

Status of Reconstruction of

Sc-Strip ECAL

17th September 2012

K.Kotera,

Shinshu University

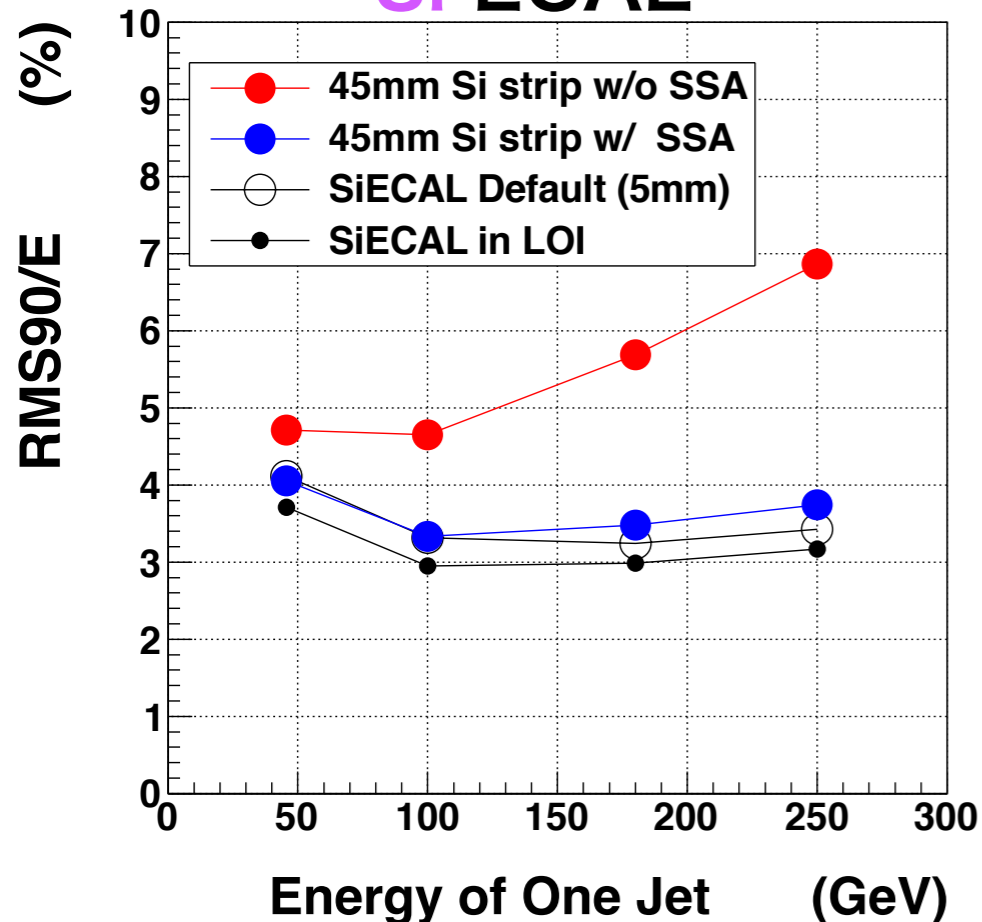
Contents

1. Results in ILD Kyushu
2. Result with 0.5 mm thick **Sc** strip ECAL
3. Hadronic interaction in **Sc** and **Si** ECAL
4. Result with 1 mm thick **Sc** strip ECAL
5. Feasibility of 1 mm thick **Sc** strip ECAL
6. Summary

These are simulation studies by using Mokka-Marlin/
PandoraPFANew.

