CFR 47 FCC PART 15 SUBPART C

CERTIFICATION TEST REPORT

For

Kasa Smart Doorbell

MODEL NUMBER: KD110

FCC ID: 2AXJ4KD110V2

REPORT NUMBER: 4790122292.1-3

ISSUE DATE: December 22, 2021

Prepared for

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Prepared by

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	12/22/2021	Initial Issue	

Summary of Test Results			
Clause	Test Items	FCC Rules	Test Results
1	Transmitter Timeout	CFR 47 FCC §15.231 (a) (1)	Pass
2	20 dB Bandwidth and	CFR 47 FCC §15.231 (c)	Pass
3	Radiated Emission	CFR 47 FCC §15.231 (b)(e) CFR 47 FCC §15.205 and §15.209	Pass
4	Conducted Emission Test for AC Power Port	FCC Part 15.207	Pass
5	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:	TP-Link Corporation Limited
Address:	Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong Kong

Manufacturer Information

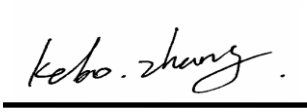
Company Name:	TP-Link Corporation Limited
Address:	Room 901, 9/F. , New East Ocean Centre, 9 Science Museum Road, Tsim Sha Tsui, Kowloon, Hong Kong

EUT Information

EUT Name:	Kasa Smart Doorbell
Model:	KD110
Sample Received Date:	September 29, 2021
Sample Status:	Normal
Sample ID:	4265987
Date of Tested:	October 08, 2021 ~ December 18, 2021

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	PASS

Prepared By:



Kebo Zhang
Project Engineer

Check By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, CFR 47 FCC Part 2, CFR 47 FCC Part 15 and KDB414788 D01 Radiated Test Site v01.

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

Note 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.

Note 3: For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz 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
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	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	Kasa Smart Doorbell
Model	KD110
Operation Frequency	433.92MHz
Modulation Type	ASK
Rated Input	16-24Vac~, 50/60Hz, 0.5A

5.2. TEST CHANNEL CONFIGURATION

Modulation Type	Frequency
ASK	433.92MHz

5.3. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	23 ~ 28°C
Voltage :	VL	N/A
	VN	AC 120 V, 60 Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage, AC 120V, 60Hz via Battery
VH= Upper Extreme Test Voltage
TN= Normal Temperature

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	Remarks
1	laptop	Lenovo	TP00094A	/
2	UART	/	/	/
3	Clsaa 2 Transformer	/	C 14758357	Input:120Vac, 60Hz Outout:16-24Vac

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	USB	/	/	1m	/

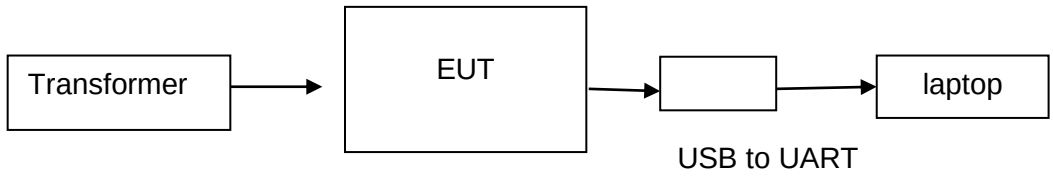
ACCESSORIES

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

TEST SETUP

The EUT can work in engineering mode with a software through a laptop.

SETUP DIAGRAM FOR TEST



5.5. MEASURING INSTRUMENT AND SOFTWARE USED

Conducted Emissions					
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
PXA Signal Analyzer	Keysight	N9030A	MY55410512	Oct.30, 2021	Oct.29, 2022
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
EMI Measurement Receiver	R&S	ESR26	101377	Oct.30, 2021	Oct.29, 2022
Horn Antenna	TDK	HRN-0118	130940	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.30, 2021	Oct.29, 2022
Horn Antenna	Schwarzbeck	BBHA9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.31, 2021	Oct.30, 2022
Preamplifier	TDK	PA-02-3	TRS-308-00002	Oct.31, 2021	Oct.30, 2022
Loop antenna	Schwarzbeck	1519B	00008	Jan.17, 2019	Jan.17,2022
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

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

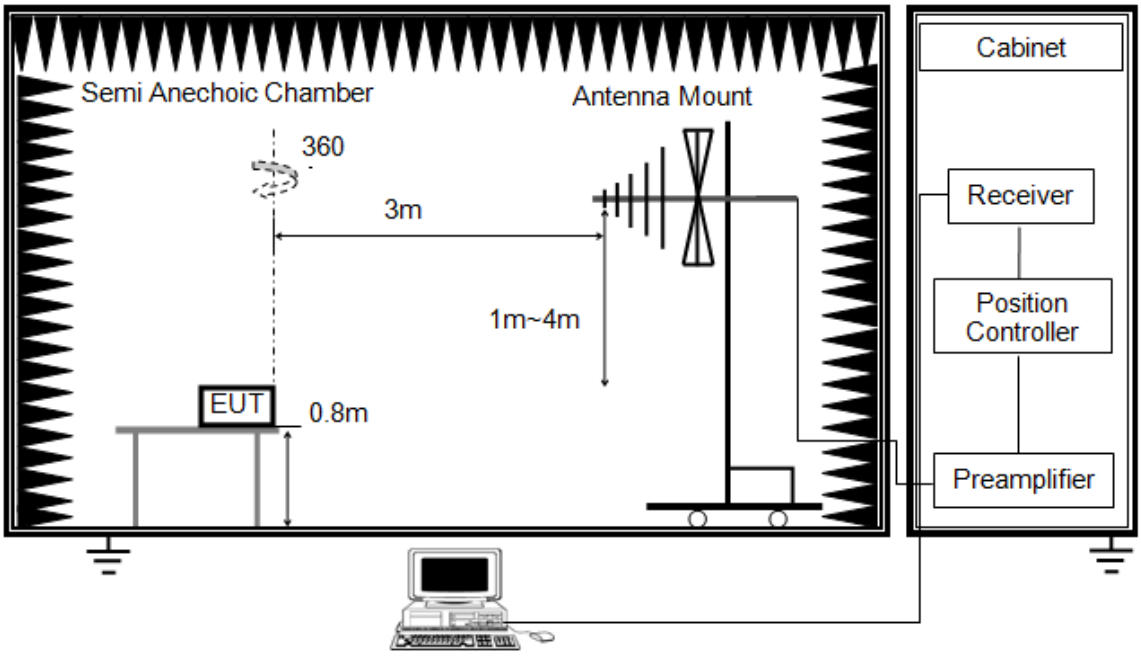
LIMITS

None; for reporting purposes only

PROCEDURE

FCC Reference:	CFR 47 Part 15.35(c)
Test Method Used:	ANSI C63.10 Section 7.5

TEST SETUP



a. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.
b. Use a video trigger with the trigger level set to enable triggering only on full pulses.
c. Sweep Time is at least a 100 ms.
d. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
e. Measure the maximum time duration of one single pulse.

TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V, 60Hz

RESULTS

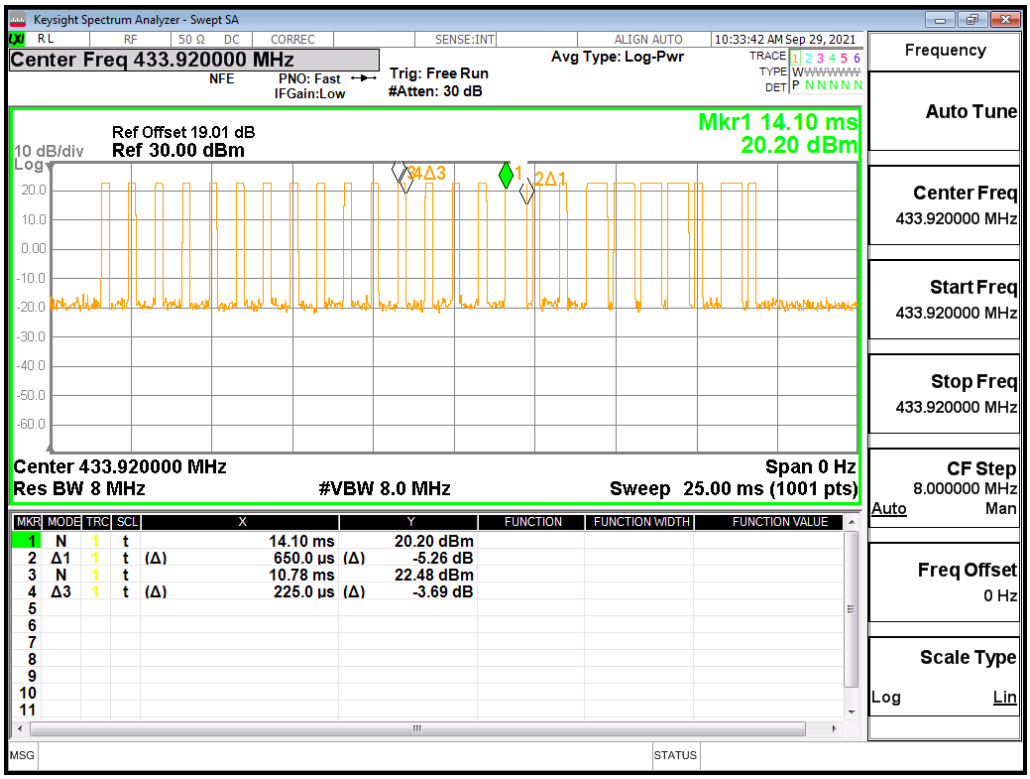
	On Time (ms)	Times	Ton (ms)	Total Ton times (ms)
Ton1	0.650	6	3.9	8.175
Ton2	0.225	19	4.275	

