

SDU#3 shashlik test

Ye Tian

Shandong University

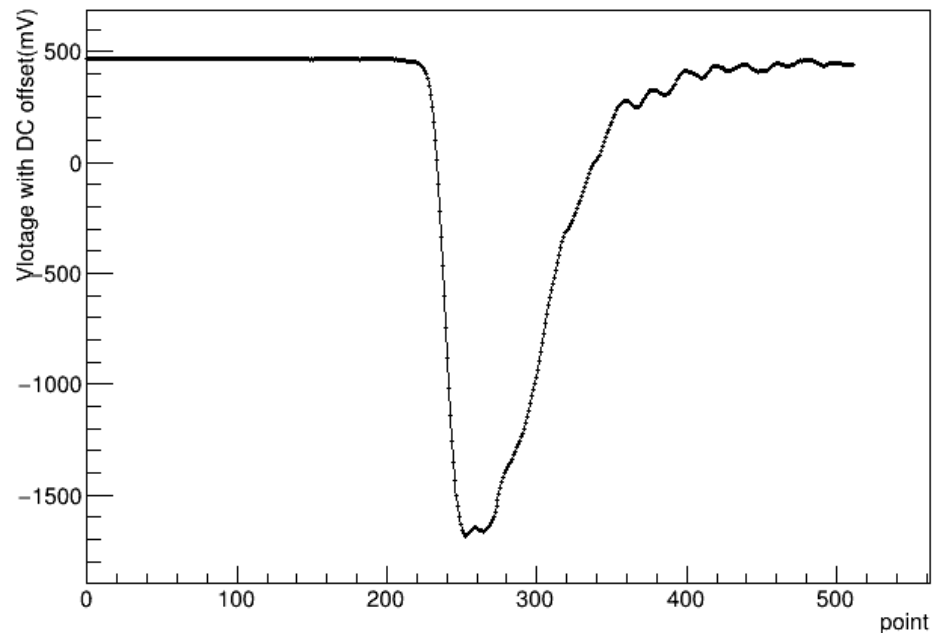
01/11/2018

DAQ upgraded from QDC to FADC

FADC specifications:

- Max Sampling Rate: 3.2GS/s (0.315ns)
- Max Sampling Points: 1024
- Full Scale range: 2.5 Vpp
- Resolution: 12 bits
- Could be used in sampling mode or charge mode.

