



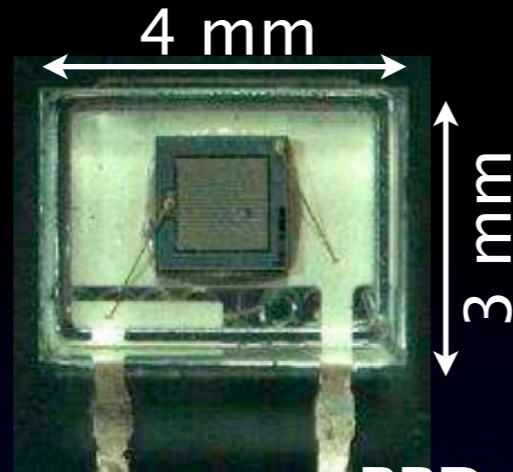
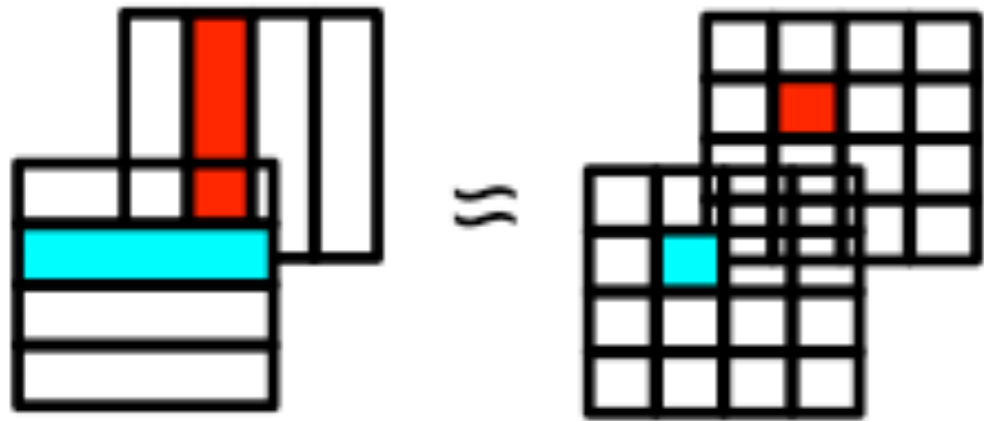
Plan of Sc part of realistic simulation in ECAL

