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

TEST REPORT

For

Vest Robot Terminal, Vest Door Robot

MODEL NUMBER: VRTA1H

FCC ID: 2BBEG-VRTA1H

IC: 31079-VRTA1H

REPORT NUMBER: E04A23080794F00401

ISSUE DATE: Dec. 29, 2023

Prepared for

HAI ROBOTICS Co., Ltd.

Room 201,301,401,Building B,Anluo Technology Industrial Park,Nanchang Community,Xixiang Street,Bao'an District, Shenzhen City,Guangdong Province, P.R. China

Prepared by

Guangdong Global Testing Technology Co., Ltd.

Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

This report is based on a single evaluation of the submitted sample(s) of the above mentioned Product, it does not imply an assessment of the production of the products.

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	Dec. 29, 2023	Initial Issue	

Summary of Test Results			
Clause	Test Items	Rules	Test Results
1	20 dB Bandwidth 99 % Occupied Bandwidt	CFR 47 FCC §15.215 (c) ISED RSS-Gen Clause 6.7	Pass
2	Radiated Emission	CFR 47 FCC §15.249 (a)(d)(e) ISED RSS-210 Annex B B.10 CFR 47 FCC §15.205 and §15.209 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
3	Conducted Emission Test for AC Power Port	CFR 47 FCC §15.207 RSS-GEN Clause 8.8	Pass
4	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. CHANNEL LIST 8

5.4. DESCRIPTION OF AVAILABLE ANTENNAS 8

5.5. TEST CHANNEL CONFIGURATION 9

5.6. THE WORSE CASE POWER SETTING PARAMETER 9

5.7. TEST ENVIRONMENT 9

5.8. DESCRIPTION OF TEST SETUP 10

6. MEASURING INSTRUMENT AND SOFTWARE USED 11

7. ANTENNA PORT TEST RESULTS 13

7.1. ON TIME AND DUTY CYCLE 13

7.2. 20 dB BANDWIDTH 16

8. RADIATED TEST RESULTS 19

8.1. LIMITS AND PROCEDURE 19

8.2. RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS 26

8.3. SPURIOUS EMISSIONS (Above 1000MHz~10th Harmonics) 30

8.4. SPURIOUS EMISSIONS BELOW 1 GHz AND ABOVE 30 MHz 34

9. AC POWER LINE CONDUCTED EMISSIONS 38

10. ANTENNA REQUIREMENTS 42

PHOTOGRAPHS OF TEST CONFIGURATION 43

PHOTOGRAPHS OF EUT 45

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	HAI ROBOTICS Co., Ltd.
Address:	Room 201,301,401,Building B,Anluo Technology Industrial Park,Nanchang Community,Xixiang Street,Bao'an District, Shenzhen City,Guangdong Province, P.R. China

Manufacturer Information

Company Name:	HAI ROBOTICS Co., Ltd.
Address:	Room 201,301,401,Building B,Anluo Technology Industrial Park,Nanchang Community,Xixiang Street,Bao'an District, Shenzhen City,Guangdong Province, P.R. China

EUT Information

EUT Name:	Vest Robot Terminal, Vest Door Robot
Model:	VRTA1H
Series Model:	VDRA1H
Brand:	N/A
Sample Received Date:	Aug. 25, 2023
Sample Status:	Normal
Sample ID:	A23080794 004
Date of Tested:	Aug. 25, 2023 to Dec. 29, 2023

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

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Checked By:

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Laboratory Leader

Approved By:

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Laboratory Manager

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 6947.01)** Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1343)** Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules **ISED (Company No.: 30714)** Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People’s Republic of China, 523808

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 recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

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

Test Item	Measurement Frequency Range	K	U(dB)
AC Power Line Conducted Emission	0.009 MHz ~ 0.15 MHz	2	4.00
	0.15 MHz ~ 30 MHz	2	3.62
Radiated Band edge and Spurious Emission	9kHz ~ 30MHz	2	2.20
	30 MHz ~ 1 GHz	2	3.16
	1 GHz ~ 18 GHz	2	5.64
	18 GHz ~ 26.5 GHz	2	5.54
Conducted Output Power	/	2	0.73
6dB Bandwidth and 99% Occupied Bandwidth	/	2	9.2ppm
Power Spectral Density	/	2	1.84
Conducted Band edge and spurious emission	9kHz ~ 30MHz	2	0.95
	30 MHz ~ 1 GHz	2	1.49
	1 GHz ~ 18 GHz	2	1.75
	18 GHz ~ 26.5 GHz	2	2.06
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	Vest Robot Terminal, Vest Door Robot		
Model	VRTA1H		
Series Model	VDRA1H		
Product Discrepancy	VRTA1H and VDRA1H have identical hardware, with inconsistent firmware.		
Product Description	Operation Frequency		915 MHz
	Modulation Type		GFSK
Ratings	24V/6W		
Power Supply	Power Adapter	Input	/
		Output	/
	Battery	N/A	
Hardware Version	SVF1A_RTM1_C230628(RTM-H-A)		
Software Version	V2.0		

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Ant.	Max Peak field strength (dBμV/m)
915 MHz	1	91.73
915 MHz	2	91.72

5.3. CHANNEL LIST

Channel	Frequency (MHz)
1	915 MHz

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	915 MHz	External Antenna	1.72
2	915 MHz	External Antenna	1.72

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
GFSK	☒1TX, 1RX	Antenna 2 can be used as transmitting/receiving antenna.

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

5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	1	915 MHz

5.6. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 915 MHz Band		
Test Software		/
Modulation Type	Transmit Antenna Number	Test Channel
		1
GFSK	1	Default
GFSK	2	Default

5.7. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65 %	
Atmospheric Pressure:	1025 Pa	
Temperature	TN	-20 ~ 55 °C
Voltage:	VL	N/A
	VN	DC 24V
	VH	N/A

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

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Equipment	Manufacturer	Model No.
Vest Robot Terminal, Vest Door Robot	HAI ROBOTICS Co., Ltd.	VRTA1H
PC	Lenovo	T14

TEST SETUP

The EUT can work in engineering mode with the software in the laptop.

SETUP DIAGRAM FOR TEST

Radiated emissions:

AC Power Line Conducted Emission:

6. MEASURING INSTRUMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2023/09/18	2024/09/17
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2023/09/18	2024/09/17
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2023/09/18	2024/09/17
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2023/09/18	2024/09/17
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2023/09/18	2024/09/17
temperature humidity chamber	Espec	SH-241	SH-241-2014	2023/09/18	2024/09/17
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2023/09/18	2024/09/17
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2023/09/18	2024/09/17
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2023/09/18	2024/09/17
Pre-Amplifier	A-INFO	HPA-1G1850	HYPA21003	2023/09/18	2024/09/17
Horn antenna	A-INFO	3117	246069	2022/03/11	2025/03/10

Pre-Amplifier	ZKJC	HPA-184057	HYPA21004	2023/09/18	2024/09/17
Horn antenna	ZKJC	3116C	246265	2022/03/29	2025/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

Test Equipment of Conducted emissions					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Shielded Room	CHENG YU	8m*5m*4m	N/A	2022/10/29	2025/10/28
EMI Test Receiver	Rohde & Schwarz	ESR3	102647	2023/09/18	2024/09/17
LISN/AMN	Rohde & Schwarz	ENV216	102843	2023/09/18	2024/09/17
NNLK 8129 RC	Schwarzbeck	NNLK 8129 RC	5046	2023/09/18	2024/09/17
Test Software	Farad	EZ-EMC (Ver. EMC-con-3A1 1+)	N/A	N/A	N/A

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

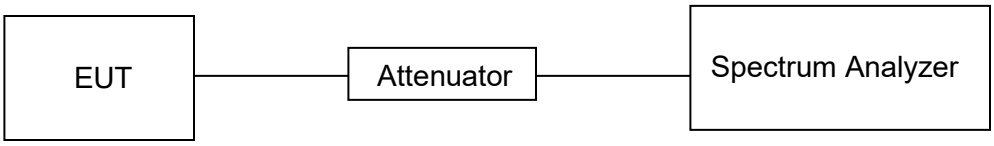
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	24.1°C	Relative Humidity	51%
Atmosphere Pressure	101 kPa	Test Voltage	DC 24V

RESULTS

Ant. 1:

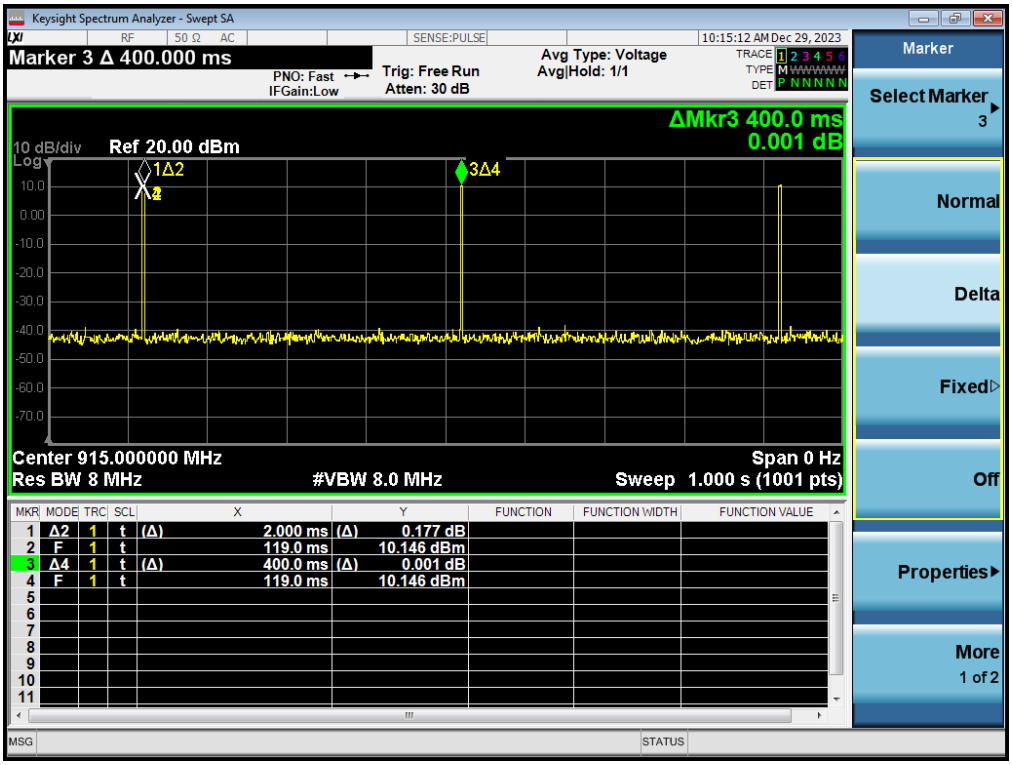
On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
2.40	400	0.006	0.6	22.22	0.42	1

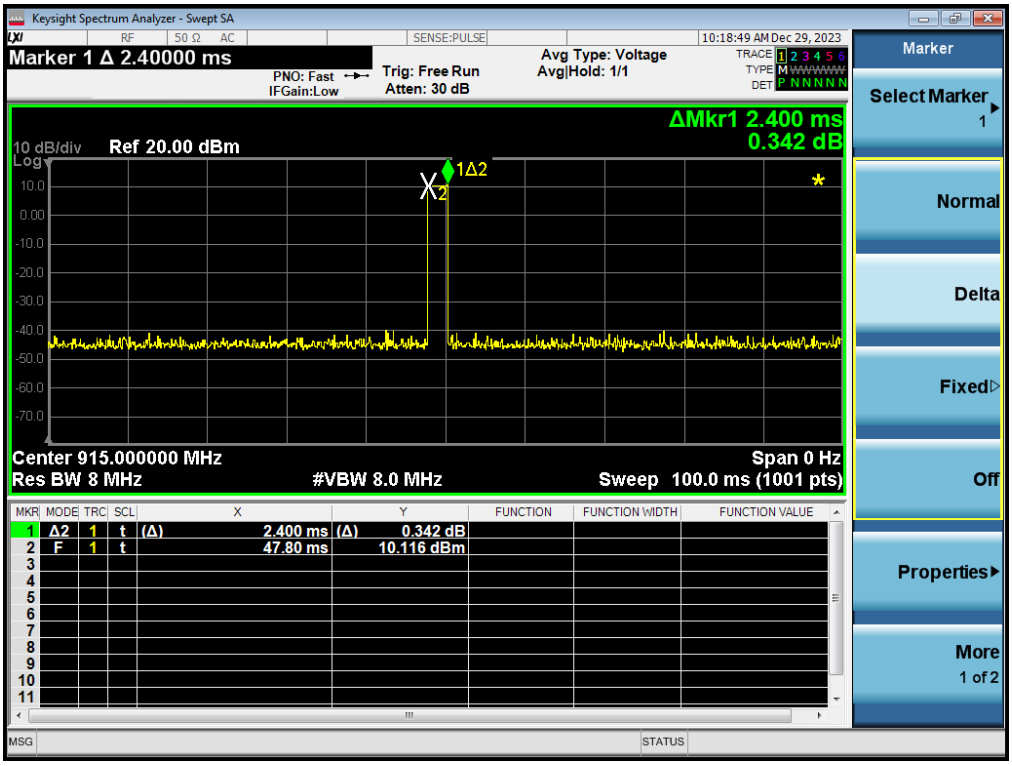
Ant. 2:

On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)	1/T Minimum VBW (kHz)	Final setting For VBW (kHz)
2.40	400	0.006	0.6	22.22	0.42	1

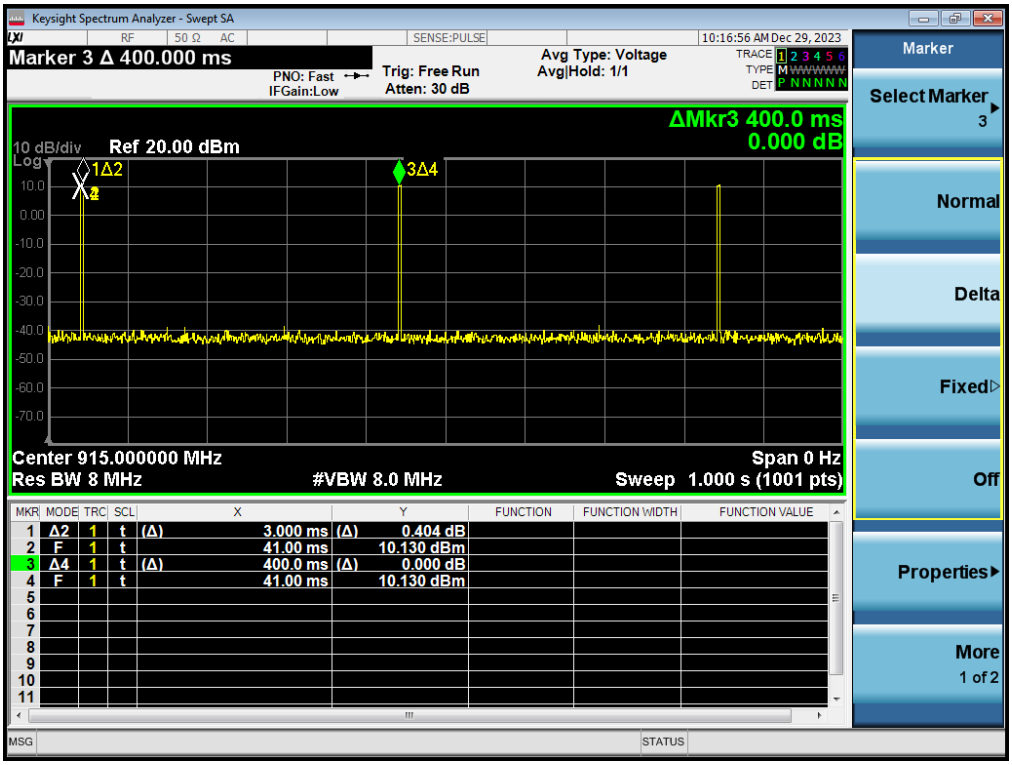
Note:
Duty Cycle Correction Factor=10log(1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time (transmitting duration)
If that calculated VBW is not available on the analyzer then the next higher value should be used.

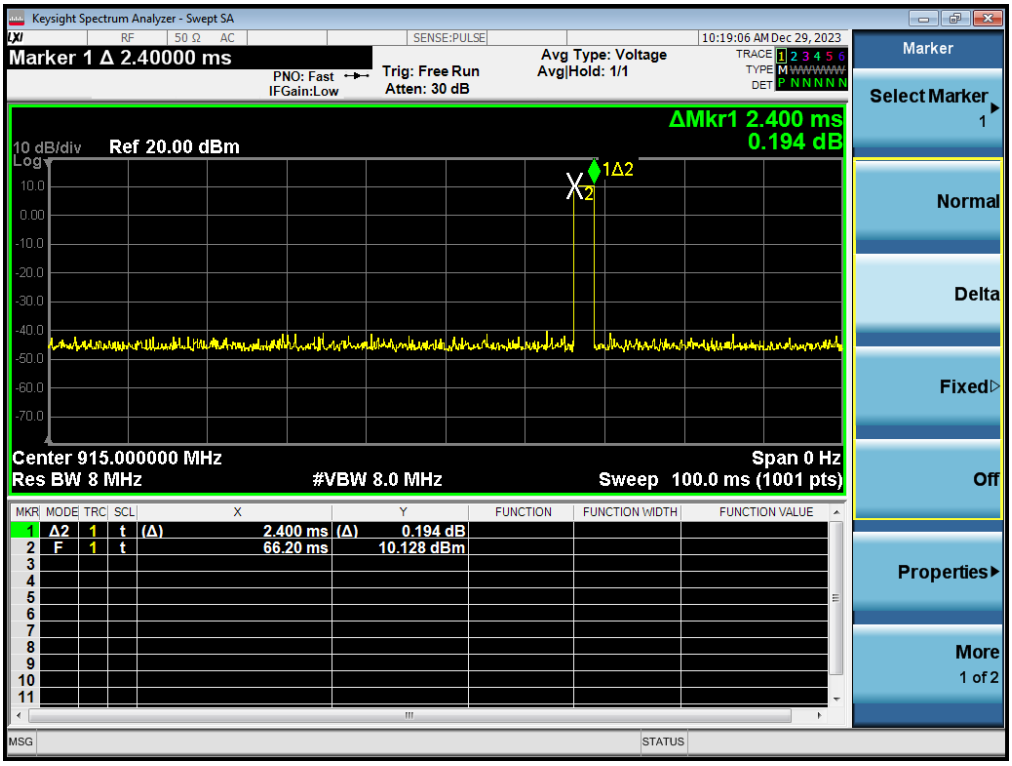
ON TIME AND DUTY CYCLE MID CH (Ant. 1)





ON TIME AND DUTY CYCLE MID CH (Ant. 2)





7.2. 20 dB BANDWIDTH

LIMITS

CFR 47 FCC Part15 (15.249) Subpart C RSS-Gen Issue 5			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.215 (c)	20 dB Bandwidth	for reporting purposes only	915
ISED RSS-Gen Clause 6.7 Issue 5	99 % Occupied Bandwidth	For reporting purposes only.	915

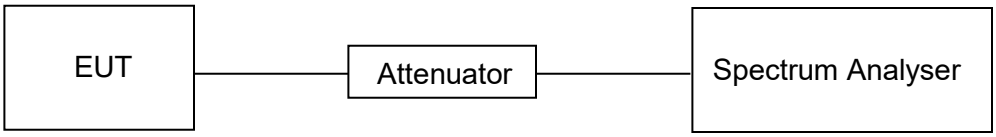
TEST PROCEDURE

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	1 % to 5 % of the occupied bandwidth
VBW	approximately 3×RBW
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 6 dB / 99 % relative to the maximum level measured in the fundamental emission.

TEST SETUP



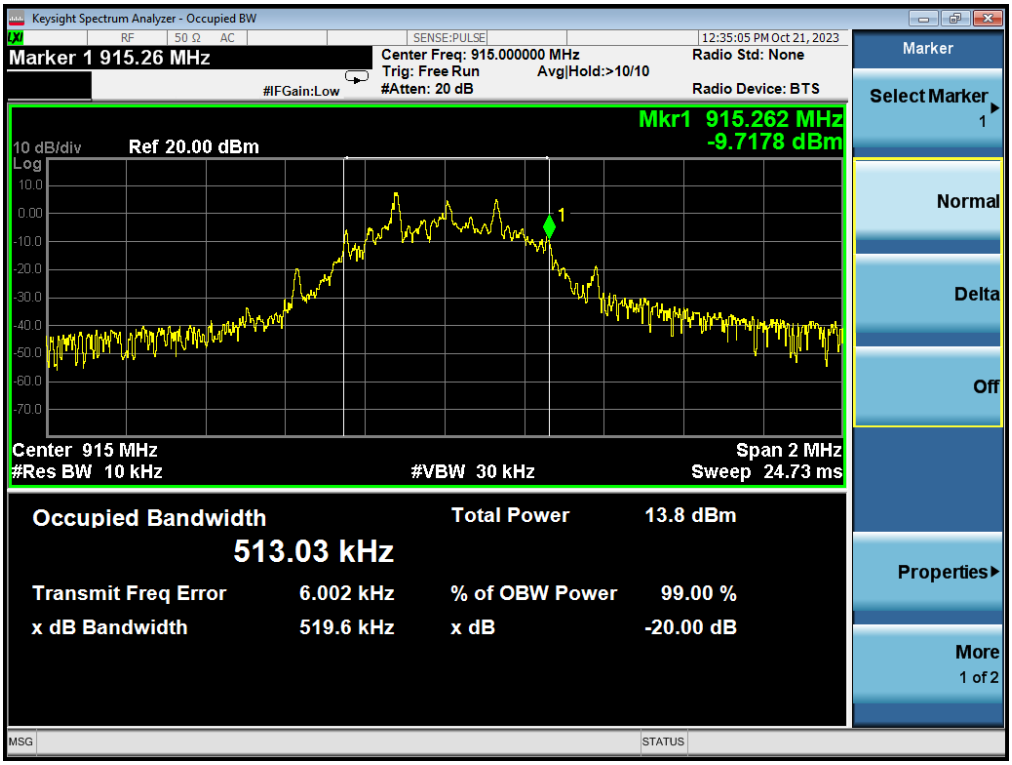
TEST ENVIRONMENT

Temperature	24.1°C	Relative Humidity	51%
Atmosphere Pressure	101 kPa	Test Voltage	DC 24V

RESULTS

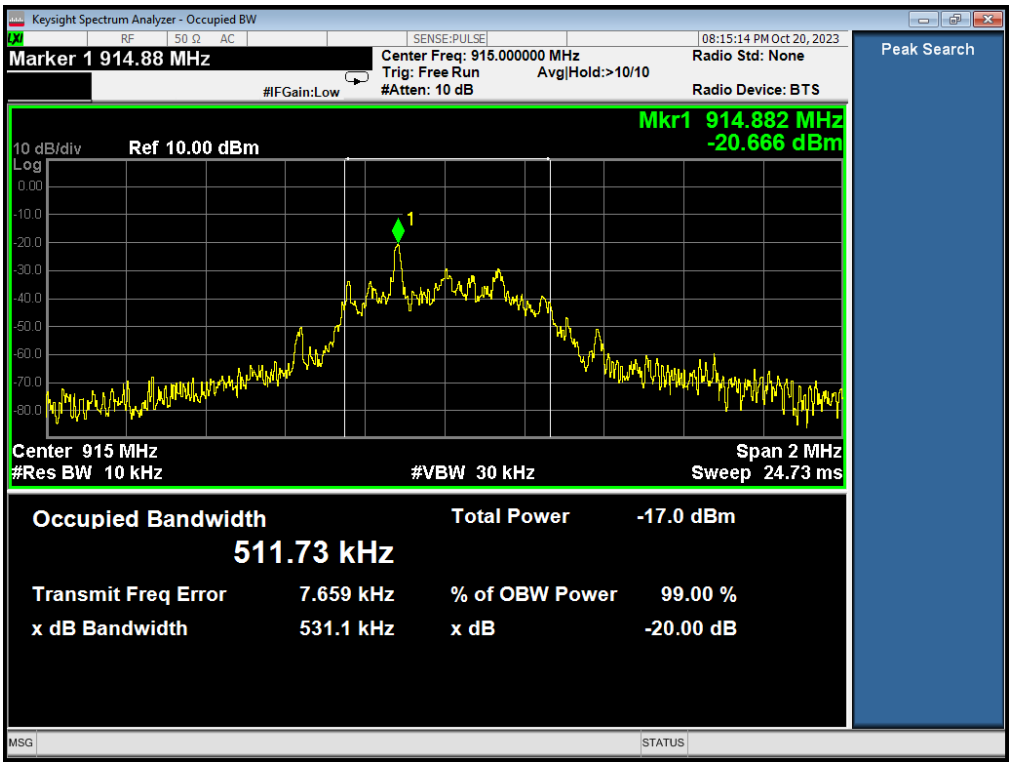
Ant. 1:

Channel	20dB bandwidth (KHz)	99 % bandwidth (KHz)	Limit (kHz)	Result
1	519.6	513.03	--	Pass



Ant. 2:

Channel	20dB bandwidth (KHz)	99 % bandwidth (KHz)	Limit (kHz)	Result
1	531.1	511.73	--	Pass



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

CFR 47 FCC §15.205 and §15.209

CFR 47 FCC §15.249 (a)(d)(e)

ISED RSS-210 Issue 10 Annex B B.10

RSS-GEN Clause 8.9

The field strength of emissions from intentional radiators operated within these frequency bands			
Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94 dBuV/m)	500 uV/m (54 dBuV/m)	3
2400 – 2483.5	50 mV/m (94 dBuV/m)	500 uV/m (54 dBuV/m)	3
5725 – 5875	50 mV/m (94 dBuV/m)	500 uV/m (54 dBuV/m)	3

Emissions radiated outside of the specified frequency bands above 30MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

Emissions radiated outside of the specified frequency bands below 30 MHz		
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

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.

