FCC 47 CFR PART 15 SUBPART C
ISED RSS-210 ISSUE 10

CERTIFICATION TEST REPORT

For

Chipper 3X BT

MODEL NUMBER: CHB30

FCC ID: 2AB7X-CHB30

IC: 24228-CHB30

REPORT NUMBER: 4789577097-11

ISSUE DATE: June 16, 2021

Prepared for

BBPOS International Limited
Suite 1903-04, Tower 2, Nina Tower, 8 Yeung Uk Road, Tsuen Wan, NT, Hong Kong

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	06/16/2021	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	Transmitter 99% Emission Bandwidth / 20dB Bandwidth	RSS-Gen 6.7/ Part 15.215 (c)	PASS
2	Transmitter Frequency Stability (Temperature & Voltage Variation)	CFR 47 FCC §15.225(e) ISED RSS-Gen Clause 6.11 ISED RSS-210 Annex B.6	PASS
3	Fundamental Field Strength	CFR 47 FCC §5.225(a)(b)(c)(d) ISED RSS-Gen Clause 6.12 ISED RSS-210 Annex B.6	PASS
4	Radiated Emissions	CFR 47 FCC§15.209(a) CFR 47 FCC§15.225(d) ISED RSS-Gen Clause 6.13 ISED RSS-210 Annex B.6	PASS
5	Band Edge Radiated Emissions	CFR 47 FCC §15.209(a) CFR 47 FCC §15.225(c)(d) ISED RSS-Gen Clause 6.13 ISED RSS-210 Annex B.6	PASS
6	Conducted Emission Test for AC Power Port	CFR 47 FCC §15.207 ISED RSS-Gen Clause 8.8	PASS
7	Antenna Requirement	CFR 47 FCC §15.203 ISED RSS-Gen Clause 6.3	Pass

Note:
1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
2. The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C >< ISED RSS-210 > when <Accuracy Method> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	BBPOS International Limited
Address:	Suite 1903-04, Tower 2, Nina Tower, 8 Yeung Uk Road, Tsuen Wan, NT, Hong Kong

Manufacturer Information

Company Name:	BBPOS International Limited
Address:	Suite 1903-04, Tower 2, Nina Tower, 8 Yeung Uk Road, Tsuen Wan, NT, Hong Kong

EUT Information

EUT Name:	Chipper 3X BT
Model:	CHB30
Brand:	BBPOS
Sample Received Date:	April 27, 2021
Sample Status:	Normal
Sample ID:	3854318
Date of Tested:	April 27, 2021~ June 16, 2021

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-210 Issue 10	PASS
ISED RSS-GEN Issue 5	PASS

Prepared By:

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Checked By:

Shawn Wen
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Approved By:

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-210 Issue 10 and RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note:

1. All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
2. The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.
3. For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OFS.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognize national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62 dB
Radiation Emission test (include Fundamental emission) (9 kHz -30 MHz)	2.2 dB
Radiation Emission test (include Fundamental emission) (30 MHz - 1 GHz)	4.00 dB
Radiation Emission test (1 GHz to 26 GHz) (include Fundamental emission)	5.78 dB (1 GHz - 18 GHz)
	5.23 dB (18 GHz - 26 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.	

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Product Name	Chipper 3X BT	
Model	CHB30	
Product Description	Operation Frequency	13.56 MHz
Modulation	ASK	
Supply Voltage	AC 120 V, 60 Hz	
Battery	DC 3.7 V	

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Max Peak field strength (dBµV/m)
13.56	11.70

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
13.56	PCB Trace Antenna	0

5.4. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage:	VL	DC 3.33V
	VN	DC 3.7V
	VH	DC 4.07

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remarks
1	Laptop	ThinkPad	T460S	SL10K24796 JS
2	UART	/	/	/
3	Adapter	SAMSUNG	ETA-U90CBC	5Vdc,2A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1.0	/
2	USB	Type-C	/	0.2	/

Note: Cable#2 provide by manufacturer.

ACCESSORY

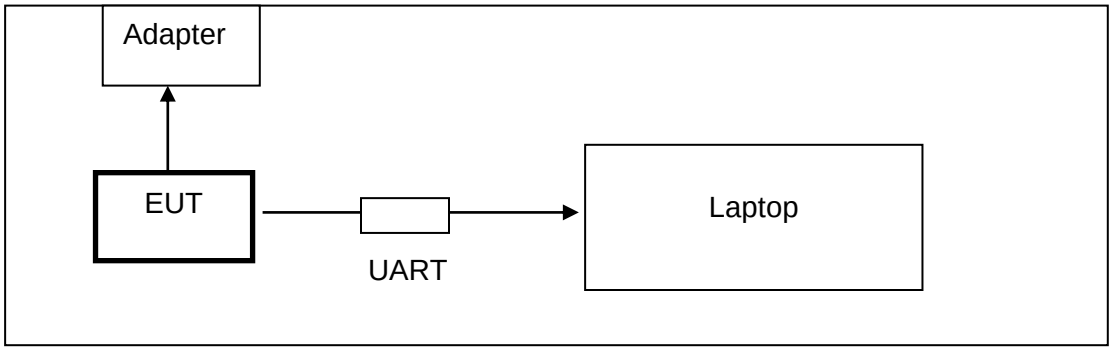
Item	Accessory	Brand Name	Model Name	Description
/	/	/	/	/

TEST SETUP

The EUT can work in continuous transmit mode with a software through a Laptop.
Full battery has been used during measurement

Note: The device was tested with and without a tag and found the worst-case configuration is without tag work in continuous transmit mode.

SETUP DIAGRAM FOR TESTS



5.6. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	EMI Test Receiver	R&S	ESR3	101961	Nov. 12, 2020	Nov. 11, 2021
☑	Two-Line V-Network	R&S	ENV216	101983	Nov. 12, 2020	Nov. 11, 2021
Software						
Used	Description		Manufacturer	Name	Version	
☑	Test Software for Conducted disturbance		Farad	EZ-EMC	Ver. UL-3A1	
Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Nov. 12, 2020	Nov. 11, 2021
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130960	Aug. 11, 2018	Aug. 10, 2021
☑	Preamplifier	HP	8447D	2944A09099	Nov. 12, 2020	Nov. 11, 2021
☑	EMI Measurement Receiver	R&S	ESR26	101377	Nov. 12, 2020	Nov. 11, 2021
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.17, 2019	Jan.17,2022
☑	Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Nov. 12, 2020	Nov. 11, 2021
Software						
Used	Description			Manufacturer	Name	Version
☑	Test Software for Radiated disturbance			Farad	EZ-EMC	Ver. UL-3A1
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	Spectrum Analyzer	R&S	FSV40	101117	Nov. 20, 2020	Nov. 19, 2021
☑	DC power supply	Keysight	E3642A	MY55159130	Nov. 20, 2020	Nov. 19, 2021
☑	Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Nov. 20, 2020	Nov. 19, 2021

6. ANTENNA PORT TEST RESULTS

6.1. 99% & 20dB BANDWIDTH

LIMITS

FCC Part15 (15.247) Subpart C RSS-247 ISSUE 2		
Section	Test Item	Limit
ANSI C63.10 Section 6.9.2	20dB % Bandwidth	For reporting purposes only.
RSS-Gen Clause 6.7	99 % Bandwidth	For reporting purposes only.

