CE EMC
TEST REPORT

for

UP core Plus

MODEL: xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or "-" or blank)

Issued to:

AAEON Technology Inc.

**5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist.,
New Taipei City, Taiwan, R.O.C**

Issued by:

Compliance Certification Services Inc.

Xindian Lab.

**No.163-1, Jhongsheng Rd., Xindian Dist.,
New Taipei City, 23151 Taiwan.**

TEL: 886-2-22170894

FAX: 886-2-22171029

Issued Date: September 18, 2018

Note: This document may be altered or revised by Compliance Certification Services Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, A2LA, NIST or any government agencies.

Report No.: T180802D07-A-RE

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		September 18, 2018		Initial Issue	ALL	Joy Hsiao

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1 TEST CERTIFICATION

Product:	UP core Plus
Model:	xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or "-" or blank)
Brand:	AAEON
Applicant:	**AAEON Technology Inc.** 5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C
Manufacturer:	**AAEON Technology Inc.** 5F, No.135, Lane 235, Pao Chiao Rd, Hsin-Tien Dist., New Taipei City, Taiwan, R.O.C
Tested:	August 3, 2018 ~ August 19, 2018
Applicable Standards:	**ETSI EN 301 489-17 V3.2.0 (2017-03) Draft** **ETSI EN 301 489-1 V2.2.0 (2017-03) Draft** EN 55032: 2015 / AC: 2016 CISPR 32: 2015 (Ed 2.0) / C1: 2016 EN 61000-3-2: 2014 EN 61000-3-3: 2013 EN 61000-4-2: 2009 EN 61000-4-3: 2006 + A1: 2008 + A2: 2010 EN 61000-4-4: 2012 EN 61000-4-5: 2014 EN 61000-4-6: 2014 EN 61000-4-11: 2004 + A1: 2017

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Sam Hu
Assistant Manager

Reviewed by:

Eva Fan
Supervisor of report document dept.

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2 TEST RESULT SUMMARY

EMISSION			
Standard	**Item**	**Result**	**Remarks**
EN 55032: 2015 / AC: 2016 CISPR 32: 2015 (Ed 2.0) / C1: 2016	Conducted (Power Port)	PASS	Meet Class B limit
	Conducted (Telecom port)	N/A	Please see the page 19
	Radiated	PASS	Meet Class B limit
EN 61000-3-2: 2014	Harmonic current emissions	PASS	Meet Class A limit
EN 61000-3-3: 2013	Voltage fluctuations & flicker	PASS	Meets the requirements

IMMUNITY【 ETSI EN 301 489-1 V2.2.0 (2017-03) Draft 】			
Standard	**Item**	**Result**	**Remarks**
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Performance Criterion TT&TR
EN 61000-4-3: 2006 + A1: 2008 + A2: 2010	RS	PASS	Meets the requirements of Performance Criterion CT&CR
EN 61000-4-4: 2012	EFT	PASS	Meets the requirements of Performance Criterion CT&CR
EN 61000-4-5: 2014	Surge	PASS	Meets the requirements of Performance Criterion CT&CR
EN 61000-4-6: 2014	CS	PASS	Meets the requirements of Performance Criterion CT&CR
EN 61000-4-11: 2004 + A1: 2017	Voltage dips & voltage variations	PASS	Meets the requirements of **Voltage Dips:** 1) 0% residual 0.5 periods Performance CT&CR 2) 0% residual 1 periods Performance CT&CR 3) 70% residual 25 periods Performance CT&CR 4) 0% residual 250 periods Performance TT or TR

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

3 EUT DESCRIPTION

Product	UP core Plus
Brand Name	AAEON
Model	xUPC-PLUSx (x – where x may be any combination of alphanumeric characters or "-" or blank)
Applicant	AAEON Technology Inc.
Housing material	N/A
Identify Number	T180802D07-A
Received Date	August 2, 2018
EUT Power Rating	12VDC from Adaptor
AC Power During Test	110VAC / 50Hz & 230VAC / 50Hz to Adaptor
Adaptor Manufacturer	Powertron Electronics Corp.
Adaptor Model	PS1065-120IB500
Adaptor Power Rating	I/P: 100-240VAC~, 50-60Hz, 1.8A O/P: 12VDC, 5.0A
DC Power Cable Type	Unshielded, 1.2m (Non-detachable, with a core)
Frequency Range	IEEE 802.11b Mode: 2412 ~ 2472 MHz IEEE 802.11g Mode: 2412 ~ 2472 MHz IEEE 802.11n HT 20 Mode: 2412 ~ 2472 MHz Bluetooth: 2042 ~ 2480 MHz IEEE 802.11a Mode: 5180 ~ 5240 MHz IEEE 802.11n HT 20 Mode: 5180 ~ 5240 MHz IEEE 802.11n HT 40 Mode: 5190 ~ 5230MHz IEEE 802.11ac VHT80 Mode: 5210MHz
Modulation Technique	IEEE 802.11b Mode: DSSS IEEE 802.11g Mode: OFDM IEEE 802.11n HT 20 Mode: OFDM Bluetooth 4.0: GFSK IEEE 802.11a Mode: OFDM IEEE 802.11n HT20 Mode: OFDM IEEE 802.11n HT40 Mode: OFDM IEEE 802.11ac VHT80 MoA de: OFDM

<table>
<tr><td>Number of Channels</td><td>IEEE 802.11b Mode: 13 Channels
IEEE 802.11g Mode: 13 Channels
IEEE 802.11n HT 20 Mode: 13 Channels
Bluetooth 4.0: 40 Channels (37 hopping + 3 advertising Channel)
IEEE 802.11a Mode: 5180 ~ 5240 MHz: 4 Channels
IEEE 802.11n HT20 Mode: 5180 ~ 5240 MHz: 4 Channels
IEEE 802.11n HT40 Mode: 5190 ~ 5230 MHz: 2 Channels
IEEE 802.11ac VHT80 Mode: 5210 MHz: 1 Channels</td></tr>
<tr><td>Transmit Power (mean EIRP)</td><td>
<table>
<tr><th>Mode</th><th>Transmit Power (dBm)</th><th>Transmit Power (mW)</th></tr>
<tr><td colspan="3">Chain 0</td></tr>
<tr><td>IEEE 802.11b Mode</td><td>15.87</td><td>38.64</td></tr>
<tr><td>IEEE 802.11g Mode</td><td>17.69</td><td>58.75</td></tr>
<tr><td>IEEE 802.11n HT 20 Mode</td><td>19.58</td><td>90.78</td></tr>
<tr><td colspan="3">Chain 1</td></tr>
<tr><td>IEEE 802.11b Mode</td><td>15.90</td><td>38.90</td></tr>
<tr><td>IEEE 802.11g Mode</td><td>17.50</td><td>56.23</td></tr>
<tr><td>IEEE 802.11n HT 20 Mode</td><td>19.74</td><td>94.19</td></tr>
<tr><td>Bluetooth 4.0</td><td>5.23</td><td>3.33</td></tr>
</table>
<table>
<tr><th>Mode</th><th>Transmit Power (dBm)</th><th>Transmit Power (mW)</th></tr>
<tr><td colspan="3">IEEE 802.11a Mode</td></tr>
<tr><td>5180 ~ 5240 MHz</td><td>19.31</td><td>85.31</td></tr>
<tr><td>5180 ~ 5240 MHz</td><td>19.10</td><td>81.28</td></tr>
<tr><td colspan="3">IEEE 802.11n 20 Mode</td></tr>
<tr><td>5180 ~ 5240 MHz</td><td>18.77</td><td>75.34</td></tr>
<tr><td>5180 ~ 5240 MHz</td><td>18.77</td><td>75.34</td></tr>
<tr><td colspan="3">IEEE 802.11n 40 Mode</td></tr>
<tr><td>5190 ~ 5230 MHz</td><td>17.53</td><td>56.62</td></tr>
<tr><td>5190 ~ 5230 MHz</td><td>18.11</td><td>64.71</td></tr>
<tr><td colspan="3">IEEE 802.11ac VHT80 Mode</td></tr>
<tr><td>5210 MHz (Chain 0)</td><td>16.64</td><td>46.13</td></tr>
<tr><td>5210 MHz (Chain 1)</td><td>16.11</td><td>40.83</td></tr>
</table>
</td></tr>
<tr><td>Antenna Specification</td><td>Dipole Antenna: ARISTOTLE / RFA-25-C2M2-M10-1
Gain: 2dBi</td></tr>
<tr><td>Temperature Range</td><td>10°C ~ +40°C</td></tr>
</table>

Model Differences

Model Name	Difference	Tested (Checked)
UPC-PLUSX5Q-A10-0432	Original	☒
xUPC-PLUSx	1. x – where x may be any combination of alphanumeric characters or "-" or blank 2. For marketing purpose only	☐

I/O PORT

I/O PORT TYPES	Q'TY	TESTED WITH
1. DP Port	1	1
2. USB 3.0 Type-A Port	1	1
3. USB 3.0 Micro-B Port	1	1
4. Antenna Port	2	2

Note: Client consigns only one model sample to test (Model Number: UPC-PLUSX5Q-A10-0432).

4 TEST METHODOLOGY

4.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the below additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ modes are as the following:

Conduction Modes:

1	**DP Mode**	**3840X2160, VF=30Hz**	**110VAC / 50Hz**
2		**3840X2160, VF=30Hz**	**230VAC / 50Hz**
3		**1920X1080, VF=60Hz**	**110VAC / 50Hz**
4		**1600X900, VF=60Hz**	**110VAC / 50Hz**
5		**1280X1024, VF=60Hz**	**110VAC / 50Hz**
6		**800X600, VF=60Hz**	**110VAC / 50Hz**

Radiation Modes:

1	**DP Mode**	**3840X2160, VF=30Hz**	**110VAC / 50Hz**
		3840X2160, VF=30Hz / 1-6GHz	
2		**3840X2160, VF=30Hz**	**230VAC / 50Hz**
3		**1920X1080, VF=60Hz**	**110VAC / 50Hz**
4		**1600X900, VF=60Hz**	**110VAC / 50Hz**
5		**1280X1024, VF=60Hz**	**110VAC / 50Hz**
6		**800X600, VF=60Hz**	**110VAC / 50Hz**

Worst:
Conduction: Mode 1
Radiation: Mode 1

4.2. EUT SYSTEM OPERATION

1. Windows 10 boots system.
2. Run colorbarmove.mp4 to activate all peripherals for test EUT.
3. Run Winemc.exe and choose “F:/” to test EUT.
4. Press the start menu, select executive and type ping 192.168.0.2&3 –t (EUT), ping 192.168.0.1&4 –t (Server PC).
5. Press the start menu, select executive and type ping 192.168.0.5&7 –t (EUT), ping 192.168.0.6&8 –t (Server PC).
6. Link WIFI/BT function of the EUT to test.

Note: Test program is self-repeating throughout the test.

5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Host PC Devices:

No.	Equipment	Model No.	Brand Name
1	Adaptor	PS1065-120IB500	Powertron Electronics Corp.
2	CPU (1.6GHz)	AtomTM Processor E3940	Intel®
3	Memory (LPDDR4 2400 / 4GB)	N/A	N/A
4	Storage (eMMC / 32GB)	HBG4a2	Hynix
5	Antenna	RFA-25-C2M2-M10-1	ARISTOTLE
6	WIFI/BT module	AP6355SD	AMPAK
7	Net Plus	UPCP-CR-NPL4-A10-001	AAEON

Peripherals Devices:

No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Brand Name	Data Cable	Power Cord
1	USB HDD	HD-EG5	N/A	DOC BSMI: D33021	SONY	Shielded, 0.7m	N/A
2	USB Mouse	M-U0026	N/A	DOC BSMI: T41126	Logitech	Shielded, 1.8m	N/A
3	USB Keyboard	Y-U0011	N/A	DOC BSMI: T51160	Logitech	Shielded, 1.8m	N/A
4	Monitor	P2415Qb	CN-0D3C8X-74261-4AV-03PL	BSMI: R43002	DELL	Shielded, 1.8m	Unshielded, 1.8m
5-8	Server PC	T3500	N/A	DOC BSMI: R33002	DELL	Unshielded, 20m	Unshielded, 1.8m
9	Server Notebook	XPS13	7R0S3G2	BSMI: R31199	DELL	N/A	Unshielded, 1.8m

Note:
1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer’s requirements and conditions for the intended use.

