

Latest Progress in Geant4 Simulation of HCAL

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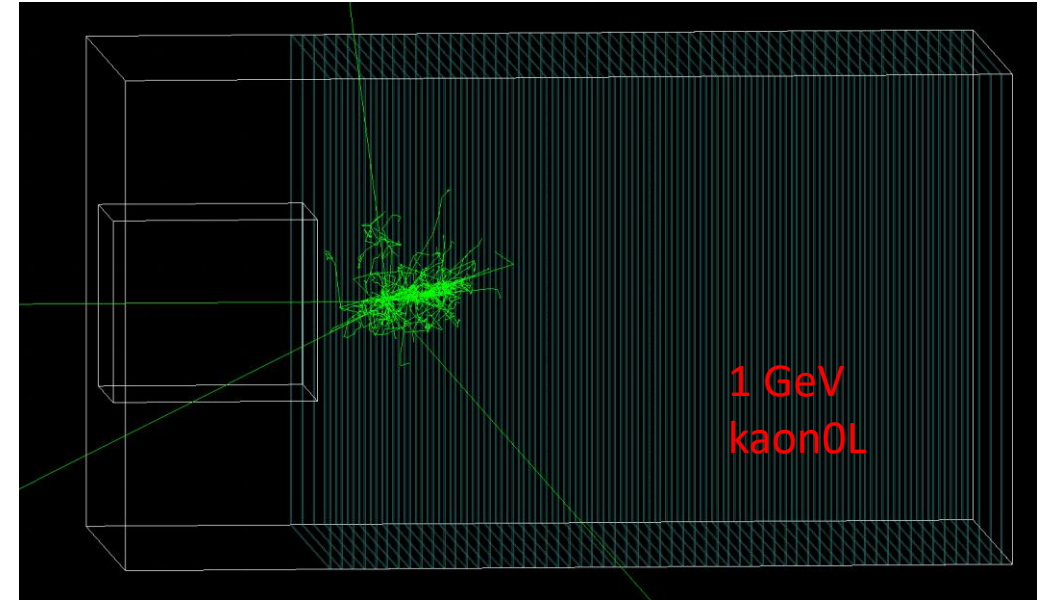
Scintillator HCAL: setup in Geant4 simulation

HCAL geometry

- Transverse plane: $108 \times 108 \text{ cm}^2$
- 60 longitudinal layers, each with
 - Scintillator: 3mm
 - PCB: 2.1mm
 - Absorber (steel): 20mm

Scintillator materials

- Plastic scintillator (polystyrene) as baseline reference
- Scintillating glass: $25\text{SiO}_2 - 30\text{B}_2\text{O}_3 - 10\text{Al}_2\text{O}_3 - 34\text{Gd}_2\text{O}_3:1\text{Ce}^+$
density = 4.94 g/cm³



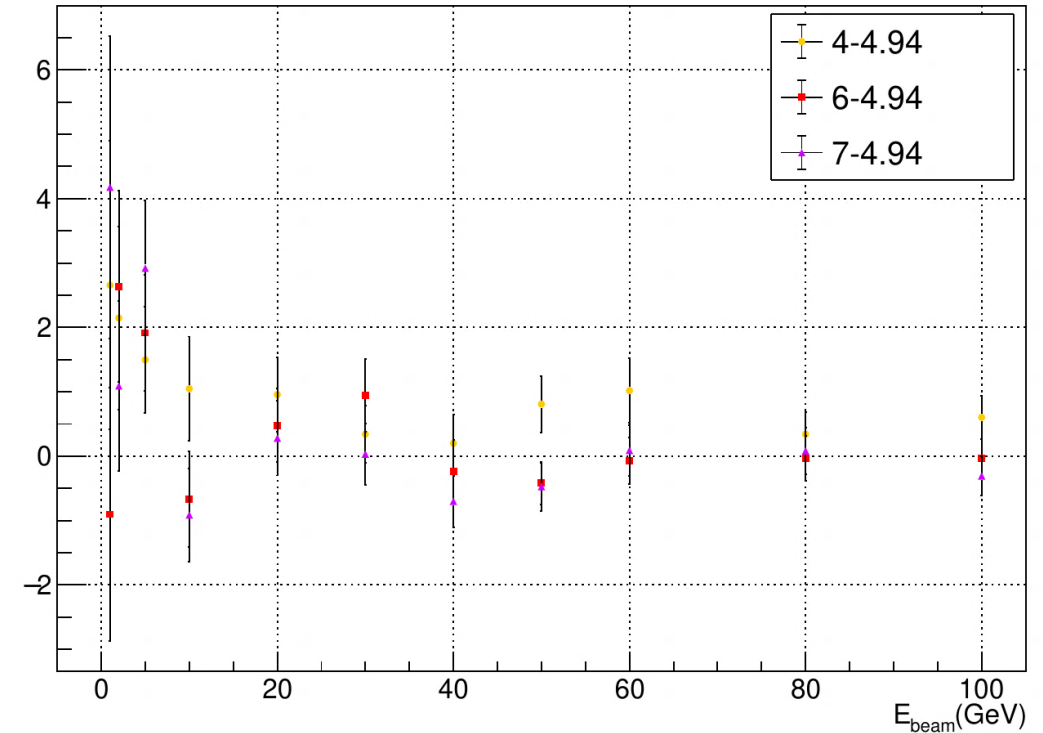
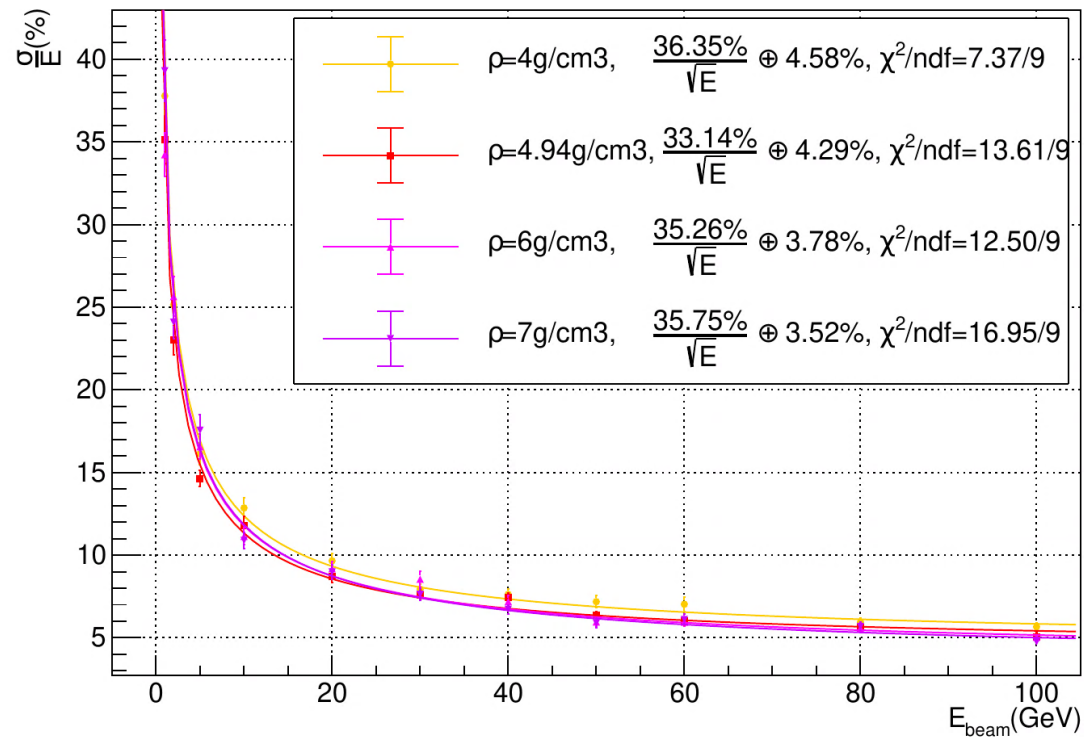
Note: HCAL with 40 layers in CEPC CDR as baseline.
Hereby use 60 layers to evaluate leakage effects

