



TEST REPORT

Applicant: Nanjing Haoyuhan Electronic Technology Co.,Ltd.
Address of Applicant: Room 620, Oujiang Building, No.15 Dongxin South Road, Dongshan Street, Jiangning District, Nanjing
Manufacturer/Factory: Nanjing Haoyuhan Electronic Technology Co.,Ltd.
Address of Manufacturer/Factory: Room 620, Oujiang Building, No.15 Dongxin South Road, Dongshan Street, Jiangning District, Nanjing
Product Name: Industrial Radio Remote Control
Model No.: H112,H110,H210,H212,M106,M108,Alpha540ZG,Alpha570ZG,L4,L6,L8,L10,L6B,L8B
Trade Mark: sloHEXtted
FCC ID: 2BDU2-H112
Applicable standards: FCC Part 15.231
Test procedure: ANSI C63.10-2013
Date of Test: Oct.31, 2022-Nov.14, 2023
Date of report issued: Dec.07, 2023
Test Result : PASS*

Remark:

* In the configuration tested, the EUT complied with the standards specified above.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full without prior written permission of the company.

The report would be invalid without specific stamp of test institute and the signatures of compiler and approver

Prepared By

Shenzhen ETR Standard Technology Co., Ltd.

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Report Revision History		
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1 Test Summary

Test Item	Section in CFR 47	Result	Test by
Antenna requirement	15.203 RSS-Gen Section 6.8	Pass	/
Conducted emission	15.207 RSS-Gen Section 8.8	N/A	/
Transmitter field strength	15.231(b) RSS210 Annex D	Pass	Yvan
Radiated emission and Restricted band	15.205 and 15.209 RSS-210 D& RSS-Gen Clause 8.9&8.10	Pass	Yvan
Occupied Bandwidth	15.215 RSS-Gen 6.7	Pass	Yvan
Release time	15.231(a)(2) RSS-210 D	Pass	Yvan

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013

Measurement Uncertainty

Test Item	Uncertainty Criterion	Measurement Uncertainty	Notes
Occupied Channel Bandwidth	±5%	±0.55%	(1)
RF output power, conducted	±1.5dB	±0.99dB	(1)
Power Spectral Density, conducted	±3dB	±0.61dB	(1)
Unwanted Emissions, conducted	±3dB	±0.64dB	(1)
AC Power Line Conducted Emission	±6dB	± 3.02 dB	(1)
Radiated emissions Below 1GHz	±6dB	±4.30 dB	(1)
Radiated emissions Above 1GHz	±6dB	±4.35 dB	(1)

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

2 General Information

2.1 General Description of EUT

Product Name:	Industrial Radio Remote Control
Model No.:	H112,H110,H210,H212,M106,M108,Alpha540ZG,Alpha570ZG,L4,L6,L8,L10,L6B,L8B
Test Model:	H112
Model of difference:	All the model are the same circuit and RF module, except the model names.
Sample(s) Status:	Engineer sample
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	433.92MHz
Channel numbers:	1
Channel separation:	N/A
Modulation type:	4GFSK
Antenna Type:	Spiral Antenna
Antenna gain:	0dBi Max (Declare by applicant)
Power supply:	DC 3V
Connecting I/O port(s)	Please refer to User's Manual

Note: For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual

2.2 Test mode

Test mode	Description
Mode 1	TX Mode: During test, Keep EUT is in continuous transmission mode, New battery is used during all test.

2.3 Description of Support Units

None.

2.4 Deviation from Standards

None.

2.5 Abnormalities from Standard Conditions

None.

2.6 Test Facility

Test laboratory: Shenzhen ETR Standard Technology Co., Ltd.
CNAS Registration Number: L11864
A2LA Certificate Number: 6640.01
FCC Designation Number: CN1326
FCC Test Firm Registration: 183064
IC Company Number: 28440

2.7 Test Location

All tests were performed at:

Laboratory location: No.103, No.10, Phase I, Zone 3, Xinxing Industrial Park, Xinhe, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Telephone: +86 755 85259392
Fax: +86 755 27219460

2.8 Additional Instructions

None.