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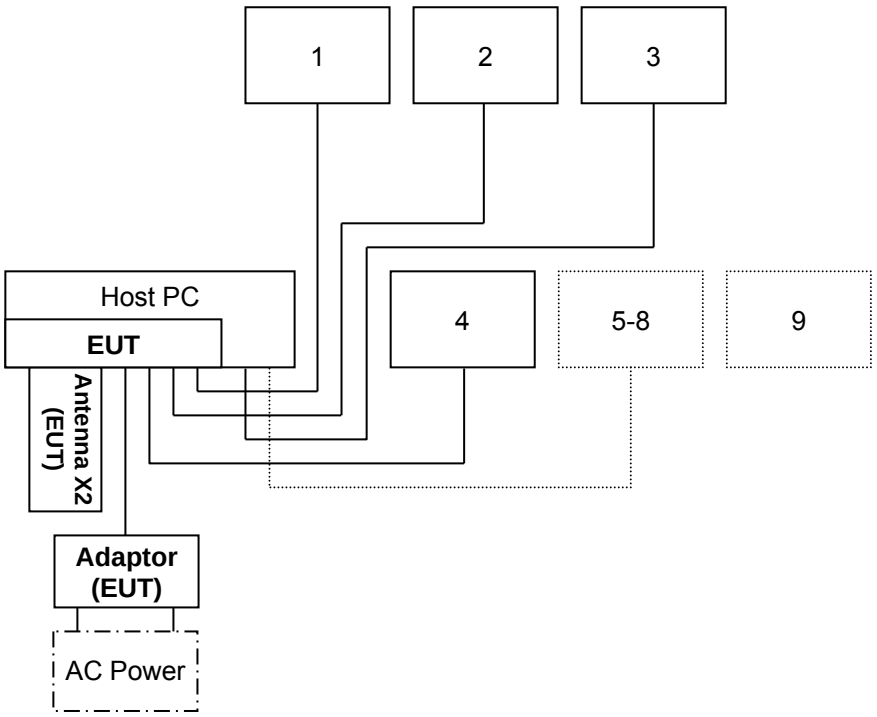
5.2. CONFIGURATION OF SYSTEM UNDER TEST



6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at:

☒ No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.

☐ No.11, Wu-Gong 6th Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)

☐ No.139, Wugong Rd., Wugu Industrial Park, New Taipei City 248, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4, CISPR 16-1-5.

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF
USA	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Japan	VCCI
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsrf.com

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	0.15MHz ~ 30MHz	± 2.8
Radiated emissions	30MHz ~ 1000MHz	± 5.3
	1000MHz ~ 6000MHz	± 4.7

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Consistent with industry standard (e.g. CISPR 22: 2005, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

7 EMISSION TEST

7.1. CONDUCTED EMISSION MEASUREMENT

7.1.1. LIMITS

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:
(1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

Conducted Emission room # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
BNC CABLE	EMEC	EMG178	BNC#A9	03/26/2019
EMI Test Receiver	R&S	ESCI	101201	09/28/2018
LISN	Schwarzbeck	NNLK 8129	8129-286	08/15/2018
LISN(EUT)	Schwarzbeck	NSLK 8127	8127527	08/15/2018
Pulse Limiter	R&S	ESH3Z2	SD-C002	08/17/2018
Thermo-Hygro Meter	Wisewind	201A	No. 02	05/06/2019
Test S/W	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

7.1.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031 & PA-041)

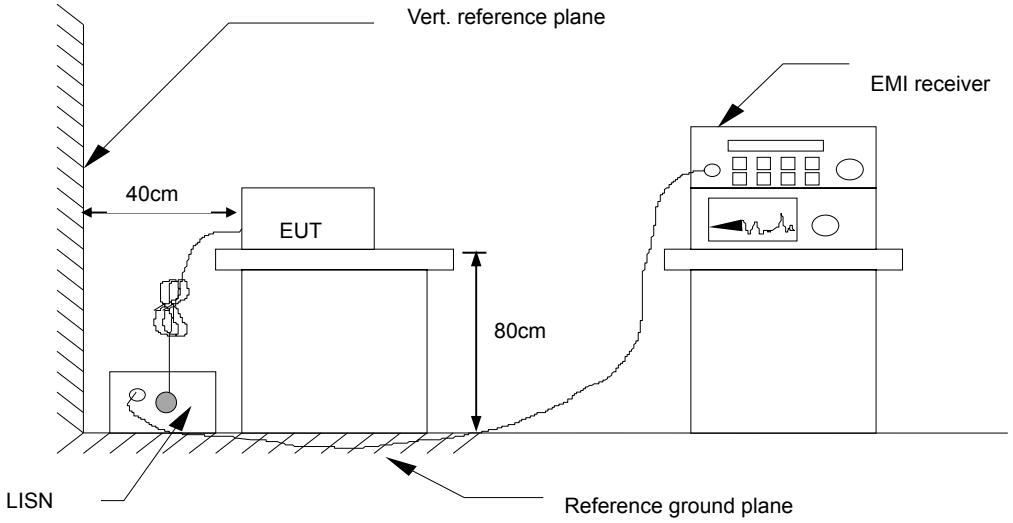
Procedure of Preliminary Test

- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per EN 55032 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per EN 55032.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.

7.1.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
x.xx	42.95	0.55	43.50	56	-12.50	Q	L1

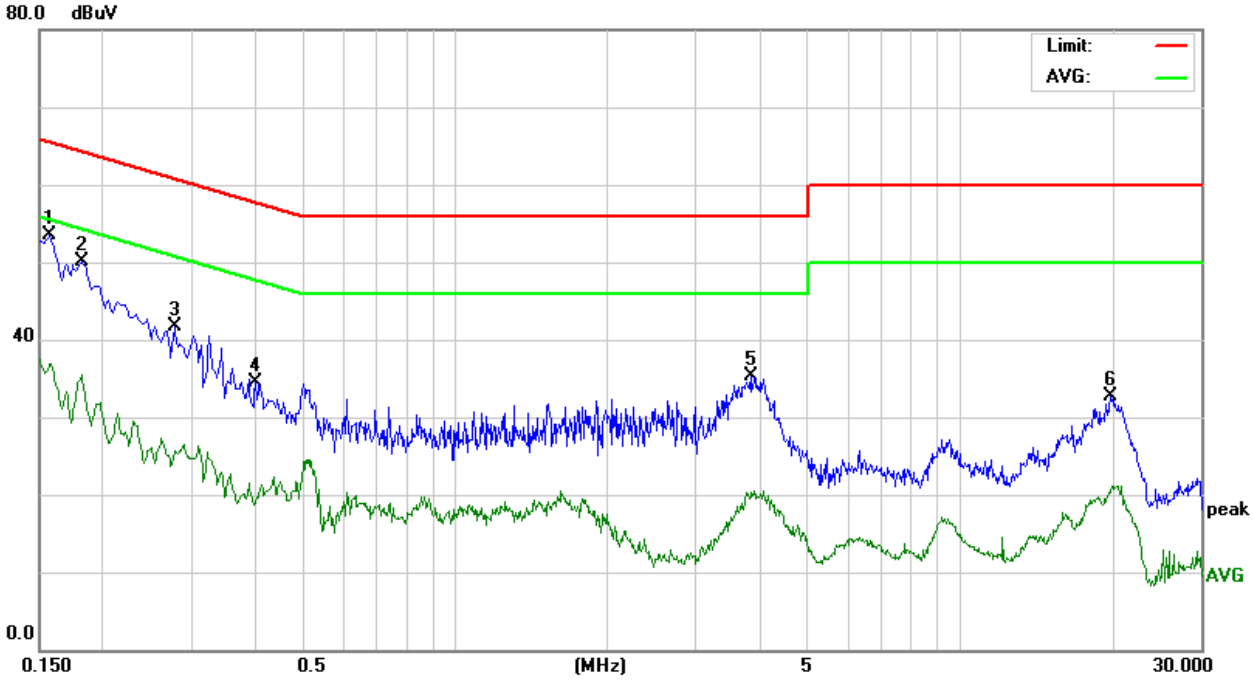
Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
L1 = Hot side
L2 = Neutral side

Calculation Formula

Margin (dB) = Result (dBuV) – Limit (dBuV)

7.1.6. TEST RESULTS

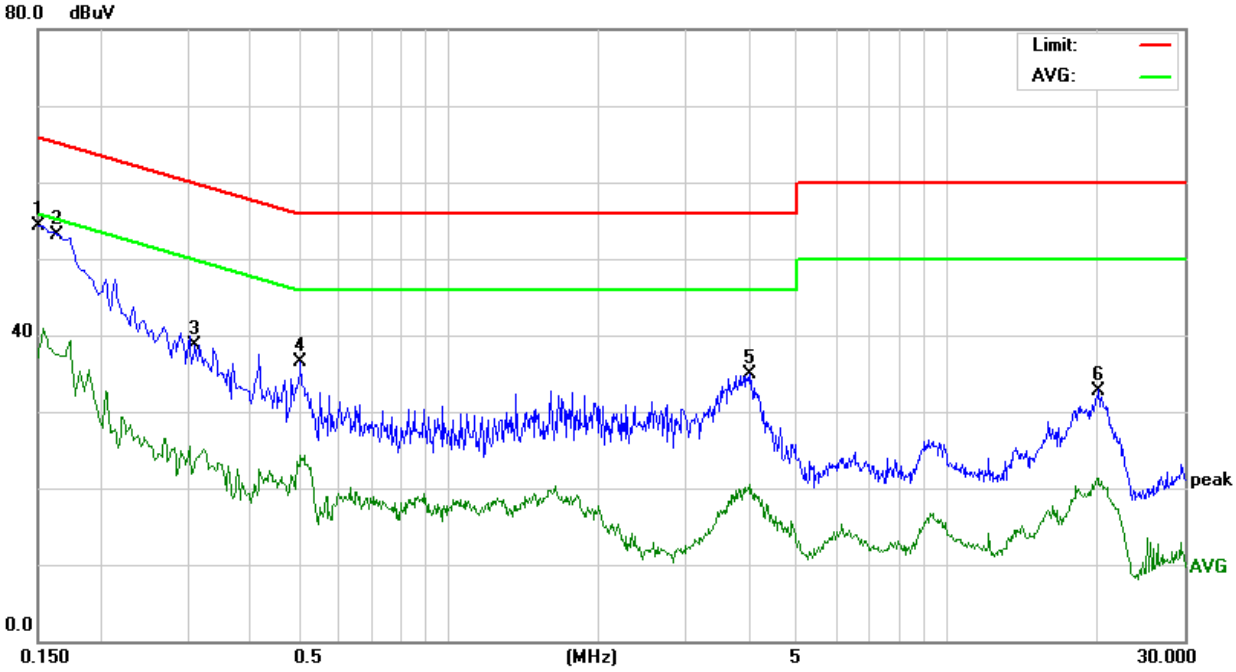
Model No.	UPC-PLUSX5Q-A10-0432	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	David Cheng	Phase	L1
Standard	EN 55032 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1580	43.43	10.01	53.44	65.56	-12.12	P	L1
0.1819	40.02	10.02	50.04	64.39	-14.35	P	L1
0.2779	31.68	10.02	41.70	60.88	-19.18	P	L1
0.4020	24.55	10.04	34.59	57.81	-23.22	P	L1
3.8580	24.99	10.25	35.24	56.00	-20.76	P	L1
19.8460	21.69	10.94	32.63	60.00	-27.37	P	L1

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

Model No.	UPC-PLUSX5Q-A10-0432	6dB Bandwidth	9 kHz
Environmental Conditions	25°C, 58% RH	Test Mode	Mode 1
Tested by	David Cheng	Phase	L2
Standard	EN 55032 CLASS B		



Conducted Emission Readings							
Frequency Range Investigated				150 kHz to 30 MHz			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)	Line (L1/L2)
0.1500	44.37	10.01	54.38	65.99	-11.61	P	L2
0.1641	43.17	10.01	53.18	65.25	-12.07	P	L2
0.3100	28.71	10.02	38.73	59.97	-21.24	P	L2
0.5060	26.50	10.03	36.53	56.00	-19.47	P	L2
4.0140	24.60	10.22	34.82	56.00	-21.18	P	L2
20.2340	21.84	10.96	32.80	60.00	-27.20	P	L2