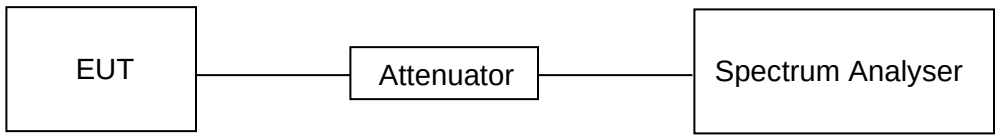
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 20dB Occupied Bandwidth: 1% to 5% of the 20 dB bandwidth For 99% Occupied Bandwidth: 1% to 5% of the occupied bandwidth
VBW	For 20dB Occupied Bandwidth: approximately 3×RBW For 99% Occupied Bandwidth: ≥ 3×RBW
Span	Between 2 times and 5 times the 20dB OBW. Between 1.5 times and 5.0 times the 99% OBW.
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 99%/20dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



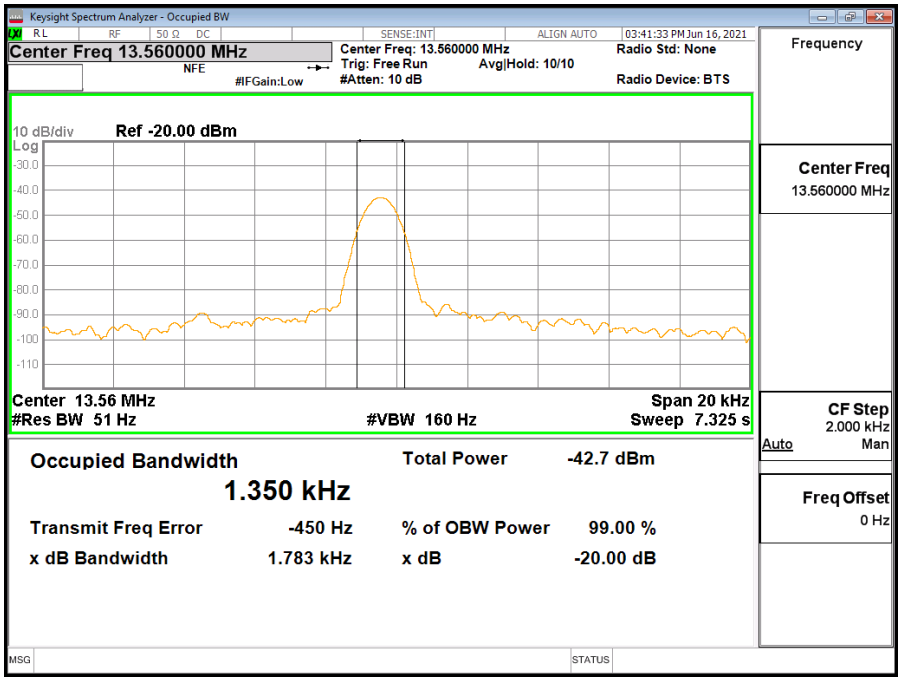
TEST ENVIRONMENT

Temperature	23.7 °C	Relative Humidity	62 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V, 60Hz

RESULTS

Frequency (MHz)	99 % bandwidth (kHz)	20 dB bandwidth (kHz)
13.56	1.35	1.783

Occupied Bandwidth



6.2. TRANSMITTER FREQUENCY STABILITY

LIMITS

CFR 47 FCC §15.225(e)

ISED RSS-210 Annex B B.5

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.

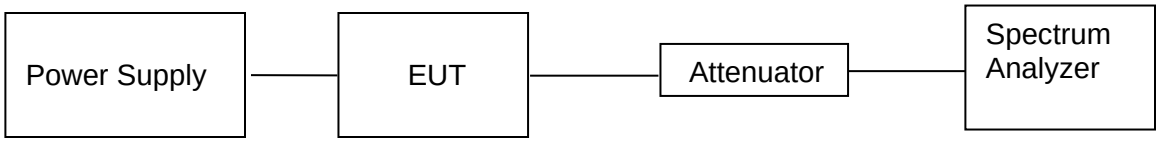
TEST SETUP AND PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	PEAK
RBW	10 kHz
VBW	≥3 × RBW
Span	Encompass the entire emissions bandwidth (EBW) of the signal
Trace	Max hold
Sweep time	Auto

Allow the trace to stabilize, find the peak value of the power envelope and record the frequency, then calculated the frequency drift.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.2 °C	Relative Humidity	61 %
Atmosphere Pressure	101kPa	Test Voltage	/

TEST RESULTS

Maximum frequency error of the EUT with variations in ambient temperature

Temperature (°C)	Time after Start-			
	0 minutes (MHz)	2 minutes (MHz)	5 minutes (MHz)	10 minutes (MHz)
-20	13.5607	13.5603	13.5608	13.5606
-10	13.5609	13.5605	13.5602	13.5603
0	13.5607	13.5607	13.5606	13.5608
10	13.5607	13.5609	13.5603	13.5607
20	13.5609	13.5609	13.5601	13.5607
30	13.5607	13.5605	13.5609	13.5609
40	13.5605	13.5603	13.5607	13.5608
50	13.5607	13.5608	13.5609	13.5605

Nominal Frequency (MHz)	Frequency with Worst Case Deviation (MHz)	Frequency Error (MHz)	Frequency Error (%)	Limit (%)	Result
13.56	13.5609	0.0009	0.0066	0.01	Pass

Maximum frequency error of the EUT with variations in nominal operating voltage at a temperature of 20 degrees C.

Supply Voltage (V)	Time after Start-up			
	0 minutes (MHz)	2 minutes (MHz)	5 minutes (MHz)	10 minutes (MHz)
3.33	13.5607	13.5606	13.5605	13.5607
3.7	13.5606	13.5607	13.5610	13.5609
4.07	13.5606	13.5606	13.5607	13.5605
Maximum frequency error (MHz)	0.0007	0.0007	0.0010	0.0009
Limit	0.01%			
Result	Pass	Pass	Pass	Pass

Note: Base on ANSI C63.10 clause 5.13, Both AC power supply and DC power supply have been tested, only the worst data of DC power supply was recorded in the report.

7. RADIATED EMISSION TEST RESULTS

LIMITS

Fundamental field strength

FCC Reference:	Part 15.225(a)(b)(c)(d) & 15.209(a)
ISED Canada Reference:	RSS-Gen 6.13 & RSS-210 B.6 & RSS-GEN Clause 8.9
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measured Distance (Meters)
13.553-13.567	15848	84	30
13.410-13.553/13.567-13.710	334	50.47	30
13.110-13.410/13.710-14.010	106	40.51	30

Note(s):
1. 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.

2. The limit is specified at a test distance of 30 meters. However, as specified by FCC Section 15.31 (f)(2) / RSS-Gen Section 6.4, measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30MHz.

Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

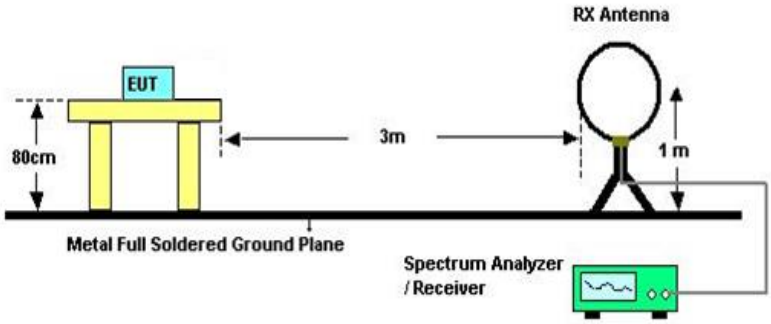
Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c
IC Restricted bands please refer to ISED RSS-GEN Clause 8.10

Table 7 – Restricted frequency bands[Note 1]		
MHz	**MHz**	**GHz**
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

TEST SETUP AND PROCEDURE

Below 30 MHz



The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz) / 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

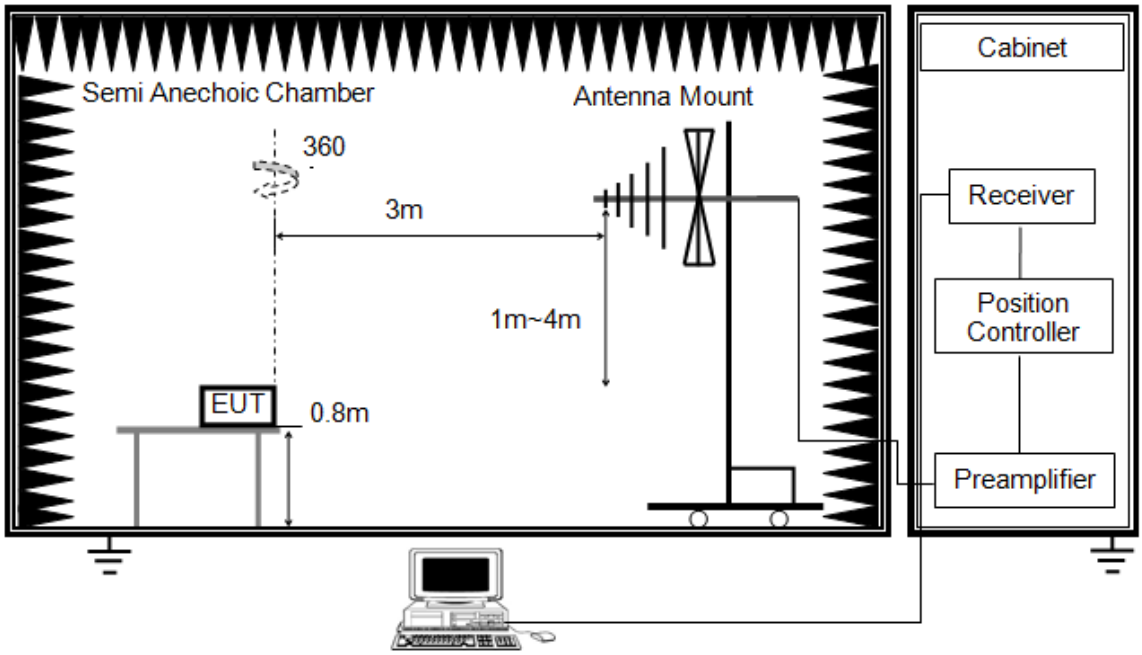
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ω. For example, the measurement frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz



The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

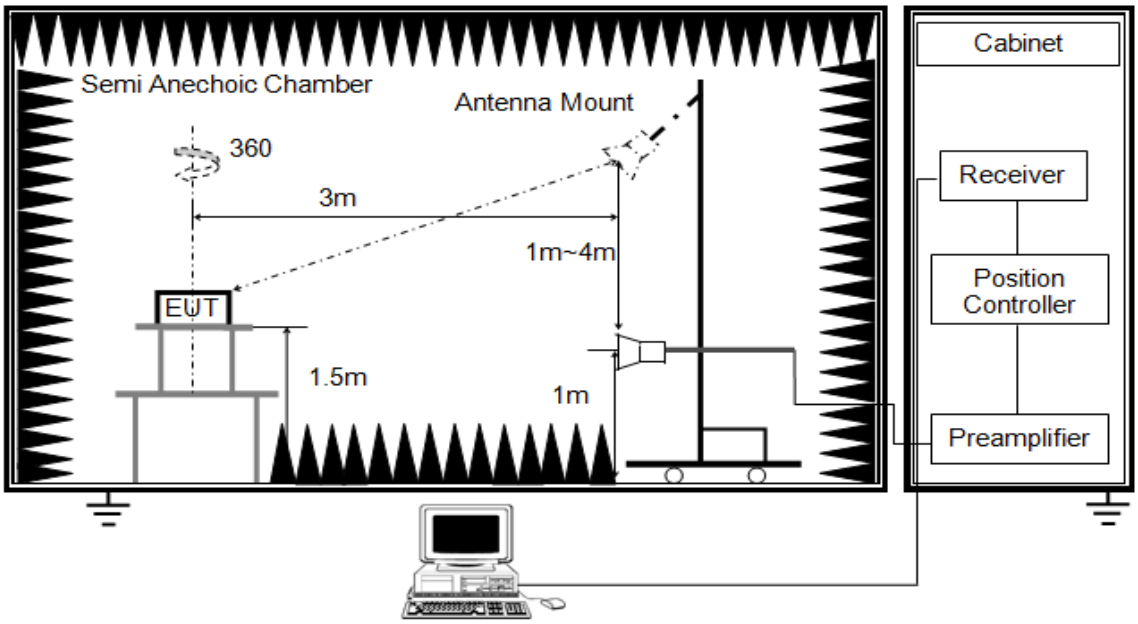
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

6. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

7. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

Above 1 GHz



The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter or band reject filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 150 cm above ground.

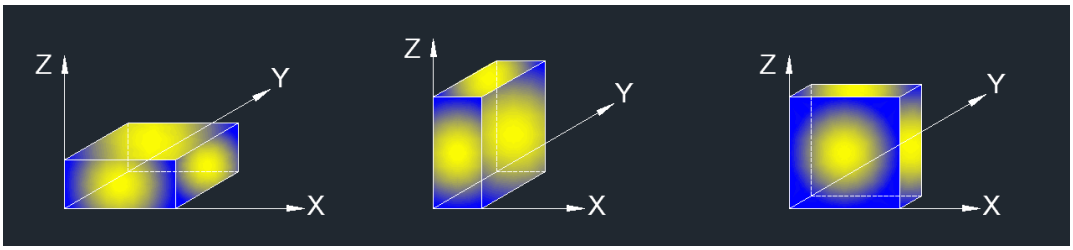
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements. Where necessary, average emission are determined by applying the Duty Cycle Correction Factor to the peak measurements. For the Duty Cycle and Correction Factor please refer to clause 6.1. ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