HCAL with scintillating glass

Impact of density for energy resolution

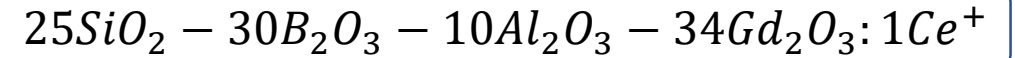
- Birks' constant, energy threshold and timing cut not included
- Incident particle: kaon0L (1-100GeV)

Resolution of Energy



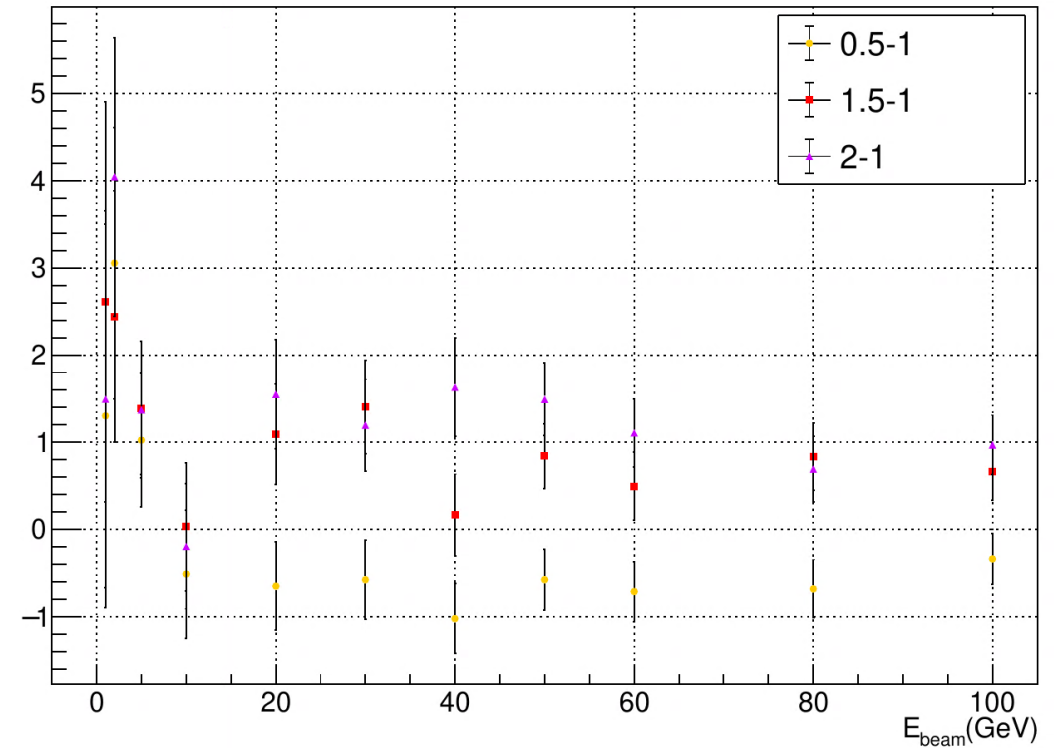
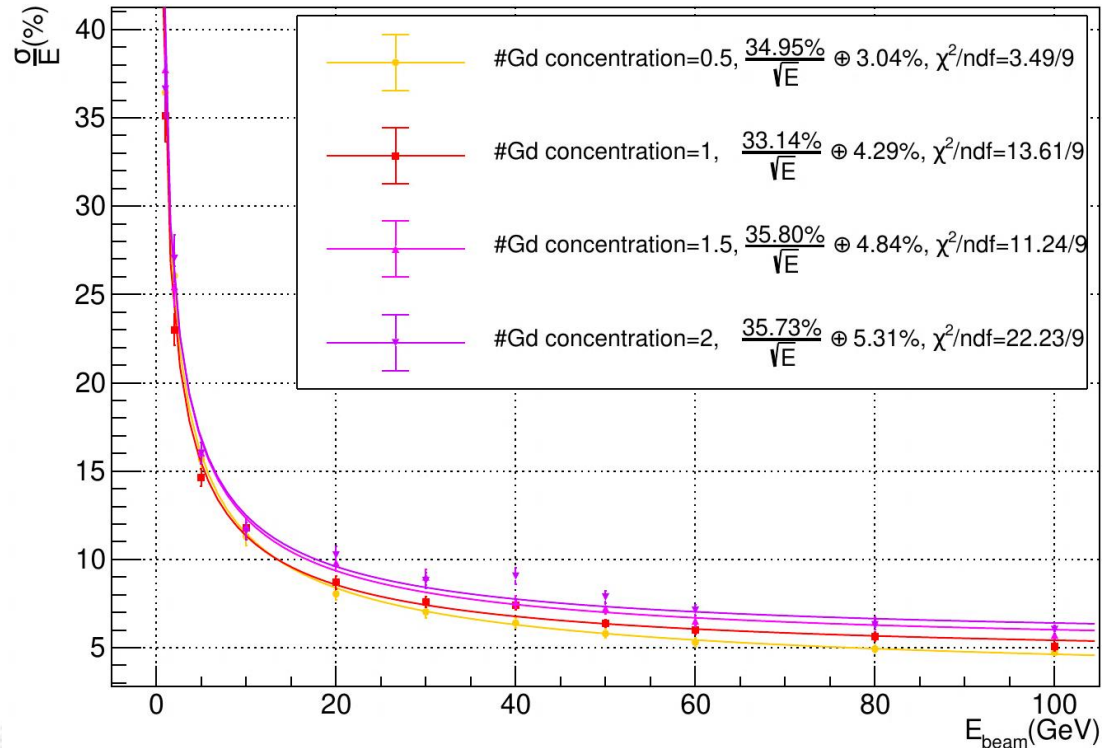
HCAL with scintillating glass