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

7.2. REQUIREMENTS FOR ASYMMETRIC MODE CONDUCTED EMISSIONS

7.2.1. LIMITS

For Class A Equipment

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 ~ 0.5	97 ~ 87	84 ~ 74	53 ~ 43	40 ~ 30
0.5 ~ 30.0	87	74	43	30

NOTE: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

For Class B Equipment

FREQUENCY (MHz)	Voltage Limit (dBuV)		Current Limit (dBuA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 ~ 74	74 ~ 64	40 ~ 30	30 ~ 20
0.5 - 30.0	74	64	30	20

NOTE: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

7.2.2. TEST INSTRUMENTS

Conducted Emission room #				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

7.2.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031)

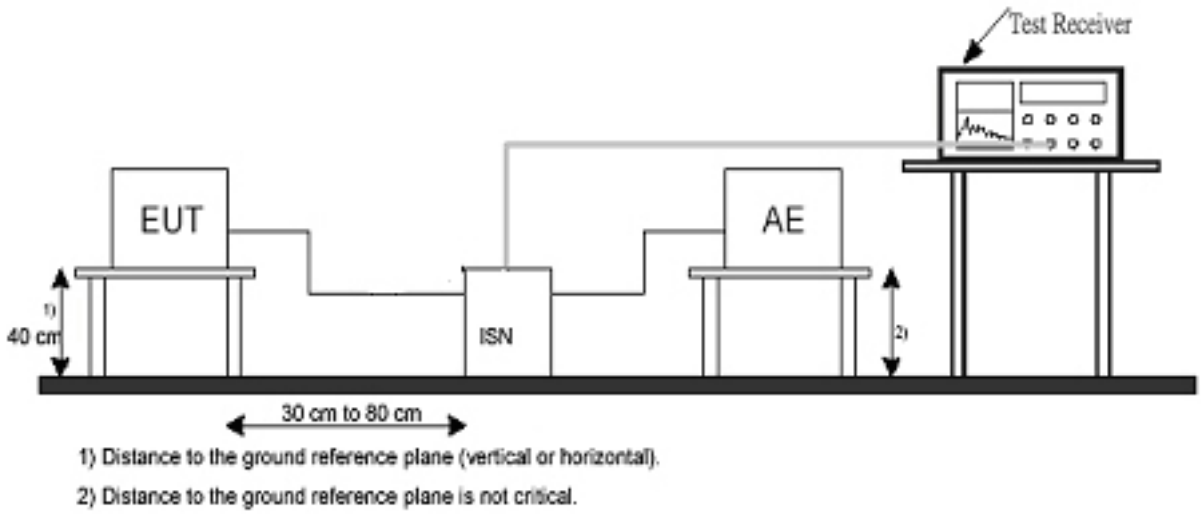
- Selecting AAN for unscreened cable or a current probe for screened cable to take measurement.
- The port of the EUT was connected to the remote side support equipment through the AAN/Current Probe and communication in normal condition.
- Making a overall range scan by using the test receiver controlled by controller and record at least six highest emissions for showing in the test report.
- Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- In case of measuring on the screened cable, the current limit shall be applied; otherwise the voltage limit should be applied.
- The following test modes was scanned during the preliminary test:

  N/A

- After the preliminary scan, we found the following test mode(s) producing the highest emission level and test data of the worst case was recorded.

  N/A

7.2.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.2.5. DATA SAMPLE

Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector (P/Q/A)
x.xx	62.95	0.55	63.50	84	-20.50	Q

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss + Pulse Limit
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading

Calculation Formula

Margin (dB) = Result (dBuV) – Limit (dBuV)

7.2.6. TEST RESULTS

Model No.	N/A	**6dB Bandwidth**	N/A
Environmental Conditions	N/A	**Test Mode**	N/A
Tested by	N/A		

Note: No applicable, the EUT doesn't have LAN Port or Modem port.

7.3. RADIATED EMISSION MEASUREMENT

7.3.1. LIMITS

Below 1GHz

FREQUENCY (MHz)	dBuV/m (At 10m)		dBuV/m (At 3m)	
	Class A	Class B	Class A	Class B
30 ~ 230	40	30	50	40
230 ~ 1000	47	37	57	47

Above 1GHz

Frequency (MHz)	Class A (dBuV/m) (At 3m)		Class B (dBuV/m) (At 3m)	
	Average	Peak	Average	Peak
1000 ~ 3000	56	76	50	70
3000 ~ 6000	60	80	54	74

NOTE: The lower limit shall apply at the transition frequencies.

According to EN 55032: 2015 / AC: 2016 Table 1 the measurement frequency range shown in the following table:

Table 1 – Required highest frequency for radiated measurement

Highest internal frequency (F_x)	Highest internal frequency
$F_X \leq 108$ MHz	1 GHz
108 MHz < $F_X \leq 500$ MHz	2 GHz
500 MHz < $F_X \leq 1$ GHz	5 GHz
$F_X > 1$ GHz	5 x F_X up to a maximum of 6 GHz
NOTE 1 For FM and TV broadcast receivers, F_X is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies. NOTE 2 F_X is defined in 3.1.19.	

Where F_X is unknown, the radiated emission measurements shall be performed up to 6 GHz.

Radiated emissions from FM receivers

Frequency range MHz	Measurement		Class B limit dB(μV/m)	
	Distance m	Detector type / bandwidth	Fundamental	Harmonics
			OATS / SAC (see Table A.1)	OATS / SAC (see Table A.1)
30 – 230	10	Quasi peak/ 120kHz	50	42
230 – 300				42
300 – 1000				46
30 – 230	3		60	52
230 – 300				52
300 – 1000				56
These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the local oscillator. Signals at all other frequencies shall be compliant with the limits given in 7.3.1 Class B Limit				

7.3.2. TEST INSTRUMENTS

Open Area Test Site # H				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Bilog Antenna	Teseq	CBL 6112D	36995	06/25/2019
Cable	EMEC	CFD400NL-LW	N-Type#H11	08/15/2019
EMI Test Receiver	R&S	ESCI	101340	03/26/2019
Pre-Amplifier	HP	8447D	1937A01554	09/28/2018
Thermo-Hygro Meter	Wisewind	201A	No. 03	05/27/2019
Test S/W	EZ-EMC			
Above 1GHz Used				
Horn Antenna	ETS	3117	139062	09/24/2018
K-Type Cable x 1m (1-40GHz)	Rosnol	K1K50-UP0264-K1k50-1M	160215-1	12/03/2018
Microflex Cable x 7m (1-18GHz)	Rosnol	A1K50-EW0630-A1k50-700CM	SD-R028	12/03/2018
Pre-Amplifier	HP	8449B	3008A01266	12/03/2018
Signal Analyzer	Agilent	N9010A	MY53440125	01/08/2019
Thermo-Hygro Meter	Wisewind	N/A	SD-R027	10/01/2018
Test S/W	EZ-EMC			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

7.3.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-031 & PA-041)

Procedure of Preliminary Test

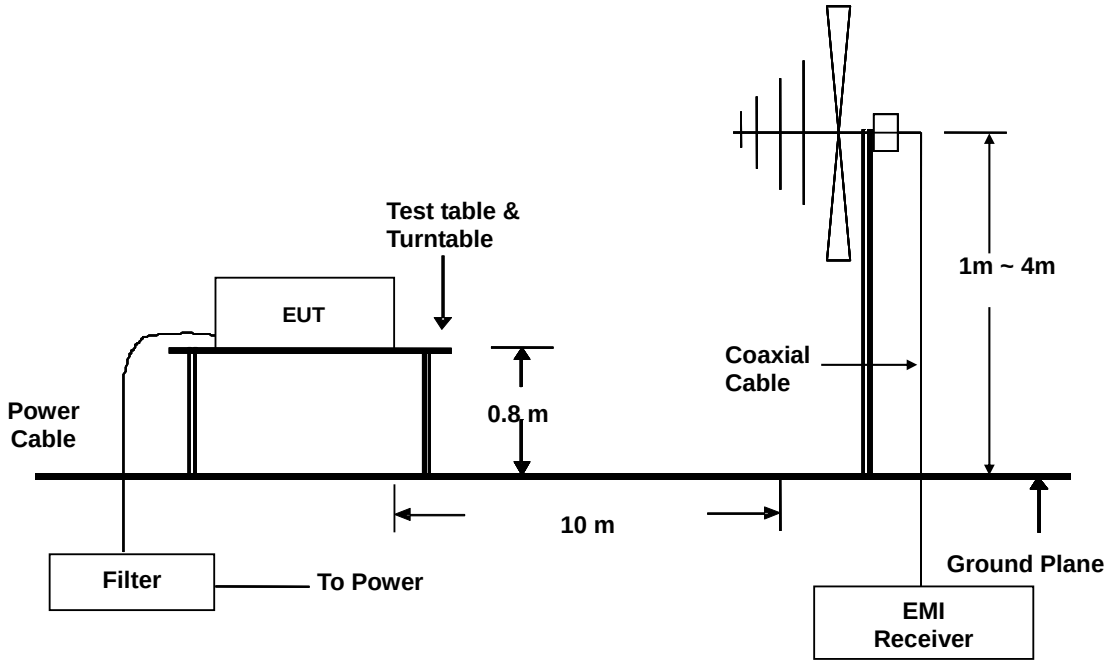
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per EN 55032.
- All I/O cables were positioned to simulate typical usage as per EN 55032.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 or 10 meter away from the EUT as stated in EN 55032. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 6000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 4.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 4.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

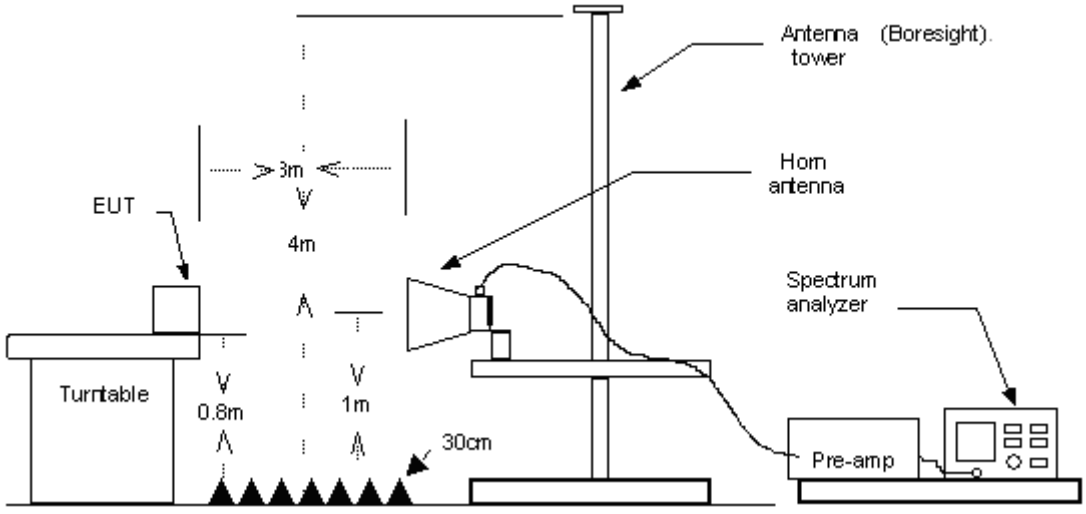
- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 6000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. Below 1GHz the Q.P. reading and above 1GHz the Peak and Average reading are presented.
- The test data of the worst-case condition(s) was recorded.

