FCC TEST REPORT

Product Name:	CR6000 Card Reader
Trade Mark:	VIX
Model No.:	CR6000.BABA
Report Number:	170410003RFC-1
Test Standards:	FCC 47 CFR Part 15 Subpart C
FCC ID:	2AIKG-CR6000
Test Result:	PASS
Date of Issue:	July 6, 2017

Prepared for:

Vix Technology (Aust) Pty Ltd
Level 4, 50 St. Georges Tce, Perth, Australia

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
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Jim Long
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Billy Li
Technical Director

Date: July 6, 2017

UnionTrust Laboratories UnionTrust * Certified *

Version

Version No.	Date	Description
V1.0	July 6, 2017	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Vix Technology (Aust) Pty Ltd
Address of Applicant:	Level 4, 50 St. Georges Tce, Perth, Australia
Manufacturer:	Vix Technology (Aust) Pty Ltd
Address of Manufacturer:	Level 4, 50 St. Georges Tce, Perth, Australia

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	CR6000 Card Reader
Model No.:	CR6000.BABA
Add. Model No.:	CR6000.BADA, CR6000.BAEA
Trade Mark:	VIX
DUT Stage:	Identical Prototype
EUT Supports Function:	13.56 MHz
Sample Received Date:	April 12, 2017
Sample Tested Date:	June 2, 2017 to June 30, 2017
Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model CR6000.BABA, but the circuit and the electronic construction do not change, declared by the manufacturer.	

1.2.2 Description of Accessories

N/A

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Range:	13.110 MHz to 14.010 MHz
Nominal Operating Frequency:	13.56 MHz
Type of Modulation:	ASK
Number of Channels:	1
Antenna Type:	Loop antenna
Maximum Field Strength:	69.36 dBμV/m
Normal Test Voltage:	24.0 Vdc
Extreme Test Voltage:	20.4 to 27.6 Vdc
Extreme Test Temperature:	-20 °C to +50 °C

1.4 OTHER INFORMATION

None

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested independently

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
PC	DELL	OPTIPLEX3020	YQF92-RD4GH-QXTMF-K6M2R	UnionTrust
keyboard	DELL	KB212-B	CN-0N291F-715	UnionTrust

mouse	DELL	MS111	CN-011D3V-738	UnionTrust
LCD Monitor	AOC	190LM00002	AC9412122148384 P1	UnionTrust

2) Support Cable

Description	Quantity	Cable Type	Length (m)	Supplied by
VGA	1	Shielded without ferrite	1.5	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

Tests were sub-contracted.
Compliance Certification Services (Shenzhen) Inc.

Address: No.10-1 Mingkeda Logistics Park, No.18 Huanguan South RD. Guan lan Town, Baoan Distr, Shenzhen, Guangdong, China.
Telephone: +86 (0) 755 28055000 Fax: +86 (0) 755 29055221

1.7 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1
The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

Compliance Certification Services (Shenzhen) Inc.

FCC Registration Number is 441872.

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product 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.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-30MHz	±3.2878 dB
2	Radiated emission 30MHz-200MHz	±3.8928 dB
3	Radiated emission 200MHz-1000MHz	±3.8753 dB
4	Radiated emission 1GHz-8GHz	±5.3112 dB
5	Radiated emission 8GHz-18GHz	±5.3493 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A
The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	FCC 47 CFR Part 15 Subpart C Section 15.225(d) /15.209	ANSI C63.10-2013	PASS*
Fundamental Field Strength and Emission Mask 13.110 MHz to 14.010 MHz	FCC 47 CFR Part 15 Subpart C Section 15.227(a) (b) (c) /15.205	ANSI C63.10-2013	PASS*
20DB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215(c)	ANSI C63.10-2013	Pass*
Frequency Tolerance	FCC 47 CFR Part 15 Subpart C Section 15.225(e)	ANSI C63.10-2013	Pass

Note:

1) N/A: In this whole report not application.
2) This EUT is DC powered.
3) "*": In this whole report "*" means tests were sub-contracted Item.
4) The EUT is also considered as a kind of other class B digital device. It has been verified to comply with the requirements of FCC Part 15B Class B(DoC). The test report has been issued by Shenzhen UnionTrust Quality and Technology Co., Ltd.

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☑	PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	02-17-2017	02-16-2018
☑	Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
☑	Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
☑	Controller	CT	N/A	N/A	N.C.R	N.C.R
☑	Bilog Antenna	SCHAFFNER	CBL6143	5082	02-12-2017	02-11-2018
☐	Horn Antenna	Schwarzbeck	BBHA9120	D286	02-11-2017	02-10-2018
☑	Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02-11-2017	02-10-2018
☑	Loop Antenna	COM-POWER	AL-130	121044	02-12-2017	02-11-2018
☐	High Noise Amplifier	Agilent	8449B	3008A01838	02-11-2017	02-10-2018
☑	Temp. / Humidity Meter	Anymetre	JR913	N/A	02-15-2017	02-14-2018
☑	Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
☑	Test S/W	FARAO	LZ-RF / CCS-SZ-3A2			

Conducted RF test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☑	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017
☐	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Dec. 22, 2016	Dec. 22, 2017
☑	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	Jun. 19, 2017	Jun. 18, 2018
☐	Temp & Humidity chamber	Ispec	GL(U)04KA(W)	1692H201P3	Sep. 21, 2016	Sep. 20, 2017

