JUSTUS-LIEBIG-
UNIVERSITÄT
GIESSEN

PASTA
tests update

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II. Physikalisches
Institut
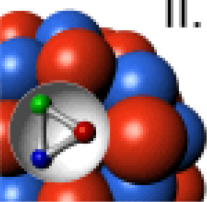
Contents

Previous Status

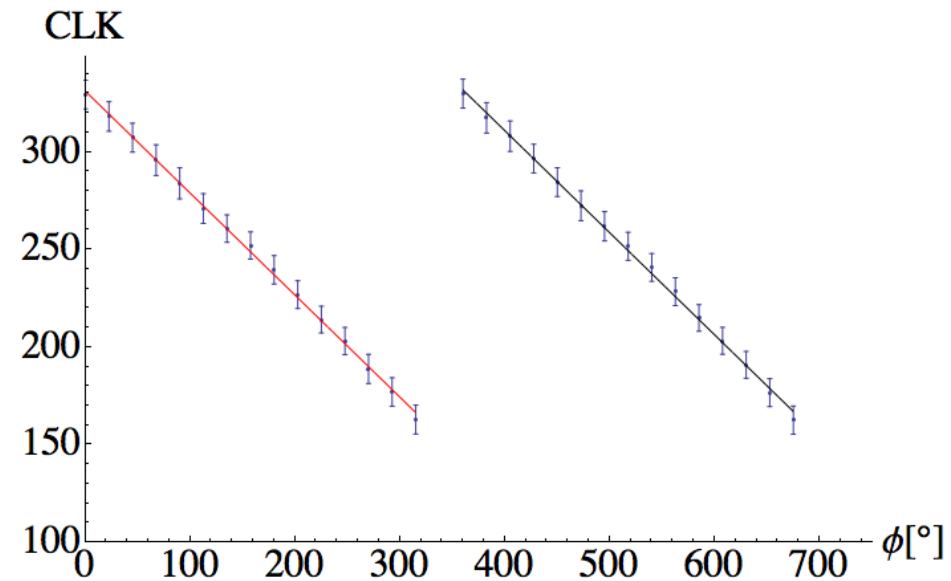Preliminary FE linearity
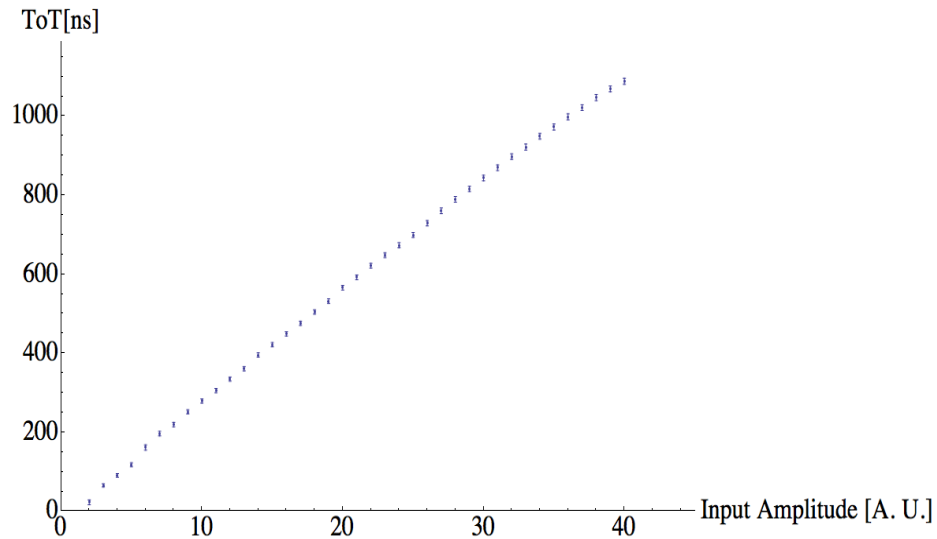
TDC linearity

Note: More than 20 dead channels

Global Parameters Optimization

28 parameters must be
optimized for the analog part

BLR_Vcas

| Channel	0	1	2	3	4	5	10	11	12	24	26	29	30
0							bad	bad!	bad				
1													
2													
3	from 6 fC	from 6 fC	from 9 fC	from 9 fC	from 9 fC	from 6 fC							
4													
5							from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
6													
7													
8													
9													
10													
11													
12													
13	350 pulses bad	from 6 fC	from 6 fC	from 9 fC	from 9 fC	from 9 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
14													
15													
16													
17													
18		from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
19							from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
20													
21													
22		from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC						
23							from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
24													
25							400 pulses	400 pulses	400 pulses	380 pulses	380 pulses	380 pulses	380 pulses
26										350 pulses (5-15,25fc)	300 pulses (27fC)	300 pulses (24fC)	
27								250 pulses (6 fC)	250 pulses (6 fC)	250 pulses (6 fC)	250 pulses (6 fC)	250 pulses (6 fC)	250 pulses (6 fC)
28							200 pulses	200 pulses	200 pulses	200 pulses	200 pulses	200 pulses	200 pulses
29	180 pulses (21fC)	180 pulses (21fC)	180 pulses (21fC)	180 pulses (21fC)	180 pulses (21fC)	180 pulses (18fC)	180 pulses (6fC)	180 pulses (6fC)	180 pulses (6fC)	180 pulses (6fC)	180 pulses (6fC)	180 pulses (6fC)	180 pulses (6fC)
30			150 pulses (6fC)	150 pulses (6fC)	150 pulses (6fC)	150 pulses (6fC)	120 pulses (6fC)	120 pulses (6fC)	120 pulses (6fC)	130 pulses (6fC)	130 pulses (6fC)	130 pulses (6fC)	130 pulses (6fC)
31													
32	200 pulses (12fC)	200 pulses (12fC)	200 pulses (15fC)	200 pulses (15fC)	200 pulses (15fC)	200 pulses (12fC)	200 pulses (6fC)	200 pulses (6fC)	200 pulses (6fC)				
33							300 pulses	300 pulses	300 pulses	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)
34													
35	150 pulses (12fC)	150 pulses (15fC)	150 pulses (15fC)	150 pulses (18fC)	150 pulses (18fC)	150 pulses (12fC)	150 pulses (9fC)	150 pulses (9fC)	150 pulses (9fC)	150 pulses (9fC)	150 pulses (9fC)	150 pulses (9fC)	150 pulses (9fC)
36								350 pulses	350 pulses	350 pulses (6fC)	350 pulses (6fC)	350 pulses (6fC)	350 pulses (6fC)
37							300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)
38							350 pulses (21fC)	350 pulses (21fC)	350 pulses (18fC)	350 pulses (18fC)	350 pulses (18fC)	350 pulses (18fC)	350 pulses (18fC)
39	250 pulses (18fC)	250 pulses (18fC)	250 pulses (18fC)	250 pulses (18fC)	250 pulses (18fC)	250 pulses (15fC)	250 pulses (6fC)	250 pulses (6fC)	250 pulses (6fC)	250 pulses (6fC)	250 pulses (6fC)	250 pulses (6fC)	250 pulses (6fC)
40							320 pulses (6fC)	320 pulses (6fC)	320 pulses (6fC)	320 pulses (6fC)	320 pulses (6fC)	320 pulses (6fC)	320 pulses (6fC)
41													
42							350 pulses (9fC)	350 pulses (9fC)	350 pulses (9fC)	350 pulses (9fC)	350 pulses (9fC)	350 pulses (9fC)	350 pulses (9fC)
43									400 pulses	400 pulses (6fC)	400 pulses (6fC)		
44							400 pulses (15fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)
45								380 pulses (6fC)	380 pulses	380 pulses	380 pulses	380 pulses	380 pulses
46								300 pulses	300 pulses	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)	300 pulses (6fC)
47							400 pulses (6fC)	400 pulses (9fC)	400 pulses (9fC)	400 pulses (9fC)	400 pulses (9fC)	400 pulses (9fC)	400 pulses (9fC)
48													
49													
50				400 pulses	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)
51	380 pulses (9fC)	380 pulses (9fC)	380 pulses (9fC)	380 pulses (12fC)	380 pulses (12fC)	380 pulses (12fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)
52							380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)	380 pulses (6fC)
53													
54							400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (12fC)
55													
56	400 pulses (15fC)	400 pulses (18fC)	400 pulses (18fC)	400 pulses (18fC)	400 pulses (18fC)	400 pulses (18fC)	400 pulses (9fC)	400 pulses (9fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (9fC)
57	400 pulses (9fC)	400 pulses (12fC)	400 pulses (12fC)	400 pulses (15fC)	400 pulses (15fC)	400 pulses (12fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)
58							400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)
59							from 9 fC	from 9 fC	from 9 fC	from 9 fC	from 9 fC	from 9 fC	from 9 fC
60													
61								400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)	400 pulses (6fC)
62													
63							between 6-24 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
ΔVth= 7	54 08 00 02	53 07 00 04	52 07 01 04	49 09 00 06	48 09 00 07	47 09 01 07	23 20 05 16	14 25 02 23	14 25 02 23	14 26 01 23	14 26 01 23 1	25 02 23	15 24 02 23

