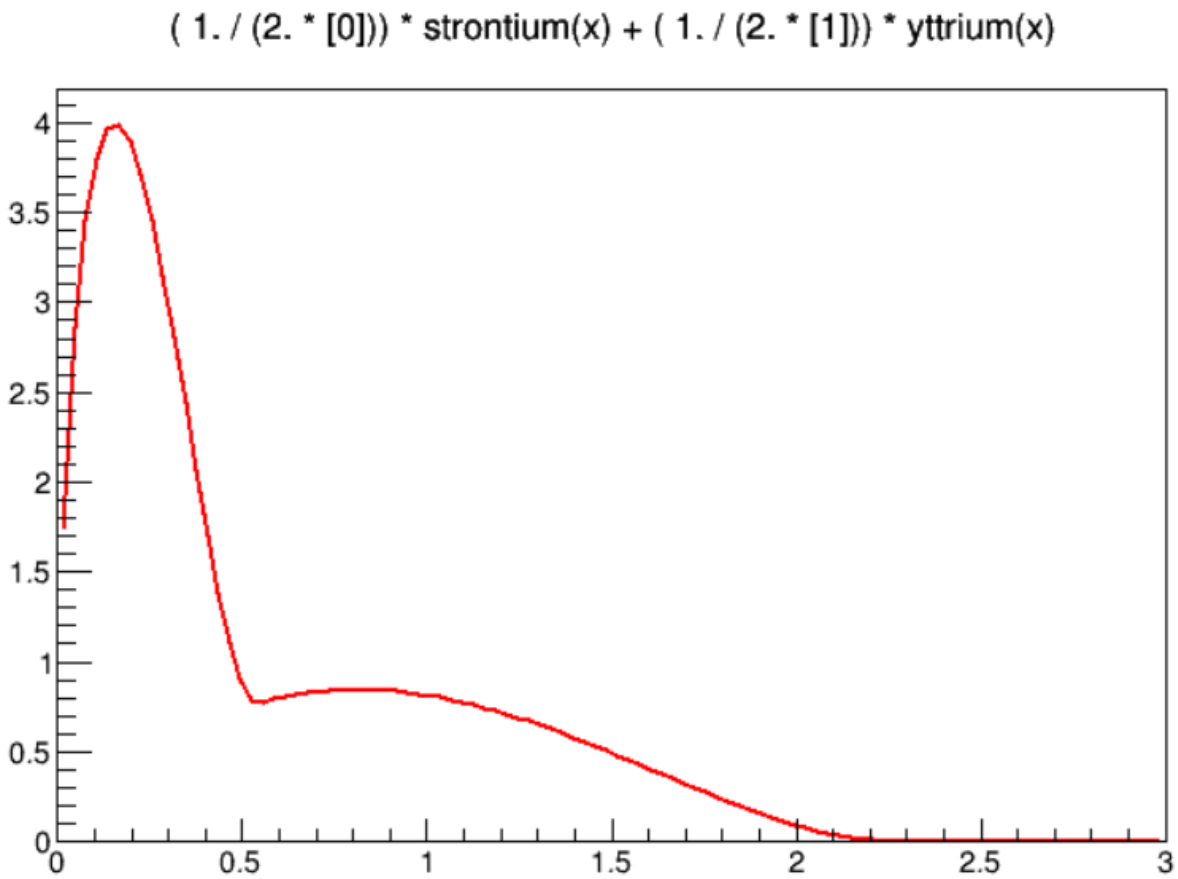
# Experiment for scintillation process

# Purpose of experiments

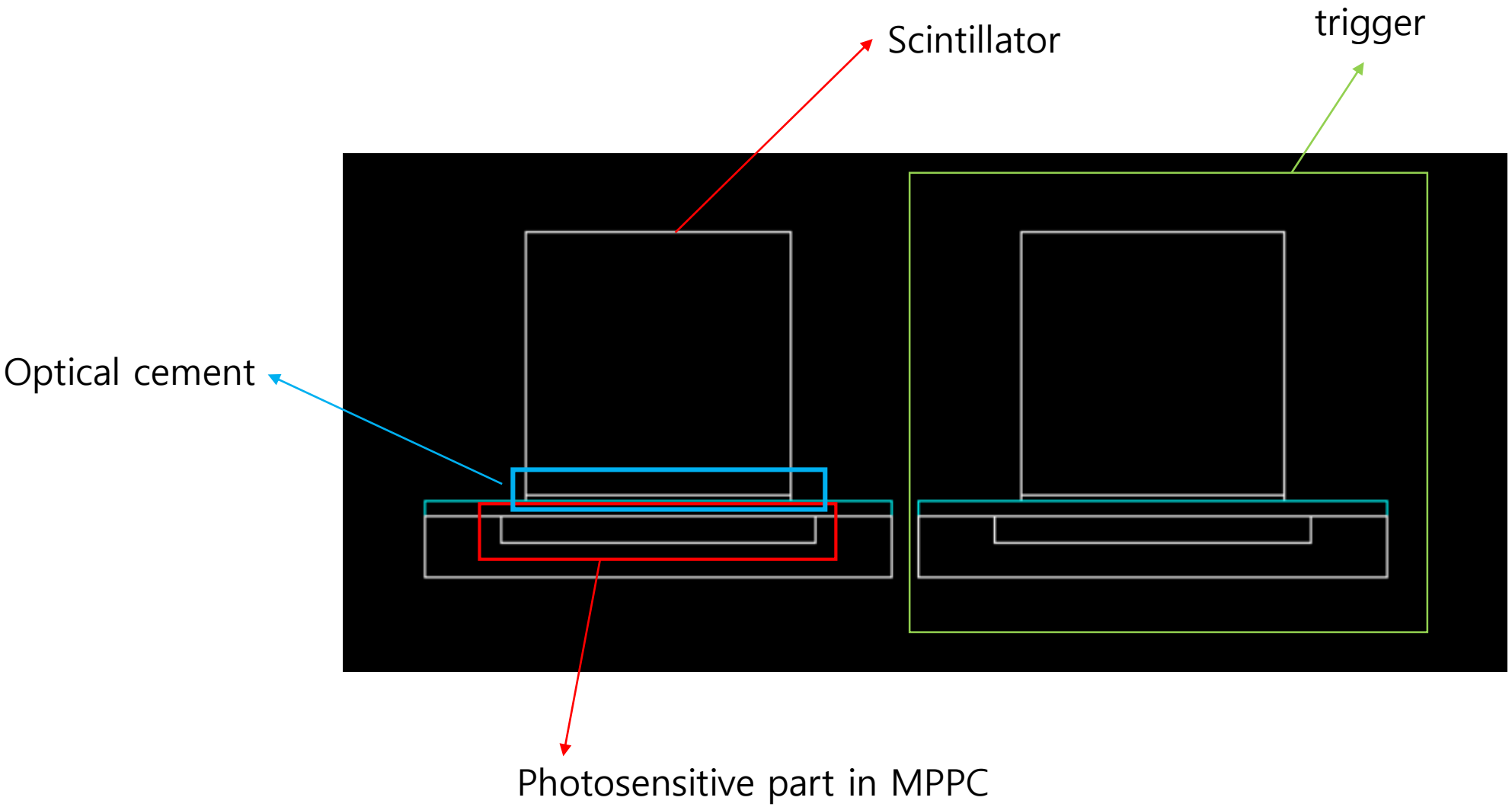
- Understanding the scintillation process in thin scintillator.

