CAEN SY4527 SYSTEM – EPICS Test Station Results Report

***Date**: September 24, 2019*
***Tested by**: Pablo Campero*

Tested CAEN A7030TN HV board using GECO2020 Script and Data Log Advanced Features

Procedure:

1. Wrote script in GECO 2020 to automate voltage ramp test for CAEN-A7030TN boards.
   1.1. System Advanced Features in GECO 2020 allows enhancement functionalities to create scripts.
   1.2. Script sets initial conditions/parameters, and ramps up/down 36 channels simultaneously to the set voltage. Script cycles ramp up/down 100 times holding voltage at set value and at zero per 10 seconds each cycle.
2. Installed one A7030TN HV at slot 0 (only one board at the time for each test).
3. Enabled EPICS server to monitor automated test via EPICS client.
4. Verified proper communications between CAEN EPICS Server Built-in and EPICS client
5. Table 1 below shows the conditions and set parameters for the test.

Table 1: Voltage Ramp Up/Down Test				
Mainframe Model	SY4527	**Set Voltage**		1500 V
Mainframe S/N	400	**Ramp Up/Down Rate**		250 V/s
Board Model	A7030TN	**Max Current Set**		1000 uA
Boards S/N	304 and 297	**Load:** 0 Ω	**Vmax:** 1800 V	**IMon:** ~ 0 uA
CPU model / SN	A4528/760	**Total time to test 36 channels**		3200 s
Total Channels Tested per board	36	**Total # Ramp Up/Down per channel and trial**		100/100

6. Configured GECO 2020 data logger with desired parameters to be archived (x9) and created log file.
7. Started GECO 2020 data logger recording (Click "On" button).
8. Ran *HV CAEN Voltage Ramp Test CSS-BOY* screen **only to monitor** voltage readouts during the 100 cycles.
9. Took screenshots for initial conditions displayed in GECO 2020 and EPICS/CSS-BOY screen. See attached screenshots.
10. Ran developed script in GECO 2020 to start automated test.
11. Verify that GECO script is completed successfully after the last cycle and all channels are off.
12. Saved data log files (Turn off GECO 2020 data logger).
13. Documented issues and screenshots with the results. See attached files and screenshots.
14. Repeated steps 2 thorough 13 to test each A7030TN board (S/N: 304 and 297).

Results

During the tests, for the two A7030TN boards tested (S/N: 304 and 297) observed:

1. All channels monitored and controlled by GECO2020 and ssh appears to be ok, while monitored EPICS PVs presented issues (100 ramps up/down completed per trial).
2. PVs associated with turn on/off status parameter ("Pw") for all 36 channels did not update while monitoring automated test with EPICS *Voltage Ramp Test –CSS-BOY screen*
3. Found discrepancy between GECO 2020/ssh and EPICS PVs for *Pw* parameter disappear after CSS-BOY screen is refreshed or "*camonitor"* EPICS commands is re-executed.
   3.1. Noticed that only this *Pw* PV has this issue. The rest of the monitored PVs (Vmon, Vmax, IMon, etc) during the test did not fail when "*camonitor"* EPICS command was executed once in the Host PC (EPICS client). The EPICS command "*camonitor"* is used to show/print continuously value updates for PVs at any change.
   3.2. Able to see correct *Pw* PV updated values when EPICS "*caget" command* is executed once.

A7030TN Board [S/N: 304] Results:

Note: Results for the two prior trails for board (S/N: 304) are not showed in this report, since they were documented on *09-04-2019 SY4527 System Results* report (See Test 2.1 and 2.1 results).

Trial 3:

1. Channel 11 ramped up to set voltage ~ 10 s later, *Pw* parameter was set to 1 (turn on channel) but channel did not ramp to the set voltage. After data logged analysis for a period between 11:41:29 and 11:41:48 (one ramp up/down cycle), found that *HV CAEN – Voltage Ramp Test CSS BOY screen* and GECO 2020 data log plotted matched. See fig.1 and fig.2.
   1.1. Fig.1 shows how channel 11 was recovered by itself in the next cycle and ramped with no issues along with the other channels. This behavior seems to happen for all failed channels during test
   1.2. Plotting all channels from the data log file generated by GECO 2020 in the above mentioned period found that, the rest 35 channels ramped up with no issues after *Pw* parameter was set 1, within the 1 s. Fig.3 show a plot with for all 36 channels at ramp up time.
   1.3. Attached table (304-*Trial 3/AllChannels-Plot.pdf* located at https://userweb.jlab.org/~campero/) shows the voltage and *Pw* parameters for each channel during the mentioned period.

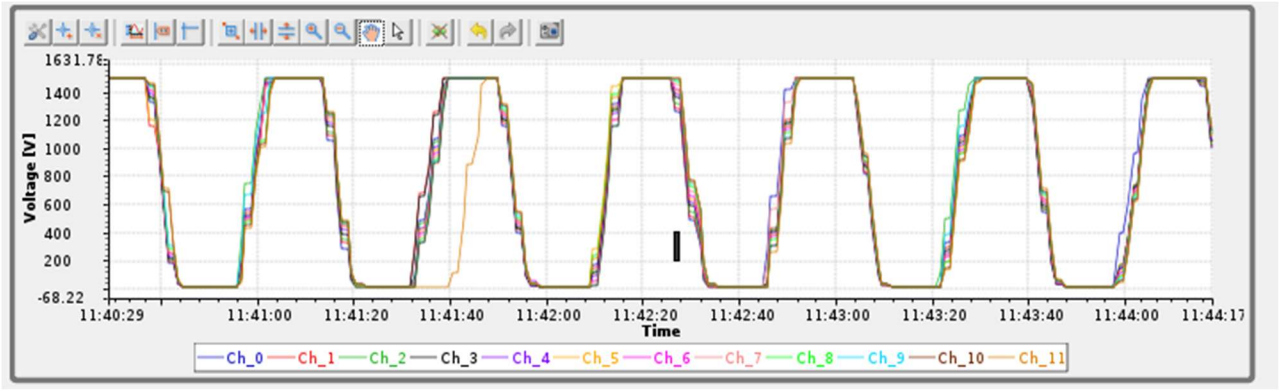
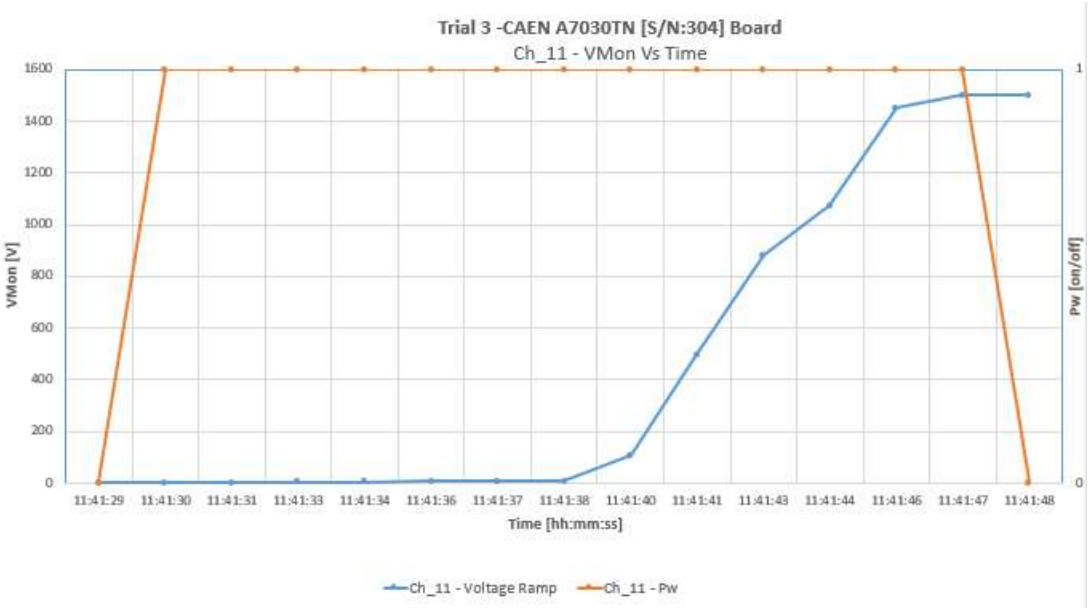


