# Test of mirror painting & clear fiber

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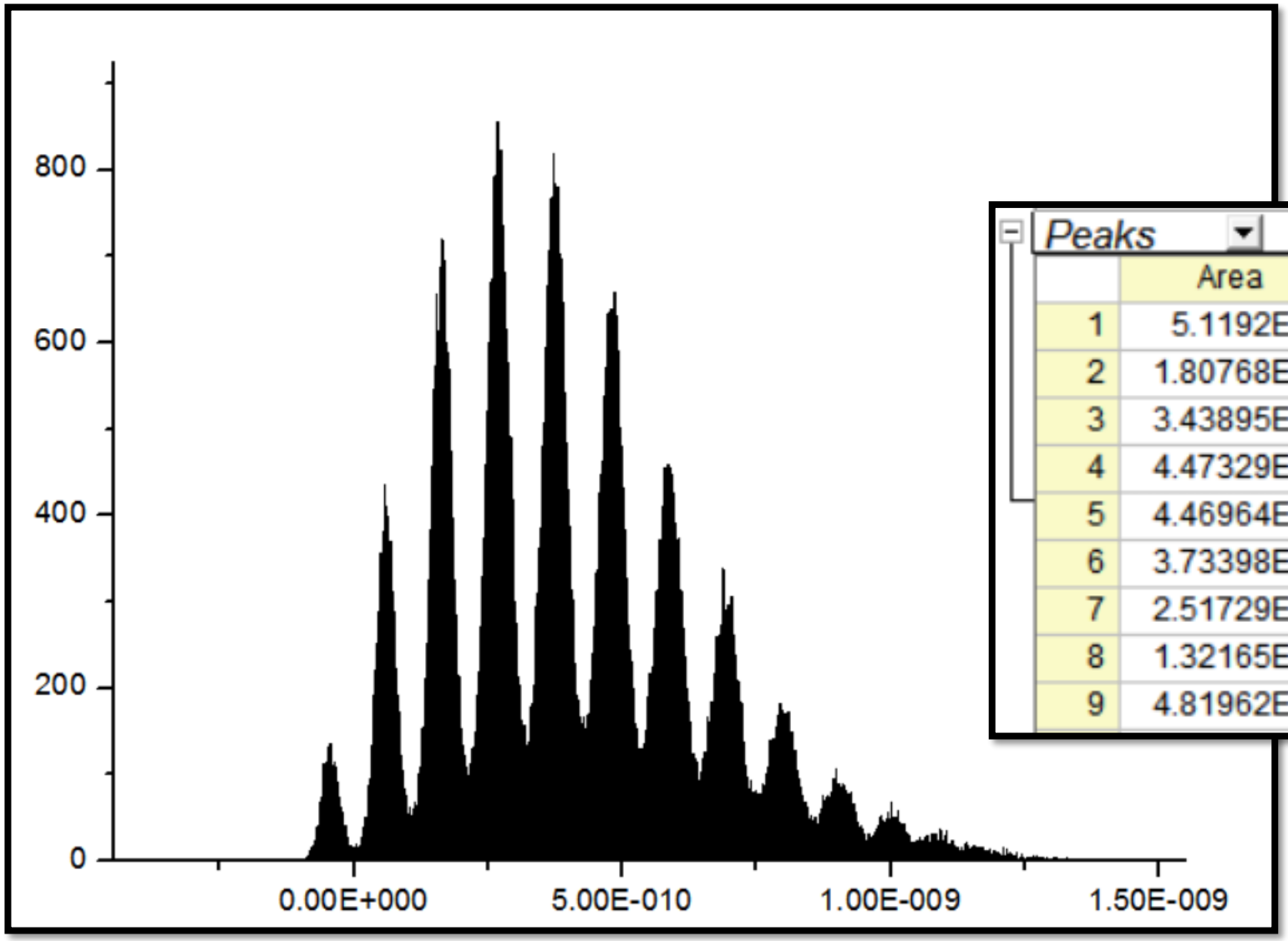
Gain of the SiPM (SPE)

$$Gain = \frac{104.1pvs}{100 \cdot R \cdot e} = 1.3 \times 10^5$$

Preamplifier

50Ω for oscilloscope

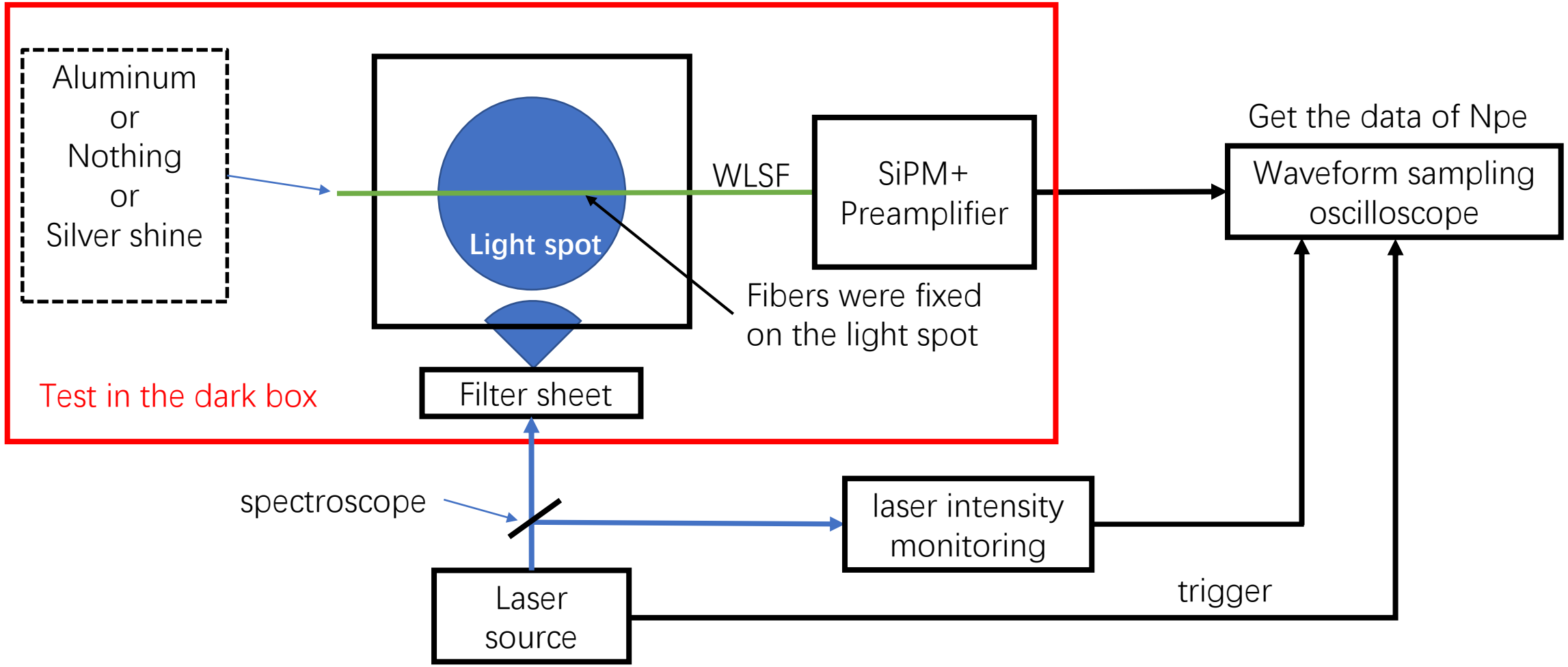
104.1pvs=1PE




Peaks

| | Area | Center | Width | Height |
|---|---|---|---|---|
| 1 | 5.1192E-9 | -4.35665E-11 | 3.35453E-11 | 121.76157 |
| 2 | 1.80768E-8 | 5.99995E-11 | 3.66584E-11 | 393.44959 |
| 3 | 3.43895E-8 | 1.63793E-10 | 4.09352E-11 | 670.29865 |
| 4 | 4.47329E-8 | 2.6905E-10 | 4.45692E-11 | 800.81594 |
| 5 | 4.46964E-8 | 3.74262E-10 | 4.65213E-11 | 766.58571 |
| 6 | 3.73398E-8 | 4.80139E-10 | 4.93503E-11 | 603.70067 |
| 7 | 2.51729E-8 | 5.86088E-10 | 4.86035E-11 | 413.24262 |
| 8 | 1.32165E-8 | 6.92427E-10 | 4.38572E-11 | 240.445 |
| 9 | 4.81962E-9 | 7.98317E-10 | 3.66647E-11 | 104.88315 |

