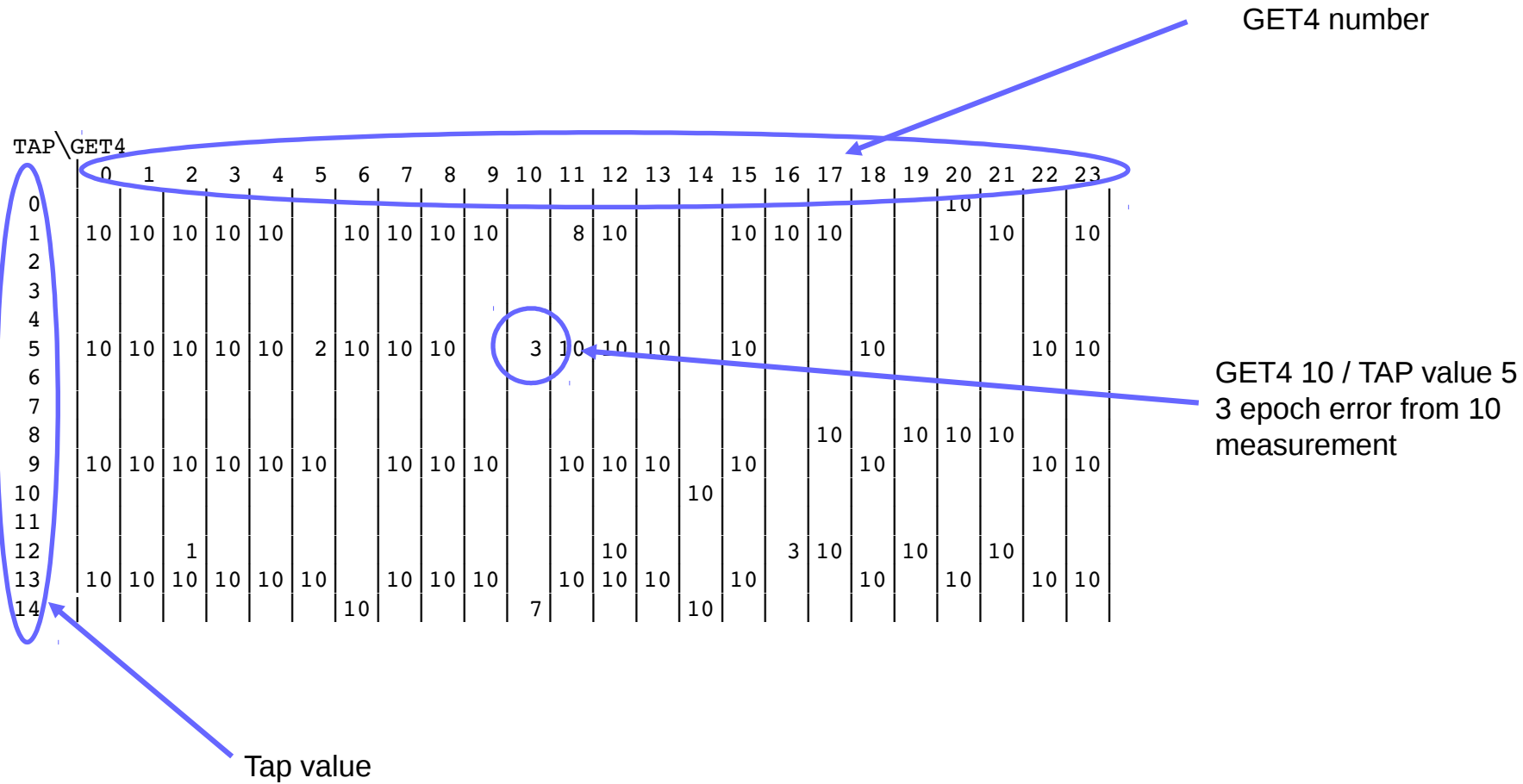


Status AFCK Latency tool

Epoch error map/histogram produced by latency tool



Problems

- 1) Epoch error map changes if hits are enabled, only by some GET4
- 2) Epoch error map has 4 bad sample point by many GET4. Maximal expected was 3
- 3) Tap value 13 and 14 are suspect

