



EMC TEST REPORT

Report No.: SET2016-00750

Product Name: Mobile Data Terminal

FCC ID: 2AC6AC4000-A

Model No. : C4000/C4050

Applicant: ShenZhen Chainway Information Technology Co.,Ltd.

Address: 9/F, Building 2, Phase 2, Daqian Industrial Park, Longchang Rd.,
District 67, Bao'an, Shenzhen

Received Date: 2015-10-20

Tested Date: 2015-10-20—2015-11-20

Issued by: CCIC-SET

Lab Location: Electronic Testing Building, Shahe Road, Xili, Nanshan District,
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Manufacturer..... : ShenZhen Chainway Information Technology Co.,Ltd.

Manufacturer Address : 9/F, Building 2, Phase 2, Daqian Industrial Park,
Longchang Rd., District 67, Bao'an, Shenzhen

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

Test Result : PASS

Tested by : Xiao long zhang 2015.11.25
Xiaolong Zhang, Test Engineer

Reviewed by..... : Shuangwen zhang 2015.11.25
Shuangwen Zhang, Senior Engineer

Approved by : Wu Lian 2015.11.25
Wu Li'an, Manager

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Change History		
Issue	Date	Reason for change
1.0	2015.11.25	First edition



1. GENERAL INFORMATION

1.1 EUT Description

EUT Name : Mobile Data Terminal
FCC ID : 2AC6AC4000-A
Trade Name..... : CHAINWAY
Brand Name..... : CHAINWAY
Hardware Version..... : NA
Software Version : NA
Power Supply : Battery1
Model No.: 935161(ICP10/51/59)
Capacitance: 3200 mAh
Rated Voltage: 3.7V
Charge Limit: 4.2V
Battery2
Model No.: 18650
Capacitance: 5000 mAh
Rated Voltage: 3.7V
Charge Limit: 4.2V
Ancillary Equipment..... : AC Adapter (Charger for Battery)
Model No.: HNC050200U
Rated Input: 100-240V, 50/60Hz ,0.35A
Rated Output: 5V=2.0A
Data cable(shield)

*Note1:*The EUT is a Mobile Data Terminal, it supports the following operating frequency band:GSM850/900/18001900,WCDMA850/1900,Wifi2.4G(b,g,n/20M,n/40M),GPS, Bluetooth 3.0+ EDR, Bluetooth4.0LE,RFID.

*Note2:*The EUT is equipped with a T-Flash card slot; equipped with a USB port which can be connected to the ancillary equipments.

*Note 3:*The highest operation frequency or processor operate frequency is 1.3GHz.

*Note 4:*The two models have been tested and were recorded in this report.

*Note 5:*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 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 C63.4:2009.



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:

Support Equipment:

Description	Brand name	Model	Serial No.	FCCID
Notebook	ThinkPad	E430C	A131101550	N/A
Micro SD card	SanDisk	N/A	N/A	N/A
Mouse	Logitech	M100r	25011051	DOC
Printer	RICOH	SP200	JM175210006	N/A

Support Cable:

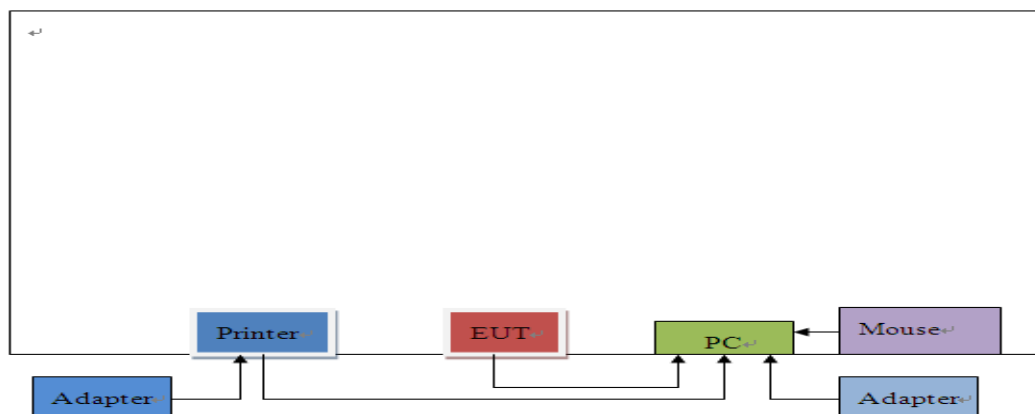
Description	Shield Type	Ferrite Core	Length
USB Cable	shielding	Yes	1.2m
RJ45 Cable	shielding	No	2m
Printer Power Cable	Un- shielding	No	1m
PC Power adapter Cable	Un- shielding	No	1.2m
Mouse Cable	Un- shielding	No	1m

2.2 Test Mode

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

2.3 Connection Diagram of Test System

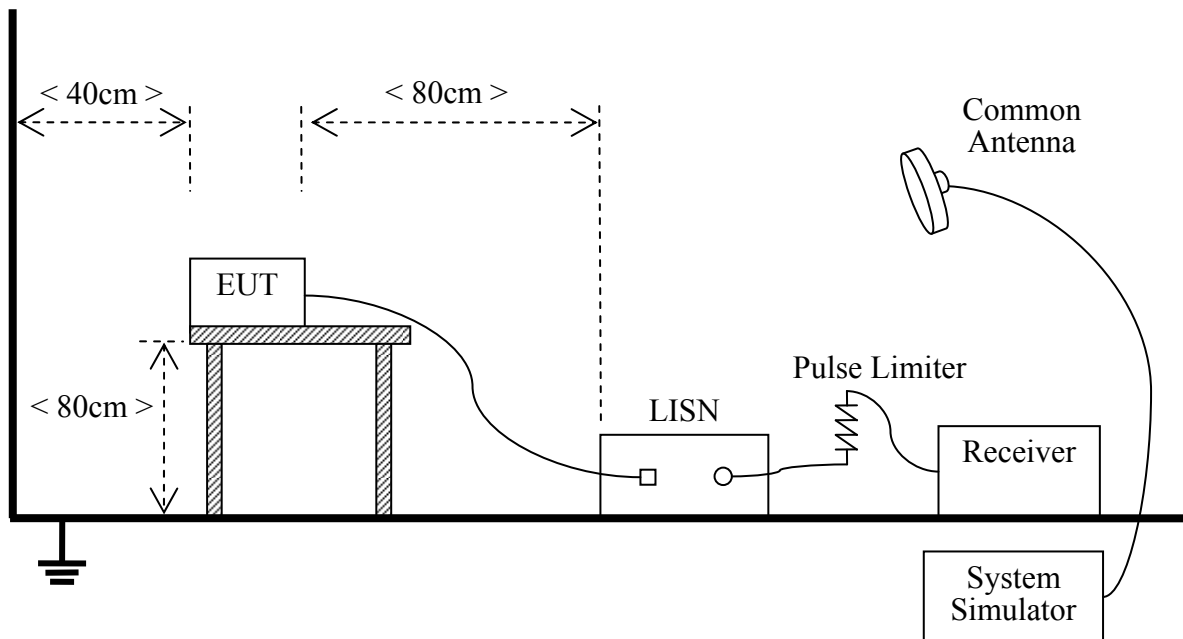
The EUT is installed in a typical configuration . Test software exercised the EUT.