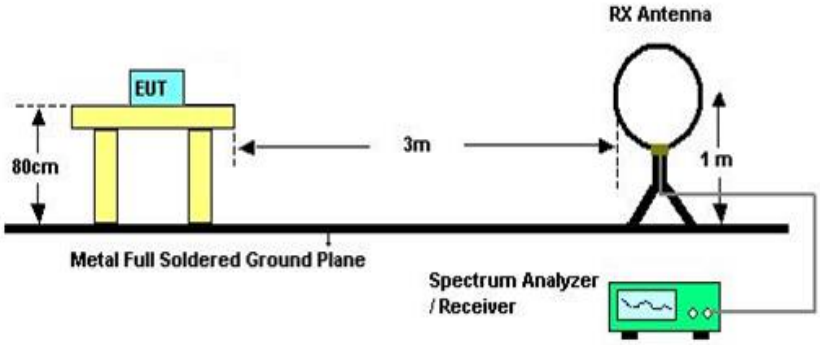
FCC Restricted bands of operation:

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 SETUP AND PROCEDURE

Below 30 MHz



The setting of the spectrum analyser

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

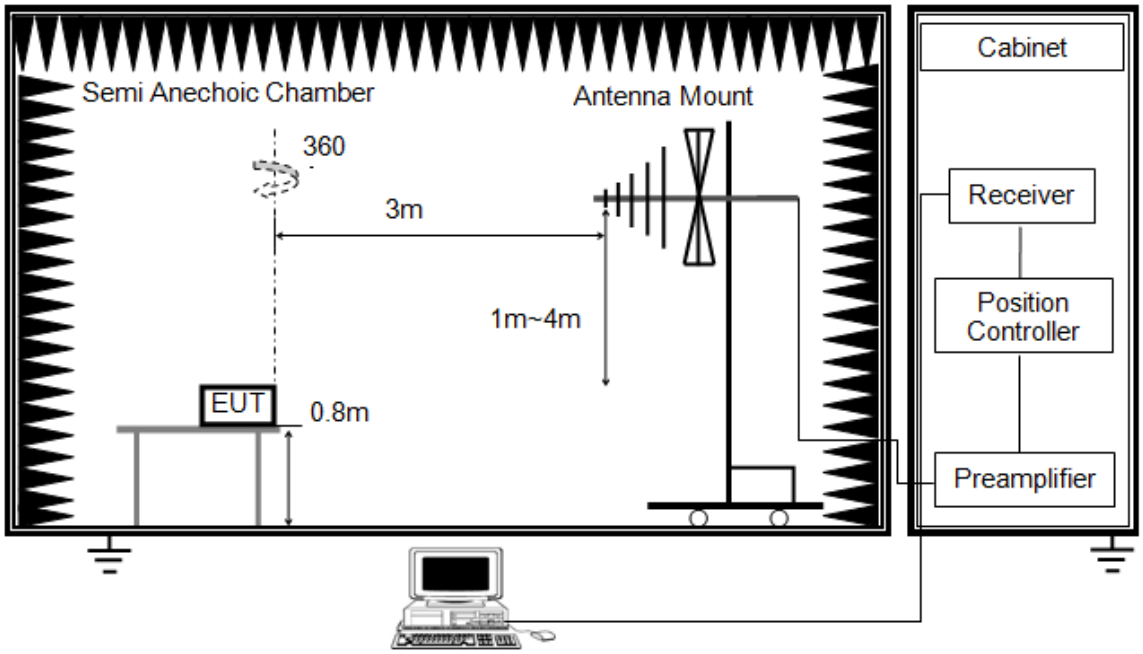
5. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

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 30 m 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 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.

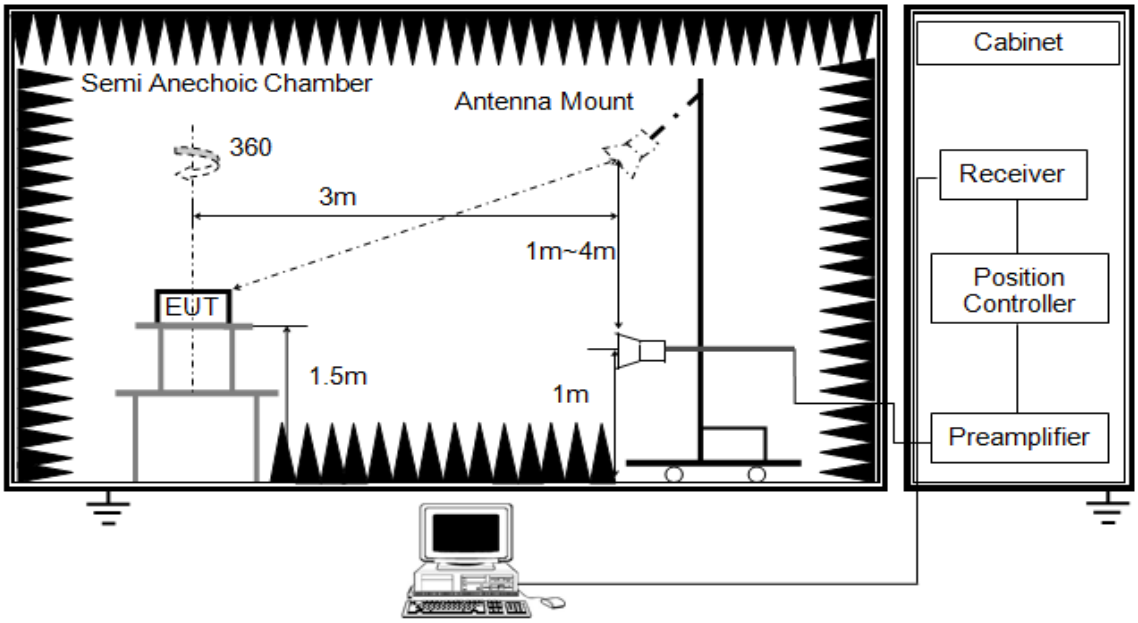
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

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 80cm above ground.

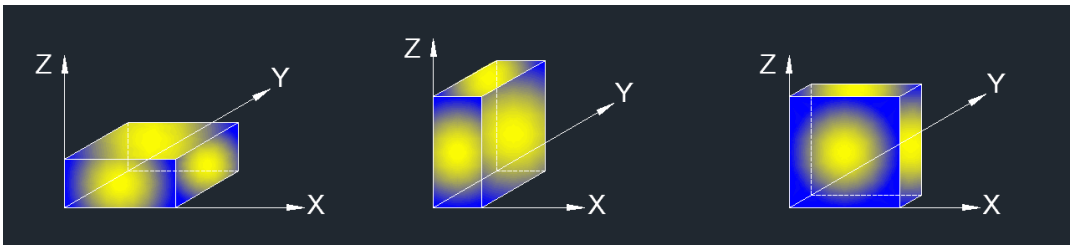
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

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. 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 and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle 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 (X axis for horizontal and Y axis for vertical) data recorded in the report.

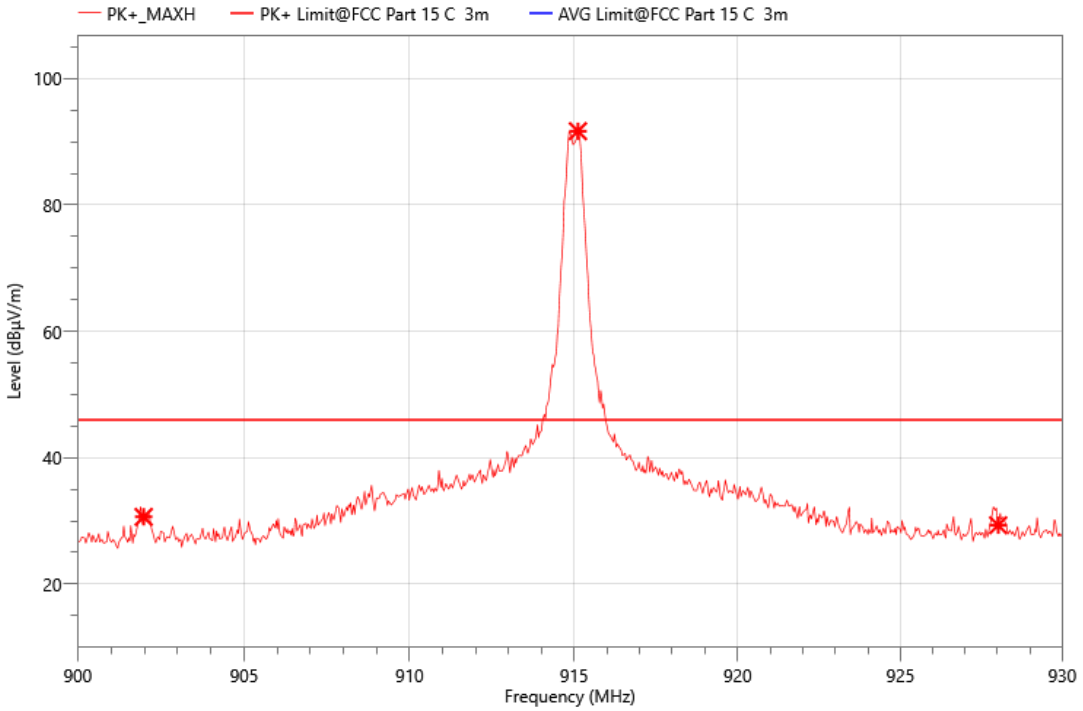
TEST ENVIRONMENT

Temperature	24.3 °C	Relative Humidity	54%
Atmosphere Pressure	101 kPa	Test Voltage	DC 24V

8.2. RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (915 MHz, HORIZONTAL)

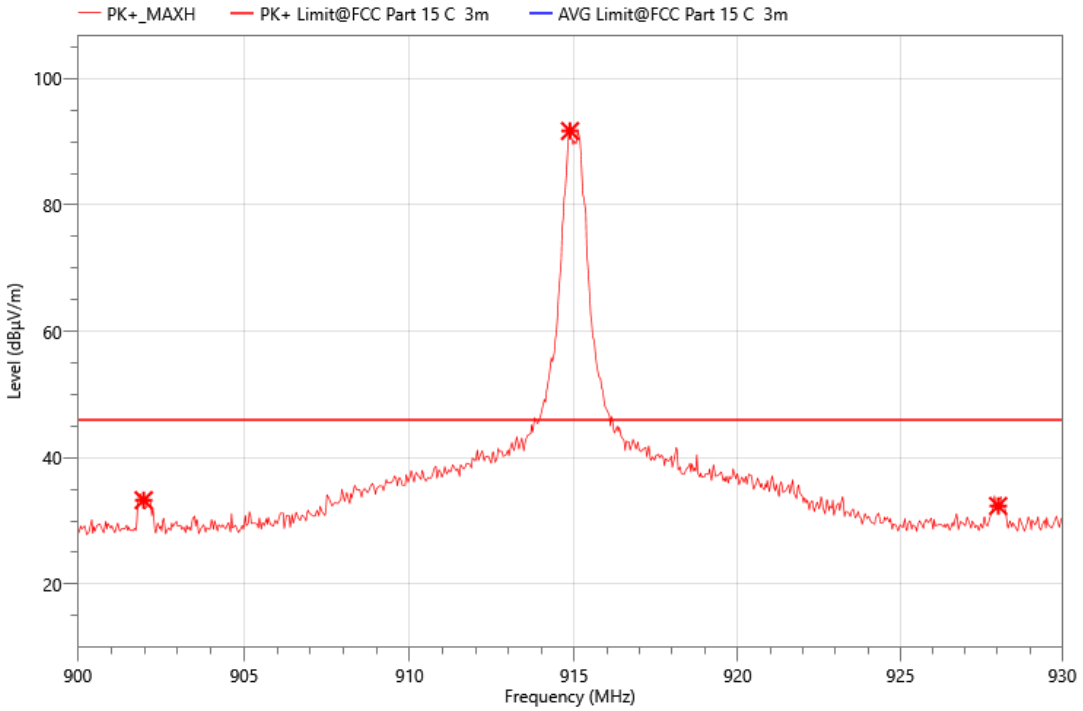
Ant. 1:



No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	901.980	34.89	-4.26	30.63	46.00	15.37	PK+	H
2	915.120	94.94	-3.25	91.69	94.00	2.31	PK+	H
3	928.020	31.53	-2.22	29.31	46.00	16.69	PK+	H

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (915 MHz, VERTICAL)

