Some progresses of SSA study

1st November 2013

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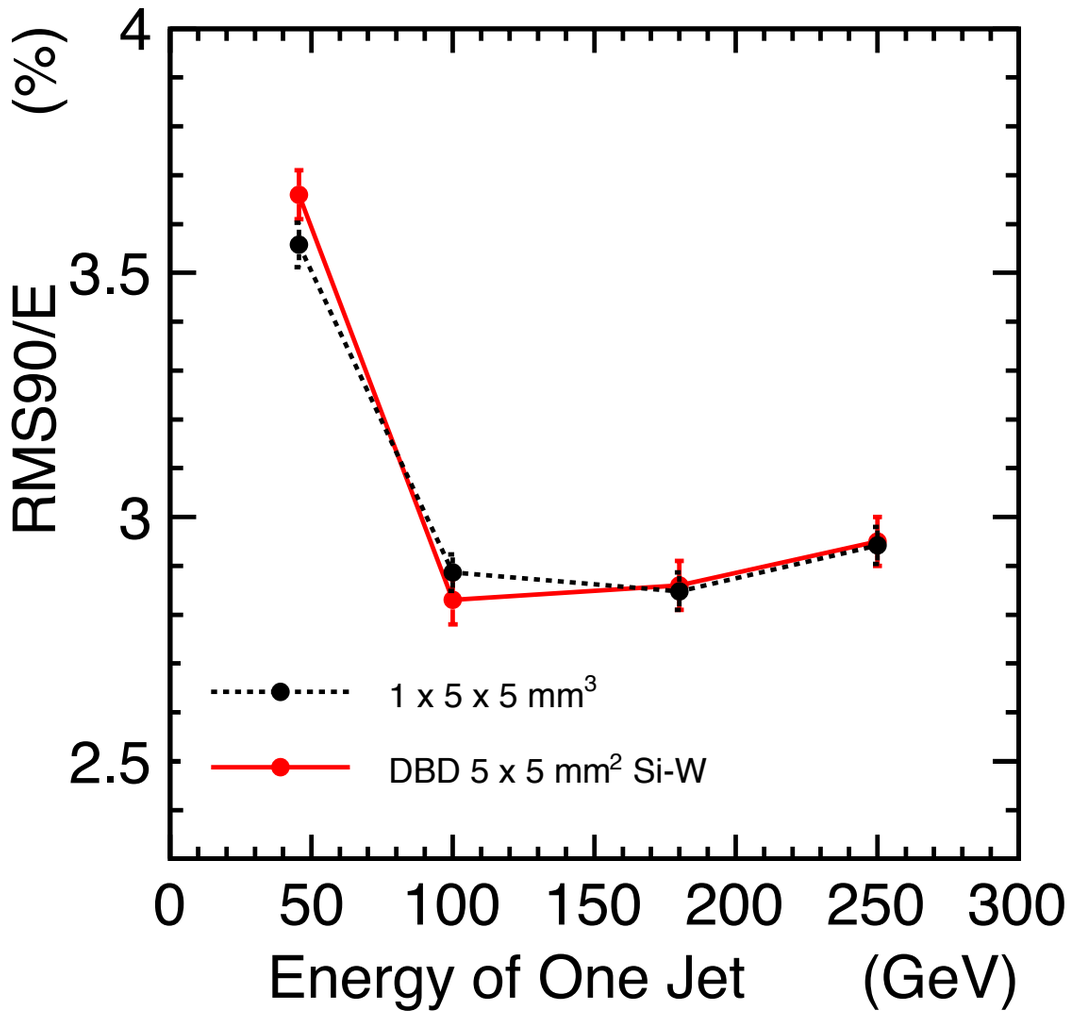
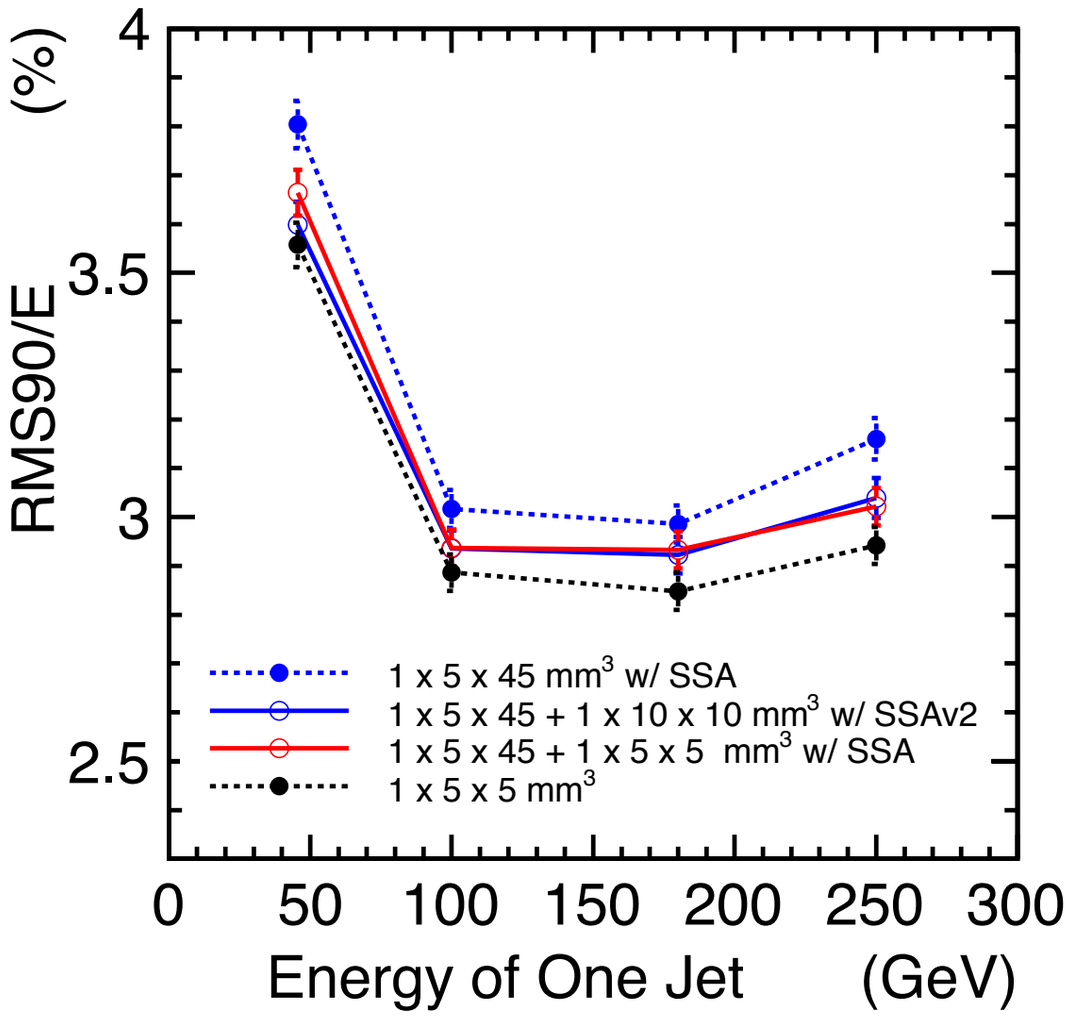
For Physics-Software meeting of ILD-Asia

