FCC RADIO TEST REPORT

FCC ID: 2AQBD-R51

Sample: Wireless Transmitter

Trade Name: N/A

Main Model: R51

Additional Model: R50

Report No.: UNIA22071301ER-61

Prepared for

FUJIAN YOUTONG INDUSTRIES CO., LTD.

North part of 1st, 2nd-3rd floor, Building 1#, M9511 industries Park, No.18, Majiang Road, Mawei District, Fuzhou City, Fujian, China

Prepared by

Shenzhen United Testing Technology Co., Ltd.

2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant	FUJIAN YOUTONG INDUSTRIES CO., LTD.
Address	North part of 1st, 2nd-3rd floor, Building 1#, M9511 industries Park, No.18, Majiang Road, Mawei District, Fuzhou City, Fujian, China
Manufacturer	FUJIAN YOUTONG INDUSTRIES CO., LTD.
Address	North part of 1st, 2nd-3rd floor, Building 1#, M9511 industries Park, No.18, Majiang Road, Mawei District, Fuzhou City, Fujian, China

Product description

Product	Wireless Transmitter
Trade Name	N/A
Model Name	R51, R50
Test Methods	FCC Part 15 Subpart C 15.231 ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date (s) of performance of tests	June 15, 2022
Date of Issue	June 16, 2022
Test Result	Pass

Prepared by: kahn.yang

Kahn yang/Supervisor

Reviewer: kelly cheng

Kelly Cheng/Supervisor

Approved & Authorized Signer: liuze

Liuze/Manager

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1 TEST SUMMARY

1 TEST PROCEDURES AND RESULTS

FCC and IC Requirements		
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.231(e)	Radiated Emission	Compliant
FCC Part 15.231(c)	20dB Bandwidth	Compliant
FCC Part 15.231(e)	Release Time Measurement	Compliant
FCC Part 15.203	Antenna Requirement	Compliant
The product is aactivated automatically transmitter.		

2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

A2LA Certificate Number: 4747.01
The EMC Laboratory has been accredited by A2LA, and in compliance with ISO/IEC 17025:2017 General Requirements for testing Laboratories.

FCC Registration Number: 674885
The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission.

IC Registration Number: 21947
The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada.

3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence ofapproximately 95 %.

A. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI	ANSI	9kHz ~ 30MHz	2.50	
		30MHz ~ 1000MHz	4.80	
		1000MHz ~ 18000MHz	4.13	

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

The following information of EUT submitted and identified by applicant:

Product	Wireless Transmitter
Trade Name	N/A
Main Model	R51
Serial No.	N/A
Model Difference	All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is model name for commercial purpose.
FCC ID	2AQBD-R51
Antenna Type	Spring Antenna
Antenna Gain	0dBi
Frequency Range	433.9116MHz
Number of Channels	1CH
Modulation Type	ASK
Battery	N/A
PowerSource	DC 3V (2 x 1.5V battery)

2.2 CARRIER FREQUENCY OF CHANNELS

Channel	Frequency(MHz)
1	433.9116

2.3 OPARATION OF EUT DURING TESTING

new battery is used during all test
Operating Mode
The mode is used: Transmitting mode

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Below1GHz Radiation testing:

EUT

Operation of EUT during Above1GHz Radiation testing:

EUT

Table forauxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
/	/	/	/

2.5 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature	Normal Temperature:	26°C
Voltage	Normal Voltage	3 V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

2.6 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2022.09.27
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2024.02.26
4	PREAMP	HP	8449B	3008A00160	2022.09.22
5	PREAMP	HP	8447D	2944A07999	2023.05.17
6	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2022.09.22
7	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2022.09.22
8	Signal Generator	Agilent	E4421B	MY4335105	2022.09.22
9	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2022.09.22
10	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2022.09.22
11	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2023.05.17
12	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2023.05.17
13	RF power divider	Anritsu	K241B	992289	2022.09.22
14	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2022.09.22
15	Active Loop Antenna	Com-Power	AL-130R	10160009	2022.07.25
16	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2022.09.22
17	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2023.05.23
18	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2022.09.27
19	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2022.09.22
20	Signal Generator	Agilent	N5183A	MY47420153	2022.09.22
21	Spctrum Analyzer	Rohde&Schwarz	FSP 40	100501	2022.09.22
22	Power Meter	KEYSIGHT	N1911A	MY50520168	2022.09.22
23	Frequency Meter	VICTOR	VC2000	997406086	2022.09.22
24	DC Power Source	HYELEC	HY5020E	055161818	2022.09.22

