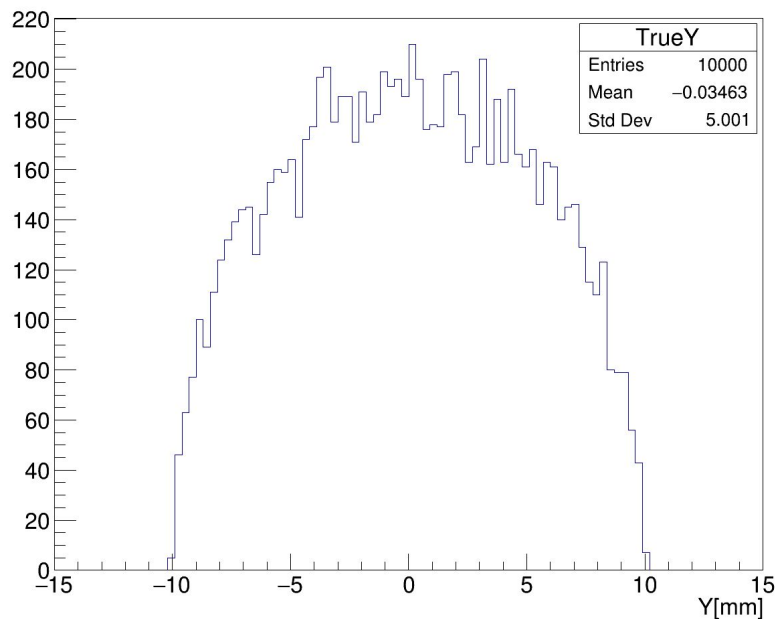
recoX, S fiber



# Spatial Resolution

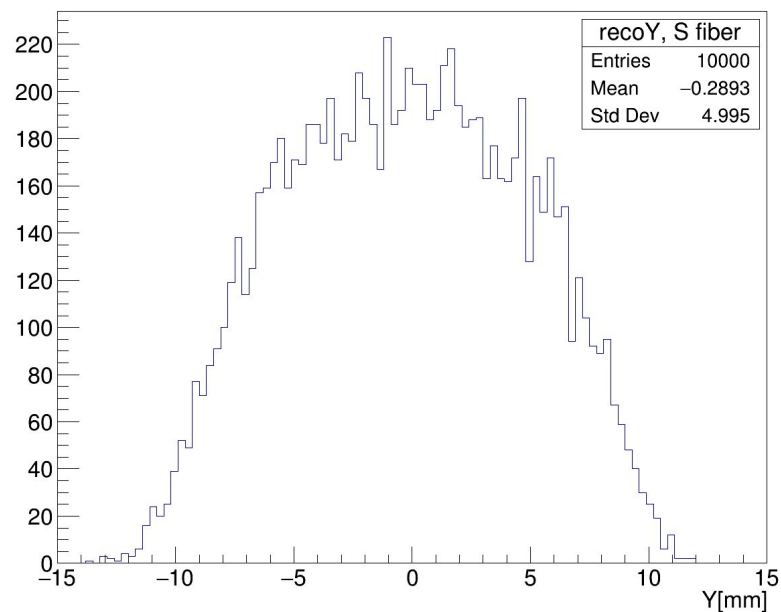
Simulated beam: 1cm diameter, tilted by 2.5 degrees in both X and Y directions