3 Test Instruments list

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESCI7	100605	2023.3.02	2024.3.01
2	EMI Test Receiver	Rohde&schwarz	ESCI3	102696	2023.3.02	2024.3.01
3	Loop Antenna	schwarabeck	FMZB 1519 B	FMZB 1519 B	2022.3.11	2024.3.10
4	Broadband antenna	schwarabeck	VULB9168	1064	2022.3.11	2024.3.10
5	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2022.3.11	2024.3.10
6	amplifier	EMtrace	RP01A	50117	2023.3.02	2024.3.01
7	Artificial power network	schwarabeck	NSLK8127	8127483	2023.3.02	2024.3.01
8	Artificial power network	ETS	3186/2NM	1132	2023.3.02	2024.3.01
9	10dB attenuator	HUBER+SUHNER	10dB	/	2023.3.02	2024.3.01
10	amplifier	Space-Dtronics	EWLAN0118G-P40	19113001	2023.3.02	2024.3.01
11	Filter	Xingbo	XBLBQ-GTA19	210410-3-1	2023.3.06	2024.3.05
12	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2023.3.02	2024.3.01
13	Power detector box	MWRFTest	MW100-PSB	MW201020JYT	2023.10.18	2024.10.17
14	Power meter	Rohde&Schwarz	NRP-Z11	1138.3004.02-117725-vh	2023.03.30	2024.3.29
15	amplifier	SKET	LNPA_1840-50 (18-40GHz)	SK2019040302	2023.8.16	2024.8.15
16	Horn antenna	schwarabeck	BBHA 9170	946	2022.3.11	2024.3.10
17	Spectrum analyzer	Rohde&schwarz	FSU40	1166.1660K43	2023.8.16	2024.8.15

Note: the calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

Software Name	Manufacturer	Model	Version
Conducted	Farad	EZ-EMC	Ver.EMC-CON 3A1.1
Radiated	Farad	EZ-EMC	Ver.FA-03A2 RE

4 Test results and Measurement Data

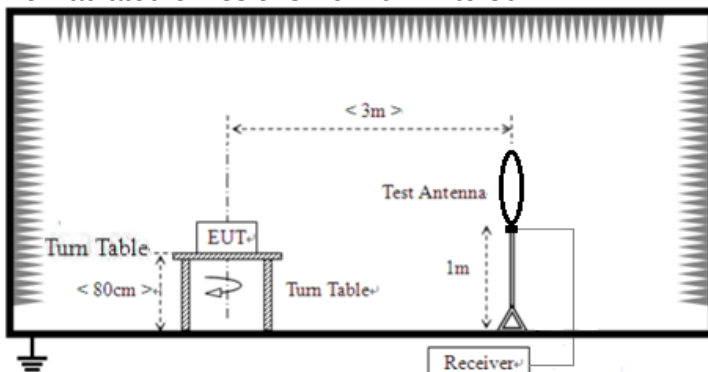
4.1 Antenna requirement

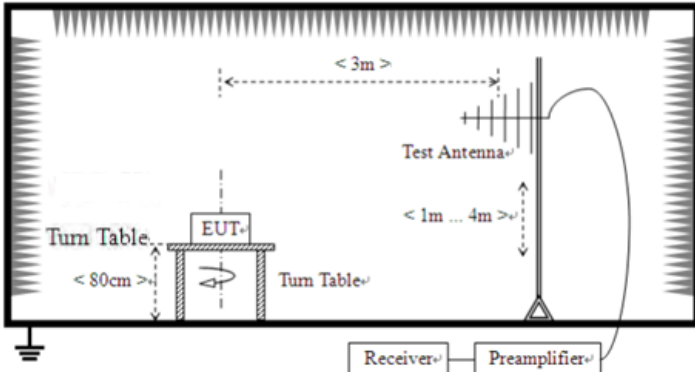
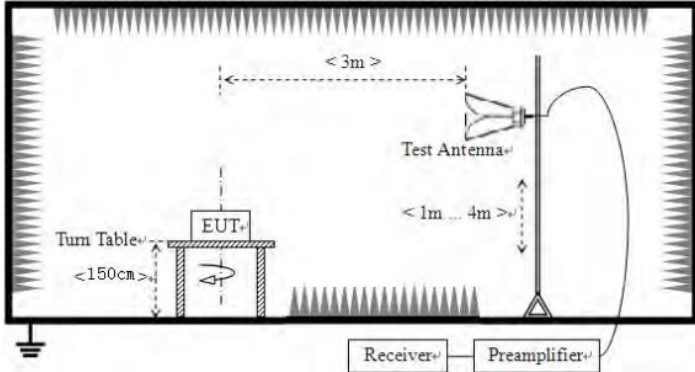
Standard requirement:
FCC part 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.
RSS-Gen 6.8: The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list. For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).
EUT Antenna:
<i>The antenna is Spiral antenna, the best case gain of the antenna is 0dBi, reference to the appendix II for details</i>

