Study on energy resolution of the dual-readout calorimeter for future e+e- colliders using GEANT4 simulation and the first test-beam data

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On behalf of the Korea Dual-Readout Calorimeter team

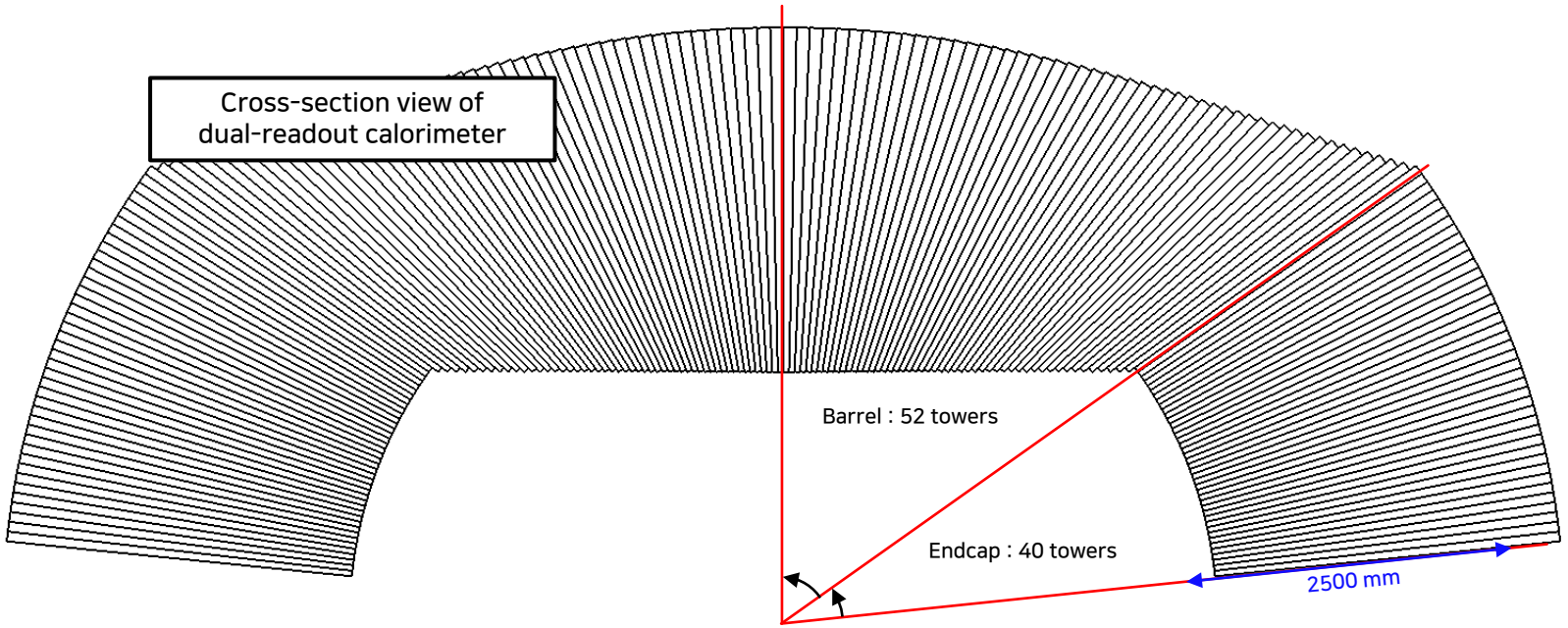
Oct. 26, 2022

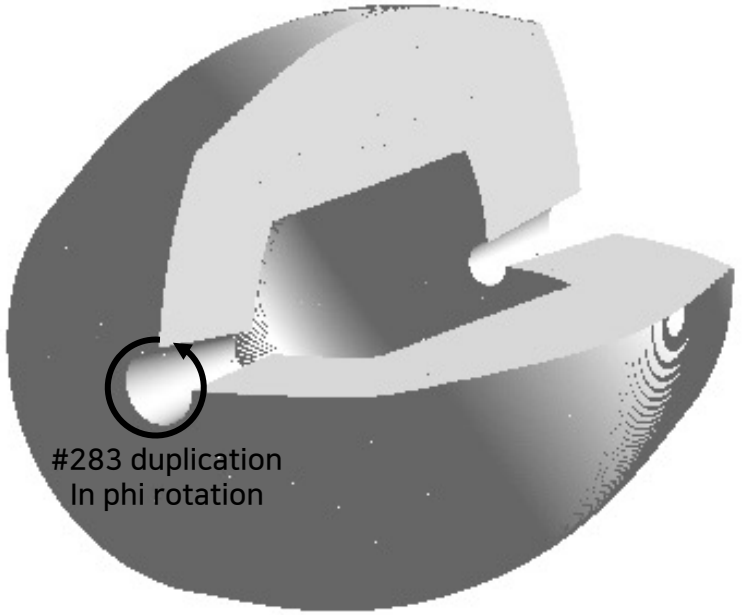
