



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

CERTIFICATION TEST REPORT

For

Remote Controller

MODEL NUMBER: PM1250-R

FCC ID: 2AX7W-PM1250

IC: 27806-PM1250

REPORT NUMBER: 4790176871-1

ISSUE DATE: February 18, 2022

Prepared for

JPW Industries

427 New Sanford Road, LaVergne, Tennessee 37086, United States

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People's Republic of China

Tel: +86 769 22038881

Fax: +86 769 33244054

Website: www.ul.com



Revision History

Rev.	Issue Date	Revisions	Revised By
V0	02/18/2021	Initial Issue	



Summary of Test Results			
Clause	Test Items	FCC/ISED Rules	Test Results
1	Transmitter Timeout	CFR 47 FCC §15.231 (a) (1) ISED RSS-210 Annex A.1.1	Pass
2	20 dB Bandwidth and 99 % Occupied Bandwidth	CFR 47 FCC §15.231 (c) ISED RSS-210 Annex A.1.3	Pass
3	Radiated Emission	CFR 47 FCC §15.231 (b)(e) CFR 47 FCC §15.205 and §15.209 RSS-210 Annex A.1.2 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
4	Conducted Emission Test for AC Power Port	FCC Part 15.207 RSS-GEN Clause 8.8	Not Applicable (Note 3)
5	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. Note 2: The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C, ISED RSS-210 Issue 10 and ISED RSS-GEN Issue 5 > when <Accuracy Method> decision rule is applied.			

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. MEASURING INSTRUMENT CALIBRATION	7
4.2. MEASUREMENT UNCERTAINTY.....	7
5. EQUIPMENT UNDER TEST	8
5.1. DESCRIPTION OF EUT	8
5.2. MAXIMUM FIELD STRENGTH.....	8
5.3. TEST CHANNEL CONFIGURATION.....	8
5.4. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.5. TEST ENVIRONMENT	8
5.6. DESCRIPTION OF TEST SETUP.....	9
5.7. MEASURING INSTRUMENT AND SOFTWARE USED.....	10
6. ANTENNA PORT TEST RESULTS.....	11
6.1. ON TIME AND DUTY CYCLE.....	11
6.2. TRANSMITTER TIMEOUT	15
6.3. 20 dB BANDWIDTH AND 99 % OCCUPIED BANDWIDTH	17
6.4. RADIATED TEST RESULTS	20
6.4.1. FIELD STRENGTH AND SPURIOUS EMISSIONS BELOW 1 GHz AND ABOVE 30 MHz	28
6.4.2. SPURIOUS EMISSIONS ABOVE 1 GHz	30
6.4.3. SPURIOUS EMISSIONS BELOW 30 MHz	32
7. ANTENNA REQUIREMENTS.....	35



1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: JPW Industries
Address: 427 New Sanford Road, LaVergne, Tennessee 37086, United States

Manufacturer Information

Company Name: JPW Industries
Address: 427 New Sanford Road, LaVergne, Tennessee 37086, United States

EUT Information

EUT Name: Remote Controller
Model: PM1250-R
Serial Model: /
Brand: /
Sample Received Date: November 10, 2020
Sample Status: Normal
Sample ID: 4387487
Date of Tested: November 15, 2021 ~ February 18, 2022

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:

Denny Huang
Project Engineer
Approved By:

Stephen Guo
Laboratory Manager

Checked By:

Shawn Wen
Laboratory Leader



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 Industry Canada. The Company Number is 21320. 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 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 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	Remote Controller	
Model	PM1250-R	
Product Description	Operation Frequency	433.92 MHz
	Modulation Type	FSK
Power Supply	DC 3 V	

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Maximum Peak Field Strength (dB μ V/m)
433.92	89.10

5.3. TEST CHANNEL CONFIGURATION

Test Mode	Frequency
FSK	433.92 MHz

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
433.92	PCB Antenna	0

Note: The value of the antenna gain was declared by customer.

5.5. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65 %	
Atmospheric Pressure:	1025 Pa	
Temperature	TN	23 ~ 28 °C
Voltage:	VL	/
	VN	DC 3.0 V
	VH	/

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



5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	/	/	/	/

I/O CABLES

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

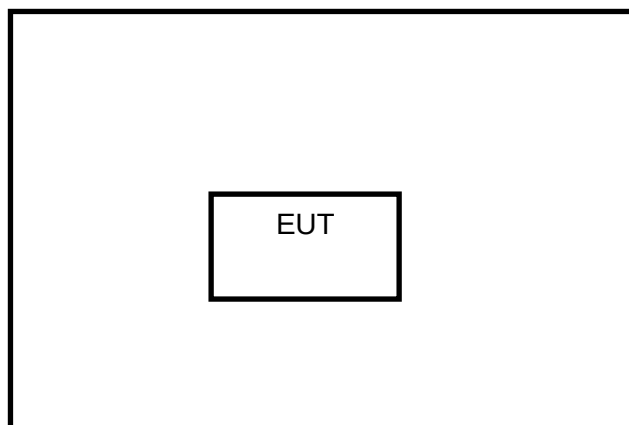
ACCESSORY

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

TEST SETUP

1. A new battery was used for all tests.
2. The test sample will transmit when press the keys.

SETUP DIAGRAM FOR TEST



**5.7. MEASURING INSTRUMENT AND SOFTWARE USED**

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
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	Dec.14, 2021	Dec.13, 2024
Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	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.
☒	Spectrum Analyzer	Keysight	N9020A	MY49100060	Oct.30, 2021	Oct.29, 2022
☒	Signal & Spectrum analyzer	R&S	FSW	1312.8000K26-103950-sj	Oct.31, 2021	Oct.30, 2022

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

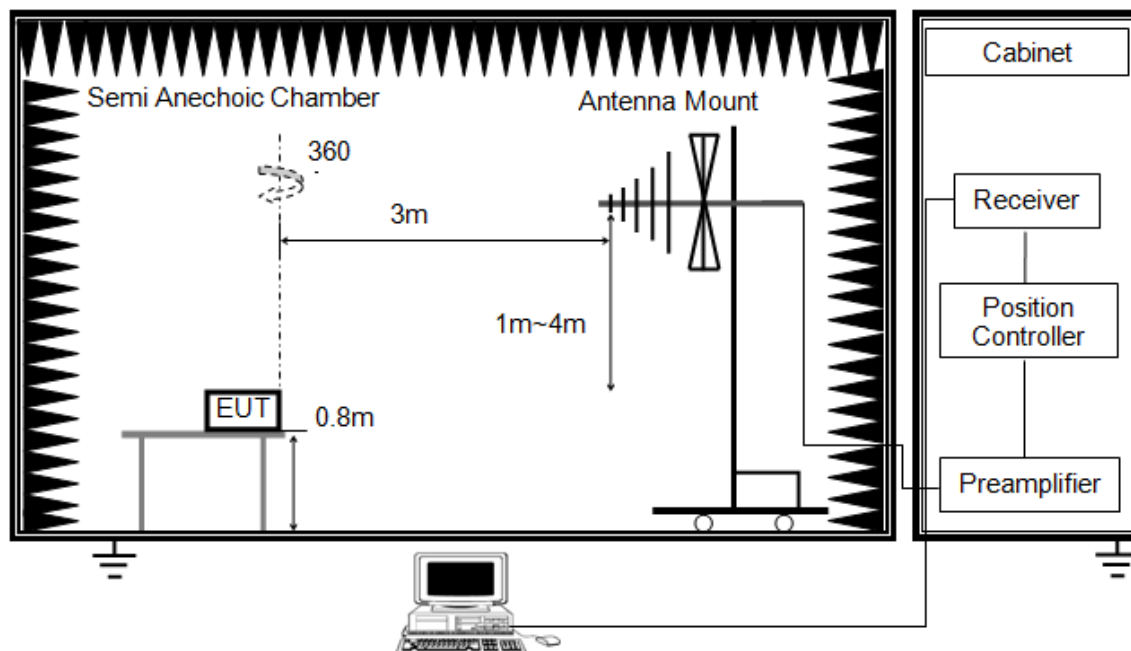
LIMITS

None; for reporting purposes only

PROCEDURE

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

TEST SETUP



- Set RBW of spectrum analyzer to 3 MHz and VBW to 3 MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is at least a 100 ms.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.