2.4 Test Setup and Equipments List

2.4.1 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.

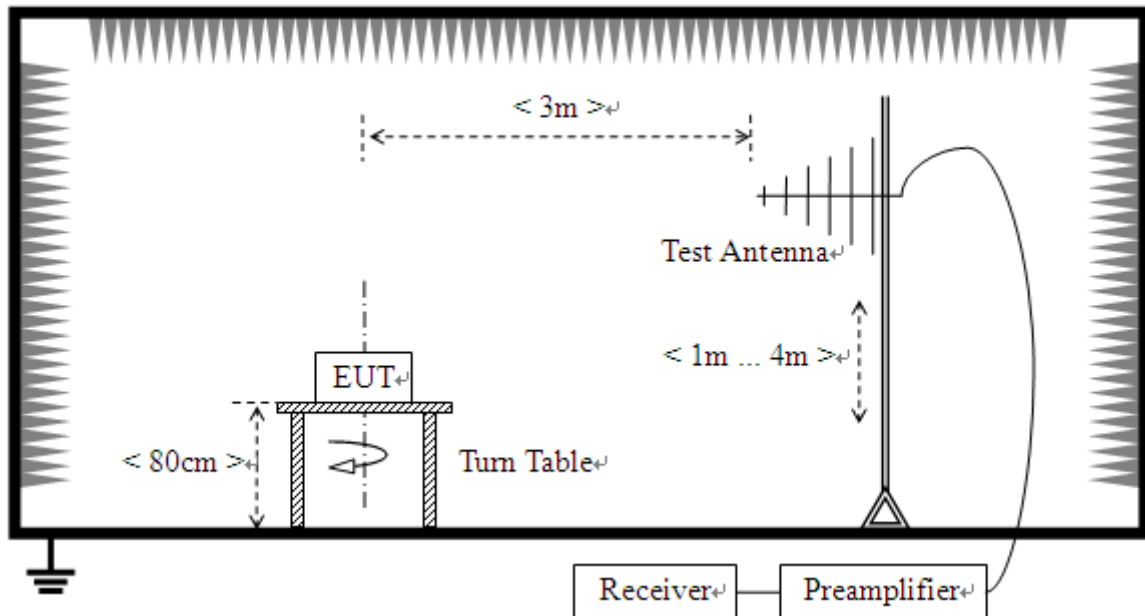
B. Equipments List:

Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due. Date
Test Receiver	ROHDE&SCHWARZ	ESCI	A130901475	2015.09.09	2016.09.08
LISN	ROHDE&SCHWARZ	ENV216	/	2015.04.28	2016.04.27
Cable	MATCHING PAD	W7	/	2015.06.05	2016.06.04

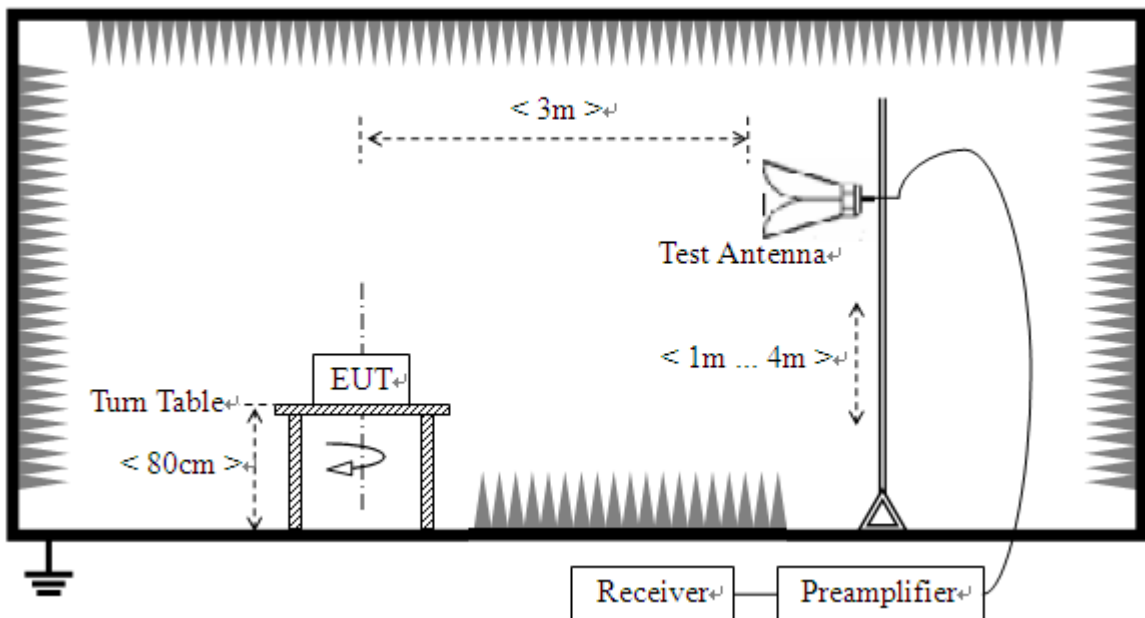
2.4.2 Radiated Emission

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	2015.06.10	2016.06.09
Test Receiver	ROHDE&SCHWARZ	ESIB26	A0304218	2015.06.10	2016.06.09
Semi-Anechoic Chamber	Albatross	9m*6m*6m	A0412372	2015.03.22	2016.03.21
Test Antenna - Bi-Log	HP	CBL6111A	A9704202	2015.06.10	2016.06.09
Test Antenna – Horn	ROHDE&SCHWARZ	HF906	A0304225	2015.06.10	2016.06.09
Anechoic Chamber	Albatross	SAC-5MAC 12.8x6.8x6.4m	A0304210	2015.03.22	2016.03.21
Amplifier 1G~18GHz	ROHDE&SCHWARZ	MITEQ AFS42-001018 00	A0509366	2015.06.10	2016.06.09
Amplifier 20M~3GHz	Compliance Direction System	PAP-0203H	A0509377	2015.06.10	2016.06.09
Cable	SUNHNER	SUCOFLEX 100	/	2015.06.10	2016.06.09
Cable	SUNHNER	SUCOFLEX 104	MY1758/4	2015.06.10	2016.06.09

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 2.4.1 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.