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	24.0	20 to 75
TL/VL	-20	20.4	20 to 75
TH/VL	+50	20.4	20 to 75
TL/VH	-20	27.6	20 to 75
TH/VH	+50	27.6	20 to 75

Remark:

1) The EUT just work in such extreme temperature of -20 °C to +50 °C and the extreme voltage of 20.4 V to 27.6 V, so here the EUT is tested in the temperature of -20 °C to +50 °C and the voltage of 20.4 V to 27.6 V.
2) VN: Normal Voltage; TN: Normal Temperature;
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)	Tested by
Conducted Emission	N/A	N/A	N/A	N/A
The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	26	50	101.1	Warlen Song
Fundamental Field Strength and Emission Mask 13.110 MHz to 14.010 MHz	26	50	101.1	Warlen Song
20DB Bandwidth	26	50	101.1	Warlen Song

4.2 TEST CHANNELS

Frequency	Test RF Channel
13.56 MHz	Channel 1
	13.56 MHz

4.3 EUT TEST STATUS

Frequency	Tx Function	Description
13.56 MHz	1Tx	1. Keep the EUT in continuously transmitting during the test.

4.4 PRE-SCAN

4.4.1 Pre-scan under all data rates

Pre-scan under all data rates				
Frequency	**Work in Modes**	**Type**	**Data Rate (Kbps)**	**H-field dBμV/m at 3 m distance**
13.56 MHz	Card Emulation	A	106	63.77
			212	63.28
			424	63.36
			848	64.09
		B	106	63.29
			212	63.45
			424	63.22
			848	63.68
		F	106	N/A
			212	N/A
			424	N/A
			848	N/A
		V	106	N/A
			212	N/A
			424	N/A
			848	N/A
	Reader/Writer	From Card Emulation mode Worst-case data rates		63.22
	Peer-to-Peer	From Card Emulation mode Worst-case data rates		63.15

4.4.2 Used for testing of worst-case data rates

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, work in modes and data rates. Selected for the final test as listed below.

Frequency	**Work in Modes**	**Type**	**Data Rate (Kbps)**
13.56 MHz	☑ Card Emulation ☐ Reader/Writer ☐ Peer-to-Peer	☑ A ☐ B ☐ F ☐ V	☐ 106 ☐ 212 ☐ 424 ☑ 848
Remark: The mark"☑" means is chosen for testing; The mark"☐" means is not chosen for testing.			

4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

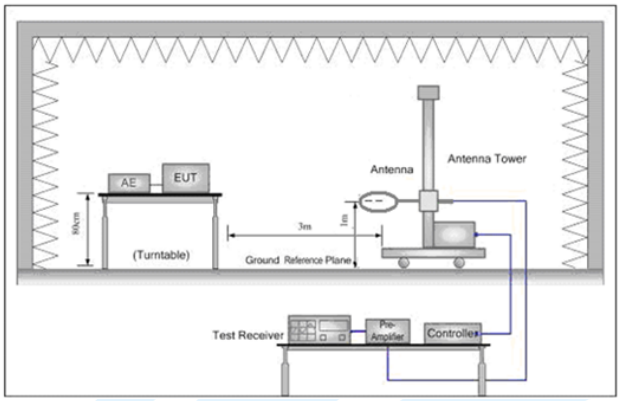


Figure 1. Below 30MHz

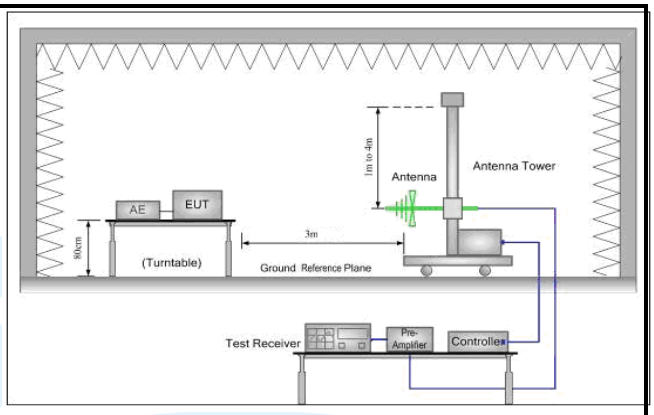
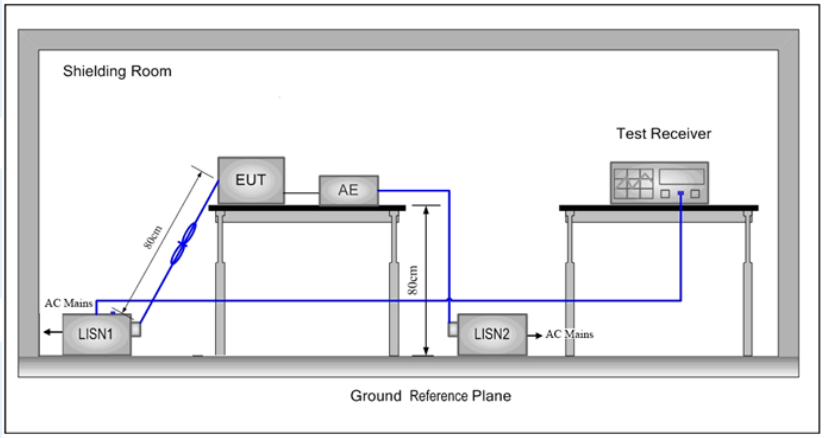