TrueY



Reconstructed center of gravity  
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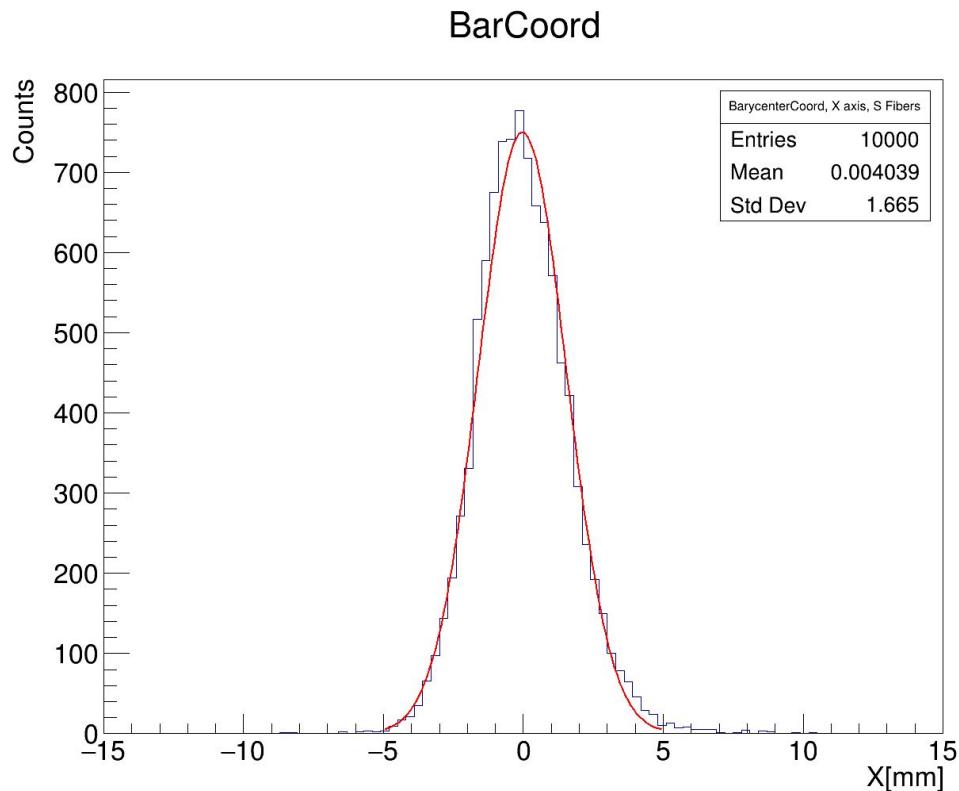
recoY, S fiber



# Spatial Resolution

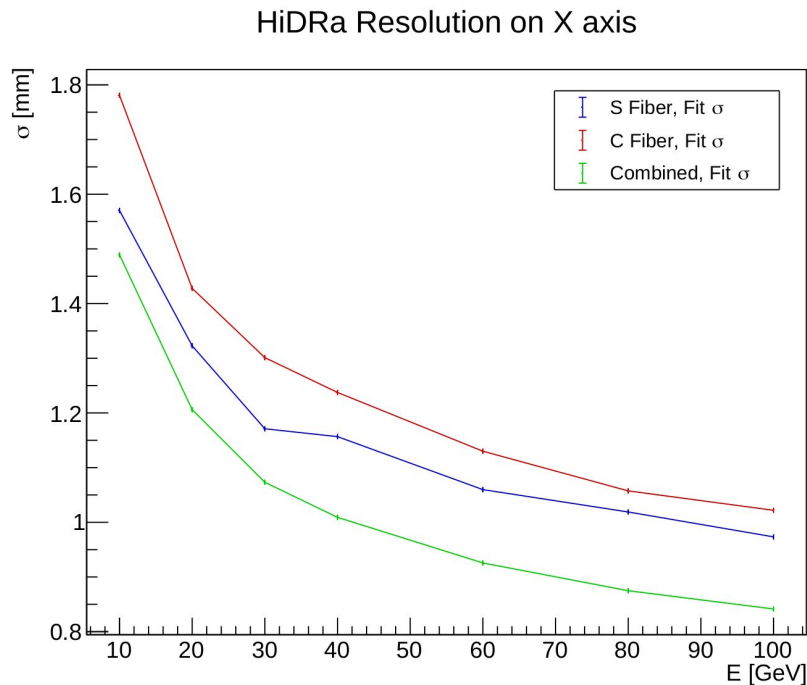
Estimate resolution:

- Profile true impact point coordinates and CoG coordinates
- Linear fit of profile plot to correct CoG reconstructed position
- Fit new coordinates with a gaussian
- Tail at higher x (and lower y) as expected



# Spatial Resolution

Plot gaussian fit RMS between [10, 100] GeV:



Combine S and C fibers reconstructed coordinates taking into account different phe/GeV ratio

$$X_{\text{Combined}} = \frac{(X_{\text{Bar}, S \text{ fiber}} / (phe/GeV)_S) + (X_{\text{Bar}, C \text{ fiber}} \cdot (phe/GeV)_S / (phe/GeV)_C)}{(E_{\text{Tot}, S \text{ fiber}} + E_{\text{Tot}, C \text{ fiber}})}$$