- Check the scintillation yield

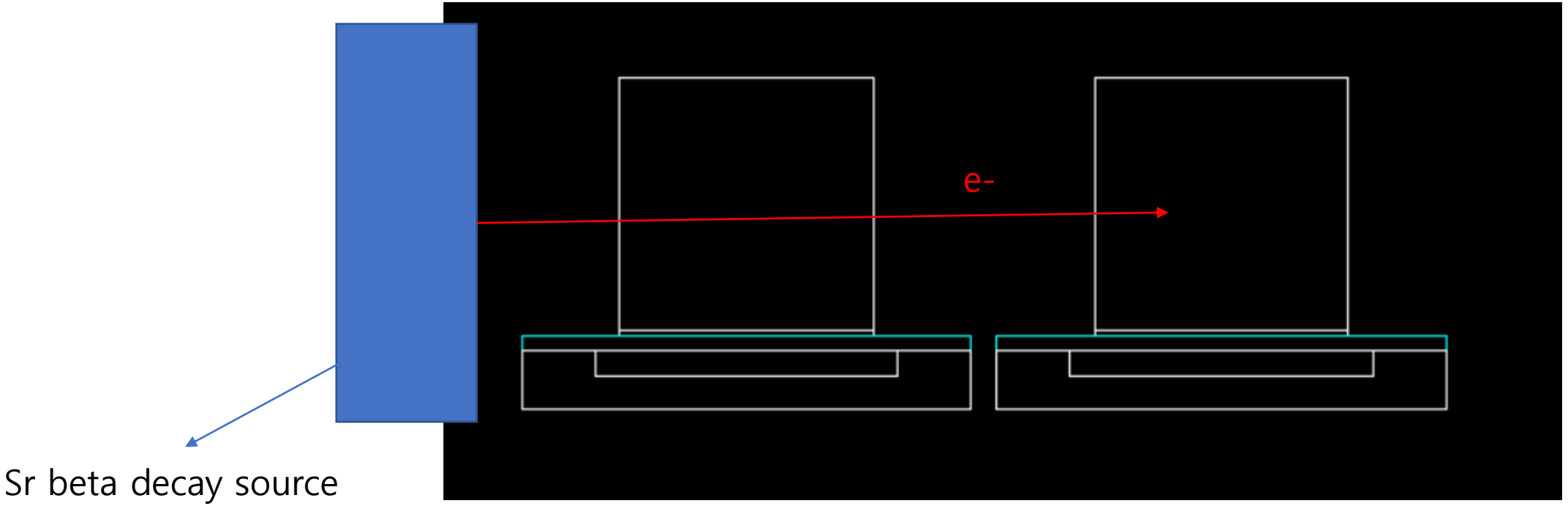
# Beta decay spectrum



# Simulation


Scintillator
trigger
Optical cement
Photosensitive part in MPPC

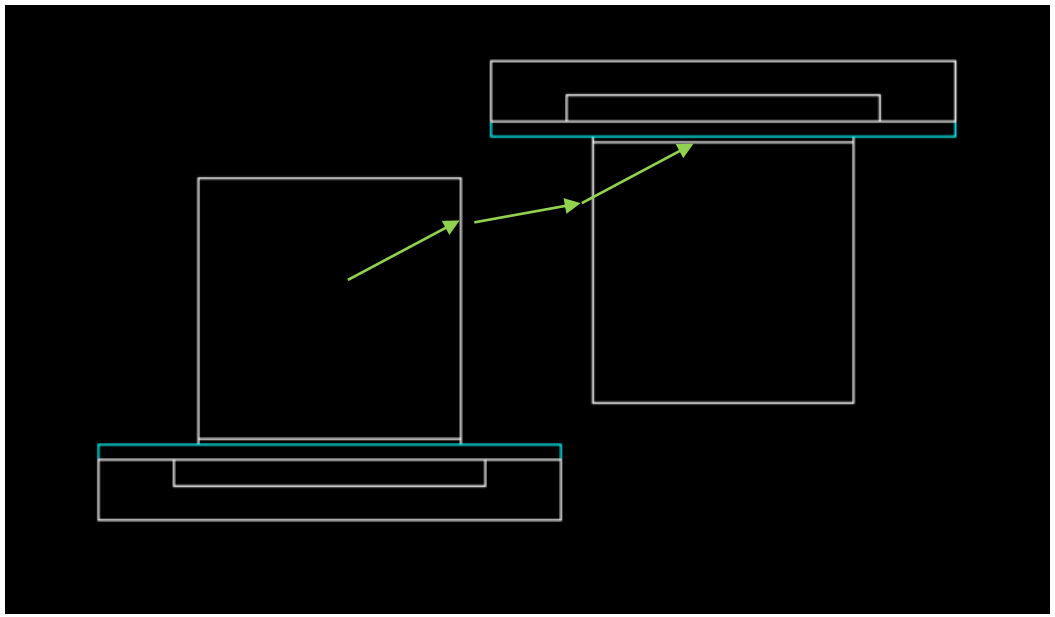
# Plan for experiments

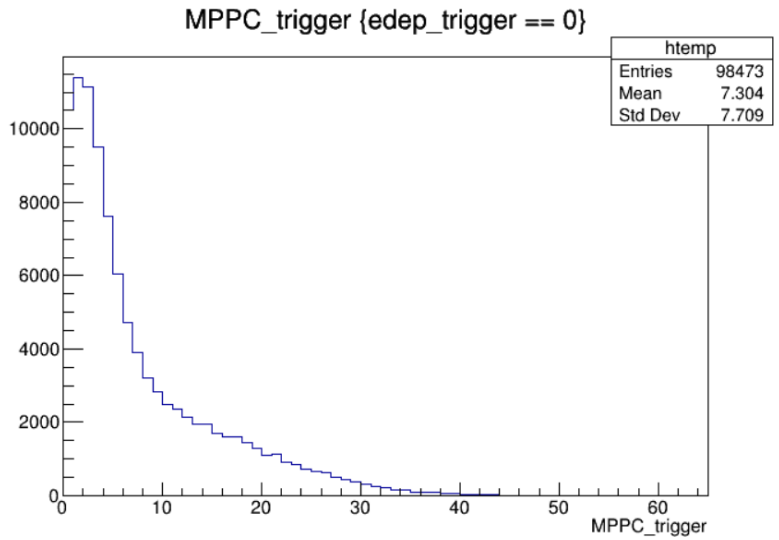



When signal of trigger over the threshold about 200 photons, get data. The peak of histogram of ADC is appeared when energy deposit is about 1 MeV.

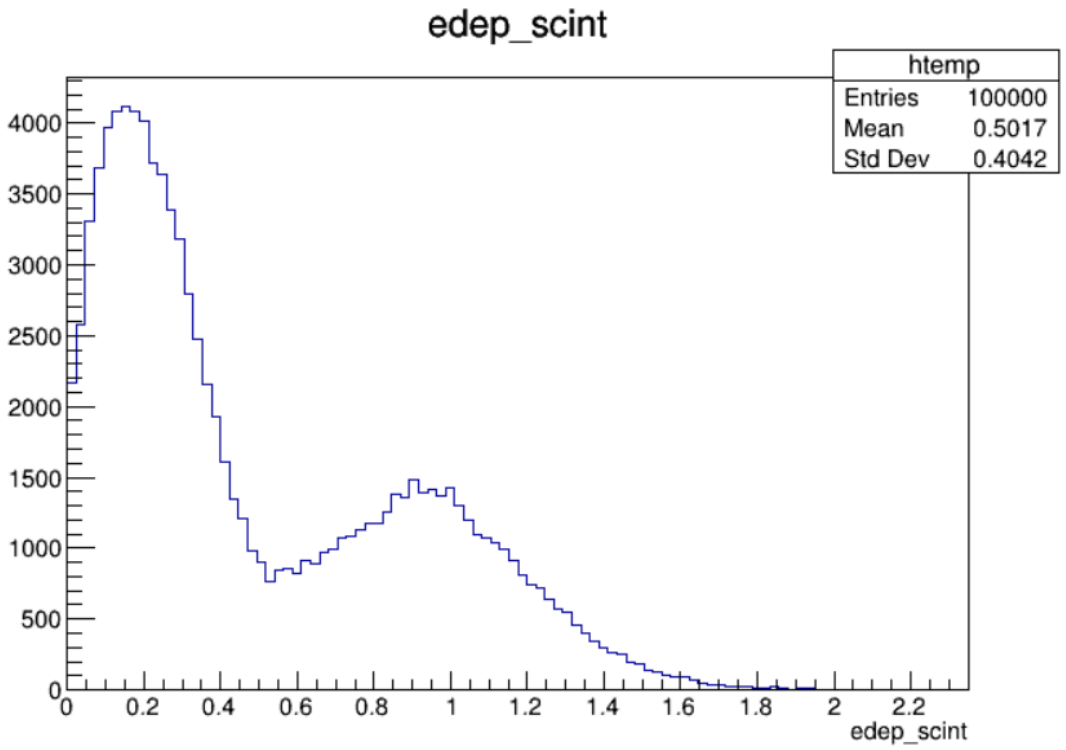
# Reasons for experiments conditions

- Place triggers on the right of scintillators to eliminate the effects of cosmic ray.
- Place the MPPC of the scintillator and the trigger in the same direction to count the number of photons from each scintillator.(Of course there are photons arrived at trigger's MPPC from scintillator. However the number is very small)