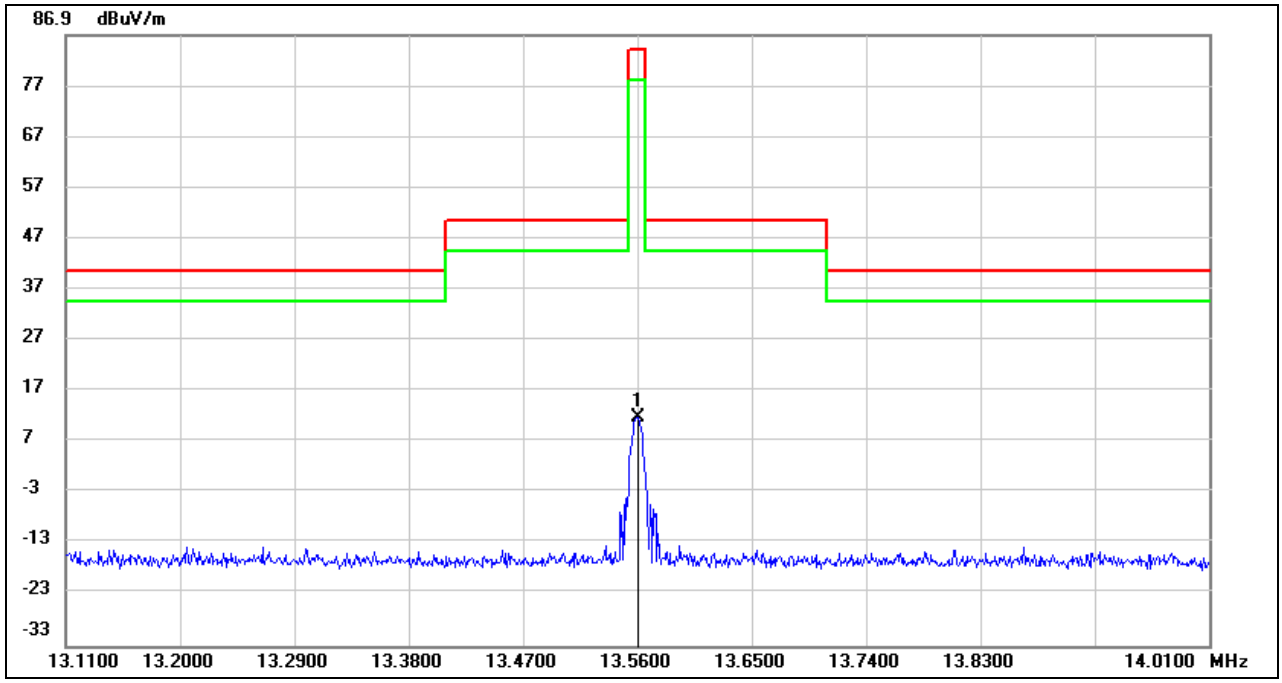
TEST ENVIRONMENT

Temperature	23.4°C	Relative Humidity	64%
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V, 60Hz

RESULTS

7.1. FIELD STRENGTH OF INTENTIONAL EMISSIONS

FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

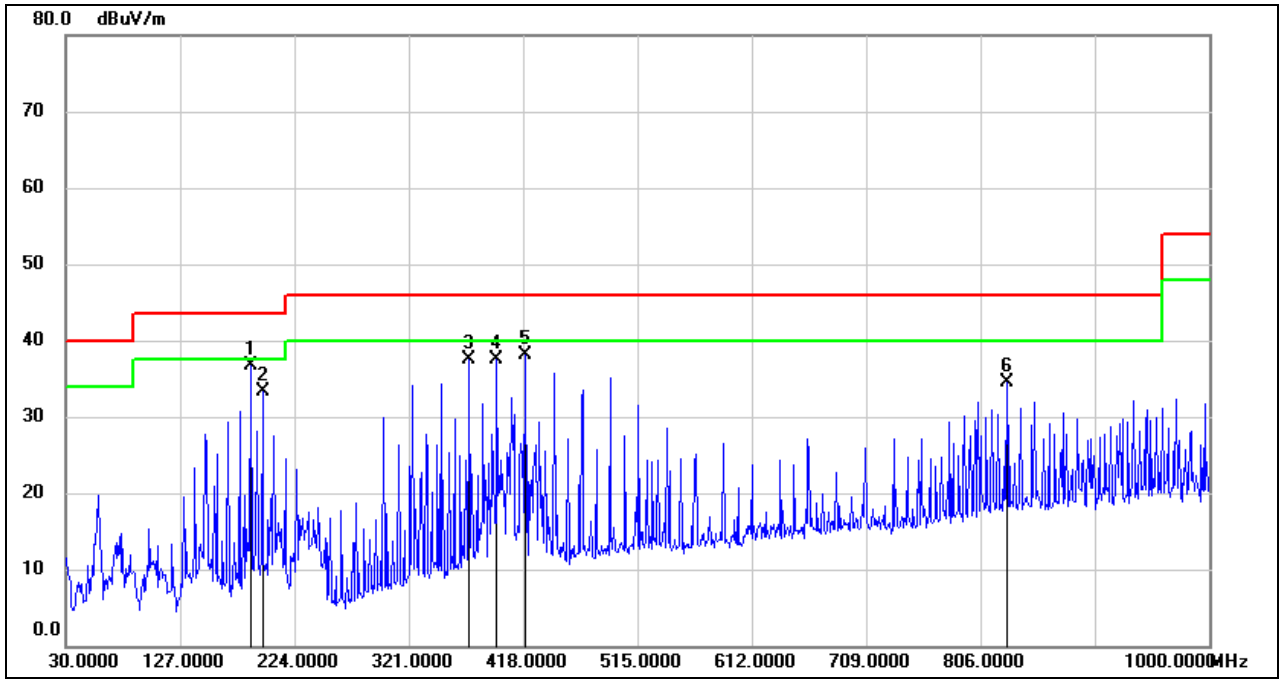


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5600	73.11	-61.41	11.70	84.00	-72.30	peak

Note: 1. Result Level = Read Level + Correct Factor.
2. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

7.2. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz

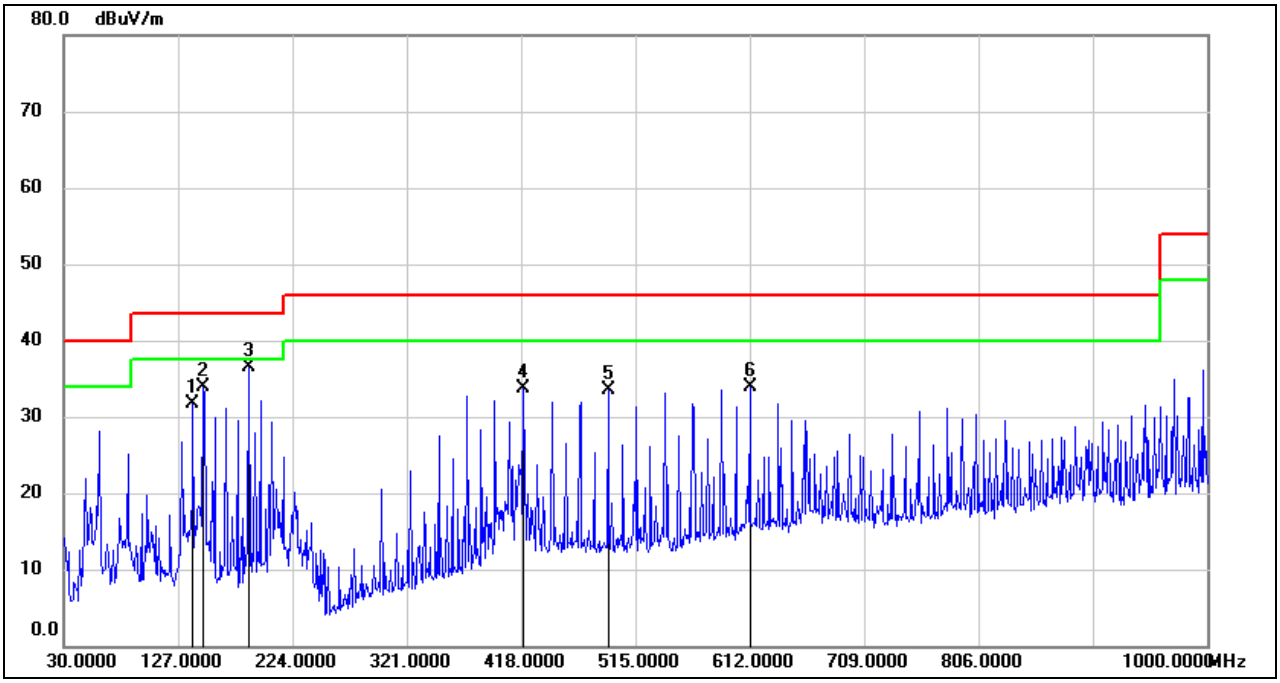
SPURIOUS EMISSIONS (HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	187.1400	53.46	-16.69	36.77	43.50	-6.73	QP
2	196.8400	49.78	-16.45	33.33	43.50	-10.17	QP
3	372.4100	51.39	-13.87	37.52	46.00	-8.48	QP
4	395.6900	50.86	-13.41	37.45	46.00	-8.55	QP
5	419.9400	51.08	-12.99	38.09	46.00	-7.91	QP
6	828.3100	41.18	-6.72	34.46	46.00	-11.54	QP

Note: 1. Result Level = Read Level + Correct Factor.

