CE EMC Test Report

Report No.:	CE150824C11
Test Model:	FLIR K2
Received Date:	Aug. 24, 2015
Test Date:	Aug. 25 ~ Sep. 23, 2015
Issued Date:	Sep. 30, 2015
Applicant:	FLIR SYSTEMS AB.
Address:	Antennvägen 6, PO Box 7376, SE-187 15 Täby, Sweden
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
Test Location (2):	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

NVLAP LAB CODE: 200837-0

ilac-MRA

TAF Testing Laboratory 2021

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Release Control Record

Issue No.	Description	Date Issued
CE150824C11	Original release.	Sep. 30, 2015

1 Certificate of Conformity

Product:	robust and reliable infrared camera
Brand:	FLIR
Test Model:	FLIR K2
Sample Status:	Engineering sample
Applicant:	FLIR SYSTEMS AB.
Test Date:	Aug. 25 ~ Sep. 23, 2015
Standards:	**EN 61000-6-3:2007 +A1:2011 +AC:2012**
	EN 61000-3-2:2014, Class A
	EN 61000-3-3:2013
	EN 61000-6-2:2005 +AC:2005
	EN 61000-4-2:2009
	EN 61000-4-3:2006 +A1:2008 +A2:2010
	EN 61000-4-4:2012
	EN 61000-4-5:2006
	EN 61000-4-6:2014
	EN 61000-4-8:2010
	EN 61000-4-11:2004

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Sep. 30, 2015

Suntee Liu / Specialist

Approved by : _____ , **Date:** Sep. 30, 2015

Ken Liu / Senior Manager

2 Summary of Test Results

EN 61000-6-3:2007 +A1:2011 +AC:2012, Emission					
Table Clause	Basic Standard	Port	Test Item	Result/Remarks	Verdict
1.1	EN 55016-1-1:2010 +A1:2010* EN 55016-1-4:2010 +A1:2012*	Enclosure	Radiated disturbance 30-1000 MHz	Minimum passing margin is -0.42 dB at 504.00 MHz	Pass
1.4	EN 55016-1-4:2007 +A1:2008 EN 55016-2-3:2010 +A1:2010* EN 55016-2-3:2006	Enclosure	Radiated disturbance 1-6 GHz	Minimum passing margin is -20.37 dB at 1420.25 MHz	Pass
2.1	EN 61000-3-2:2006 +A1:2009 +A2:2009	Low voltage AC mains port	Harmonic current emissions, 0-2kHz	Class A	Pass
2.1	EN 61000-3-3:2013* EN 61000-3-3:2008	Low voltage AC mains port	Voltage fluctuations and flicker, 0-2kHz	$P_{st} \leqq 1.0$, $d_{max} \leqq 4\%$ $P_{lt} \leqq 0.65$, $d_c \leqq 3.3\%$ $T_{max} \leqq 500ms$	Pass
2.1	EN 55014-1:2006 +A1:2009 +A2:2011*	Low voltage AC mains port	Discontinuous disturbance, 0.15-30MHz	Without discontinuous disturbance	N/A
2.1	EN 55016-1-1:2010 +A1:2010* EN 55016-1-2:2004 +A1:2005 +A2:2006 EN 55016-2-1:2009 +A1:2011 +A2:2013*	Low voltage AC mains port	Continuous disturbance, 0.15-30MHz	Minimum passing margin is -7.85 dB at 0.42000 MHz	Pass
3.1		DC power port	0.15-30MHz	Without DC power port of the EUT	N/A
4.1	EN 55022:2010	Telecommunications / Network port	0.15-30MHz	Without telecom port of the EUT	N/A

EN 61000-6-2:2005 +AC:2005, Immunity					
Table Clause	Basic standard	Port	Test Item	Result/Remarks	Verdict
1.1	EN 61000-4-8:2010	Enclosure	Power-frequency Magnetic Fields	Performance Criterion A	Pass
1.2	EN 61000-4-3:2006 +A1:2008 +A2:2010	Enclosure	Radio-frequency electromagnetic field, (80-1000 MHz)	Performance Criterion A	Pass
1.3	EN 61000-4-3:2006 +A1:2008 +A2:2010	Enclosure	Radio-frequency electromagnetic field, (1400-2000 MHz)	Performance Criterion A	Pass
1.4	EN 61000-4-3:2006 +A1:2008 +A2:2010	Enclosure	Radio-frequency electromagnetic field, (2000-2700 MHz)	Performance Criterion A	Pass
1.5	EN 61000-4-2:2009	Enclosure	Electrostatic Discharges	Performance Criterion B	Pass
2.1	EN 61000-4-6:2014	Signal Ports	Radio-frequency common modes	Without signal port	Pass
2.2	EN 61000-4-4:2012	Signal Ports	Fast Transients	Without signal port	N/A

EN 61000-6-2:2005 +AC:2005, Immunity					
Table Clause	Basic standard	Port	Test Item	Result/Remarks	Verdict
2.3	EN 61000-4-5:2006	Signal Ports	Surges	Without signal port	N/A
3.1	EN 61000-4-6:2014	DC Ports	Radio-frequency common modes	Without DC power port	N/A
3.2	EN 61000-4-5:2006	DC Ports	Surges	Without DC power port	N/A
3.3	EN 61000-4-4:2012	Input DC Ports	Fast Transients	Without input DC power port	N/A
4.1	EN 61000-4-6:2014	AC Ports	Radio-frequency common modes	Performance Criterion A	Pass
4.2 / 4.3	EN 61000-4-11:2004	Input AC Ports	Voltage Dips and Interruptions	Voltage Dips: 0% residual, 1 cycle, Performance Criterion A 40% residual, 10/12 cycles, Performance Criterion A 70% residual, 25/30 cycles, Performance Criterion A Voltage Interruptions: 0% residual, 250/300 cycles, Performance Criterion B	Pass
4.4	EN 61000-4-5:2006	AC Ports	Surges	Performance Criterion A	Pass
4.5	EN 61000-4-4:2012	AC Ports	Fast Transients	Performance Criterion B	Pass

N/A: Not Applicable

* Both of specific and the latest version of the basic standard are referenced to fulfill the requirements.

Note: There is no deviation to the applied test methods and requirements covered by the scope of this report.

2.1 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:

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Expended Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted disturbance at mains port using AMN, 150kHz ~ 30MHz	2.44 dB	3.4 dB (U_{cispr})
Radiated disturbance, 30MHz ~ 1GHz	3.73 dB	6.3 dB (U_{cispr})
Radiated disturbance, 1GHz ~ 6GHz	2.29 dB	5.2 dB (U_{cispr})

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 Features of EUT

The tests reported herein were performed according to the method specified by FLIR SYSTEMS AB., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

3.2 General Description of EUT

Product	robust and reliable infrared camera
Brand	FLIR
Test Model	FLIR K2
Sample Status	Engineering sample
Operating Software	NA
Power Supply Rating	5Vdc (adapter) 5Vdc (host equipment) 3.7Vdc (battery)
Accessory Device	Adapter, Battery
Data Cable Supplied	1.75m shielded USB cable with 1 core

Note:

1. The EUT consumes power from the following adapter.

Brand	CMP POWERSUPPLY
Model	GPE010G-050210-Z
Input Power	100-240Vac, 50/60Hz, 0.3A
Output Power	5Vdc, 2100mA, 10.5W
Power Line	DC 1.2m power cable without core attached on adapter

2. The EUT consumes power from the following battery.

Brand	FLIR Systems AB
Model	T198423
Input Power	3.7Vdc, 2600mAh

3.3 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT is designed with power adapter of rating 100-240Vac, 50/60Hz or battery of rating 3.7Vdc.

For radiated emission up to 1GHz evaluation, 230Vac/50Hz (for EN 55022) & 120Vac/60Hz (for FCC Part 15) had been covered during the pre-test. The worst data was recorded in the applied test report.

Radiated emission up to 1GHz has been pre-tested under following modes, and mode 1 was the worst case for final test.

Mode	Test Condition
1	Image, Adapter, 230Vac/50Hz
2	Image, Adapter, 120Vac/60Hz
3	Image, Battery
4	Image, USB, 230Vac/50Hz

Test modes are presented in the report as below.

Mode	Test Condition
Conducted emission test	
-	Image, Adapter
Radiated emission test	
-	Image, Adapter
Harmonics, Flicker, EFT, Surge, CS, Dip tests	
A	Image, Adapter
ESD, RS, PFMF tests	
A	Image, Adapter
B	Image, Battery
C	Image, USB

3.4 Test Program Used and Operation Descriptions

Emission tests (Harmonics & Flicker excluded):
a. EUT displayed image.

Harmonics, Flicker, Immunity (Mode A, B) tests:
a. EUT displayed image.

Immunity (Mode C) tests:
a. EUT displayed image.
b. Notebook read and wrote date with EUT via USB.

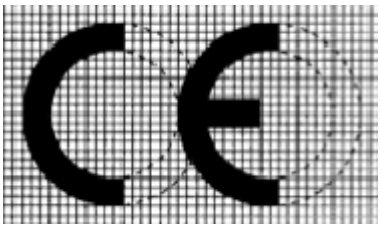
3.5 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 400 MHz provided by FLIR SYSTEMS AB., for detailed internal source, please refer to the manufacturer's specifications.

3.6 Miscellaneous

➢ **Affix CE marking**

The marking must be placed visibly and legibly on the product or, if not possible due to the nature of the product, be affixed to the packaging and the accompanying document. The CE marking shall consist of the initials 'CE' taking the following form:



The various components of the CE marking must have the same vertical dimension, and may not be smaller than 5 mm. If the CE marking is reduced or enlarged, the proportions given in the graduated drawing above must be respected.

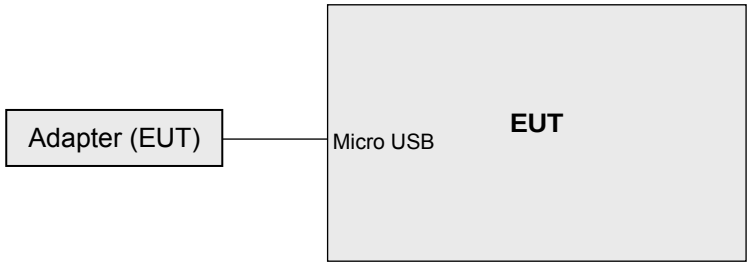
When the product is subject to other Directives covering other aspects and which also provide for the 'CE' marking, the accompanying documents must indicate that the product also conforms to those other Directives.

However, when one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking has to indicate conformity only with the Directives applied by the manufacturer. In this case, the particularities of the Directives applied, as published in the Official Journal of the European Union, must be given in the documents, notices or instructions required by the Directives and accompanying such products.

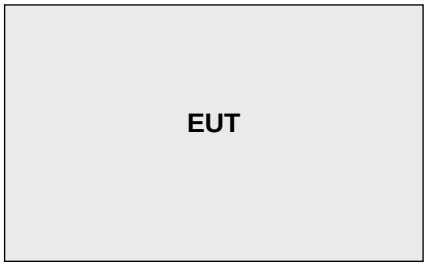
4 Configuration and Connections with EUT

4.1 Connection Diagram of EUT and Peripheral Devices

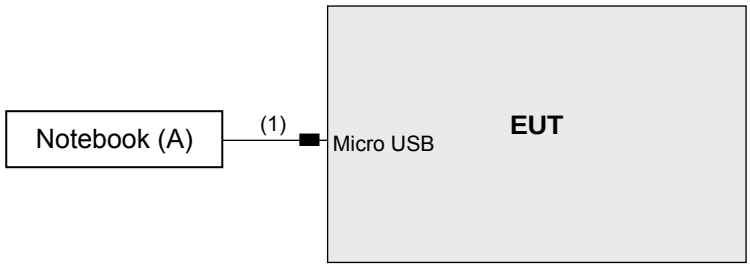
Emission tests, Harmonics, Flicker, Immunity (Mode A) tests:



Immunity (Mode B) tests:



Immunity (Mode C) tests:



4.2 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E6400	HJ2M32S	FCC DoC Approved	-

Note: All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Core/Turn	Remarks
1.	USB	1	1.75	Y	1	Accessory of EUT

Note: The core(s) is(are) originally attached to the cable(s).