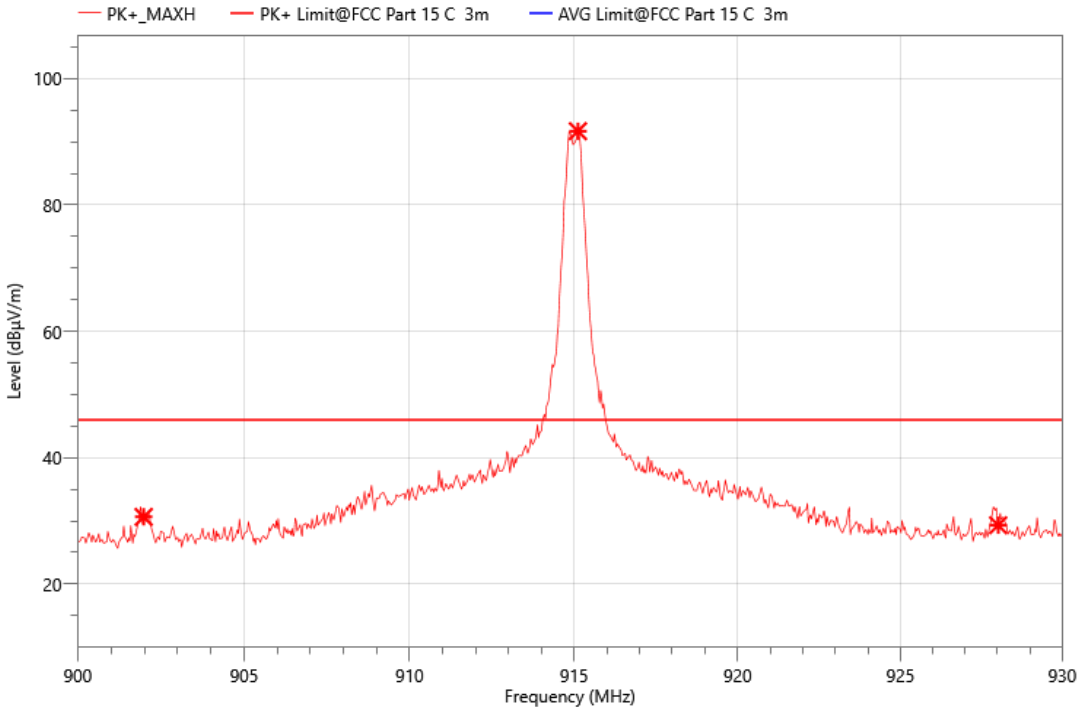


No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	901.980	37.54	-4.26	33.28	46.00	12.72	PK+	V
2	914.880	94.99	-3.27	91.72	94.00	2.28	PK+	V
3	928.020	34.58	-2.22	32.36	46.00	13.64	PK+	V

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (915 MHz, HORIZONTAL)

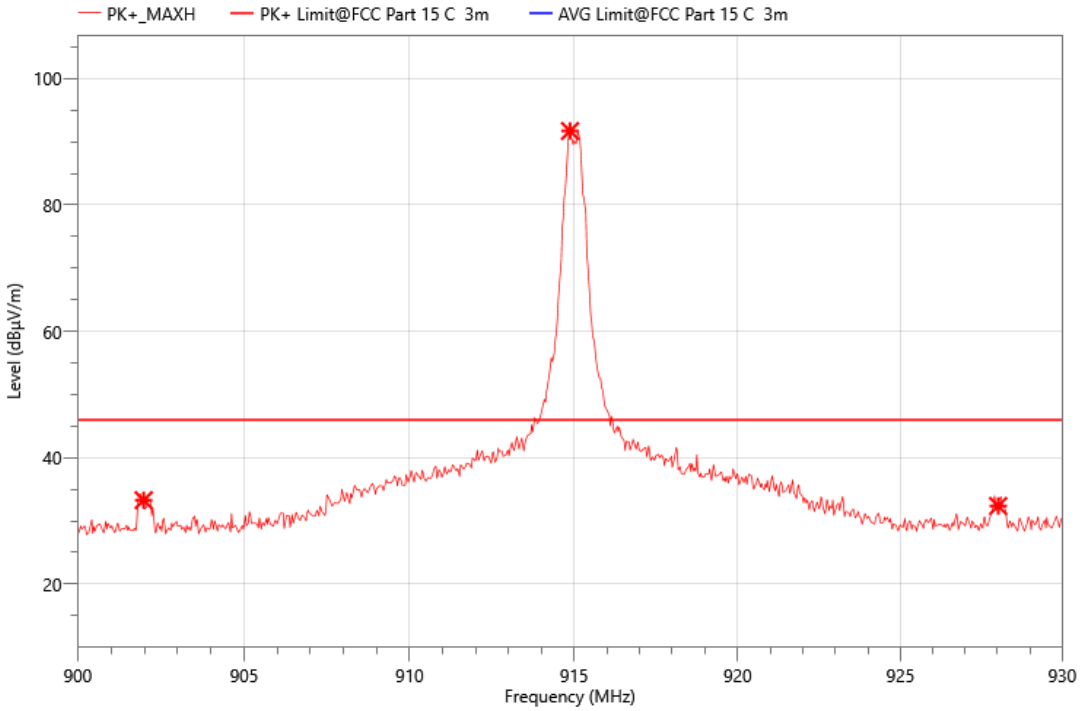
Ant. 2:



No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	901.980	34.89	-4.26	30.63	46.00	15.37	PK+	H
2	915.120	94.94	-3.25	91.69	94.00	2.31	PK+	H
3	928.020	31.53	-2.22	29.31	46.00	16.69	PK+	H

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (915 MHz, VERTICAL)



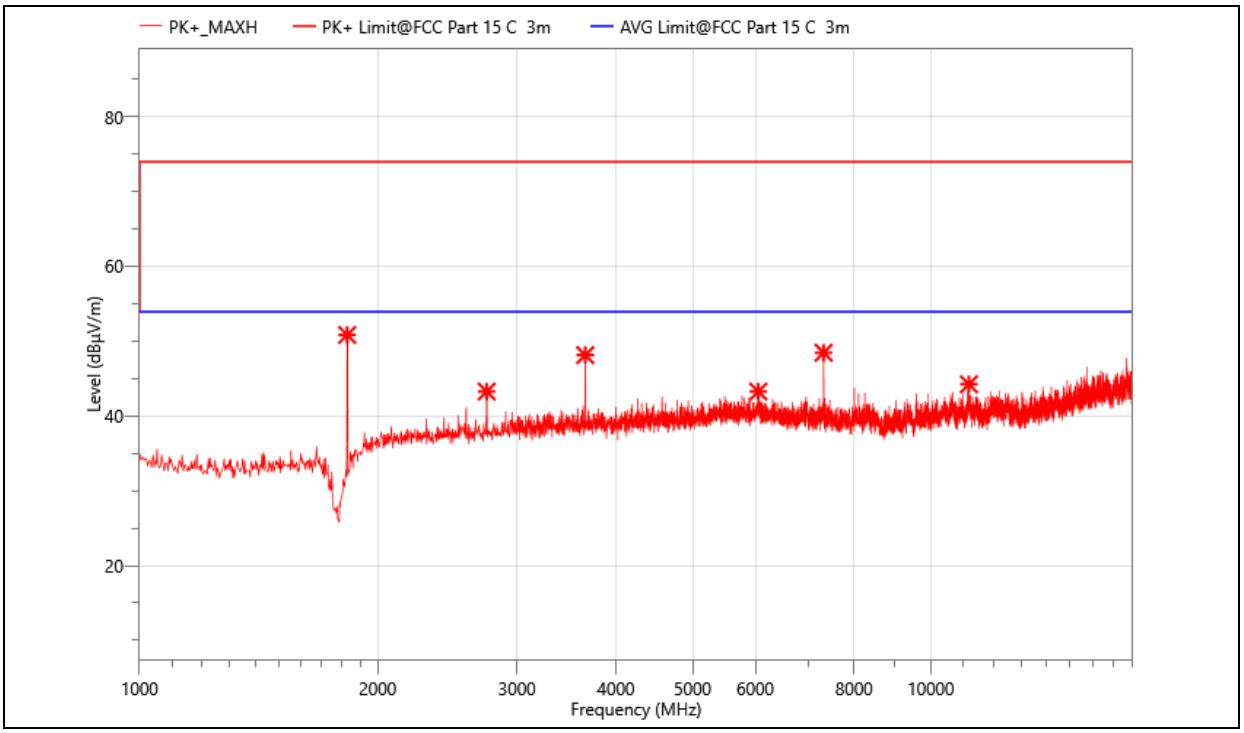
No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	901.980	37.54	-4.26	33.28	46.00	12.72	PK+	V
2	914.880	94.99	-3.27	91.72	94.00	2.28	PK+	V
3	928.020	34.58	-2.22	32.36	46.00	13.64	PK+	V

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

8.3. SPURIOUS EMISSIONS (Above 1000MHz~10th Harmonics)

HARMONICS AND SPURIOUS EMISSIONS (915 MHz, HORIZONTAL)

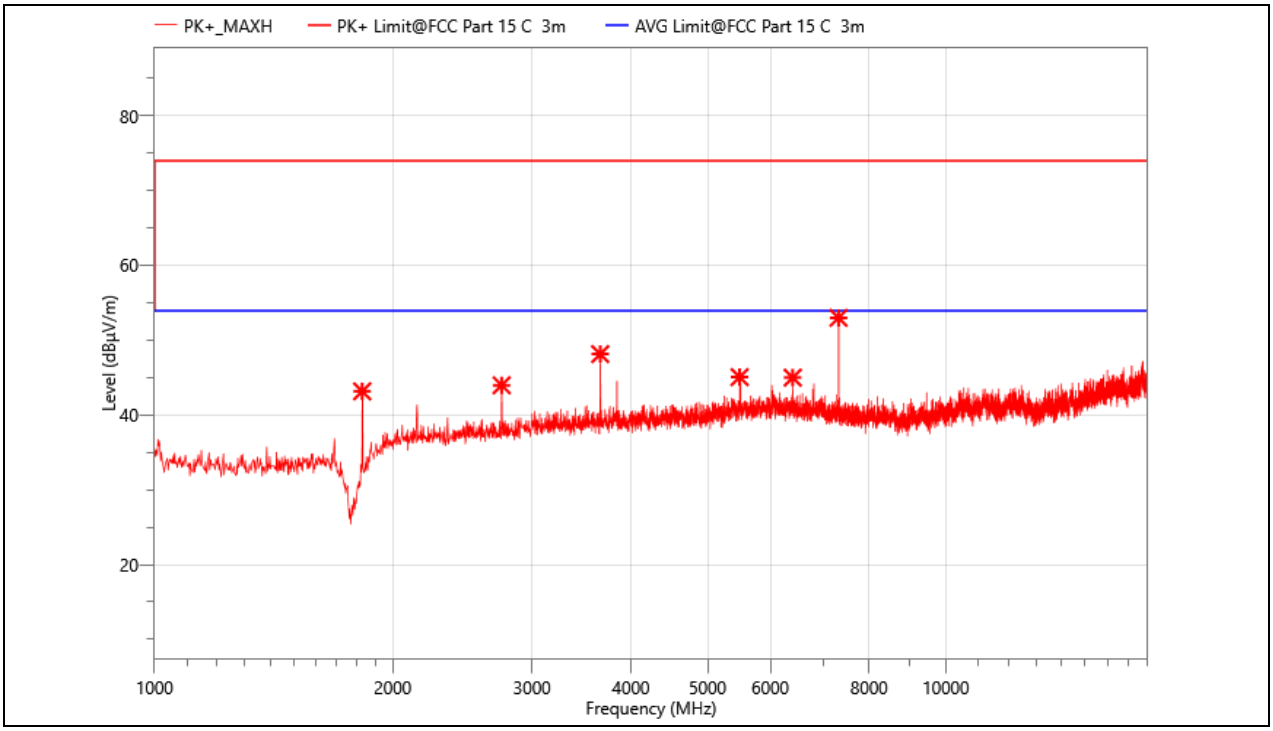
Ant. 1:



No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	1830.000	70.61	50.82	74.00	23.18	PK+	150.0	H	-0.7	-19.79
2	2746.000	60.02	43.26	74.00	30.74	PK+	150.0	H	-0.7	-16.76
3	3658.500	61.48	48.13	74.00	25.87	PK+	150.0	H	-0.7	-13.35
4	6054.000	51.26	43.25	74.00	30.75	PK+	150.0	H	-0.7	-8.01
5	7321.500	56.35	48.44	74.00	25.56	PK+	150.0	H	-0.7	-7.91
6	11173.500	48.64	44.23	74.00	29.77	PK+	150.0	H	-0.7	-4.41

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

HARMONICS AND SPURIOUS EMISSIONS (915 MHz, VERTICAL)

