

EC update from SDU

Ye Tian, Liping Wang

09/05/2019

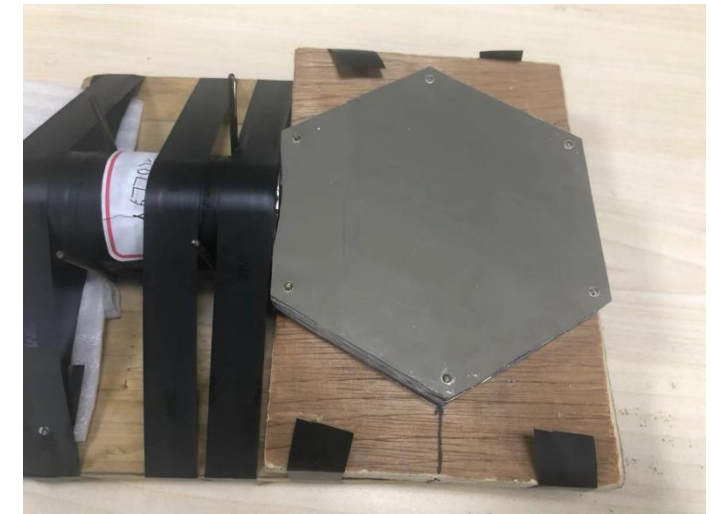
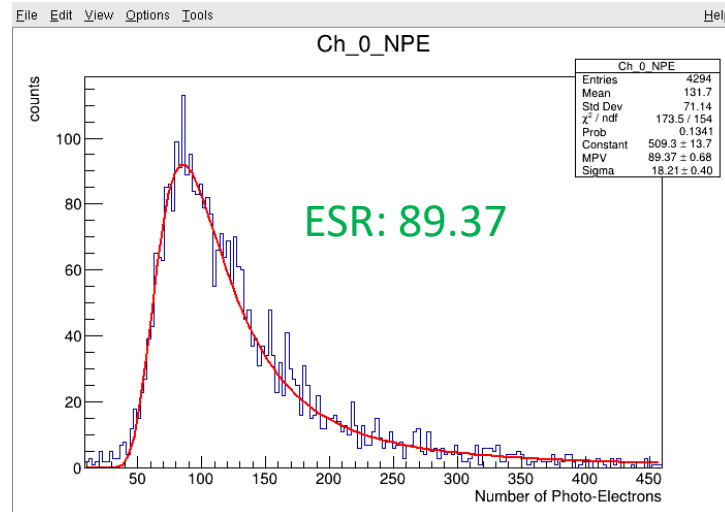
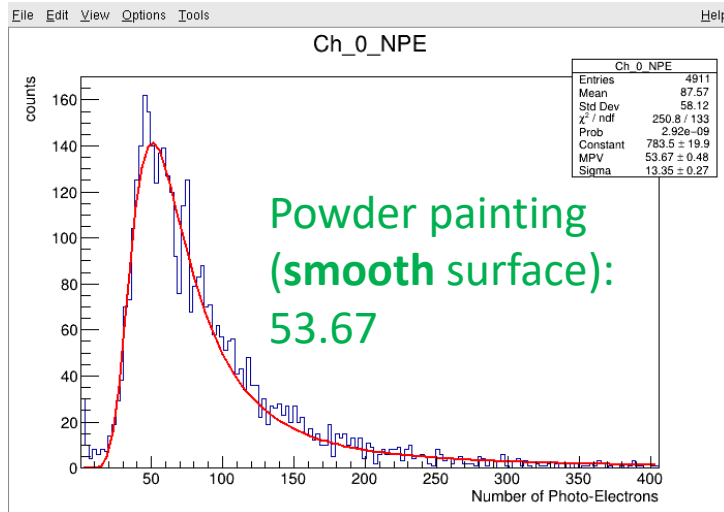
Shandong University

outline

- Reflector layer test, ESR added in test
- WLS fiber bending loss test
- Clear fiber attenuation length test
- Fiber polishing in SDU