Fig.1. *HV CAEN – Voltage Ramp Test CSS BOY* screen shows channel 11 latency to ramp up



GECO2020 Data Logged

Time	Ch_11 - Pw	Ch_11- VMon
hh:mm:ss	[On/Off]	[V]
11:41:29	0	1.23
11:41:30	1	1.23
11:41:31	1	1.88
11:41:33	1	4.37
11:41:34	1	5.54
11:41:36	1	7.3
11:41:37	1	8.69
11:41:38	1	9.05
11:41:40	1	105.62
11:41:41	1	497.64
11:41:43	1	881.71
11:41:44	1	1073.66
11:41:46	1	1449.93
11:41:47	1	1499.54
11:41:48	0	1499.55

Value did not change

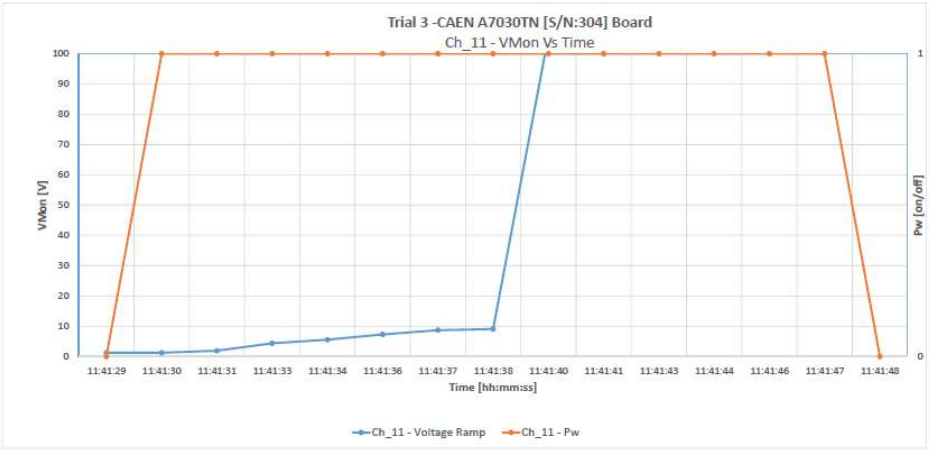


Fig.2. GECO 2020 plot from data logged shows the same latency to ramp up for channel 11 shown by *HV CAEN – Voltage Ramp Test CSS BOY* screen

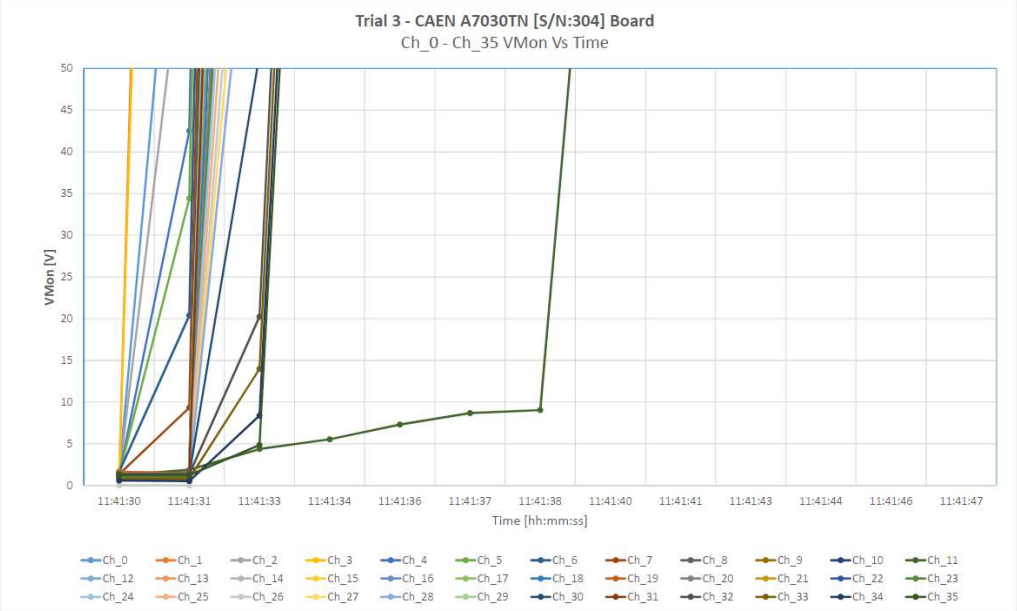


Fig.3. GECO 2020 data logged plot shows all 36 channel zoom in view at the ramp up time. Notice that ch_11 ramped only to from 0 to 9 V after of *Pw* was set to 1, this is not a proper behavior for ch_11 since voltage ramp up value was set to 250 V/s. Ch_11 started ramping with correct set value after 9 s.

2. Channel 23 had exactly same latency ~ 10 sec and behavior as mentioned for channel 11, during the 100-cycle trial the latency for channel 23 was observed two times. See fig.4 and fig.5

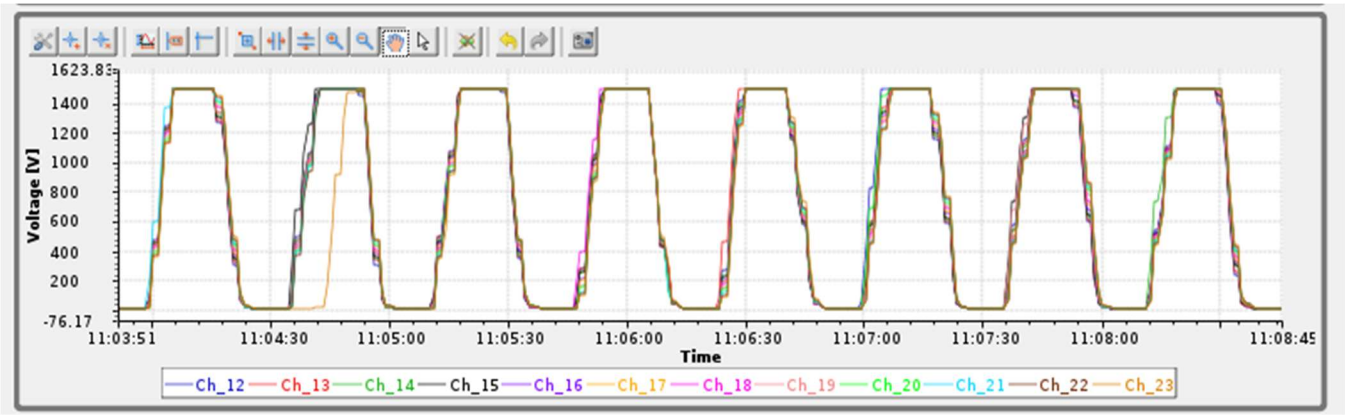


Fig.4. *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the first channel 23 latency to ramp up

