EMC TEST REPORT

Report No.:	SET2014-04800
Product Name:	RVGPS
FCC ID:	A4C10003A
Model No. :	RVND7730,RVND7735
Applicant:	RM Acquisition LLC
Address:	9855 Woods Drive Skokie, Illinois 60077
Received Date:	2014-05-15
Tested Date:	2013-05-15—2014-05-26

Issued by:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
Lab Location:	Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen, 518055, P. R. China
	Tel: 86 755 26627338 **Fax:** 86 755 26627238

Test Report

Product Name ..... :	RVGPS
Model No. ..... :	RVND7730,RVND7735
Applicant ..... :	RM Acquisition LLC
Applicant Address ..... :	9855 Woods Drive Skokie, Illinois 60077
Manufacturer ..... :	Longhorn Auto Limited
Manufacturer Address ..... :	Longhorn Hi-tech Estate,Gongyeyuan Rd.,Dalangstreet,Longhua,Shenzhen,China
Test Standards ..... :	47 CFR Part 15 Subpart B: Radio Frequency Devices
Test Result ..... :	PASS
Tested by ..... :	Xiaolong Zhang 2014.05.27 Xiaolong Zhang, Test Engineer
Reviewed by ..... :	Shuangwen zhang 2014.05.27 Shuangwen Zhang, Senior Engineer
Approved by ..... :	Wu Lian 2014.05.27 Wu Li'an, Manager

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Change History		
Issue	Date	Reason for change
1.0	2014.05.27	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Name ..... :	RVGPS
Serial No..... :	(n.a, marked #1 by test site)
FCC ID ..... :	A4C10003A
Trade Name……..:	Rand McNally, Good Sam
Brand Name……:	/
Hardware Version..... …. :	LR007 VER3.0
Software Version……..:	VER1.01
Power Supply ..... :	Battery
	Brand Name: SouthRiver
	Model No.: SR384254HT-1S1P
	Serial No.: (n.a. marked #1 by test site)
	Capacitance: 950 mAh
	Rated Voltage: 3.7V
	Charge Limit: 4.2V
Ancillary Equipment 1 ..... :	AC Adapter (Charger for Battery)
	Brand Name: Gospell
	Model No.: GP061Z
	Serial No.: (n.a. marked #1 by test site)
	Rated Input: 12-24V, 0.5A, 1000mA
	Rated Output: 5V⎓2.0A
Ancillary Equipment 2……..:	PC
	Brand Name: ThinkPad
	Model Name:E430C
	Serial No.:A131101550

Note1:The EUT is a RVGPS, it supports the following operating frequency band:802.11b,802.11g, 802.11n/20M.

Note2:The EUT is equipped with a T-Flash card slot; equipped with a USB port which can be connected to the ancillary equipments supplied by the manufacturer e.g. the car charger.

Note 3:The EUT is powered by 12V DC or Notebook. The USB cable is attached with a core.

Note 4:For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.2 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B 2012	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.107	Conducted Emission	PASS
2	15.109	Radiated Emission	PASS

NOTE:

(1) The EUT has been tested according to 47 CFR Part 15 Subpart B，Class B.The test procedure is according to ANSI C63.4:2009 and CISPR 22:2008.The test results are as following：

1.3 Facilities and Accreditations

1.3.1 Facilities

CNAS-Lab Code: L1659
CCIC-SET Southern Electronic Product Testing (Shenzhen) Co., Ltd. CCIC is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659. A 12.8*6.8*6.4 (m) fully anechoic chamber was used for the radiated spurious emissions test.
FCC-Registration No.: 406086
CCIC-SET Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 406086, Renewal date Nov. 19, 2011, valid time is until Nov. 18, 2014.

1.3.2 Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15℃- 35℃
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

1.3.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission:	Uc = 3.6 dB (k=2)
Uncertainty of Radiated Emission:	Uc = 4.5 dB (k=2)

2. TEST CONDITIONS SETTING

2.1 Test Mode

(1) The first test mode

The EUT configuration of the emission tests is TransFlash Card + EUT + Battery + PC.

In this test mode, the EUT with a TransFlash Card embedded is connected with a PC via a USB cable supplied by applicant. During the measurement, the data is transmitting between the PC and the TransFlash Card of the EUT.

(2) The second test mode

The EUT configuration of the emission tests is Internal memory+ EUT + Battery + PC.

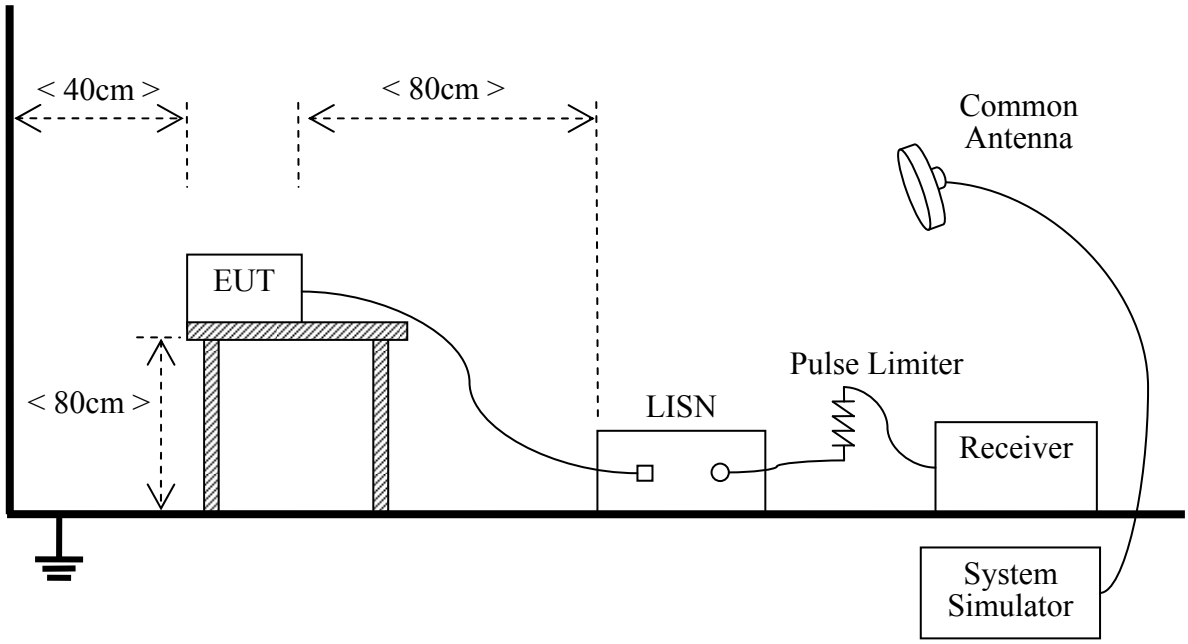
In this test mode, the EUT with a Internal memory is connected with a PC via a USB cable supplied by applicant. During the measurement, the data is transmitting between the PC and the Internal memory of the EUT.