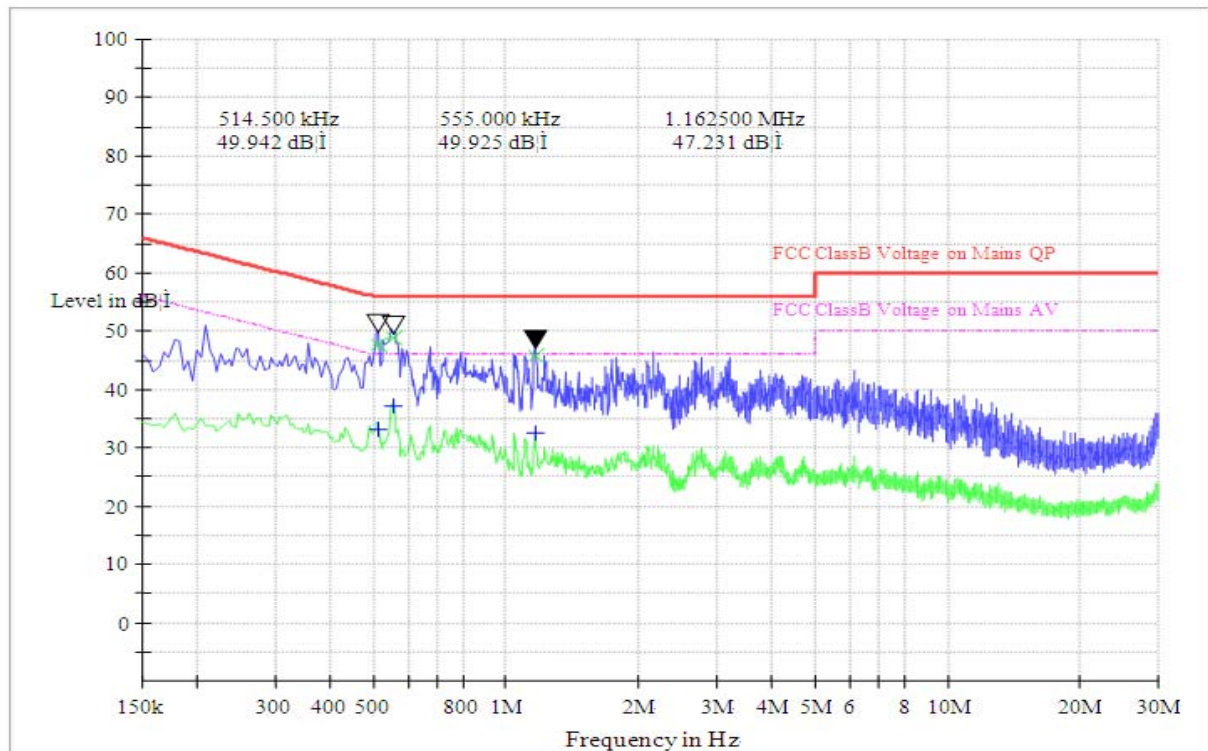
Note:

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a Nominal 120V AC,50/60Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

Test voltage and frequency (120V AC,60Hz)

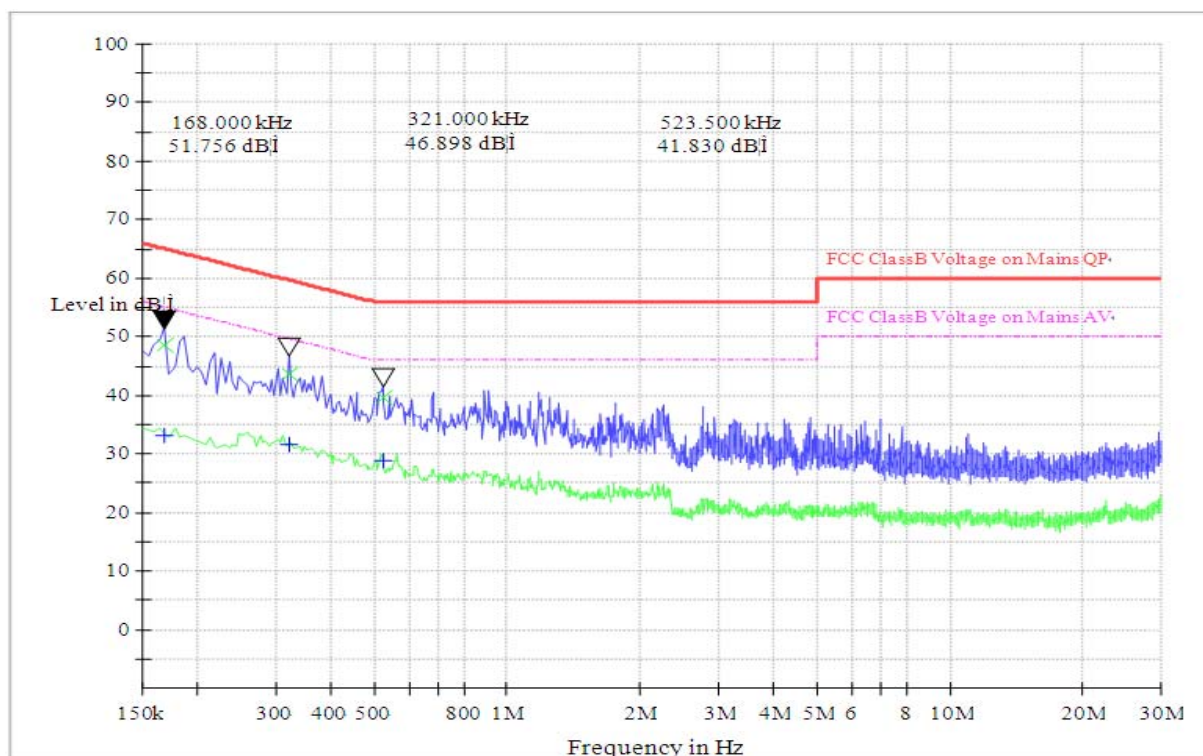
A. Test Plot and Suspicious Points:

Test result of EUT model C4050



(Plot A: L Phase)

