

CAEN SY4527 SYSTEM – EPICS Test Station Results Report

Date: September 4, 2019

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Test 1: Tested CAEN A7030 HV board by setting and monitoring PVs using CSS-BOY screens

Procedure

1. Connected only one A7030TN board to mainframe's slot 0 (15 empty slots).
2. Enabled System Advanced Features in GECO 2020.
 - 2.1. System Advanced Logging allows the user to create a log file with desired parameters for each board's channel.
 - 2.2. Enabled GECO logging advanced option for: *V0set*, *SVmax*, *I0set*, *Rup*, *RDWn*, *Pw*, *VMon*, *IMon*, and *Trip* parameters for all 36 channels.
3. Enabled CAEN EPICS Server Built-in to allow controls and monitoring from EPICS-CSS screens (EPICS Client).
4. Verified communication between CAEN EPICS Server and EPICS client.
5. Used *HV CAEN Expert Controls* CSS-BOY screen to set and read above-mentioned parameters.
 - 5.1. Screen runs six JavaScripts to set all 36 channels' above-mentioned parameters simultaneously.
 - 5.2. Screen runs two JavaScripts to turn on and turn off ($Pw = 1/0$) all 36 channels simultaneously.
6. SY4527 system specs and set values for each of the three test performed are show in the table 1 below:

Table – 1: Voltage Ramp Up/Down Test				
Mainframe Model	SY4527	Set Voltage		1500 V
Mainframe S/N	400	Set Ramp Up/Down Rate		25 V/s
Board Model / S/N	A7030TN / 304	Max Current Set		1000 μ A
CPU model / SN	A4528 / 760	Load: 0 Ω	Vmax: 1800 V	IMon: $\sim$ 0 μ A
Total Channels Tested	36	Total # Ramp Up/Down per channel		15/15

7. Took screen shots for initial conditions displayed in GECO 2020 and EPICS/CSS-BOY screens (See attached screenshots for each test).
8. Started ramp up for all 36 channels by clicking “All Turn On/Off” button on *HV CAEN Expert Controls* CSS-BOY screen.
9. Ran *HV CAEN Voltage Ramp Test* CSS-BOY screen to monitor voltage readouts.
10. Saved data log files and screenshots with the results (See attached files and screenshots)

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11. Repeated steps 1 through 10 for each of the three test performed. For each test ramped up/down five times.

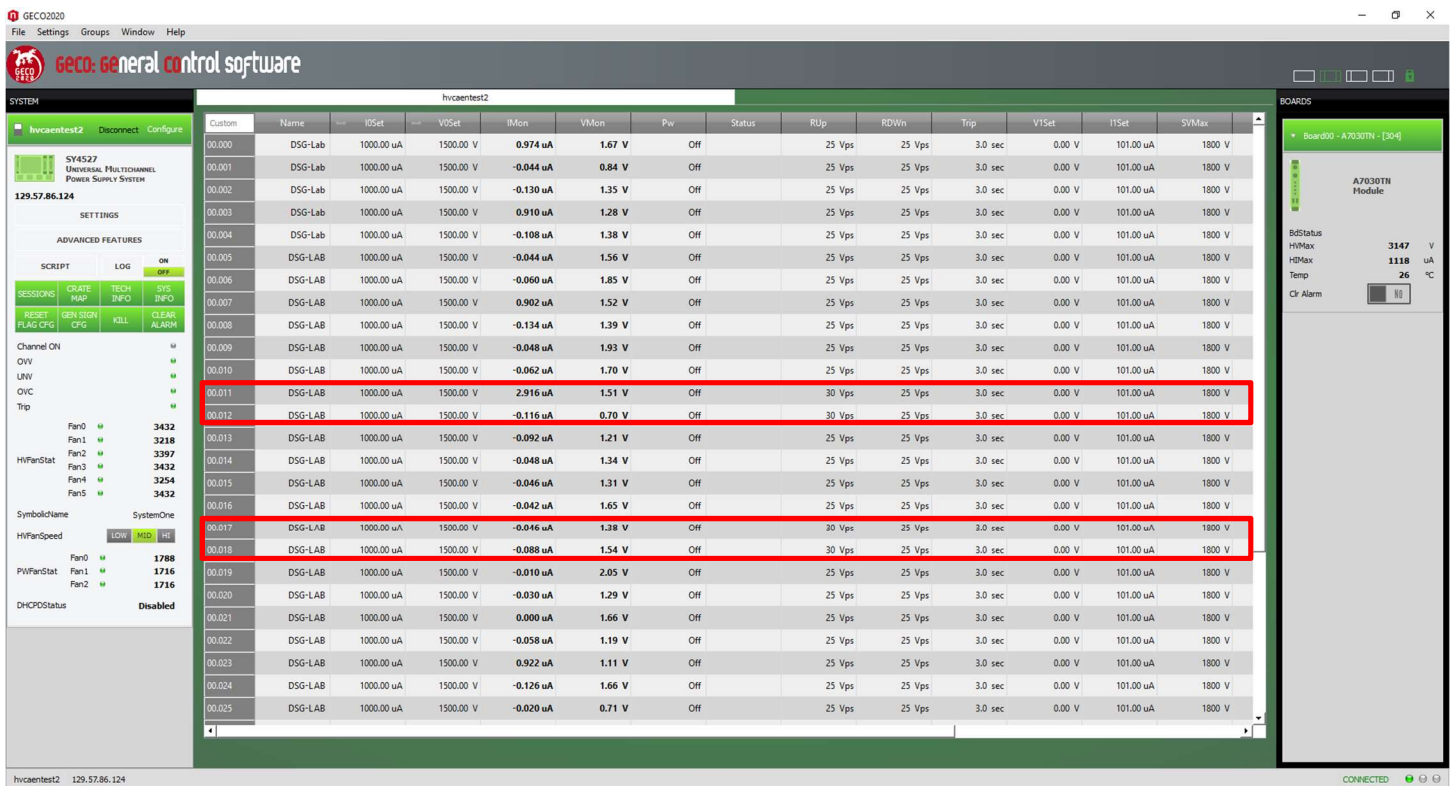
Results

Test 1.1

1. Channel 11, 12, 17 and 18 did not change PV associated with ramp up parameter (*Rup*) to set value 25 V/s after JavaScript to set all channels to same value was executed. See fig.5.

1.1. JavaScript sends the command to set *RUp* value to set value, one time for all channels.

1.2. Verified that neither PVs and GECO values for mentioned channels went to set point. See fig.1 and fig.2.



Custom	Name	ISet	VSet	IMon	VMon	Pw	Status	RUp	RDWn	Trip	V1Set	I1Set	SVMax
00.000	DSG-Lab	1000.00 uA	1500.00 V	0.974 uA	1.67 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.001	DSG-Lab	1000.00 uA	1500.00 V	-0.044 uA	0.84 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.002	DSG-Lab	1000.00 uA	1500.00 V	-0.130 uA	1.35 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.003	DSG-Lab	1000.00 uA	1500.00 V	0.910 uA	1.28 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.004	DSG-Lab	1000.00 uA	1500.00 V	-0.108 uA	1.38 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.005	DSG-LAB	1000.00 uA	1500.00 V	-0.044 uA	1.56 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.006	DSG-LAB	1000.00 uA	1500.00 V	-0.060 uA	1.85 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.007	DSG-LAB	1000.00 uA	1500.00 V	0.902 uA	1.52 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.008	DSG-LAB	1000.00 uA	1500.00 V	-0.134 uA	1.39 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.009	DSG-LAB	1000.00 uA	1500.00 V	-0.048 uA	1.93 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.010	DSG-LAB	1000.00 uA	1500.00 V	-0.062 uA	1.70 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.011	DSG-LAB	1000.00 uA	1500.00 V	2.916 uA	1.51 V	Off		30 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.012	DSG-LAB	1000.00 uA	1500.00 V	-0.116 uA	0.70 V	Off		30 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.013	DSG-LAB	1000.00 uA	1500.00 V	-0.092 uA	1.21 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.014	DSG-LAB	1000.00 uA	1500.00 V	-0.048 uA	1.34 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.015	DSG-LAB	1000.00 uA	1500.00 V	-0.046 uA	1.31 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.016	DSG-LAB	1000.00 uA	1500.00 V	-0.042 uA	1.65 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.017	DSG-LAB	1000.00 uA	1500.00 V	-0.046 uA	1.38 V	Off		30 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.018	DSG-LAB	1000.00 uA	1500.00 V	-0.088 uA	1.54 V	Off		30 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.019	DSG-LAB	1000.00 uA	1500.00 V	-0.010 uA	2.05 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.020	DSG-LAB	1000.00 uA	1500.00 V	-0.030 uA	1.29 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.021	DSG-LAB	1000.00 uA	1500.00 V	0.000 uA	1.66 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.022	DSG-LAB	1000.00 uA	1500.00 V	-0.058 uA	1.19 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.023	DSG-LAB	1000.00 uA	1500.00 V	0.922 uA	1.11 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.024	DSG-LAB	1000.00 uA	1500.00 V	-0.126 uA	1.66 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V
00.025	DSG-LAB	1000.00 uA	1500.00 V	-0.020 uA	0.71 V	Off		25 Vps	25 Vps	3.0 sec	0.00 V	101.00 uA	1800 V

Fig.1 — GECO2020 screenshot shows channel 11, 12, 17 and 18 with incorrect RUp values (30 V/s)