Note: Total Ton times= Ton1*9+Ton2*16

Total Ton times (ms)	Period (ms)	Duty Cycle (Linear)	Duty Cycle Correction Factor
8.175	26.7	0.306	-10.29

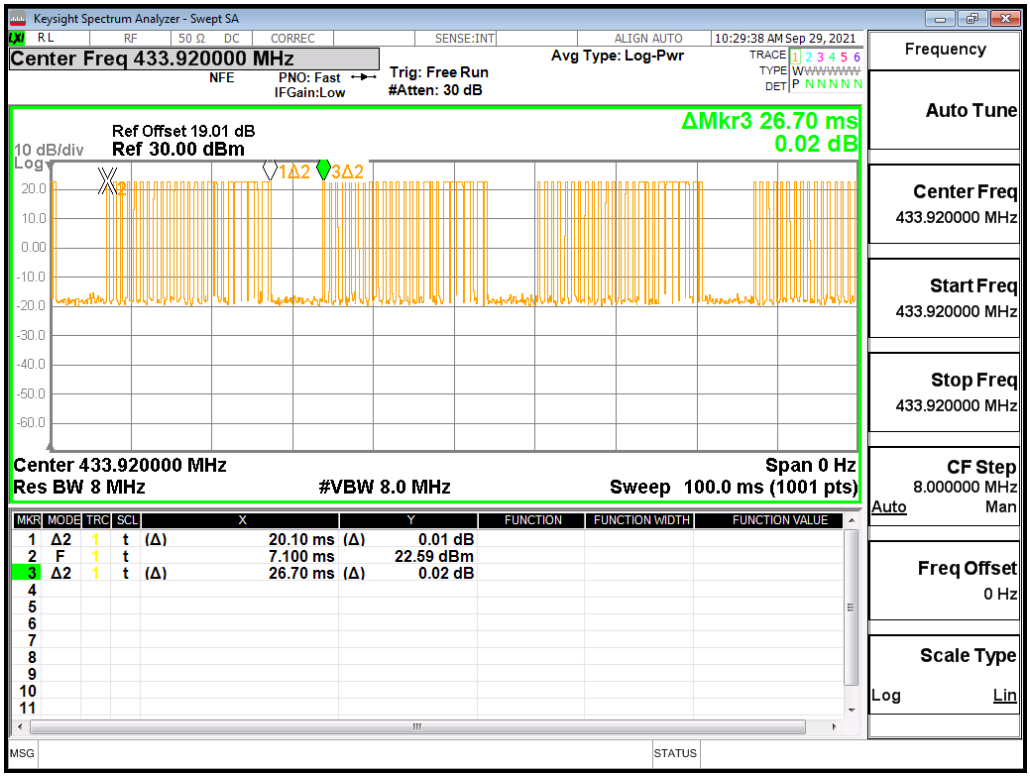
Note: Duty Cycle Correction Factor=20log(x).
Where: x is Duty Cycle

Ton



Period

(ms)



6.2. TRANSMITTER TIMEOUT

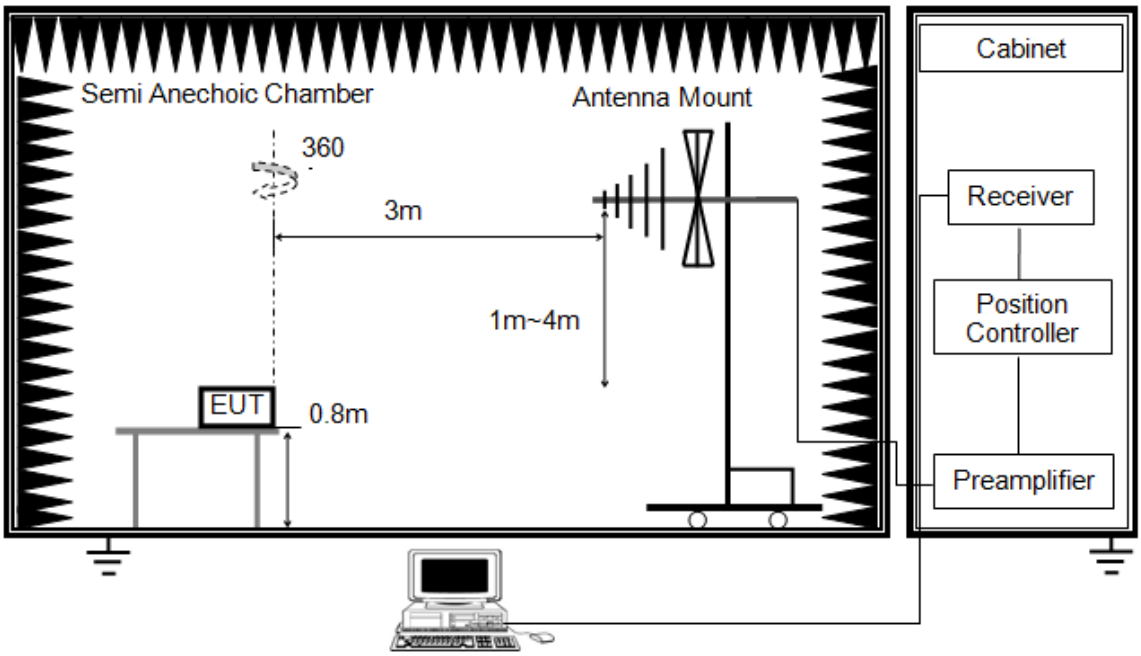
LIMITS

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

TEST PROCEDURE

FCC Reference:	CFR 47 Part 15.231(a)
Test Method Used:	The EUT transmitter was activated and monitored using a spectrum analyser for a period of 10 seconds.

TEST SETUP



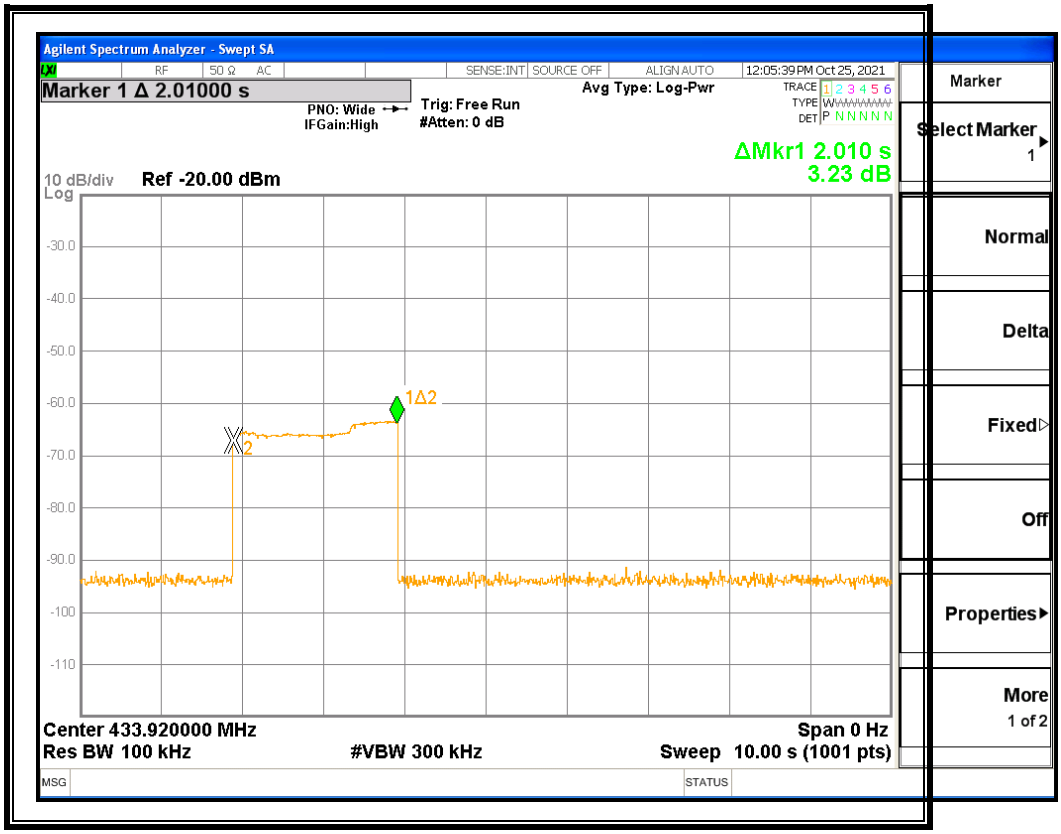
a. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz.
b. Use a video trigger with the trigger level set to enable triggering only on full pulses.
c. Sew Sweep Time to 10 s.
d. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
e. Measure the maximum time duration of one single pulse.

TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	51%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V, 60Hz

RESULTS

Deactivation Time (seconds)	Limit (seconds)	Result
2.01	5.000	PASS



6.3. 20dB BANDWIDTH

LIMITS

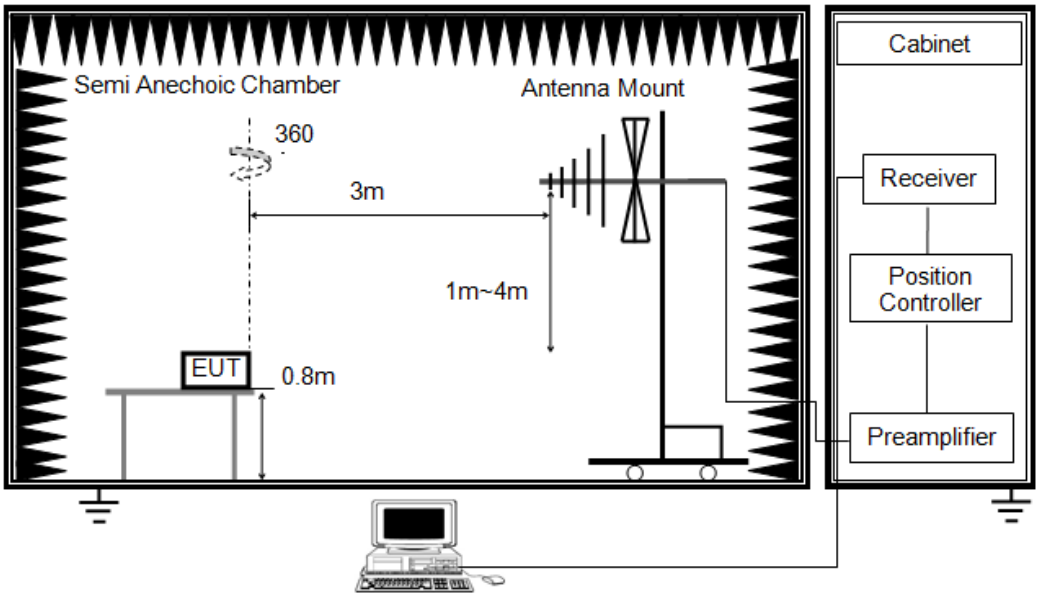
1. The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

2. The limit has been calculated as: 0.0025 * 433.92 MHz = 1.0848 MHz

TEST PROCEDURE

FCC Reference:	CFR 47 Part 15.231(c)
Test Method Used:	ANSI C63.10 Section 6.9.2

TEST SETUP



1. 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.

2. The EUT was placed on a turntable with 0.8 meter above ground.

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

4. Set the spectrum analyzer in the following setting as:
RBW is set to 1 kHz and VBW is set 3 kHz.

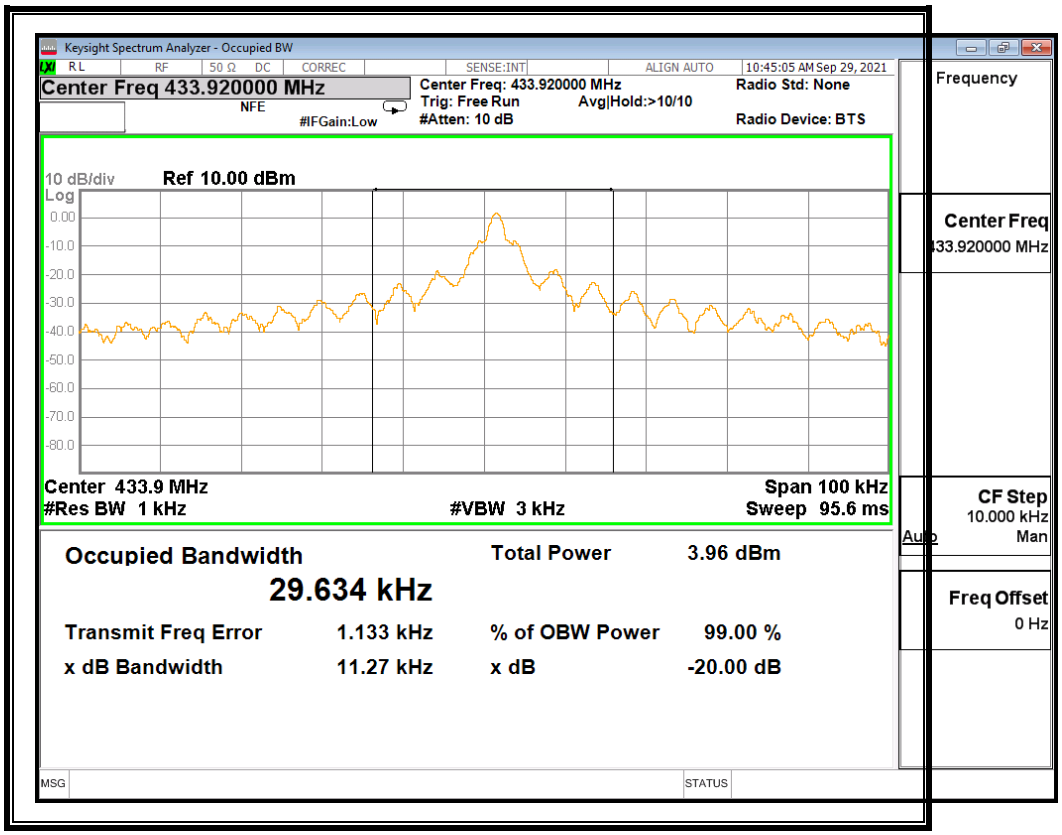
TEST ENVIRONMENT

Temperature	22.3°C	Relative Humidity	63%

Atmosphere Pressure	101kPa	Test Voltage	AC 120V, 60Hz

RESULTS

Transmitter 20 dB Bandwidth (MHz)	Limit (MHz)	Result
0.01127	1.0848	Complied



6.4. RADIATED EMISSION

LIMITS

1. In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

Note:
1. To obtain the average limit at the test frequency the values given in the table of FCC part 15.231(b) have to be linear interpolated and then converted to dBµV/m. The limit at 260 MHz is 3750 µV/m and at 470 MHz it is 12500 µV/m. Limit at 433.92 MHz is calculated as shown in ANSI C63.10 Section 7.6.2:

Limit [µV/m] = Limlower + ΔF [(Limupper – Limlower) / ($f$upper – $f$lower)]
where ΔF = fc – $f$lower = 433.92 – 260 = 173.92

Limit = 3750 + 173.92 * [(12500 – 3750) / (470 -260)]
= 3750 + 173.92 * [8750 / 210]
= 10996.7 µV/m

dBµV/m = 20 * log (µV/m)
= 20 * log (10996.7)

Average Limit at 433.92 MHz = 80.8 dBµV/m

2. If the average limit is specified for the EUT, the peak limit is 20 dB above the average limit as specified in FCC 15.35 (b)

2. Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permItted under other sections of this part, e.g., §§15.231 and 15.241.

3. 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

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 30 MHz.

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			

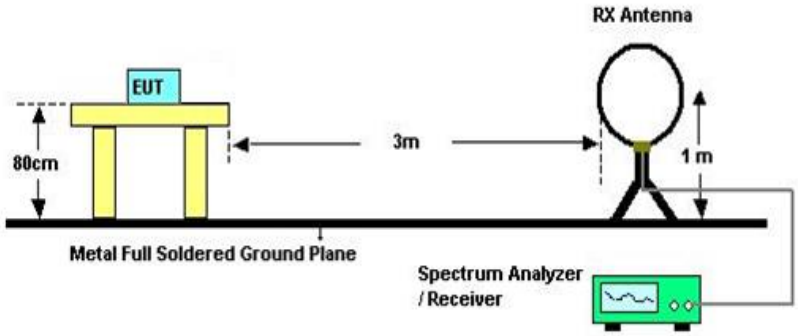
Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

TEST PROCEDURE

FCC Reference:	CFR 47 Parts 15.231(b) / 15.209
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5

TEST SETUP

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 and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

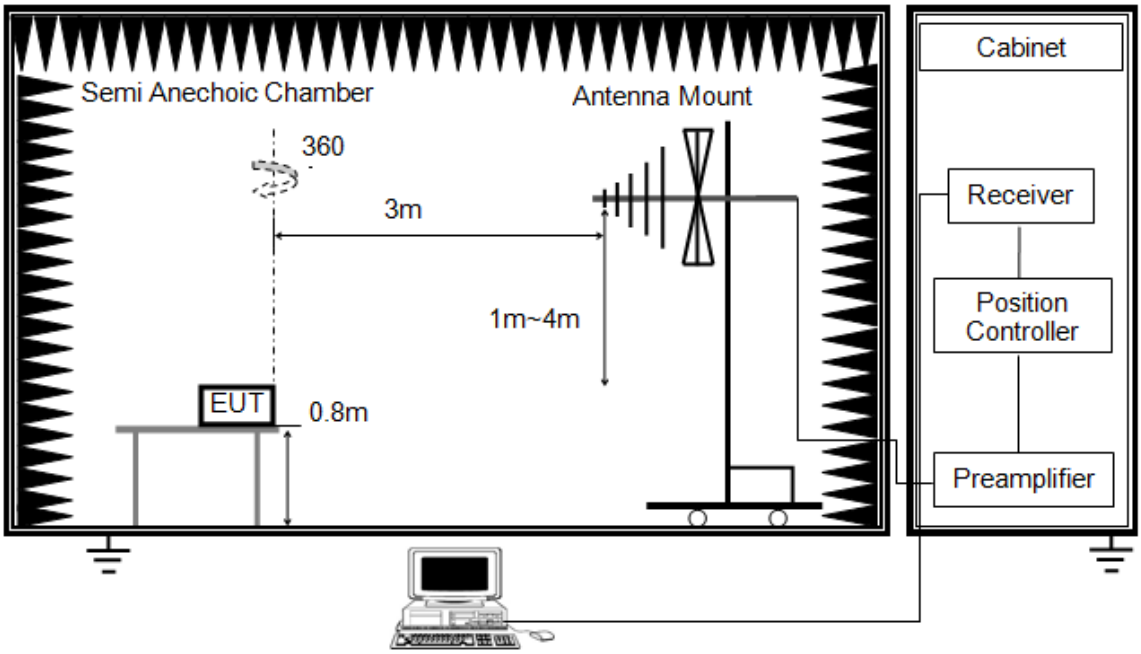
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

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 1GHz, 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 area test site, adequate comparison measurements were confirmed against 30m open are test 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 based on KDB 414788.

