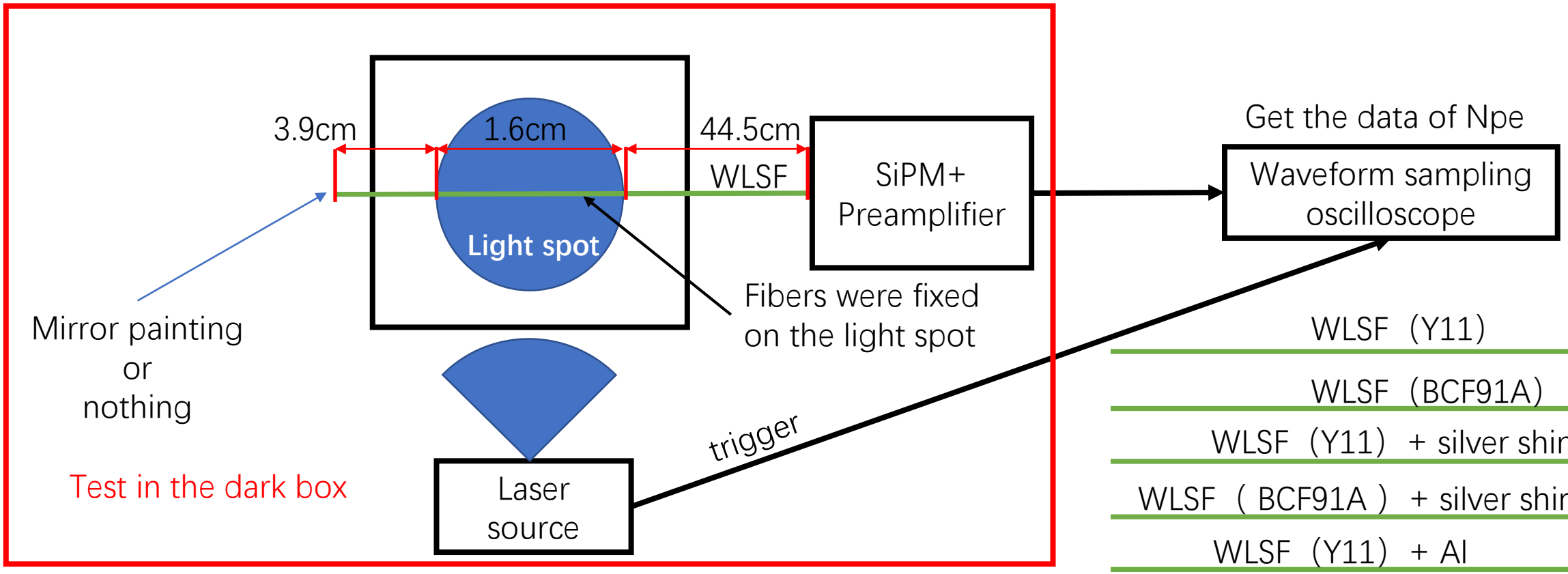
Test of two different fiber & mirror painting (2)



WLSF（Y11）

WLSF（BCF91A）

WLSF（Y11）+ silver shine 415001

WLSF（BCF91A）+ silver shine 415001

WLSF（Y11）+ Al

WLSF（BCF91A）+ Al

WLSF（Y11）+ Al (bending)

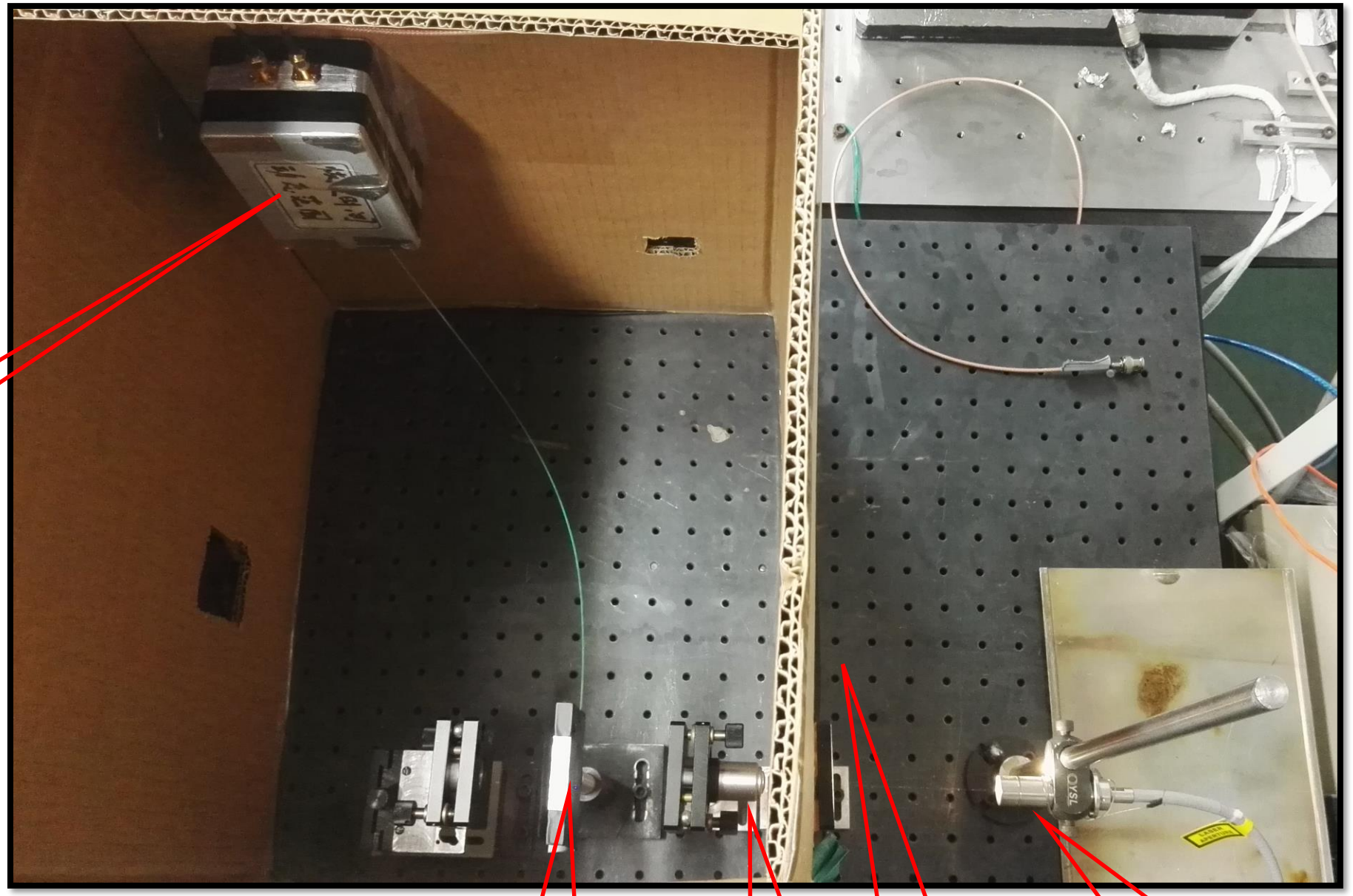
WLSF（BCF91A）+ Al (bending)

