Preliminary test result of SDU #6

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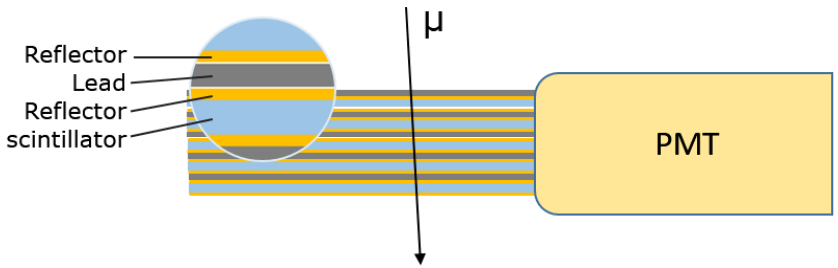
SDU #6 introduction

Module No.	WLS fiber	Scintillator	Fiber reflector	Painting	Reflector layer
SDU #6	Y11-MC	Kedi(enhanced)	ESR film(no front hole)	TiO2+glue	ESR

Two main improvements: Y11 Multi-cladding fiber and ESR reflector:

- Previous result(1 month agao) shows 44% ((1947+1898)/(1337+1326)- 1) more light yield of Y11-MC compared to BCF91A-SC.
- Recent 5-layers test shows about 37% improvement for ESR compared to powder painting.(need to check, previous result is better)

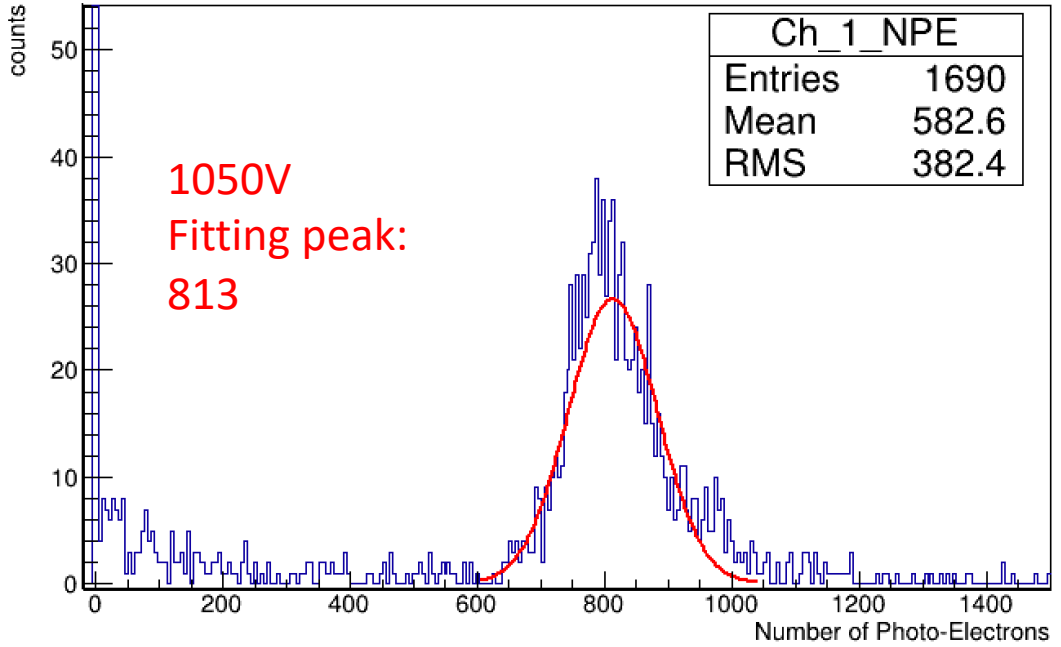
Fiber improvement result is more reliable than ESR reflector.