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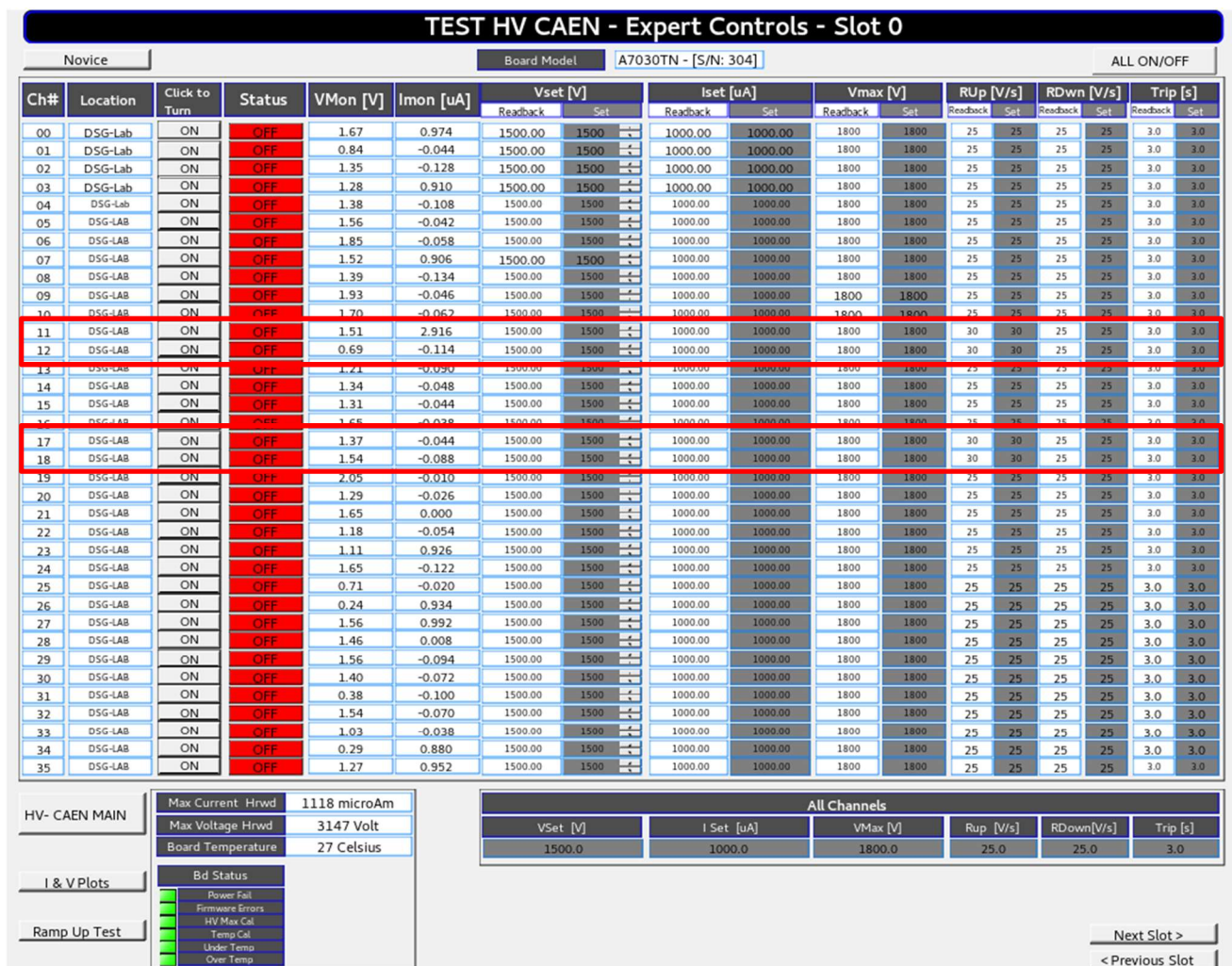


Fig.2 — Expert Controls CSS-BOY screen shows channel 11, 12, 17 and 18 with incorrect RUp values (30 V/s)

2. Channel 2 did not ramp down; PV associated with Pw parameter (Power on/off channel) did not change from 1 to 0 after JavaScript was executed as part of *Expert Controls CSS-BOY* screen. See fig.5.
 - 2.1. JavaScript send the command to set Pw to 0 value, command executed once for all channels.
 - 2.2. Verified that nether PVs and GECO values went to set point.
3. Channel 14 did not ramp up; PV associated with Pw parameter did not change from 0 to 1 after JavaScript was executed as part of *Expert Controls CSS-BOY* screen. See fig.5.
 - 3.1. JavaScript send the command to set Pw value to 1, command executed once for all channels.
 - 3.2. Verified that nether PVs and GECO values went to set point. See fig.3 and fig.4.

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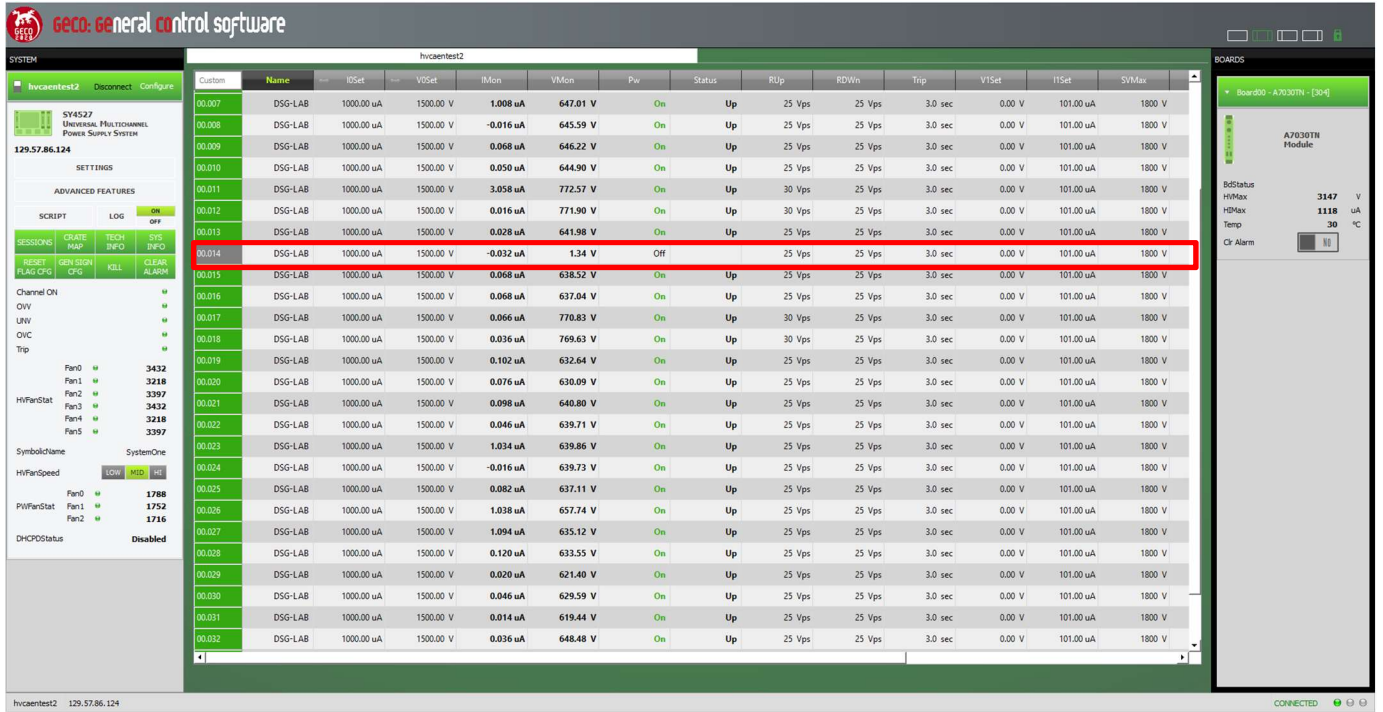


Fig.3 — GECON2020 screenshot shows channel 14 is off after all channels were set to turn on from JavaScript at CSS screen.

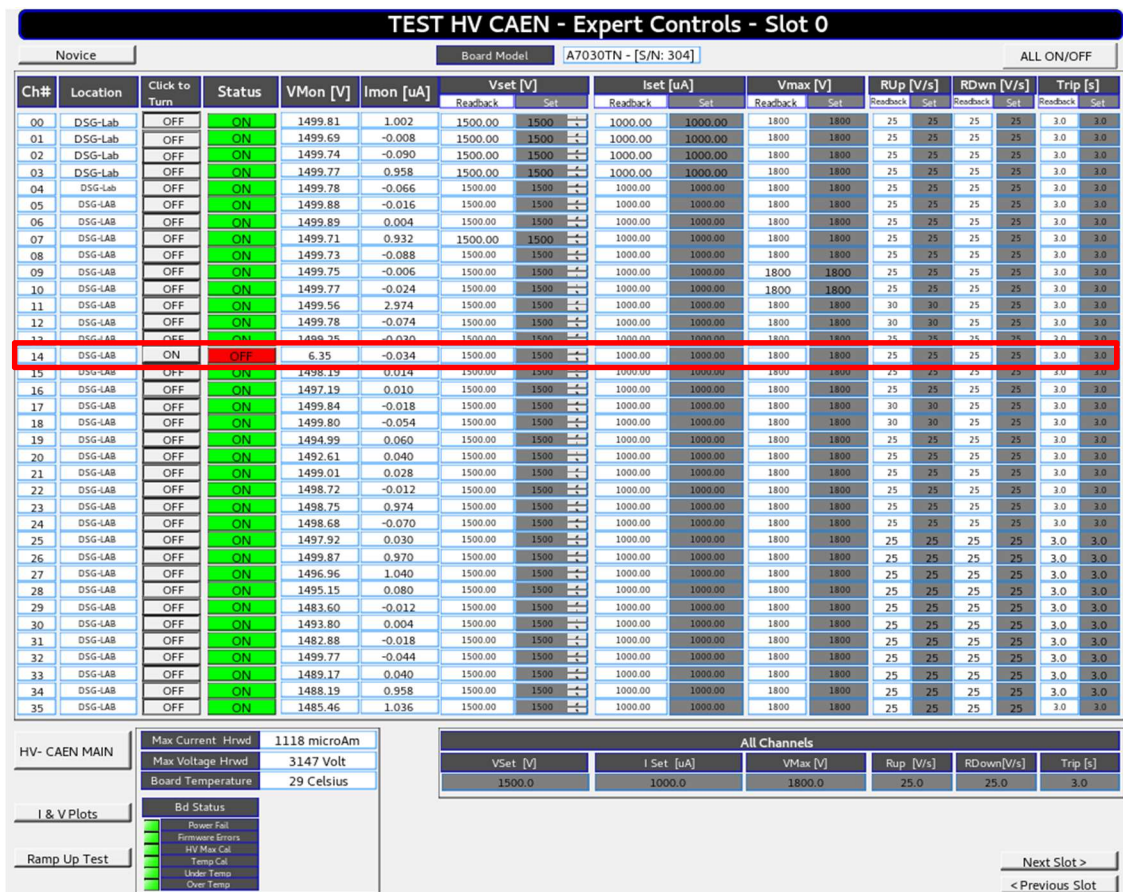


Fig.4 — Expert Controls CSS-BOY screen shows channel 14 off status after all channels were set to turn on simultaneously