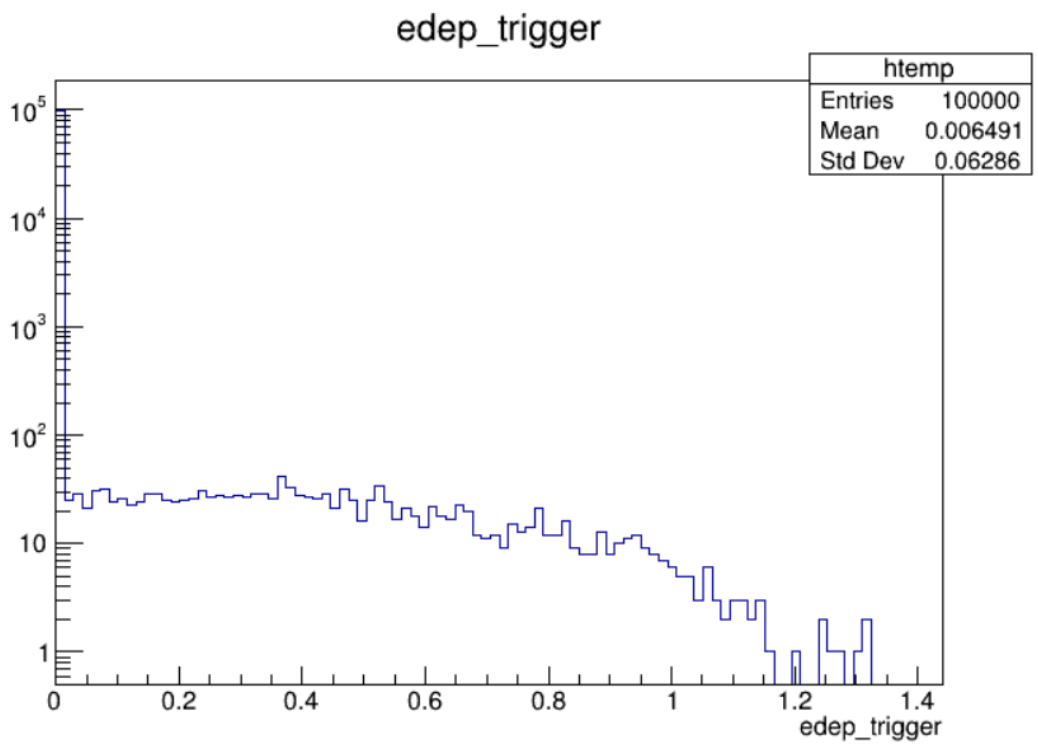




# Simulation result

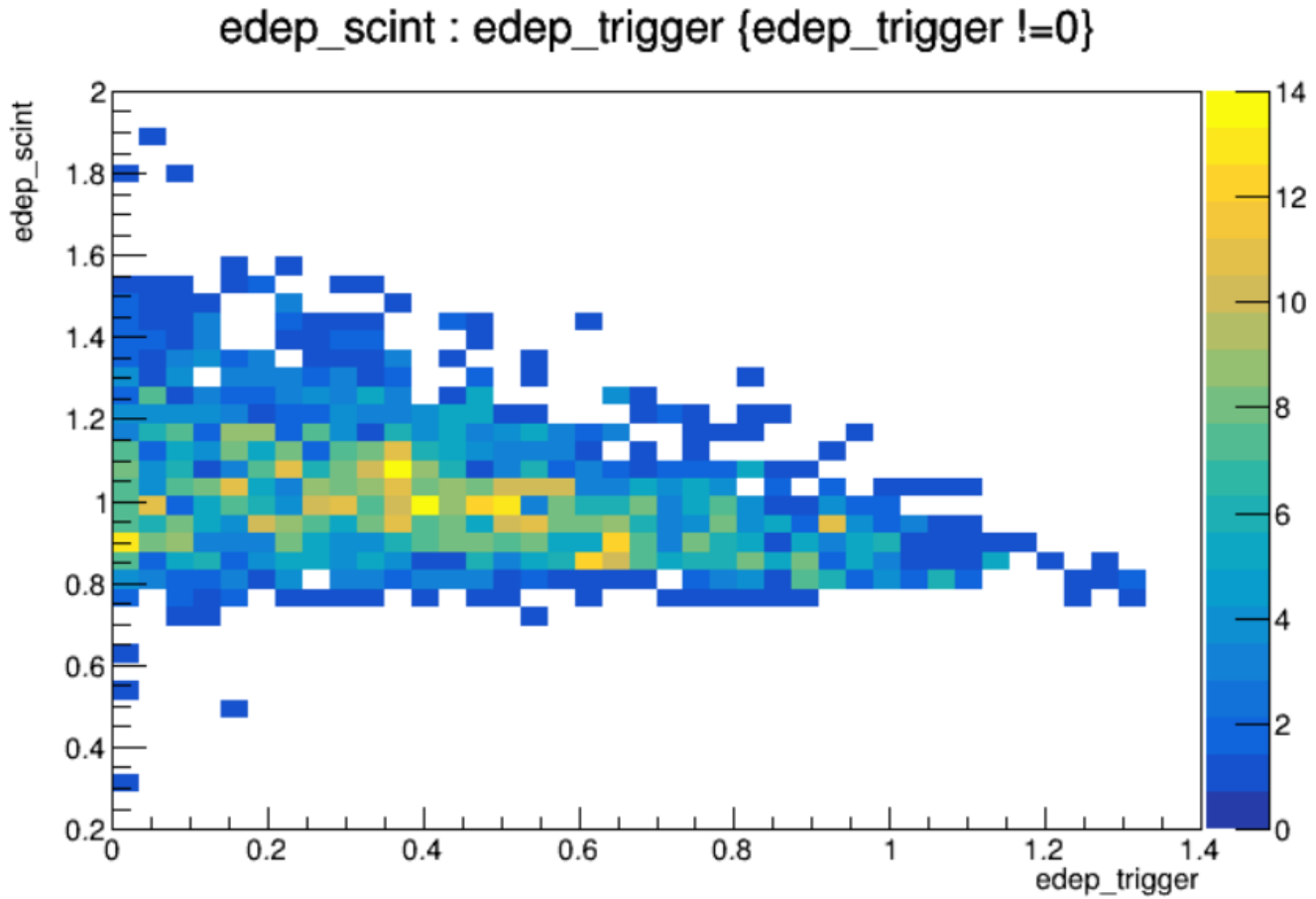



Energy deposit on scintillator

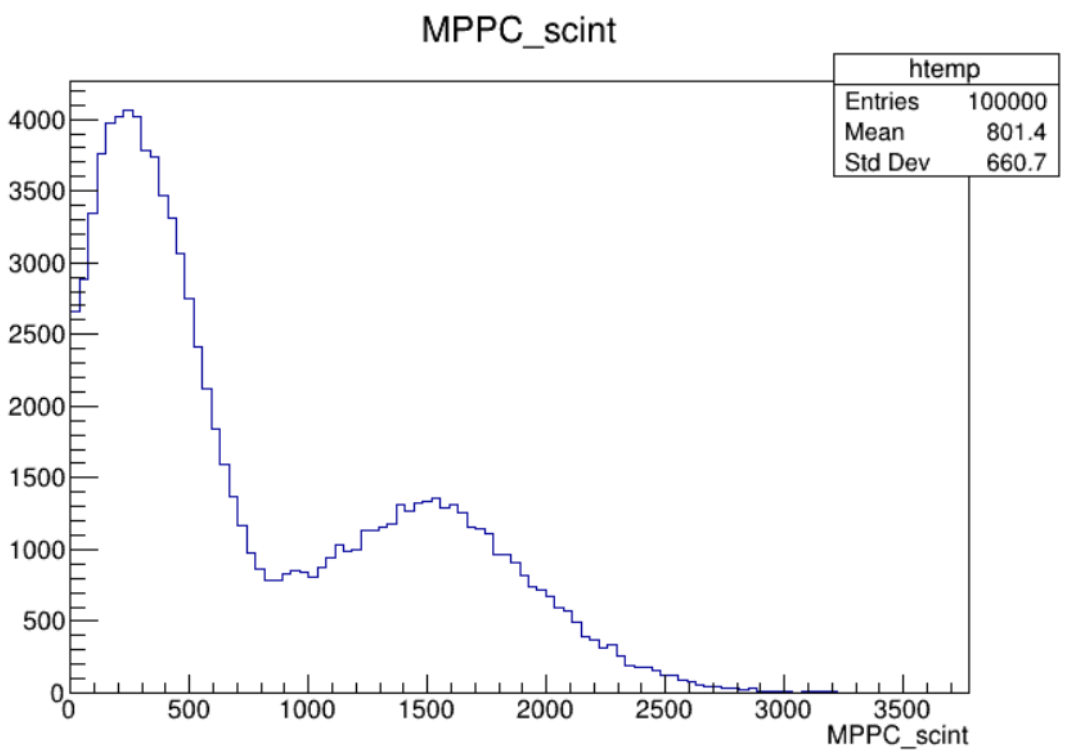


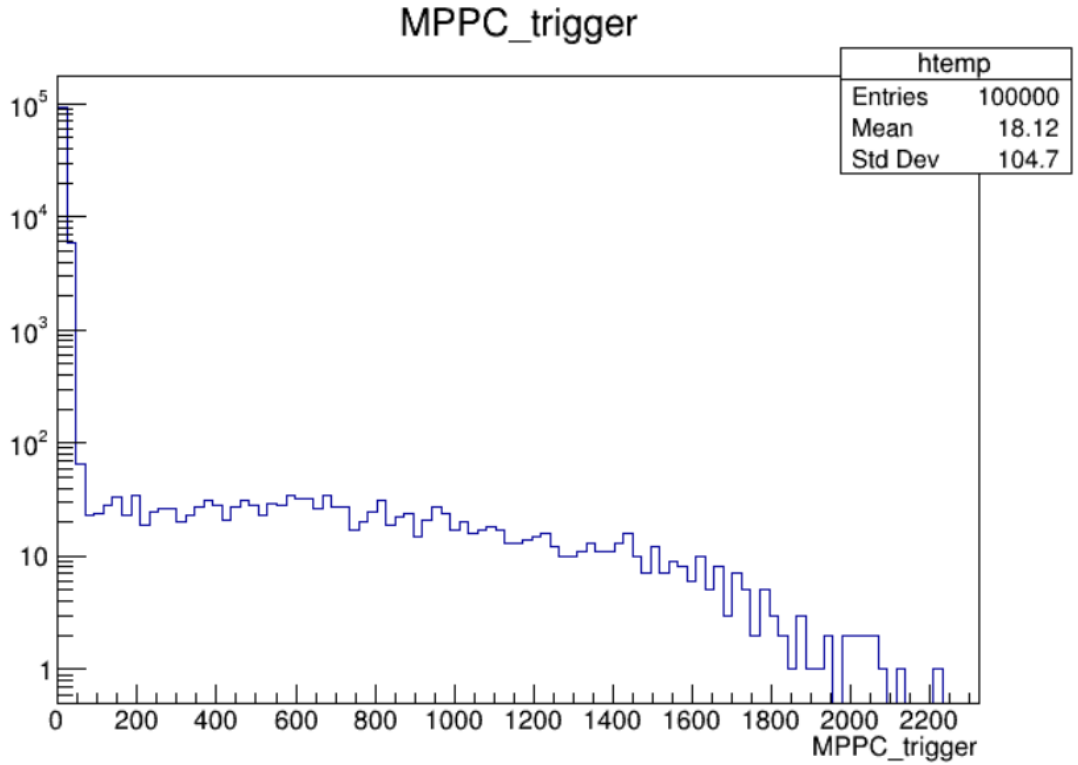

Energy deposit on trigger

# Simulation result 2-D Plot

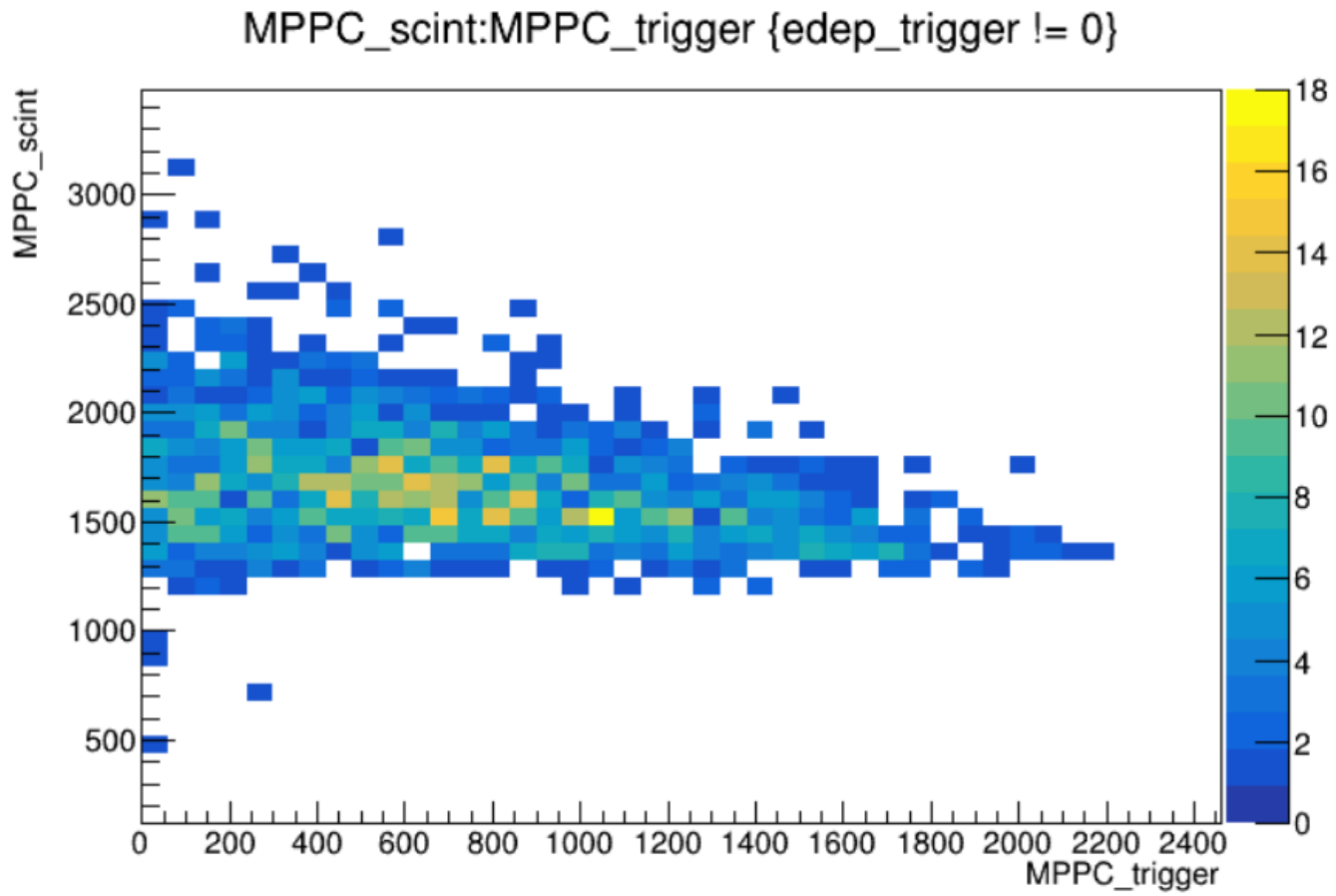