7.3.4. TEST SETUP

Below 1GHz



Above 1GHz



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.3.5. DATA SAMPLE

Below 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q)	Pol. (H/V)
x.xx	14.0	12.2	26.2	30	-3.8	Q	H

Above 1GHz

Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
x.xx	42.95	0.55	43.50	54	-10.50	A	H

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Antenna Factor + Cable Loss - Amplifier Gain
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
H = Antenna Polarization: Horizontal
V = Antenna Polarization: Vertical

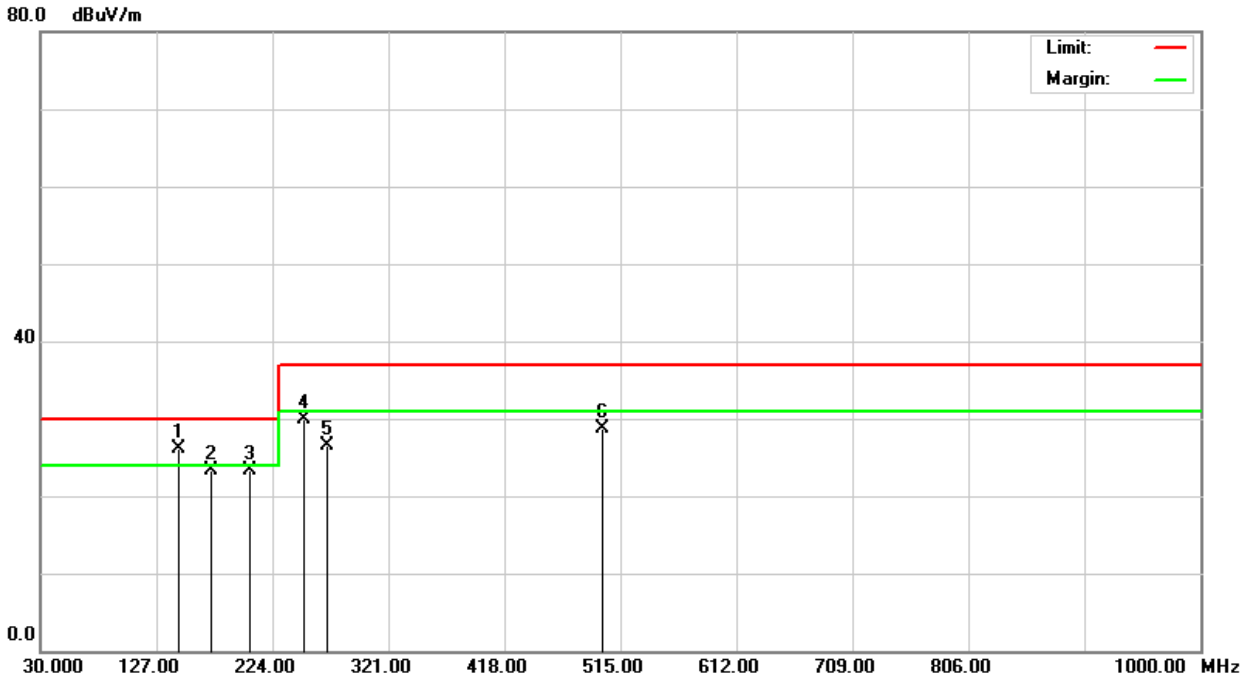
Calculation Formula

Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)

7.3.6. TEST RESULTS

Below 1GHz

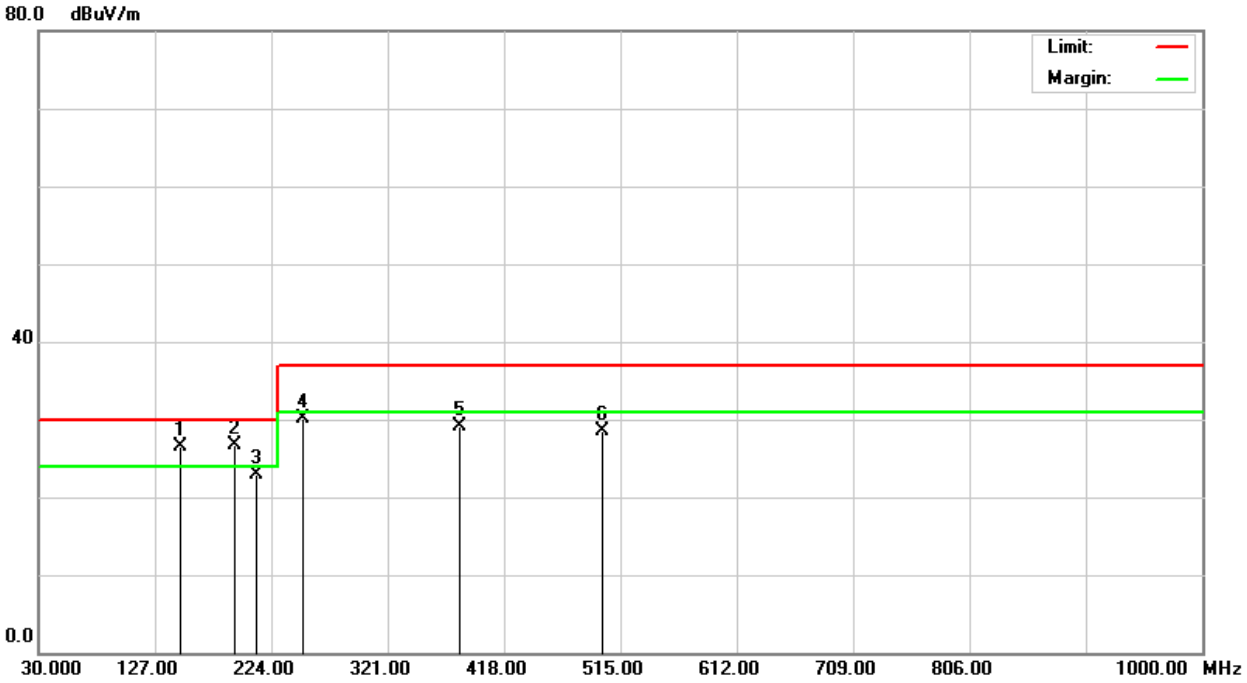
Model No.	UPC-PLUSX5Q-A10-0432	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Lion Lee
Standard	EN 55032 CLASS B		



Radiated Emission Readings									
Frequency Range Investigated				30 MHz to 1000 MHz at 10m					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
145.3200	35.27	-9.09	26.18	30.00	-3.82	100	153	Q	V
172.4299	33.89	-10.58	23.31	30.00	-6.69	100	341	Q	V
205.6600	33.64	-10.33	23.31	30.00	-6.69	100	100	Q	V
250.8100	37.11	-7.27	29.84	37.00	-7.16	100	63	Q	V
269.3000	33.25	-6.70	26.55	37.00	-10.45	100	24	Q	V
500.6600	30.25	-1.55	28.70	37.00	-8.30	400	0	Q	V

Note: 1. P= Peak Reading; Q= Quasi-peak Reading.

Model No.	UPC-PLUSX5Q-A10-0432	Test Mode	Mode 1
Environmental Conditions	26°C, 60% RH	6dB Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Lion Lee
Standard	EN 55032 CLASS B		



Radiated Emission Readings									
Frequency Range Investigated				30 MHz to 1000 MHz at 10m					
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Detector (P/Q)	Pol. (H/V)
148.2600	35.92	-9.37	26.55	30.00	-3.45	400	341	Q	H
193.2400	37.46	-10.80	26.66	30.00	-3.34	400	152	Q	H
211.3700	33.26	-10.28	22.98	30.00	-7.02	400	322	Q	H
250.3000	37.42	-7.34	30.08	37.00	-6.92	400	142	Q	H
381.7600	32.99	-3.85	29.14	37.00	-7.86	400	33	Q	H
500.0400	30.14	-1.58	28.56	37.00	-8.44	100	135	Q	H

Note: 1. P= Peak Reading; Q= Quasi-peak Reading.

Above 1GHz

Model No.	UPC-PLUSX5Q-A10-0432	**Test Mode**	Mode 1
Environmental Conditions	26°C, 60% RH	**6dB Bandwidth**	1 MHz
Antenna Pole	Vertical / Horizontal	**Antenna Distance**	3m
Highest frequency generated or used	5000MHz	**Upper frequency**	6000MHz
Detector Function	Peak and average.	**Tested by**	David Cheng
Standard	EN 55032 CLASS B		

Radiated Emission Readings							
Frequency Range Investigated				**Above 1GHz at 3m**			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
1066.667	**53.19**	**-7.37**	**45.82**	**70.00**	**-24.18**	**P**	**V**
1266.667	**54.02**	**-7.33**	**46.69**	**70.00**	**-23.31**	**P**	**V**
1900.000	**52.14**	**-3.26**	**48.88**	**70.00**	**-21.12**	**P**	**V**
2008.333	**50.53**	**-2.26**	**48.27**	**70.00**	**-21.73**	**P**	**V**
2466.667	**50.74**	**-2.04**	**48.70**	**70.00**	**-21.30**	**P**	**V**
3033.333	**48.23**	**-1.42**	**46.81**	**74.00**	**-27.19**	**P**	**V**

Radiated Emission Readings							
Frequency Range Investigated				**Above 1GHz at 3m**			
Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
1066.667	**55.26**	**-7.37**	**47.89**	**70.00**	**-22.11**	**P**	**H**
1683.333	**53.94**	**-5.45**	**48.49**	**70.00**	**-21.51**	**P**	**H**
1900.000	**52.12**	**-3.26**	**48.86**	**70.00**	**-21.14**	**P**	**H**
2466.667	**50.60**	**-2.04**	**48.56**	**70.00**	**-21.44**	**P**	**H**
3033.333	**49.77**	**-1.42**	**48.35**	**74.00**	**-25.65**	**P**	**H**
3858.333	**49.05**	**-0.25**	**48.80**	**74.00**	**-25.20**	**P**	**H**

Note: 1. P= Peak Reading; A= Average Reading.

7.4. HARMONICS CURRENT MEASUREMENT

7.4.1. LIMITS OF HARMONICS CURRENT MEASUREMENT

Limits for Class A equipment	
Harmonics Order n	Max. permissible harmonics current A
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15<=n<=39	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8<=n<=40	0.23x8/n

Limits for Class D equipment		
Harmonics Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd Harmonics only		
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
13	0.30	0.21
15<=n<=39	3.85/n	0.15x15/n

NOTE: 1. Class A and Class D are classified according to item 7.4.3.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

7.4.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
5kVA Power Source	Teseq	5001IX-208-TSQ	1537A01296	11/02/2018
H/F Measurement System	EMC Partner	HAR1000-1P	189	11/02/2018
Software	HARCS V4.19			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

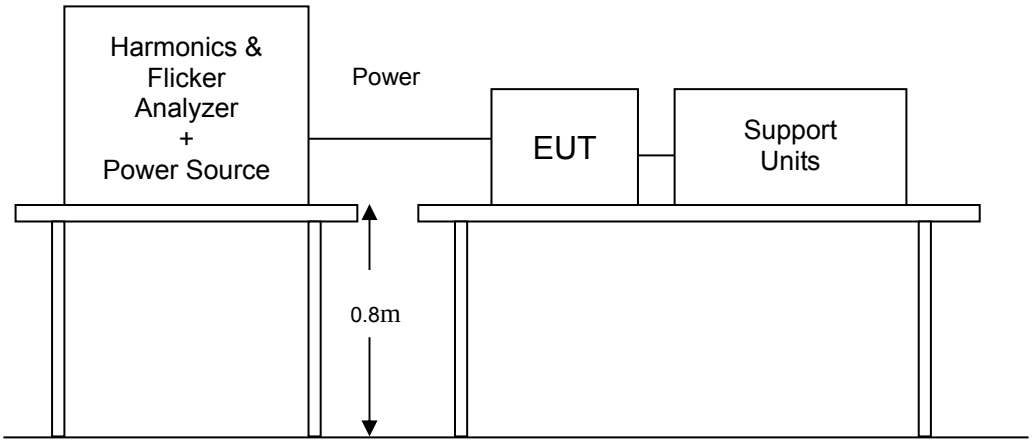
7.4.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-029)

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
- The classification of EUT is according to section 5 of EN 61000-3-2.
- The EUT is classified as follows:

  Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
  Class B: Portable tools; Arc welding equipment which is not professional equipment.
  Class C: Lighting equipment.
  Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; television receivers and refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