5 Conducted Disturbance at Mains Ports

5.1 Limits

Frequency (MHz)	dBuV	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

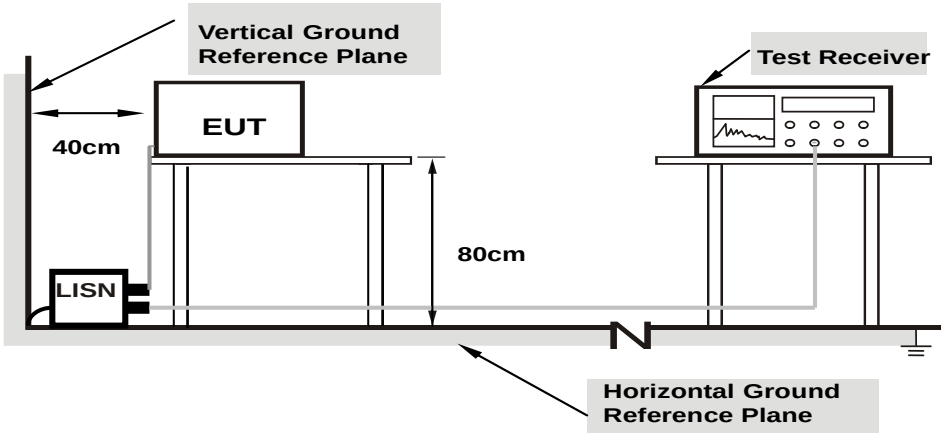
5.3 Test Arrangement

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

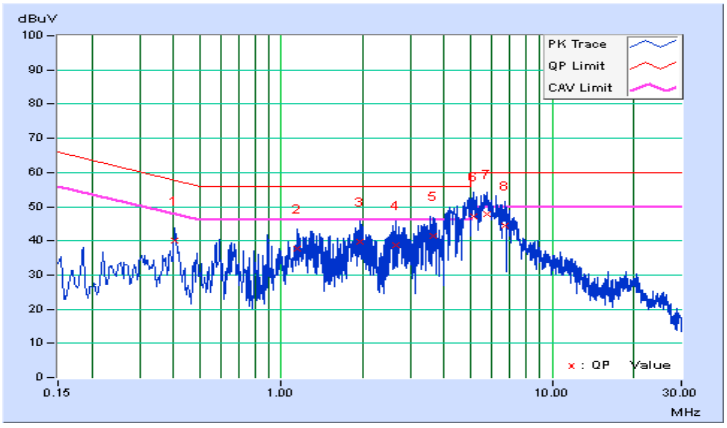
5.4 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	26℃, 67%RH
Tested by	Rolan Zheng	Test Date	2015/8/25

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.40415	0.08	40.15	31.52	40.23	31.60	57.77	47.77	-17.54	-16.17
2	1.14705	0.19	37.38	29.11	37.57	29.30	56.00	46.00	-18.43	-16.70
3	1.95675	0.22	39.41	28.41	39.63	28.63	56.00	46.00	-16.37	-17.37
4	2.63676	0.23	38.43	26.45	38.66	26.68	56.00	46.00	-17.34	-19.32
5	3.64163	0.24	41.14	27.71	41.38	27.95	56.00	46.00	-14.62	-18.05
6	5.13525	0.29	46.91	30.70	47.20	30.99	60.00	50.00	-12.80	-19.01
7	5.74521	0.32	47.48	29.64	47.80	29.96	60.00	50.00	-12.20	-20.04
8	6.66797	0.35	44.11	26.50	44.46	26.85	60.00	50.00	-15.54	-23.15

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

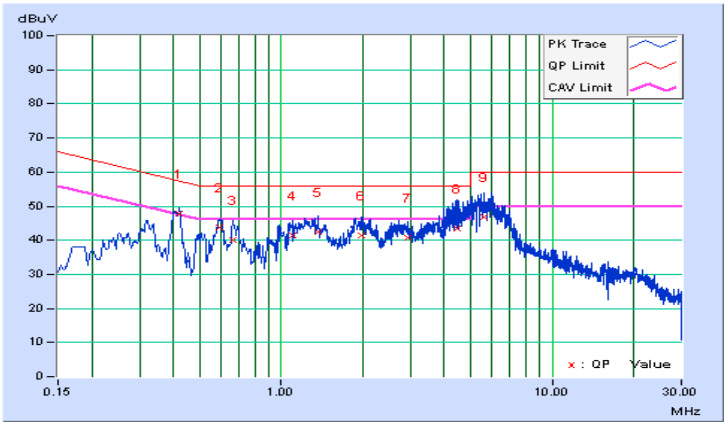


Frequency Range	150kHz ~ 30MHz	Detector Function & Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	26℃, 67%RH
Tested by	Rolan Zheng	Test Date	2015/8/25

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.42000**	**0.17**	**47.52**	**39.43**	**47.69**	**39.60**	**57.45**	**47.45**	**-9.76**	**-7.85**
2	0.59471	0.17	43.64	36.41	43.81	36.58	56.00	46.00	-12.19	-9.42
3	0.66221	0.17	39.98	32.26	40.15	32.43	56.00	46.00	-15.85	-13.57
4	1.09622	0.18	41.13	33.83	41.31	34.01	56.00	46.00	-14.69	-11.99
5	1.36210	0.19	42.37	34.69	42.56	34.88	56.00	46.00	-13.44	-11.12
6	1.98770	0.21	41.11	34.53	41.32	34.74	56.00	46.00	-14.68	-11.26
7	2.93392	0.29	40.42	34.24	40.71	34.53	56.00	46.00	-15.29	-11.47
8	4.44318	0.40	43.00	34.21	43.40	34.61	56.00	46.00	-12.60	-11.39
9	5.57317	0.43	46.42	34.03	46.85	34.46	60.00	50.00	-13.15	-15.54

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



6 Radiated Disturbance up to 1 GHz

6.1 Limits

Frequency (MHz)	dBuV/m (at 10m)
30 - 230	30
230 - 1000	37

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
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.

6.2 Test Instruments

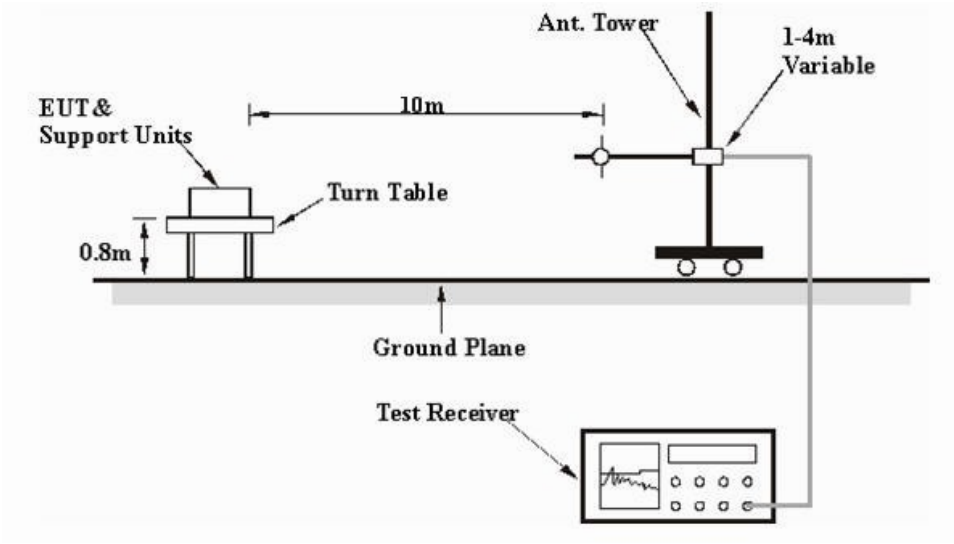
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Agilent Preamplifier	8447D	2432A03504	Feb. 26, 2015	Feb. 25, 2016
Agilent Test Receiver	N9038A	MY51210129	Jan. 20, 2015	Jan. 19, 2016
Schwarzbeck Antenna	VULB9168	137	Feb. 09, 2015	Feb. 08, 2016
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
WOKEN RF cable	8D	CABLE-CH6-02	Jul. 22, 2015	Jul. 21, 2016

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. The test was performed in Lin Kou Open Site No. 3. (NVLAP LAB CODE: 200836-0)
3. The VCCI Site Registration No. is R-269.
4. The FCC Site Registration No. 90424.

6.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



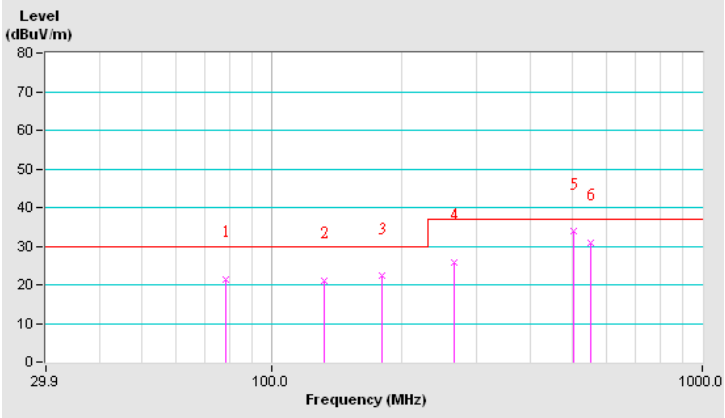
6.4 Test Results

Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Environmental Conditions	28℃, 77%RH	Tested by	Chin-Wen Wang
Test Date	2015/9/11		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	78.20	21.45 QP	30.00	-8.55	4.00 H	105	13.18	8.27
2	132.00	21.08 QP	30.00	-8.92	4.00 H	46	7.66	13.42
3	180.00	22.27 QP	30.00	-7.73	4.00 H	186	11.28	10.99
4	266.12	25.71 QP	37.00	-11.29	3.64 H	258	10.49	15.22
5	503.99	33.79 QP	37.00	-3.21	1.91 H	264	12.21	21.58
6	552.25	30.87 QP	37.00	-6.13	2.53 H	198	6.79	24.08

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

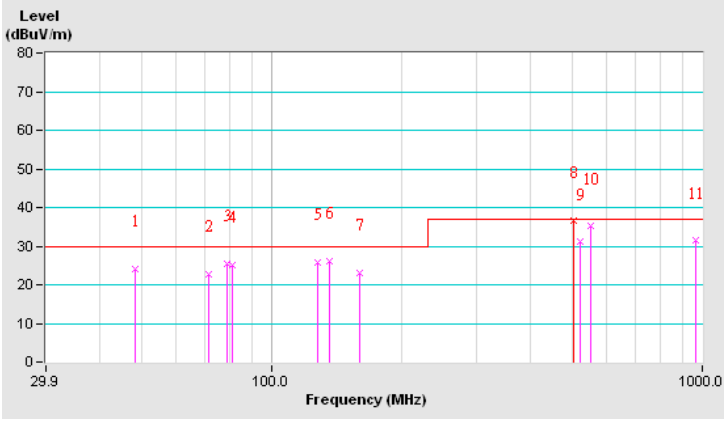


Frequency Range	30MHz ~ 1GHz	Detector Function & Bandwidth	Quasi-Peak (QP), 120kHz
Environmental Conditions	28℃, 77%RH	Tested by	Chin-Wen Wang
Test Date	2015/9/11		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	48.30	24.20 QP	30.00	-5.80	1.11 V	3	14.78	9.42
2	71.65	22.84 QP	30.00	-7.16	2.21 V	81	15.05	7.79
3	78.60	25.51 QP	30.00	-4.49	1.81 V	260	17.16	8.35
4	81.00	25.09 QP	30.00	-4.91	2.21 V	20	16.33	8.76
5	127.85	25.78 QP	30.00	-4.22	1.00 V	199	12.41	13.37
6	136.00	26.03 QP	30.00	-3.97	1.00 V	172	12.46	13.57
7	159.95	23.22 QP	30.00	-6.78	1.00 V	289	10.55	12.67
8	**504.00**	**36.58 QP**	**37.00**	**-0.42**	**3.03 V**	**26**	**15.00**	**21.58**
9	518.81	31.07 QP	37.00	-5.93	3.62 V	214	9.28	21.79
10	552.00	35.12 QP	37.00	-1.88	3.38 V	317	11.05	24.07
11	966.25	31.37 QP	37.00	-5.63	1.97 V	19	2.12	29.25

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



7 Radiated Disturbance above 1 GHz

7.1 Limits

Frequency (GHz)	dBuV/m (at 3m)	
	Average	Peak
1 to 3	50	70
3 to 6	54	74

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
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.

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the EUT or on which the EUT operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	Up to 5 times of the highest frequency or 6 GHz, whichever is less

Where the highest internal frequency is not known, tests shall be performed up to 6 GHz.

7.2 Test Instruments

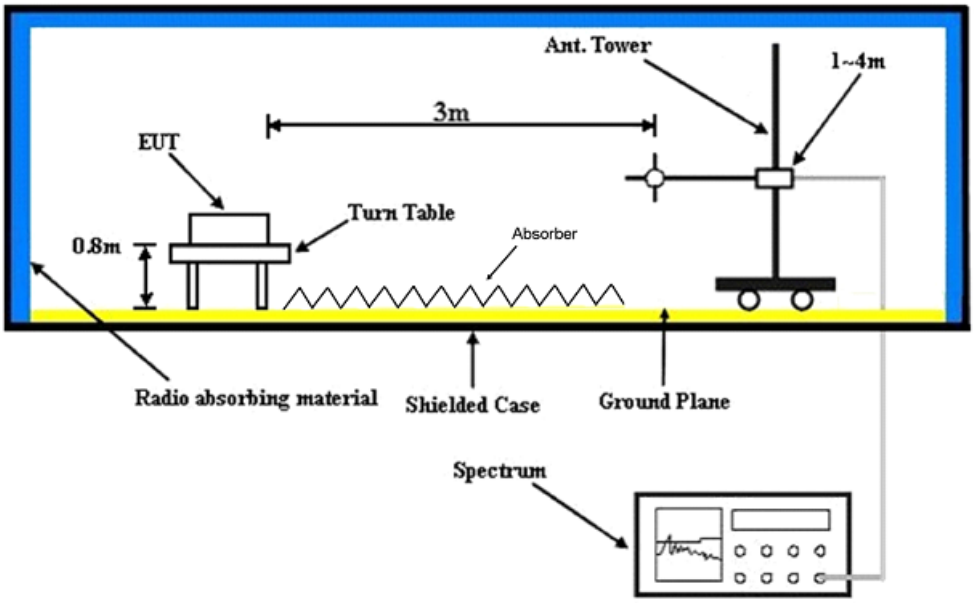
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR7	101471	Feb. 09, 2015	Feb. 08, 2016
Spectrum Analyzer Agilent	E4446A	MY51100039	Aug. 25, 2015	Aug. 24, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-157	Feb. 03, 2015	Feb. 02, 2016
RF signal cable Woken	8D-FB	Cable-CH2-01	Mar. 22, 2015	Mar. 21, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-405	Feb. 06, 2015	Feb. 05, 2016
Preamplifier Agilent (Above 1GHz)	8449B	3008A01961	Oct. 18, 2014	Oct. 17, 2015
RF signal cable ALLTEST	JUNFLON	Cable-CH2-02 (MWX322+MWX2211 3028S0295)	Nov. 06, 2014	Nov. 05, 2015
Software BV ADT	BV ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Controller BV ADT	SC100	SC93021702	NA	NA
HORN Antenna SCHWARZBECK	BBHA 9170	148	Feb. 09, 2015	Feb. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 102	Cable-CH1-03-38218	Oct. 25, 2014	Oct. 24, 2015
RF signal cable HUBER+SUHNER	SUCOFLEX 102	Cable-CH1-04-37433	Oct. 25, 2014	Oct. 24, 2015

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. The test was performed in HwaYa Chamber 2.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 686814.
5. The IC Site Registration No. is IC 7450F-2.
6. The VCCI Site Registration No. is G-18.
7. The 3dB beamwidth of the horn antenna is minimum 30 degree (or w = 1.6m at 3m distance) for 1~6 GHz.