# 1. Test of mirror painting



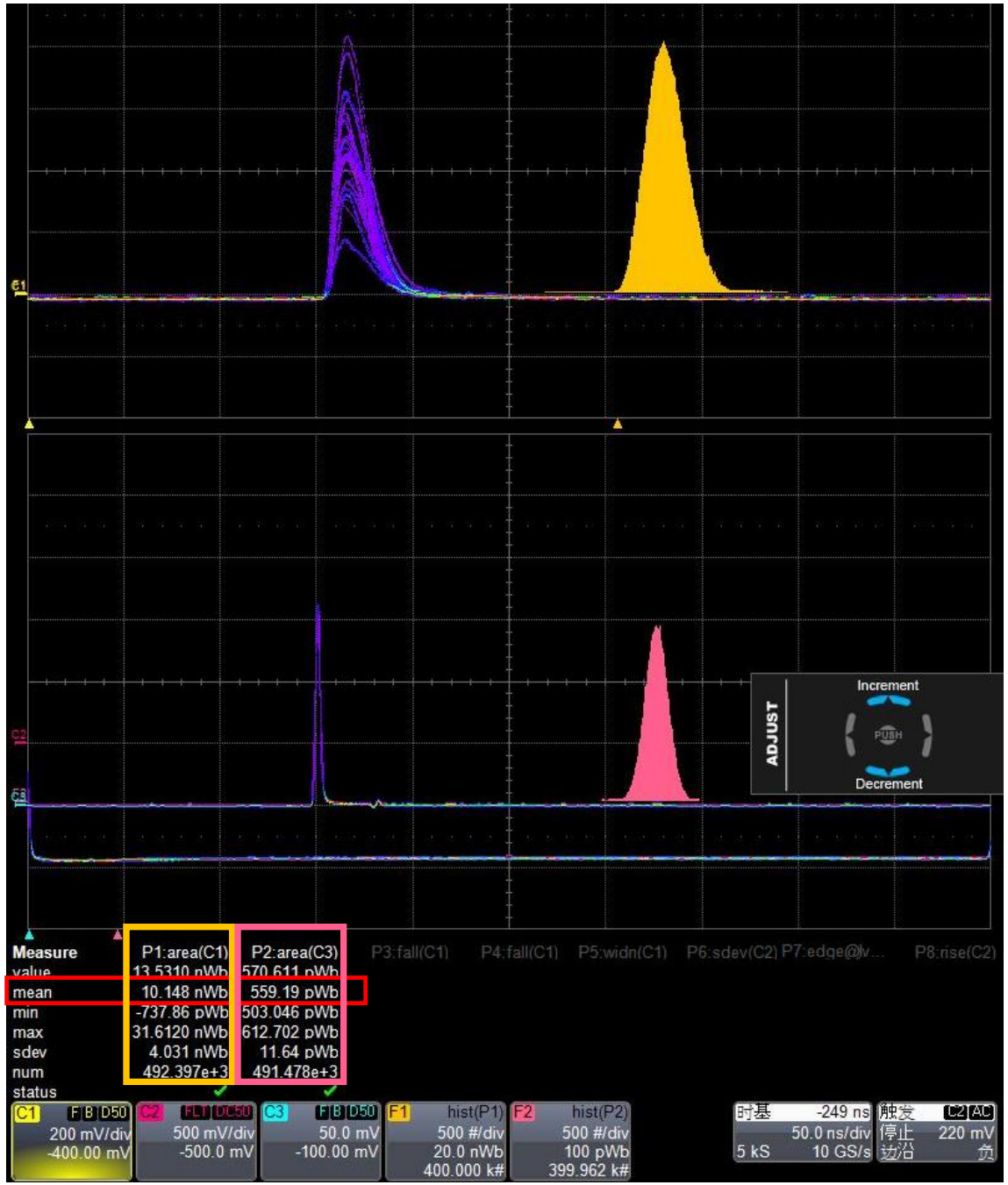

For laser source:
- 420 nm
- 1 MHz

For SiPM:
- Gain : $1.3 \times 10^5$
- 104.1pWb=1 pe
- Voltage=25.0 V

For the fibers:
- 50 cm
- Have been polished

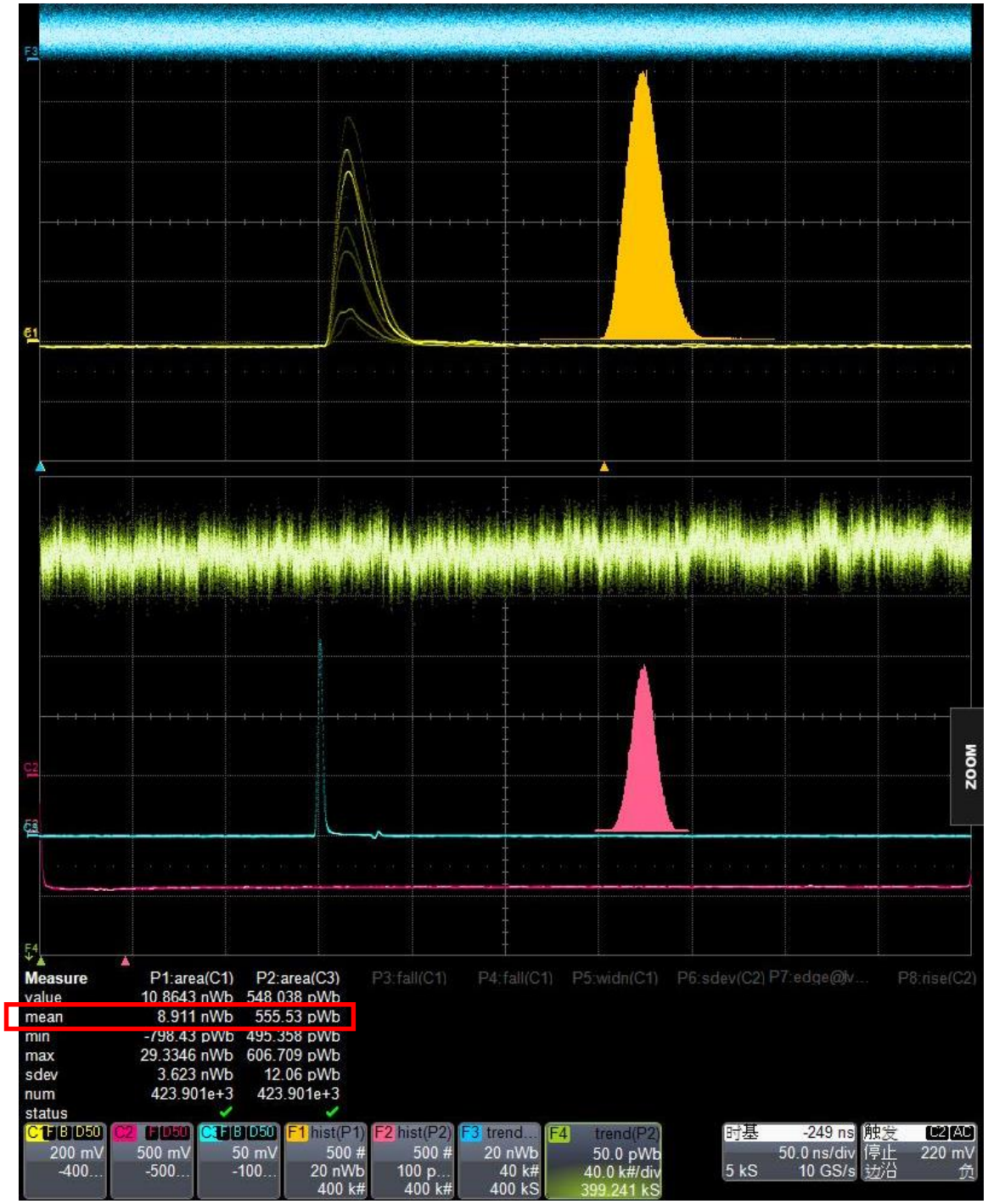
# WLSF（Y11）+ Al

$$\text{Npe}=\frac{10148pVs}{104.1pVs}=97.4$$



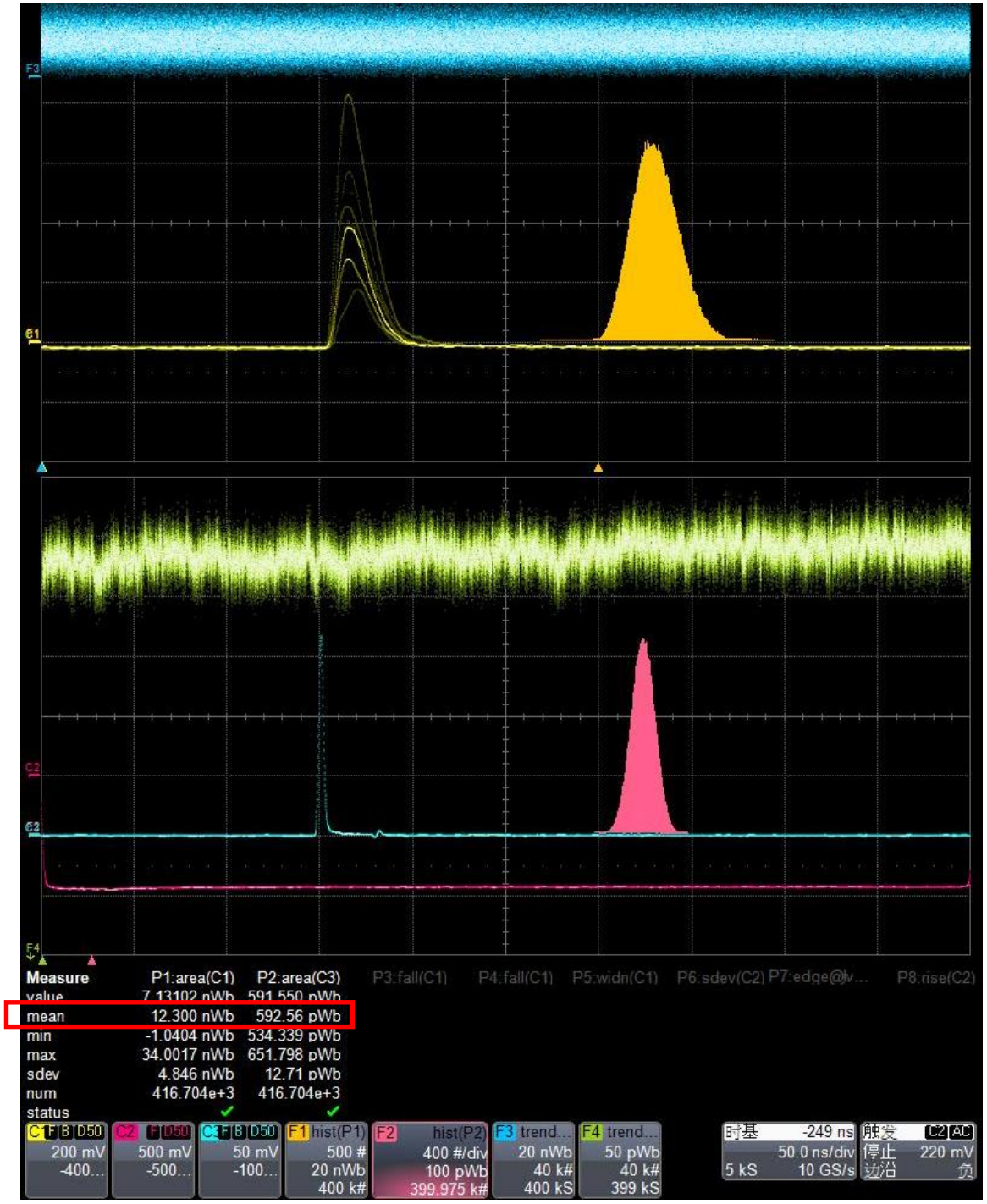
WLSF（Y11） （after polishing to remove Al）

$$\text{Npe}=\frac{8911pVs}{104.1pVs}=85.6$$



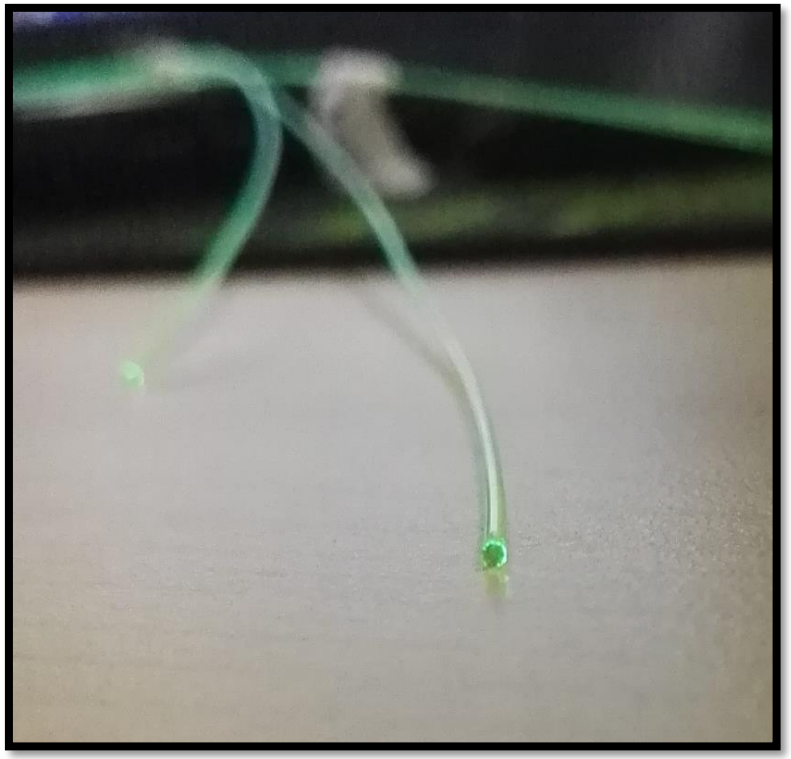
# WLSF（Y11）+ silver shine 415001

$$\text{Npe}=\frac{555\times 12300pVs}{592\times 104.1pVs}=110.7$$



# Compared results

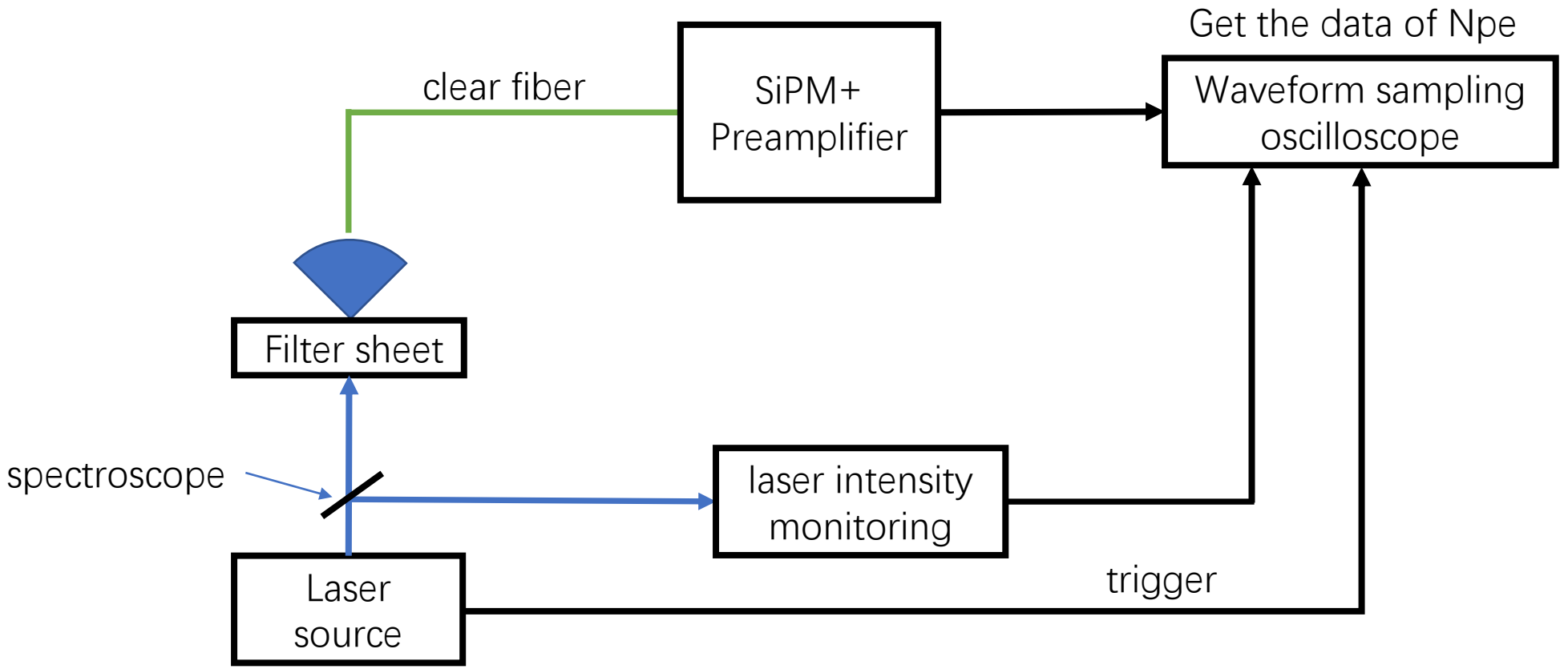
| | Y11 |
|---|---|
| No mirror painting | 85.6 |
| Al | 97.4 (+13.8%) |
| Silver shine 415001 | 110.7 (+29.3%) |



(Al —— light leakage)

So it is not the real proformance of this method. It should be better than 13.8%.