TEST ENVIRONMENT

Temperature	21.7 °C	Relative Humidity	61.3 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.0 V



RESULTS

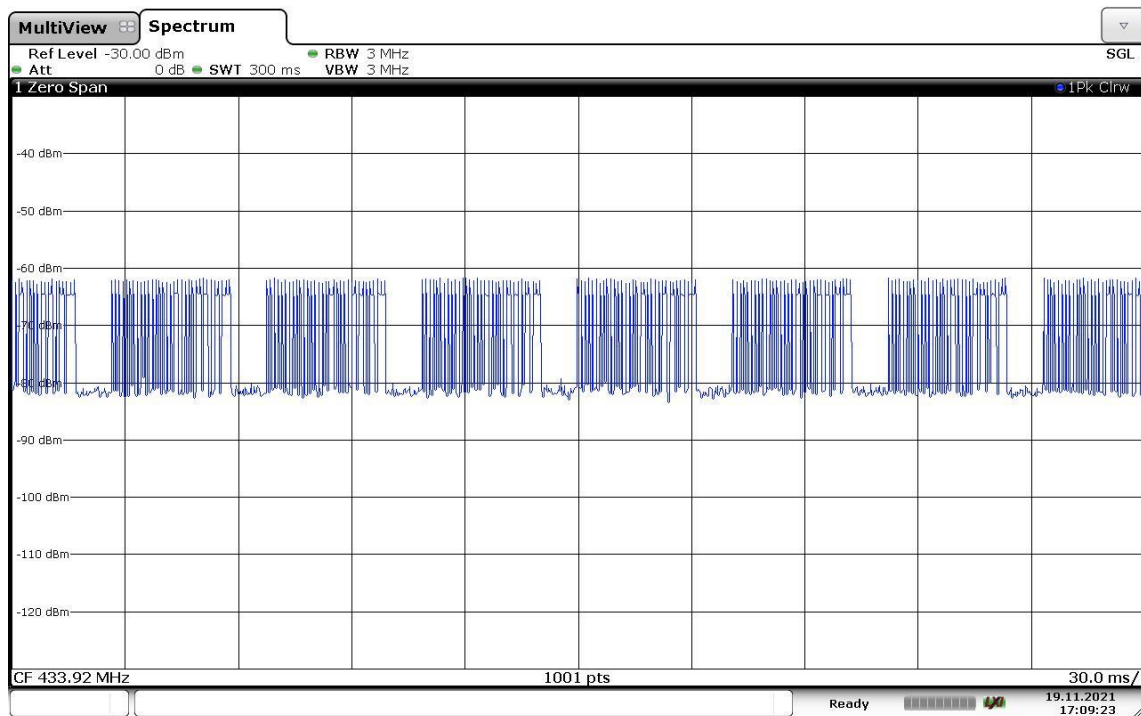
	On Time (ms)	Times	Ton (ms)	Total Ton times (ms)
Ton1	0.315	66	20.79	35.28
Ton2	0.805	18	14.49	

Note: Total Ton times= Ton1*66+Ton2*18

Total Ton times (ms)	Period (ms)	Duty Cycle (Linear)	Duty Cycle Correction Factor
35.28	100	0.3528	-9.05

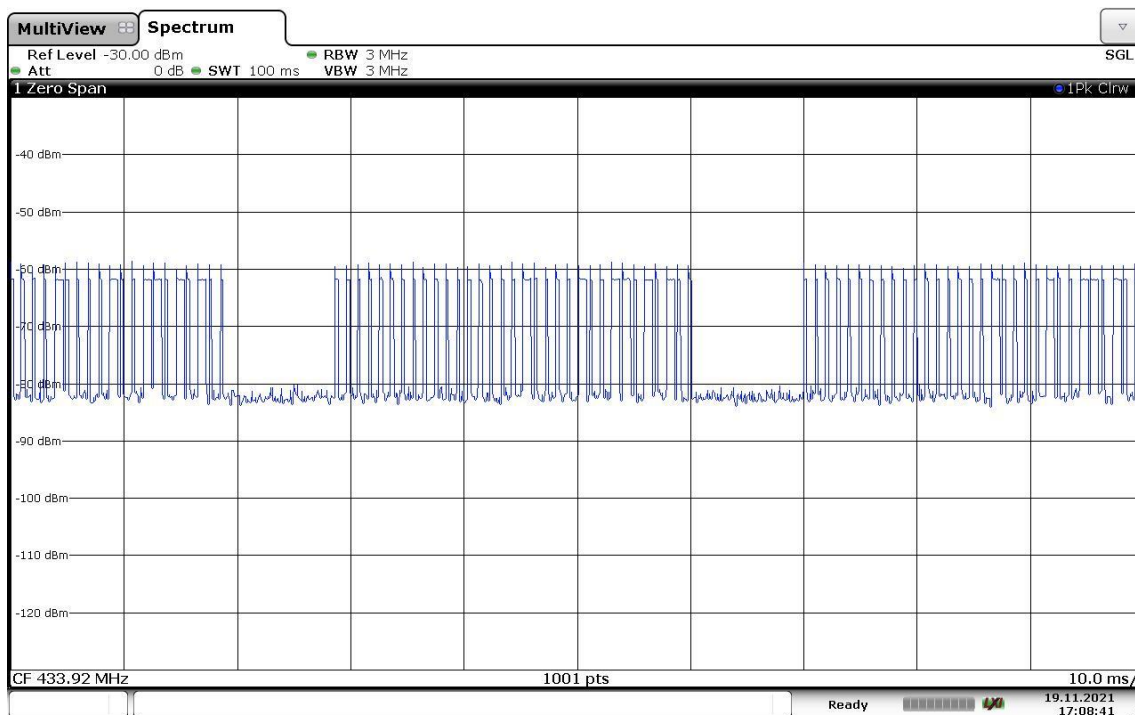
Note: Duty Cycle Correction Factor=20log(x).
Where: x is Duty Cycle