7.4.4. TEST SETUP



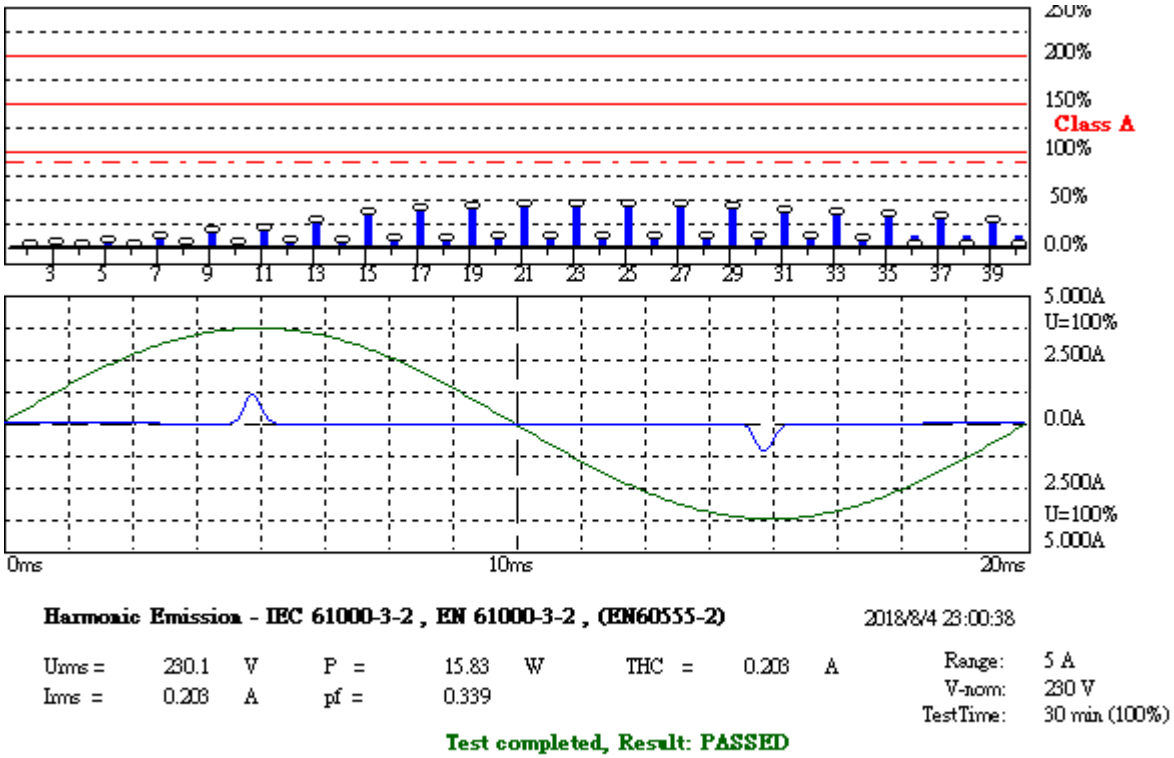
- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.4.5. TEST RESULTS

Power Consumption	15.83W	**Test Results**	PASS
Environmental Conditions	22°C, 50% RH, 1009mbar	**Limits**	Class ☒ A ☐ B ☐ C ☐ D
Test Mode	Operating	**Tested by**	David Cheng

NOTE: Limits classified according to item 7.4.1.

Test result of EN 61000-3-2



Harmonic Emission - IEC 61000-3-2 , EN 61000-3-2 , (EN60555-2) 2018/8/4 23:00:38

Urms =	230.1	V	P =	15.83	W	THC =	0.203	A	Range:	5 A
Irms =	0.203	A	pf =	0.339					V-nom:	230 V
									TestTime:	30 min (100%)

Test completed, Result: PASSED

HAR-1000 EMC-Partner

Urms =	230.1V	Freq =	50.000	Range:	5 A
Irms =	0.203A	Ipk =	1.394A	cf =	6.880
P =	15.83W	S =	46.63VA	pf =	0.339
THDi =	273 %	THDu =	0.10 %	Class A	

Test - Time : 30min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Irms% [%]	Irms%L [%]	Imax [A]	Imax% [%]	Imax%L [%]	Limit [A]	Status
1	50	0.0739	0.0739	36.446		0.0778	38.404			
2	100	0.0071	0.0070	3.4639	0.6499	0.0073	3.6145	0.6782	1.0800	
3	150	0.0645	0.0647	31.928	2.8129	0.0687	33.886	2.9854	2.3000	
4	200	0.0072	0.0073	3.6145	1.7033	0.0076	3.7651	1.7743	0.4300	
5	250	0.0639	0.0638	31.476	5.5949	0.0677	33.434	5.9429	1.1400	
6	300	0.0072	0.0073	3.6145	2.4414	0.0076	3.7651	2.5431	0.3000	
7	350	0.0628	0.0629	31.024	8.1644	0.0665	32.831	8.6400	0.7700	
8	400	0.0073	0.0073	3.6145	3.1844	0.0076	3.7651	3.3171	0.2300	
9	450	0.0612	0.0613	30.271	15.335	0.0650	32.078	16.251	0.4000	
10	500	0.0074	0.0076	3.7651	4.1464	0.0079	3.9157	4.3123	0.1840	
11	550	0.0592	0.0592	29.217	17.941	0.0626	30.873	18.958	0.3300	
12	600	0.0074	0.0076	3.7651	4.9757	0.0079	3.9157	5.1747	0.1533	
13	650	0.0568	0.0568	28.012	27.030	0.0601	29.669	28.628	0.2100	
14	700	0.0075	0.0076	3.7651	5.8050	0.0079	3.9157	6.0372	0.1314	
15	750	0.0541	0.0540	26.657	36.011	0.0574	28.313	38.249	0.1500	
16	800	0.0074	0.0076	3.7651	6.6343	0.0079	3.9157	6.8996	0.1150	
17	850	0.0512	0.0513	25.301	38.737	0.0540	26.657	40.812	0.1324	
18	900	0.0074	0.0076	3.7651	7.4635	0.0079	3.9157	7.7621	0.1022	
19	950	0.0480	0.0479	23.645	40.460	0.0507	25.000	42.779	0.1184	
20	1000	0.0072	0.0073	3.6145	7.9611	0.0076	3.7651	8.2928	0.0920	
21	1050	0.0447	0.0446	21.988	41.585	0.0470	23.193	43.864	0.1071	
22	1100	0.0071	0.0073	3.6145	8.7572	0.0076	3.7651	9.1221	0.0836	
23	1150	0.0412	0.0412	20.331	42.114	0.0433	21.386	44.298	0.0978	
24	1200	0.0068	0.0070	3.4639	9.1553	0.0073	3.6145	9.5533	0.0767	
25	1250	0.0377	0.0375	18.524	41.707	0.0397	19.578	44.081	0.0900	
26	1300	0.0065	0.0067	3.3133	9.4870	0.0070	3.4639	9.9182	0.0708	
27	1350	0.0342	0.0342	16.867	41.016	0.0357	17.620	42.847	0.0833	
28	1400	0.0062	0.0064	3.1627	9.7524	0.0067	3.3133	10.217	0.0657	
29	1450	0.0307	0.0305	15.060	39.334	0.0320	15.813	41.300	0.0776	
30	1500	0.0058	0.0061	3.0120	9.9514	0.0061	3.0120	9.9514	0.0613	
31	1550	0.0273	0.0272	13.404	37.421	0.0284	14.006	39.103	0.0726	
32	1600	0.0053	0.0055	2.7108	9.5533	0.0058	2.8614	10.084	0.0575	
33	1650	0.0240	0.0238	11.747	34.912	0.0250	12.349	36.702	0.0682	
34	1700	0.0040	0.0052	2.5602	9.5865	0.0052	2.5602	9.5865	0.0541	
35	1750	0.0209	0.0208	10.241	32.281	0.0217	10.693	33.705	0.0643	
36	1800	0.0000	0.0046	2.2590	8.9562	0.0046	2.2590	8.9562	0.0511	
37	1850	0.0179	0.0177	8.7349	29.107	0.0186	9.1867	30.613	0.0608	
38	1900	0.0000	0.0040	1.9578	8.1933	0.0040	1.9578	8.1933	0.0484	
39	1950	0.0151	0.0150	7.3795	25.920	0.0156	7.6807	26.978	0.0577	
40	2000	0.0000	0.0034	1.6566	7.2977	0.0037	1.8072	7.9611	0.0460	

Definitions of Abbreviations

Urms	***	Actual total Voltage in Volt RMS
Irms	***	Actual total Current in Ampere RMS
Ipk	***	Actual Peak value of the Current in Ampere
cf	***	Actual Crest Factor (Ipk/Irms)
P	***	Actual Active Power in Watt
S	***	Actual Apparent Power in VA (Urms*Irms)
pf	***	Actual Power Factor (P/S)
THDi	***	Actual Total Harmonic Current Distortion in %
THDu	***	Actual Total Harmonic Voltage Distortion in %
THC	***	Actual Total Harmonic Current in Ampere
PHC	***	Actual Partial Harmonic Current in Ampere

Individual measurements for 2nd to 40th order:

Iavg		Average value of the Individual Harmonic Current in Ampere RMS
Irms	***	Actual Individual Harmonic Current in Ampere RMS
Irms%	***	Actual Individual Harmonic Current in percentage of the actual total RMS Current
Irms%L	***	Actual Individual Harmonic Current in percentage of the applicable Limit
Imax		Maximum Individual Harmonic Current in Ampere RMS
Imax%		Maximum Individual Harmonic Current in percentage of the actual total RMS Current
Imax%lim		Maximum Individual Harmonic Current in percentage of the applicable Limit
Limit Irms		Individual Limit (100%) for the selected Class in Ampere RMS

7.5. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

7.5.1. LIMITS OF VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

TEST ITEM	LIMIT	REMARK
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that dt exceeds 3 %.
d_{max} (%)	4%	d_{max} means maximum relative voltage change.
dc (%)	3.3%	dc means relative steady-state voltage change

7.5.2. TEST INSTRUMENTS

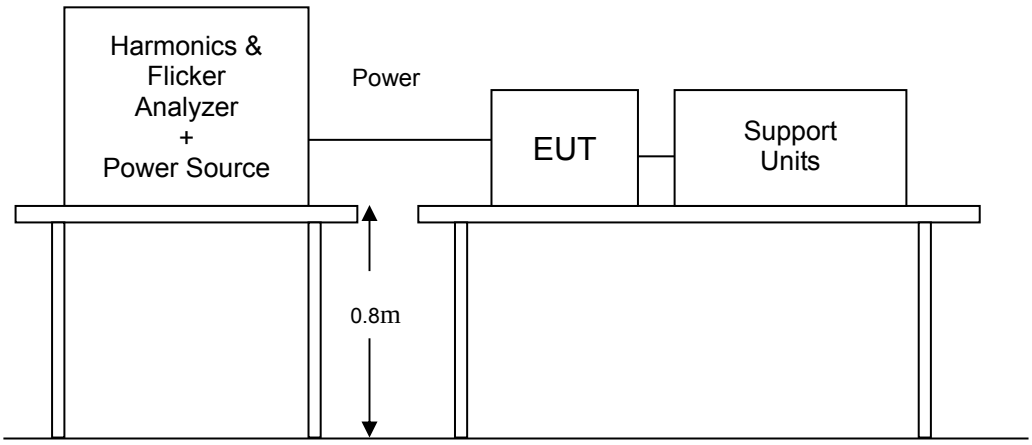
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
5kVA Power Source	Teseq	5001IX-208-TSQ	1537A01296	11/02/2018
H/F Measurement System	EMC Partner	HAR1000-1P	189	11/02/2018
Software	HARCS V4.19			

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

7.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-030)

- The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

7.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

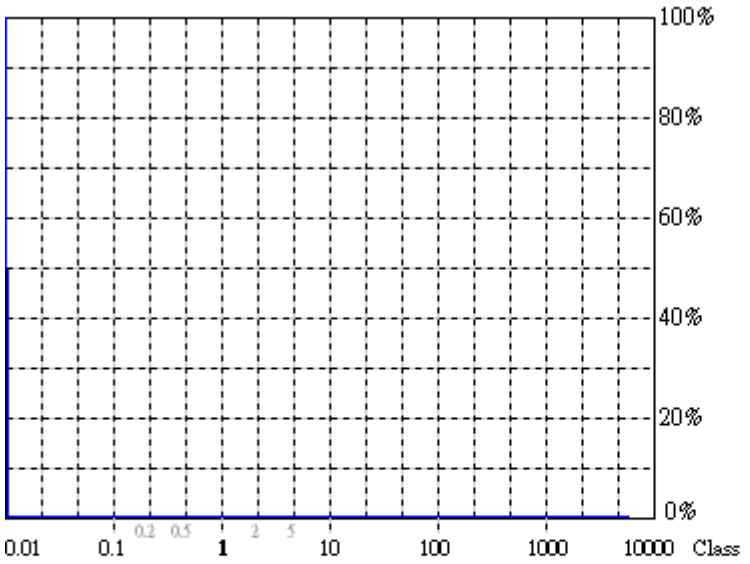
7.5.5. TEST RESULTS

Observation Period (Tp)	30mins	**Test Mode**	Operating
Environmental Conditions	22°C, 50% RH, 1009mbar	**Tested by**	David Cheng

TEST PARAMETER	MEASUREMENT VALUE	LIMIT	REMARK
P_{st}	0.07	1.0	PASS
P_{lt}	0.07	0.65	PASS
T_{dt} (ms)	0	500	PASS
d_{max} (%)	0	4%	PASS
dc (%)	0.04	3.3%	PASS

Note: None.

