

15003iX-CTS-EOS-MODE

s/n 1423A02910

**Harmonics – Flicker
Test System**

Calibration & Verification Report

For

Customer in Israel

**EMC lab at XXXXXXXXXXXXXXXX
Haim Levanon 42 Tel Aviv Israel**

January 13-14, 2015
Mathieu van den Bergh

Summary of activities, conclusions & recommendations January 13-14, 2015

1: Equipment inspection – verification – calibration and tests

The 15003iX-CTS was shipped to Ametek, in San Diego. The system arrived in good physical condition, and was inspected for functionality. Subsequently, the system was calibrated, using the customer's PC with Windows-7 Professional and the A/D card installed in the PC. After calibration, a series of tests were performed per IEC61000-3-2, IEC 61000-3-3, IEC 61000-4-11, IEC 61000-4-13, IEC 61000-4-14, and IEC61000-4-28. The system complies with all of the foregoing standards, as well as with the measurement standards IEC 61000-4-7 and IEC 61000-4-15.

The system building blocks – integrated into one 19" rack - consist of;

- 15003iX – 3 phase 15 kVA power source
- PACS-3 – 3 phase signal conditioning/power analysis unit
- OMNI-3-18 – 3 phase Reference Impedance
- Windows-7 PC and the associated National Instruments A/D card

Details of the harmonics and Flicker tests, as well as tests in accordance with the voltage immunity standards are included in this report.

All system functions were within the respective parameter tolerances, and calibration stickers were applied to the system. The complete system was ready for return on January 16, 2015.

2: Calibration equipment and ISO-17025 traceable calibration data

The list of primary test equipment, along with ISO-17025 traceable calibration certificate numbers is provided on page 3 of this report. Copies of calibration certificates are provided as an appendix to this report.

3: Conclusions and recommendations

The overall system performance, and all measured parameters are well within permitted tolerances. The next calibration interval is at the user's discretion.

It is recommended that the customer store the calibration file on a PC other than the CTS system PC. This calibration file is necessary in the event the software has to be re-installed because of a PC problem or hard disk failure.

The system was configured for RS-232/serial interface control. If the user wishes to use the LAN interface option, the appropriate jumper setting in the master power source has to be set accordingly.



Mathieu van den Bergh
January 19, 2015

System inspection and calibration activities, January 13-14, 2015

System inspection

Upon receipt of the system – shipped in a crate - the system was installed, and verified for functionality in the final test department of Ametek in San Diego.

The system was found to be operational. Since this is a new system, the standard calibration procedure was performed, using the certified CNS Inc. calibration equipment. Upon completion the harmonics & Flicker measurement accuracy were verified with a series of detailed tests. Subsequently, a series of tests were run to verify the system performance for public supply line immunity test standards. All parameters were found to be well within tolerances. Several of the tests were run in 3 –phase testing mode, with a linear load of 5.16 A rms connected to 2 phases, and the various test class harmonics patterns applied to one phase. Details of these tests are provided later in this report. Note that the times shown in the various detailed tests reflect the customer's "PC time for Israel". All tests were done during normal San Diego working hours.

The system was initially operated via the LAN interface, with an Ametek networked PC, with the system IP address set to 169.254.76.27. This was changed to operation via the serial interface (COM-1) of the customer's PC, as it was not permitted to connect this PC could to the internal Ametek network. After consultation with the customer, the internal jumper setting of the master power source, the system was left with the serial interface active. If LAN control is required the jumper needs to be changed accordingly.

The CIGUI control software version 2.7.0 was used for both, LAN controlled operation, and for RS-232/serial controlled operation.

The 15003iX-CTS consists of;

15003iX, 3 phase power source, s/n 1423A02910, firmware version 5.15
 PACS-3, 3 phase Signal conditioner unit, s/n 1423A02910
 NI "M" series 1 MHz A/D card s/n 1949BD0
 OMNI-3-18 Reference Impedance s/n 1423A02910
 CTS software version 4.6.0 Harmonics & Flicker test software operated on a Windows- 7 PC

Temperature during tests: 23 ° C ± 2 °C Humidity: 40 % RH ± 3 %

ISO-17025 Calibrated test equipment

Model #	Serial #	Equipment type	Trace #	Cal due date
Keithley Model 2000	0641161	Multimeter,	2200812062032	2/16/2015
Agilent 34410A	MY45002306	Multimeter,	2200812062076	2/16/2015
TDS2014B	C034121	Dig. Storage scope	32306	3/6/2015
DS6062V	DS606221301058	Dig. Storage scope	32305	3/7/2015
7003-257	0724	Shunt	2200812059755	2/15/2015
75 AMP RMS	CD9083	Shunt	2200812077447	2/15/2015

15003iX-CTS overall voltage, current, frequency and Flicker data

Table-1 below illustrates the voltage and current measurement accuracy of the overall system as left after calibration, along with the Flicker tests. Table-2 (next page) shows the power source accuracy and linearity for different voltage and frequency settings. The reference readings for the voltage accuracy were made at the load connection point. Thus, there is a small voltage drop for higher current readings vs. the CTS readings (which are before the cable going to the connection point). At 16 A-rms, the voltage drop at the EUT connection point is ~ 0.4 V, i.e. less than 0.2 % vs. the 2 % tolerance permitted in harmonics & Flicker, and 5 % permitted in the immunity test standard.