4.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207					
Test Method:	ANSI C63.10:2013					
Test Frequency Range:	150KHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto					
Limit:	Frequency range (MHz)		Limit (dBuV)			
			Quasi-peak		Average	
	0.15-0.5		66 to 56*		56 to 46*	
	0.5-5		56		46	
	5-30		60		50	
* Decreases with the logarithm of the frequency.						
Test setup:	Reference Plane 40cm LISN AUX Equipment E.U.T 80cm LISN Filter AC power EMI Receiver Test table/Insulation plane Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m					
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.					
Test Instruments:	Refer to section 3.0 for details					
Test mode:	Refer to section 2.2 for details					
Test environment:	Temp.:	/ °C	Humid.:	/%	Press.:	/mbar
Test voltage:	/					
Test results:	N/A EUT power by battery 3.0V, So this test item not applicable.					

4.3 Radiated Emission Measurement

Test Requirement:	FCC Part15 C Section 15.209 & 15.231 (b) and 15.205(a). RSS-210 D & RSS-Gen Clause 8.9&8.10				
Test Method:	ANSI C63.10: 2013 & RSS-Gen				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	9kHz-150kHz	Quasi-peak	200Hz	300Hz	Quasi-peak Value
	150kHz-30MHz	Quasi-peak	9kHz	10kHz	Quasi-peak Value
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit: (Field strength of the fundamental signal)	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	11250 to 3750		1125 to 375	
	174-260	3.750		375	
	260-470	13750 to 12500		1375 to 1250	
	Above 470	12500		1250	
Limit: (Spurious Emissions)	Frequency	Limit (uV/m)		Remark	
	0.009MHz-0.490MHz	2400/F(kHz) @300m		Quasi-peak Value	
	0.490MHz-1.705MHz	24000/F(kHz) @30m		Quasi-peak Value	
	1.705MHz-30.0MHz	30 @30m		Quasi-peak Value	
	30MHz-88MHz	100 @3m		Quasi-peak Value	
	88MHz-216MHz	150 @3m		Quasi-peak Value	
	216MHz-960MHz	200 @3m		Quasi-peak Value	
	960MHz-1GHz	500 @3m		Quasi-peak Value	
	Above 1GHz	500 @3m		Average Value	
		5000 @3m		Peak Value	
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.				
Test setup:	For radiated emissions from 9kHz to 30MHz 				

	For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 					
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 3.0 for details					
Test mode:	Refer to section 2.2 for details					
Test environment:	Temp.:	26.1 °C	Humid.:	49%	Press.:	1012mbar
Test voltage:	DC 3V					
Test results:	Pass					

Measurement Data

4.3.1 Field Strength of Fundamental

Peak value:

Frequency (MHz)	Read Level (dBuV/m)	Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
433.92	84.54	-16.01	68.53	100.83	-32.30	Vertical
433.92	84.87	-16.01	68.86	100.83	-31.97	Horizontal

Average value:

Frequency (MHz)	Peak Level (dBuV/m)	DC Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
433.92	68.53	-10.36	58.17	80.83	-22.66	Vertical
433.92	68.86	-10.36	58.50	80.83	-22.33	Horizontal

Remark: Average=Peak+ Duty Cycle factor (see 4.5 clause)

