TaichuPix Laser test update

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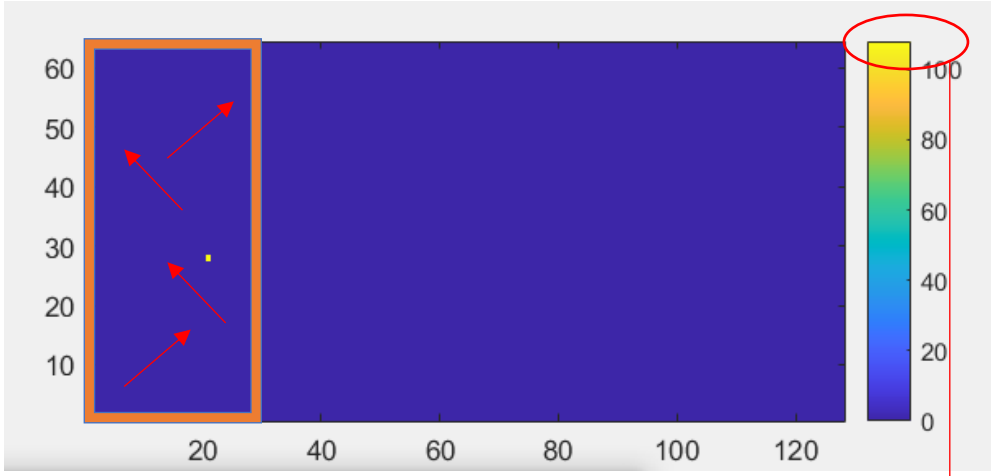
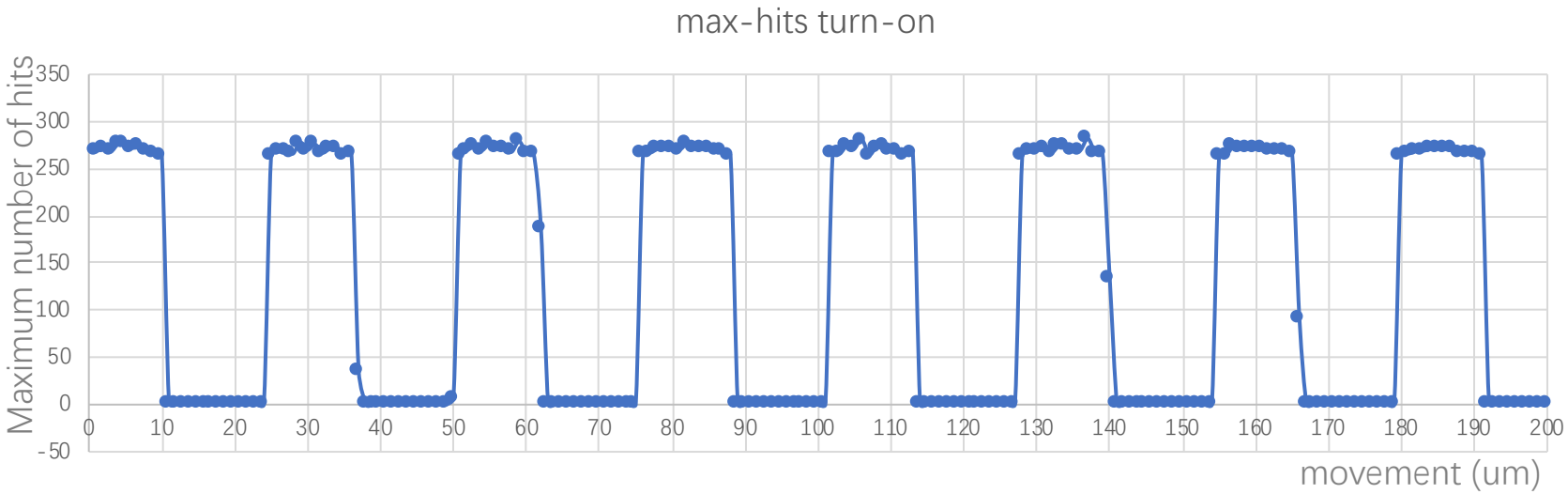
Set up



- Laser diode with 1064nm
- Efficient laser spot size 1~4um
  - turn-on width = mask window size + spot size
- Test area: Sector 1 (32x64 Pixels)
- Linear scan with random lines of 200 step * 1um/step (~8 Pixels/line)
- TaichuPix threshold fixed to ITHR:1000

