

# THU module test

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# SDU #2 module horizontal cosmic ray test in JLab

SDU #2 prototype (PMT R11102)

## Specification of test

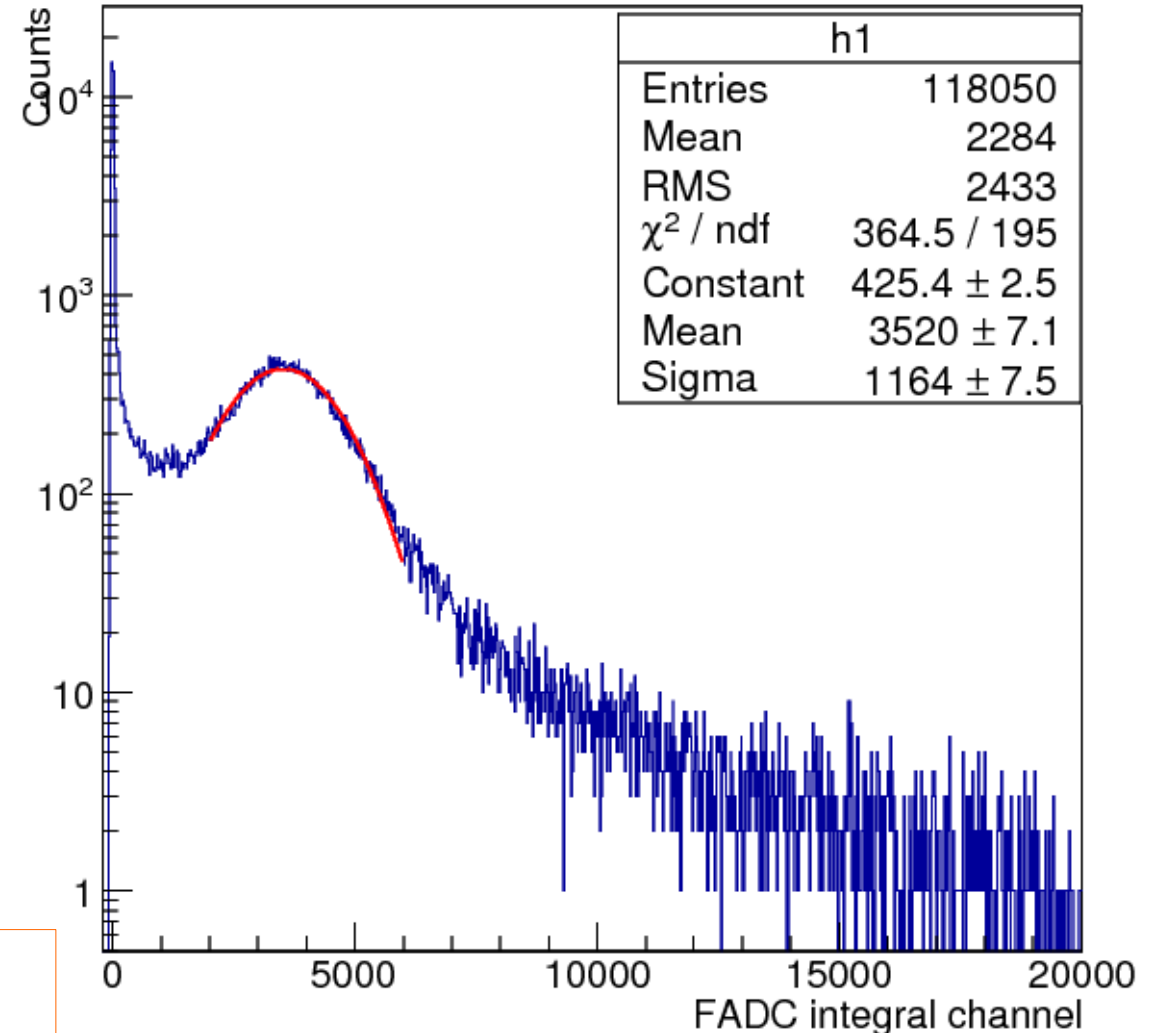
- Horizontal cosmic ray test
- Triggered by two scintillator bar on module
- PMT: original PMT in SDU #2(R11102, Gain: $5.1 \times 10^6$ )

## Result

- Peak:3520
- Npe=86.25

(reference value from previous result at SDU in 2016: 77 Npe)

Note: PMT gain determined at SDU in 2016 using LED and the single p.e. peak method.