Impact of Gd concentration for energy resolution



- Birks' constant, energy threshold and timing cut not included
- Incident particle: kaon0L (1-100GeV)

Resolution of Energy

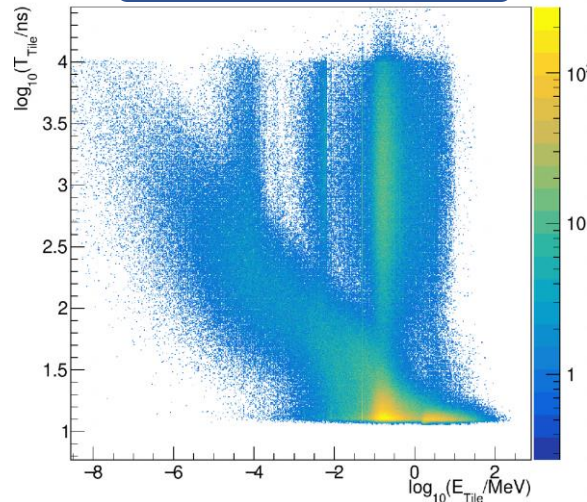


HCAL: Tiles time & energy distribution

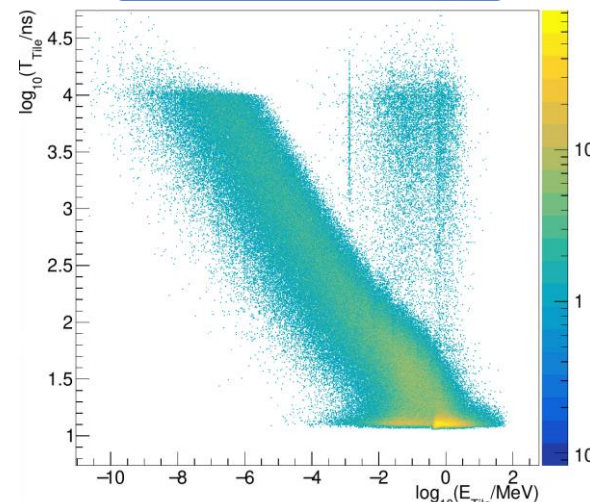
- Birks' constant, energy threshold and timing cut not included
- Incident particle: kaon0L and e- (**1GeV**)

kaon0L

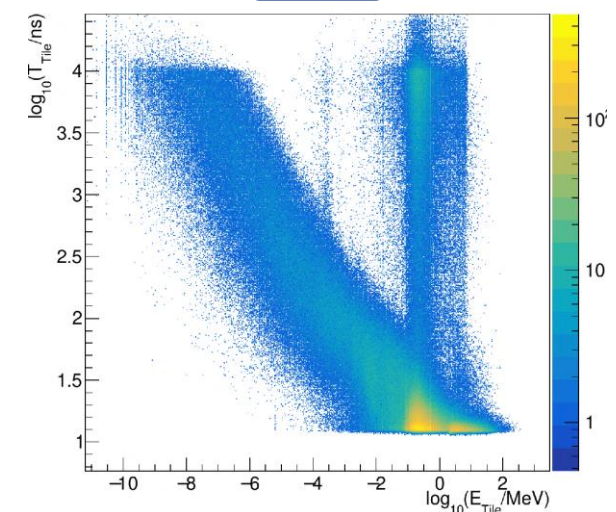
Scintillating Glass



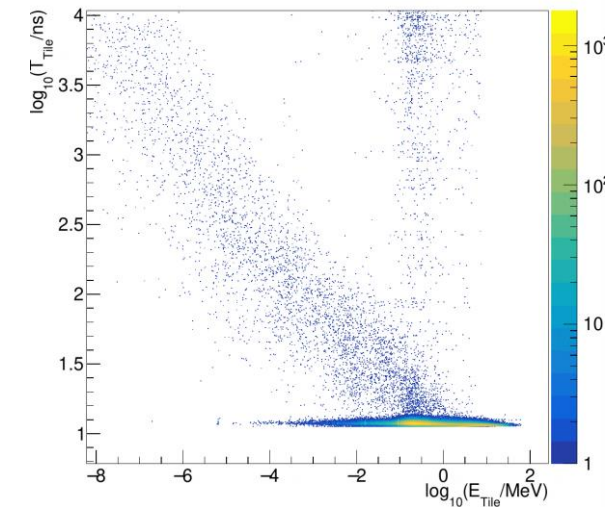
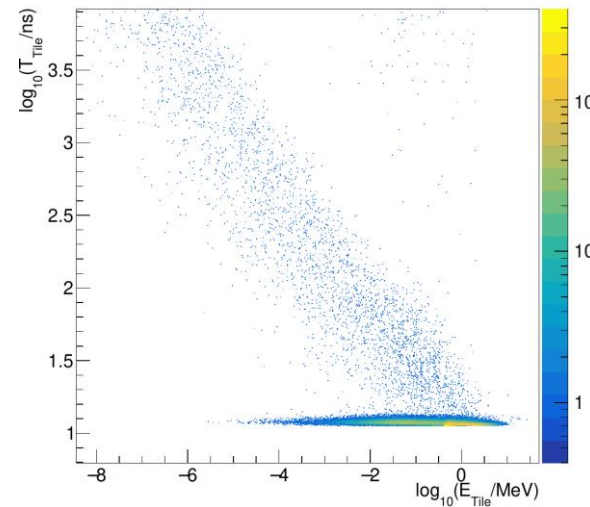
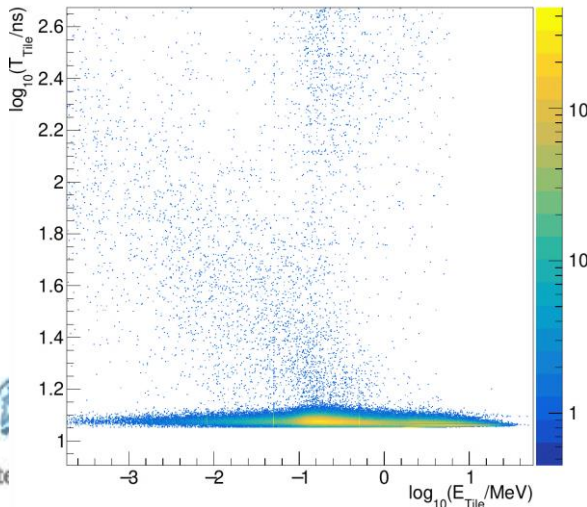
Plastic Scintillator