Test result of EN 61000-3-3



Actual Flicker (Fli): **0.00**

Short-term Flicker (Pst): **0.07**
Limit (Pst): 1.00

Long-term Flicker (Plt): **0.07**
Limit (Plt): 0.65

Maximum Relative Volt. Change (dmax): **0.00%**
Limit (dmax): 4.00%

Relative Steady-state Voltage Change (dc): **0.04%**
Limit (dc): 3.30%

Maximum Interval exceeding 3.30% (dt): **0.00ms**
Limit (dt>Lim): 500ms

Flicker Emission - IEC 61000-3-3 , EN 61000-3-3

2018/8/4 22:10:14

Urms = 230.1 V P = 17.06 W
Irms = 0.181 A pf = 0.410

Range: 5 A
V-nom: 230 V
TestTime: 30 min (100%)

Test completed, Result: PASSED

HAR-1000 EMC-Partner

8 IMMUNITY TEST

8.1. GENERAL DESCRIPTION

Product Standard	ETSI EN 301 489-1 V2.2.0 (2017-03) DRAFT	
	Test Type	Minimum Requirement
Basic Standard, Specification, and Performance Criterion required	EN 61000-4-2	Electrostatic Discharge – ESD: 8kV air discharge, 4kV Contact discharge, Performance Criterion TT&TR According to special request by client: 12kV air discharge, 8kV Contact discharge
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80 ~ 6000MHz, 3V/m, 80% AM(1kHz) Performance Criterion CT&CR
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT, AC Power Port: 1kV, DC Power Port: 0.5kV; Signal Port: 0.5kV Performance Criterion TT&TR
	EN 61000-4-5	Surge Immunity Test: 1.2/50 μs Open Circuit Voltage, 8 /20 μs Short Circuit Current, 10/700 μs Open Circuit Voltage AC Power Port ~ line to line: 1kV, line to earth: 2kV Signal Port ~ line to line: 0.5kV, line to earth: 1kV (Outdoor Cable) Signal Port ~ line to earth: 0.5kV (Indoor Cable) Performance Criterion TT&TR
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test –CS: AC Power Port; DC Power Port; Signal Ports: 0.15 ~ 80 MHz, 3Vrms, 80% AM, 1kHz, Performance Criterion CT&CR
	EN 61000-4-11	Voltage Dips: 1) 0% residual 0.5 cycle Performance TT or TR 2) 0% residual 1 cycle Performance TT or TR 3) 70% residual 25 cycles Performance TT or TR 4) 0% residual 250 cycles Performance TT or TR

8.2. GENERAL PERFORMANCE CRITERIA DESCRIPTION

General performance criteria

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Performance table

Table 1: Performance criteria

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for Continuous phenomena applied to Transmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement.

(NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

8.3. ELECTROSTATIC DISCHARGE (ESD)

8.3.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 2 ; 4 ; 8 ; 12 kV (Direct) Contact Discharge: 2 ; 4 ; 6 ; 8 kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point
Discharge Mode:	Single Discharge 1 second minimum

8.3.2. TEST INSTRUMENT

IMMUNITY SHIELDED ROOM				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Aneroid Barometer	SATO	7610-20	89090	09/25/2018
ESD Simulator	Teseq	NSG 437	1189	10/05/2018
Thermo-Hygro Meter	Wisewind	N/A	SD-S017	10/01/2018

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

8.3.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-022)

The discharges shall be applied in two ways:

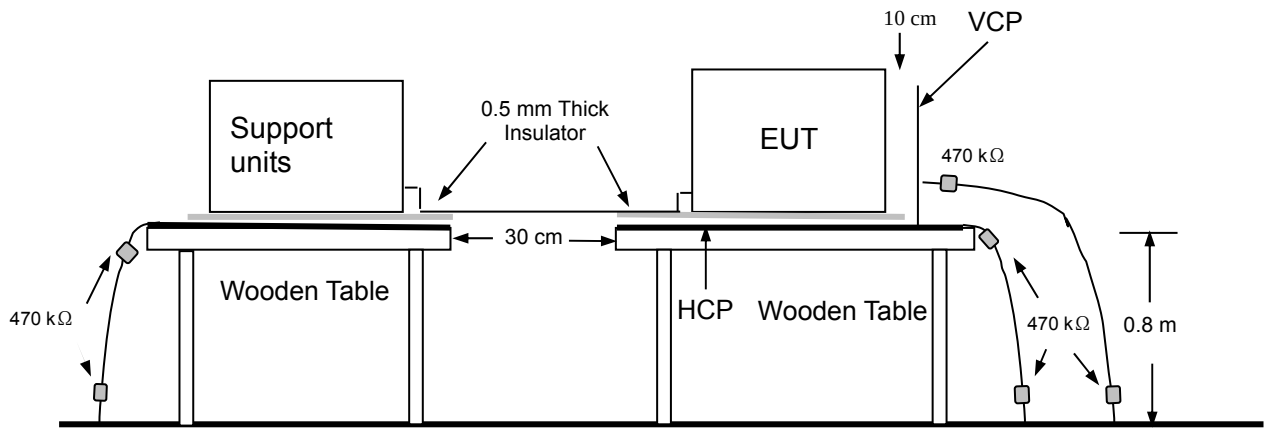
a) Contact discharges to the conductive surfaces and coupling planes:
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the **H**orizontal **C**oupling **P**lane (**HCP**). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b) Air discharges at slots and apertures and insulating surfaces:
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the **HCP** (dimensions 1.6m x 0.8m).
b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.
c) The time interval between two successive single discharges was at least 1 second.
d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each **HCP** opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the **HCP** and perpendicular to its front edge during the discharge.
g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **V**ertical **C**oupling **P**lane (**VCP**) in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

8.3.4. TEST SETUP



Ground Reference Plane

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **G**round **R**eference **P**lane. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **H**orizontal **C**oupling **P**lane (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

Report No.: T180802D07-A-RE

8.3.5. TEST RESULTS

Temperature	18°C	**Humidity**	51% RH
Pressure	1009mbar	**Tested By**	David Cheng
Required Passing Performance		**Criterion CT&CR**	

Air Discharge								
Test Points	**Test Levels**				**Results**			
	± 2 kV	**± 4 kV**	**± 8 kV**	**± 12 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**
Right	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☐1 ☒2 ☐3

Contact Discharge								
Test Points	**Test Levels**				**Results**			
	± 2 kV	**± 4 kV**	**± 6 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**
Front	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Back	☒	☒	☒	☒	☒	☐	☐ CT / ☐ CR ☒ TT / ☒ TR	Note ☐1 ☐2 ☒3
Left	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Right	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Top	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Bottom	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3

Discharge To Horizontal Coupling Plane								
Side of EUT	**Test Levels**				**Results**			
	± 2 kV	**± 4 kV**	**± 6 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**
Front	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Back	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Left	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Right	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3

Discharge To Vertical Coupling Plane								
Side of EUT	**Test Levels**				**Results**			
	± 2 kV	**± 4 kV**	**± 6 kV**	**± 8 kV**	**Pass**	**Fail**	**Performance Criterion**	**Observation**
Front	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Back	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Left	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3
Right	☒	☒	☒	☒	☒	☐	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2 ☐3

NOTE: 1. There was no change compared with initial operation during the test.
2. No discharge point.
3. As ± 8 kV contact discharge applying to back test point, the transmitting was interrupted during test. It could become normal after test stop.

8.4. RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD (RS)

8.4.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	80 MHz ~ 6000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5m

8.4.2. TEST INSTRUMENT

844 RS Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Electric Field Probe	AR	FL7006	0338955	04/03/2019
Field of Calibration	CCS	Chamber#RS	80-1000MHz	05/01/2019
Power Sensor	Boonton	51013-4E	35812	02/08/2019
RF Power Meter	Boonton	4242-01-02	14357	02/08/2019
Thermo-Hygro Meter	Wisewind	N/A	SD-S018	11/06/2018
Broadband Antenna	AR	AT1080	311819	N.C.R
Power Amplifier	Milmega	80RF1000-600	1079361	N.C.R
Signal Generator	Agilent	N5181A	MY47421336	11/23/2018
Field of Calibration	CCS	Chamber#RS	1-3GHz	03/12/2019
Field of Calibration	CCS	Chamber#RS	1.7-6GHz	04/29/2019
Direction Coupler	AR	DC7200	0343647	N.C.R
Horn Antenna	EMCO	3115	5761	N.C.R
Power Amplifier	AR	60S1G3	302728	N.C.R
Power Amplifier	Milmega	AS1860-100	1075832	N.C.R
Software	EmcwareVer. 2.6.0.16			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

8.4.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-023)

The test procedure was in accordance with EN 61000-4-3

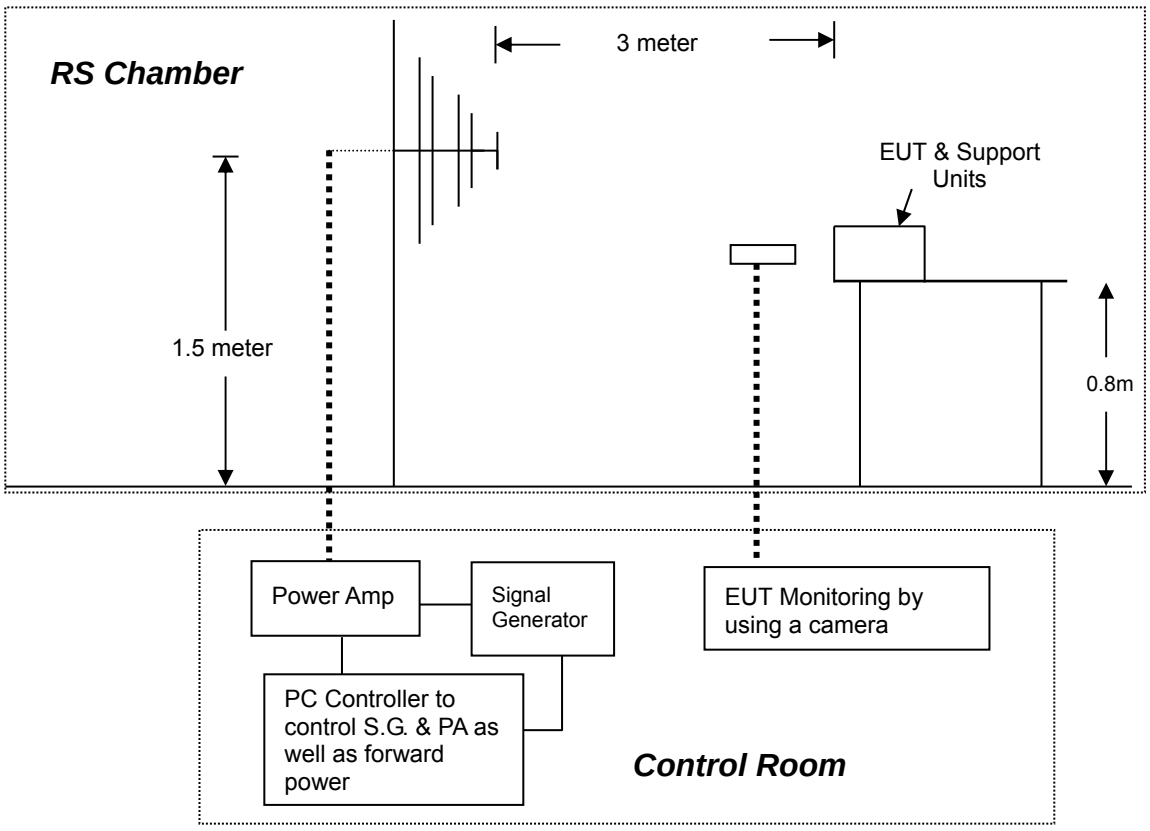
a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80 MHz to 6000 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5 x 10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

8.4.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

8.4.5. TEST RESULTS

Temperature	20°C	**Humidity**	50% RH
Pressure	1009mbar	**Dwell Time**	3 sec.
Tested By	David Cheng	**Required Passing Performance**	**Criterion CT&CR**

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Observation	Result
80 ~ 6000	V&H	0	3	☒CT ☒CR	Note ☒1 ☐2	PASS
80 ~ 6000	V&H	90	3	☒CT ☒CR	Note ☒1 ☐2	PASS
80 ~ 6000	V&H	180	3	☒CT ☒CR	Note ☒1 ☐2	PASS
80 ~ 6000	V&H	270	3	☒CT ☒CR	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with the initial operation during the test.