# Results for MPPC

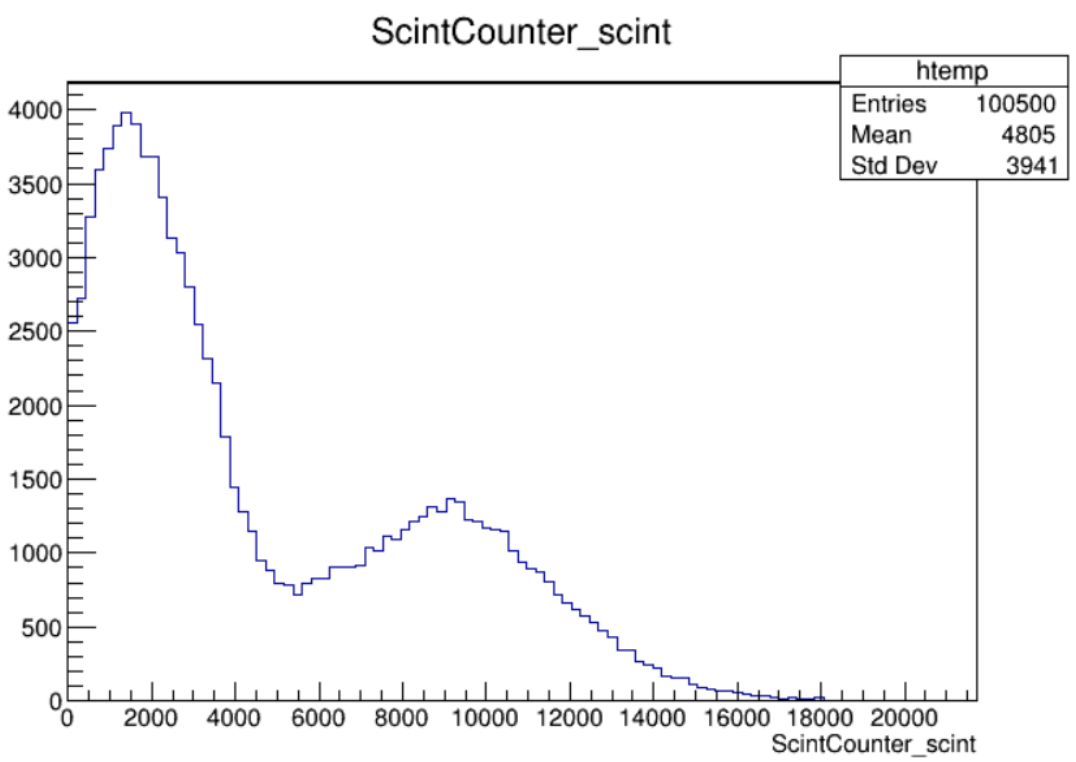


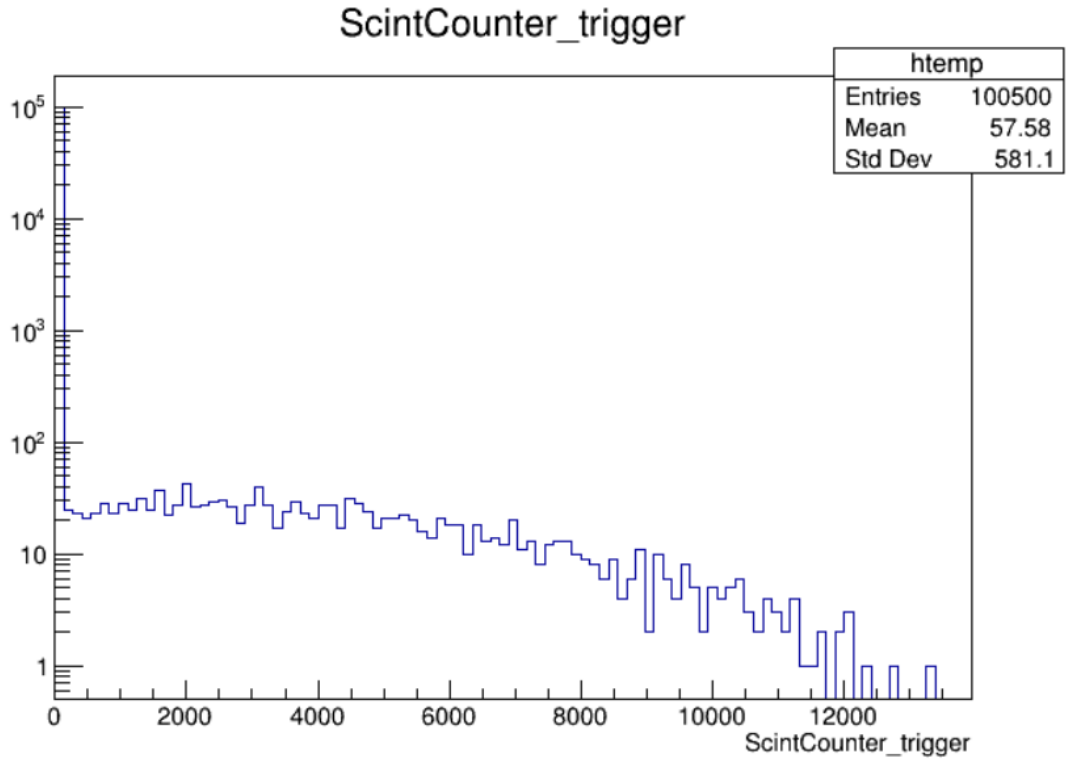



# Simulation result for the number of photons

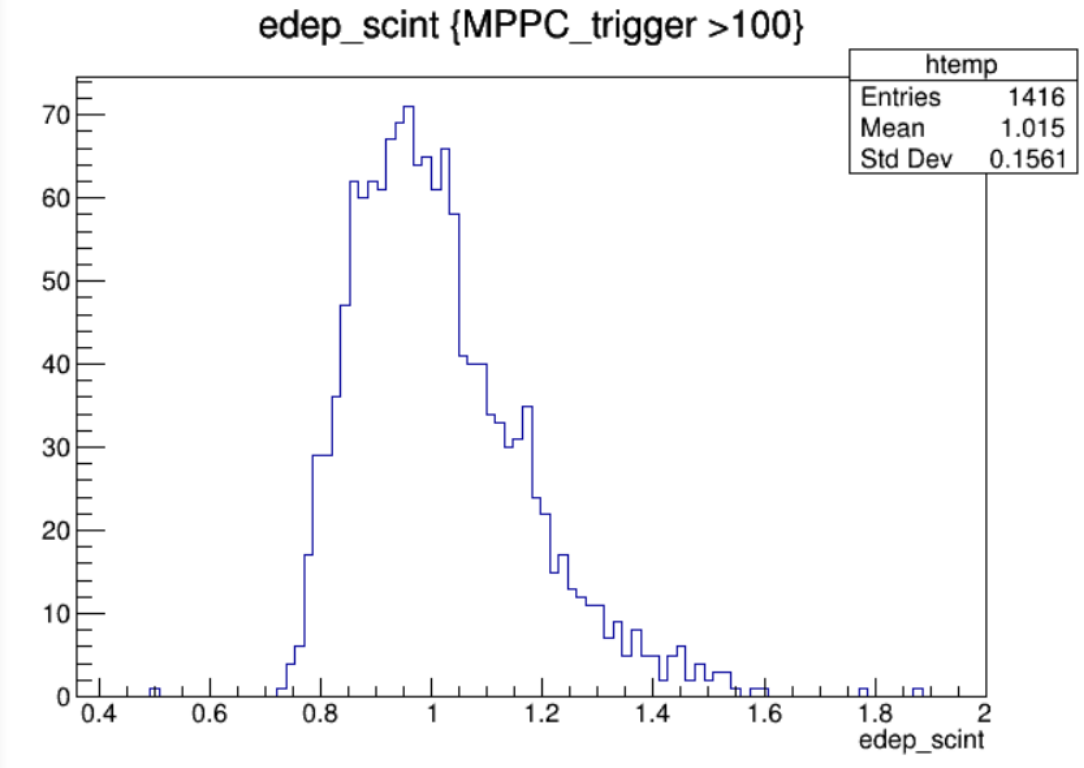


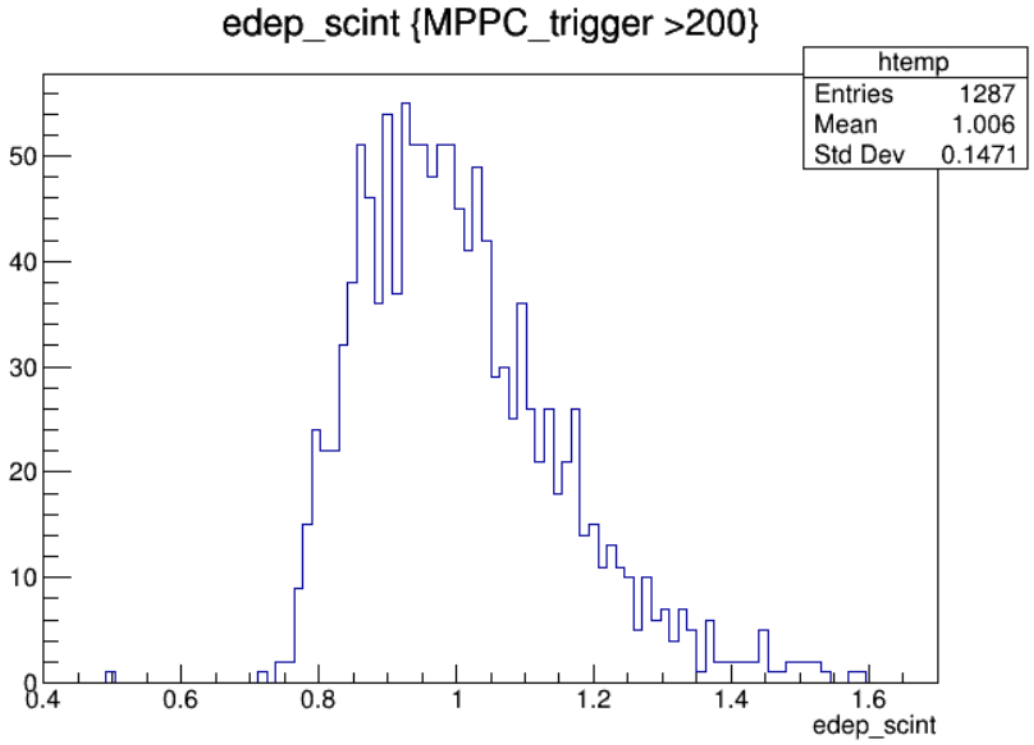
# Results for Scintillation photons



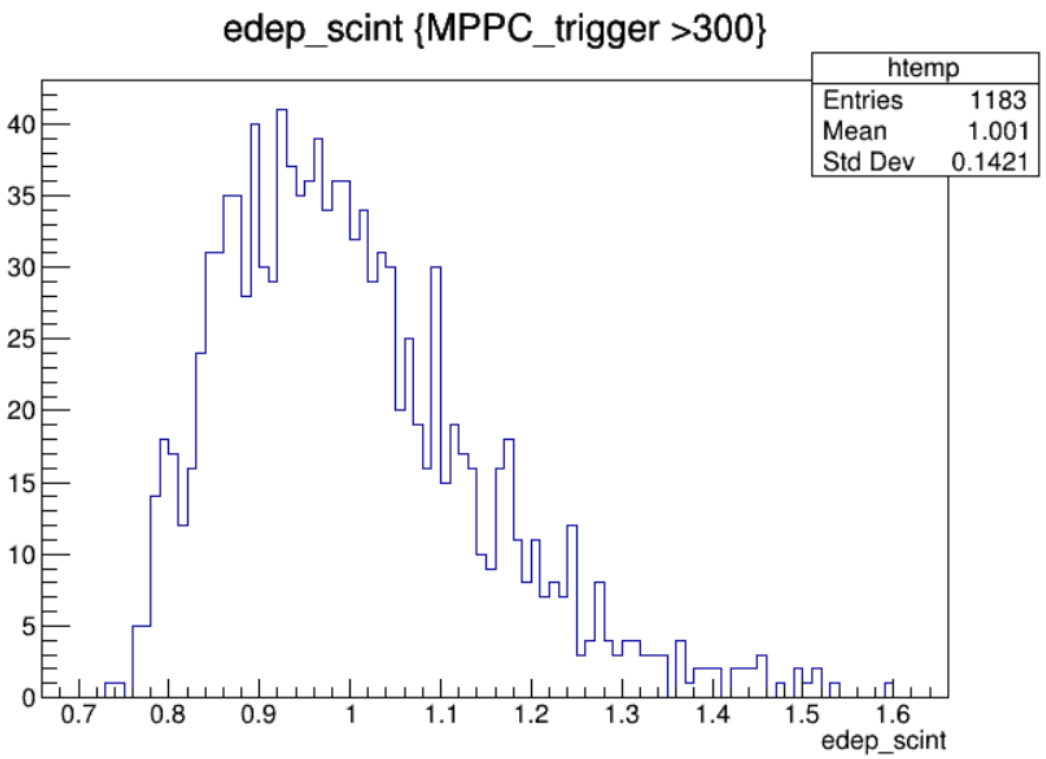