Working
Strage
Dead
Losing events

Local Parameters Optimization

Front End calibration p-strips

Front End calibration n-strips
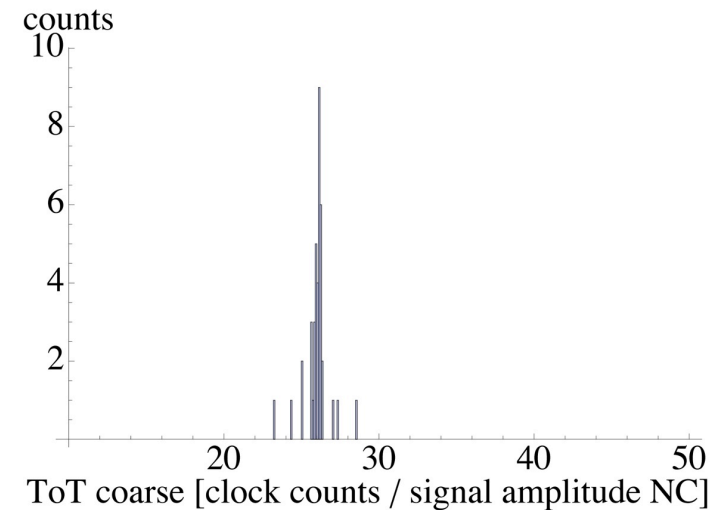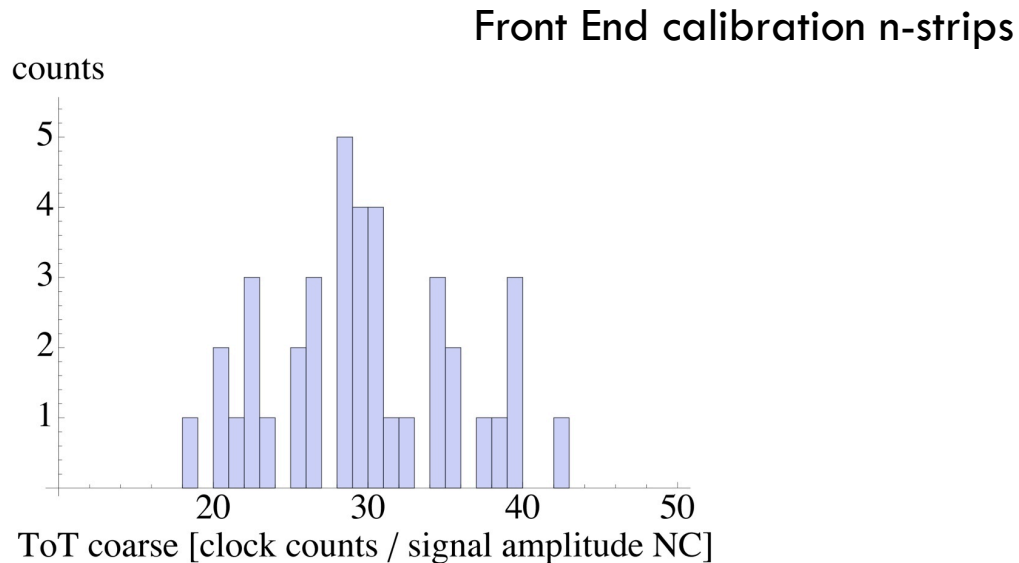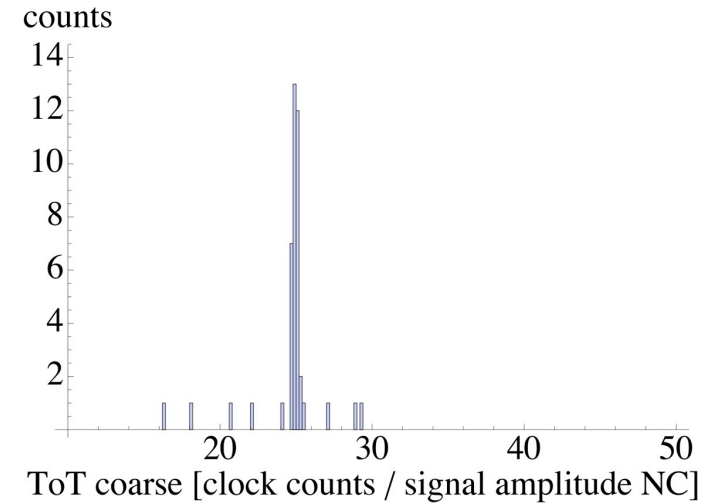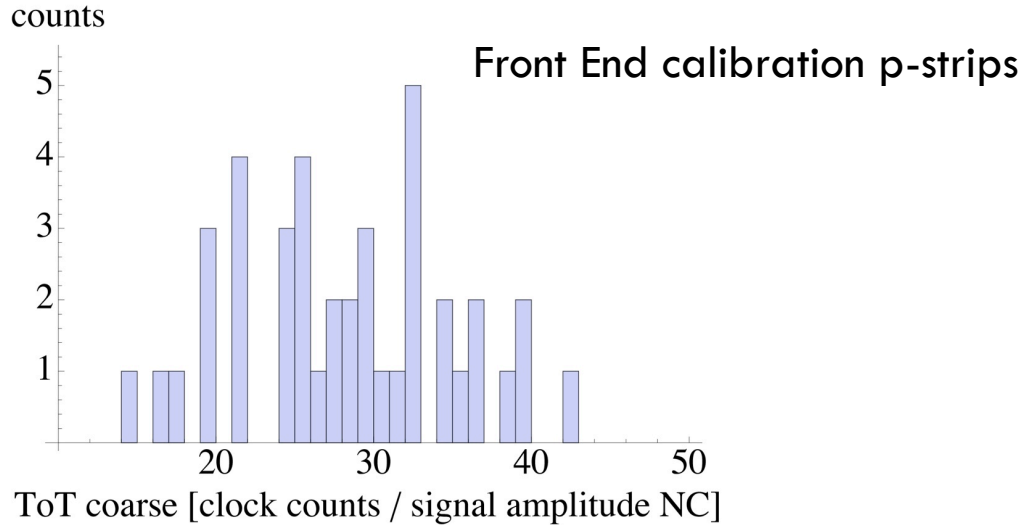
Local Calibration (Vth)

