



FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Payment terminal

MODEL NUMBER: SOLO

FCC ID: 2A39U-SOLO002

REPORT NUMBER: 4790095248-4

ISSUE DATE: May 19, 2022

Prepared for

SumUp Inc

2000 Central Ave Ste 100 Boulder Colorado 80301 United States

Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	5/19/2022	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	Transmitter 99% Emission Bandwidth / 20dB Bandwidth	Part 15.215 (c)	PASS
2	Transmitter Frequency Stability (Temperature & Voltage Variation)	CFR 47 FCC §15.225(e)	PASS
3	Fundamental Field Strength	CFR 47 FCC §15.225(a)(b)(c)(d)	PASS
4	Radiated Emissions	CFR 47 FCC§15.209(a) CFR 47 FCC§15.225(d)	PASS
5	Band Edge Radiated Emissions	CFR 47 FCC §15.209(a) CFR 47 FCC §15.225(c)(d)	PASS
6	Conducted Emission Test for AC Power Port	CFR 47 FCC §15.207	PASS
7	Antenna Requirement	CFR 47 FCC §15.203	Pass
Note 1: This test report is only published to and used by the applicant, and it is not for evidence purpose in China. Note 2: The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C> when <Accuracy Method> decision rule is applied.			



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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: SumUp Inc
Address: 2000 Central Ave Ste 100 Boulder Colorado 80301 United States

Manufacturer Information

Company Name: SumUp Inc
Address: 2000 Central Ave Ste 100 Boulder Colorado 80301 United States

EUT Information

EUT Name: Payment terminal
Model: SOLO
Sample Received Date: January 06, 2022
Sample Status: Normal
Sample ID: 4405274
Date of Tested: January 06~May 19, 2022

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C	PASS

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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 Declaration 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
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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) (9KHz-30MHz)	2.2 dB
Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	4.00 dB
Radiation Emission test (1GHz to 26GHz) (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

EUT Name	Payment terminal
Model	SOLO
Operation Frequency	13.56MHz
Modulation	ASK
Battery	Li-ion 1.6 Ah, 3,8 Vdc
Ratings	5 Vdc via USB Type C

Note: NFC support both ISO /IEC 14443A and ISO /IEC 14443B. All lowest and highest data rates as per the standards are supported - 106 kbps, 212 kbps, 424 kbps and 848 kbps. Only the worst data of 848kbps recorded in the report.

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Max Peak field strength (dB μ V/m)
13.56	17.67

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
13.56	Coil 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 3.42 V
	VN	DC 3.8 V
	VH	DC 4.18 V

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	Lenovo	E14	/
2	Adapter	SAMSUNG	ETA-U90CBC	5Vdc,2A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	USB	Unshielded	1.0	N/A

ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	/	/	/	/

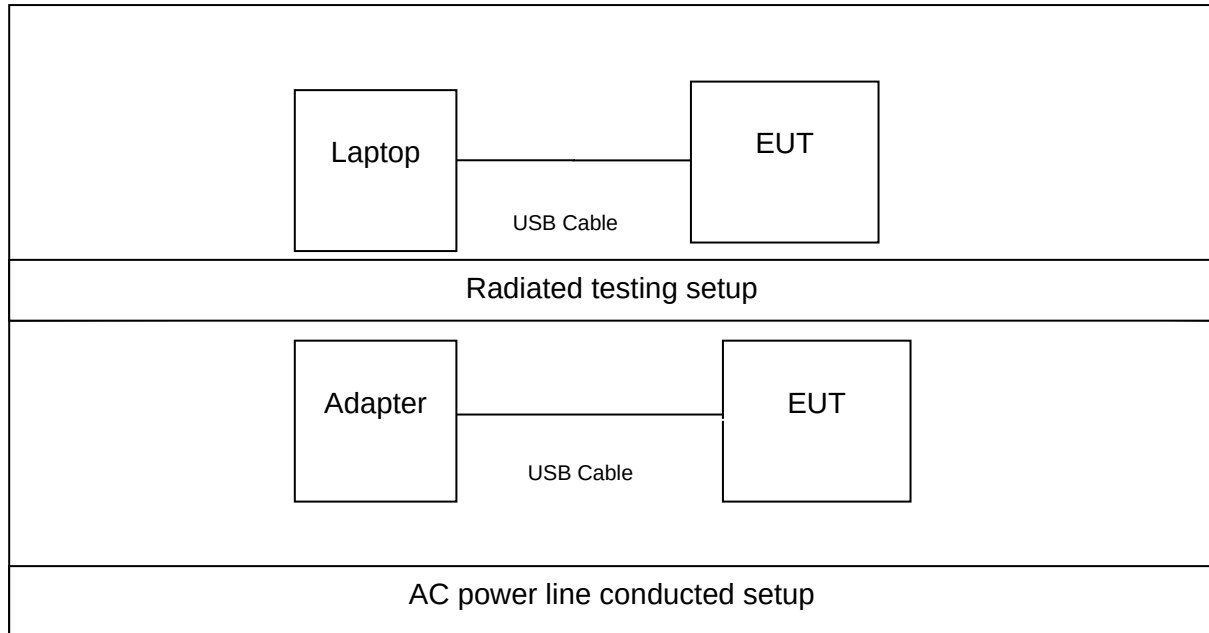
TEST SETUP

The EUT can work in engineering mode with the software.

New battery has been used during measurement.

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

SETUP DIAGRAM FOR TESTS



**5.6. MEASURING INSTRUMENT AND SOFTWARE USED**

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
EMI Test Receiver	R&S	ESR3	101961	Oct.30, 2021	Oct.29, 2022
Two-Line V-Network	R&S	ENV216	101983	Oct.30, 2021	Oct.29, 2022
Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Oct.30, 2021	Oct.29, 2022
Software					
Description			Manufacturer	Name	Version
Test Software for Conducted Emissions			Farad	EZ-EMC	Ver. UL-3A1

Radiated Emissions						
Equipment		Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver		KESIGHT	N9038A	MY56400036	Oct.30, 2021	Oct.29, 2022
Hybrid Log Periodic Antenna		TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
Preamplifier		HP	8447D	2944A09099	Oct.30, 2021	Oct.29, 2022
Loop antenna		Schwarzbeck	1519B	00008	Dec.14, 2022	Dec.13, 2024
Preamplifier		TDK	PA-02-001-3000	TRS-302-00050	Oct.31, 2021	Oct.30, 2022
Preamplifier		Mini-Circuits	ZX60-83LN-S+	SUP01201941	Oct.31, 2021	Oct.30, 2022
Software						
Description			Manufacturer		Name	Version
Test Software for Radiated Emissions			Farad		EZ-EMC	Ver. UL-3A1
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☒	Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Nov.10, 2021	Nov.09, 2022

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.
ISED RSS-Gen Clause 6.7 Issue 5	99 % Occupied Bandwidth	For reporting purposes only.