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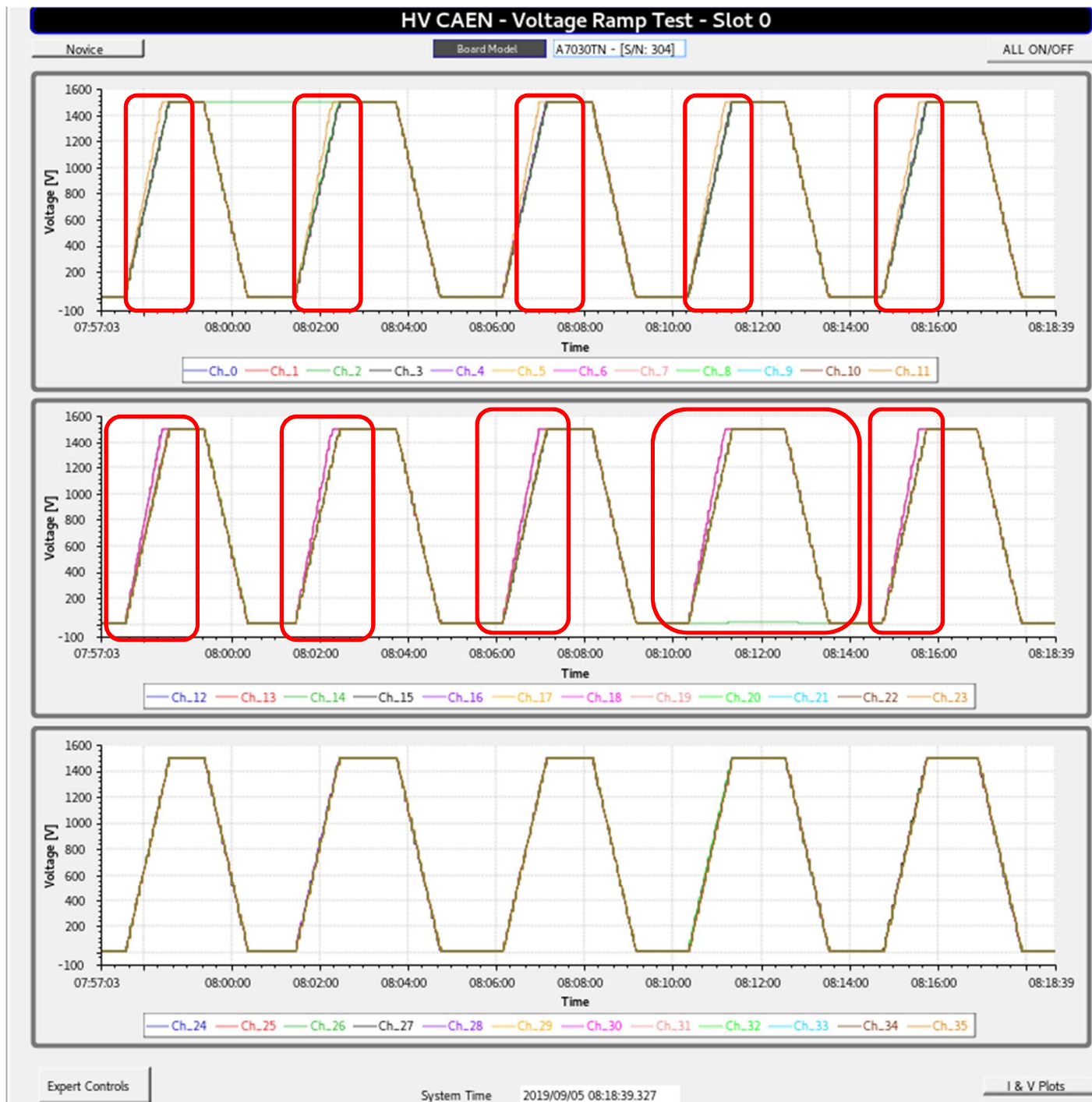


Fig.5 — *Voltage Ramp Test CSS-BOY* screen shows test 1.1 results. Red rounded rectangles focus the issues found

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Test 1.2

1. Channel 16 did not ramp up; PV associated with P_w parameter did not change from 0 to 1 after JavaScript was executed as part of *Expert Controls CSS-BOY* screen. See fig.8.

1.1. JavaScript send the command to set P_w value to 1, command executed once for all 36 channels.

1.2. Verified that neither the PV and GECO value went to set point. See fig.6 and fig.7.

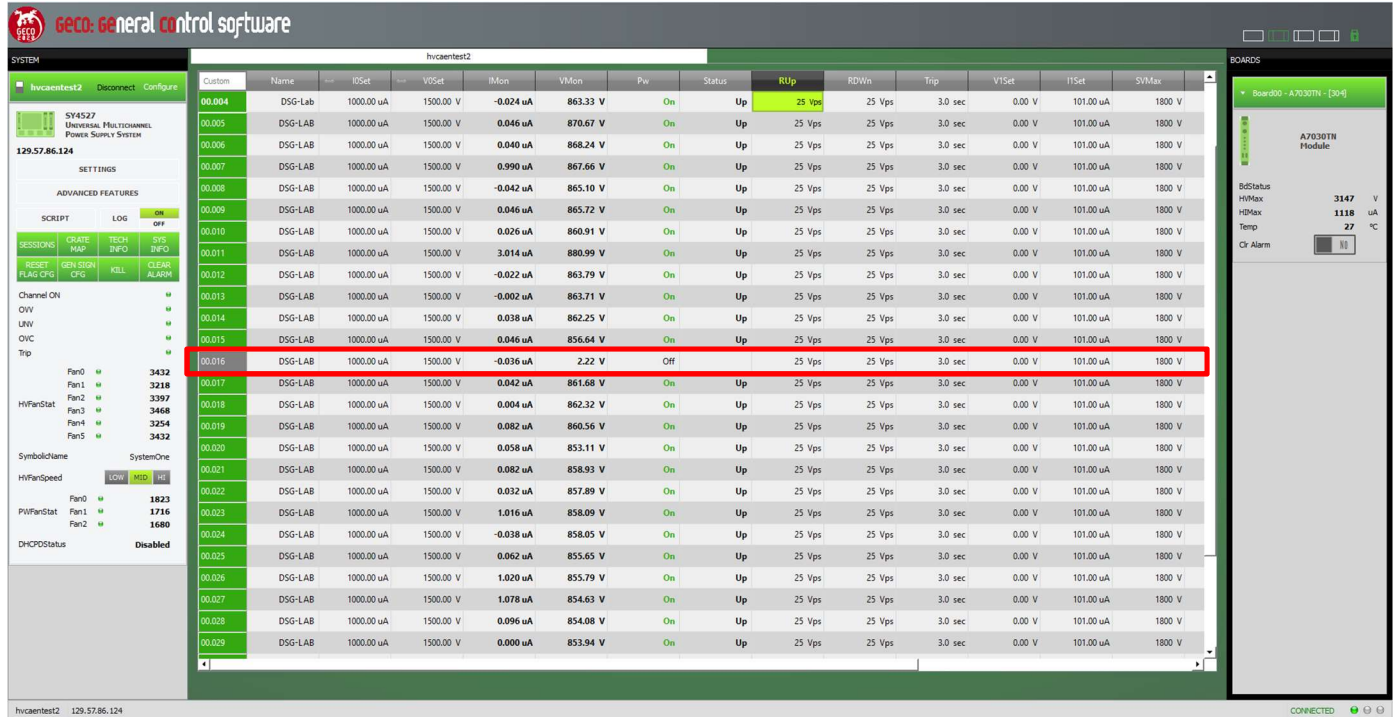


Fig.6 — GECO2020 screenshot shows channel 16 off after all channels were set to turn-on from JavaScript at CSS screen.