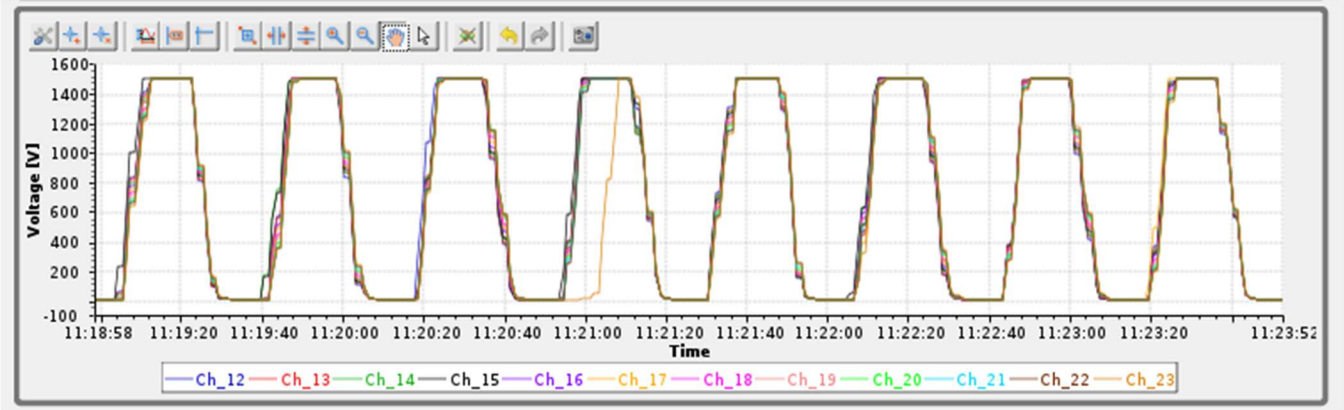


Fig.5. *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the second channel 23 latency to ramp up

Trial 4:

Channel 23 had exactly same latency ~ 10 sec and behavior as the mentioned channels in trial 3, during the 100-cycle trial the latency for channel 23 was observed only one time. See fig.6.

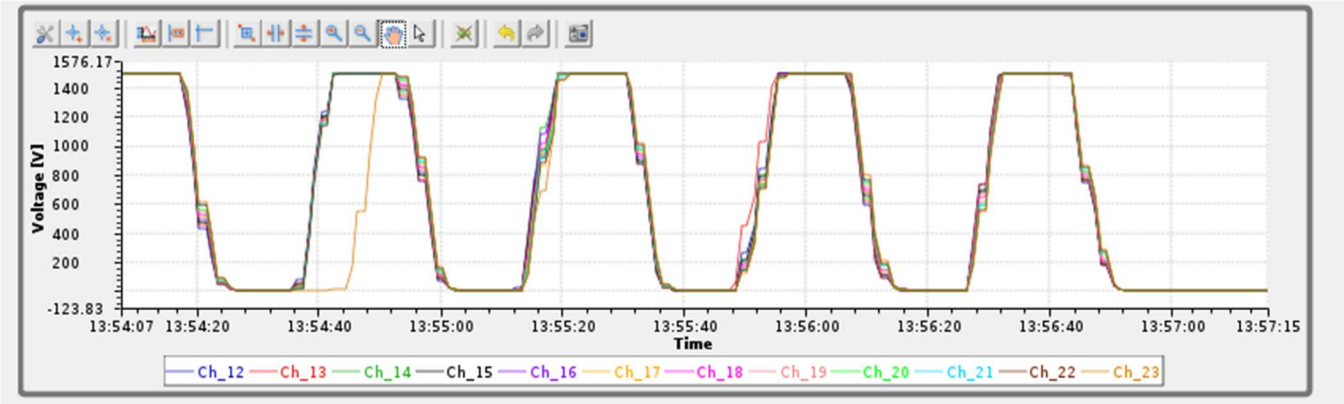


Fig.6. *HV CAEN – Voltage Ramp Test CSS BOY* screen shows channel 23 latency to ramp up

Summary:

CAEN A7030TN [S/N:304] Board - GECO 2020 Data						
Trial #	**Total Ramp Up/Down per Trial**	**Channel #**	**Channel Incident # During Trial**	***Pw* (On=1) Time**	**Channel Ramping Up Time**	**Latency Time [s]**
3	100	11	1	11:41:30	11:41:40	0:00:10
		23	1	11:04:33	11:04:43	0:00:10
			2	11:20:52	11:21:02	0:00:10
4	100	23	1	13:54:34	13:54:44	0:00:10
Total Cycles	**200**	**Total Incidents**	**4**			

A7030TN Board [S/N: 297] Results:

Trial 1

1. Channel 11 had a latency to ramp up and same behavior as mentioned in previous tests, channel 11 presented the latency issue two times during this trial. See fig.7 and fig.8.

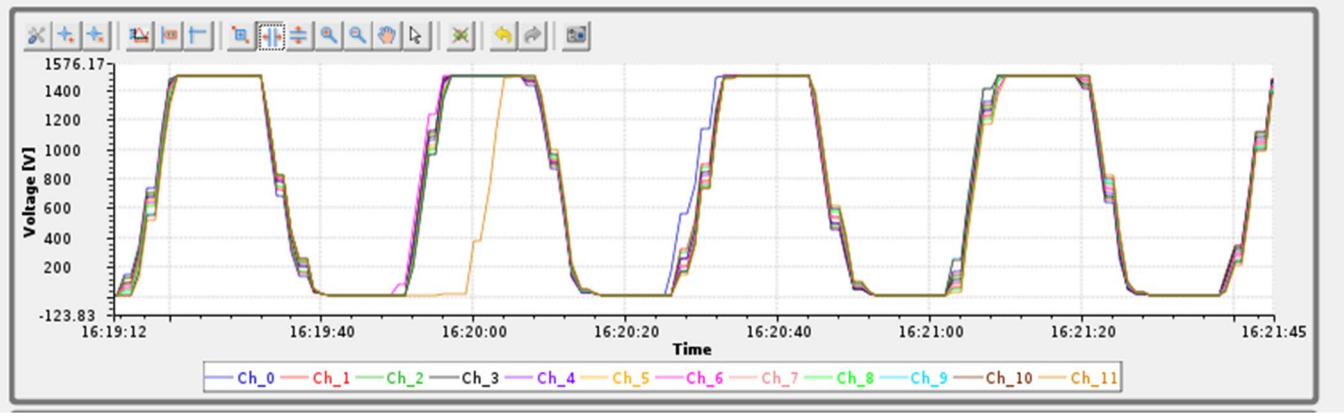


Fig.7 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the first latency incident for channel 11. Channel 11 ramped up after ~ 10 s of *Pw* value was set to 1