2022 CEPC workshop

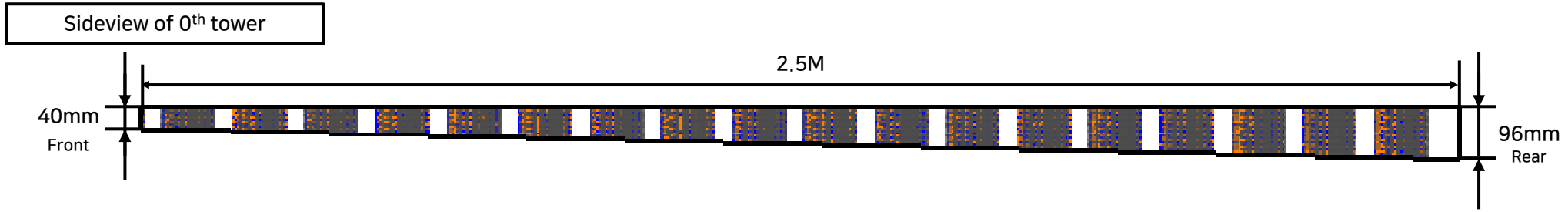
Supported by KiSTi www.kisti.re.kr

GEANT4 simulation setup

- **Geometry setup**

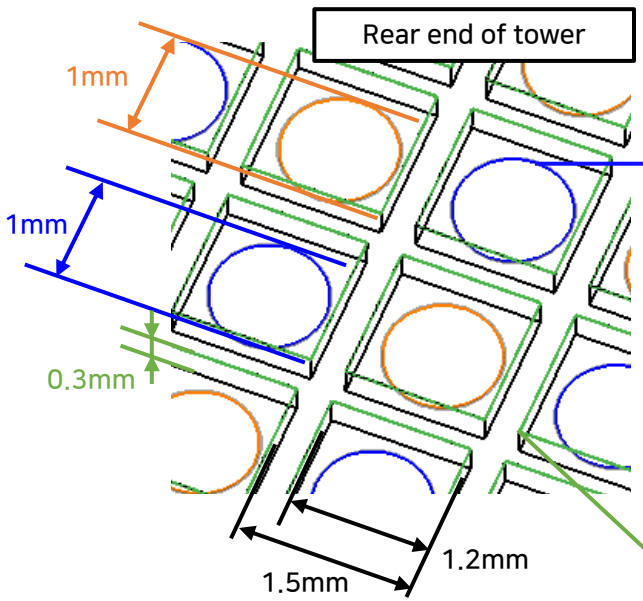




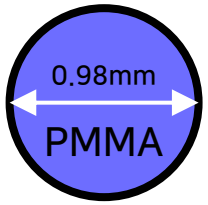


GEANT4 simulation setup

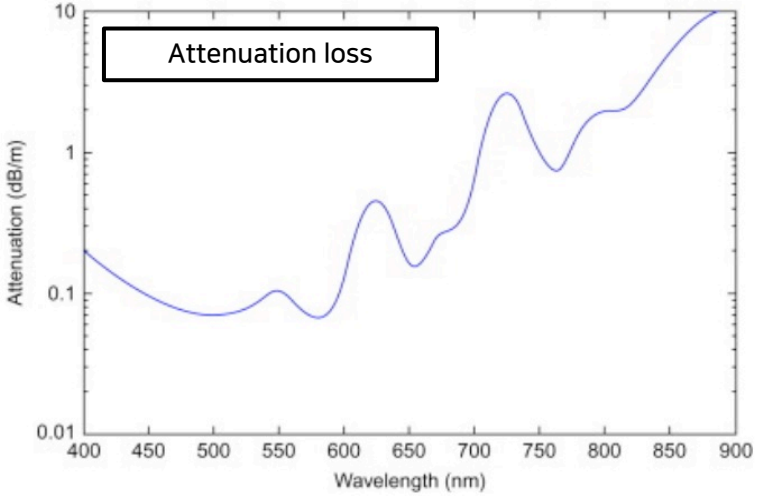
- **Optical setup**



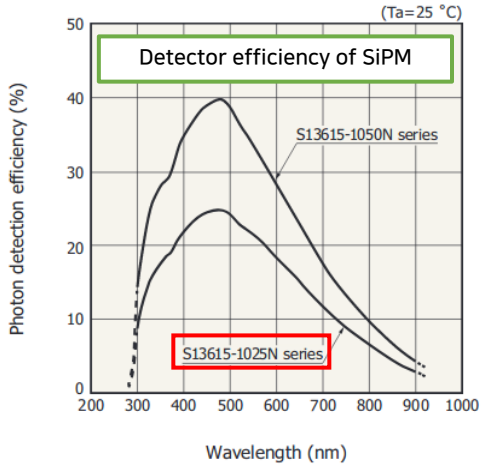