in ILD meeting at Kyushu

Si ECAL

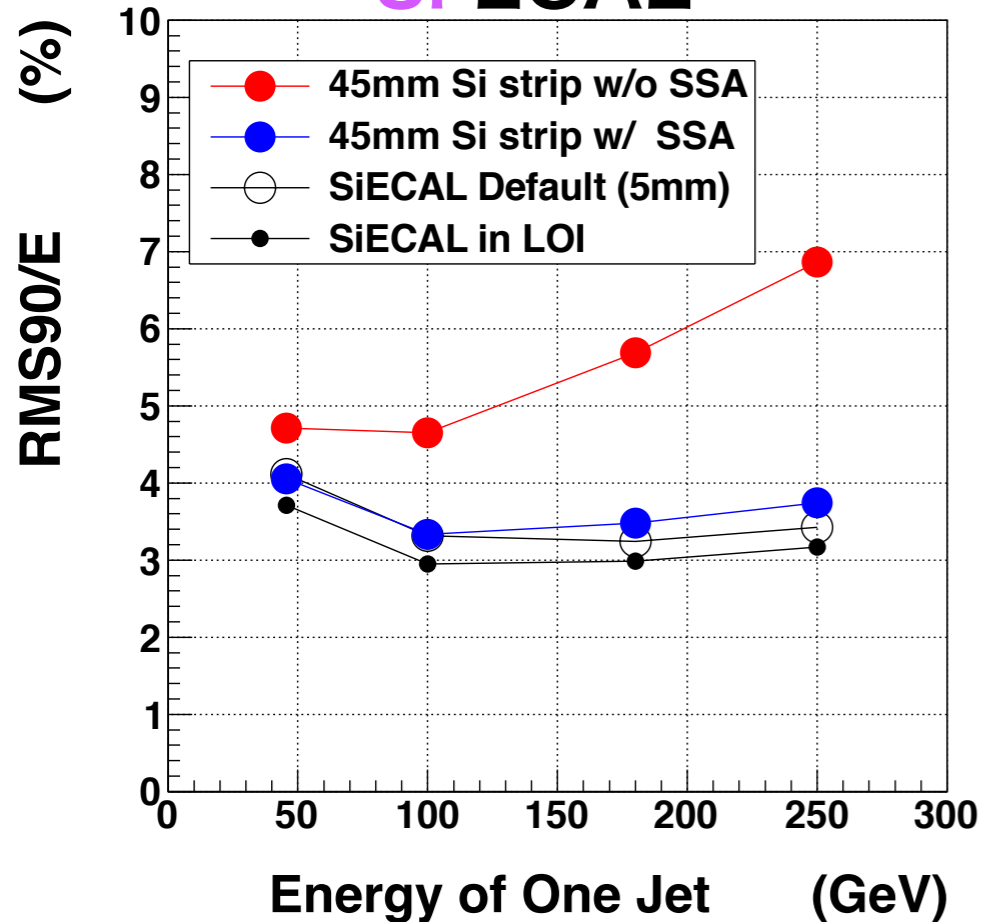


2.1 mm x 20 tungsten,
4.2 mm x 19 tungsten,
0.5 mm x 30 silicon ,
total 185 mm with other
materials

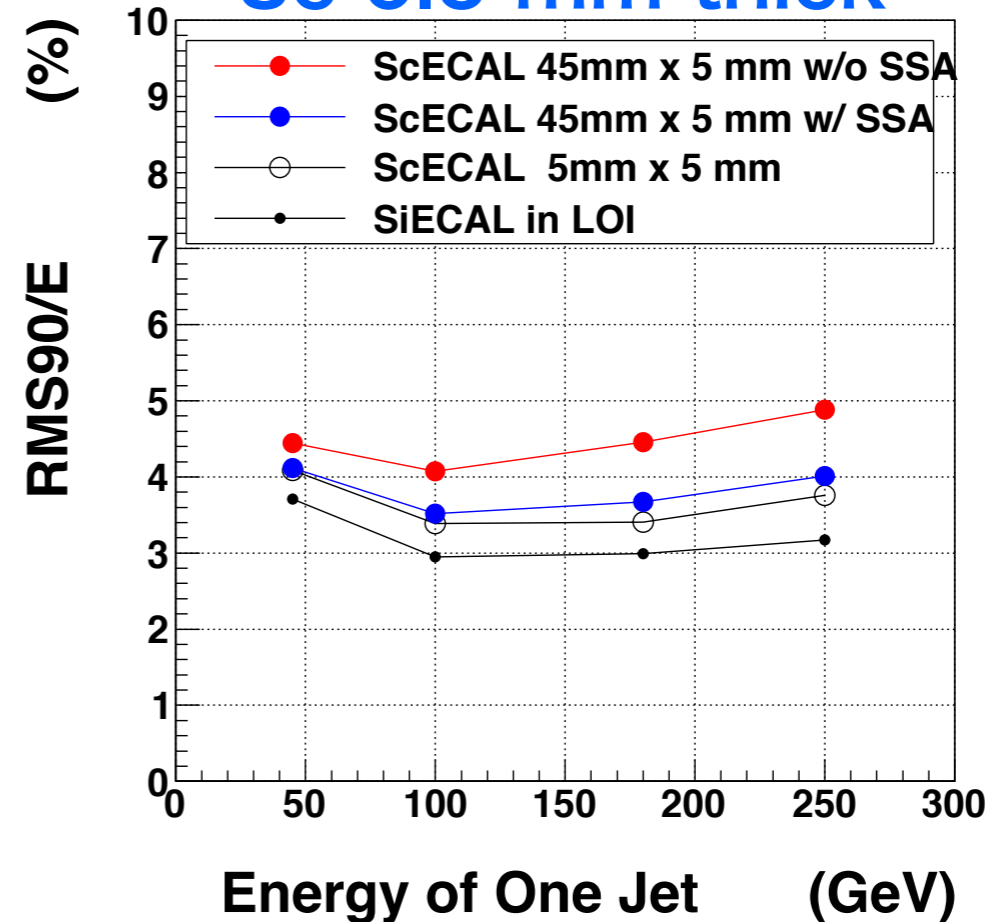
- Strip Splitting Algorithm was tested by using a special ECAL model with Si-Strip readout in order to minimize effects of calibration in PandoraPFA,
- JER improves significantly, by SSA (● → ●) especially H.E.
- A little degradation of strip ECAL is seen at H.E (● → ○).
- Systematic difference between LOI and this ECAL exists (● → ●).
- JER of ScECAL at 45 GeV is 4%. Hope to be improved by tunings.
- Next step is to see Sc-strip ECAL