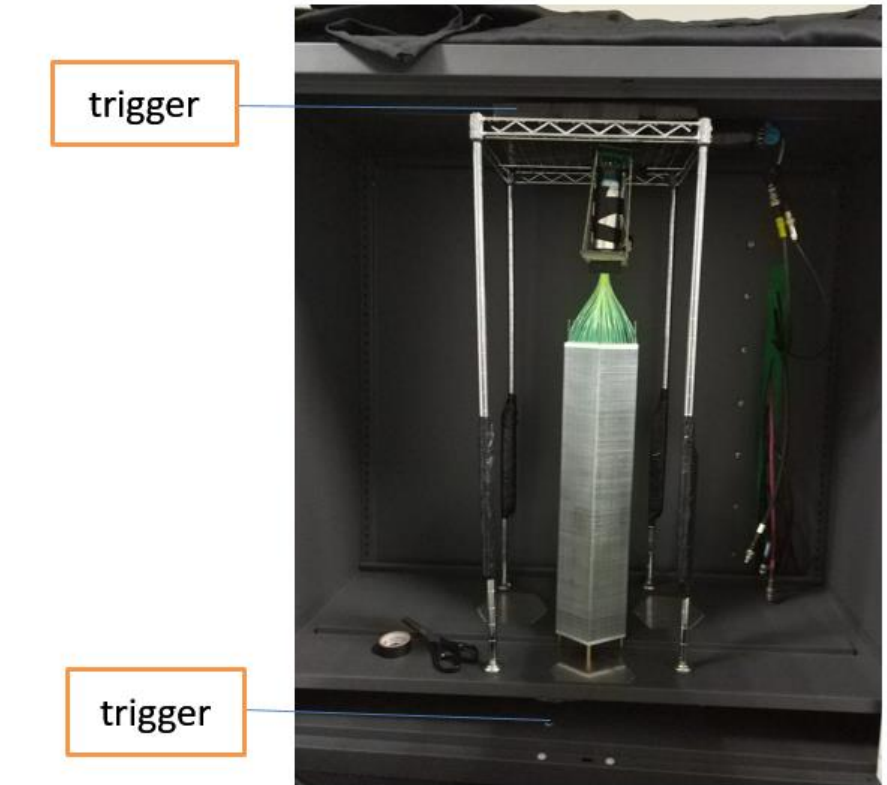
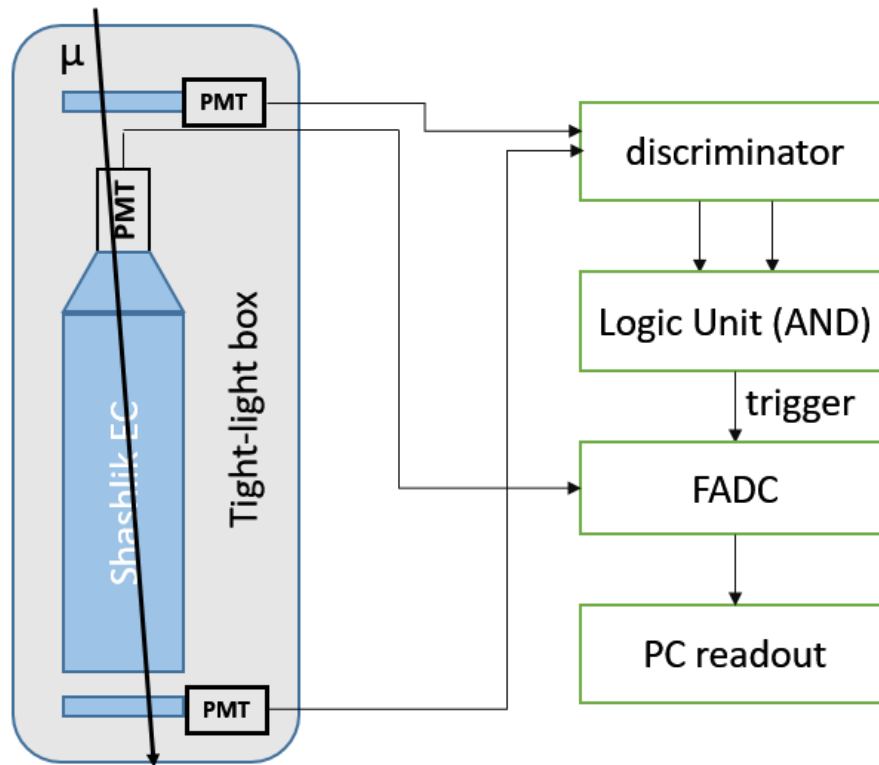
Typical shashlik signal waveform:



