Updates on HRPPD #25 activities

Mapping, position scans, light source characterisation

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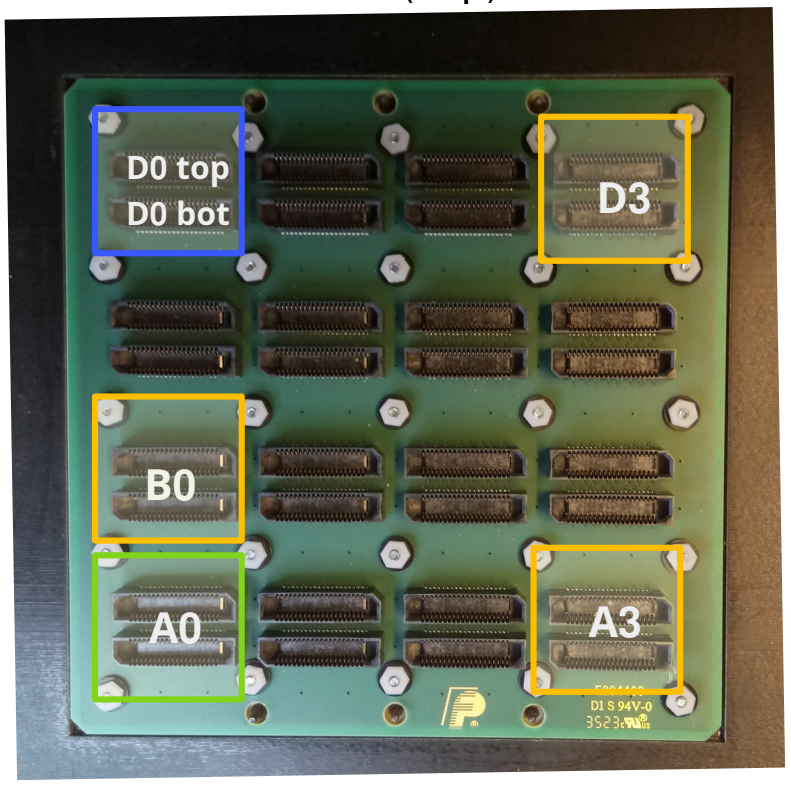
Outline

- Mapping of pixel to pin
- Position scans
  (modified optics – narrower spot)
- Characterisation of
  - Pulsed Laser
  - Continuous LED

Mapping

PC (Top)



G (bottom)

D0

?	27	33	23	19	14	11	9
34	?	29	24	20	13	3	10
30	?	31	21	17	7	4	?
38	28	32	22	18	8	12	?
2	12	8	18	22	32	28	38
1	4	7	17	21	?	40	37
10	3	13	20	24	29	?	34
9	11	14	19	23	30	27	33

A0

37	27	33	?	19	14	11	9
34	39	29	24	20	13	3	10
30	40	31	21	17	7	4	1
38	28	32	22	?	8	12	2
2	12	8	18	22	32	28	38
1	4	7	17	21	31	40	37
10	3	13	20	24	29	39	34
9	11	14	19	23	30	27	33

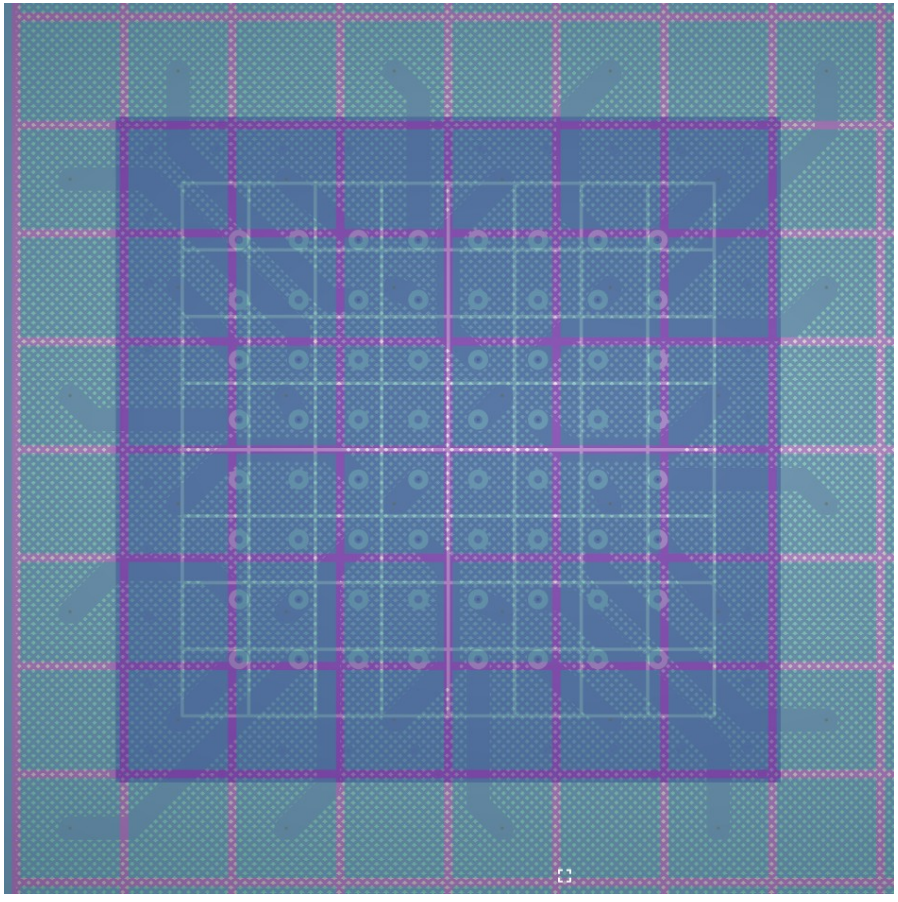
Rear End View

33	27	30	23	19	9	11	1
34	39	29	24	20	13	3	10
37	40	31	21	17	7	4	14
38	28	32	22	18	8	12	2
2	12	8	18	22	32	28	38
1	4	7	17	21	31	40	37
10	3	13	20	24	29	39	34
9	11	14	19	23	30	27	33