For laser source:
- 420 nm
- 1 MHz

For SiPM:
- Gain : 1.8×10^5
- 143.6pWb=1 pe
- Voltage=26.0 V

For the fibers:
- 50 cm
- Have been polished

Set up


SiPM
Light spot
Attenuates
Filter sheet
(420nm)
Laser source
White light

Gain of the SiPM (SPE)

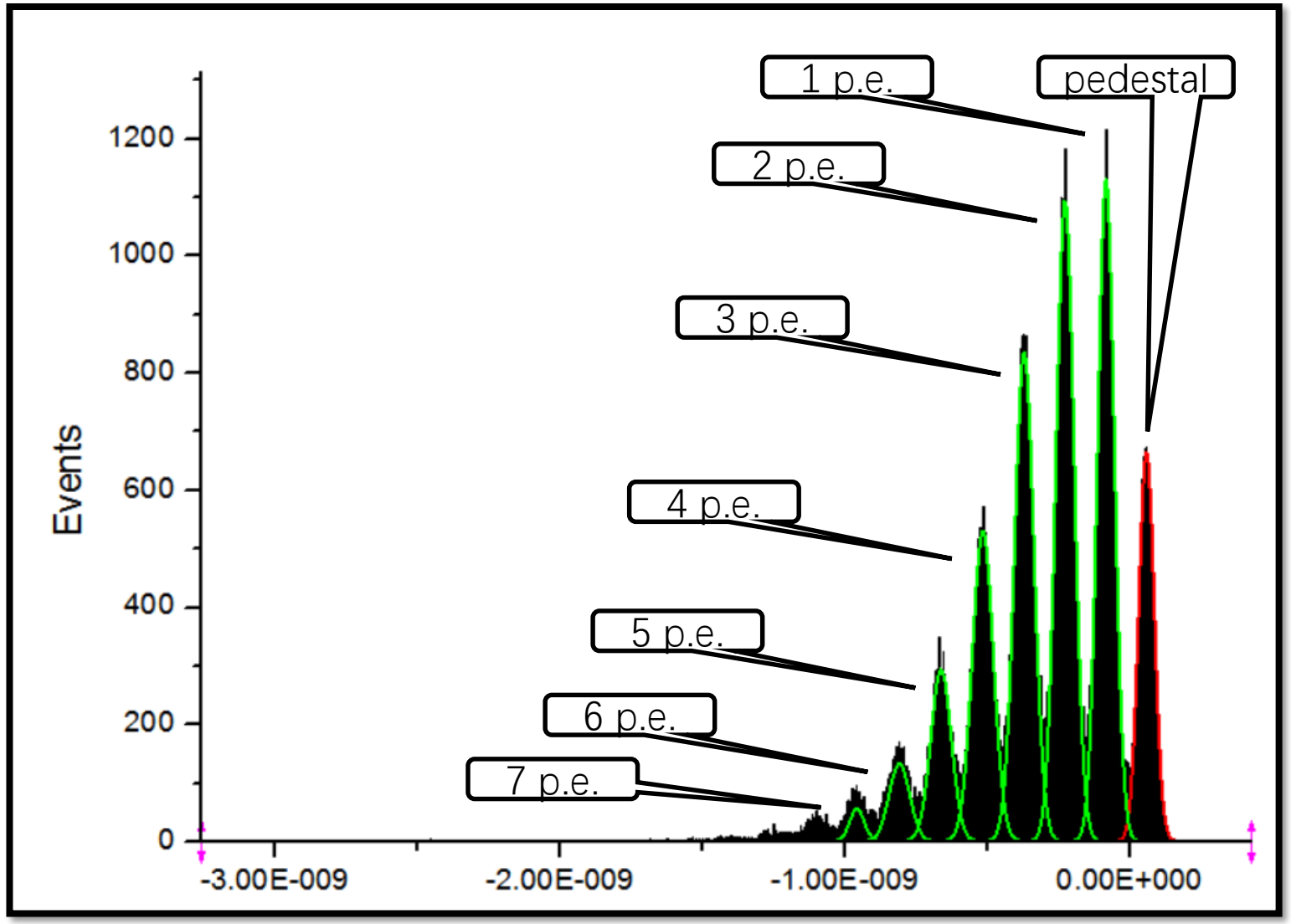
$$Gain = \frac{(\text{Center2} - \text{Center1}) + \frac{Center3 - Center1}{2} + \frac{Center4 - Center1}{3} + \frac{Center5 - Center1}{4} + \frac{Center6 - Center1}{5} + \frac{Center7 - Center1}{6} + \frac{Center8 - Center1}{7}}{7 \cdot 100 \cdot R \cdot e}$$