7.3 Test Arrangement

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

Note: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection (PK) at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.



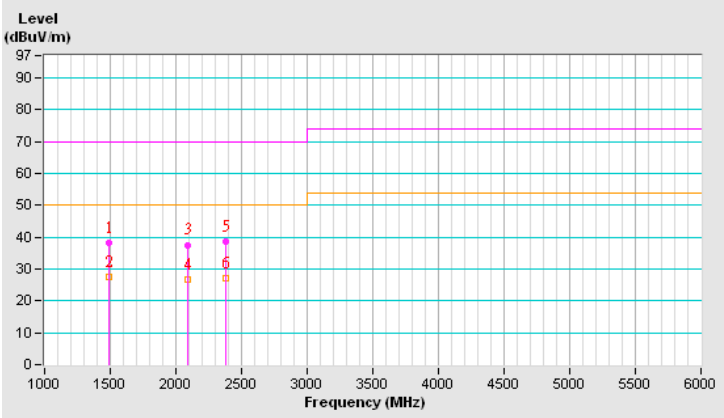
7.4 Test Results

Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	23℃, 68%RH
Tested by	Scott Yang	Test Date	2015/8/26

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1490.23	38.12 PK	70.00	-31.88	2.25 H	156	45.54	-7.42
2	1490.23	27.45 AV	50.00	-22.55	2.25 H	156	34.87	-7.42
3	2090.69	37.55 PK	70.00	-32.45	1.00 H	215	43.81	-6.26
4	2090.69	26.54 AV	50.00	-23.46	1.00 H	215	32.80	-6.26
5	2380.32	38.45 PK	70.00	-31.55	1.00 H	63	43.56	-5.11
6	2380.32	26.96 AV	50.00	-23.04	1.00 H	63	32.07	-5.11

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

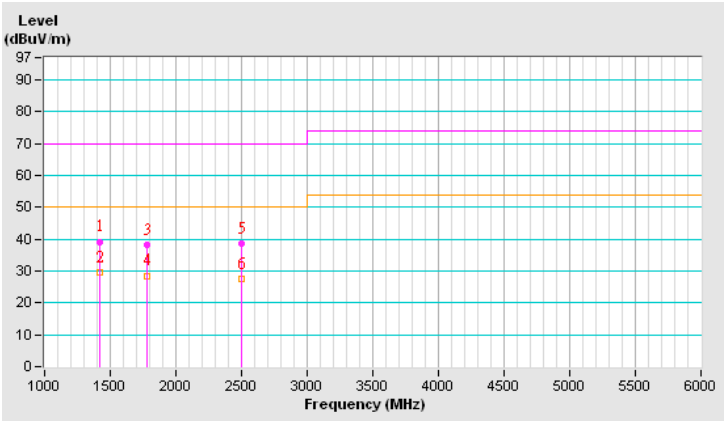


Frequency Range	1GHz ~ 6GHz	Detector Function & Bandwidth	Peak (PK) / Average (AV), 1MHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	23℃, 68%RH
Tested by	Scott Yang	Test Date	2015/8/26

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1420.25	39.25 PK	70.00	-30.75	1.10 V	245	47.15	-7.90
2	**1420.25**	**29.63 AV**	**50.00**	**-20.37**	**1.10 V**	**245**	**37.53**	**-7.90**
3	1780.15	38.15 PK	70.00	-31.85	1.00 V	335	45.12	-6.97
4	1780.15	28.52 AV	50.00	-21.48	1.00 V	335	35.49	-6.97
5	2500.03	38.69 PK	70.00	-31.31	1.69 V	254	43.33	-4.64
6	2500.03	27.54 AV	50.00	-22.46	1.69 V	254	32.18	-4.64

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



8 Harmonics Current Measurement

8.1 Limits

Limits for Class A equipment	
Harmonic 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	0.15 x 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≦n≦40	0.23 x 8/n

Limits for Class D equipment		
Harmonic 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	0.15 x 15/n

Notes: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.
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.

8.2 Classification of Equipment

The EUT is Class A in accordance with EN 61000-3-2 as follows:

Class A	Class B	Class C	Class D
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.	Portable tools; Arc welding equipment which is not professional equipment.	Lighting equipment.	Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; Television receivers; Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

8.3 Test Instruments

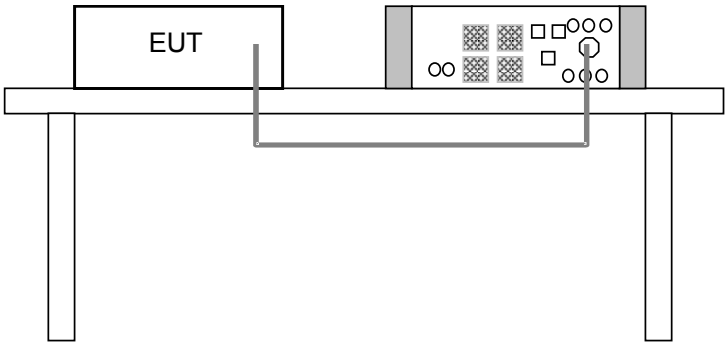
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 20, 2015	Aug. 19, 2016
Software	Win2100 V4.5.8	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EMS Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

8.4 Test Arrangement

a. 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.

b. 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.



8.5 Test Results

Test Duration (mins)	3	Test Date	2015/9/22
Fundamental Voltage/Ampere	227.88 Vrms/ 0.122 Arms	Power Frequency	50 Hz
Power Consumption	10.0 W	Power Factor	0.369
Environmental Conditions	25 ˚C, 60% RH	Tested by	Davis Chen
Test Mode	A		

Note: 1. Limits are not specified for equipment with a rated power of 75W or less (other than lighting equipment).
2. According to EN 61000-3-2 the manufacturer shall specify the power of the apparatus. This value shall be used for establishing limits. The specified power shall be within +/-10% of the measured power.

9 Voltage Fluctuations and Flicker Measurement

9.1 Limits

Test item	Limit	Note
P_{st}	1.0	$P_{st:}$ short-term flicker severity.
P_{lt}	0.65	$P_{lt:}$ long-term flicker severity.
T_{max} (ms)	500	$T_{max:}$ maximum time duration during the observation period that the voltage deviation d(t) exceeds the limit for d_c .
d_{max} (%)	4	$d_{max:}$ maximum absolute voltage change during an observation period.
d_c (%)	3.3	$d_{c:}$ maximum steady state voltage change during an observation period.

9.2 Test Instruments

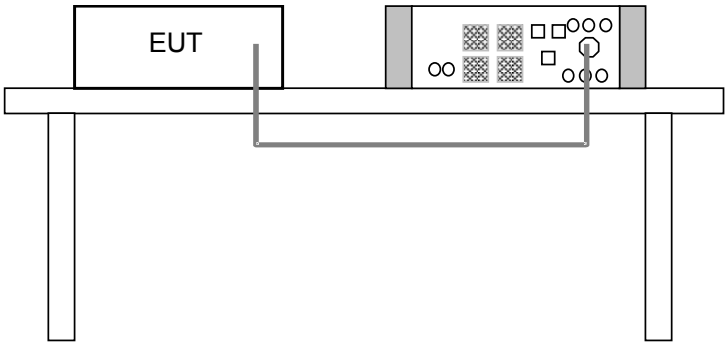
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 20, 2015	Aug. 19, 2016
Software	Win2100 V4.5.8	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EMS Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

9.3 Test Arrangement

a. 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.

b. 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.



9.4 Test Results

Observation (T_p)	120 min.	Test Date	2015/9/22
Fundamental Voltage/Ampere	227.77 Vrms/ 0.122 Arms	Power Frequency	50 Hz
Power Consumption	10.0 W	Power Factor	0.369
Environmental Conditions	25 ˚C, 60% RH	Tested by	Davis Chen
Test Mode	A		

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.064	1.00	Pass
P_{lt}	0.064	0.65	Pass
T_{max} (ms)	0	500	Pass
d_{max} (%)	0.13	4	Pass
d_c (%)	0	3.3	Pass

Note: (1) P_{st} means short-term flicker indicator.
(2) P_{lt} means long-term flicker indicator.
(3) T_{max} means accumulated time value of d(t) with a deviation exceeding 3.3 %.
(4) d_{max} means maximum relative voltage change.
(5) d_c means maximum relative steady-state voltage change.

10 General Immunity Requirements

EN 61000-6-2:2005 +AC:2005 , Immunity requirements			
Table Clause	Test specification	Basic standard	Performance Criterion
1.5	Enclosure port: ±8kV Air discharge, ±4kV Contact discharge	EN 61000-4-2:2009 ESD	B
1.2 1.3 1.4	Enclosure port: 80-1000 MHz, 10V/m, 80% AM (1kHz) 1.4-2.0 GHz, 3V/m, 80% AM (1kHz) 2.0-2.7 GHz, 1V/m, 80% AM (1kHz)	EN 61000-4-3:2006 +A1:2008 +A2:2010 RS	A
2.2	Signal ports: (capacitive clamp used; cable > 3 m) ±1kV, 5/50 (T_r/T_h) ns, 5kHz	EN 61000-4-4:2012 EFT	B
3.3	Input and output DC power ports: (cable > 3 m) ±2kV, 5/50 (T_r/T_h) ns, 5kHz		
4.5	Input and output AC power ports: ±2kV, 5/50 (T_r/T_h) ns, 5kHz		
2.3	Signal ports (cable > 30 m): 1.2/50 (8/20) (T_r/T_h) μs Line-to-earth: ±1kV	EN 61000-4-5:2006 Surge	B
3.2	Input and output DC power ports: 1.2/50 (8/20) (T_r/T_h) μs Line-to-earth: ±0.5kV Line-to-line: ±0.5kV		
4.4	Input and output AC power ports: 1.2/50 (8/20) (T_r/T_h) μs Line-to-earth: ±2kV Line-to-line: ±1kV		
2.1	Signal and telecommunication ports(cable length > 3m): 0.15-80 MHz, 10V, 80% AM (1kHz) except ITU broadcast band 47-68 MHz, 3V, 80% AM (1kHz)	EN 61000-4-6:2014 CS	A
3.1	Input and output DC power port(cable length > 3m): 0.15-80 MHz, 10V, 80% AM (1kHz) except ITU broadcast band 47-68 MHz, 3V, 80% AM (1kHz)		
4.1	Input and output AC Power ports: 0.15-80 MHz, 10V, 80% AM (1kHz)		
1.1	Enclosure port: 50, 60 Hz, 30A/m, for intended power supply frequency only	EN 61000-4-8:2010 PFMF	A
4.2	Input AC power ports, Voltage dips: 0% residual – 1 cycle 40% residual – 10/12 cycles at 50/60Hz 70% residual –25/30 cycles at 50/60Hz	EN 61000-4-11:2004 Dips & Interruptions	 B C C
4.3	Input AC power ports, Voltage interruptions: 0% residual – 250/300 cycles at 50/60Hz		C

10.1 Performance Criteria

Performance criterion A: The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

11 Electrostatic Discharge Immunity Test (ESD)

11.1 Test Specification

Basic Standard:	EN/IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: ±2, ±4, ±8kV (Direct) Contact Discharge: ±2, ±4kV (Direct/Indirect)
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1-second minimum

11.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Electronic Discharge Simulator (KeyTek)	MZ-15/EC	1411213	Nov. 19, 2014	Nov. 18, 2015

Notes: 1. The test was performed in Hwa Ya ESD Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

11.3 Test Arrangement

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.

b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

c. The time interval between two successive single discharges was at least 1 second.

d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

f. 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.

g. At least ten single discharges (in the most sensitive polarity) were applied to the **H**orizontal **C**oupling **P**lane at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP.**

h. 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 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.

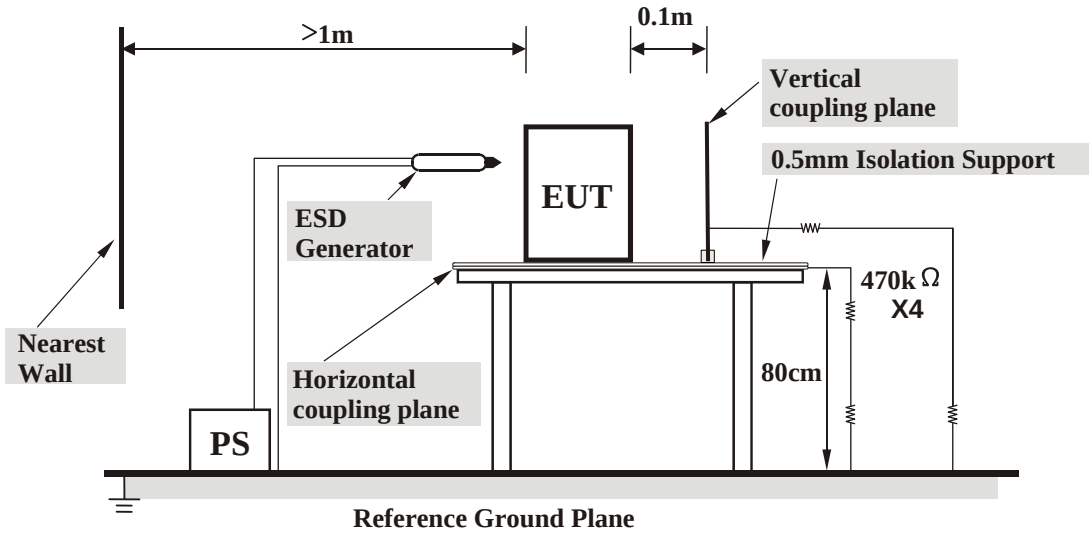


Table-top Equipment

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 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/IEC 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.