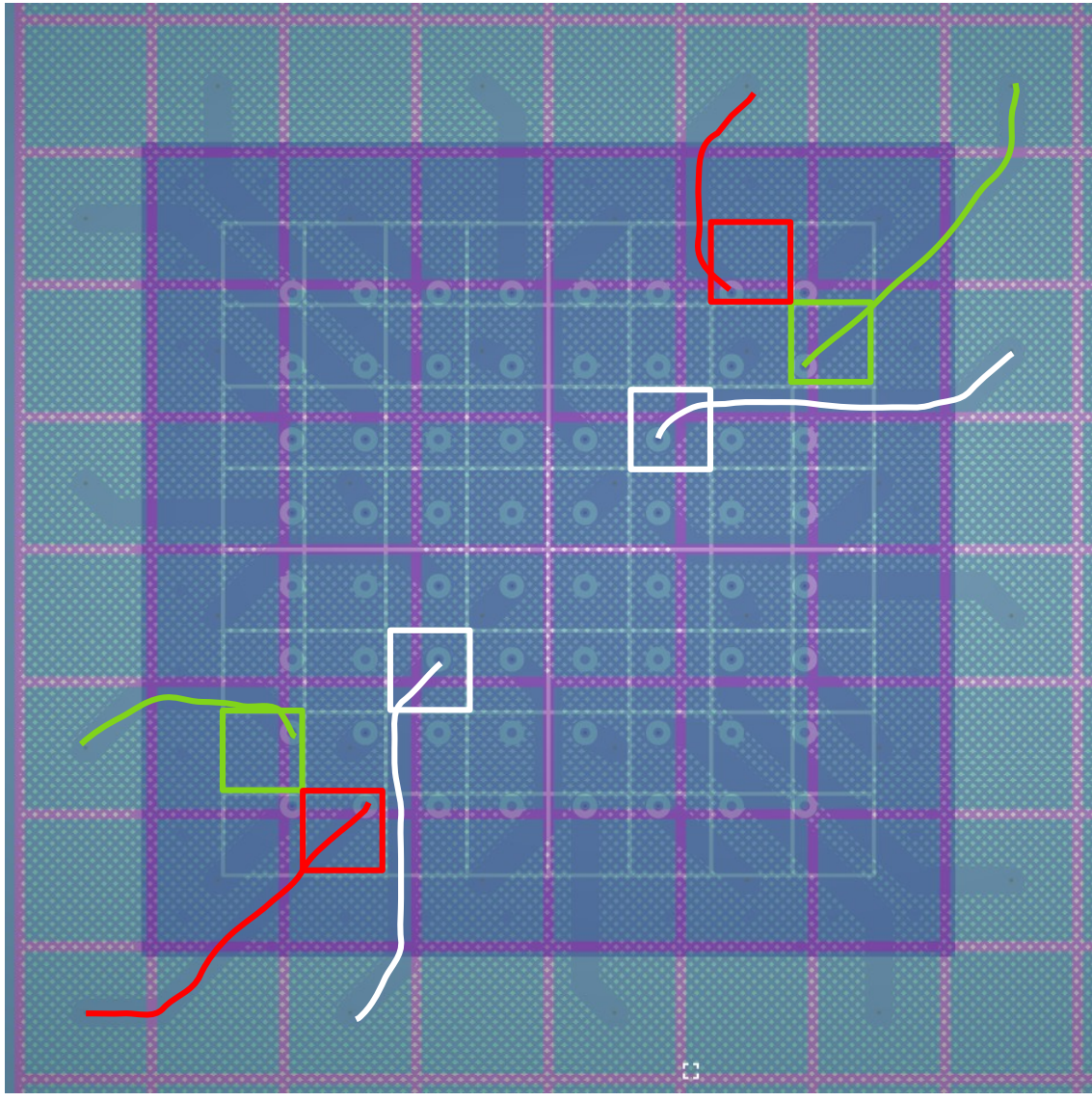
From two Gerber files
Alexander's Map

Measured (A0, D0) and Alexander's are NOT compatible for Top (4 x 8)