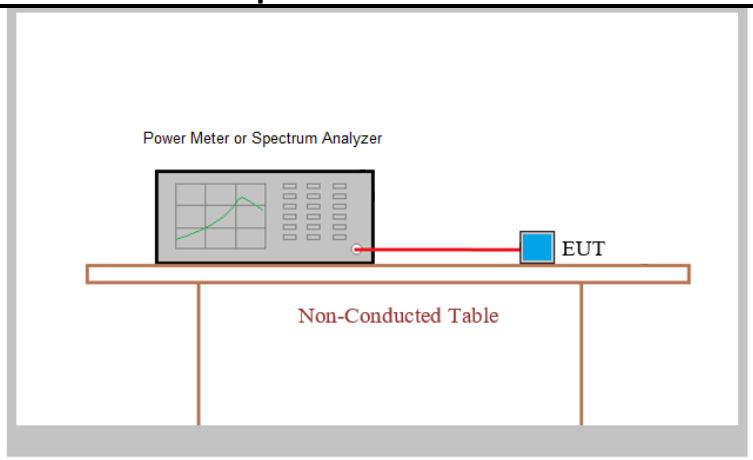
Figure 2. 30MHz to 1GHz

4.5.2 For Conducted Emissions test setup

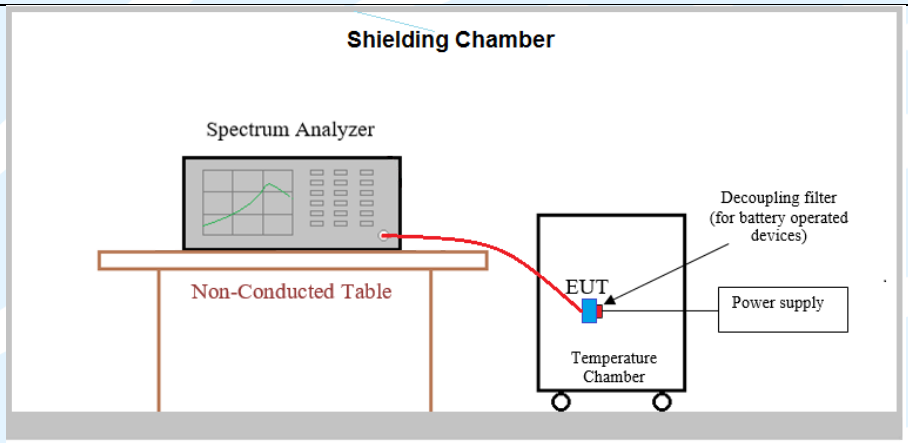
Figure 3. Conducted Emissions setup



4.5.3 For Conducted RF test setup



Normal Environment



Extreme Environment

4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by 24Vdc. Only the worst case data were recorded in this test report.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 15	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard Requirement
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
EUT Antenna:
This product has a permanent antenna, fulfill the requirement of this section.

5.3 20DB BANDWIDTH

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.215 (c)

Test Method: ANSI C63.10

Limit: Operation within the band 13.110 MHz to 14.010 MHz

Requirement : Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equip compliance with the 20dB attenuation specification may base on measurement at the intentional radiator's antenna output terminal unless the intentional radiator uses a permanently attached antenna, in which case compliance shall be. Demonstrated by measuring the radiated emissions.

Test Procedure: Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency
b) Span = approximately 2 to 5 times the OBW
c) RBW = 1% to 5%of the OBW
d) VBW ≥ 3*RBW
e) Sweep = auto;
f) Detector function = peak
g) Trace = max hold
h) All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.4.3 for details.