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



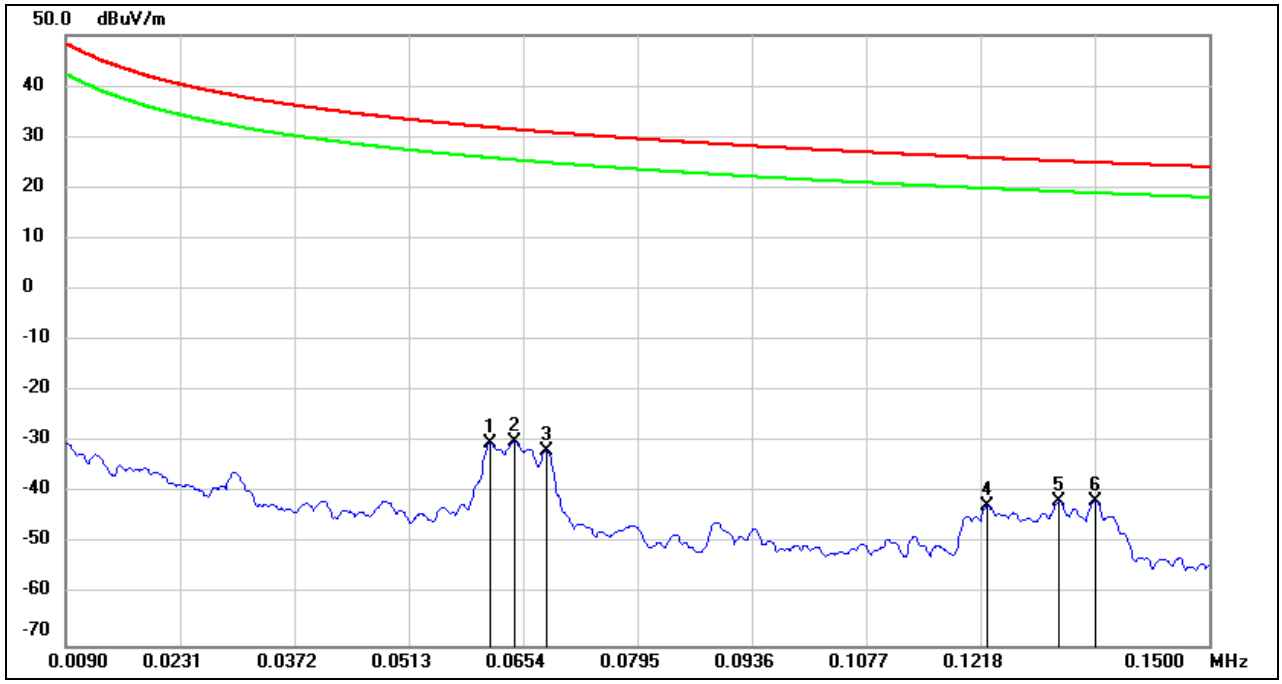
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	139.6100	50.48	-18.87	31.61	43.50	-11.89	QP
2	148.3400	52.36	-18.36	34.00	43.50	-9.50	QP
3	187.1400	53.13	-16.69	36.44	43.50	-7.06	QP
4	419.9400	46.61	-12.99	33.62	46.00	-12.38	QP
5	491.7200	45.23	-11.66	33.57	46.00	-12.43	QP
6	612.0000	43.23	-9.41	33.82	46.00	-12.18	QP

Note: 1. Result Level = Read Level + Correct Factor.

7.3. SPURIOUS EMISSIONS BELOW 30MHz

SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

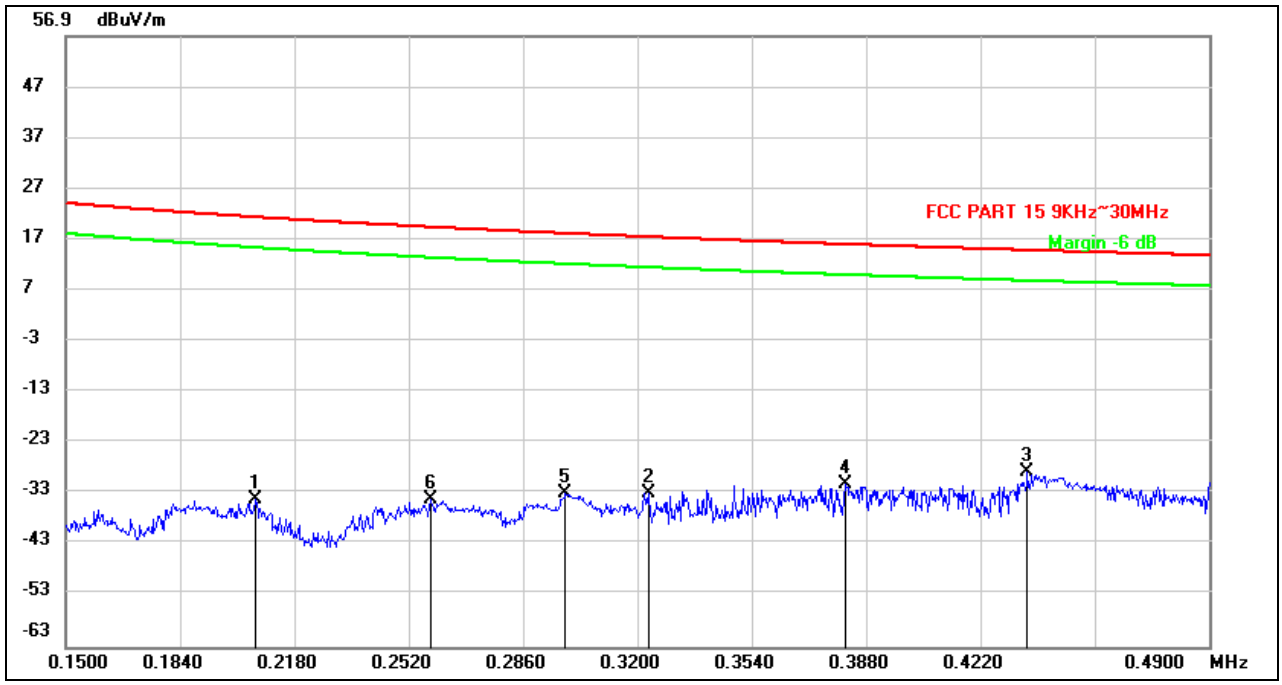
0.09 kHz~ 150 kHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0613	71.03	-101.15	-30.12	31.85	-61.97	peak
2	0.0644	71.11	-101.09	-29.98	31.42	-61.40	peak
3	0.0682	69.21	-101.01	-31.80	30.93	-62.73	peak
4	0.1226	59.15	-101.56	-42.41	25.84	-68.25	peak
5	0.1315	59.93	-101.67	-41.74	25.23	-66.97	peak
6	0.1358	60.09	-101.72	-41.63	24.95	-66.58	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