Channel	NOMINAL	Optimized
0	3 fC	2 fC
1	3 fC	3 fC
2	3 fC	2 fC
3	3 fC	2 fC
4	3 fC	2 fC
5	4 fC	3 fC
6	3 fC	2 fC
7	2 fC	2 fC
8	3 fC	2 fC
9	3 fC	2 fC
10	3 fC	3 fC
11	3 fC	3 fC
12	3 fC	2 fC
13	5 fC	3 fC
14		
15		
16	3 fC	2 fC
17		
18	4 fC	3 fC
19	4 fC	4 fC
20	3 fC	3 fC
21		
22	3 fC	3 fC
23	4 fC	4 fC
24	3 fC	2 fC
25	3 fC	3 fC
26		4 fC
27	5 fC	3 fC
28	3 fC	3 fC
29	4 fC	4 fC
30	4 fC	3 fC
31		
32		

Delta
1 fC
0 fC
1 fC
1 fC
1 fC
1 fC
1 fC
0 fC
1 fC
1 fC
0 fC
0 fC
1 fC
2 fC
1 fC
1 fC
0 fC
0 fC
0 fC
0 fC
1 fC
0 fC
2 fC
0 fC
0 fC
1 fC

Channel	NOMINAL	Optimized
33	3 fC	3 fC
34	5 fC	5 fC
35	6 fC	4 fC
36	3 fC	2 fC
37	5 fC	4 fC
38	15 fC	5 fC
39	3 fC	3 fC
40	3 fC	3 fC
41	3 fC	3 fC
42	7 fC	7 fC
43	5 fC	3 fC
44	11 fC	5 fC
45	3 fC	3 fC
46	4 fC	3 fC
47	7 fC	4 fC
48		
49		
50	5 fC	5 fC
51	4 fC	4 fC
52	5 fC	5 fC
53		
54	9 fC	6 fC
55		
56	5 fC	5 fC
57	4 fC	4 fC
58	4 fC	4 fC
59		
60	9 fC	3 fC
61	4 fC	3 fC
62		
63	5 fC	5 fC

Delta
0 fC
0 fC
2 fC
1 fC
1 fC
10 fC
0 fC
0 fC
0 fC
0 fC
2 fC
6 fC
0 fC
1 fC
3 fC
0 fC
0 fC
0 fC
3 fC
0 fC
0 fC
0 fC
6 fC
1 fC
0 fC

