



EMC TEST REPORT

Report No.: SET2015-05113

Product Name: EFTPOS

FCC ID: VWZT1000I

Model No. : SPECTRA T1000

Applicant: SPECTRA Technologies Holdings Co., Ltd.

Address: Unit 1301-09, 19-20, Tower II, Grand Century Place, 193 Prince Edward Road West, Kowloon, Hong Kong

Received Date: 2014.12.09

Tested Date: 2015.01.07—2015.02.25

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

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Test Report

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Prince Edward Road West, Kowloon, Hong Kong

Manufacturer..... : SPECTRA Technologies Holdings Co., Ltd.

Manufacturer Address : Unit 1301-09, 19-20, Tower II, Grand Century Place, 193
Prince Edward Road West, Kowloon, Hong Kong

Test Standards..... : 47 CFR Part 15 Subpart B: Radio Frequency Devices

Test Result : PASS

Tested by : Xiaolong Zhang 2015.04.17
Xiaolong Zhang, Test Engineer

Reviewed by..... : Shuangwen Zhang 2015.04.17
Shuangwen Zhang, Senior Engineer

Approved by : Wu Li'an 2015.04.17
Wu Li'an, Manager



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Change History		
Issue	Date	Reason for change
1.0	2015.04.17	First edition



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 2014	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 C63.4:2014.



1.3 Facilities and Accreditations

1.3.1 Facilities

CNAS-Lab Code: L1659

CCIC 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 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, valid time is until October 28, 2017.

1.3.2 Test Environment Conditions

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

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	25% -75%
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 Peripherals

The following is a listing of the EUT and peripherals utilized during the performance of EMC test:

Description	Manufacturer	Model	Serial No.	FCCID /DOC
Notebook	ThinkPad	E430C	A131101550	/
Micro SD card	SanDisk	/	/	/
Mouse	Microsoft	1068	/	DOC

2.2 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.

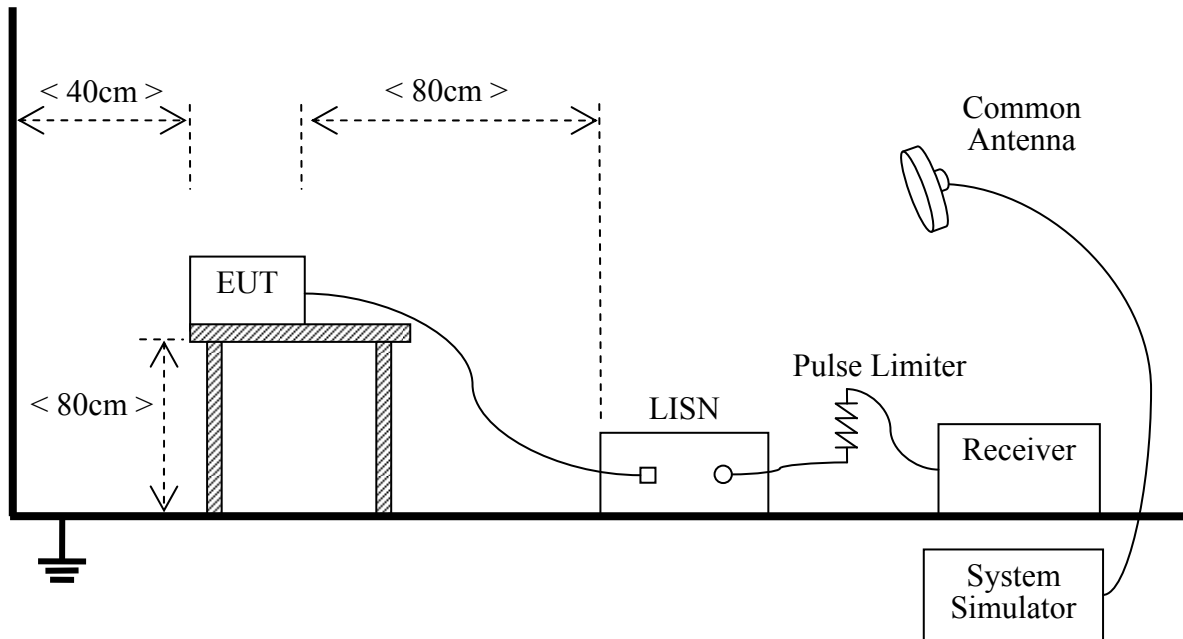
- (2) The Second test mode

The EUT configuration of the emission tests is EUT + Battery + Network+Adapter.

2.3 Test Setup and Equipments List

2.3.1 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 $50\Omega/50\mu\text{H}$ 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.

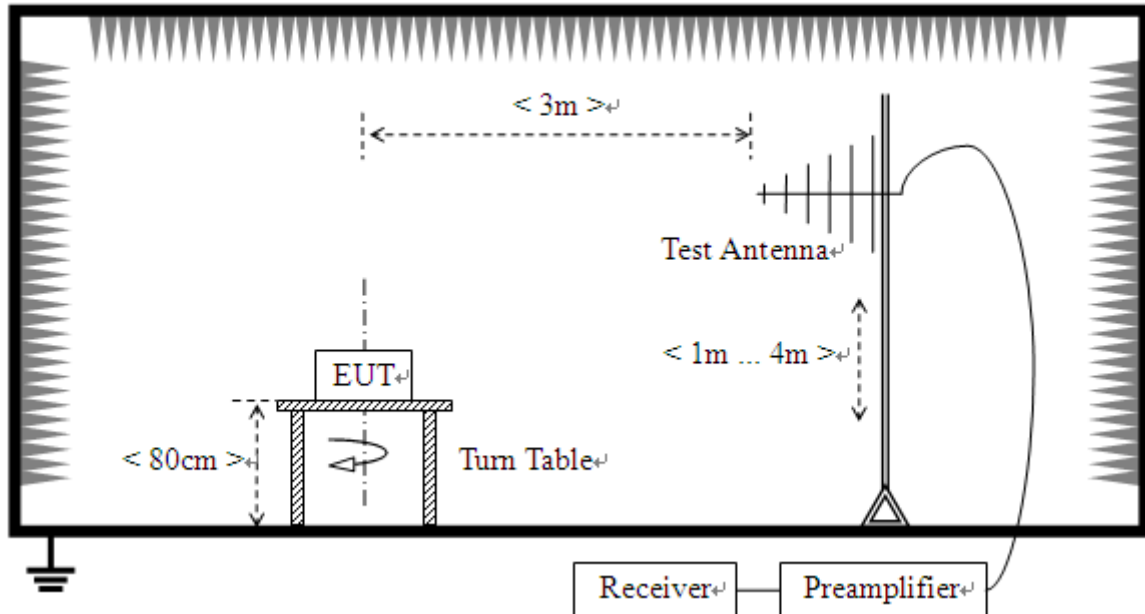
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	ROHDE&SCHWARZ	ESCI	A130901475	2014.09.09	2015.09.08
LISN	ROHDE&SCHWARZ	ENV216	/	2014.04.28	2015.04.27
Cable	MATCHING PAD	W7	/	2014.06.05	2015.06.04