Test Plot-1



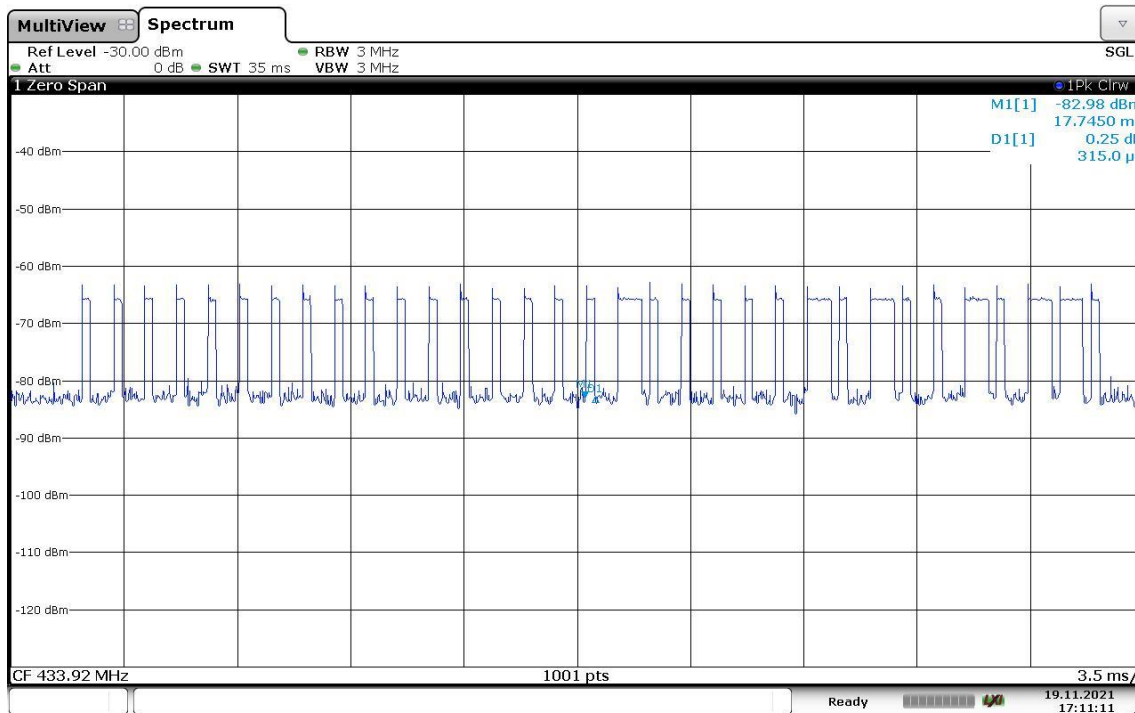
17:09:24 19.11.2021

Test Plot-2



17:08:42 19.11.2021

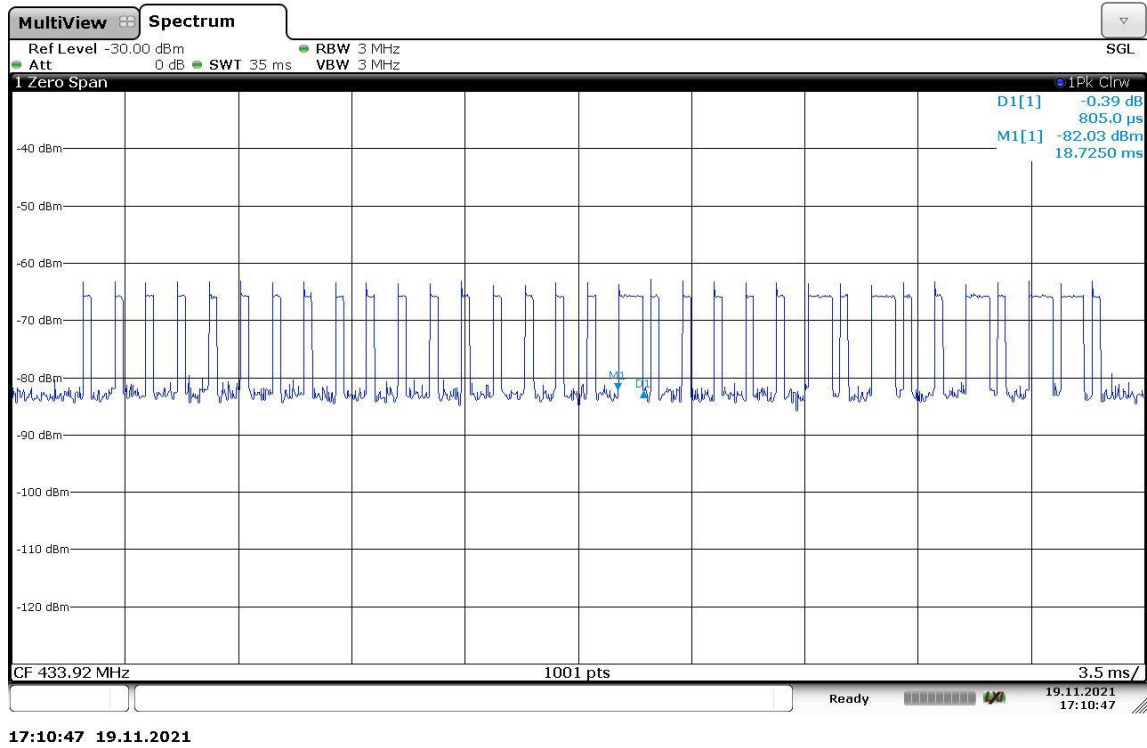
Test Plot-3



17:11:12 19.11.2021



Test Plot-4



Note: All the modes had been tested, only the worst data was recorded in the report.

6.2. TRANSMITTER TIMEOUT

LIMITS

CFR 47 §15.231(a):

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

RSS-210 Issue 10 Annex A.1.1 Types of Momentarily Operated Devices

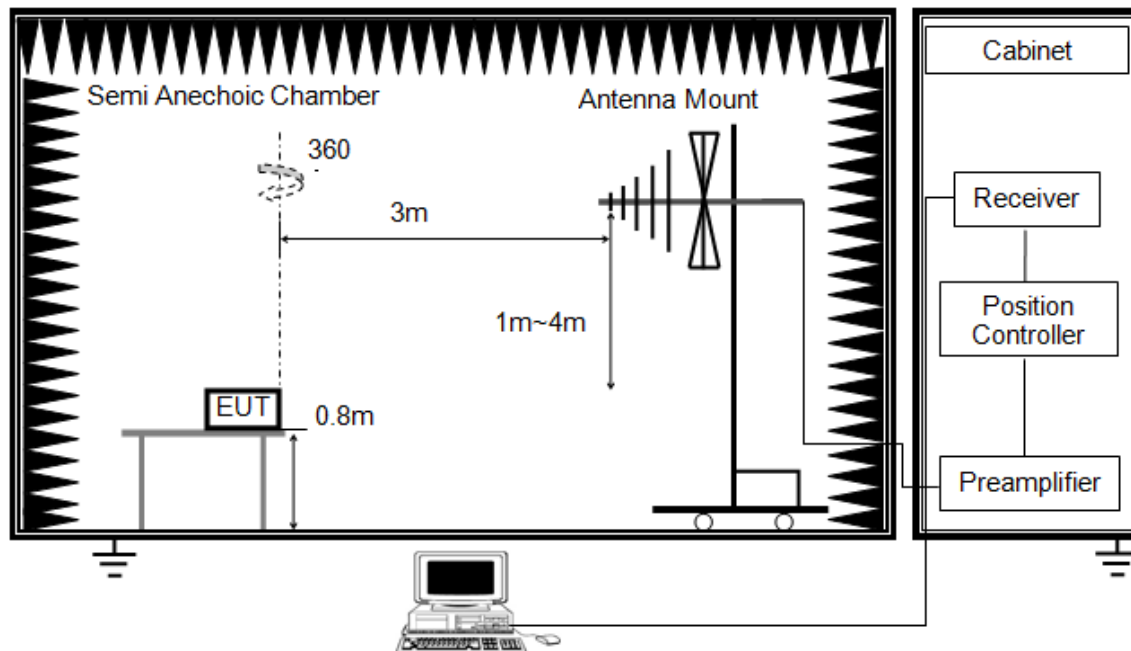
Devices shall comply with the following for momentary operation:

a. A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.

TEST PROCEDURE

FCC Reference:	CFR 47 FCC §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



For CFR 47 Part 15.231(a):

- Set RBW of spectrum analyzer to 1 MHz and VBW to 3 MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sew Sweep Time to 10 s.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.

TEST ENVIRONMENT

Temperature	21.7 °C	Relative Humidity	61.3 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.0 V

RESULTS

Manually transmitting mode			
Deactivation Time (seconds)	Limit (seconds)	Margin (seconds)	Result
0.22	5.000	4.78	PASS



Note: All the modes had been tested, only the worst data record in the report.