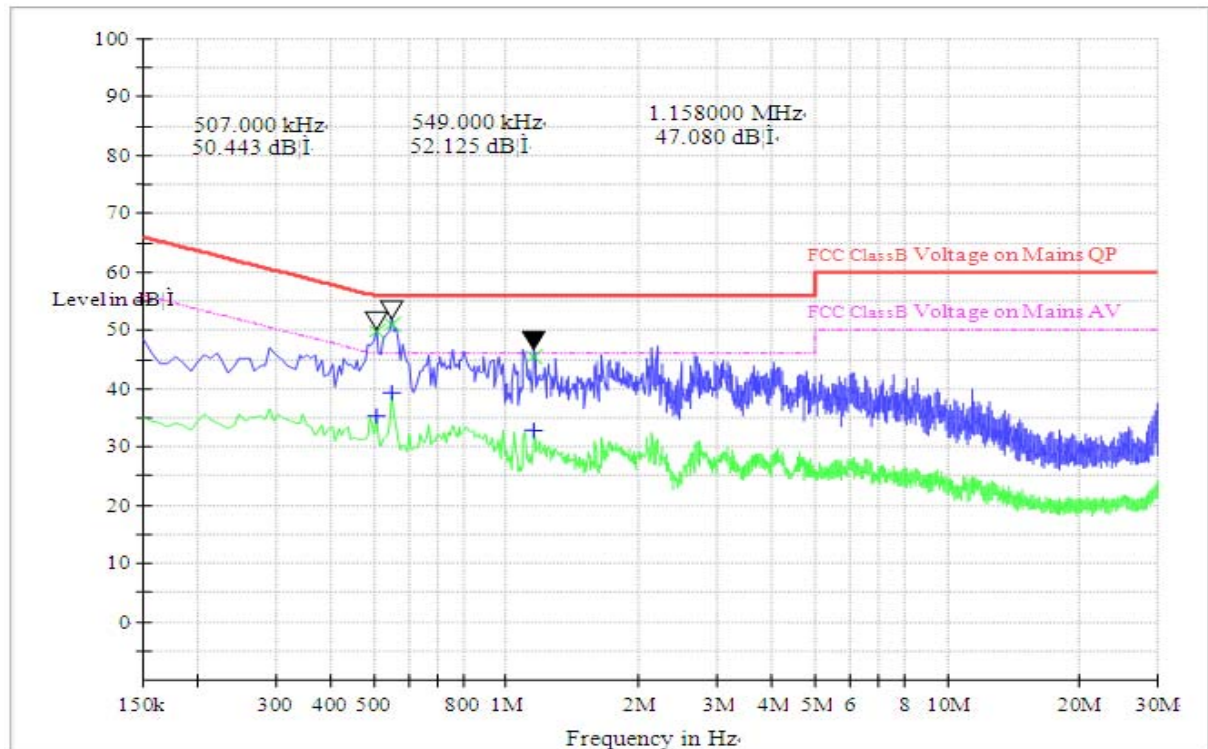
Conducted Disturbance at Mains Terminals							
L Test Data							
QP				AV			
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)
0.5145	56.00	47.71	8.29	0.5145	46.00	33.09	12.91
0.5550	56.00	48.81	7.19	0.5550	46.00	37.26	8.74
1.1625	56.00	45.83	10.17	1.1625	46.00	32.47	13.53



(Plot B: N Phase)

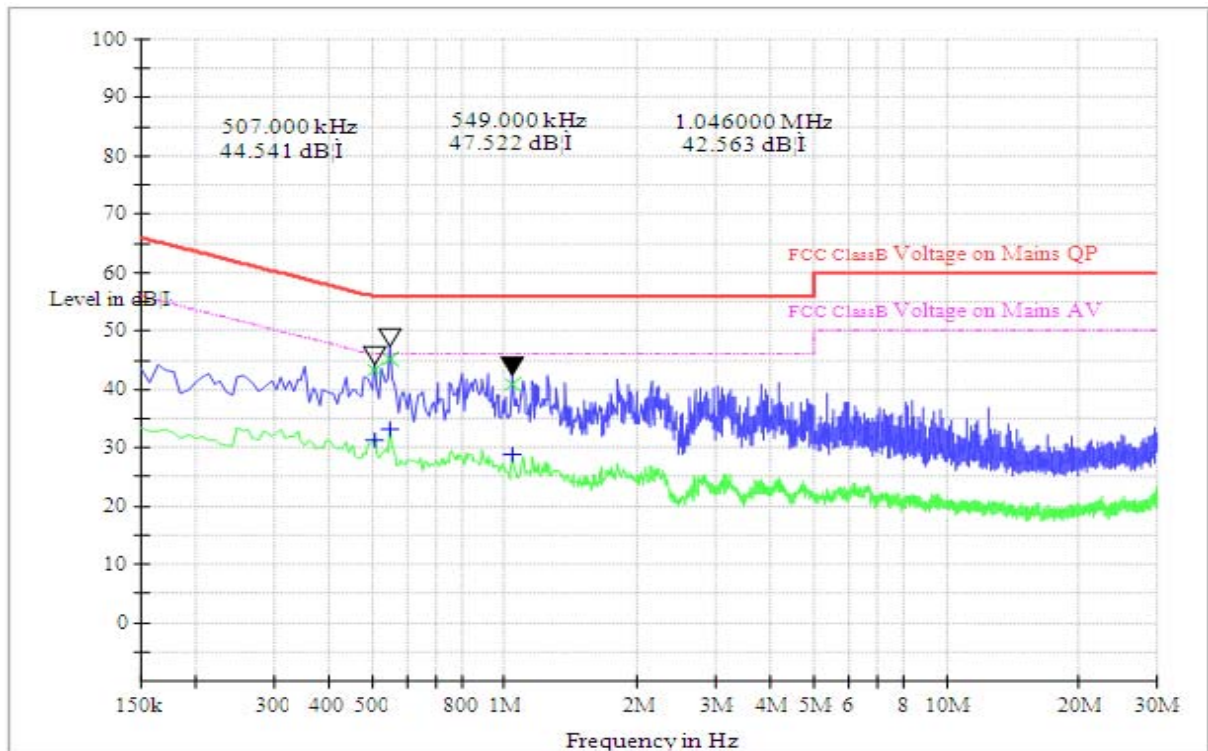
Conducted Disturbance at Mains Terminals							
N Test Data							
QP				AV			
Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)	Frequency (MHz)	Limits (dBμV)	Measurement Value (dBμV)	Margin (dB)
0.1680	65.10	48.51	16.59	0.1680	55.10	33.24	21.86
0.3210	59.70	43.64	16.06	0.3210	49.70	31.64	18.06
0.5235	56.00	39.65	16.35	0.5235	46.00	28.91	17.09

Test result of EUT model C4000



(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)
0.5070	56.00	49.65	6.35	0.5070	46.00	35.28	10.72
0.5490	56.00	51.13	4.87	0.5490	46.00	39.32	6.68
1.1580	56.00	45.56	10.44	1.1580	46.00	32.76	13.24



(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)
0.5070	56.00	43.20	12.80	0.5070	46.00	31.36	14.64
0.5490	56.00	45.23	10.77	0.5490	46.00	33.24	12.76
1.0460	56.00	40.94	15.06	1.0460	46.00	28.91	17.09

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	($\mu\text{V/m}$)	(dBuV/m)
0.009 - 0.490	$2400/\text{F(kHz)}$	300m	$10000 * 2400/\text{F(kHz)}$	$20\log 2400/\text{F(kHz)} + 80$
0.490 - 1.705	$2400/\text{F(kHz)}$	30m	$100 * 2400/\text{F(kHz)}$	$20\log 2400/\text{F(kHz)} + 40$
1.705 - 30.00	30	30m	$100 * 30$	$20\log 30 + 40$
30.0 - 88.0	100	3m	100	$20\log 100$
88.0 - 216.0	150	3m	150	$20\log 150$
216.0 - 960.0	200	3m	200	$20\log 200$
Above 960.0	500	3m	500	$20\log 500$

- 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.
- 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.
- For below 1G :QP detector RBW 120kHz ,VBW 300kHz.
- For Above 1G: PK detector RBW 1MHz,VBW 3MHz for PK value ;PK detector RBW 1MHz, VBW 10Hz for AV value.