K. Kotera, Shinshu university, 27th January
2010

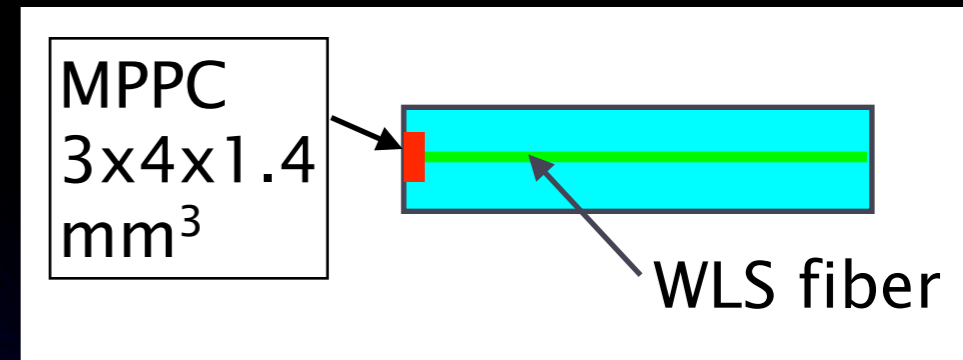
ILD Software Meeting



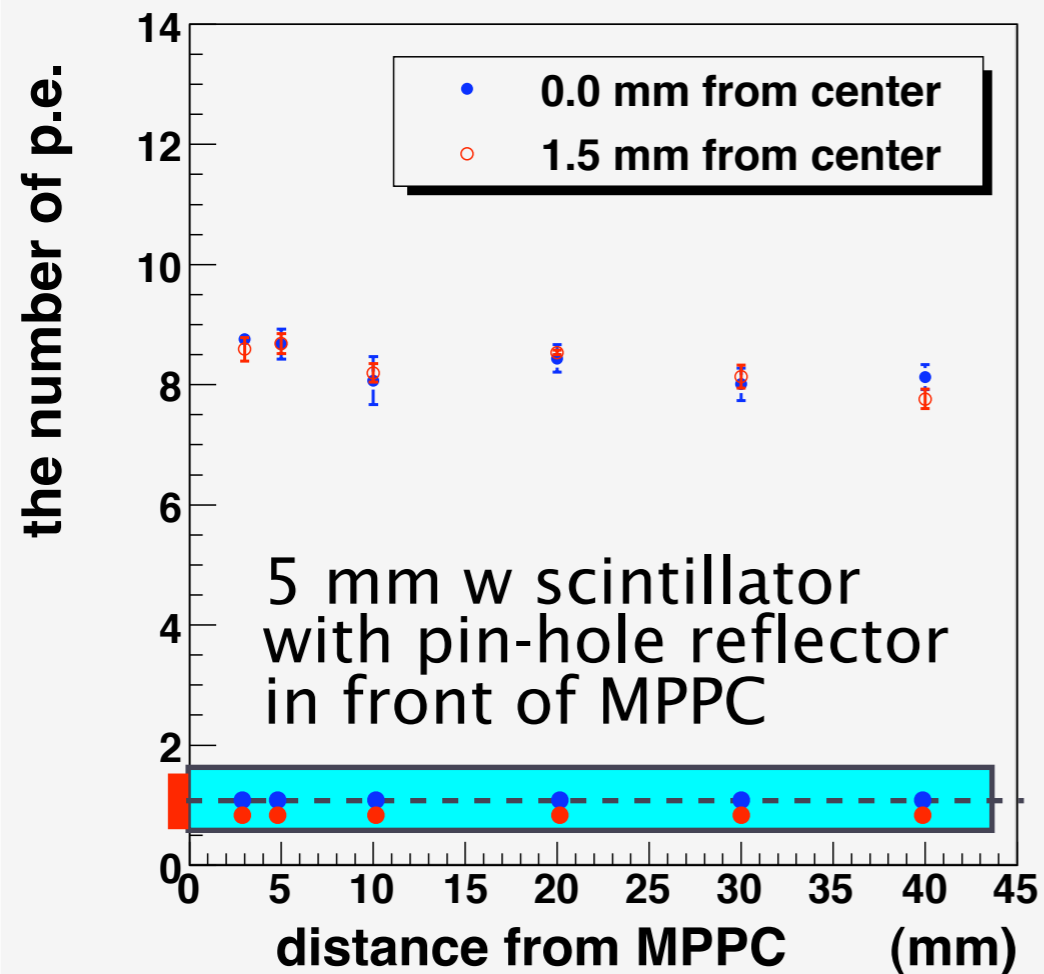
10 mm → 5 mm



Hamamatsu-PPD=MPPC
1600 pixel 1 x 1 mm

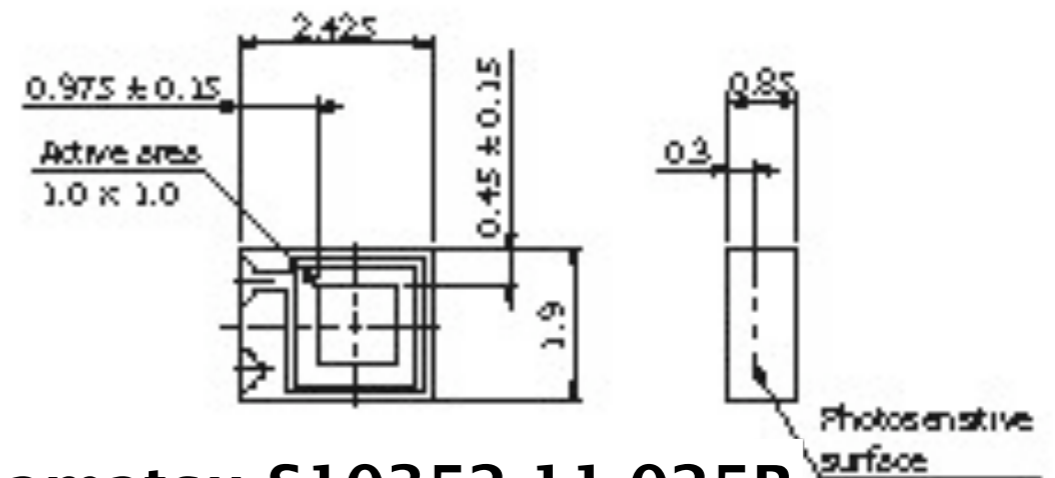


10mm x 45 mm x 3mm
1mm ϕ WLS fiber



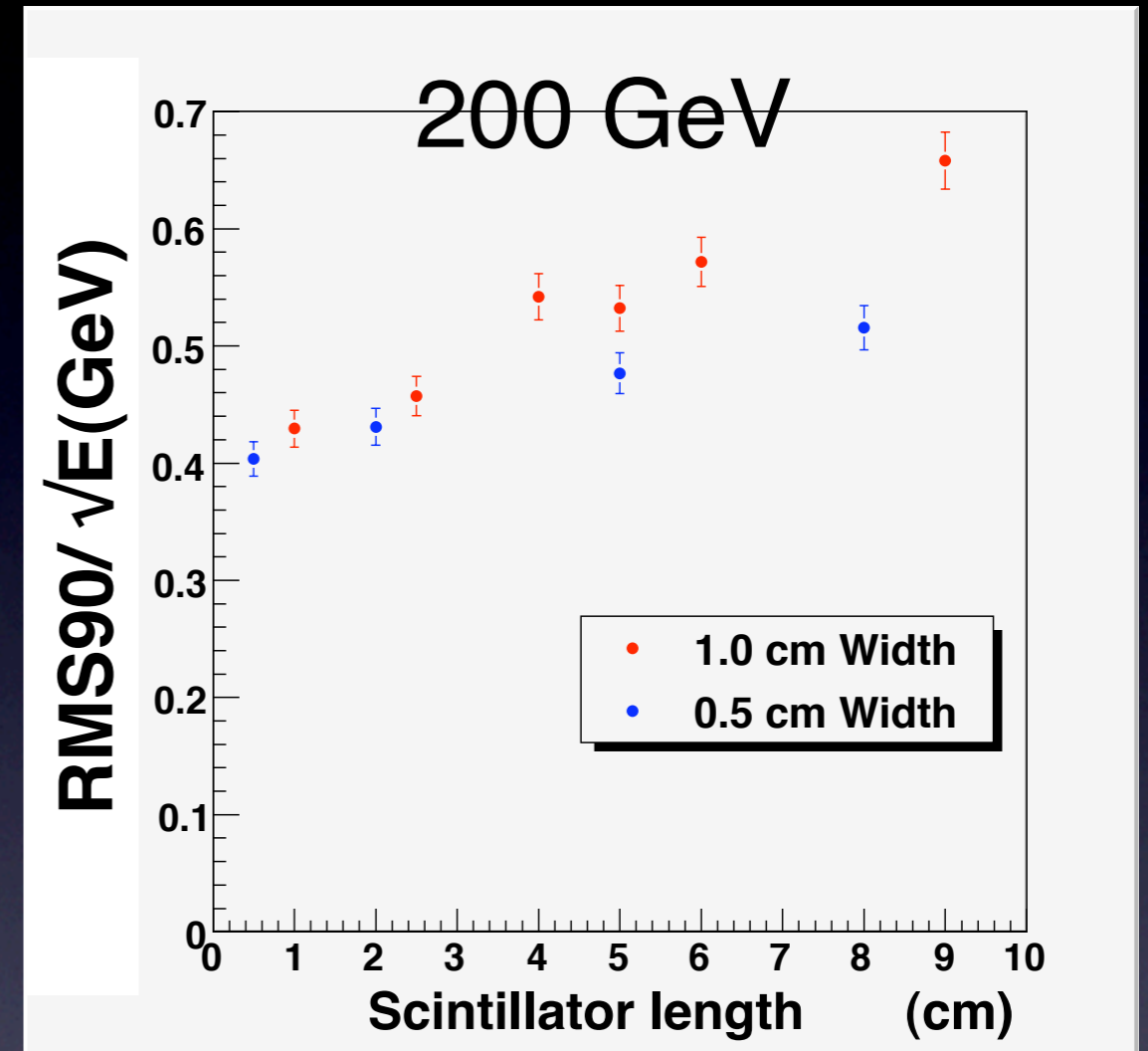
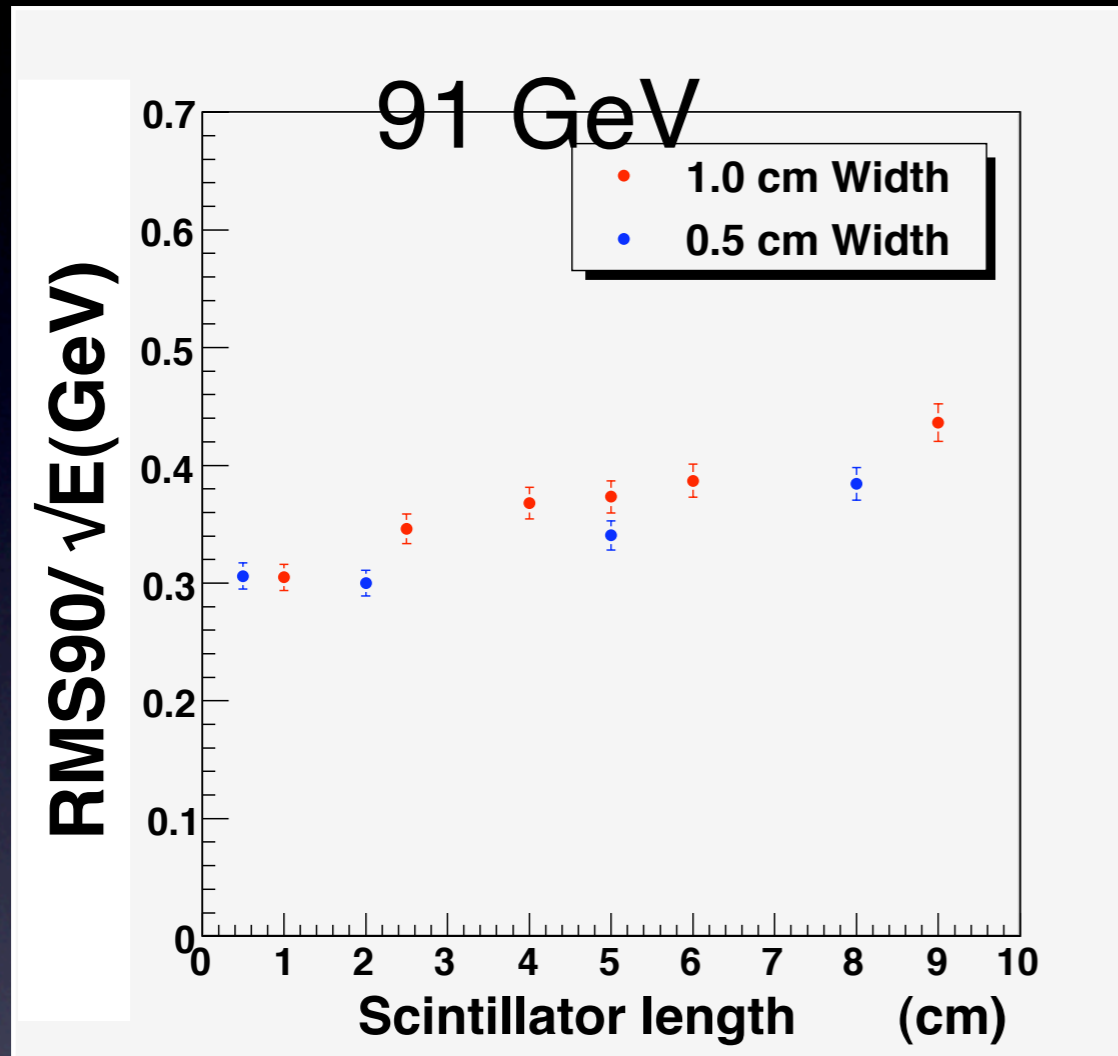
MPPC
2x2.5x0.9
mm³