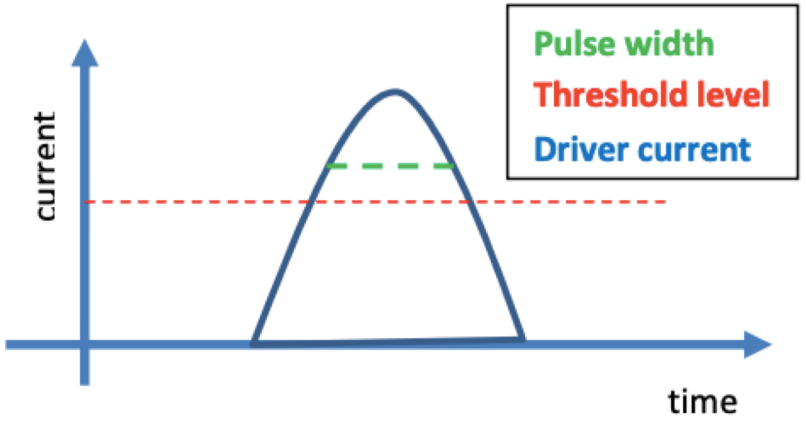


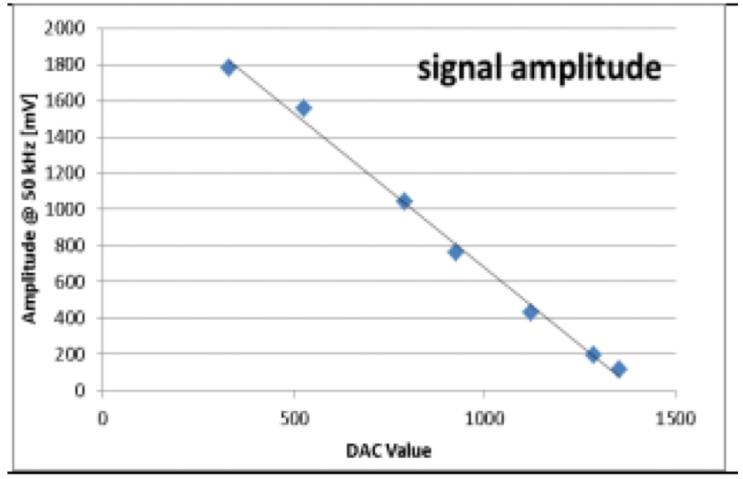
Maximum of the number of hits

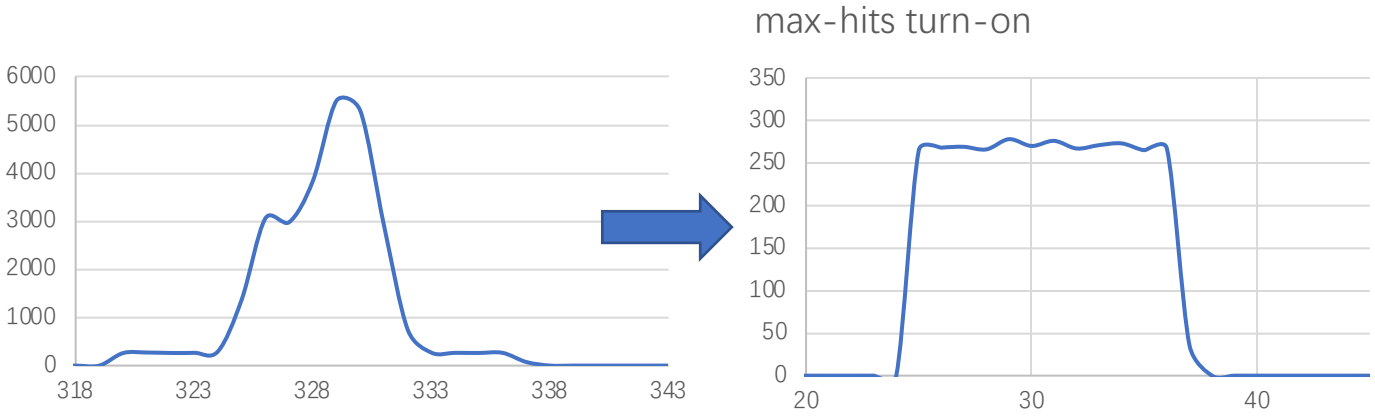
w.r.t the movement (1um/step)