NOTE: All test modes are performed, only the worse case（the first test mode）is recorded in this report.

2.2 Test Setup and Equipments List

2.2.1 Conducted Emission

A. Test Setup:



The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides 50Ω/50μH of coupling impedance for the measuring instrument. The Common Antenna is used for the call between the EUT and the System Simulator (SS). A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

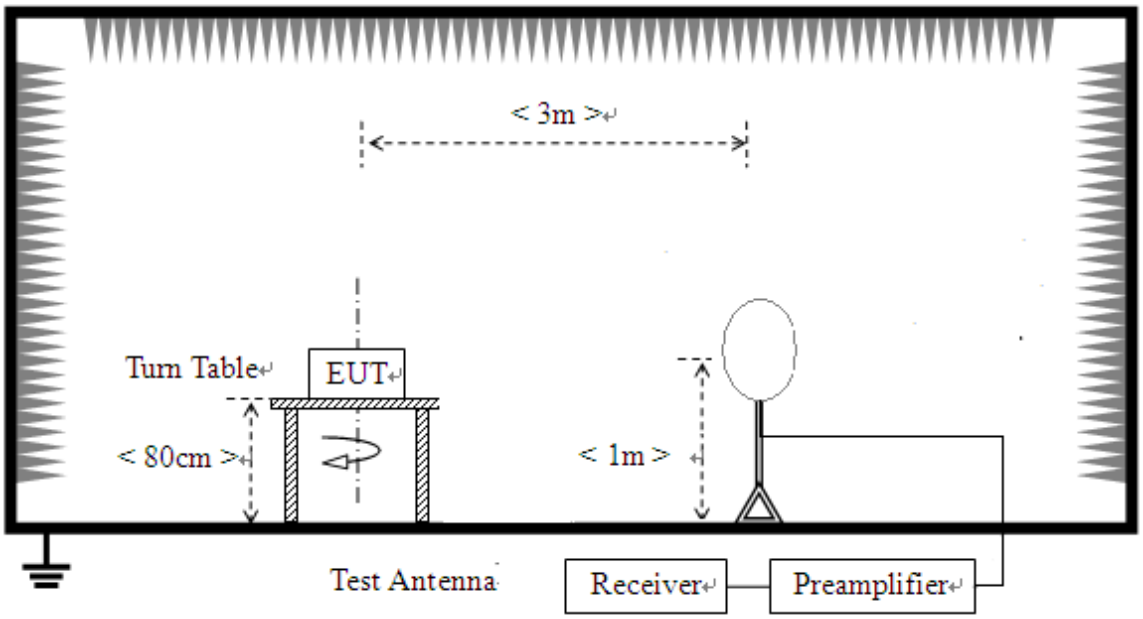
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Due. Date
Test Receiver	ROHDE&SCHWARZ	ESCI	A130901475	2014.09.09
LISN	Schaffner	NNB41	A0304245	2014.09.11