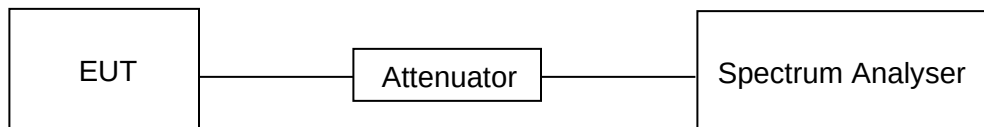
TEST PROCEDURE

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

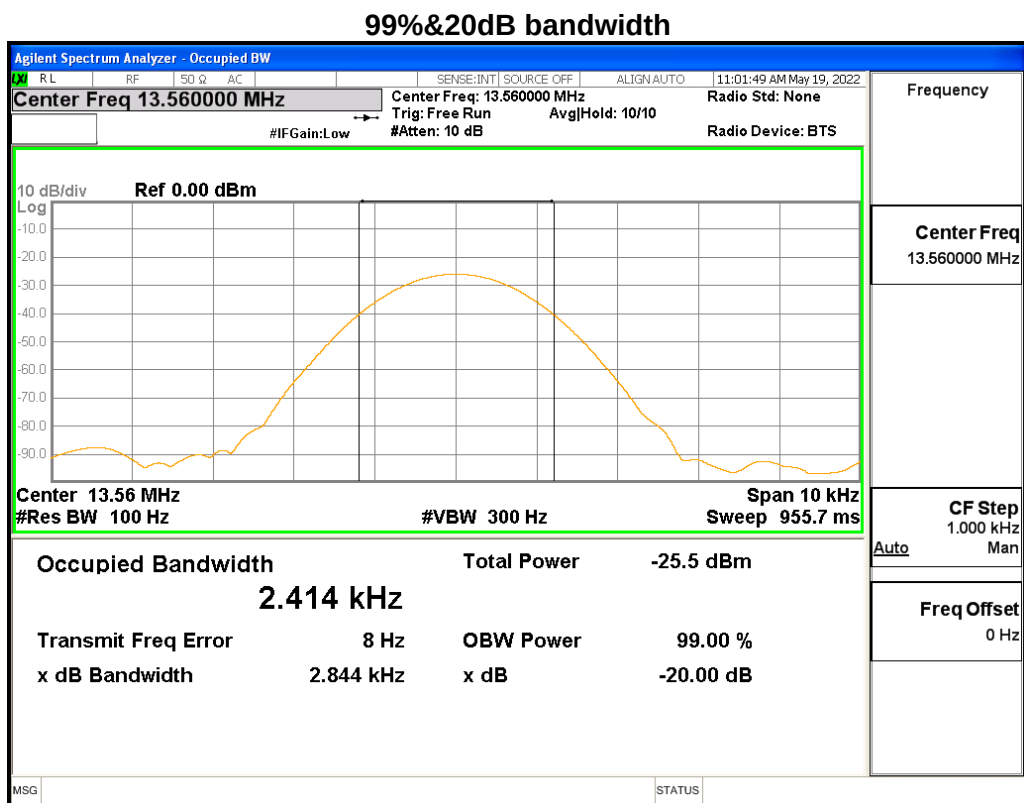


**TEST ENVIRONMENT**

Temperature	21.8 °C	Relative Humidity	56.9 %
Atmosphere Pressure	101kPa	Test Voltage	DC 3.8 V

RESULTS

Frequency (MHz)	99% Occupied Bandwidth (kHz)	20dB bandwidth (kHz)
13.56	2.414	2.844



6.2. TRANSMITTER FREQUENCY STABILITY

LIMITS

CFR 47 FCC §15.225(e)
ISED RSS-210 Annex B B.6

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.

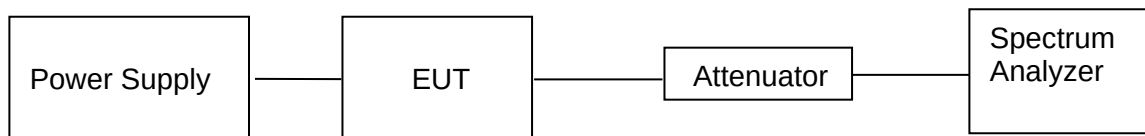
TEST SETUP AND PROCEDURE

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	10KHz
VBW	$\geq 3 \times \text{RBW}$
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



**RESULTS**

Maximum frequency error of the EUT with variations in ambient temperature

Temperature (°C)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
-20	13.5598	13.5607	13.5591	13.5589
-10	13.5592	13.5598	13.5606	13.5609
0	13.5608	13.5593	13.5605	13.5588
10	13.5596	13.5611	13.5612	13.5603
20	13.5593	13.5600	13.5596	13.5597
30	13.5593	13.5603	13.5606	13.5612
40	13.5589	13.5608	13.5605	13.5589
50	13.5608	13.5603	13.5601	13.5588
Maximum frequency error	0.0081%	0.0081%	0.0088%	0.0088%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass

Maximum frequency error of the EUT with declared battery operation voltage at a temperature of 20 degrees C.

Supply Voltage (V)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
DC 3.23 V	13.5593	13.5589	13.5609	13.5598
DC 3.8 V	13.5596	13.5589	13.5605	13.5599
DC 4.37 V	13.5609	13.5592	13.5612	13.5608
Maximum frequency error	0.0066%	0.0081%	0.0088%	0.0059%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass

Maximum frequency error of the EUT with 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

Supply Voltage by adapter	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
138 Vac, 60Hz	13.5602	13.5605	13.5595	13.5606
120 Vac, 60Hz	13.5598	13.5594	13.5604	13.5602
102 Vac, 60Hz	13.5607	13.5601	13.5603	13.5609
Maximum frequency error	0.0052%	0.0044%	0.0037%	0.0066%
Limit	0.01%			
Result	Pass	Pass	Pass	Pass



7. RADIATED EMISSION TEST RESULTS

LIMITS

Fundamental field strength

FCC Reference:	Part 15.225(a)(b)(c)(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	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), 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) (9KHz-1GHz)

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

Restricted bands of operation

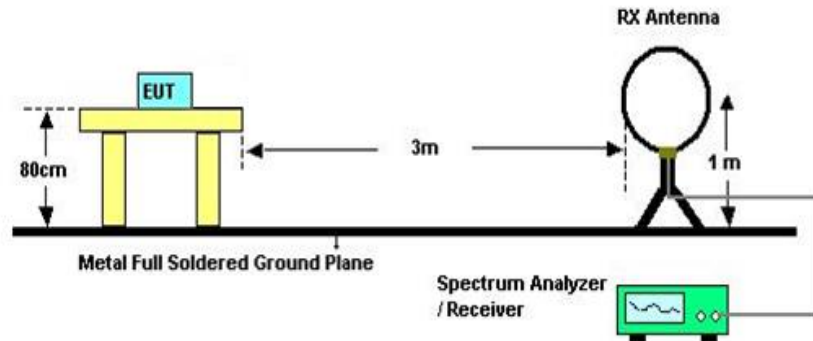
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	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: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST SETUP AND PROCEDURE