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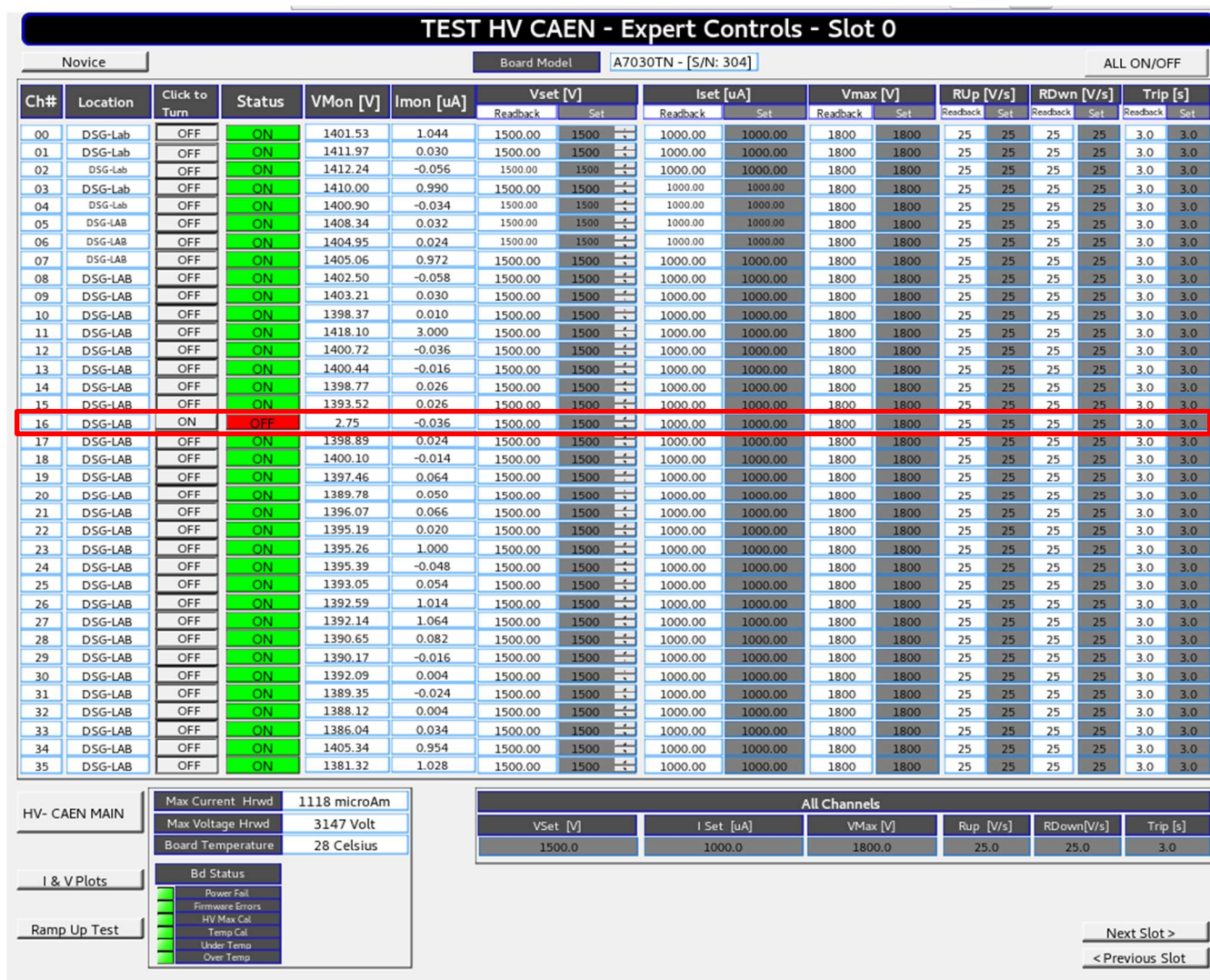


Fig.7 — Expert Controls CSS-BOY screen shows channel 16 off status after all channels were set to turn-on simultaneously

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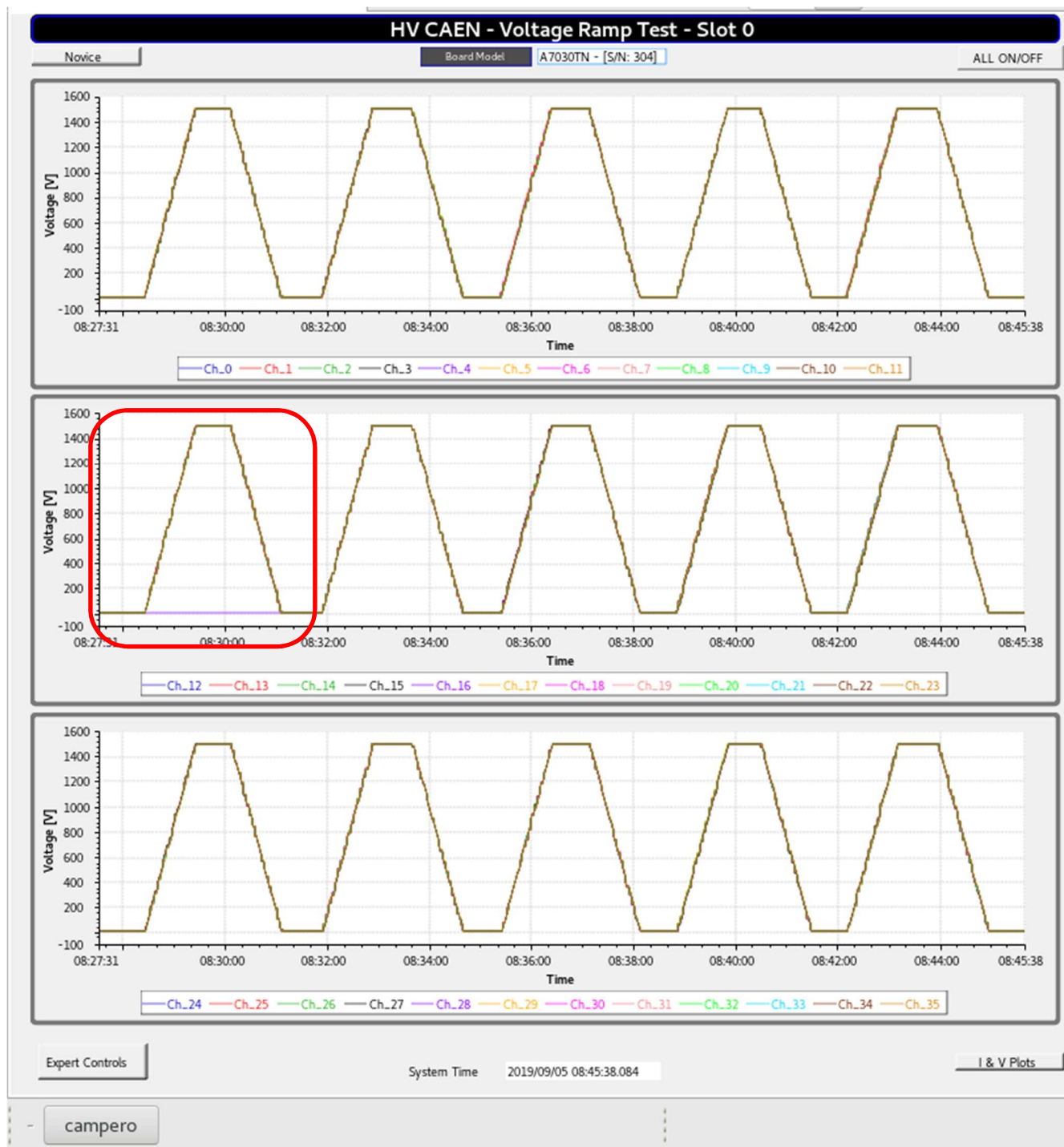


Fig.8 — Voltage Ramp Test CSS-BOY screen shows test 1.2 results. Red rounded rectangles focus the issues found

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Test 1.3

1. Channel 19 did not ramp up; PV associated with Pw parameter did not change from 0 to 1 after JavaScript was executed as part of *Expert Controls CSS-BOY* screen. See fig.13.
- 1.3. JavaScript send the command to set Pw value to 1, command executed once for all channels.
- 1.4. Verified that nether PV and GECO value went to set point. See fig.9 and fig.10.

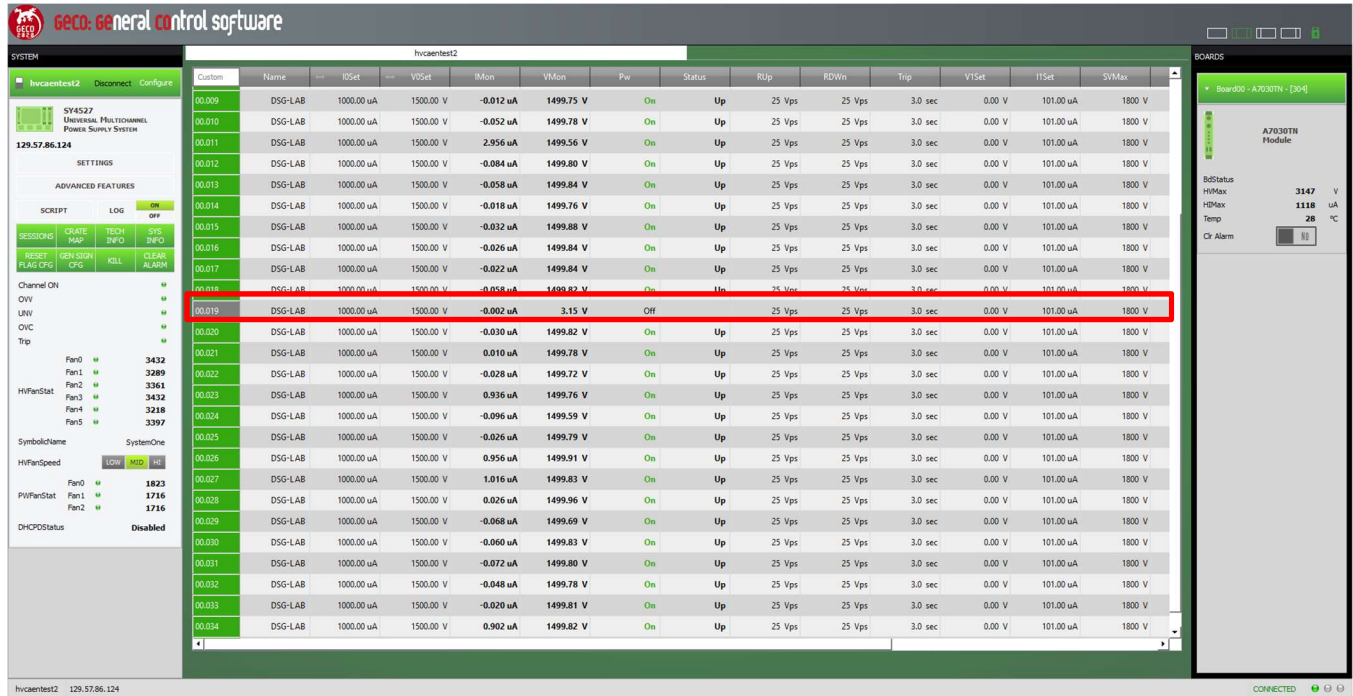


Fig.9 — GECO2020 screenshot shows channel 19 is off after all channels were set to turn-on from JavaScript at CSS screen.