Mod. v1743

SDU#3 cosmic test setup

- Vertical shashlik test
- HV in test: 900V, 950V, 1000V

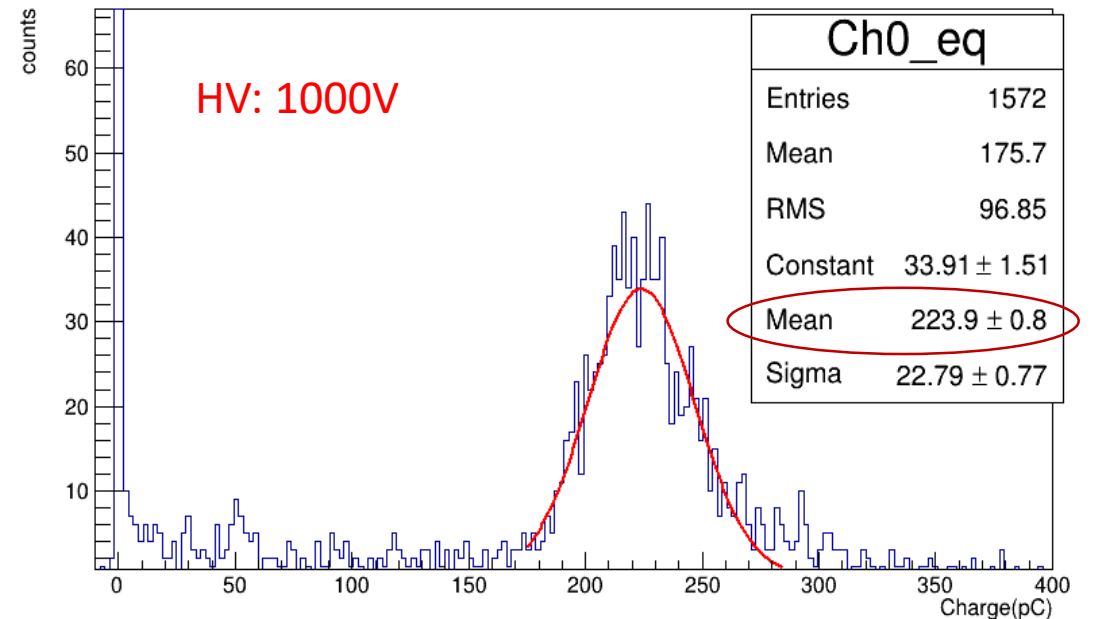
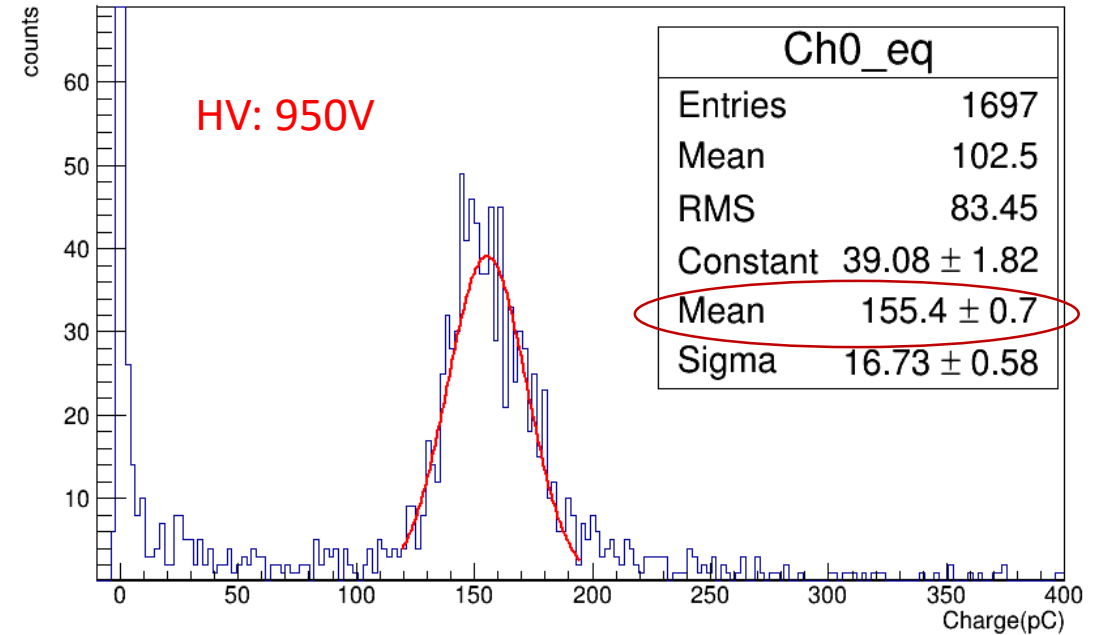
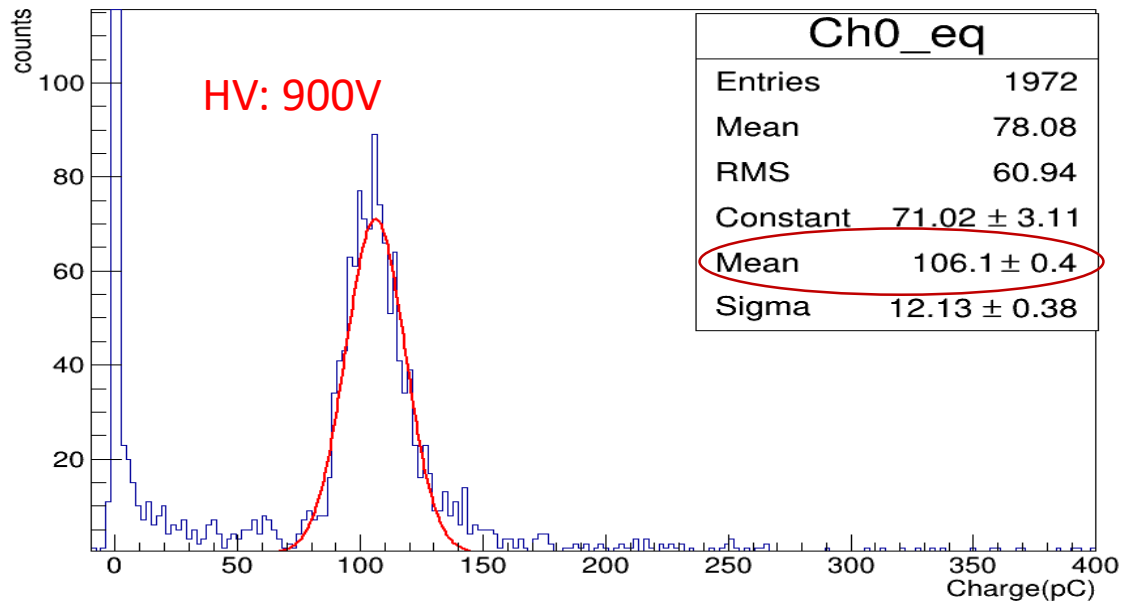


