



Updates on ZDC Simulation

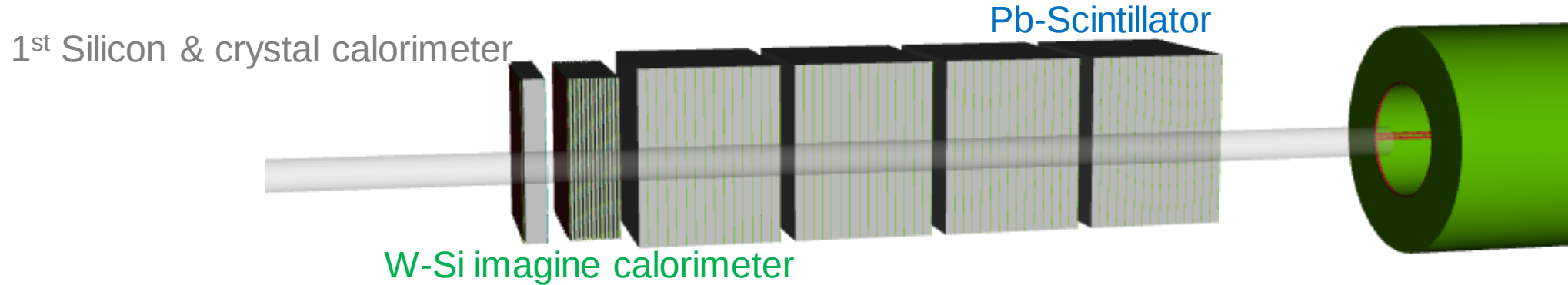
July 11, 2023

Far-forward Weekly Meeting

Po-Ju Lin

Academia Sinica

New ZDC Geometry

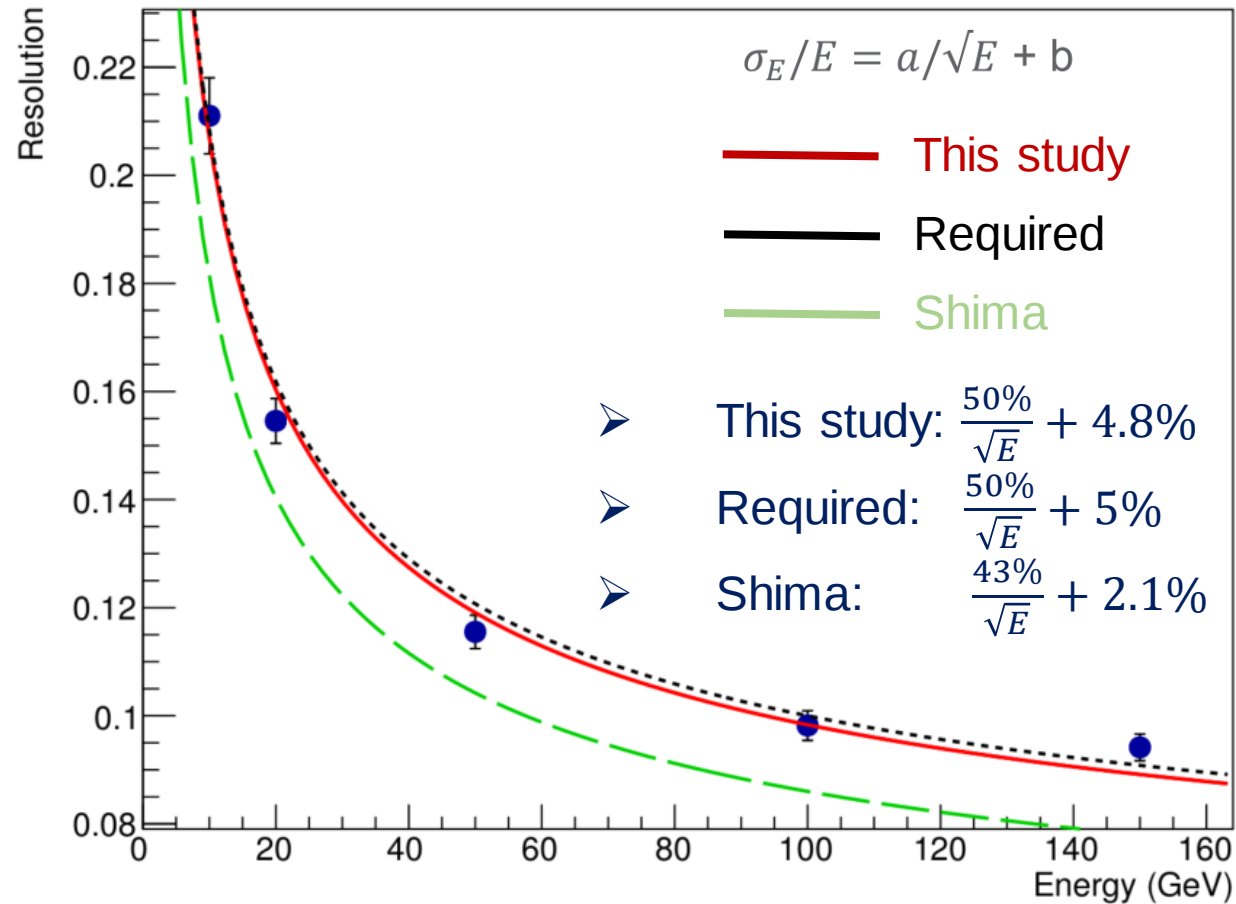


- Use particle gun to generate neutrons of different energy
 - Position at the front of ZDC, at angle along the ZDC center
 - Five different energy settings: (10, 20, 50, 100, 150) GeV
 - 1000 events for each setting
- Do calibration with linear fitter

$$E_{rec.} = c_1 E_{SiPix} + c_2 E_{Crystal} + c_3 E_{WSi} + c_4 E_{PbScint} + b$$