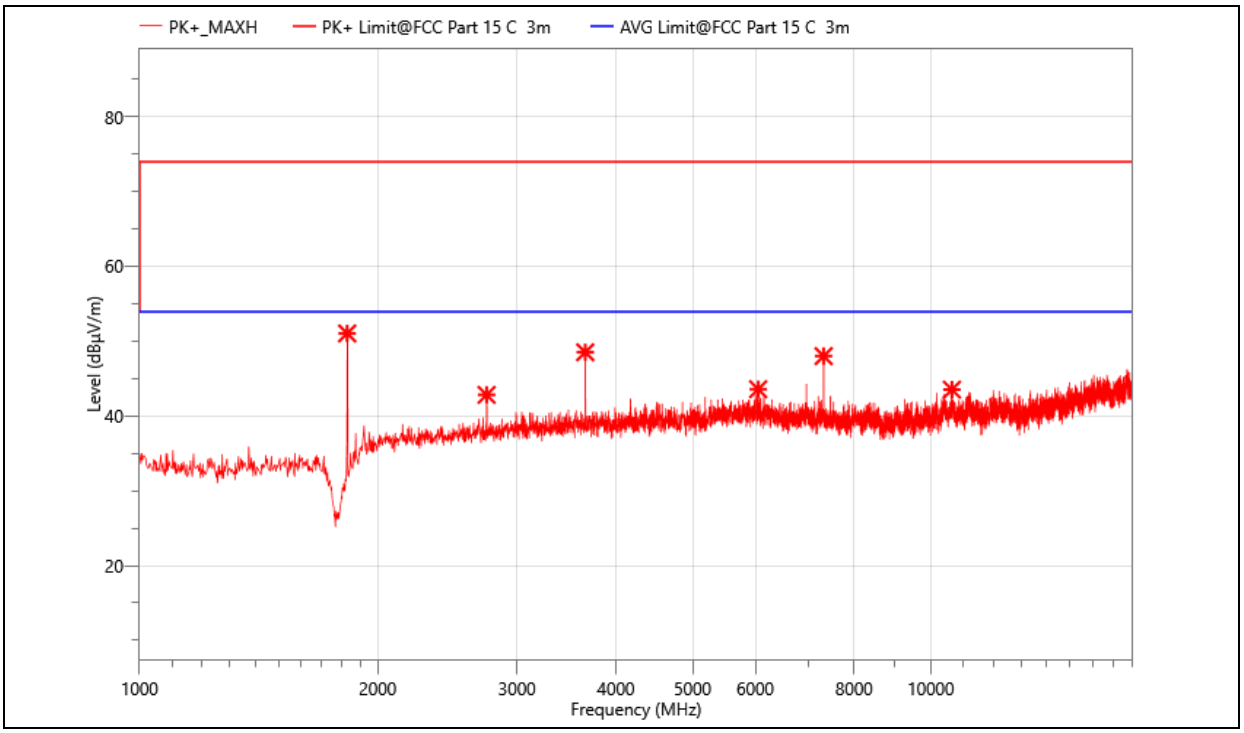


No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	1830.000	62.94	43.15	74.00	30.85	PK+	150.0	V	-0.7	-19.79
2	2746.000	60.72	43.96	74.00	30.04	PK+	150.0	V	-0.7	-16.76
3	3658.500	61.48	48.13	74.00	25.87	PK+	150.0	V	-0.7	-13.35
4	5488.500	54.84	45.05	74.00	28.95	PK+	150.0	V	-0.7	-9.79
5	6405.000	53.19	44.98	74.00	29.02	PK+	150.0	V	-0.7	-8.21
6	7318.500	60.79	52.97	74.00	21.03	PK+	150.0	V	-0.7	-7.82

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

HARMONICS AND SPURIOUS EMISSIONS (915 MHz, HORIZONTAL)

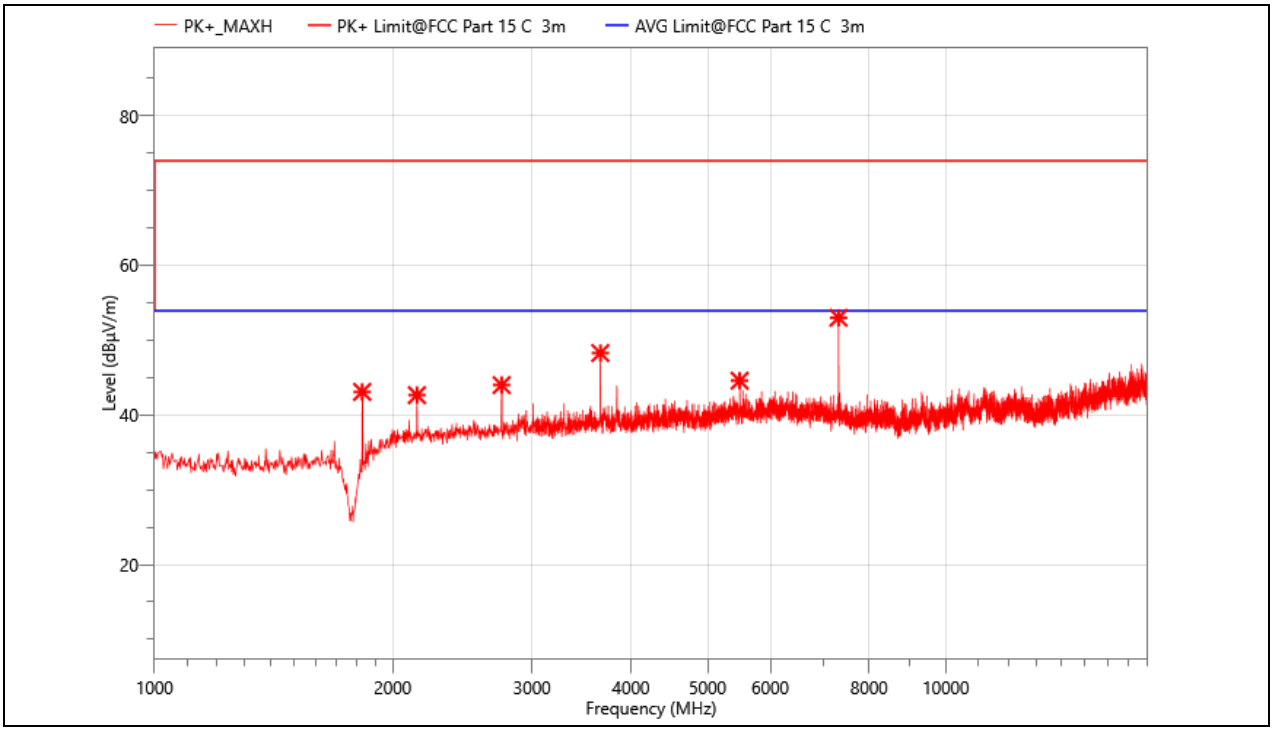
Ant. 2:



No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	1830.000	70.81	51.02	74.00	22.98	PK+	150.0	H	-0.7	-19.79
2	2746.000	59.57	42.81	74.00	31.19	PK+	150.0	H	-0.7	-16.76
3	3658.500	61.85	48.50	74.00	25.50	PK+	150.0	H	-0.7	-13.35
4	6052.500	51.61	43.57	74.00	30.43	PK+	150.0	H	-0.7	-8.04
5	7321.500	55.90	47.99	74.00	26.01	PK+	150.0	H	-0.7	-7.91
6	10635.000	48.92	43.51	74.00	30.49	PK+	150.0	H	-0.7	-5.41

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

HARMONICS AND SPURIOUS EMISSIONS (915 MHz, VERTICAL)



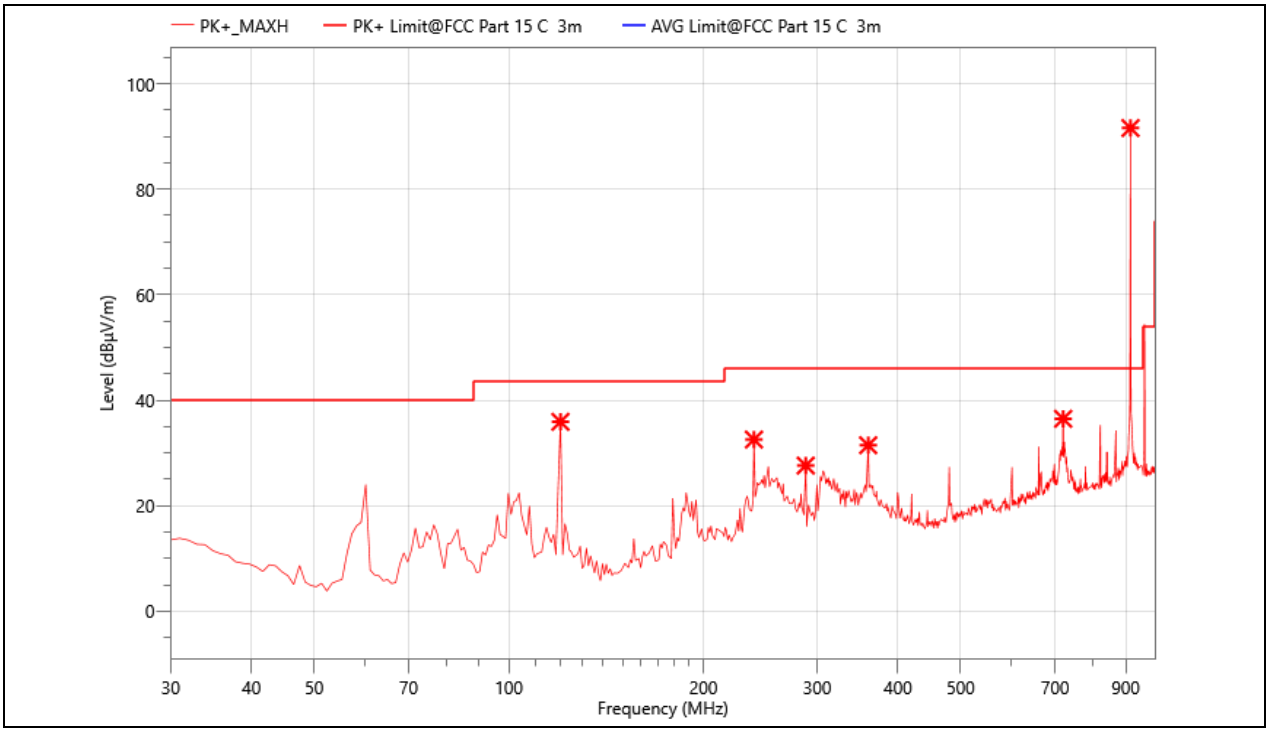
No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)	Det.	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)
1	1830.000	62.86	43.07	74.00	30.93	PK+	150.0	V	-0.7	-19.79
2	2146.000	60.63	42.64	74.00	31.36	PK+	150.0	V	-0.7	-17.99
3	2746.000	60.75	43.99	74.00	30.01	PK+	150.0	V	-0.7	-16.76
4	3660.000	61.63	48.27	74.00	25.73	PK+	150.0	V	-0.7	-13.36
5	5488.500	54.36	44.57	74.00	29.43	PK+	150.0	V	-0.7	-9.79
6	7318.500	60.80	52.98	74.00	21.02	PK+	150.0	V	-0.7	-7.82

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for BRF losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

8.4. SPURIOUS EMISSIONS BELOW 1 GHz AND ABOVE 30 MHz

SPURIOUS EMISSIONS (915 MHz, WORST-CASE CONFIGURATION, HORIZONTAL)

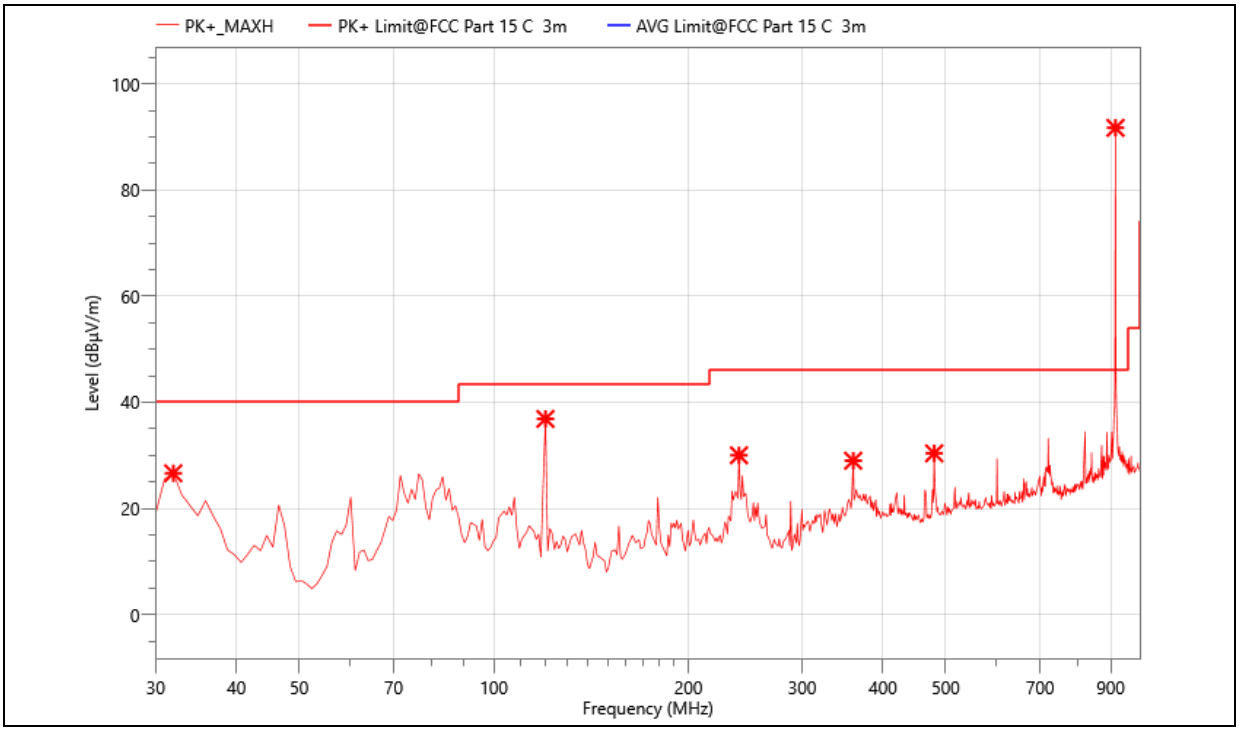
Ant. 1:



No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	120.210	60.47	-24.57	35.90	43.50	7.60	PK+	H
2	239.520	51.80	-19.26	32.54	46.00	13.46	PK+	H
3	288.020	47.00	-19.4	27.60	46.00	18.40	PK+	H
4	359.800	47.17	-15.7	31.47	46.00	14.53	PK+	H
5	720.640	42.93	-6.46	36.47	46.00	9.53	PK+	H
6	915.610	94.82	-3.22	91.60	94.00	2.40	PK+	H