11.4 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/21
Environmental Conditions	25 ˚C, 40% RH 988 mbar	Tested by	Tom Tang
Test Mode	A		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4	+/-	1-3	Note 1	NA	A
2, 4, 8	+/-	4-9	NA	Note 1	A

Description of test points of direct application: Please refer to following page for representative mark only.

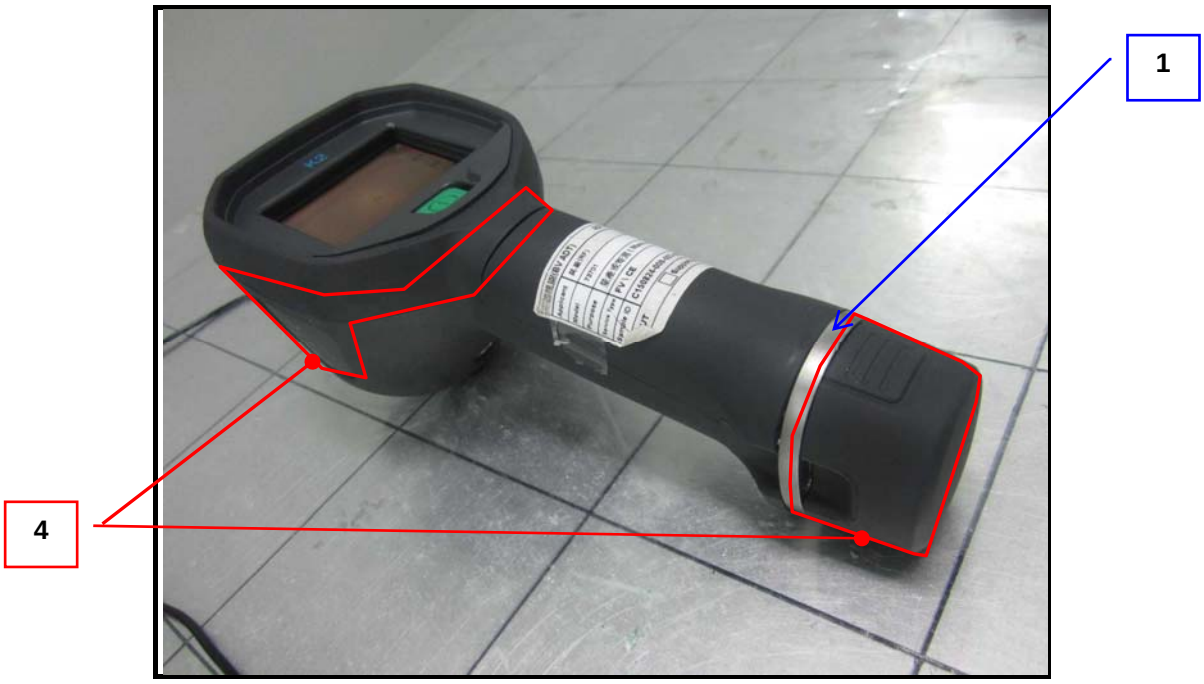
Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4	+/-	Four Sides	Note 1	Note 1	A

Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

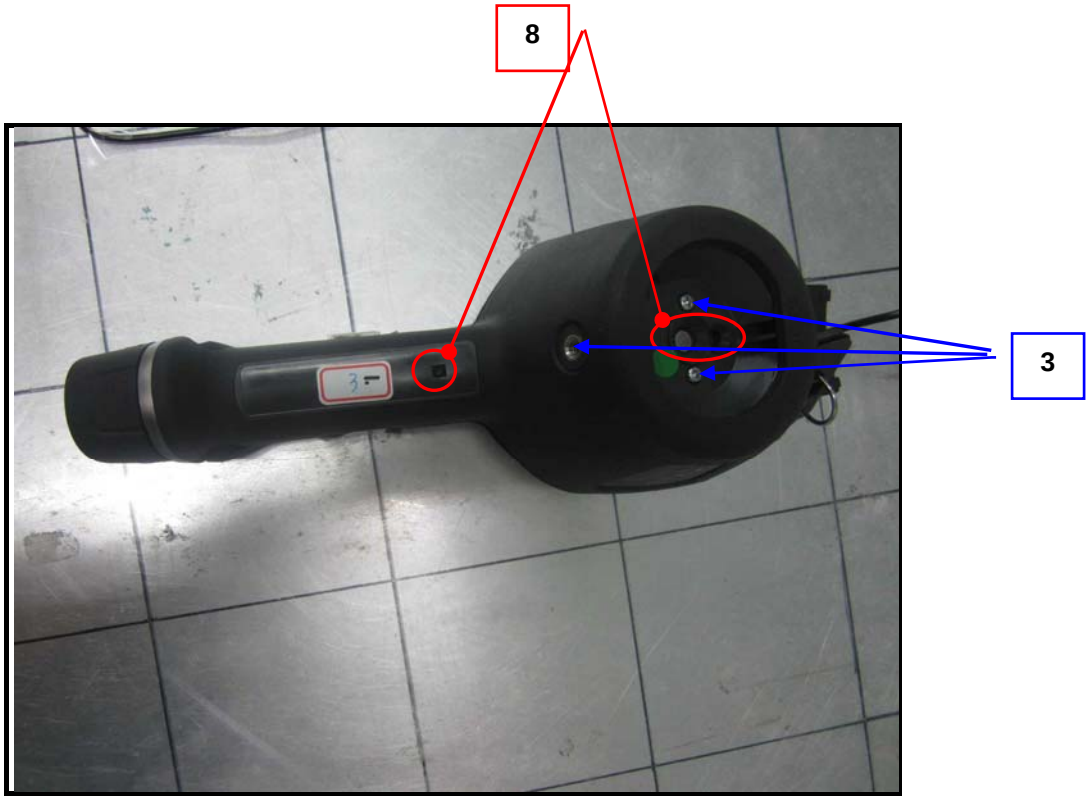
Note: 1. The EUT function was correct during the test.

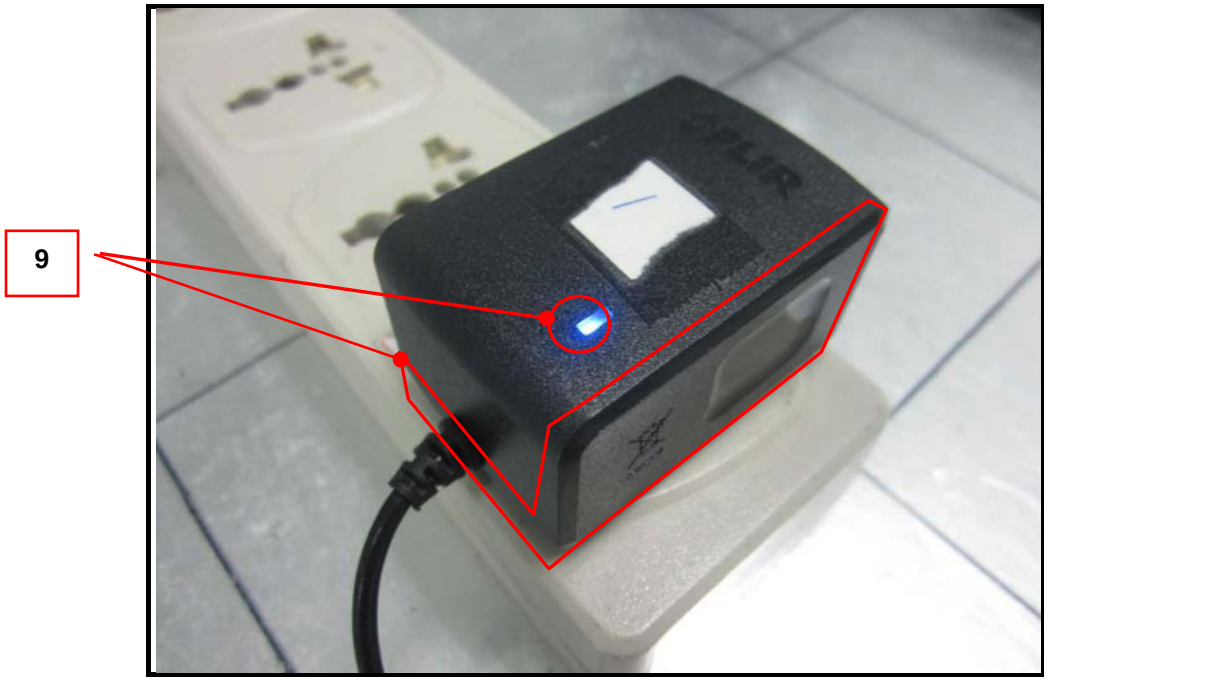
Description of Test Points




K2
500
300
150
26℃
6


7
2


8
3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Input Power	3.7 Vdc	Test Date	2015/9/21
Environmental Conditions	25 ˚C, 40% RH 988 mbar	Tested by	Tom Tang
Test Mode	B		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4	+/-	1-2	Note 1	NA	A
2, 4, 8	+/-	3-7	NA	Note 1	A

Description of test points of direct application: Please refer to following page for representative mark only.

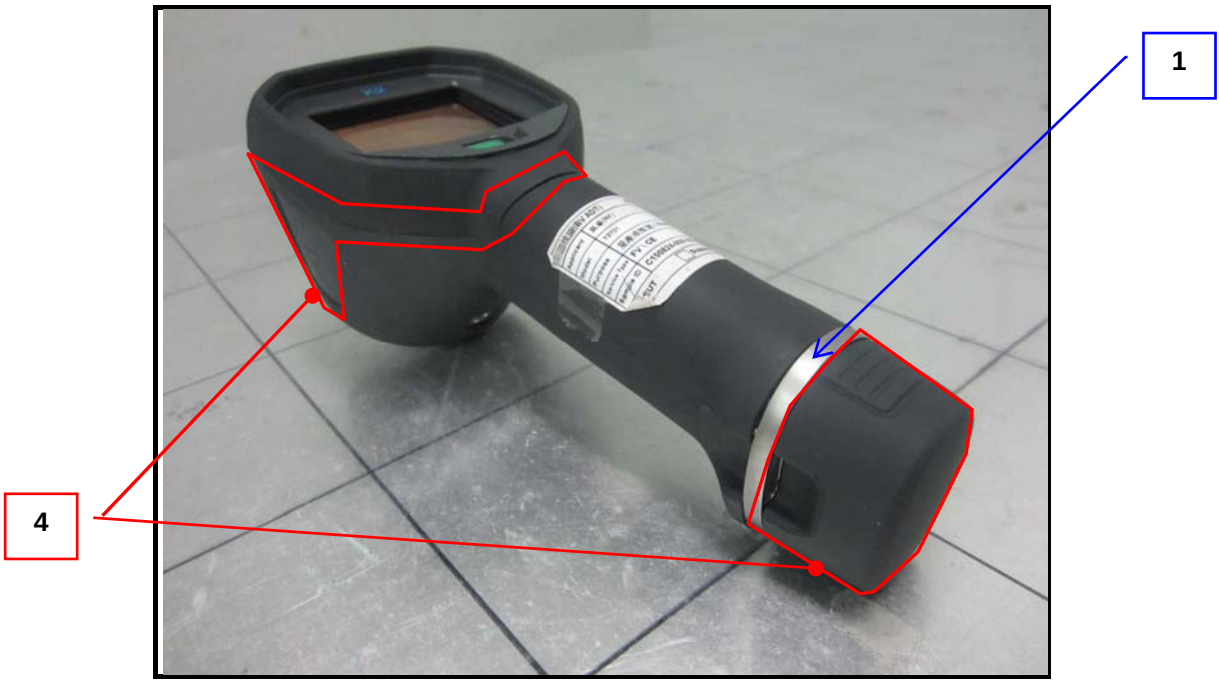
Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4	+/-	Four Sides	Note 1	Note 1	A

Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

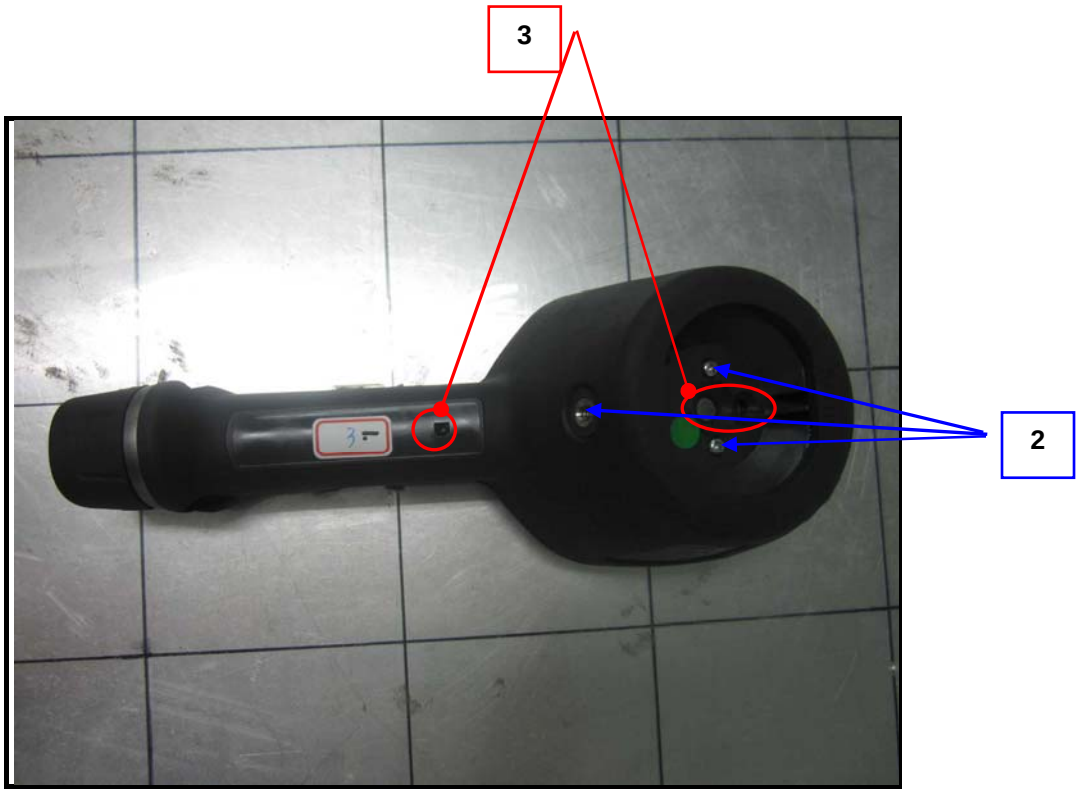
Note: 1. The EUT function was correct during the test.