Problem 1: Epoch error map changes

Epoch error, acquisition time 1 second, no hits

TAP\GET4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0																					10			
1																					10			
2					10											10			10	10	10		10	
3				10		10		10	10			1			10						10			
4																					10			
5																					10			
6			10		10											10	10		1	10	10	10	10	
7	10	10		10		10	10	10	10	10		10			10						10			

FW updated to save GET4 samples if epoch error.

Epoch error, acquisition time 1 second, 100 Hz hit generator

TAP\GET4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0					10																10			
1					10																10			
2					10											10			10	10	10		10	
3				10	10	10		10	10			10			10						10			
4					10																10			
5					10																10			
6			10		10											10	7		10	10	10	6	1	
7	10	10		10	10	10	10	10	10	10	10	10	10	3	10						10			

Implemented 128x64-bits Ring buffer
32-bits timestamp
32-bits GET4 package

Problem 1: Epoch error map changes

GET4 number 4

Pos	Timestamp	Time diff	Event data	Type	Epoch	t. epoch	Error code
184	0000903972	0000004104	0x0169ff7a	epoch	11861949	4104	----
186	0000908064	0000004092	0x0169ff7c	epoch	11861950	4092	----
188	0000911520	0000003456	0x80000016	error	----	----	0010110
190	0000911592	0000000072	0xe5e4ee34	hit	----	----	----
192	0000911664	0000000072	0xede4cb30	hit	----	----	----
194	0000911740	0000000076	0xf5e4cb30	hit	----	----	----
196	0000911812	0000000072	0xfde4cf30	hit	----	----	----
198	0000916256	0000004444	0x0169ff80	epoch	11861952	8192	----
200	0000916328	0000000072	0x0169ff80	epoch	11861952	72	----
202	0000916404	0000000076	0x80000013	error	----	----	0010011
204	0000920360	0000003956	0x0169ff82	epoch	11861953	4032	----
206	0000924452	0000004092	0x0169ff84	epoch	11861954	4092	----
208	0000928544	0000004092	0x0169ff86	epoch	11861955	4092	----