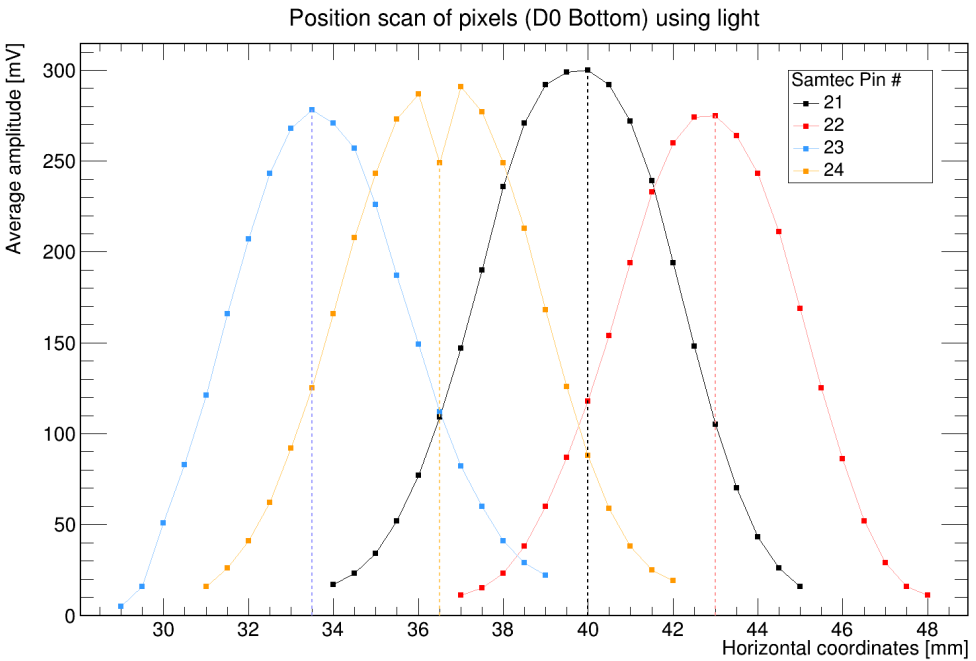
Mapping



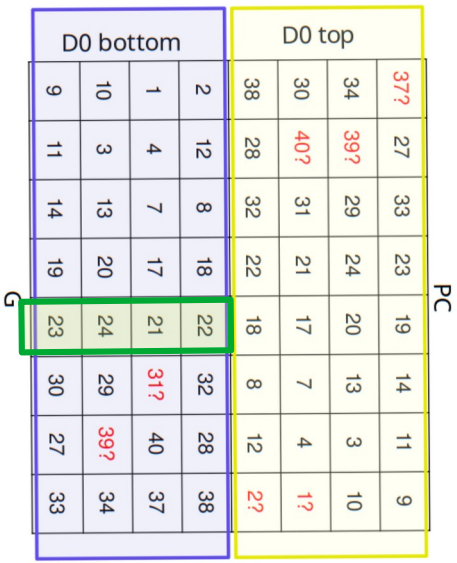
Layer 1



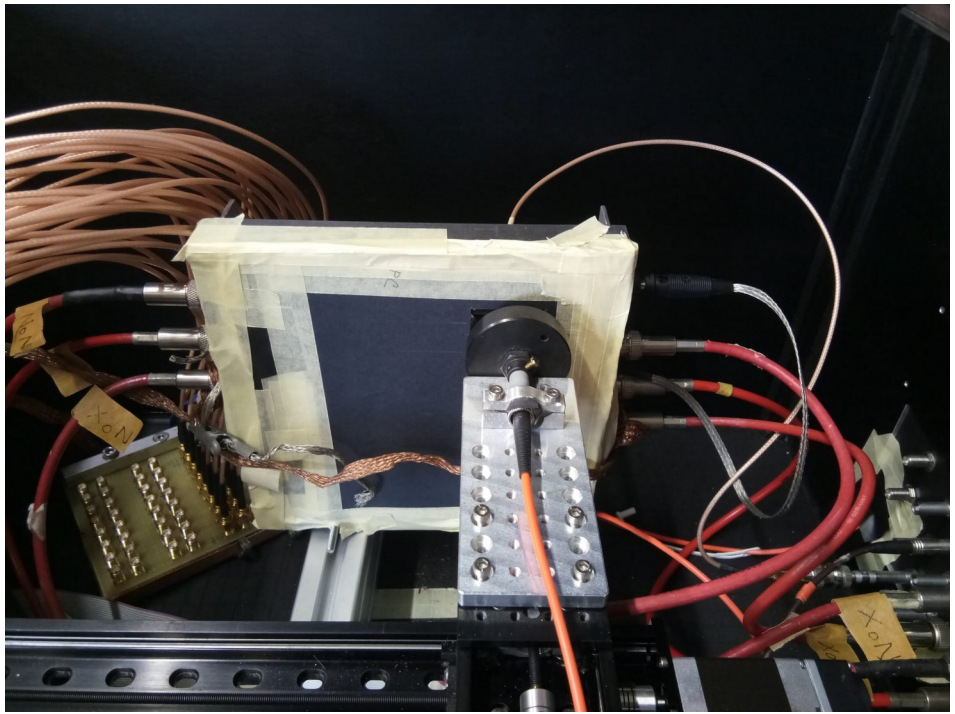
Position scan

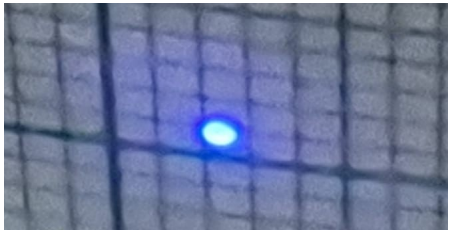


- Average amplitude of ~ 2k events as a function of position
- In a step of 0.5 mm
- -200_-700_-200-700_-30 V
- Light intensity 2.0
- Trigger at -150 mV on Laser sync pulse (1.2 V_{RMS}) of rate 1.0 kHz



Optics modified





Focusing fibre lens mounted

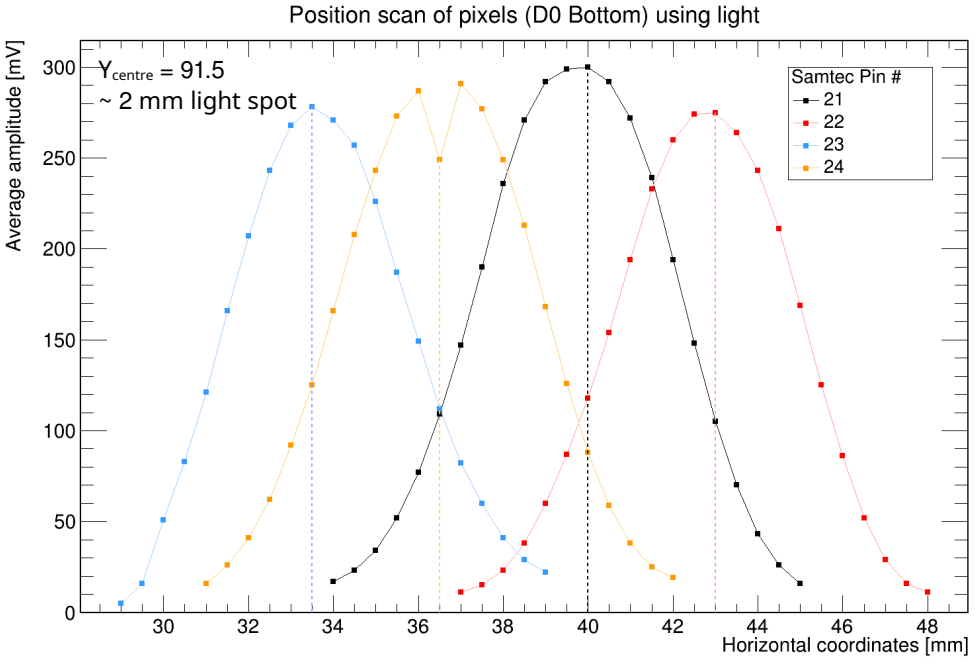
- 2.4 cm focal length, ~ 4 mm diameter
- ~ 10 % acceptance

- Coordinate modified from (Y, 48 mm, X) to (Y, 27mm, X)
- Intensity 2.0 (without lens) is compatible with intensity ~ 3.5 (with lens) – corresponding to npe ~7

Position scan – lateral charge spread

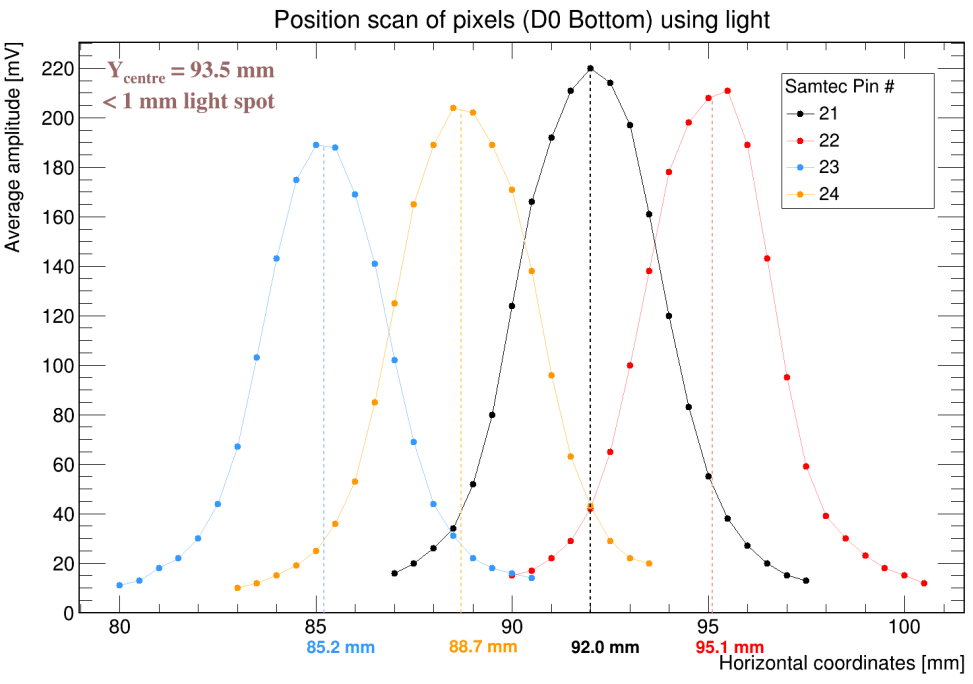
HV bias: -200_-700_-200_-700_-30V

~ 2 mm light spot
Intensity 2.0 (n.p.e. ~7)



