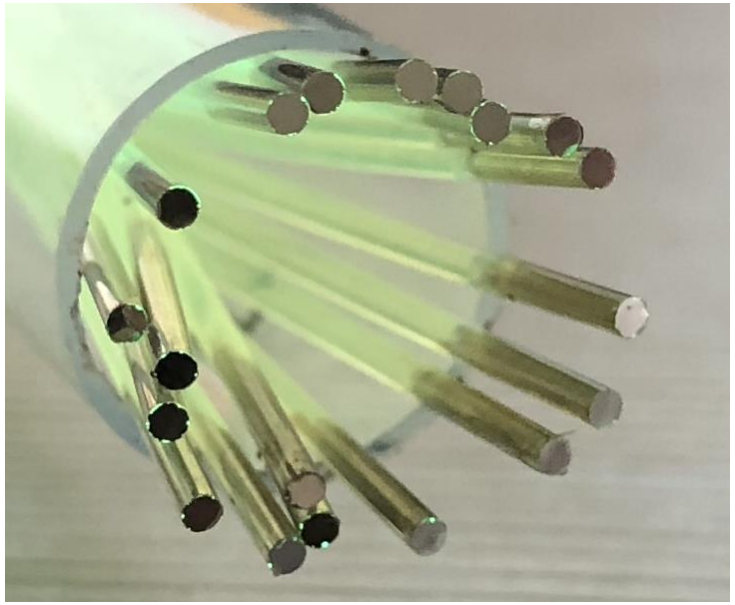
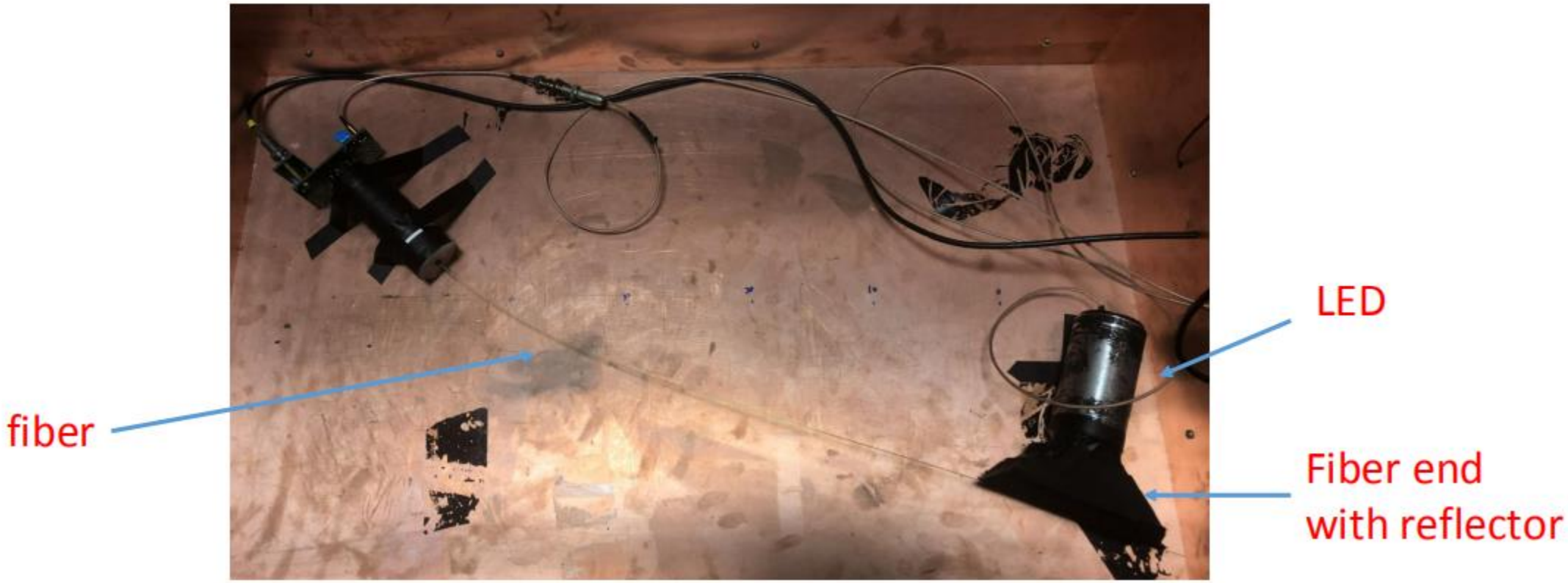
New sliver mirror test



- Sliver mirror made by factory
- Use steam method to deposit silver layer
- Polished fiber end + enhance adhesive power layer + sliver + protection layer(SiO2?)
- Very good quality, very hard to shed(even use tape to stick)
- High price(charge ￥30/each, ￥600 for 20, ask more money for small quantity)

Test method

- Same test method as before
- The end with mirror is polished by company, and the other end is polished by polishing mashine in SDU
- Data is readout by QDC



Test result

	Fiber No.	test result(QDC channel, pedestal 69)
No reflector (As reference)	old 1	1340
	old 2	1451±29.5
	1	1337
	2	1392±28.7
	3	1363±28.5
	4	1343±27.8
	5	1445±29.0
Average 1381 – 69 = 1312		

This result show the sliver mirror technique could improve more than 90%(2531/1312 =1.93).