Below 30MHz

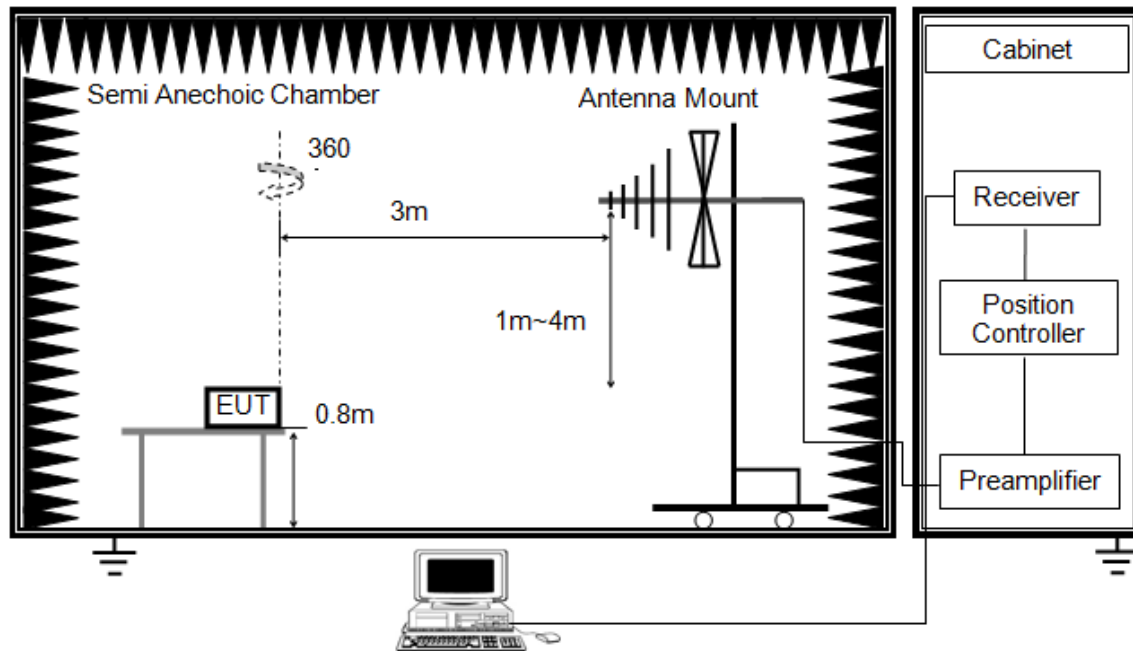


The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
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 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 80cm meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1m height antenna tower.
5. 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.
6. 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.
7. 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 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
8. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open field site. Therefore, the sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Below 1G

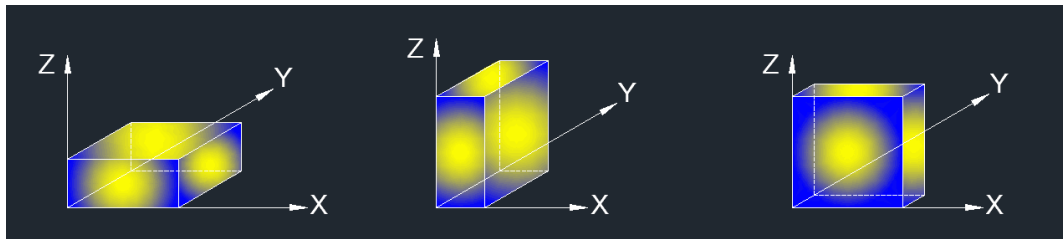


The setting of the spectrum analyser

RBW	120K
VBW	300K
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 80cm 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.

X axis, Y axis, Z axis positions:



Note 1: 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.

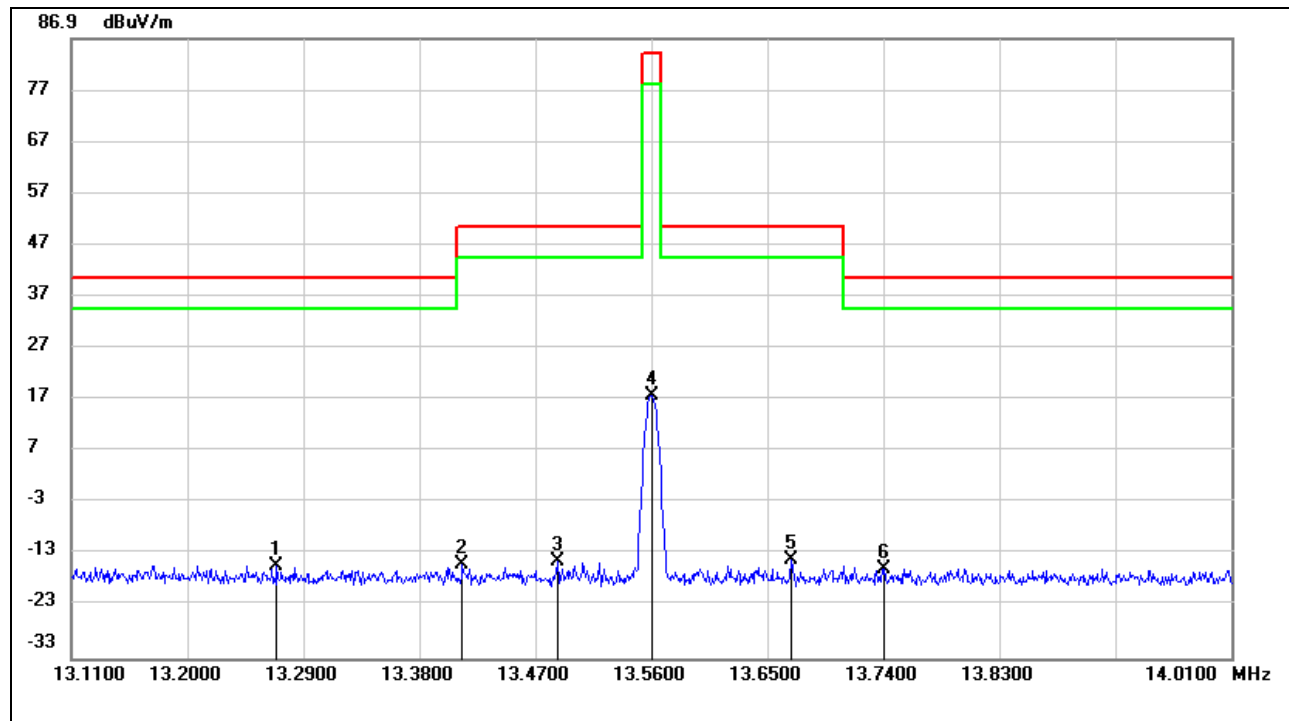
TEST ENVIRONMENT

Temperature	21.8 °C	Relative Humidity	56.9 %
Atmosphere Pressure	101kPa	Test Voltage	DC 3.8 V