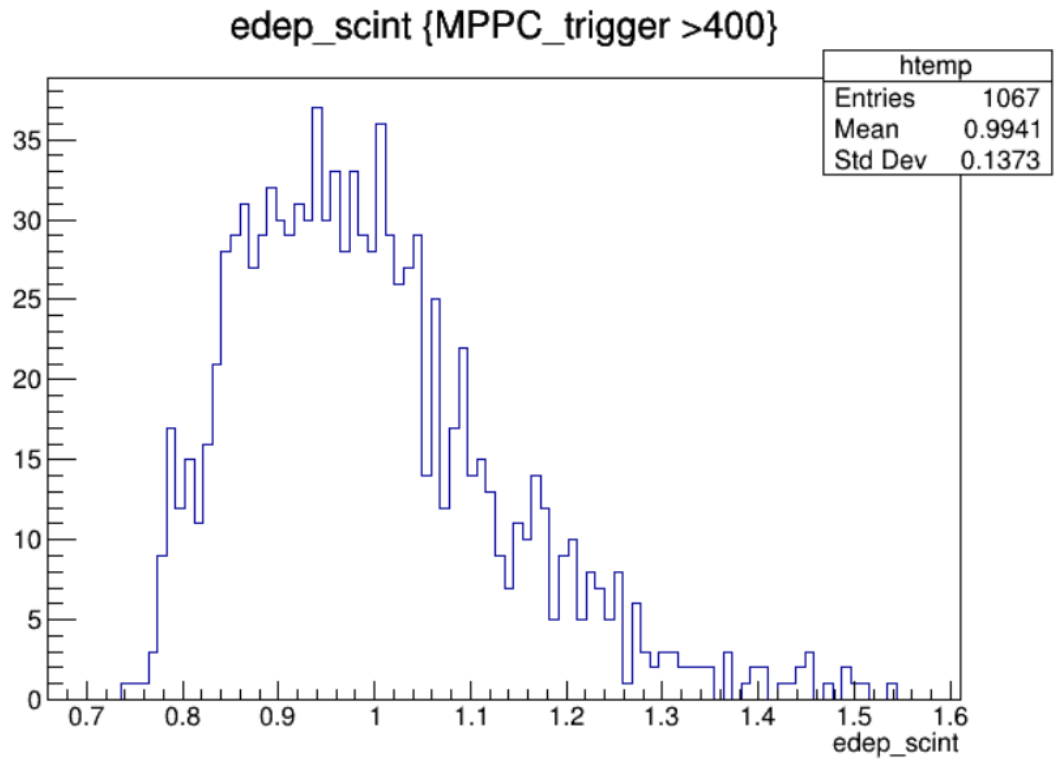
# Evidences


edep_scint {MPPC_trigger >100}
htemp
Entries 1416
Mean 1.015
Std Dev 0.1561
70
60
50
40
30
20
10
0
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
edep_scint

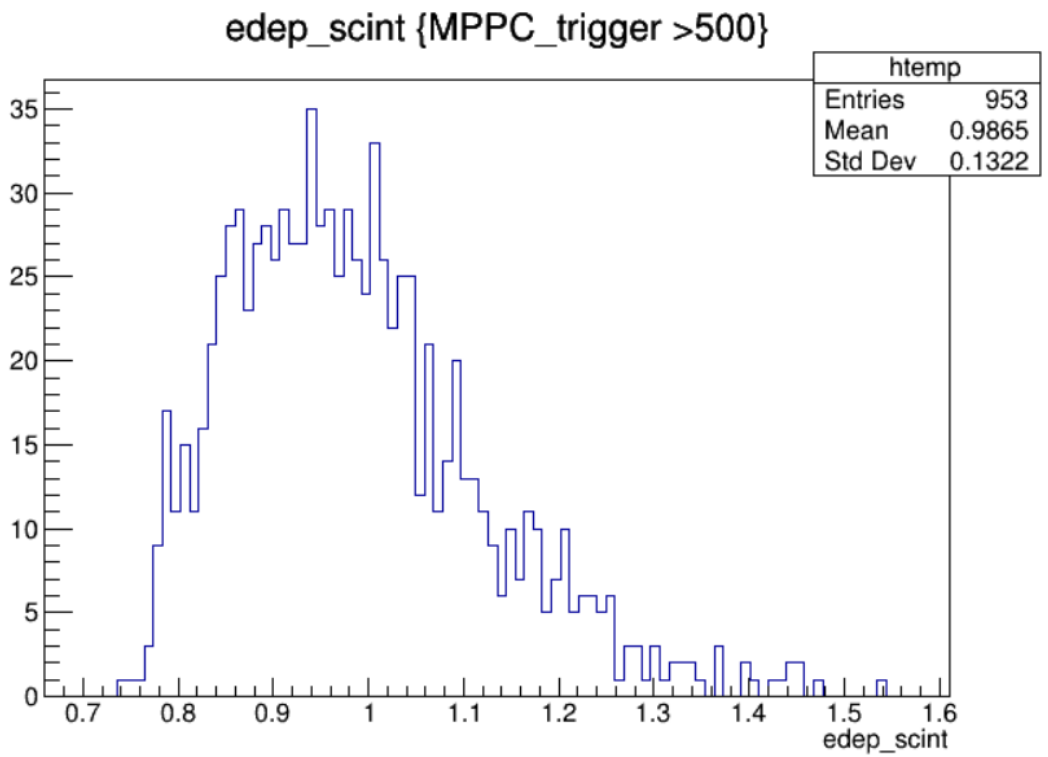

edep_scint {MPPC_trigger >200}
htemp
Entries 1287
Mean 1.006
Std Dev 0.1471