New ZDC Geometry

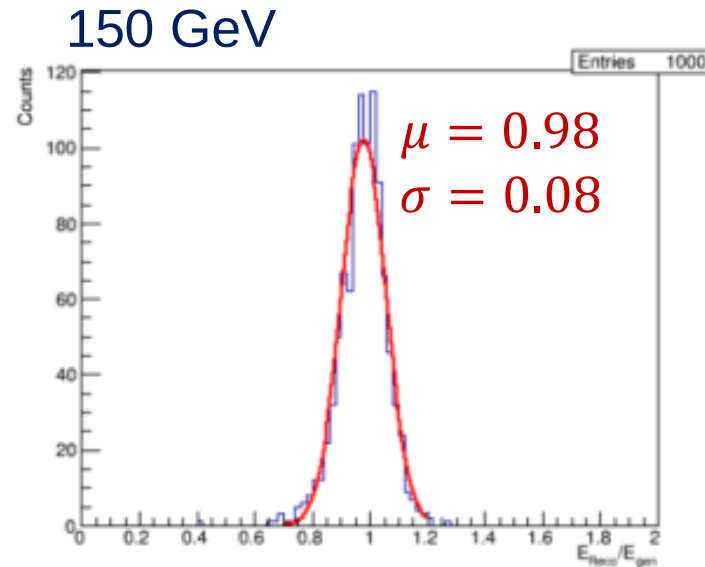
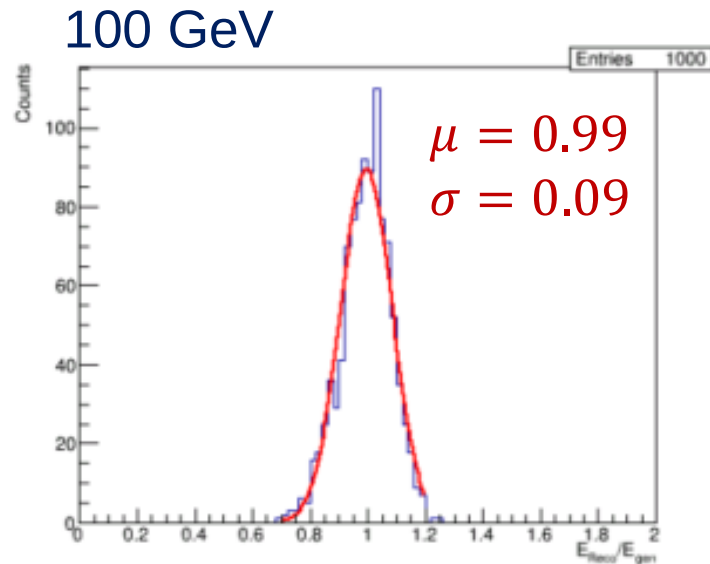
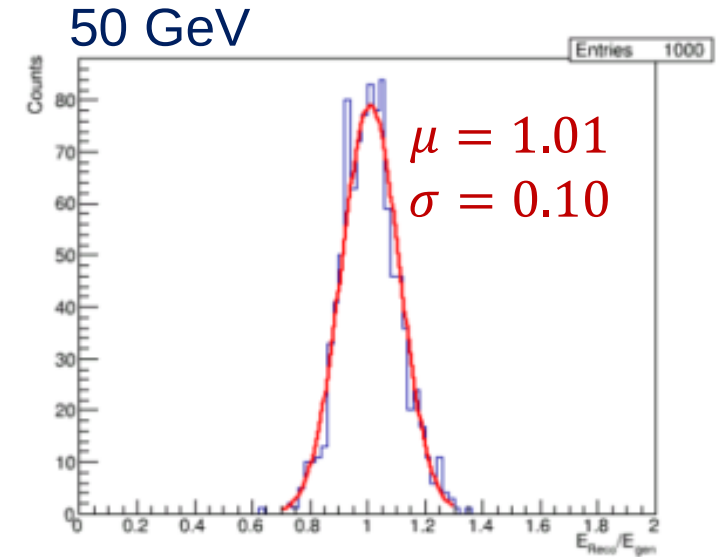
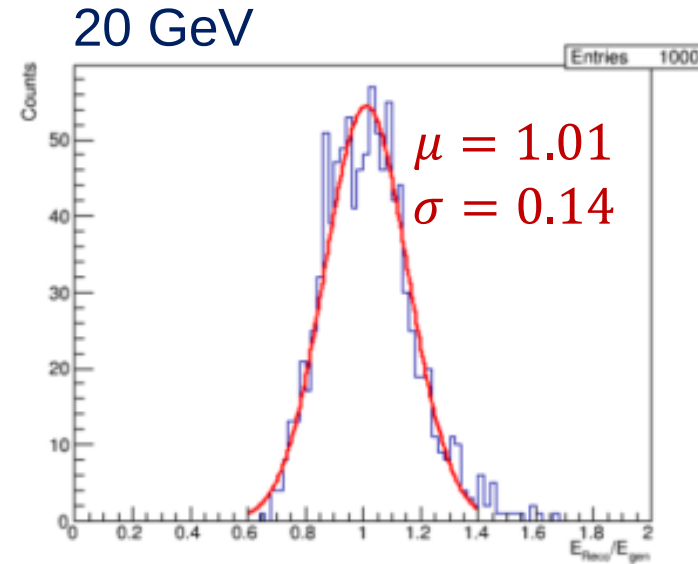
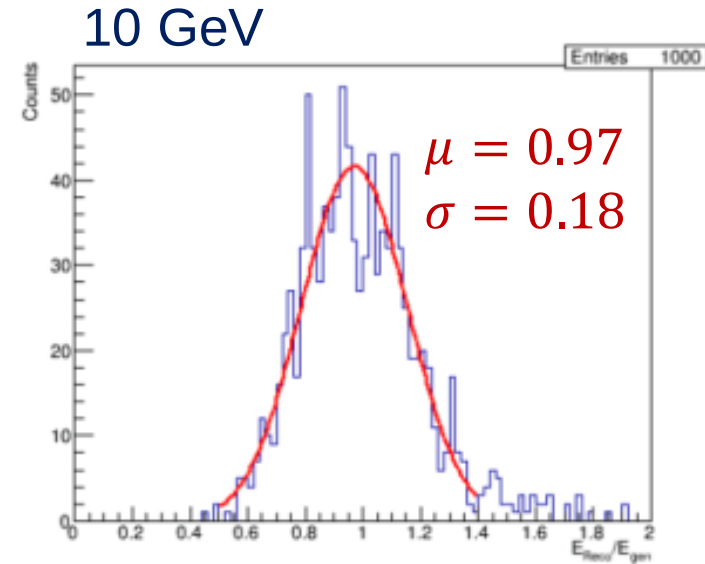
Energy Resolution



- A test suggested → modify the ratio of the thickness of Pb:Scintillator to 4:1
- Before:
 - Lead = 30 mm
 - Scintillator = 2 mm
 - Now:
 - Lead = 25.6 mm
 - Scintillator = 6.4 mm

Each module contains 15 layers of Pb/Scintillators (480mm), unchanged.

