

TEST REPORT

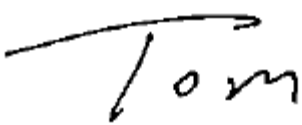
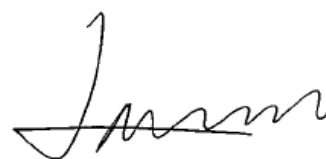
Applicant	Particle Industries, Inc
Address	1400 Tennessee St, #4 San Francisco, CA 94107

Manufacturer or Supplier	Particle Industries, Inc	
Address	1400 Tennessee St, #4 San Francisco, CA 94107	
Product	ELECTRON	
Brand Name	Particle	
Model	U270	
Additional Model & Model Difference	N/A	
Date of tests	Dec. 01, 2015 ~ Jan. 27, 2016	

The submitted sample of the above equipment has been tested according to the following European Directive - Electromagnetic directive 2004/108/EC and the requirements of the following standards:

- ☒ EN 55022:2010 + AC:2011, Class B
- ☒ EN 55024:2010

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Tom Chen Project Engineer / EMC Department	Approved by Madison Luo Supervisor / EMC Department
	 Date: Jan. 27, 2016

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.



Table of Contents

RELEASE CONTROL RECORD	4
1 SUMMARY OF TEST RESULTS	5
1.1 MEASUREMENT UNCERTAINTY	5
2 GENERAL INFORMATION	6
2.1 GENERAL DESCRIPTION OF EUT	6
2.2 DESCRIPTION OF TEST MODES	7
2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS	7
2.4 DESCRIPTION OF SUPPORT UNITS	7
3 EMISSION TEST	8
3.1 CONDUCTED EMISSION MEASUREMENT	8
3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT	8
3.1.2 TEST INSTRUMENTS	8
3.1.3 TEST PROCEDURE	9
3.1.4 DEVIATION FROM TEST STANDARD	9
3.1.5 TEST SETUP	9
3.1.6 EUT OPERATING CONDITIONS	9
3.1.7 TEST RESULTS	10
3.2 RADIATED EMISSION MEASUREMENT	12
3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT	12
3.2.2 TEST INSTRUMENTS	13
3.2.3 TEST PROCEDURE	14
3.2.4 DEVIATION FROM TEST STANDARD	15
3.2.5 TEST SETUP	16
3.2.6 EUT OPERATING CONDITIONS	16
3.2.7 TEST RESULTS	17
4 IMMUNITY TEST	19
4.1 GENERAL DESCRIPTION	19
4.1.1 GENERAL DESCRIPTION OF EN 55024	19
4.1.2 PERFORMANCE CRITERIA	20
4.1.3 EUT OPERATING CONDITION	20
4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)	21
4.2.1 TEST SPECIFICATION	21
4.2.2 TEST INSTRUMENTS	21
4.2.3 TEST PROCEDURE	21
4.2.4 DEVIATION FROM TEST STANDARD	22
4.2.5 TEST SETUP	23
4.2.6 TEST RESULTS	24
4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)	25
4.3.1 TEST SPECIFICATION	25
4.3.2 TEST INSTRUMENTS	25
4.3.3 TEST PROCEDURE	26
4.3.4 DEVIATION FROM TEST STANDARD	26
4.3.5 TEST SETUP	27
4.3.6 TEST RESULTS	28



Test Report No.: CE151201N015

4.4	POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST	29
4.4.1	TEST SPECIFICATION	29
4.4.2	TEST INSTRUMENTS.....	29
4.4.3	TEST PROCEDURE.....	29
4.4.4	DEVIATION FROM TEST STANDARD.....	29
4.4.5	TEST SETUP.....	30
4.4.6	TEST RESULTS	31
5	PHOTOGRAPHS OF THE TEST CONFIGURATION	32
6	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	36



BUREAU
VERITAS

Test Report No.: CE151201N015

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
CE151201N015	Original release	Jan. 27, 2016



1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN 55022:2010 + AC:2011, Class B	Conducted test	PASS	Meets limits minimum passing margin is -10.06dB at 0.18516MHz
	Radiated test (30MHz~1GHz)	PASS	Meets limits minimum passing margin is -4.29dB at 255.040MHz

IMMUNITY (EN 55024:2010)			
Standard	Test Type	Result	Remarks
IEC 61000-4-2:2008 ED. 2.0	Electrostatic discharge immunity test	PASS	Electrostatic Discharge – ESD: 8kV Air discharge, 4kV Contact discharge, Performance Criterion A
IEC 61000-4-3:2010 ED. 3.2	Radiated, radio-frequency, electromagnetic field immunity test	PASS	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
IEC 61000-4-8:2009 ED. 2.0	Power frequency magnetic field immunity test.	PASS	Power Frequency Magnetic Field Test, 50 Hz, 1A/m, Performance Criterion A

1.1 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:

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Mains Terminal Disturbance Voltage Test	0.15MHz ~ 30MHz	+/- 2.70 dB
Radiated Emission Test	30MHz ~ 1000MHz	+/- 4.10 dB



2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	ELECTRON
MODEL NO.	U270
ADDITIONAL MODELS	N/A
POWER SUPPLY	DC 3.7V from Li-ion battery or DC 5V from Host Unit
DATA CABLE SUPPLIED	USB Cable: Shielded, Detachable, 0.5m.
THE HIGHEST OPERATING FREQUENCY	Below 108MHz

NOTE:

1. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
2. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
3. Please refer to the EUT photo document (Reference No.:151201N015) for detailed product photo.



2.2 DESCRIPTION OF TEST MODES

The EUT was tested under the **Charging** mode for all tests.

2.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT has been tested and complied with the requirements of the following standards:

EN 55022:2010 + AC:2011, Class B

EN 55024:2010

IEC 61000-4-2:2008 ED. 2.0

IEC 61000-4-3:2010 ED. 3.2

IEC 61000-4-8:2009 ED. 2.0

Notes: The above IEC basic standard are applied with latest version if customer has no special requirement.

Due to the EUT is powered by computer, there was no need for the Harmonics, Flicks, EFT, Surge, CS, Dips tests.