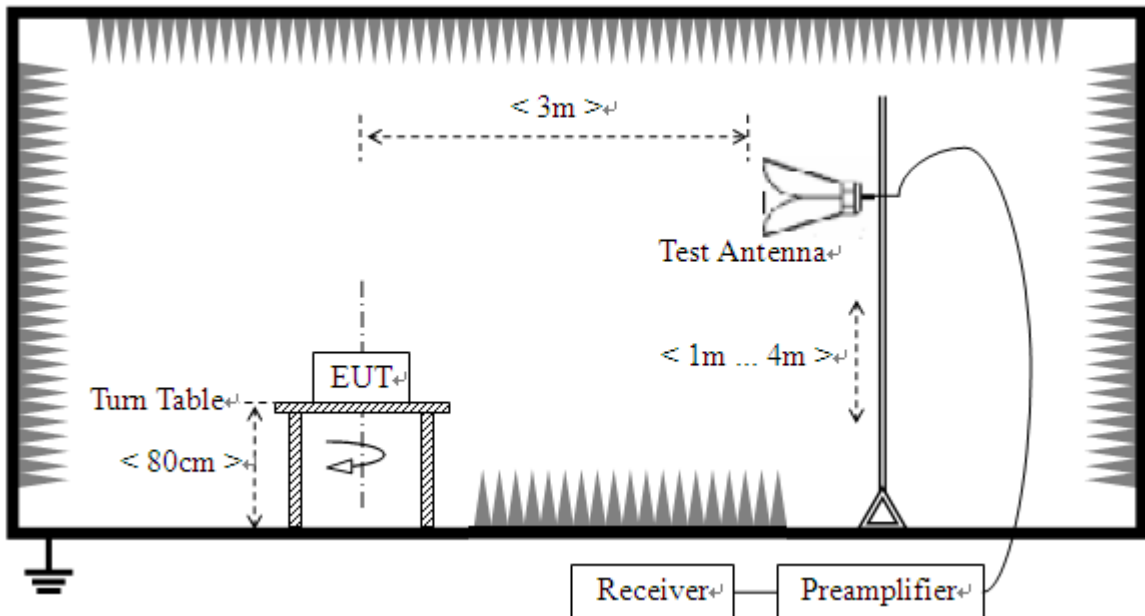
2.3.2 Radiated Emission

A. Test Setup:

- 1) For radiated emissions from 30MHz to 1GHz



- 2) 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 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 Date	Calibration Due. Date
Test Receiver	ROHDE&SCHWARZ	ESIB7	A0501375	2014.06.10	2015.06.09
Test Receiver	ROHDE&SCHWARZ	ESIB26	A0304218	2014.06.10	2015.06.09
Semi-Anechoic Chamber	Albatross	9m*6m*6m	A0412372	2015.03.22	2016.03.21
Test Antenna - Bi-Log	HP	CBL6111A	A9704202	2014.06.10	2015.06.09
Test Antenna – Horn	ROHDE&SCHWARZ	HF906	A0304225	2014.06.10	2015.06.09
Anechoic Chamber	Albatross	SAC-5MAC 12.8x6.8x6.4m	A0304210	201503.22	2016.03.21
Amplifier 1G~18GHz	ROHDE&SCHWARZ	MITEQ AFS42-001018 00	A0509366	2014.06.10	2015.06.09
Amplifier 20M~3GHz	Compliance Direction System	PAP-0203H	A0509377	2014.06.10	2015.06.09
Cable	SUNHNER	SUCOFLEX 100	/	2014.06.10	2015.06.09
Cable	SUNHNER	SUCOFLEX 104	MY1758/4	2014.06.10	2015.06.09



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 50 μ H/50 Ω line impedance stabilization network (LISN).

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

NOTE:

- The limit subjects to the Class B digital device.
- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2 Test Description

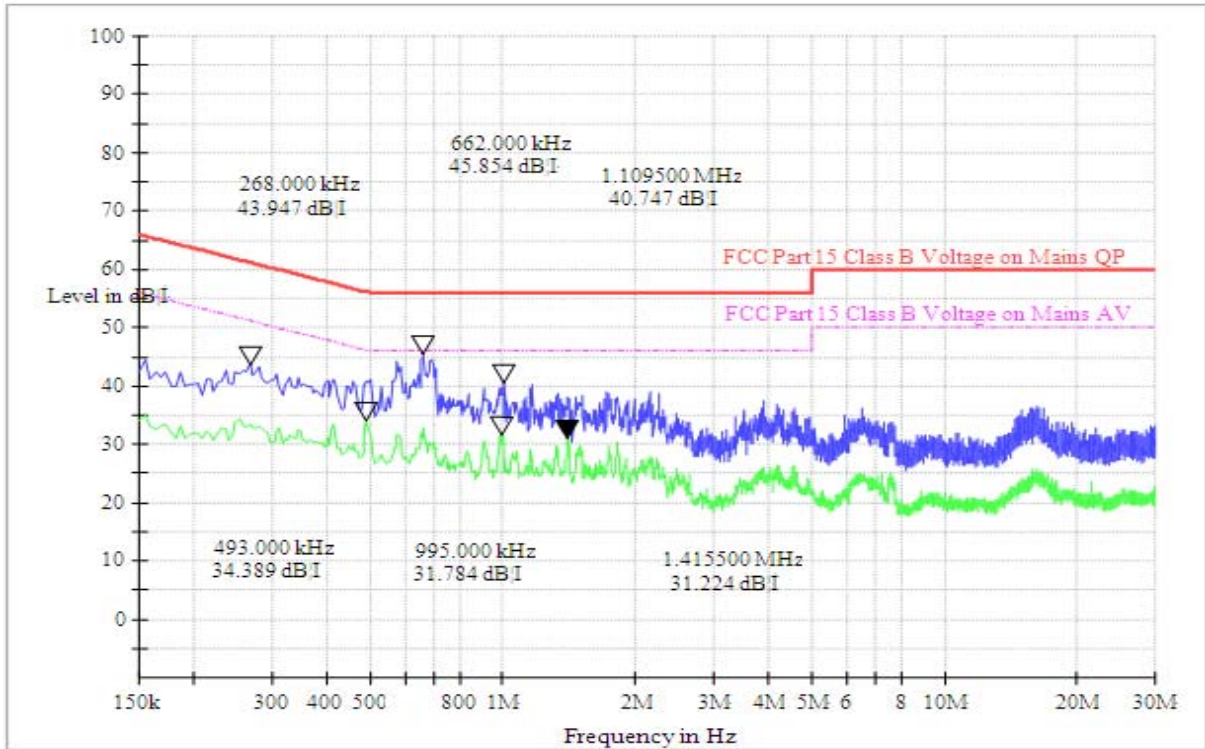
See section 2.3.1 of this report.