Laster config

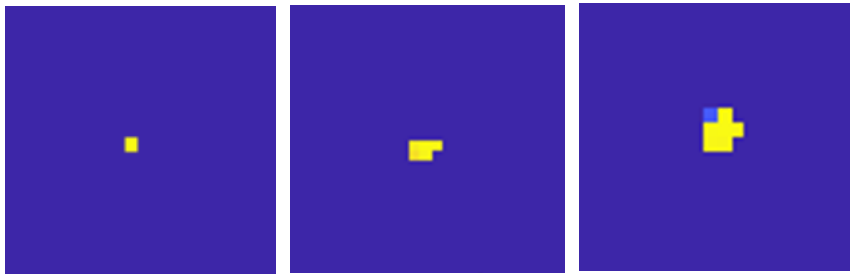
- Laser threshold 70%, 75%, 80%
- Laser pulse frequency 100Hz
  - turn-on plateau get flat when laser frequency >= 100 Hz (peak disappeared)
  - readout efficiency ~ 50%
  - cluster size also get larger by increasing the laser frequency







max-hits turn-on



Cluster computation

- Readouts considered in one cluster if
  - within 3 timestamp
  - within a radius of 5 pixel

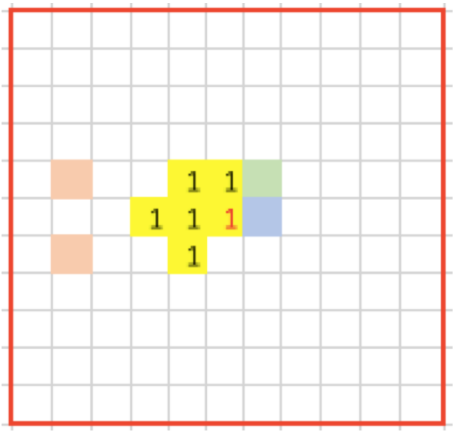
Timestamp
Same MSB
ΔLSB <=3

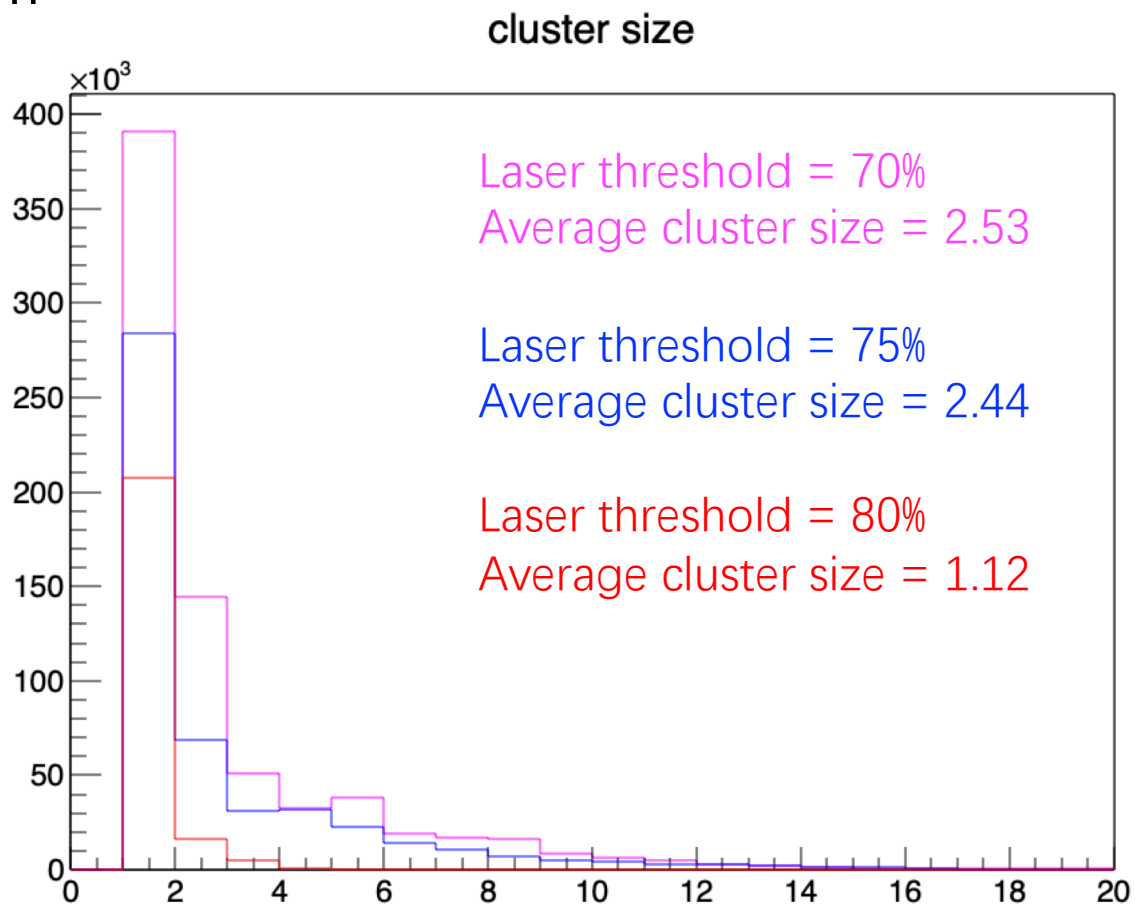
1	29	13	65	0	13	32	60	235
1	29	13	67	0	13	32	60	235
1	29	13	66	0	13	32	60	235
1	29	13	64	0	13	32	60	235
1	29	13	63	0	13	32	60	235
1	31	12	65	0	13	32	60	235
1	32	14	64	0	13	32	60	235
1	37	12	62	0	13	32	60	235
1	37	12	66	0	13	32	60	235
1	42	14	67	0	13	32	60	235