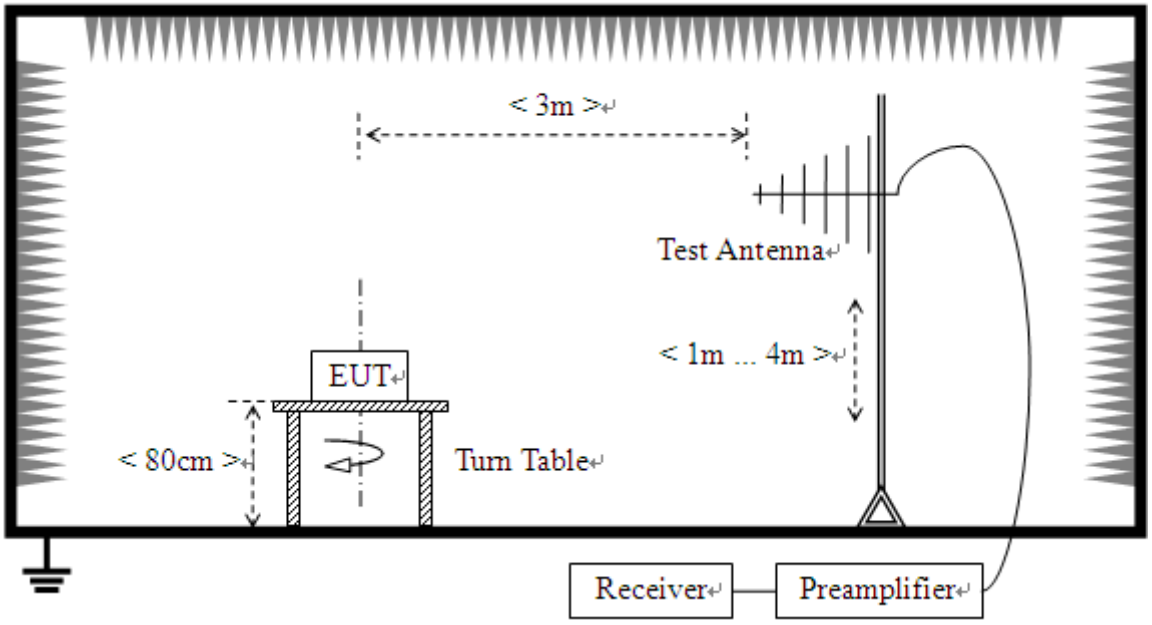
2.2.2 Radiated Emission

A. Test Setup:

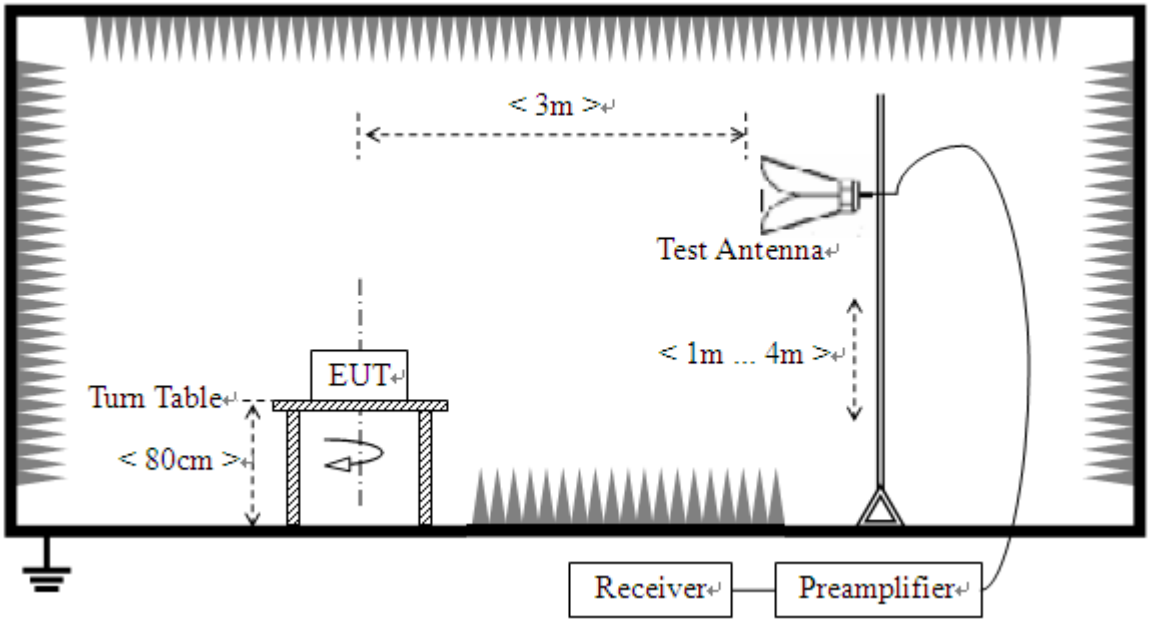
1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



3) For radiated emissions above 1GHz



B. Test Procedure

The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

1) In the frequency range of 9 kHz to 30MHz, magnetic field is measured with Loop Test Antenna.

The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

2) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

C. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Due. Date
Test Receiver	ROHDE&SCHWARZ	ESIB7	A0501375	2014.06.10
Test Receiver	ROHDE&SCHWARZ	ESIB26	A0304218	2014.06.10
Semi-Anechoic	Albatross	9m*6m*6m	A0412372	2015.01.04

Description	Manufacturer	Model	Serial No.	Calibration Due. Date
Chamber				
Test Antenna - Bi-Log	HP	CBL6111A	A9704202	2014.06.10
Test Antenna – Horn	ROHDE&SCHWARZ	HF906	A0304225	2014.06.10
System Simulator	ROHDE&SCHWARZ	CMU200	A0304212	2014.06.10
Anechoic Chamber	Albatross	SAC-5MAC 12.8x6.8x6.4m	A0304210	2015.03.09
Amplifier 1G~18GHz	ROHDE&SCHWARZ	MITEQ AFS42-00101800	A0509366	2014.06.10
Amplifier 20M~3GHz	Compliance Direction System	PAP-0203H	A0509377	2014.06.10
loop antenna	HFH2-Z2	R&S	A0304220	2016.06.28
Anechoic Chamber	Albatross	SAC-5MAC 19.6x11.8x8.5m	A0304210	2015.03.09
EMI Test Receiver	R&S	ESCI	A0902601	2014.09.09

3. 47 CFR PART 15B REQUIREMENTS

3.1 Conducted Emission

3.1.1 Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

a) The limit subjects to the Class B digital device.

b) The lower limit shall apply at the band edges.

c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2 Test Description

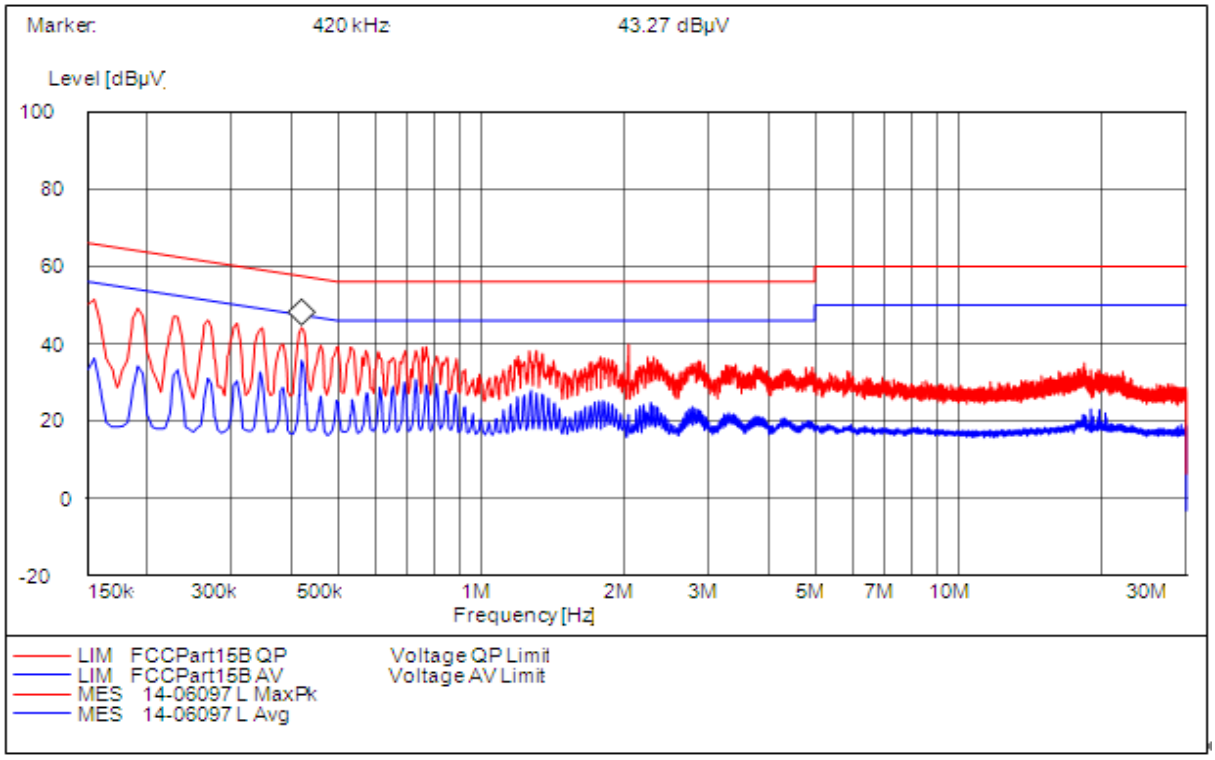
See section 2.2.1 of this report.