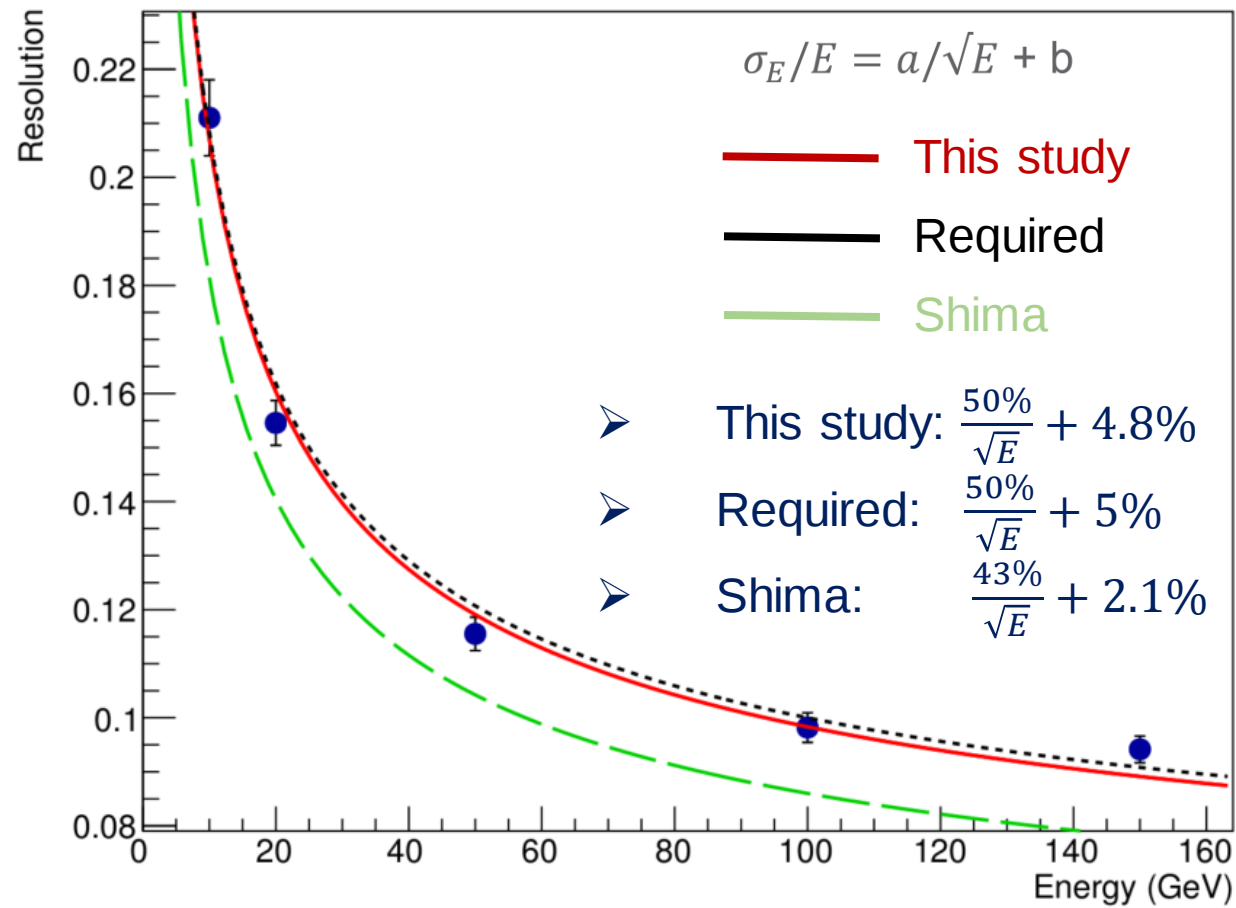
New ZDC Geometry



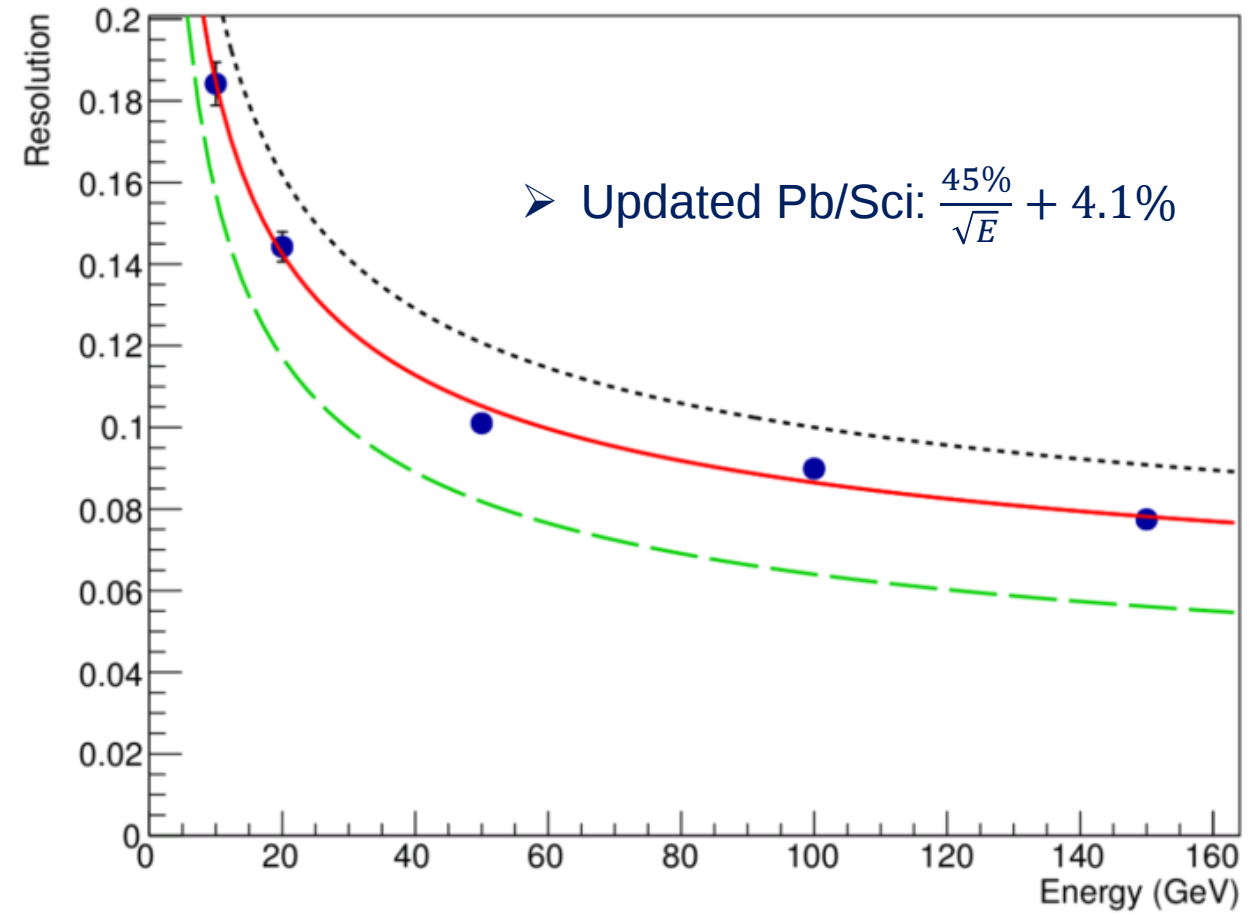
➤ Gaussian fits of $E_{\text{reco}}/E_{\text{Gen}}$

New ZDC Geometry