alternative half of layers are replaced with tile layers

to avoid the ghosts



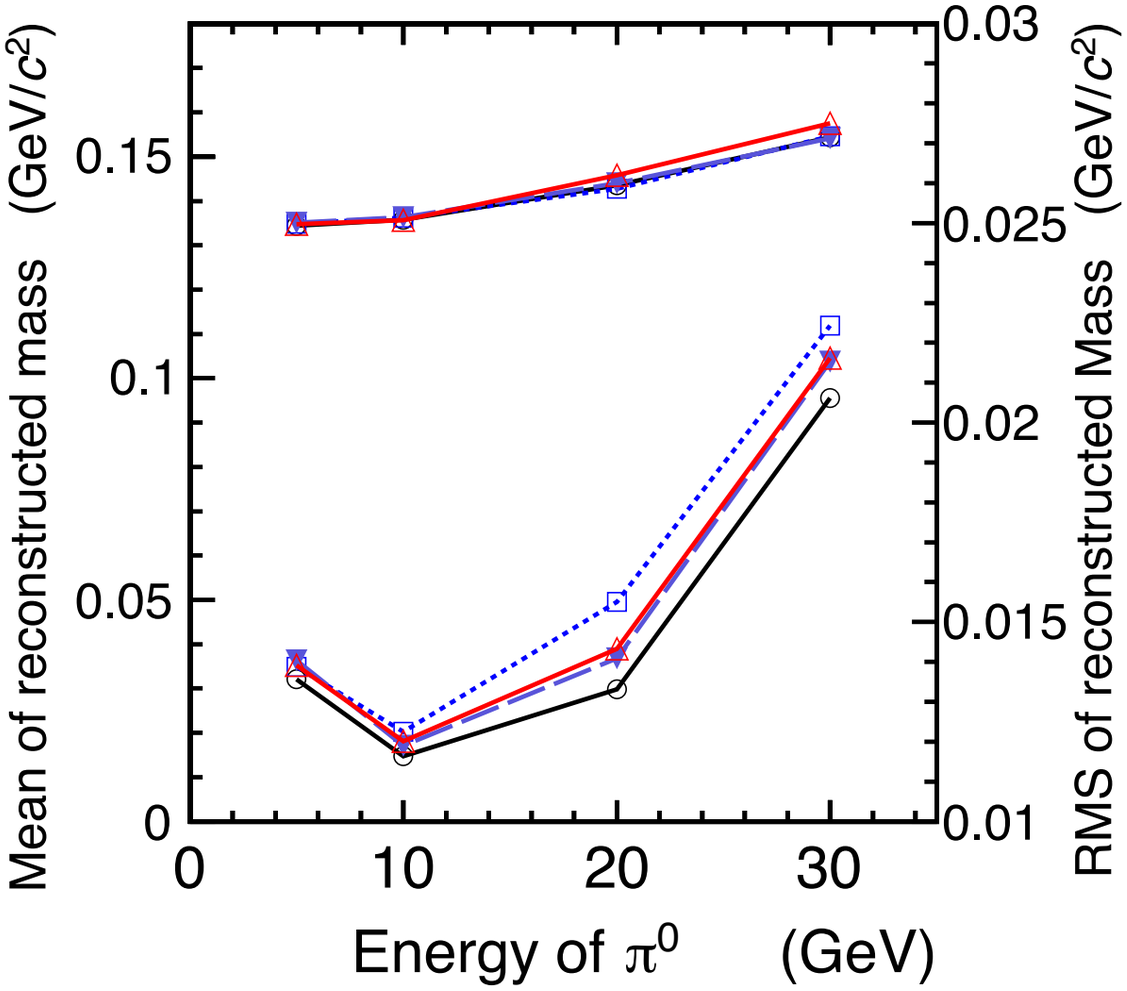


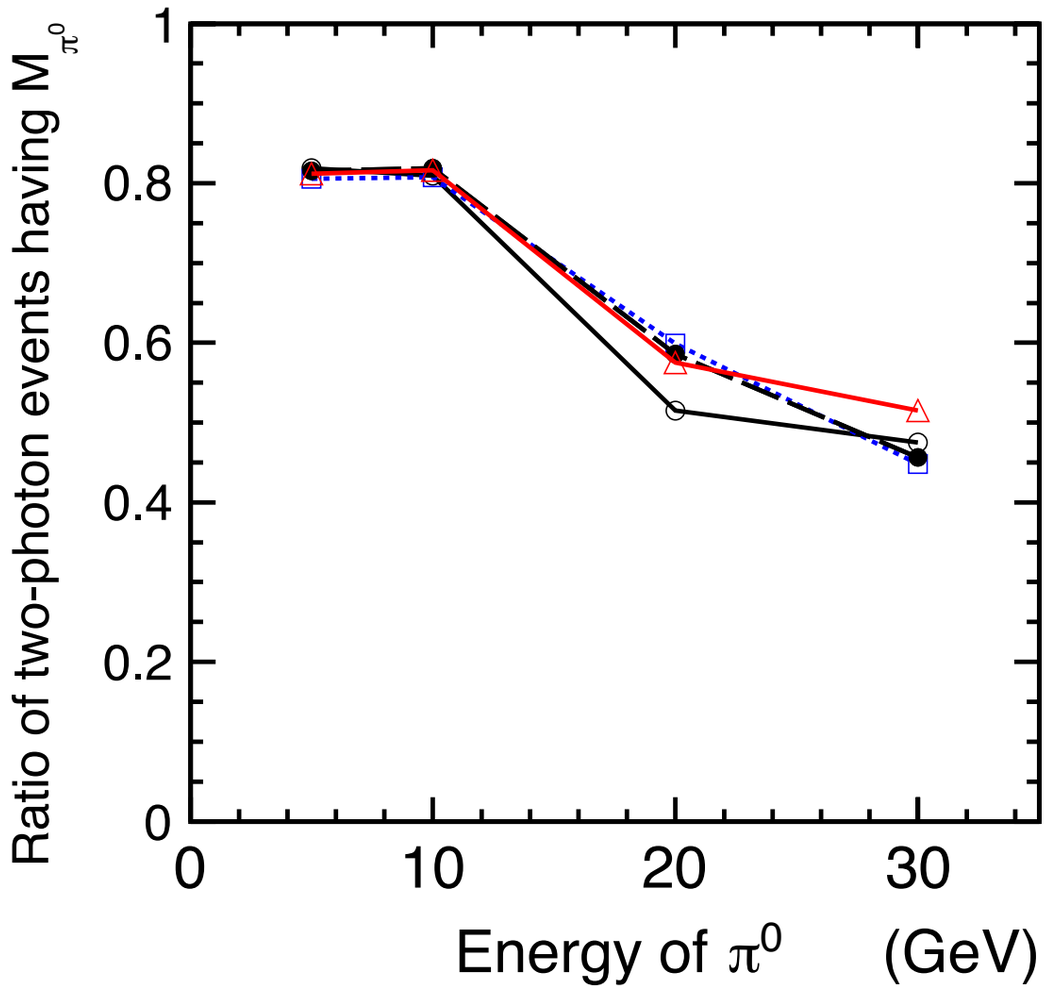
alternate with 5x5 mm² tile layers (right ⊖)
➡ close to all 5x5 mm² tile ScECAL (right -●-·).

alternate with 15x15 mm2 tile layers ➡ not so improves ●

alternate with 10x10 mm2 tile layers (left ●)
➡ almost similar to the alternative with 5x5 mm²