Description of Test Points




K2
6


7


3
2

Input Power	230 Vac, 50 Hz (System)	Test Date	2015/9/21
Environmental Conditions	25 ˚C, 40% RH 988 mbar	Tested by	Tom Tang
Test Mode	C		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2, 4	+/-	1-3	Note 1	NA	A
2, 4, 8	+/-	4-8	NA	Note 1	A
2, 4	+/-	9	NA	Note 1	A
8	+/-	9	NA	Note 2	B

Description of test points of direct application: Please refer to following page for representative mark only.

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4	+/-	Four Sides	Note 1	Note 1	A

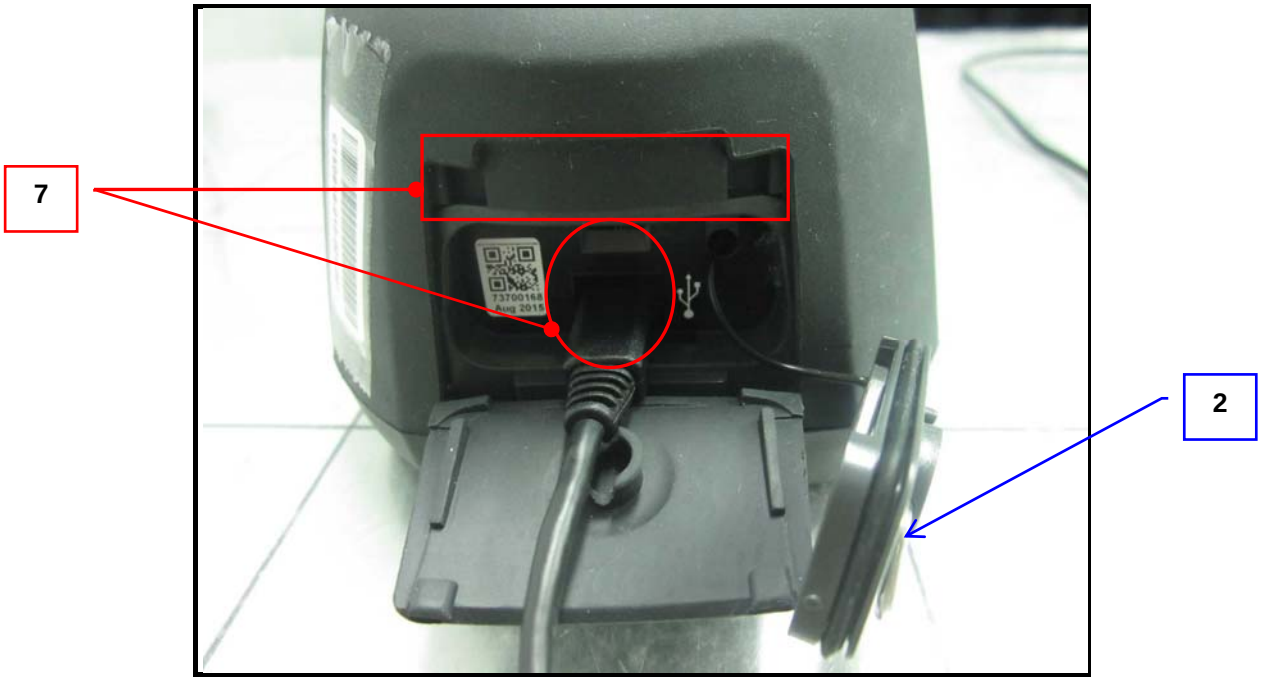
Description of test points of indirect application:

1. Front side 2. Rear side 3. Right side 4. Left side

Note: 1. The EUT function was correct during the test.
2. The R/W function delayed during the test, but could self-recover after the test.

Description of Test Points


K2
6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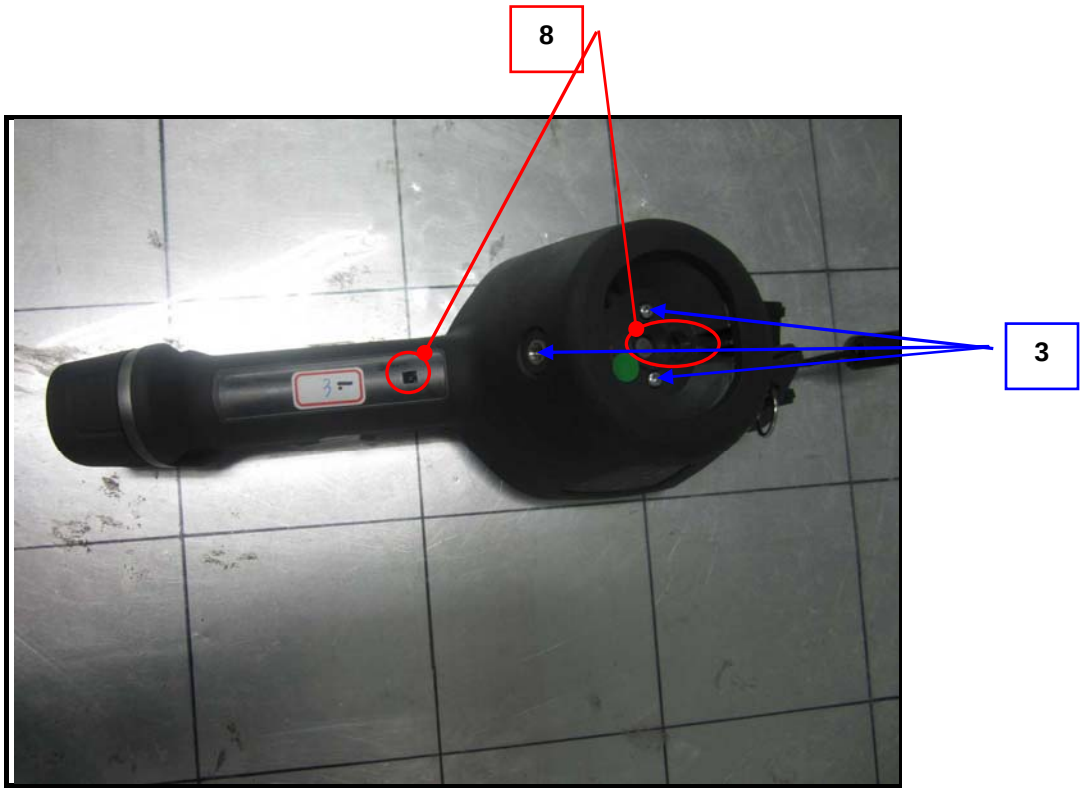
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3


9

12 Radiated, Radio-frequency, Electromagnetic Field Immunity Test (RS)

12.1 Test Specification

Basic Standard:	EN/IEC 61000-4-3
Frequency Range:	80 MHz - 1000 MHz, 1.4-2.0 GHz, 2.0-2.7 GHz
Field Strength:	10 V/m, 3 V/m, 1 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.55m
Dwell Time:	3 seconds

12.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Power Amp ROHDE & SCHWARZ	BBA 100	101761	NA	NA
Power Amp ROHDE & SCHWARZ	BBA150	101714	NA	NA
Power Sensor ROHDE & SCHWARZ	NRP-Z91	102733	Oct. 13, 2014	Oct. 12, 2015
Power Sensor ROHDE & SCHWARZ	NRP-Z91	102732	Oct. 13, 2014	Oct. 12, 2015
Signal Generator ROHDE & SCHWARZ	SMBV100A	260761	Oct. 14, 2014	Oct. 13, 2015
R&S Software	EMC32 Version 9.15.03	NA	NA	NA
LOG ANTENNA Schwarzbeck	STLP9149	9149-280	NA	NA
LOG ANTENNA Amplifier Research	AT5080ANT	303730	NA	NA
ECTRIC FIELD PROBE AR	FL7006	0338717	May 19, 2015	May 18, 2016

Notes: 1. The test was performed in Hwa Ya RS Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The transmit antenna was located at a distance of 3 meters from the EUT.

12.3 Test Arrangement

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

a. The testing was performed in a modified semi-anechoic chamber.

b. The frequency range is swept from 80 MHz to 1000 MHz, 1.4-2.0 GHz & 2.0-2.7 GHz with the signal 80% amplitude modulated with a 1kHz sine wave.

c. The field strength level was 10 V/m, 3 V/m, 1 V/m.

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

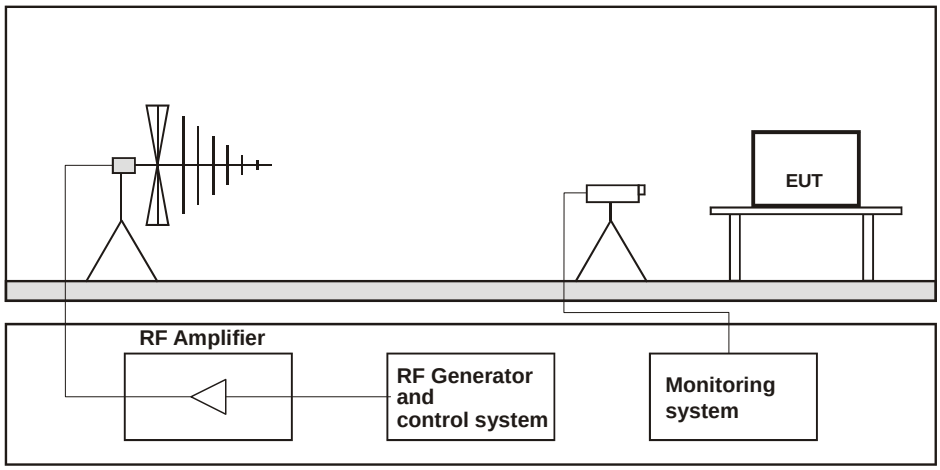


Table-top Equipment

The EUT installed in a representative system as described in section 7 of EN/IEC 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.

12.4 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/22
Environmental Conditions	25 ˚C, 59% RH	Tested by	Leo Chan
Test Mode	A		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0, 90, 180, 270	10	80% AM (1kHz)	Note 1	A
1400 - 2000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note 1	A
2000 - 2700	V&H	0, 90, 180, 270	1	80% AM (1kHz)	Note 1	A

Note: 1. The EUT function was correct during the test.

Input Power	3.7 Vdc	Test Date	2015/9/22
Environmental Conditions	25 ˚C, 59% RH	Tested by	Leo Chan
Test Mode	B		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0, 90, 180, 270	10	80% AM (1kHz)	Note 1	A
1400 - 2000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note 1	A
2000 - 2700	V&H	0, 90, 180, 270	1	80% AM (1kHz)	Note 1	A

Note: 1. The EUT function was correct during the test.

Input Power	230 Vac, 50 Hz (System)	Test Date	2015/9/22
Environmental Conditions	25 ˚C, 59% RH	Tested by	Leo Chan
Test Mode	C		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criterion
			(V/m)	Modulation		
80 - 1000	V&H	0, 90, 180, 270	10	80% AM (1kHz)	Note 1	A
1400 - 2000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note 1	A
2000 - 2700	V&H	0, 90, 180, 270	1	80% AM (1kHz)	Note 1	A

Note: 1. The EUT function was correct during the test.

13 Electrical Fast Transient/Burst Immunity Test (EFT)

13.1 Test Specification

Basic Standard:	EN/IEC 61000-4-4
Test Voltage:	Signal ports: NA Input DC power ports: N/A Input and output AC power ports: ±2kV
Impulse Repetition Frequency:	5kHz
Impulse Wave Shape:	5/50 (T_r/T_h) ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	1 min.