150 kHz ~ 490 kHz



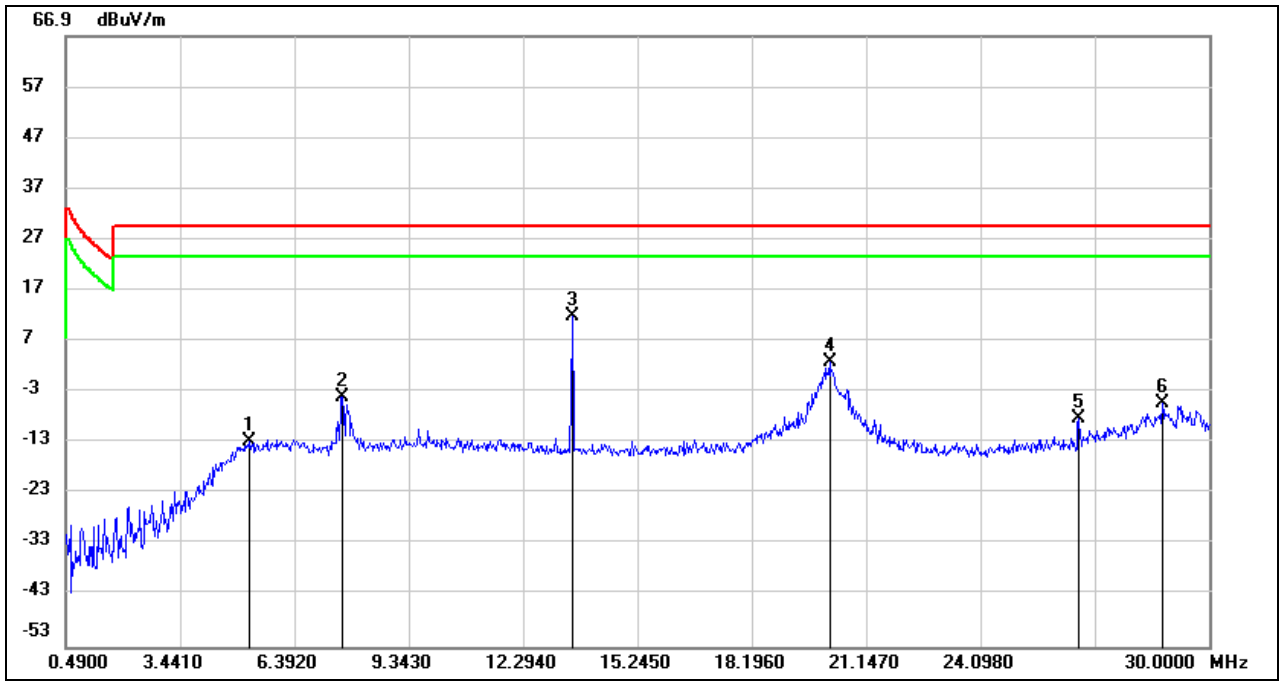
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.2064	67.78	-101.83	-34.05	21.31	-55.36	peak
2	0.3234	68.79	-101.77	-32.98	17.41	-50.39	peak
3	0.4359	72.84	-101.73	-28.89	14.81	-43.70	peak
4	0.3818	70.50	-101.75	-31.25	15.96	-47.21	peak
5	0.2985	68.73	-101.77	-33.04	18.10	-51.14	peak
6	0.2584	67.51	-101.79	-34.28	19.36	-53.64	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

490 kHz ~ 30 MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5.2411	49.10	-61.90	-12.80	29.54	-42.34	peak
2	7.6314	57.53	-61.54	-4.01	29.54	-33.55	peak
3	13.5629	73.18	-61.41	11.77	/	/	Fundamental
4	20.2027	63.84	-61.09	2.75	29.54	-26.79	peak
5	26.6359	52.69	-60.87	-8.18	29.54	-37.72	peak
6	28.7901	55.43	-60.73	-5.30	29.54	-34.84	peak

Note: 1. Measurement = Reading Level + Correct Factor.

2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. About the Fundamental emission test result please refer to section 7.1.

8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

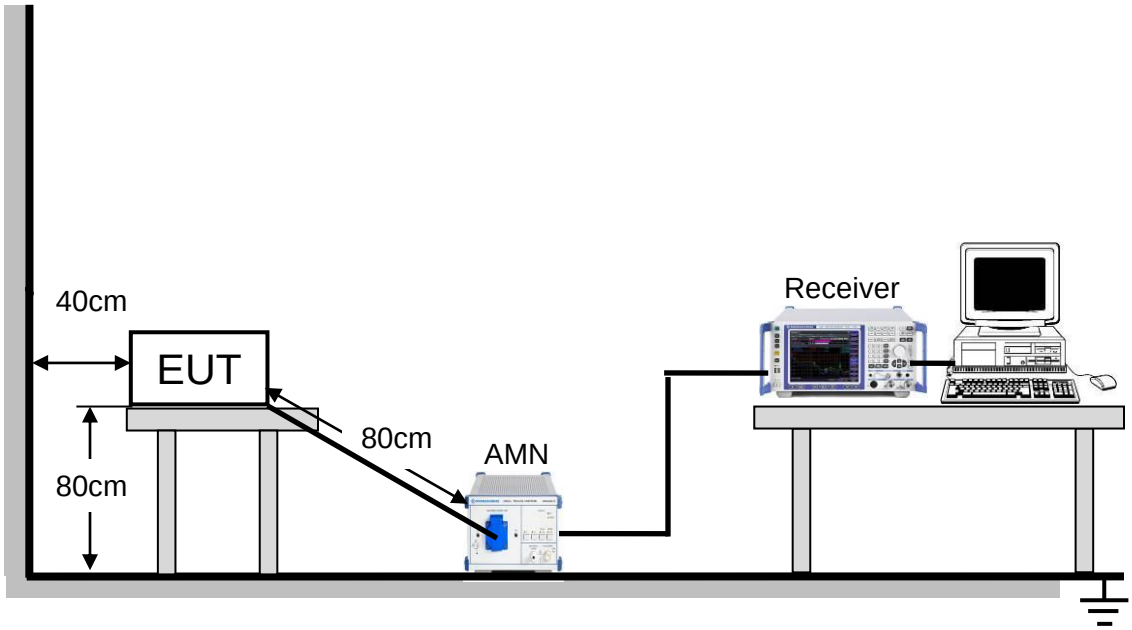
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

TEST SETUP AND PROCEDURE



The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was placed on the top of a rotating table 0.8 meters above the horizontal ground plane and being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

3. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

4. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

5. LISN at least 80 cm from nearest part of EUT chassis.

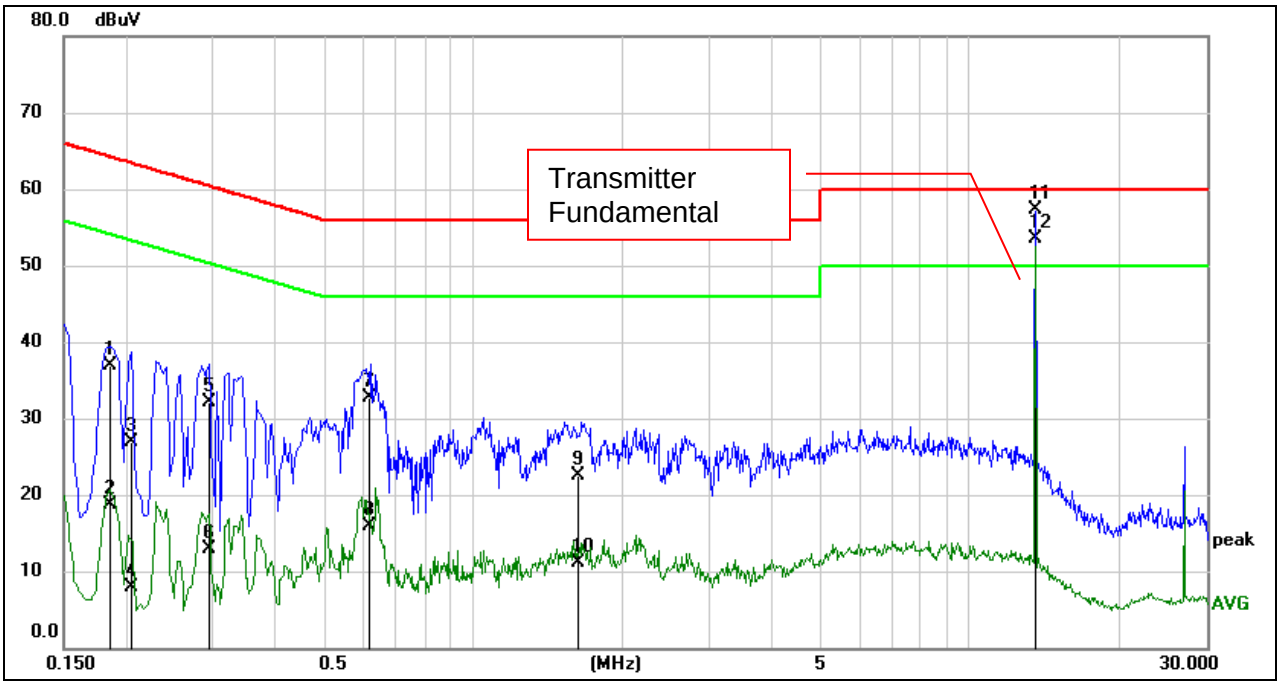
6. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

7. The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Temperature	24.1°C	Relative Humidity	61%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V,60Hz

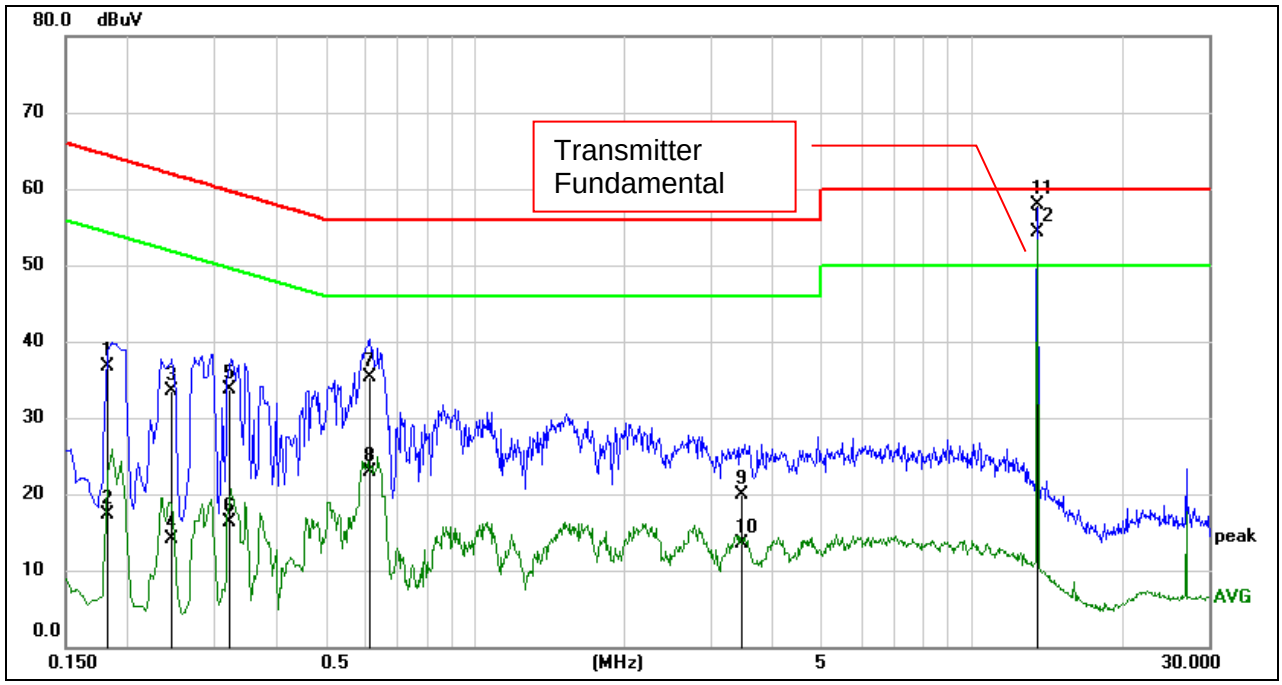
LINE N RESULTS with unmodified sample (antenna present)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1850	27.36	9.59	36.95	64.26	-27.31	QP
2	0.1850	9.16	9.59	18.75	54.26	-35.51	AVG
3	0.2043	17.34	9.59	26.93	63.43	-36.50	QP
4	0.2043	-1.60	9.59	7.99	53.43	-45.44	AVG
5	0.2948	22.46	9.59	32.05	60.39	-28.34	QP
6	0.2948	3.31	9.59	12.90	50.39	-37.49	AVG
7	0.6217	23.01	9.60	32.61	56.00	-23.39	QP
8	0.6217	6.38	9.60	15.98	46.00	-30.02	AVG
9	1.6327	12.94	9.62	22.56	56.00	-33.44	QP
10	1.6327	1.39	9.62	11.01	46.00	-34.99	AVG
11	13.5596	47.69	9.66	57.35	60.00	-2.65	QP
12	13.5596	43.94	9.66	53.60	50.00	3.60	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