Shany Tech - EMC labs - A02910 - Jan. 2015						
New Calibration as left CTS 4.6.0						
Phase-A data			CTS		CTS	
Reference	CTS	error %	Reference	CTS	error %	
DVM-1	Voltage	voltage	DVM-2	Current	Current	Current
			100 mV/amp			
230.203	230.19	-0.006	0.1000	1.0000	1.002	2 mA
230.159	230.18	0.009	0.2000	2.0000	2.001	0.050
230.049	230.13	0.035	0.5000	5.0000	5.000	0.000
229.858	230.09	0.101	1.0000	10.0000	10.002	0.020
229.606	229.96	0.154	1.6000	16.0000	16.003	0.019
Phase-B data						
Reference	CTS	error %	Reference	CTS	error %	
DVM-1	Voltage	voltage	DVM-2	Current	Current	Current
230.201	230.16	-0.018	0.1000	1.0000	1.001	1 mA
230.175	230.19	0.007	0.2000	2.0000	2.000	0.000
230.075	230.16	0.037	0.5000	5.0000	5.000	0.000
229.864	230.09	0.098	1.0000	10.0000	10.002	0.020
229.604	229.97	0.159	1.6000	16.0000	16.004	0.025
Phase-C data						
Reference	CTS	error %	Reference	CTS	error %	
DVM-1	Voltage	voltage	DVM-2	Current	Current	Current
230.208	230.24	0.014	0.1000	1.0000	1.001	1 mA
230.188	230.22	0.014	0.2000	2.0000	2.000	0.000
230.090	230.18	0.039	0.5000	5.0000	5.000	0.000
229.892	230.11	0.095	1.0000	10.0000	10.001	0.010
229.645	230.01	0.159	1.6000	16.0000	16.000	0.000
Flicker Pst accuracy verification				Permitted errors		
Setting	target	actual	error	in standards:		
				Harmonics IEC61000-3-2		
2 CPM	1.018	1.024	0.589	Voltage IEC61000-4-7		
39 CPM	0.977	0.981	0.409	Flicker IEC61000-3-3 "Pst"		
110 CPM	1.028	1.022	-0.584	Flicker IEC61000-3-3 "dc"		
1620 CPM	1.220	1.209	-0.902	Power measurements		
				Permitted Pst error per IEC6100-4-1 ± 5 % or ± 0.05		
Environmental			Humidity: 40 % ± 3 %RH			
Conditions during tests:			Temperature: 23 °C ± 2 °C			
Measurement uncertainty:				Voltage +/- 0.1 %		
(evaluation method per ISO-17025 K=2)				Current +/- 0.15 %		

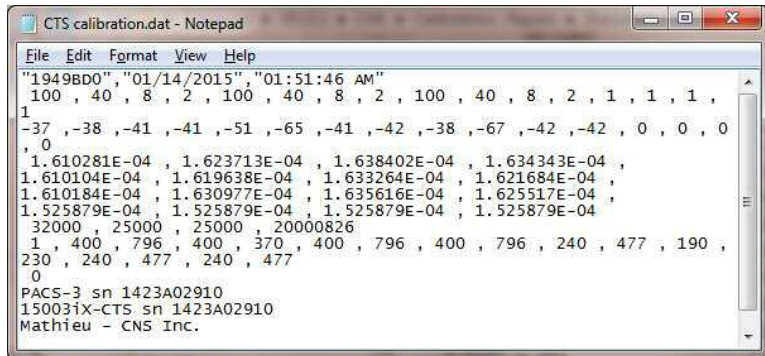
Table-1 CTS voltage-current & Flicker measurement accuracy

Table-2 15003iX-CTS voltage and frequency verification data.

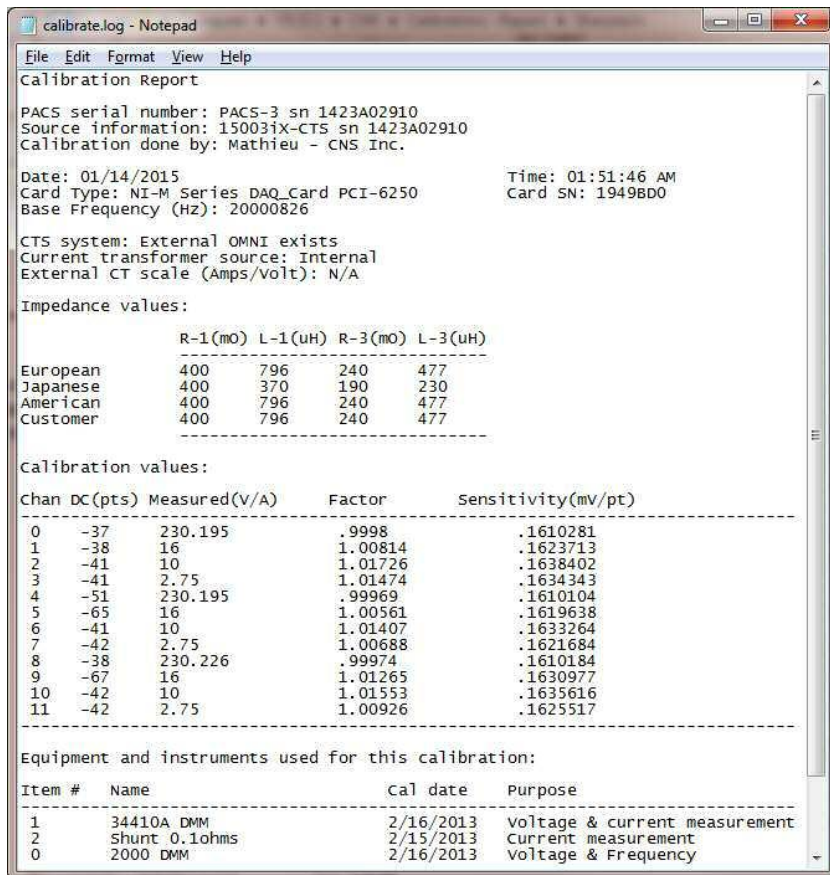
Voltage level test per IEC61000-4-11			
as found and as left			
Programmed	Calculated	Measurement	
value in %	voltage	values	
100	230.00	230.20	
90	207.00	207.15	
80	184.00	184.15	
70	161.00	161.09	
60	138.00	138.06	
50	115.00	115.10	
40	92.00	92.01	
30	69.00	69.02	
20	46.00	46.04	
10	23.00	23.01	
0	0.00	0.70	
100	230.00	230.16	
IEC 61000-4-28 key parameter verification			
Generic Level -2 test			
	Frequency Hz	Error	
50 Hz programmed	50.00022	n/a	
+ 3 %	51.50008	n/a	
- 3 %	48.500023	n/a	
IEC 61000-4-14 key parameter verification			
Table-1, Class-2 & 3 parameters			
Programmed	Actual	Actual %	
230 V rms	230.16 V-rms	100.0%	
+ 8 % voltage	248.35 V-rms	+ 8.0 %	
- 8 % voltage	211.76 V-rms	- 8.0 %	
+ 10 % voltage	253.19 V-rms	+ 10.0 %	
- 10 % Voltage	207.06 V-rms	- 10.0 %	