PASTA under α -source
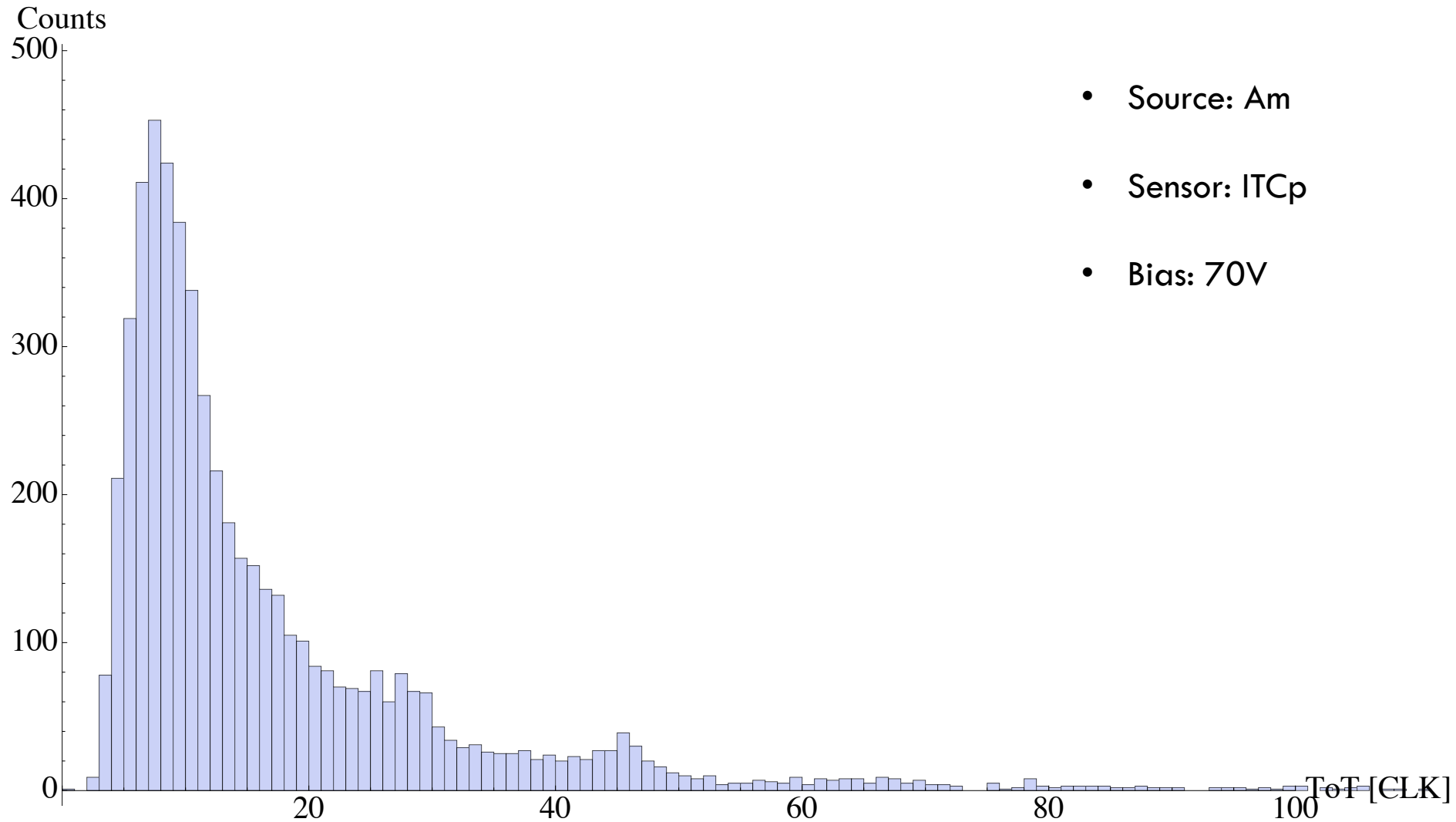
- Source: Am

- Sensor: ITCp

- Bias: 70V

Single Channles Spectrum
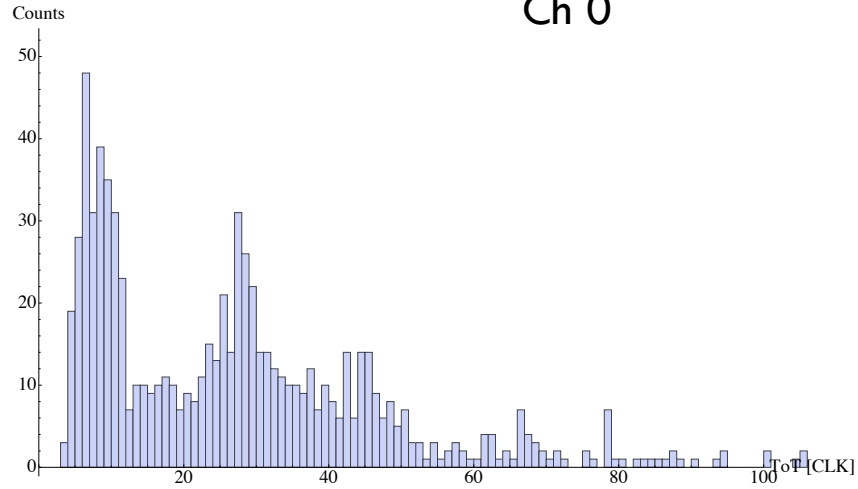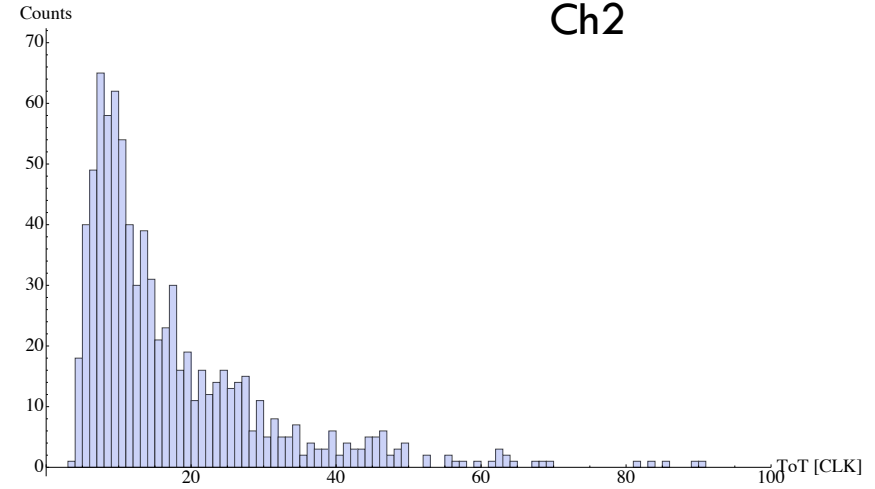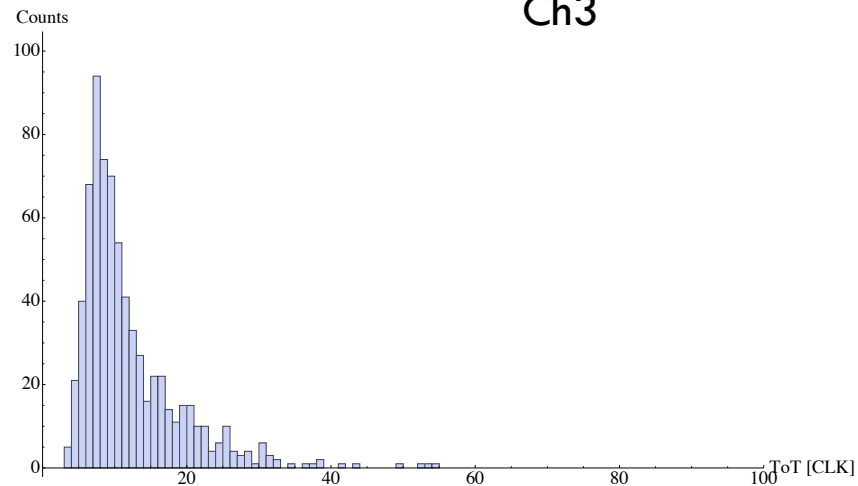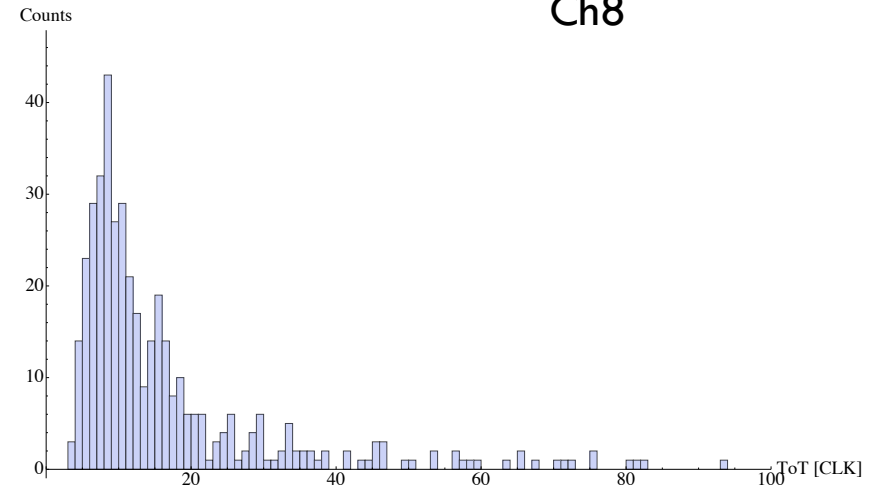
Interesting News

Channel	160 MHz	140 MHz	120 MHz	100 MHz	80 MHz
24					
25	350 pulses (6fC)				
26	300 (from 6 to 15fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
27	220 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
28	200 pulses (6fC)				
29	150 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
30	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
31		375 pulses (6fC)	375 pulses (6fC)	375 pulses (6fC)	375 pulses (6fC)
32					
33	220 pulses (6fC)	from 6 fC	from 6 fC		
34	300 pulses (6fC) bad	380 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
35	100 pulses (6fC)	350 pulses (6fC)	from 9 fC	from 6 fC	from 6 fC
36	300 pulses (6fC)				
37	220 pulses (6fC)	380 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
38	280 pulses (18fC)	320 pulses (18fC)	from 18 fC	from 15 fC	from 15 fC
39	180 pulses	220 pulses			
40	280 pulses (6fC)	300 pulses (6fC)	from 6 fC		
41		350 pulses (6fC)			
42	300 pulses (9fC)	320 pulses (6fC)	from 9 fC	from 9 fC	from 9 fC
43	300 pulses (6fC)	350 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
44	350 pulses (15fC)	from 12 fC	from 12 fC	from 9 fC	from 9 fC
45	300 pulses	350 pulses (6fC)			
46	280 pulses (6fC)	230 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
47	340 pulses (6fC)	340 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
48		340 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
49		180 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
50	350 pulses (6fC)	335 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
51	300 pulses (6fC)	280 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
52	300 pulses (6fC)	290 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
53					
54	340 pulses (12fC)	300 pulses (12fC)	from 12 fC	from 9 fC	from 9 fC
55			from 6 fC	from 6 fC	from 6 fC
56	370 pulses (6fC)	370 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
57	350 pulses (6fC)	290 pulses (6fC)	370 pulses (6fC)	from 6 fC	from 6 fC
58	350 pulses (6fC)	310 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
59				from 12 fC	from 12 fC
60	from 12 fC	370 pulses (6fC)		from 9 fC	from 9 fC
61	310 pulses (6fC)	300 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
62					
63	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
ΔVth= 7	13 32 00 19	08 24 01 31	08 02 01 53	07 01 00 56	07 01 00 56