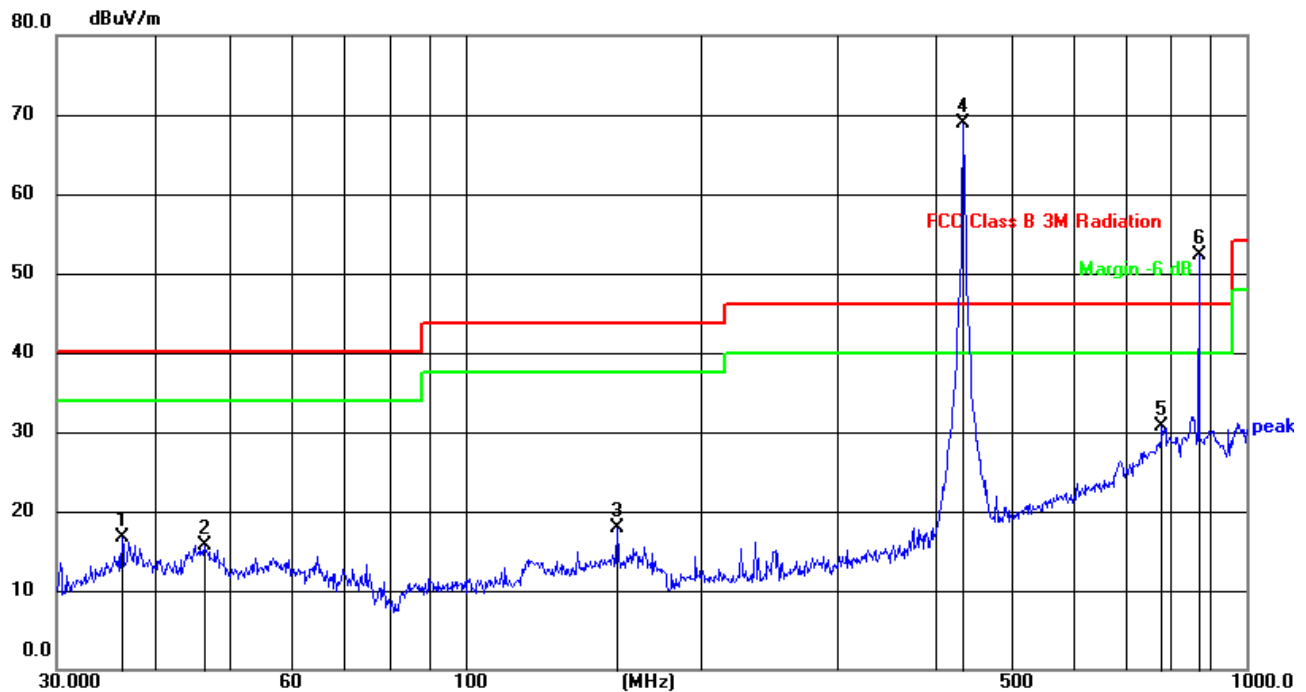
4.3.2 Spurious emissions and Bandedge

■ Below 30MHz

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

■ Below 1GHz

Horizontal:



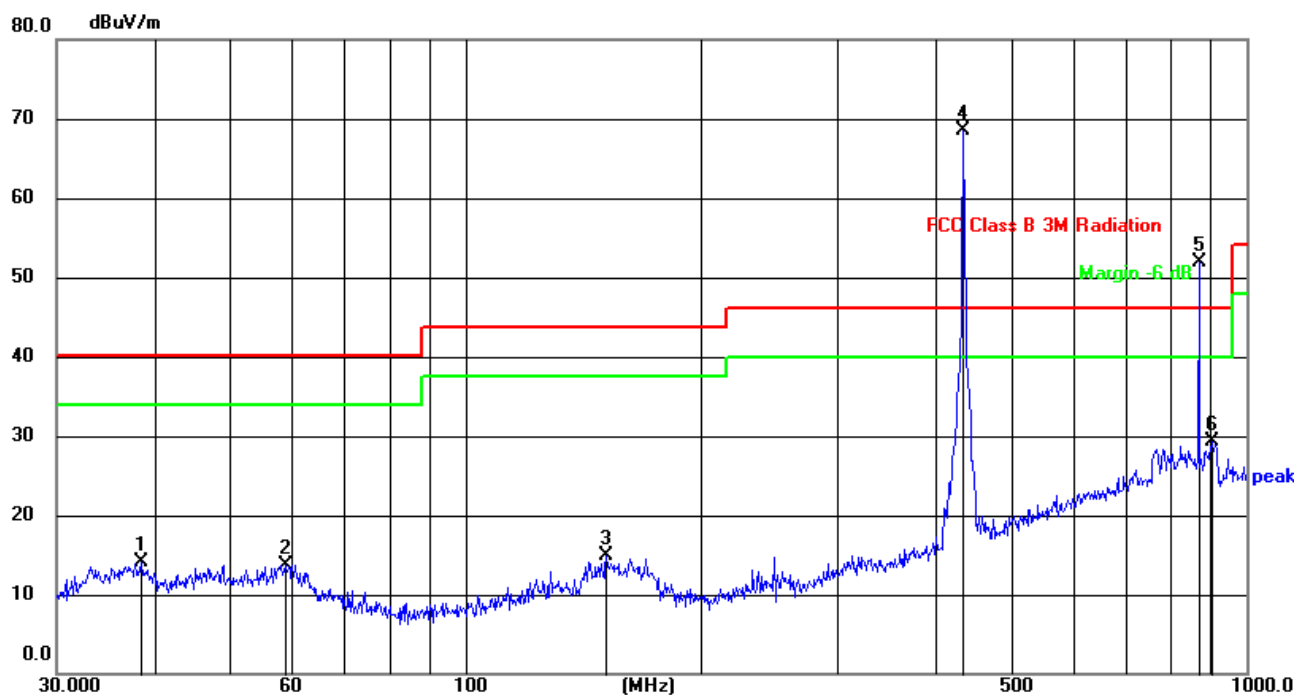
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	36.3813	38.13	-21.50	16.63	40.00	-23.37	QP
2	46.3402	37.09	-21.36	15.73	40.00	-24.27	QP
3	156.4576	38.48	-20.55	17.93	43.50	-25.57	QP
4	434.0649	84.87	-16.01	68.86	46.00	22.86	peak
5	779.6067	37.90	-7.15	30.75	46.00	-15.25	QP
6	869.1300	58.30	-5.95	52.35	46.00	6.35	peak

Average value:

Frequency (MHz)	Peak Level (dBuV/m)	DC Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
869.1300	52.35	-10.36	41.99	60.83	-18.84	Horizontal

Remark: Average=Peak+ Duty Cycle factor

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.4808	35.34	-21.18	14.16	40.00	-25.84	QP
2	58.8185	36.23	-22.46	13.77	40.00	-26.23	QP
3	151.5971	35.50	-20.51	14.99	43.50	-28.51	QP
4	434.0649	84.54	-16.01	68.53	46.00	22.53	peak
5	869.1300	57.89	-5.95	51.94	46.00	5.94	peak
6	903.3093	34.73	-5.34	29.39	46.00	-16.61	QP

Average value:

Frequency (MHz)	Peak Level (dBuV/m)	DC Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
869.1300	51.94	-10.36	41.58	60.83	-19.25	vertical

Average=Peak+ Duty Cycle factor

■ Above 1GHz

Peak value:

No.	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Polar
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(H/V)
1	1301.332	66.86	-15.66	51.20	74.00	-22.80	Horizontal
2	1736.483	66.84	-15.90	50.94	74.00	-23.06	Horizontal
3	2168.510	60.04	-15.38	44.66	74.00	-29.34	Horizontal
4	2603.351	62.54	-13.64	48.90	74.00	-25.10	Horizontal
1	1301.174	63.49	-15.66	47.83	74.00	-26.17	Vertical
2	1736.273	56.65	-15.90	40.75	74.00	-33.25	Vertical
3	2168.247	56.15	-15.38	40.77	74.00	-33.23	Vertical
4	2608.020	65.43	-13.63	51.80	74.00	-22.20	Vertical