13.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
EMC-Partner EFT Generator	TRA2000 EFT-C1	623	May 14, 2015	May 13, 2016
EMC-Partner Capacitive Coupling clamp	CN-EFT1000	364	May 14, 2015	May 13, 2016
EFT Adapter WONPRO	WA	EF1Ada-001	NA	NA
Software	EMC-Partner GENECS	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EFT Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

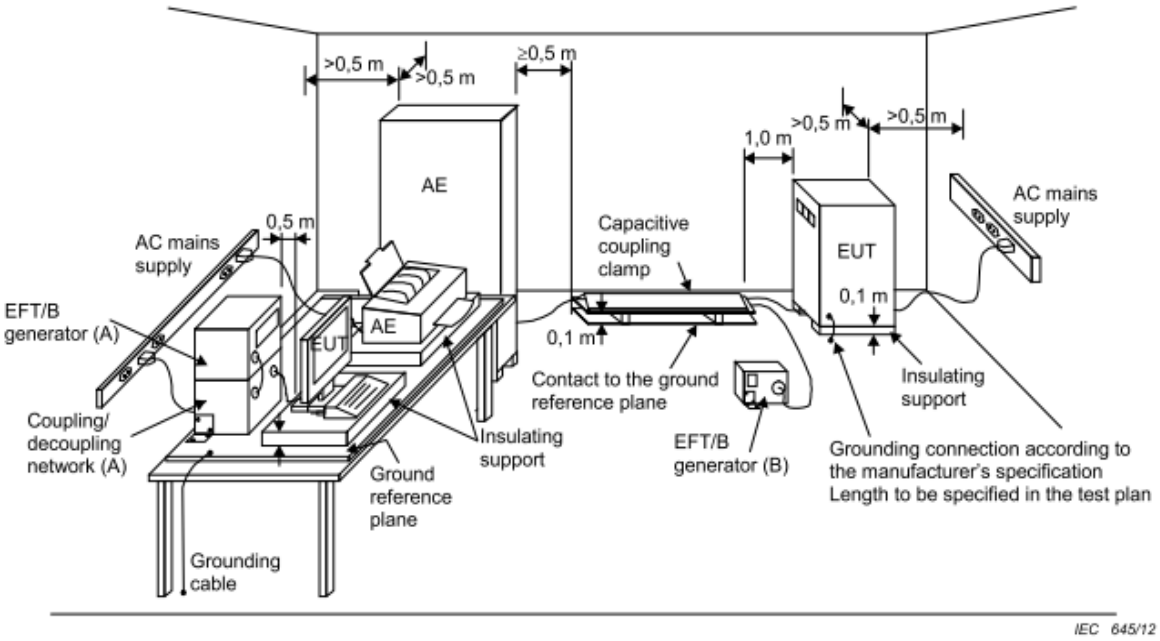
13.3 Test Arrangement

a. Both positive and negative polarity discharges were applied.

b. The distance between any coupling devices and the EUT should be 0.5 m for table-top equipment testing, and 1.0 m for floor standing equipment.

c. The duration time of each test sequential was 1 minute.

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



Note:
(A) location for supply line coupling
(B) location for signal lines coupling

13.4 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/23
Environmental Conditions	25 ˚C, 55% RH	Tested by	Leo Chan
Test Mode	A		

Input AC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
2	L1	+/-	Note 1	B
2	L2	+/-	Note 1	B
2	L1-L2	+/-	Note 1	B

Note: 1. The EUT screen showed disturbance noise during the test, but could self-recover after the test.

14 Surge Immunity Test

14.1 Test Specification

Basic Standard:	EN/IEC 61000-4-5
Wave-Shape:	1.2/50 μs Open Circuit Voltage 8/20 μs Short Circuit Current
Test Voltage:	Input and output DC power port: N/A
	Input and output AC power ports: Line to line: ±0.5, ±1kV, Line to earth: N/A
	Signal ports: N/A
AC Phase Angle (degree):	0°, 90°, 180°, 270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 positive and 5 negative at selected points

14.2 Test Instruments

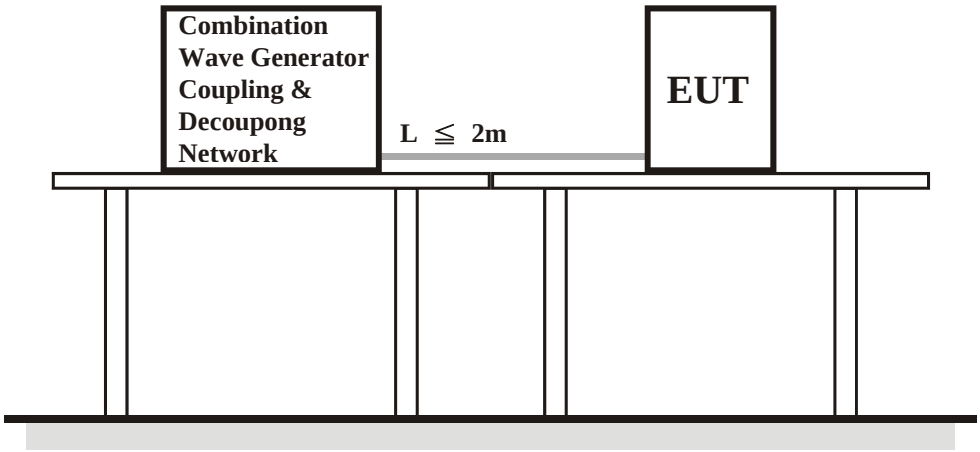
Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Modular Impulse Generator EMC-Partner	MIG0603IN3 IEC-ANSI	352	Sep. 03, 2015	Sep. 02, 2016
Universal Surge Coupling De-Coupling Network EMC-Partner	CDN-UTP8	011	Sep. 03, 2015	Sep. 02, 2016
Surge Adapter WONPRO	WA	SU1 Ada-001	NA	NA

Notes: 1. The test was performed in Hwa Ya Surge Room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

14.3 Test Arrangement

The surge is to be 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 shall be 2 meters in length (or shorter).

For double-insulated products without PE or external earth connections, the test shall be done in a similar way as for grounded products but without adding any additional external grounded connections. If there are no other possible connections to earth, line-to-ground tests may be omitted.



14.4 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/23
Environmental Conditions	25 °C, 55% RH	Tested by	Vincent Yang
Test Mode	A		

Input AC power port

Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criterion
0.5, 1	L1-L2	+/-	Note 1	A

Note: 1. The EUT function was correct during the test.

15 Immunity to Conducted Disturbances Induced by RF Fields (CS)

15.1 Test Specification

Basic Standard:	EN/IEC 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Voltage Level:	10 V
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

15.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M1-25A	03030	Apr. 22, 2015	Apr. 21, 2016
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M2-25A	03049	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M2-25A	03050	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M3-25A	03056	Nov. 07, 2014	Nov. 06, 2015
FCC POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-M3-25A	03057	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-T2	03030	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	FCC-801-T4	03031	Nov. 07, 2014	Nov. 06, 2015
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	F-090407-1004-1	100923	Jul. 13, 2015	Jul. 12, 2016
EMI Injection Clamp	F203I-23MM	434	Nov. 07, 2014	Nov. 06, 2015
Amplifier Research Power Amplifier	75A250AM2	307804	NA	NA
BOONTON 4232ARF POWER METER	4232A	104302	Nov. 24, 2014	Nov. 23, 2015
R&S Signal Generator	SML01	102148	Nov. 14, 2014	Nov. 13, 2015
Software	ADT_CS_V37	NA	NA	NA
POWER SENSOR	51011-EMC	30028	Nov. 24, 2014	Nov. 23, 2015
POWER SENSOR	51011-EMC	33029	Nov. 24, 2014	Nov. 23, 2015
6dB Attenuator	HFP-575-3/6-N M/F	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya CS Room 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

15.3 Test Arrangement

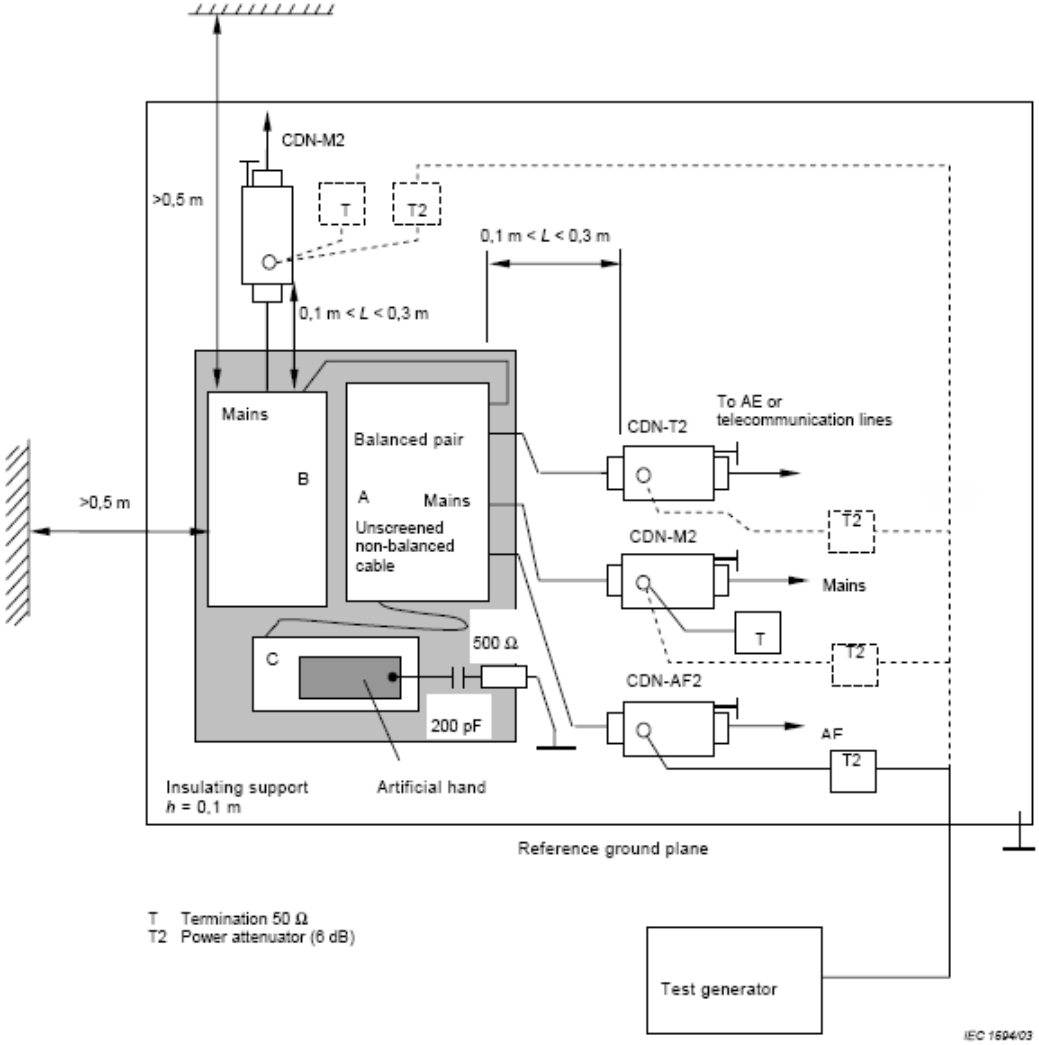
a. The EUT shall be tested within its intended operating and climatic conditions.

b. An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.

c. One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.

d. The frequency range is 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 is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.

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



Note: 1. The EUT clearance from any metallic obstacles shall be at least 0,5 m.
2. Interconnecting cables (≦1 m) belonging to the EUT shall remain on the insulating support.

15.4 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/22
Environmental Conditions	25 ˚C, 55% RH	Tested by	Tim Mai
Test Mode	A		

Frequency (MHz)	Level (Vrms)	Tested Line	Injection Method	Return Path	Observation	Performance Criterion
0.15 – 80	10	AC Power	CDN-M2	-	Note 1	A

Note: 1. The EUT function was correct during the test.

16 Power Frequency Magnetic Field Immunity Test

16.1 Test Specification

Basic Standard:	EN/IEC 61000-4-8
Frequency Range:	50Hz, 60Hz
Field Strength:	30, 100 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

16.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
F.W.BELL 4190 Gaussmeter	4190	0743043	Mar. 04, 2015	Mar. 03, 2016
5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 20, 2015	Aug. 19, 2016
Multi turn Magnetic TESEQ	INA702/INA2141	268/1427	Aug. 20, 2015	Aug. 19, 2016

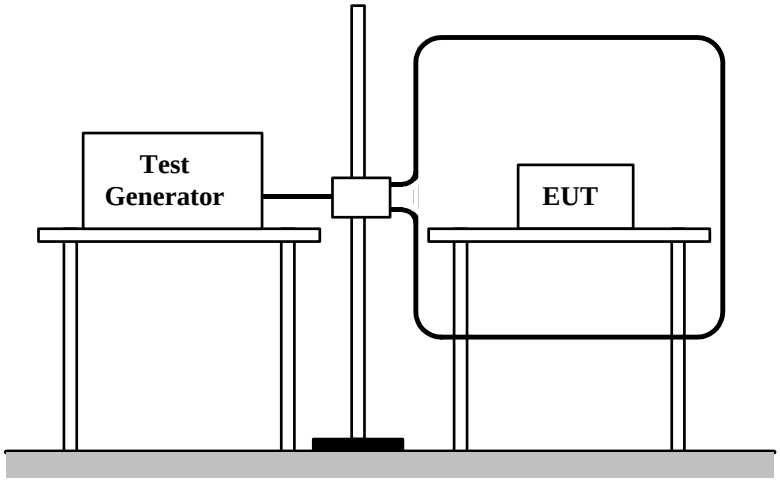
Notes: 1. The test was performed in Hwa Ya EMS Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

16.3 Test Arrangement

a. The equipment is configured and connected to satisfy its functional requirements.

b. The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.

c. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.