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

SPURIOUS EMISSIONS (915 MHz, WORST-CASE CONFIGURATION, VERTICAL)



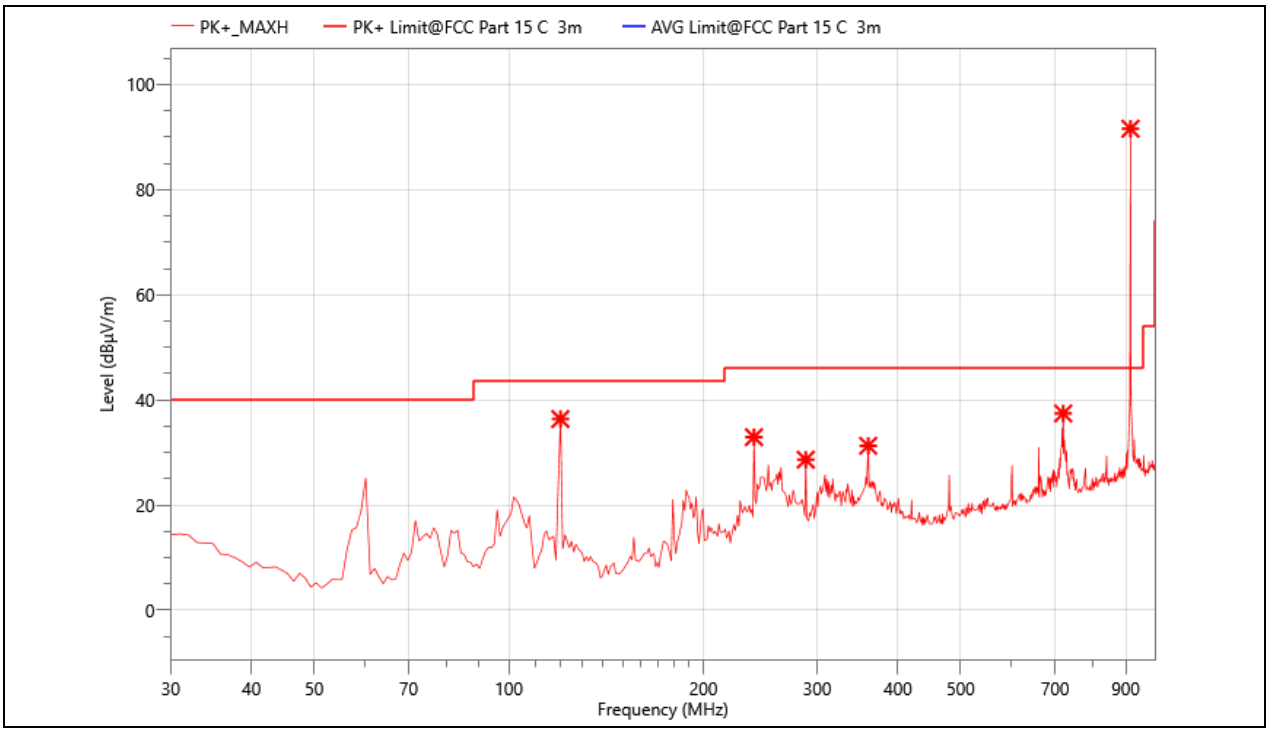
No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	31.940	42.07	-15.44	26.63	40.00	13.37	PK+	V
2	120.210	61.44	-24.57	36.87	43.50	6.63	PK+	V
3	239.520	49.29	-19.26	30.03	46.00	15.97	PK+	V
4	359.800	44.70	-15.7	29.00	46.00	17.00	PK+	V
5	480.080	43.05	-12.66	30.39	46.00	15.61	PK+	V
6	915.610	94.95	-3.22	91.73	94.00	2.27	PK+	V

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

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

SPURIOUS EMISSIONS (915 MHz, WORST-CASE CONFIGURATION, HORIZONTAL)

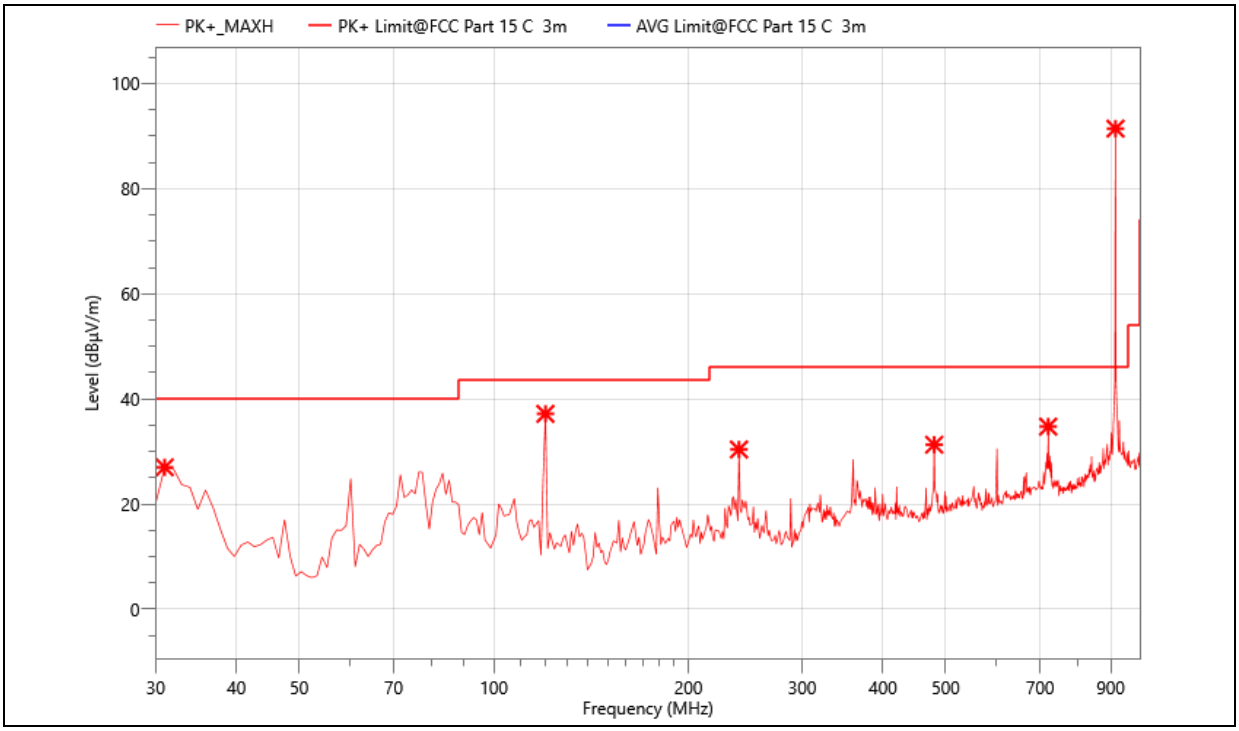
Ant. 2:



No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	120.210	60.93	-24.57	36.36	43.50	7.14	PK+	H
2	239.520	52.17	-19.26	32.91	46.00	13.09	PK+	H
3	288.020	48.03	-19.4	28.63	46.00	17.37	PK+	H
4	359.800	46.97	-15.7	31.27	46.00	14.73	PK+	H
5	720.640	43.89	-6.46	37.43	46.00	8.57	PK+	H
6	915.610	94.83	-3.22	91.61	94.00	2.39	PK+	H

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

SPURIOUS EMISSIONS (915 MHz, WORST-CASE CONFIGURATION, VERTICAL)



No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	30.970	41.85	-14.87	26.98	40.00	13.02	PK+	V
2	120.210	61.73	-24.57	37.16	43.50	6.34	PK+	V
3	239.520	49.64	-19.26	30.38	46.00	15.62	PK+	V
4	480.080	43.95	-12.66	31.29	46.00	14.71	PK+	V
5	720.640	41.19	-6.46	34.73	46.00	11.27	PK+	V
6	915.610	94.65	-3.22	91.43	94.00	2.57	PK+	V

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

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

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

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

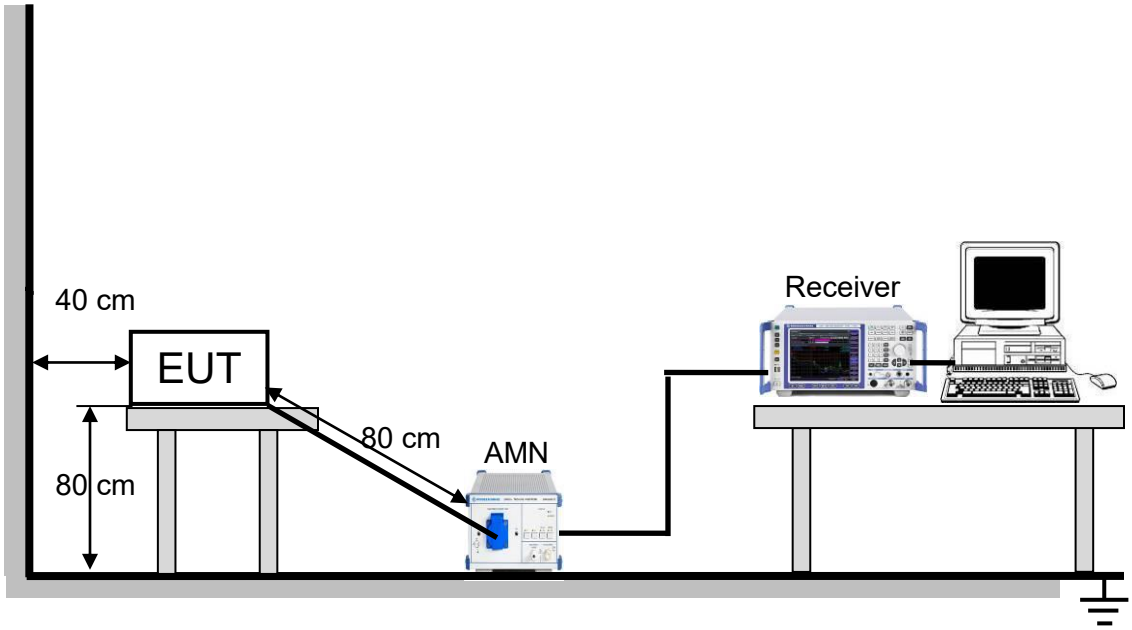
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

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

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

TEST SETUP AND PROCEDURE



The following table is the setting of the receiver

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

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

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

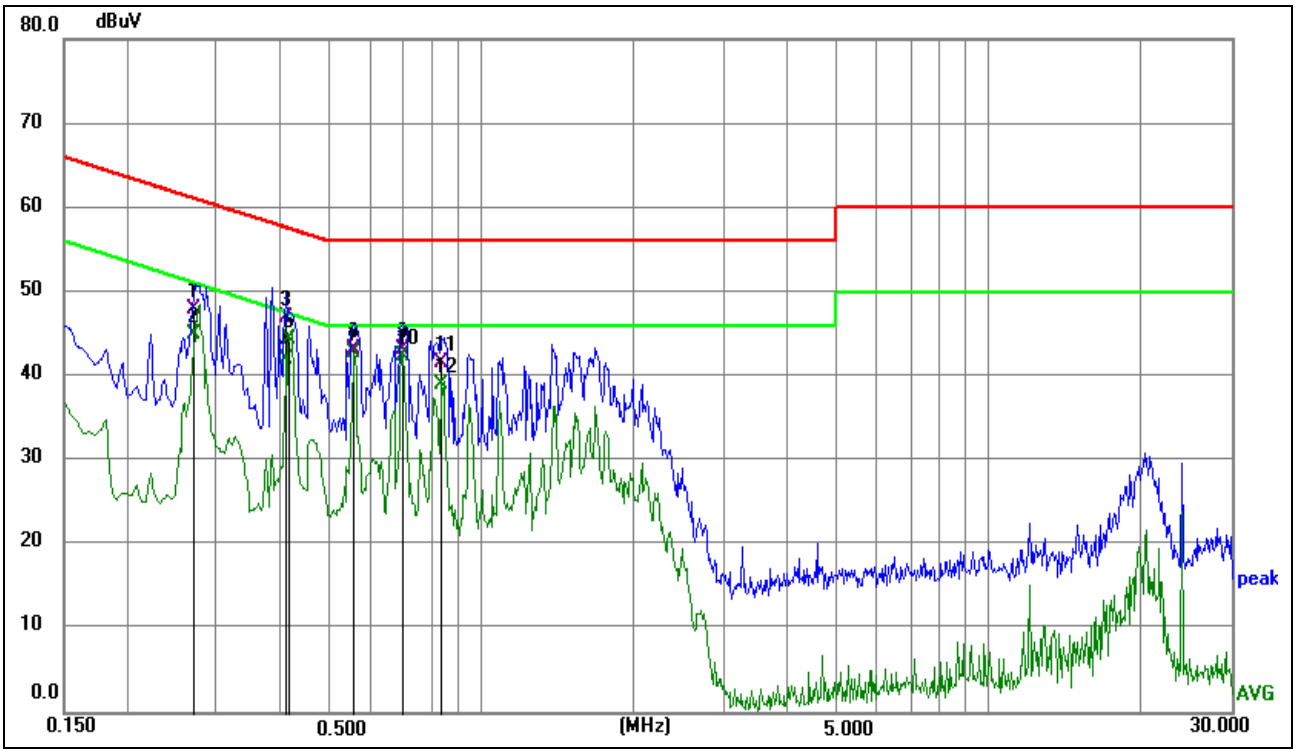
7. The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST ENVIRONMENT