CTS calibration file and calibration log file

The illustration below shows the contents of the calibration file called “CTS calibration.dat” which is required for proper operation of the Profline harmonics & Flicker test software.



This file is installed in the root directory
 “ C:\”of the system PC



The calibrate.log file is created in the process of the calibration, and it is normally stored in the “database” sub-directory of the CTS application directory. The calibration constants are very close to 1.000, indicating that the basic hardware accuracy of the PACS-3 unit in conjunction with the A/D card is excellent.

Detailed test data

The following pages illustrate some of the detailed tests that were run to verify proper operation of the system. The tests included various harmonics patterns per Class-A, Class-C and Class-D of IEC61000-3-2, as well as Flicker tests per IEC 61000-3-3. The harmonic emission patterns for Class-A FAIL and Class-D FAIL are deliberately set to exceed the limits for a number of harmonics, and thus the system is supposed to produce a FAIL (which it does). The Class-C test is set to produce harmonics that just pass the limits.

Immunity test patterns

Detailed pages are included for tests per IEC 61000-4-11 dips/interrupts and IEC 61000-4-13 harmonic & inter-harmonic distortion test. The typical dips and interrupts patterns were programmed for IEC 61000-4-11. For IEC 61000-4-13, the flat top and over-swing patterns, as well a complete sweep per the Meister curve were verified.

Table-2 (see page 5) provides details on voltage and frequency tests, to verify compliance with IEC 61000-4-14 and IEC 61000-4-28 test requirements.