# 2. Test of clear fiber

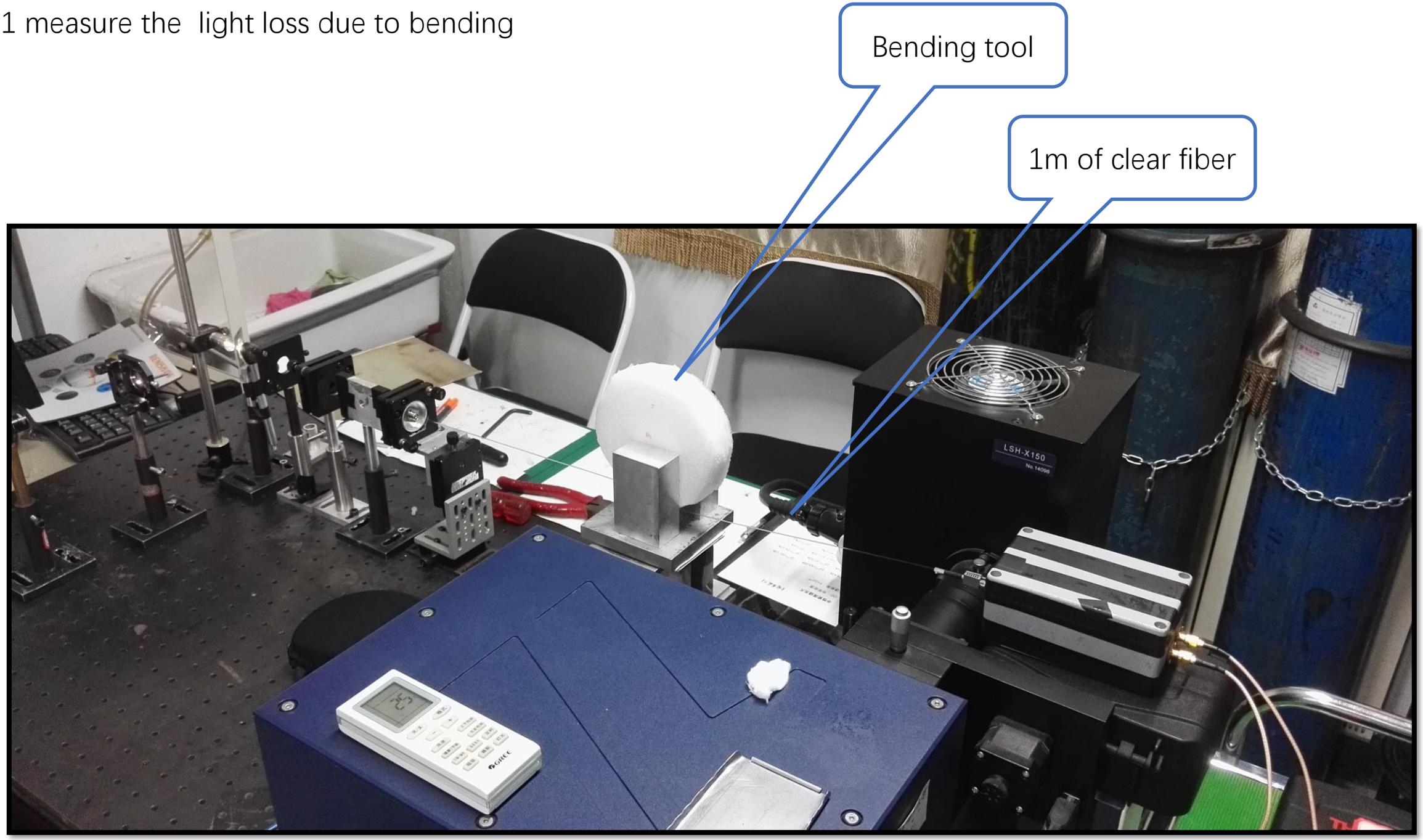



For laser source:
- 420 nm
- 1 MHz

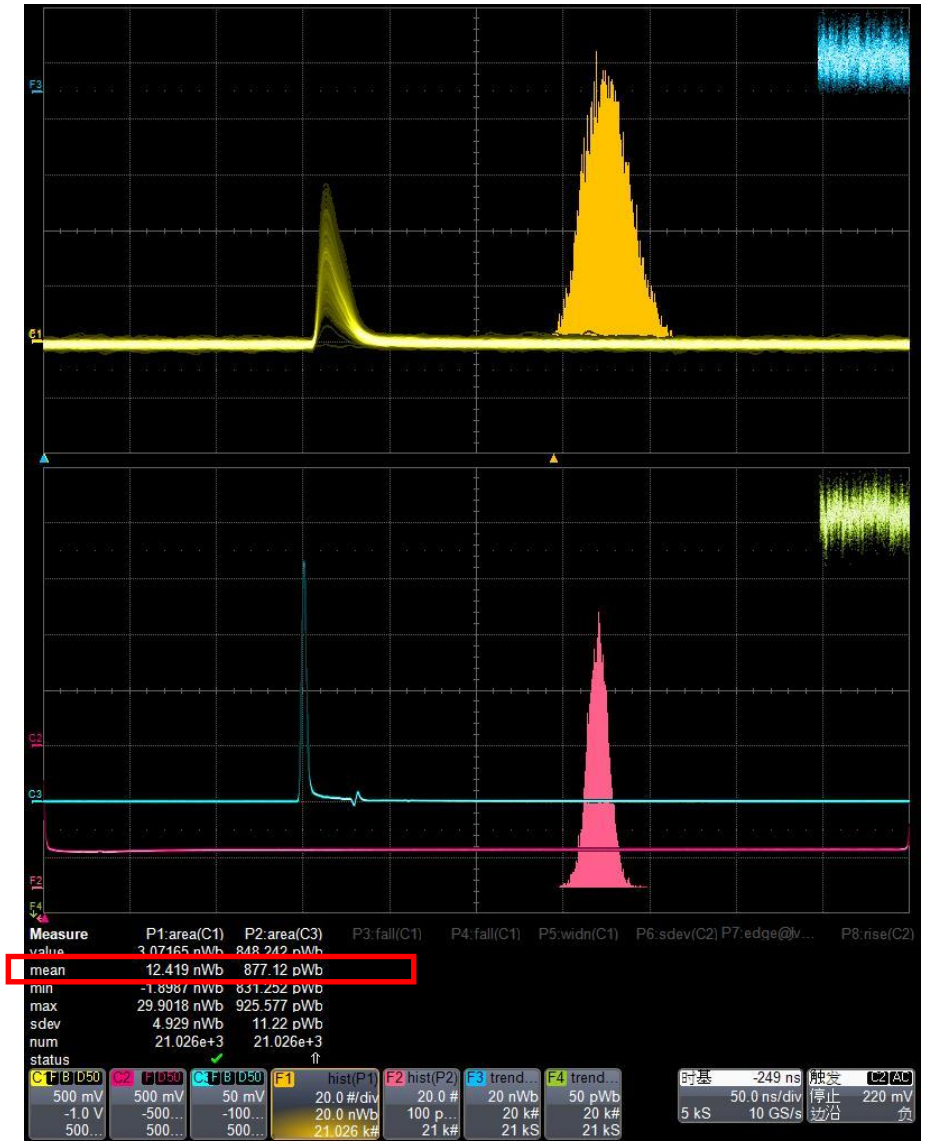
For SiPM:
- Gain : $1.8 \times 10^5$
- 143.6pWb=1 pe
- Voltage=25.0 V

For the fibers:
- 1m, 2m, 3m, 4m, 5m, 7m and 9m
- Have been polished

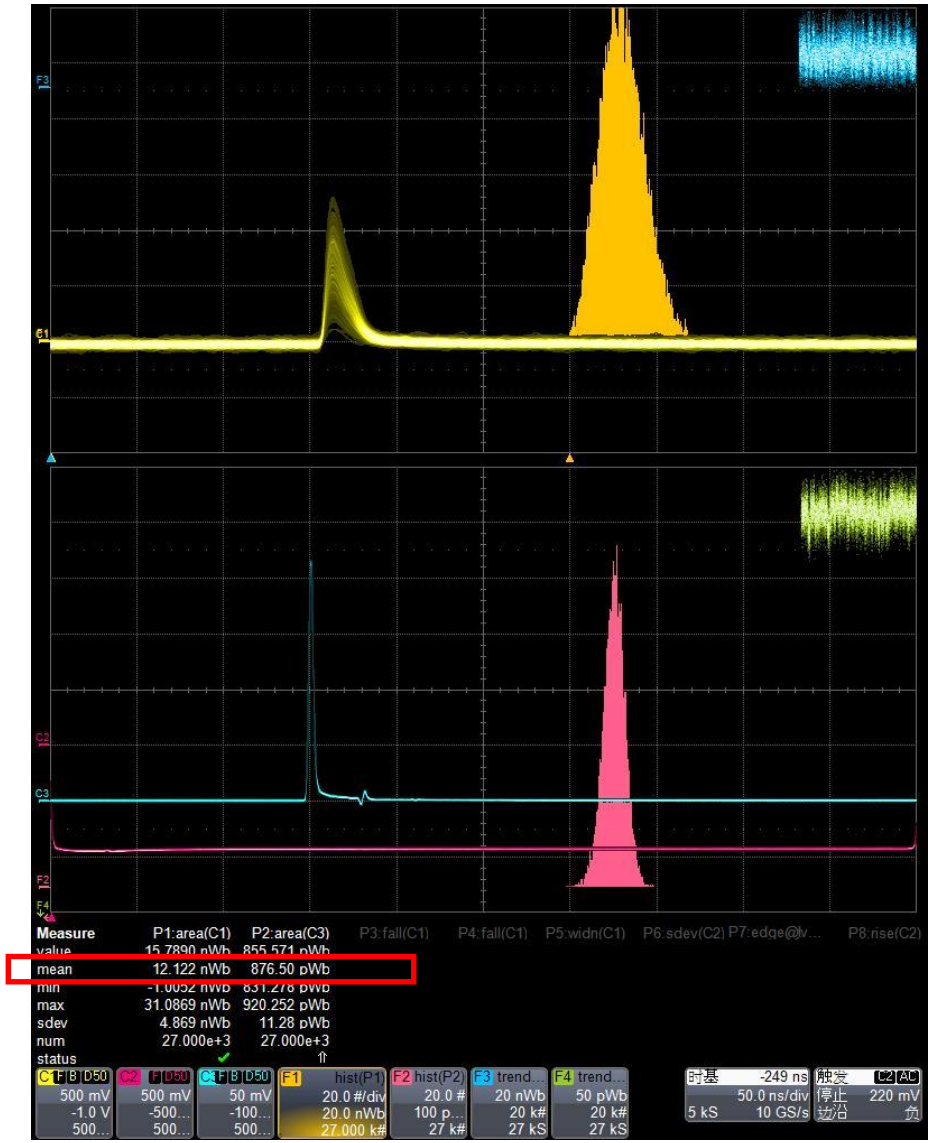
2.1 measure the  light loss due to bending



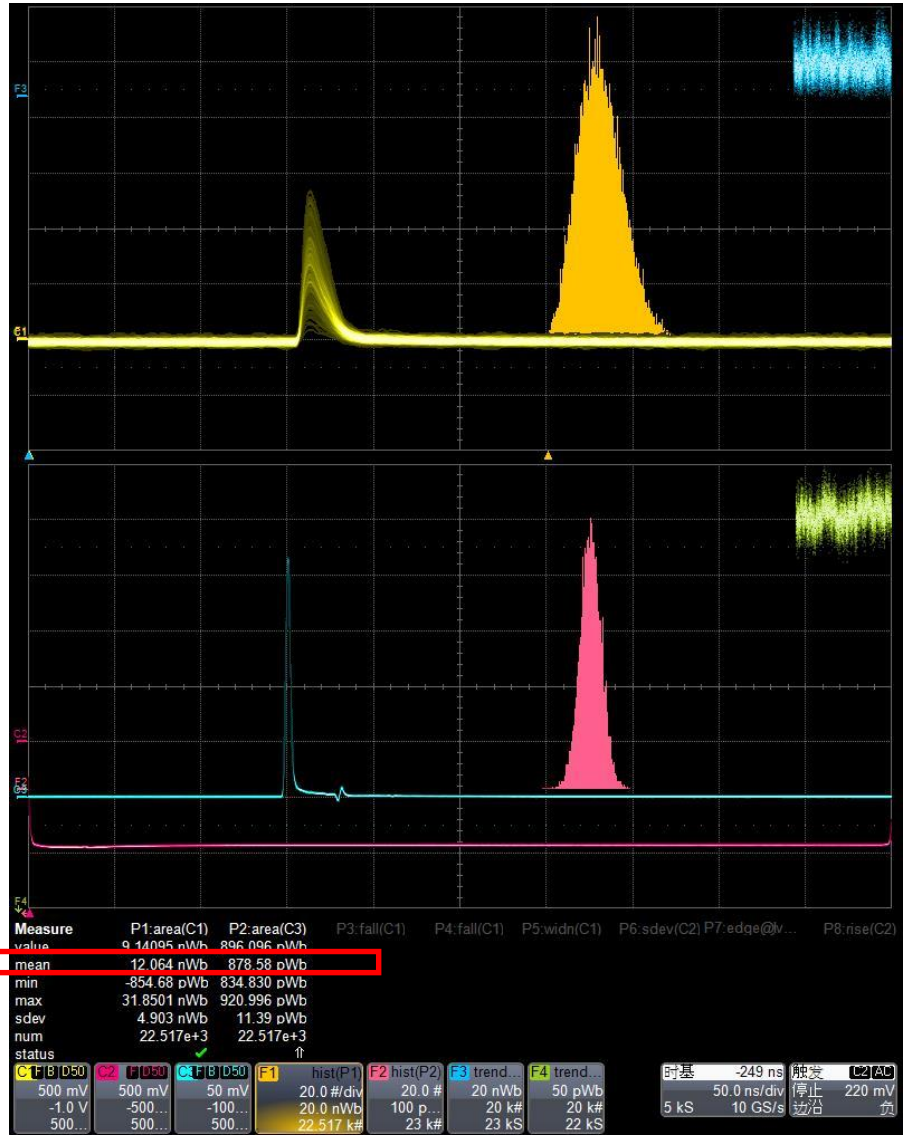
No bending= $\frac{12419pVs}{104.1pVs}$=119.3