Good Sliver mirror	1	2651±44.8
	2	2455±42.4
	3	2671±45.6
	4	2682±48.6
	5	2627±44.7
	6	2587±43.6
	7	2710±45.2
	8	2352±41.1
	9	2660±44.3
	10	2610±44.9
	11	2716±45.8
	12	2418±42.0
	13	2695±46
	14	2787±46.5
	15	2661±44.5
	16	2455±42.4
Suppose 2600 – 69 = 2531		

Following test

- Since the price is too high, we contacted the factory in YanTai that made the fiber mirror of SDU#2 and SDU#3 for help.
- They improve the technique, 8 fiber receieved and appearance looks good and better than before
- Polished fiber + enhance adhesive power method(?) + sliver layer

Difference in test

Use Osilloscope to get waveform statistic data, larger error(RMS/mean about 10%, which QDC is only 2%)

Test result

Fiber mirror type	Fiber No.	Test1	test2
No reflector (As reference)	1	2.15	2.29
	2	2.17	2.4
	3	2.58	
	4	2.51	
	5	2.53	
	old1	2.44	
Good Sliver mirror	1	4.16	
	2	4.1	
	3	3.74	3.61
	4	4.03	
	5	4.16	

Sliver mirror from YanTai

Fiber mirror type	Fiber No.	Test1	test2
Previous fiber mirror	1	2.57	2.58
	2	2.19	
	3	2.12	
New fiber sample from YanTai	1	3.68	
	2	3.52	
	3	3.6	
	4	2.8	
	5	2.8	
	6	2.27	2.29
	7	3.25	

Unit in nVs, pedestal is only 0.02nVs, which could be ignored.

Conclusion

- Fisrt test is performed one week ago, three days after the mirror was finished. And the second test is performed yesterday.
- No damage and apprent difference in apperence.

- The result need to confirm with test in later, which may be caused from olding by oxidation.

- Need to confirm if this sliver method is worthing investigate.

Aluminum mirror in ALICE EC technical proposal

- Only 25% improvement with aluminum mirror

distance of approximately 33 cm. The lower curve shows the light transmission efficiency in arbitrary units as a function of distance from the APD for a fibre without mirrored end. The upper curve shows the effect of including mirroring on the fibre end. The response is considerably flatter with an overall increase in efficiency in the range of about 25% in the vicinity of shower maximum (i.e. the location of the highest energy deposition for an electromagnetic shower). Shower maximum occurs at about 26 cm on the distance scale of Fig. 2.7. This number accounts for material immediately in front of the detector; which ranges between 0.4 and 0.8 radiation lengths, and assumes 5.5 - 6.0 radiation lengths for shower maximum for 10 GeV photons. At this depth in the detector, the mirrored fibre response is very uniform and contributes nothing significant to the non-linearity of the detector as a whole.

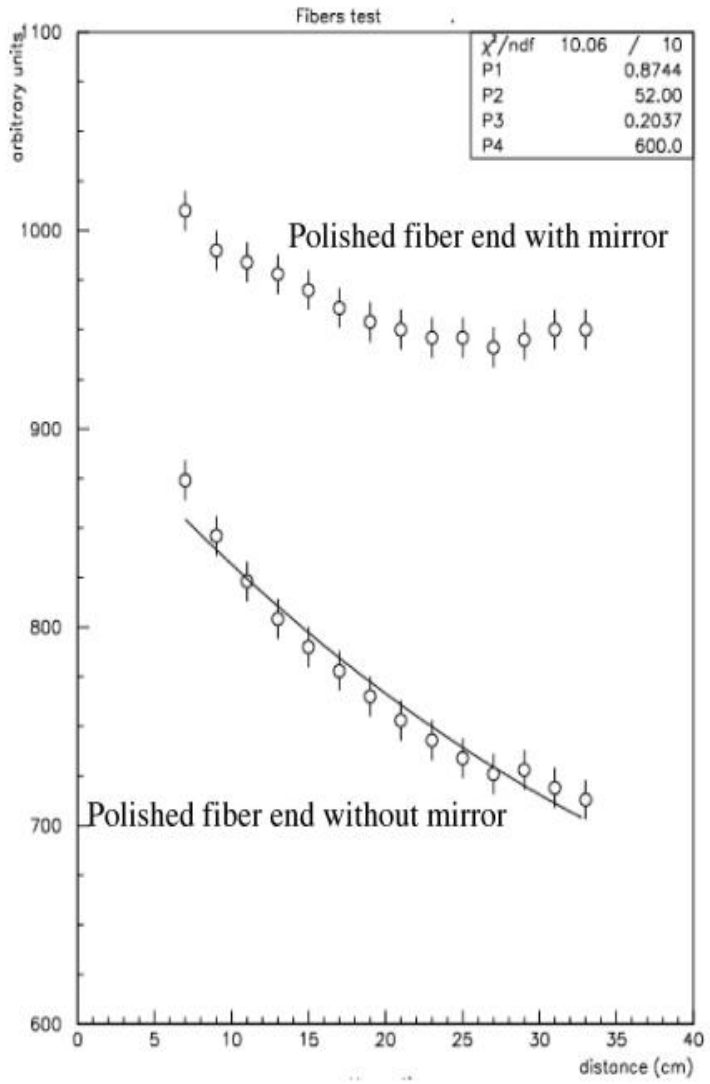


Figure 2.7: Comparison of light transmission efficiency versus distance of propagation for Kuraray Y-11 fibres with and without aluminized mirrored ends.