5 x 45 x 2 mm³
w/o WLS fiber



Hamamatsu S10352-11-025P

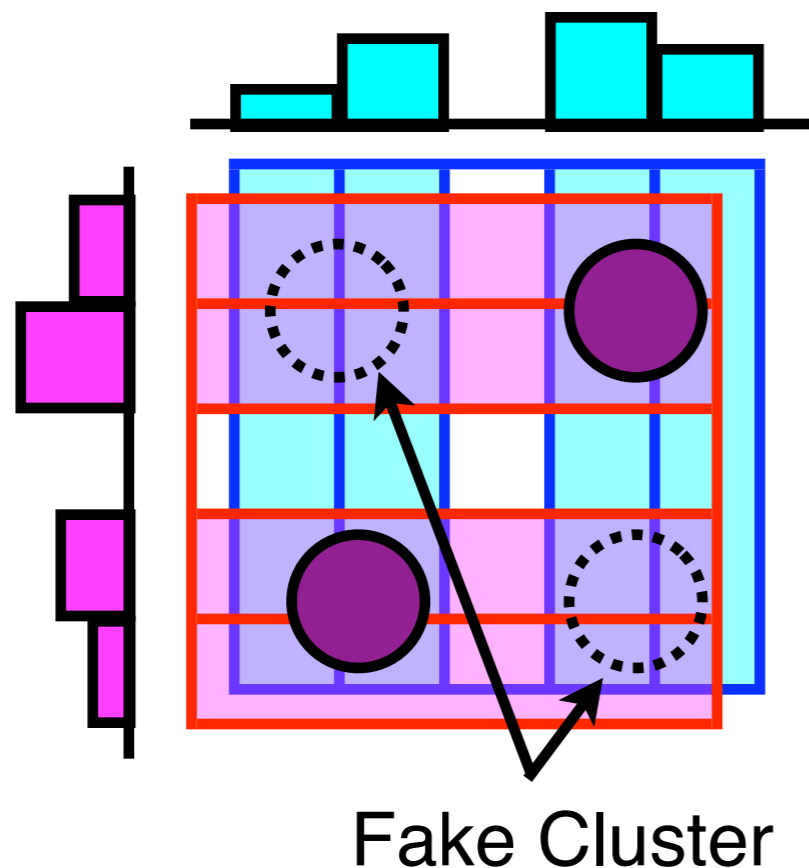
Sc. length dependence of the Jet energy resol.n (Jupiter-PandoraPFA)



- We want to restrain the scintillator length dependence of the energy resolution.
- The E resolution gets worse as the length increases so far.
 - we have to improve the clustering method
 - with Mokka-Marlin/PandoraPFA combination.

one of possible reasons of getting worse

Two (Multi) -fold ambiguity

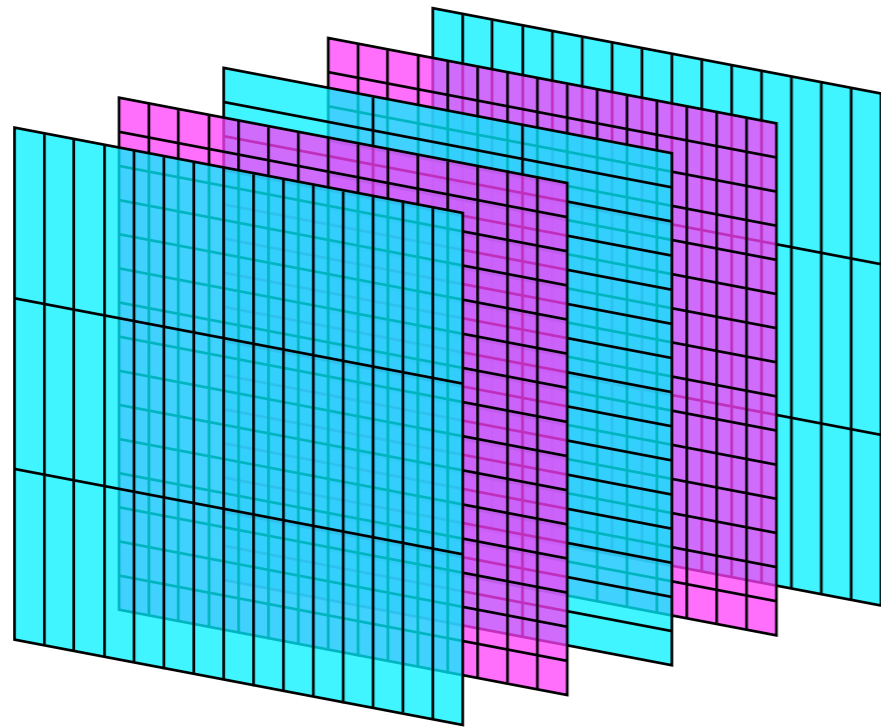


- Four or more calorimeter tracks (clusters) are constructed for actual two cluster events.
- When TPC track-information works well, fake clusters are merged into true clusters.
- But photons do not have their tracks.

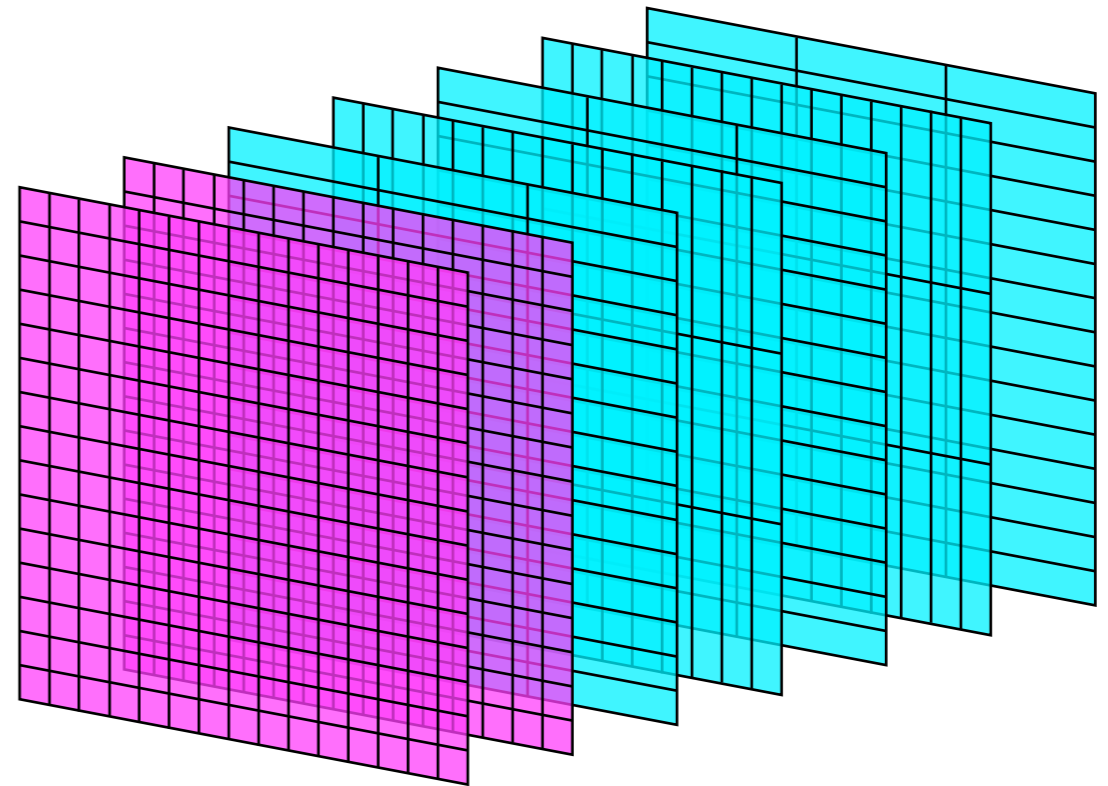
One of the way to avoid this problem is to use granular square cell layers in first few layers or to put granular cell layers between strip layers.