Before



Now



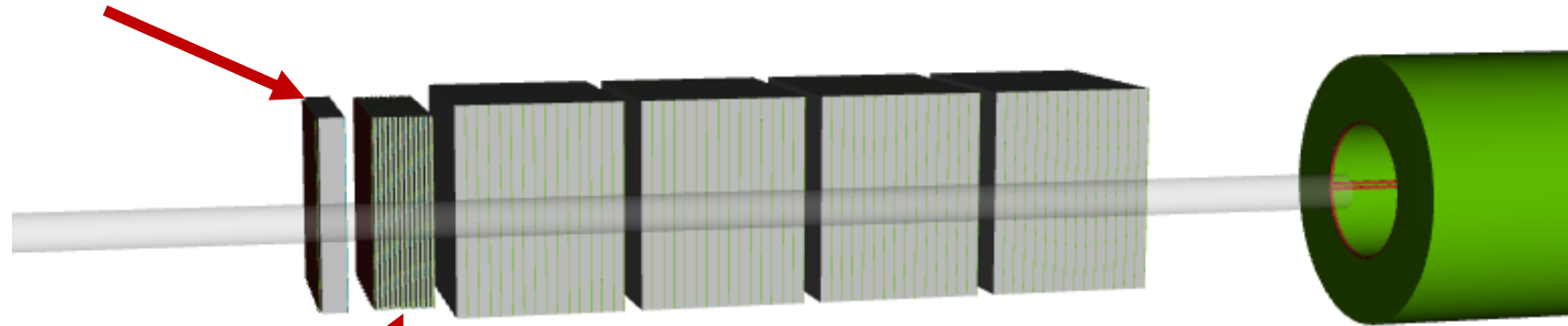
BACKUP

New ZDC Geometry

➤ 1st Silicon & crystal calorimeter:

- Smaller lateral dimension (x, y) = (56, 54) cm.