π^0 reconstruction





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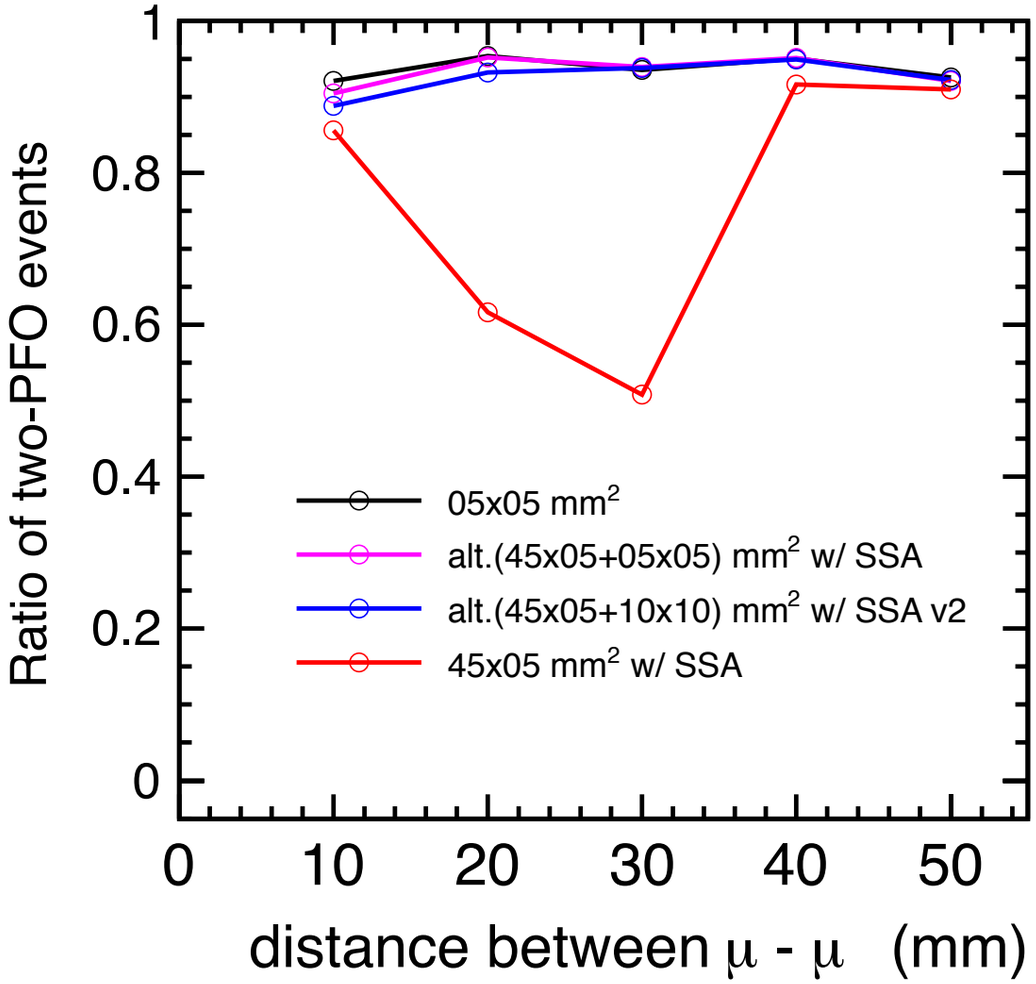