3 TEST CONDITIONS AND RESULTS

3.1 RADIATED EMISSION TEST

Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

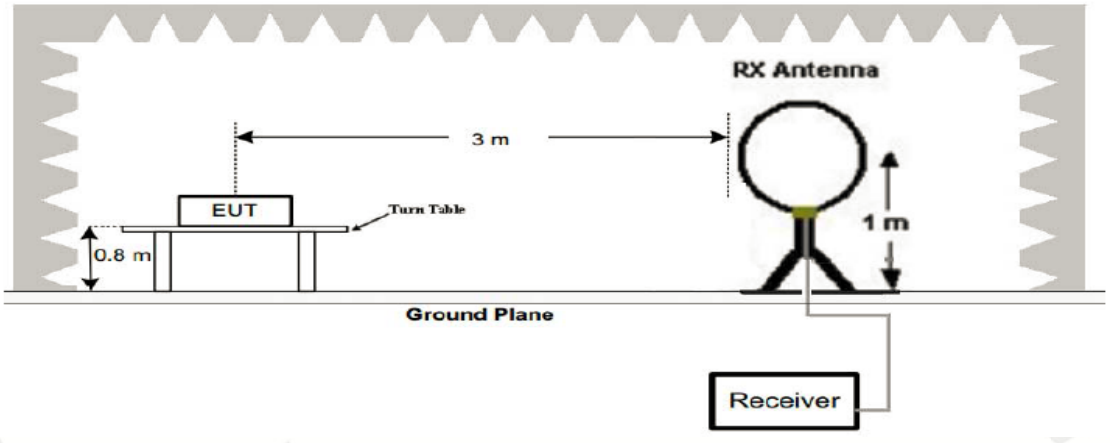
In addition to the provisions of 15.231(e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
40.66-40.70	1000	100
70-130	500	50
130-174	500-1500*	50-150*
174-260	1500	150
260-470	1500-5000*	150-500*
Above 470	5000	500
Note:*Linear interpolation		

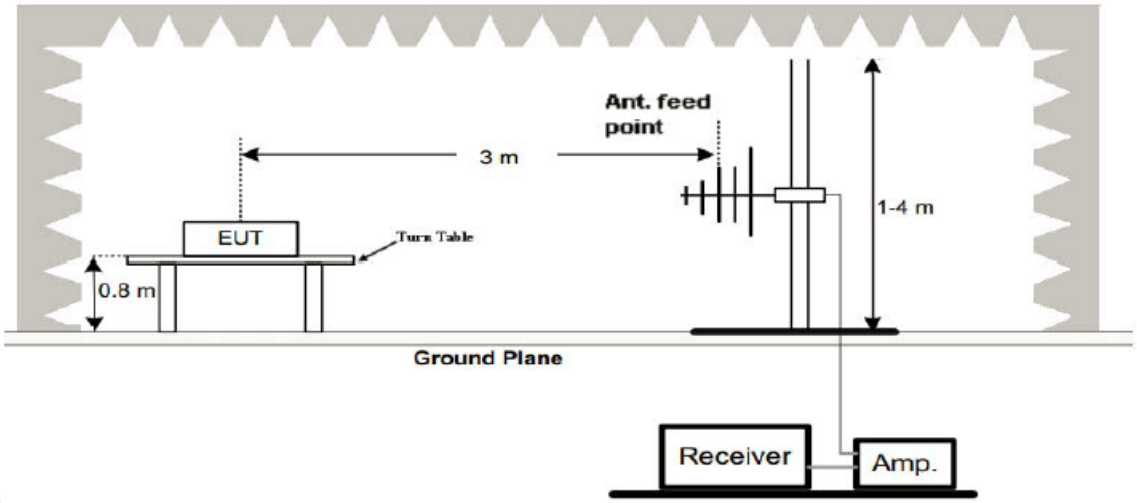
Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters= 22.73(F) – 2454.55; forthe band 260-470 MHz, uV/m at 3 meters=16.67(F)-2833.33. The maximum permitted unwantedemission level is 20 dB below the maximum permitted fundamental level.