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.

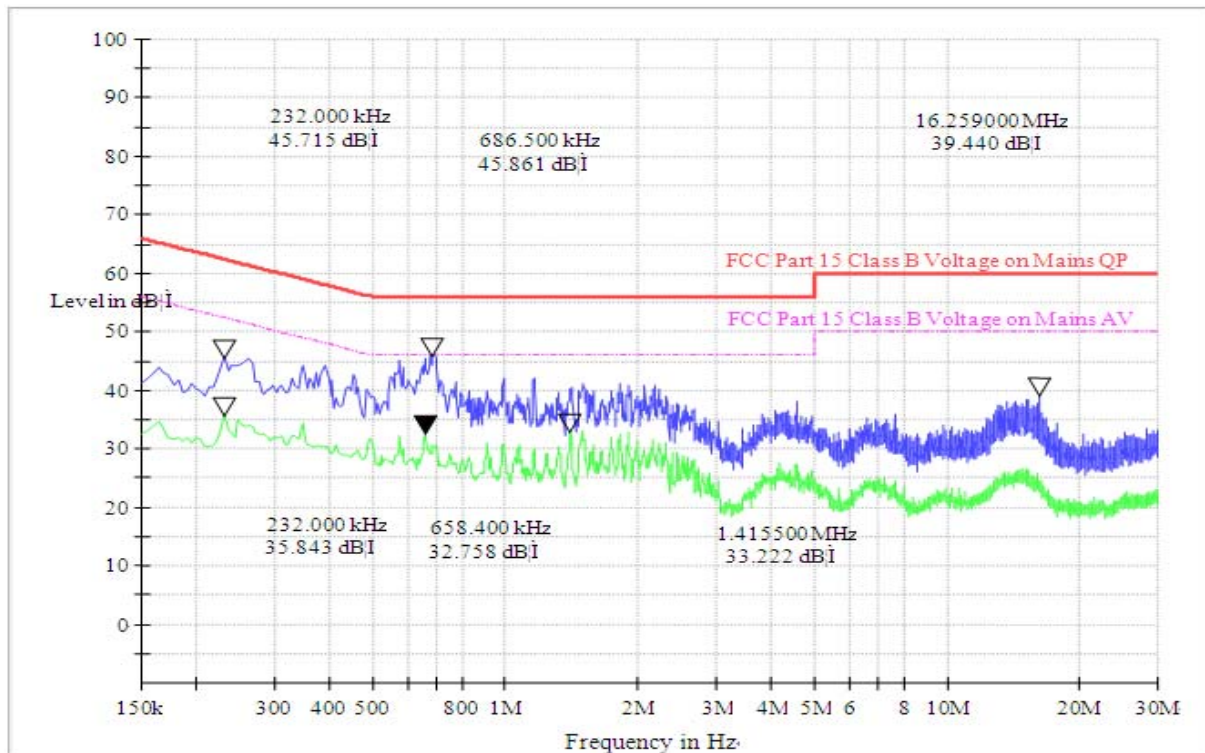
A. Test Plot and Suspicious Points:

The data of first test mode



(Plot A: L Phase)

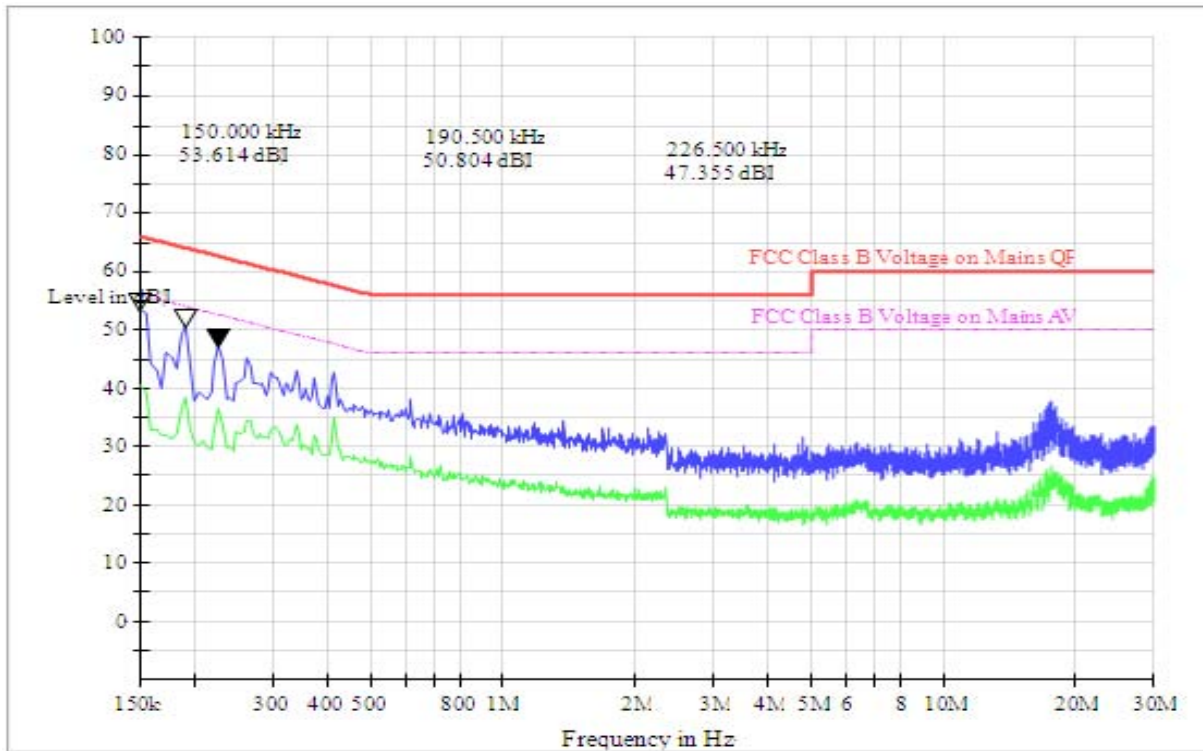
Conducted Disturbance at Mains Terminals							
L Test Data							
QP				AV			
Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)	Margin (dB)	Frequency (MHz)	Limits (dB μ V)	Measurement Value (dB μ V)	Margin (dB)
0.2680	61.20	41.35	19.85	0.4930	46.10	32.15	13.95
0.6620	56.00	43.25	12.75	0.9950	46.00	29.24	16.76
1.1095	56.00	38.24	17.76	1.4155	46.00	28.35	17.65