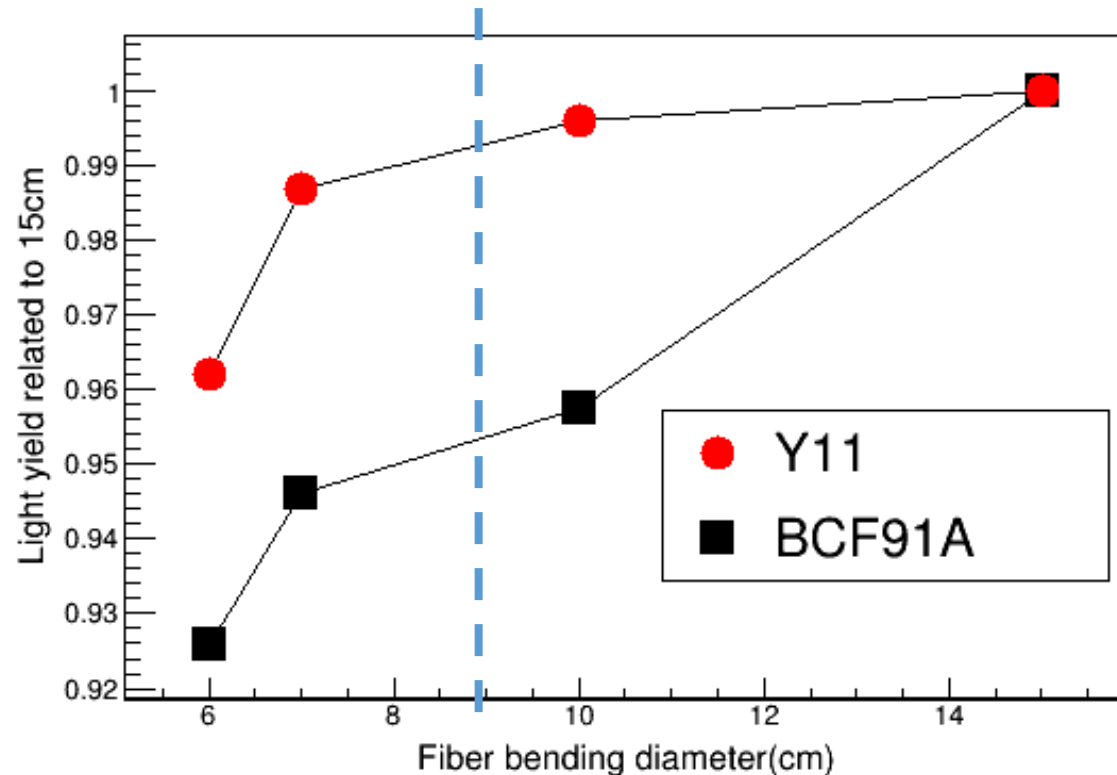
Reflection layer test

Reflector material	Thickness(μm)	Light yield(5 scintillator layers test)
Powder painting(wrinkled surface)(SDU#4)	70	53.85
Powder painting(smooth surface)	80-100(bad quality control)	53.67
ESR	75	89.37 (66% improvement?) Only one test



- No experiment use specular reflection layer, How about the influence of energy resolution compared to diffuse reflection layer in simulation? (We only we energy deposition simulation, no light transport in simulation?)
- Why previous specular layer not show such good light yield, even worse than printer paper? (such as Aluminum foil)

Bending light loss test



BCF91A lose more light than Y11 with same bending diameter, but the difference is not too much.

bend diameter (result in channel)		15cm	10cm	7cm	6cm
BCF91A (SC)	#1 (1m)	447	428	423	414
	#2 (1m)	326	313	402	402
Y11 (MC)	#1 (1m)		524	519	506
	#2 (1m)	767	760	751	758