$\varphi$20cm = $\frac{12122pVs}{104.1pVs}$=116.4



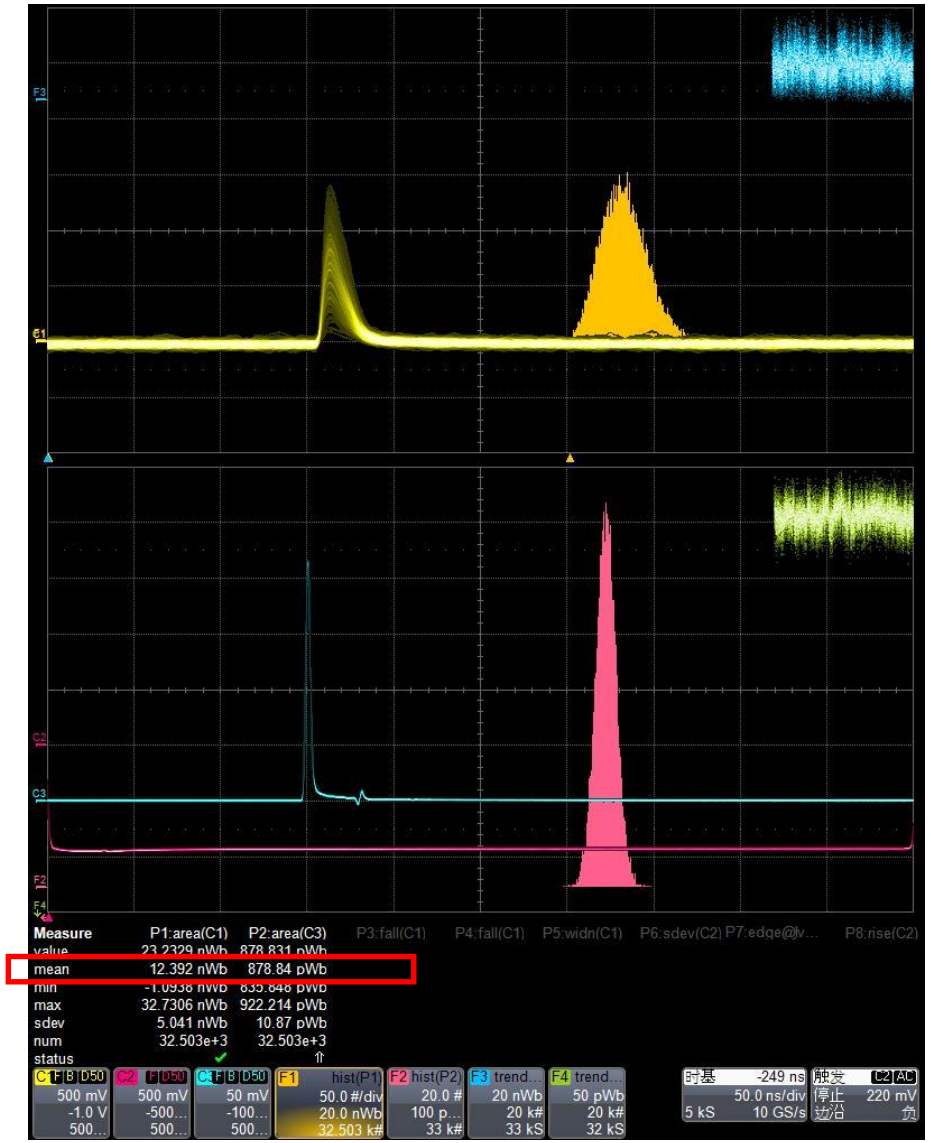
$$\varphi 11\text{cm} = \frac{12064pVs}{104.1pVs} = 115.9$$

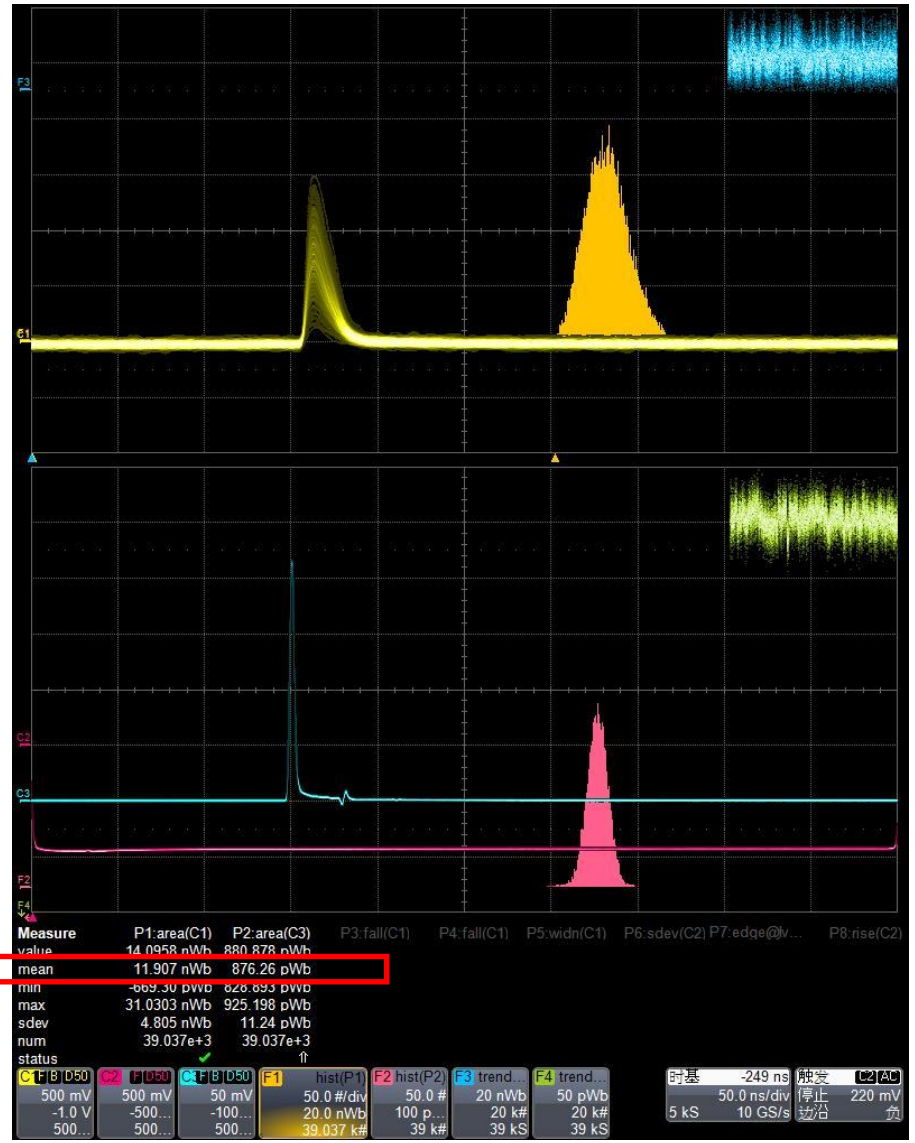



$$\varphi 8\text{cm} = \frac{12156pVs}{104.1pVs} = 116.8$$

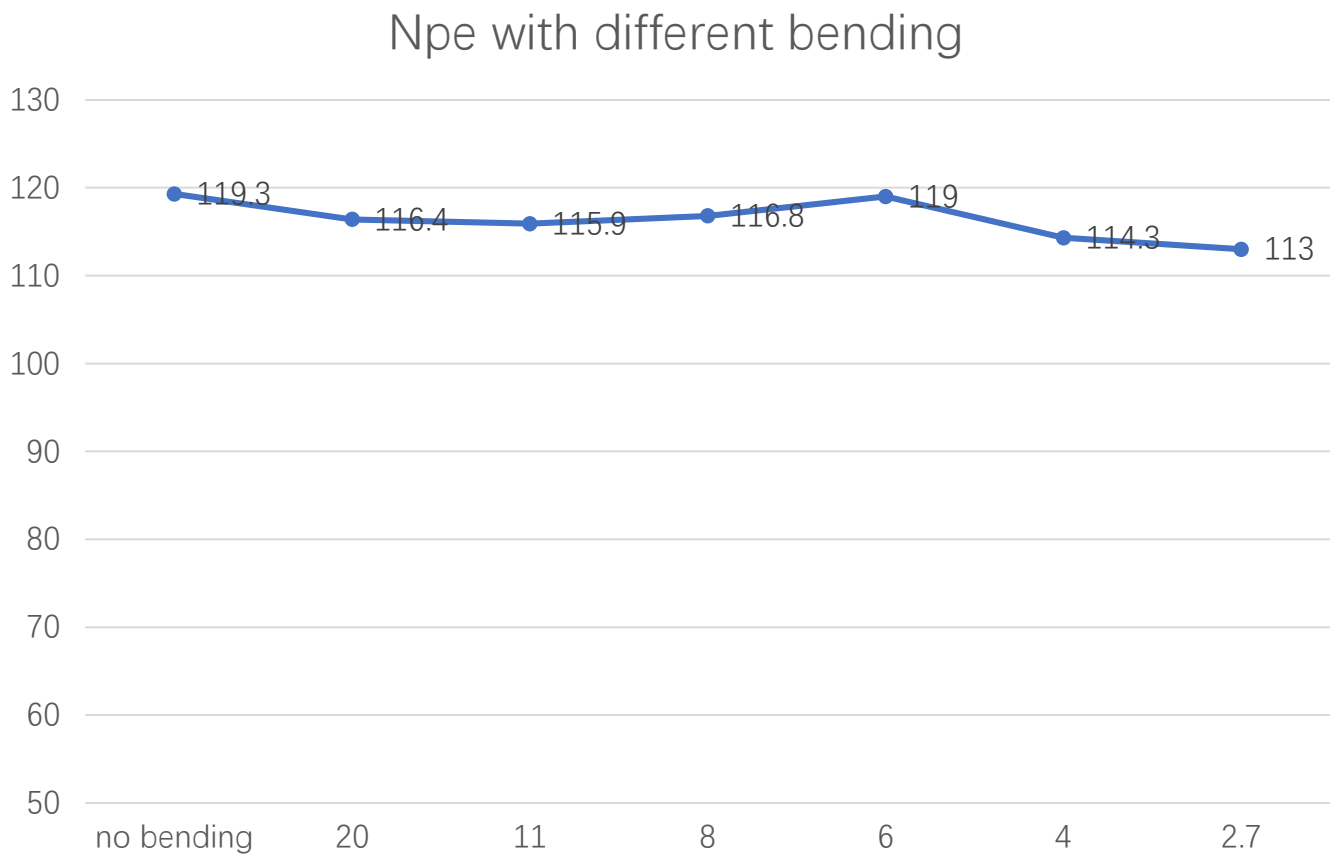
$$\varphi 6\text{cm} = \frac{12392pVs}{104.1pVs} = 119$$