Scintillator strip ECAL

Si ECAL

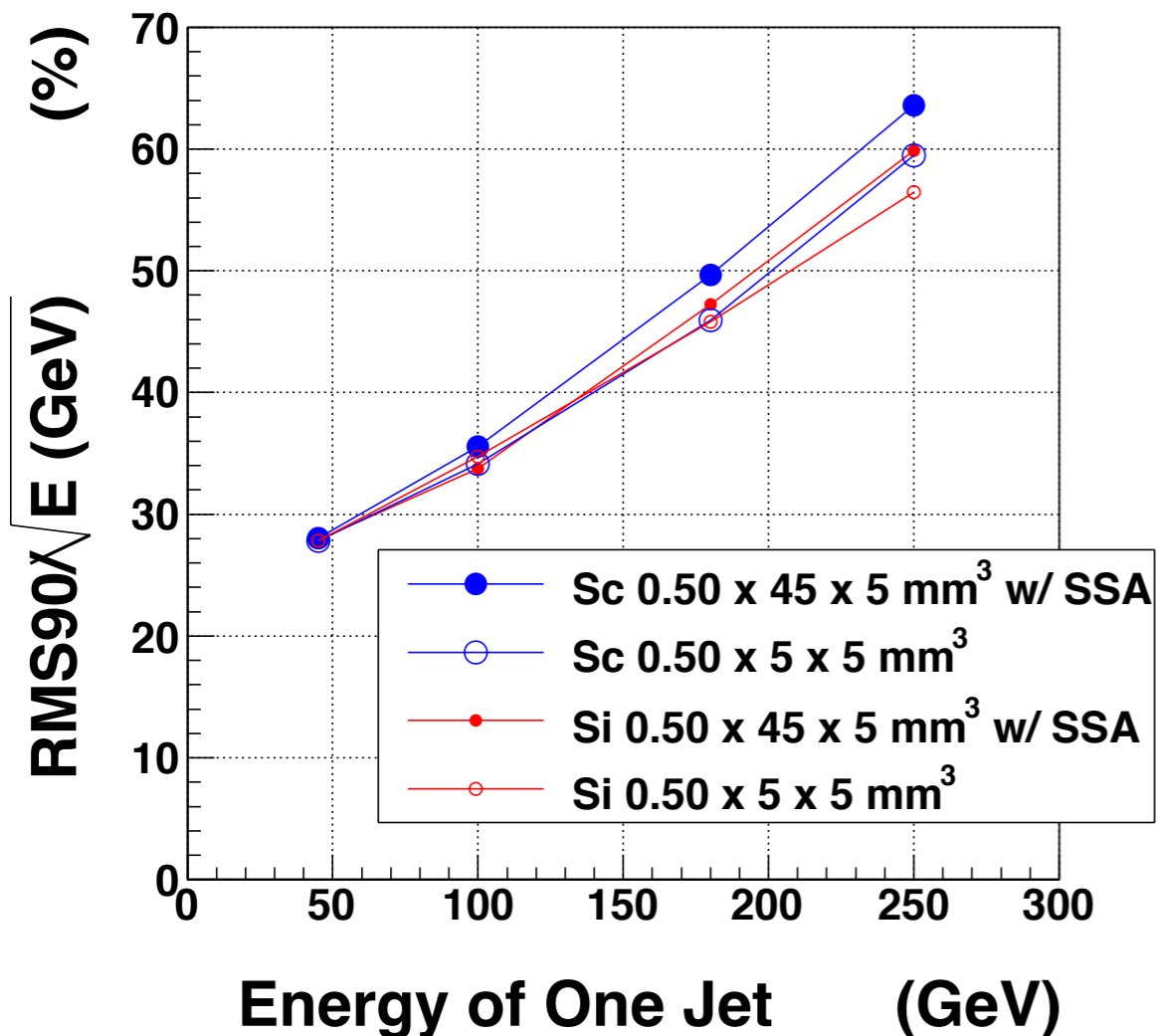


Sc 0.5 mm thick



- SSA **works well** also for **Sc**-Strip ECAL (right **blue**).
- **Sc**-Strip w/o SSA is better than **Si**-Strip w/o SSA (Way?).
- Systematic difference between LOI and **Sc**ECAL increase, we expect that the detail tuning for hadronic interaction in ECAL (explain in later page).

Comparing in $\text{RMS}/\sqrt{E}(\text{GeV})$ between **Sc** and **Si** 0.5 mm thick strip ECAL