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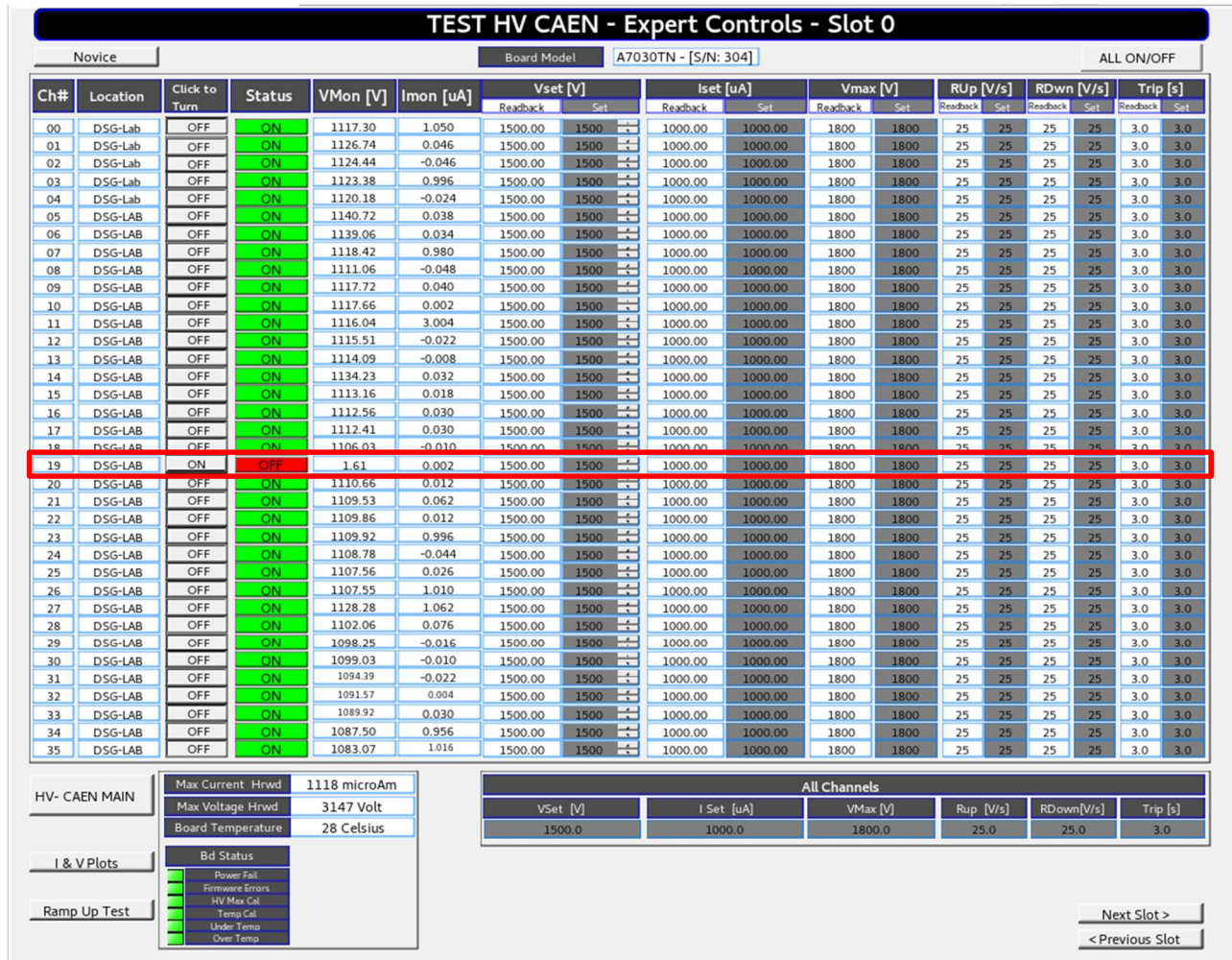


Fig.10 — *Expert Controls CSS-BOY* screen shows channel 19 off status after all channels were set to turn-on simultaneously

2. Channel 2 did not ramp down; PV associated with P_w parameter did not change from 1 to 0 after JavaScript was executed as part of *Expert Controls CSS-BOY* screen. See fig.13.
 - 2.1. JavaScript send the command to set P_w to 0 value, command executed once for all channels.
 - 2.2. Verified that nether PV and GECO values went to set point. See fig.11 and fig.12.

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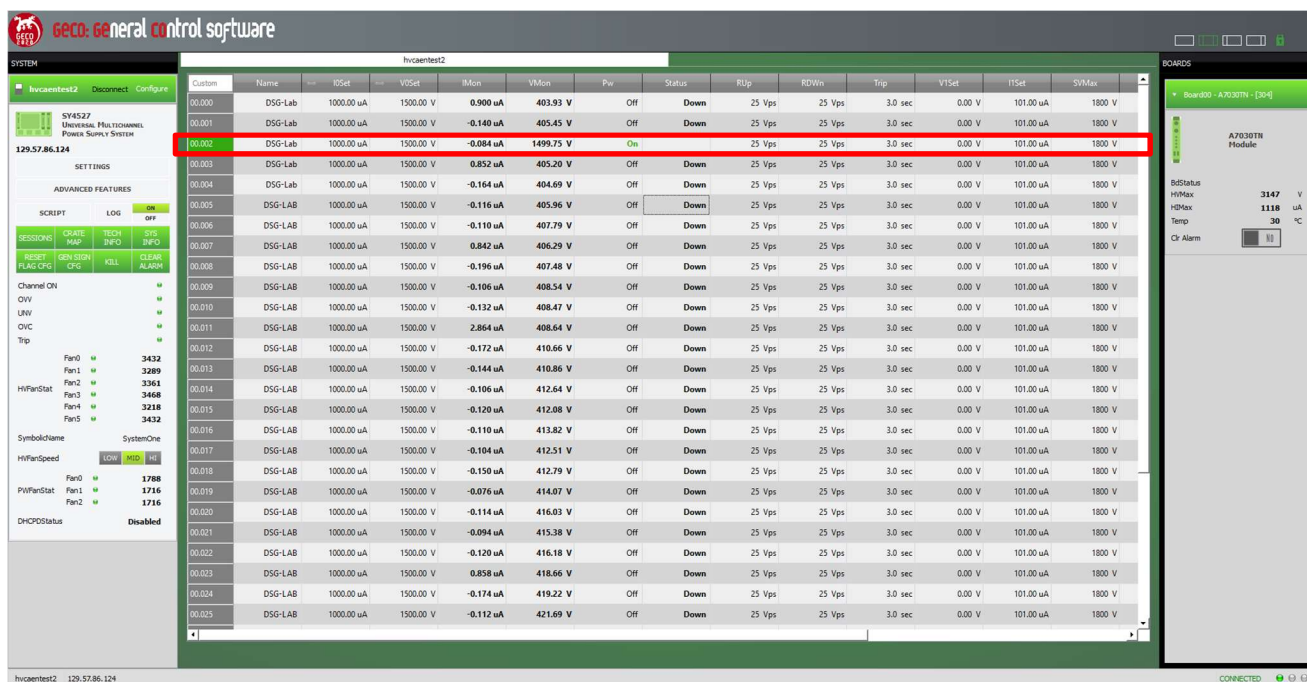


Fig.11 — GECCO2020 screenshot shows channel 2 stayed on after all channels were set to turn off from the JavaScript at CSS screen.

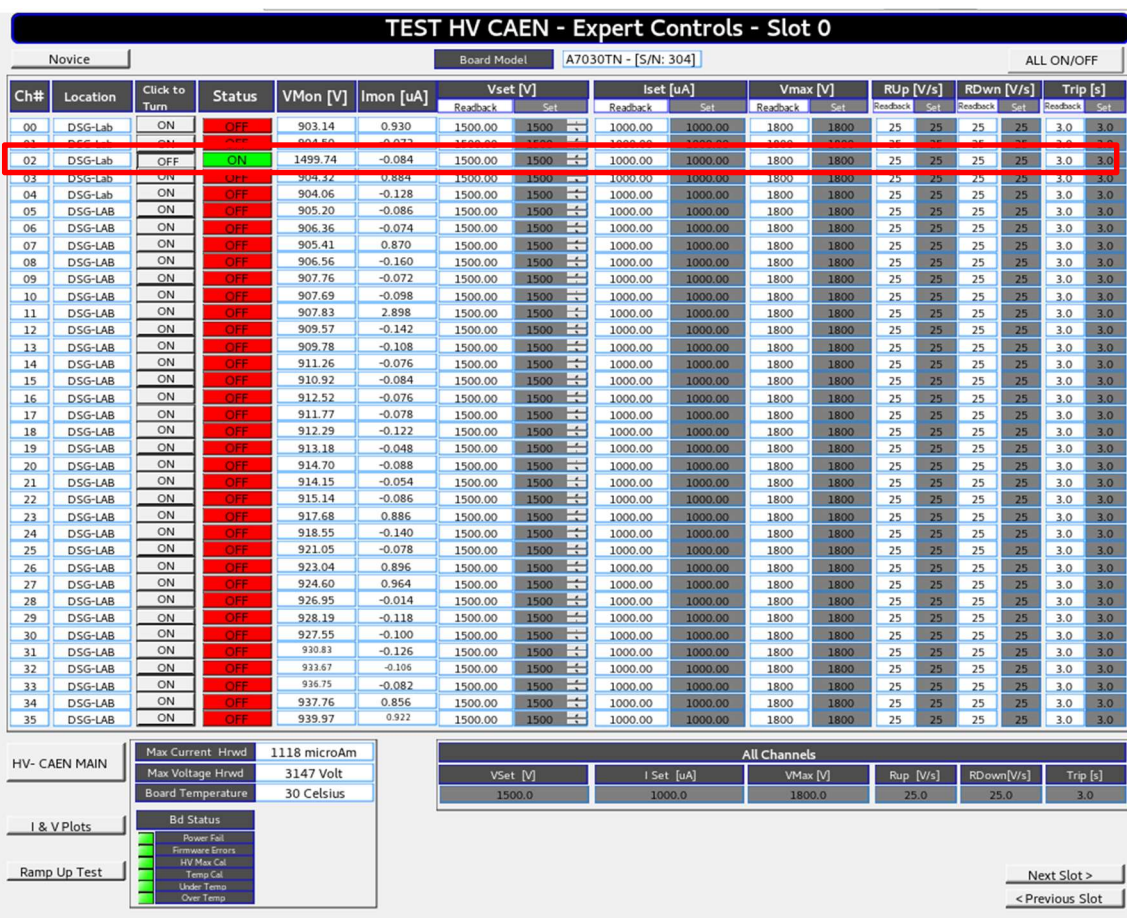


Fig.12 — Expert Controls CSS-BOY screen shows channel 02 on status after all channels were set to turn off simultaneously