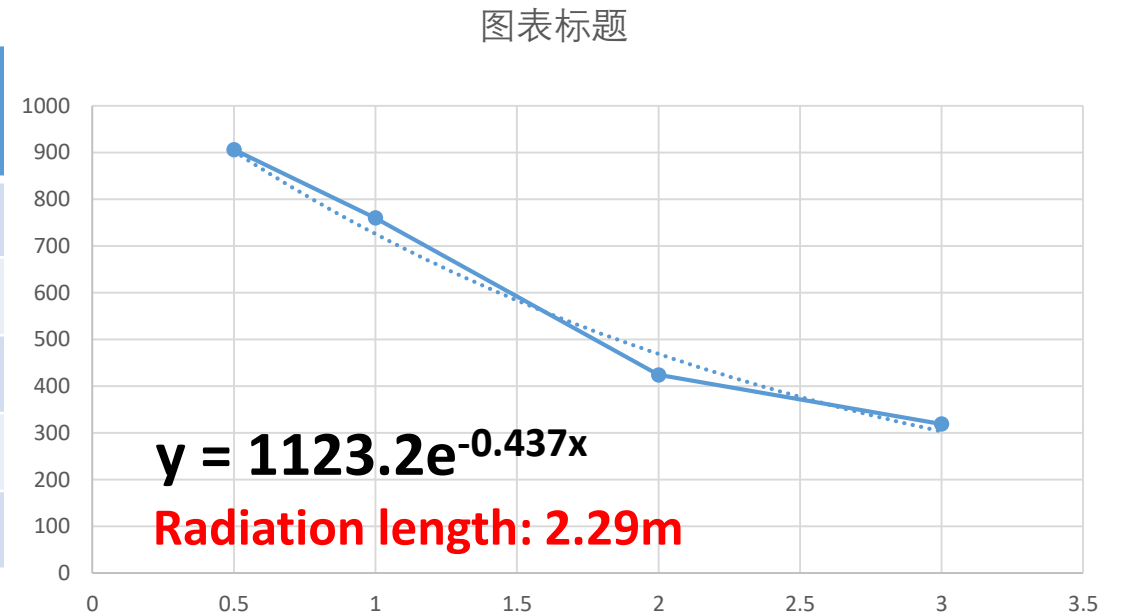
- For same LED light, each fiber of same type has different light yield, may cause from polishing quality.
- MC-Y11 has significant light yield than SC-BCF91A.
- Bending loss is much smaller than my expectation, confused.

Clear fiber attenuation length test

Test setup:

- LED light, transfer light from WLS fiber to clear fiber with connector
- Clear fibers are polished by polishing machine in SDU
- For long fibers, bend with same 15cm diameter

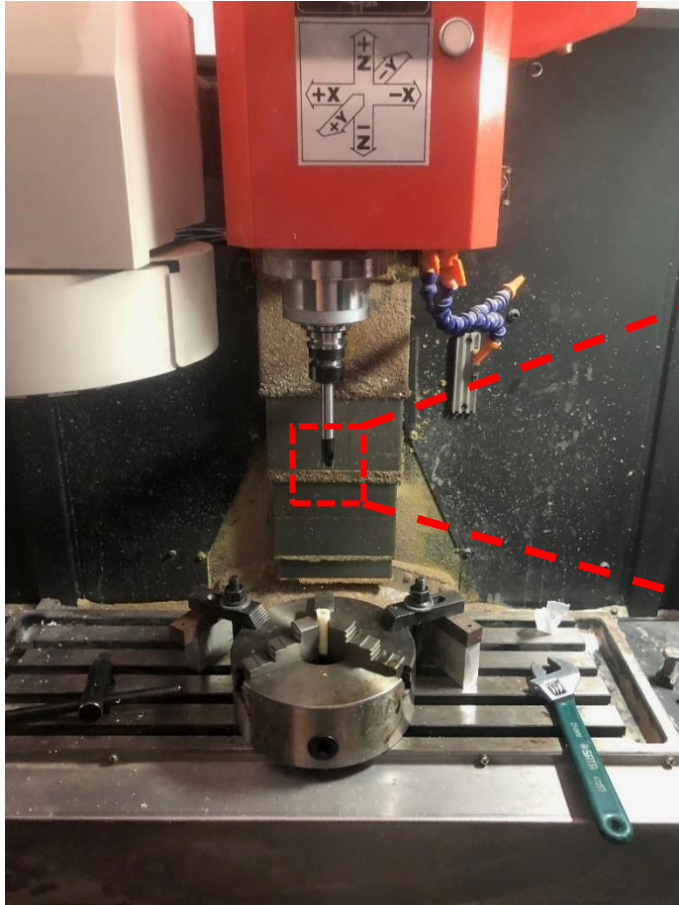
Fiber length	Bend circles(15cm diameter)	QDC channel
0.5m	0	906
1m	0	771/771(two tests)
1m	0.5	771/754(two tests)
2m	3	424
3m	5	319



Still get very bad attenuation length result.....

Fiber polishing in SDU

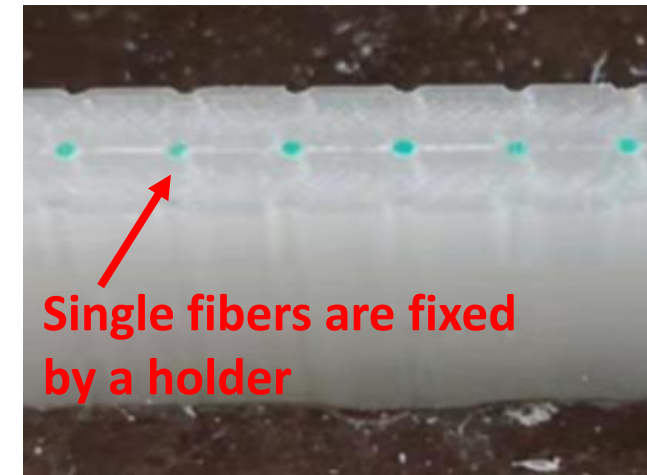
Fiber is polished in bundle or as single by a diamond milling cutter in SDU. This method shows good efficiency and quality.