$$= \frac{143.6pvs}{100 \cdot R \cdot e} = 1.8 \times 10^5$$

143.6pvs=1PE

Preamplifier

50Ω for oscilloscope



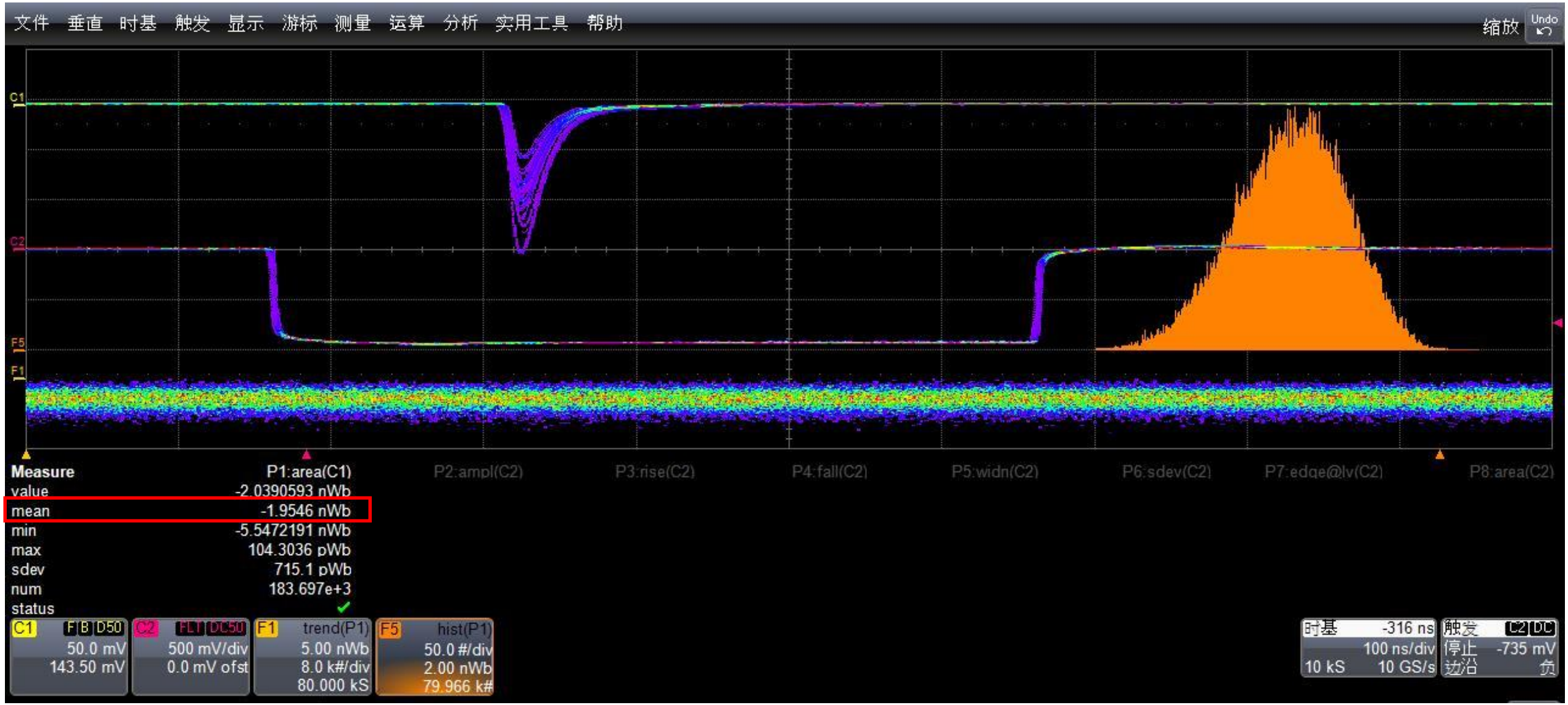
Peaks

	Area	Center	Width	Height
1	4.53063E-8	5.72544E-11	5.43624E-11	664.96661
2	8.33702E-8	-8.49256E-11	5.88727E-11	1129.89165
3	8.69636E-8	-2.28389E-10	6.3393E-11	1094.55243
4	7.07623E-8	-3.71933E-10	6.76893E-11	834.1086
5	4.83356E-8	-5.17147E-10	7.29513E-11	528.65696
6	2.61374E-8	-6.63694E-10	7.11253E-11	293.20997
7	1.18386E-8	-8.09885E-10	7.16004E-11	131.9238
8	3.51896E-9	-9.58835E-10	5.05406E-11	55.55388