Temperature	21.8°C	Relative Humidity	52%
Atmosphere Pressure	101kPa	Test Voltage	

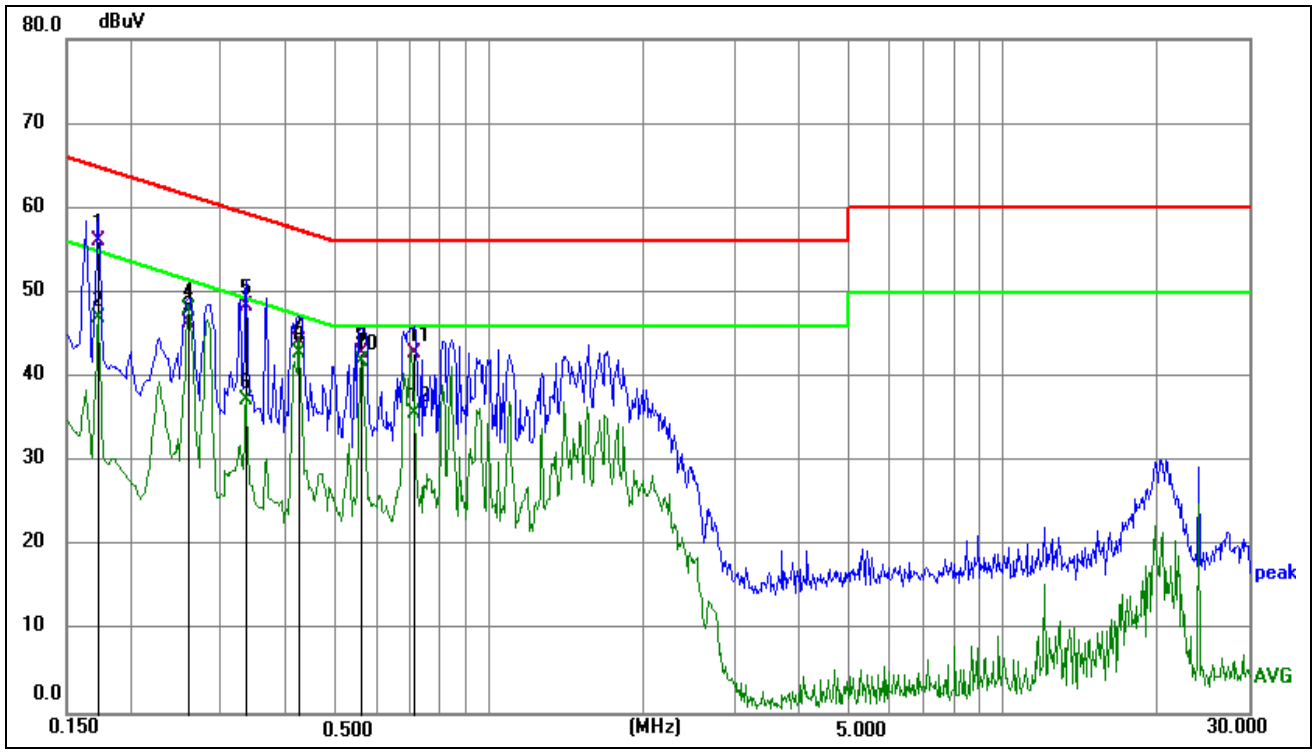
RESULTS

The worst result as bellow:



Phase: L1	Mode: 915MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.2714	38.17	9.82	47.99	61.07	-13.08	QP
2	0.2714	35.19	9.82	45.01	51.07	-6.06	AVG
3	0.4105	37.20	9.82	47.02	57.64	-10.62	QP
4	0.4105	32.15	9.82	41.97	47.64	-5.67	AVG
5	0.4155	34.46	9.82	44.28	57.54	-13.26	QP
6	0.4155	34.51	9.82	44.33	47.54	-3.21	AVG
7	0.5594	32.88	9.94	42.82	46.00	-3.18	AVG
8	0.5595	33.30	9.94	43.24	56.00	-12.76	QP
9	0.6990	33.37	9.86	43.23	56.00	-12.77	QP
10	0.6990	32.62	9.86	42.48	46.00	-3.52	AVG
11	0.8340	31.47	10.11	41.58	56.00	-14.42	QP
12	0.8340	28.83	10.11	38.94	46.00	-7.06	AVG



Phase: N	Mode: 915MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1725	46.08	9.94	56.02	64.84	-8.82	QP
2	0.1725	36.92	9.94	46.86	54.84	-7.98	AVG
3	0.2580	36.49	9.91	46.40	61.50	-15.10	QP
4	0.2580	38.00	9.91	47.91	51.50	-3.59	AVG
5	0.3345	38.54	9.89	48.43	59.34	-10.91	QP
6	0.3345	27.41	9.89	37.30	49.34	-12.04	AVG
7	0.4245	34.18	9.95	44.13	57.36	-13.23	QP
8	0.4245	32.77	9.95	42.72	47.36	-4.64	AVG
9	0.5639	32.82	9.99	42.81	56.00	-13.19	QP
10	0.5639	31.80	9.99	41.79	46.00	-4.21	AVG
11	0.7125	32.67	10.03	42.70	56.00	-13.30	QP
12	0.7125	25.60	10.03	35.63	46.00	-10.37	AVG

10. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203, ISED RSS-Gen Clause 6.3
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.

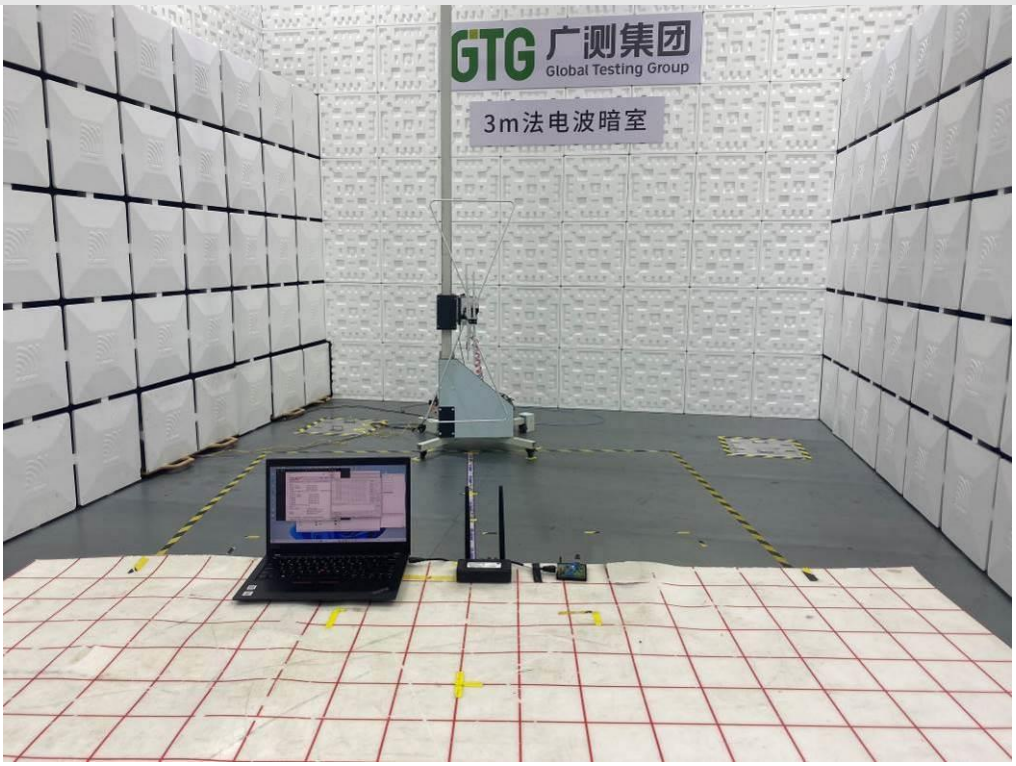
Please refer to FCC §15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 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