Polishing Machine tool



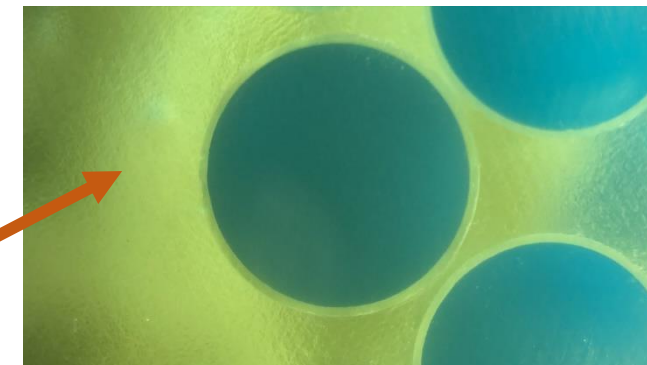
Diamond milling cutter



Loose single fiber (unglued)



Single fiber in connector



Fiber in bundle

Optical glue

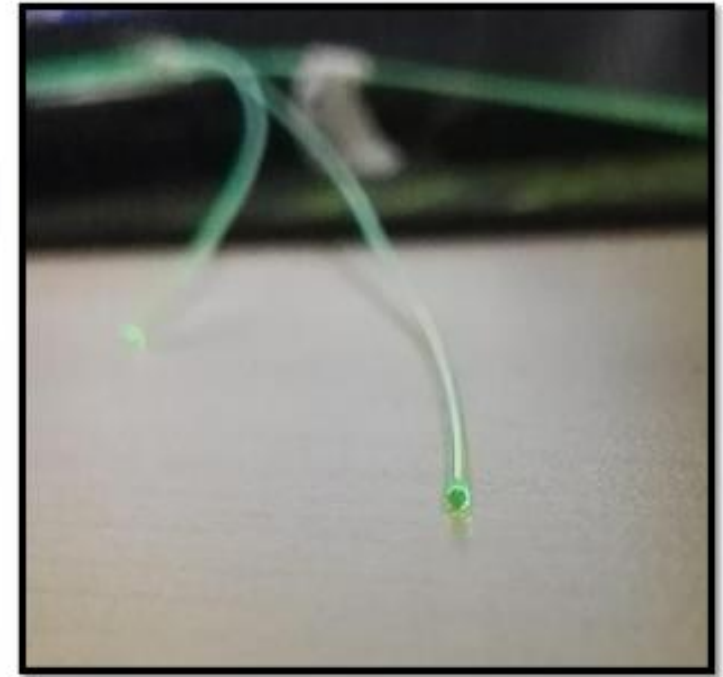
Summary and outlook

- ✓ **ESR** get very high light yield, need to check again
(ESR is made of polyester(聚酯), radiation length should be long)
- ✓ **Bending light lost** is acceptable (less than 5%) for 9cm diameter
- ✓ Good **fiber polishing quality** achieved in SDU, still have problem in single fiber polishing
- SDU **receive THU#2** from THU group today, the result will be acquire soon.
- Test and compare the fiber used in **THU#2(SC-BCF91A?)** and SC- BCF91A in SDU
- Use **preshower to replace the LED** to test the fiber again
- Fiber in test will be **polished by diamond milling cutter in future**, to minimum the influence of polishing quality, and polishing quality will be tested
- New module is ready to build

03/23/2017 Weekly meeting

Compared results

	BCF91A	Y11
Al (reference group)	14	13
No mirror painting	14 (no difference)	14 (no difference)
Silver 415001	17 (+21.4%)	16 (+23%)
Al+bending	4 (-71%)	11 (-15%)



(Al — light leakage)

Our result is consistent with the LHCb Calo TDR

A comparison of Y11 and BCF91A multi-clad fibers has shown that Y11(250) double-clad S-type fiber from KURARAY [18] and BCF91A from BICRON [19] give about the same light yield,

but that the Y11 S-type has better mechanical properties [20]. The BCF91A fiber has less mechanical stability against bending at small radius.