BGO



e-

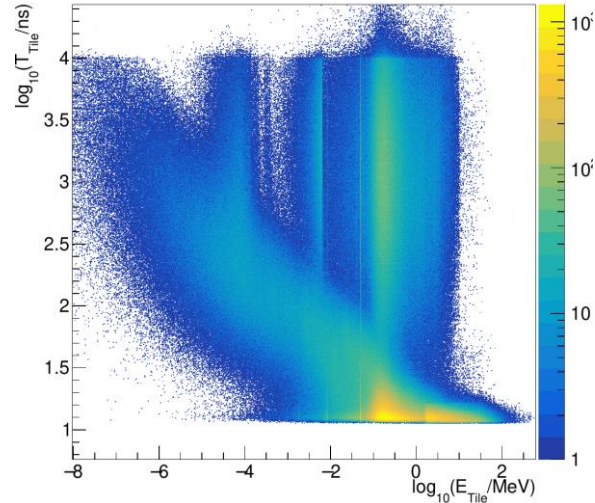


HCAL: Tiles time & energy distribution

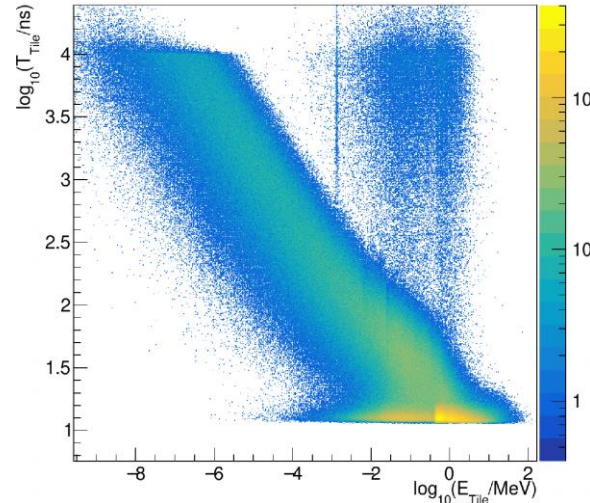
- Birks' constant, energy threshold and timing cut not included
- Incident particle: kaon0L and e- (10GeV)

kaon0L

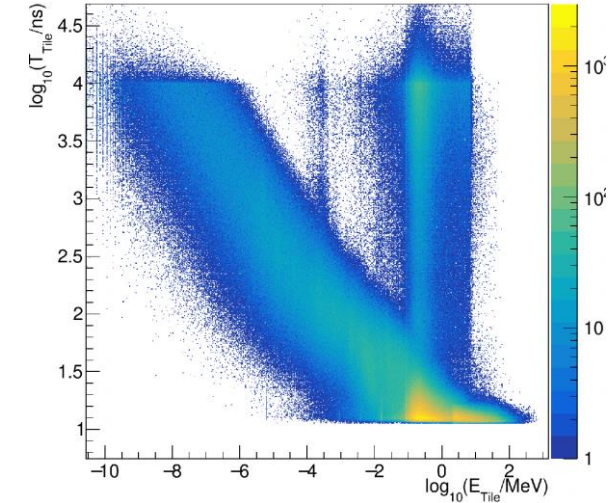
Scintillating Glass



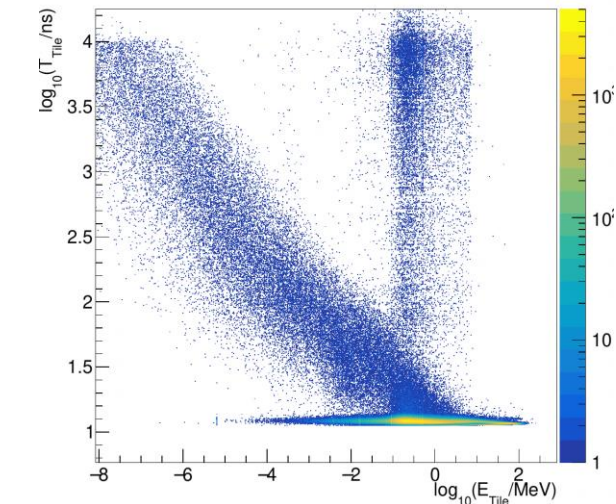
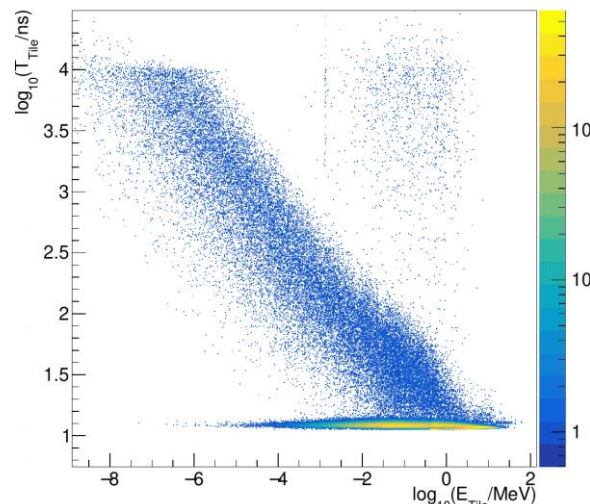
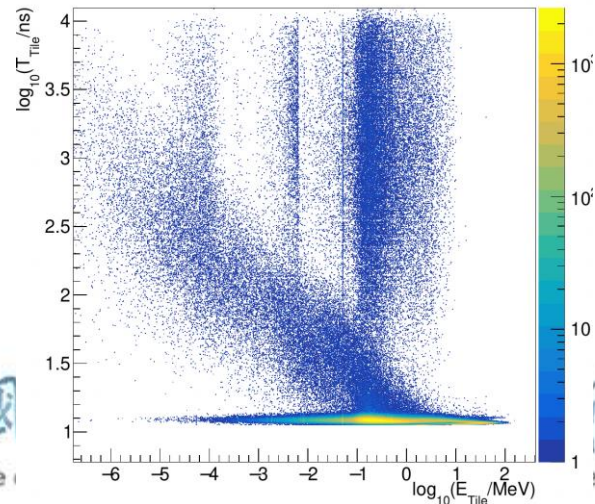
Plastic Scintillator