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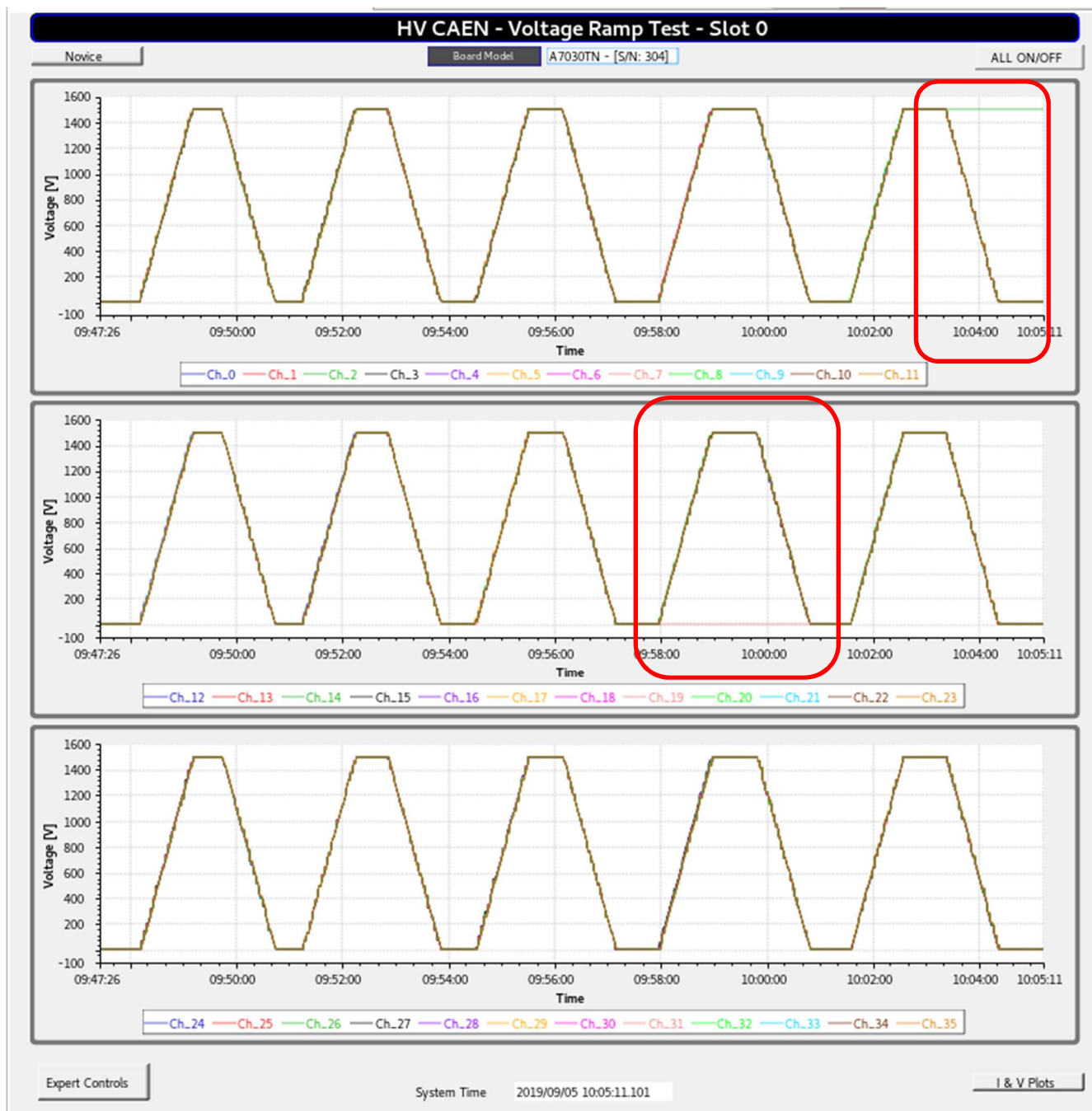


Fig.13 — Voltage Ramp Test CSS-BOY screen shows test 1.3 results. Red rounded rectangles focus the issues found

Summary:

1. Noticed channels randomly did not turn on/off after executing JavaScript (to turn on/off 36 channel simultaneously) on *HV CAEN Expert Controls* CSS-BOY screen.
2. Some channels' parameters randomly did not get the set value on the first attempt after running the JavaScripts.
3. No changes of the PVs values; all PVs keep initial set point values during the test.
4. No discrepancies between GECO2020 and EPICS PVs.

Test 2: Tested CAEN A7030 HV board using GECO2020 Script Advanced Feature Procedure:

1. Wrote script in GECO 2020 to automate voltage test on CAEN-A7030TN board.
 - 1.1. System Advanced Features in GECO 2020 allows enhancement functionalities to create scripts.
 - 1.2. Script set initial conditions/parameters, and ramps up/down 36 channels simultaneously to the set voltage parameters 100 times.
2. Enabled EPICS server to monitor via EPICS client.
3. Verified proper communications between CAEN EPICS Server Built-in and EPICS client (CSS screen).
4. Bellow table 2 shows the conditions and set parameters for the test.

Table 2: 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
Board S/N	304	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	36	Total # Ramp Up/Down per channel	100/100

5. Ran *Voltage Ramp Test – Slot 0 CSS-BOY* screen only to monitor automated test.
6. Took screen shots for initial conditions displayed in GECO 2020 and EPICS/CSS-BOY screen. See attached screenshots.
7. Ran developed script developed in GECO 2020.
8. Ran *HV CAEN Voltage Ramp Test CSS-BOY* screen **only to monitor** voltage readouts during the 100 cycles.
9. Saved data log files and screenshots with the results (See attached files and screenshots)
 - 9.1. Documented all results and pictures for the test.
10. Repeated steps 1 thorough 9 for test 2.1 and test 2.2. **Note** data log file not recorded for test 2.1

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Results:

Test 2.1

1. All channels monitored and controlled by GEICO2020 and SSH appears to be ok, while monitored EPICS PVs presented issues during the test (100 ramps up/down completed).

2. PV 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

2.1. Verified discrepancy between GEICO 2020 and EPICS PVs. See fig.13

2.2. Verified discrepancy between Secure Shell Connection (ssh terminal) and EPICS PVs. See fig.14.

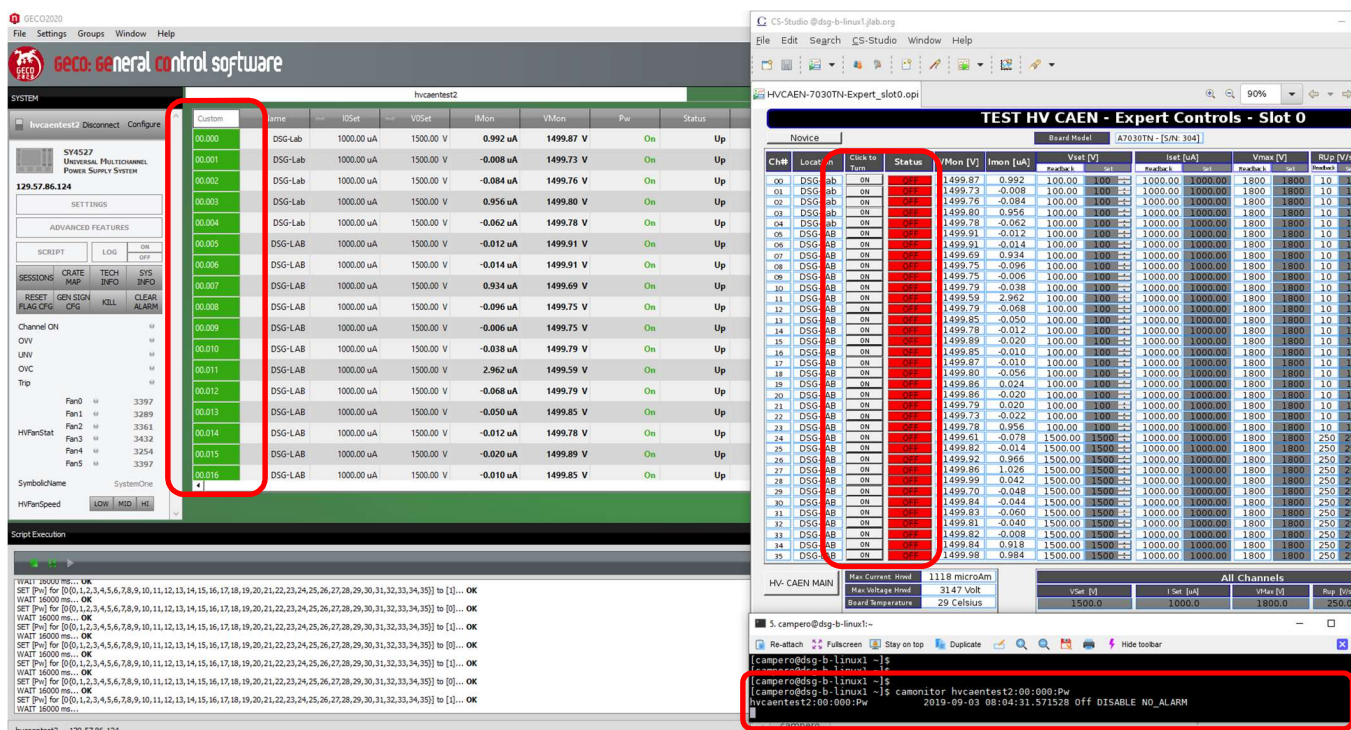


Fig. 13 – Discrepancies between GEICO2020 values and PVs showed in CSS screen only for P_w parameters. Noticed that also used EPICS basic command “camonitor” to monitor and verified that P_w PVs did not update during this test.