50
40
30
20
10
0
0.4
0.6
0.8
1
1.2
1.4
1.6
edep_scint

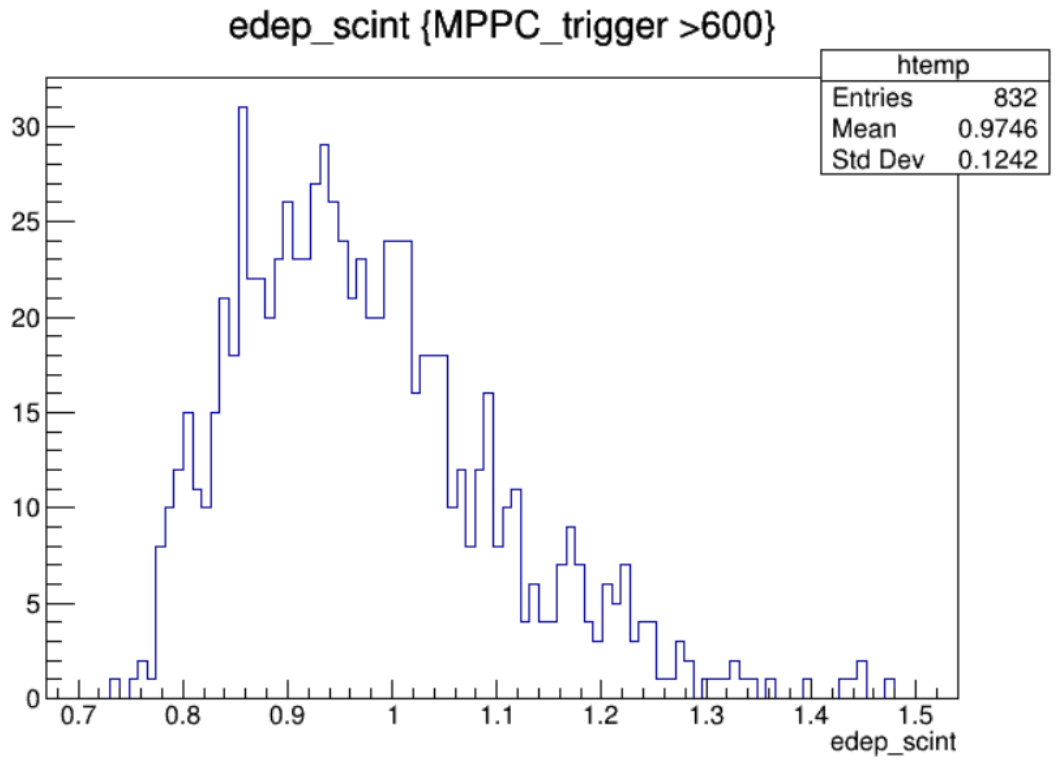
# Evidences


edep_scint {MPPC_trigger >300}
htemp
Entries 1183
Mean 1.001
Std Dev 0.1421
edep_scint

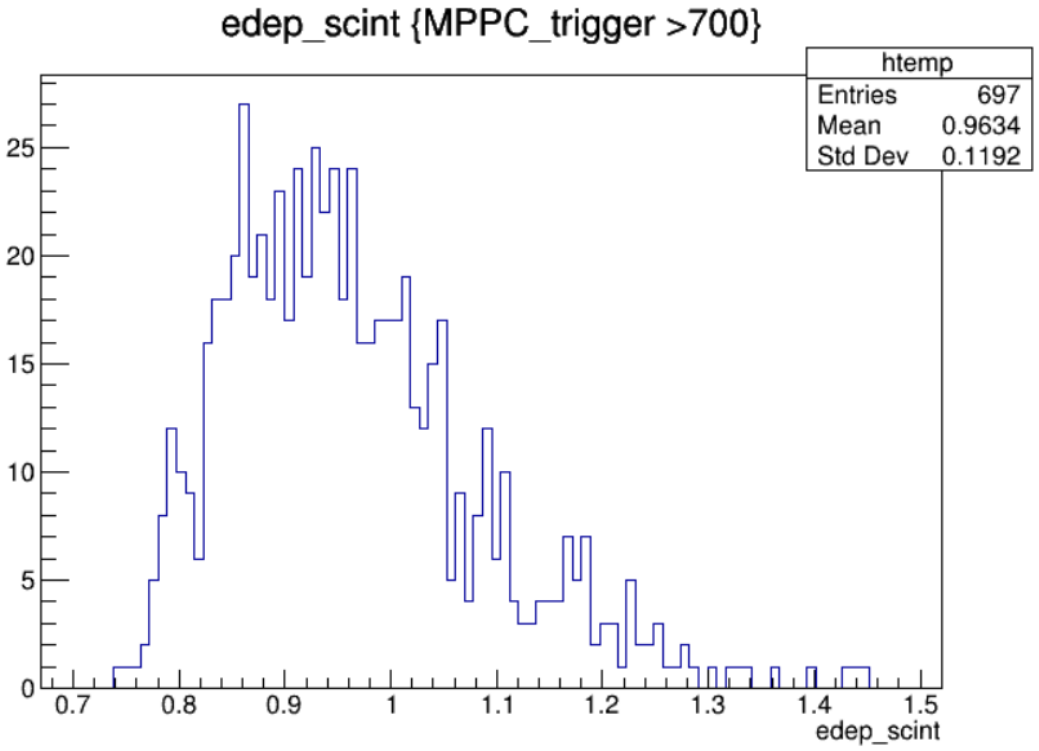

edep_scint {MPPC_trigger >400}
htemp
Entries 1067
Mean 0.9941
Std Dev 0.1373
edep_scint