Tabletop equipment
The equipment shall be subjected to the test magnetic field (see example as above).
The plane of the inductive coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

16.4 Supplementary Information

The requirement followed by the manufacturer's specification.

16.5 Test Results

Input Power	230 Vac, 50 Hz	Test Date	2015/9/22
Environmental Conditions	26 ˚C, 57% RH	Tested by	Davis Chen
Test Mode	A		

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50, 60	30	Note	A
Y - Axis	50, 60	30	Note	A
Z - Axis	50, 60	30	Note	A
X - Axis	50, 60	100	Note	A
Y - Axis	50, 60	100	Note	A
Z - Axis	50, 60	100	Note	A

Note: The EUT function was correct during the test.

Input Power	3.7 Vdc	Test Date	2015/9/22
Environmental Conditions	26 ˚C, 57% RH	Tested by	Davis Chen
Test Mode	B		

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50, 60	30	Note	A
Y - Axis	50, 60	30	Note	A
Z - Axis	50, 60	30	Note	A
X - Axis	50, 60	100	Note	A
Y - Axis	50, 60	100	Note	A
Z - Axis	50, 60	100	Note	A

Note: The EUT function was correct during the test.

Input Power	230 Vac, 50 Hz (System)	Test Date	2015/9/22
Environmental Conditions	26 ˚C, 57% RH	Tested by	Davis Chen
Test Mode	C		

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criterion
X - Axis	50, 60	30	Note	A
Y - Axis	50, 60	30	Note	A
Z - Axis	50, 60	30	Note	A
X - Axis	50, 60	100	Note	A
Y - Axis	50, 60	100	Note	A
Z - Axis	50, 60	100	Note	A

Note: The EUT function was correct during the test.

17 Voltage Dips and Interruptions

17.1 Test Specification

Basic Standard:	EN/IEC 61000-4-11
Test levels:	Voltage Dips: 0% residual voltage for 1 cycle 40% residual voltage for 10/12 cycles at 50/60 Hz 70% residual voltage for 25/30 cycles at 50/60 Hz Voltage Interruptions: 0% residual voltage for 250/300 cycles at 50/60 Hz
Interval between Event:	Minimum ten seconds
Sync Angle (degrees):	0° / 180°
Test Cycle:	3 times

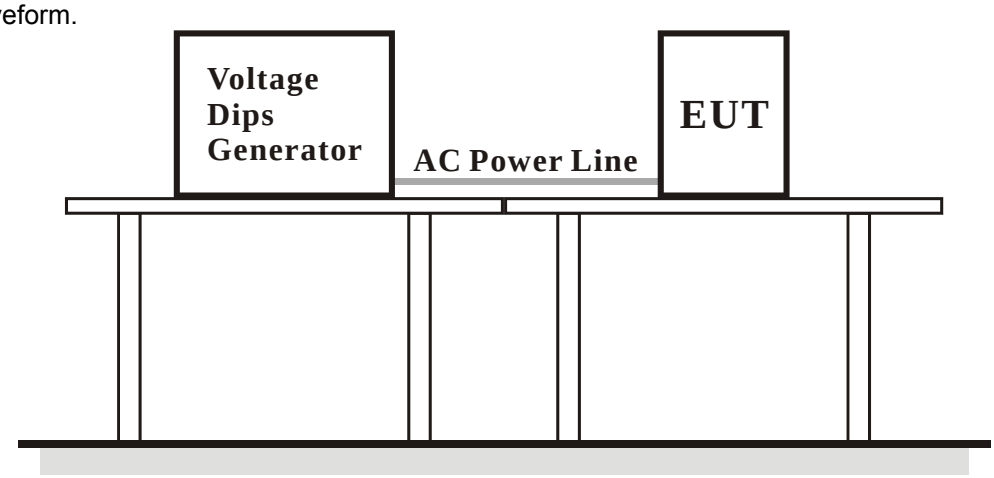
17.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
TESEQ 5KVA AC POWER SOURCE/CONDITION UNIT	NSG 1007/ CCN 1000-1	1323A00070/ 1318A02119	Aug. 20, 2015	Aug. 19, 2016
Software	Win2100 V4	NA	NA	NA

Notes: 1. The test was performed in Hwa Ya EMS Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

17.3 Test Arrangement

The EUT shall be tested for each selected combination of test levels and duration with a sequence of 3 dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at 0 dregee crossover point of the voltage waveform.



17.4 Test Results

Input Power	100-240 Vac, 50 Hz	Test Date	2015/9/22
Environmental Conditions	26 ˚C, 57% RH	Tested by	Davis Chen
Test Mode	A		

Input Power for testing: 230 Vac, 50 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	10	10	3	Note 1	A
70	25	10	3	Note 1	A
0	250	10	3	Note 2	B

Input Power for testing: 240 Vac, 50 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	10	10	3	Note 1	A
70	25	10	3	Note 1	A
0	250	10	3	Note 2	B

Input Power for testing: 100 Vac, 50 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	10	10	3	Note 1	A
70	25	10	3	Note 1	A
0	250	10	3	Note 2	B

Note: 1. The EUT function was correct during the test.
2. The power supply changed from adapter to battery during the test, but could self-recover after the test.

Input Power	100-240 Vac, 60 Hz	Test Date	2015/9/22
Environmental Conditions	26 ˚C, 57% RH	Tested by	Davis Chen
Test Mode	A		

Input Power for testing: 230 Vac, 60 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	12	10	3	Note 1	A
70	30	10	3	Note 1	A
0	300	10	3	Note 2	B

Input Power for testing: 240 Vac, 60 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	12	10	3	Note 1	A
70	30	10	3	Note 1	A
0	300	10	3	Note 2	B

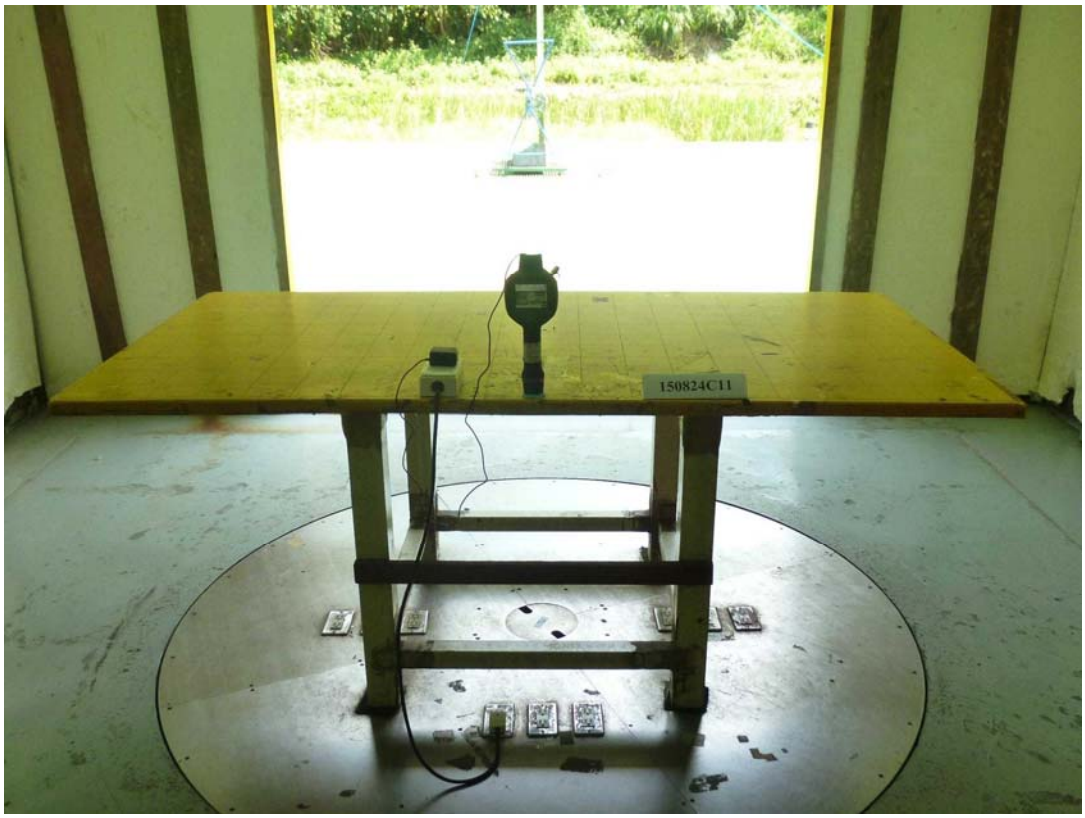
Input Power for testing: 100 Vac, 60 Hz (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criterion
0	1	10	3	Note 1	A
40	12	10	3	Note 1	A
70	30	10	3	Note 1	A
0	300	10	3	Note 2	B

Note: 1. The EUT function was correct during the test.
2. The power supply changed from adapter to battery during the test, but could self-recover after the test.

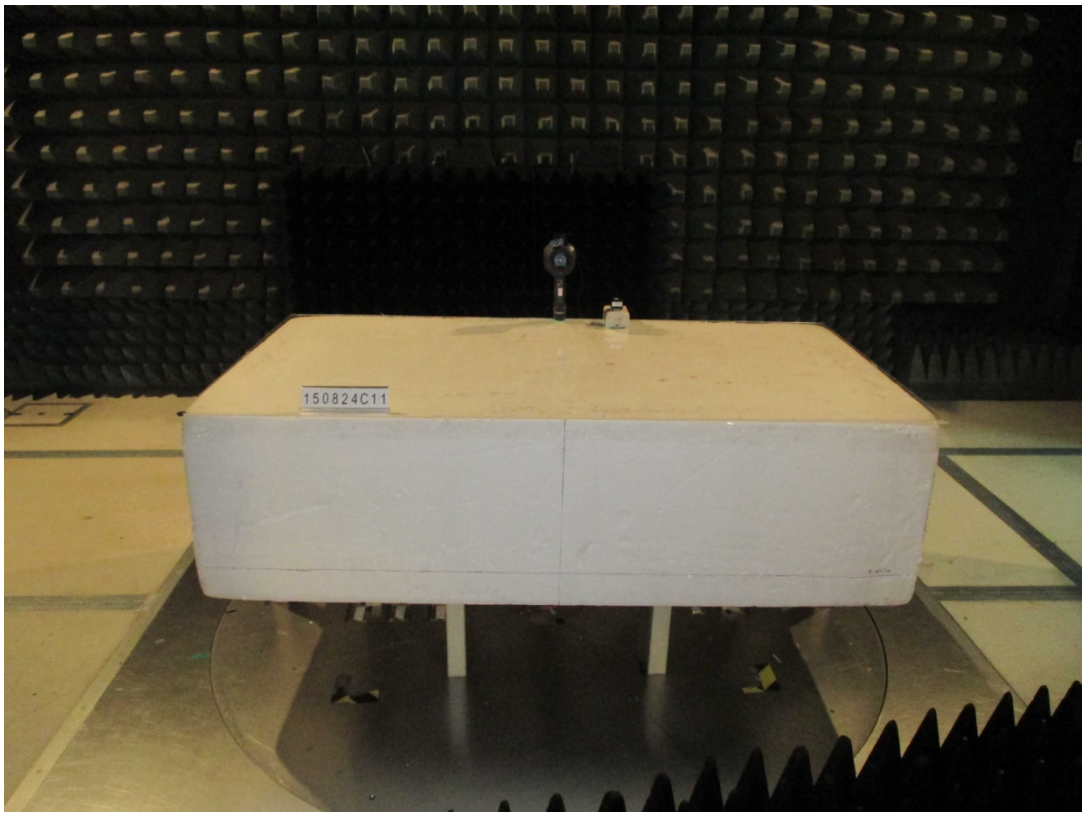
18 Pictures of Test Arrangements

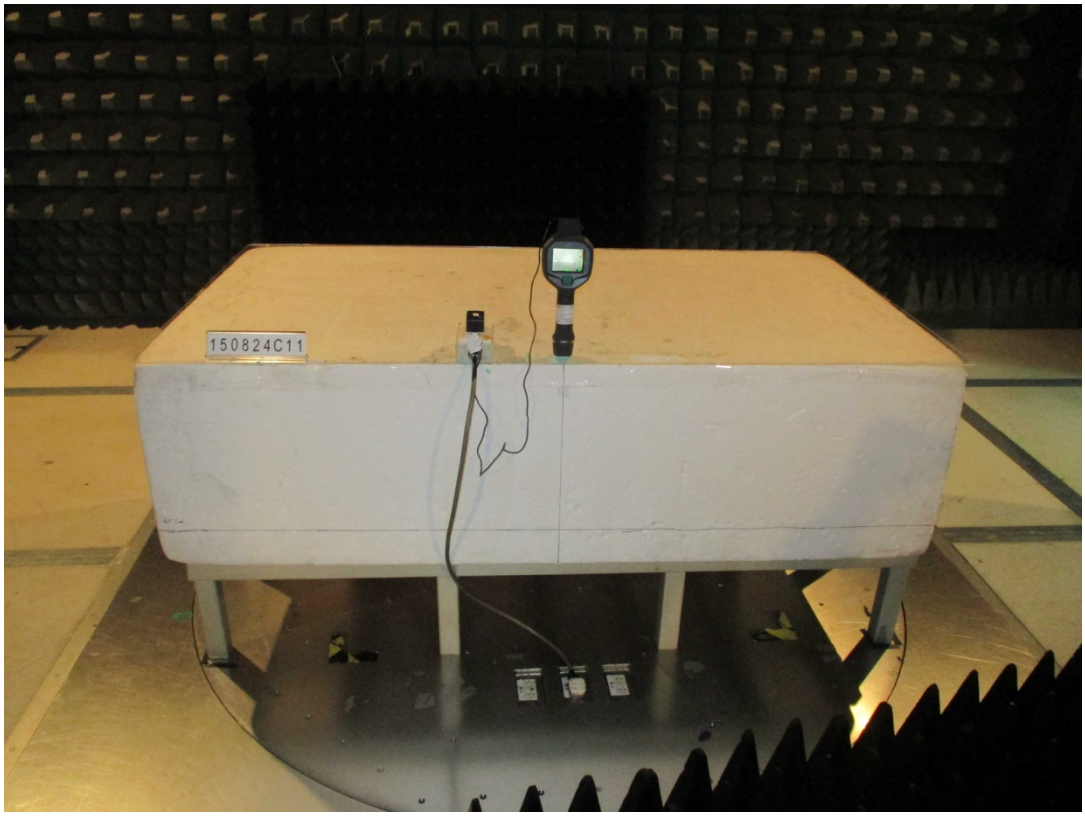
18.1 Conducted Disturbance at Mains Ports