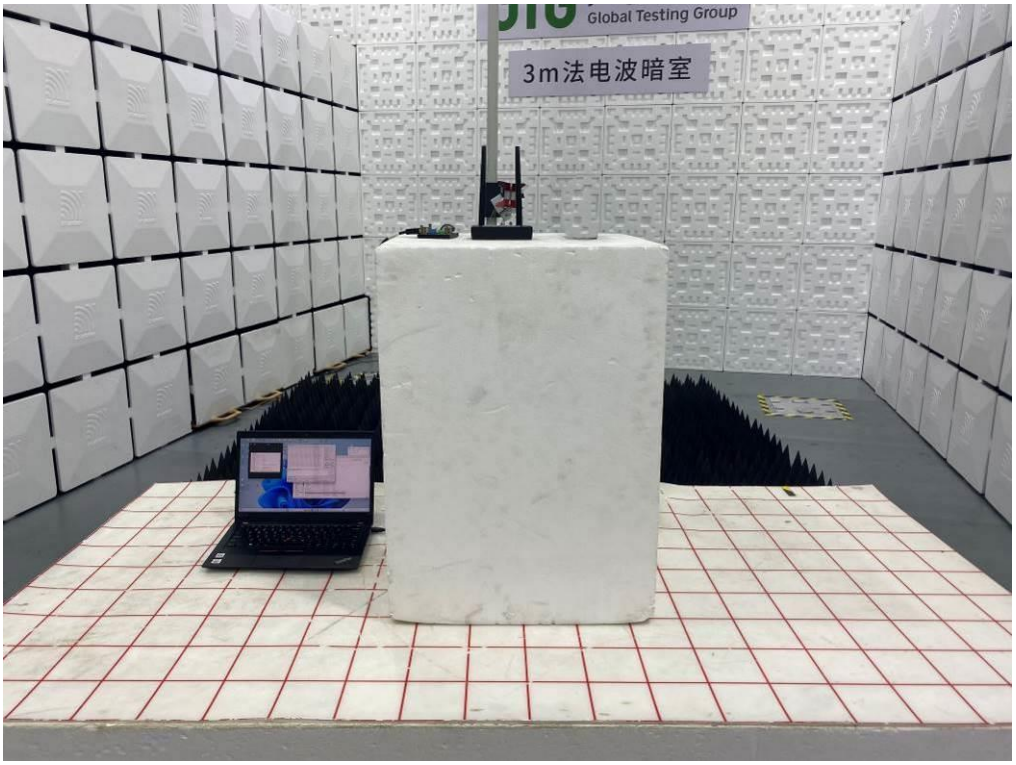
Complies

PHOTOGRAPHS OF TEST CONFIGURATION

Radiated emissions below 1GHz



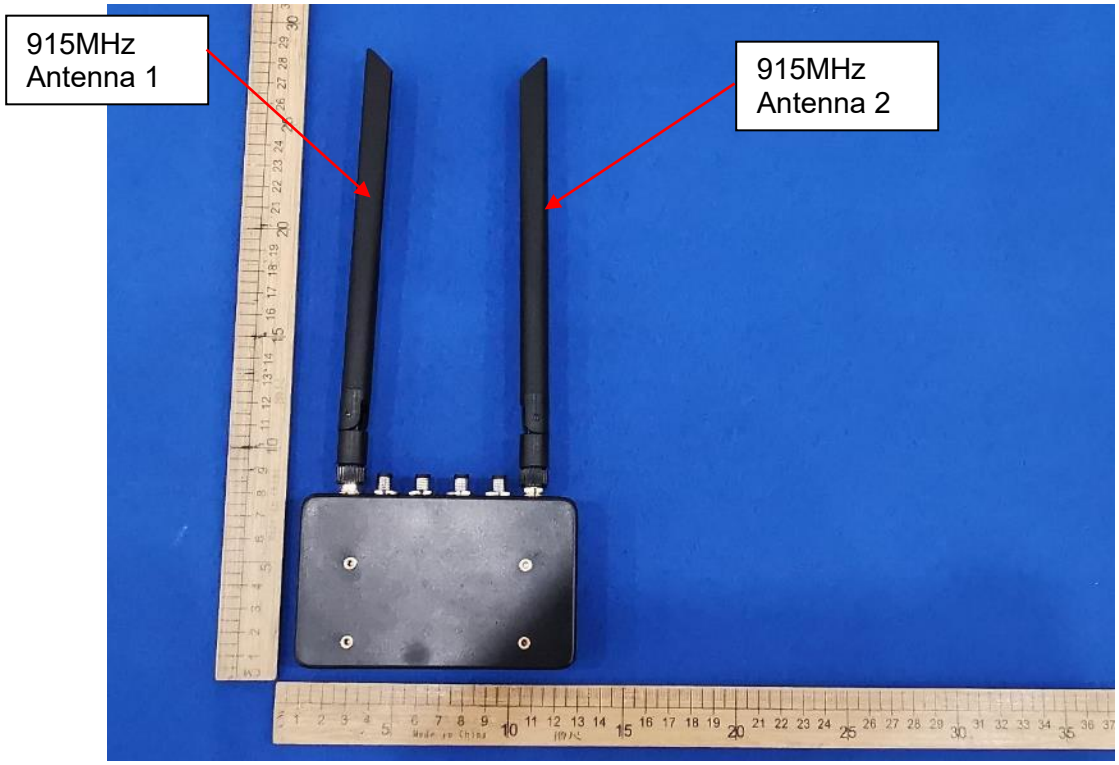
Radiated emissions above 1GHz



AC Power Line Conducted Emission

PHOTOGRAPHS OF EUT

External

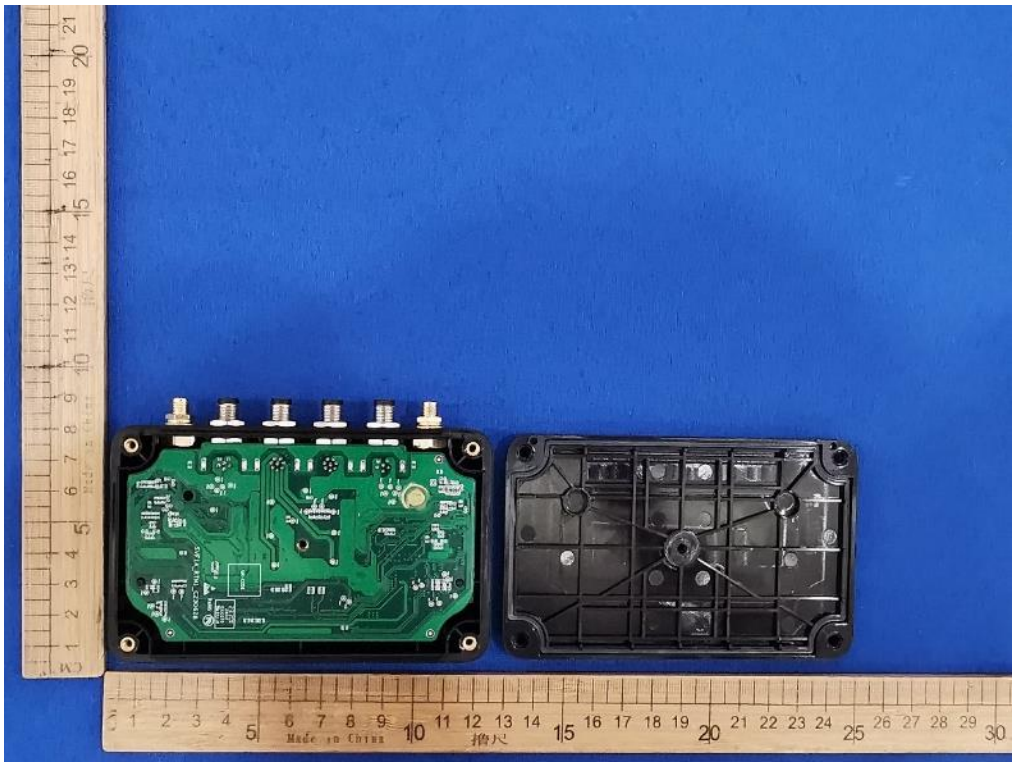

915MHz
Antenna 1
915MHz
Antenna 2

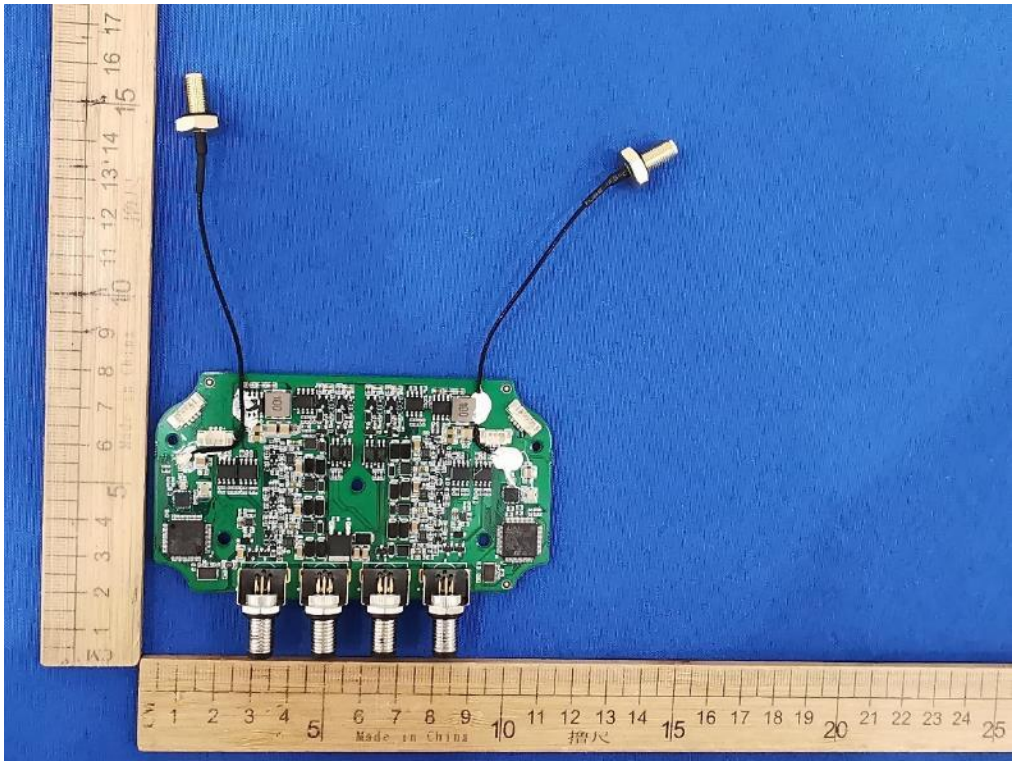
CM
Made in China
撸尺

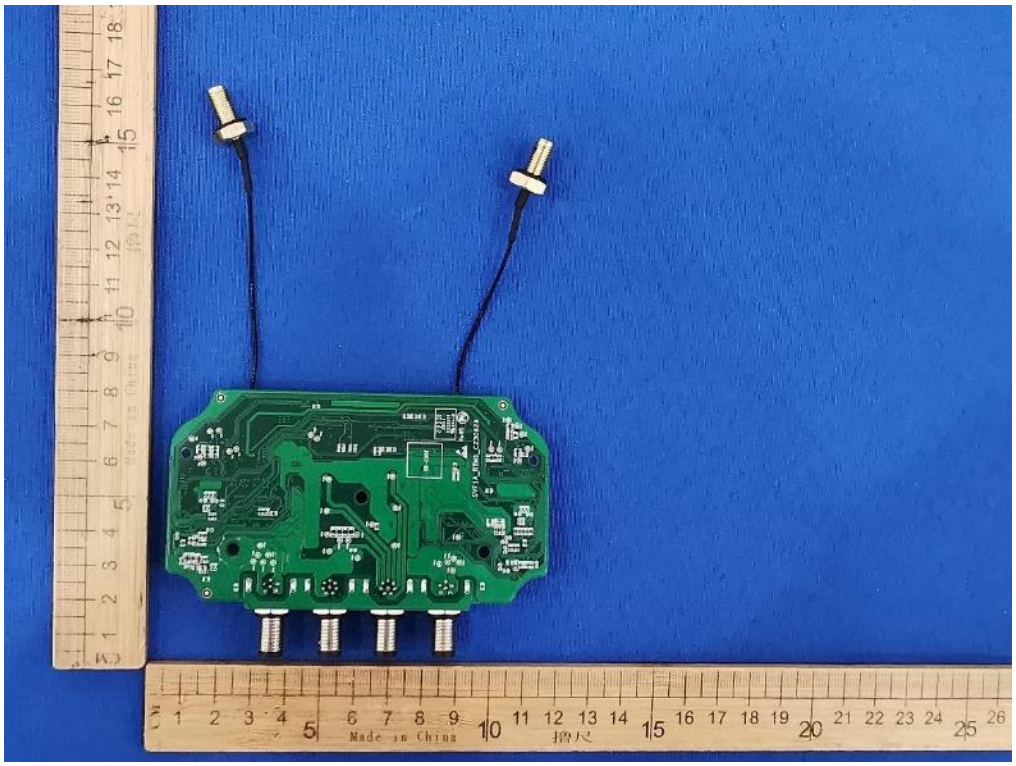
Made in China
撸尺

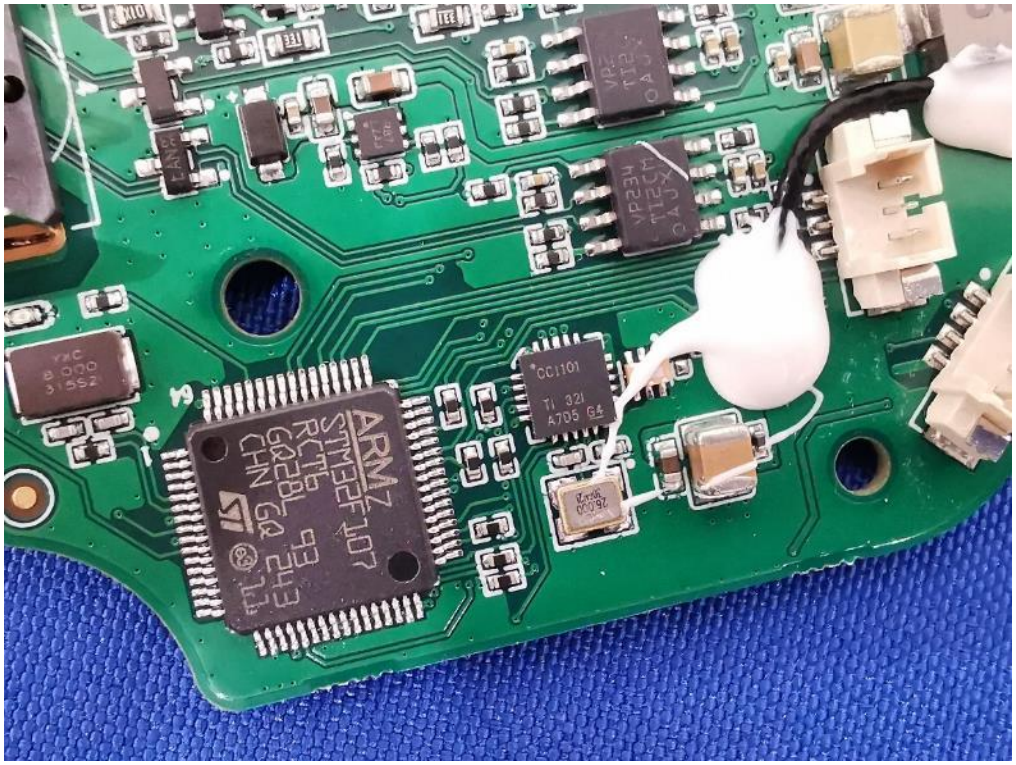
Made in China

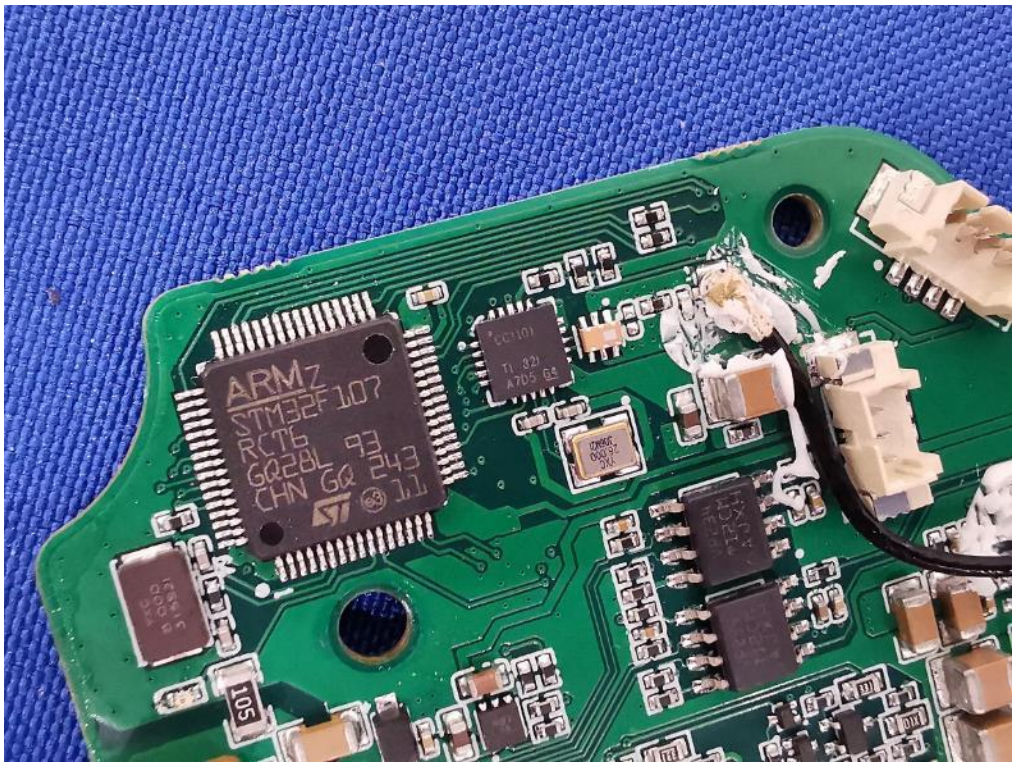
Internal











END OF REPORT