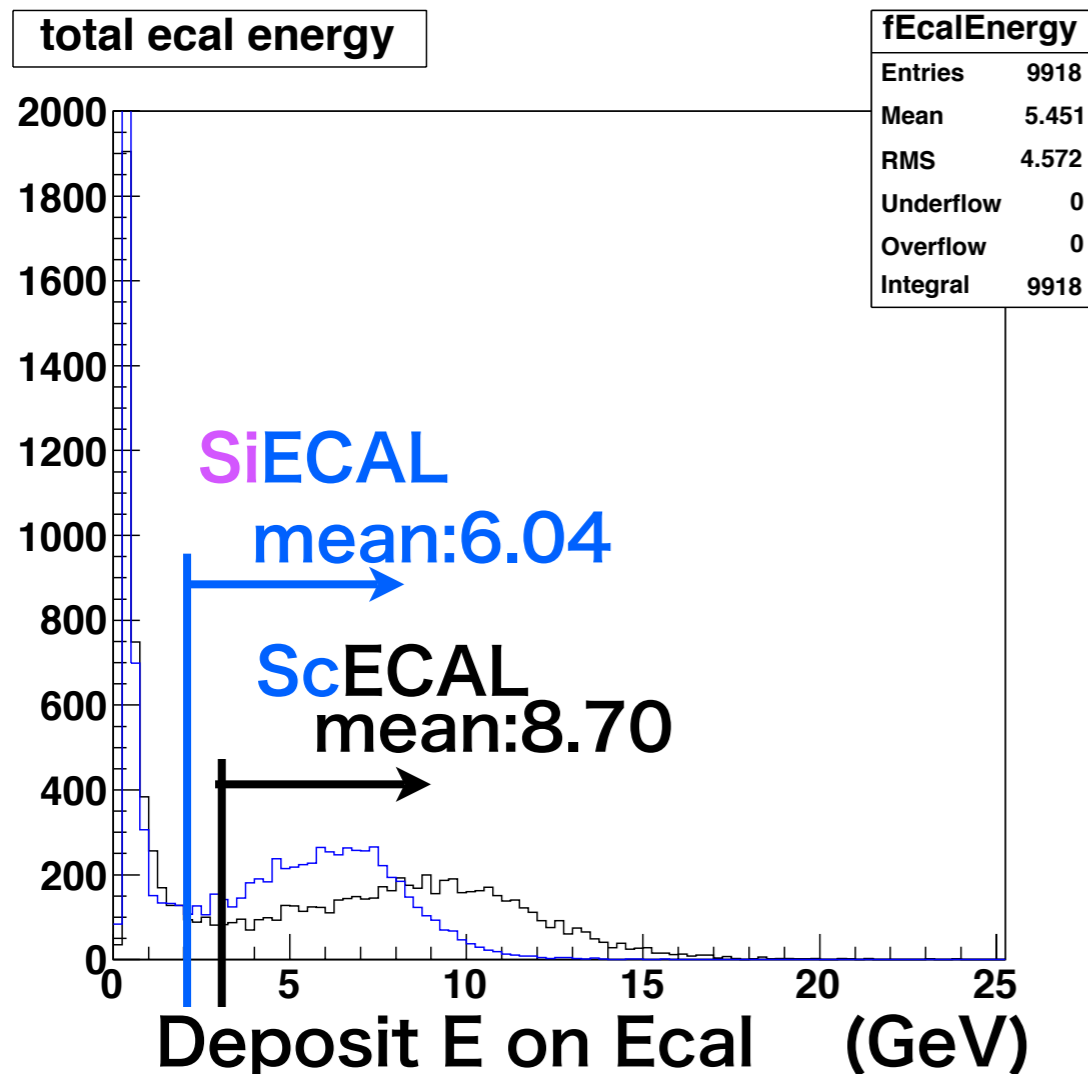


- $\text{RMS}/\sqrt{E}(\text{GeV})$ shows up difference of JER at high energy.
- Strip 45 mm ECALs have also good JER with SSA for both **Si** and **Sc** 0.5 mm thick strip ECAL.
- a little degradation appears than tile ECAL and it increases as the jet energy increases.