6.3. 20 dB BANDWIDTH AND 99 % OCCUPIED BANDWIDTH

LIMITS

CFR 47 FCC §15.231 (c)

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

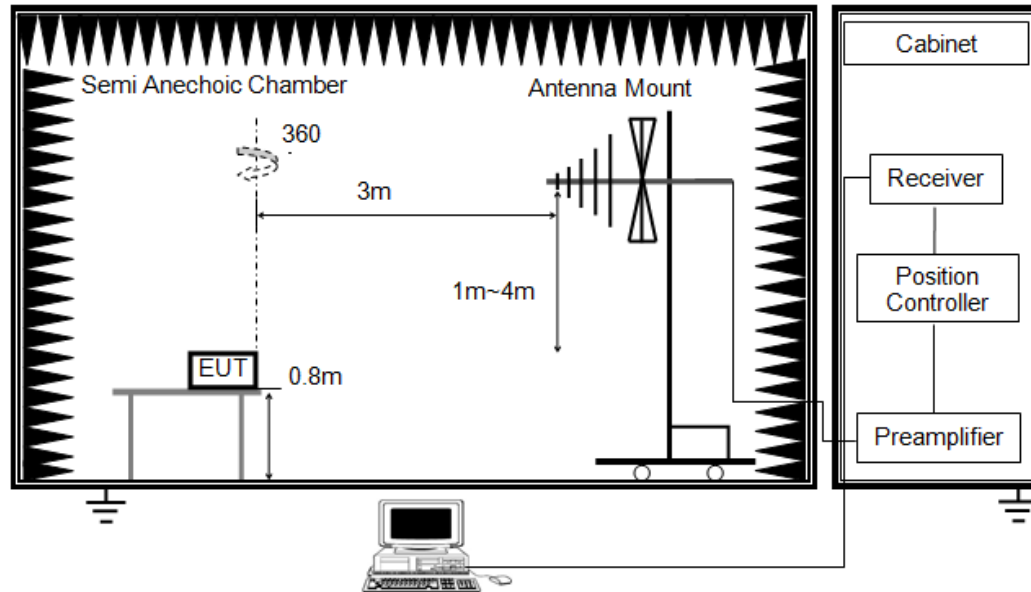
RSS-210 Issue 10 Annex A.1.3 Bandwidth of Momentary Signals

The 99% bandwidth of momentarily operated devices shall be less or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the centre frequency.

TEST PROCEDURE

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

TEST SETUP



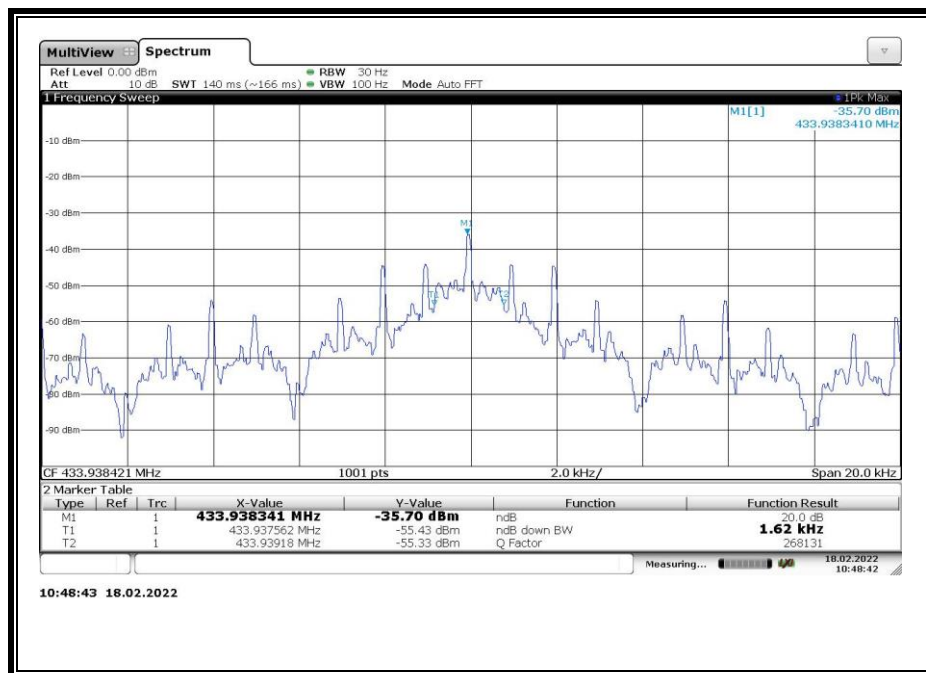
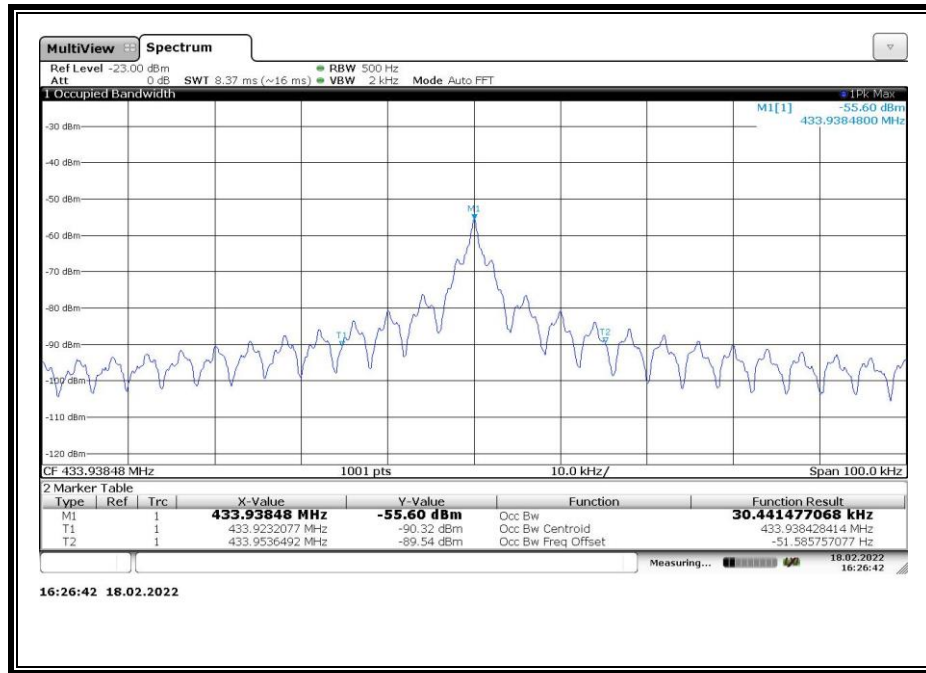
1. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters 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% to 5% of the OBW and VBW is set $3 * RBW$.

TEST ENVIRONMENT

Temperature	21.7 °C	Relative Humidity	61.3 %
Atmosphere Pressure	101 kPa	Test Voltage	DC 3.0 V

RESULTS

20 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)	Limit (MHz)	Result
1.62	30.44	1.0848	Pass



Note: All the modes had been tested, only the worst data was recorded in the report.

6.4. RADIATED TEST RESULTS

LIMITS

CFR 47 FCC §15.231 (b)(e)

CFR 47 FCC §15.205 and §15.209

ISED RSS-210 Issue 10 Annex A.1.2 Field Strengths

ISED RSS-GEN Clause 8.9

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) / (fupper – flower)]
where ΔF = fc – flower = 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. Please refer to CFR 47 FCC part 15.231(e)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emission (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 ¹	50 to 150 ¹
174-260	1,500	150
260-470	1,500 to 5,000 ¹	150 to 500 ¹
Above 470	5,000	500

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) / (fupper – flower)]
where ΔF = fc – flower = 433.92 – 260 = 173.92

Limit = 1500 + 173.92 * [(5000 – 1500) / (470 -260)]
= 1500 + 173.92 * [3500 / 210]
= 4398.7 μV/m

dBμV/m = 20 * log (μV/m)
= 20 * log (4398.7)

Average Limit at 433.92 MHz = 72.87 dBμV/m

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)

3. 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.

4. 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).