Square-cell layers + Strip-cell layers

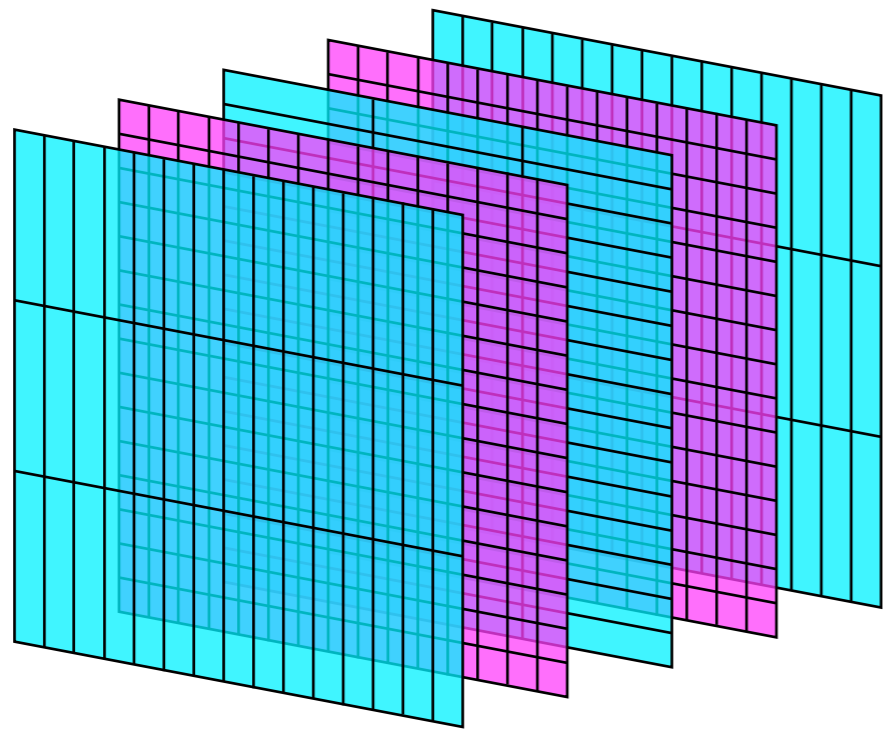
example (1)



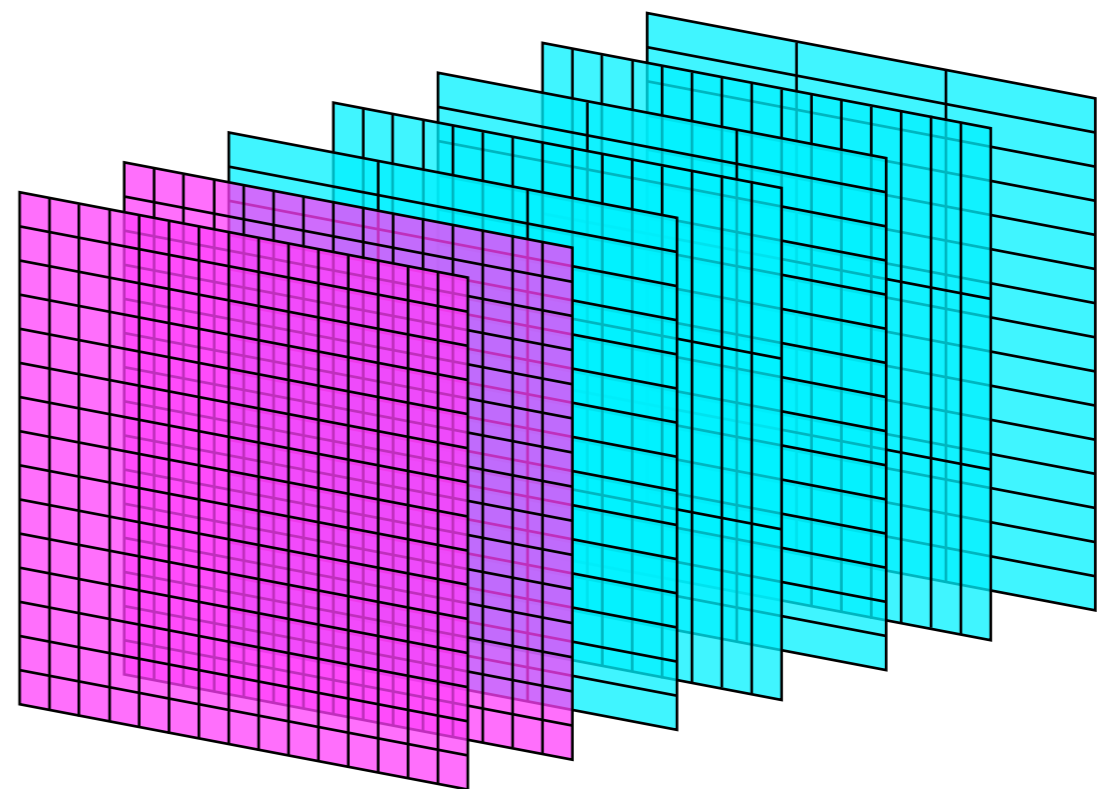
example (2)



example (1)

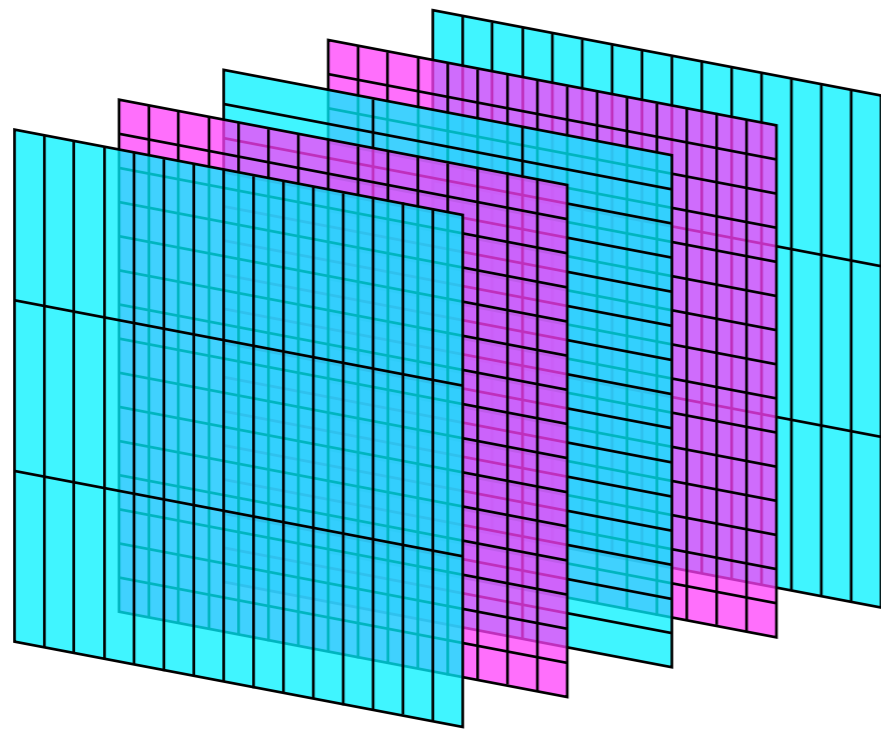


example (2)

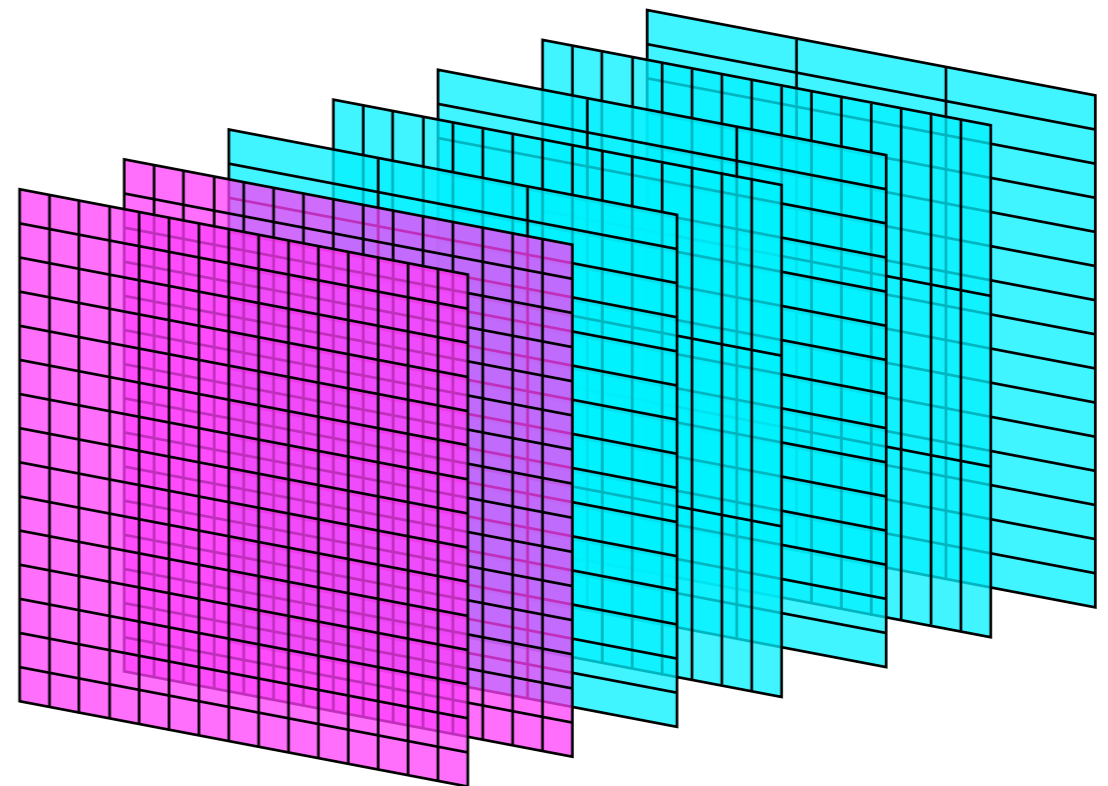


~Si-cell layers + Sc-cell layers

example (1)