Instruments Used: Refer to section 3 for details

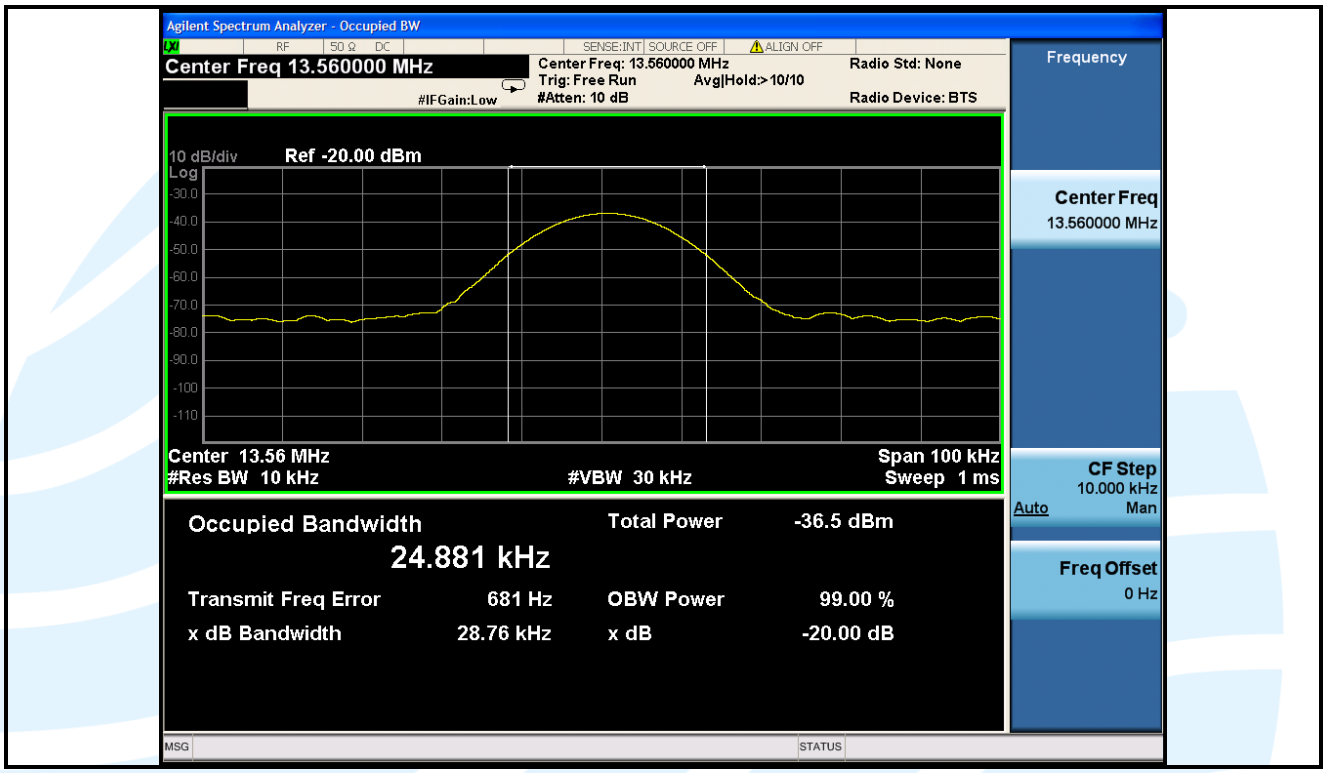
Test Mode: Transmitter mode

Test Results: Pass

Test Data:

Frequency (MHz)	20 dB Bandwidth (KHz)	Limit	Pass / Fail
13.56 MHz	28.76	Operation within the band 13.110 MHz to 14.010 MHz	Pass

The test plot as follows:



5.4 THE FIELD STRENGTH OF ANY EMISSIONS APPEARING OUTSIDE OF THE 13.110-14.010 MHZ BAND

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.225(d) /15.209

Test Method: ANSI C63.10

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak
	Peak	1 MHz	10 Hz	Average

Limits:

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.
4. For Below 30MHz, the measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

   Example:

   Field strength limit for 13.56MHz = 15848 μV/m at 30m
   = 84 dBμV/m at 30m
   = 84 dBμV/m + 40log(30/3) dB at 3m
   = 124 dBμV/m at 3m

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3) For below 30MHz, the antenna height is varied one meter above the ground. Both horizontal and vertical polarizations of the antenna are set to make the measurement, and found horizontal which it is worse

case. Only the test worst case mode is recorded in the report. For above 30MHz, the antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

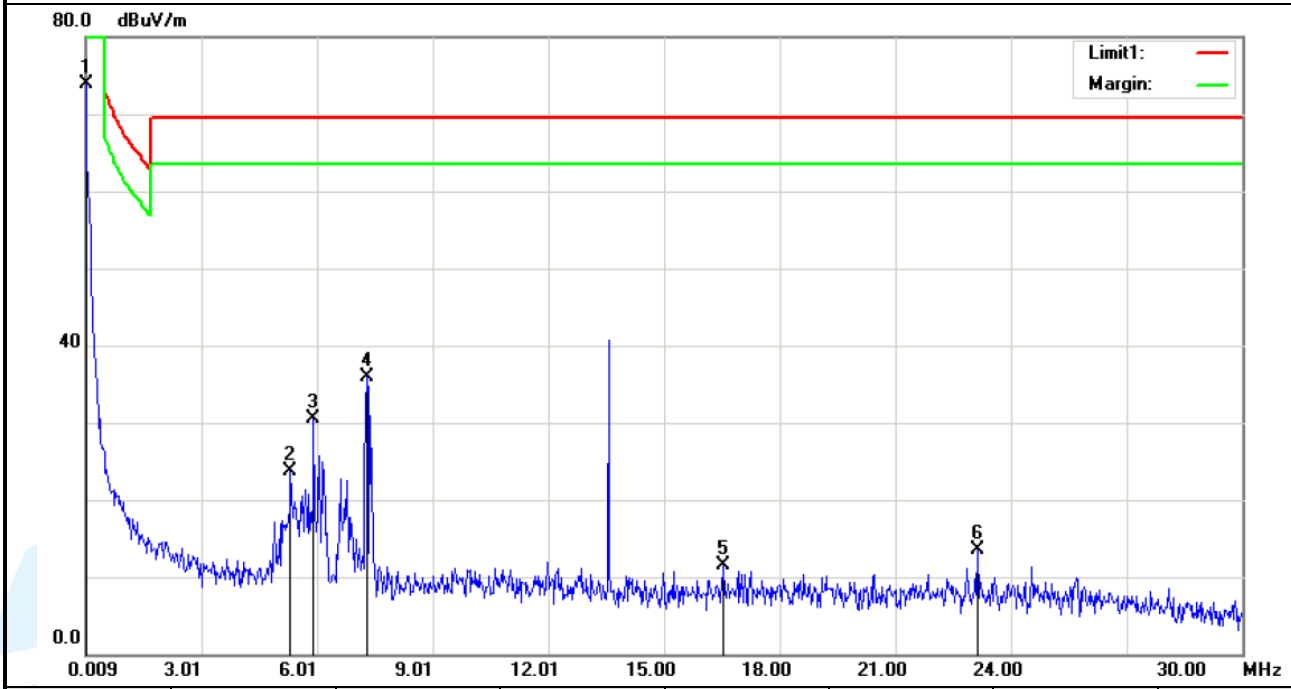
4) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7) The radiation measurements are performed in X, Y, Z axis positioning. And found the Z axis positioning which it is worse case. For above 30MHz, only the test worst case mode is recorded in the report.(for portable and mobile devices)

Equipment Used: Refer to section 3 for details.