Note: (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: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c



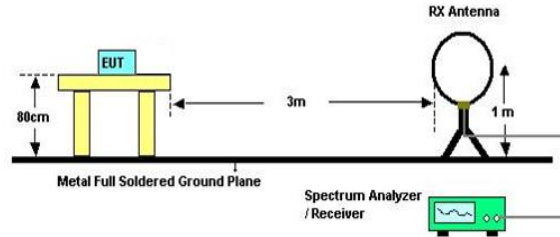
IC Restricted bands please refer to ISED RSS-GEN Clause 8.10

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 30MHz

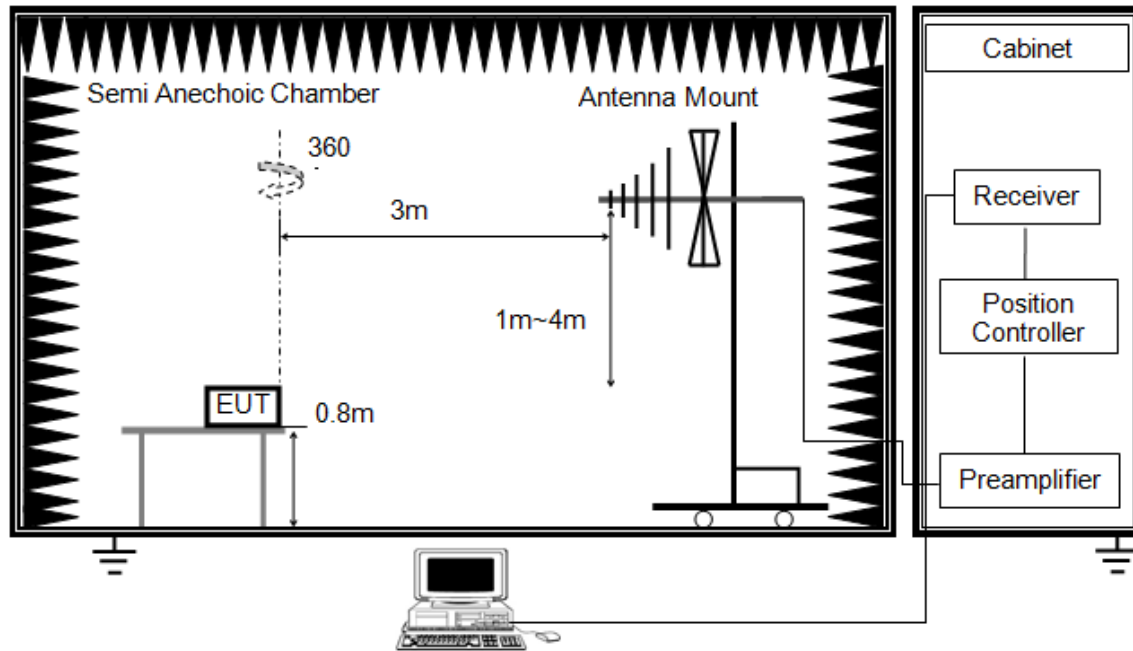


The setting of the spectrum analyser

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
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 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

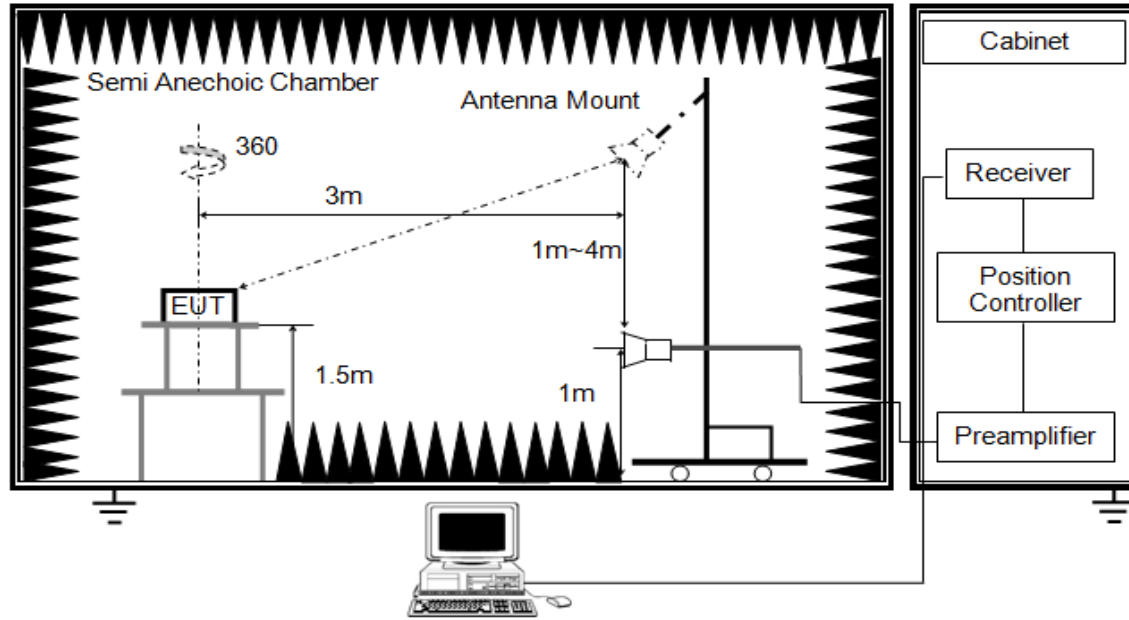


The setting of the spectrum analyser

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

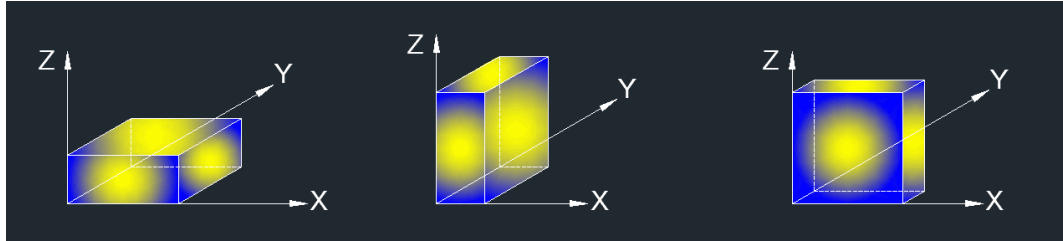


The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz 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 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.
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 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (Z axis for vertical) data recorded in the report.

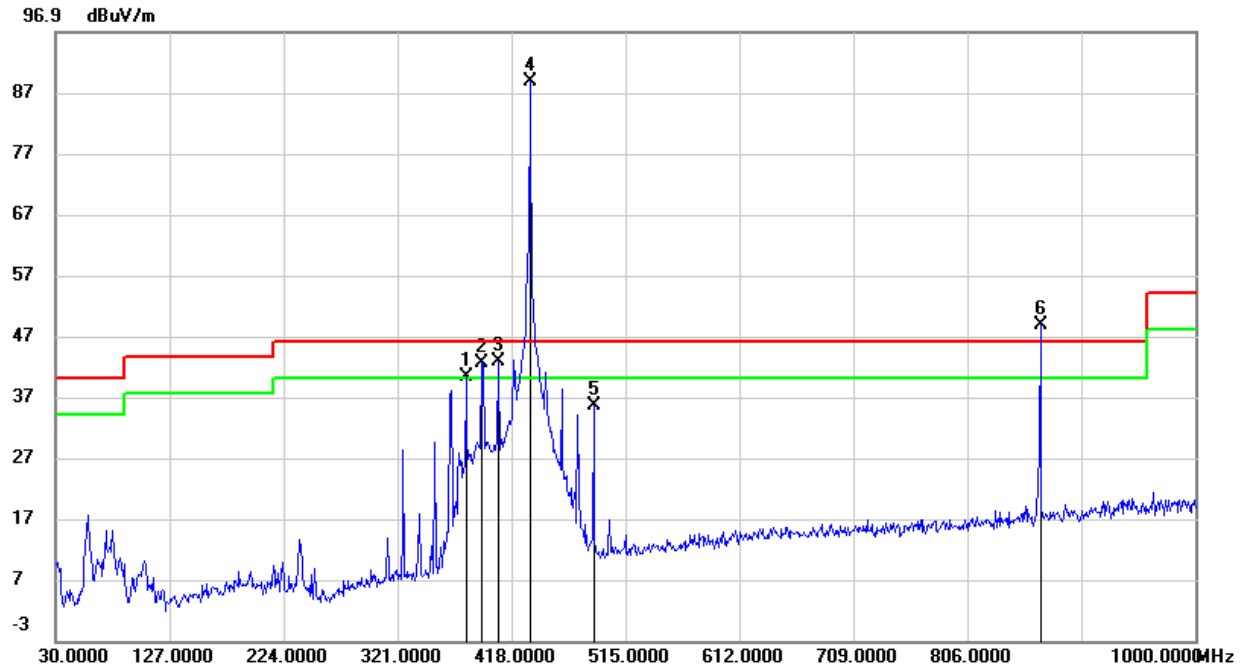
TEST ENVIRONMENT

Radiated Emissions - Below 1 GHz		Radiated Emissions - Above 1 GHz	
Temperature:	21.6 °C	Temperature:	24.3 °C
Humidity:	59.6 %	Humidity:	61 %
Atmosphere Pressure	101 kPa	Atmosphere Pressure	101 kPa