(Plot B: N Phase)

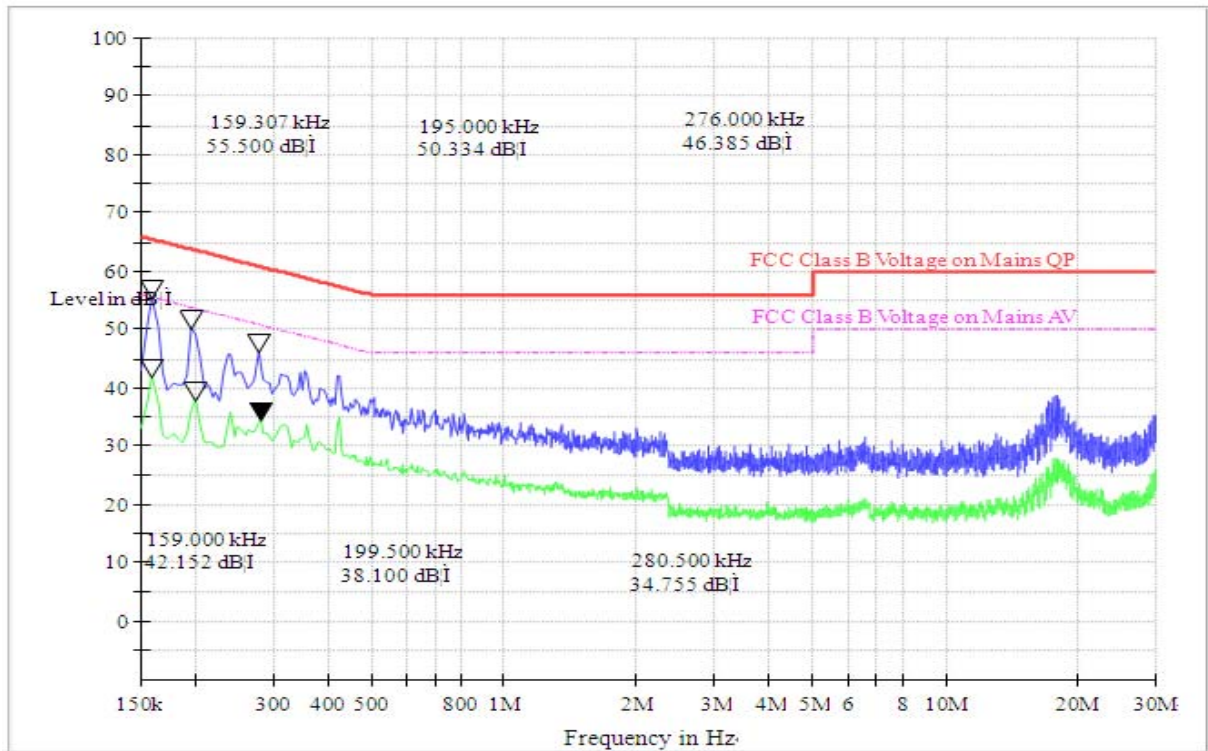
Conducted Disturbance at Mains Terminals							
N Test Data							
QP				AV			
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)
0.2320	62.40	43.65	18.75	0.2320	52.40	33.52	18.88
0.6860	56.00	43.21	12.79	0.4560	46.80	30.51	16.29
16.3590	60.00	37.61	22.39	1.4155	46.00	31.24	14.76

The data of second test mode



(Plot C: L Phase)

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)
0.1500	66.00	51.36	14.64	0.1500	56.00	39.44	16.56
0.1905	64.00	48.56	15.44	0.1905	54.00	37.19	16.81
0.2265	62.60	52.60	10.00	0.2265	52.60	30.35	22.25



(Plot D: N 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)
0.1590	65.50	53.36	12.14	0.1590	55.50	40.17	15.33
0.1950	63.80	47.99	15.81	0.1950	53.80	36.49	17.31
0.2760	60.90	44.85	16.05	0.2760	50.90	32.43	18.47

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	
	$\mu\text{V/m}$	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 $20\log \text{Emission Level}(\text{uV/m})$.
- 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

$$Ld1 = L1 = 30\text{uV/m} * (10)^2 = 100 * 30\text{uV/m}.$$

3.2.2 Test Description

See section 2.3.2 of this report.