Class-A Pass test

Current Test Result Summary (Phase A-Replay)													
EUT: CNS Inc. HFC-III calibrator							Tested by: Mathieu & Phong						
Test category: Class-A per Ed. 4.0 (2014) (European)							Test Margin: 100						
Test date: 1/14/2015 End time: 2:20:28 AM							Start time: 2:19:05 AM						
Test duration (min): 1							Data file name: H-000006.cts_data						
Comment: Class A Pass													
Customer: Shany Tech - Israel													
Test Result: Pass							Source qualification: Normal						
THC(A): 1.102			I-THD(%): 46.2		POHC(A): 0.202		POHC Limit(A): 0.251						
Highest parameter values during test:													
V_RMS (V)		230.21		Frequency(Hz):		50.00							
I_Peak (A)		4.133		I_RMS (Ar)		2.632		THC-I		POHC			
I_Fund (A)		2.386		Crest Fact		1.571		1.099		0.206			
Power (W)		1107.4		Power Fa		0.907							
Harm#	Harms(av)	100%Limit	% of Limit	Harms(ma)	150%Limit	% of Limit	Status	Ideal	Min	Max	Limits	Pass/Fail	Percent of Limit
								2.375	Tolerance				
2	0.001	1.08	N/A	0.002	1.62	N/A	Pass	0.000	0.000	0.013	1.080	PASS	0
3	0.928	2.3	40.3	0.929	3.45	26.9	Pass	0.923	0.877	0.967	2.300	PASS	40.1
4	0.001	0.43	N/A	0.003	0.645	N/A	Pass	0.000	0.000	0.013	0.430	PASS	0
5	0.308	1.14	27	0.309	1.71	18.1	Pass	0.308	0.292	0.322	1.140	PASS	27.0
6	0.001	0.3	N/A	0.002	0.45	N/A	Pass	0.000	0.000	0.013	0.300	PASS	0
7	0.309	0.77	40.1	0.31	1.155	26.9	Pass	0.308	0.292	0.322	0.770	PASS	40.0
8	0.001	0.23	N/A	0.003	0.345	N/A	Pass	0.000	0.000	0.013	0.230	PASS	0
9	0.184	0.4	46.1	0.185	0.6	30.9	Pass	0.185	0.172	0.198	0.400	PASS	46.2
10	0	0.184	N/A	0.002	0.276	N/A	Pass	0.000	0.000	0.013	0.184	PASS	0
11	0.185	0.33	56	0.186	0.495	37.7	Pass	0.185	0.172	0.198	0.330	PASS	55.9
12	0.001	0.153	N/A	0.003	0.23	N/A	Pass	0.000	0.000	0.013	0.153	PASS	0
13	0.131	0.21	62.4	0.132	0.315	41.9	Pass	0.132	0.119	0.145	0.210	PASS	62.8
14	0	0.131	N/A	0.002	0.197	N/A	Pass	0.000	0.000	0.013	0.131	PASS	0
15	0.132	0.15	87.9	0.133	0.225	59.3	Pass	0.132	0.119	0.145	0.150	PASS	87.9
16	0.001	0.115	N/A	0.003	0.173	N/A	Pass	0.000	0.000	0.013	0.115	PASS	0
17	0.102	0.132	76.9	0.103	0.198	51.8	Pass	0.103	0.090	0.116	0.132	PASS	77.5
18	0	0.102	N/A	0.002	0.153	N/A	Pass	0.000	0.000	0.013	0.102	PASS	0
19	0.102	0.118	86.4	0.104	0.178	58.4	Pass	0.103	0.090	0.115	0.118	PASS	86.6
20	0.001	0.092	N/A	0.003	0.138	N/A	Pass	0.000	0.000	0.013	0.092	PASS	0
21	0.083	0.107	77.2	0.084	0.161	52.1	Pass	0.084	0.071	0.097	0.107	PASS	78.4
22	0	0.084	N/A	0.002	0.125	N/A	Pass	0.000	0.000	0.013	0.084	PASS	0
23	0.083	0.098	85.2	0.085	0.147	57.9	Pass	0.084	0.071	0.097	0.098	PASS	85.8
24	0.001	0.077	N/A	0.003	0.115	N/A	Pass	0.000	0.000	0.013	0.077	PASS	0
25	0.07	0.09	77.3	0.071	0.135	52.3	Pass	0.071	0.058	0.084	0.090	PASS	79.0
26	0	0.071	N/A	0.002	0.107	N/A	Pass	0.000	0.000	0.013	0.071	PASS	0
27	0.07	0.083	84.4	0.072	0.125	57.5	Pass	0.071	0.058	0.084	0.083	PASS	85.3
28	0.001	0.066	N/A	0.003	0.099	N/A	Pass	0.000	0.000	0.013	0.066	PASS	0
29	0.06	0.078	77.2	0.061	0.116	52.4	Pass	0.062	0.049	0.075	0.078	PASS	79.4
30	0	0.061	N/A	0.002	0.092	N/A	Pass	0.000	0.000	0.013	0.061	PASS	0
31	0.061	0.073	83.5	0.062	0.109	57.1	Pass	0.062	0.049	0.074	0.073	PASS	84.9
32	0.001	0.058	N/A	0.003	0.086	N/A	Pass	0.000	0.000	0.013	0.058	PASS	0
33	0.052	0.068	77	0.054	0.102	52.3	Pass	0.054	0.042	0.067	0.068	PASS	79.8
34	0	0.054	N/A	0.002	0.081	N/A	Pass	0.000	0.000	0.013	0.054	PASS	0
35	0.053	0.064	82.8	0.055	0.096	56.8	Pass	0.054	0.042	0.067	0.064	PASS	84.6
36	0.001	0.051	N/A	0.003	0.077	N/A	Pass	0.000	0.000	0.013	0.051	PASS	0
37	0.047	0.061	76.5	0.048	0.091	52.2	Pass	0.049	0.036	0.062	0.061	PASS	80.1
38	0	0.048	N/A	0.002	0.073	N/A	Pass	0.000	0.000	0.013	0.048	PASS	0
39	0.047	0.058	82	0.049	0.087	56.5	Pass	0.049	0.036	0.062	0.058	PASS	84.4
40	0.001	0.046	N/A	0.003	0.069	N/A	Pass	0.000	0.000	0.013	0.046	PASS	0

The above data shows the detailed results of test no. 6, per the Class-A PASS pattern at 1107 Watt. The permitted tolerance per IEC61000-3-2 is (1 % of the fundamental current + 10 mA), but the target accuracy used by CNS inc. is (0.3 % + 5 mA). This approximately 3 : 1 ratio results for this test (2.386 A-rms) in a permitted tolerance of (7 mA + 5 mA) = 12 mA. The CTS test data (see column 3 vs. the “ideal” column) shows just a few milli-amperes deviation, i.e. a fraction of this tight tolerance, and thus an even smaller fraction of the tolerances permitted per IEC61000-3-2. Hence, the system performance is excellent.