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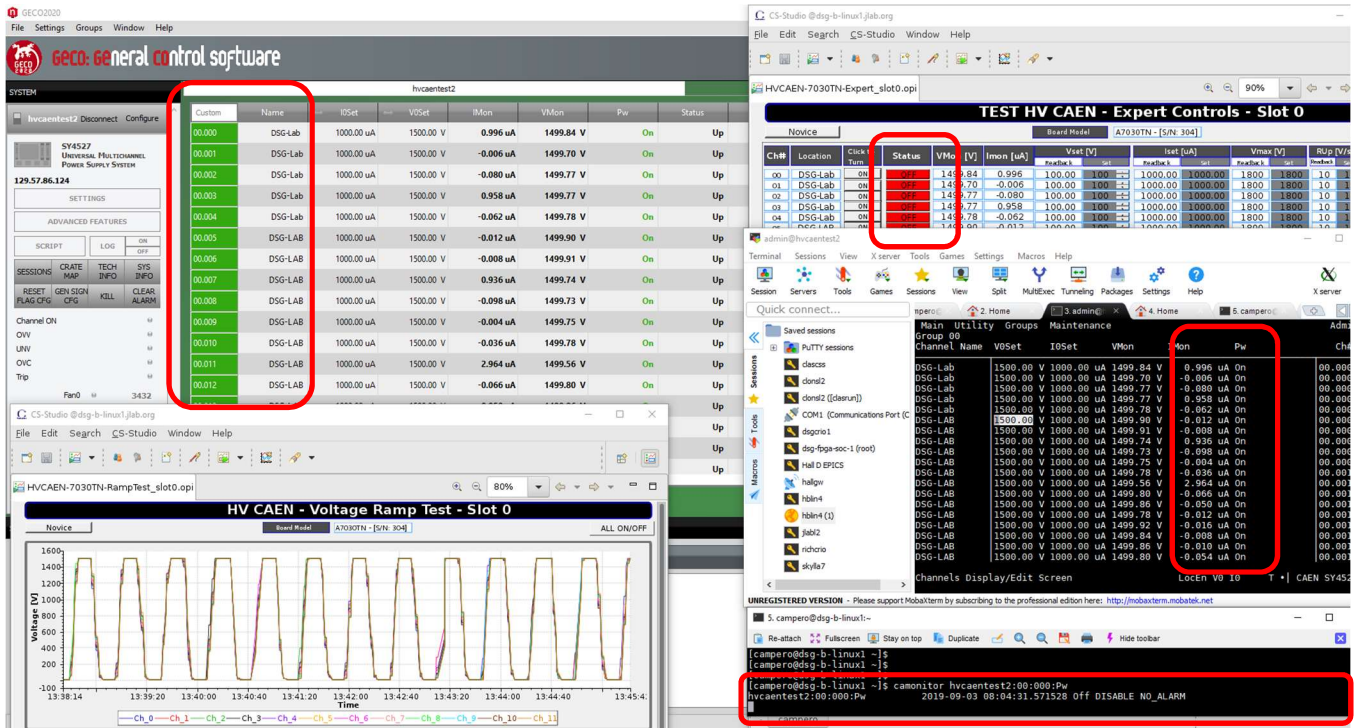


Fig. 14 – Discrepancies between SSH values and PVs showed in CSS screen only for Pw parameters. Noticed that also used EPICS basic command “camonitor” to monitor and verified that Pw PVs did not update during this test.

3. Noticed that Pw PV readout for channel 17 had an update latency of ~ 8 s while ramping to set voltage, only in one cycle. This issue was recover by itself in next cycle. See fig.15.

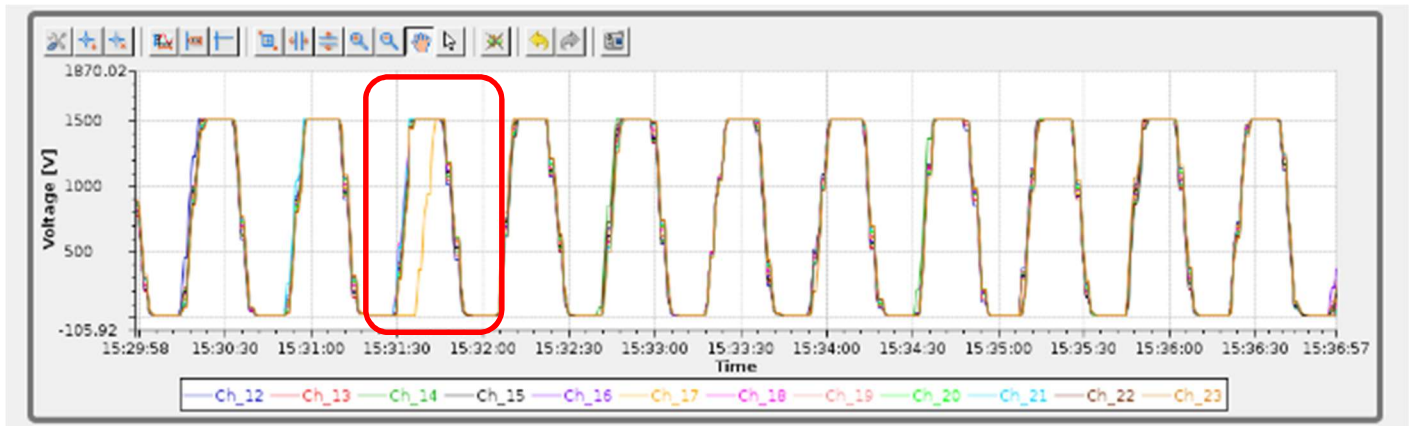


Fig.15 – Zoomed view of Voltage Ramp Test CSS-BOY screen shows channel 17 latency of 8 s to ramp up

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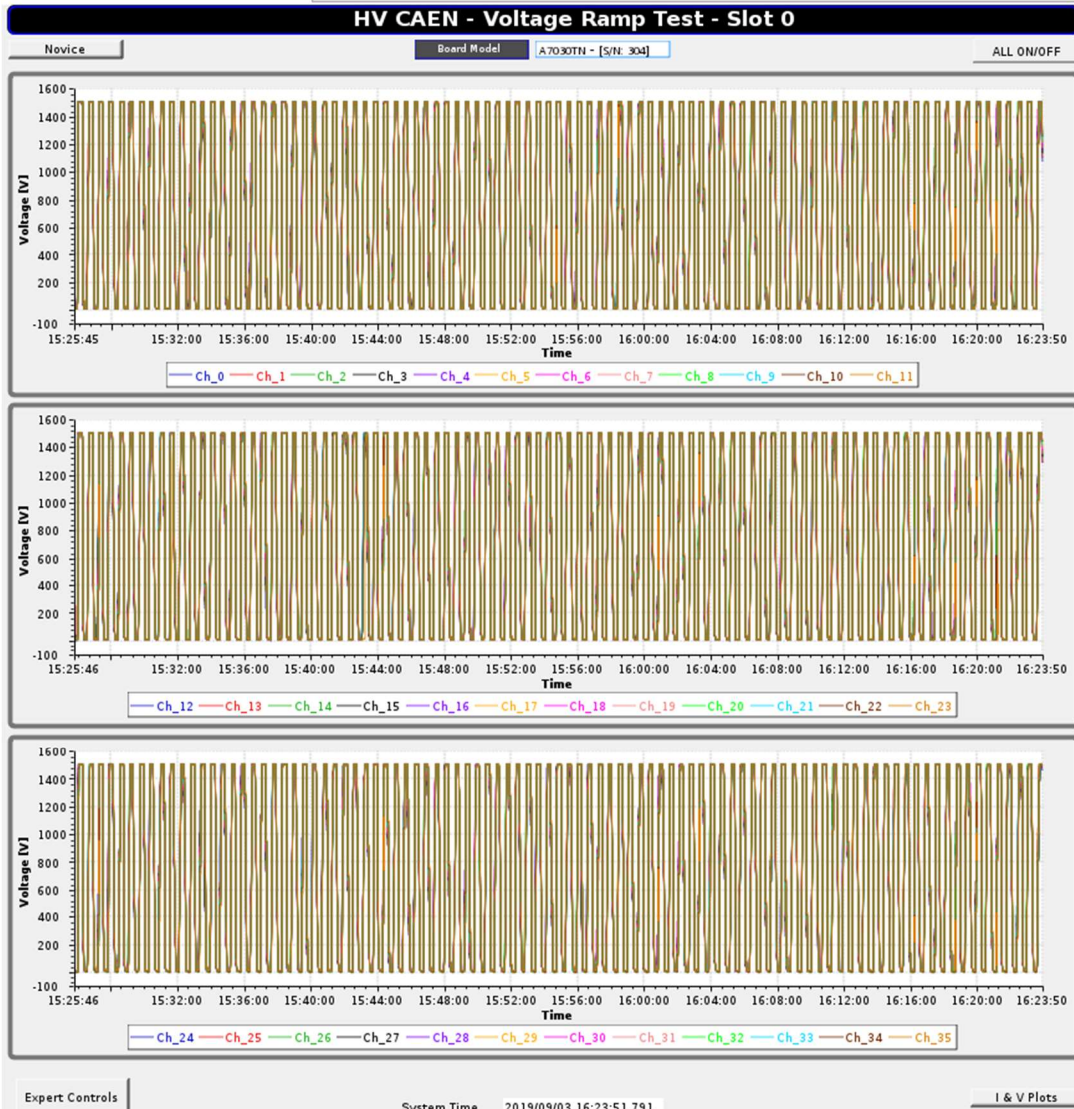


Fig.16 – Voltage Ramp Test CSS-BOY screen shows 100 cycles of voltage ramp up/downs

Test 2.2

1. Similar issues as test 2.1; during this test found that the discrepancy between GECO 2020/SSH and EPICS PVs for P_w parameter disappear after CSS-BOY screen is refreshed or “camonitor” EPICS commands is re-executed. See fig.17 and 18.
 - 1.1. Noticed that only this P_w PV has this issue. The rest of the monitored PVs (V_{mon} , V_{max} , I_{mon} , etc) during the test did not fail, when *camonitor* EPICS command was executed once in the Host PC (EPICS client).