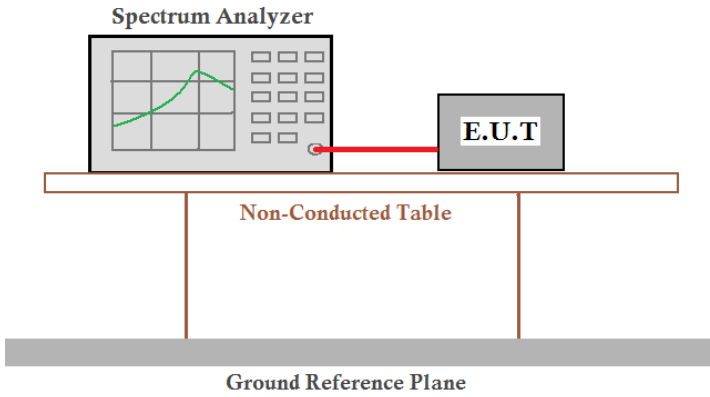
Average value:

No.	Frequency	Peak	DC Factor	Result	Limits	Margin	Polar
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(H/V)
1	1301.332	51.20	-10.36	40.84	54.00	-13.16	Horizontal
2	1736.483	50.94	-10.36	40.58	54.00	-13.42	Horizontal
3	2168.510	44.66	-10.36	34.30	54.00	-19.70	Horizontal
4	2603.351	48.90	-10.36	38.54	54.00	-15.46	Horizontal
1	1301.174	47.83	-10.36	37.47	54.00	-16.53	Vertical
2	1736.273	40.75	-10.36	30.39	54.00	-23.61	Vertical
3	2168.247	40.77	-10.36	30.41	54.00	-23.59	Vertical
4	2608.020	51.80	-10.36	41.44	54.00	-12.56	Vertical

Remark:

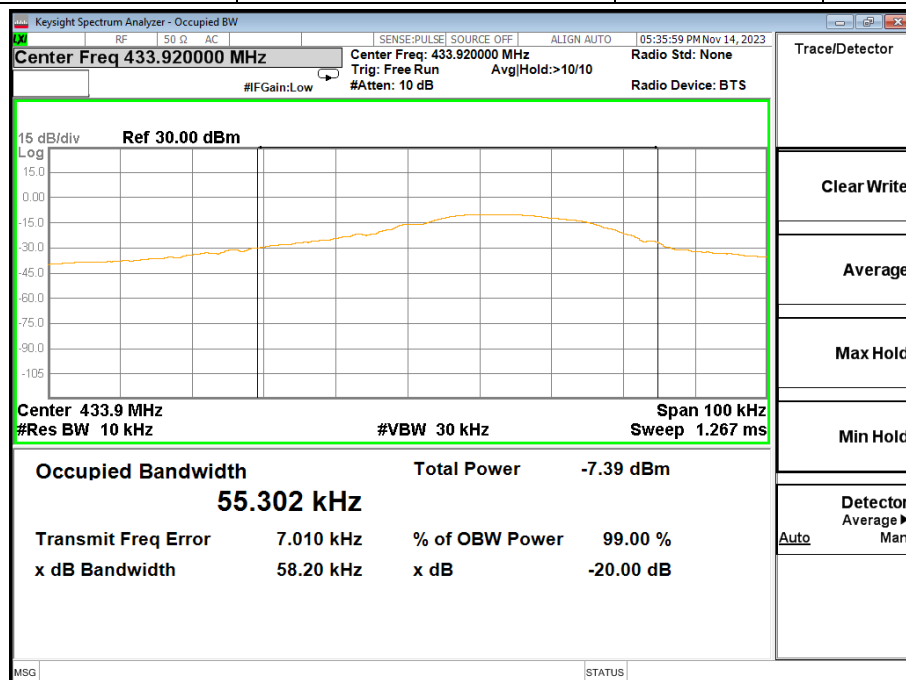
1. Final Level =Receiver Read level +Correction Factor(Antenna Factor + Cable Loss – Preamplifier Factor)
2. The emission levels of other frequencies are more than 20 dB below the limit and not show in test report.
3. “*”, means this data is the too weak instrument of signal is unable to test.
4. Average=Peak+ Duty Cycle factor