2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as a dependent 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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook PC	Lenovo	E430	MP-0DN27	N/A
2	Notebook PC	DELL	E6420	9H12FS1	N/A
3	Printer	HP	hp LaserJet 1300	CNSJF75989	N/A
4	Printer	Lenovo	LJ2200L	LP00857415	N/A
5	Mouse	DELL	MOC5UO	J0Z008H3	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line :Unshielded, Detachable,1.0m; DC Line: Unshielded, Undetachable,2.0m;
2	AC Line :Unshielded, Detachable,1.5m; DC Line: Unshielded, Undetachable,1.8m;
3	AC Line :Unshielded, Detachable 1.5m; USB Line: Unshielded, Detachable 1.5m
4	AC Line :Unshielded, Detachable 1.5m; USB Line: Unshielded, Detachable 1.8m
5	USB Line: Unshielded, Detachable 1.8m



3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	100340	May 11,15	May 10,16
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	April 25,15	April 24,16
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	April 25,15	April 24,16
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Jan. 08,16	Jan. 07,17
Test software	ADT	ADT_Cond_ V7.3.7	N/A	N/A	N/A

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
 2. The test was performed in shielding room 553.



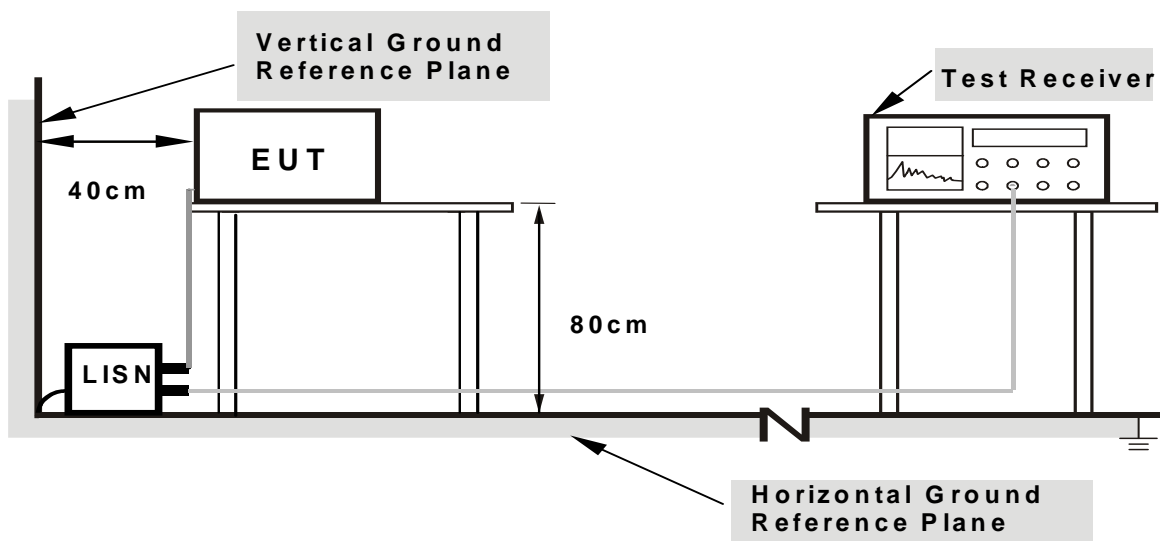
3.1.3 TEST PROCEDURE

- 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 frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

3.1.5 TEST SETUP



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

3.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power of all equipment.
- b. EUT was operated according to the type description in manufacturer's specifications or the User's Manual.

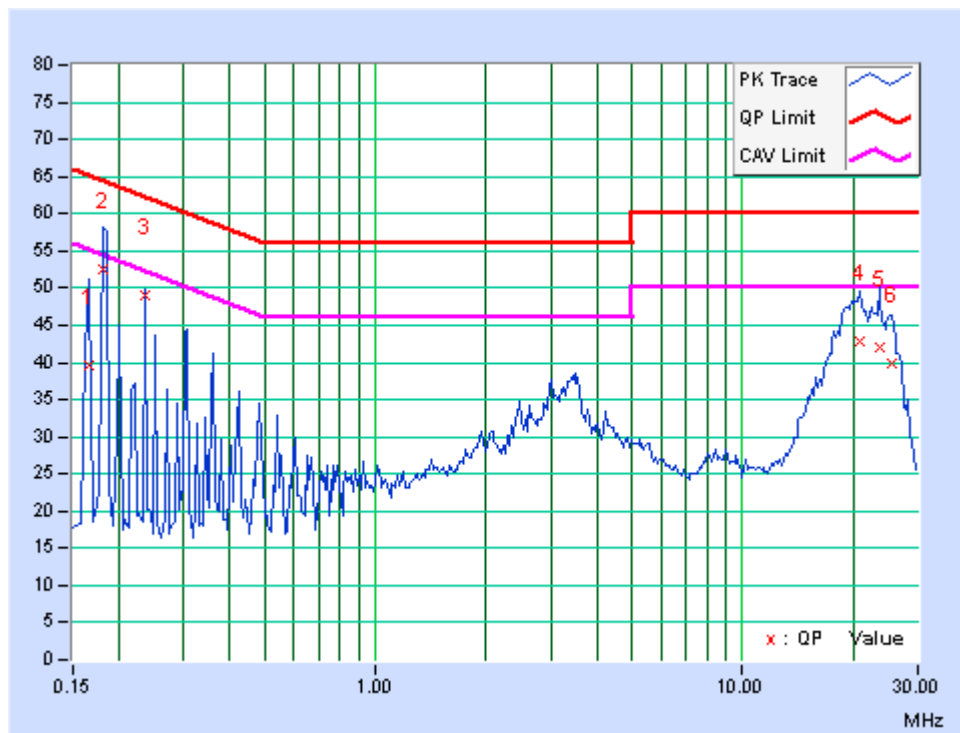


3.1.7 TEST RESULTS

TEST MODE	Charging	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 5V from notebook	PHASE	Line (L)
ENVIRONMENTAL CONDITIONS	25 deg. C, 67% RH	TESTED BY	David

No.	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.74	29.99	6.51	39.73	16.25	65.18	55.18	-25.45	-38.93
2	0.18125	9.72	42.93	27.66	52.65	37.38	64.43	54.43	-11.77	-17.04
3	0.23594	9.72	39.34	22.03	49.06	31.75	62.24	52.24	-13.18	-20.49
4	20.82422	10.06	32.90	26.44	42.96	36.50	60.00	50.00	-17.04	-13.50
5	23.51563	10.15	31.85	24.22	42.00	34.37	60.00	50.00	-18.00	-15.63
6	25.56641	10.17	29.81	20.95	39.98	31.12	60.00	50.00	-20.02	-18.88