Note:

- The tighter limit shall apply at the boundary between two frequency range.
- Limitation expressed in dBuV/m is calculated by $20\log \text{Emission Level}(\mu\text{V/m})$.
- If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.

Example:

F.S Limit at 30m distance is $30\mu\text{V/m}$, then F.S Limitation at 3m distance is adjusted as

$$L_{d1} = L_1 = 30\mu\text{V/m} * (10)^2 = 100 * 30\mu\text{V/m}.$$



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.

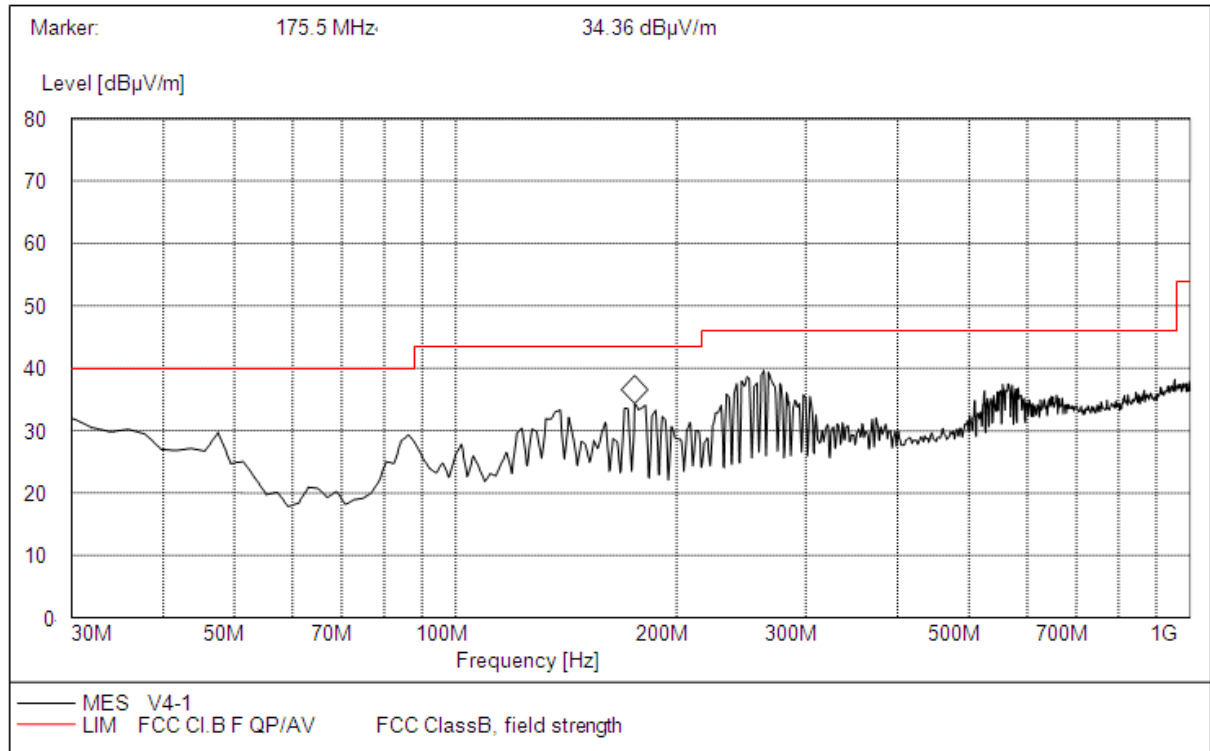
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

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:

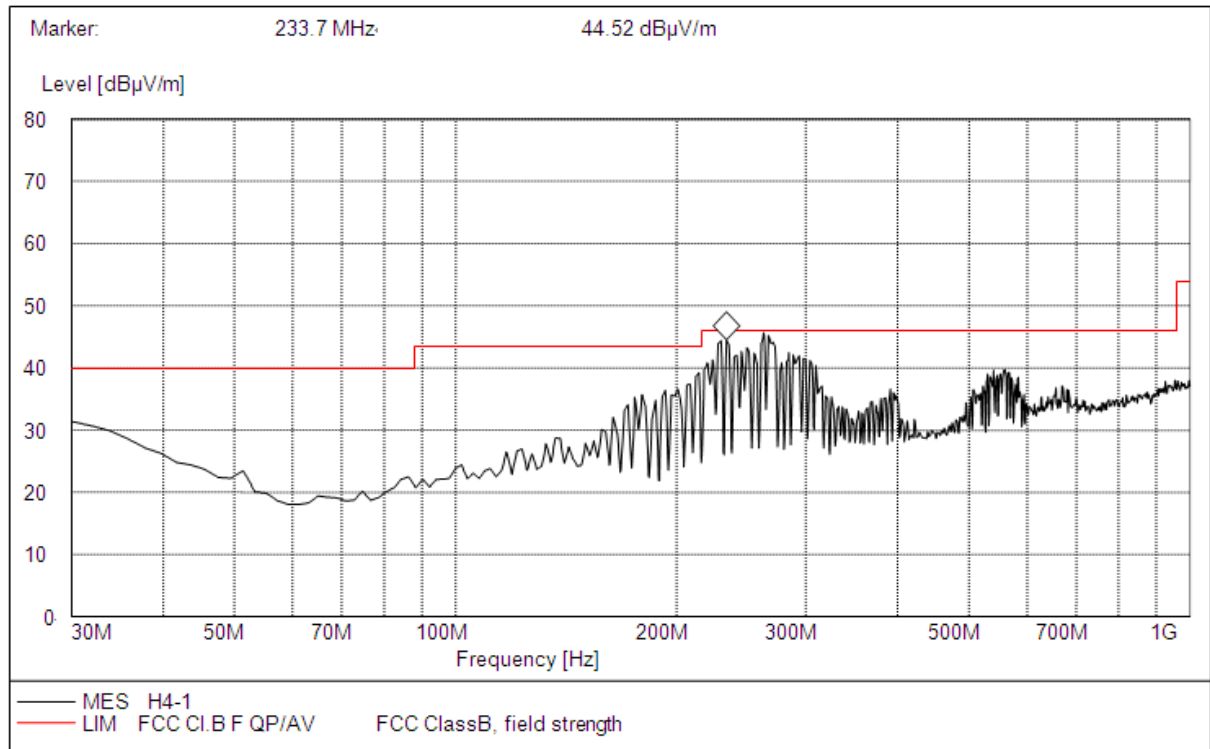
Test result of EUT model C4050

Test result of radiated emission below 1GHz



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

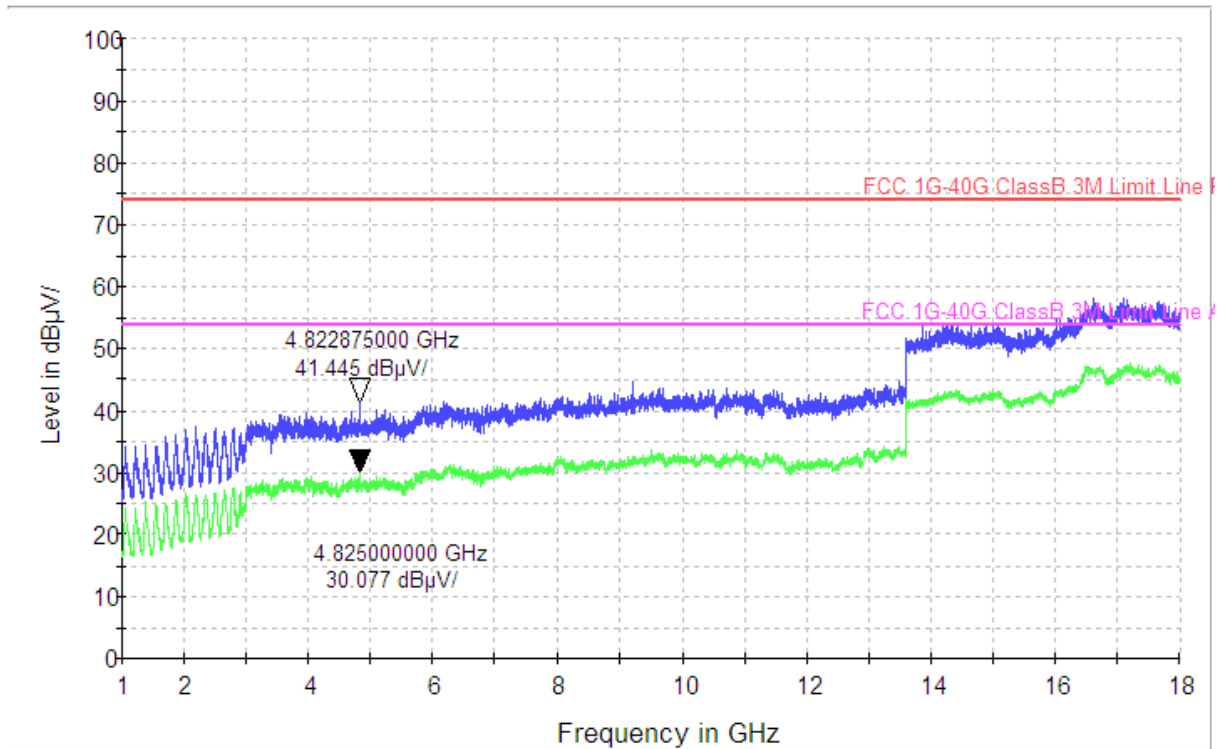
Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dBμV/m)	Margin (dB)	Antenna	Verdict
175.23000	32.51	120.000	159.0	43.50	10.99	Vertical	Pass
249.38000	36.28	120.000	186.0	46.00	9.72	Vertical	Pass
262.19000	37.59	120.000	237.0	46.00	8.41	Vertical	Pass



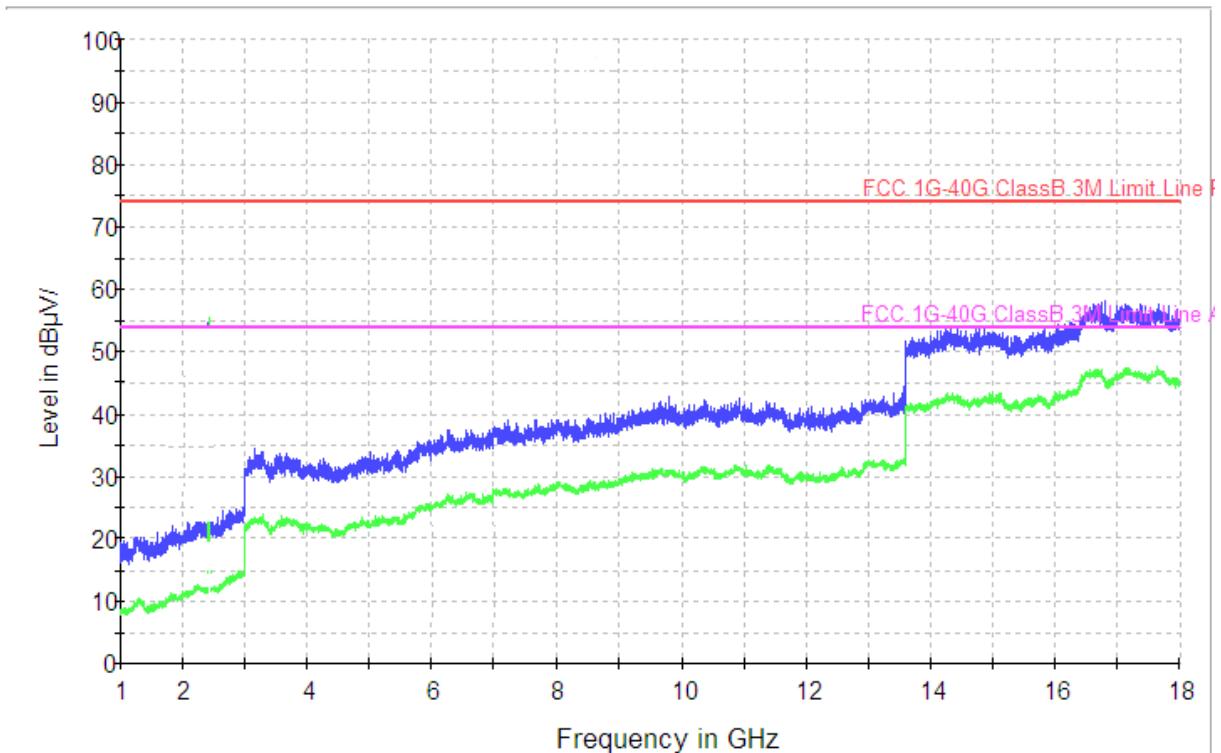
(Plot F: Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
233.50000	44.36	120.000	218.0	46.00	1.64	Horizontal	Pass
264.19000	45.43	120.000	210.0	46.00	0.57	Horizontal	Pass
266.35000	45.26	120.000	310.0	46.00	0.74	Horizontal	Pass