Cerenkov channel



- Eska SK40 (Mitsubishi)



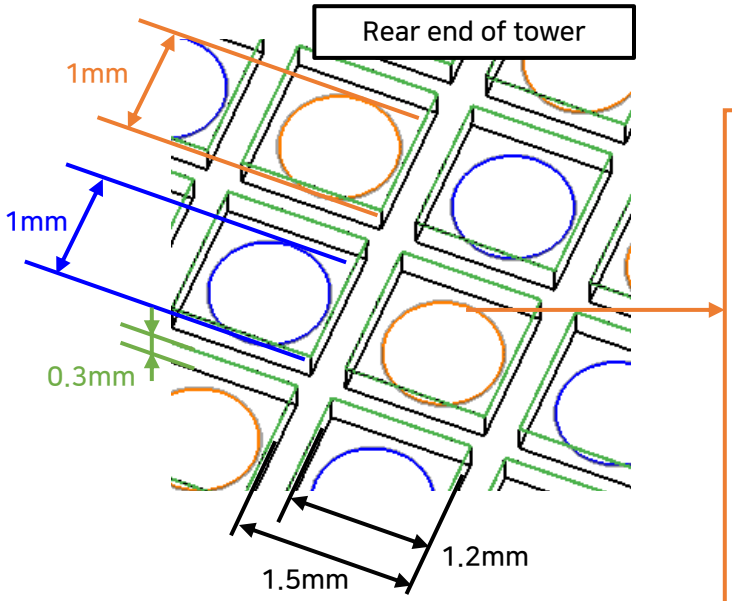
SiPM



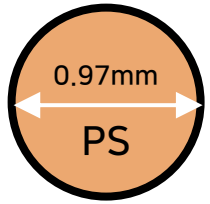
- S13615-1025N (Hamamatsu)

GEANT4 simulation setup

Optical setup

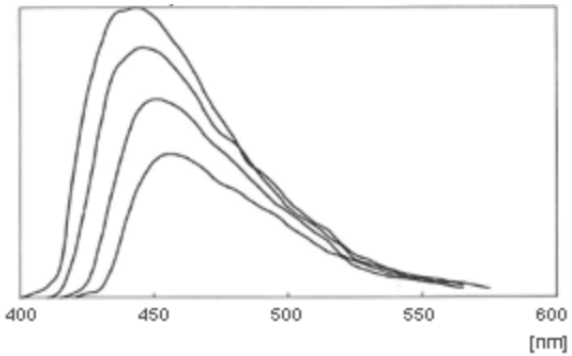


Scintillation channel

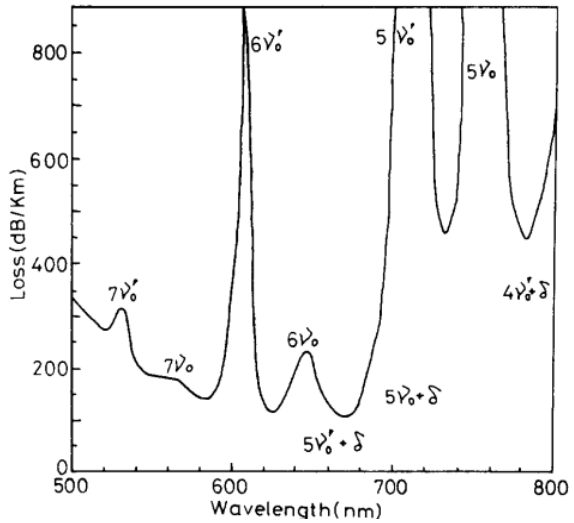


- SCSF-78 (Kuraray)