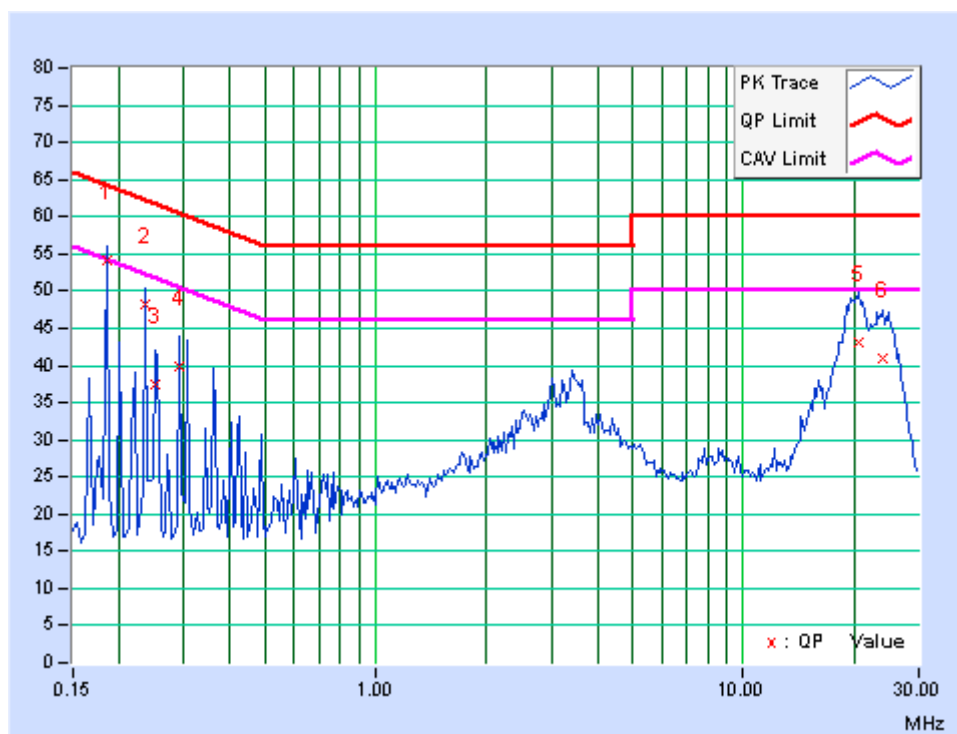
REMARKS: The emission levels of other frequencies were very low against the limit.



TEST MODE	Charging	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 5V from notebook	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	25 deg. C, 67% RH	TESTED BY	David

No.	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18516	9.48	44.71	27.44	54.19	36.92	64.25	54.25	-10.06	-17.33
2	0.23594	9.48	38.75	22.21	48.23	31.69	62.24	52.24	-14.01	-20.55
3	0.25156	9.48	28.07	8.25	37.55	17.73	61.71	51.71	-24.16	-33.98
4	0.29063	9.47	30.52	10.25	39.99	19.72	60.51	50.51	-20.51	-30.78
5	20.50781	9.71	33.26	28.00	42.97	37.71	60.00	50.00	-17.03	-12.29
6	23.80469	9.87	31.10	23.88	40.97	33.75	60.00	50.00	-19.03	-16.25

REMARKS: The emission levels of other frequencies were very low against the limit.





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: EN 55022

FOR FREQUENCY BELOW 1000 MHz

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	Quasi-Peak dBuV/m	Quasi-Peak dBuV/m
30 – 230	40	30
230 – 1000	47	37

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	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

TEST STANDARD: EN 55022

FOR FREQUENCY ABOVE 1000 MHz

FREQUENCY (GHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1 to 3	76	56	70	50
3 to 6	80	60	74	54

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



3.2.2 TEST INSTRUMENTS

Frequency range below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	100962	Mar. 05,15	Mar. 04,16
EMI Test Receiver	Rohde&Schwarz	ESCI	101418	Mar. 05,15	Mar. 04,16
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-555	Nov. 20, 15	Nov. 19, 16
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-554	Dec. 30, 15	Dec. 29, 16
Bilog Antenna	Teseq	CBL 6111D	27089	Jun. 25,15	Jun. 24,16
Signal Amplifier	Agilent	8447D	2944A10488	Jun. 25,15	Jun. 24,16
Signal Amplifier	Agilent	8447D	2944A11174	Jun. 25,15	Jun. 24,16
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Jun. 10, 15	Jun. 09, 16
Test Software	ADT	ADT_Radiated_V8.7.x	N/A	N/A	N/A

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV40	101003	Apr. 07, 15	Apr. 06, 16
Pre-Amplifier (100MHz-26.5GHz)	EMCI	EMC 012645	980077	May 26,15	May 25,16
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 11,15	Nov. 10,16
Test Software	ADT	ADT_Radiated_V8.7.x	N/A	N/A	N/A

NOTE: 1. The test was performed in 10m Chamber.
2. The calibration interval of the above test instruments is 24 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	ETS-Lindgren	3117	00085519	Dec. 30, 15	Dec. 29, 16

NOTE: 1. The test was performed in 10m Chamber.
2. The calibration interval of the above test instruments is 24 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170242	Feb. 13,14	Feb. 12,17

NOTE: 1. The test was performed in 10m Chamber.
2. The calibration interval of the above test instruments is 36 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber room. 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 height of antenna is varied from 1 meter to 4 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 below 1GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
4. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier).
5. $\text{Margin value} = \text{Emission level} - \text{Limit value}$.

**<Frequency Range above 1GHz>**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter 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. The bore sight should be used during the test above 1GHz.
- 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 test receiver/spectrum was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
3. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
4. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
5. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier).
6. $\text{Margin value} = \text{Emission level} - \text{Limit value}$.