Test result of radiated emission above 1GHz



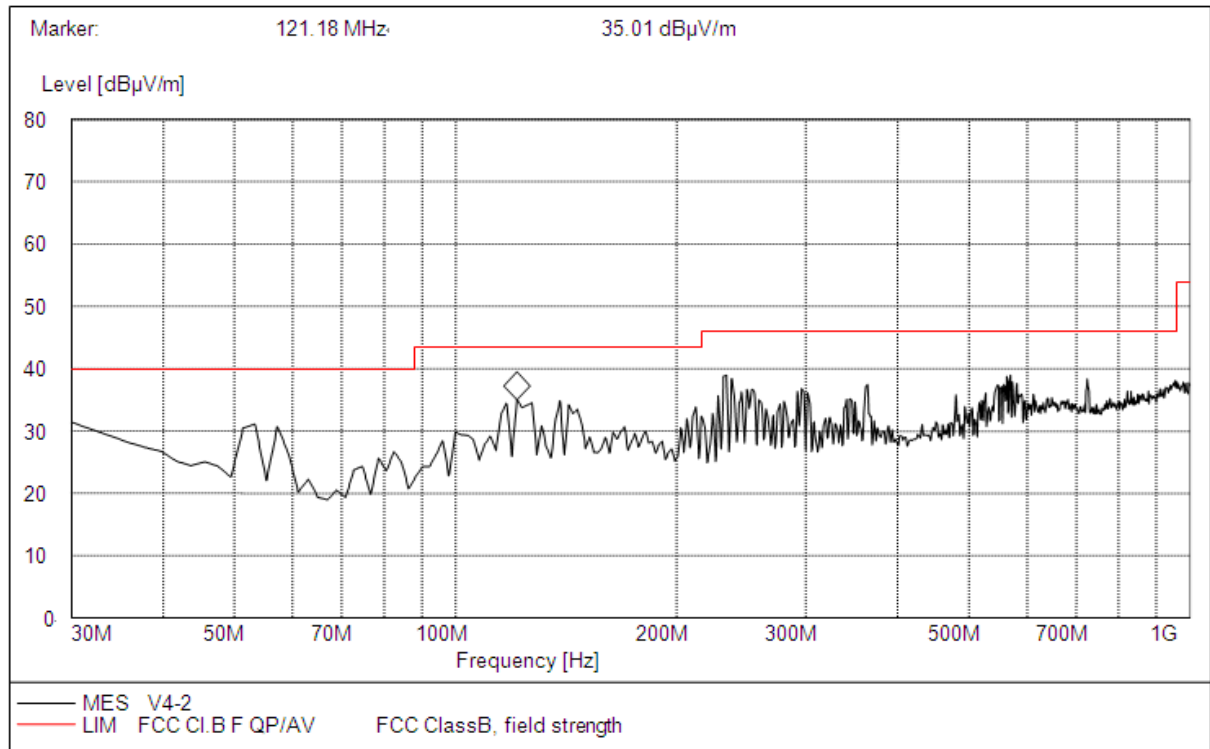
(Plot G: Test Antenna Horizontal 1G – 18G)



(Plot H: Test Antenna Vertical 1G – 18G)