Convert
to map

7	6
4	5
3	2
0	1

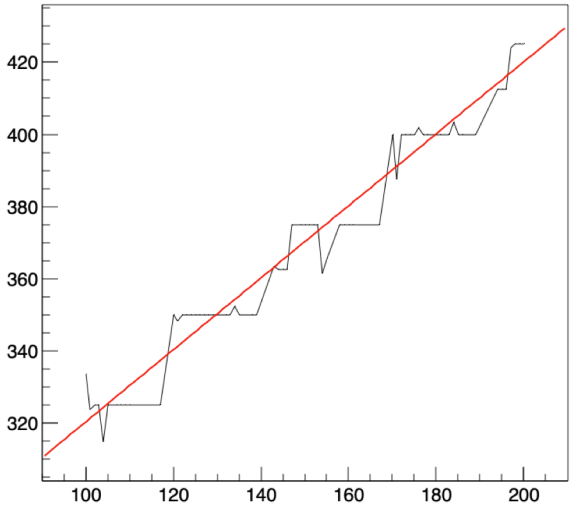
Take the first pixel
As the seed;
Find fired pixels
within 5-pix radius
around the seed



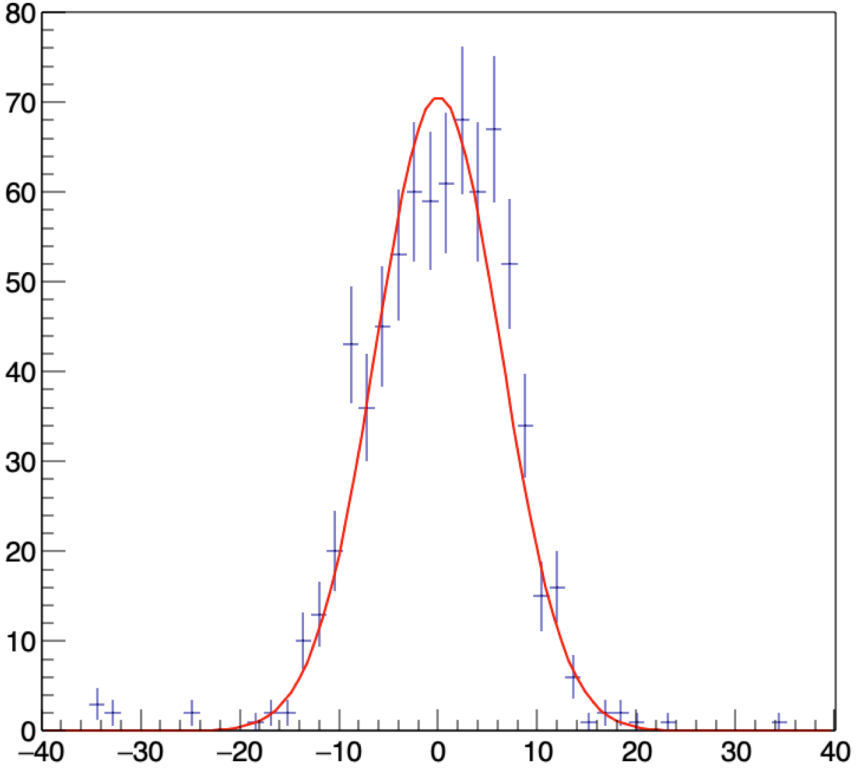


Resolution

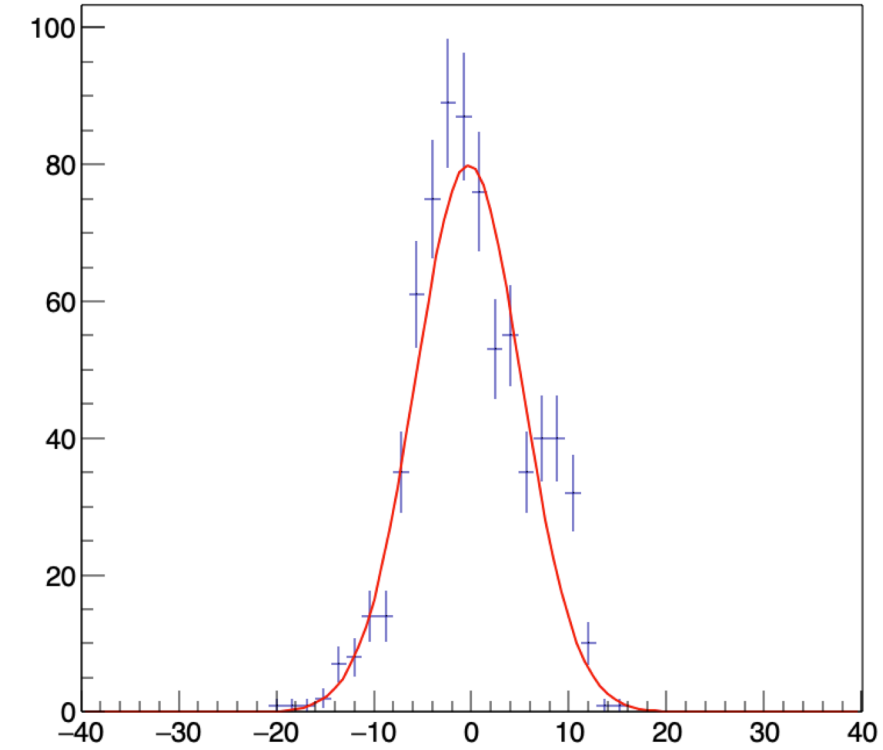
- Expected X, Y computed from linear fit of the observed X, Y