# review of SDU#2 cosmic test result at SDU in 2016

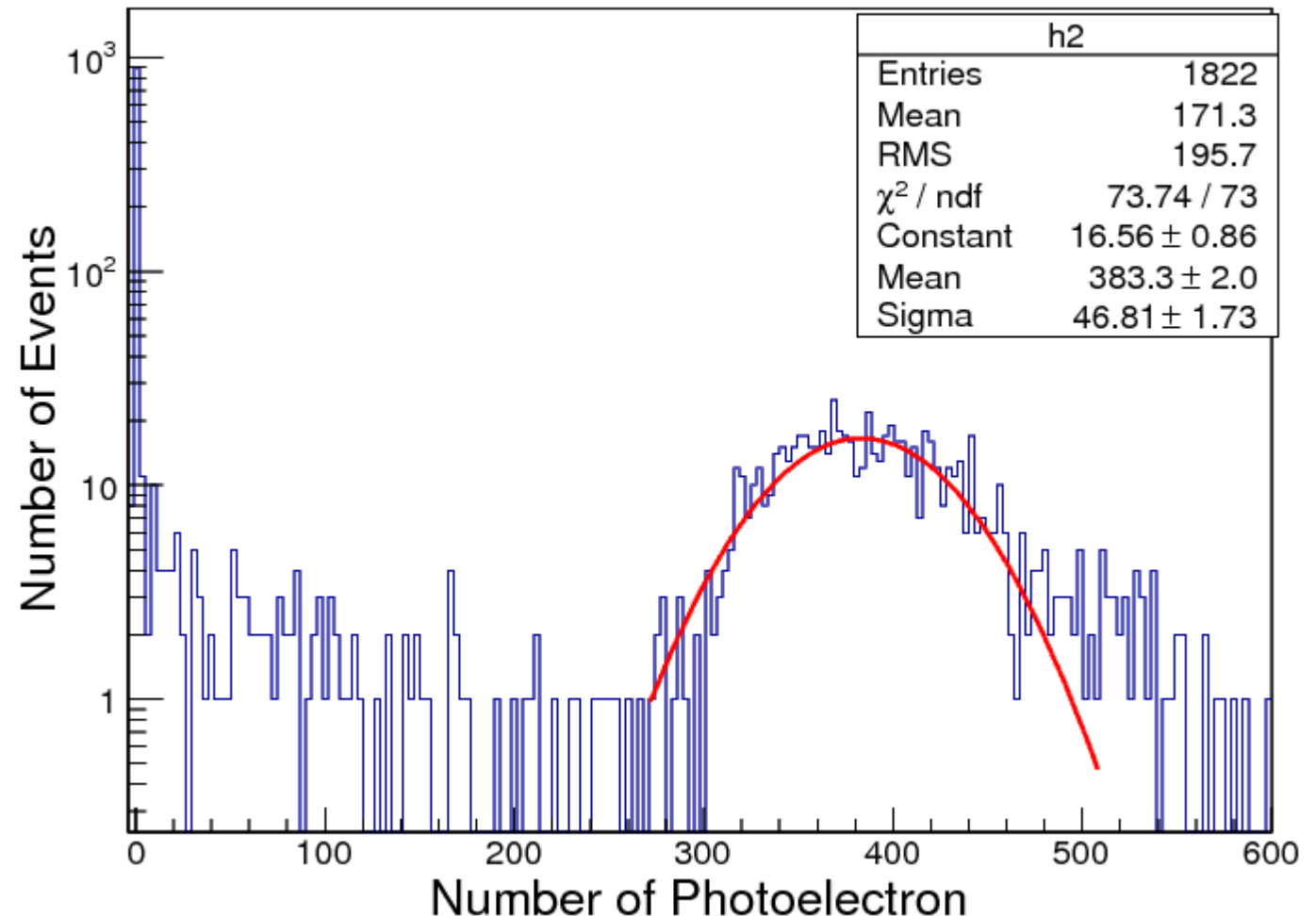
Note: There were two sets of test done on this module at SDU in 2016: first with sides unpainted and loosely covered in Tyvek (both horizontal and vertical), and then with sides painted in TiO<sub>2</sub> (vertical only because we needed the module to be shipped to JLab). However, the TiO<sub>2</sub> painting quality was not very good.

