Updates on ZDC Simulation

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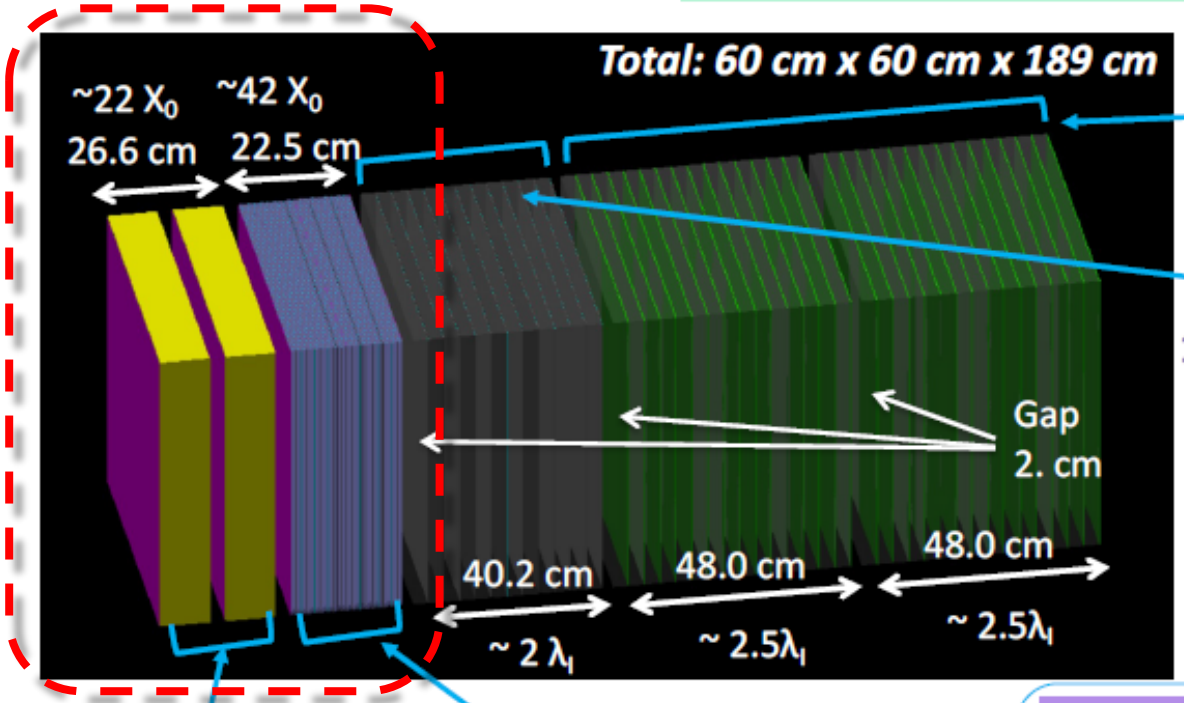
First ZDC design

Plots of energy deposition are in backup slides.



30 layers (15 layers x 2)

Pb 3cm Thickness
Scintilator
10 cm x 10 cm x 2 mm
Gap 0.0013 mm

12 layers

Pb 3cm Thickness
PET (Glue) 0.11 mm
Silicon
1 cm x 1 cm x 320 µm
PET (Glue, FPC) 0.41 mm
Gap 1. mm

2 layers

Silicon
3 mm x 3mm x 300 µm
PET (Glue, FPC) 0.39 mm
Gap 1.2mm
Crystal (PbWO4)
3cm x 3cm x 10 cm
Gap 3 cm

Si: 3 layers,
Si: 40 layers,
W: 42 layers

= **Si** + 2 x

20 layers +

Tungsten 3.5 mm Thickness
PET (Glue) 0.11 mm
Silicon 1 cm x 1 cm x 320 µm
PET (Glue, FPC) 0.41 mm, Gap 1.mm

1 layer

Tungsten 3.5 mm Thickness
PET (Glue) 0.11 mm
Silicon 3 mm x 3mm x 300 µm
PET (Glue, FPC) 0.39 mm, Gap 1.2mm

- Try to reproduce the result of Shima with the first design.