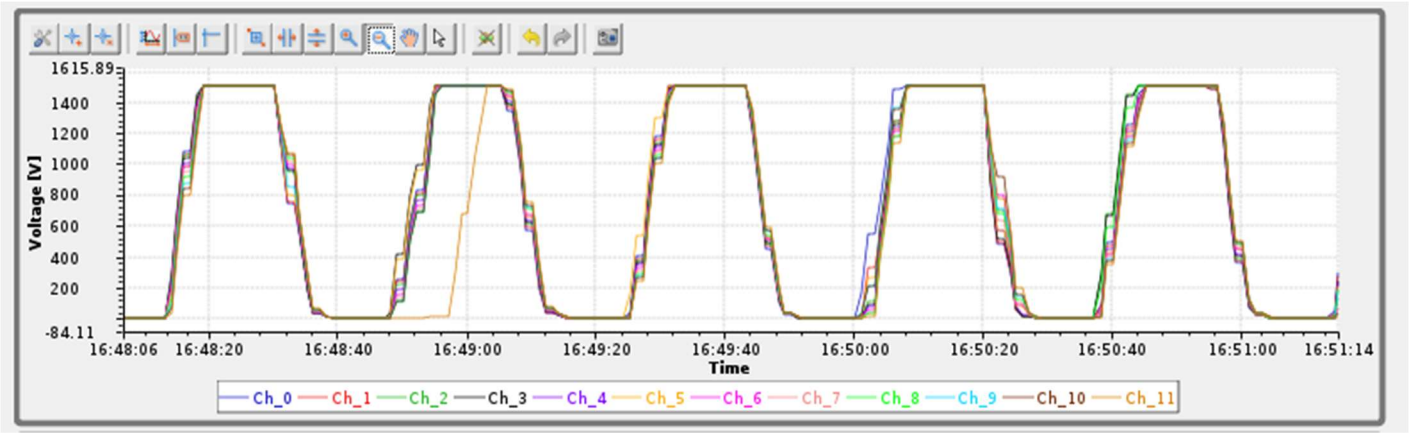


Fig.8 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the second latency incident for channel 11. Channel 11 ramped up after ~ 10 s of *Pw* value was set to 1

2. Channel 25 had a latency to ramp up and same behavior as mentioned channels in previous test, during the trial the latency for channel 25 was observed four times. See fig.9 to fig.12.

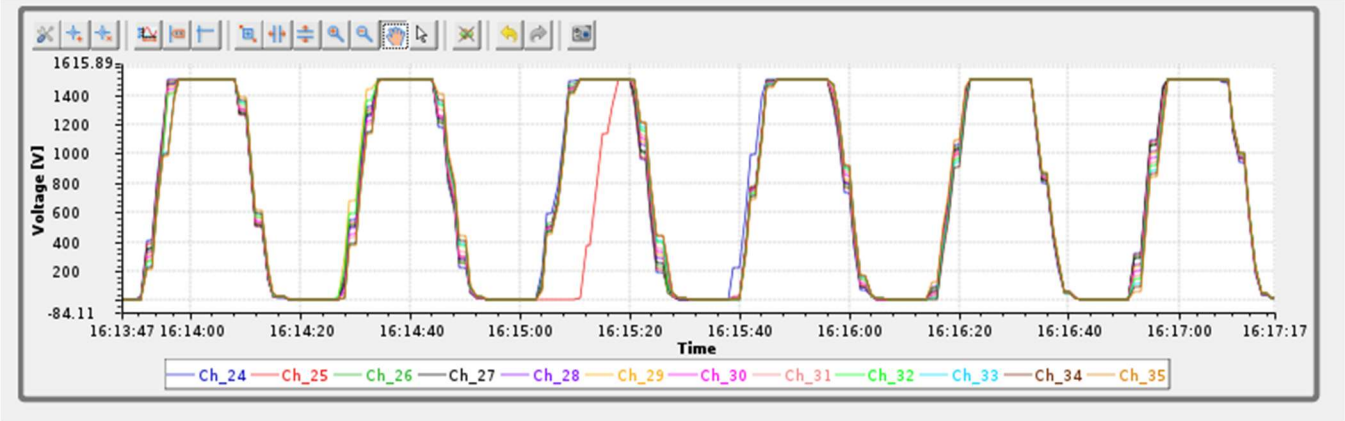


Fig.9 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the first latency incident for channel 25. Channel 25 ramped up after ~ 9 s of *Pw* value was set to 1

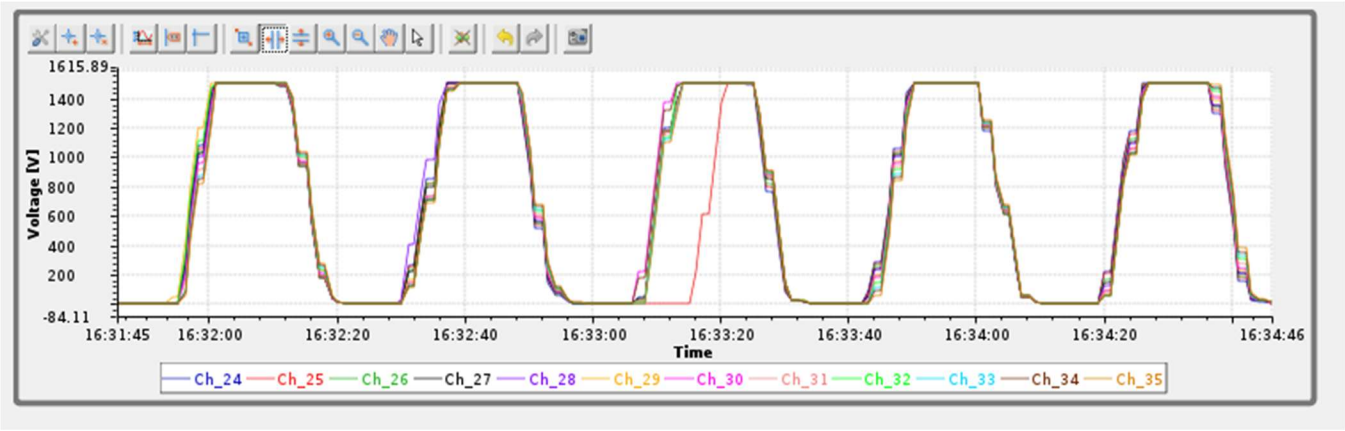


Fig.10 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the second latency incident for channel 25. Channel 25 ramped up after ~ 11 s of *Pw* value was set to 1