3.2.3 Test Result

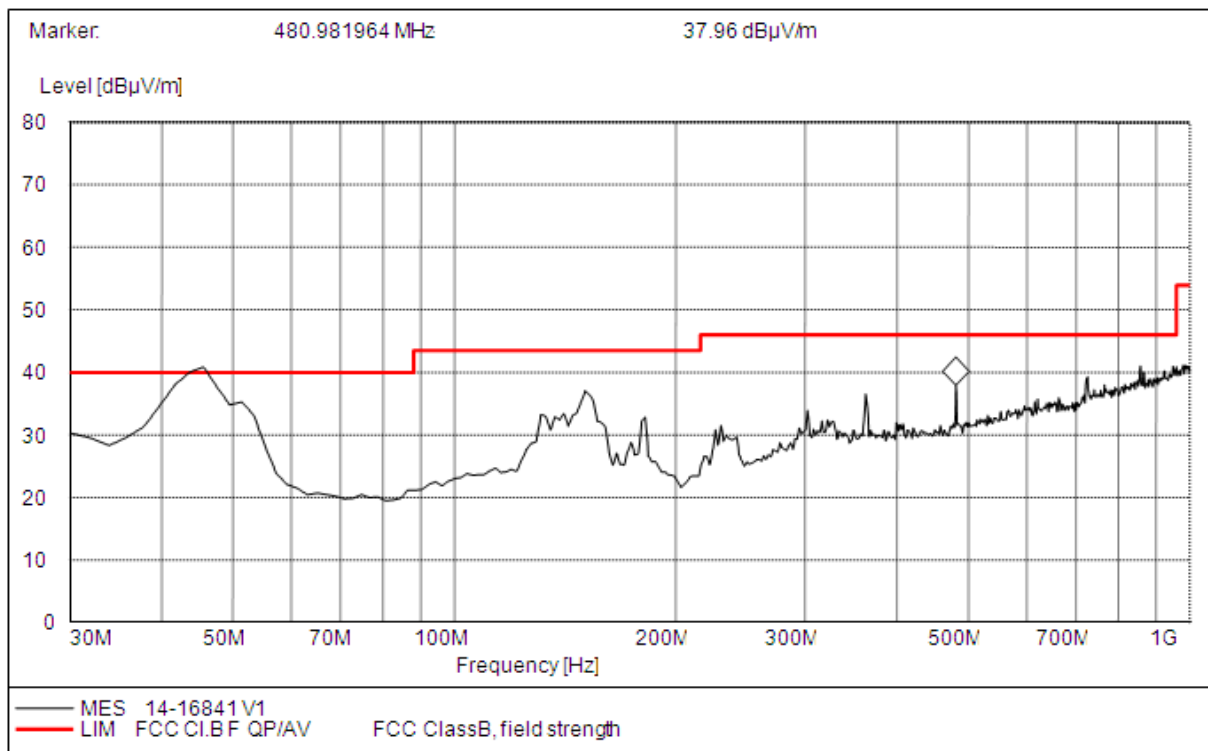
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform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

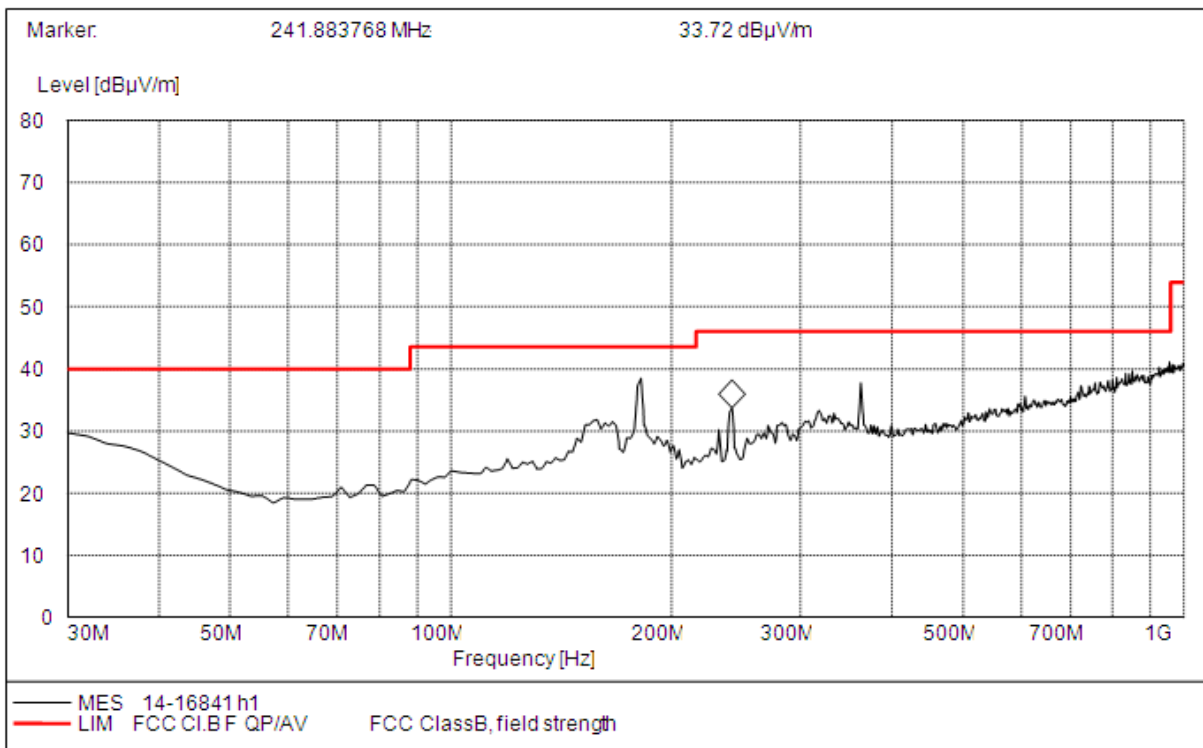
The data of first test mode



(Plot E: 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
43.74000	37.50	120.000	100.0	40.00	2.50	Vertical	Pass
150.26000	35.19	120.000	100.0	43.50	8.31	Vertical	Pass
480.05000	36.56	120.000	100.0	46.00	9.44	Vertical	Pass