$$\varphi 4\text{cm} = \frac{11907pVs}{104.1pVs} = 114.3$$



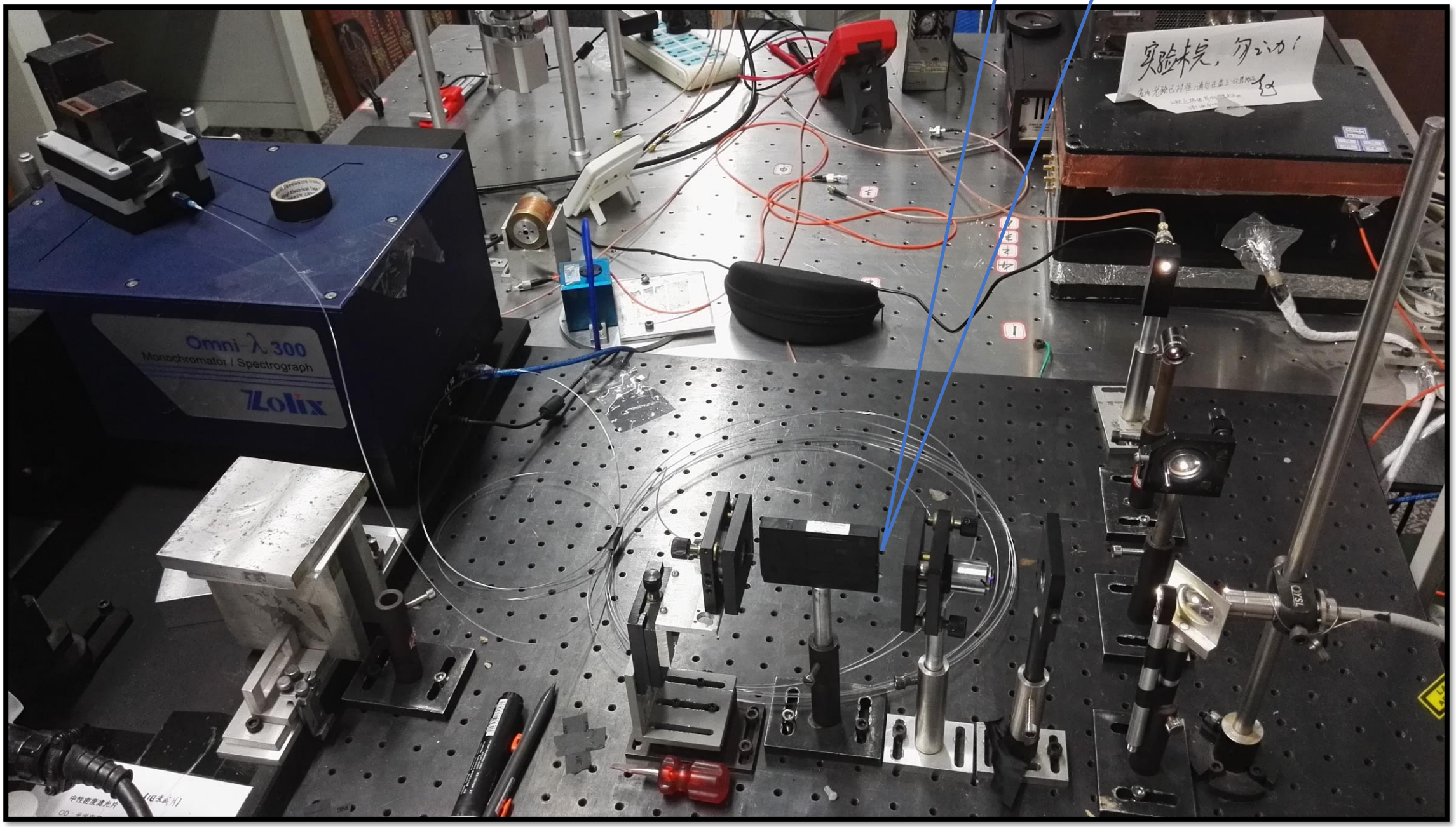



$$\varphi 2.7\text{cm} = \frac{11763pVs}{104.1pVs} = 113$$

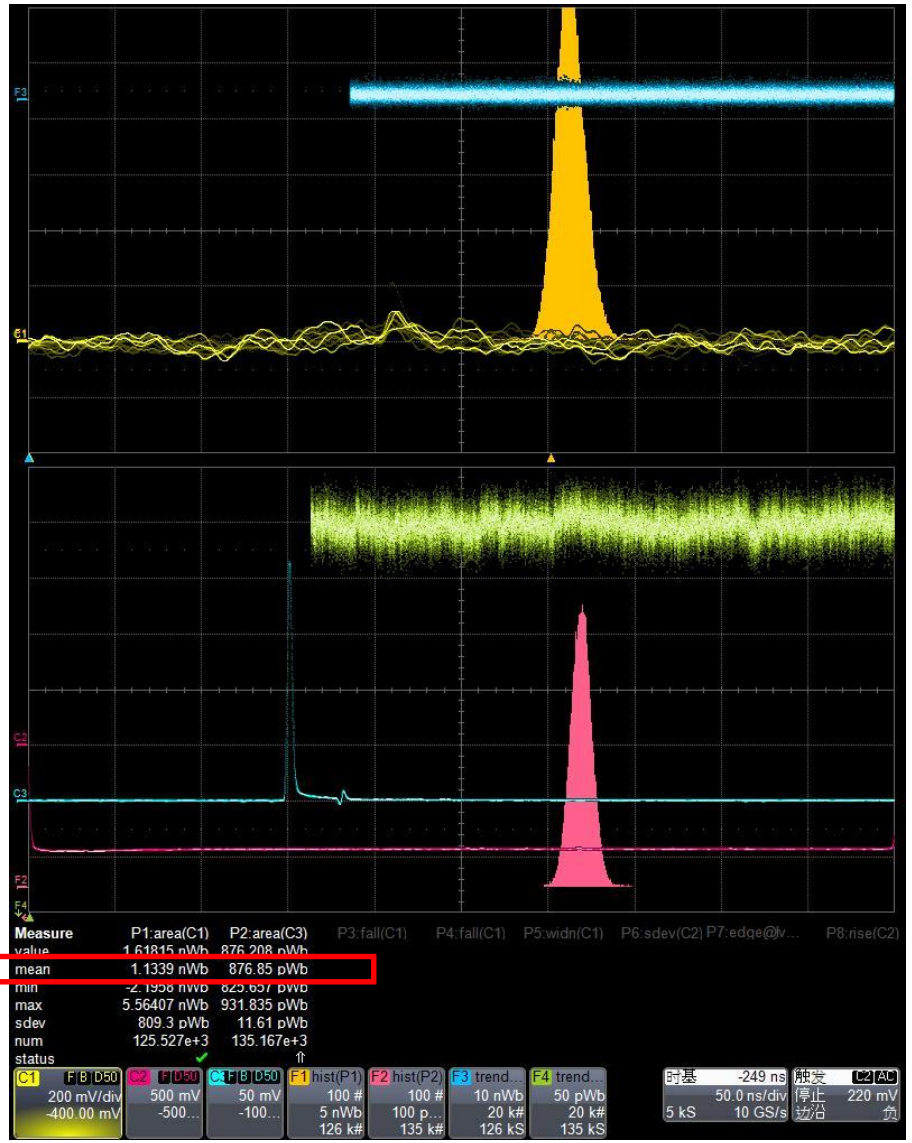

The effect of bending on the clear fiber can be ignored

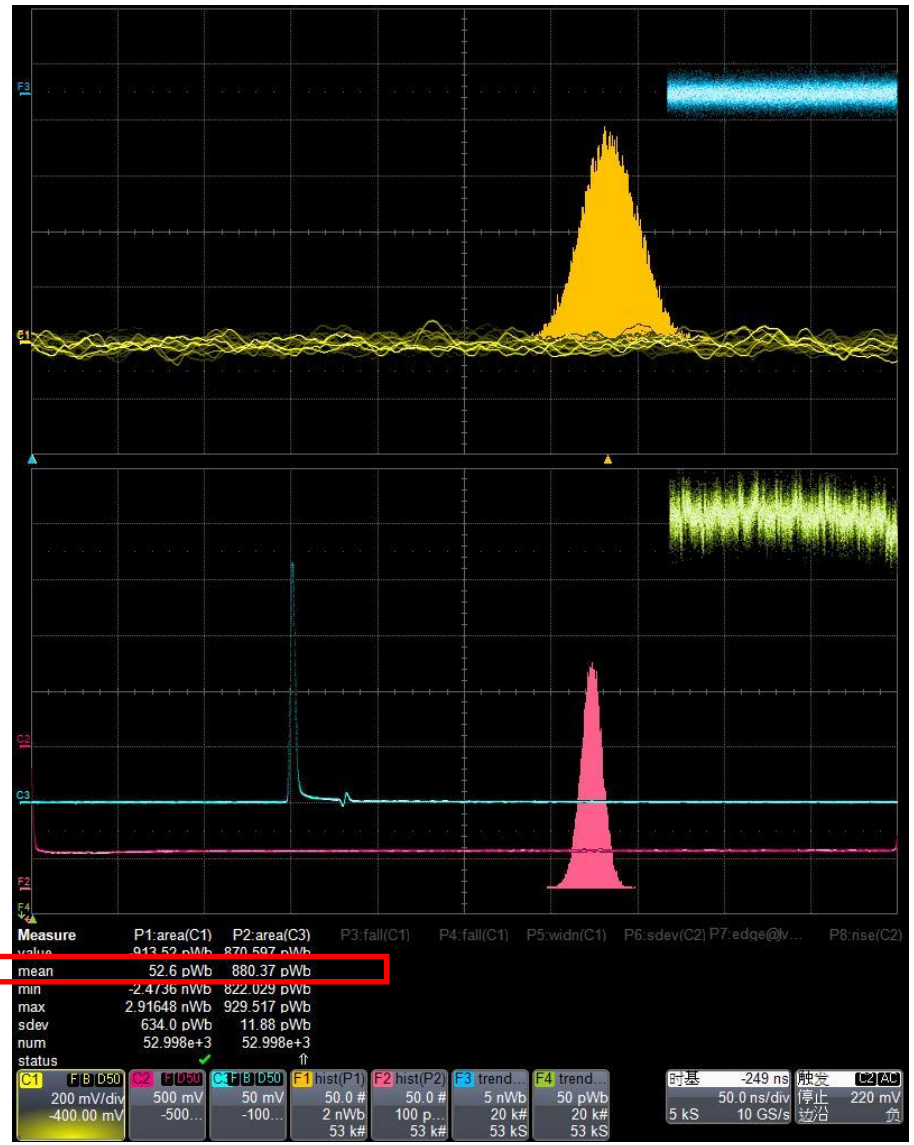
2.1 measure the  light loss due to length



$$Npe(9m) = \frac{1133.9-52.6pVs}{104.1pVs} = 10.38$$

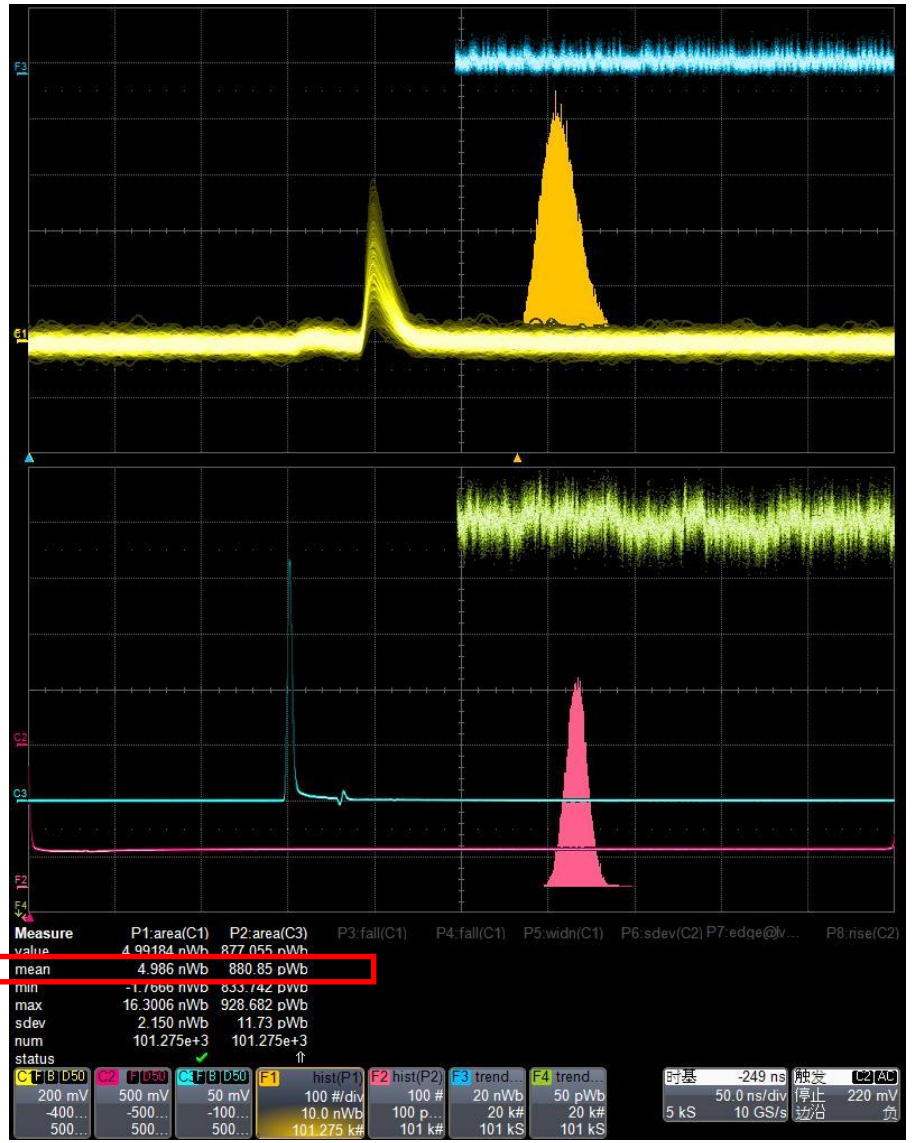
Background (9m)