- Laser_th=70%
- Rx=6.28
- Ry=5.45



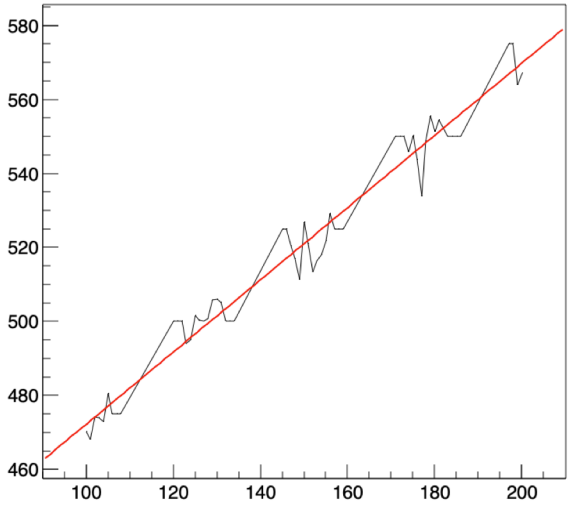
residual x



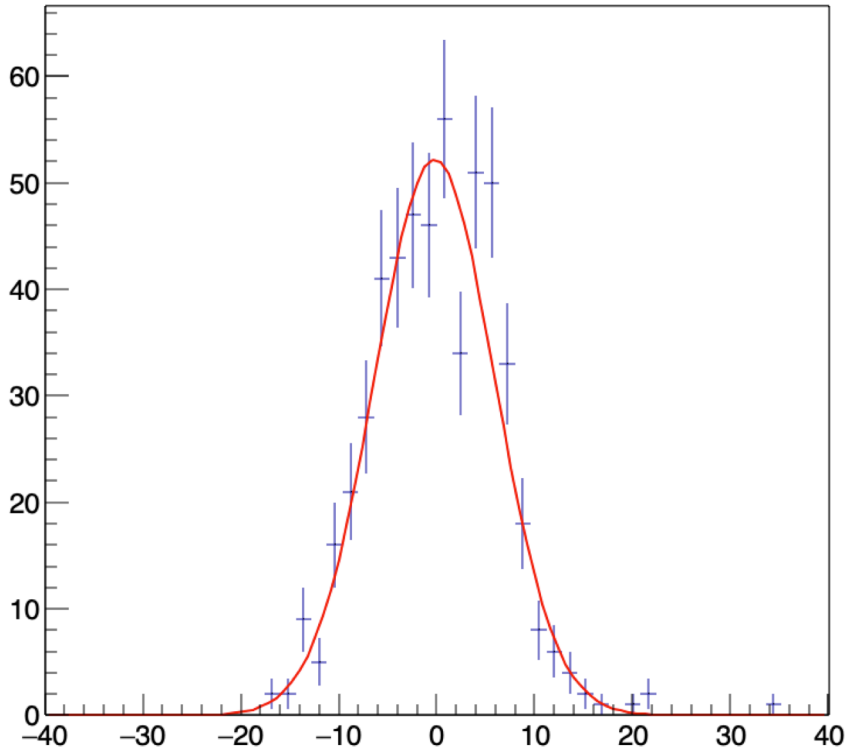
residual y

Resolution

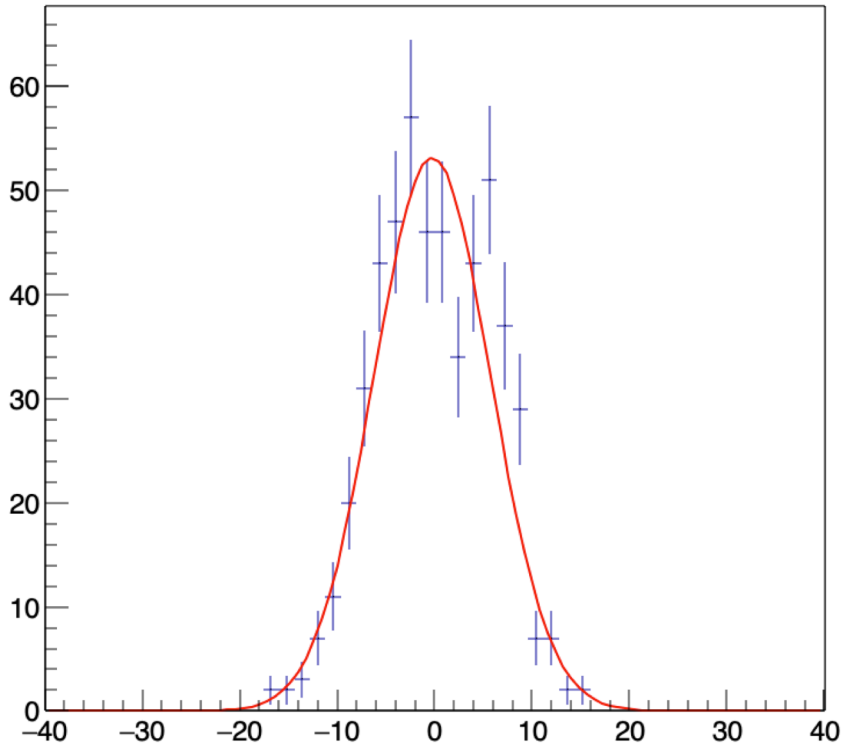
- Expected X, Y computed from linear fit of the observed X, Y