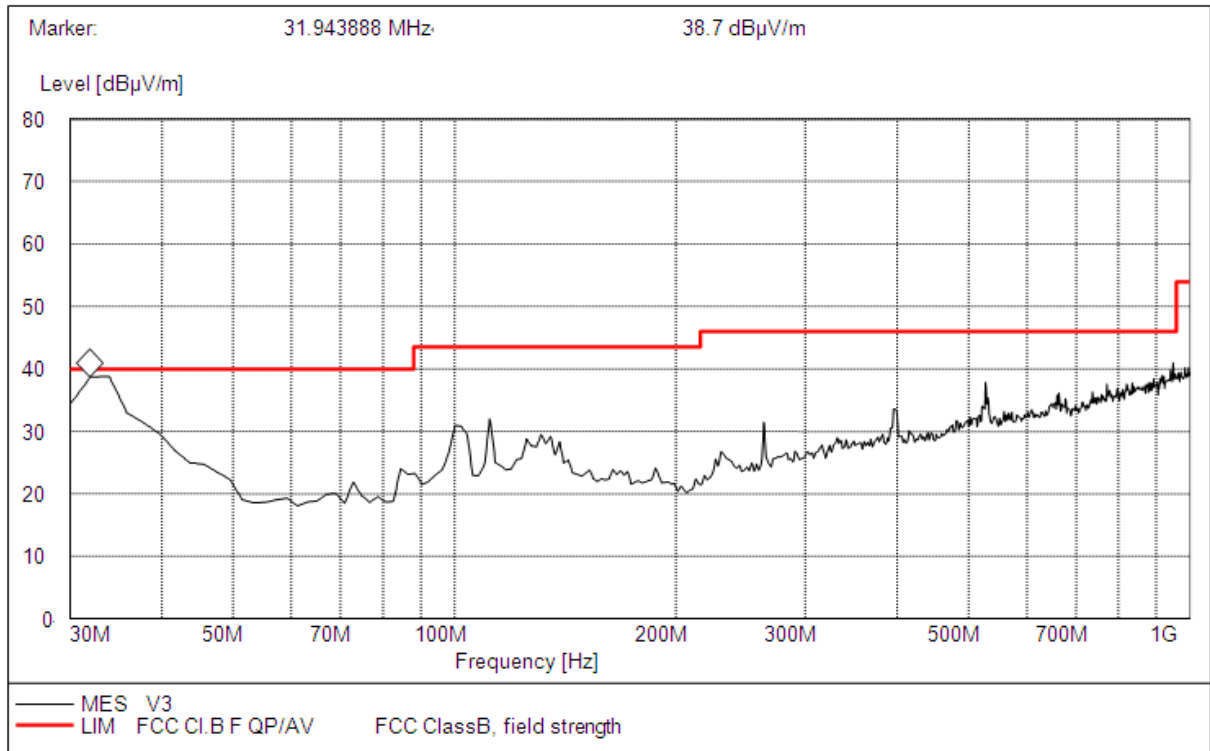


(Plot F:Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
181.36000	37.10	120.000	100.0	43.50	6.40	Horizontal	Pass
241.45000	31.29	120.000	100.0	46.00	14.71	Horizontal	Pass
362.22000	36.59	120.000	100.0	46.00	9.41	Horizontal	Pass

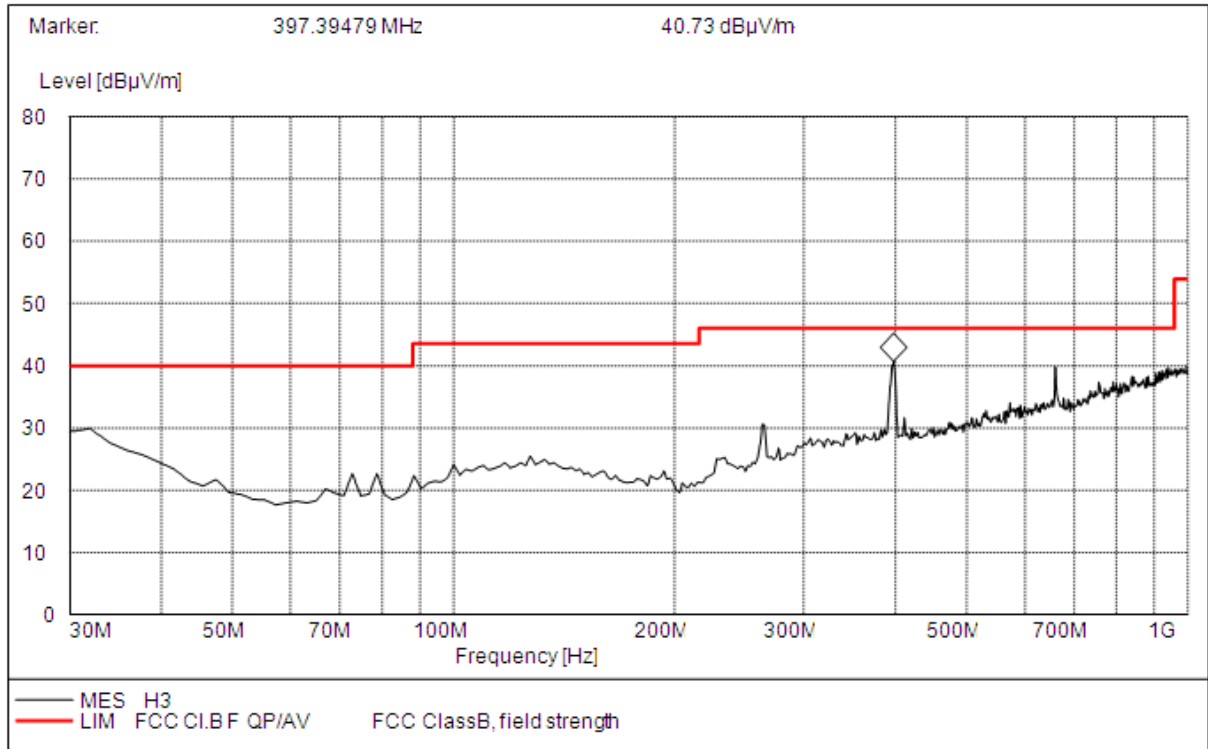


The data of second test mode



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

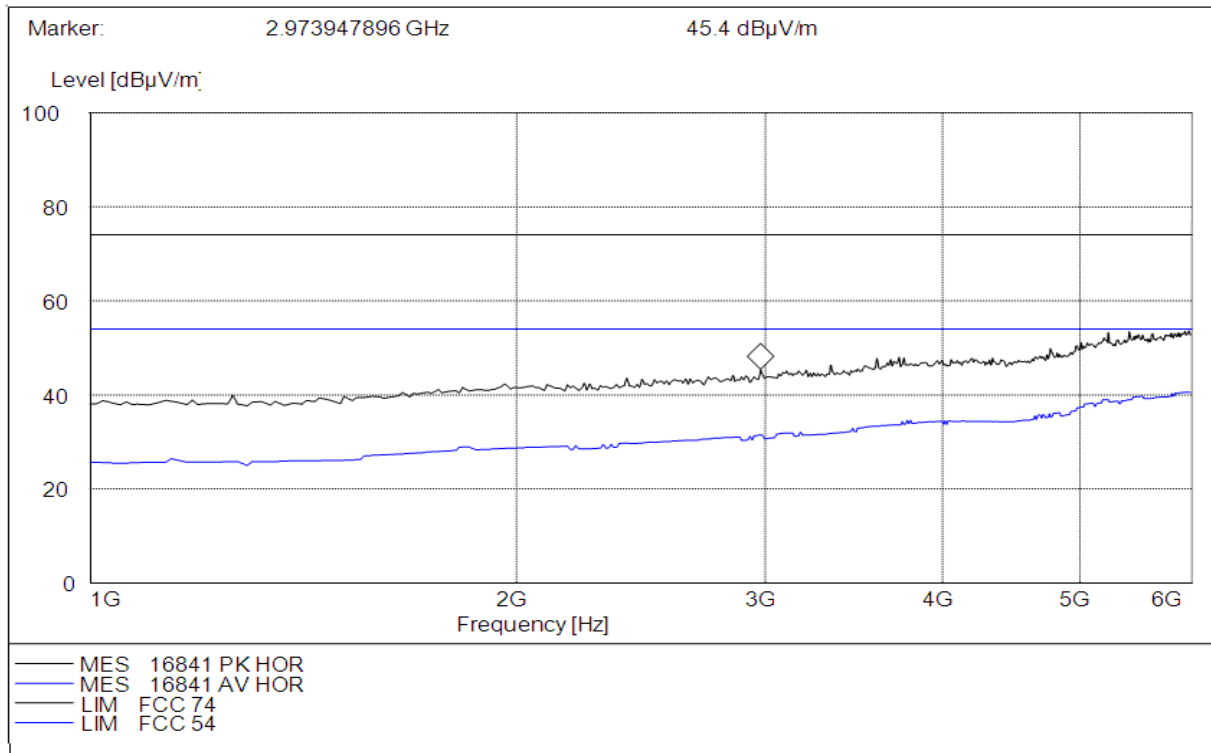
Frequency (MHz)	QuasiPeak (dB µ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB µ V/m)	Margin (dB)	Antenna	Verdict
33.78000	36.42	120.000	200.0	40.00	3.58	Vertical	Pass
114.13000	29.49	120.000	150.0	43.50	14.01	Vertical	Pass
511.29000	35.67	120.000	180.0	46.00	10.33	Vertical	Pass