➤ Silicon Pixel lateral size (x, y) = (4, 3) mm



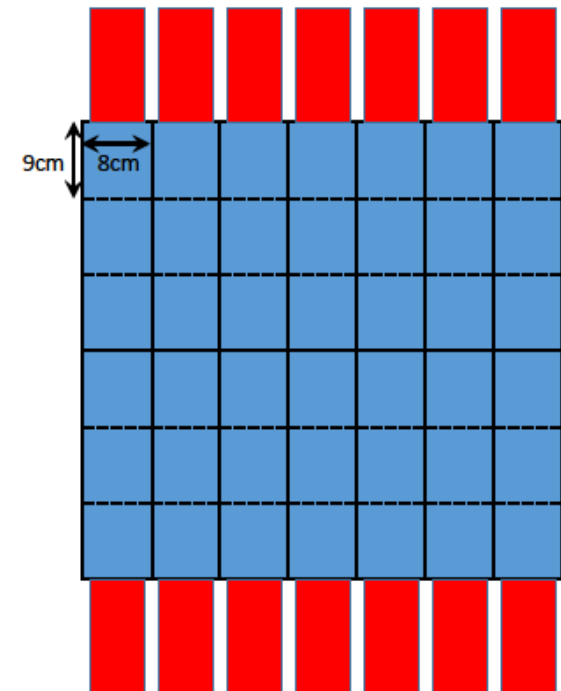
➤ W-Si imagine calorimeter

- Smaller lateral dimension (x, y) = (56, 54) cm.
- Smaller number of layers $1X_0 \times 22 \rightarrow 2X_0 \times 12$ layers

➤ Pb-Scintillator + fused silica

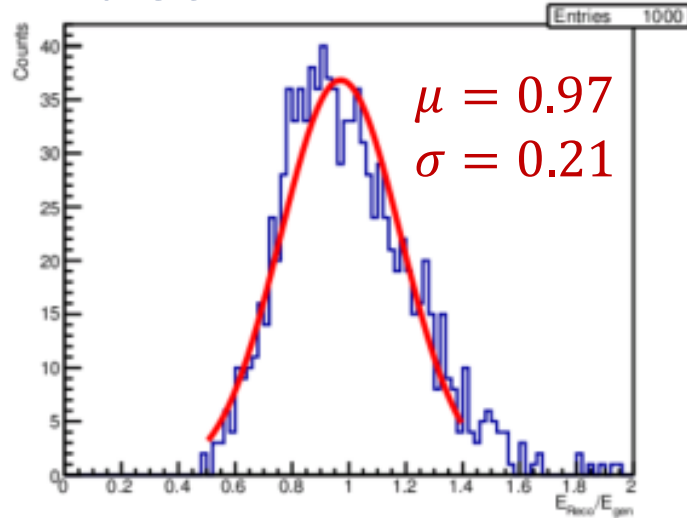
- Towers of 10cm x 10cm x 48cm, each module is 60cm x 60cm x 48cm
- 4 modules
- Not yet have the implementation of fused silica – **only scintillator now**