Test Setup

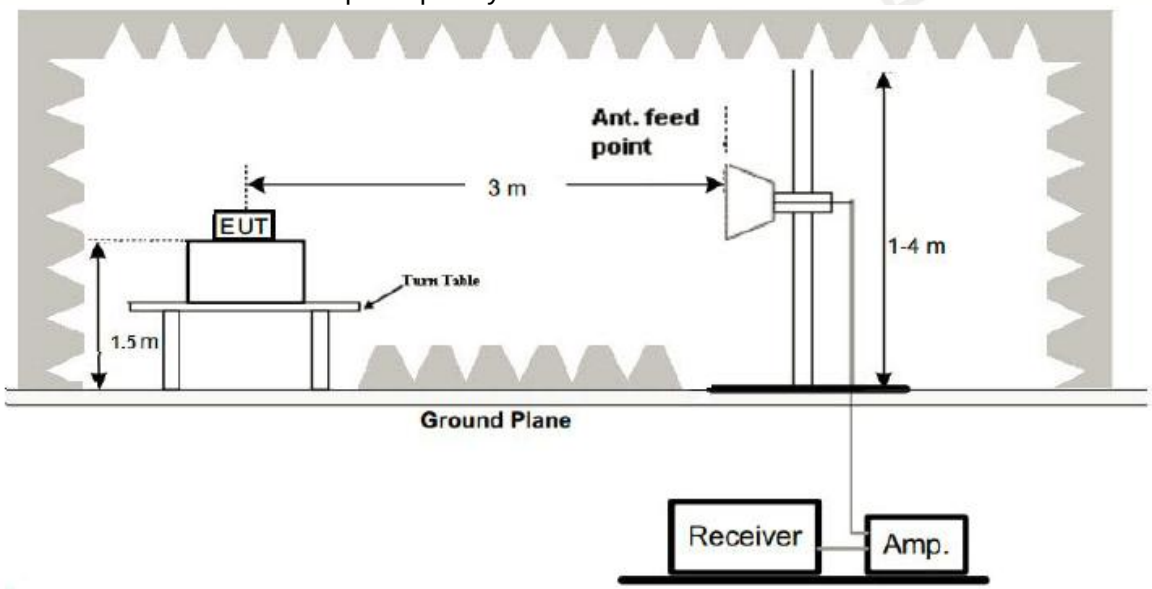
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



Test Procedure

TheEUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 120 kHz in 30-1000MHz, and 1MHz in 1000 MHz.

Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Result

---PASS---

Remark:

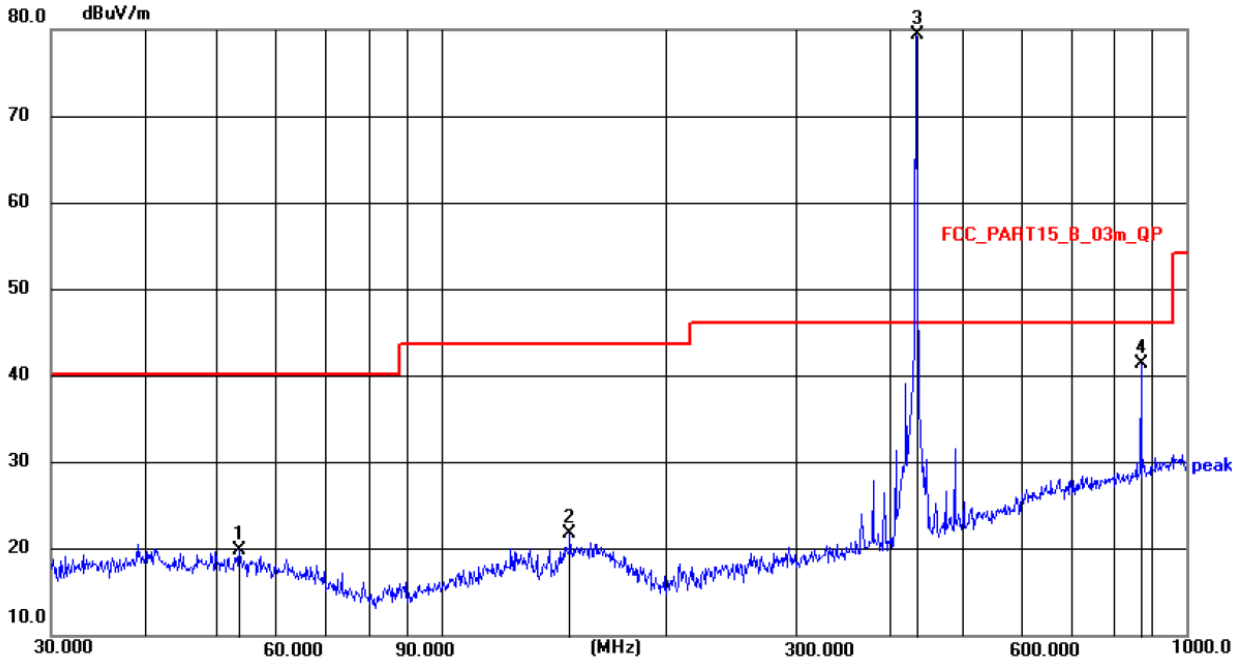
1. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, and test data recorded in this report.

2. The frequency range from 9 kHz to 5000 MHz is checked.

3. Below 30MHz, the emissions are lower than 20dB below the allowable limit. Therefore, 9kHz-30MHz data were not recorded.