WLSF（Y11）

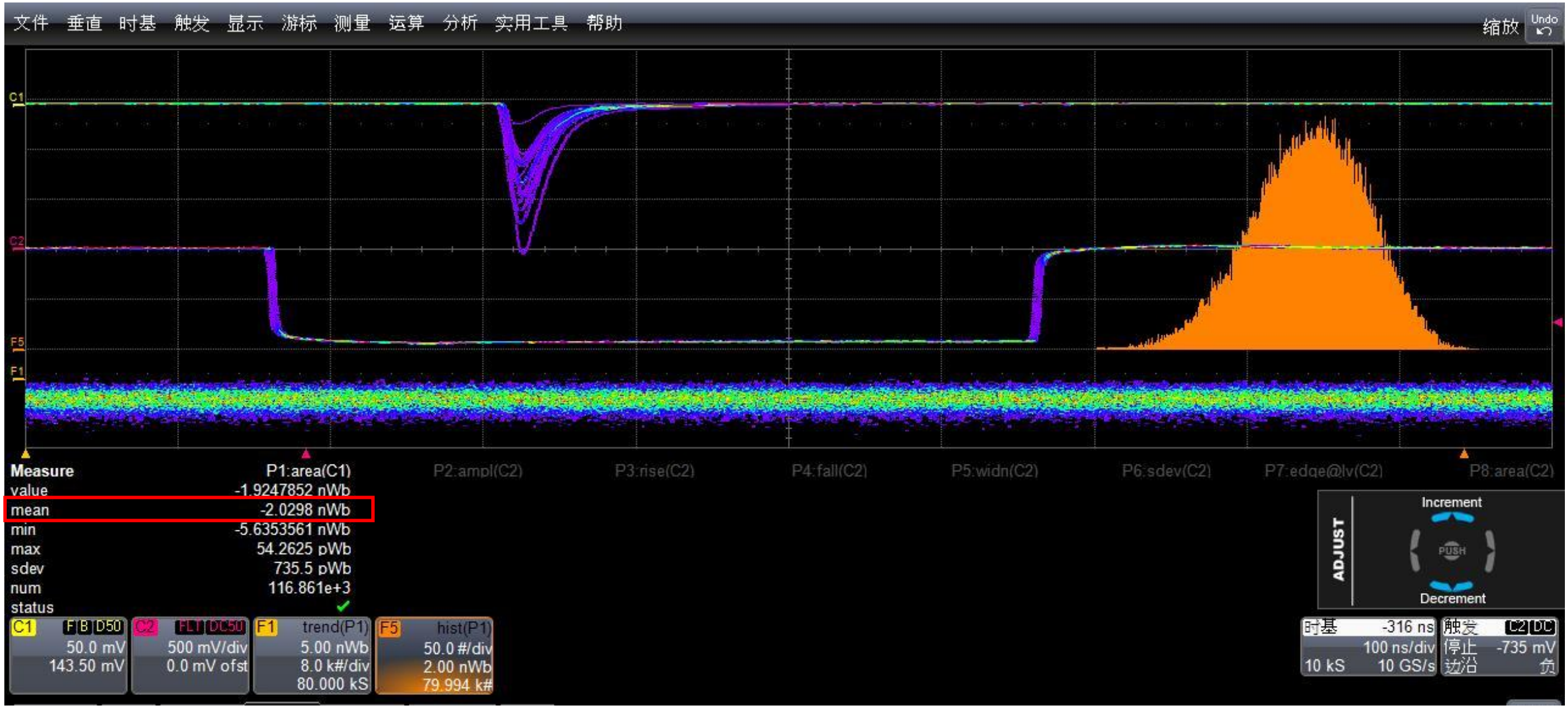
1nWb=1000pVs

$$Npe=\frac{1954.6pVs}{143.6pVs}=14$$



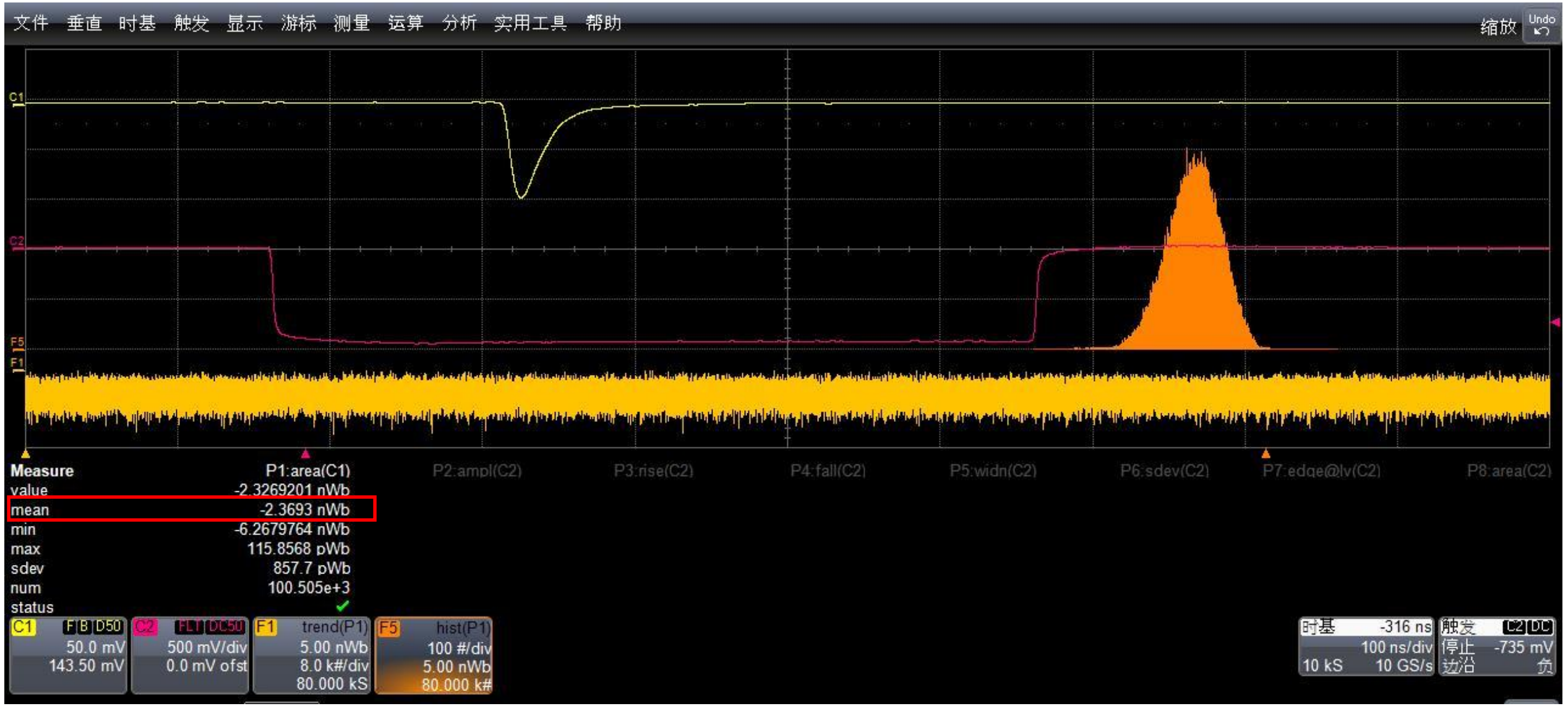
WLSF（BCF91A）

$$Npe=\frac{2029.8pVs}{143.6pVs}=14$$