➤ Pb-Si modules removed

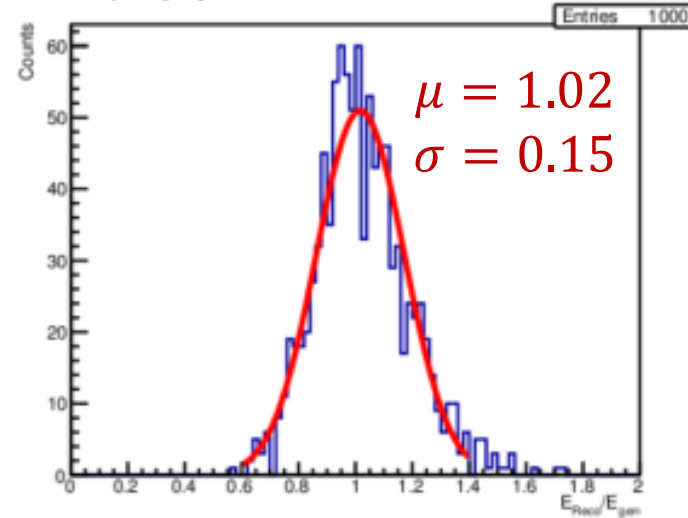


New ZDC Geometry

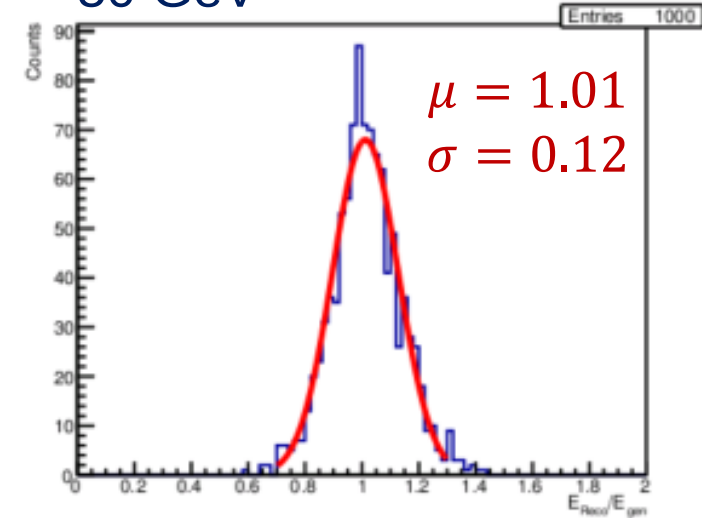
10 GeV



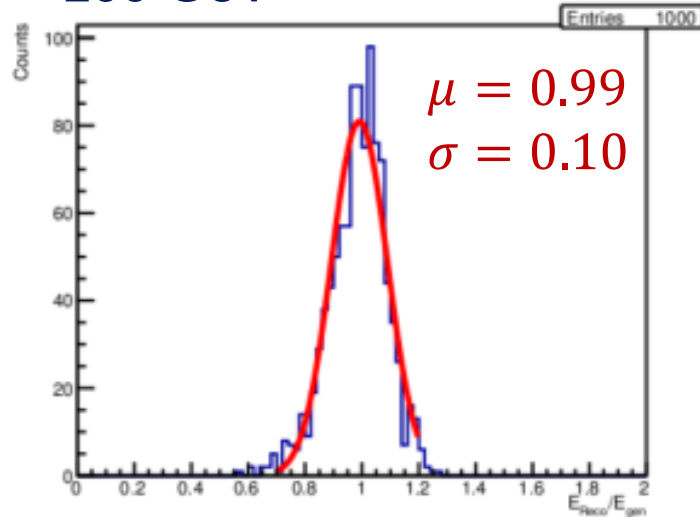
20 GeV



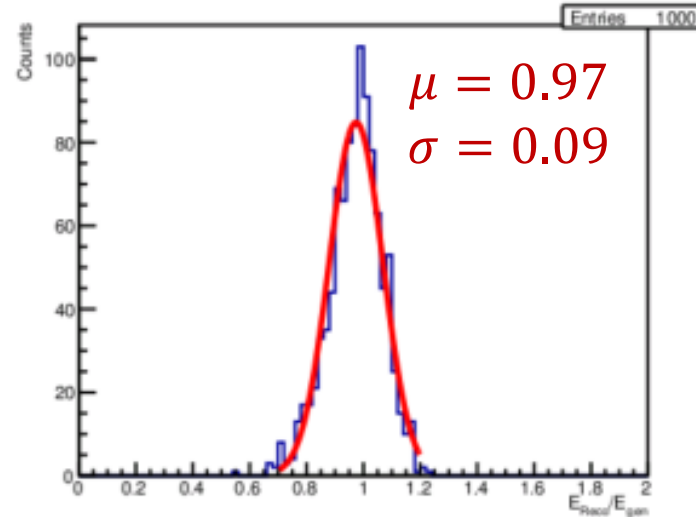
50 GeV



100 GeV



150 GeV



➤ Gaussian fits of $E_{\text{reco}}/E_{\text{Gen}}$