Below 1G



The setting of the spectrum analyser

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

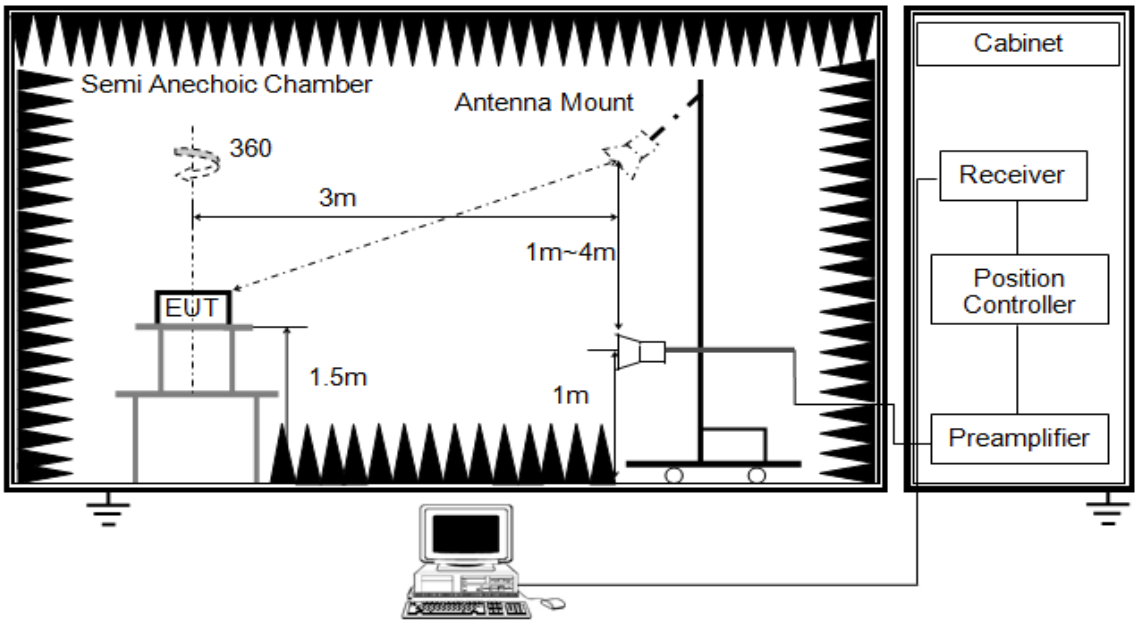
1. The testing follows the guidelines in ANSI C63.10-2013.

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 0.8 meter above ground.

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

ABOVE 1G



RBW	1 MHz
VBW	3 MHz
Sweep	Auto
Detector	Peak For Average see note 6
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 1.5m above ground.

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

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

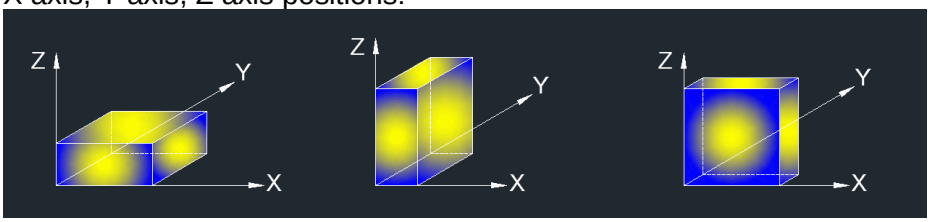
6. For average value=peak average+Duty Correction Factor

For the Duty Cycle and Correction Factor please refer to clause 7.1.ON TIME AND DUTY CYCLE.

8. For the actual test configuration, please refer to the related item in this test report. (Photographs of the Test Configuration)

RESULTS

X axis, Y axis, Z axis positions:



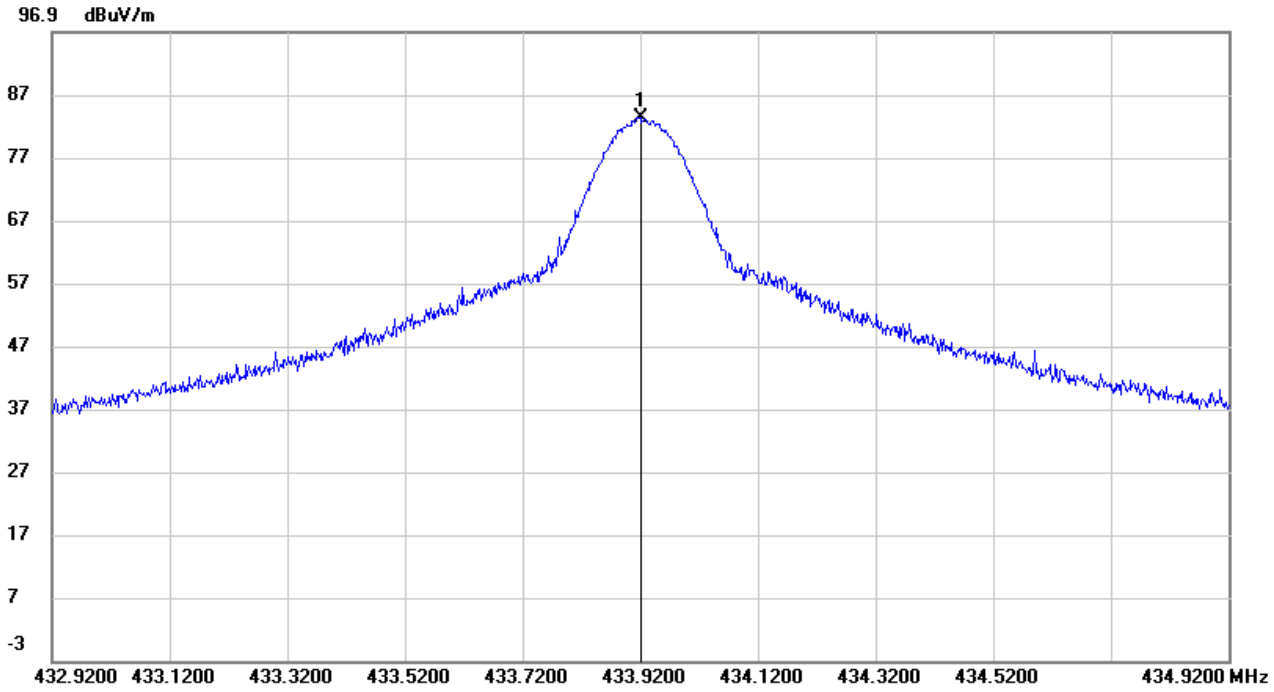
Note: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

TEST ENVIRONMENT

Temperature	24.5°C	Relative Humidity	42%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V, 60Hz

6.4.1. FUNDAMENTAL FIELD STRENGTH

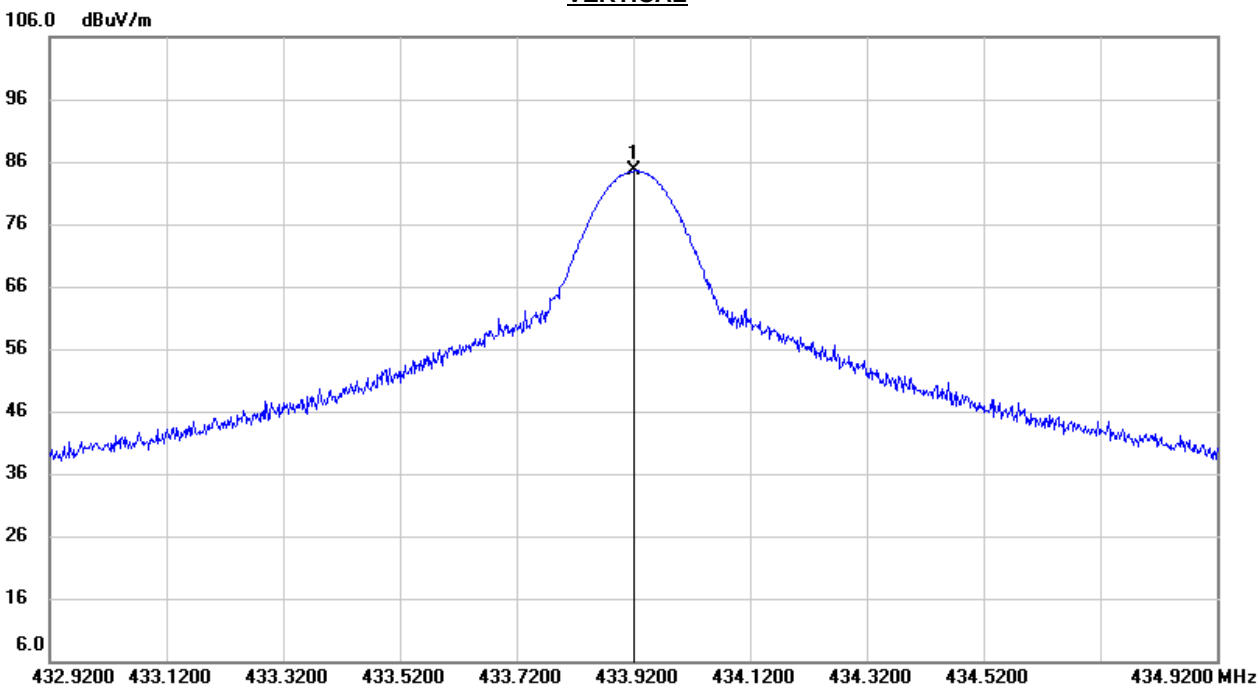
HORIZONTAL



Frequency	Reading	Correct	Peak Result	Average Result	Limit	Margin	Remark
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
433.9200	96.00	-12.67	83.33	/	100.8	-17.47	peak
	/	/	/	73.04	80.8	-7.76	Average