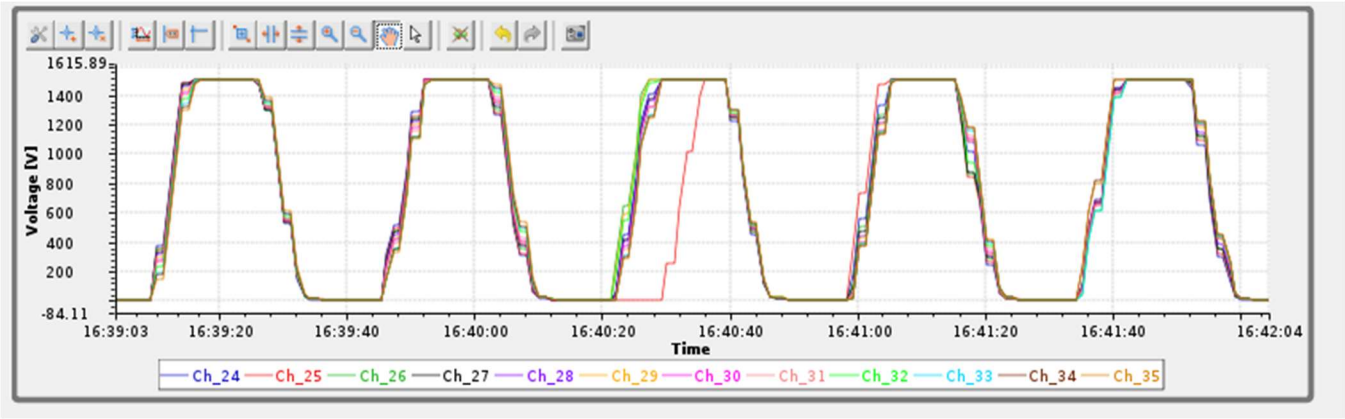


Fig.11 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the third latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

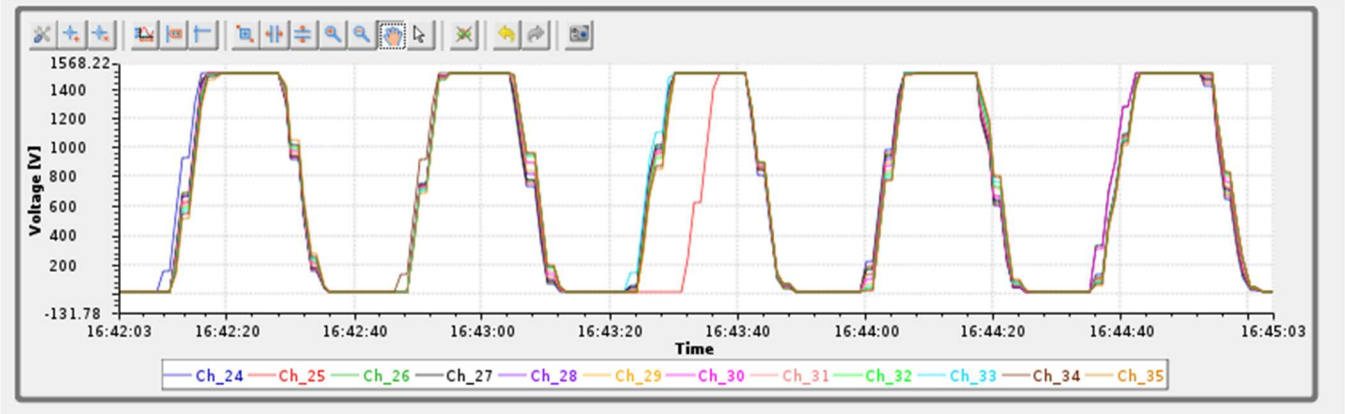


Fig.12 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the fourth latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

Trial 2

1. Channel 25 had a latency to ramp up and same behavior as mentioned in previous test, channel 25 presented the latency issue two times during this trial. See fig.13 and fig.14.

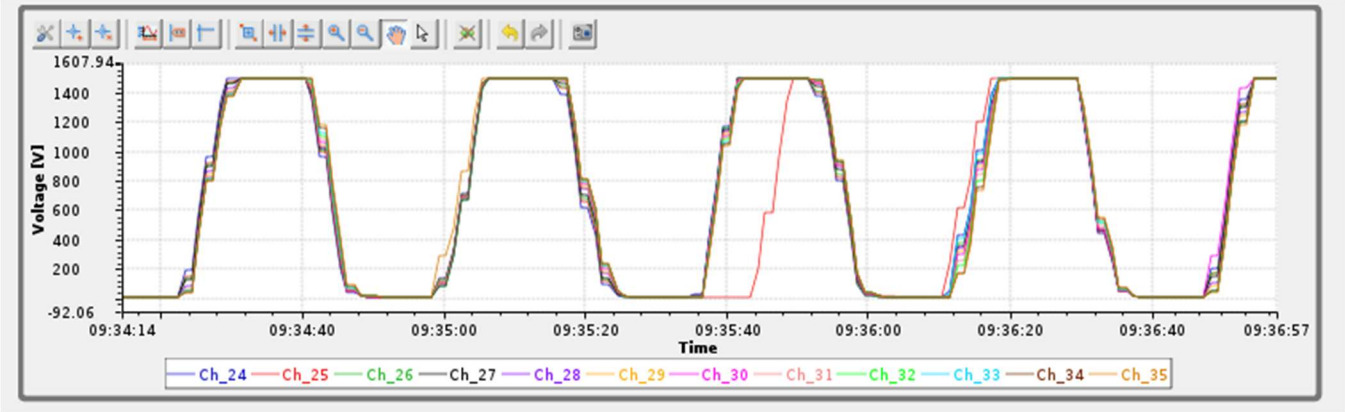


Fig.13 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the fourth latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

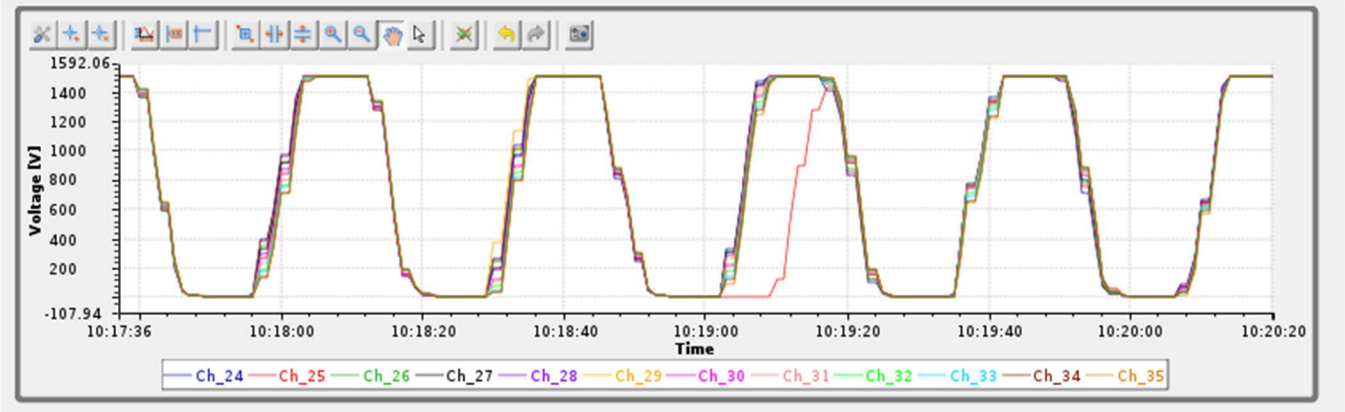


Fig.14 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the fourth latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

2. Channel 35 had same misbehavior as mentioned in previous test; channel 35 had one latency incident during this trial. See fig.15.