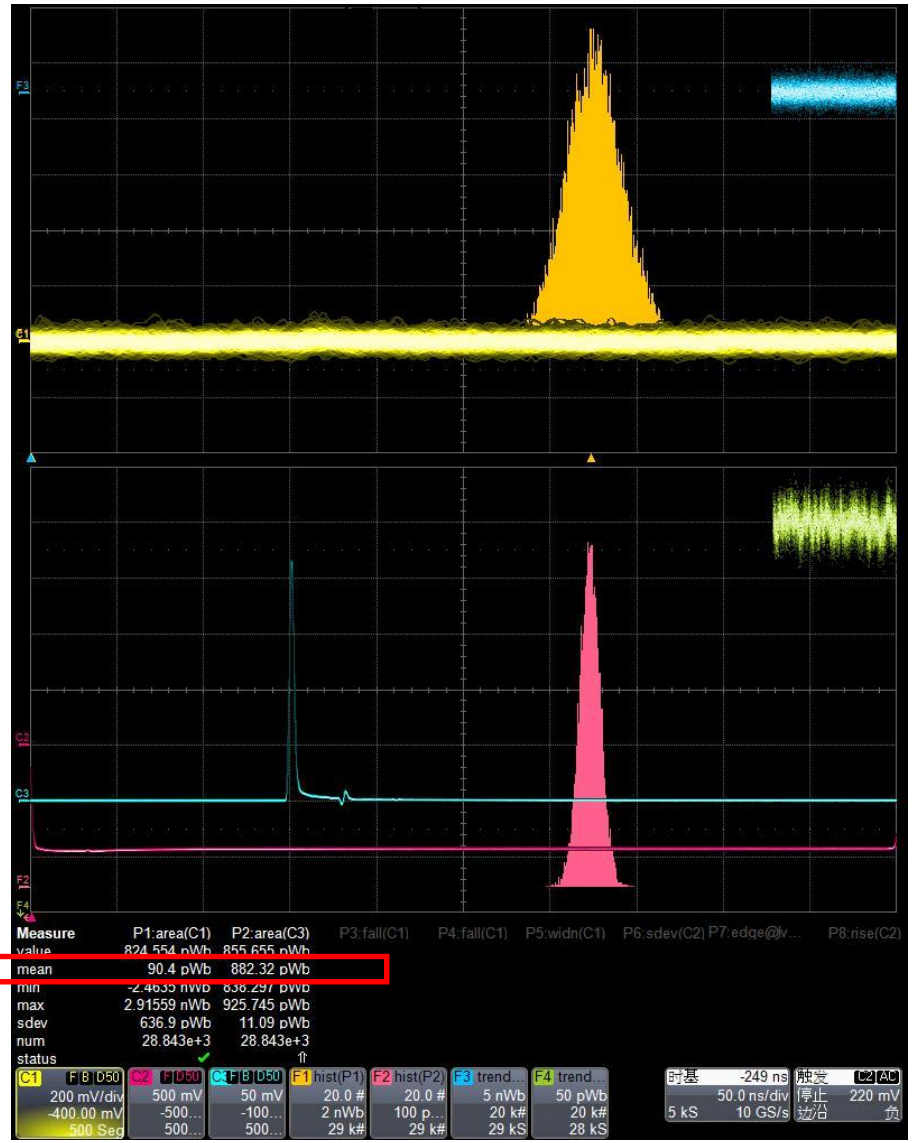


$$Npe(7m) = \frac{4986-90.4pVs}{104.1pVs} = 47.03$$

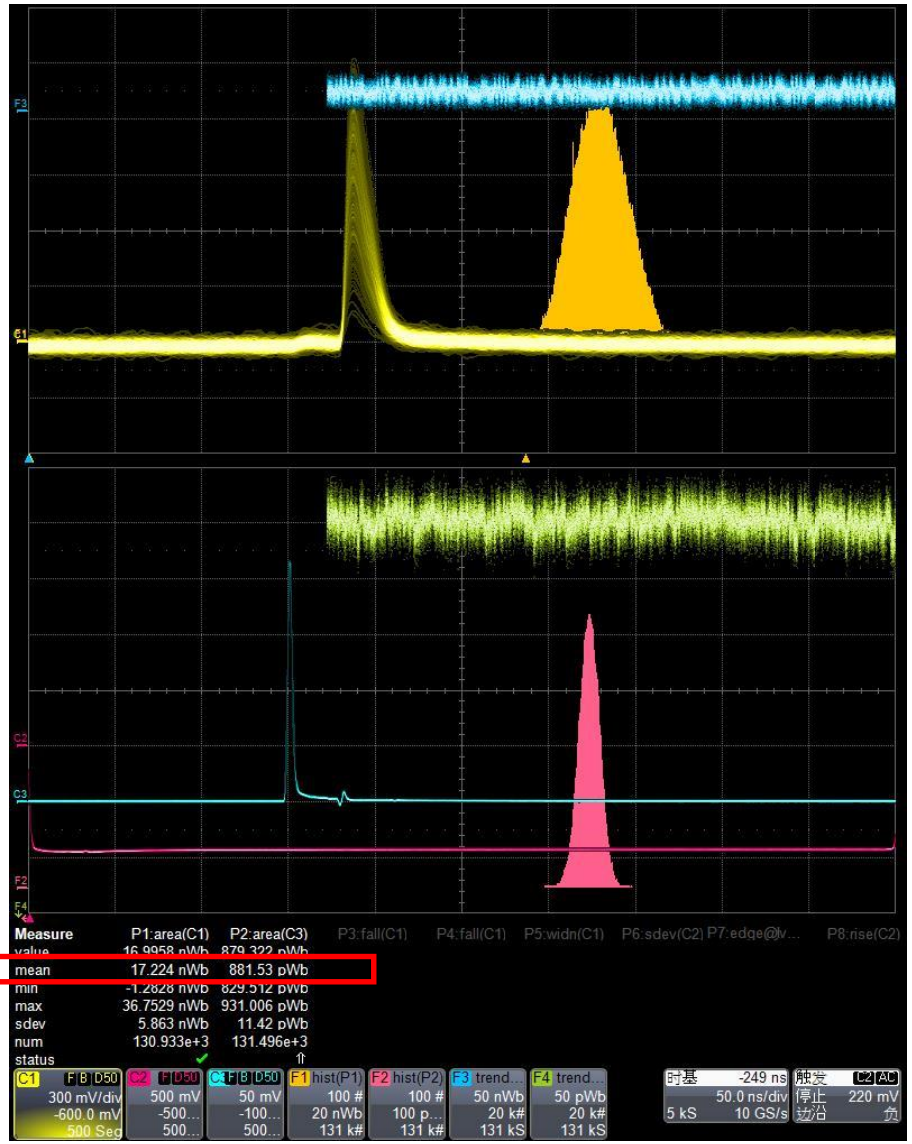
Background

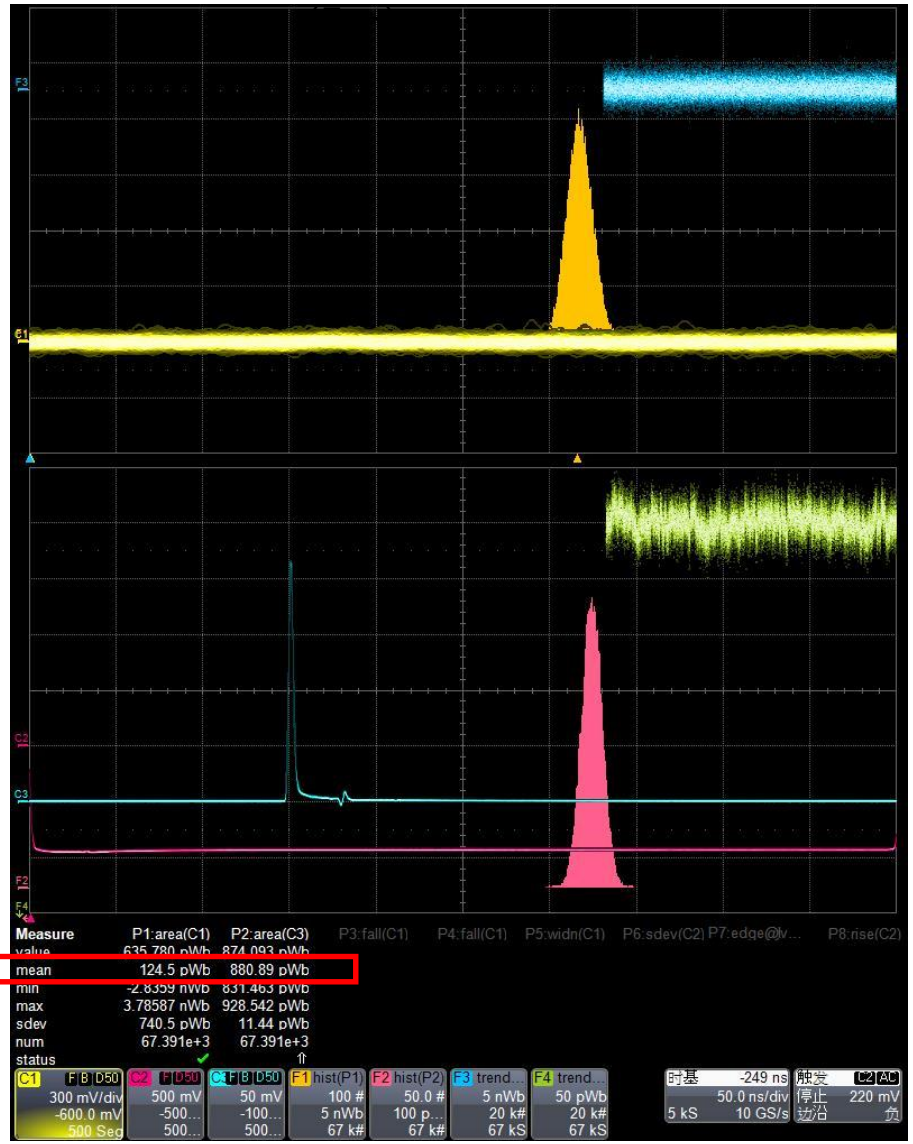


$$Npe(5m) = \frac{17224-124.5pVs}{104.1pVs} = 164.26$$

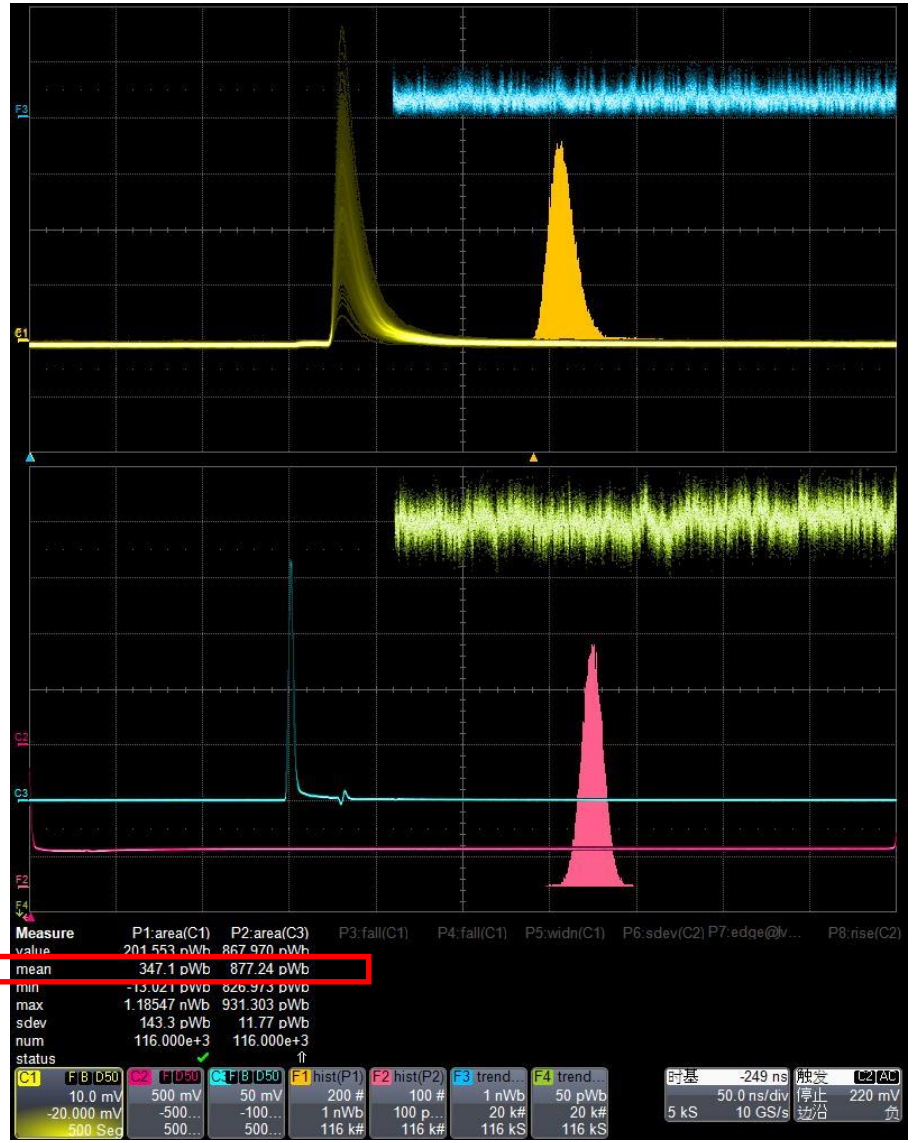
Background



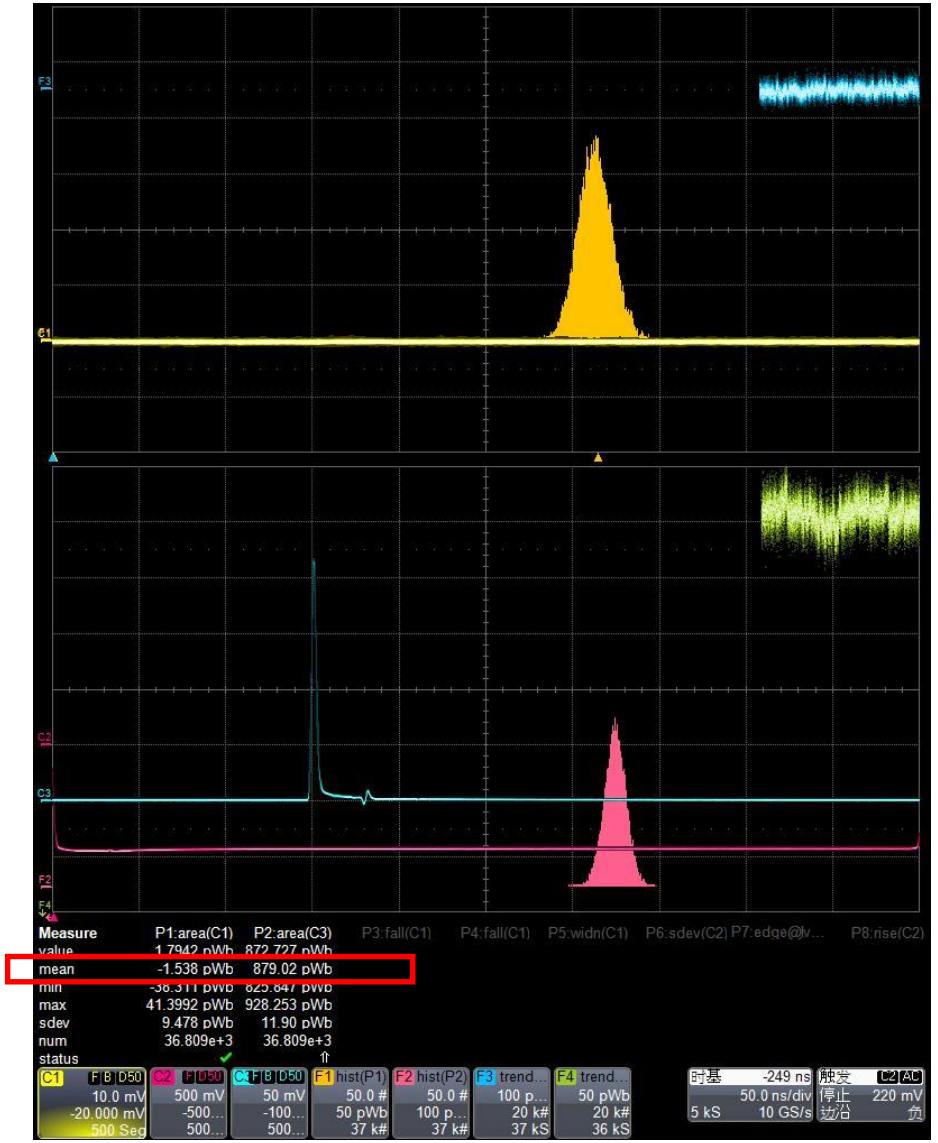



$$Npe(4m) = \frac{347.1+1.538pVs}{1.041pVs} = 334.91$$

As the signal is too large, so when the length is less than 4m, we removed the preamplifier.
That means 1.041pVs=1PE