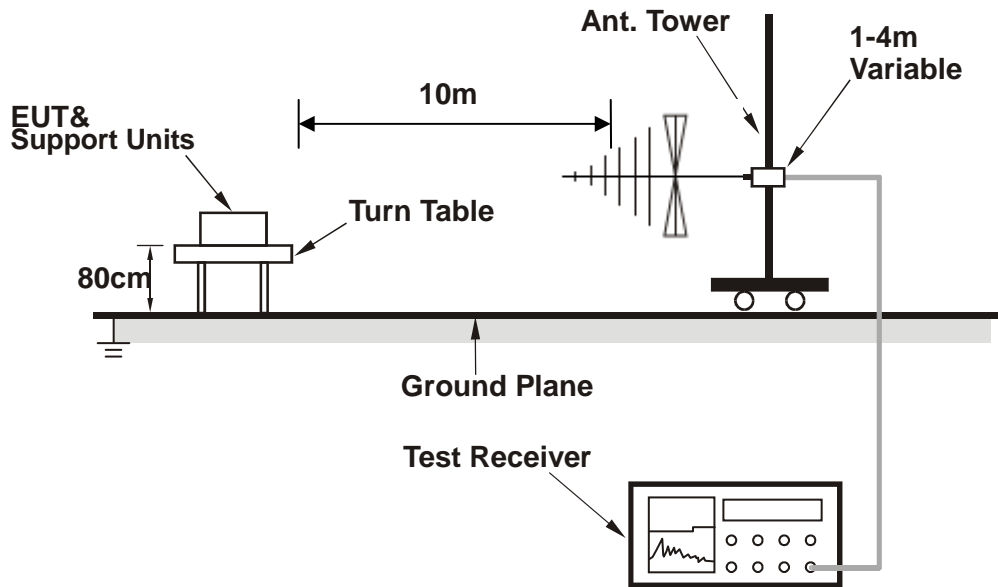
3.2.4 DEVIATION FROM TEST STANDARD

No deviation.

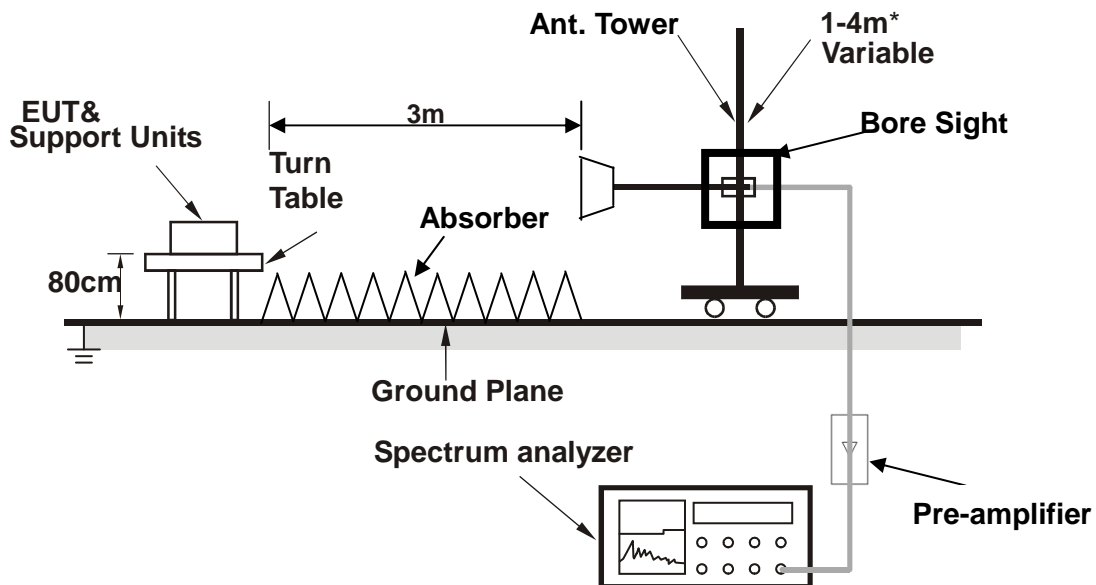


3.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



*depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3

3.2.6 EUT OPERATING CONDITIONS

Same as item 3.1.6.



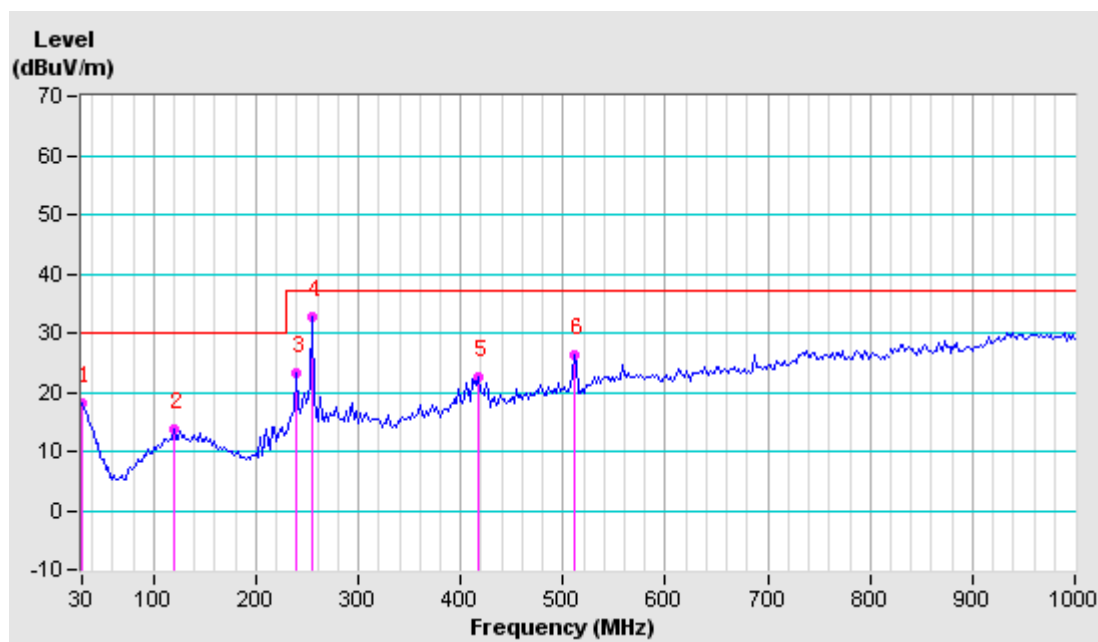
3.2.7 TEST RESULTS

TEST MODE	Charging	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	DC 5V from notebook	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 55% RH	TESTED BY:	Ian xie

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M

No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	30.000	-8.39	26.52	18.13	30.00	-11.87	200	128
2	119.240	-14.43	28.13	13.70	30.00	-16.30	400	248
3	239.520	-14.34	37.62	23.28	37.00	-13.72	400	82
4	255.040	-11.76	44.47	32.71	37.00	-4.29	400	188
5	418.000	-8.35	31.06	22.71	37.00	-14.29	200	295
6	511.120	-6.77	33.18	26.41	37.00	-10.59	200	60

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 30MHz to 1000MHz.
 4. Only emissions significantly above equipment noise floor are reported.