- The vertical test of the SDU#2 with TiO<sub>2</sub> coating on the side is 383, the earlier results (covered by Tyvek) were better: 426.5 (v) and 83(h)
- If we assume the ratio 1/5 is unchanged, then we expect the vertical of the module in its state now (TiO<sub>2</sub> coating) to be  $383/5=77$

Difference compared with JLab test:

- Triggered by two preshower scintillators (average track is shorter than test in JLab)
- Attenuation from delay cable: 3% (No delay in JLab test)

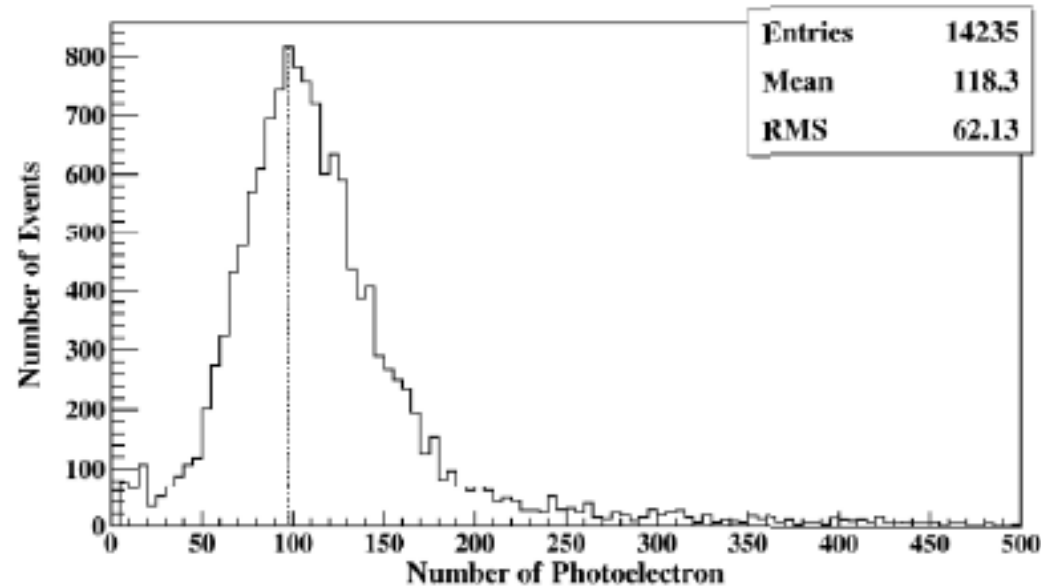
The Distribution of Photoelectron



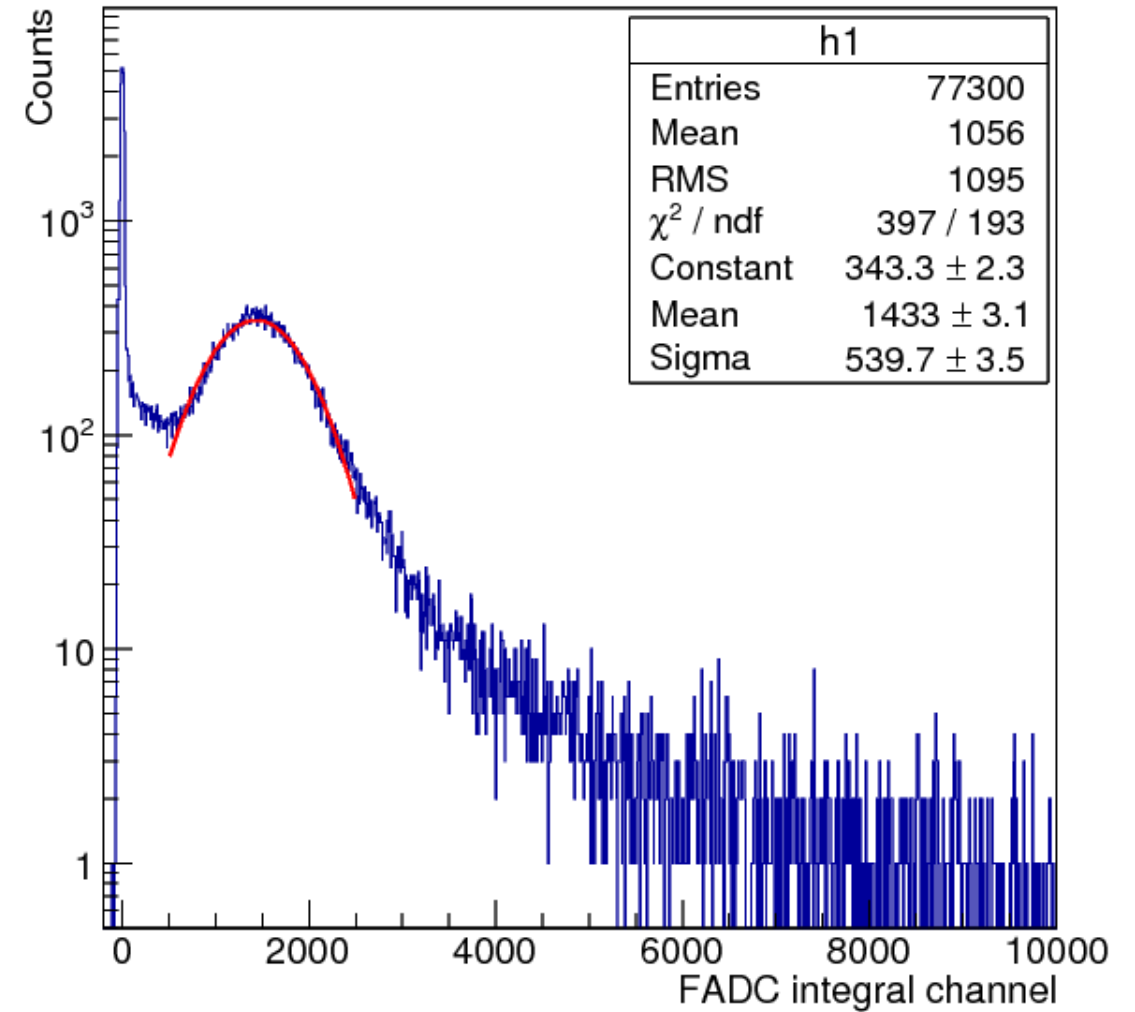
# THU module horizontal cosmic ray test using SDU #2 PMT

- Same test method as SDU #2 module
- Peak: 1433
- $N_{pe}=35.12$

(Previous test in THU shows horizontal result  
~96  $N_I$ )