- The degradation is rather larger for **Sc** strip ECAL than **Si** strip ECAL for High energy.
- Differences come from the difference of the hadronic interaction in ECAL (→next page).

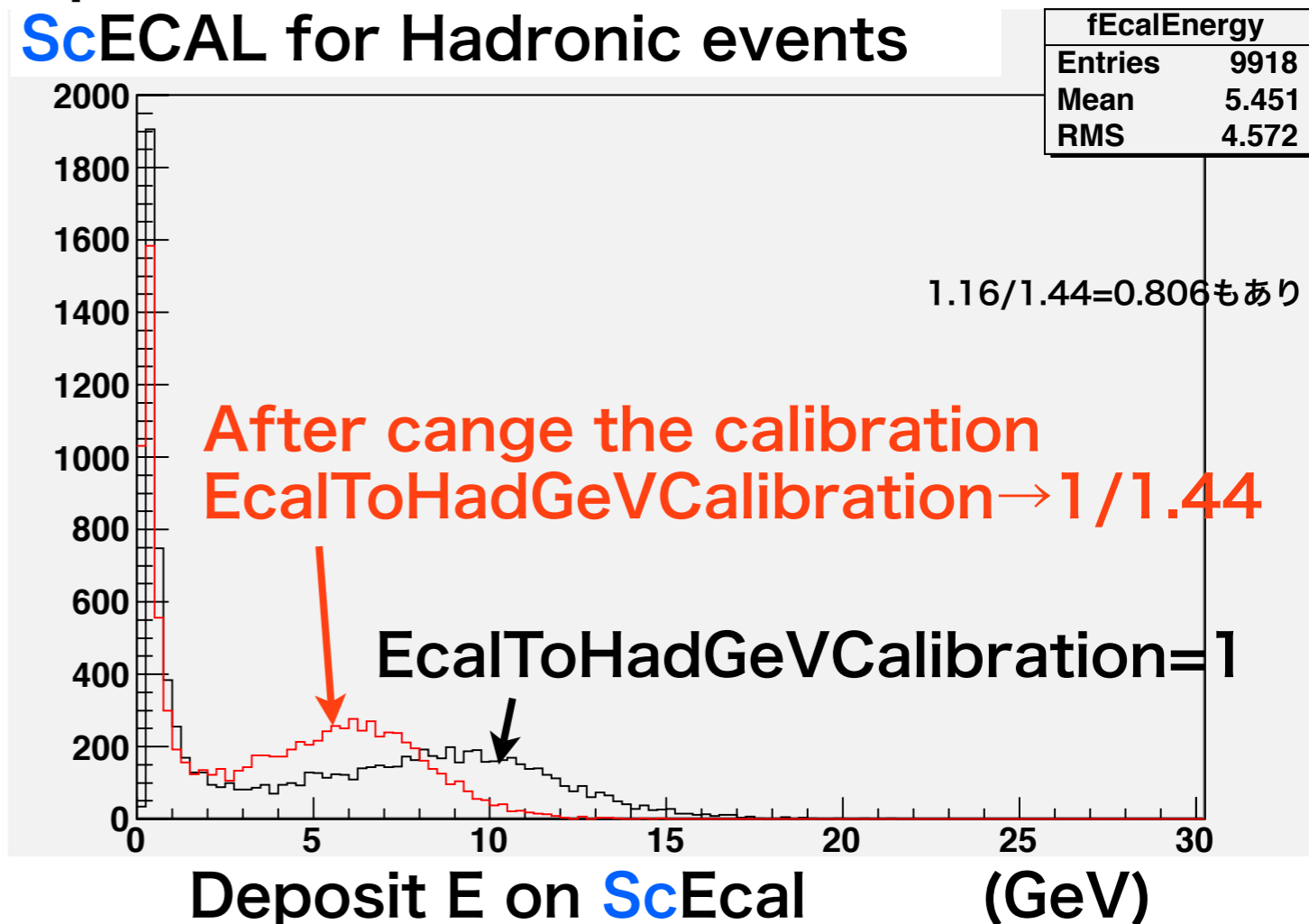
Ecal calibration for Hadronic events

Results of **ScECAL** in previous slides required large change of calibration of **ScECAL** for Hadronic events.