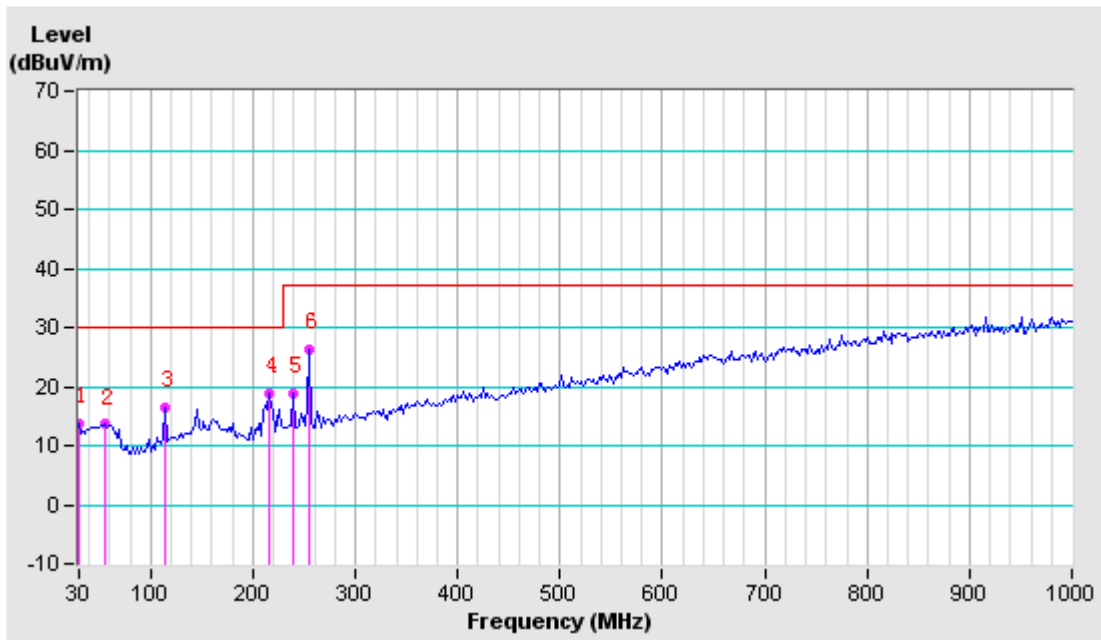




TEST MODE	Charging	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	DC 5V from notebook	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	20deg. C, 55% RH	TESTED BY: Ian xie	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Correction Factor (dB/m)	Raw Value (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)
1	30.000	-14.45	28.18	13.73	30.00	-16.27	200	345
2	55.220	-13.39	27.02	13.63	30.00	-16.37	300	92
3	113.420	-15.93	32.36	16.43	30.00	-13.57	300	153
4	216.240	-14.45	33.24	18.79	30.00	-11.21	100	358
5	239.520	-13.04	31.93	18.89	37.00	-18.11	400	20
6	255.040	-12.47	38.79	26.32	37.00	-10.68	400	205

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 30MHz to 1000MHz.
 4. Only emissions significantly above equipment noise floor are reported.





4 IMMUNITY TEST

4.1 GENERAL DESCRIPTION

4.1.1 GENERAL DESCRIPTION OF EN 55024

Product Standard:	EN 55024:2010	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: 4kV Contact discharge, 8kV air discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50 Hz, 1A/m, Performance Criterion A



4.1.2 PERFORMANCE CRITERIA

According to Clause 7.1 of EN 55024:2010 standard, the following describes the general performance criteria.

CRITERION A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT 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, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.
CRITERION B	<p>After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance.</p> <p>During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.</p> <p>If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the EUT if used as intended.</p>
CRITERION C	<p>During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions.</p> <p>Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p>

4.1.3 EUT OPERATING CONDITION

Same as item 3.1.6



4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

4.2.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Contact Discharge : +/- 4 kV (Direct & Indirect) Air Discharge: +/- 8kV (Direct)
Polarity:	Positive & Negative
Number of Discharge:	Contact Discharge :200 times in total Air Discharge:20 times on each test points
Discharge Mode:	Single Discharge
Discharge Period:	1 second

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD Generator	TESEQ	NSG 437	279	Feb. 03, 15	Feb. 02, 16
Test Software	TESEQ	V03.03	N/A	N/A	N/A
ESD Generator	EM TEST	Dito	V1211112265	Aug. 08,15	Aug. 07,16
Test Software	EM TEST	V 2.31	N/A	N/A	N/A

NOTE: 1. The test was performed in ESD Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.2.3 TEST PROCEDURE

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 horizontal coupling plane. 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 IEC 61000-4-2:

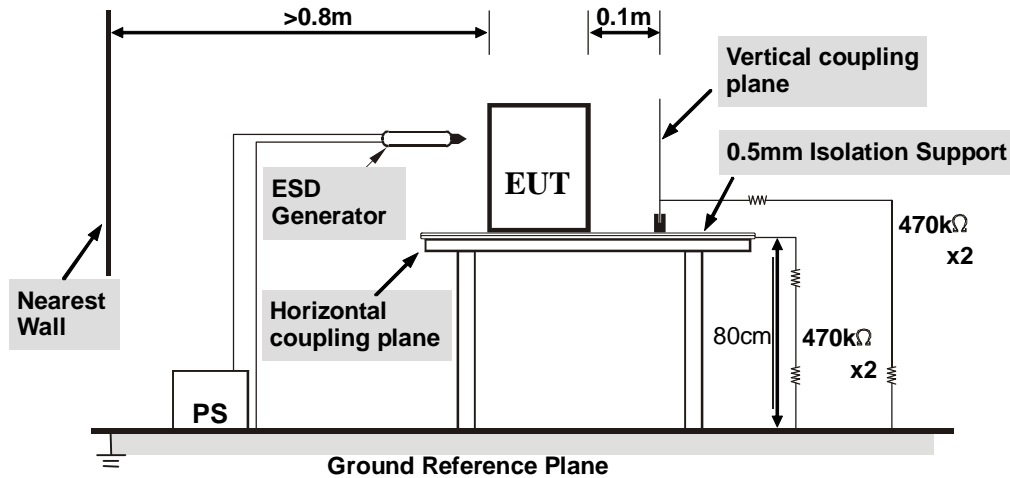
- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive 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 Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned horizontal 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 Vertical Coupling Plane 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.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.