Test Result: Pass

Radiated Emission Test Data (9 KHz ~ 30 MHz):

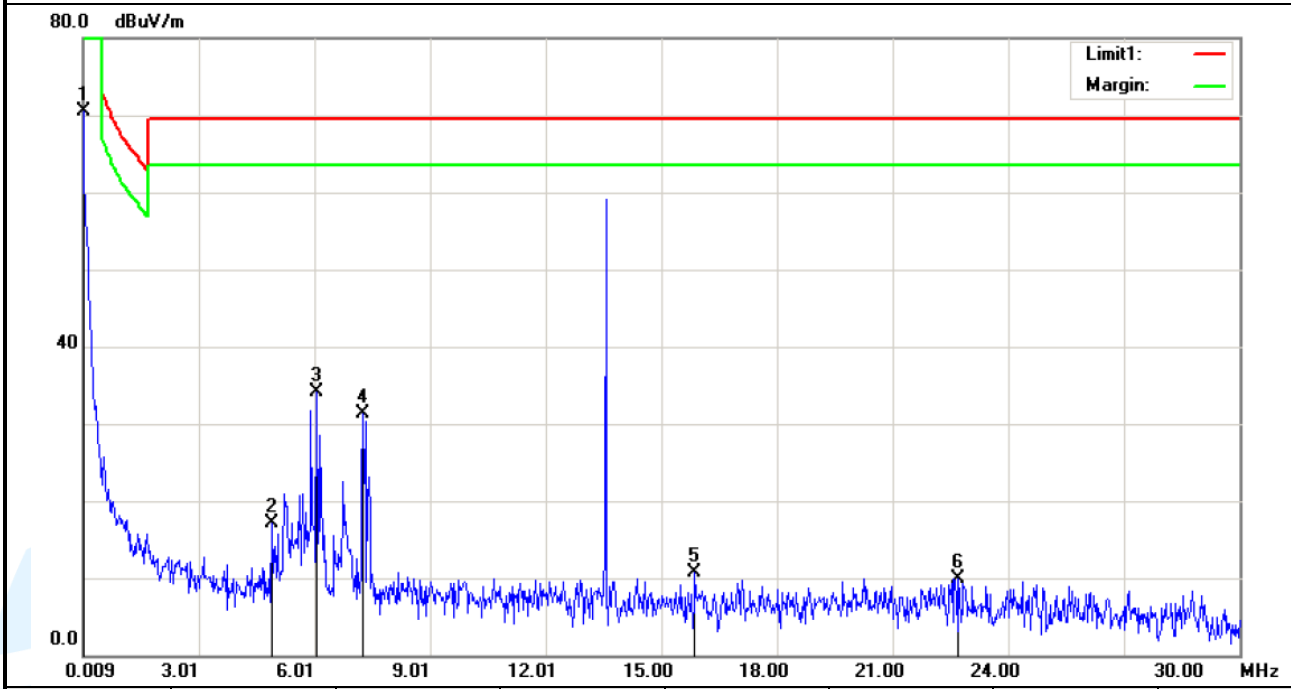
X axis



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	0.009	58.49	15.46	73.95	128.50	54.55	QP
2	5.317	8.81	14.86	23.67	69.54	45.87	QP
3	5.917	15.78	14.79	30.57	69.54	38.97	QP
4*	7.297	21.23	14.73	35.96	69.54	33.58	QP
5	16.534	-2.66	14.12	11.46	69.54	58.08	QP
6	23.132	-0.69	14.12	13.43	69.54	56.11	QP

Radiated Emission Test Data (9 KHz ~ 30 MHz):