Epoch 11861951 lost

Sequence error in ch0

Time between epochs 8192 clocks
and 72 clocks

Event discarded error

Double epoch

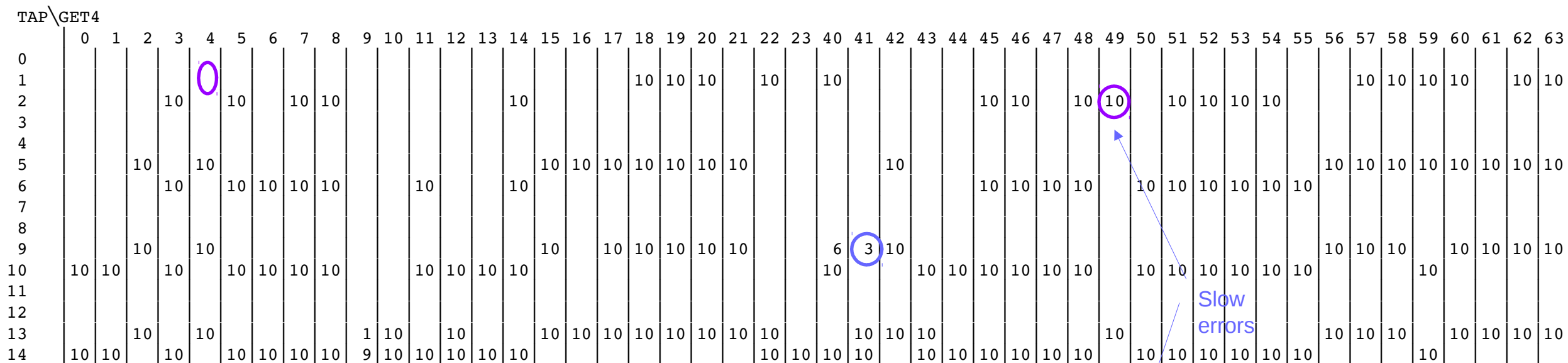
GET4 number 44

Pos	Timestamp	Time diff	Event data	Type	Epoch	t. epoch	Error code
102	0035475388	0000004092	0x0155da80	epoch	11201856	4092	----
104	0035479484	0000004096	0x0155da82	epoch	11201857	4096	----
106	0035480452	0000000968	0xe9942e2d	hit	----	----	----
108	0035480524	0000000072	0xe1942b2e	hit	----	----	----
110	0035480600	0000000076	0xf1942d2e	hit	----	----	----
112	0035487676	0000007076	0x0155da86	epoch	11201859	8192	----
114	0035487748	0000000072	0x0155da86	epoch	11201859	72	----
116	0035487820	0000000072	0x80000013	error	----	----	0010011
118	0035491776	0000003956	0x0155da88	epoch	11201860	4028	----
120	0035495868	0000004092	0x0155da8a	epoch	11201861	4092	----
122	0035499964	0000004096	0x0155da8c	epoch	11201862	4096	----

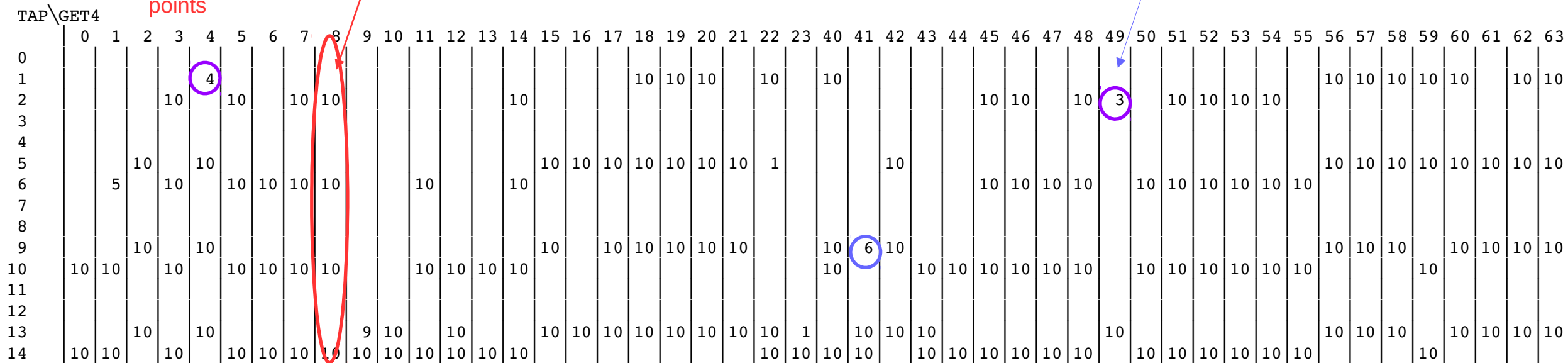
Conclusion: Epoch lost and double
epoch due to event discarded error