4.2.5 TEST SETUP



NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. 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 **Horizontal Coupling Plane** (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 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.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC 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.



4.2.6 TEST RESULTS

TEST MODE	Charging	TEST VOLTAGE	DC 5V from notebook
ENVIRONMENTAL CONDITIONS	23.5deg. C, 44.5% RH, 101.5Kpa	TESTED BY: Paul Liang	

Direct Discharge Application				
Test Level (kV)	Polarity	Test Point	Test Result of Contact Discharge	Test Result of Air Discharge
4	+/-	All metal parts	A	N/A
8	+/-	All nonmetal parts	N/A	A

Indirect Discharge Application				
Discharge Level (kV)	Polarity	Test Point	Test Result of HCP	Test Result of VCP
4	+/-	HCP	A	N/A
4	+/-	VCP	N/A	A

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



4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

4.3.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-3
Frequency Range:	80-1000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	at least 3 seconds

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Generator	Agilent	N5181A	MY50142530	Oct. 12,15	Oct. 11,16
Bilog Antenna	Teseq	CBL 6111D	27089	Jun. 25,15	Jun. 24,16
Antenna Log-Periodic	CORAD	ATS700M11G	0336821	N/A	N/A
Switch Controller	CORAD	SC1000	0337343	N/A	N/A
RF Power Meter	ESE	4242	13984	Nov. 09,15	Nov. 08,16
Power Sensor	ESE	51011EMC	35716	Nov. 09,15	Nov. 08,16
Power Sensor	ESE	51011EMC	35715	Nov. 09,15	Nov. 08,16
E-Field probe	Narda	NBM-520	2403/01B	May 28, 15	May 27, 16
Power Amplifier	TESEQ	CBA 1G-150	T44029	N/A	N/A
Power Amplifier	TESEQ	CBA 3G-100	T44030	N/A	N/A
Power Amplifier	TESEQ	CBA 6G-050	1041204	N/A	N/A
Dual Directional Coupler	TESEQ	C5982	95208	Nov. 09,15	Nov. 08,16
Dual Directional Coupler	TESEQ	C6187	95175	Nov. 09,15	Nov. 08,16
Dual Directional Coupler	TESEQ	CPH-274F	M251304-01	Nov. 09,15	Nov. 08,16
Test Software	ADT	BVADT_RS_V7. 6.4-DG	N/A	N/A	N/A

NOTE: 1. The test was performed in RS chamber.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



4.3.3 TEST PROCEDURE

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

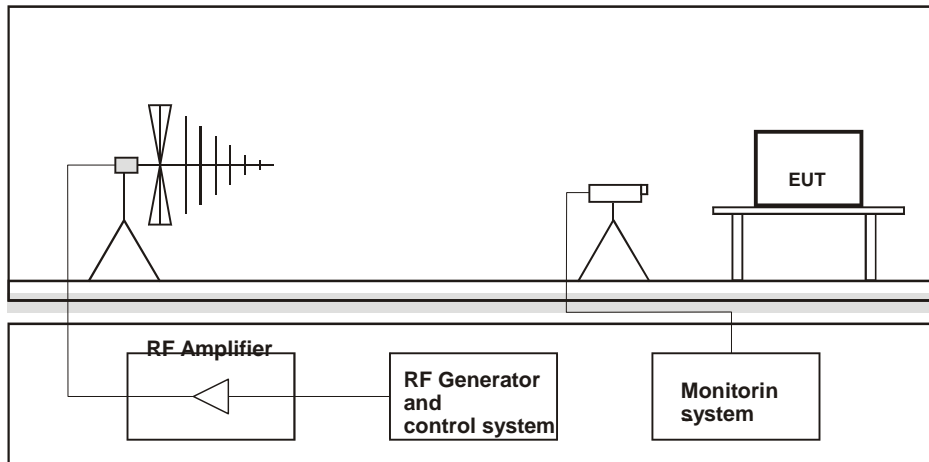
- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave.
- c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.
- d. The field strength levels were 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.



4.3.5 TEST SETUP



NOTE:

TABLETOP EQUIPMENT

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

FLOOR STANDING EQUIPMENT

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



4.3.6 TEST RESULTS

TEST MODE	Charging	TEST VOLTAGE	DC 5V from notebook
ENVIRONMENTAL CONDITIONS	23.5 deg. C, 44.5% RH	TESTED BY: Paul Liang	

Field Strength (V/m)	Test Frequency Note ^{#1} (MHz)	Polarization of antenna (Horizontal / Vertical)	Test Distance (m)	Test Result	Remark
3	80 - 1000	H&V	3	A	N/A

Note^{#1}:

Tested Israel SII Frequencies 89,100,107,144,163,196,244,315,434,460,600,825,845,880 MHz

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



4.4 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC 61000-4-8
Frequency Range:	50Hz
Field Strength:	1A/m
Observation Time:	5 minute
Inductance Coil:	Rectangular type, 1mx1m

4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Magnetic Field Tester	HAEFELY	MAG100.1	150579	Oct. 12,15	Oct. 11,16
Test Software	N/A	N/A	N/A	N/A	N/A

NOTE: 1. The test was performed in Shielding Room 843. .
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.4.3 TEST PROCEDURE

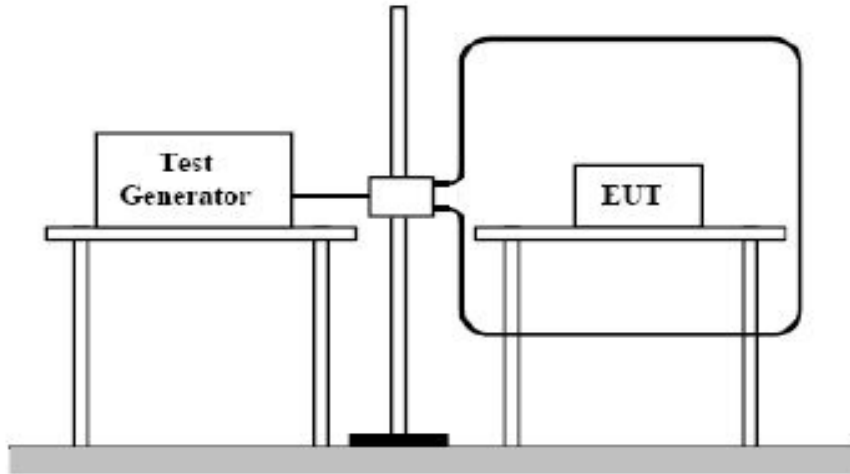
- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.