BGO



e-

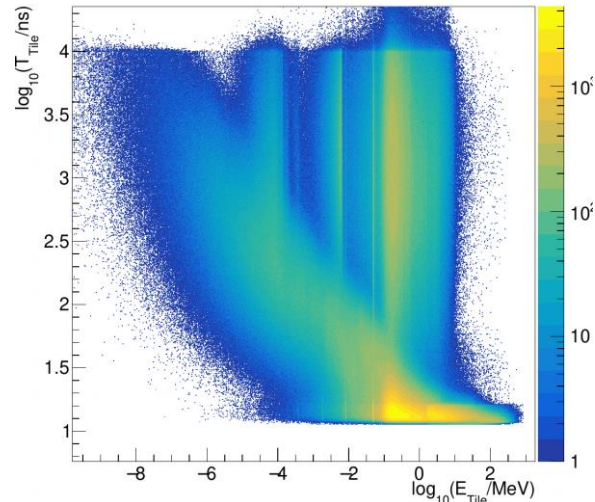


HCAL: Tiles time & energy distribution

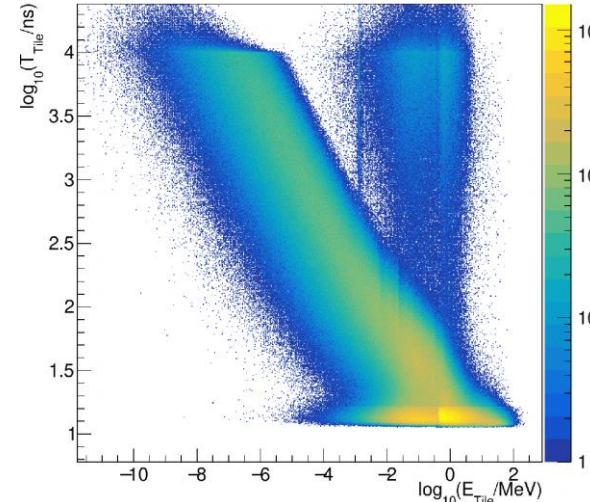
- Birks' constant, energy threshold and timing cut not included
- Incident particle: kaon0L and e- (**100GeV**)

kaon0L

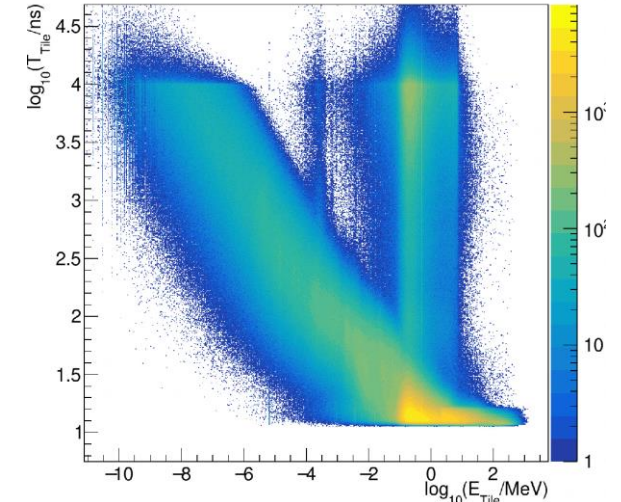
Scintillating Glass



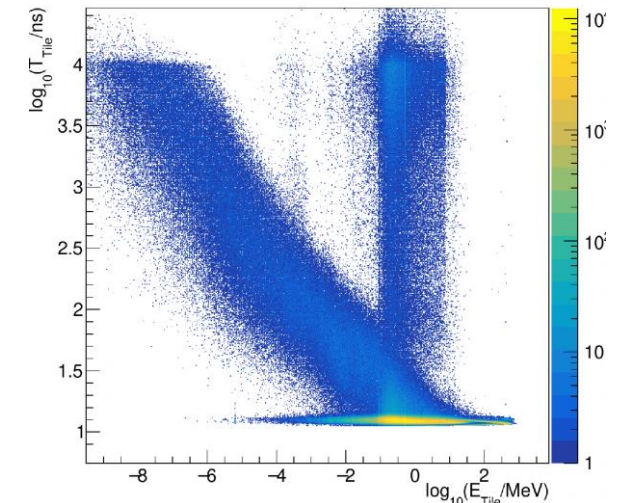
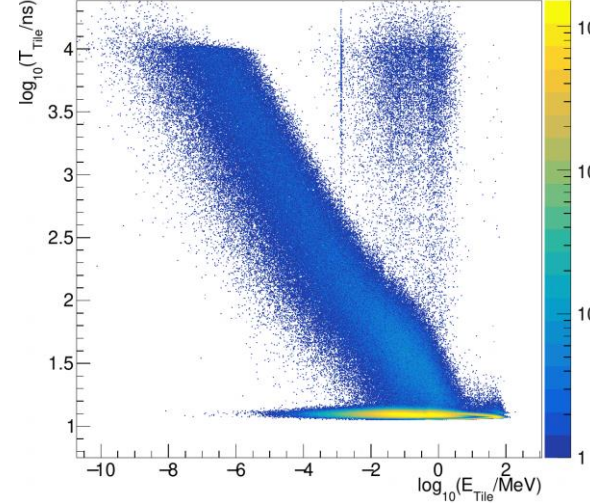
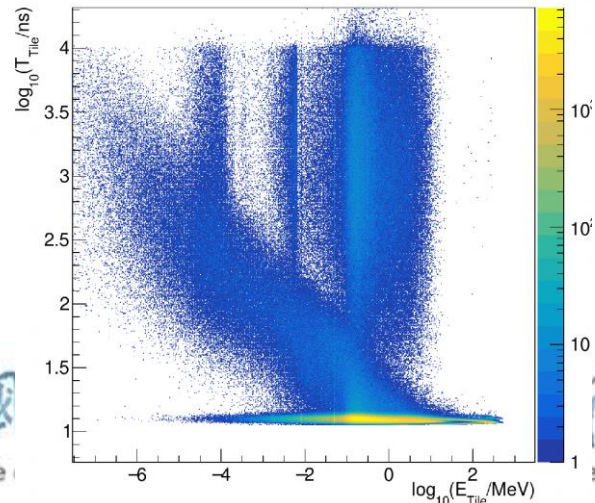
Plastic Scintillator