Test result from FADC

Integral charge calculation:

$$\text{charge} = \frac{\text{Voltage}}{50\Omega} \times \text{time} \times \text{points} - \text{pedestal}$$

In which, time = 0.315ns, points = 512



PMT Gain-HV test

For same photons as input, test the signal with different HV

- SPE test result

HV(V)	Gain(*10 ⁶)
1000	2.93
1100	5.56
1200	10.47

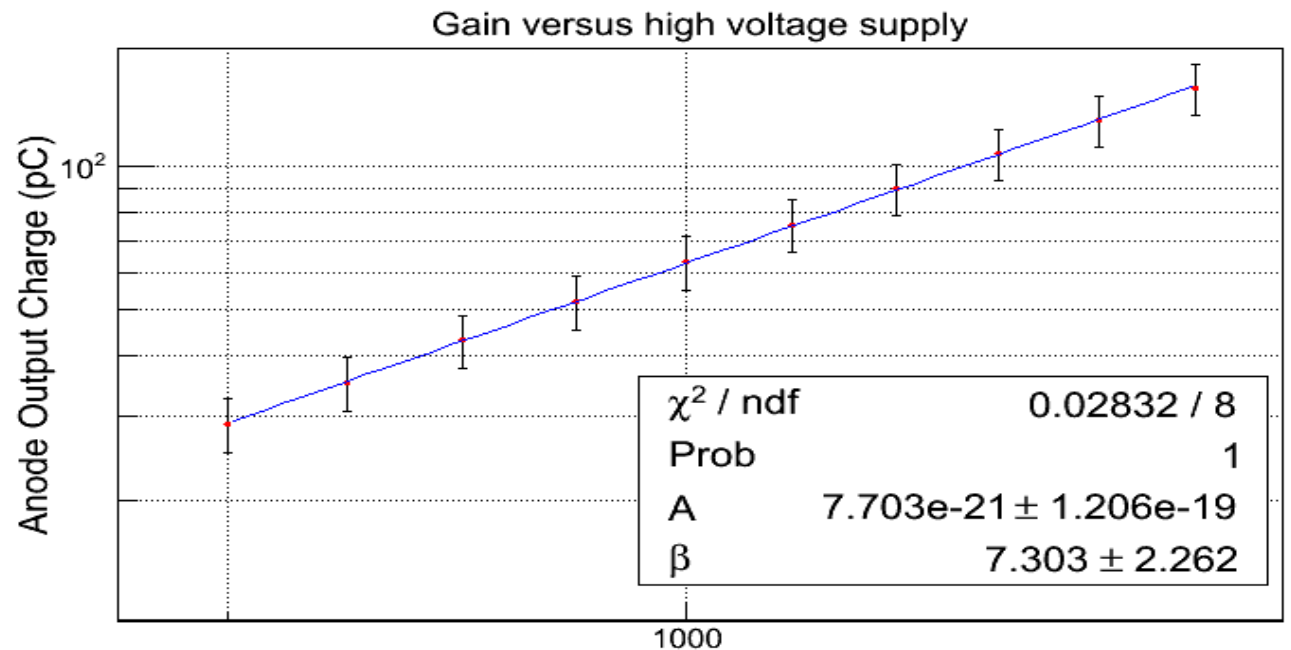
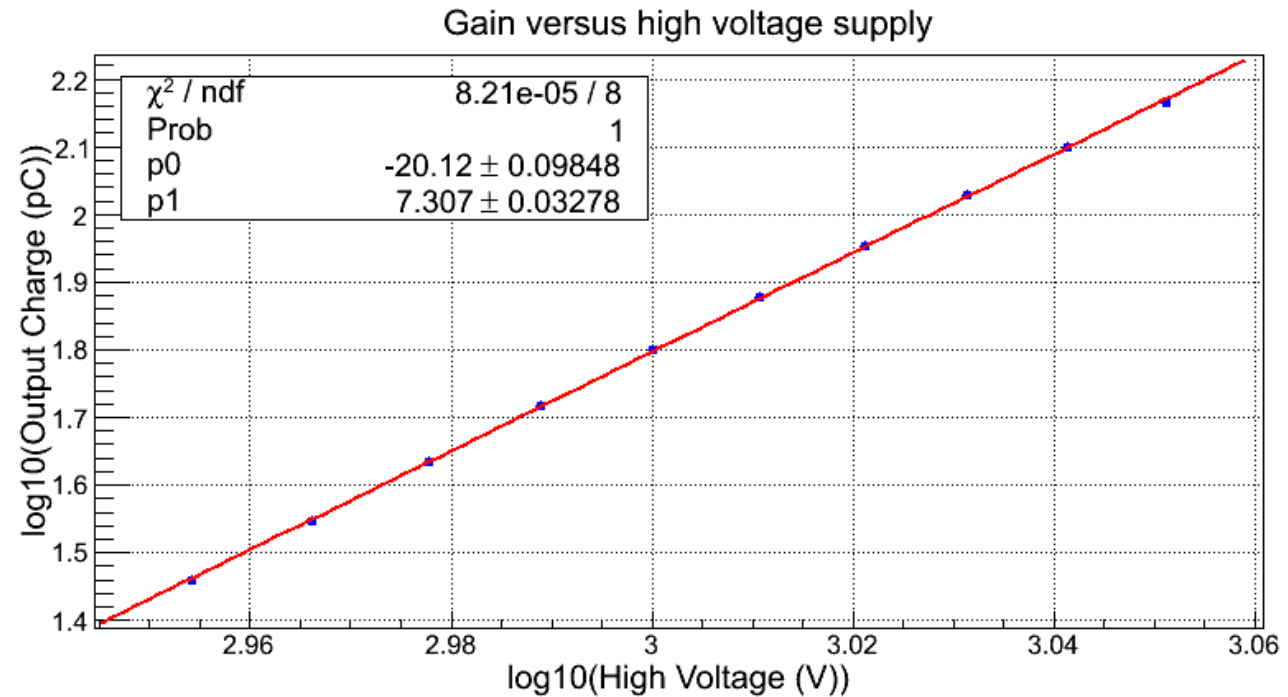
- Based on $Gain \propto V^\beta$,

$$\frac{Gain_{V1}}{Gain_{V2}} = \left(\frac{V1}{V2}\right)^\beta$$

in which $\beta=7.30$ from fitting in right plot

- So the gain for low HV: (calculated according 1000V value)

HV(V)	Gain(*10 ⁶)
950	2.01
900	1.35



NPE result of SDU#3

- Calculation of $NPE = \frac{Q}{e * Gain}$

HV	Gain(*10^6)	Charge(pC)	NPE
900	1.35	106.1	491.2
950	2.01	155.4	483.2
1000	2.93	223.9	477.6

Previous result tested by Ang Li, with Gain=5*10^6, got the NPE = 491.3

Result:

- The test result got from FADC match well with previous result.
- No obvious saturation of PMT with high HV appears for SDU#3.

Module No.	WLS fiber	Scintillator	Lead layer	Fiber end	Reflective layer	Front plate	Coating
SDU #3	Y11	Kedi(enhanced)	US company	Silver mirror	Print paper	No holes	TiO2+glue(1:1)