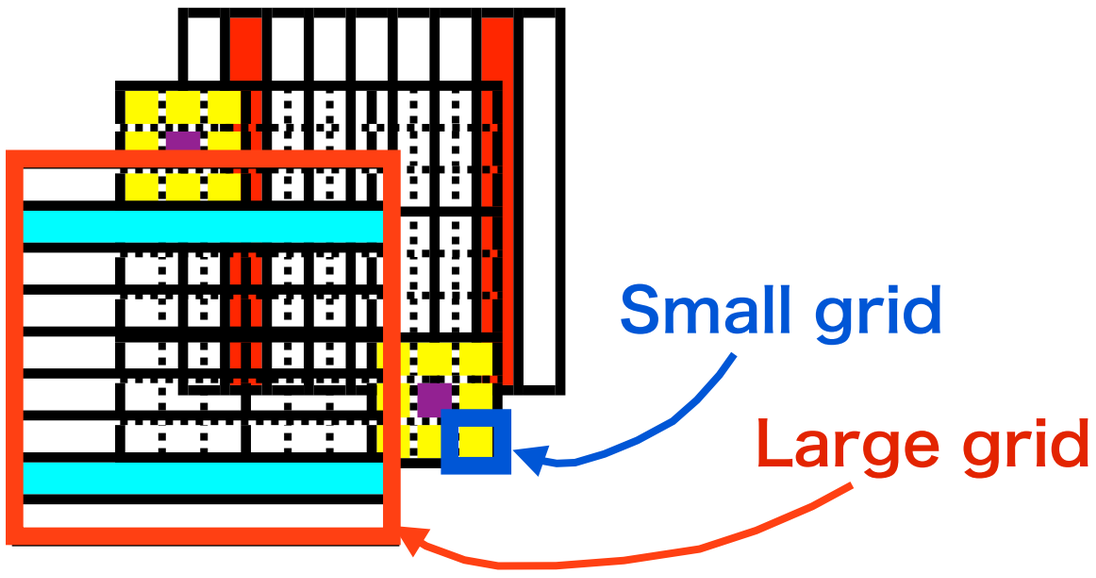
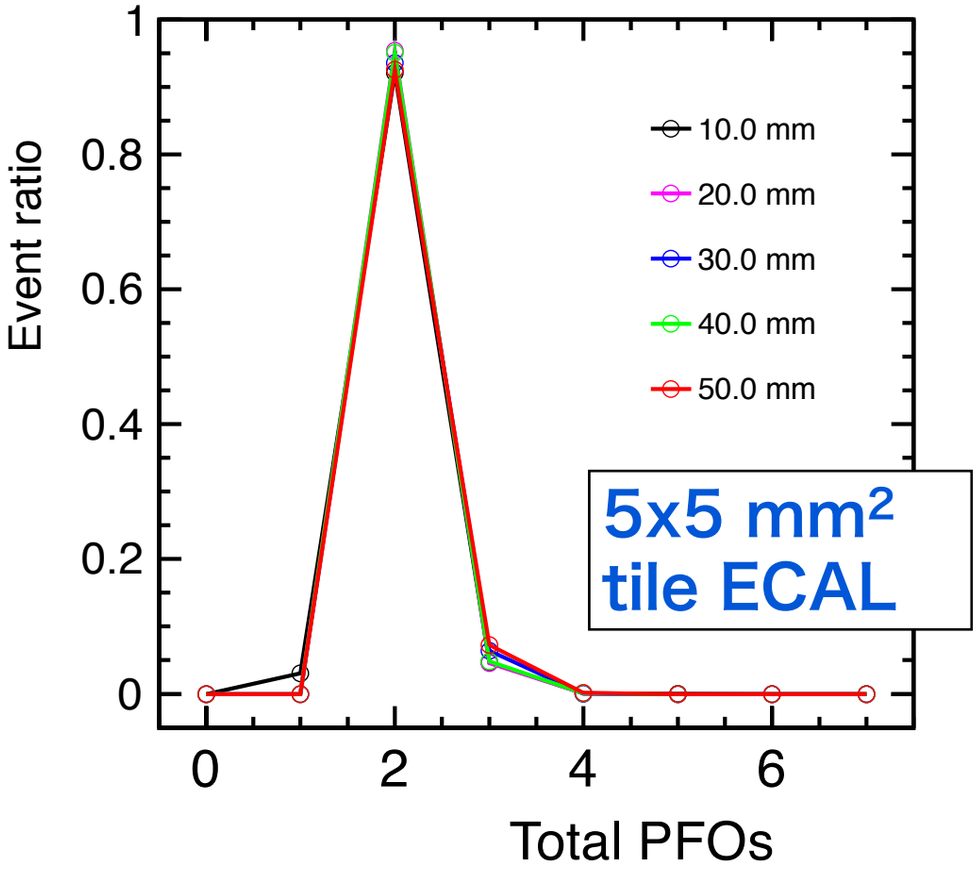
μ-μ events