RESULTS

7.1. FIELD STRENGTH OF INTENTIONAL EMISSIONS

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



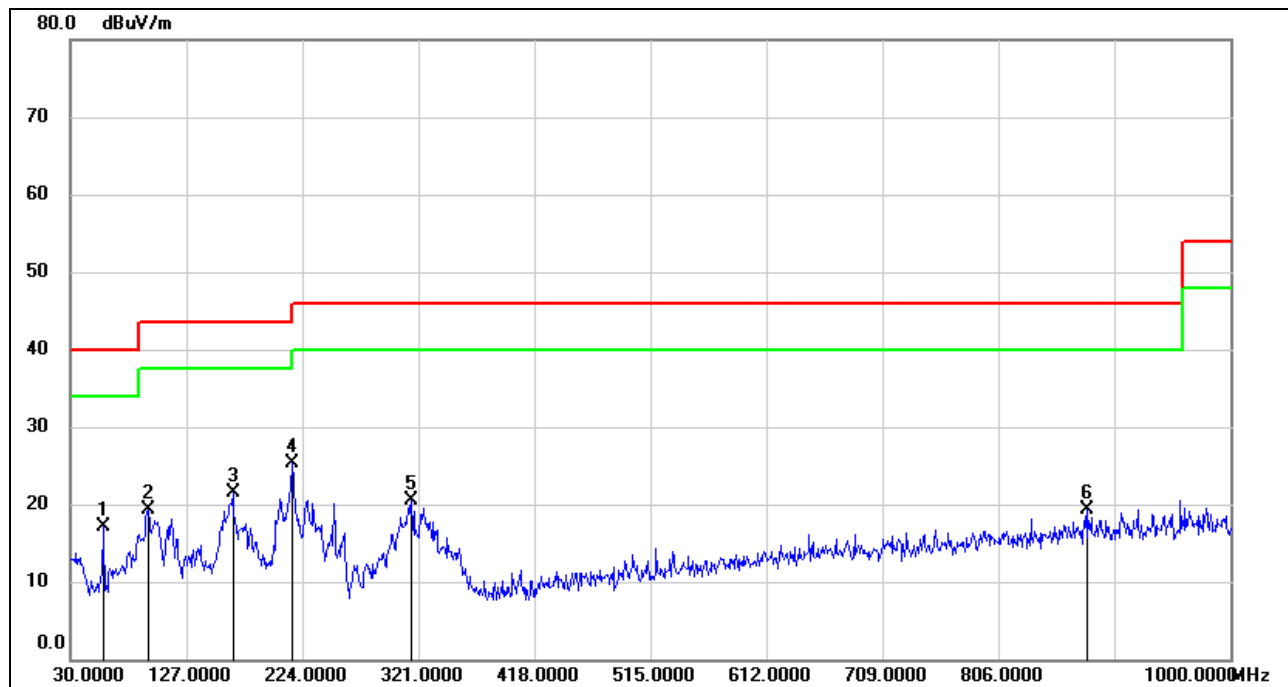
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.2693	46.19	-61.40	-15.21	40.51	-55.72	peak
2	13.4133	46.39	-61.40	-15.01	50.47	-65.48	peak
3	13.4871	47.19	-61.41	-14.22	50.47	-64.69	peak
4	13.5600	79.08	-61.41	17.67	84.00	-66.33	peak
5	13.6689	47.40	-61.41	-14.01	50.47	-64.48	peak
6	13.7409	45.72	-61.42	-15.70	40.51	-56.21	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.

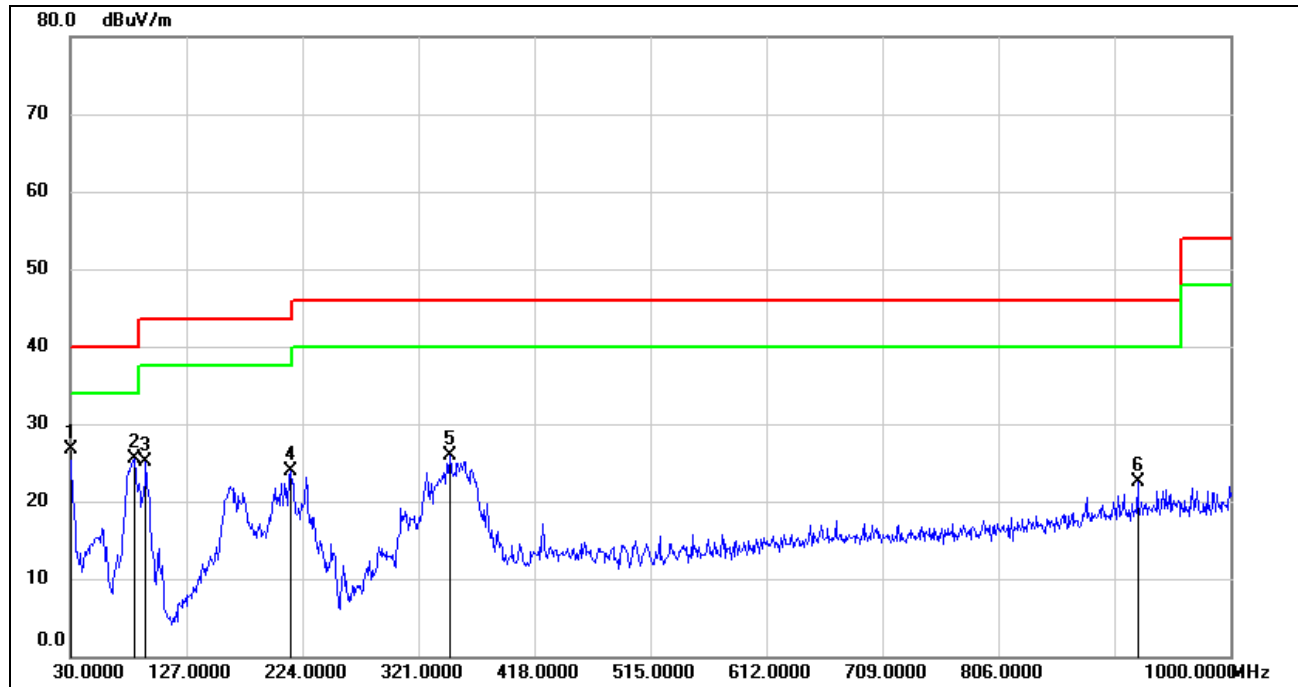
7.2. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz

SPURIOUS EMISSIONS (HORIZONTAL)