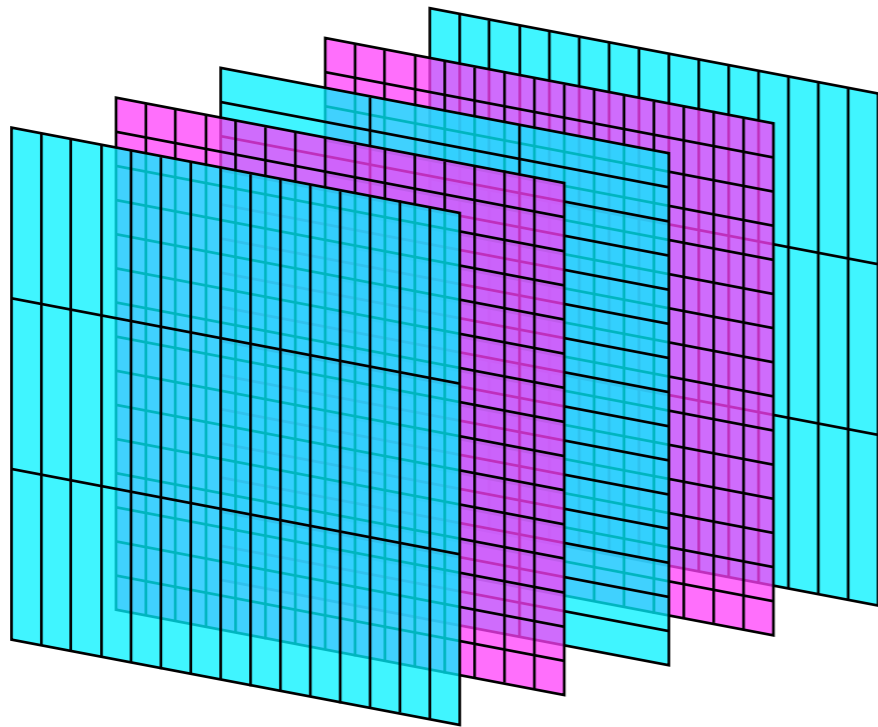


example (2)

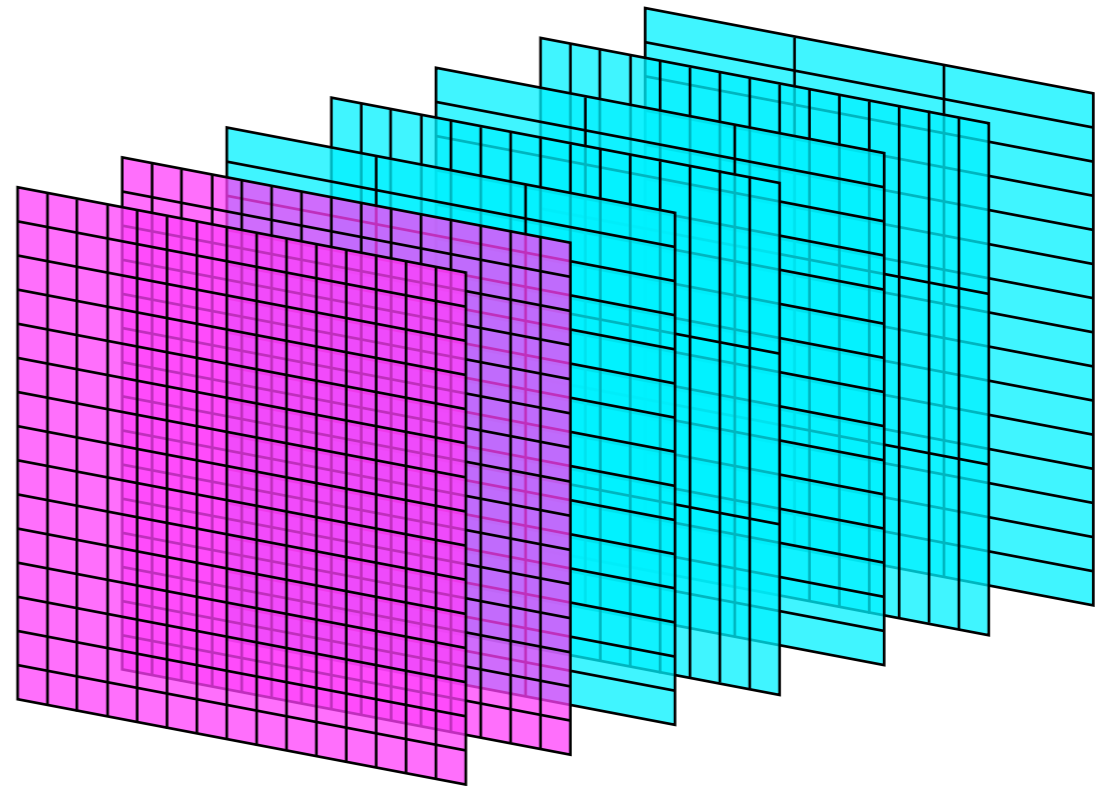


~Si-cell layers + Sc-cell layers

example (1)



example (2)

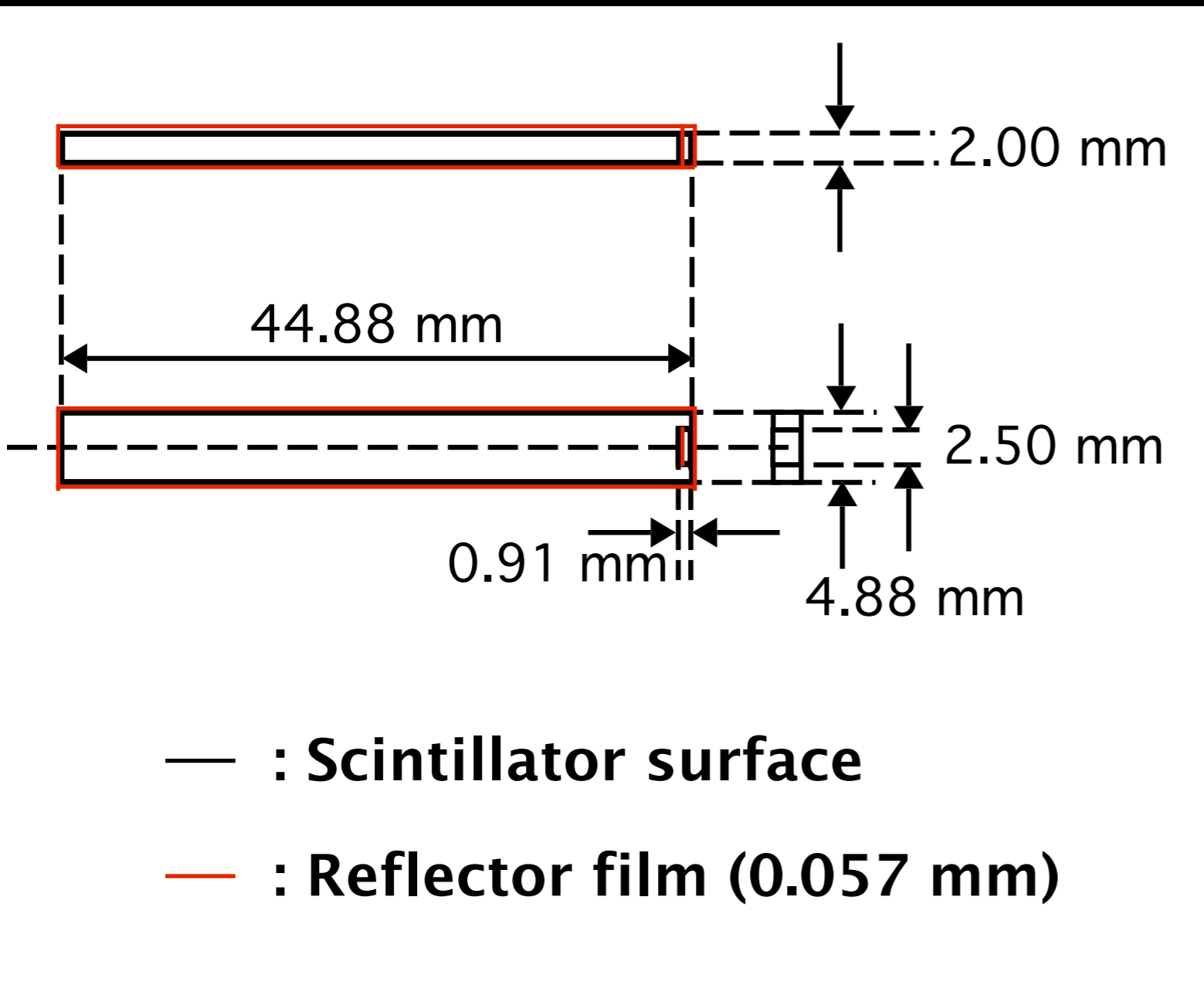
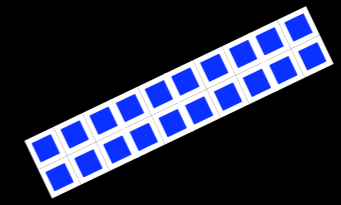