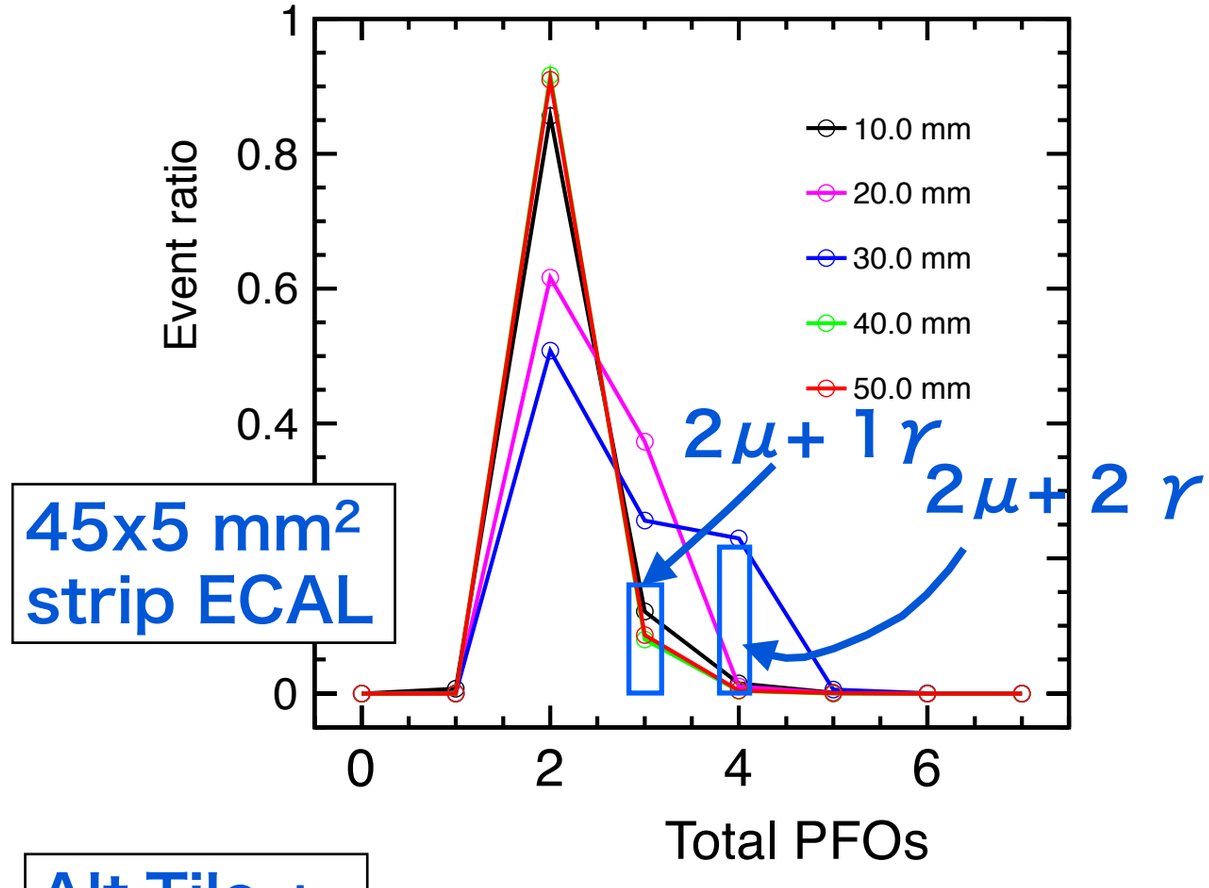




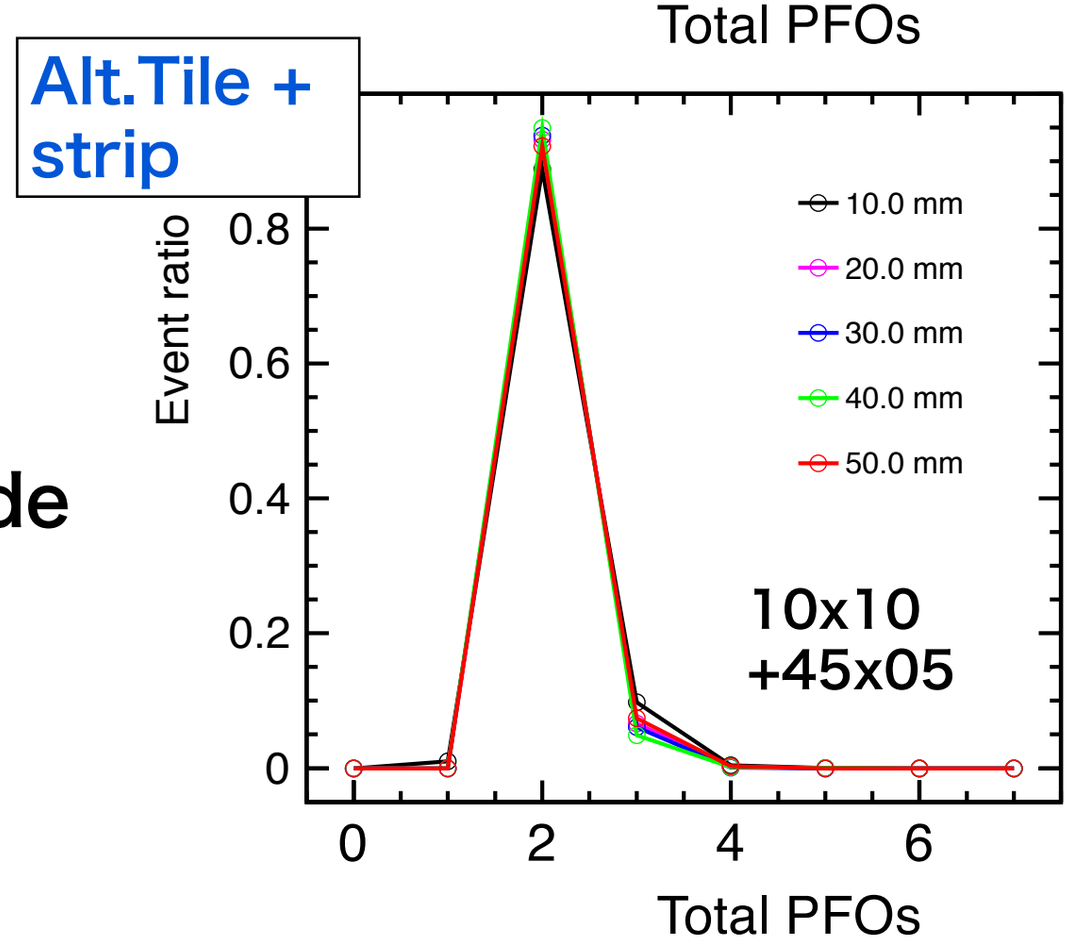
- Two 10 GeV muons are injected into diagonal positions with respect to the grid of strip direction.
- Using tracks,
- Even with track information, two-PFO event ratio decrease until 30 mm distance with 45x5 mm² ScECAL with SSA
- Larger than 40 mm distance away, the performance recovered since the second cluster reached into the next large grid region.
- Alt. tile + strip ScECALs recover this phenomenon.