Class-A “FAIL” test pattern

Current Test Result Summary (Phase A-Replay)													
EUT: CNS Inc. HFC-III calibrator						Tested by: Mathieu & Phong							
Test category: Class-A per Ed. 4.0 (2014) (European)						Test Margin: 100							
Test date: 1/14/2015 End time: 2:23:31 AM						Start time: 2:22:08 AM							
Test duration (min): 1						Data file name: H-000007.cts_data							
Comment: Class A FAIL													
Customer: Shany Tech - Israel													
Test Result: Pass Source qualification: Normal													
THC(A): 1.371 I-THD(%): 46.2 POHC(A): 0.251 POHC Limit(A): 0.251													
Highest parameter values during test:													
V_RMS (V) 230.19 Frequency(Hz): 50.00													
I_Peak (A) 5.14 I_RMS (Ar) 3.274													
I_Fund (A) 2.968 Crest Fact 1.571													
Power (W) 1123.9 Power Fa 0.907													
Harm#	Harms(av)	100%Limit	% of Limit	Harms(ma)	150%Limit	% of Limit	Status	Ideal	Min	Max	Limits	Pass/Fail	Percent of Limit
2	0.001	1.08	N/A	0.002	1.62	N/A	Pass	2.954	Tolerance		1.080	PASS	0
3	1.154	2.3	50.2	1.156	3.45	33.5	Pass	1.148	1.091	1.203	2.300	PASS	49.9
4	0.002	0.43	N/A	0.004	0.645	N/A	Pass	0.000	0.000	0.015	0.430	PASS	0
5	0.383	1.14	33.6	0.384	1.71	22.5	Pass	0.383	0.364	0.401	1.140	PASS	33.6
6	0.001	0.3	N/A	0.002	0.45	N/A	Pass	0.000	0.000	0.015	0.300	PASS	0
7	0.384	0.77	49.9	0.385	1.155	33.4	Pass	0.383	0.364	0.401	0.770	PASS	49.7
8	0.002	0.23	N/A	0.004	0.345	N/A	Pass	0.000	0.000	0.015	0.230	PASS	0
9	0.229	0.4	57.3	0.23	0.6	38.4	Pass	0.230	0.215	0.244	0.400	PASS	57.4
10	0.001	0.184	N/A	0.002	0.276	N/A	Pass	0.000	0.000	0.015	0.184	PASS	0
11	0.23	0.33	69.7	0.231	0.495	46.7	Pass	0.230	0.215	0.244	0.330	PASS	69.6
12	0.002	0.153	N/A	0.004	0.23	N/A	Pass	0.000	0.000	0.015	0.153	PASS	0
13	0.163	0.21	77.6	0.164	0.315	52.1	Pass	0.164	0.149	0.179	0.210	PASS	78.1
14	0.001	0.131	N/A	0.002	0.197	N/A	Pass	0.000	0.000	0.015	0.131	PASS	0
15	0.164	0.15	109.4	0.165	0.225	73.5	Fail	0.164	0.149	0.179	0.150	Fail	109.4
16	0.002	0.115	N/A	0.004	0.173	N/A	Pass	0.000	0.000	0.015	0.115	PASS	0
17	0.126	0.132	95.6	0.127	0.198	64.3	Pass	0.128	0.113	0.142	0.132	PASS	96.5
18	0.001	0.102	N/A	0.002	0.153	N/A	Pass	0.000	0.000	0.015	0.102	PASS	0
19	0.127	0.118	107.5	0.129	0.178	72.4	Fail	0.128	0.113	0.142	0.118	Fail	107.8
20	0.002	0.092	N/A	0.004	0.138	N/A	Pass	0.000	0.000	0.015	0.092	PASS	0
21	0.103	0.107	95.9	0.104	0.161	64.6	Pass	0.104	0.090	0.119	0.107	PASS	97.5
22	0.001	0.084	N/A	0.002	0.125	N/A	Pass	0.000	0.000	0.015	0.084	PASS	0
23	0.104	0.098	106.1	0.105	0.147	71.6	Fail	0.104	0.090	0.119	0.098	Fail	106.8
24	0.002	0.077	N/A	0.004	0.115	N/A	Pass	0.000	0.000	0.015	0.077	PASS	0
25	0.086	0.09	96	0.088	0.135	64.8	Pass	0.088	0.074	0.103	0.090	PASS	98.3
26	0.001	0.071	N/A	0.002	0.107	N/A	Pass	0.000	0.000	0.015	0.071	PASS	0
27	0.087	0.083	104.9	0.089	0.125	71.1	Fail	0.088	0.074	0.103	0.083	Fail	106.1
28	0.002	0.066	N/A	0.004	0.099	N/A	Pass	0.000	0.000	0.015	0.066	PASS	0
29	0.074	0.078	95.8	0.075	0.116	64.8	Pass	0.077	0.062	0.091	0.078	PASS	98.8
30	0.001	0.061	N/A	0.002	0.092	N/A	Pass	0.000	0.000	0.015	0.061	PASS	0
31	0.075	0.073	103.9	0.077	0.109	70.5	Fail	0.077	0.062	0.091	0.073	Fail	105.6
32	0.002	0.058	N/A	0.004	0.086	N/A	Pass	0.000	0.000	0.015	0.058	PASS	0
33	0.065	0.068	95.5	0.066	0.102	64.7	Pass	0.068	0.053	0.082	0.068	PASS	99.3
34	0.001	0.054	N/A	0.002	0.081	N/A	Pass	0.000	0.000	0.015	0.054	PASS	0
35	0.066	0.064	103	0.068	0.096	70.1	Fail	0.068	0.053	0.082	0.064	Fail	105.2
36	0.002	0.051	N/A	0.004	0.077	N/A	Pass	0.000	0.000	0.015	0.051	PASS	0
37	0.058	0.061	94.9	0.059	0.091	64.4	Pass	0.061	0.046	0.075	0.061	PASS	99.6
38	0.001	0.048	N/A	0.002	0.073	N/A	Pass	0.000	0.000	0.015	0.048	PASS	0
39	0.059	0.058	101.9	0.06	0.087	69.6	Fail	0.061	0.046	0.075	0.058	Fail	105.0
40	0.002	0.046	N/A	0.004	0.069	N/A	Pass	0.000	0.000	0.015	0.046	PASS	0

The above data illustrates the Class-A “FAIL” pattern for test file no 7. As the data shows, the system properly evaluates the test and produces accurate harmonics data.