Requirements to the simulator are;

- Combination of Sc and Si layers is a parameter.
- Cell size can be changed with respect to each layer.

Paulo accepted this. Thanks Paulo!

Merge in MerlinReco → Strip implemented in Mokka

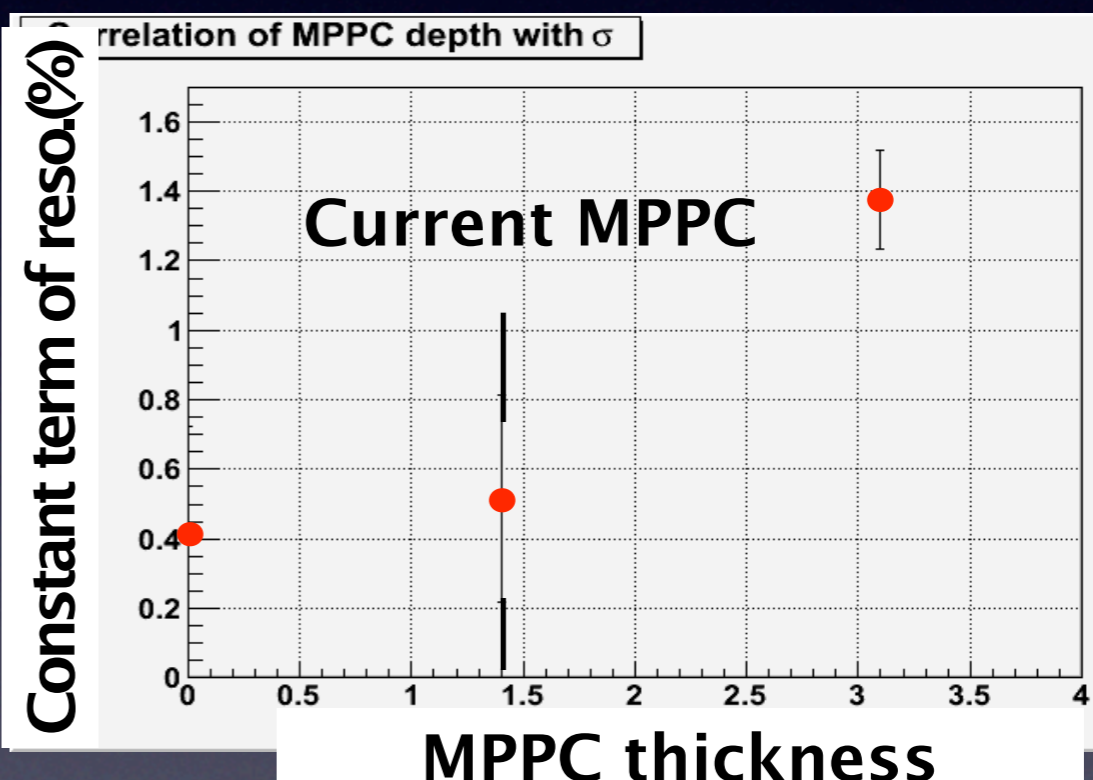
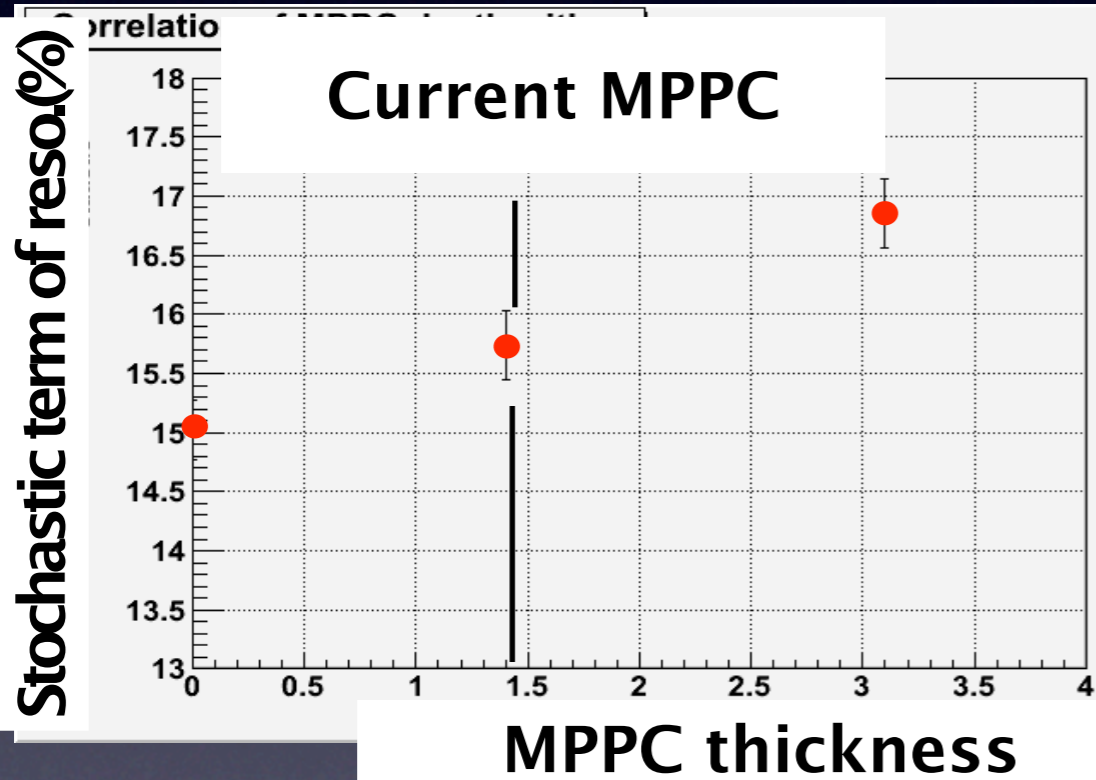
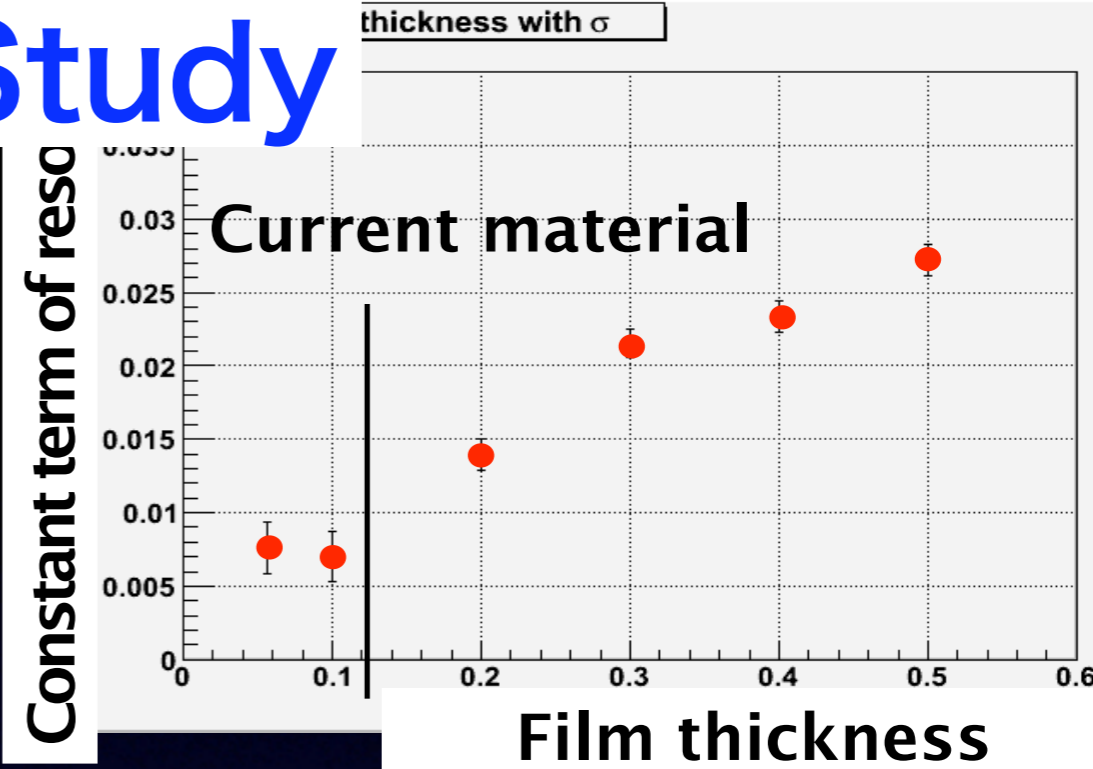
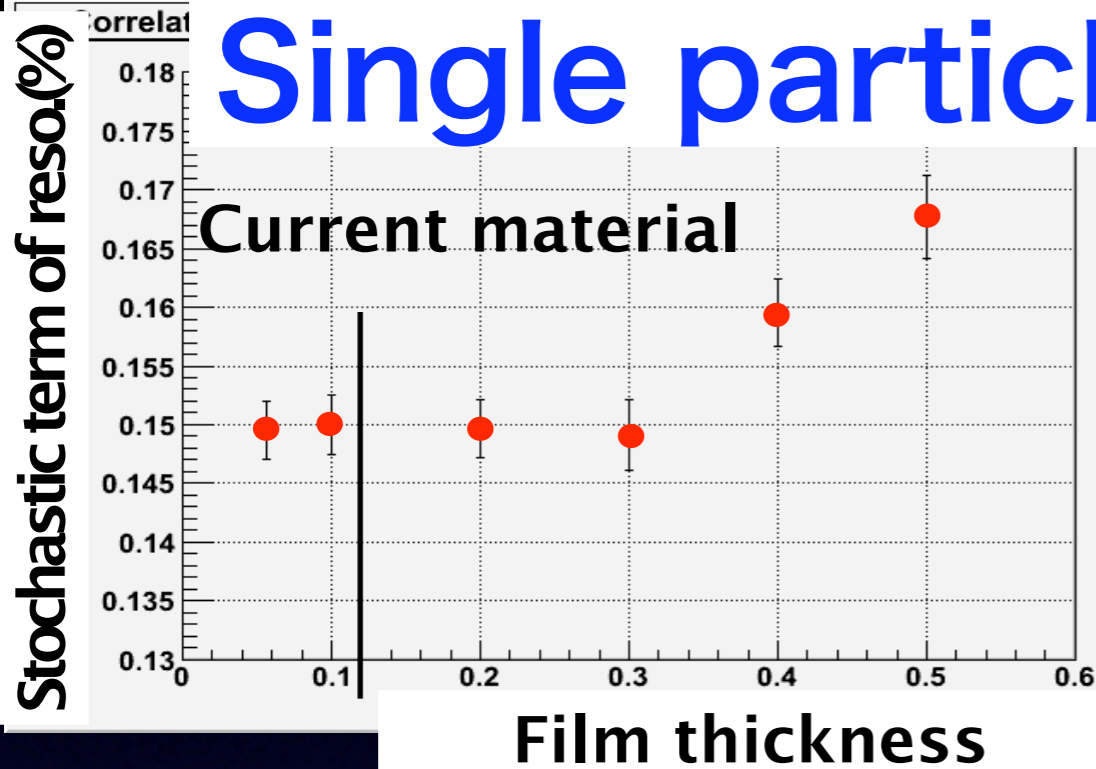