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

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



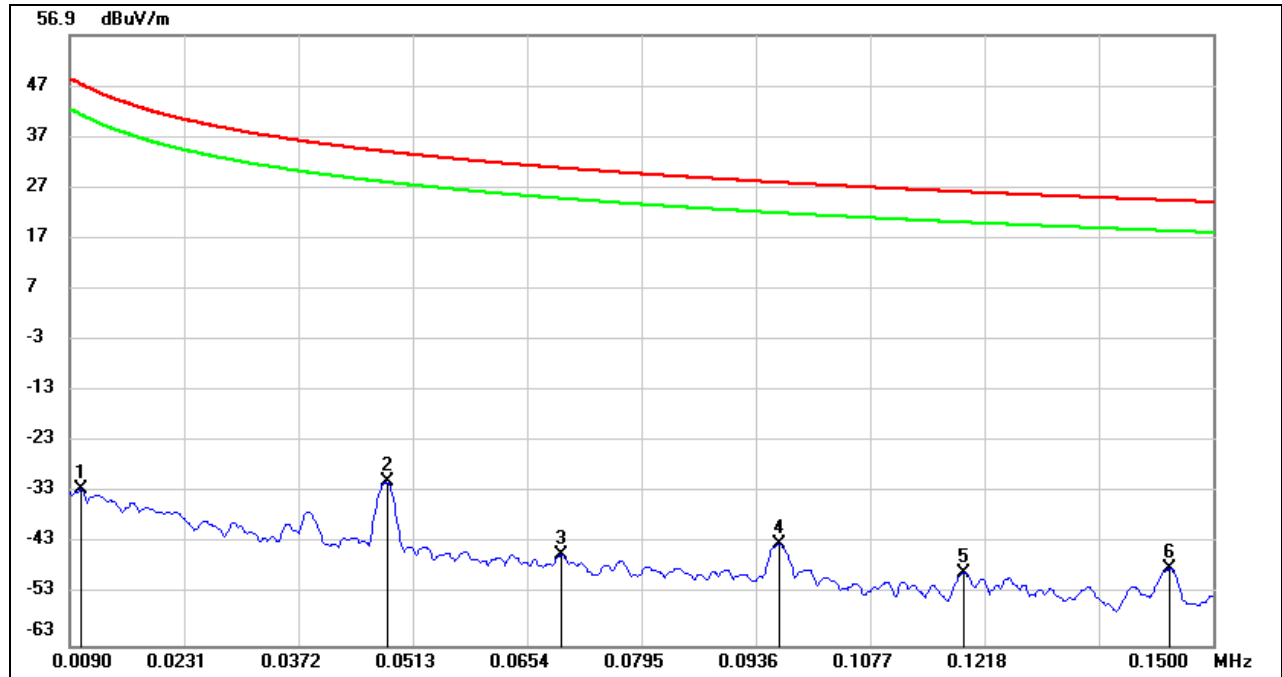
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	45.57	-18.94	26.63	40.00	-13.37	peak
2	83.3500	47.15	-21.56	25.59	40.00	-14.41	peak
3	93.0500	46.71	-21.69	25.02	43.50	-18.48	peak
4	214.3000	41.52	-17.66	23.86	43.50	-19.64	peak
5	347.1900	40.32	-14.35	25.97	46.00	-20.03	peak
6	922.4000	27.19	-4.76	22.43	46.00	-23.57	peak

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

7.3. SPURIOUS EMISSIONS BELOW 30MHz

SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

9 kHz~ 150 kHz



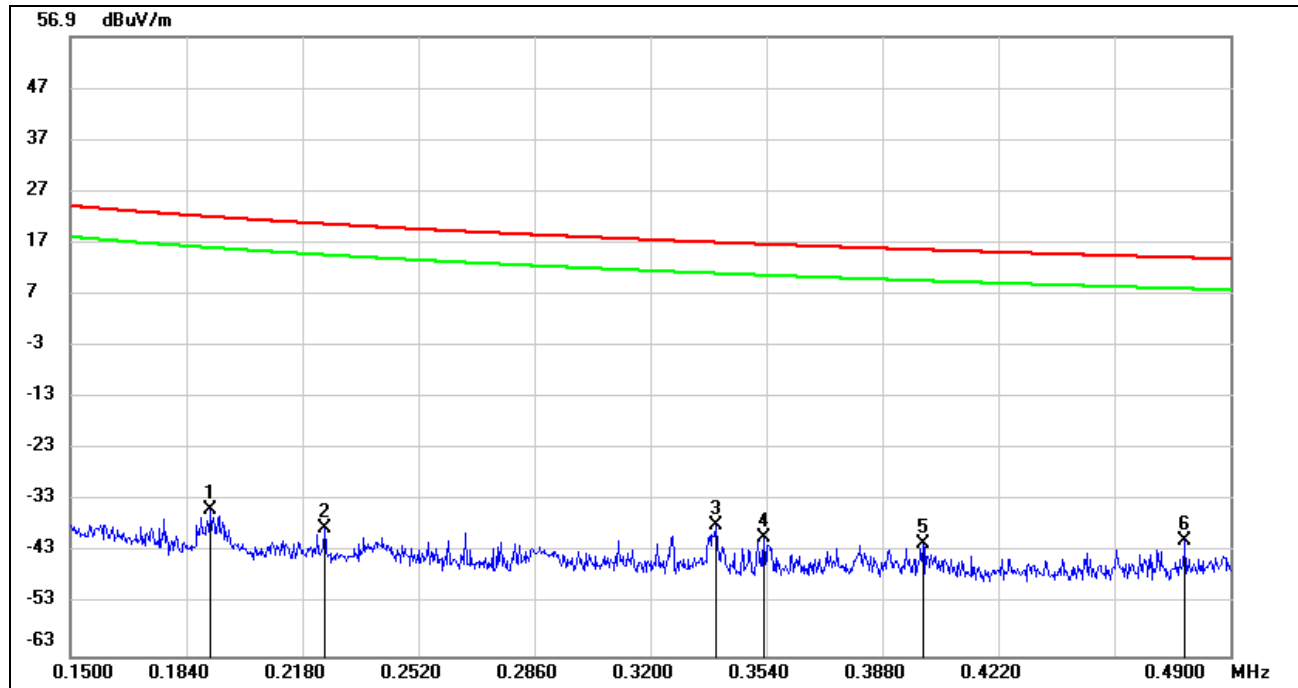
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0104	69.07	-101.56	-32.49	47.26	-79.75	peak
2	0.0481	70.35	-101.35	-31.00	33.96	-64.96	peak
3	0.0696	55.67	-100.99	-45.32	30.75	-76.07	peak
4	0.0964	58.08	-101.22	-43.14	27.92	-71.06	peak
5	0.1193	52.80	-101.52	-48.72	26.07	-74.79	peak
6	0.1446	53.88	-101.83	-47.95	24.40	-72.35	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