BGO



e-

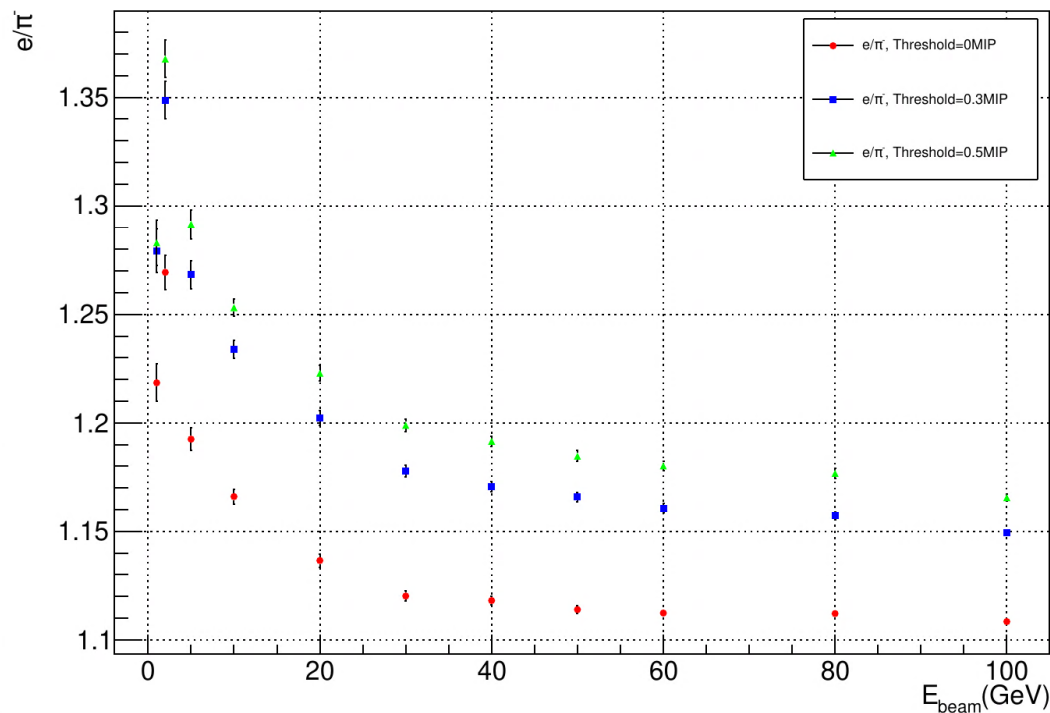


Scintillator HCAL: e/π^- ratio

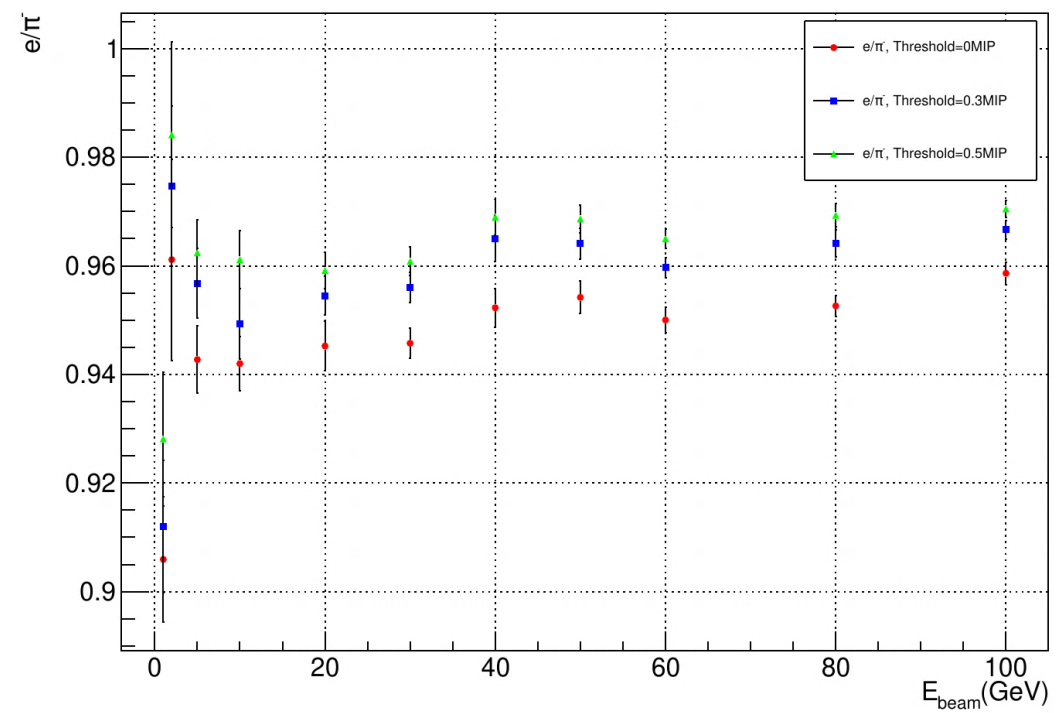
Impact of energy threshold for e/π^- ratio