Strip directly implemented method

- Reflector film is implemented.
- The currently smallest MPPC package is implemented.
- position dependence of response is achieved as a function.

← empirical

Single particle Study



- for single particle, current film thickness and MPPC dead volume thickness do not have large effect.
- combined effects is yet not studied.
- need to investigate the effects on Jet energy resolution in ILD-ECAL.

So far using current ScECAL Mokka;

Sc/Si ECAL parameters

- | | | | | | |
|-----------|--|--------|-----------|--|--------|
| Sc | - Ecal_Barrel_halfZ = 2350
- Ecal_Sc_thickness = 2.
- Ecal_Slab_H_fiber_thickness = 0.55
- Ecal_Slab_PCB_thickness = 0.8
- Ecal_Slab_copper_thickness = 0.4
- Ecal_Slab_reflector = 0.12 (not yet)
- Ecal_Slab_ground_thickness = 0.1
- Ecal_Slab_shielding = 0.1
- Ecal_barrel_number_of_towers = 5
- Ecal_cables_gap = 25???? (not yet).
- Ecal_cells_size = 4.9
- Ecal_fiber_thickness = .15
- Ecal_front_face_thickness = 2
- Ecal_guard_ring_size = 0.010
- Ecal_lateral_face_thickness = 2
- Ecal_nlayers1 = 14
- Ecal_nlayers2 = 13
- Ecal_radiator_layers_set1_thickness = 3.0
- Ecal_radiator_layers_set2_thickness = 3.0
- Ecal_radiator_material = tungsten
- Ecal_sensitive_material = polystyrene
- Ecal_support_thickness = 9.3 | (mm) | Si | - Ecal_Barrel_halfZ = 2350
- Ecal_Si_thickness = 0.5-->0.3?
- Ecal_Slab_H_fiber_thickness = 0.55
- Ecal_Slab_PCB_thickness = 1.2
- Ecal_Slab_copper_thickness = 0.4
- Ecal_Slab_glue_gap = 0.1
- Ecal_Slab_ground_thickness = 0.1
- Ecal_Slab_shielding = 0.1
- Ecal_barrel_number_of_towers = 5
- Ecal_cables_gap = 100.
- Ecal_cells_size = 4.9
- Ecal_fiber_thickness = .15
- Ecal_front_face_thickness = 2
- Ecal_guard_ring_size = 0.5
- Ecal_lateral_face_thickness = 2
- Ecal_nlayers1 = 20
- Ecal_nlayers2 = 9
- Ecal_radiator_layers_set1_thickness = 2.1
- Ecal_radiator_layers_set2_thickness = 4.2
- Ecal_radiator_material = tungsten
- Ecal_sensitive_material = silicon_2.33gcm
- Ecal_support_thickness = 9.3 | (mm) |
|-----------|--|--------|-----------|--|--------|