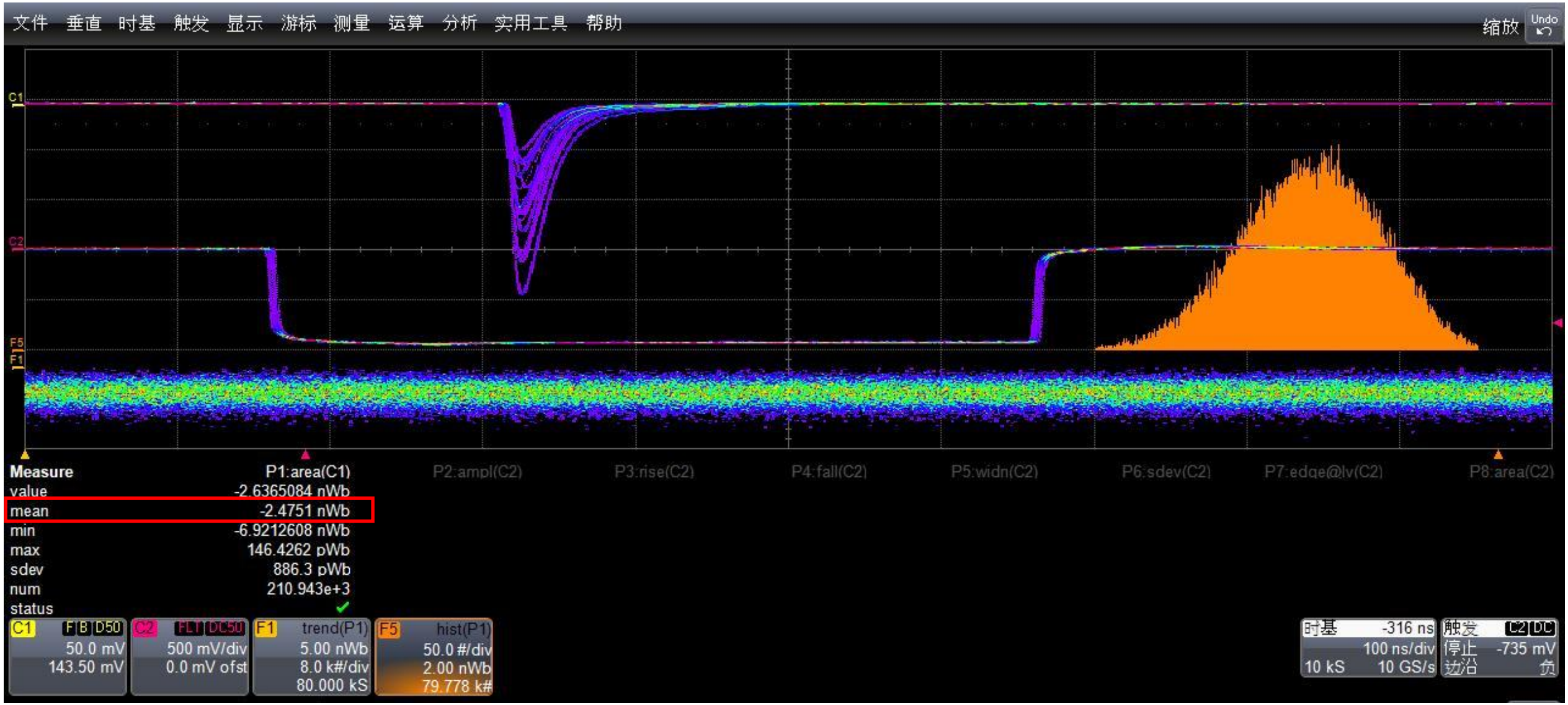
WLSF（Y11）+ silver shine 415001

$$Npe=\frac{2369.3pVs}{143.6pVs}=16$$



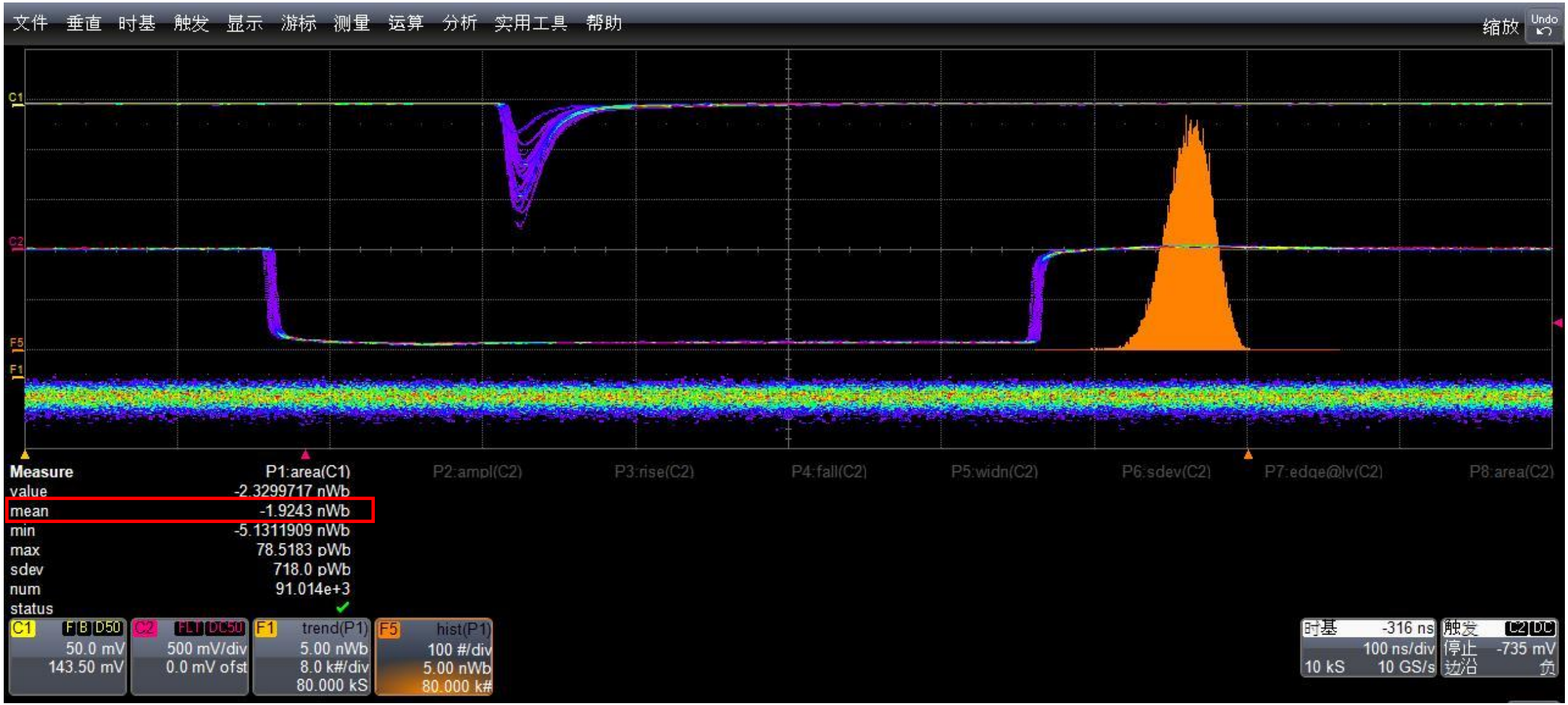
WLSF（BCF91A）+ silver shine 415001

$$Npe=\frac{2475.1pVs}{143.6pVs}=17$$