Scintillation spectra

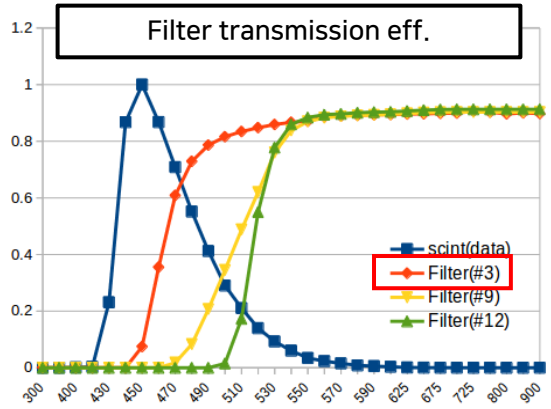


Attenuation loss



- Attenuation diverges under 500nm – to moderate it, filter is applied to scintillation fiber

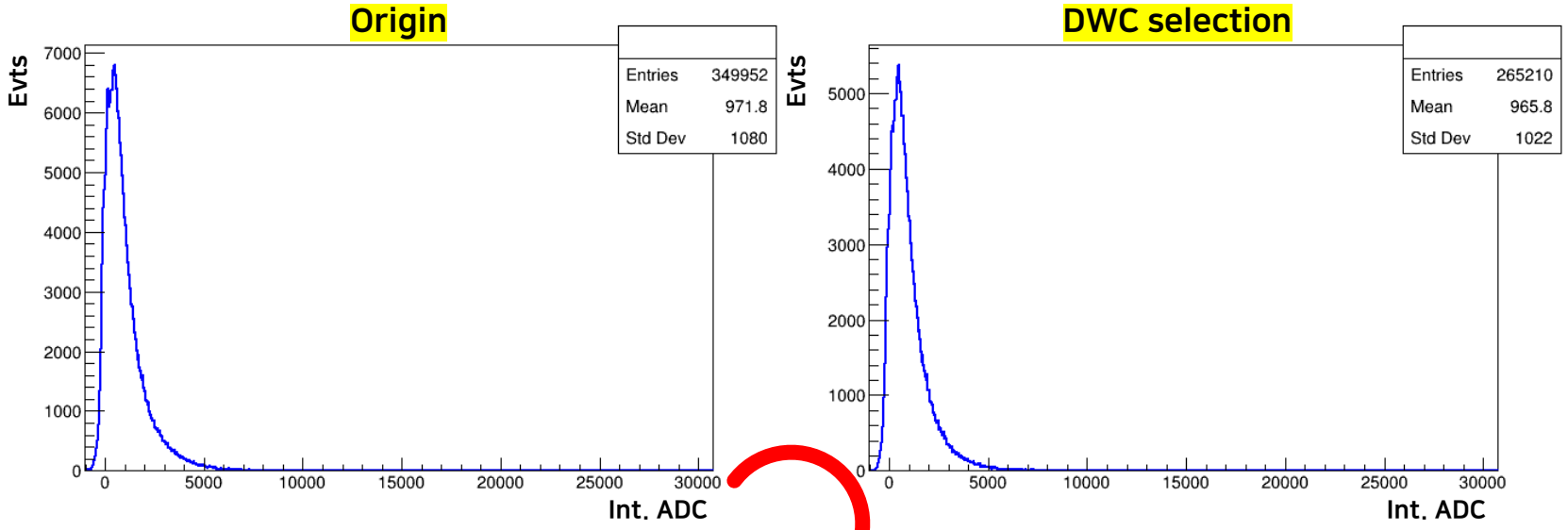
Filter transmission eff.