Ghost in μ-μ events

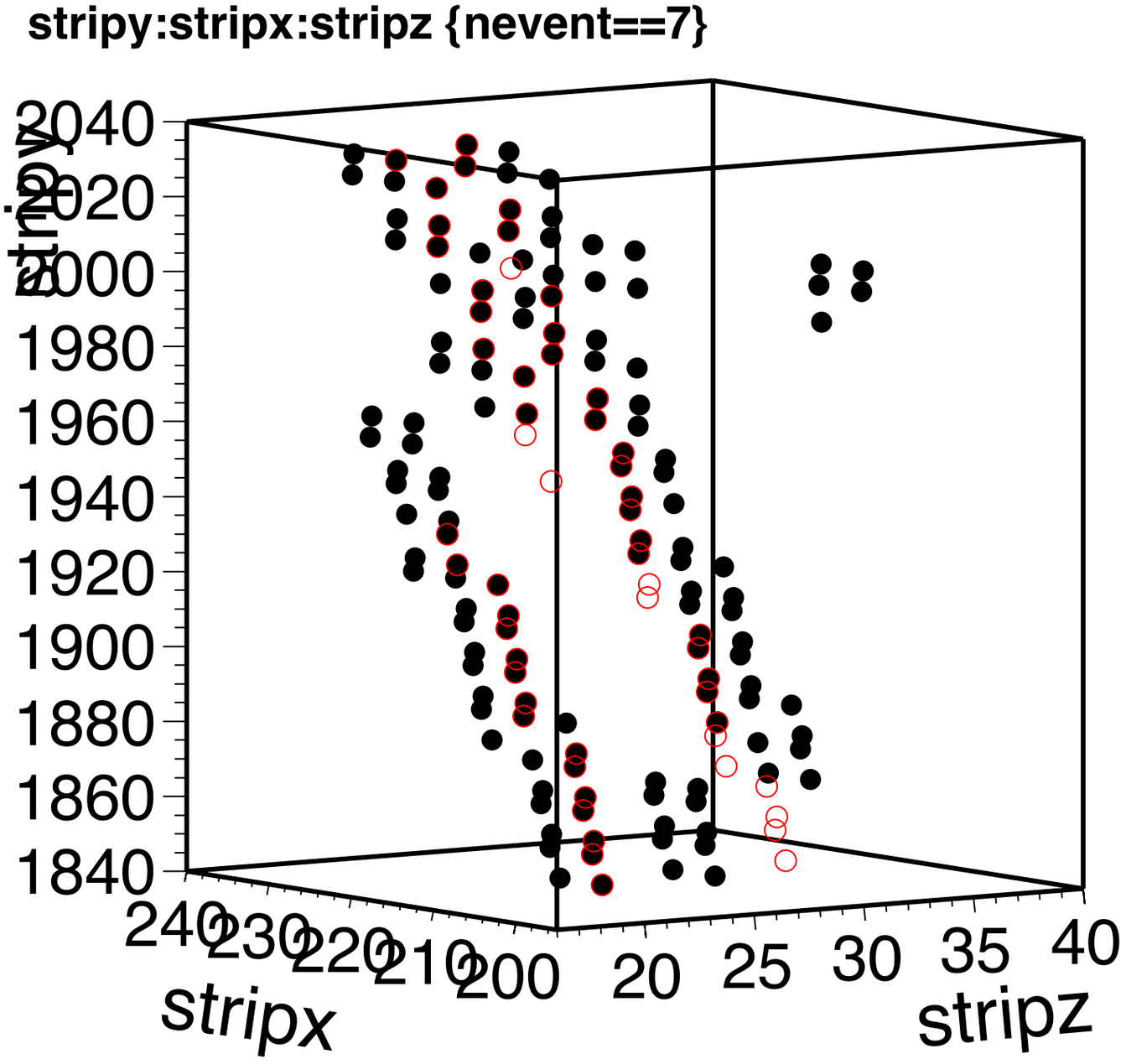




- ghost photons are created in 45x5 strip ECAL even with SSA.
- 10 mm distance is two small to identify a ghost between calorimeter tracks (ghost is made in successive neighbor grid).
- This phenomenon is clearly removed with alt. tile and strip ECAL.



Ghost hits in μ-μ events with 10 mm distance



- 10 mm distance.
- 5x5 mm tile ECAL has two tracks with one bit/track/layer hits.
- 45x5 mm strip ECAL with SSA has also two tracks but with two bits/track/layer hits. One of them is the ghost hit but too close to the other to separate them. Therefore, there is no ghost with 10 mm distance of μ-μ, even with strip ECAL.
- Since we can easily select the ghost event in those μ-μ events, I will see the phenomena in event by event by using CED in this case ▶ Plan.

1st Nov.