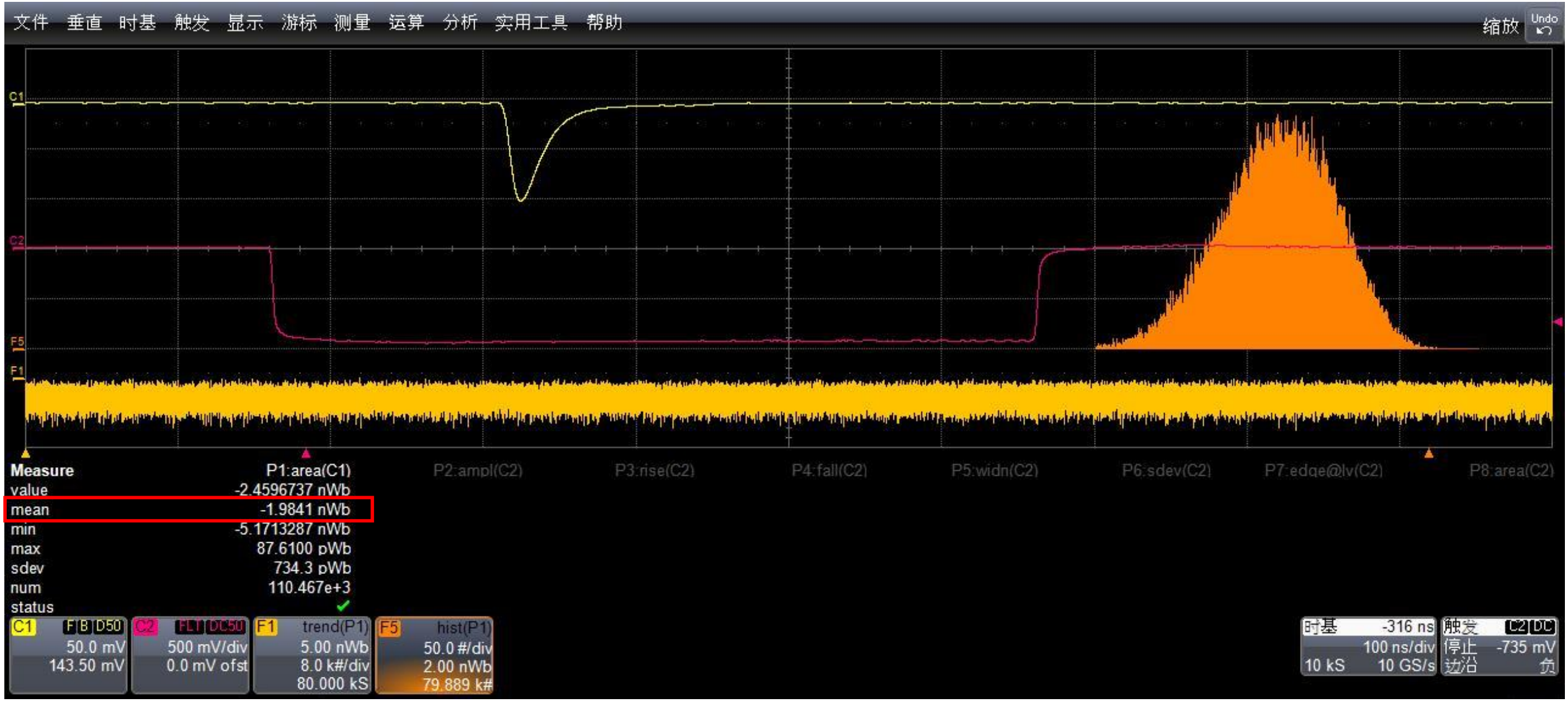
WLSF（Y11）+ Al

$$Npe = \frac{1924.3pVs}{143.6pVs} = 13$$

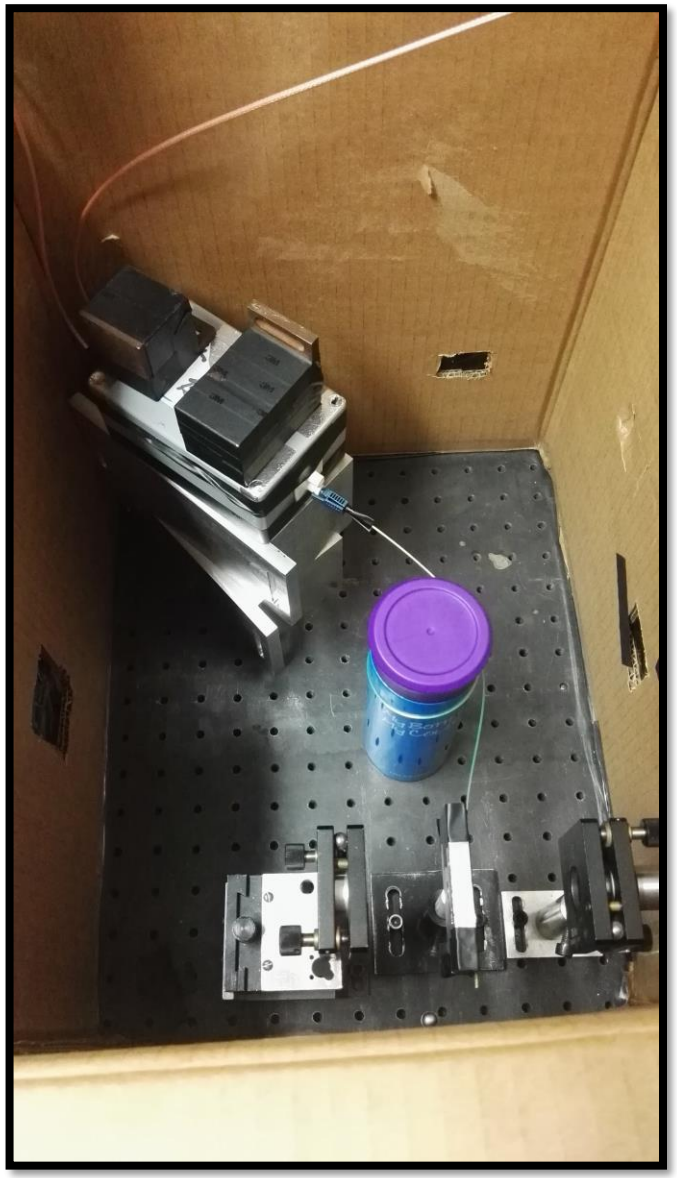


WLSF（BCF91A）+ Al

$$Npe=\frac{1984.1pVs}{143.6pVs}=14$$