Test with 400 pulses separated by 20 Frame

1 Frame = 1024*CLK period

Interesting News (II)

Channel	160 MHz	140 MHz	120 MHz	100 MHz	80 MHz
24					
25					
26	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
27	200 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
28	200 pulses				
29	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
30	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
31		280 pulses (6fC)	280 pulses (6fC)	285 pulses (6fC)	275 pulses (6fC)
32					
33	140 pulses (6fC)	from 6 fC	from 6 fC		
34	250 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
35	100 pulses (9fC)	from 9 fC	from 6 fC	from 6 fC	from 6 fC
36	200 pulses (6fC)				
37	130 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
38	170 pulses (21fC)	280 pulses (18fC)	from 18 fC	from 15 fC	from 15 fC
39	80 pulses	220 pulses			
40	150 pulses (6fC)				
41		250 pulses (6fC)			
42	200 pulses (9fC)	220 pulses (9fC)	from 9 fC	from 9 fC	from 9 fC
43	200 pulses (6fC)	250 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
44	250 pulses (12fC)	from 12 fC	from 12 fC	from 9 fC	from 9 fC
45	200 pulses (6fC)	250 pulses (6fC)			
46	160 pulses (6fC)	200 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
47	250 pulses (6fC)	250 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
48		250 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
49		180 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
50	250 pulses (6fC)	235 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
51	200 pulses (6fC)	180 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
52	200 pulses (6fC)	190 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
53					
54	230 pulses (12fC)	200 pulses (9fC)	from 9 fC	from 9 fC	from 9 fC
55			from 6 fC	from 6 fC	from 6 fC
56	270 pulses (6fC)	270 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
57	250 pulses (6fC)	190 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
58	250 pulses (6fC)	210 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
59			from 9 fC	from 9 fC	from 9 fC
60	from 12 fC	270 pulses (6fC)		from 9 fC	from 9 fC
61	230 pulses (6fC)	200 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
62					
63	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
ΔVth= 7	13 30 00 20	08 24 01 31	08 01 00 55	07 01 00 56	07 01 00 56

Test with 300 pulses separated by 20 Frame

1 Frame = 1024*CLK period

Interesting News (III)

Channel	160 MHz	140 MHz	120 MHz	100 MHz	80 MHz
24					
25					
26	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
27	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
28					
29	150 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
30	130 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
31		190 pulses (6fC)	190 pulses (6fC)	195 pulses (6fC)	190 pulses (6fC)
32					
33	130 pulses (6fC)	from 6 fC	from 6 fC		
34	150 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
35	80 pulses (9fC)	from 9 fC	from 6 fC	from 6 fC	from 6 fC
36	110 pulses (6fC)				
37	50 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
38	70 pulses (24fC)	from 18 fC	from 18 fC	from 15 fC	from 15 fC
39					
40	80 pulses (6fC)				
41		190 pulses			
42	100 pulses (9fC)	180 pulses (9fC)	from 9 fC	from 9 fC	from 9 fC
43	110 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
44	150 pulses (15fC)	from 12 fC	from 12 fC	from 9 fC	from 9 fC
45	110 pulses				
46	60 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
47	150 pulses (9fC)	160 pulses (9fC)	from 6 fC	from 6 fC	from 6 fC
48		160 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
49		160 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
50	150 pulses (6fC)	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
51	120 pulses (6fC)	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
52	120 pulses (6fC)	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
53					
54	135 pulses (12fC)	150 pulses (6fC)	from 9 fC	from 9 fC	from 9 fC
55			from 6 fC	from 6 fC	from 6 fC
56	170 pulses (6fC)	150 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
57	150 pulses (6fC)	120 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
58	150 pulses (6fC)	140 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
59			from 9 fC	from 9 fC	from 12 fC
60	from 12 fC	170 pulses (6fC)		from 9 fC	from 9 fC
61	130 pulses (6fC)	150 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC
62					
63	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
ΔVth= 7	13 23 01 27	07 15 02 40	08 01 00 55	07 01 00 56	07 01 00 56

Test with 200 pulses separated by 20 Frame

1 Frame = 1024*CLK period

Interesting News (IV)

Channel	160 MHz	140 MHz	120 MHz	100 MHz	80 MHz
24					
25					
26	from 27 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
27	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
28					
29	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
30	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
31		95 pulses (6fC)	95 pulses (6fC)	95 pulses (6fC)	95 pulses (6fC)
32					
33					
34	90 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
35	90 pulses (9fC)	from 9 fC	from 9 fC	from 6 fC	from 6 fC
36	from 6 fC				
37	45 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
38	50 pulses (21fC)	from 18 fC	from 18 fC	from 15 fC	from 15 fC
39					
40	80 pulses (6fC)				
41					
42		from 9 fC	from 9 fC	from 9 fC	from 9 fC
43		from 6 fC	from 6 fC	from 6 fC	from 6 fC
44	50 pulses (12fC)	from 12 fC	from 12 fC	from 12 fC	from 12 fC
45					
46		from 6 fC	from 6 fC	from 6 fC	from 6 fC
47	40 pulses (9fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
48		from 6 fC	from 6 fC	from 6 fC	from 6 fC
49		from 6 fC	from 6 fC	from 6 fC	from 6 fC
50	45 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
51		from 6 fC	from 6 fC	from 6 fC	from 6 fC
52		from 6 fC	from 6 fC	from 6 fC	from 6 fC
53					
54	30 pulses (12fC)	from 9 fC	from 9 fC	from 9 fC	from 9 fC
55		from 6 fC	from 6 fC	from 6 fC	from 6 fC
56	70 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
57	50 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
58	45 pulses (6fC)	from 6 fC	from 6 fC	from 6 fC	from 6 fC
59			from 9 fC	from 12 fC	from 12 fC
60	from 9 fC	from 9 fC		from 9 fC	from 9 fC
61		from 6 fC	from 6 fC	from 6 fC	from 6 fC
62					
63	from 6 fC	from 6 fC	from 6 fC	from 6 fC	from 6 fC
ΔVth= 7	16 12 05 31	07 01 01 55	08 01 00 55	07 01 00 56	07 01 00 56