RESULTS

6.4.1. FIELD STRENGTH AND SPURIOUS EMISSIONS BELOW 1 GHz AND ABOVE 30 MHz

FIELD STRENGTH AND SPURIOUS EMISSIONS (HORIZONTAL)



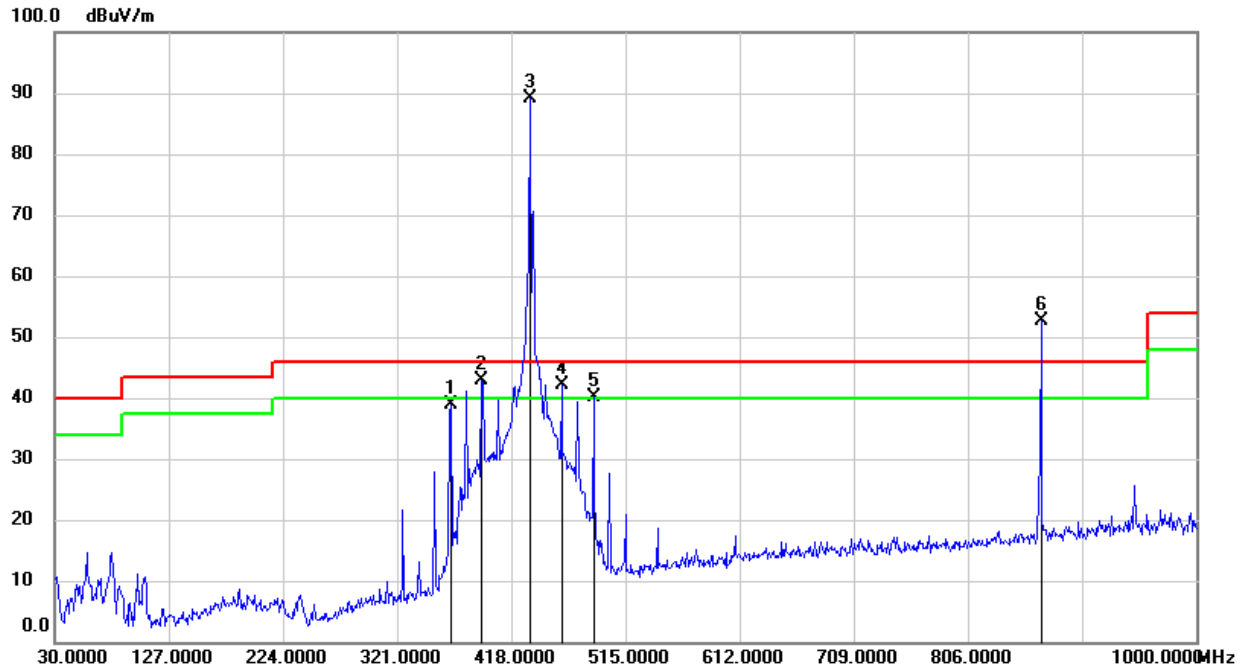
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	379.2000	53.85	-13.67	40.18	46.00	-5.82	QP
2	392.7800	56.06	-13.46	42.60	46.00	-3.40	QP
3	406.3599	55.94	-13.22	42.72	46.00	-3.28	QP
4 (Fundamental)	433.9200	101.33	-12.67	88.66	100.8	-12.14	Peak
	433.9200	/	/	79.61	80.8	-1.19	AVG
5	487.8400	47.13	-11.72	35.41	46.00	-10.59	QP
6(2th Harmonic)	867.8400	54.65	-5.80	48.85	80.8	-31.95	Peak
	867.8400	/	/	39.8	60.8	-21.00	AVG

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

2. Peak: Peak detector.

3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

4. Mark 4 is the fundamental frequency, Mark 6 is 2th harmonic.

**FIELD STRENGTH HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)**

No.	Frequency	Reading	Correct	Peak Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	366.5900	52.91	-14.01	38.9	46.00	-5.82	QP
2	392.7800	56.36	-13.46	42.9	46.00	-3.40	QP
3(Fundamental)	433.9200	101.77	-12.67	89.10	100.8	-11.7	Peak
	433.9200	/	/	80.05	80.8	-0.75	AVG
4	460.6800	54.18	-12.11	42.07	46.00	-3.93	QP
5	487.8400	51.82	-11.72	40.10	46.00	-10.59	QP
6(2th Harmonic)	867.8400	58.37	-5.8	52.57	80.8	-28.23	Peak
	867.8400	/	/	43.52	60.8	-17.28	AVG

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

2. Peak: Peak detector.

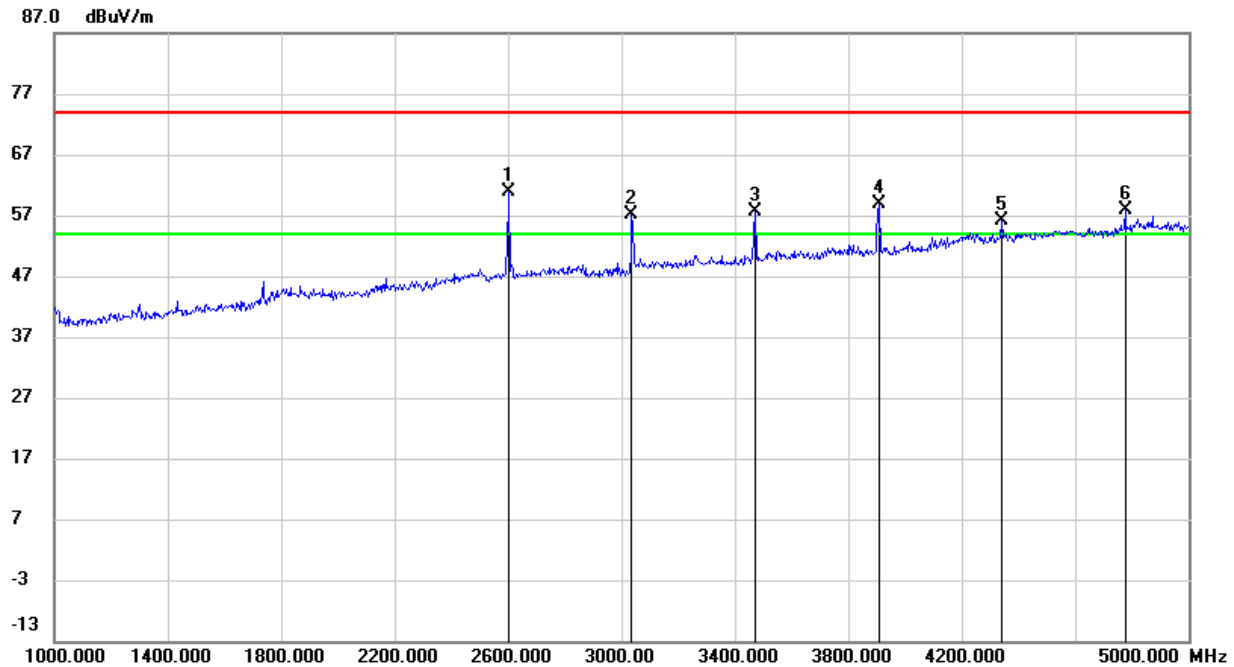
3. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

4. Mark 3 is the fundamental frequency, Mark 6 is 2th harmonic.

Note: All the modes had been tested, only the worst data was recorded in the report.