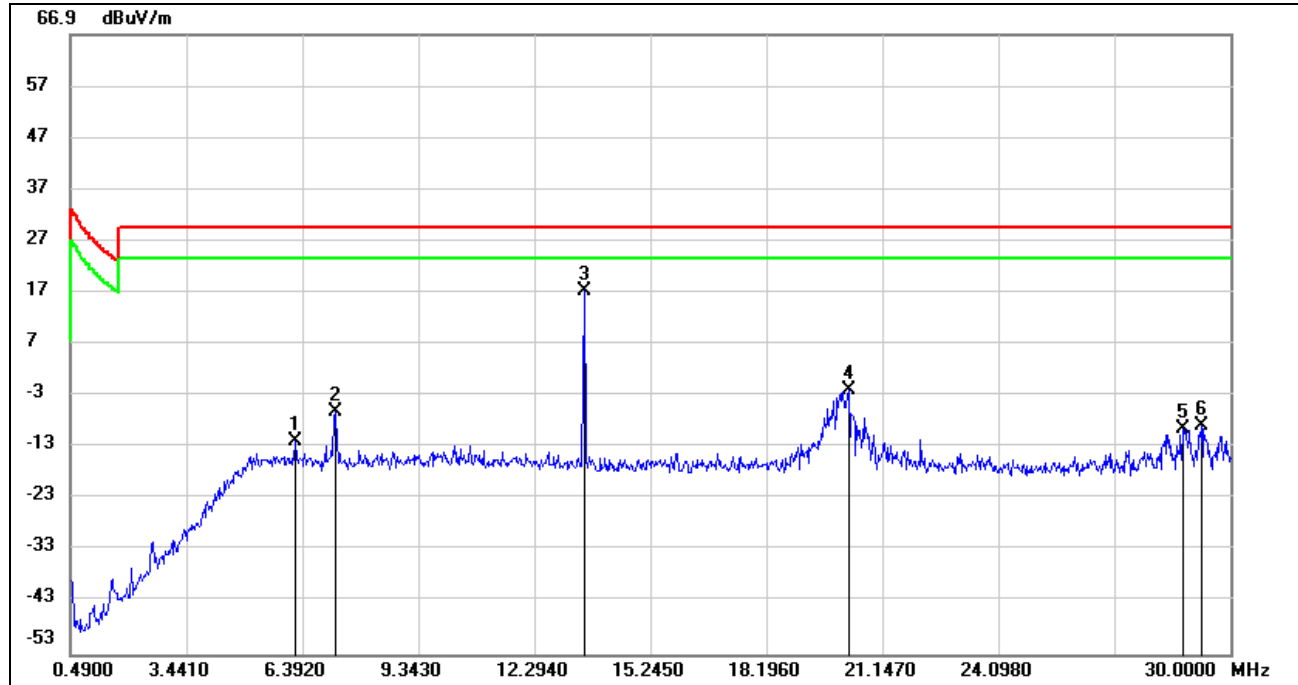
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1911	67.08	-101.85	-34.77	21.98	-56.75	peak
2	0.2245	63.32	-101.82	-38.50	20.58	-59.08	peak
3	0.3390	64.11	-101.76	-37.65	17.00	-54.65	peak
4	0.3533	61.53	-101.76	-40.23	16.64	-56.87	peak
5	0.3998	60.46	-101.74	-41.28	15.56	-56.84	peak
6	0.4767	60.87	-101.71	-40.84	14.04	-54.88	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.

490kHz ~ 30MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6.2149	49.76	-61.75	-11.99	29.54	-41.53	peak
2	7.2183	55.57	-61.60	-6.03	29.54	-35.57	peak
3	13.5629	78.63	-61.41	17.22	29.54	-12.32	peak
4	20.2912	59.20	-61.08	-1.88	29.54	-31.42	peak
5	28.7901	51.27	-60.73	-9.46	29.54	-39.00	peak
6	29.2623	51.89	-60.70	-8.81	29.54	-38.35	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

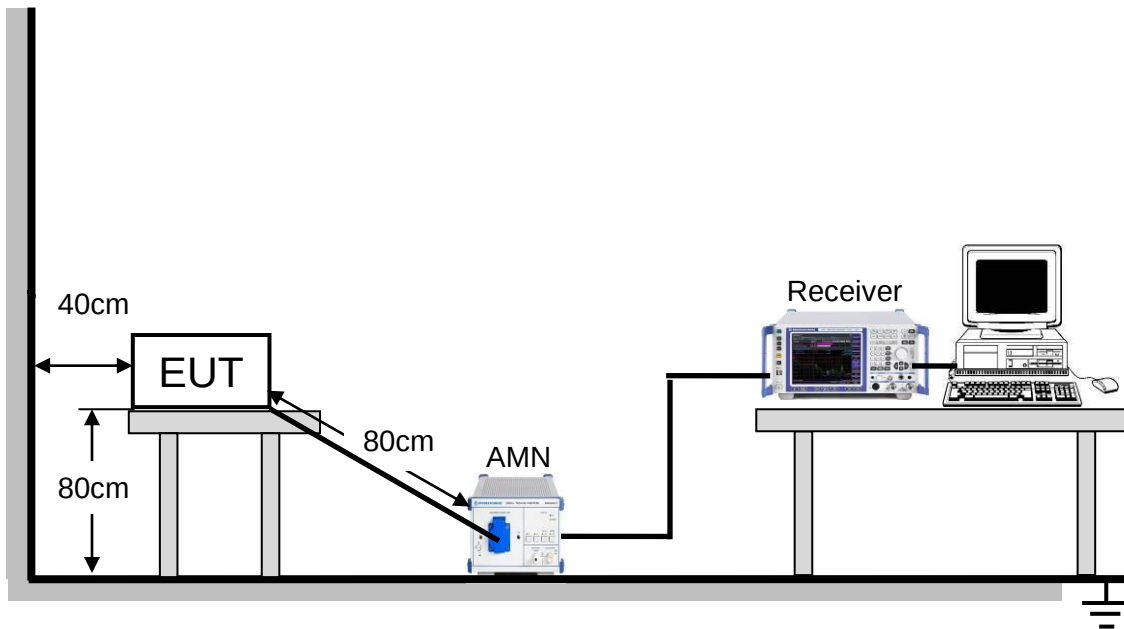
Please refer to CFR 47 FCC §15.207 (a).

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



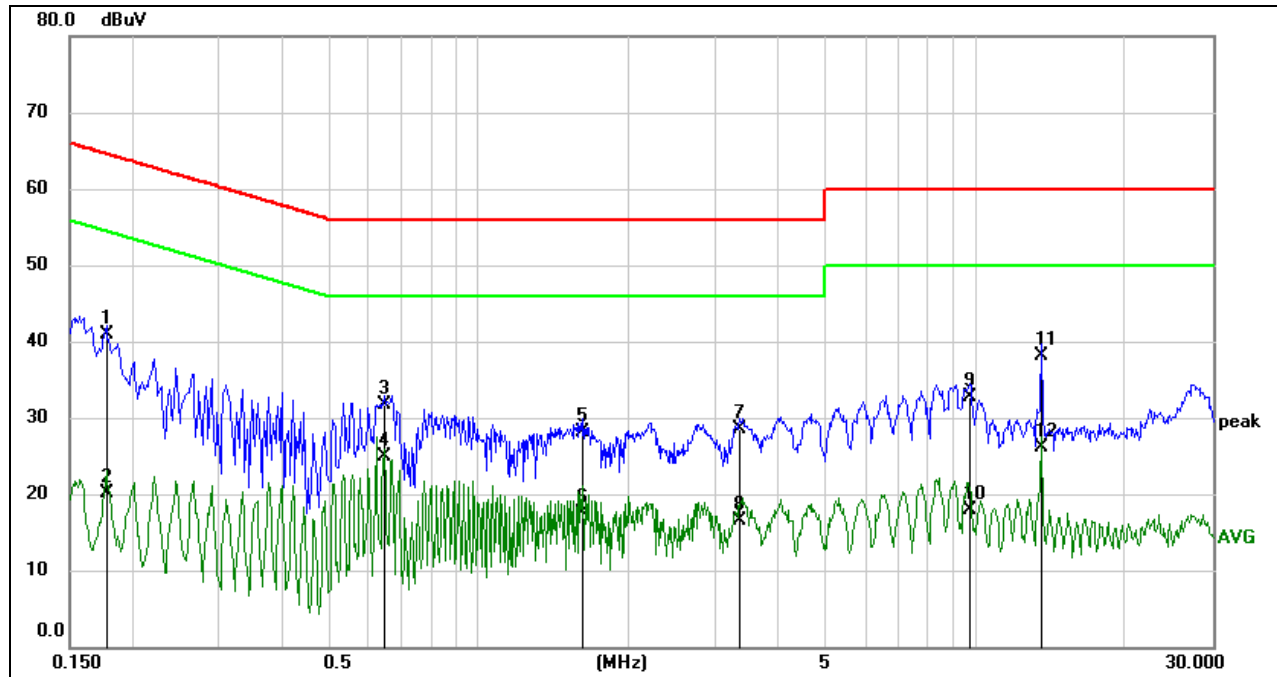
The following table is the setting of the receiver