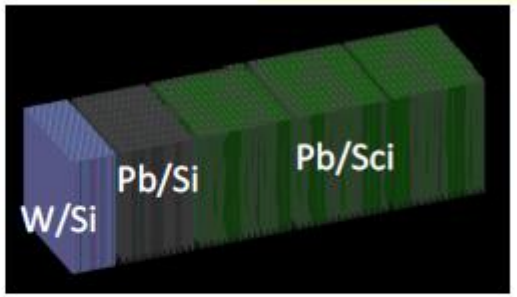
1st Version of ZDC Geometry

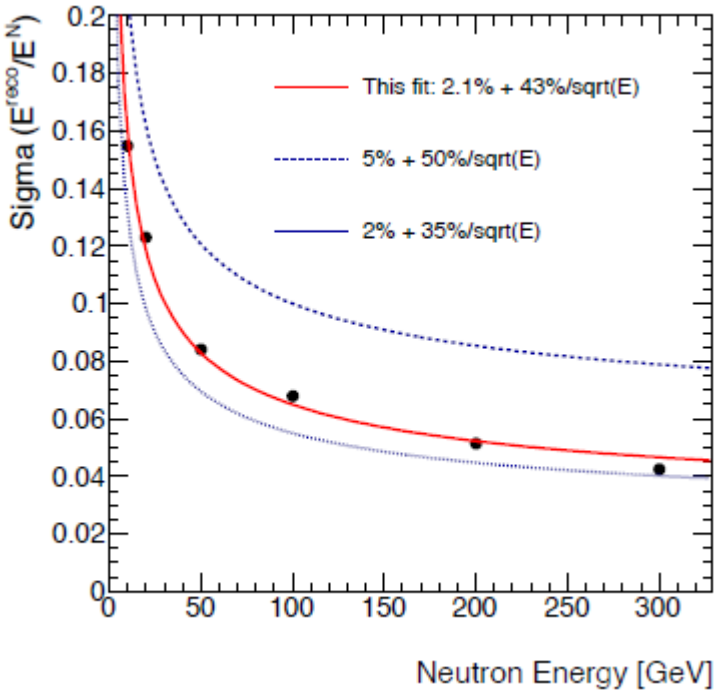
Parameters from fit

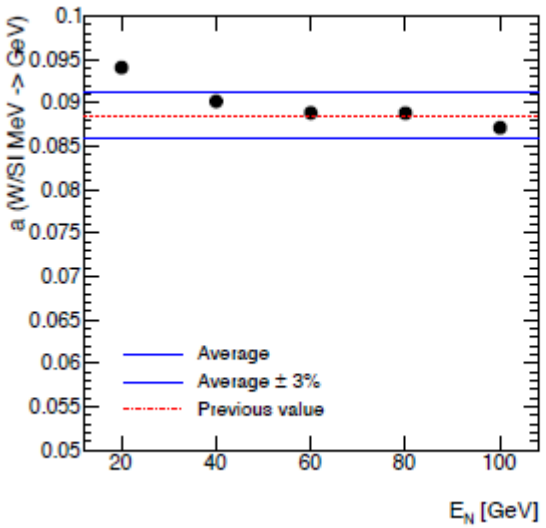
- The energy response in each detector looks quite linear.
- Extract parameters from fits:

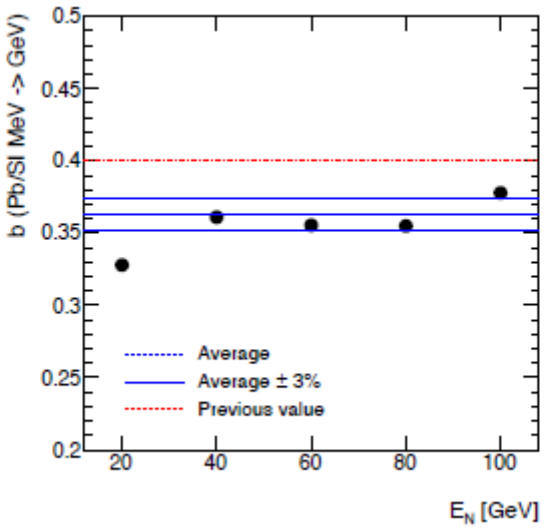
$$a \cdot E_{\mathrm{SI\ (W/SI)}} + b \cdot E_{\mathrm{SI\ (Pb/SI)}} + c \cdot E_{\mathrm{Sci}} = E_{\mathrm{N}}$$ (E_N = Neutron energy)