Class-C Pass test

Current Test Result Summary (Phase A-Replay)													
EUT: CNS Inc. HFC-III calibrator							Tested by: Mathieu & Phong						
Test category: Class-C per Ed. 4.0 (2014) (European)							Test Margin: 100						
Test date: 1/14/2015 End time: 2:26:55 AM							Start time: 2:25:32 AM						
Test duration (min): 1							Data file name: H-000008.cts_data						
Comment: Class-C PASS													
Customer: Shany Tech - Israel													
Test Result: Pass Source qualification: Normal													
THC(A): 0.114 I-THD(%): 16.5 POHC(A): 0.027 POHC Limit(A): 0.066													
Highest parameter values during test:													
V_RMS (V)	230.24	Frequency(Hz):	50.00										
I_Peak (A)	1.018	I_RMS (Ar)	0.702										
I_Fund (A)	0.692	Crest Fact	1.451										
Power (W)	1058.6	Power Fa	0.983										
							THC-I	POHC	PF	I-fund			
							0.113	0.027	0.982	0.689			
Harm#	Harms(av)	100%Limit	%of Limit	Harms(mz)	150%Limit	%of Limit	Status	Ideal	Min	Max	Limits	Pass/Fail	Percent of Limit
								0.689	Tolerance				
2	0	0.014	N/A	0	0.021	N/A	Pass	0.000	0.000	0.007	0.014	PASS	0
3	0.065	0.204	31.7	0.066	0.306	21.4	Pass	0.063	0.056	0.071	0.203	PASS	31.2
4	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
5	0.058	0.069	83.9	0.058	0.104	56.3	Pass	0.058	0.050	0.065	0.069	PASS	83.5
6	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
7	0.047	0.048	98	0.048	0.073	65.5	Pass	0.047	0.040	0.054	0.048	PASS	98.2
8	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
9	0.034	0.035	97.5	0.034	0.052	65.1	Pass	0.034	0.027	0.041	0.034	PASS	98.4
10	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
11	0.02	0.021	98.2	0.02	0.031	65.7	Pass	0.020	0.013	0.028	0.021	PASS	99.1
12	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
13	0.014	0.021	66.8	0.014	0.031	45.3	Pass	0.014	0.007	0.021	0.021	PASS	67.0
14	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
15	0.016	0.021	77	0.016	0.031	51.8	Pass	0.016	0.009	0.023	0.021	PASS	77.5
16	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
17	0.017	0.021	84	0.018	0.031	56.2	Pass	0.018	0.010	0.025	0.021	PASS	84.8
18	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
19	0.015	0.021	71.4	0.015	0.031	47.8	Pass	0.015	0.008	0.022	0.021	PASS	72.2
20	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
21	0.01	0.021	48.7	0.01	0.031	32.8	Pass	0.010	0.003	0.017	0.021	PASS	49.2
22	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
23	0.008	0.021	39.5	0.008	0.031	26.9	Pass	0.008	0.001	0.015	0.021	PASS	39.8
24	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
25	0.01	0.021	48.8	0.01	0.031	32.8	Pass	0.010	0.003	0.017	0.021	PASS	49.4
26	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
27	0.011	0.021	52.4	0.011	0.031	35.2	Pass	0.011	0.004	0.018	0.021	PASS	53.3
28	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
29	0.009	0.021	43.4	0.009	0.031	29.1	Pass	0.009	0.002	0.016	0.021	PASS	44.3
30	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
31	0.006	0.021	30.2	0.006	0.031	20.4	Pass	0.006	-0.001	0.013	0.021	PASS	30.6
32	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
33	0.006	0.021	29.6	0.006	0.031	20	Pass	0.006	-0.001	0.013	0.021	PASS	30.1
34	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
35	0.008	0.021	37	0.008	0.031	24.9	Pass	0.008	0.001	0.015	0.021	PASS	38.0
36	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
37	0.008	0.021	37.5	0.008	0.031	25.2	Pass	0.008	0.001	0.015	0.021	PASS	38.5
38	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0
39	0.006	0.021	29.1	0.006	0.031	19.7	Pass	0.006	-0.001	0.013	0.021	PASS	30.0
40	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	n/l	PASS	0

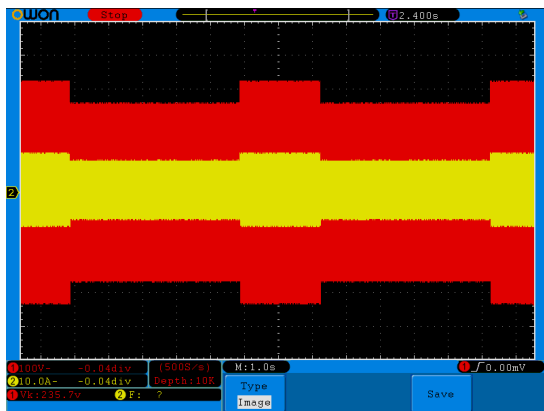
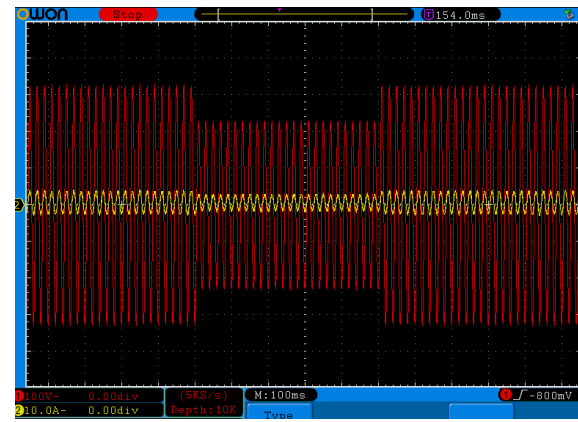
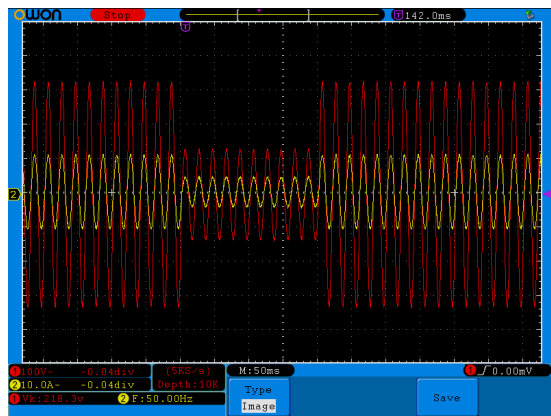
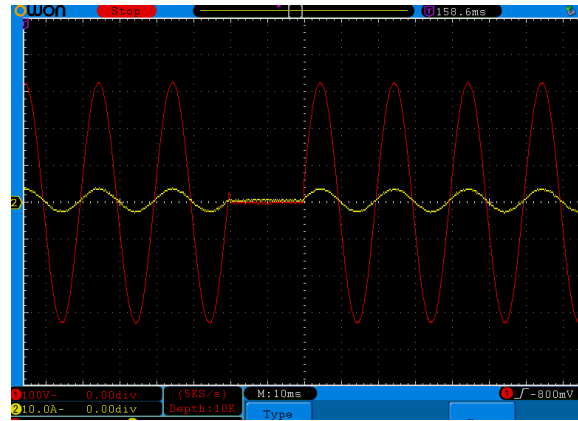
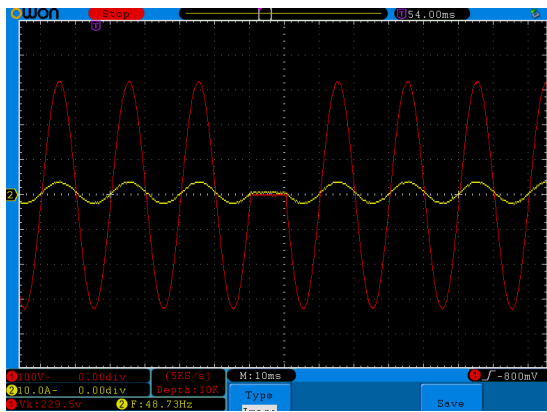
The above data illustrates the detailed test per Class-C (just) PASSING of IEC 61000-3-2 per test no. 8. All parameters are well within their respective tolerances.