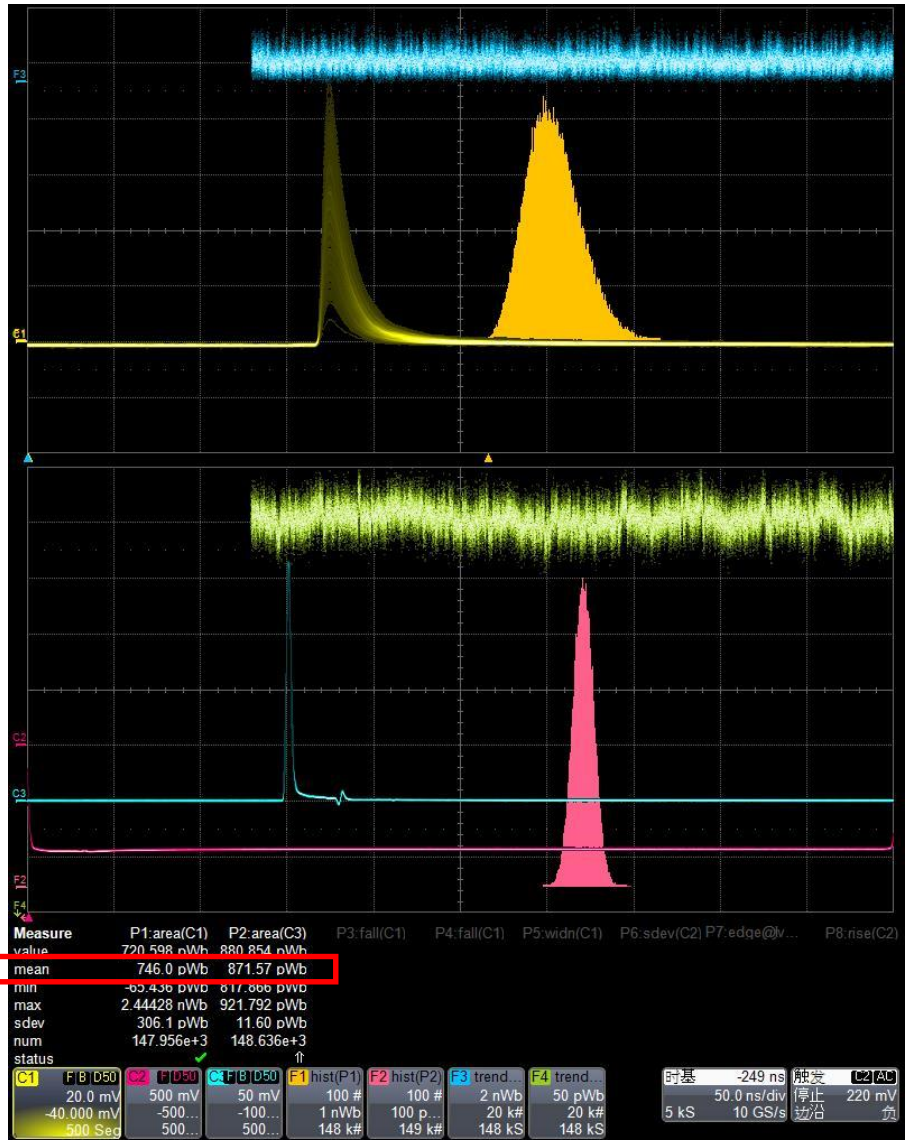


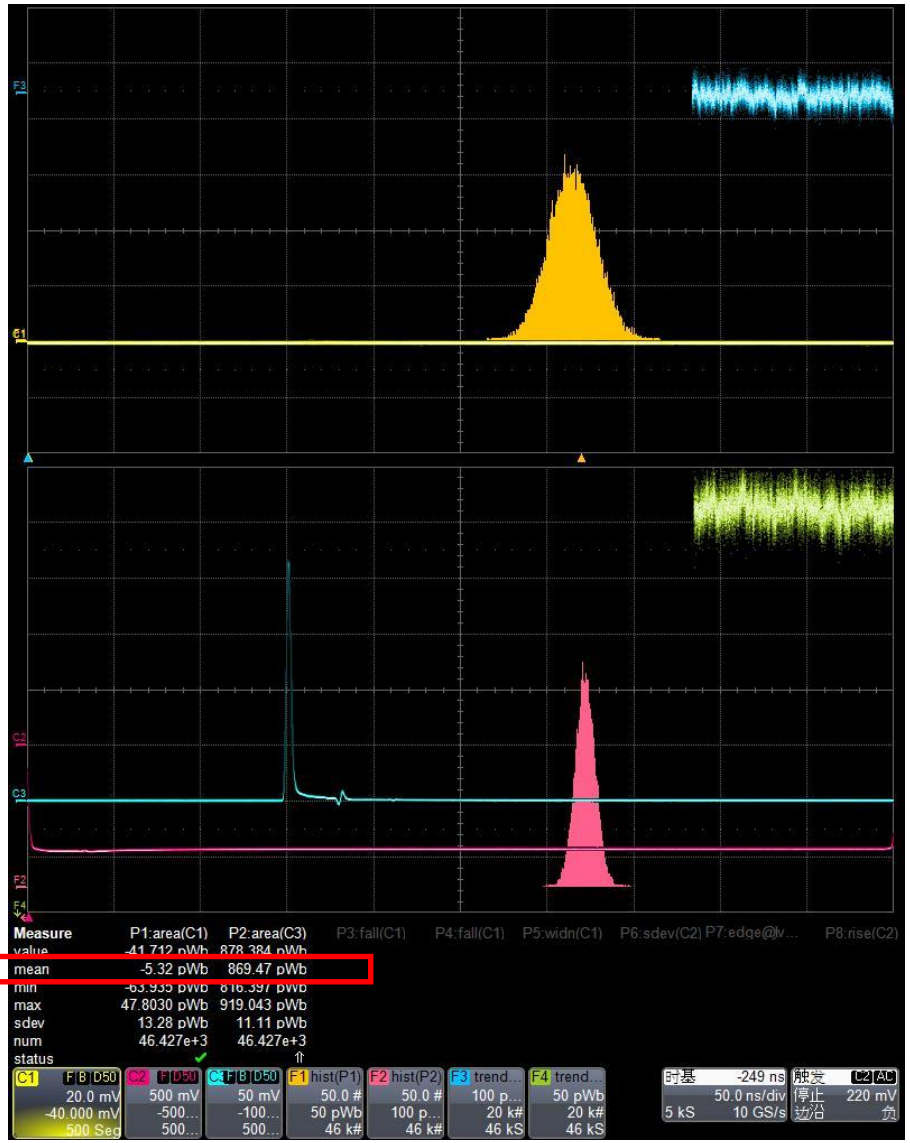

Background (4m)



$$Npe(3m) = \frac{746+5.32pVs}{1.041pVs} = 721.73$$

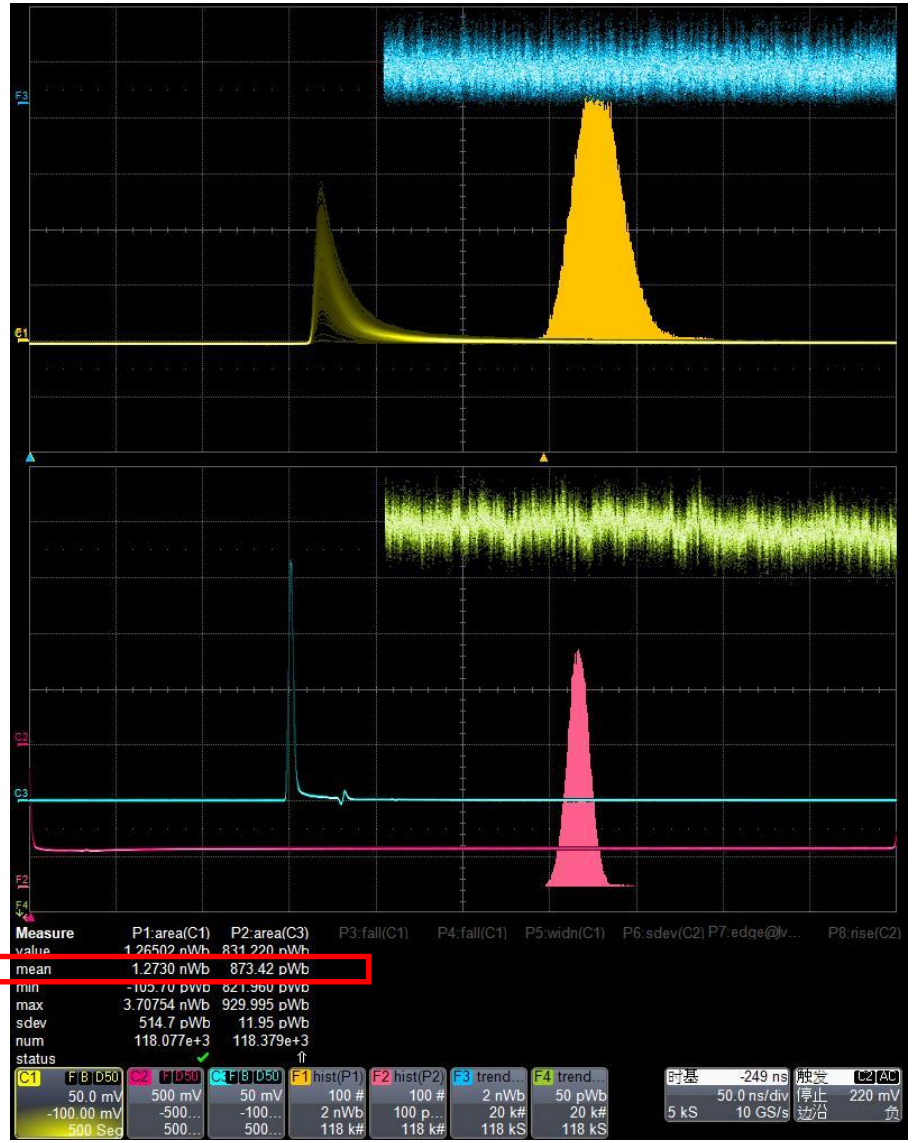
Background (3m)