Test with 100 pulses separated by 20 Frame

1 Frame = 1024*CLK period

- Dependence on the number of pulses is under investigation

- For f<140MHz, 86% of the channels responds
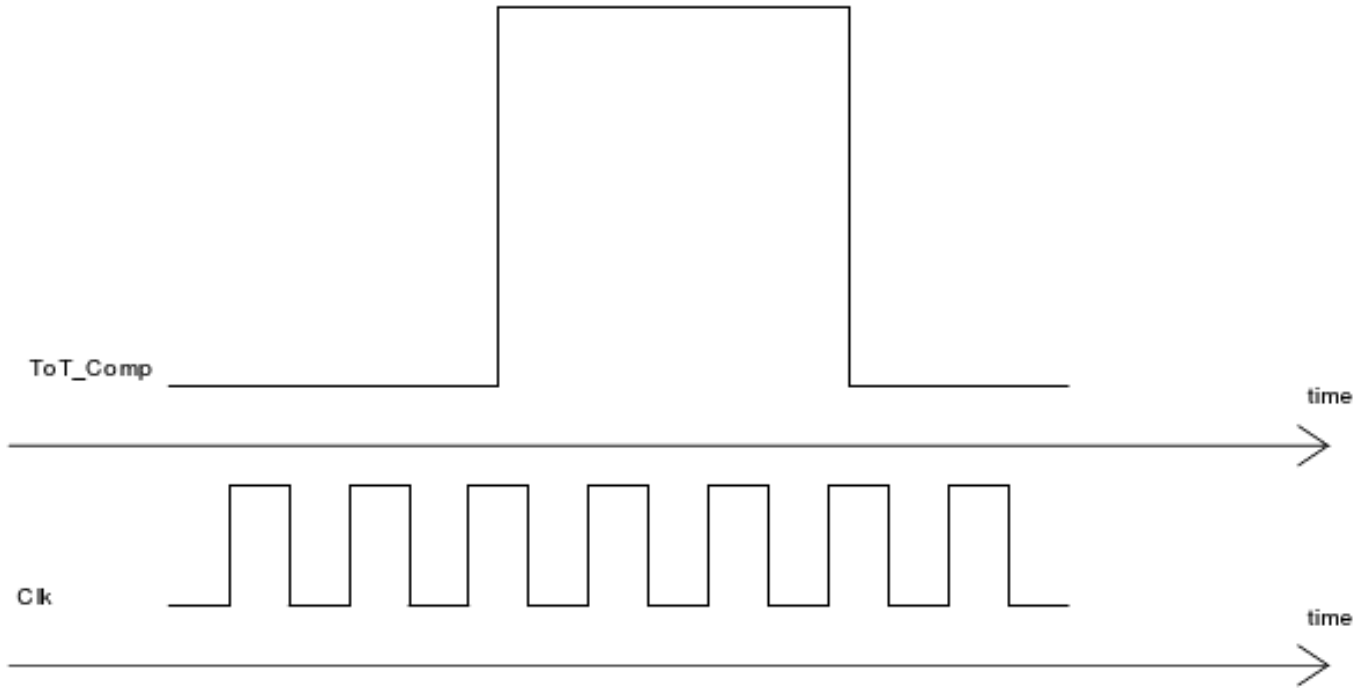
Conclusions

- PASTA seems to works better with frequencies lower than 140MHz (more than 86% of the channels responds)

- An adjustment of the local parameters allow the calibration of each channel

- Despite the connection with the sensor is working, more studies with a source are needed