Note: 1. Peak Result = Reading+ Duty Correction Factor
2. Average Result= Peak Result+ Correct Factor
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

VERTICAL

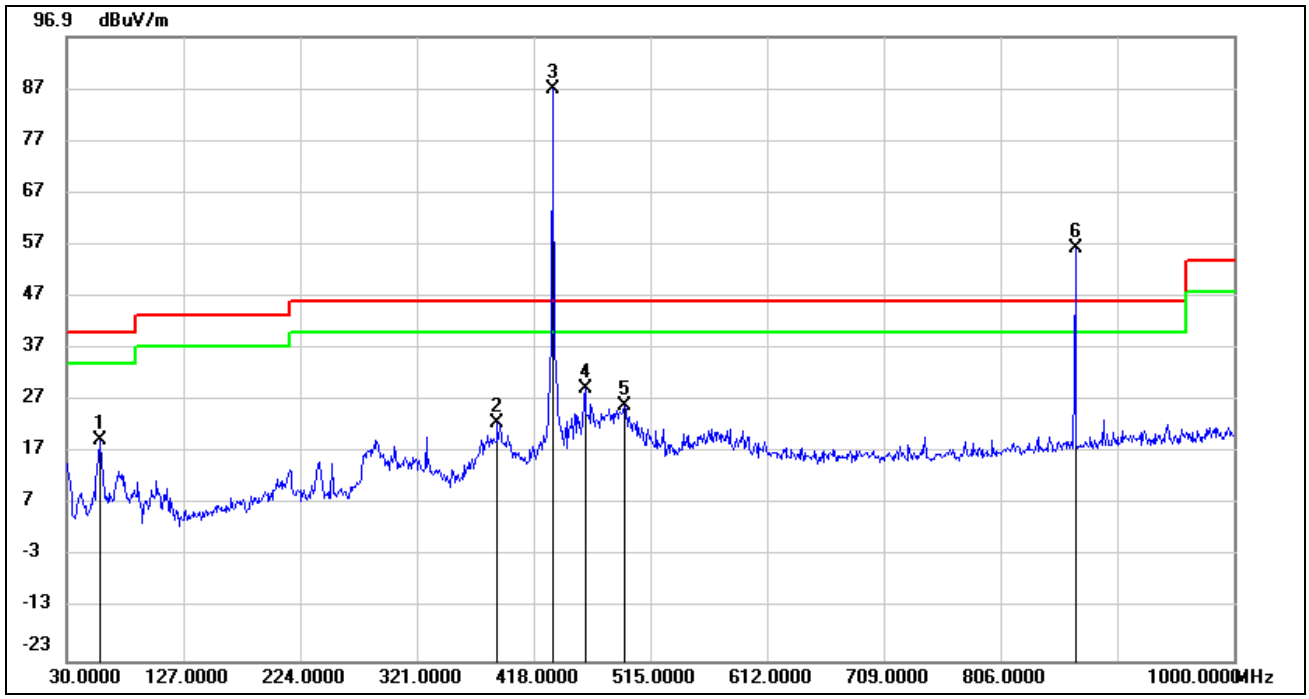


Frequency	Reading	Correct	Peak Result	Average Result	Limit	Margin	Remark
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
433.920	97.24	-12.67	84.57		100.8	-16.23	peak
				74.28	80.8	-6.52	Average

Note: 1. Peak Result = Reading+ Duty Correction Factor
2. Average Result= Peak Result+ Correct Factor
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

6.4.2. SPURIOUS EMISSIONS BELOW 1G

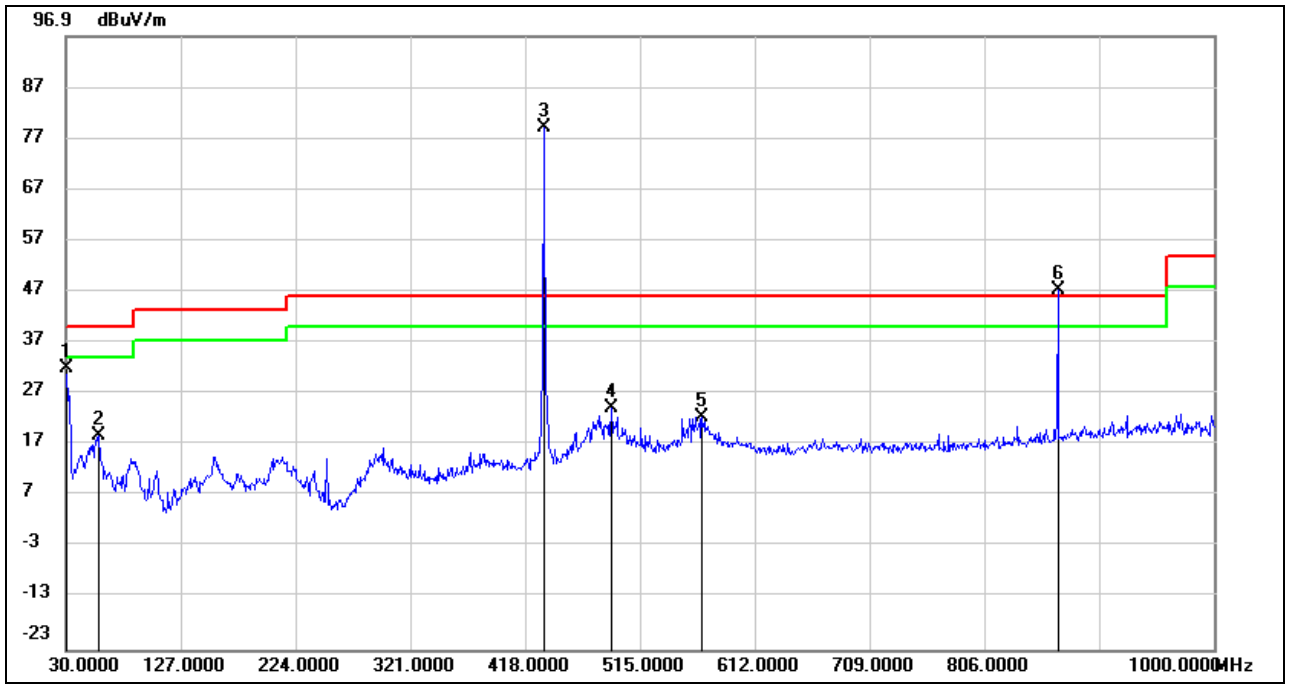
HORIZONTAL



No.	Frequency	Reading	Correct	Peak Result	Average Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	57.1600	39.99	-20.58	19.41	/	40.00	-20.59	peak
2	387.9300	36.09	-13.53	22.56	/	46.00	-23.44	peak
3	433.5200	99.49	-12.67	86.82	/	/	/	Fundamental
4	460.6800	41.29	-12.11	29.18	/	46.00	-16.82	peak
5	493.6600	37.67	-11.61	26.06	/	46.00	-19.94	peak
6	868.0800	61.99	-5.80	56.19	/	80.80	-24.61	peak
(2th harmonic)	/	/	/	/	45.9	60.80	-14.9	Average

Note: 1. Peak Result = Reading Level + Correct Factor.
2. Average Result = Peak Result + Duty Correction Factor.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