- Laser_th=75%
- Rx=6.13
- Ry=5.98



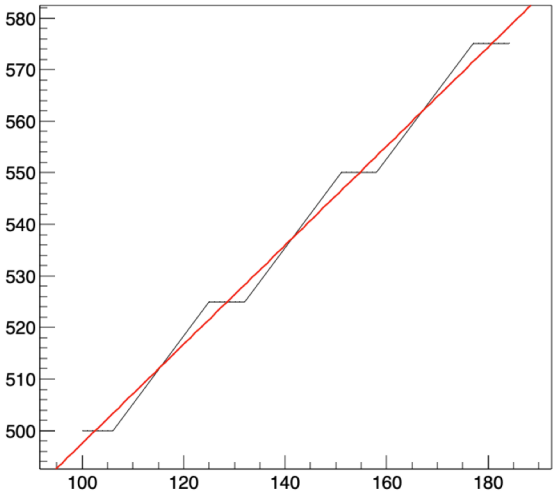
residual x



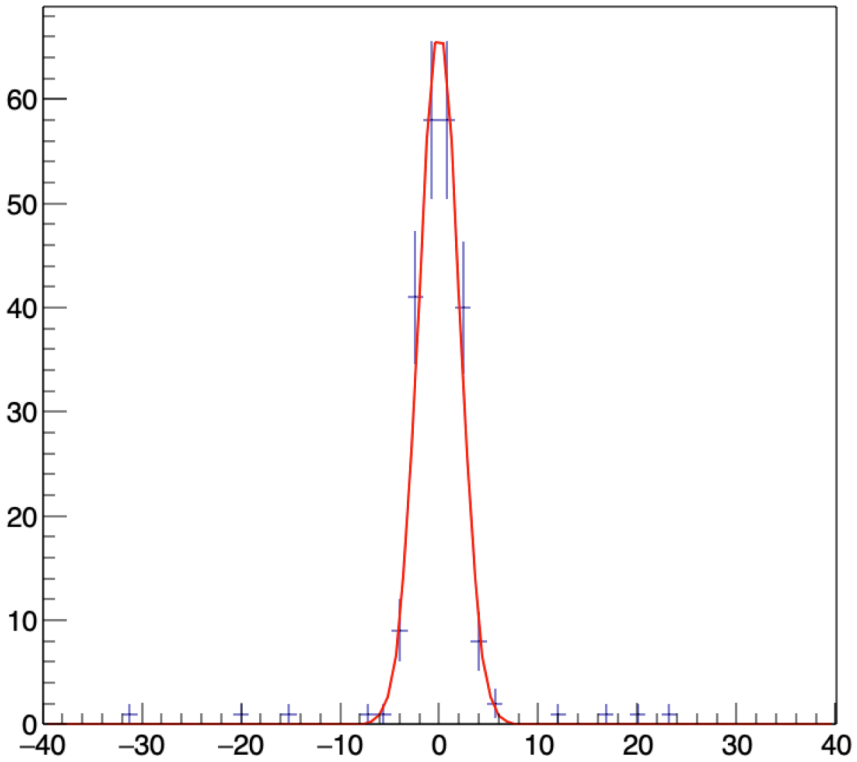
residual y

Resolution

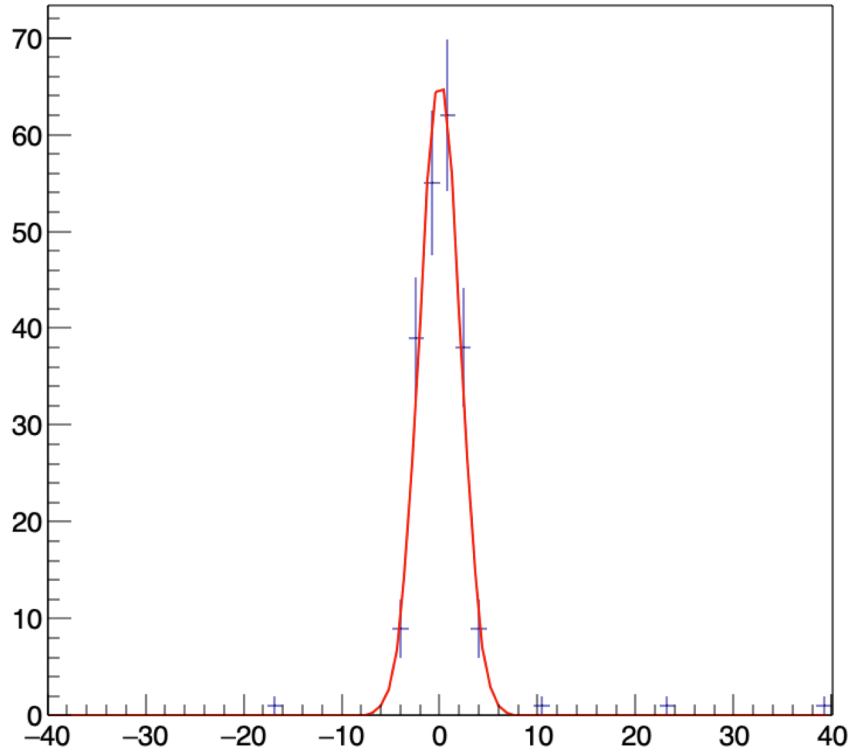
- Expected X, Y computed from linear fit of the observed X, Y