- Further studies on the dependence of the performance from the clock frequency are required
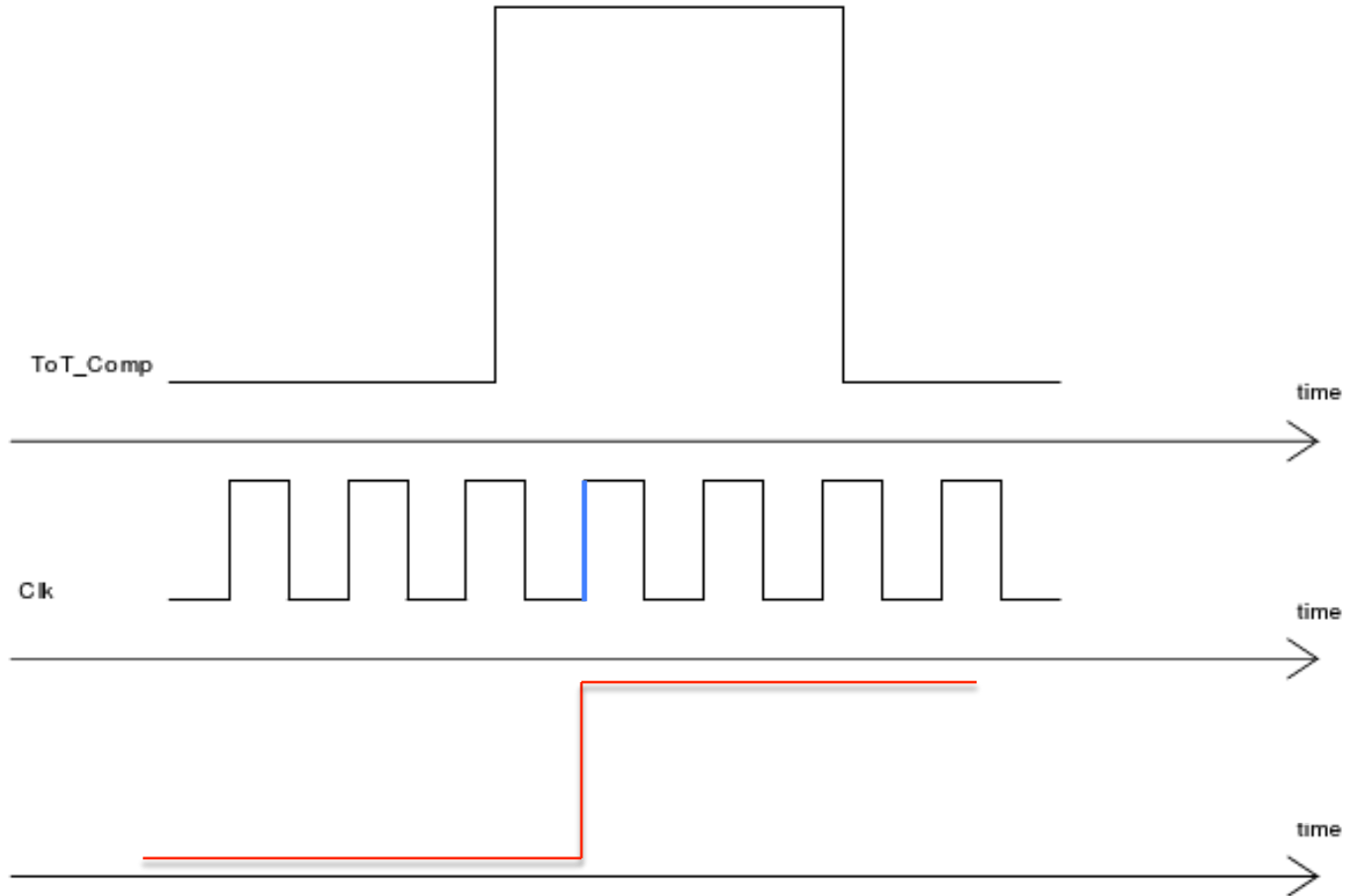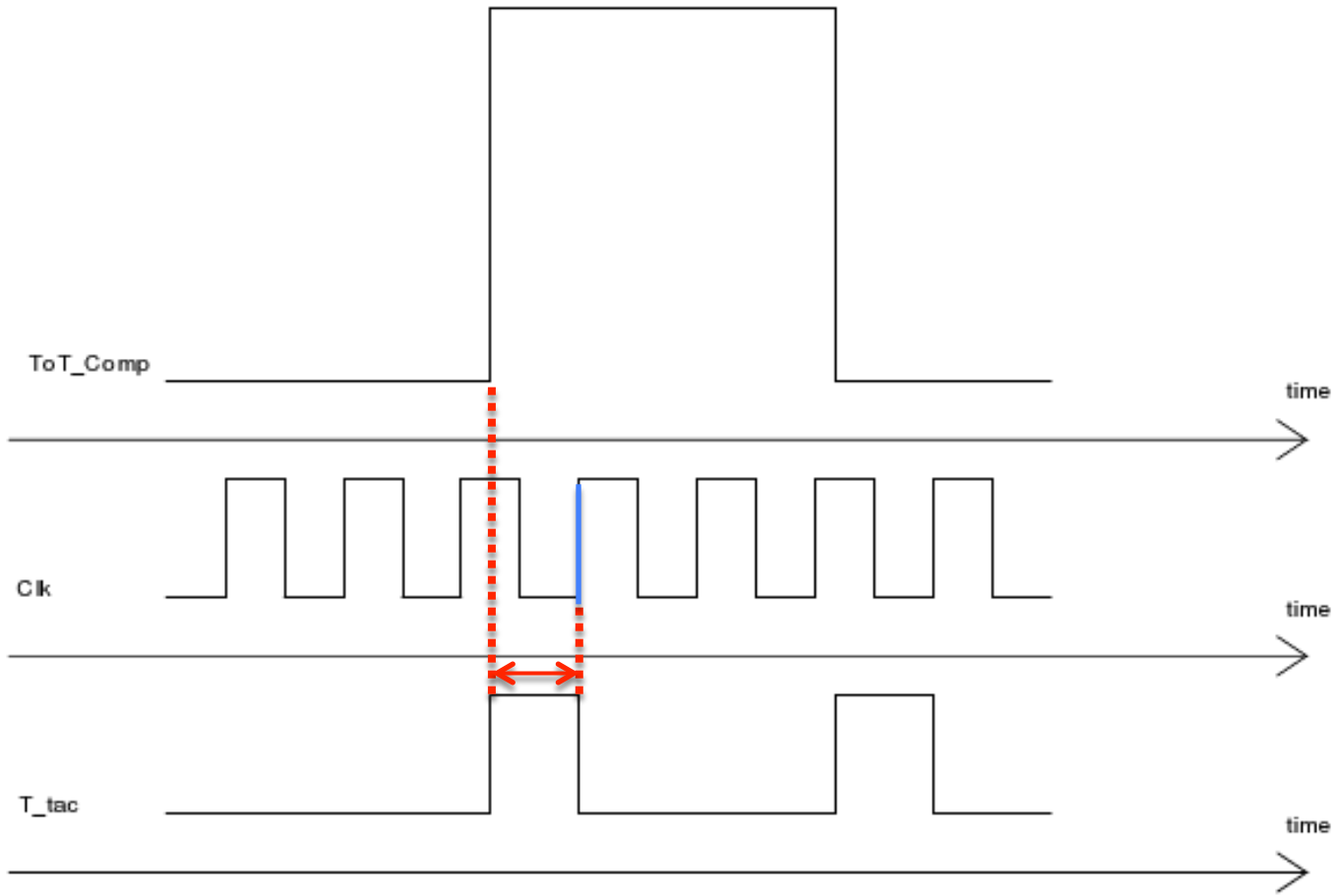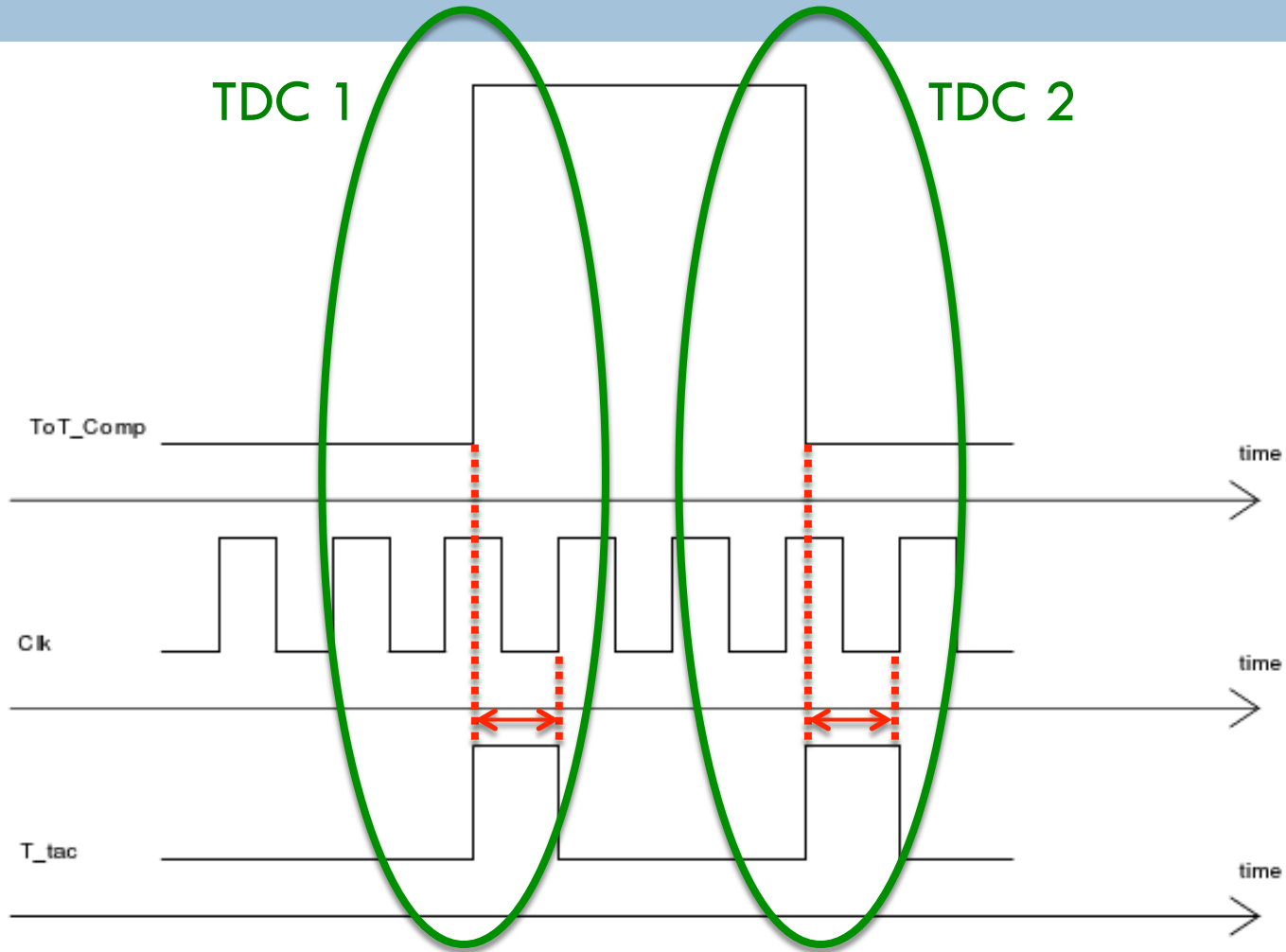
Thank you for your attention