- After tune with 10 GeV photon
- π^+ 10 GeV



Optimization of Calibration of **ScECAL** for Hadronic events



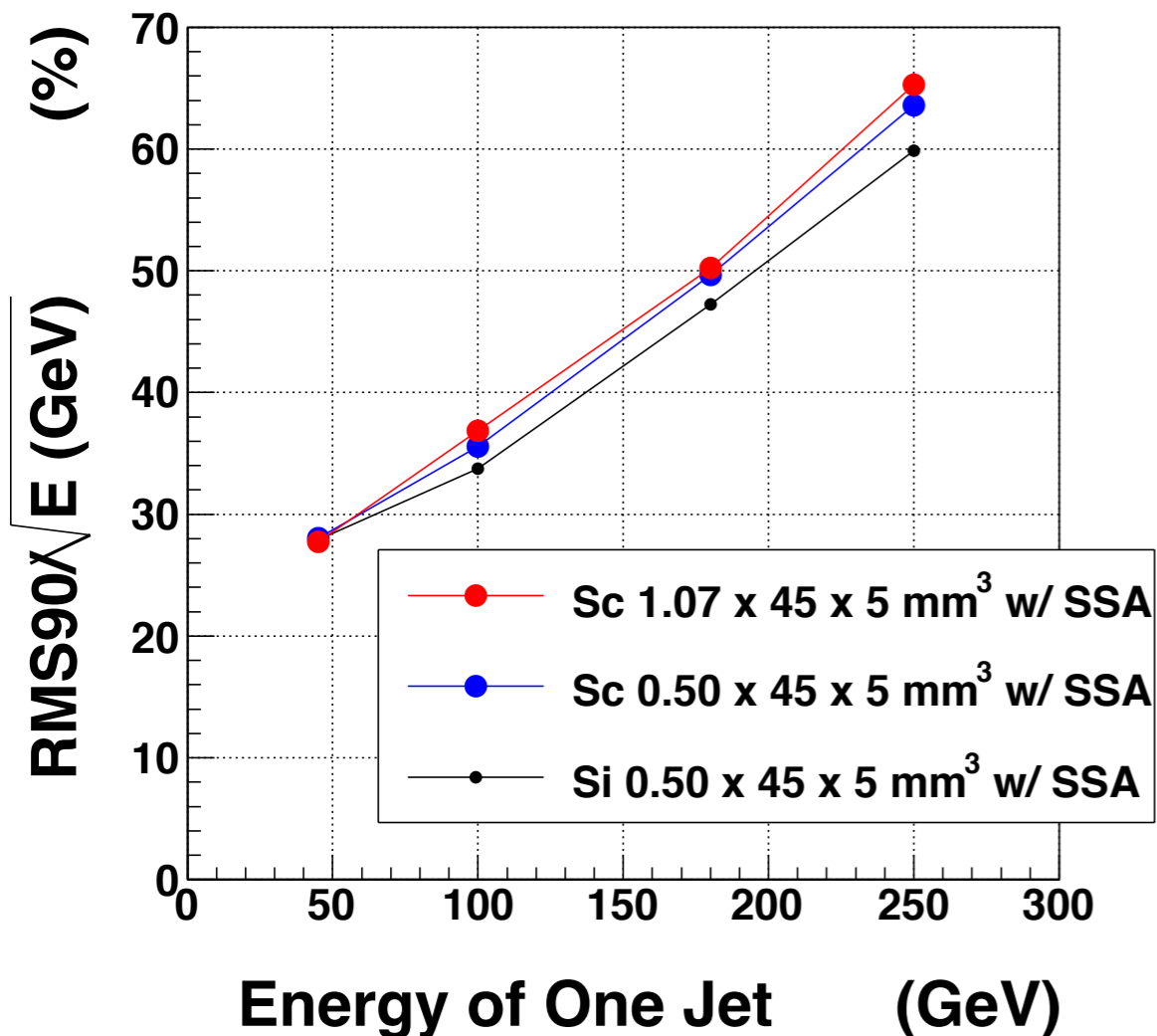
- This tune makes 10 GeV K_L energy mean worse, but improve JER.
- This means there are rooms to improve the tuning about hadronic interaction in **ScECAL**.