~ 60% on the pad
~ 40% on neighbouring pads

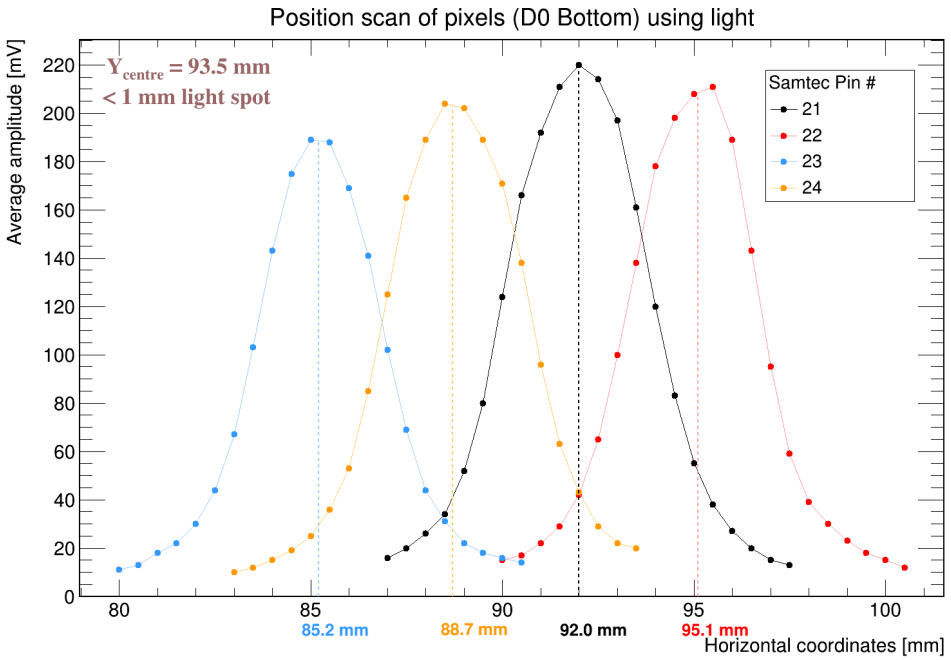
< 1 mm light spot
Intensity 3.5 (n.p.e. ~7)



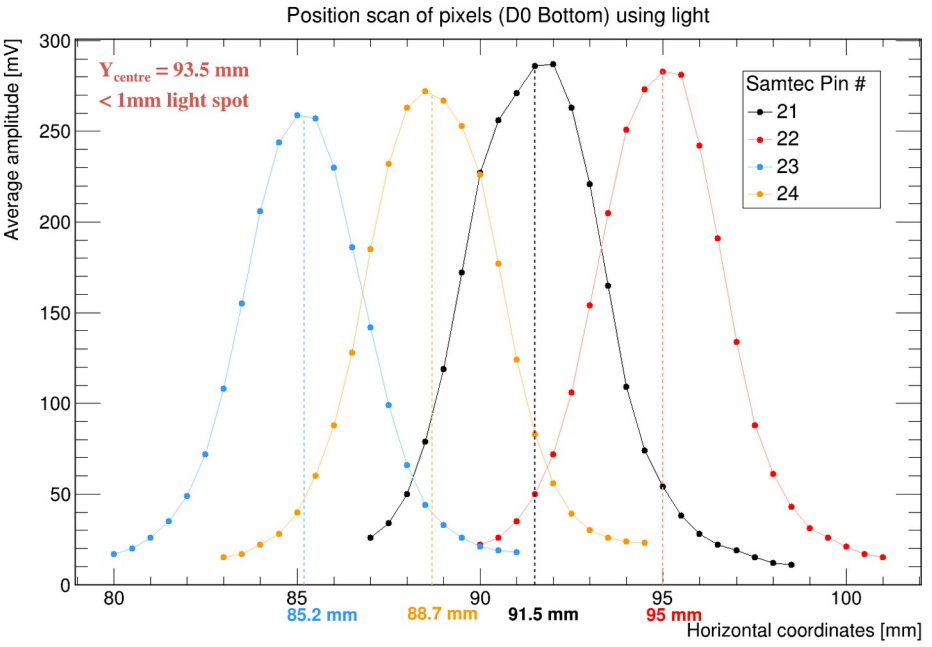
~ 80% on the pad
~ 20% on neighbouring pads

Position scan

HV bias: -200_-700_-200_-700_-30V



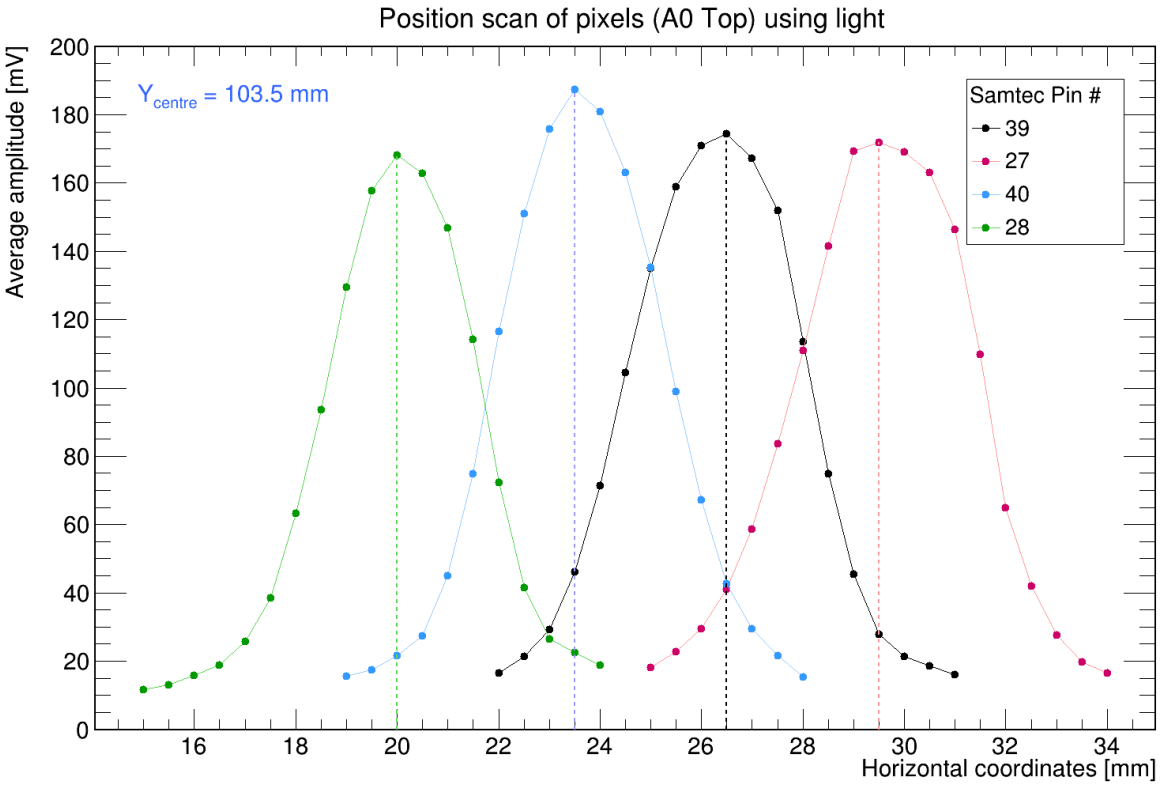
HV bias: -200_-700_-200_-700_**-100**V



Further narrower distribution expected
NOT the case

Position scan - A0

37	27	33	?	19	14	11	9
34	39	29	24	20	13	3	10
30	40	31	21	17	7	4	1
38	28	32	22	?	8	12	2
2	12	8	18	22	32	28	38
1	4	7	17	21	31	40	37
10	3	13	20	24	29	39	34
9	11	14	19	23	30	27	33