3.1.3 Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

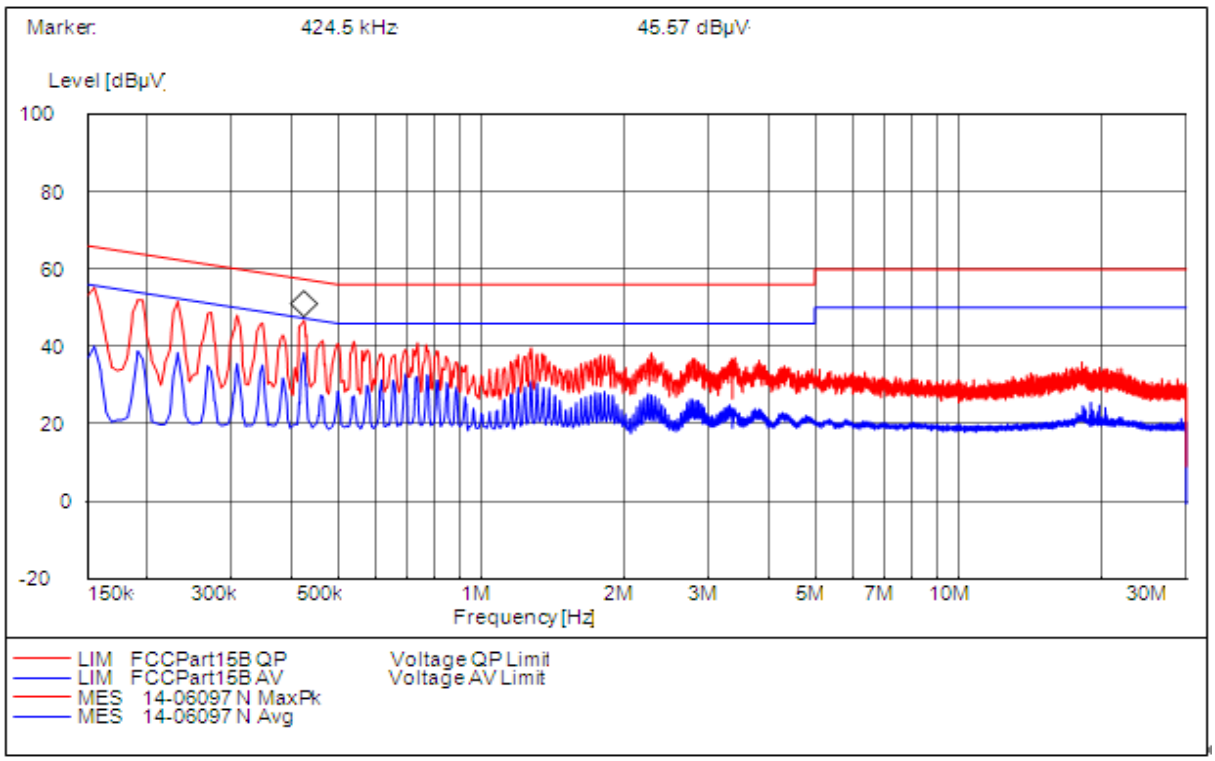
3.1.3.1 Test Mode

A. Test Plot and Suspicious Points:



Conducted Disturbance at Mains Terminals							
L Test Data							
QP				AV			
Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)	Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)
0.1545	65.80	47.89	17.91	0.1545	55.80	35.78	20.02
0.3480	59	39.64	19.36	0.3480	49	32.52	16.48
0.4200	57.40	41.89	15.51	0.4200	47.40	37.12	10.28
L Test Curve							

(Plot A: L Phase)



Conducted Disturbance at Mains Terminals							
N Test Data							
QP				AV			
Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)	Frequency (MHz)	Limits (dBµV)	Measurement Value (dBµV)	Margin (dB)
0.1545	52.96	65.80	13.84	0.1545	55.80	38.21	17.59
0.2310	62.40	49.78	12.62	0.2310	52.40	37.46	14.94
0.4245	56.00	42.96	13.04	0.4245	46.00	37.24	8.76
N Test Curve							

(Plot B: N Phase)

Test Result: PASS

3.2 Radiated Emission

3.2.1 Requirement

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength		Field Strength Limitation at 3m Measurement Dist	
	μV/m	Dist	(uV/m)	(dBuV/m)
0.009 - 0.490	2400/F(kHz)	300m	10000* 2400/F(kHz)	20log 2400/F(kHz) + 80
0.490 - 1.705	2400/F(kHz)	30m	100* 2400/F(kHz)	20log 2400/F(kHz) + 40
1.705 - 30.00	30	30m	100*30	20log 30 + 40
30.0 - 88.0	100	3m	100	20log 100
88.0 - 216.0	150	3m	150	20log 150
216.0 - 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

a) As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

b) Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

c) For below 1G :QP detector RBW 120kHz ,VBW 300kHz.

d) For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;PK detector RBW 1MHz, VBW 10Hz for AV value.

Note:

1) The tighter limit shall apply at the boundary between two frequency range.
2) Limitation expressed in dBuV/m is calculated by 20log Emission Level(uV/m).
3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of Ld1 = Ld2 * $(d2/d1)^{2.}$
   Example:
   F.S Limit at 30m distance is 30uV/m, then F.S Limitation at 3m distance is adjusted as
   Ld1 = L1 = 30uV/m * $(10)^2$ = 100 * 30uV/m.

3.2.2 Test Description

See section 2.2.2 of this report.