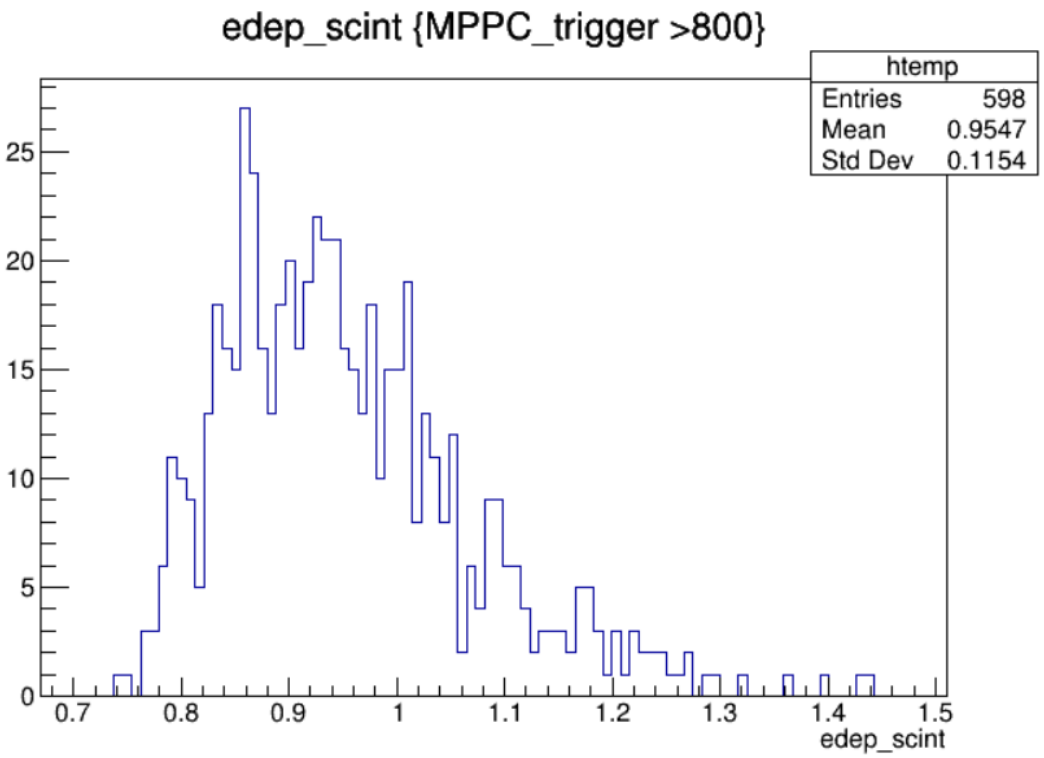
# Evidences


edep_scint {MPPC_trigger >500}
htemp
Entries 953
Mean 0.9865
Std Dev 0.1322
0 5 10 15 20 25 30 35
0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5 1.6
edep_scint

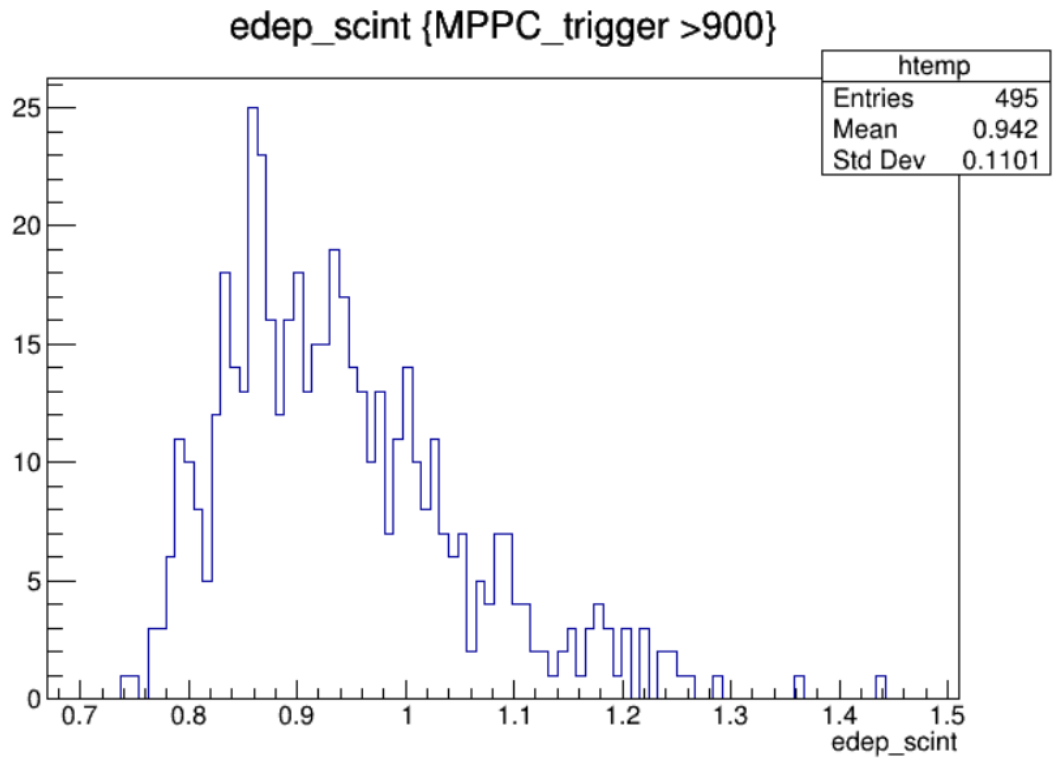

edep_scint {MPPC_trigger >600}
htemp
Entries 832
Mean 0.9746
Std Dev 0.1242
0 5 10 15 20 25 30
0.7 0.8 0.9 1 1.1 1.2 1.3 1.4 1.5
edep_scint

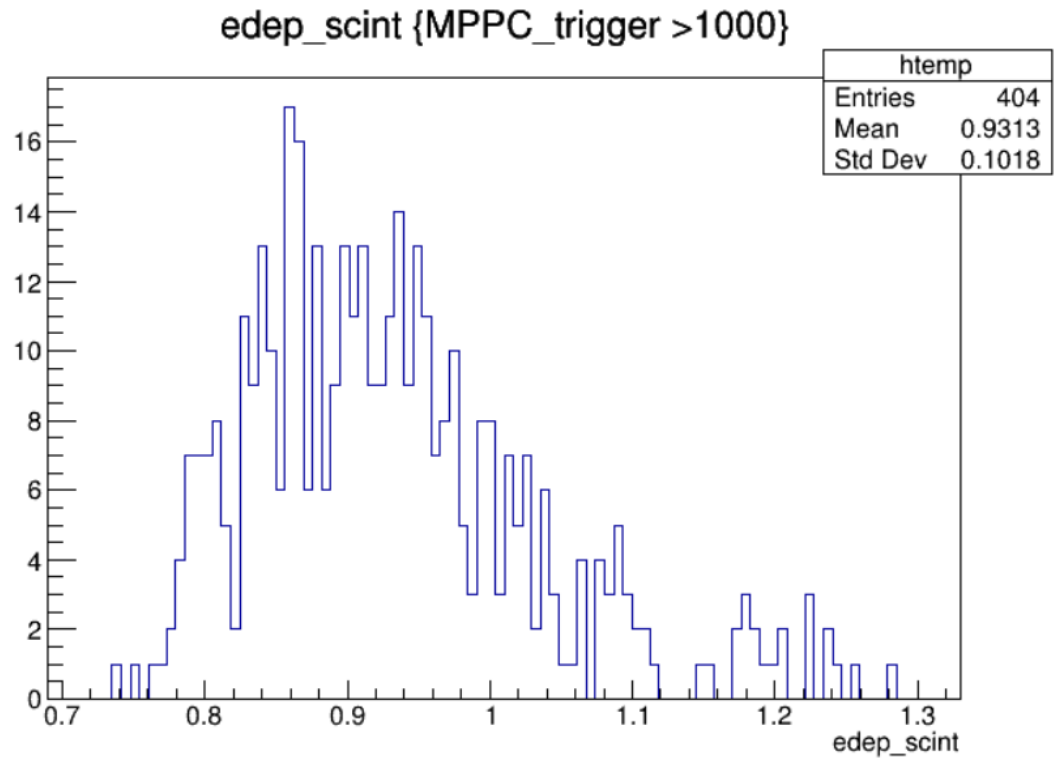
# Evidences


edep_scint {MPPC_trigger >700}
htemp
Entries 697
Mean 0.9634
Std Dev 0.1192
0
5
10
15
20
25
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
edep_scint


edep_scint {MPPC_trigger >800}
htemp
Entries 598
Mean 0.9547
Std Dev 0.1154
0
5
10
15
20
25
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
edep_scint