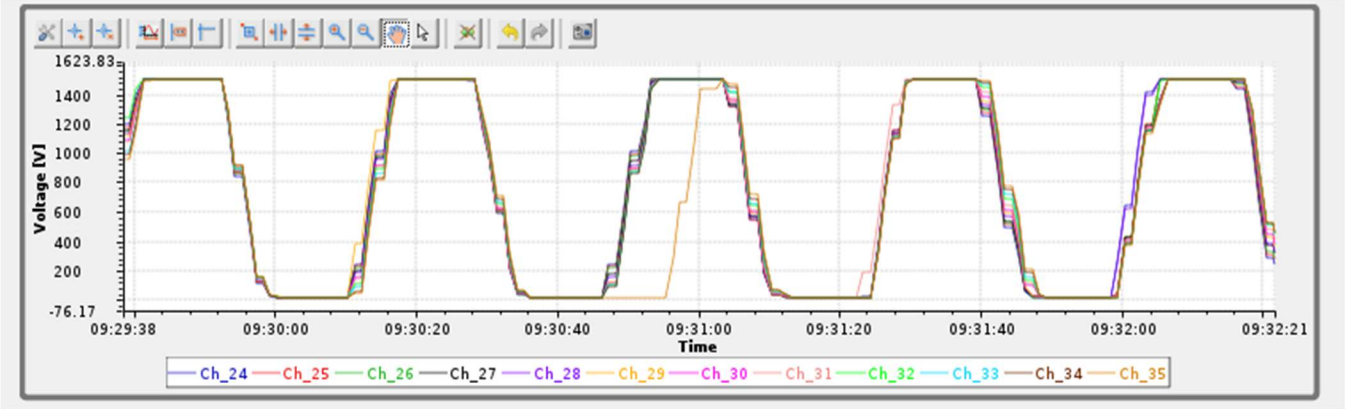


Fig.15 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows the fourth latency incident for channel 35. Channel 35 ramped up after ~ 10 s of *Pw* value was set to 1

Trial 3

1. Channel 2 had same misbehavior as mentioned in previous test; channel 2 presented one latency incident during this trial. See fig.16

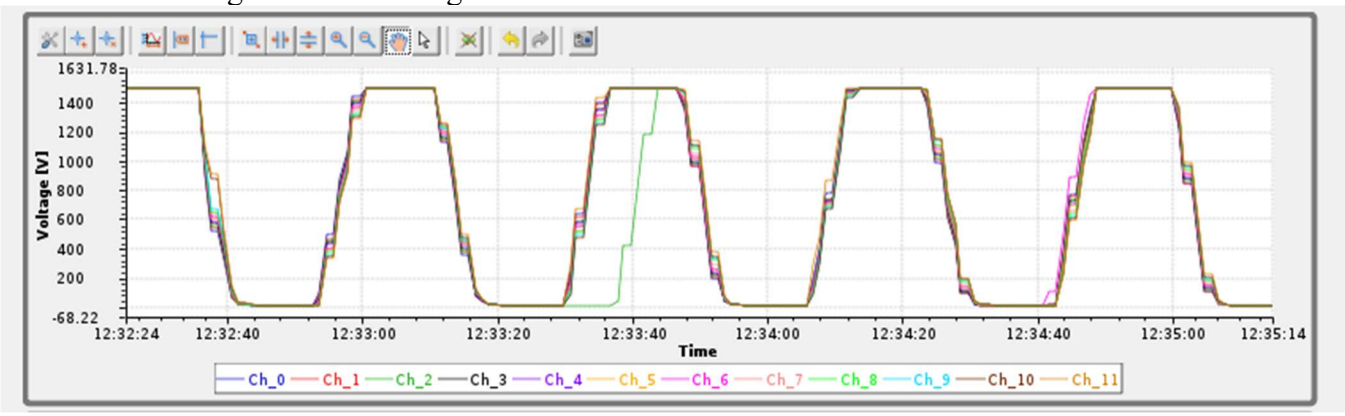


Fig.16 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows latency incident for channel 2. Channel 2 ramped up after ~ 9 s of *Pw* value was set to 1

2. Channel 25 had same misbehavior as mentioned in previous test; channel 25 presented one latency incident during this trial. See fig.17

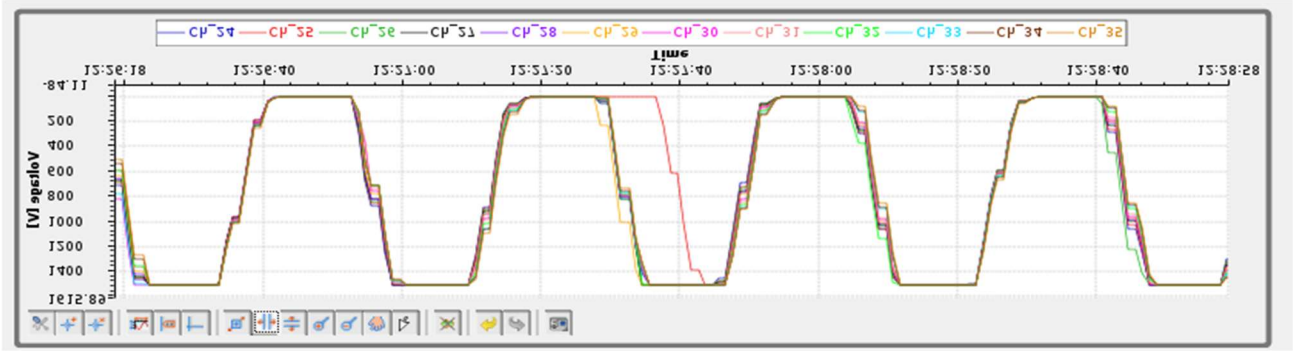


Fig.17 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

Trial 4

1. Channel 11 had same misbehavior as mentioned in previous test; channel 11 presented one latency incident during this trial. See fig.18.