8.5. ELECTRICAL FAST TRANSIENT (EFT)

8.5.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-4
Test Voltage:	AC Power Port: 1kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

8.5.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Capacitive Clamp	EMC-Partner	CN-EFT1000	589	07/08/2019
EMC Immunity Tester	EMC Partner	TRANSINT 2000	1117	03/13/2019
Software	GenecsVer. 3.27			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

8.5.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-024)

a) All types of cables, including their length, and the interface port of the EUT to which they were connected.

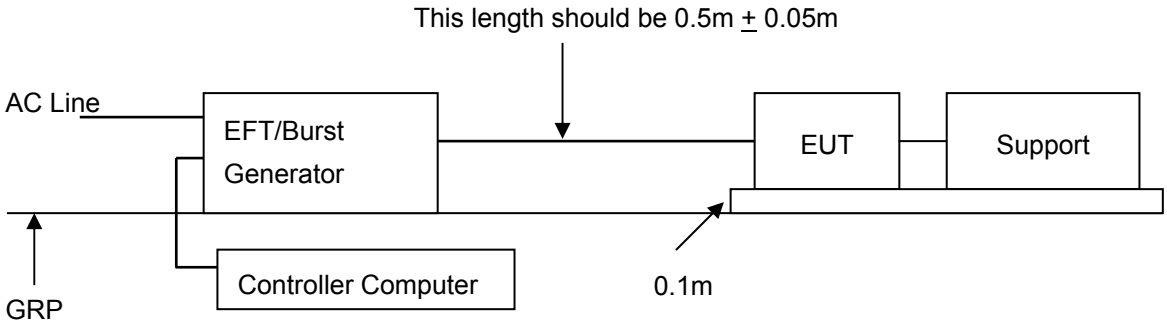
b) Both positive and negative polarity discharges were applied.

c) The length of the “hot wire” from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 0.5 meter.

d) The duration time of each test sequential was 1 minute.

e) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

8.5.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The configuration consisted of a wooden table (0.1m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

8.5.5. TEST RESULTS

Temperature	22°C	**Humidity**	50% RH
Pressure	1009mbar	**Tested By**	David Cheng
Required Passing Performance		**Criterion TT&TR**	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L	+/-	1	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS
N	+/-	1	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS
L - N	+/-	1	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS

NOTE: 1. There was no change compared with initial operation during the test.

8.6. SURGE IMMUNITY TEST

8.6.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	AC Power Port ~ line to line: 1kV
Surge Input/Output:	AC Power Line: L-N
Generator Source Impedance:	2 ohm between networks 42 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0° / 90° / 180° / 270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

8.6.2. TEST INSTRUMENT

Immunity Shield Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
CDN	EMC-Partner	CDN-UTP8	1505	02/06/2019
EMC Immunity Tester	EMC Partner	TRANSINT 2000	1117	03/13/2019
Software	GenecsVer. 3.27			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

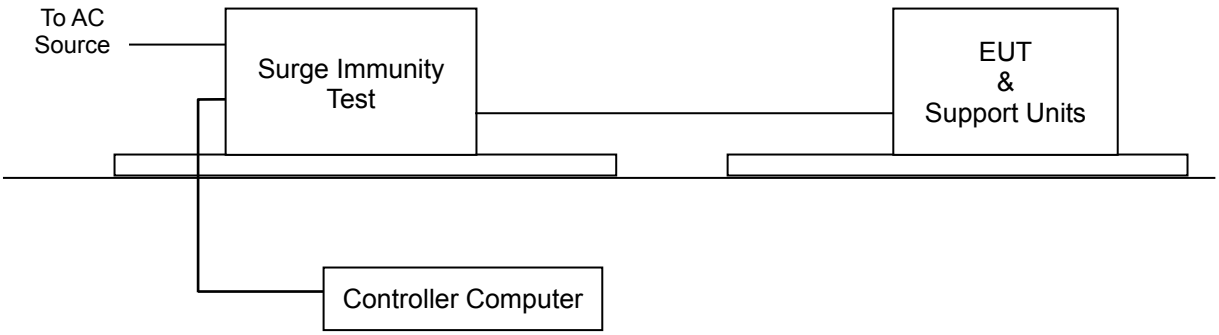
8.6.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-025)

a) For EUT power supply:
The surge is applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

b) For test applied to unshielded un-symmetrically operated interconnection lines of EUT:
The surge was applied to the lines via the capacitive coupling. The coupling / decoupling networks didn't influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

c) For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:
The surge was applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor were not specified. The interconnection line between the EUT and the coupling/decoupling networks was shorter than 2 meters in length.

8.6.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.6.5. TEST RESULTS

Temperature	22°C	Humidity	50% RH
Pressure	1009mbar	Tested By	David Cheng
Required Passing Performance		Criterion TT&TR	

Test Point	Polarity	Test Level (kV)	Performance Criterion	Observation	Result
L - N	+/-	1	☒ CT / ☒ CR ☐ TT / ☐ TR	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.

8.7. CONDUCTED RADIO FREQUENCY DISTURBANCES (CS)

8.7.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-6
Frequency Range:	0.15 MHz ~ 80 MHz
Field Strength:	3 Vrms
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Coupled cable:	Power Mains, Unshielded
Coupling device:	CDN-M2 (2 wires)

8.7.2. TEST INSTRUMENT

CS Room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Attenuator	EMCI	SA3NL	10006F	N.C.R
CDN	Teseq	CDN M016	35820	02/05/2019
CDN	Teseq	CDN M016	35821	02/05/2019
Continuous Wave Simulator	EM Test	CWS 500N1.4	P1446143188	02/04/2019
CDN	SCHAFFNER	CDN M325	17457	12/07/2018
Software	icd.controlVer. 5.3.5			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

8.7.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-026)

The EUT shall be tested within its intended operating and climatic conditions.

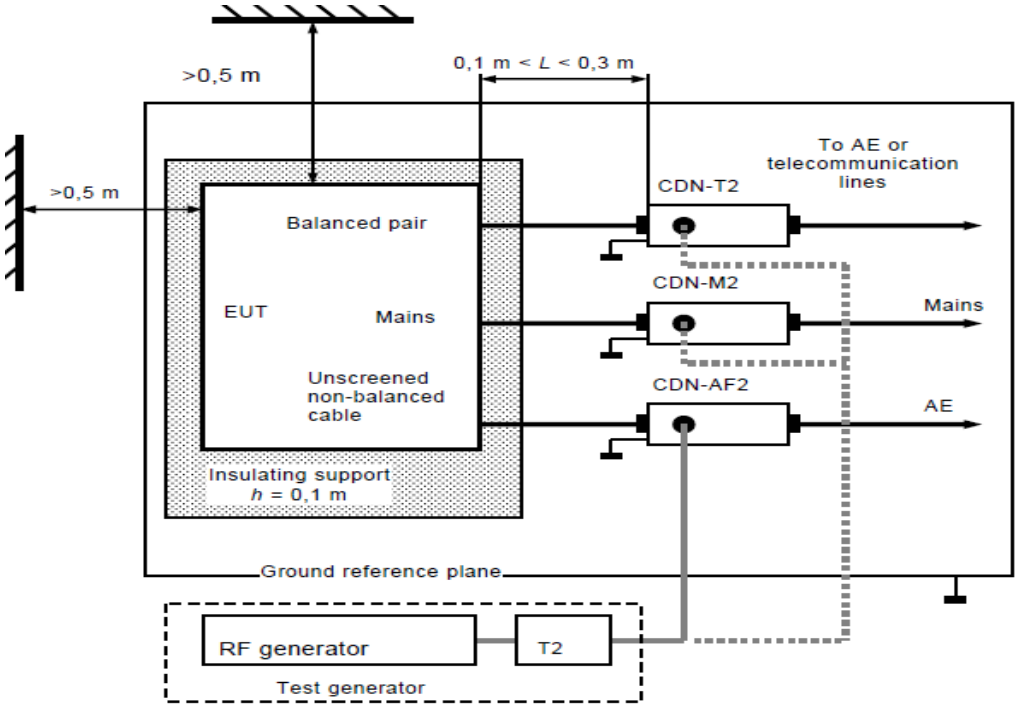
The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10-3 decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

8.7.4. TEST SETUP



Note: 1. The CDNs and / or EM clamp used for real test depends on ports and cables configuration of EUT.
2. The EUT clearance from any metallic obstacles shall be at least 0.5m

- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:
TABLE-TOP AND FLOOR-STANDING EQUIPMENT
The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

8.7.5. TEST RESULTS

Temperature	22ºC	**Humidity**	50% RH
Pressure	1009mbar	**Tested By**	David Cheng
Required Passing Performance		**Criterion CT&CR**	

Frequency Band (MHz)	Field Strength (Vrms)	Cable	Injection Method	Performance Criterion	Observation	Result
0.15 ~ 80	3	AC Power Line (0.3m)	CDN-M2	☒CT ☒CR	Note ☒1 ☐2	PASS

NOTE: 1. There was no change compared with initial operation during the test.

8.8. VOLTAGE DIPS & VOLTAGE INTERRUPTIONS

8.8.1. TEST SPECIFICATION

Basic Standard:	EN 61000-4-11
Test duration time:	Minimum three test events in sequence
Interval between event:	Minimum 10 seconds
Angle:	0~360 degree
Step:	45 degree

8.8.2. TEST INSTRUMENT

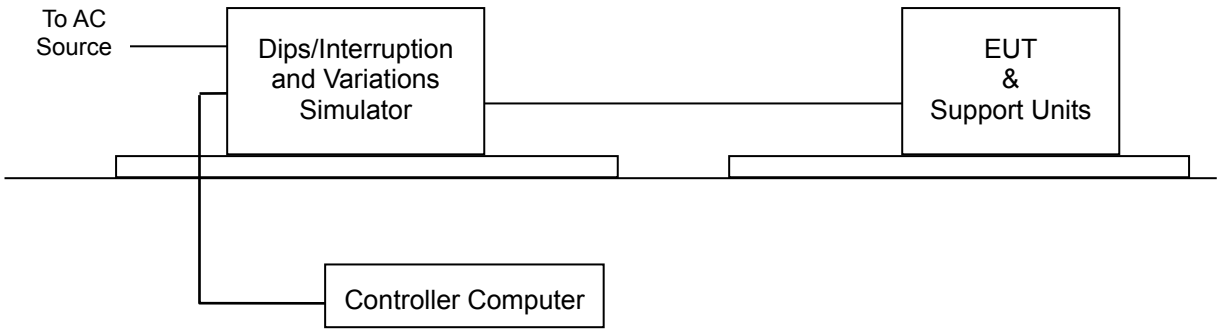
Immunity shielded room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
AC/DC Clamp Meter	Lutron	CM-9930R	I.200121	05/21/2019
EMC Immunity Tester	EMC Partner	TRANSINT 2000	1117	03/13/2019
Software	GenecsVer. 3.27			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R.= No Calibration required.

8.8.3. TEST PROCEDURE (please refer to measurement standard or CCS SOP PA-028)

1. The EUT and support units were located on a wooden table, 0.8 m away from ground floor.
2. Setting the parameter of tests and then perform the test software of test simulator.
3. Conditions changes to occur at 0 degree crossover point of the voltage waveform.
4. Recording the test result in test record form.