Below 1GHz Test Results:

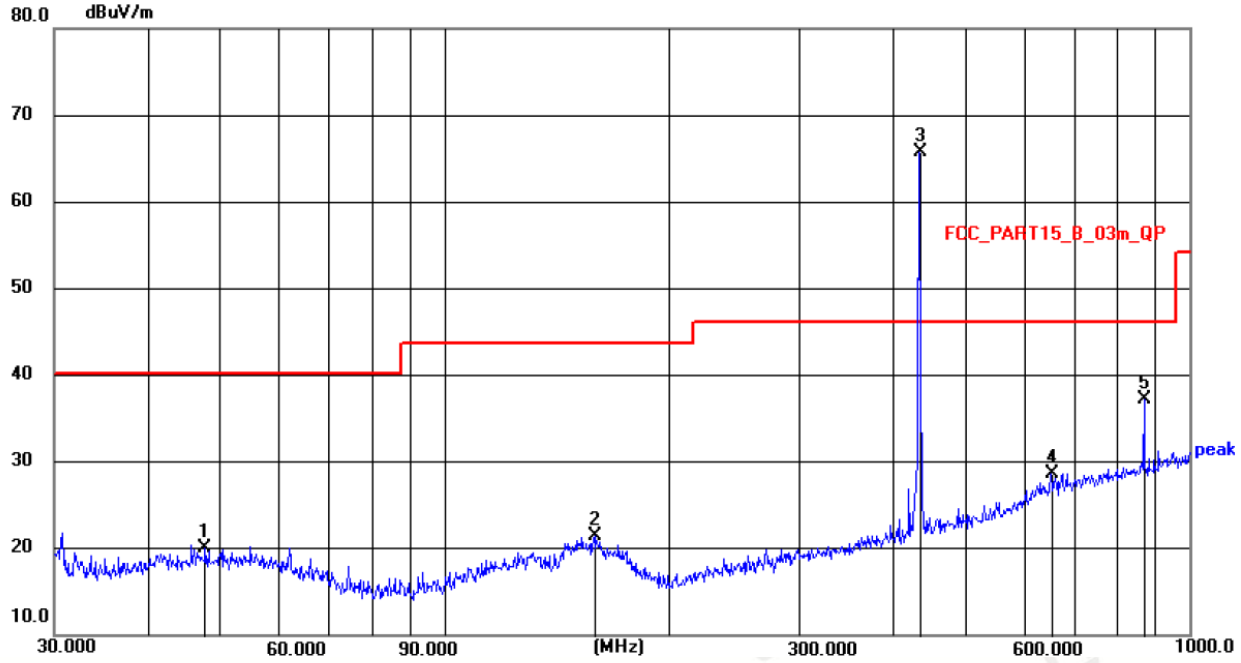
Temperature:	24℃	Relative Humidity:	49%
Test Date:	June 28,2022	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Horizontal
Test Mode:	Normal work		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Remark
1	53.6931	5.50	14.31	19.81	40.00	20.19	238	64	peak
2	148.9624	5.98	15.78	21.76	43.50	21.74	219	322	peak
3	433.9116	61.70	17.65	79.35	100.82	21.47	153	107	peak
4	867.8232	17.73	23.67	41.40	80.82	39.42	160	86	peak

Remark: Level= Reading+ Factor, Margin= Limit- Level
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24℃	Relative Humidity:	49%
Test Date:	June 28,2022	Pressure:	1010hPa
Test Voltage:	DC 3V	Polarization:	Vertical
Test Mode:	Normal work		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Remark
1	47.8260	5.46	14.55	20.01	40.00	19.99	128	126	peak
2	159.7844	5.42	15.99	21.41	43.50	22.09	160	360	peak
3	433.9116	48.10	17.65	65.75	100.82	35.07	122	53	peak
4	651.9417	7.03	21.64	28.67	46.00	17.33	219	274	peak
5	867.8232	13.63	23.67	37.30	80.82	43.52	105	3	peak

Remark: Level= Reading + Factor, Margin= Limit- Level
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Above 1 GHz Test Results:

Frequency (MHz)	Reading (dBμV/m)	Factor Corr.	Average Factor	Result (dBμV/m)		Limit (dBμV/m)		Margin (dB)		Polarization
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
433.9116	61.7	17.65	-12.04	67.31	79.35	72.86	92.86	-5.55	-13.51	Horizontal
867.8232	17.73	23.67	-12.04	29.36	41.4	52.86	72.86	-23.5	-31.46	
1735.6464	62.43	-12.34	-12.04	38.05	50.09	52.86	72.86	-14.81	-22.77	
2603.4696	59.77	-9.43	-12.04	38.3	50.34	52.86	72.86	-14.56	-22.52	
3037.3812	62.66	-8.36	-12.04	42.26	54.3	52.86	72.86	-10.6	-18.56	
3471.2928	68.85	-7.88	-12.04	48.93	60.97	52.86	72.86	-3.93	-11.89	
3905.2044	66.96	-6.92	-12.04	48	60.04	52.86	72.86	-4.86	-12.82	
4339.116	56.6	-6.09	-12.04	38.47	50.51	52.86	72.86	-14.39	-22.35	
4773.0276	59.67	-5.09	-12.04	42.54	54.58	52.86	72.86	-10.32	-18.28	
433.9116	48.1	17.65	-12.04	53.71	65.75	72.86	92.86	-19.15	-27.11	Vertical
867.8232	13.63	23.67	-12.04	25.26	37.3	52.86	72.86	-27.6	-35.56	
1735.6464	55.36	-12.34	-12.04	30.98	43.02	52.86	72.86	-21.88	-29.84	
2603.4696	54.35	-9.43	-12.04	32.88	44.92	52.86	72.86	-19.98	-27.94	
3037.3812	56.81	-8.36	-12.04	36.41	48.45	52.86	72.86	-16.45	-24.41	
3471.2928	60.76	-7.88	-12.04	40.84	52.88	52.86	72.86	-12.02	-19.98	
3905.2044	64.97	-6.92	-12.04	46.01	58.05	52.86	72.86	-6.85	-14.81	

Note: 1.Average value= PK value + Average Factor (duty factor)

2. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to performa separate average measurement.

3.2 -20db OCCUPIED BANDWIDTH

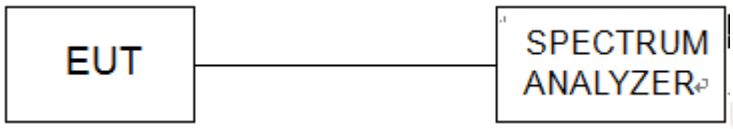
Limit

According to 47 CFR 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the centre frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

Test Procedure

1.Set SPA Center Frequency = Fundamental frequency, RBW = 10 kHz, VBW = 30 kHz, Span = 1MHz.
2. Set SPA Max hold, Mark peak, -20 dB.

Test Configuration

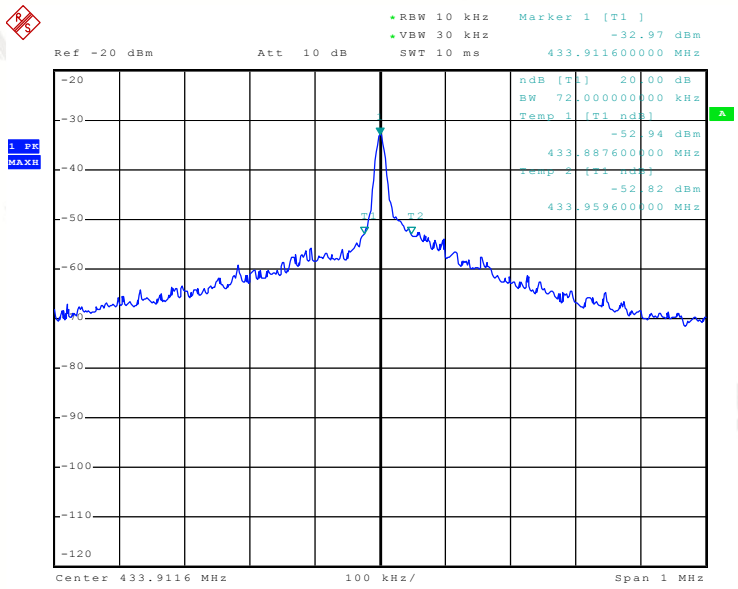


Test Result

---PASS---

Modulation	Channel Frequency (MHz)	20dB bandwidth (kHz)	Limit (kHz)	Result
ASK	433.9116	72	0.25%*433911.6=1084.8	Pass

ASK Modulation



3.3 Deactivation Time

LIMIT

According to FCC §15.231(e), Section 15.231(e) devices operated under theprovisions of this paragraph shall be provided with a means for automaticallylimiting operation so that the durationof each transmission shall notbe greater than one second and the silentperiod between transmissions shallbe at least 30 times the duration of thetransmission but in no case less than 10seconds.