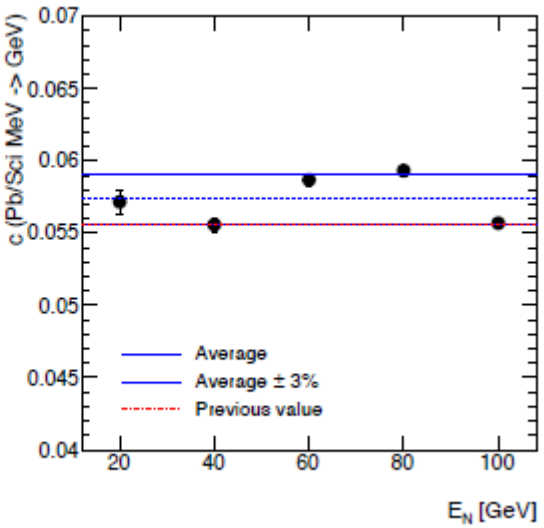
Fit is done for each energy sample (E_N= 20, 40, 60, 80, 100 GeV)







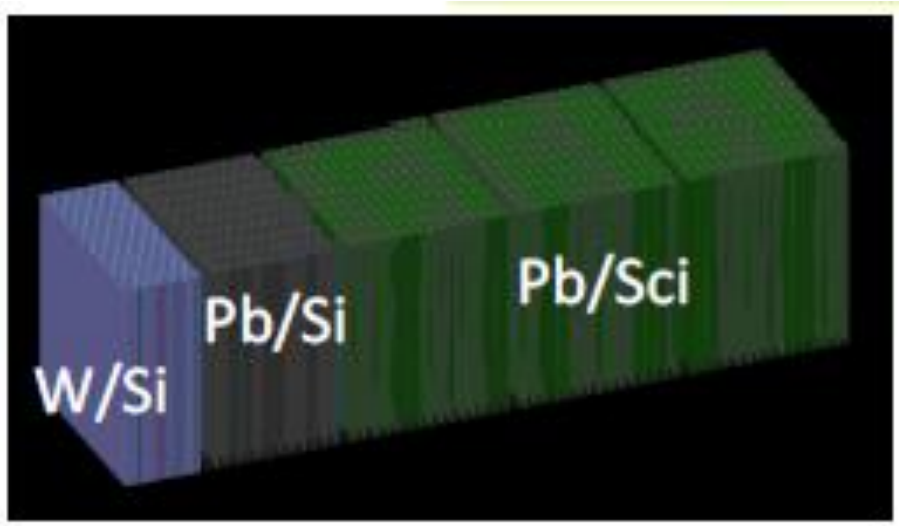




- Unable to have the same resolution with the current design.