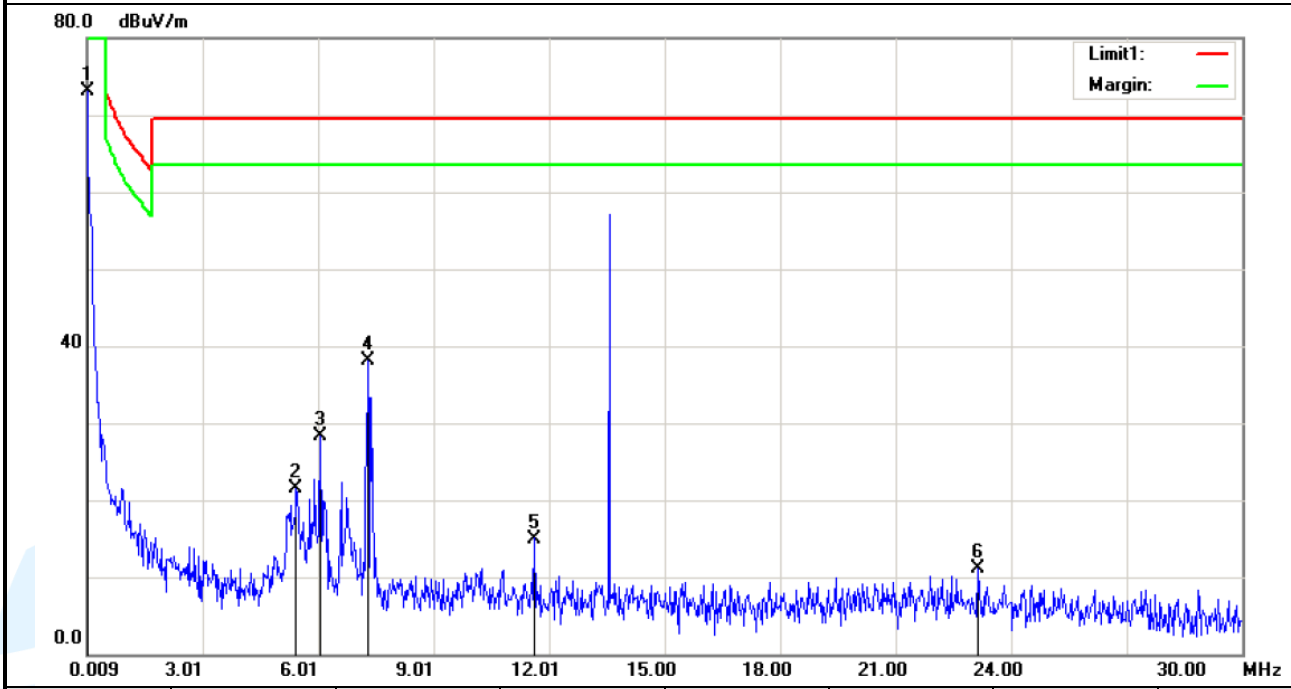
Y- axis



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	0.009	55.04	15.46	70.50	128.50	58.00	QP
2	4.898	2.17	14.89	17.06	69.54	52.48	QP
3*	6.067	19.32	14.78	34.10	69.54	35.44	QP
4	7.267	16.65	14.72	31.37	69.54	38.17	QP
5	15.874	-3.37	14.04	10.67	69.54	58.87	QP
6	22.712	-4.27	14.17	9.90	69.54	59.64	QP

Radiated Emission Test Data (9 KHz ~ 30 MHz):

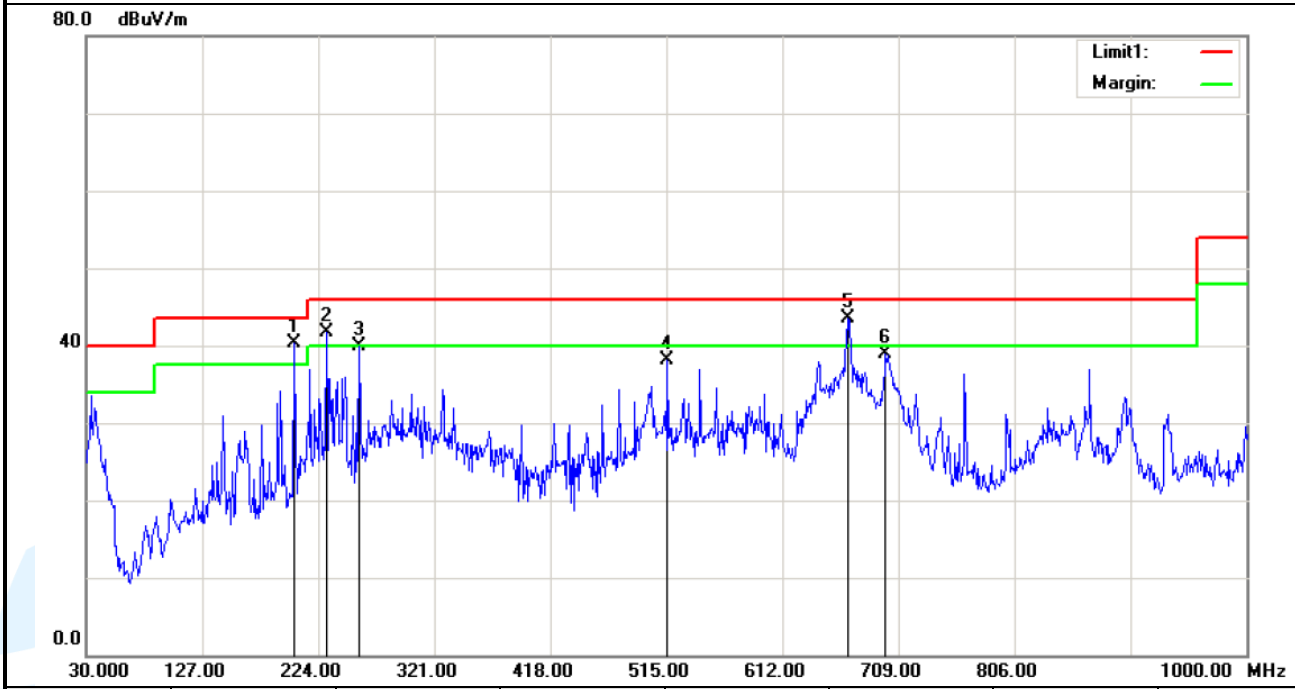
Z- axis



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	0.009	57.73	15.46	73.19	128.50	55.31	QP
2	5.437	6.71	14.84	21.55	69.54	47.99	QP
3	6.067	13.54	14.78	28.32	69.54	41.22	QP
4*	7.297	23.30	14.73	38.03	69.54	31.51	QP
5	11.616	0.23	14.77	15.00	69.54	54.54	QP
6	23.132	-2.99	14.12	11.13	69.54	58.41	QP