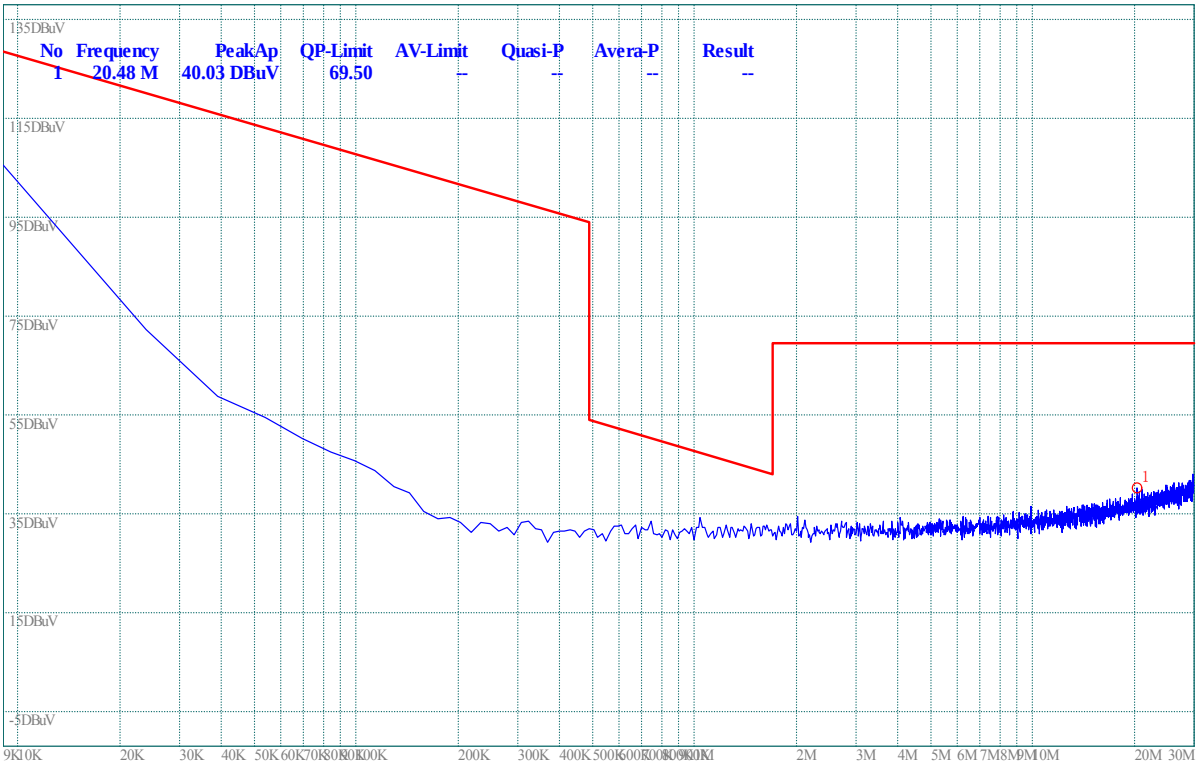
3.2.3 Test Result

The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

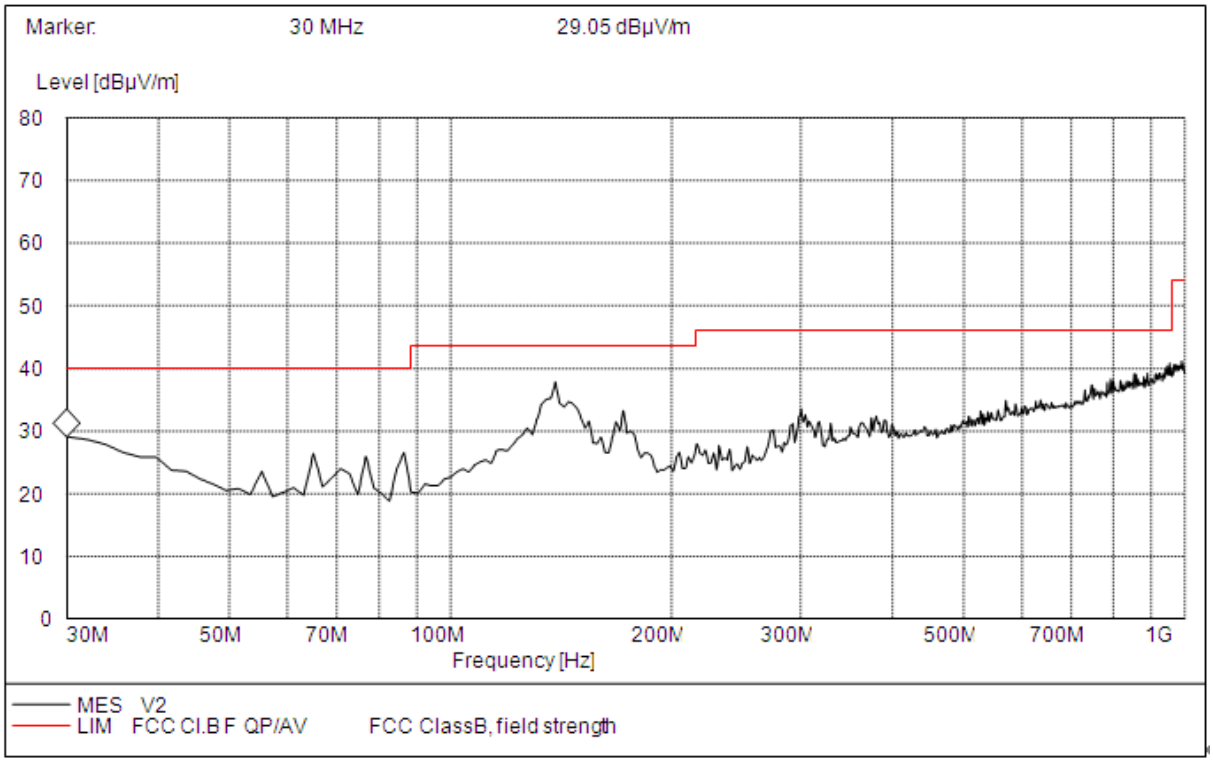
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