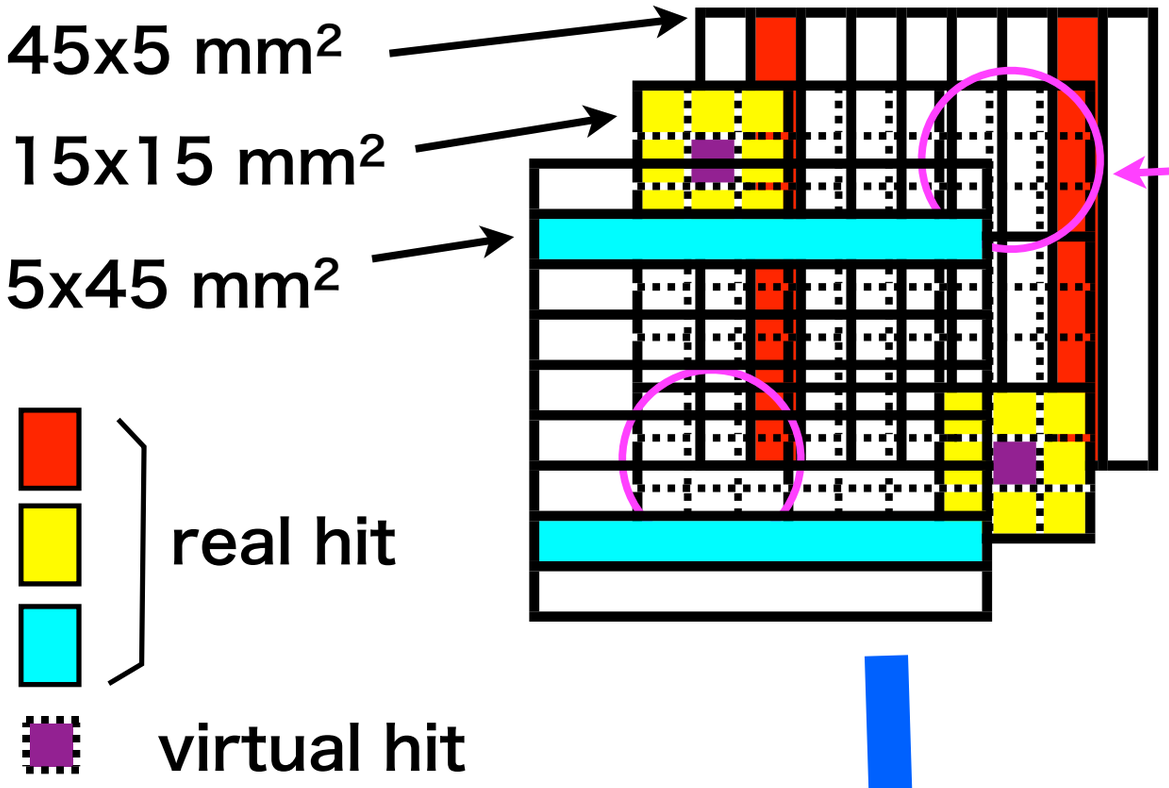
Summary and plan

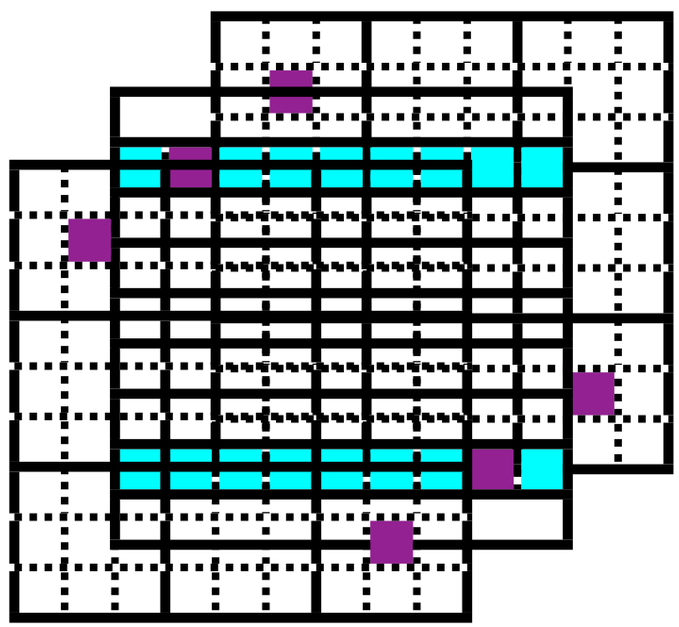
- Performance of π^0 reconstruction of 45x5 mm^2 strip ScECAL is comparable to 5x5 mm^2 tile ScECAL.
- Both alt. 5x5 mm^2 and 10 x 10 mm^2 tile layers replaced with strip layers make significant improvement of π^0 mass resolution.
- In μ-μ events, ghost creations are seen.
- These simple events can be a probe to study the ghost phenomenon.

Plan

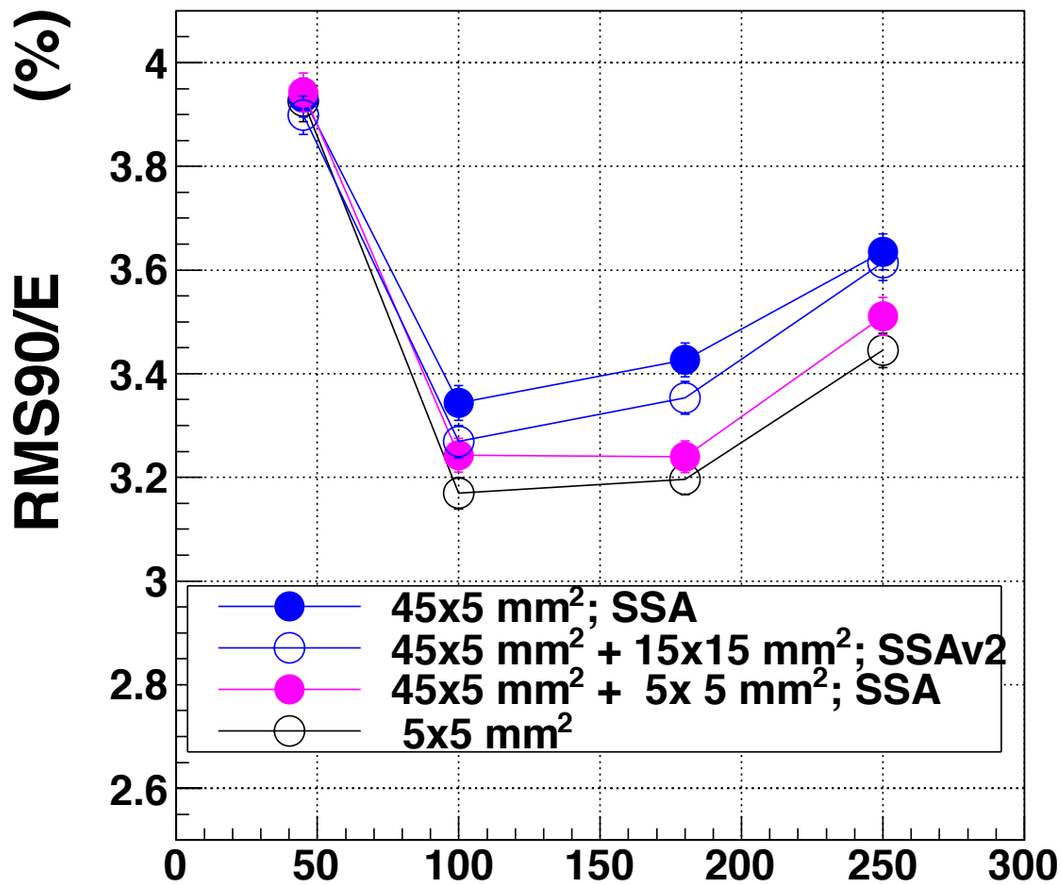
- See events, event by event.
- μ-e events also...