Class-D “FAIL” test pattern

Current Test Result Summary (Replay)													
EUT: CNS Inc. HFC-III calibrator							Tested by: Mathieu & Phong						
Test category: Class-D per Ed. 4.0 (2014) (European)							Test Margin: 100						
Test date: 1/14/2015 End time: 2:31:03 AM							Start time: 2:29:41 AM						
Test duration (min): 1							Data file name: H-000009.cts_data						
Comment: Class-D FAIL													
Customer: Shany Tech - Israel													
Test Result: Fail Source qualification: Normal													
THC(A): 0.332 I-THD(%): 77.6 POHC(A): 0.062 POHC Limit(A): 0.041													
Highest parameter values during test:													
V_RMS (V)	230.23	Frequency(Hz):	50.00										
I_Peak (A)	1.018	I_RMS (Ar)	0.543										
I_Fund (A)	0.428	Crest Fac:	1.876										
Power (W)	95.6	Power Fa	0.766										
							THC-I	POHC	Pwr	I-THD			
							0.331	0.063	95.75	77.5%			
Harm#	Harms(av)	100%Limit	%of Limit	Harms(ma)	150%Limit	%of Limit	Status	Ideal	Min	Max	Limits	Pass/Fail	Percent of Limit
								0.427	Tolerance				
2	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
3	0.286	0.325	88	0.286	0.488	58.7	Pass	0.285	0.271	0.299	0.326	PASS	87.6
4	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
5	0.093	0.182	51	0.093	0.273	34.1	Pass	0.091	0.085	0.098	0.182	PASS	50.3
6	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
7	0.054	0.096	57	0.055	0.143	38.2	Pass	0.055	0.049	0.062	0.096	PASS	57.6
8	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
9	0.085	0.048	177.8	0.085	0.072	118.6	Fail	0.085	0.078	0.092	0.048	Fail	177.4
10	0	0	N/A	0	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
11	0.034	0.033	100.1	0.034	0.05	67.5	Fail	0.033	0.026	0.039	0.034	PASS	97.5
12	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
13	0.033	0.029	115.5	0.033	0.043	77.7	Fail	0.034	0.027	0.041	0.028	Fail	120.2
14	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
15	0.05	0.025	201.2	0.05	0.037	134.4	Fail	0.050	0.044	0.057	0.025	Fail	204.2
16	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
17	0.019	0.022	84.9	0.019	0.033	57.7	Pass	0.018	0.011	0.025	0.022	PASS	82.8
18	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
19	0.024	0.019	126	0.025	0.029	85	Fail	0.026	0.019	0.032	0.019	Fail	131.8
20	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
21	0.035	0.018	200.3	0.035	0.026	134	Fail	0.035	0.029	0.042	0.018	Fail	201.6
22	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
23	0.012	0.016	74.3	0.012	0.024	51.1	Pass	0.011	0.005	0.018	0.016	PASS	70.4
24	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
25	0.02	0.015	133.8	0.02	0.022	90.4	Fail	0.021	0.014	0.028	0.015	Fail	142.0
26	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
27	0.027	0.014	194.9	0.027	0.021	130.7	Fail	0.027	0.020	0.034	0.014	Fail	198.5
28	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
29	0.008	0.013	62.6	0.008	0.019	43.6	Pass	0.007	0.001	0.014	0.013	PASS	59.0
30	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
31	0.017	0.012	140.2	0.017	0.018	94.8	Fail	0.018	0.011	0.025	0.012	Fail	151.3
32	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
33	0.021	0.011	191.2	0.021	0.017	128.5	Fail	0.022	0.015	0.028	0.011	Fail	194.8
34	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
35	0.005	0.011	51.5	0.006	0.016	36.5	Pass	0.005	-0.002	0.012	0.011	PASS	48.6
36	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
37	0.014	0.01	145	0.015	0.015	98.2	Fail	0.016	0.009	0.023	0.010	Fail	159.8
38	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0
39	0.017	0.009	183.2	0.018	0.014	123.5	Fail	0.018	0.011	0.025	0.009	Fail	190.4
40	0	0	N/A	0.001	0	N/A	Pass	0.000	0.000	0.007	N/A	PASS	0

The above data illustrates the Class-D “FAIL” pattern for test file no 9. As the data shows, the system properly evaluates the test and produces highly accurate harmonics data.