B. Test Plots and Suspicious Points:

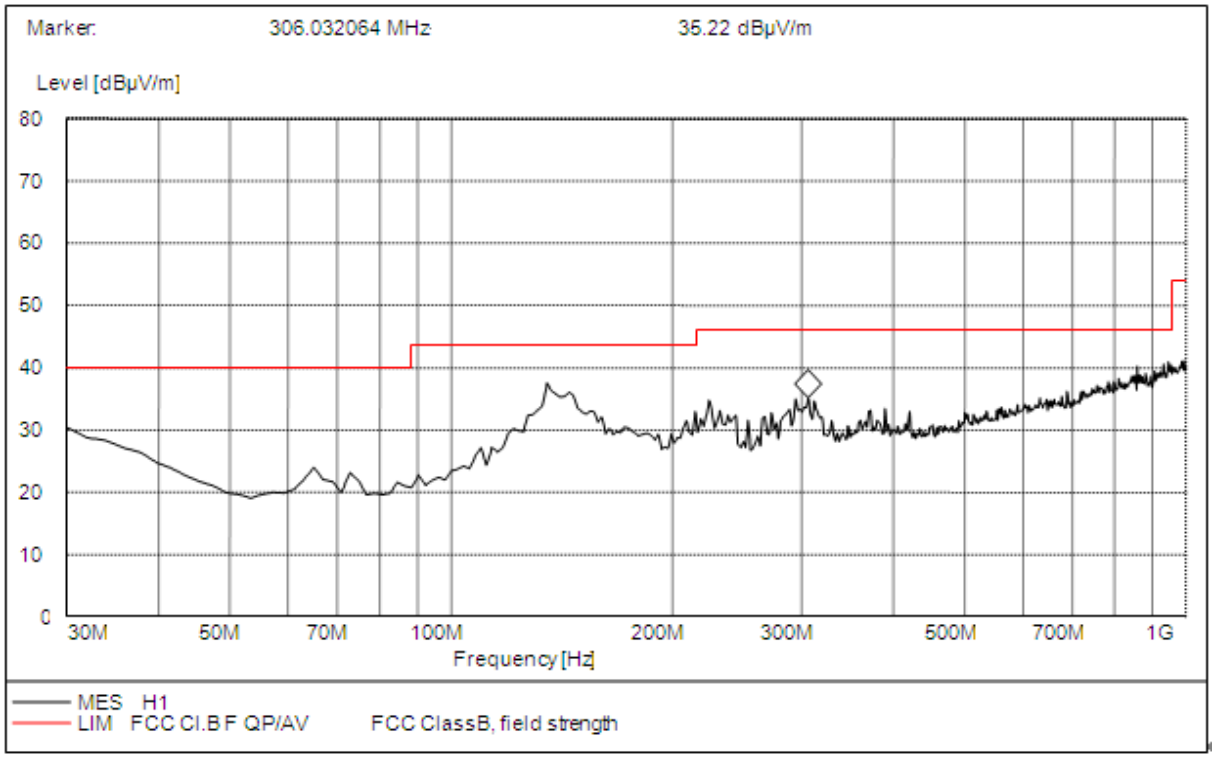


(Plot A: 9K – 30M)



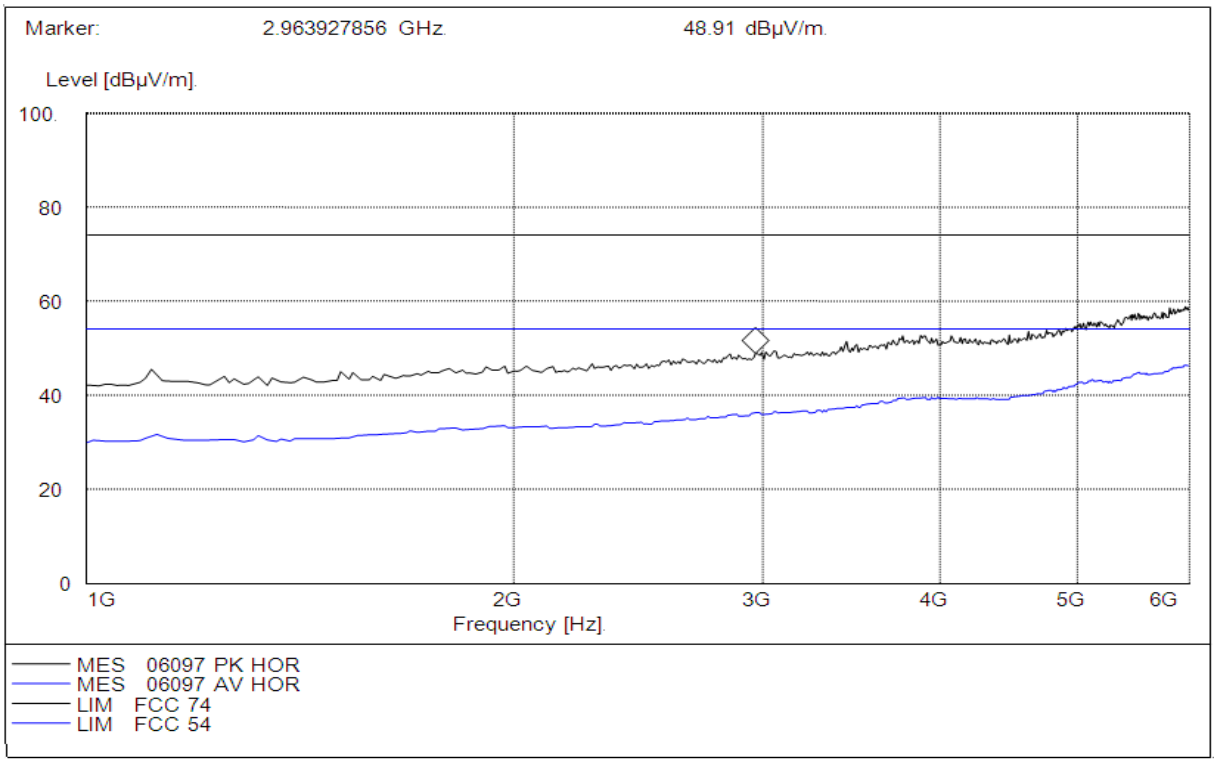
(Plot B: Test Antenna Vertical 30M - 1G)

Frequency (MHz)	QuasiPeak (dB µ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB µ V/m)	Margin (dB)	Antenna	Verdict
30.100000	29.01	120.000	100.0	40.00	10.99	Vertical	Pass
138.200000	37.79	120.000	100.0	43.50	5.71	Vertical	Pass
300.000000	33.50	120.000	100.0	46.00	12.50	Vertical	Pass



(Plot C: Test Antenna Horizontal 30M - 1G)