Event discarded error

Epoch error map@GSI / 2xGBTx / 24xGET4 / no hits 1 vs 10 second acquisition time



Typical GET4 with 4 bad sampling points



Epoch error map @HD / 2xGBTx / 24xGET4 / no hits

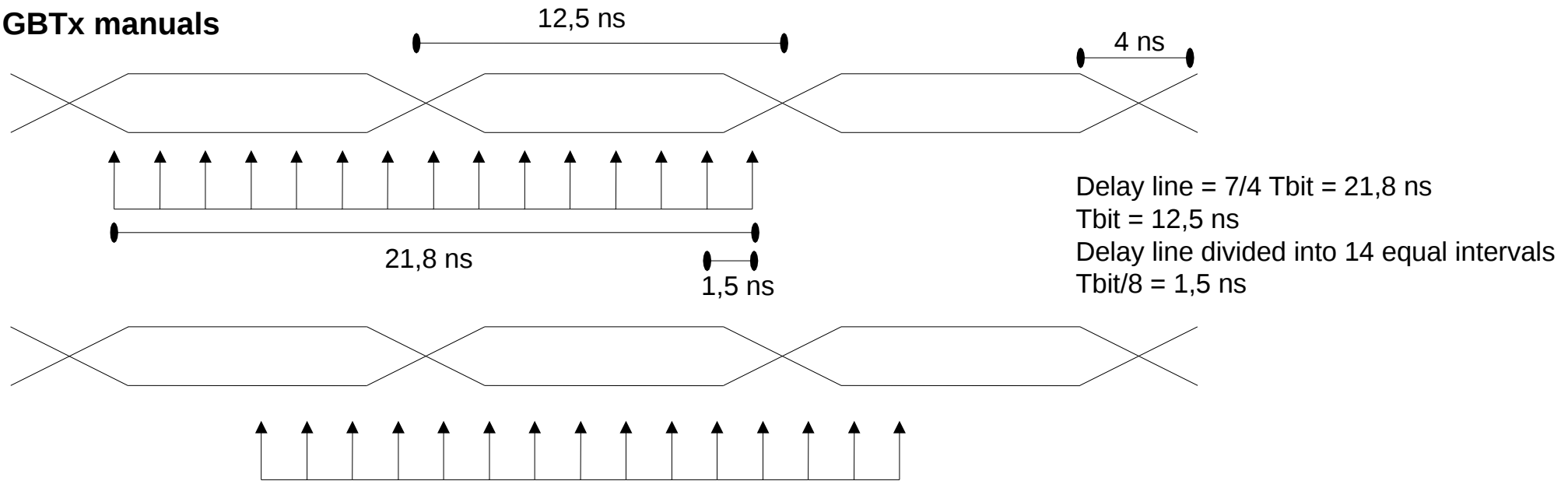
1 vs 10 second acquisition time

TAP\GET4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	
0																					10																												
1	10	10	10	10	10		10	10	10	10		8	10			10	10	10			10		10				10	10															10	10					
2																											10	10			10	4	10	10	10	10		10			10								
3																																																	
4																																																	
5	10	10	10	10	10	2	10	10	10		3	10	10	10		10			10				10	10																			10	10		10	10		
6																										10	10	10					9	10	10		10			10									
7																																																	
8																		10		10	10	10																											
9	10	10	10	10	10	10		10	10	10		10	10	10		10			10				10	10	10		10																10	10	10		10	10	
10															10												10	10	10																				
11																																																	
12			1										10				3	10		10		10														10													
13	10	10	10	10	10	10		10	10	10		10	10	10		10			10		10		10	10	10																			10	10	10		10	10
14							10				7				10											10	10	10			10	10	10	10	10	10	8	10			10					6			