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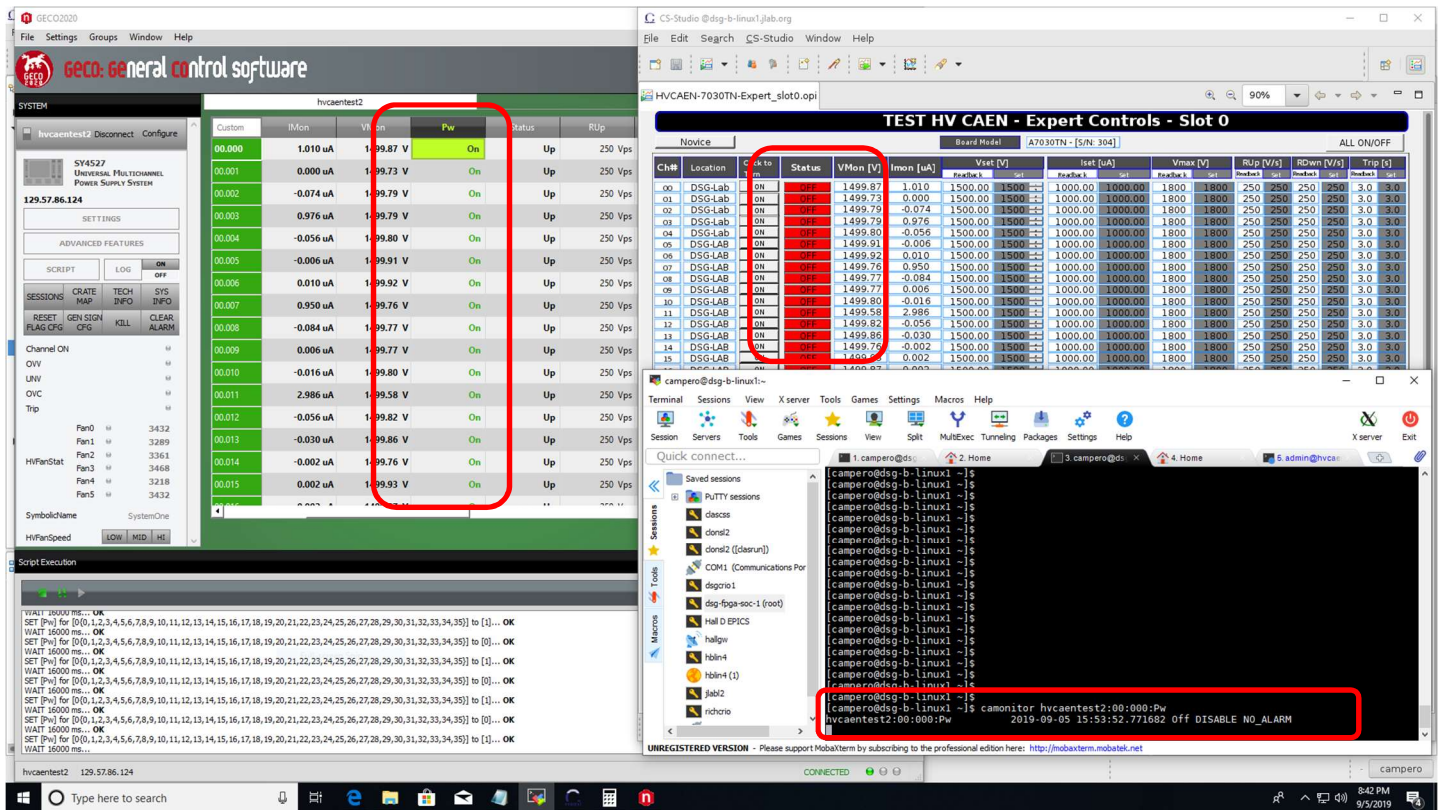


Fig.17 – Screenshot shows discrepancies between GECO values and EPICS PVs (P_w) monitored in CSS screen and *camonitor* command executed – Before CSS screen refreshment and re-send command.

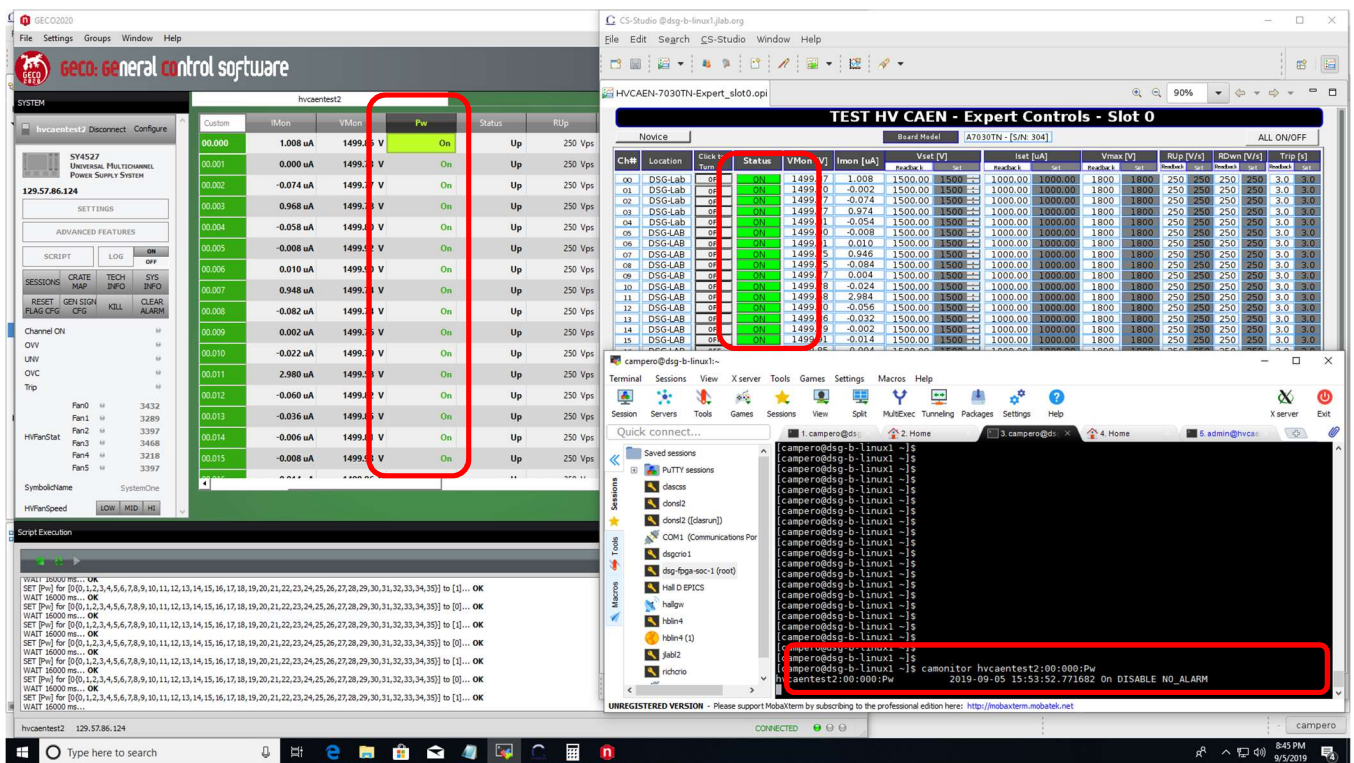


Fig.18 – Screenshot shows discrepancies between GECO values and EPICS PVs (P_w) monitored in CSS screen and *camonitor* command executed – After CSS screen refreshment and re-send command.

2. Noticed that P_w PV readout for channel 17 had an update latency of ~ 8 s while ramping to set voltage. Issue occurred two times and it was recover by itself in next cycles. See fig.19

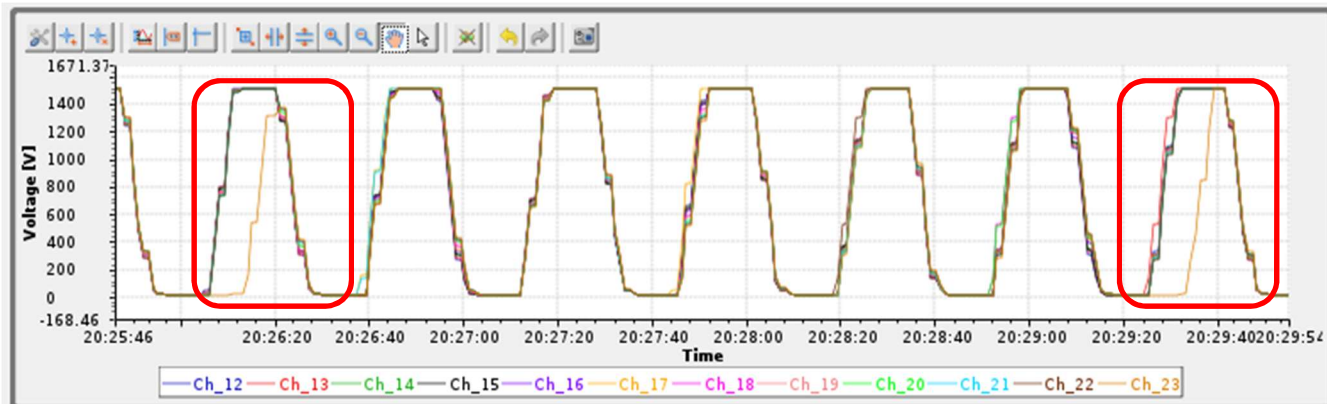


Fig.19 – Zoomed view of *Voltage Ramp Test CSS-BOY* screen shows channel 17 latency of 8 s to ramp up