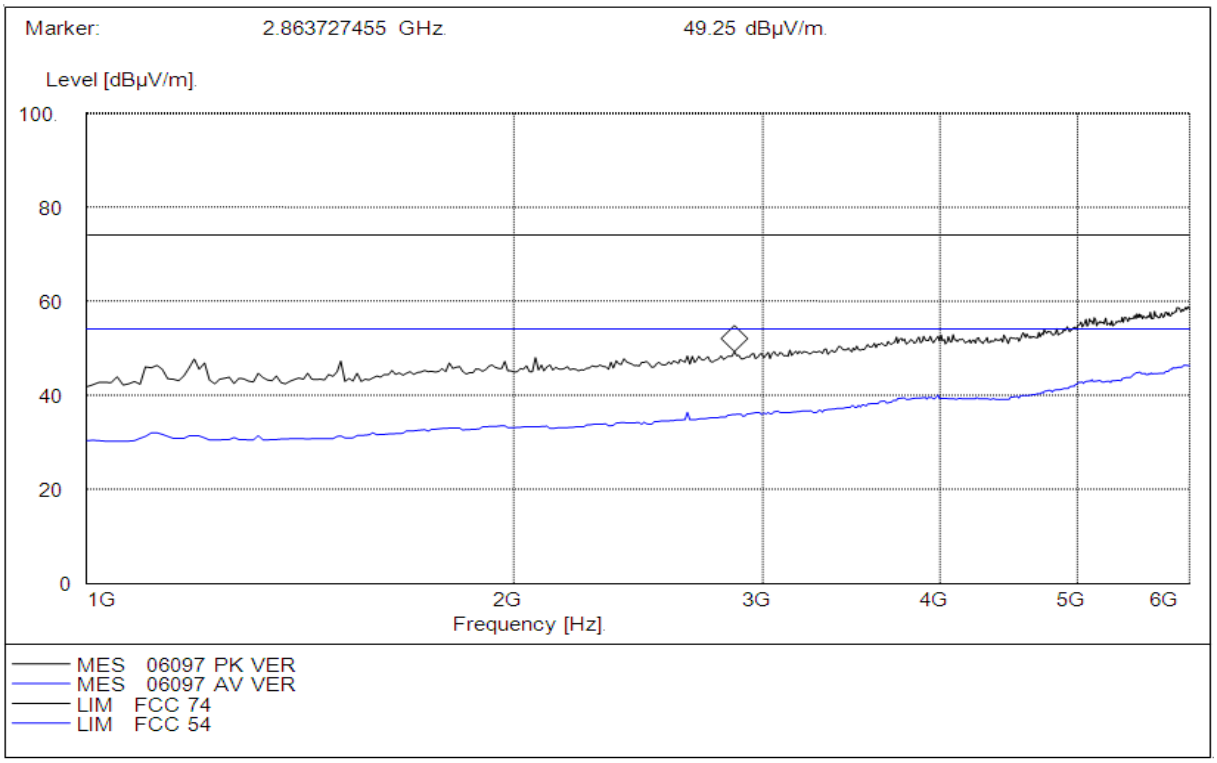
Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
134.960000	37.52	120.000	100.0	43.50	5.98	Horizontal	Pass
224.388000	34.82	120.000	100.0	46.00	11.18	Horizontal	Pass
306.030000	35.21	120.000	100.0	46.00	10.79	Horizontal	Pass



(Plot D: Test Antenna Horizontal 1G – 6G)

Frequency (MHz)	AV (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
1090.48090	30.62	1000.000	150.0	54.00	23.38	Horizontal	Pass
1962.92384	33.51	1000.000	150.0	54.00	20.49	Horizontal	Pass
2963.92786	36.51	1000.000	150.0	54.00	17.49	Horizontal	Pass
3745.38857	39.42	1000.000	150.0	54.00	14.58	Horizontal	Pass
4548.19418	39.81	1000.000	150.0	54.00	14.19	Horizontal	Pass
5840.77935	45.92	1000.000	100.0	54.00	8.08	Horizontal	Pass

Frequency (MHz)	PK (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBμV/m)	Margin (dB)	Antenna	Verdict
1090.48090	44.63	1000.000	150.0	74.00	29.37	Horizontal	Pass
1962.92384	46.88	1000.000	150.0	74.00	27.12	Horizontal	Pass
2963.92786	48.91	1000.000	150.0	74.00	25.09	Horizontal	Pass
3745.38857	52.36	1000.000	150.0	74.00	21.64	Horizontal	Pass
4548.19418	52.77	1000.000	150.0	74.00	21.23	Horizontal	Pass
5840.77935	58.91	1000.000	100.0	74.00	15.09	Horizontal	Pass



(Plot E: Test Antenna Vertical 1G – 6G)

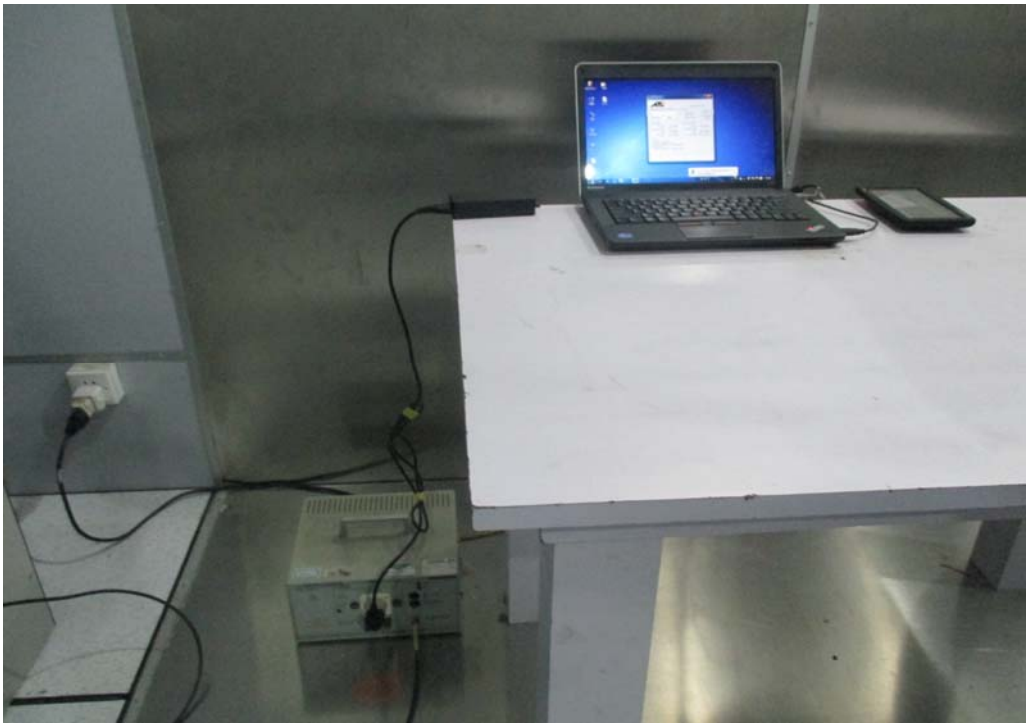
Frequency (MHz)	AV (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBμV/m)	Margin (dB)	Antenna	Verdict
1281.26232	31.78	1000.000	100.0	54.00	22.22	Vertical	Pass
1561.48677	34.98	1000.000	150.0	54.00	19.02	Vertical	Pass
2863.78770	36.68	1000.000	150.0	54.00	17.32	Vertical	Pass
3815.63120	39.25	1000.000	150.0	54.00	14.75	Vertical	Pass
4708.42483	40.10	1000.000	100.0	54.00	13.90	Vertical	Pass
5787.57915	45.12	1000.000	150.0	54.00	8.88	Vertical	Pass