6.4.2. SPURIOUS EMISSIONS ABOVE 1 GHz

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1 (6th Harmonic)	2603.52	28.14	32.69	60.83	80.8	-19.97	peak
	/	/	/	51.78	60.8	-9.02	Average
2 (7th Harmonic)	3037.44	22.87	34.15	57.02	80.8	-23.78	peak
	/	/	/	47.97	60.8	-12.83	Average
3 (8th Harmonic)	3471.36	22.69	34.87	57.56	80.8	-23.24	peak
	/	/	/	48.51	60.8	-12.29	Average
4 (9th Harmonic)	3905.28	22.85	36.06	58.91	80.8	-21.89	peak
	/	/	/	49.86	60.8	-10.94	Average
5 (10th Harmonic)	4339.2	18.85	37.27	56.12	74.0	-17.88	peak
	/	/	/	47.07	54.0	-6.93	Average
6 (11th Harmonic)	4773.12	18.98	39	57.98	74.0	-16.02	peak
	/	/	/	48.93	54.0	-5.07	Average

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

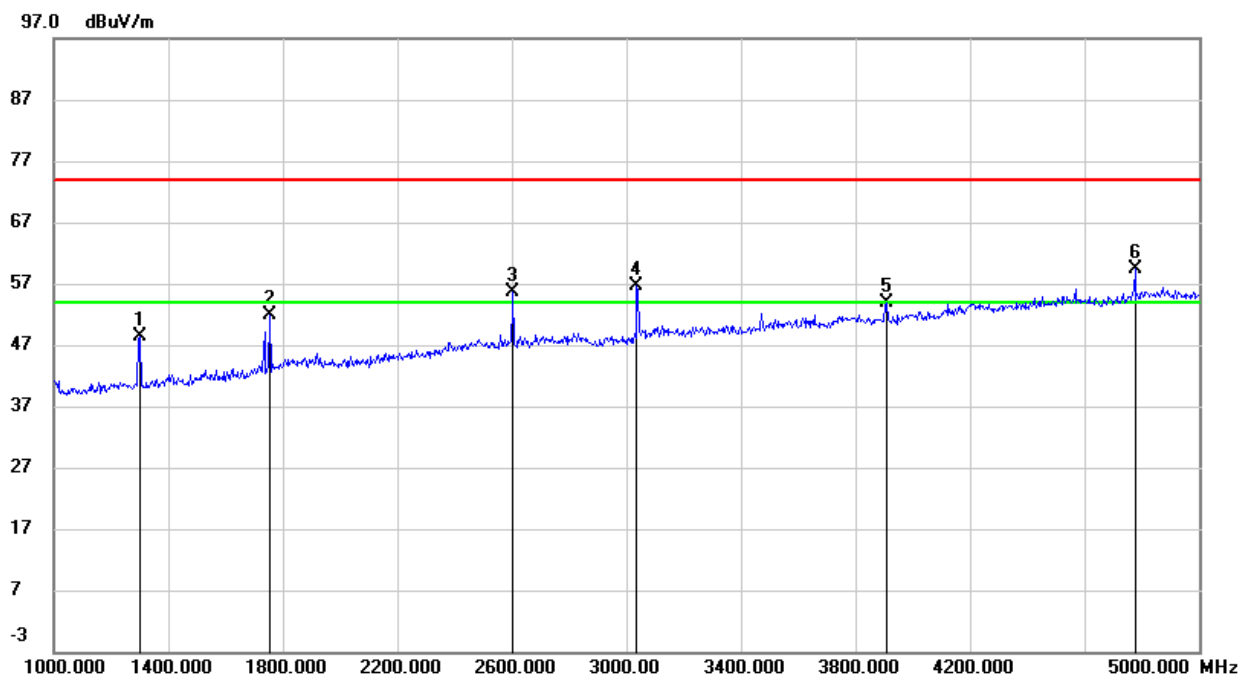
2. Peak: Peak detector.

3. Average: Peak Result - Duty Cycle Correction Factor.

4. Duty Cycle Correction Factor: Refer to clause 6.1.

5. If peak result complies with average limit, the average result is deemed to comply with average limit.

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1 (3 th Harmonic)	1301.76	19.97	28.37	48.34	80.8	-32.46	peak
	/	/	/	39.29	60.8	-21.51	Average
2 (4 th Harmonic)	1735.68	21.7	30.26	51.96	80.8	-28.84	peak
	/	/	/	42.91	60.8	-17.89	Average
4 (6 th Harmonic)	2603.52	22.82	32.69	55.51	80.8	-25.29	peak
	/	/	/	46.46	60.8	-14.34	Average
5 (7 th Harmonic)	3037.44	22.52	34.15	56.67	80.8	-24.13	peak
	/	/	/	47.62	60.8	-13.18	Average
5 (9 th Harmonic)	3905.28	17.76	36.06	53.82	80.8	-26.98	peak
	/	/	/	44.77	60.8	-16.03	Average
5 (11 th Harmonic)	4773.12	20.31	39	59.31	74.0	-14.69	peak
	/	/	/	50.26	54.0	-3.74	Average

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

2. Peak: Peak detector.

3. Average: Peak Result - Duty Cycle Correction Factor.

4. Duty Cycle Correction Factor: Refer to clause 6.1.

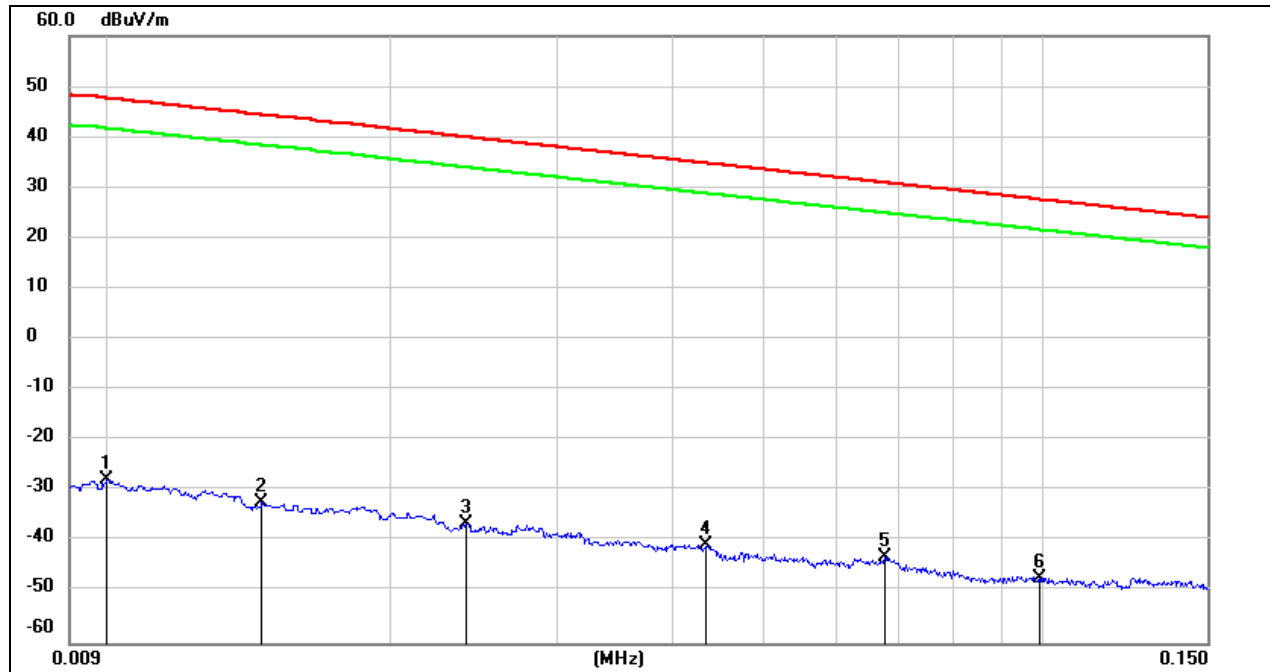
5. If peak result complies with average limit, the average result is deemed to comply with average limit.

Note: All the modes had been tested, only the worst data was recorded in the report.