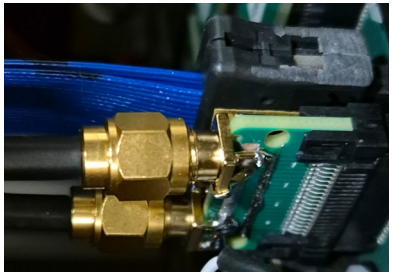


Same as D0

~ 80% on the pad

~ 20% on neighbouring pads

Pulsed laser

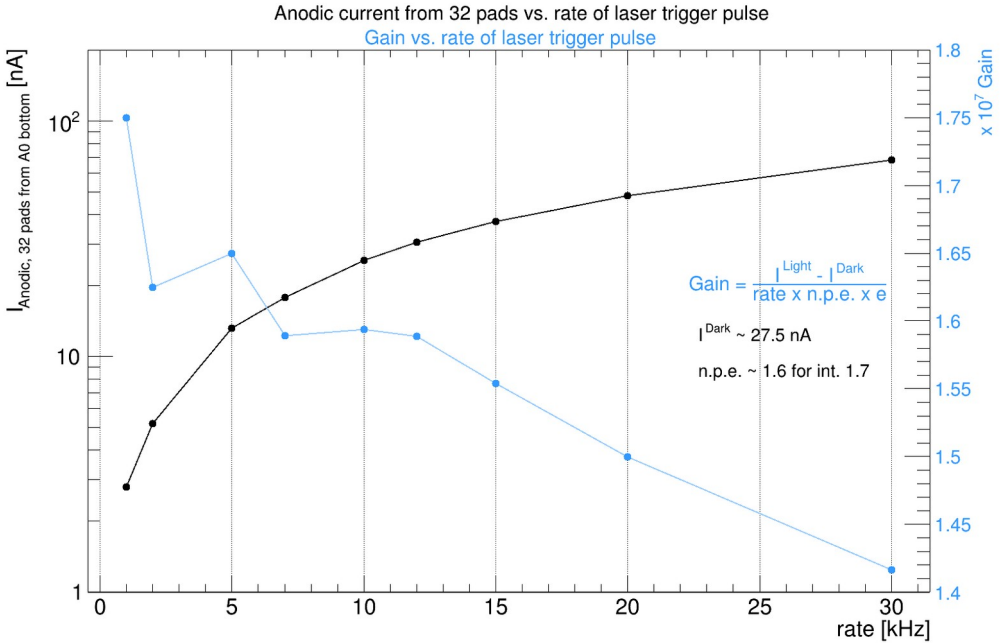


Before mounting the lens

A0 top

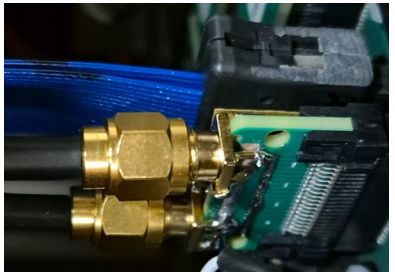
37	27	33	?	19	14	11	9
34	39	29	24	20	13	3	10
30	40	31	21	17	7	4	1
38	28	32	22	?	8	12	2
2	12	8	18	22	32	28	38
1	4	7	17	21	31	40	37
10	3	13	20	24	29	39	34
9	11	14	19	23	30	27	33

Current from 32 Pad (A0 Top) measured with Keithley as a function of rate of pulses that trigger the Laser



I_Keithley, Gain saturates after 10 kHz

Pulsed laser



Before mounting the lens

A0 top

37	27	33	?	19	14	11	9
34	39	29	24	20	13	3	10
30	40	31	21	17	7	4	1
38	28	32	22	?	8	12	2
2	12	8	18	22	32	28	38
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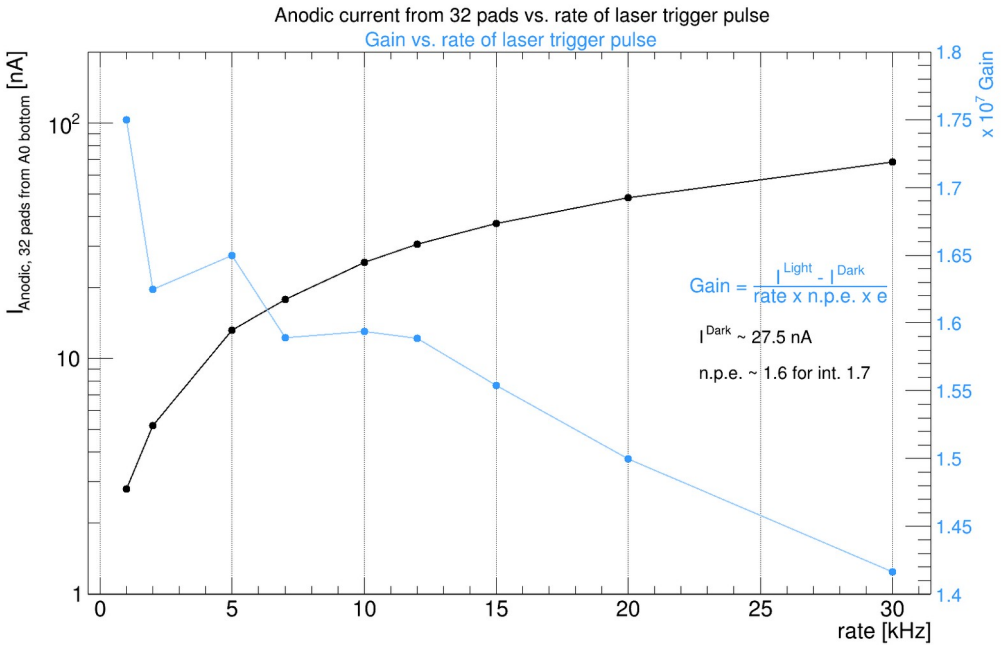
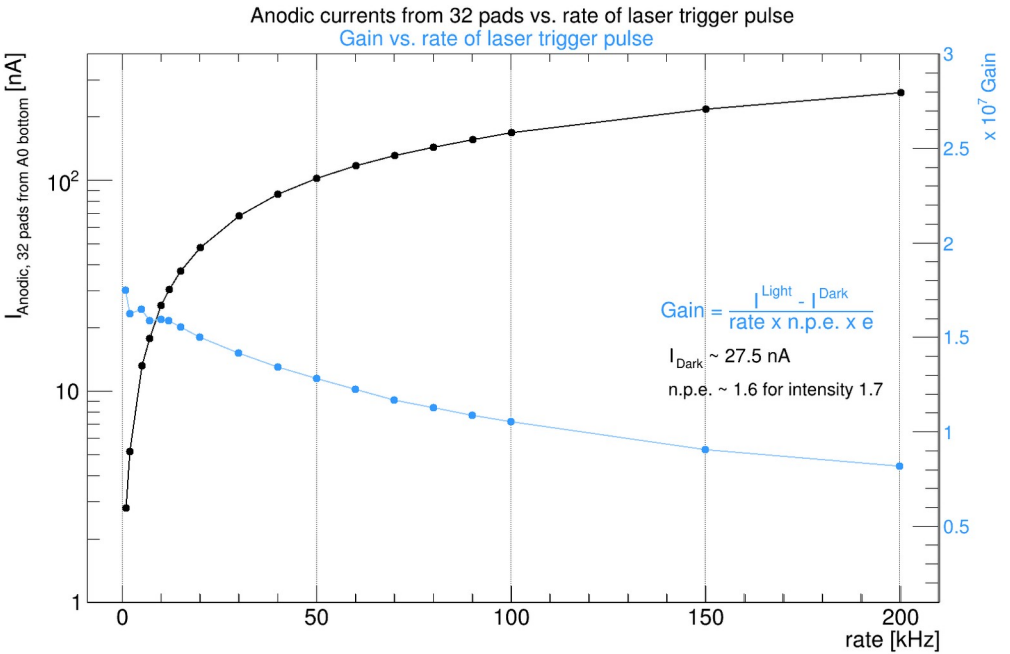
9	11	14	19	23	30	27	33