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

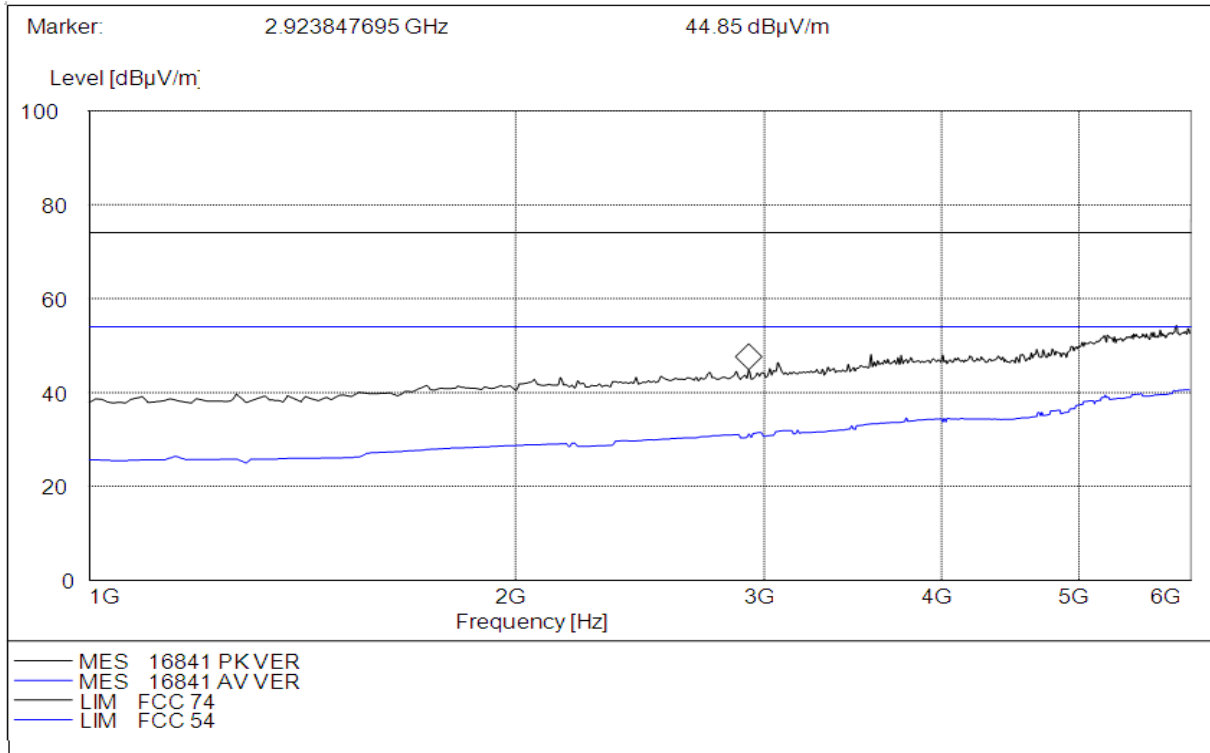
Frequency (MHz)	QuasiPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
30..39000	28.56	120.000	180.0	43.50	14.94	Horizontal	Pass
396.26000	39.65	120.000	200.0	46.00	6.35	Horizontal	Pass
660.13000	39.84	120.000	230.0	46.00	6.16	Horizontal	Pass

The data of first test mode



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

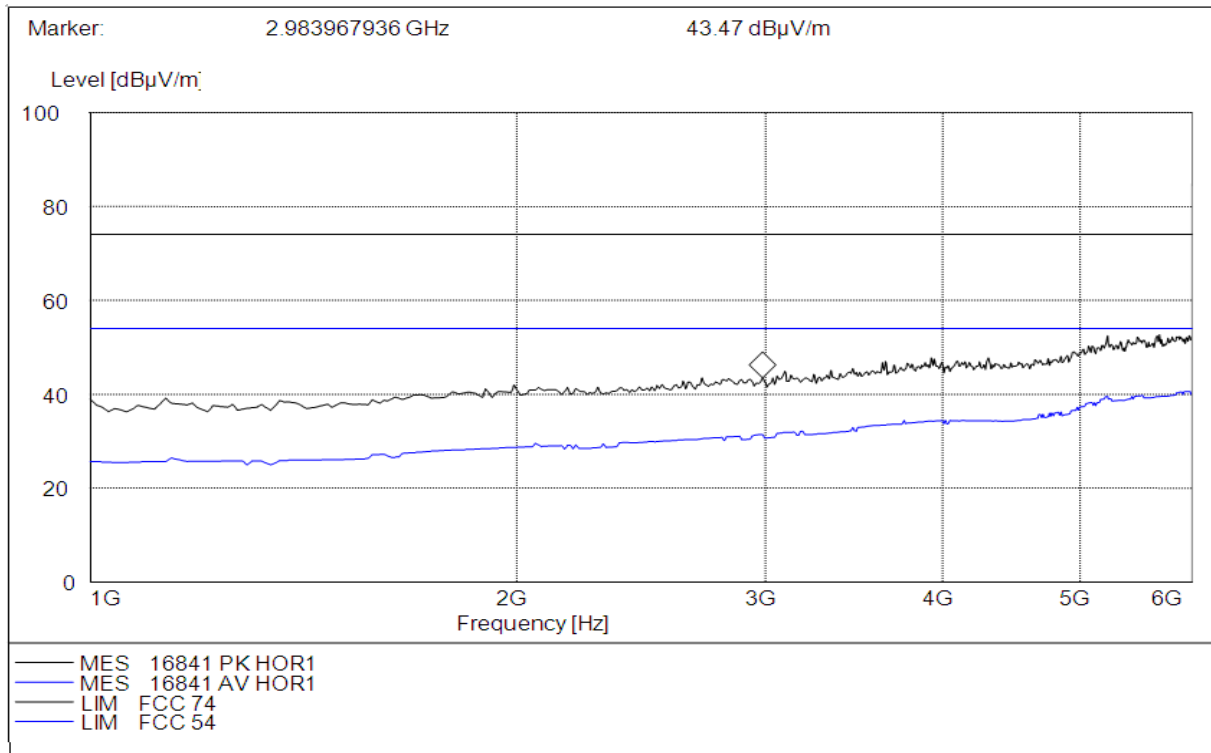
Frequency (MHz)	PK/AV (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
1155.14090	31.58	1000.000	150.0	54.00	22.42	Horizontal	Pass
1935.76352	32.64	1000.000	150.0	54.00	21.36	Horizontal	Pass
2972.65456	34.55	1000.000	275.0	54.00	19.45	Horizontal	Pass
1155.14090	41.88	1000.000	150.0	74.00	32.12	Horizontal	Pass
1935.76352	42.85	1000.000	250.0	74.00	31.15	Horizontal	Pass
2972.65456	45.02	1000.000	150.0	74.00	28.98	Horizontal	Pass