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	23.8°C	Relative Humidity	68.4%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V_60Hz

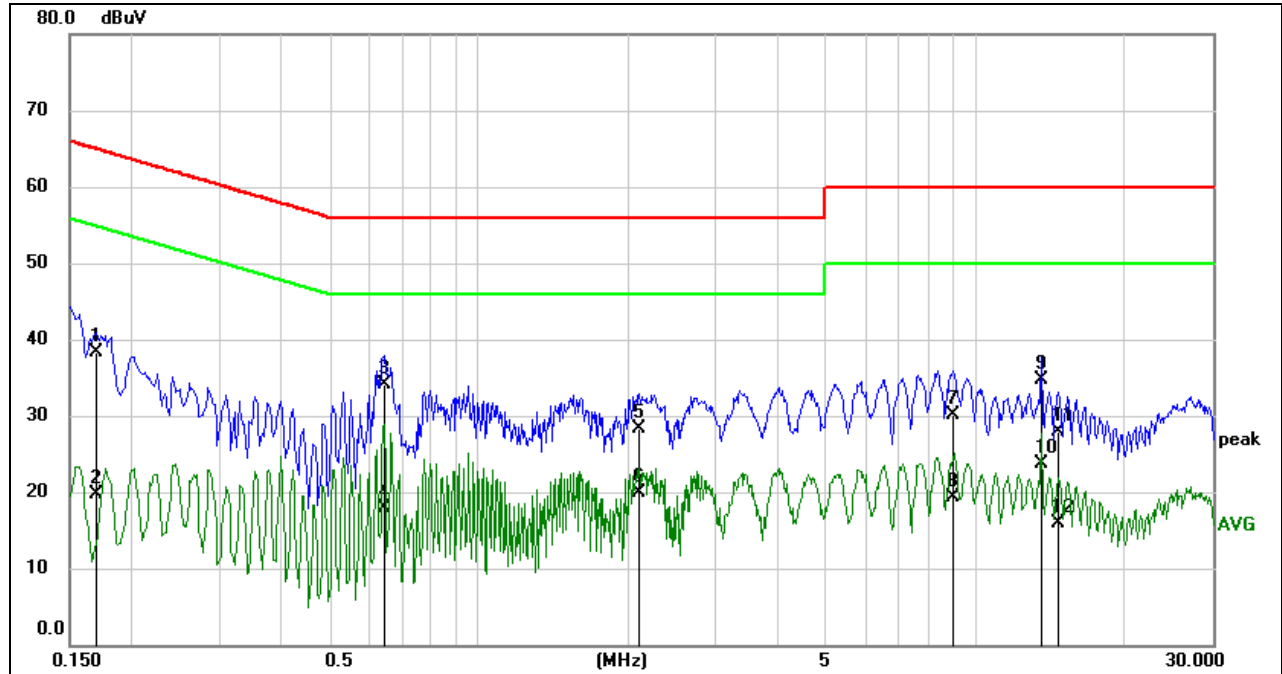
LINE N RESULTS with modified sample (transmitter terminated into a dummy load)

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1779	31.22	9.59	40.81	64.58	-23.77	QP
2	0.1779	10.59	9.59	20.18	54.58	-34.40	AVG
3	0.6460	22.14	9.60	31.74	56.00	-24.26	QP
4	0.6460	15.26	9.60	24.86	46.00	-21.14	AVG
5	1.6220	18.55	9.62	28.17	56.00	-27.83	QP
6	1.6220	7.88	9.62	17.50	46.00	-28.50	AVG
7	3.3580	18.98	9.61	28.59	56.00	-27.41	QP
8	3.3580	6.88	9.61	16.49	46.00	-29.51	AVG
9	9.7100	23.12	9.62	32.74	60.00	-27.26	QP
10	9.7100	8.22	9.62	17.84	50.00	-32.16	AVG
11	13.5618	28.54	9.66	38.20	60.00	-21.80	QP
12	13.5618	16.36	9.66	26.02	50.00	-23.98	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)