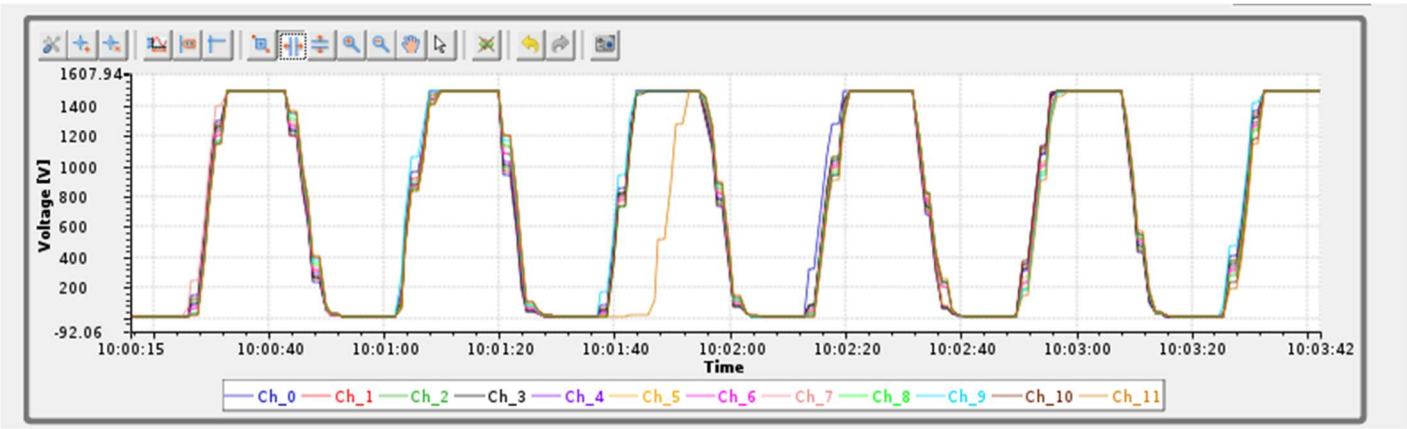


Fig.18 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows latency incident for channel 11. Channel 11 ramped up after ~ 10 s of *Pw* value was set to 1

2. Channel 25 had same misbehavior as mentioned in previous test; channel 25 presented three latency incidents during this trial. See fig.19 to fig 21.

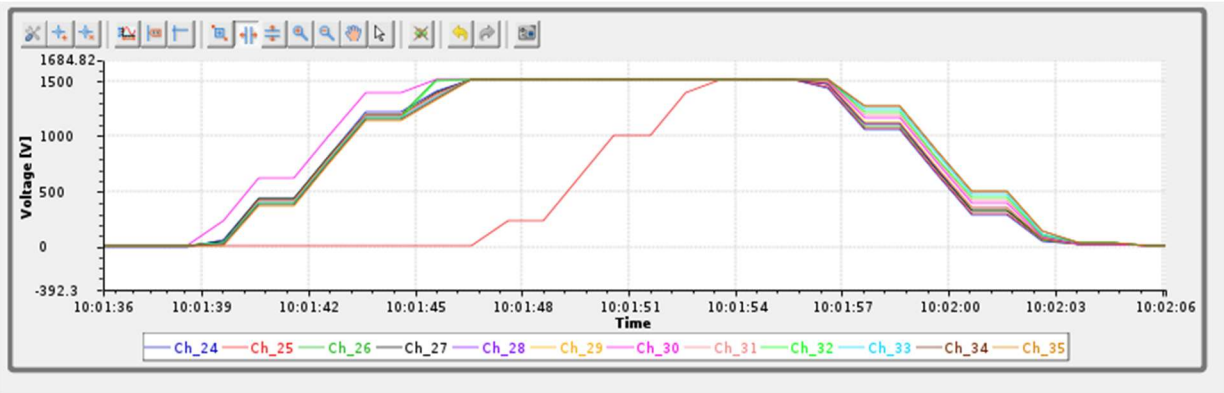


Fig.19 – *HV CAEN – Voltage Ramp Test CSS BOY* screen zoom in view shows first latency incident for ch_25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

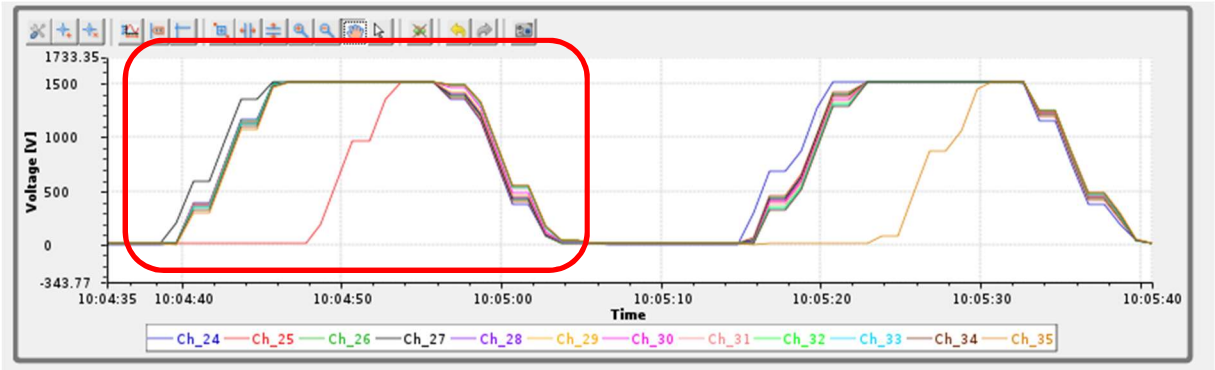


Fig.20 – *HV CAEN – Voltage Ramp Test CSS BOY* screen zoom in view shows second latency incident for ch_25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

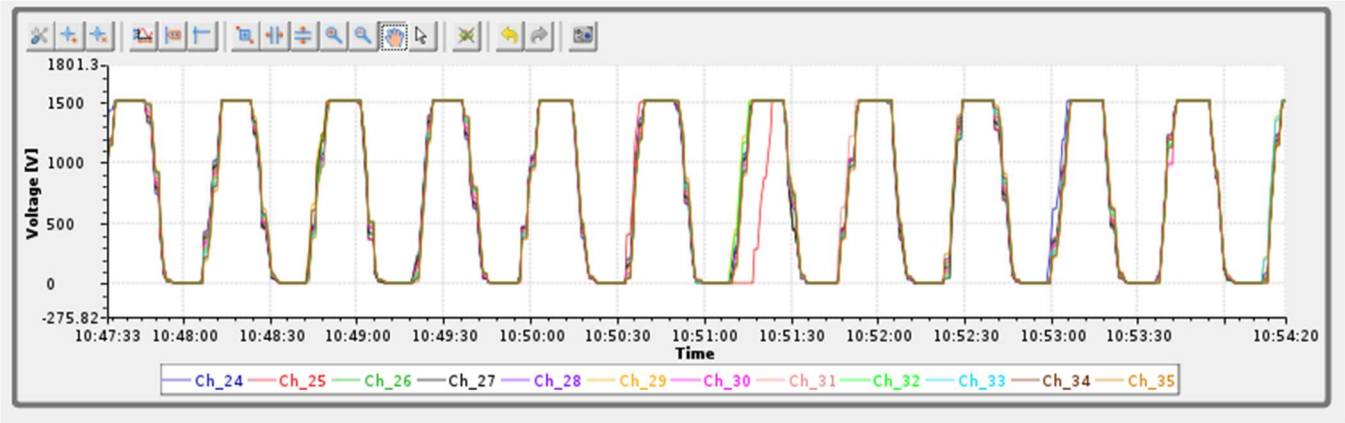


Fig.21 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows second latency incident for channel 25. Channel 25 ramped up after ~ 10 s of *Pw* value was set to 1