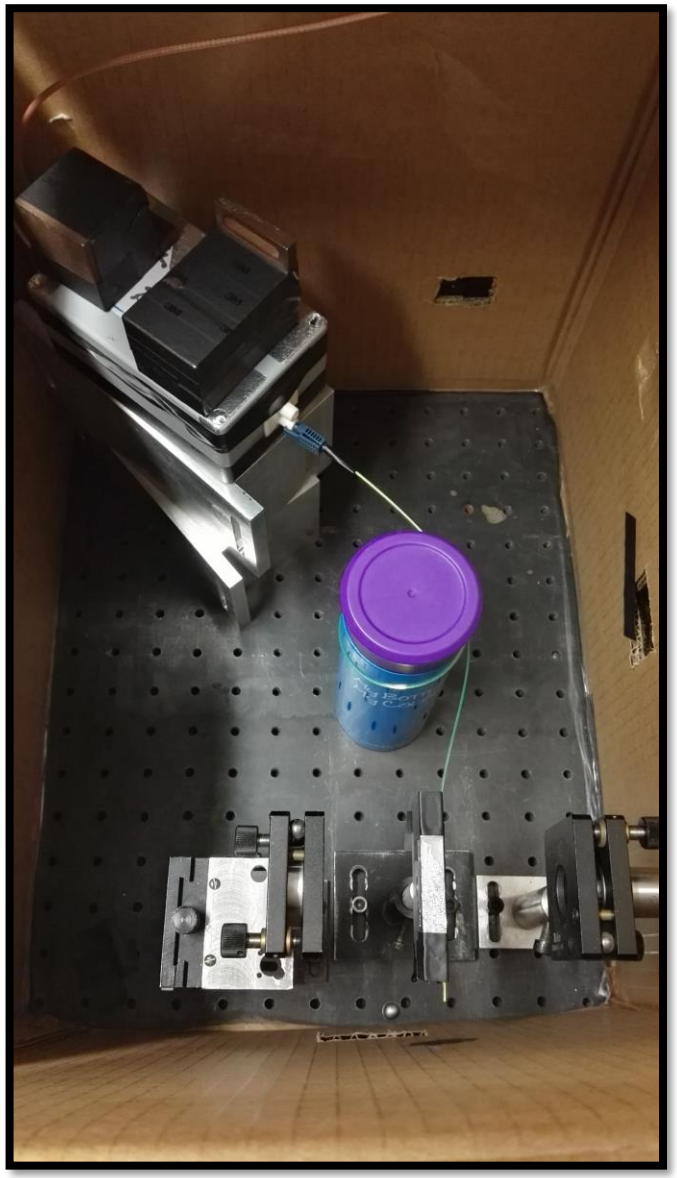


(set up) Al+bending



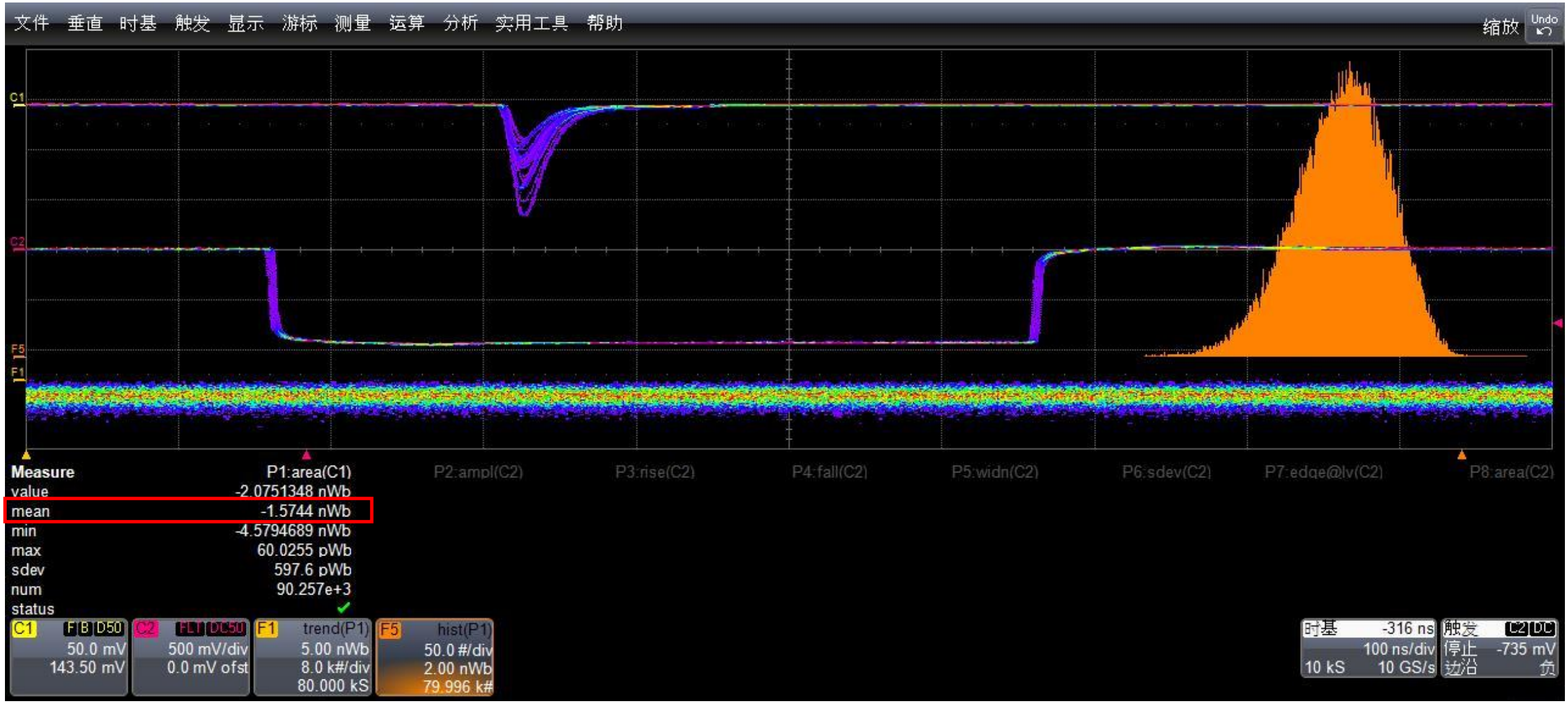
Same location with different fiber

(the diameter of the cup is about 6cm)



WLSF（Y11）+ Al (bending)