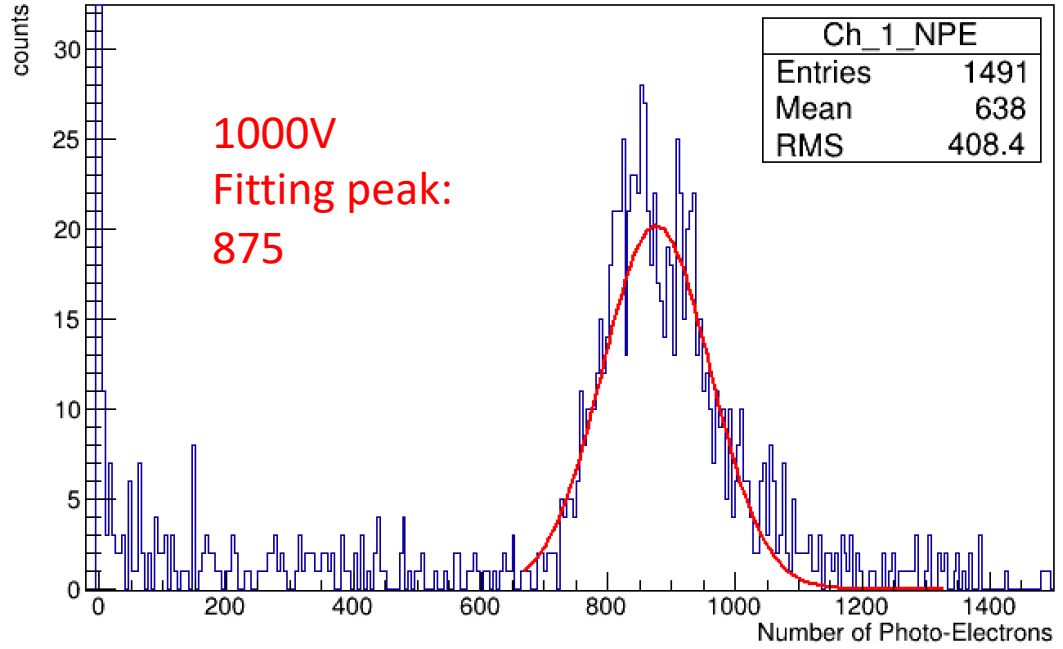


SDU #6 Cosmic ray light yield result

Coating	HV of PMT	NPEs	Coating improvement
No coating	1050	633	
ESR (loose)	1050	798	26%
TiO_2 + glue coating	1050	813	28%
	1000	875	

HV	1000	1050
Gain(10^6)	3.09	4.48





Discussion

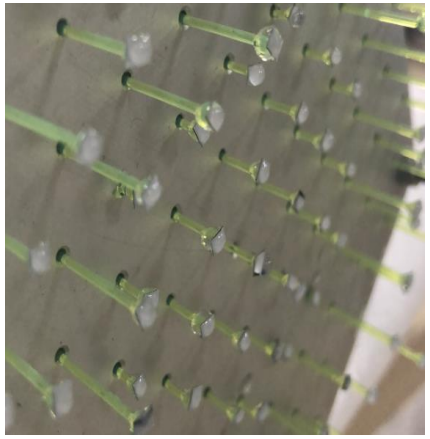
- 51% light yield improvement than SDU#4, worse than expected 72%(1.44*1.37*1.28/1.42)
- PMT gain problem. Will test again with other PMT.

Pros and cons	Absolute Gain's measurement	linearity
High gain	precise	May exceed the linear range
Low gain	Not so precise	good

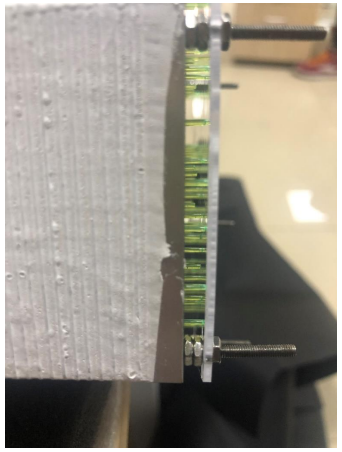
SDU prototype module result summary

Module No.	Vertical (NPE)	WLS fiber	Scintillator	Fiber reflector	Coating	Reflector layer
SDU #1	212.5	BCF91A-SC	Kedi	No reflector	TiO2+glue	Print paper
SDU #2	413.8	BCF91A-SC	Kedi(enhanced)	Silver mirror	TiO2+glue	Print paper
SDU #3	484.5	Y11-MC	Kedi(enhanced)	Silver mirror	TiO2+glue(29%)	Print paper
SDU #4	563.2	BCF91A-SC	Kedi(enhanced)	ESR film(52%)	TiO2+glue(42%?)	Powder painting
SDU #5	397.7	BCF91A-SC	Kedi(enhanced)	ESR film(43%)	TiO2+glue(27%)	tyvek
SDU #6	~850	Y11-MC	Kedi(enhanced)	ESR film	TiO2+glue(28%)	ESR

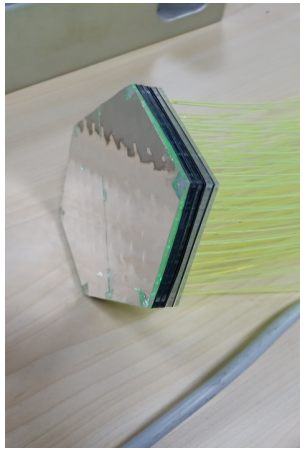
- Don’t understand why the coating of SDU #4 is much better than others.
- #4 #5 and #6 all use ESR as fiber reflector, but with different method.



SDU #4



SDU #5



SDU #6

Evaluate equivalent NPEs for electron

- Different method compared to Ye's presentation "ECAL Digitization Updates"
- Evaluation principle: the energy deposition ratio between moun and electron is equal to the light yield ratio
  - For muon, energy deposition in scintillator is about 58MeV("ECAL Digitization Updates")
  - For electron, scintillator sampling ratio is about 0.24, so 1 GeV electron will deposit 240MeV.
  - 850 NPEs for muon is equivalent to 3500(*4.14) NPEs for electron
- This method get similar result as method in "ECAL Digitization Updates" for SDU #4