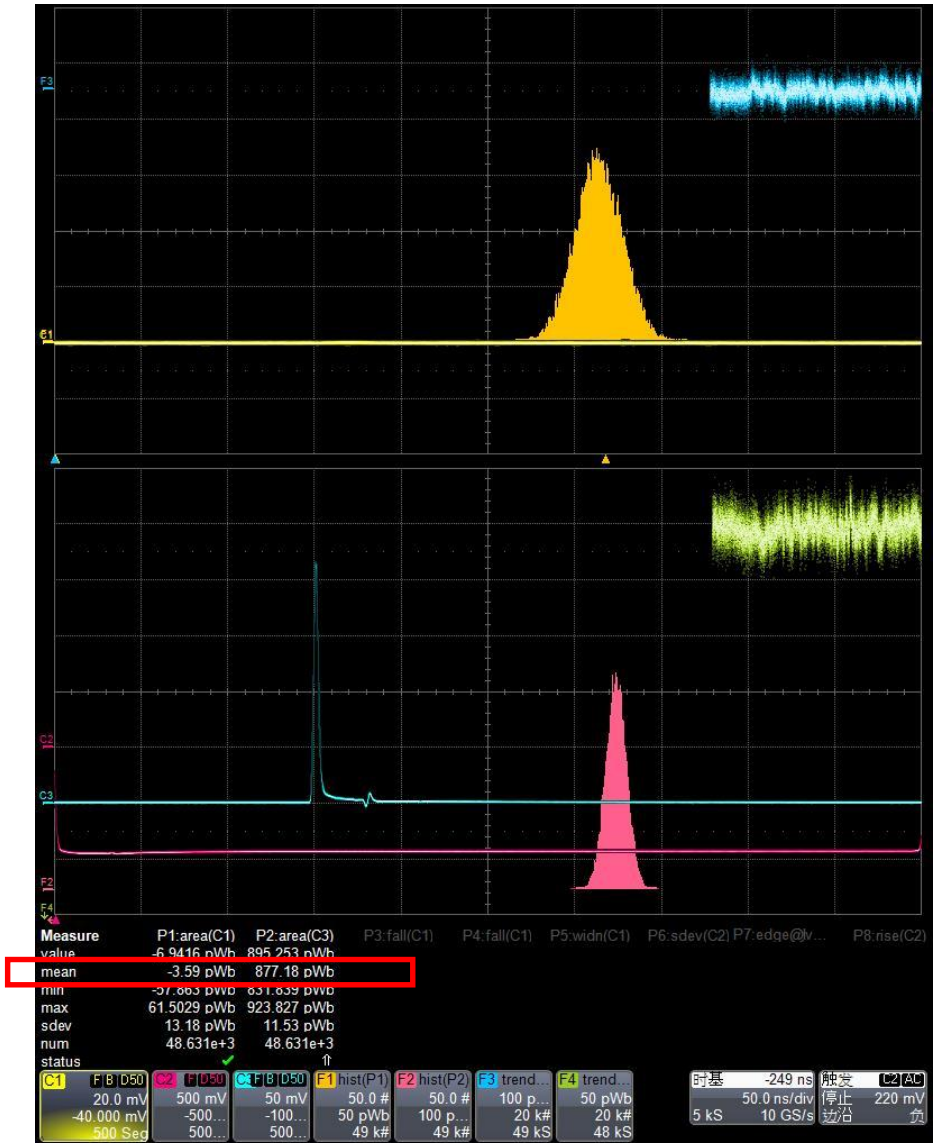


$$Npe(2m) = \frac{1273+3.59pVs}{1.041pVs} = 1226.31$$

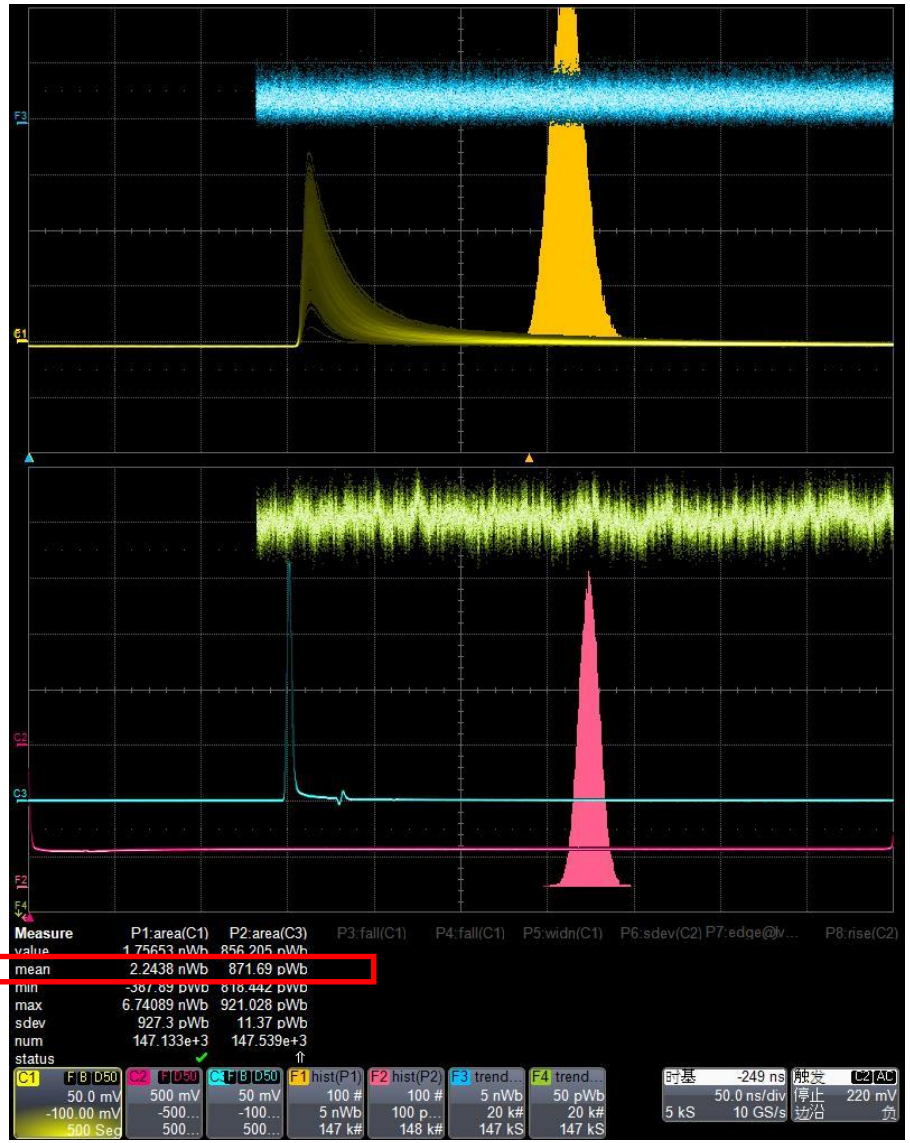
Background (2m)

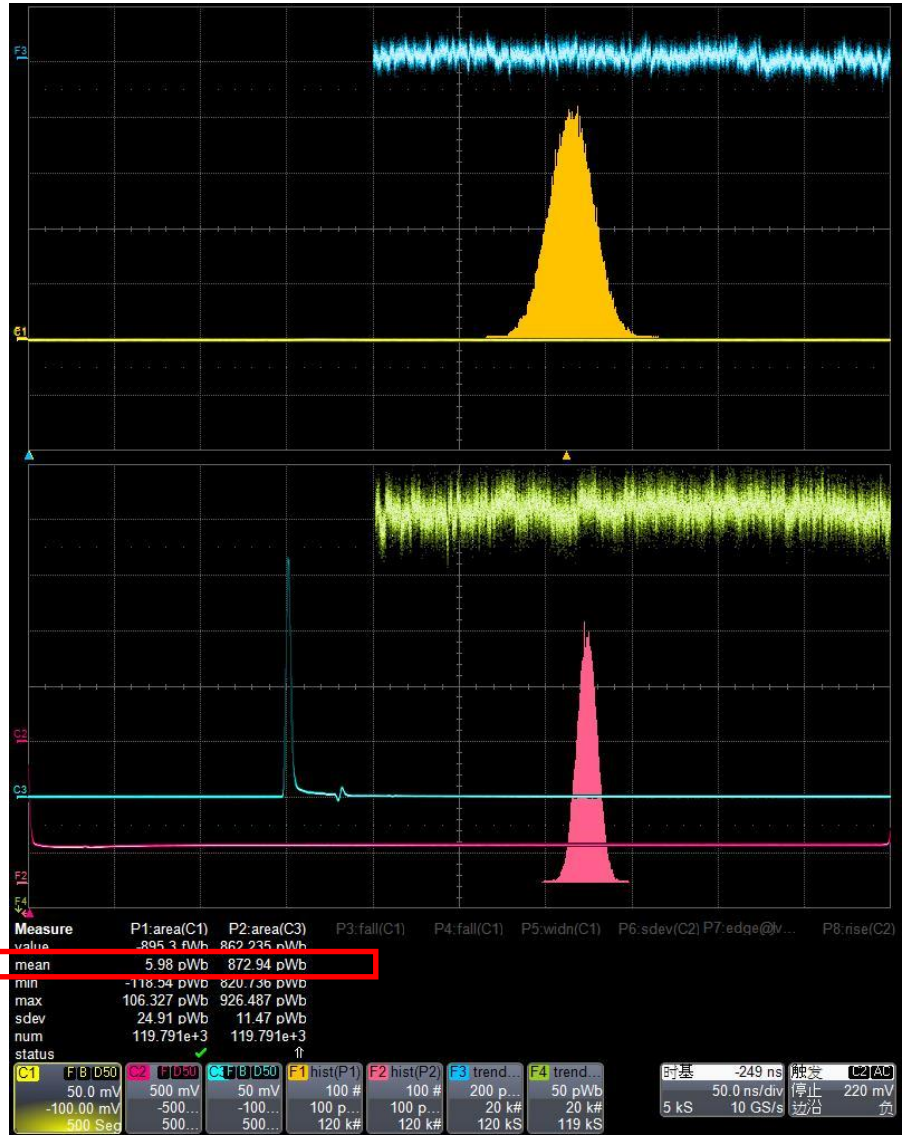


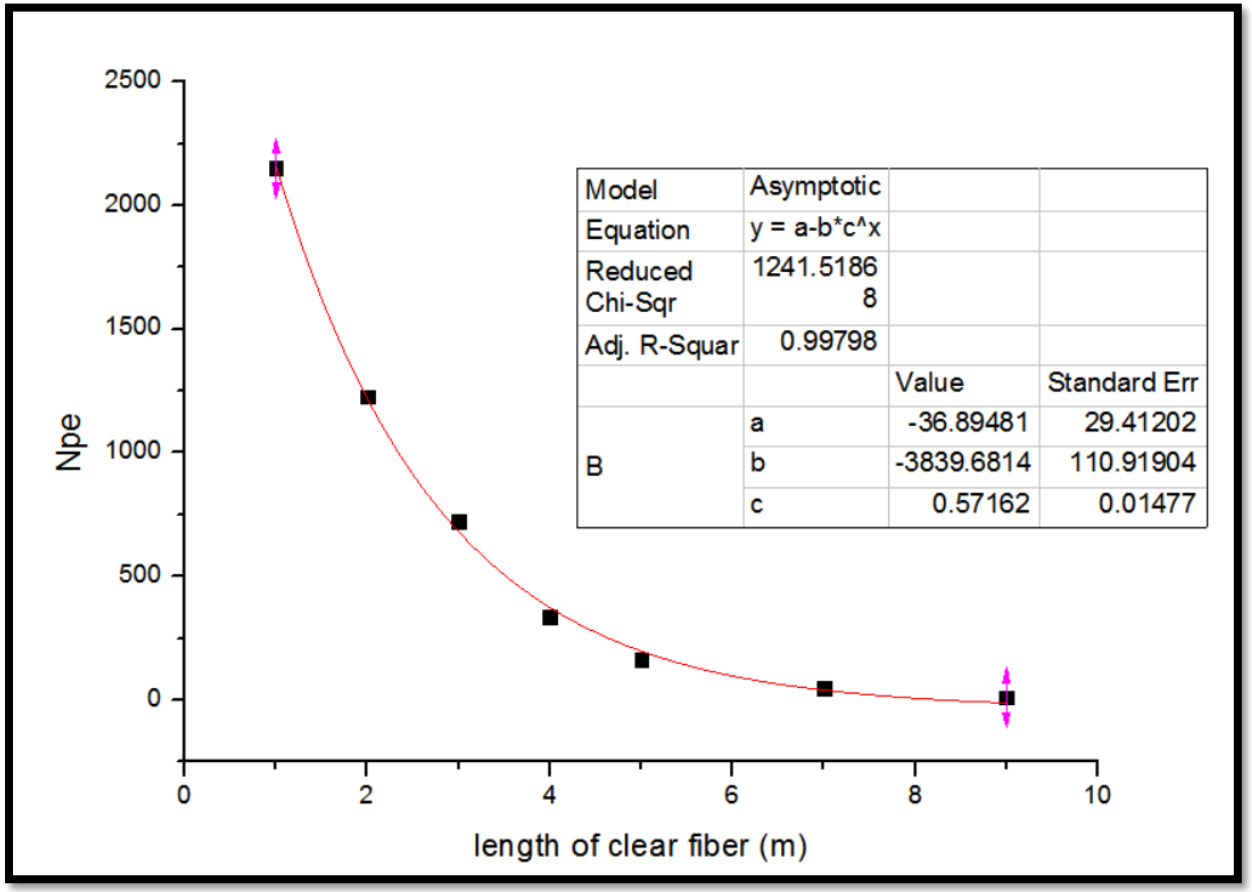
$$Npe(1m) = \frac{2243.8-5.98pVs}{1.041pVs} = 2149.68$$

Background (1m)

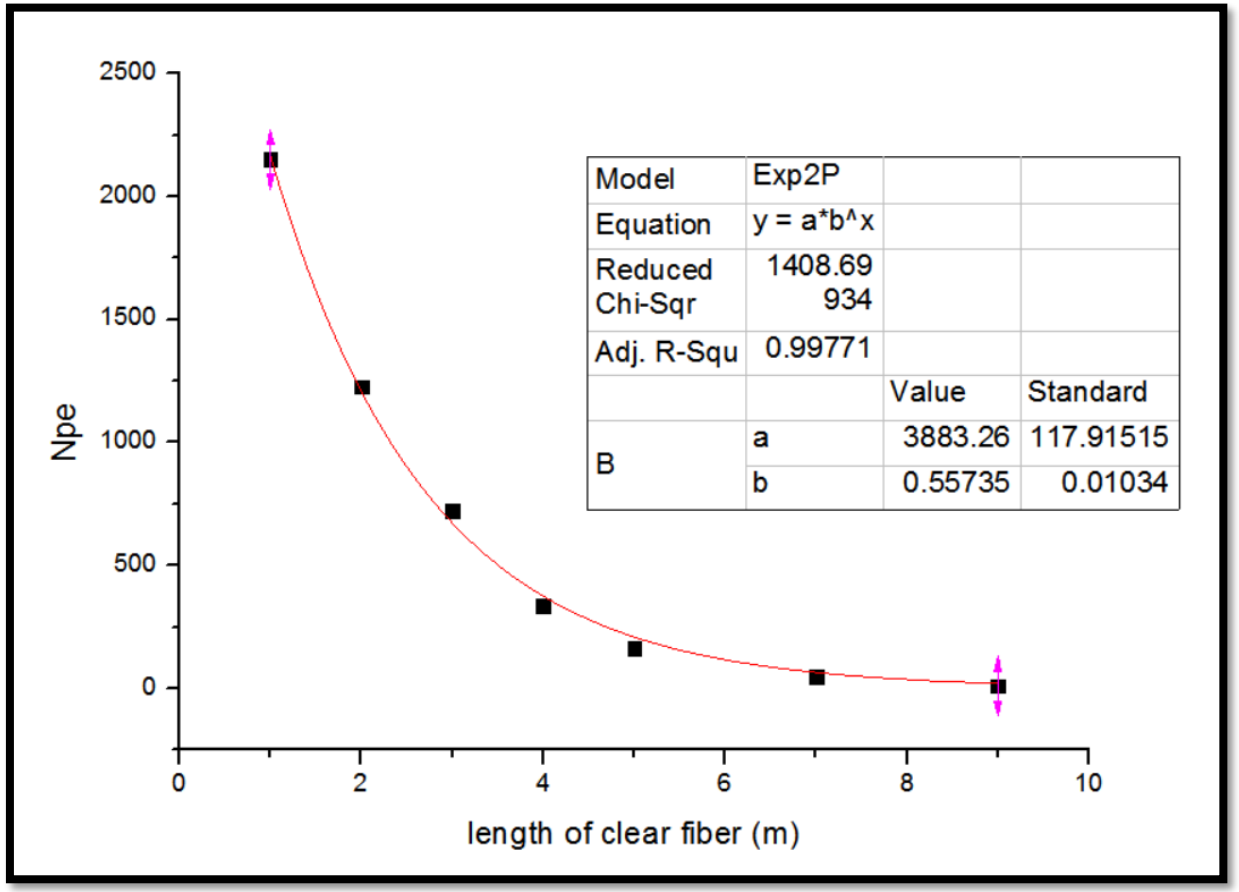


# Two kinds of exponential fitting with different function




$$y = -37 + 3840 \times 0.57^x$$




$$y = 3883 \times 0.56^x$$