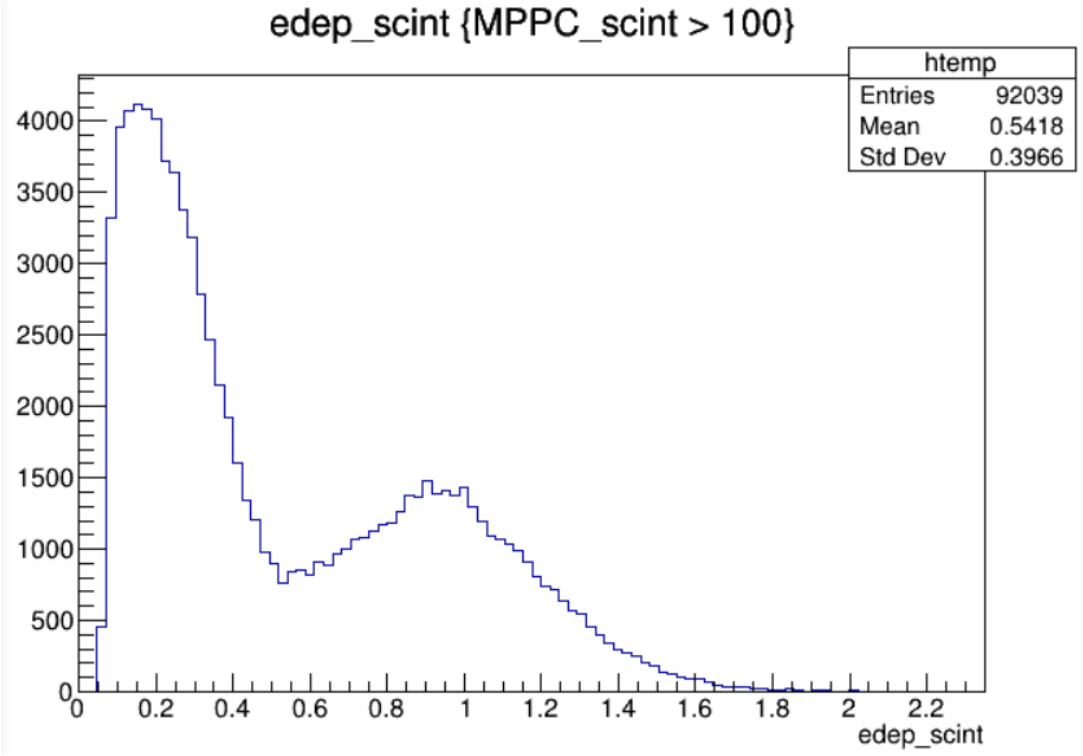
# Evidences


edep_scint {MPPC_trigger >900}
htemp
Entries 495
Mean 0.942
Std Dev 0.1101
25
20
15
10
5
0
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
edep_scint

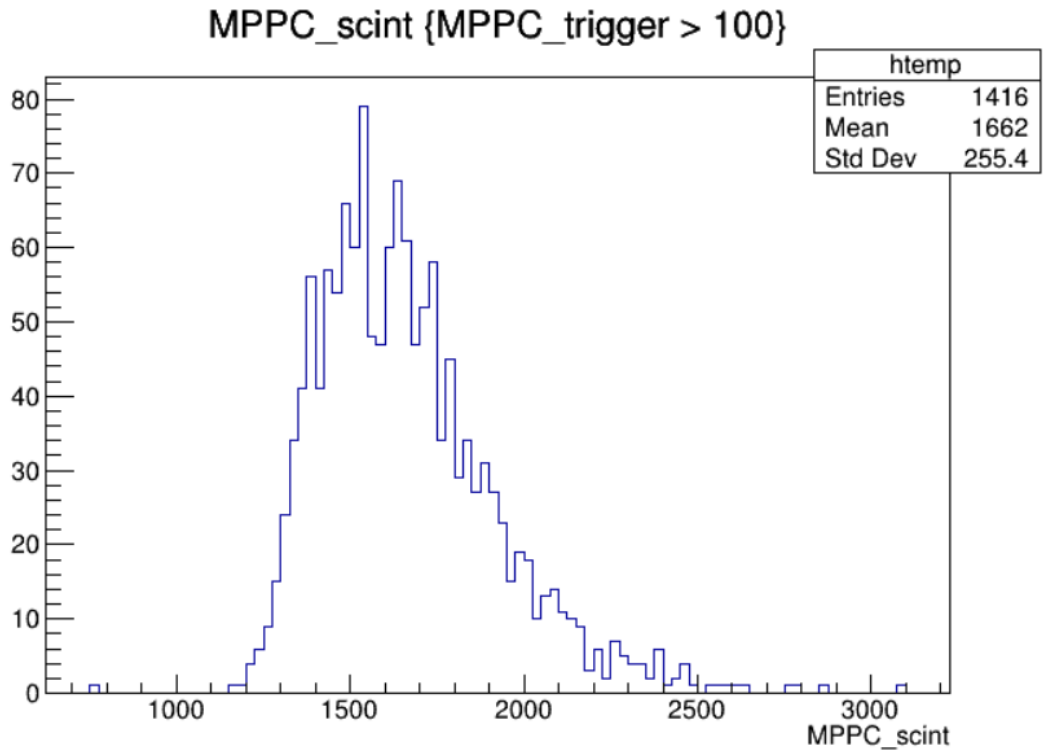

edep_scint {MPPC_trigger >1000}
htemp
Entries 404
Mean 0.9313
Std Dev 0.1018
16
14
12
10
8
6
4
2
0
0.7
0.8
0.9
1
1.1
1.2
1.3
edep_scint

# Plan for experiments

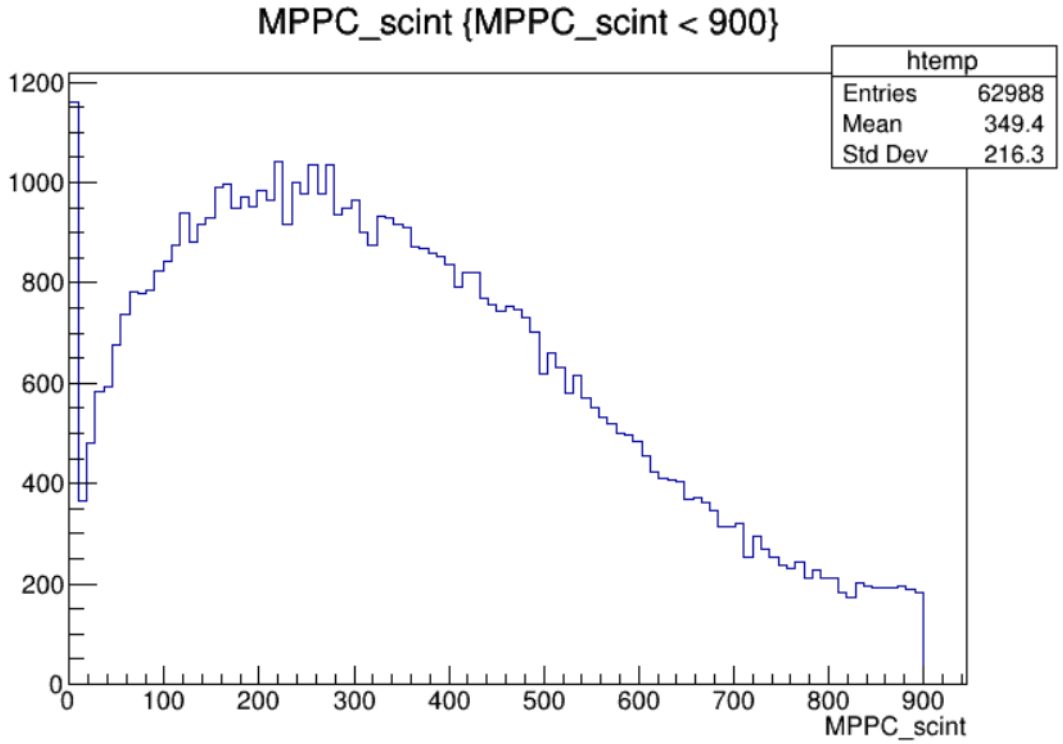
- Get data with self trigger.
- In this case, we can get two peak, one is near 1 MeV the other is near 0.2 MeV.



# Conclusion




The number of photons with trigger




The number of photons with self trigger

>> The other components are not consistent. Therefore we cannot speculate scintillation yield. (Emission positions of scintillation photon are top of scintillator)

>> We need to find the condition that emission of scintillation photons is occurred in top of scintillator

# Plan for experiments

- Make threshold higher than 800 photons, because peak of energy deposit is about 0.9 MeV in that condition.

- Problems
- We don’t know the exact threshold for peak of energy deposit is about 0.9 MeV.
- And frequency is too low about 400/100000