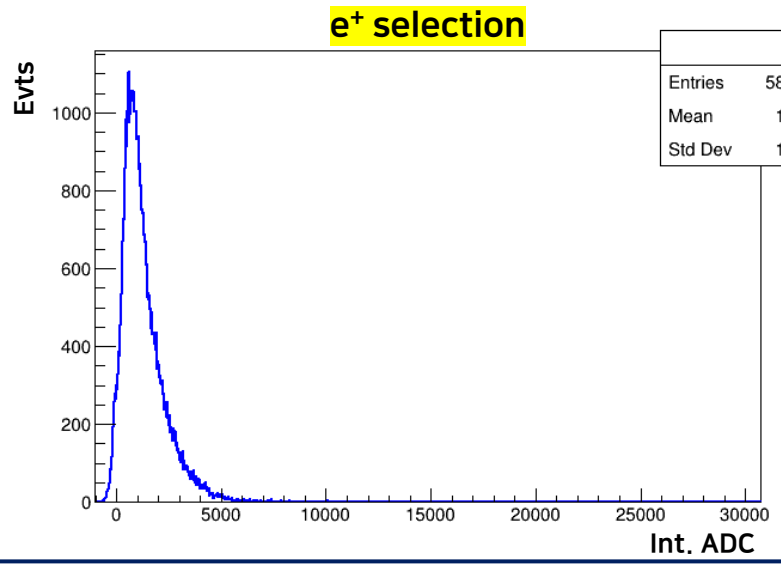


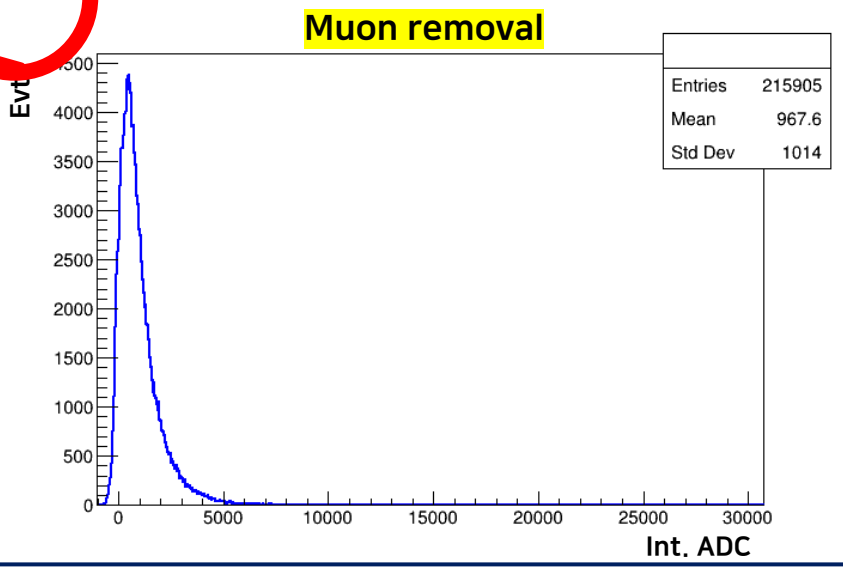
- Wratten#3 filter (yellow filter) is applied

Module response

- Cerenkov signal







Origin

↓ 84742 (24%)

DWC selection

↓ 49305 (14%)

Muon removal

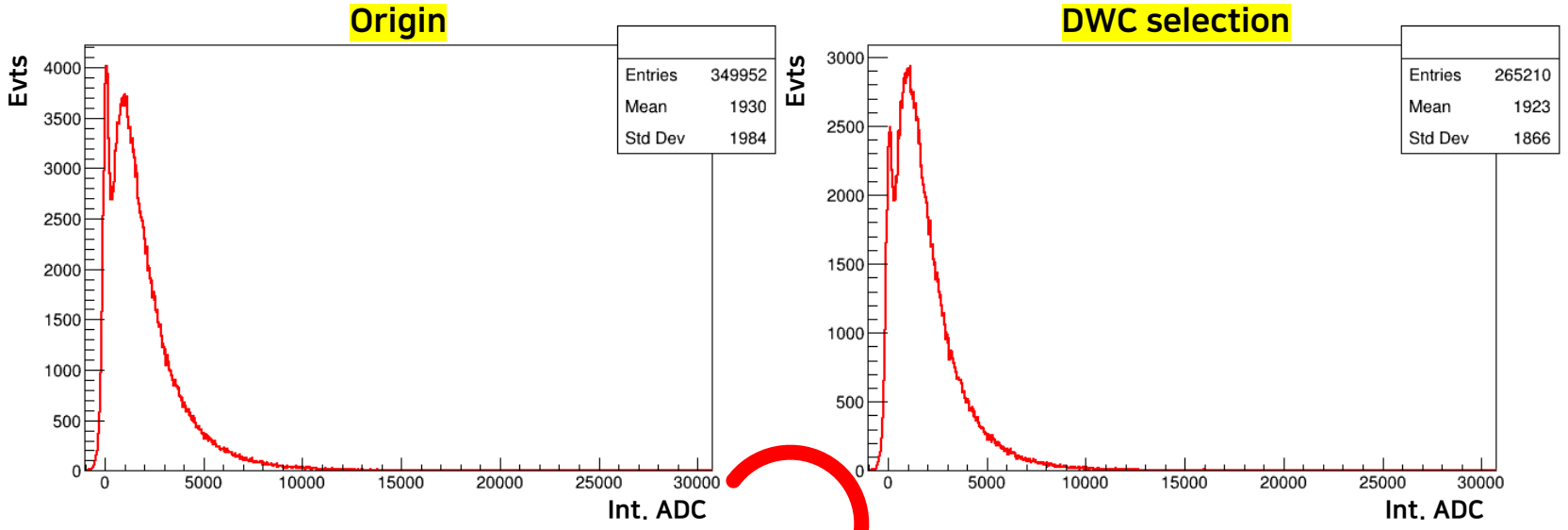
↓ 157756 (45%)