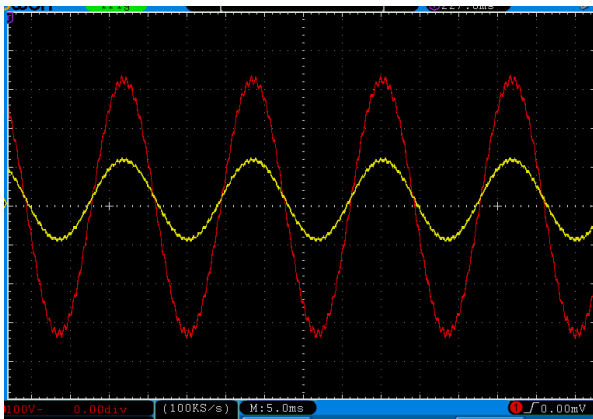
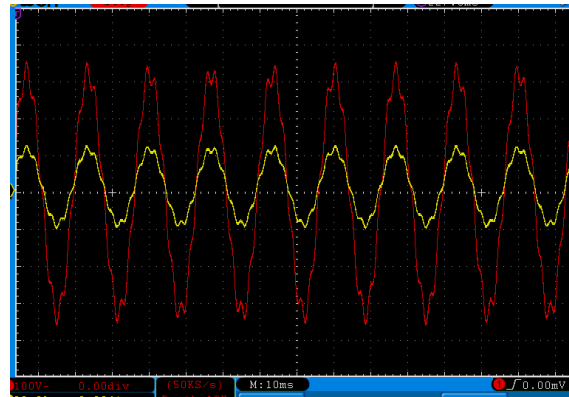
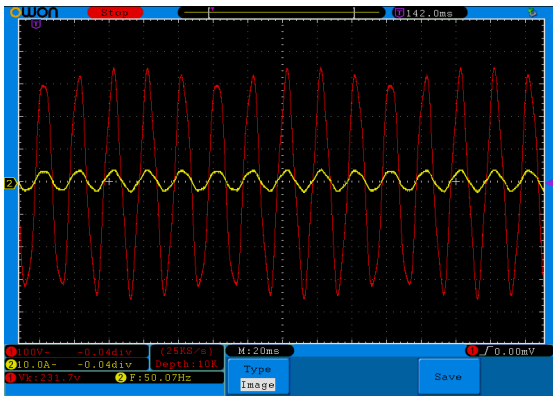
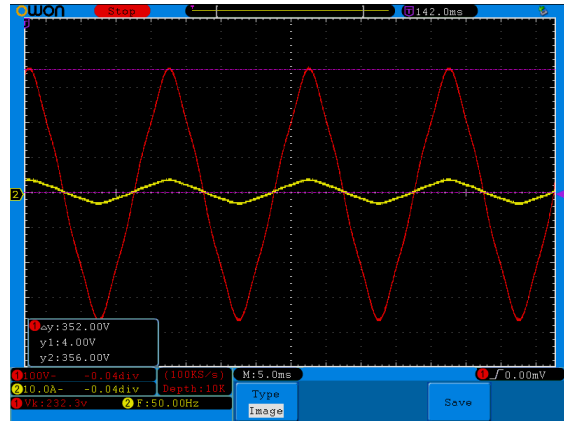
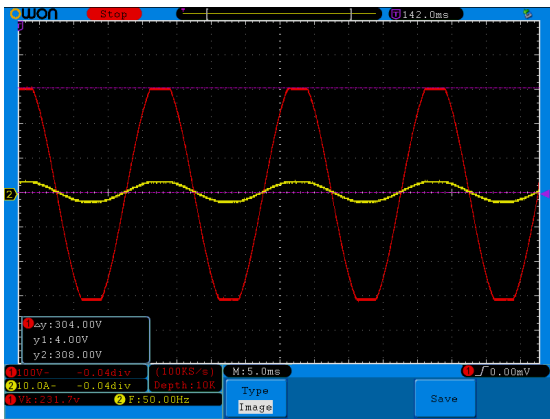
Test patterns per IEC 61000-4-11



The above scope shots on this page illustrate a series of tests per Table-1 of IEC 61000-4-11, with a half cycle drop out to “0” volt, a 1 cycle drop out, and “dip” patterns to 40 % for 10 cycles, 70 % for 25 cycles and to 80 % for 250 cycles of the 50 Hz fundamental (50 Hz) voltage. These are the recommended patterns per Table-1 of IEC 61000-4-11.

The load during this test was approximately 106 Ohms.

Test patterns per IEC 61000-4-13



This page shows a series of scope shots that illustrate test patterns per IEC 61000-4-13. The top two shots show the flat top (229.95 V-rms), and the so-called over-swing pattern (229.89 V-rms) and the next 3 shots show inter-harmonics per the Meister curve, taken while the power source sweeps from low to medium and higher frequency modulations.



System prior to calibration



**System with
new
calibration
stickers
applied.**

**End of calibration & verification report for
Shany Tech and EMC Lab, Israel - January 2015**