Current from 32 Pad (A0 Top) measured with Keithley as a function of rate of pulses that trigger the Laser





Power measurement with photometer

Photometer

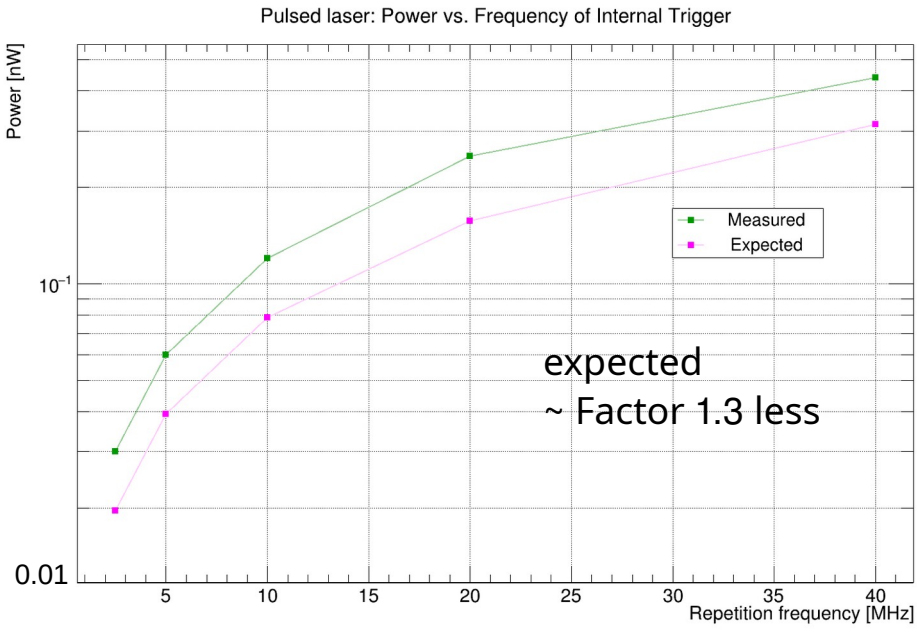
- FC/PC mount
- SMA mount

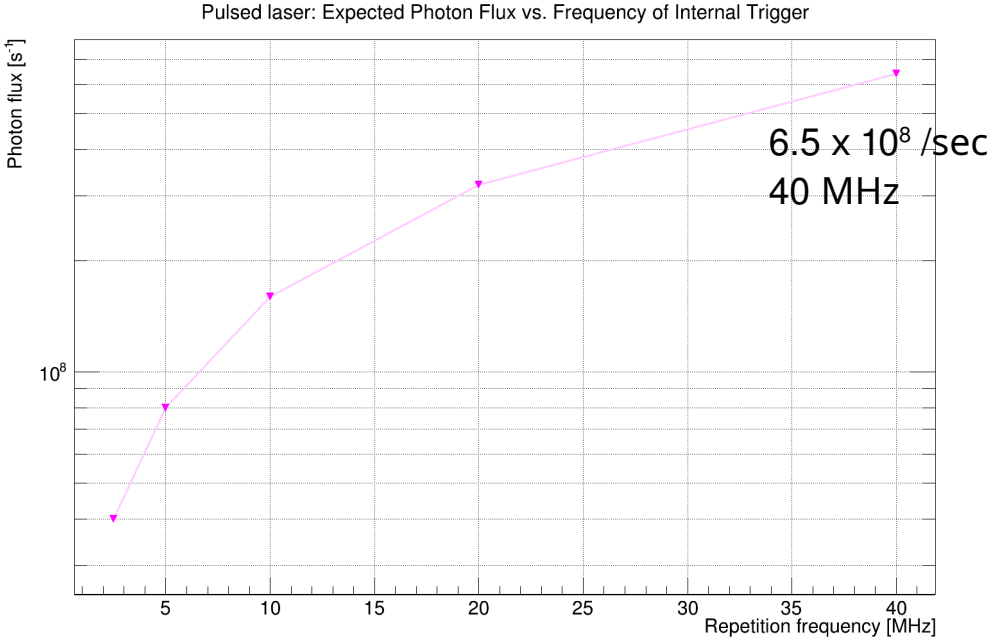
Console

- Connects to Computer
- Data can be visualised and saved

Pulsed laser

Laser at internal trigger mode; **Fixed Intensity 1.7** (npe ~ 1.6)





$P_{expected}$ (W) = f (Hz) x npe (/pulse) x QE^-1 x E (J)