Timing

ToT_Comp

time

Clk

time

Timing

Timing

Timing

PASTA Architecture

Analog TDC Performance

Clock frequency	160 MHz
Amplification	128
Time bin width	50ps
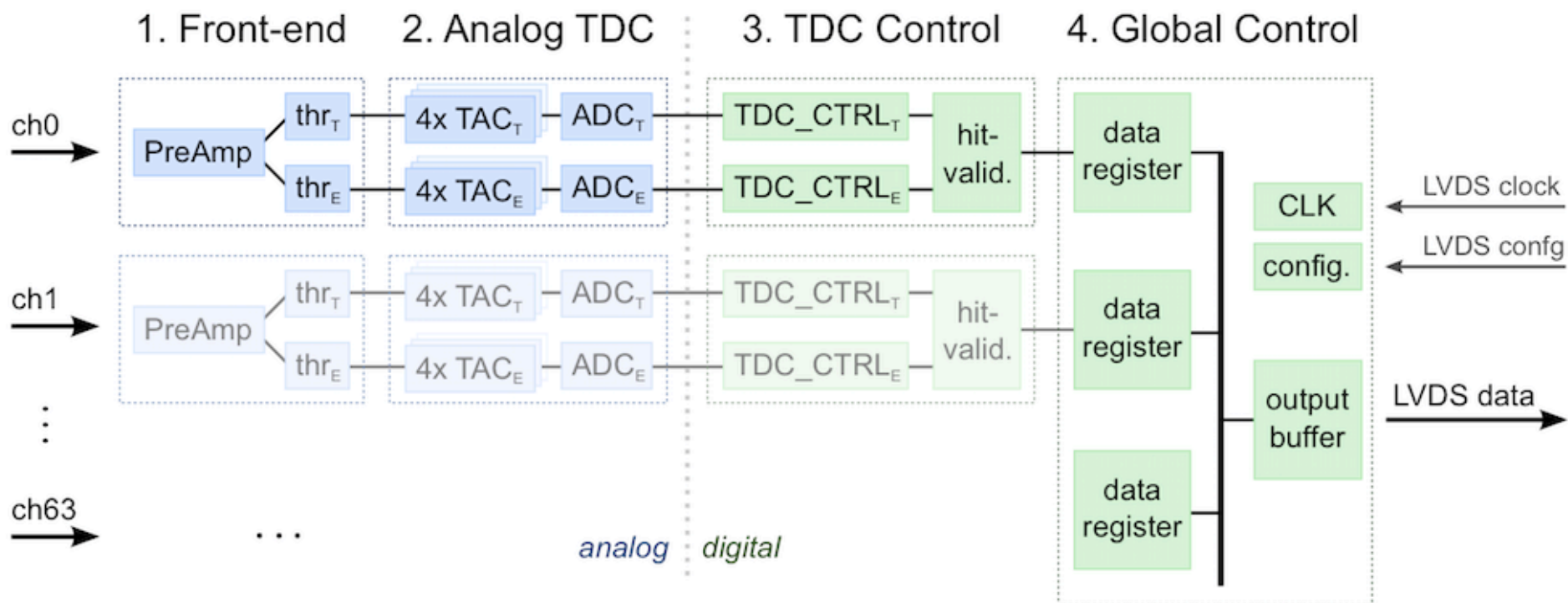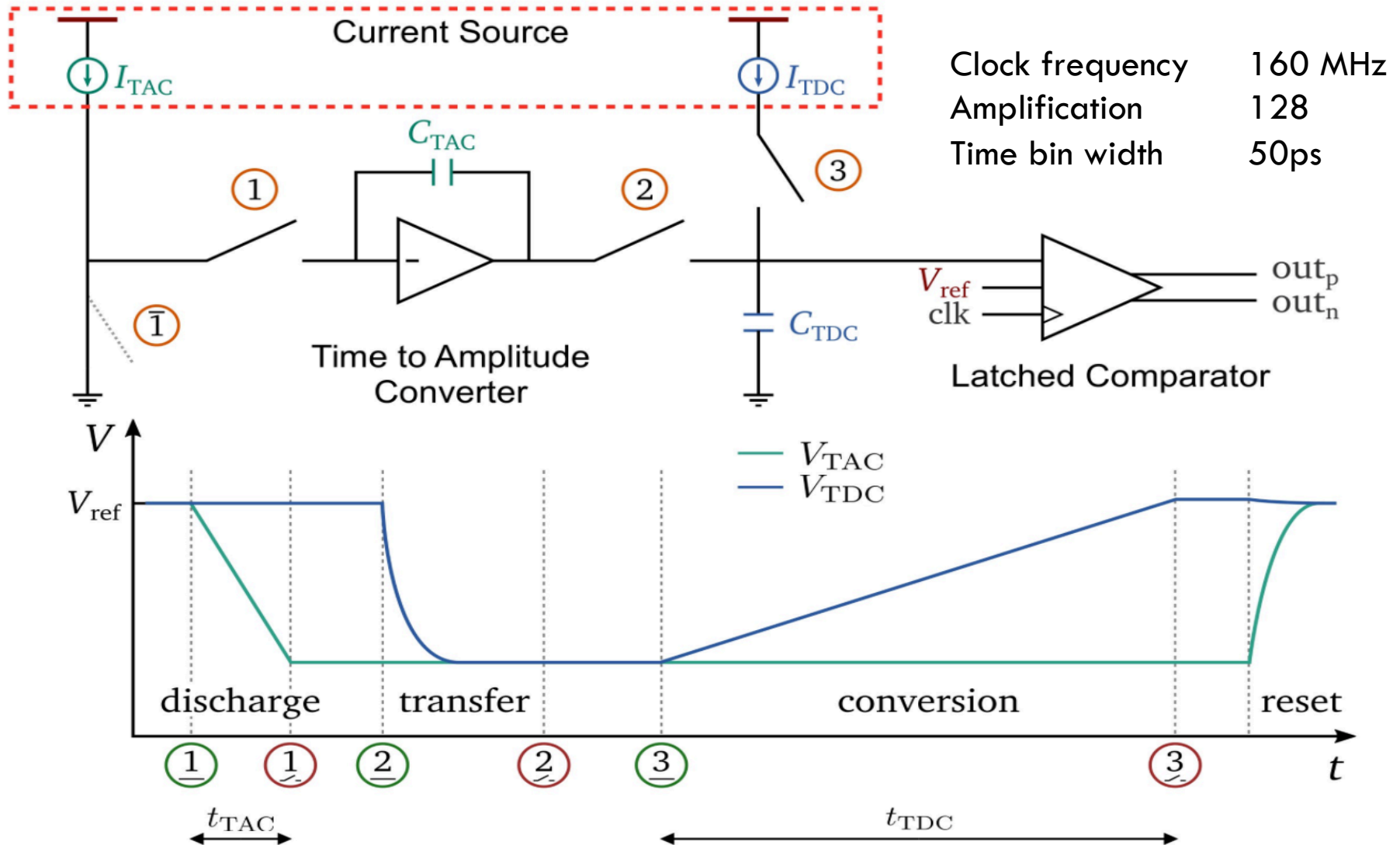
Measurement Concept

- Low threshold: better time stamp resolution

- High threshold: better jitter performance