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

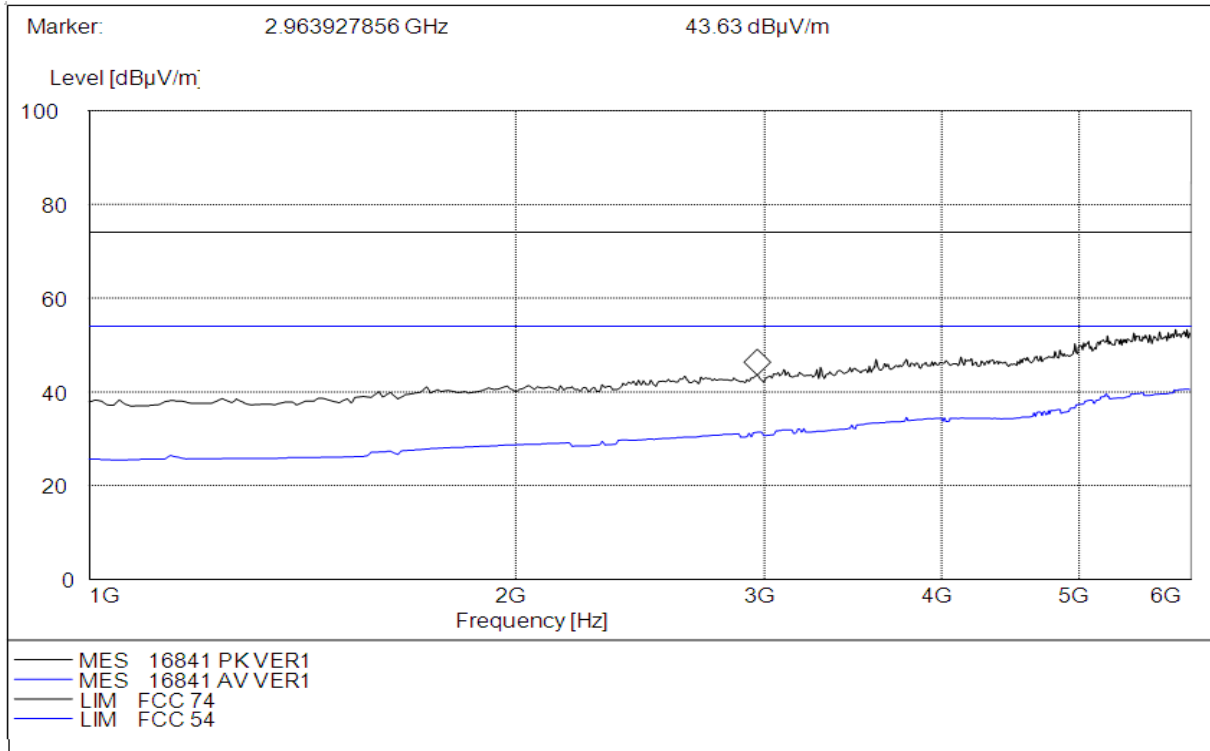
Frequency (MHz)	PK/AV (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
1106.21090	29.53	1000.000	200.0	54.00	24.47	Vertical	Pass
1826.75452	31.26	1000.000	150.0	54.00	22.74	Vertical	Pass
2923.24549	34.19	1000.000	100.0	54.00	19.84	Vertical	Pass
1106.21090	40.26	1000.000	150.0	74.00	33.74	Vertical	Pass
1826.75452	41.35	1000.000	200.0	74.00	32.65	Vertical	Pass
2923.24549	44.52	1000.000	150.0	74.00	29.48	Vertical	Pass

The data of second test mode



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

Frequency (MHz)	PK/AV (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
1160.64090	28.28	1000.000	150.0	54.00	25.72	Horizontal	Pass
1940.56352	30.60	1000.000	200.0	54.00	23.40	Horizontal	Pass
2982.65456	31.25	1000.000	150.0	54.00	22.75	Horizontal	Pass
1160.64090	38.88	1000.000	180.0	74.00	35.12	Horizontal	Pass
1940.56352	40.85	1000.000	160.0	74.00	33.15	Horizontal	Pass
2982.65456	43.58	1000.000	250.0	74.00	30.42	Horizontal	Pass



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

Frequency (MHz)	PK/AV (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBµV/m)	Margin (dB)	Antenna	Verdict
1110.21090	29.24	1000.000	200.0	54.00	24.76	Vertical	Pass
1826.75452	30.29	1000.000	150.0	54.00	23.71	Vertical	Pass
2963.43549	34.09	1000.000	130.0	54.00	19.91	Vertical	Pass
1110.21090	39.26	1000.000	175.0	74.00	34.74	Vertical	Pass
1826.75452	40.35	1000.000	120.0	74.00	33.65	Vertical	Pass
2963.43549	43.26	1000.000	150.0	74.00	30.74	Vertical	Pass

Test Result: PASS