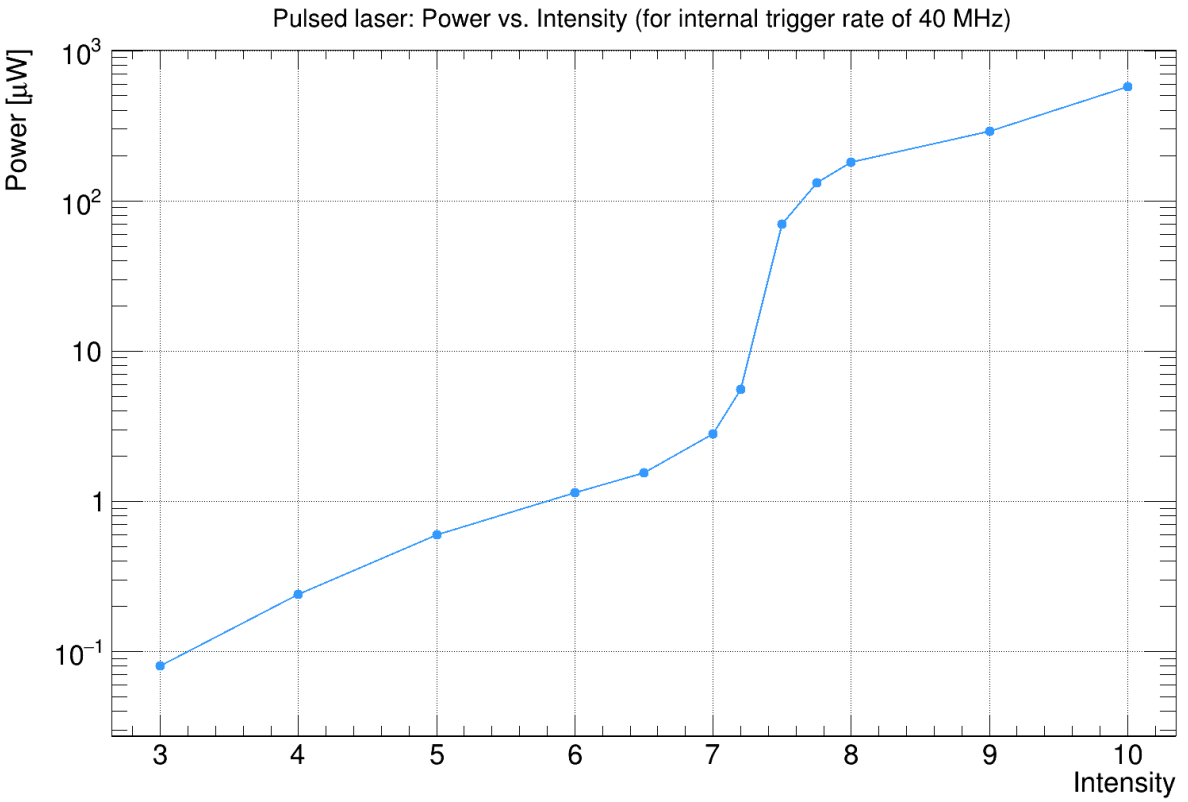
E = hc/λ

λ = 405 nm

Pulsed laser

Laser at internal trigger mode;

Fixed repetition frequency 40 MHz 1.7

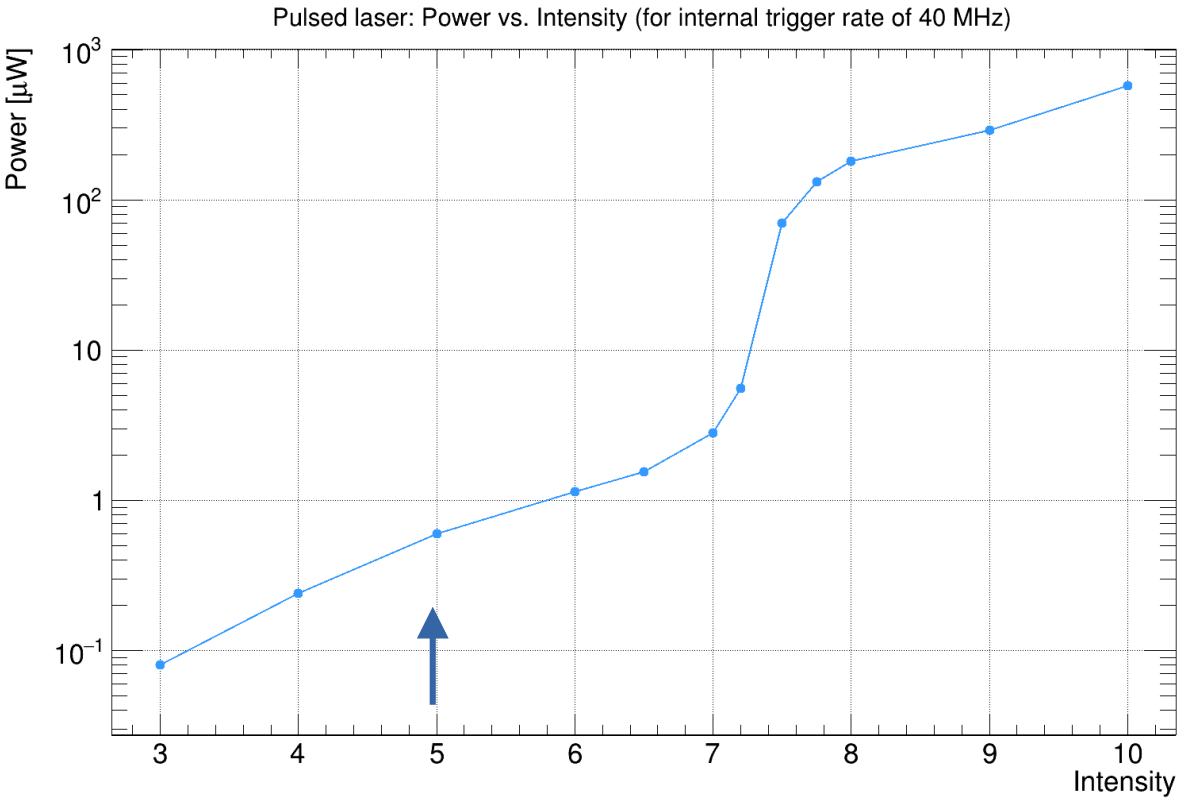


Pulsed laser

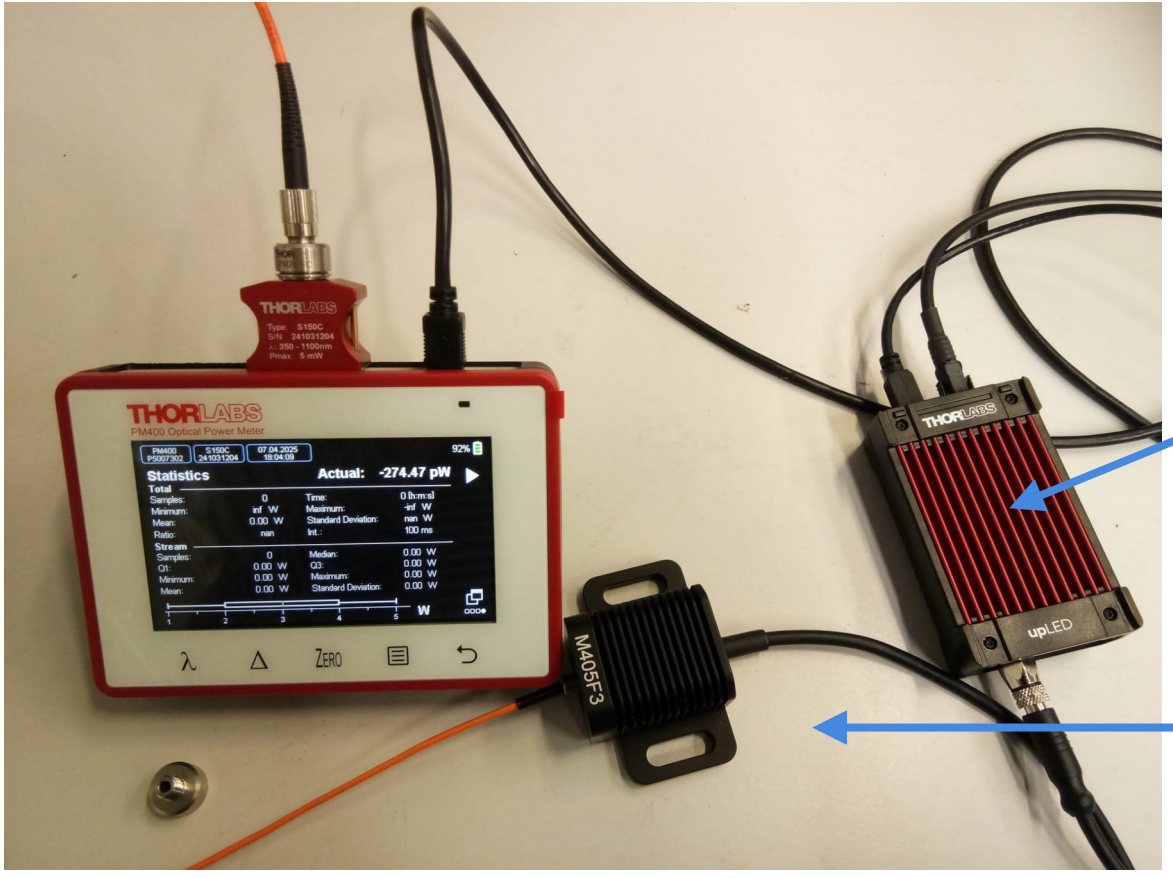
Laser at internal trigger mode;
Fixed repetition frequency 40 MHz 1.7