Other solution(2)





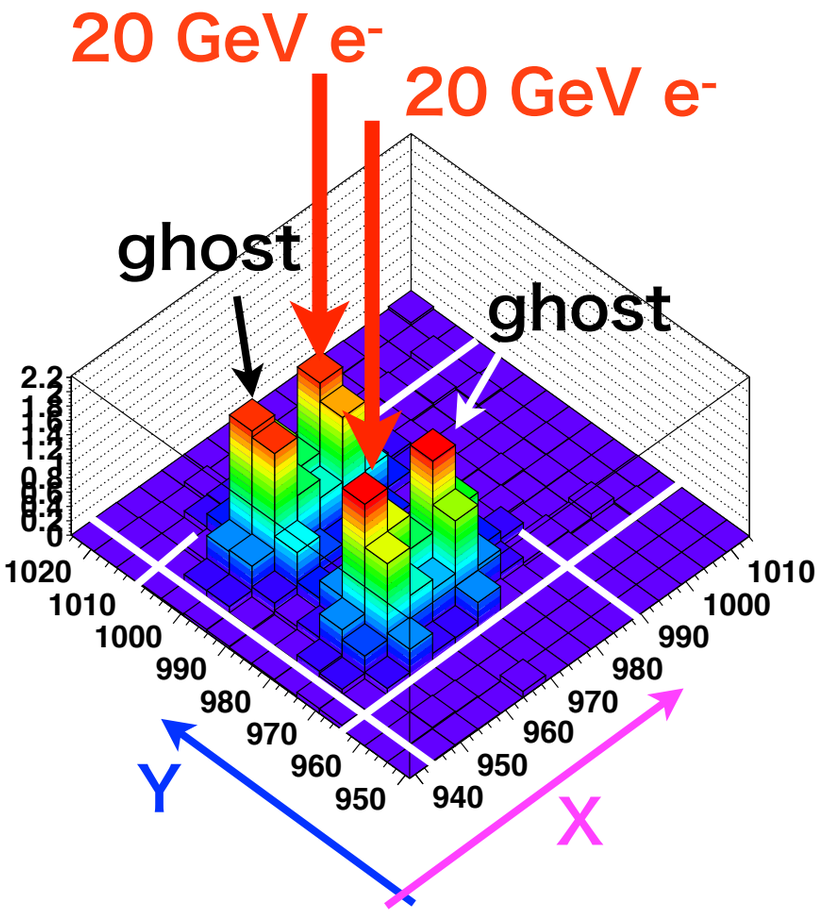
a layer is affected by the second nearest layers

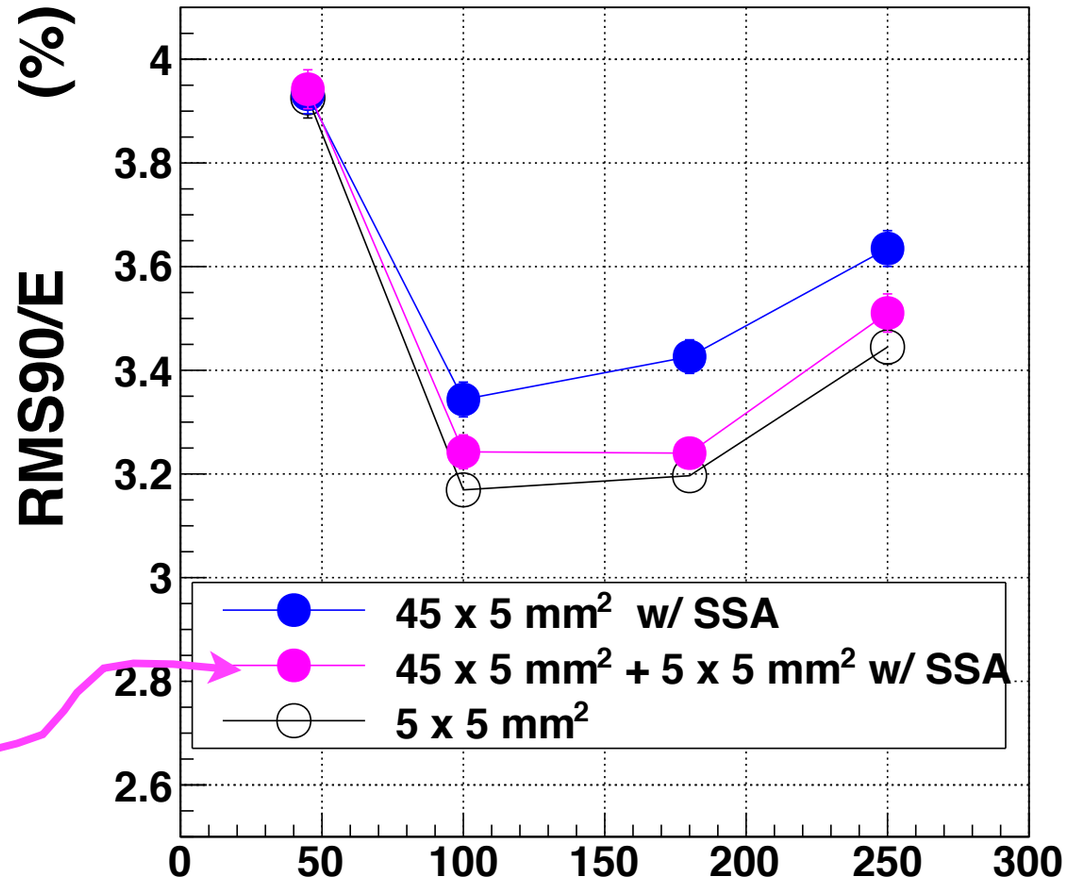


effect decrease as energy becomes higher

➡ test 10 x 10 mm²

ghost problem and its solution(1)





Solution

5 x 5 mm² interleaved between strip layers

↓ too small for current technology

Use Si - layers for 5 x 5 mm² layers

= Hybrid ECAL