4.4.5 TEST SETUP



NOTE:

TABLETOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 % of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.



4.4.6 TEST RESULTS

TEST MODE	Charging	TEST VOLTAGE	DC 5V from notebook
ENVIRONMENTAL CONDITIONS	20.4 deg. C, 50.7% RH	TESTED BY: Sook	

Magnetic field direction	Testing result	Remark
X - Axis	A	1A/m
Y - Axis	A	1A/m
Z - Axis	A	1A/m

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

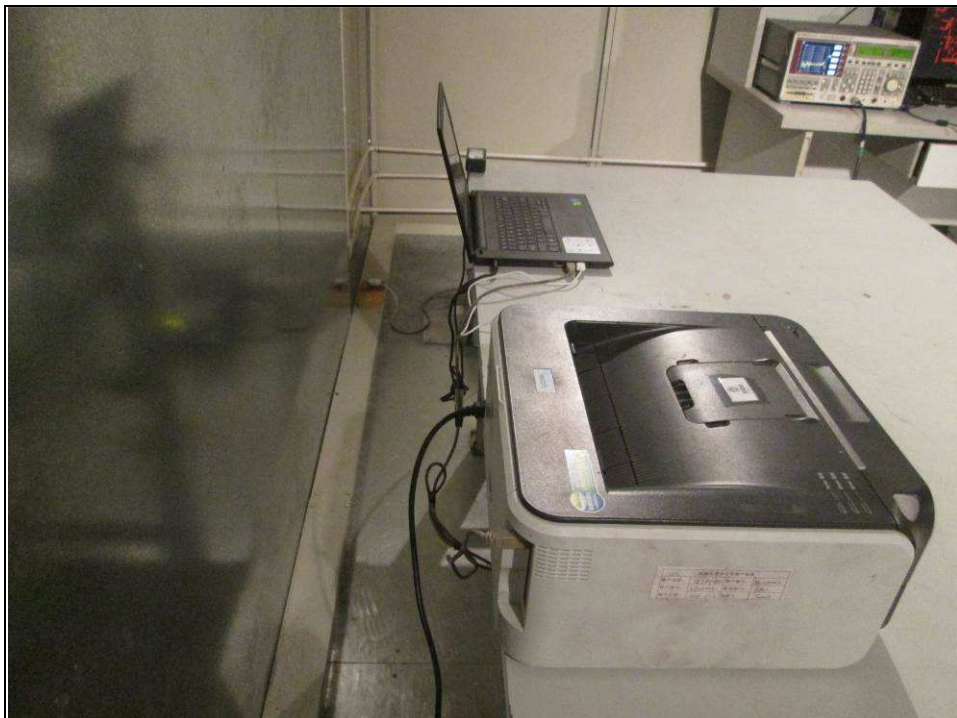
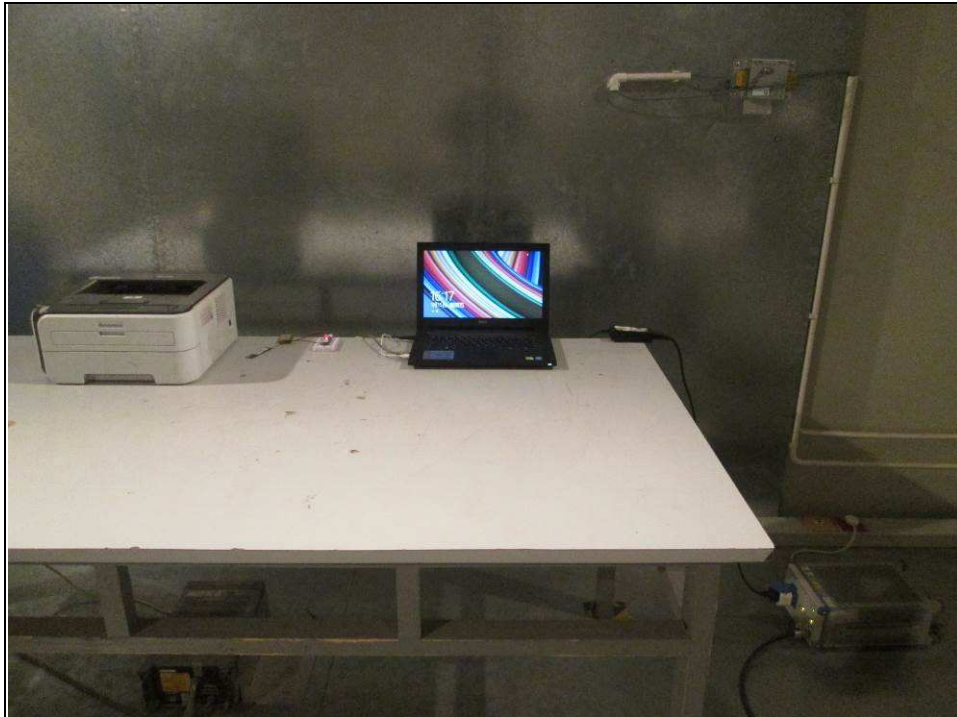