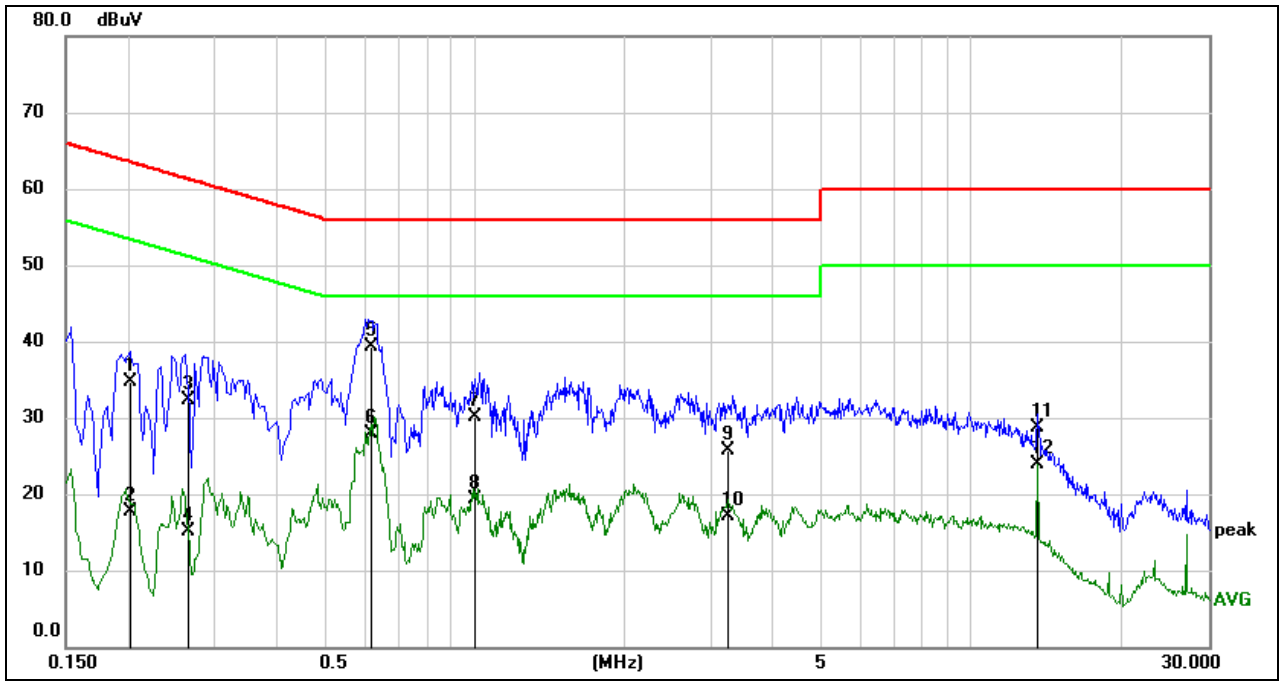
LINE L RESULTS with unmodified sample (antenna present)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1821	27.17	9.59	36.76	64.39	-27.63	QP
2	0.1821	7.70	9.59	17.29	54.39	-37.10	AVG
3	0.2457	23.88	9.59	33.47	61.90	-28.43	QP
4	0.2457	4.55	9.59	14.14	51.90	-37.76	AVG
5	0.3195	24.17	9.59	33.76	59.72	-25.96	QP
6	0.3195	6.70	9.59	16.29	49.72	-33.43	AVG
7	0.6165	25.72	9.60	35.32	56.00	-20.68	QP
8	0.6165	13.23	9.60	22.83	46.00	-23.17	AVG
9	3.4696	10.30	9.61	19.91	56.00	-36.09	QP
10	3.4696	3.85	9.61	13.46	46.00	-32.54	AVG
11	13.5596	48.17	9.66	57.83	60.00	-2.17	QP
12	13.5596	44.68	9.66	54.34	50.00	4.34	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

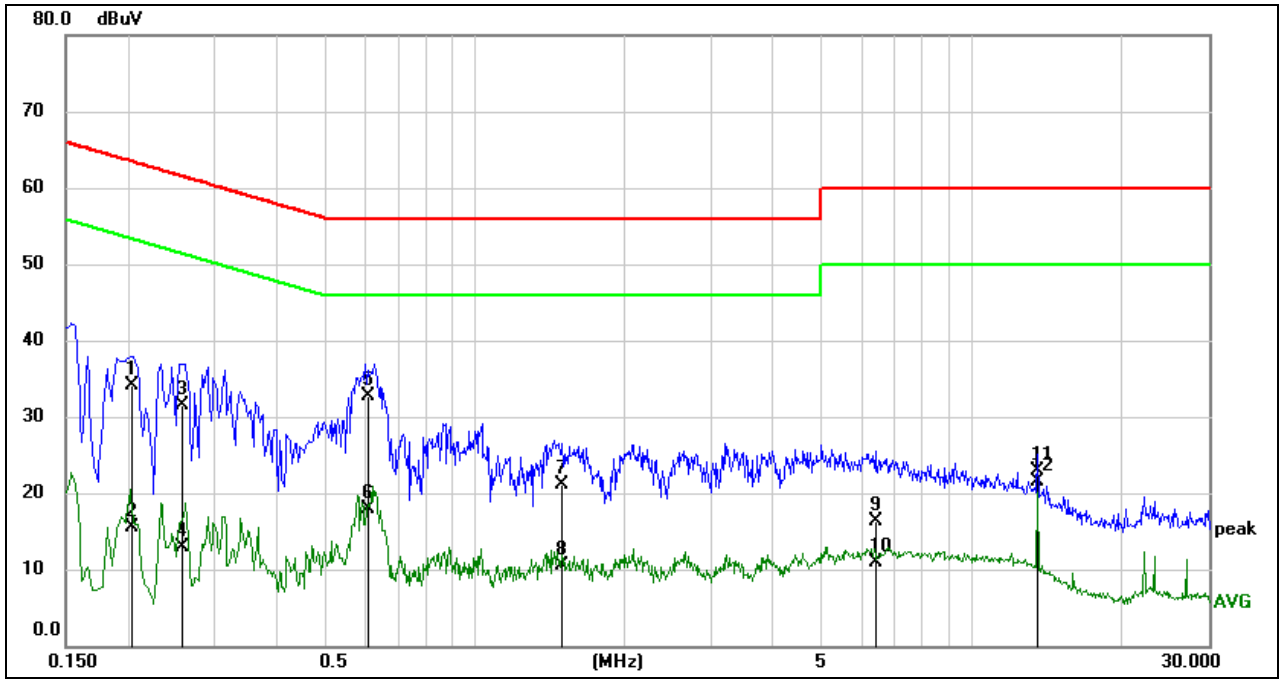
LINE N RESULTS with modified sample (transmitter terminated into a dummy load)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2019	25.14	9.59	34.73	63.53	-28.80	QP
2	0.2019	8.06	9.59	17.65	53.53	-35.88	AVG
3	0.2645	22.72	9.59	32.31	61.29	-28.98	QP
4	0.2645	5.50	9.59	15.09	51.29	-36.20	AVG
5	0.6178	29.65	9.60	39.25	56.00	-16.75	QP
6	0.6178	18.39	9.60	27.99	46.00	-18.01	AVG
7	1.0065	20.40	9.61	30.01	56.00	-25.99	QP
8	1.0065	9.77	9.61	19.38	46.00	-26.62	AVG
9	3.2235	16.02	9.61	25.63	56.00	-30.37	QP
10	3.2235	7.56	9.61	17.17	46.00	-28.83	AVG
11	13.5595	18.95	9.66	28.61	60.00	-31.39	QP
12	13.5595	14.28	9.66	23.94	50.00	-26.06	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

LINE L RESULTS with modified sample (transmitter terminated into a dummy load)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2033	24.60	9.59	34.19	63.47	-29.28	QP
2	0.2033	5.94	9.59	15.53	53.47	-37.94	AVG
3	0.2581	21.90	9.59	31.49	61.49	-30.00	QP
4	0.2581	3.24	9.59	12.83	51.49	-38.66	AVG
5	0.6121	23.11	9.60	32.71	56.00	-23.29	QP
6	0.6121	8.40	9.60	18.00	46.00	-28.00	AVG
7	1.4959	11.39	9.62	21.01	56.00	-34.99	QP
8	1.4959	0.94	9.62	10.56	46.00	-35.44	AVG
9	6.4139	6.65	9.64	16.29	60.00	-43.71	QP
10	6.4139	1.23	9.64	10.87	50.00	-39.13	AVG
11	13.5595	13.22	9.66	22.88	60.00	-37.12	QP
12	13.5595	11.83	9.66	21.49	50.00	-28.51	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

9. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203
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 shall be considered sufficient to comply with the provisions of this section. 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.

Please refer to FCC §15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies

END OF REPORT