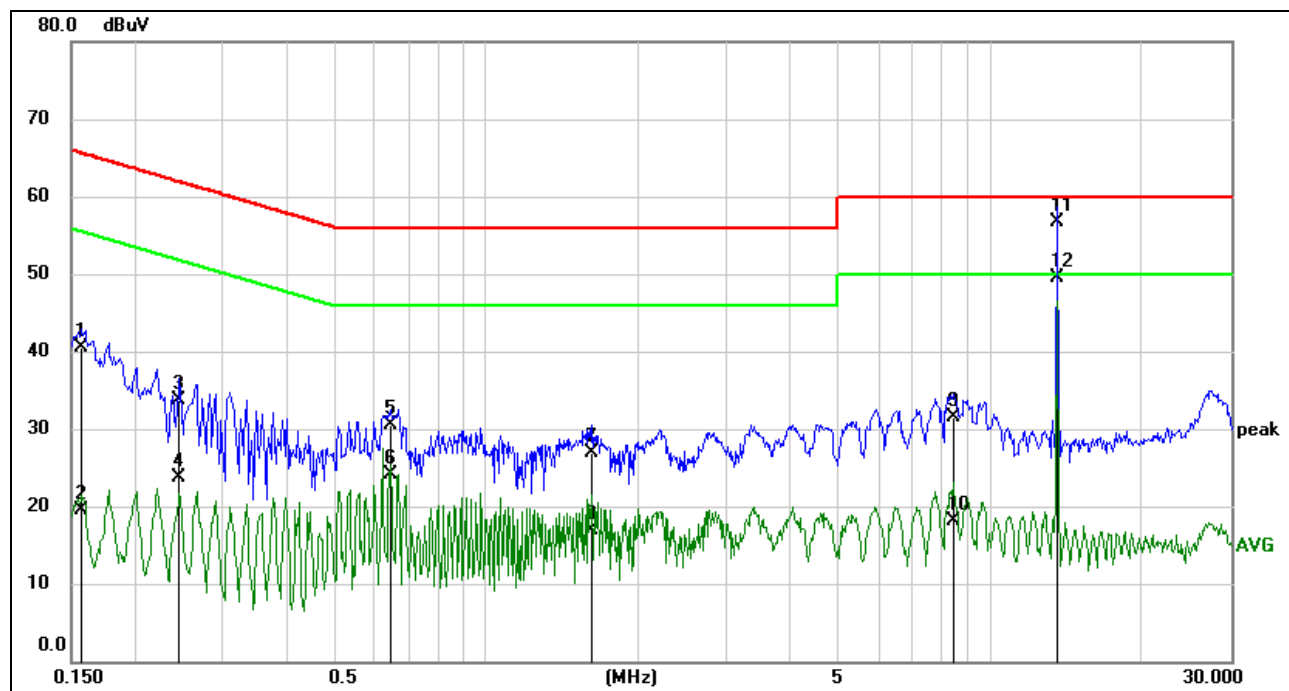


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1700	28.65	9.59	38.24	64.96	-26.72	QP
2	0.1700	10.20	9.59	19.79	54.96	-35.17	AVG
3	0.6460	24.52	9.60	34.12	56.00	-21.88	QP
4	0.6460	8.33	9.60	17.93	46.00	-28.07	AVG
5	2.1099	18.64	9.63	28.27	56.00	-27.73	QP
6	2.1099	10.36	9.63	19.99	46.00	-26.01	AVG
7	9.0138	20.48	9.61	30.09	60.00	-29.91	QP
8	9.0138	9.68	9.61	19.29	50.00	-30.71	AVG
9	13.5539	25.11	9.66	34.77	60.00	-25.23	QP
10	13.5539	14.03	9.66	23.69	50.00	-26.31	AVG
11	14.6700	18.22	9.66	27.88	60.00	-32.12	QP
12	14.6700	6.33	9.66	15.99	50.00	-34.01	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 unmodified sample (antenna present)

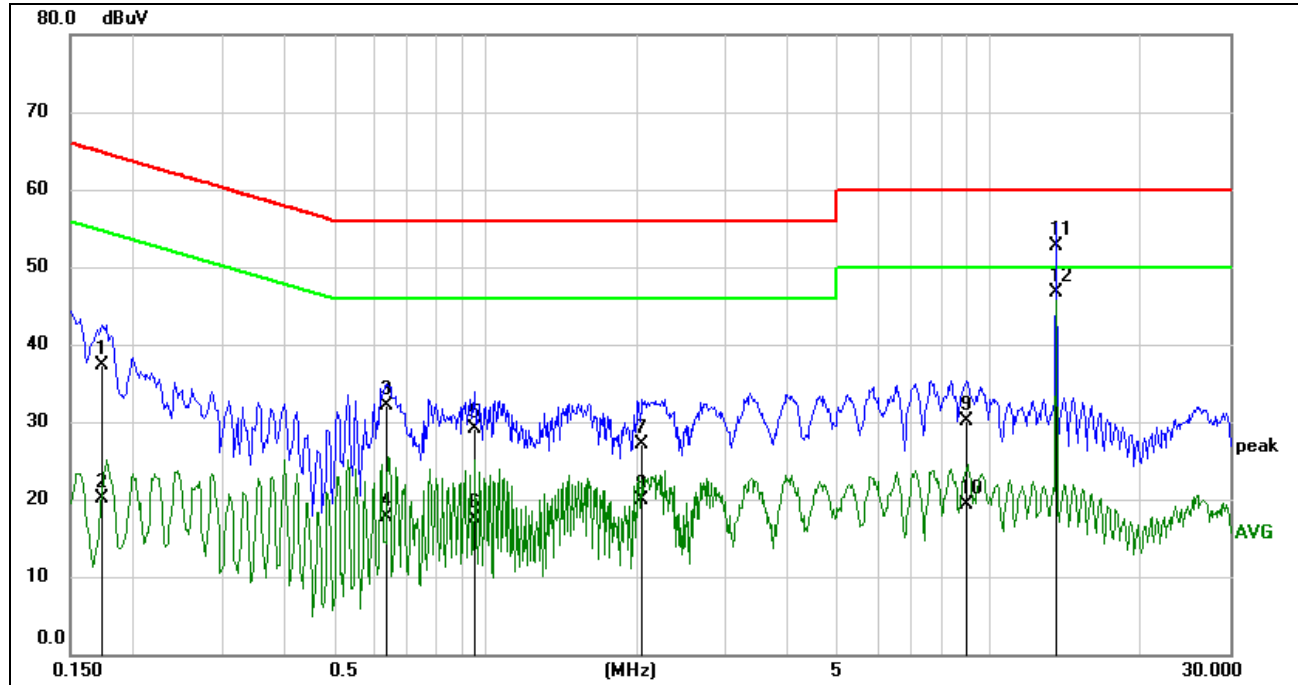


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1580	30.88	9.59	40.47	65.57	-25.10	QP
2	0.1580	9.85	9.59	19.44	55.57	-36.13	AVG
3	0.2459	24.15	9.59	33.74	61.89	-28.15	QP
4	0.2459	14.03	9.59	23.62	51.89	-28.27	AVG
5	0.6460	20.85	9.60	30.45	56.00	-25.55	QP
6	0.6460	14.58	9.60	24.18	46.00	-21.82	AVG
7	1.6220	17.36	9.62	26.98	56.00	-29.02	QP
8	1.6220	7.25	9.62	16.87	46.00	-29.13	AVG
9	8.4138	21.85	9.61	31.46	60.00	-28.54	QP
10	8.4138	8.47	9.61	18.08	50.00	-31.92	AVG
11	13.5617	46.99	9.66	56.65	60.00	-3.35	QP
12	13.5617	39.88	9.66	49.54	50.00	-0.46	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	0.1731	27.65	9.59	37.24	64.81	-27.57	QP
2	0.1731	10.55	9.59	20.14	54.81	-34.67	AVG
3	0.6380	22.54	9.60	32.14	56.00	-23.86	QP
4	0.6380	8.14	9.60	17.74	46.00	-28.26	AVG
5	0.9536	19.52	9.61	29.13	56.00	-26.87	QP
6	0.9536	7.88	9.61	17.49	46.00	-28.51	AVG
7	2.0459	17.52	9.63	27.15	56.00	-28.85	QP
8	2.0459	10.25	9.63	19.88	46.00	-26.12	AVG
9	9.0137	20.48	9.61	30.09	60.00	-29.91	QP
10	9.0137	9.65	9.61	19.26	50.00	-30.74	AVG
11	13.5539	42.98	9.66	52.64	60.00	-7.36	QP
12	13.5539	37.12	9.66	46.78	50.00	-3.22	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