VERTICAL

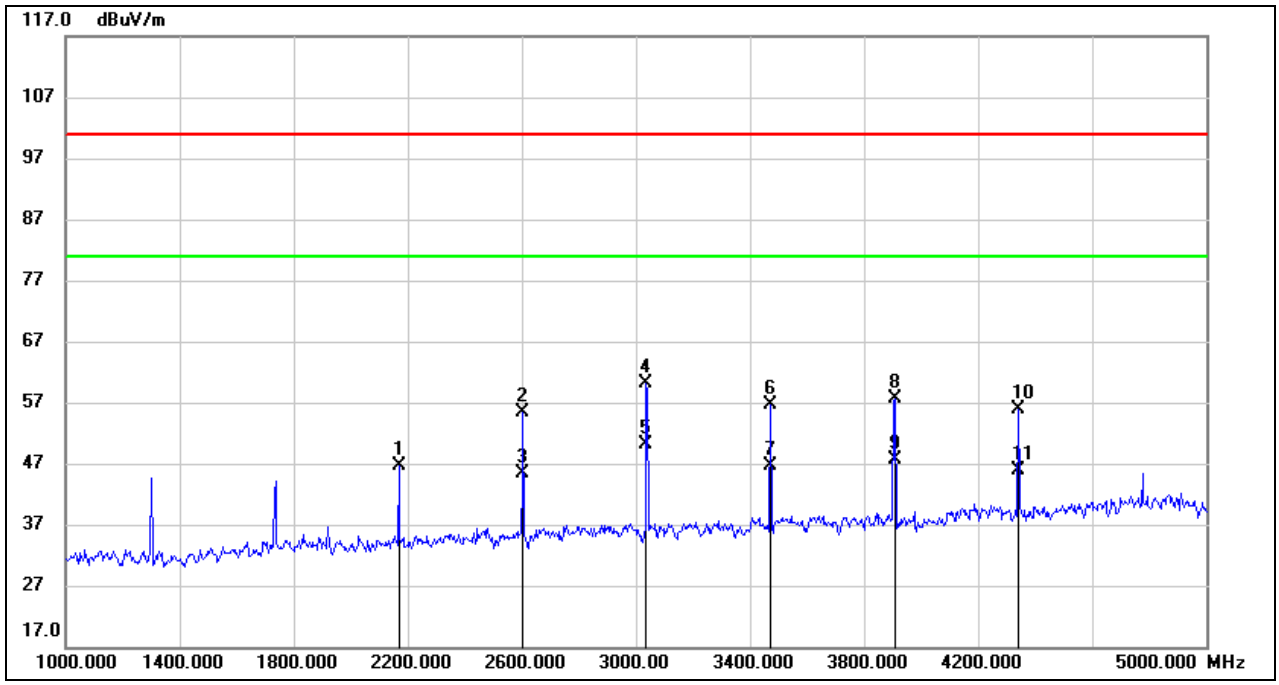


No.	Frequency	Reading	Correct	Peak Result	Average Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	30.0000	50.79	-18.94	31.85	/	40.00	-8.15	peak
2	58.1300	39.22	-20.55	18.67	/	40.00	-21.33	peak
3	433.5200	91.62	-12.67	78.95	/	/	/	Fundamental
4	490.7500	35.90	-11.68	24.22	/	46.00	-21.78	peak
5	567.3800	32.54	-10.13	22.41	/	46.00	-23.59	peak
6	868.0800	52.94	-5.80	47.14	/	80.80	-33.66	peak
(2th harmonic)	/	/	/	/	36.85	60.80	-224.03	Average

Note: 1. Peak Result = Reading Level + Correct Factor.
2. Average Result = Peak Result + Duty Correction Factor.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

6.4.3. SPURIOUS EMISSIONS ABOVE 1G

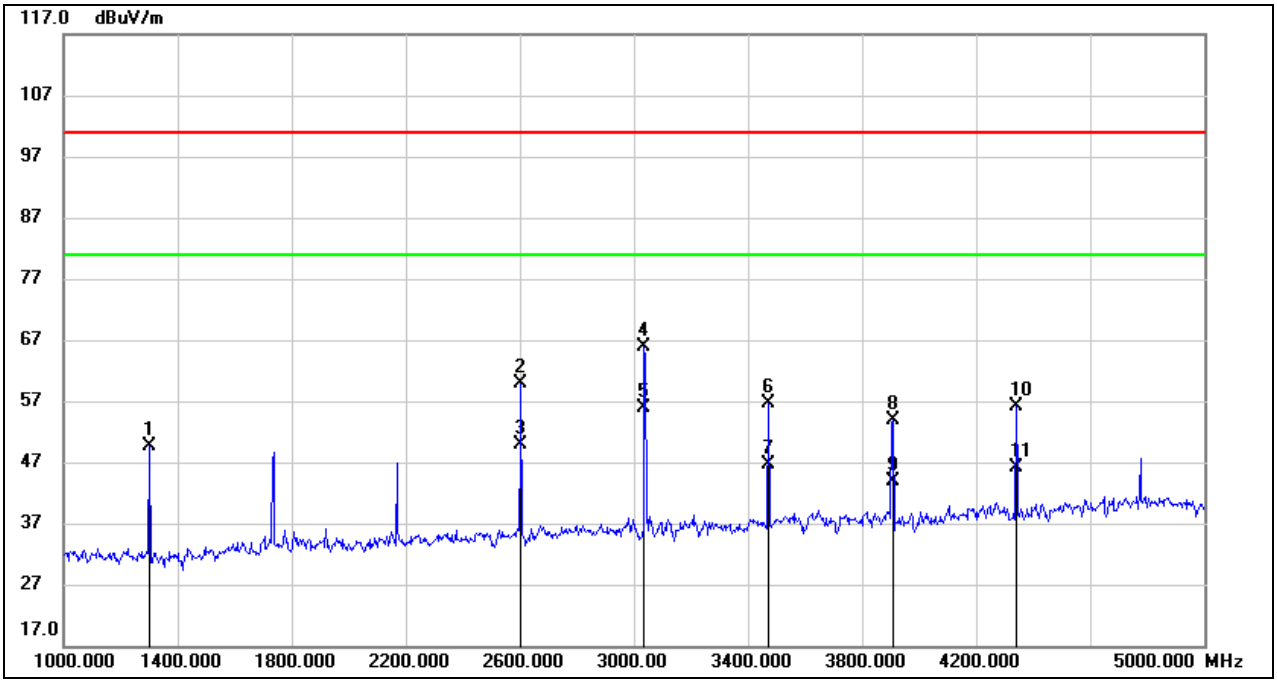
HORIZONTAL



No.	Frequency	Reading	Correct	Peak Result	AVG Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2169.6	55.94	-9.22	46.72	/	100.8	-54.08	peak
2	2603.52	63.27	-7.84	55.43	/	100.8	-45.37	peak
3	2603.52	/	/	/	45.14	80.8	-35.66	AVG
4	3037.44	65.66	-5.52	60.14	/	100.8	-40.66	peak
5	3037.44	/	/	/	49.85	80.8	-30.95	AVG
6	3471.36	61.39	-4.82	56.57	/	100.8	-44.23	peak
7	3471.36	/	/	/	46.28	80.8	-34.52	AVG
8	3905.28	61.03	-3.44	57.59	/	100.8	-43.21	peak
9	3905.28	/	/	/	47.3	80.8	-33.5	AVG
10	4339.2	57.58	-1.81	55.77	/	100.8	-45.03	peak
11	4339.2	/	/	/	45.48	80.8	-35.32	AVG

Note: 1. Peak Result = Reading Level + Correct Factor.
2. Average Result = Peak Result + Duty Correction Factor.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

VERTICAL



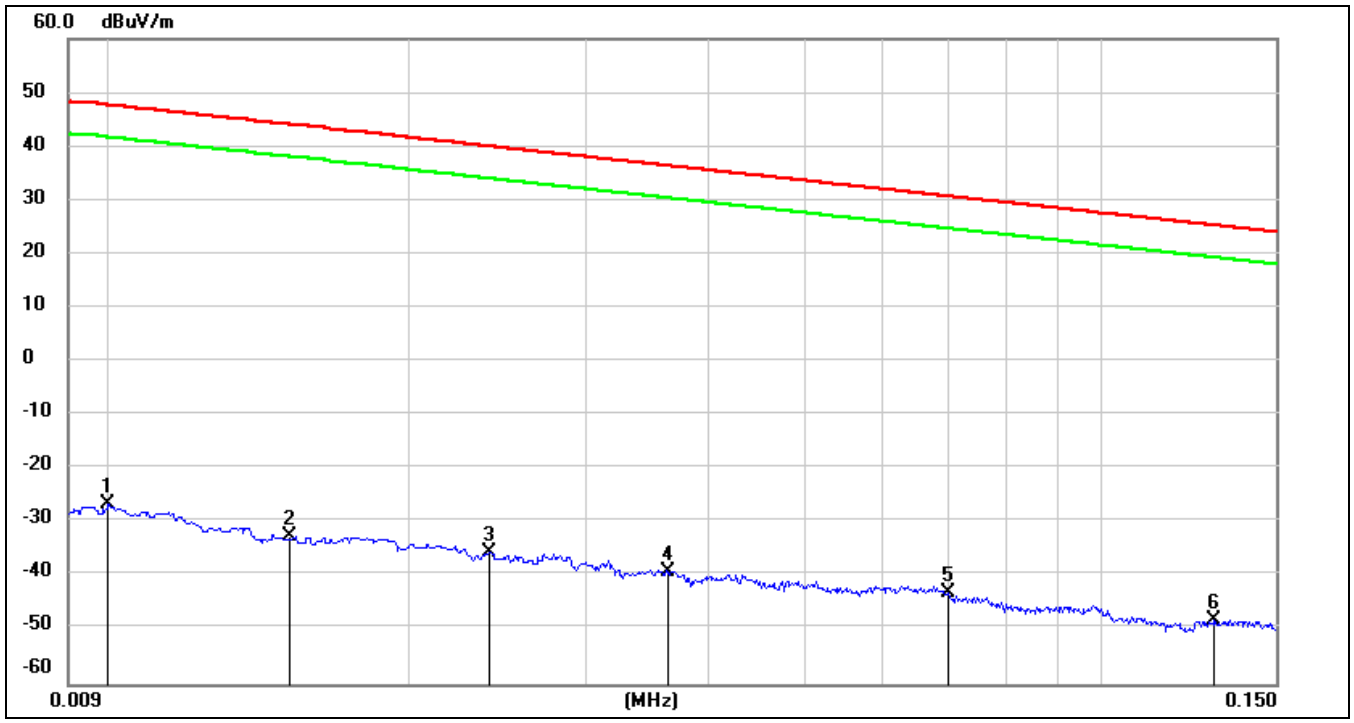
No.	Frequency	Reading	Correct	Peak Result	AVG Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1301.76	62.54	-12.85	49.69	/	100.8	-51.11	peak
2	2603.52	67.76	-7.84	59.92	/	100.8	-40.88	peak
3	2603.52	/	/	/	49.63	80.8	-31.17	AVG
4	3037.44	71.52	-5.52	66	/	100.8	-34.8	peak
5	3037.44	/	/	/	55.71	80.8	-25.09	AVG
6	3471.36	61.34	-4.82	56.52	/	100.8	-44.28	peak
7	3471.36	/	/	/	46.23	80.8	-34.57	AVG
8	3905.28	57.38	-3.44	53.94	/	100.8	-46.86	peak
9	3905.28	/	/	/	43.65	80.8	-37.15	AVG
10	4339.2	57.97	-1.81	56.16	/	100.8	-44.64	peak
11	4339.2	/	/	/	45.87	80.8	-34.93	AVG