8.8.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

8.8.5. TEST RESULTS

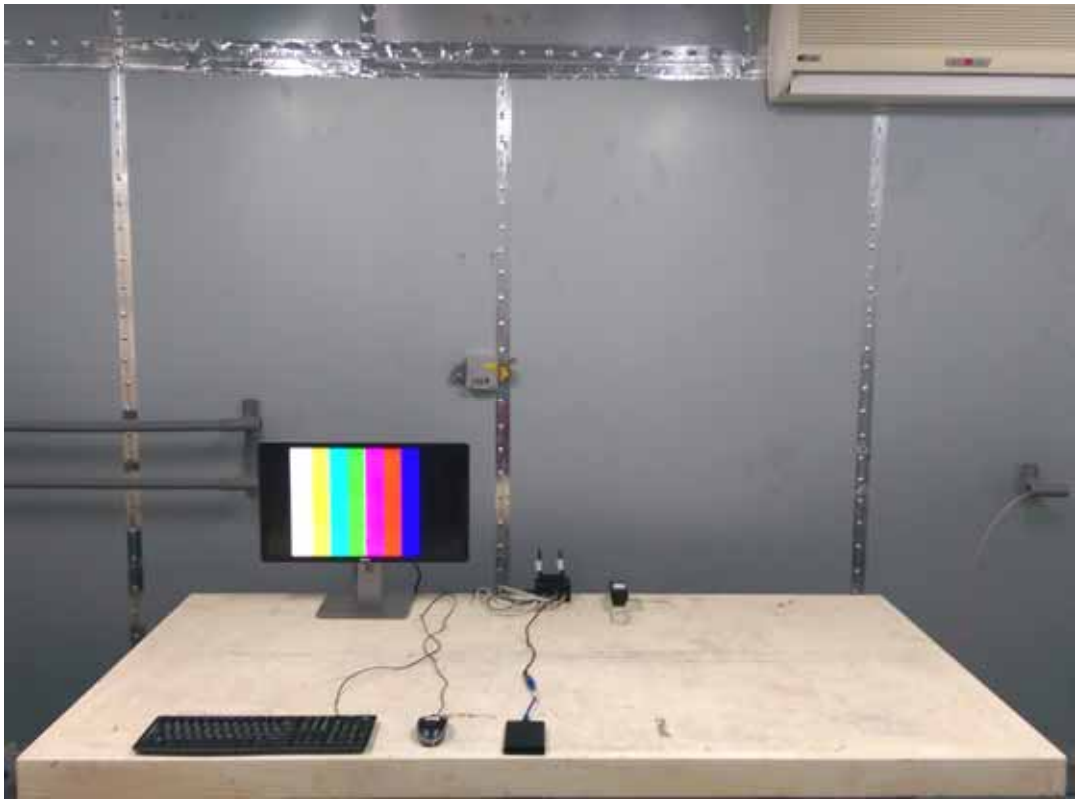
Temperature	22°C	**Humidity**	50% RH
Pressure	1009mbar	**Tested By**	David Cheng
Required Passing Performance	**TT or TR: 0% residual 0.5 cycle** **0% residual 1 cycle** **70% residual 25 cycles** **TT or TR: 0% residual 250 cycles**		

Test Power: 230Vac, 50Hz				
Voltage (% Residual)	**Duration (Cycle)**	**Performance Criterion**	**Observation**	**Test Result**
0	0.5	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS
0	1	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS
70	25	☒ **CT /** ☒ **CR** ☐ **TT /** ☐ **TR**	**Note** ☒**1** ☐**2**	PASS
0	250	☐ **CT /** ☐ **CR** ☒ **TT /** ☒ **TR**	**Note** ☐**1** ☒**2**	PASS

NOTE: 1. There was no change compared with initial operation during and after the test. No unintentional response was found during the test.
2. EUT shut down, it could not become normal except reinstalled by operator.

9 PHOTOGRAPHS OF THE TEST CONFIGURATION

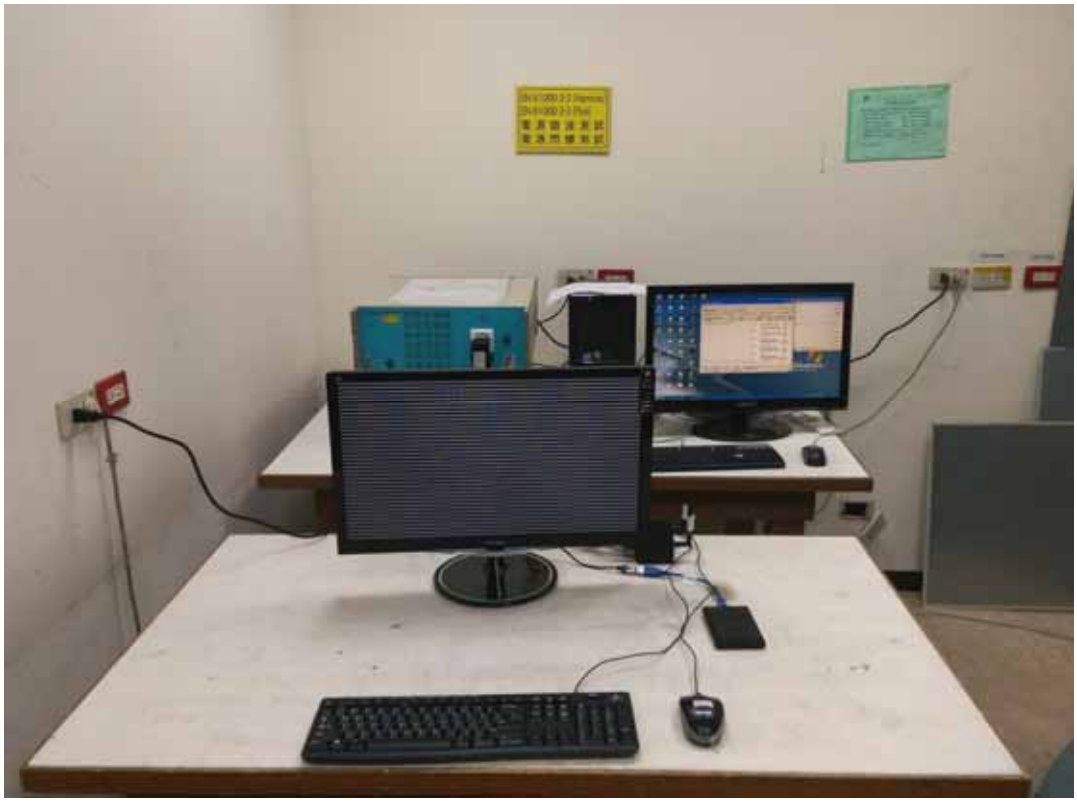
CONDUCTED EMISSION TEST



RADIATED EMISSION TEST

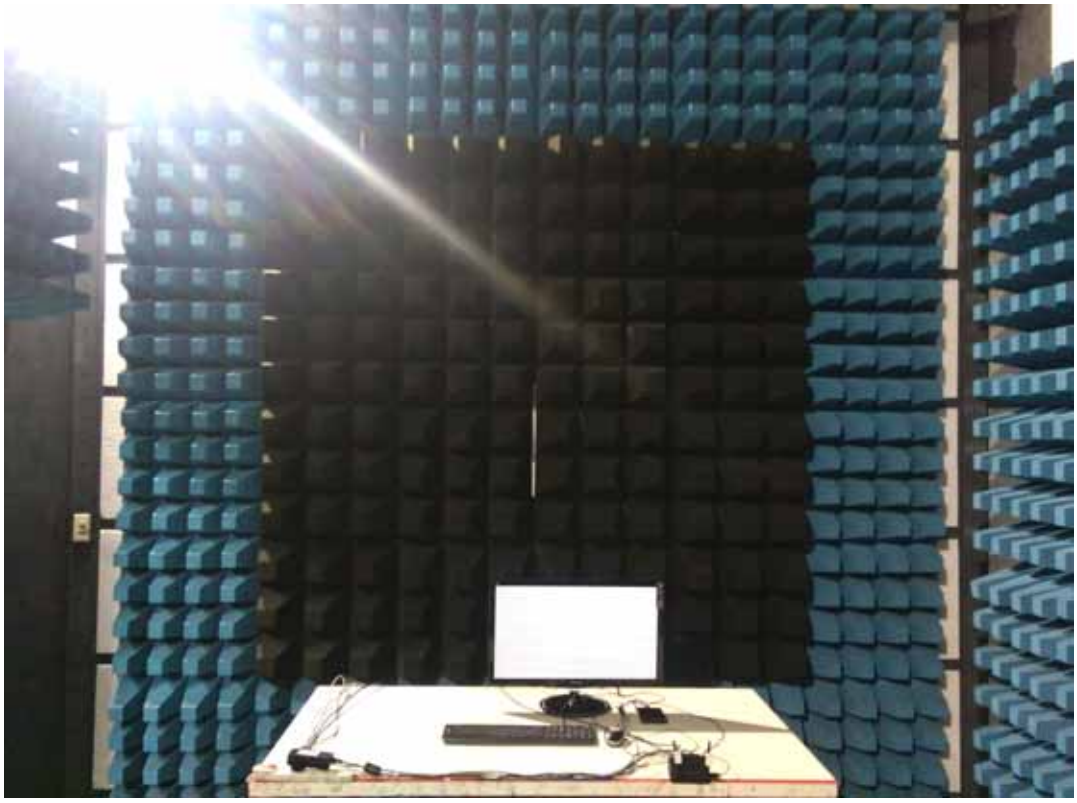
Report No.: T180802D07-A-RE

Harmonic & Flicker Test



ESD Test

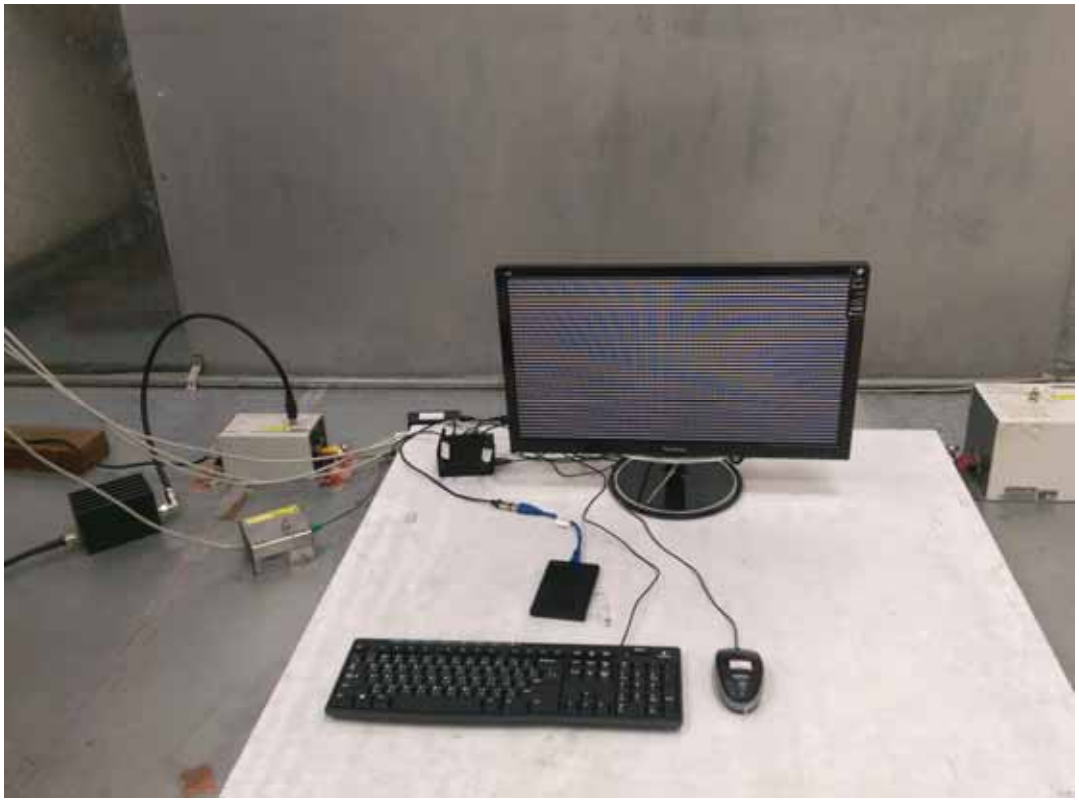
RS Test



EFT Test

Surge Test

CS Test



Voltage Dips / Interruptions Test