18.2 Radiated Disturbance up to 1 GHz



18.3 Radiated Disturbance above 1 GHz





18.4 Harmonics Current, Voltage Fluctuations and Flicker Measurement

18.5 Electrostatic Discharge Immunity Test (ESD)

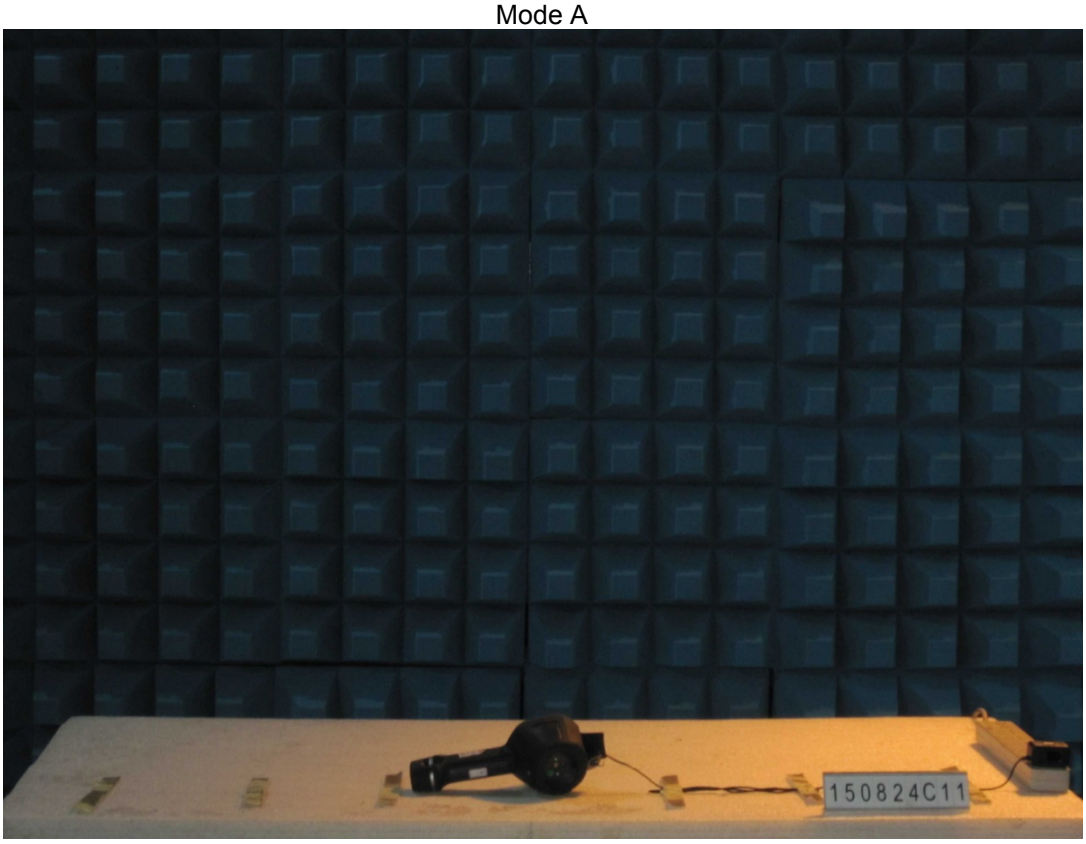
Mode A

Mode B

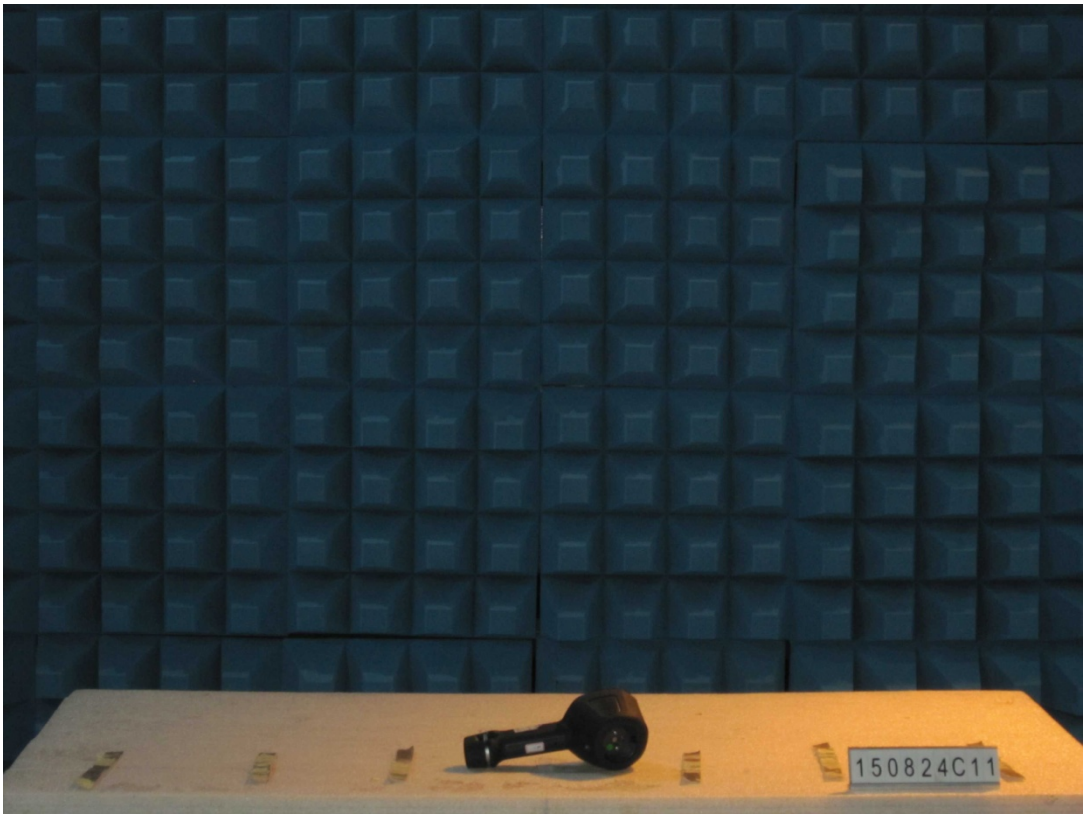
Mode C

18.6 Radio-frequency, Electromagnetic Field Immunity Test (RS)

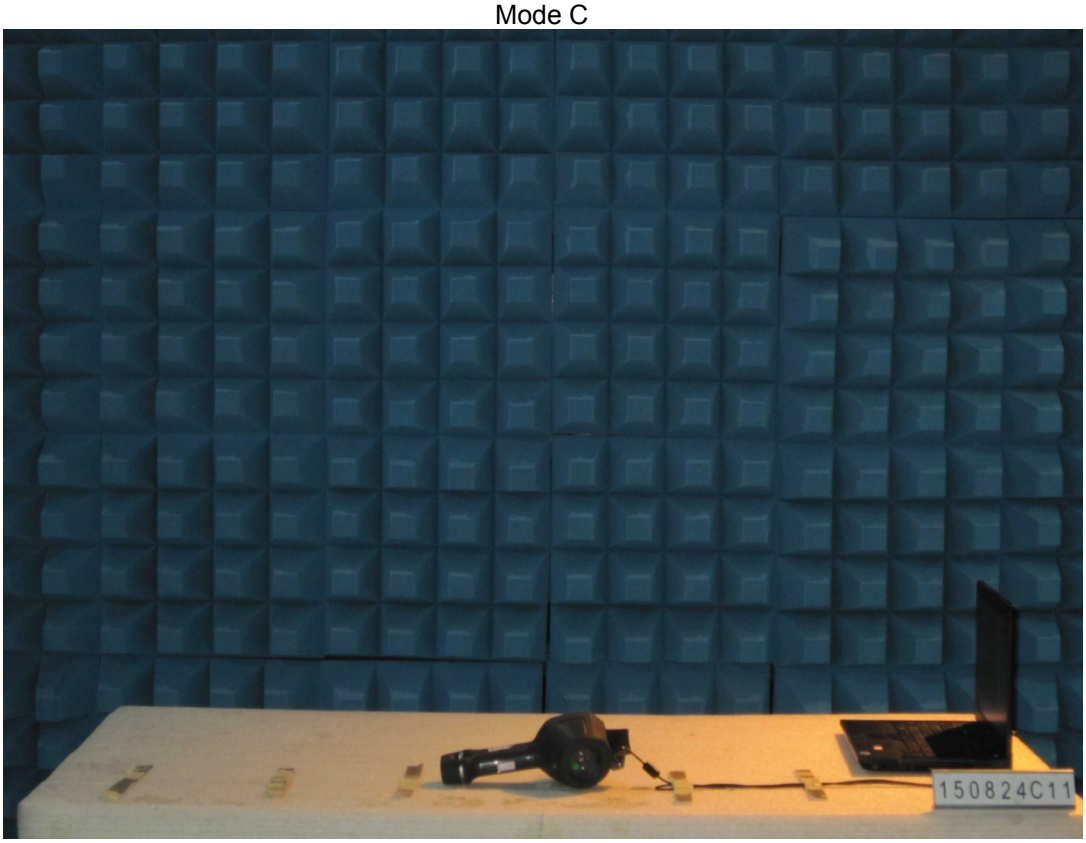
Mode A



Mode B



Mode C



18.7 Electrical Fast Transient/Burst Immunity Test (EFT)

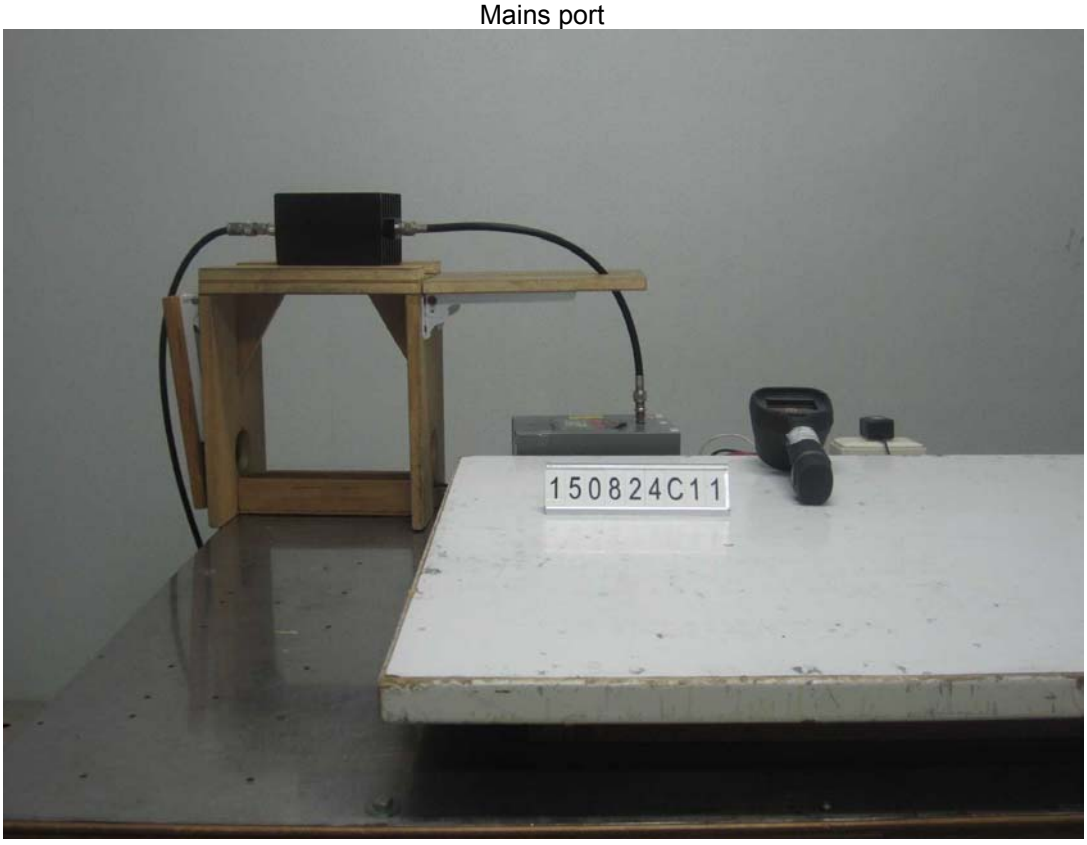
Mains port

18.8 Surge Immunity Test

Mains port

18.9 Conducted Disturbances Induced by RF Fields (CS)

Mains port



18.10 Power Frequency Magnetic Field Immunity Test (PFMF)

Mode A

Mode B

Mode C

18.11 Voltage Dips and Interruptions

Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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