Frequency (MHz)	PK (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBμV/m)	Margin (dB)	Antenna	Verdict
1281.26232	47.38	1000.000	100.0	74.00	26.62	Vertical	Pass
1561.48677	48.23	1000.000	150.0	74.00	25.77	Vertical	Pass
2863.78770	49.27	1000.000	150.0	74.00	24.73	Vertical	Pass
3815.63120	51.92	1000.000	100.0	74.00	22.08	Vertical	Pass
4708.42483	52.88	1000.000	150.0	74.00	21.12	Vertical	Pass
5787.57915	57.36	1000.000	100.0	74.00	16.64	Vertical	Pass

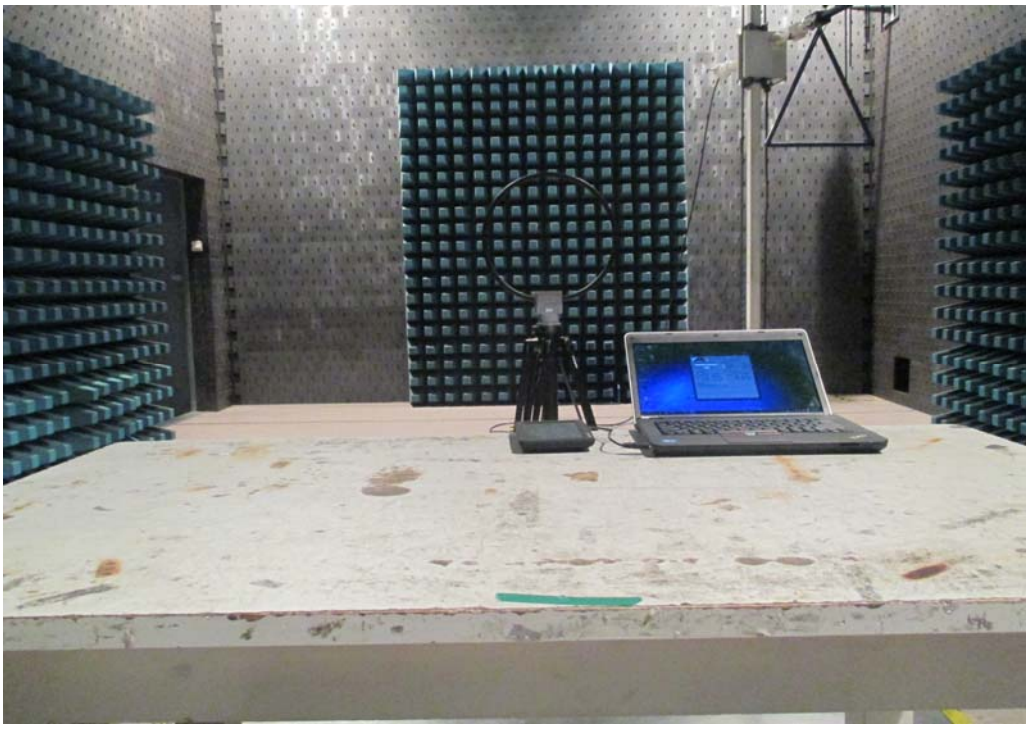
Test Result: PASS

4. PHOTOGRAPHS OF THE EUT

5. PHOTOGRAPHS OF THE TEST SET-UP

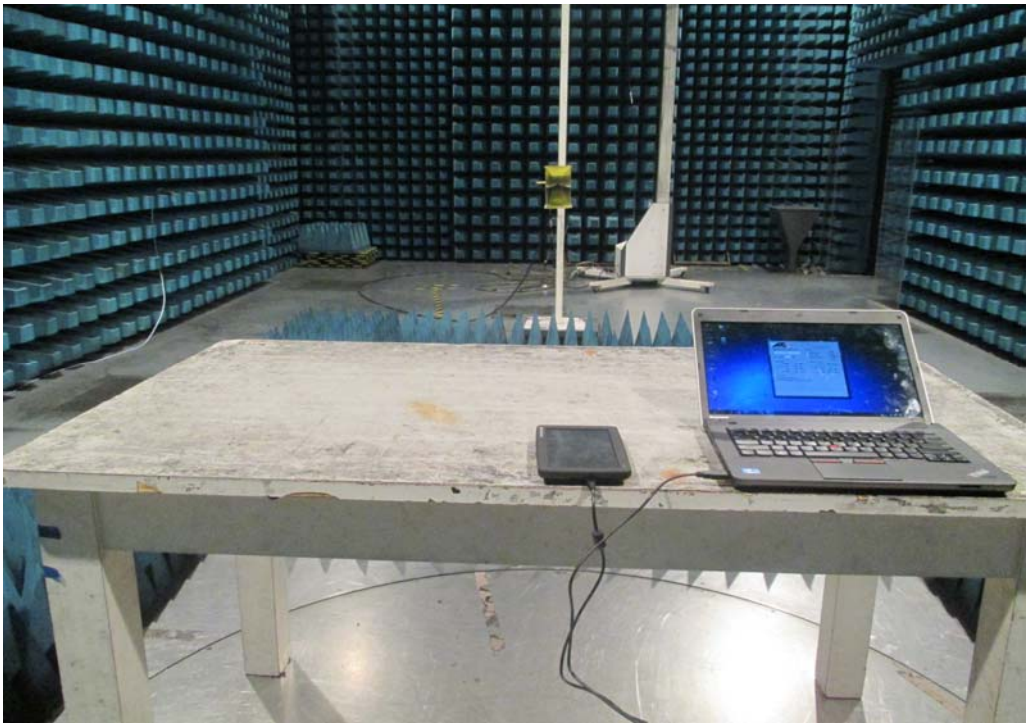


Conducted Emission



Radiated Emission of 9k-30M

Radiated Emission of 30M-1G



Radiated Emission of 1-6G

** END OF REPORT **