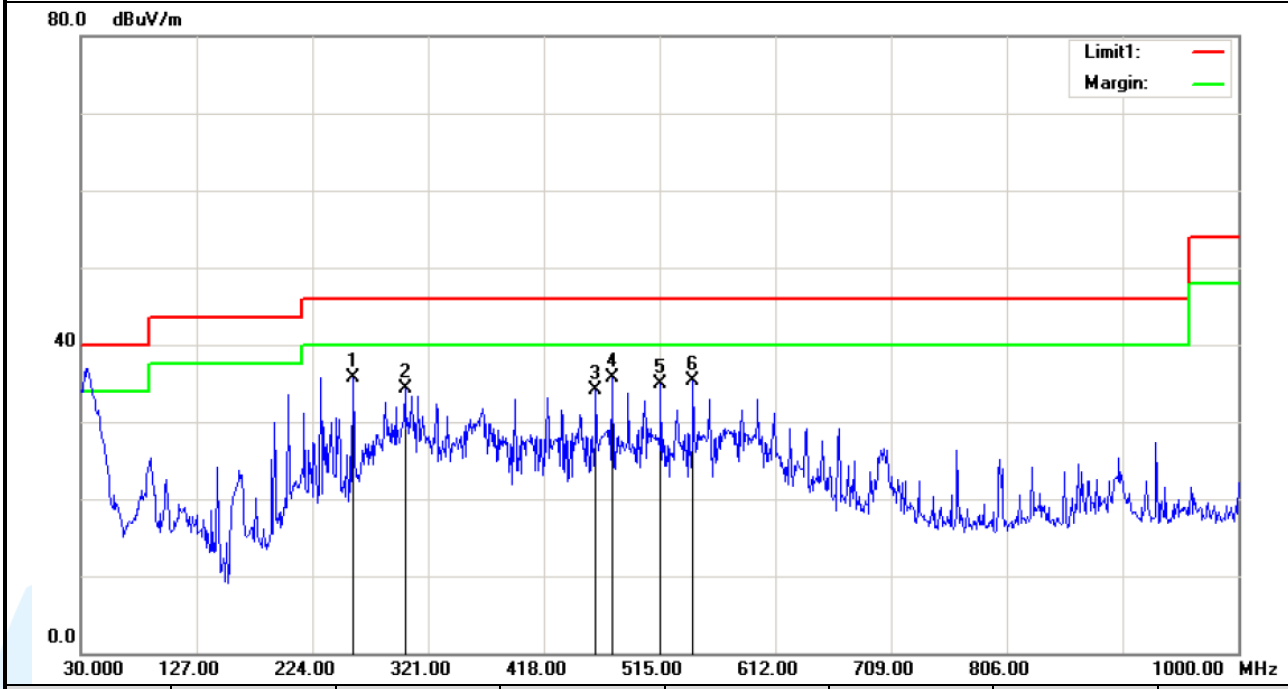
Radiated Emission Test Data (30 MHz ~ 1 GHz):

Horizontal



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	203.630	62.67	-22.29	40.38	43.50	3.12	QP
2	230.790	63.50	-21.82	41.68	46.00	4.32	QP
3	257.950	60.07	-20.15	39.92	46.00	6.08	QP
4	515.970	52.22	-14.18	38.04	46.00	7.96	QP
5*	667.290	55.60	-12.19	43.41	46.00	2.59	QP
6	698.330	50.84	-11.98	38.86	46.00	7.14	QP

Vertical



No.	Frequency (MHz)	Reading (dBµV)	Correction factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
1*	257.950	55.90	-20.15	35.75	46.00	10.25	QP
2	301.600	53.82	-19.51	34.31	46.00	11.69	QP
3	461.650	49.24	-15.10	34.14	46.00	11.86	QP
4	475.230	50.23	-14.53	35.70	46.00	10.30	QP
5	515.970	48.99	-14.18	34.81	46.00	11.19	QP
6	543.130	48.54	-13.22	35.32	46.00	10.68	QP

5.5 FUNDAMENTAL FIELD STRENGTH AND EMISSION MASK 13.110 MHZ TO 14.010 MHZ

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.227(a) (b) (c) /15.205

Test Method: ANSI C63.10

Limits:

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. For Below 30MHz, the measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

Field strength limit for 13.56MHz = 15848 μV/m at 30m
= 84 dBμV/m at 30m
= 84 dBμV/m + 40log(30/3) dB at 3m
= 124 dBμV/m at 3m

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

As the radiation test, set the RBW=10kHz VBW=30kHz, observed the outside band of 13.110 MHz to 14.010 MHz, than mark the higher-level emission for comparing with the FCC rules.
The antenna height is varied one meter above the ground. Both horizontal and vertical polarizations of the antenna are set to make the measurement, and found horizontal which it is worse case. Only the test worst case mode is recorded in the report.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