- Laser_th=80%
- Rx=2.04
- Ry=2.07



residual x

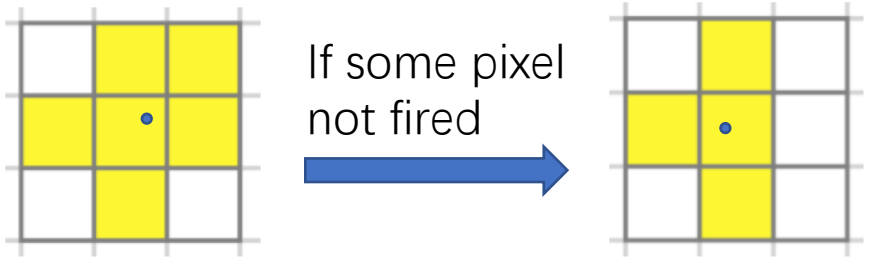


residual y

Problems & Discussion

- Cluster computation
  - Some mismatch occurred
  - Charge diffusion should happen within one timestamp (25ns)
  - Readout time~ 3 timestamp
  - Need to decide a standard algorithm for laser/beta/beam test
- Resolution computation
  - Geometry center of the fired pixels
  - Extremely good resolution with single pixel, why? ($8/\sqrt{12}=2.31$)
  - Threshold discrepancy in neighbor pixels degrades the position accuracy

Laser Threshold(%)	70	75	80
Cluster Size	2.53	2.44	1.12
Resolution X (um)	6.28	6.13	2.04
Resolution Y (um)	5.45	5.98	2.07



Back-up

DAC_reg_all_TC2.xlsx

port name		bits		
ENBGR	1	1	1	
REG_BGR_OFFSET	100	3	100	
ENIBG	1	1	0	
REG_CDAC0	00001010	8	1010	IBIAS:7.45uA:11111111,463nA:1010; 255nA:101
EN_CDAC	1	1	1	
EN_CDAC_T	1	1	1	
REG_CDAC1	101100	8	1000	ITHR:100110
EN_CDAC	1	1	1	
EN_CDAC_T	1	1	1	
REG_CDAC2	00011000	8	101	IDB:0.79uA:100, 0.977uA:101; 0.61uA:11
EN_CDAC	1	1	1	
EN_CDAC_T	1	1	1	
REG_VDAC0	0010000001	10	10000001	VCLIP:1.01V:1110000001，0.183V 10000001
REG_VDAC0_C	01111	5	10000	
REG_VDAC0_T	11	2	11	
EN_VDAC	1	1	1	
REG_VDAC1	0110000101	10	100	VCASP 0.869V:1001000010 0.6V:110000100; 0.55V:101011111
REG_VDAC1_C	01111	5	10000	
REG_VDAC1_T	11	2	11	
EN_VDAC	1	1	1	
REG_VDAC2	0101100100	10	100000000	VCASN: 523mV 100000000 838mV:1000000010; 535mV:100000111
REG_VDAC2_C	01111	5	10000	
REG_VDAC2_T	11	2	11	
EN_VDAC	1	1	1	
REG_VDAC3	0101000100	10	101000100	VCASN2: 630mV: 110000000; 533mV:100111010
REG_VDAC3_C	01111	5	10000	10010100
REG_VDAC3_T	11	2	11	
EN_VDAC	1	1	1	
REG_MUX	000	3	1	
REG_MUXO	00	2	1	