**BUREAU
VERITAS**

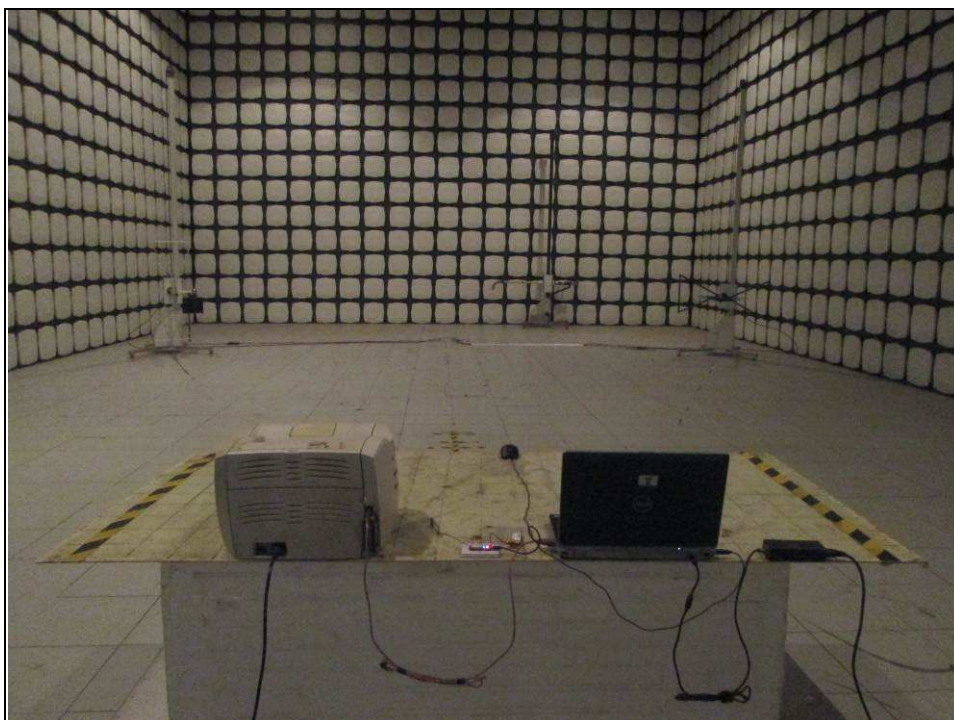
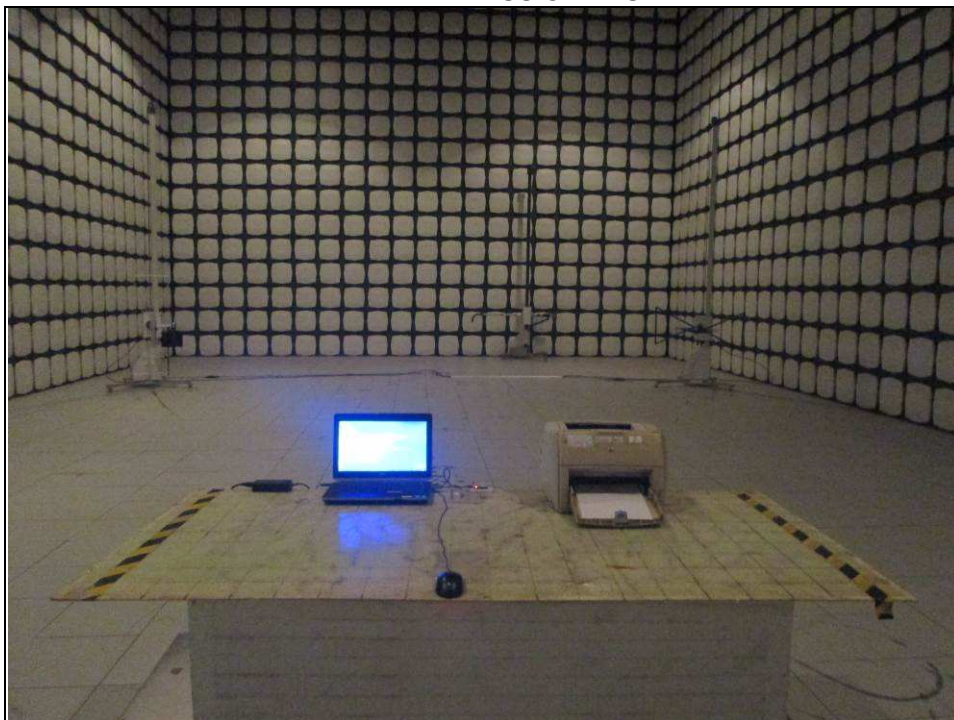
Test Report No.: CE151201N015

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

CONDUCTED EMISSION TEST



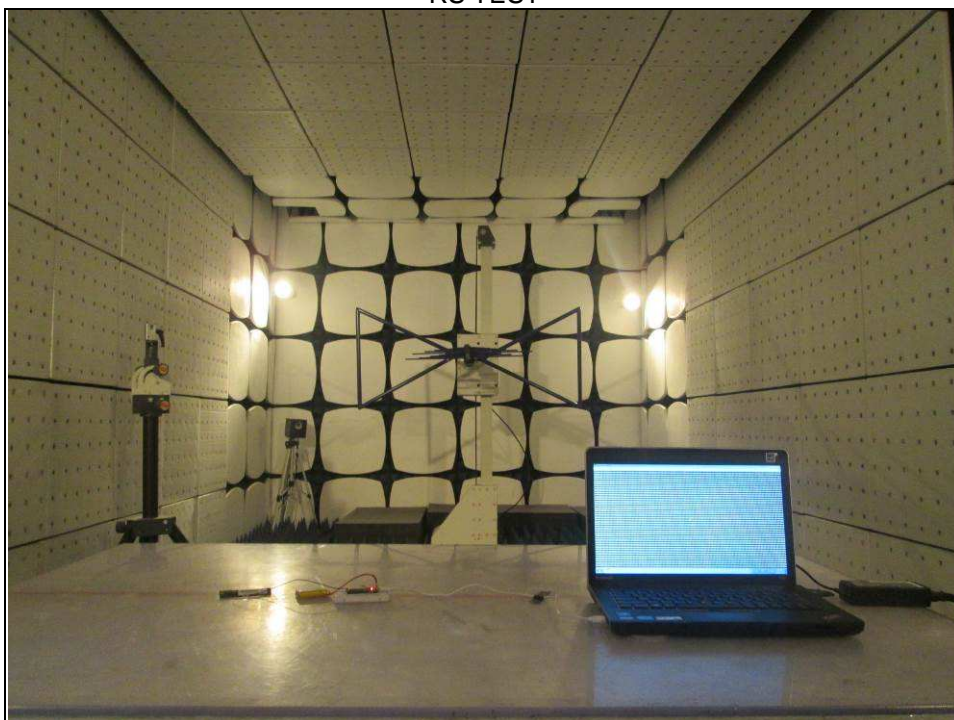
RADIATED EMISSION TEST



ESD TEST



RS TEST



POWER-FREQUENCY MAGNETIC FIELDS TEST





Test Report No.: CE151201N015

6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---