Arshak's number:
10^12 photons/sec
25k photons/pulse

~ 0,5 mW (has to be checked)



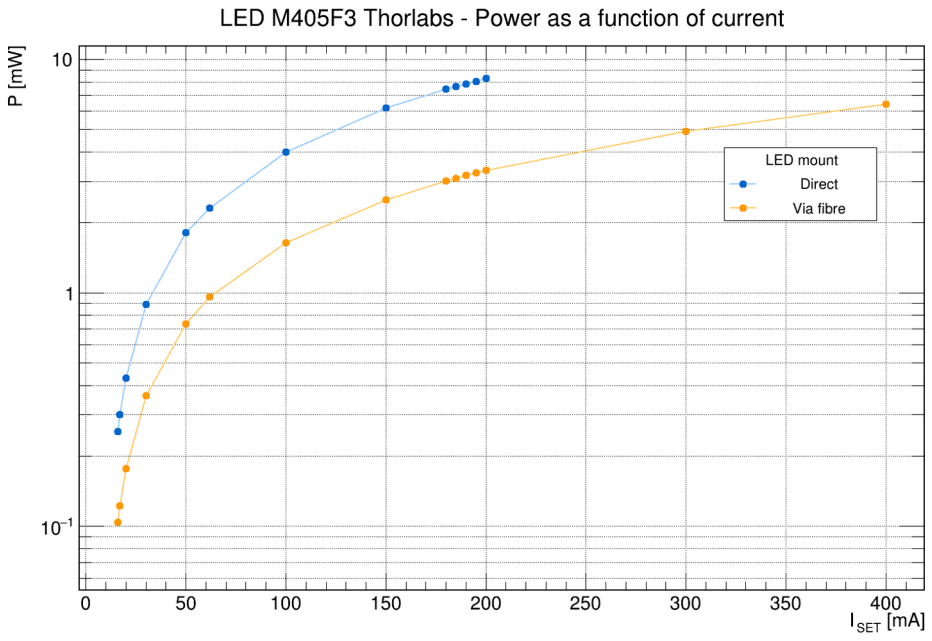
Continuous LED

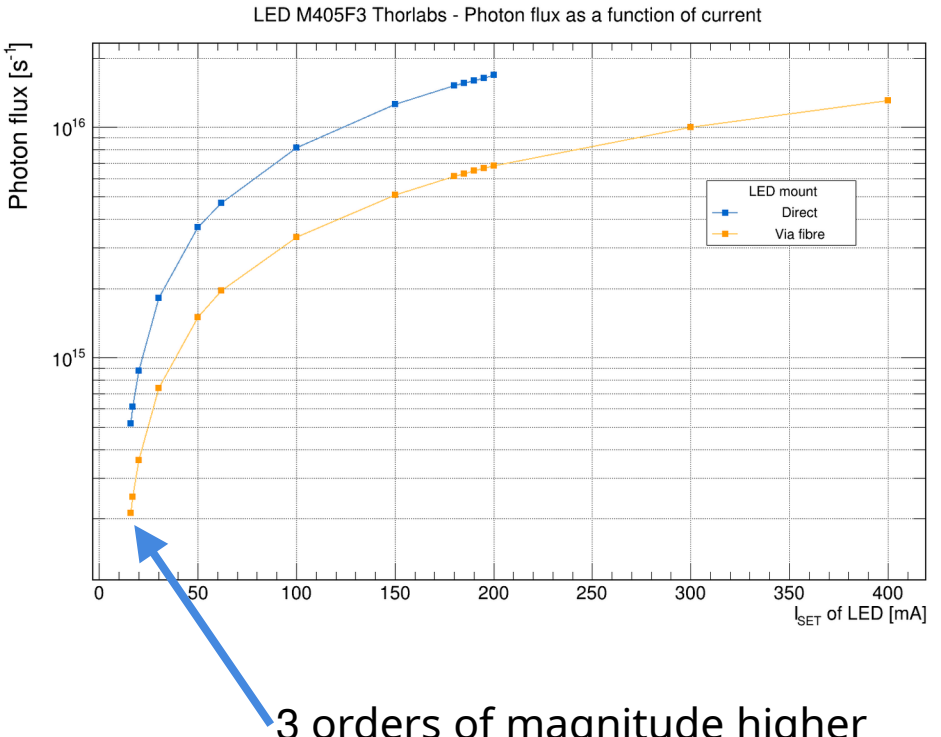


Continuous LED

LED from Thorlabs
M405F3
400 µm, 0.39 NA

Minimum set current
16 mA





3 orders of magnitude higher
Compared to Arshak's number

Numbers from analysis

Rate	Ikeithley	Gain(10^7)
rate and Ik and G: 1	30.3	1.75
rate and Ik and G: 2	32.7	1.625
rate and Ik and G: 5	40.7	1.65
rate and Ik and G: 7	45.3	1.58929
rate and Ik and G: 10	53	1.59375
rate and Ik and G: 12	58	1.58854
rate and Ik and G: 15	64.8	1.55417
rate and Ik and G: 20	75.5	1.5
rate and Ik and G: 30	95.5	1.41667
rate and Ik and G: 40	113.5	1.34375
rate and Ik and G: 50	130	1.28125
rate and Ik and G: 60	145.2	1.22604
rate and Ik and G: 70	158.5	1.16964
rate and Ik and G: 80	171.7	1.12656
rate and Ik and G: 90	184	1.08681
rate and Ik and G: 100	196	1.05313
rate and Ik and G: 150	245.2	0.907083
rate and Ik and G: 200	289	0.817187

Power[LED]	Photon flux[Hz]
0.104	2.1e+14
0.122	2.5e+14
0.176	3.6e+14
0.362	7.4e+14
0.736	1.5e+15
0.961	1.9e+15
1.639	3.3e+15
2.496	5.1e+15
3.003	6.1e+15
3.09	6.3e+15
3.181	6.5e+15
3.266	6.6e+15
3.356	6.8e+15
4.93	1.0e+16
6.409	1.3e+16