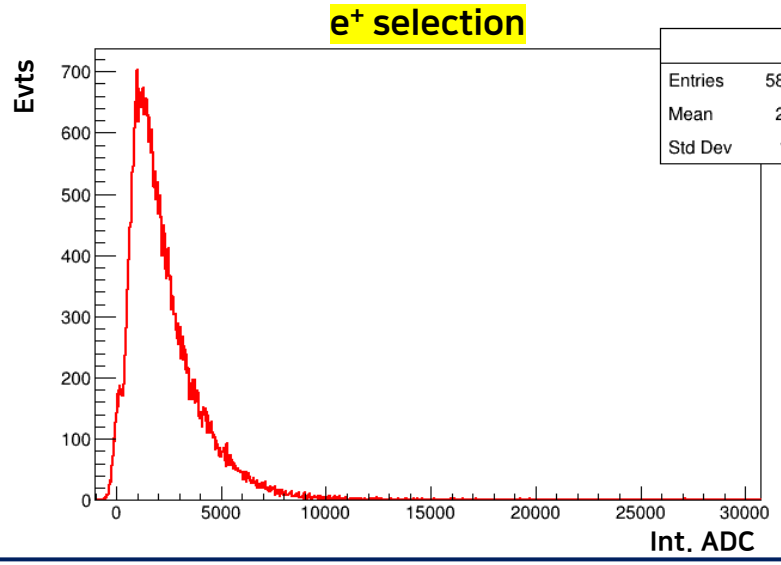
e⁺ selection

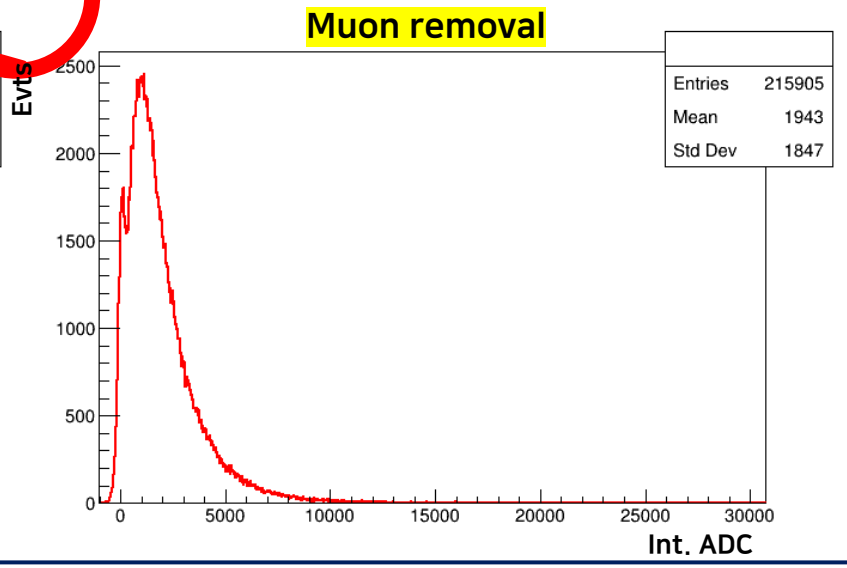
58149 (17%) remain

Module response

- Scintillation signal







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Analytical purity estimation

- **Signal parameterization**

Done by Minseok Oh

◎ PDF for each MIP peak : LanGaus = Landau(m_L, σ_L) ⊗ Gaussian(m_G, σ_G)

◎ Single peak fits : MIP peak ~ 296, 3 MIP peak ~ 868 and 5 MIP peak ~ 1480

Single peak fits