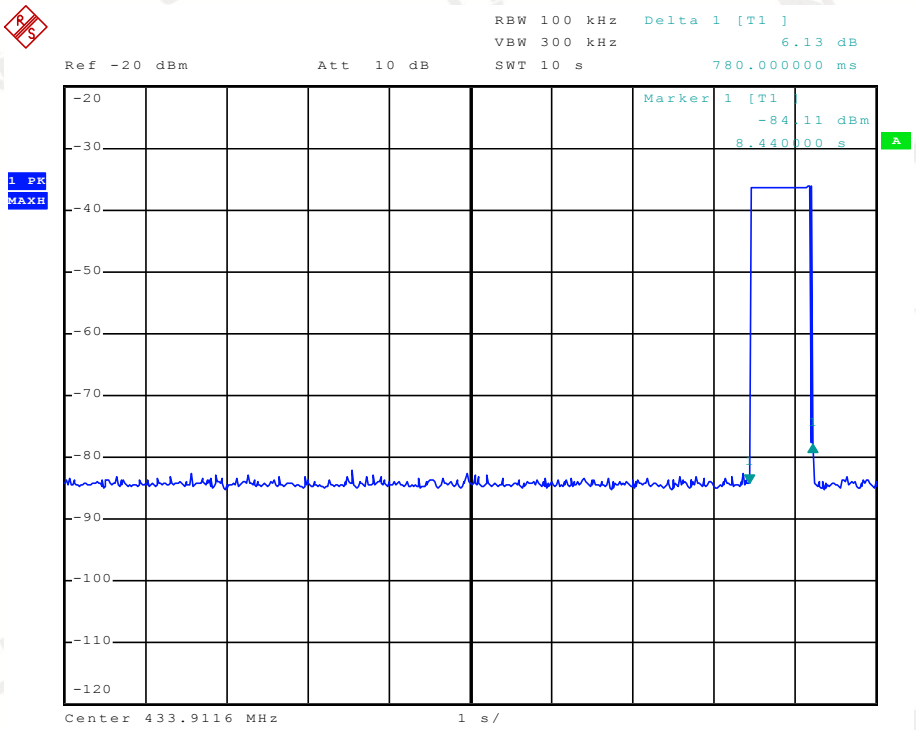
TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency,
   RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.

Test Configuration

TEST RESULTS

Period Time = 55.8s+0.78s=56.58s
Duration time =0.78s＜1s
Silent time =55.8s >10s
Silent time =55.8s >30*0.78s=23.4s



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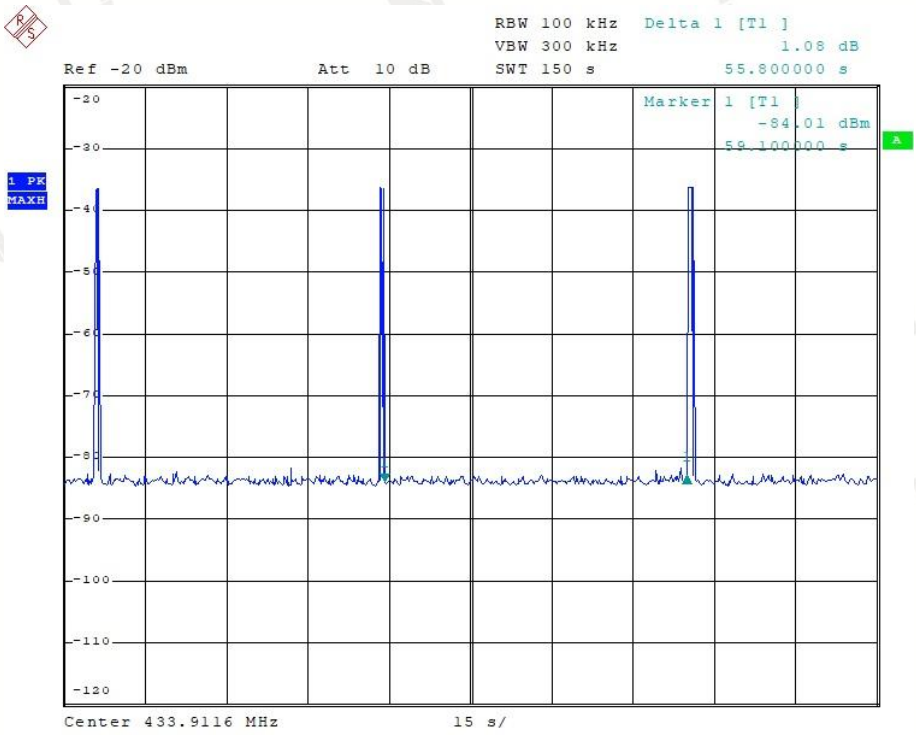

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3.4 CALCULATION OF AVERAGE FACTOR

According to ANSI C63.10-2013.

ANSI C63.10-2013 Section 7.5 Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval.64 The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation (10):

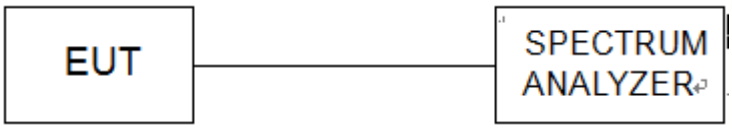
Average factor in dB = 20 log (duty cycle)

TEST RESULTS

1. Set SPA Center Frequency = Fundamental frequency,
   RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.
4. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation

Test Configuration

The equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.