2.1. Noticed that channel 11 and channel 25 had the latency incident in the same cycle. See fig.222.

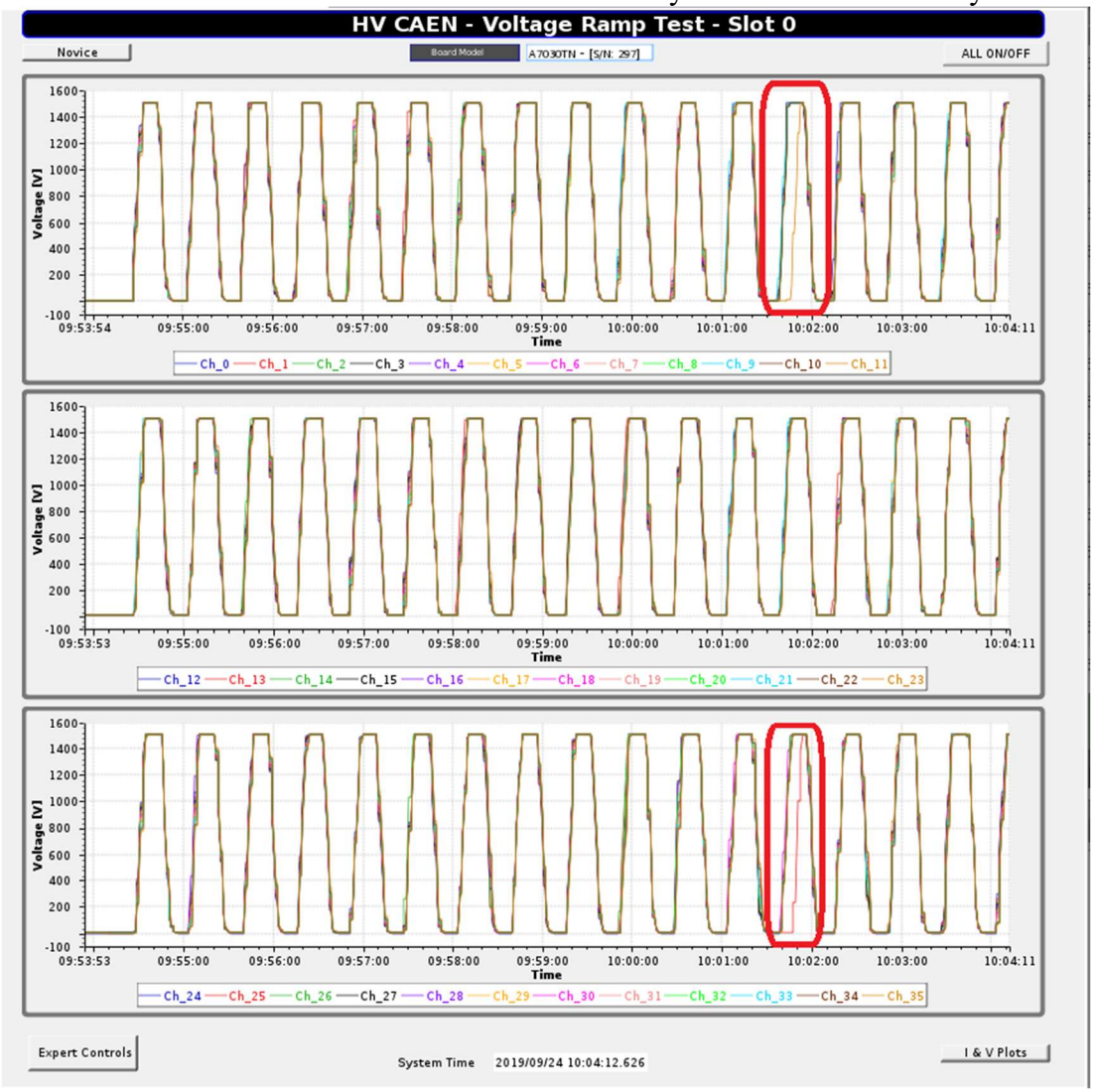


Fig.22 – *HV CAEN – Voltage Ramp Test CSS BOY* screen shows latency incident for channel 11 and channel 25 occurred in the same ramp up period.

3. Channel 35 had same misbehavior as mentioned in previous test; channel 25 presented one latency incident during this trial. See fig.23.

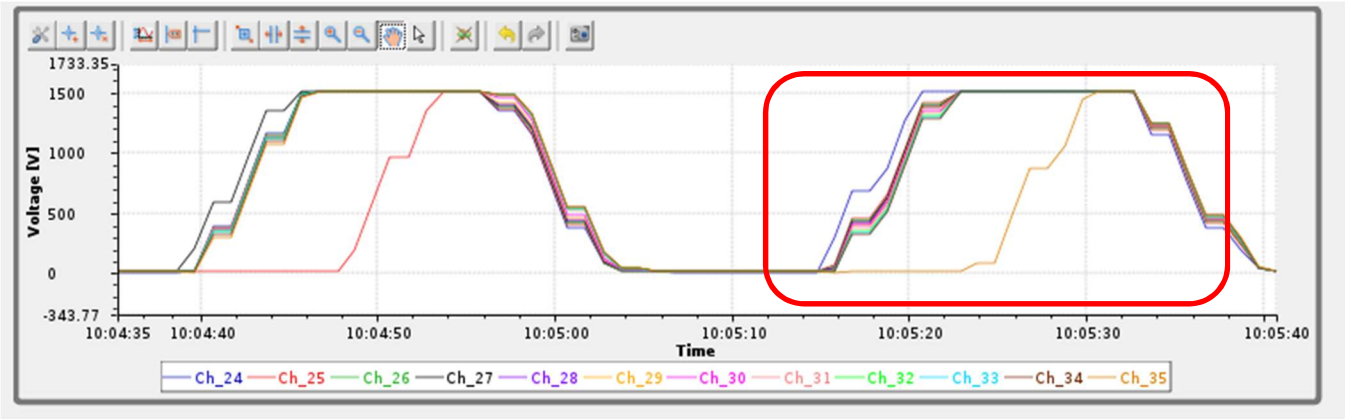


Fig.23 – *HV CAEN – Voltage Ramp Test CSS BOY* screen zoom in view shows latency incident for channel 35. Channel 35 ramped up after ~ 10 s of *Pw* value was set to 1

Summary

CAEN A7030TN [S/N:297] Board - GECO 2020 Data						
Trial #	**Total Ramp Up/Down per Trial**	**Channel #**	**Channel Incident # during Trial**	***Pw* (On=1) Time**	**Channel Ramping Up Time**	**Latency Time**
1	100	11	1	16:19:48	16:19:58	0:00:10
			2	16:48:47	16:48:57	0:00:10
		25	1	16:15:01	16:15:10	0:00:09
			2	16:33:04	16:33:15	0:00:11
			3	16:40:19	16:40:29	0:00:10
			4	16:43:21	16:43:31	0:00:10
2	100	25	1	9:35:33	9:35:43	0:00:10
			2	10:18:59	10:19:09	0:00:10
		35	1	9:30:45	9:30:55	0:00:10
3	100	2	1	12:33:27	12:33:36	0:00:09
		25	1	12:27:26	12:27:36	0:00:10
4	100	11	1	10:01:36	10:01:46	0:00:10
		25	1	10:01:37	10:01:47	0:00:10
			2	10:04:37	10:04:47	0:00:10
			3	10:51:07	10:51:17	0:00:10
		35	1	10:05:14	10:05:23	0:00:09
Total Cycles	**400**	**Total Incidents**	**16**			