$$Npe=\frac{1574.4pVs}{143.6pVs}=11$$

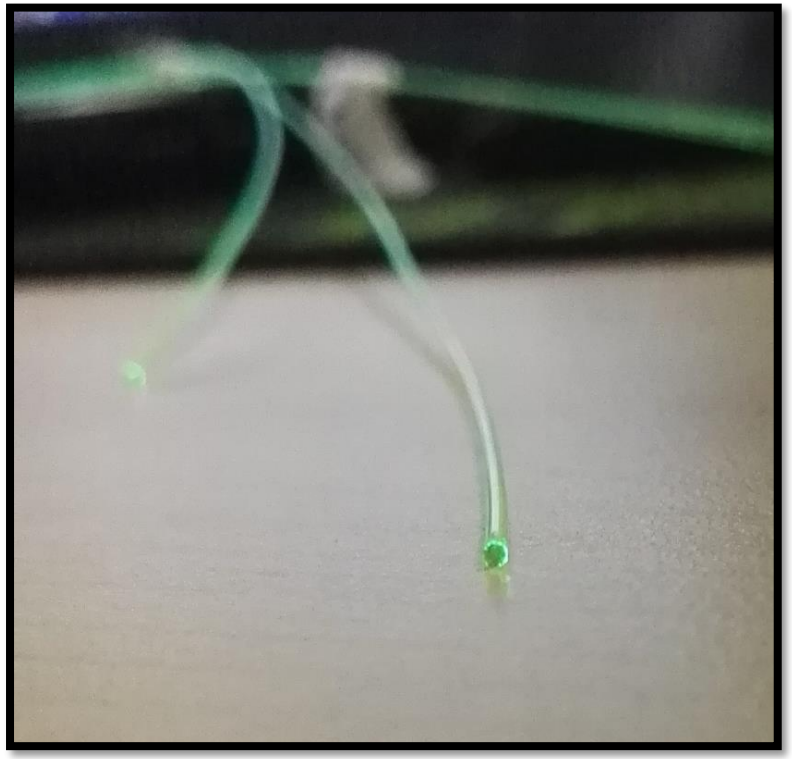


WLSF（BCF91A）+ Al (bending)

$$Npe=\frac{618.4pVs}{143.6pVs}=4$$

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.