Note: 1. Peak Result = Reading Level + Correct Factor.
2. Average Result = Peak Result + Duty Correction Factor.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

6.4.4. SPURIOUS EMISSIONS BELOW 30M

SPURIOUS EMISSIONS (LOW CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

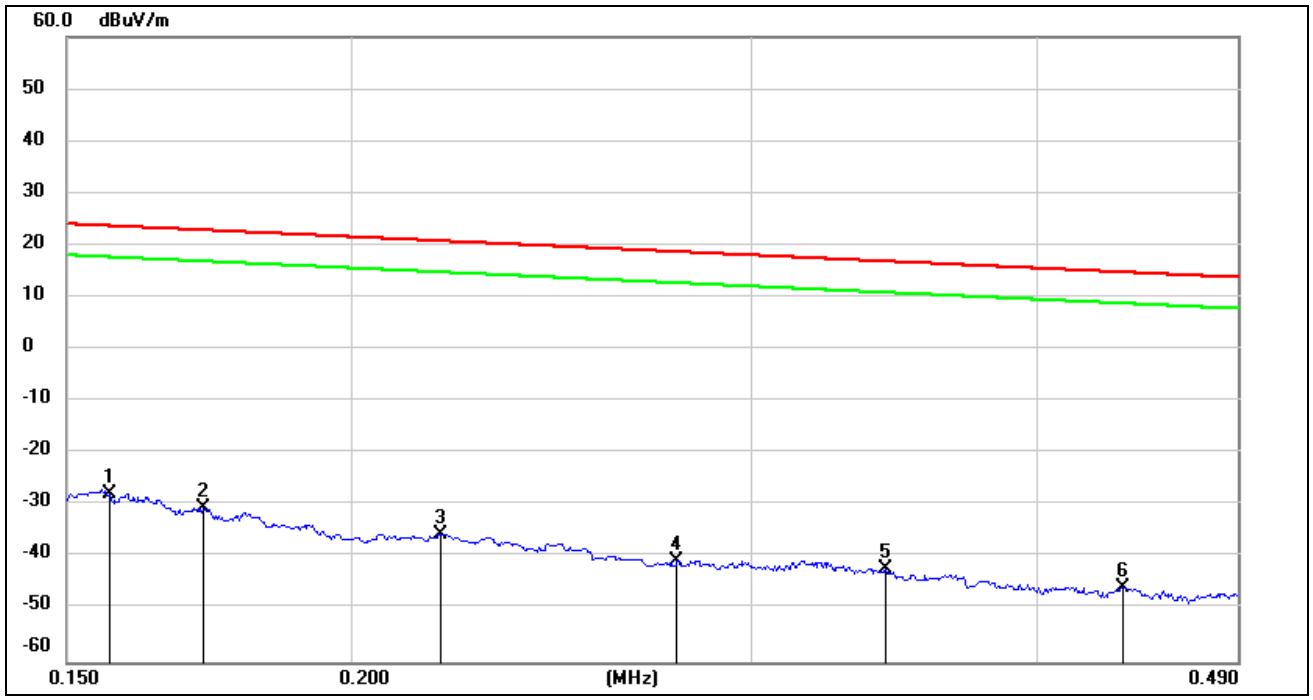
9 kHz~ 150 kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.0100	74.72	-101.40	-26.68	47.60	-74.28	peak
2	0.0151	68.71	-101.37	-32.66	44.02	-76.68	peak
3	0.0240	65.82	-101.36	-35.54	40.00	-75.54	peak
4	0.0364	62.38	-101.42	-39.04	36.38	-75.42	peak
5	0.0700	58.41	-101.57	-43.16	30.70	-73.86	peak
6	0.1300	53.43	-101.70	-48.27	25.33	-73.60	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. Test setup: RBW: 200 Hz, VBW: 200 Hz, Sweep time: auto.

150 kHz ~ 490 kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.1567	73.95	-101.65	-27.70	23.70	-51.40	peak
2	0.1720	71.19	-101.67	-30.48	22.90	-53.38	peak
3	0.2190	66.27	-101.75	-35.48	20.79	-56.27	peak
4	0.2782	61.29	-101.83	-40.54	18.71	-59.25	peak
5	0.3431	59.67	-101.90	-42.23	16.89	-59.12	peak
6	0.4364	56.36	-101.99	-45.63	14.80	-60.43	peak

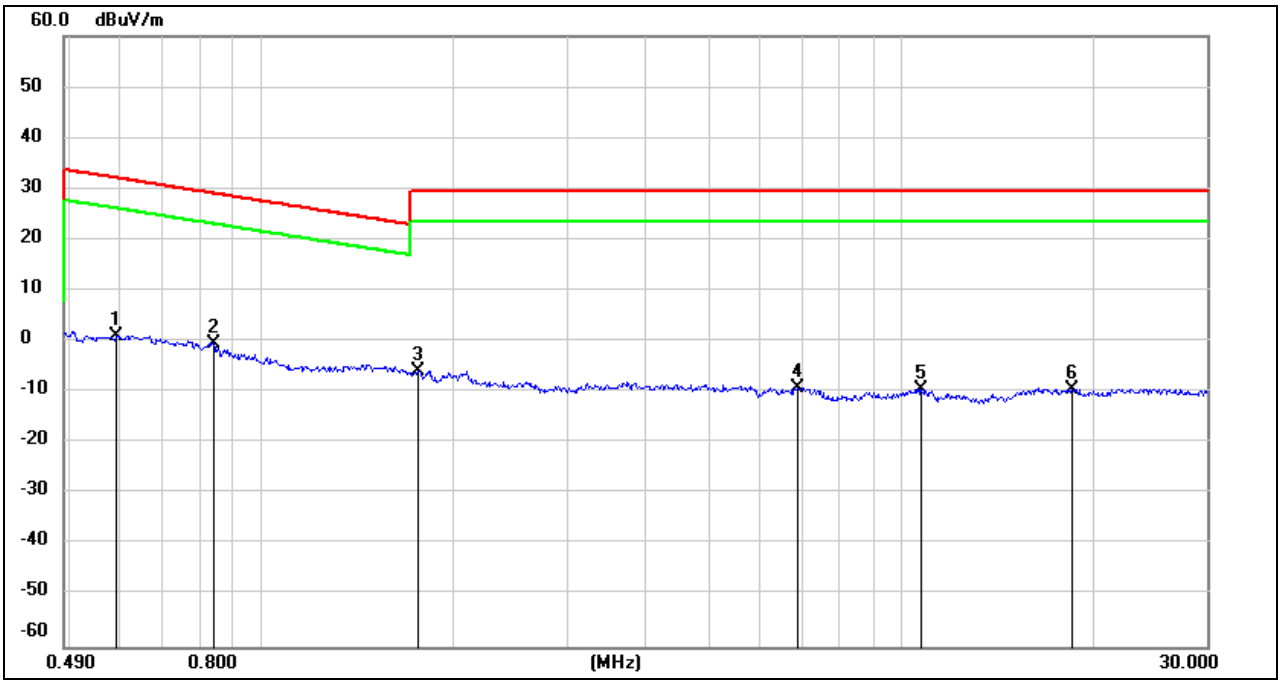
Note: 1. Measurement = Reading Level + Correct Factor

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. Test setup: RBW: 200 Hz, VBW: 200 Hz, Sweep time: auto.

490 kHz ~ 30 MHz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	FCC Result (dBuV/m)	FCC Limit (dBuV/m)	Margin (dB)	Remark
1	0.5917	63.24	-62.08	1.16	32.16	-31.00	peak
2	0.8400	61.71	-62.17	-0.46	29.12	-29.58	peak
3	1.7580	56.08	-61.93	-5.85	29.54	-35.39	peak
4	6.8936	52.09	-61.22	-9.13	29.54	-38.67	peak
5	10.7299	51.48	-60.83	-9.35	29.54	-38.89	peak
6	18.4908	51.55	-60.89	-9.34	29.54	-38.88	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.