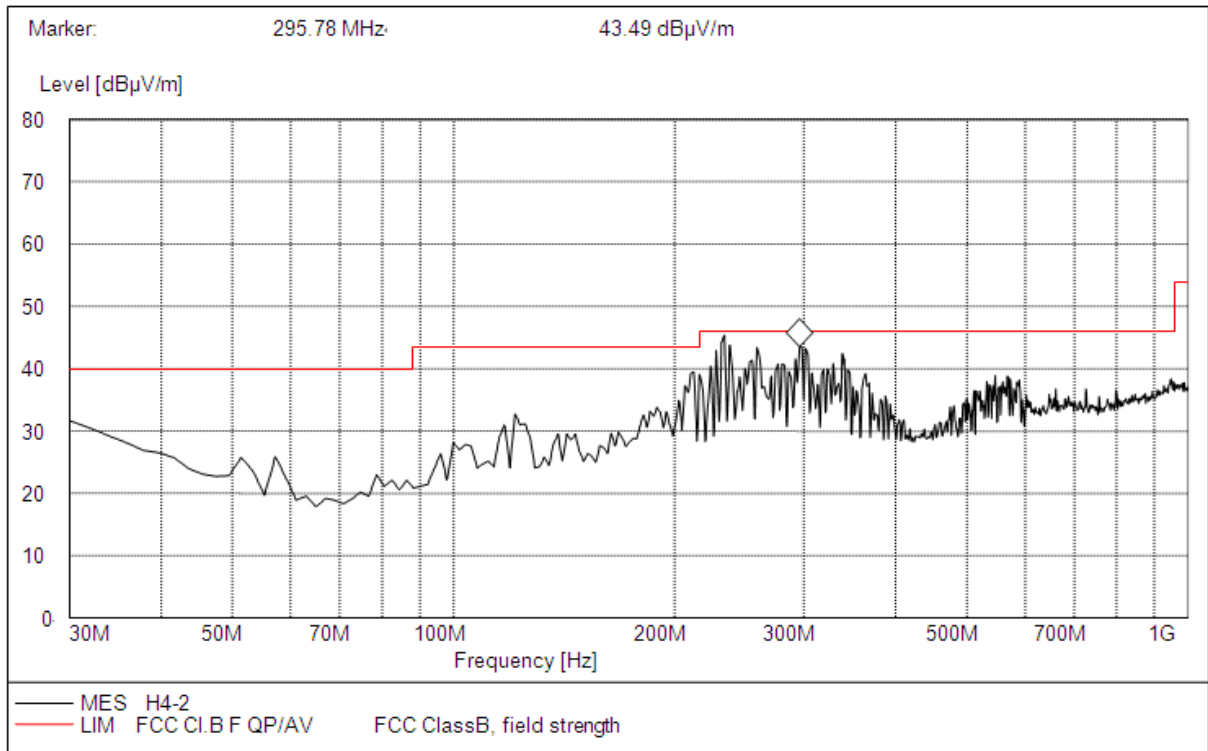
Test result of EUT model C4000

Test result of radiated emission below 1GHz



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

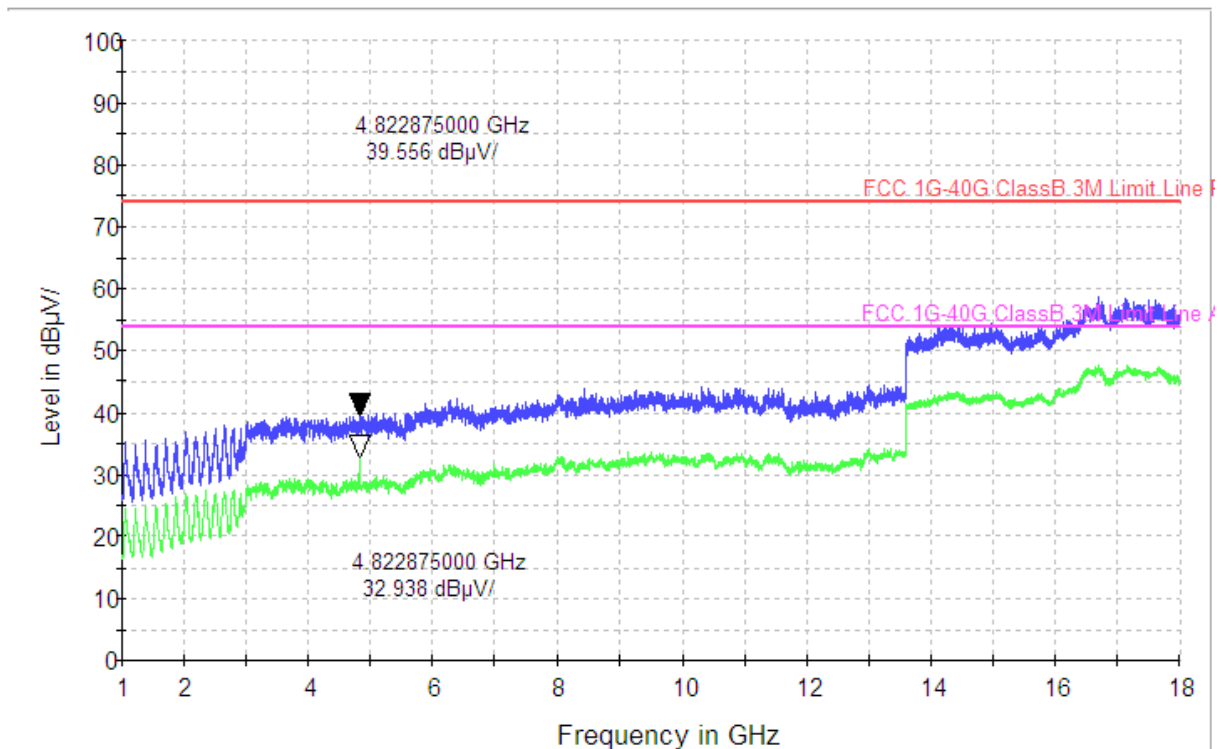
Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
121.36000	32.52	120.000	152.0	43.50	10.98	Vertical	Pass
233.19000	36.28	120.000	214.0	46.00	9.72	Vertical	Pass
569.18000	34.25	120.000	189.0	46.00	11.75	Vertical	Pass



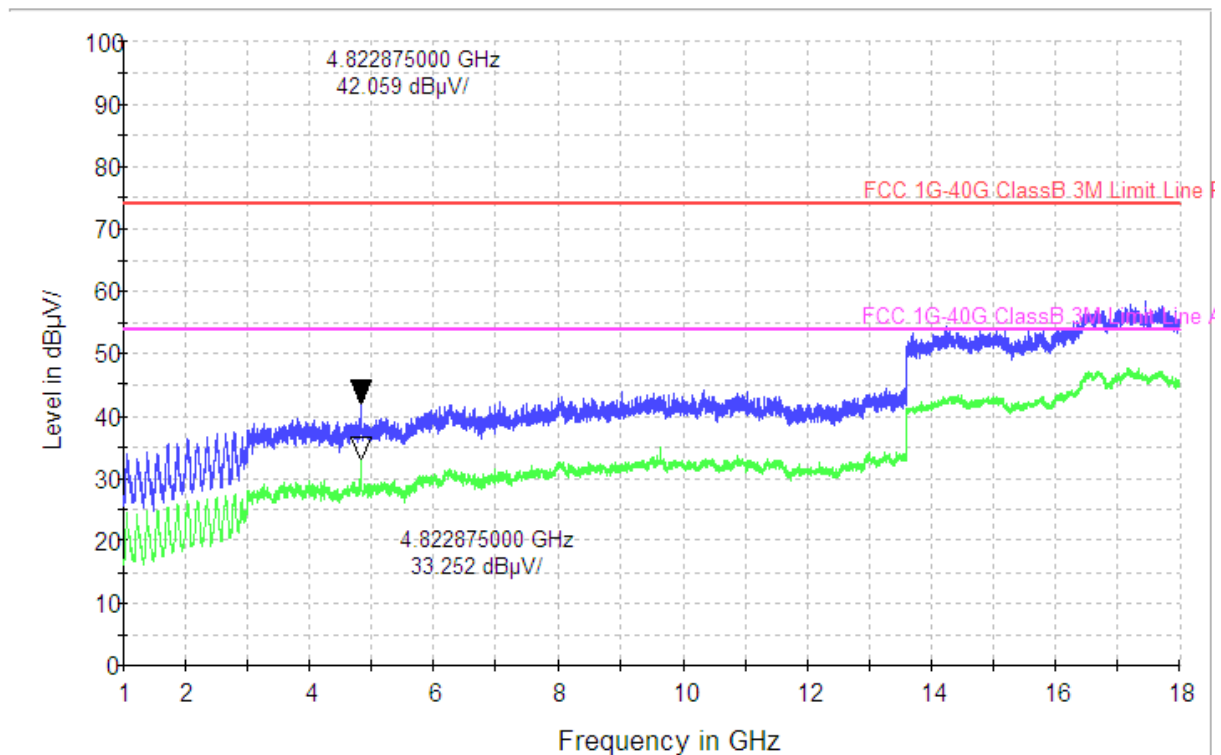
(Plot G : Test Antenna Horizontal 30M - 1G)

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Margin (dB)	Antenna	Verdict
233.69000	42.42	120.000	163.0	46.00	3.58	Horizontal	Pass
258.36000	41.29	120.000	186.0	46.00	4.71	Horizontal	Pass
295.78000	41.06	120.000	243.0	46.00	4.94	Horizontal	Pass

Test result of radiated emission above 1GHz



(Plot K: Test Antenna Horizontal 1G – 18G)



(Plot L: Test Antenna Vertical 1G – 18G)

Test Result: PASS