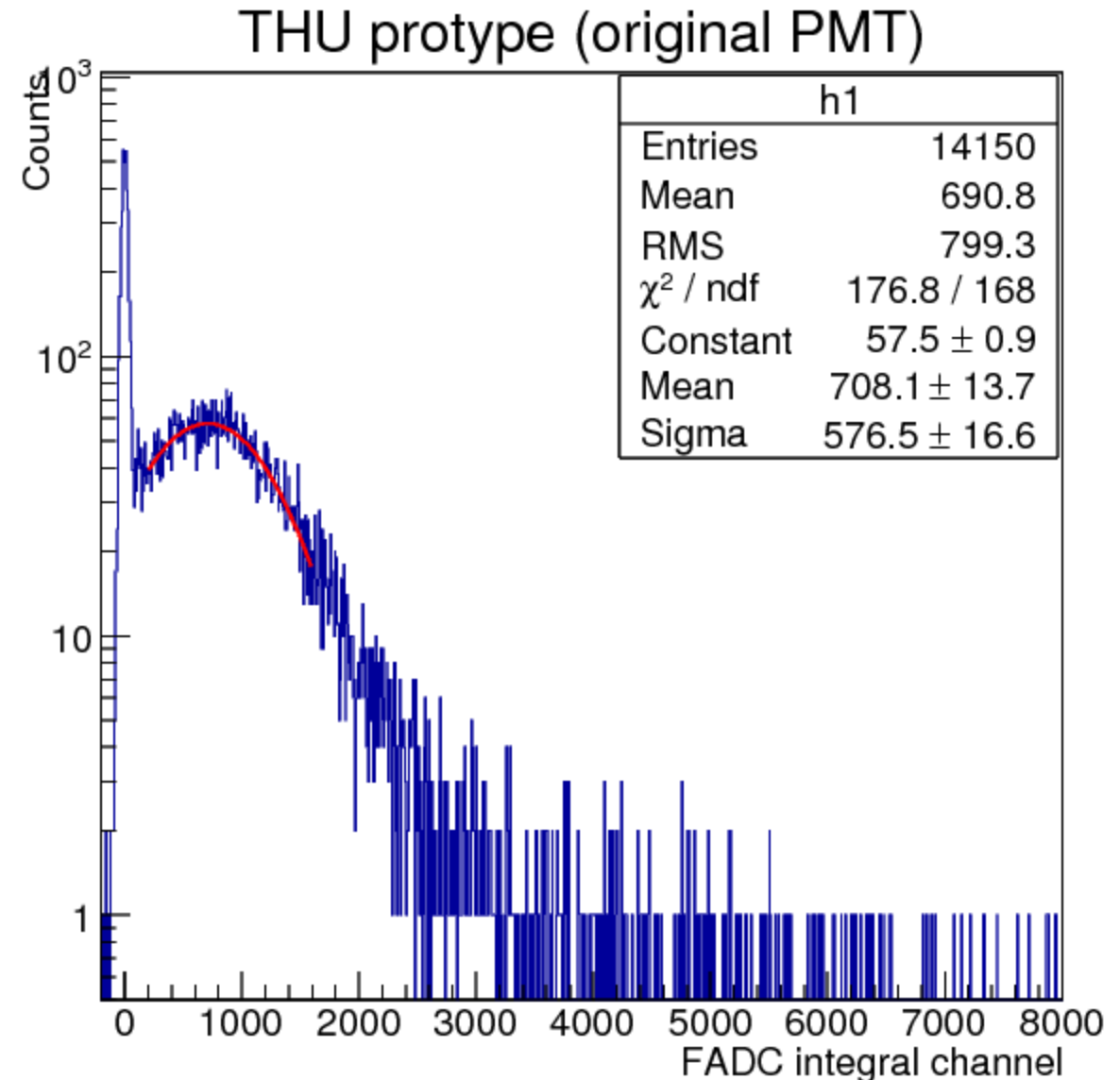
THU prototype (PMT R11102)



Note: In THU report by Chendi on 2016/09/08, an R11102-type PMT was used but the gain was not measured. The report that claimed 96 p.e. assumed the factory-provided gain vs. HV chart

# THU module horizontal cosmic ray test(Original PMT)

- Peak: 708
- Supposing the two test of THU module have same Npe (same PMT Q.E.), and the only difference is PMT gain. We could get
- THU PMT Gain= $2.52 \times 10^6$





# Test setup and THU module