- Birks' constant and timing cut not included
- Energy threshold: 0MIP, 0.3MIP, 0.5MIP

Scintillating Glass



Plastic Scintillator

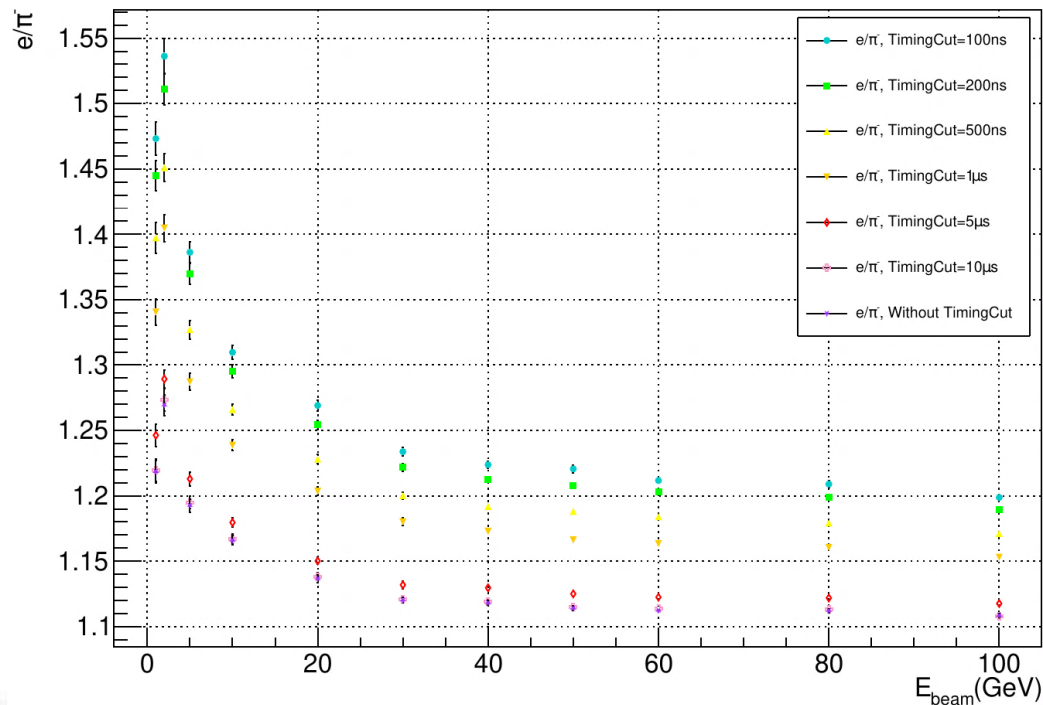


Scintillator HCAL : e/π^- ratio

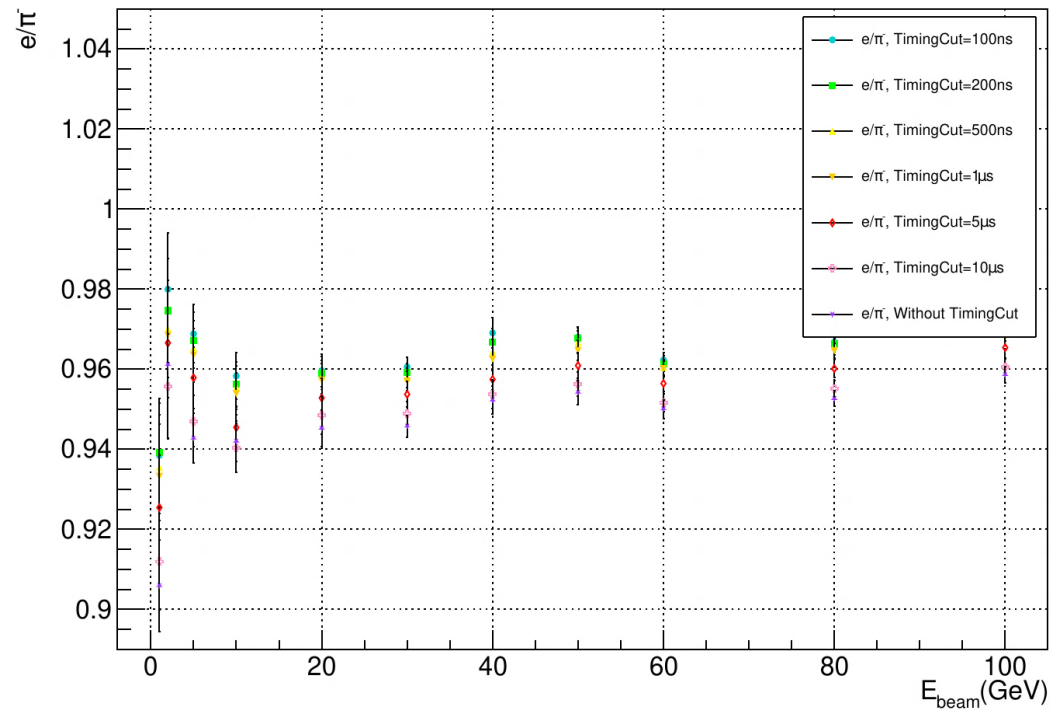
Impact of timing cut for e/π^- ratio

- Birks' constant and energy threshold not included
- Timing Cut: 100ns, 200ns, 500ns, 1 μ s, 5 μ s, 10 μ s