1 mm thick scintillator

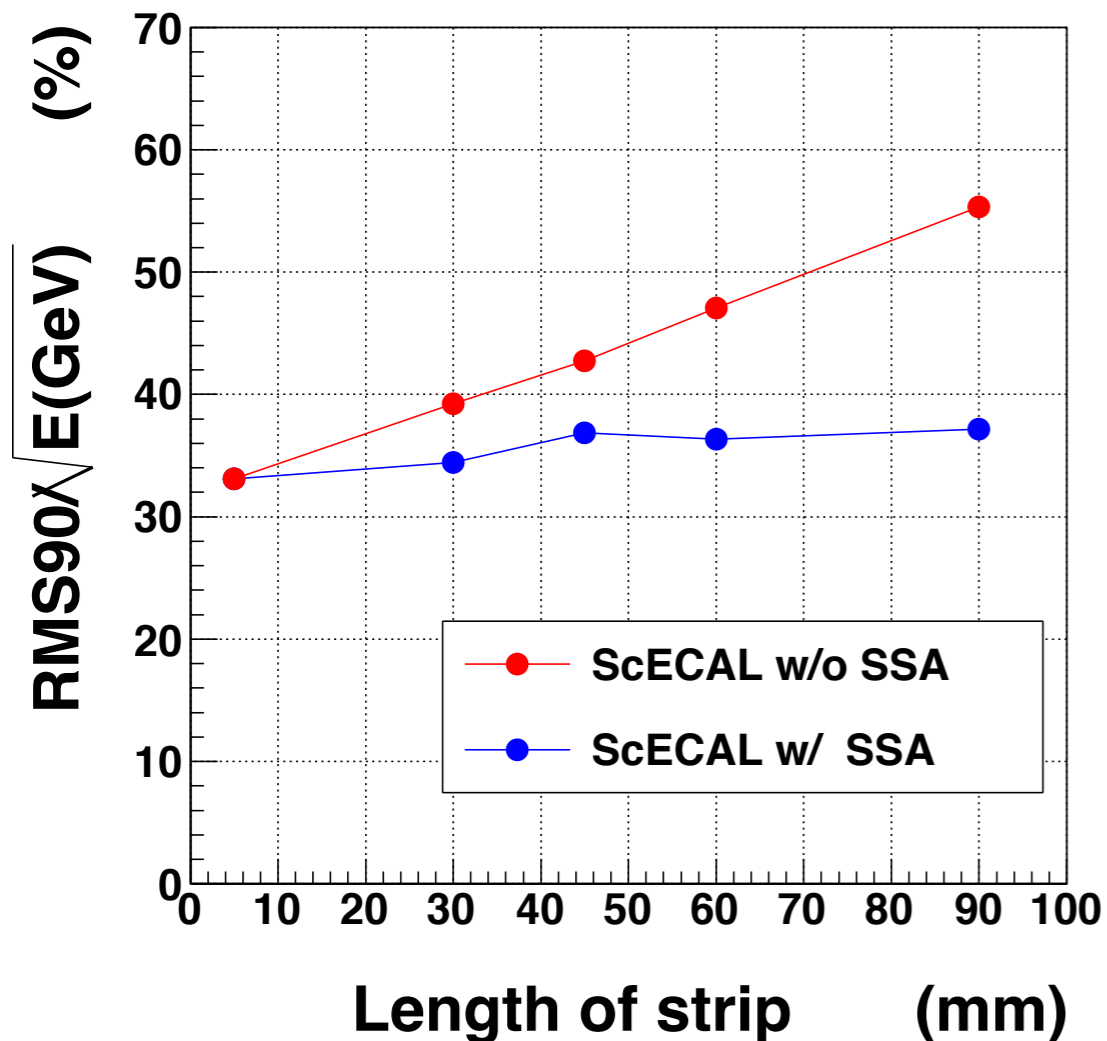
- Making **0.5** mm thick scintillator strip ECAL is not realistic.

Therefore;

- **1 (.07)** mm thick scintillator has been tested in Mokka-Marlin.
- JER with **1** mm thick scintillator is comparable with **0.5** mm sc.
- Energy deposit in 1 mm thick scintillator is close to one in 0.5 mm silicon.
- Total module thickness of Ecal becomes only 1.5 cm greater than default **Si** ECAL of 18.5 cm.