6.4.3. SPURIOUS EMISSIONS BELOW 30 MHz

SPURIOUS EMISSIONS (LOOP ANTENNA FACE ON TO THE EUT)

0.09 kHz ~ 150 kHz



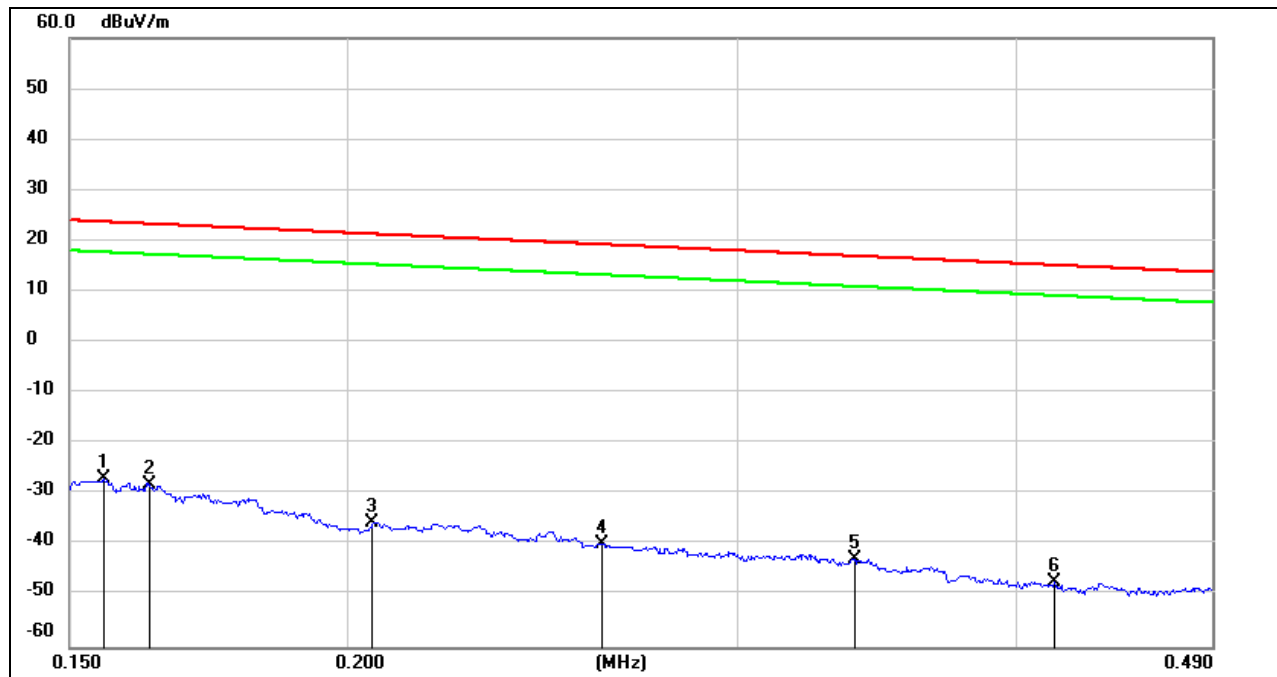
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Result (dBuA/m)	Limit (dBuV/m)	Limit (dBuA/m)	Margin (dB)	Remark
1	0.0100	73.72	-101.4	-27.68	-79.18	47.60	-3.90	-75.28	peak
2	0.0145	69.05	-101.38	-32.33	-83.83	44.37	-7.13	-76.70	peak
3	0.0240	64.82	-101.36	-36.54	-88.04	40.00	-11.50	-76.54	peak
4	0.0434	60.82	-101.45	-40.63	-92.13	34.85	-16.65	-75.48	peak
5	0.0675	58.64	-101.56	-42.92	-94.42	31.02	-20.48	-73.94	peak
6	0.0994	54.70	-101.80	-47.10	-98.60	27.65	-23.85	-74.75	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



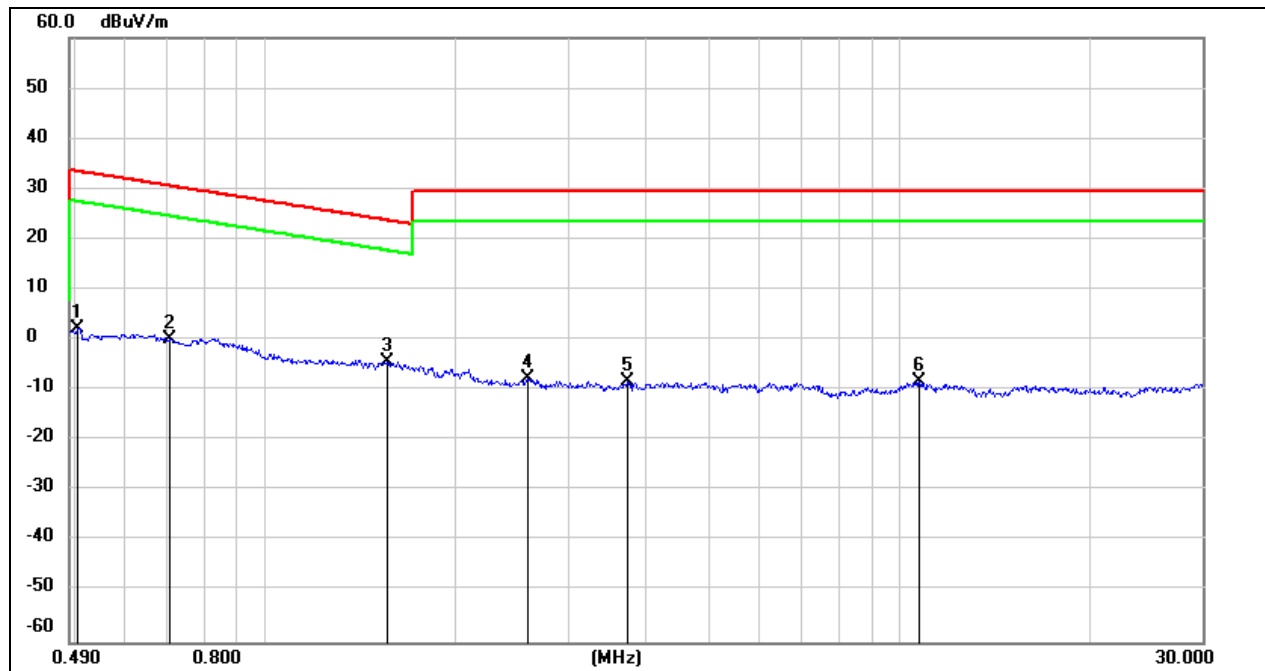
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Result (dBuA/m)	Limit (dBuV/m)	Limit (dBuA/m)	Margin (dB)	Remark
1	0.1554	74.77	-101.65	-26.88	-78.38	23.77	-27.73	-50.65	peak
2	0.1630	73.49	-101.65	-28.16	-79.66	23.36	-28.14	-51.52	peak
3	0.2053	66.29	-101.73	-35.44	-86.94	21.35	-30.15	-56.79	peak
4	0.2605	62.14	-101.81	-39.67	-91.17	19.28	-32.22	-58.95	peak
5	0.3382	59.23	-101.90	-42.67	-94.17	17.02	-34.48	-59.69	peak
6	0.4162	54.68	-101.98	-47.3	-98.80	15.22	-36.28	-62.52	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)	Result (dBuA/m)	Limit (dBuV/m)	Limit (dBuA/m)	Margin (dB)	Remark
1	0.5039	64.44	-62.07	2.37	-49.13	33.56	-17.94	-31.19	peak
2	0.7066	62.4	-62.11	0.29	-51.21	30.62	-20.88	-30.33	peak
3	1.5564	57.68	-62.02	-4.34	-55.84	23.76	-27.74	-28.10	peak
4	2.5935	54.11	-61.68	-7.57	-59.07	29.54	-21.96	-37.11	peak
5	3.7100	53.2	-61.41	-8.21	-59.71	29.54	-21.96	-37.75	peak
6	10.7299	52.48	-60.83	-8.35	-59.85	29.54	-21.96	-37.89	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.

Note: All the modes had been tested, only the worst data was recorded in the report.



7. 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