TEST RESULTS

---PASS---

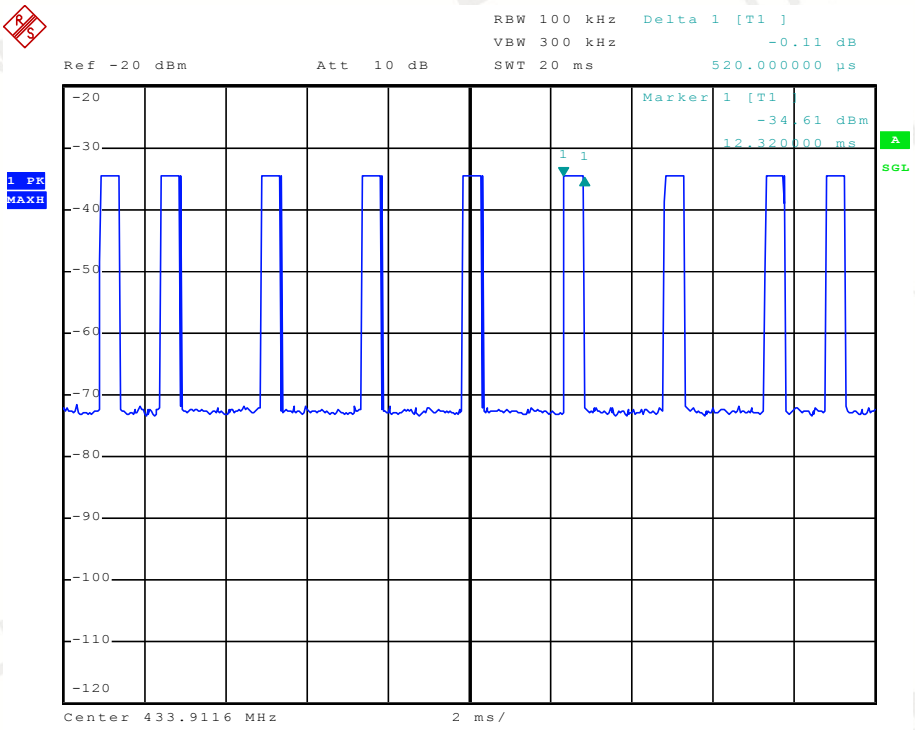
The duty cycle is simply the on time divided by the period:

Effective period of the cycle = (0.52*49)ms =25.48ms

DC = 25.48ms / 100ms =0.25

Therefore, the average factor is found by 20log0.25= -12.04dB

The spectral following.



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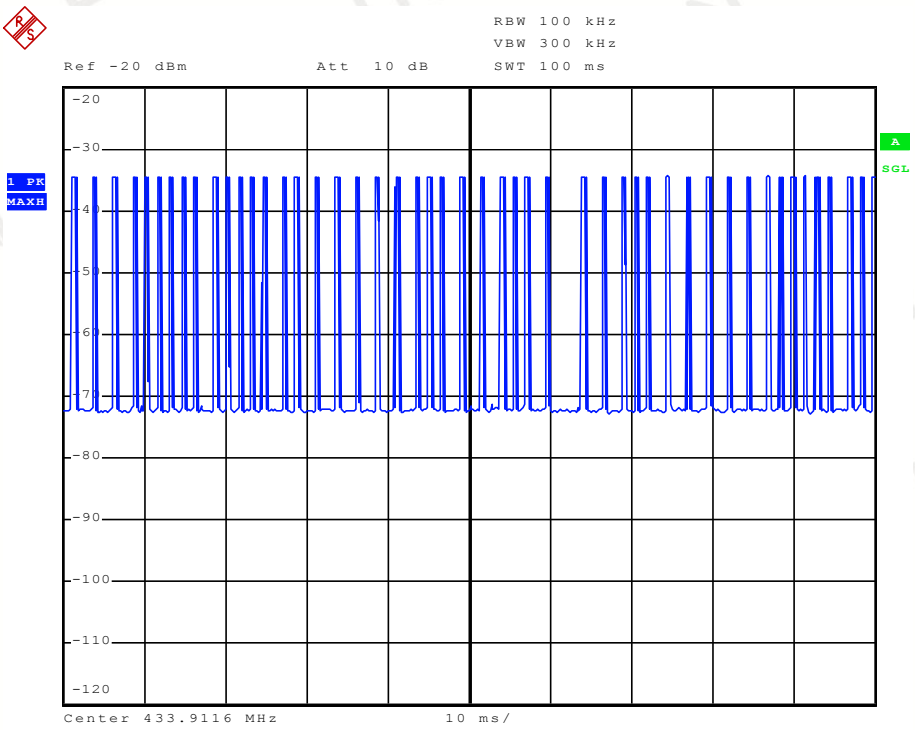