total 27 so far

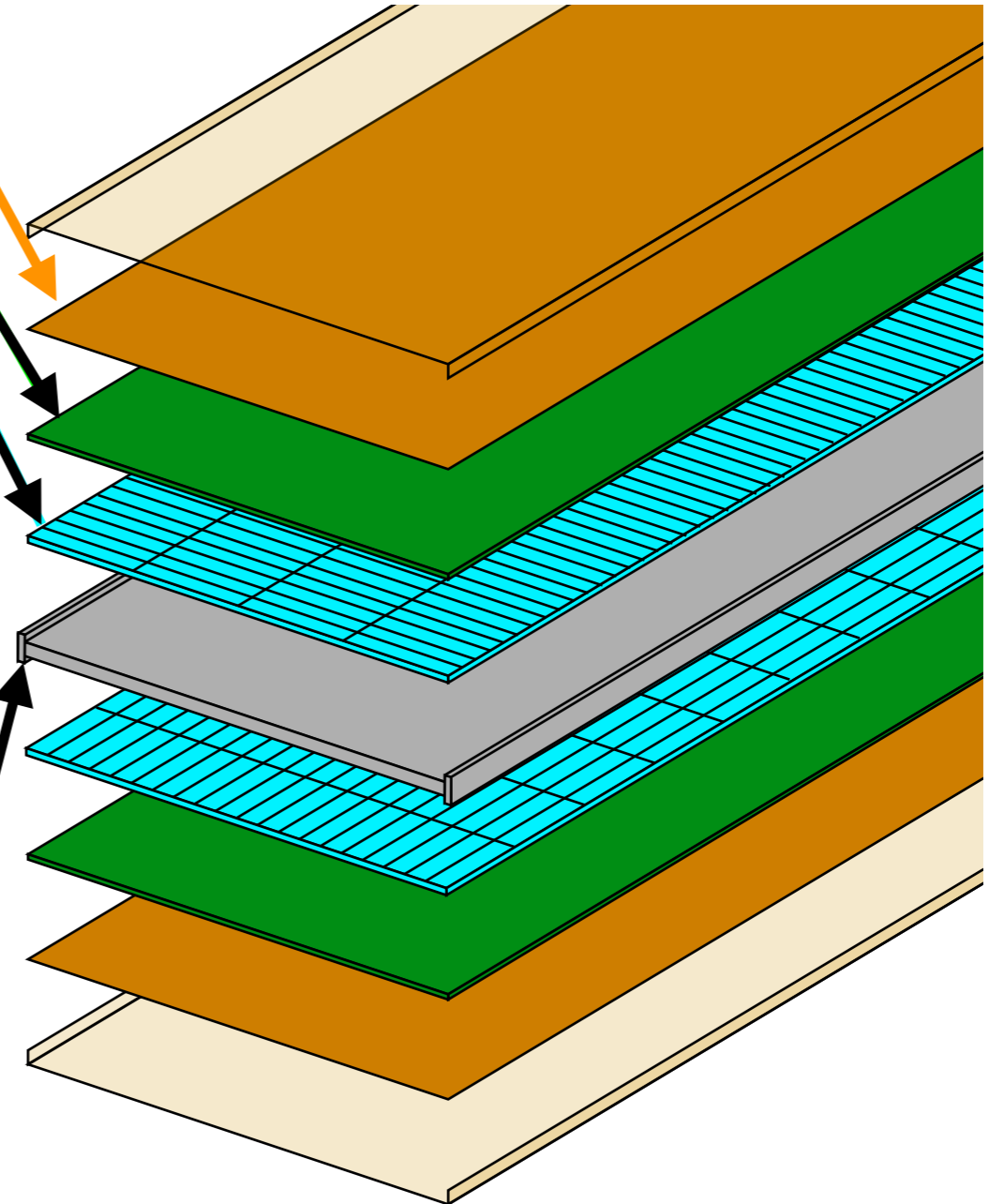
total 29

So far using current ScECAL Mokka;

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 - Ecal_Slab_copper_thickness = 0.4
 - Ecal_Slab_reflector = 0.12 (not yet)
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 - Ecal_Slab_shielding = 0.1
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 - Ecal_lateral_face_thickness = 2
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 - Ecal_nlayers2 = 13
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 - Ecal_radiator_layers_set2_thickness = 3.0
 - Ecal_radiator_material = tungsten
 - Ecal_sensitive_material = polystyrene
 - Ecal_support_thickness = 9.3

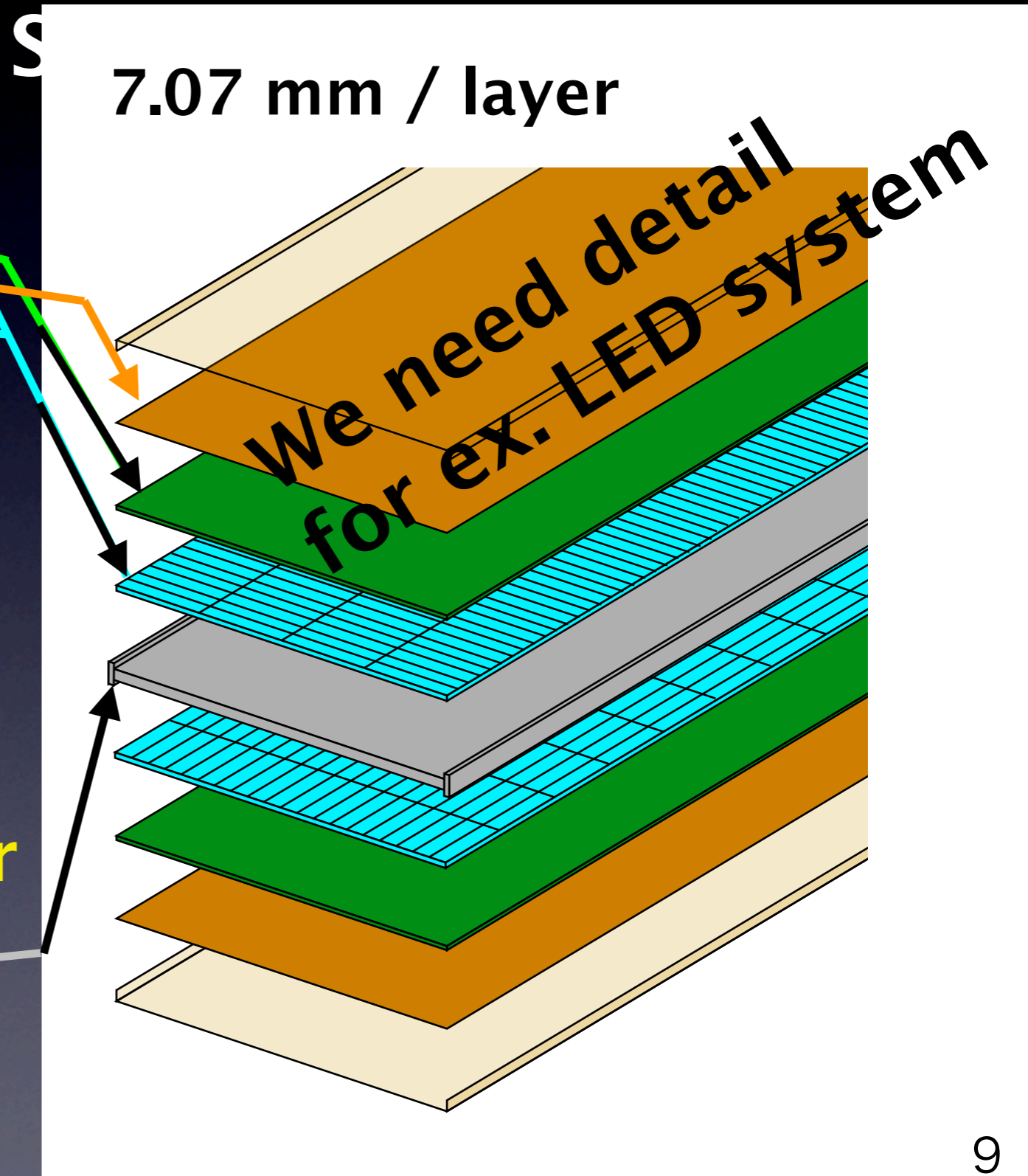
Si 7.07 mm / layer



So far using current ScECAL Mokka;

Sc/Si ECAL parameters

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 - Ecal_Slab_PCB_thickness = 0.8
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 - Ecal_Slab_reflector = 0.12 (not yet)
 - Ecal_Slab_ground_thickness = 0.1
 - Ecal_Slab_shielding = 0.1
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 - Ecal_sensitive_material = polystyrene
 - Ecal_support_thickness = 9.3



Plan of ScECAL simulation

Merge method to
make strip scinti.



Strip directly
implemented
method

develop merge processor
in MarlinReco level

Daniel Jeans have already
done in Jupiter-Marlin

implement detail
materials and non-
uniformity of response

develop clustering algorithm

optimize layer numbers
: square cell layers
: strip cell layers
strip size

tune parameters
according to the results
of Merge method

Best performance!

Current issues

Rather less resolution of square cell version of ScECAL, why?

- In current default geometry of Sc and Si ECAL, ScECAL has larger sampling ratio than SiECAL. ScECAL should have better resolution as long as we use 5 mm x 5 mm square cells.
- However, ScECAL has rather less resolution than SiECAL(29 : 27%). PandoraPFA calibration process according to “Readme” did not help this.
- There might exist some tunes for SiECAL?
(the large calibration coefficient for SiECAL comparing the inverse of the sampling ratio, why?)



Back up