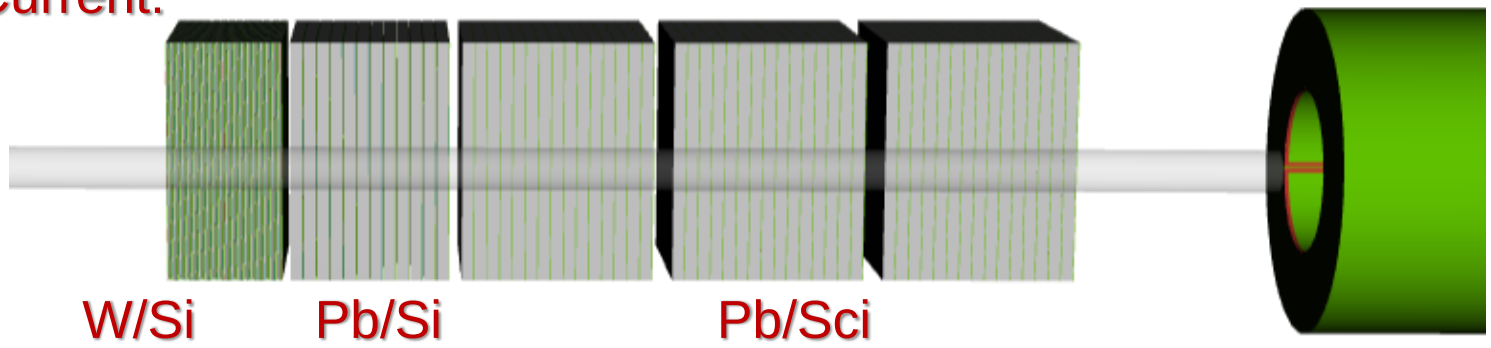
1st Version of ZDC Geometry

Shima:



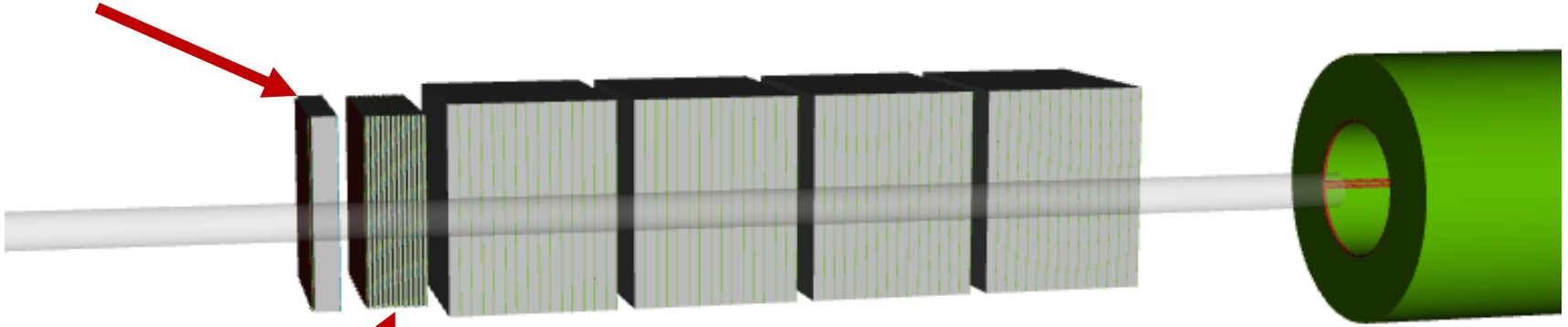
- Implementation of the 1st-version ZDC Geometry
  - Based on the slides that I have, should be similar enought, if not identical
- Got errors while running the simulation:
  - ERROR: MultiSegmentation: Invalid sub-segmentation identifier!
  - Debug ongoing...

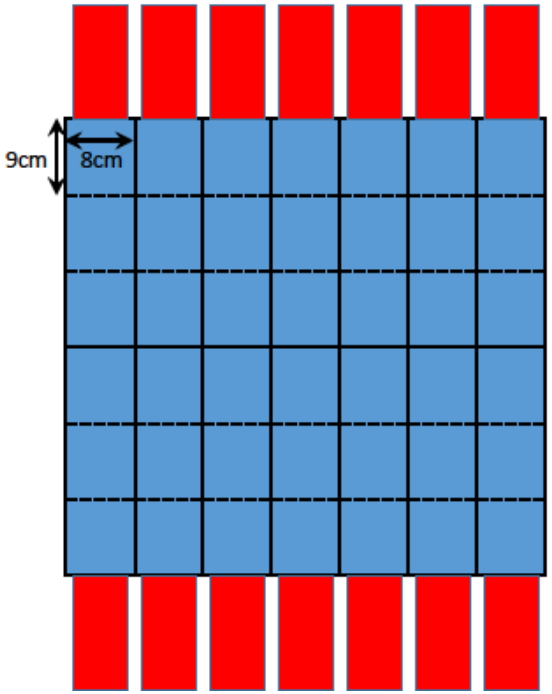
Current:



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
  - Will contact Yuji for the implementation of fused silica
- Pb-Si modules removed

✓ Tried running npsim with this setup, worked