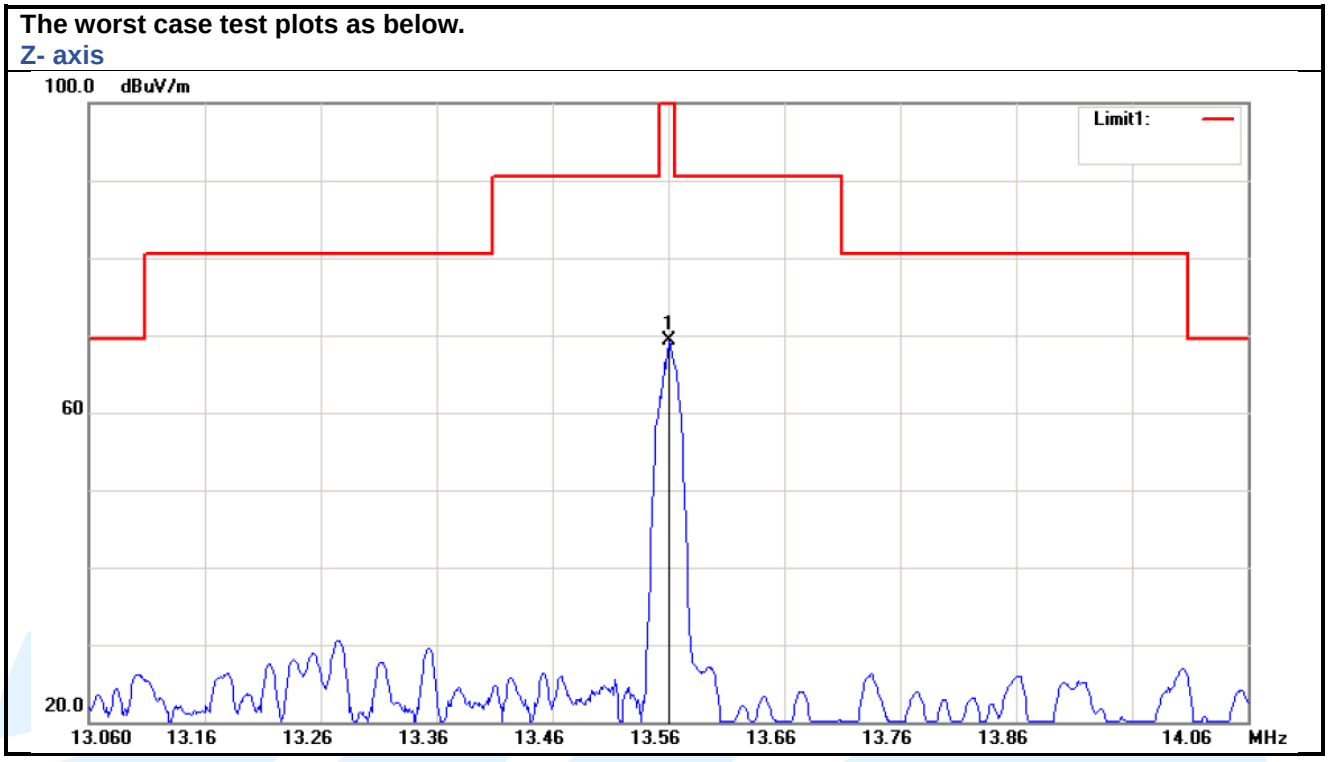
Maximum Field Strength:

Fundamental frequency	Polari-zation	Detector	Result at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)
13.56 MHz	X	Peak	49.87	124	-74.13
	Y	Peak	64.02	124	-59.98
	Z	Peak	69.36	124	-54.64

Emission Mask:

The worst case test plots as below.

Z- axis



5.6 FREQUENCY TOLERANCE

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.225(e)

Test Method: ANSI C63.10-2013

Limits:

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

1) The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2) Turn the EUT on and couple its output to a spectrum analyzer.
3) Turn the EUT off and set the chamber to the highest temperature specified.
4) Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
5) Repeat step c) and d) with the temperature chamber set to the lowest temperature.
6) The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

Frequency Tolerance VS Temperature and Voltage									
Temp. (°C)	Voltage	Test time (minutes)							
		0	2	5	10	0	2	5	10
		Measured Frequency (MHz)				Frequency Drift (%)			
50	VN	13.560145	13.559993	13.559978	13.559977	0.00107	-0.00005	-0.00016	-0.00017
40	VN	13.560037	13.560148	13.559986	13.559986	0.00027	0.00109	-0.00010	-0.00010
30	VN	13.560026	13.560031	13.560116	13.560163	0.00019	0.00023	0.00086	0.00120
20	VN	13.559993	13.560015	13.560026	13.559969	-0.00005	0.00011	0.00019	-0.00023
	VL	13.560032	13.559983	13.560014	13.559973	0.00024	-0.00013	0.00010	-0.00020
	VH	13.56022	13.559967	13.559985	13.560003	0.00162	-0.00024	-0.00011	0.00002
10	VN	13.559996	13.559931	13.559967	13.559984	-0.00003	-0.00051	-0.00024	-0.00012
0	VN	13.559968	13.55986	13.559934	13.559965	-0.00024	-0.00103	-0.00049	-0.00026
-10	VN	13.559977	13.559972	13.559996	13.559937	-0.00017	-0.00021	-0.00003	-0.00046
-20	VN	13.559890	13.559962	13.559940	13.559915	-0.00081	-0.00028	-0.00044	-0.00063
Limit: ±0.01 %									

5.7 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.207

Test Method: ANSI C63.10-2013

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

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

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

Test frequency range :150KHz-30MHz

7) The mains terminal disturbance voltage test was conducted in a shielded room.
8) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
9) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
10) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
11) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Equipment Used: Refer to section 3 for details.

Test Result: Not applicable.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

See test photographs attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photographs.

*** End of Report ***