4. Test setup: RBW: 200 Hz, VBW: 200 Hz, Sweep time: auto.

7. AC POWER LINE CONDUCTED EMISSIONS

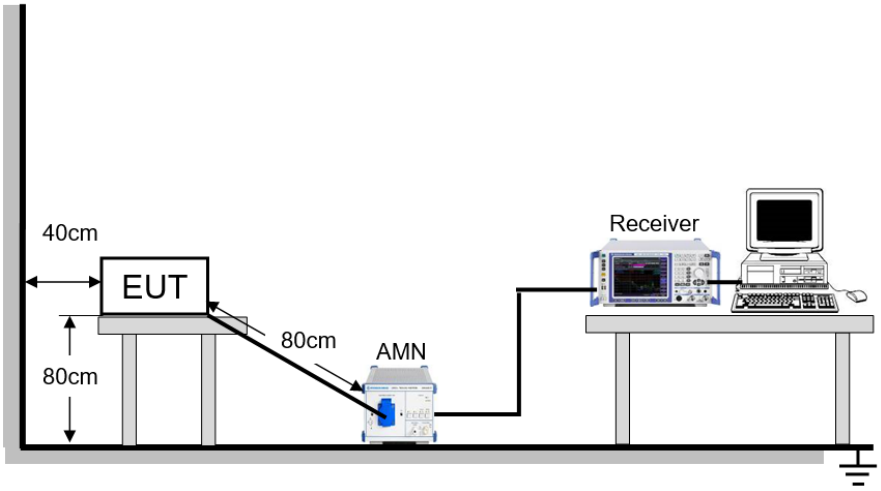
LIMITS

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

TEST SETUP AND PROCEDURE

Refer to ANSI C63.10-2013 clause 6.2.



The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

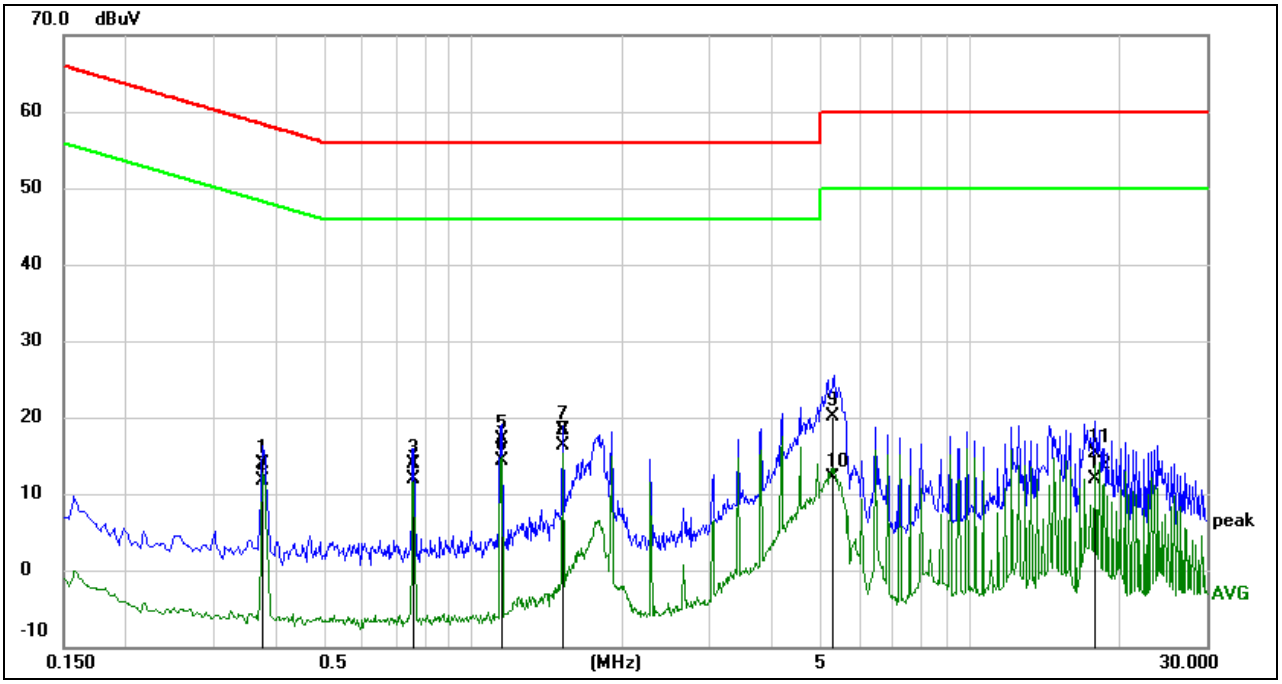
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Temperature	26.1°C	Relative Humidity	63 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V, 60 HZ

RESULTS

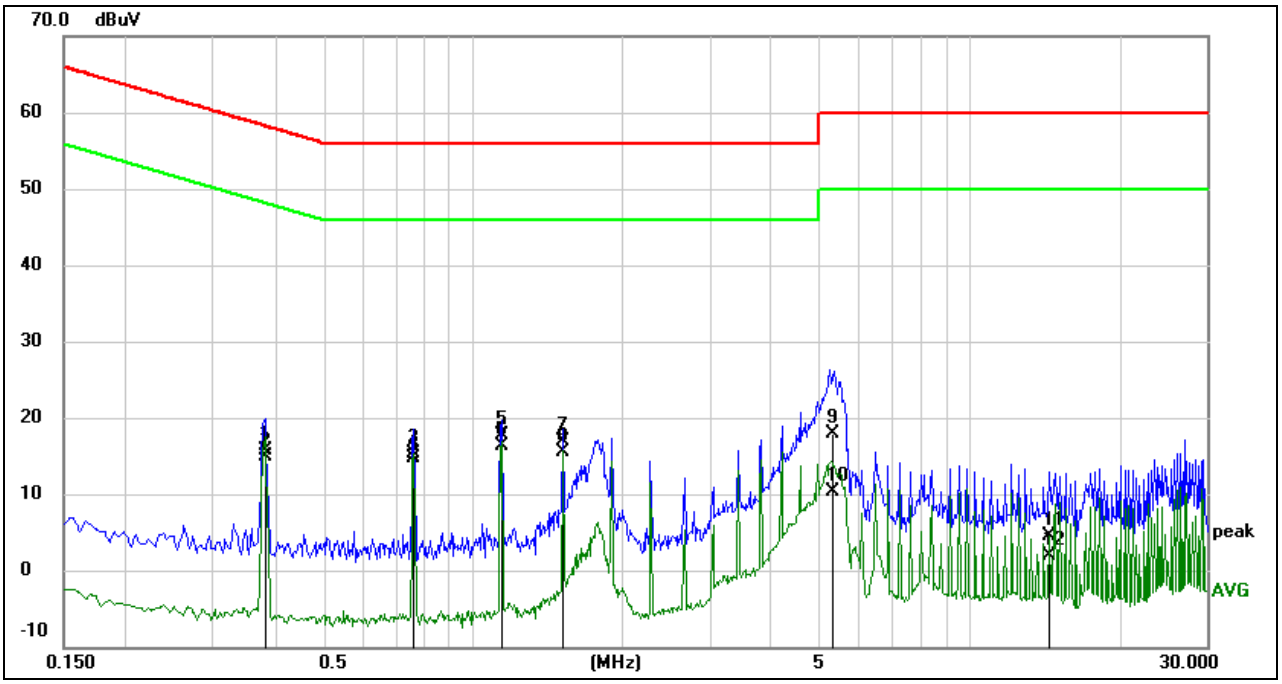
LINE L RESULTS (WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3786	14.33	-0.40	13.93	58.31	-44.38	QP
2	0.3786	12.07	-0.40	11.67	48.31	-36.64	AVG
3	0.7600	14.34	-0.40	13.94	56.00	-42.06	QP
4	0.7600	12.39	-0.40	11.99	46.00	-34.01	AVG
5	1.1408	17.25	-0.10	17.15	56.00	-38.85	QP
6	1.1408	14.48	-0.10	14.38	46.00	-31.62	AVG
7	1.5199	18.35	-0.10	18.25	56.00	-37.75	QP
8	1.5199	16.45	-0.10	16.35	46.00	-29.65	AVG
9	5.2669	20.55	-0.41	20.14	60.00	-39.86	QP
10	5.2669	12.49	-0.41	12.08	50.00	-37.92	AVG
11	17.8632	16.47	-1.11	15.36	60.00	-44.64	QP
12	17.8632	12.98	-1.11	11.87	50.00	-38.13	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

LINE N RESULTS (HIGH CHANNEL, WORST-CASE CONFIGURATION)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3806	16.05	-0.40	15.65	58.27	-42.62	QP
2	0.3806	15.28	-0.40	14.88	48.27	-33.39	AVG
3	0.7601	15.77	-0.40	15.37	56.00	-40.63	QP
4	0.7601	15.02	-0.40	14.62	46.00	-31.38	AVG
5	1.1408	17.88	-0.10	17.78	56.00	-38.22	QP
6	1.1408	16.32	-0.10	16.22	46.00	-29.78	AVG
7	1.5212	16.96	-0.10	16.86	56.00	-39.14	QP
8	1.5212	15.67	-0.10	15.57	46.00	-30.43	AVG
9	5.2867	18.27	-0.41	17.86	60.00	-42.14	QP
10	5.2867	10.74	-0.41	10.33	50.00	-39.67	AVG
11	14.4523	5.46	-0.98	4.48	60.00	-55.52	QP
12	14.4523	2.86	-0.98	1.88	50.00	-48.12	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

8. 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