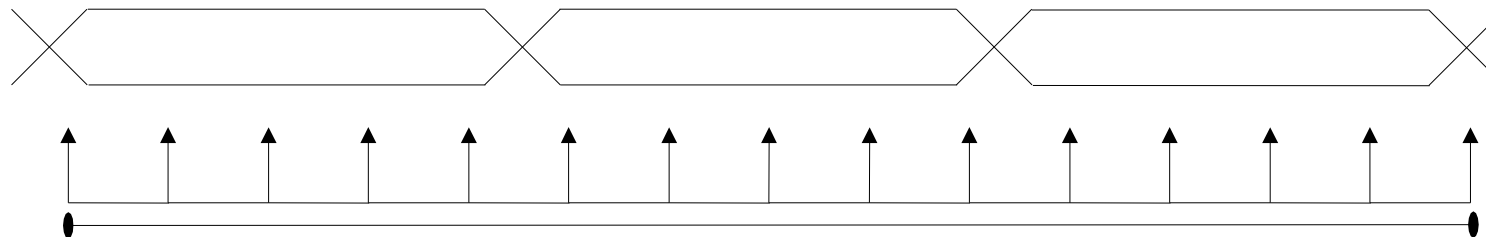
TAP\GET4	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63		
0																					10																													
1	10	10	10	10	10		10	10	10	10	2	10	10			10	10	10			10			10				10	10		10	10	10	10		10			10				10	10		3				
2																											10	10			10	9	10	10	10	10		10			10									
3																																																		
4																																																		
5	10	10	10	10	10	9	10	10	10	5	10	10	10	10		10			10				10	10																				10	10		10	10		
6																										10	10	10		10		10	10	10	10		10			10										
7																																																		
8																		10		10	10	10																												
9	10	10	10	10	10	10	2	10	10	10		10	10	10		10			10				10	10	10				10																10	10		10	10	
10														10													10	10	10																					
11																																																		
12													10				10	10		10		10																												
13	10	10	10	10	10	10		10	10	10		10	10	10		10			10		10		10	10	10				10																	10	10		10	10
14							10				10				10												10	10	10			10	10	10	10	10	10			10			10							

Problem 2: Bad sampling points

From GBTx manuals



Possible explanation of our system behavior



Conclusion

- Try to find the middle point between 2 bad sampling points
- There is often 3 taps error free between two bad sampling points
- Find the first error and set sampling point in this point+2 or -2. Check if the selected point is error free
- GET4 without errors (Get4 54 HD setup). Take the mean sampling point of the neighbors GET4
- Open question: TAP value 13 and 14

GBTx lost

Epoch

31	30	29 – 25	24 – 1	0
0	0	unused	Epoch counter	Sync

Data/Hit

23	22	21	20	19	18 – 7	6 – 0
1	1	Channel	Edge	Time stamp	Fine time	

Slow control

31	30	29	28	27	26	25	24	23 – 0
0	1	0	Channel	Edge	Type	Data		

Error

31	30	29	28	27	26	25 – 7	6 – 0
1	0	0	Edge	Channel	unused	Error code	

GBT frame still receiving data after GBTx is power down

Received data is always 0xAAAAAAAAA
Valid frame signal is not working properly and
It is not used!

As you see 0xAAAAAAAAA is not a valid data!
Work around found!

```
1 GSI
2
3 f=0, no hits enable, acquisition 1 sec
4 Histo resume error flags
5
6 0 1 2 3 4 5 6 7 8 9 10
7
8 0
9 1
10 2
11 3
12 4
13 5
14 6
15 7
```

```
16 f=0, hits enable, acquisition 1 sec
17 Histo resume error flags
18
19 0 1 2 3 4 5 6 7 8 9 10
20
21 0
22 1
23 2
24 3
25 4
26 5
27 6
28 7
```

```
29 f=100, hits enable, acquisition 1 sec
30 Histo resume error flags
31
32 0 1 2 3 4 5 6 7 8 9 10
33
34 0
35 1
36 2
37 3
38 4
39 5
40 6
41 7
```

```
42 f=100K, hits enable, acquisition 1 sec
43 Histo resume error flags
44
45 0 1 2 3 4 5 6 7 8 9 10
46
47 0
48 1
49 2
50 3
51 4
52 5
53 6
54 7
```

```
1 GBTx 0
2 TAPS\GET4
3
4 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
5
6 0
7 1
8 2
9 3
10 4
11 5
12 6
13 7
14
15 GBTx 1
16 TAPS\GET4
17
18 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
19
20 0
21 1
22 2
23 3
24 4
25 5
26 6
27 7
28
29 GBTx 0
30 TAPS\GET4
31
32 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
33
34 0
35 1
36 2
37 3
38 4
39 5
40 6
41 7
42
43 GBTx 1
44 TAPS\GET4
45
46 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
47
48 0
49 1
50 2
51 3
52 4
53 5
54 6
55 7
```