Scintillating Glass



Plastic Scintillator

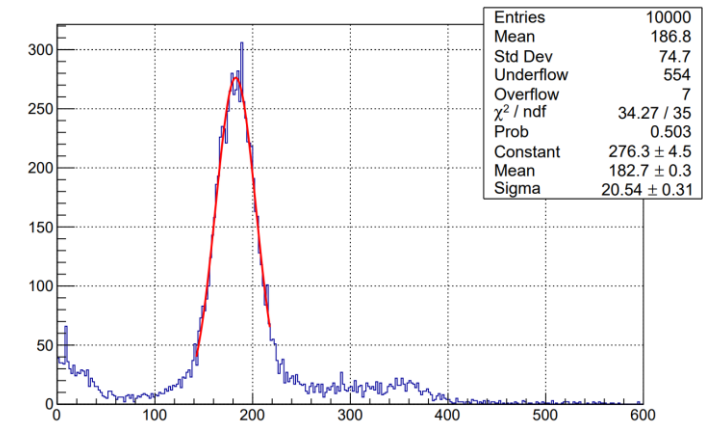
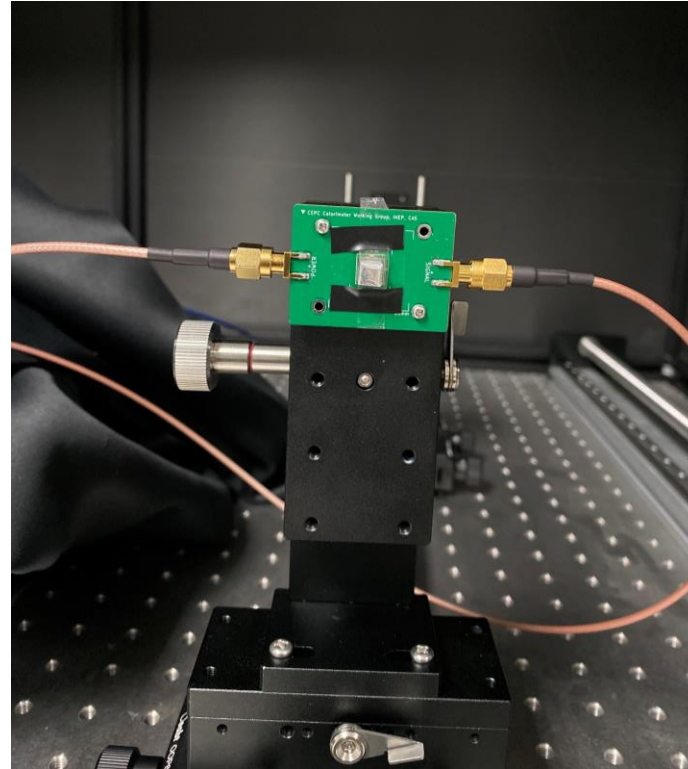
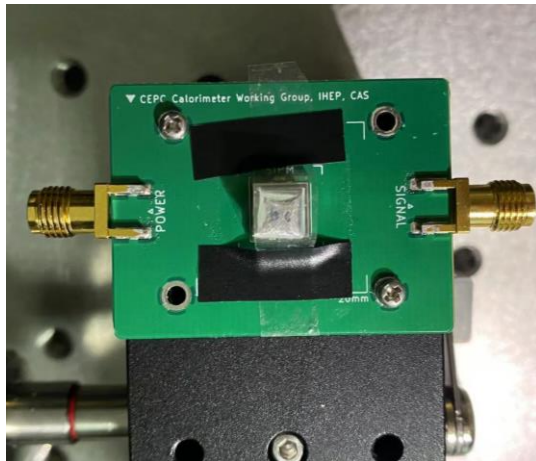


Part II

Cosmic Ray Experiment of Scintillating Glass

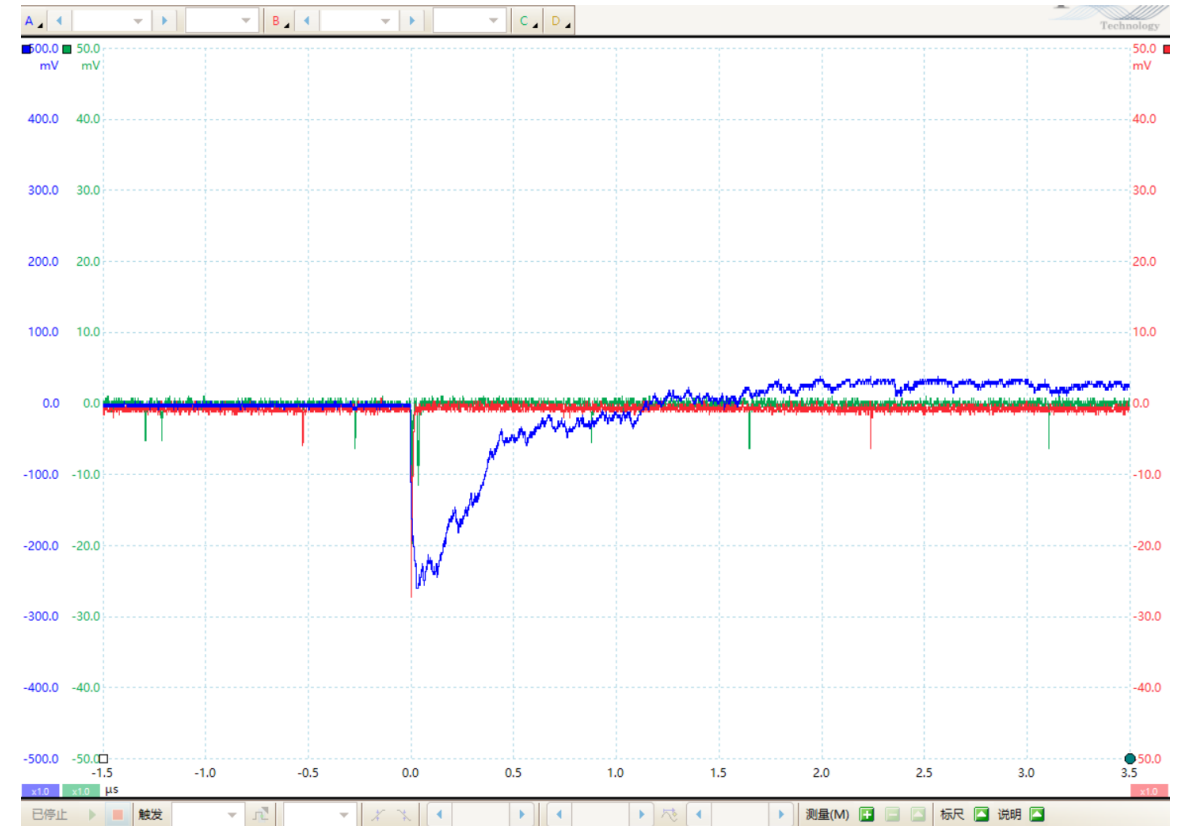
Cosmic Ray Experiment of Scintillating Glass

- Sample: #7, $\sim 4.5 \times 4.5 \times 3 \text{ mm}^3$
- Coupling of Sample and SiPM: Air



SiPM: single photon

Cosmic Ray Experiment of Scintillating Glass



Cosmic Ray Experiment of Scintillating Glass