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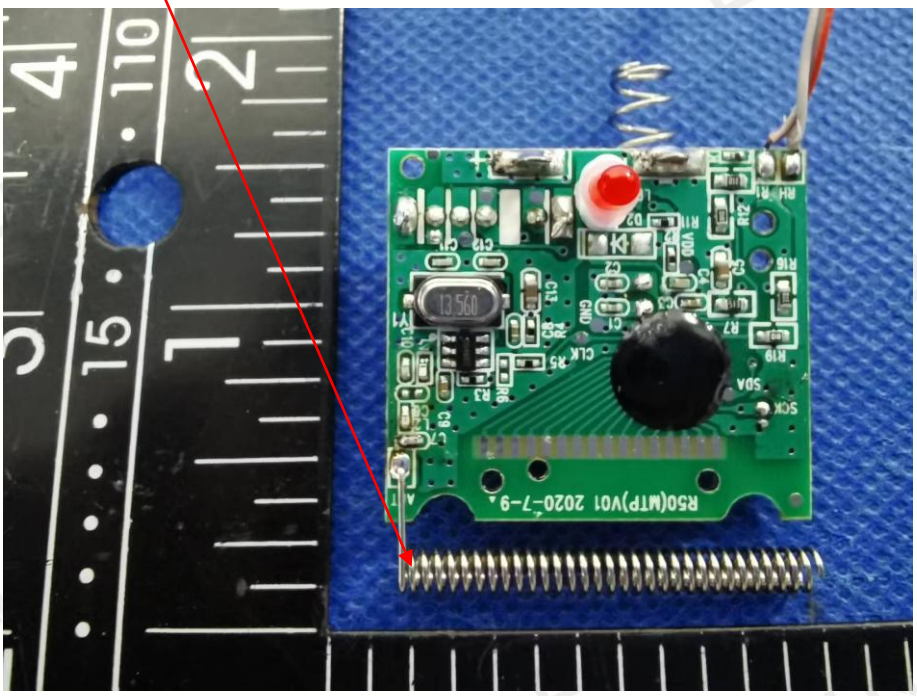
3.5 ANTENNA REQUIREMENT

Standard Applicable:
For intentional device, according to FCC 47 CFR Section 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.

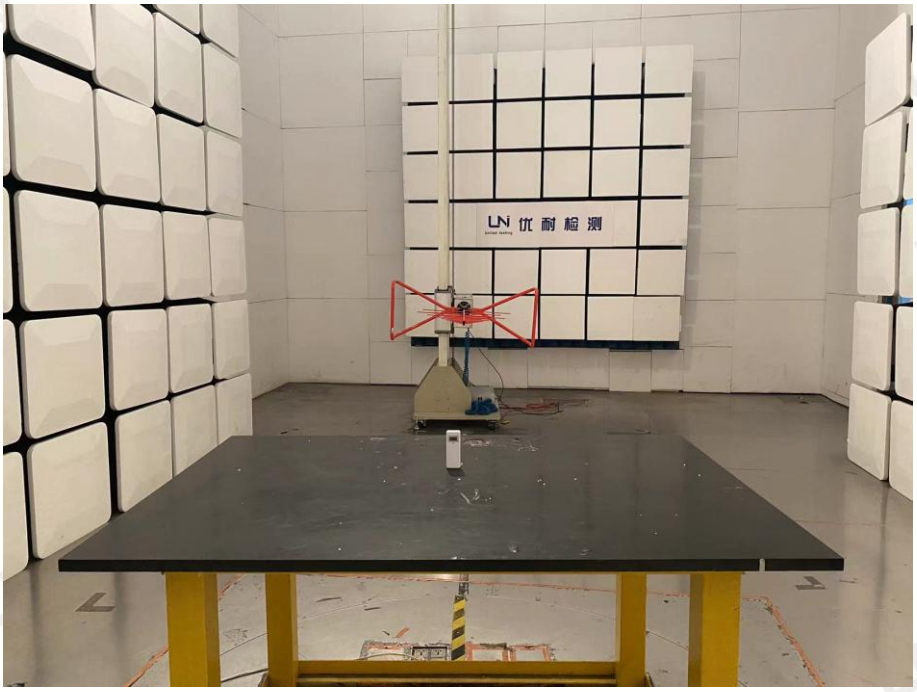
Antenna Construction
Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

ANTENNA:



4 PHOTOGRAPH OF TEST

Radiated Emission



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