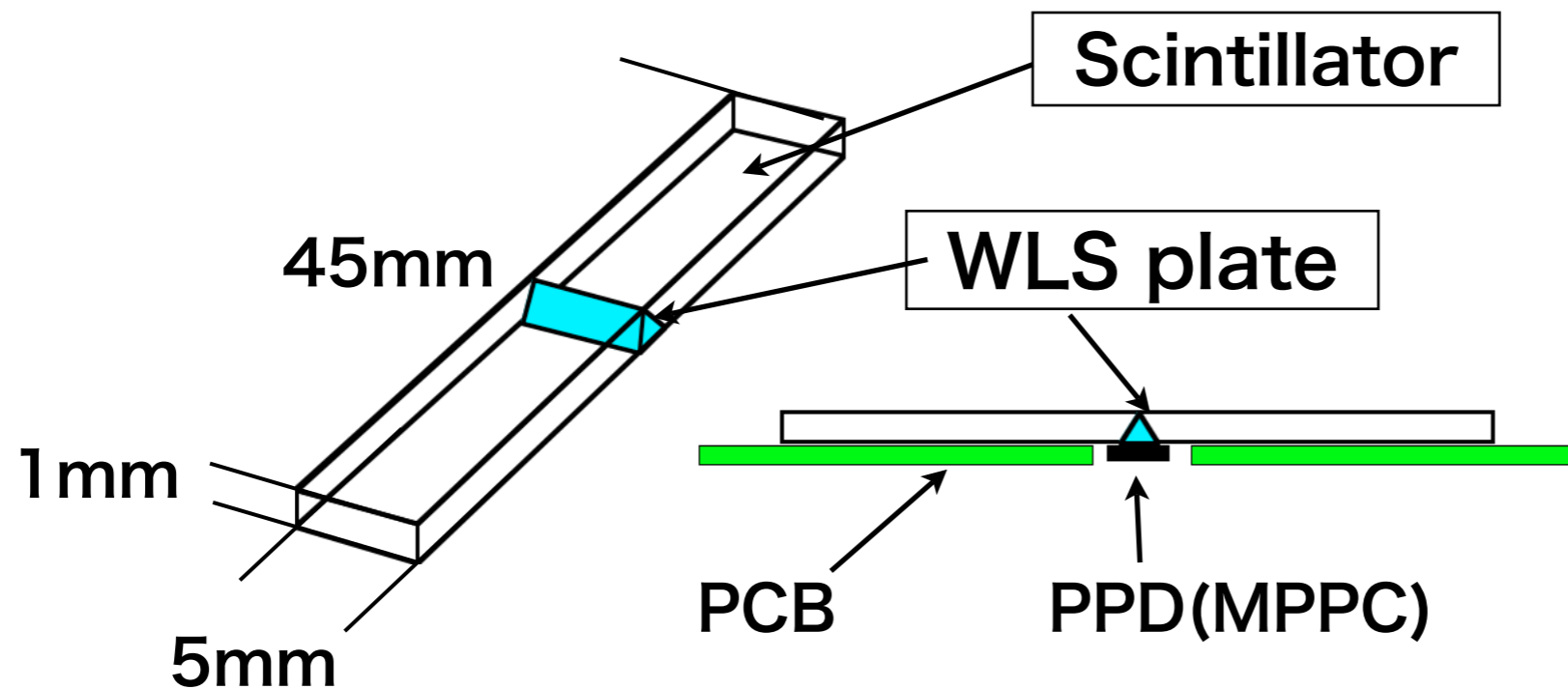


100 GeV JER depending on strip length



- 1 mm thick scintillator strip
Ecal is tested with uds two jet events with 200 GeV of center of energy
- For two-100 GeV jet events, 90 mm strip **Sc**ECAL still keep the performance.

Feasibility of 1mm thick Scintillator ECAL



- This is one of the various ideas to make 1 mm thick scintillator / PPD unit.
- We preparing to test this.
- We are developing various possible ways to make 1 mm thick scintillator/PPD unit be feasible.

Summary

- Strip 45 mm ECALs have good JER with **Strip Split Algorithm** for both **Si** and **Sc** 0.5 mm thick and **Sc** 1 mm thick strip ECAL.
- 1 mm thick scintillator strip ECAL is feasible.
→ we are moving to developing 1 mm thick scintillator ECAL from 2 mm thick scintillator ECAL.

To do

- Difference of Hadronic interaction between occurring in **Sc**ECAL and **Si**ECAL is pretty large. → to understand what is happening and to care properly for that.
- To show performance of separation of particles
- To show performance with some Physics mode.
- ILC soft v01-09-02 was used → now moving to DBD version v01-15.
- To fix technological problem in Endcap

Backup