4.4 20dB Occupy Bandwidth

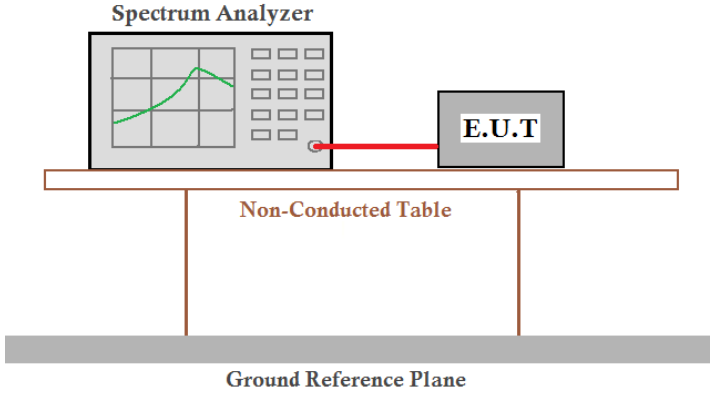
Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Limit:	20dB bandwidth of the emissions shall not exceed 0.25% of the center frequency
Test setup:	
Test Procedure:	With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

Measurement Data

Center Frequency	20dB bandwidth(kHz)	Limit(kHz)	Result
433.92MHz	58.20	1084.8	Pass



4.5 DUTY CYCLE

Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Procedure:	1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. 2. The Duty Cycle Was Determined By The Following Equation: To Calculate The Actual Field Intensity,The Duty Cycle Correction Factor In Decibel Is Needed For Later Use And Can Be Obtained From Following Conversion Duty Cycle(%)=Total On Interval In A Complete Pulse Train/ Length Of A Complete Pulse Train * % Duty Cycle Correction Factor(Db)=20 * Log10(Duty Cycle(%))
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

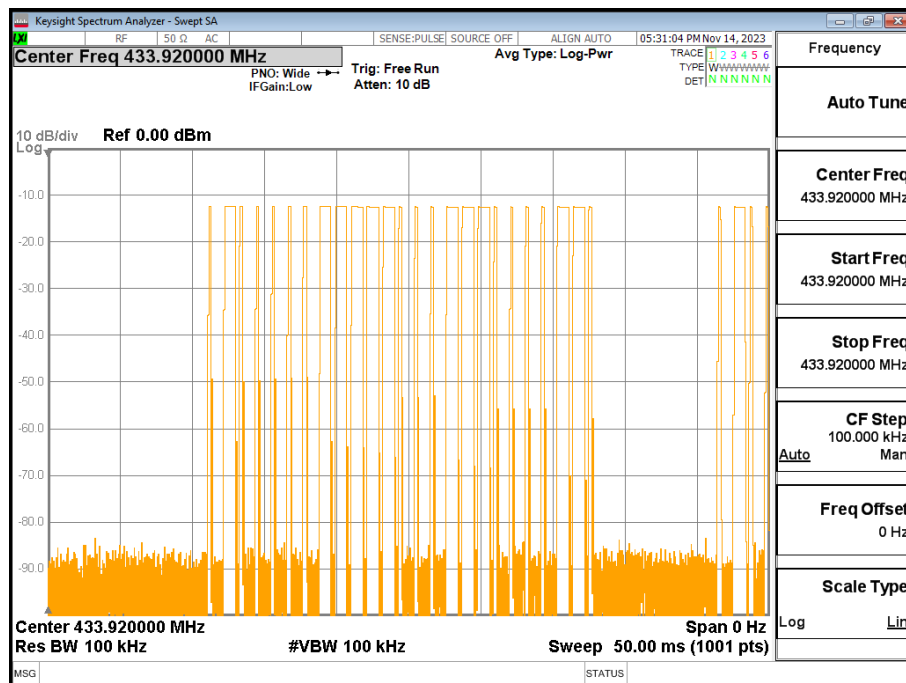
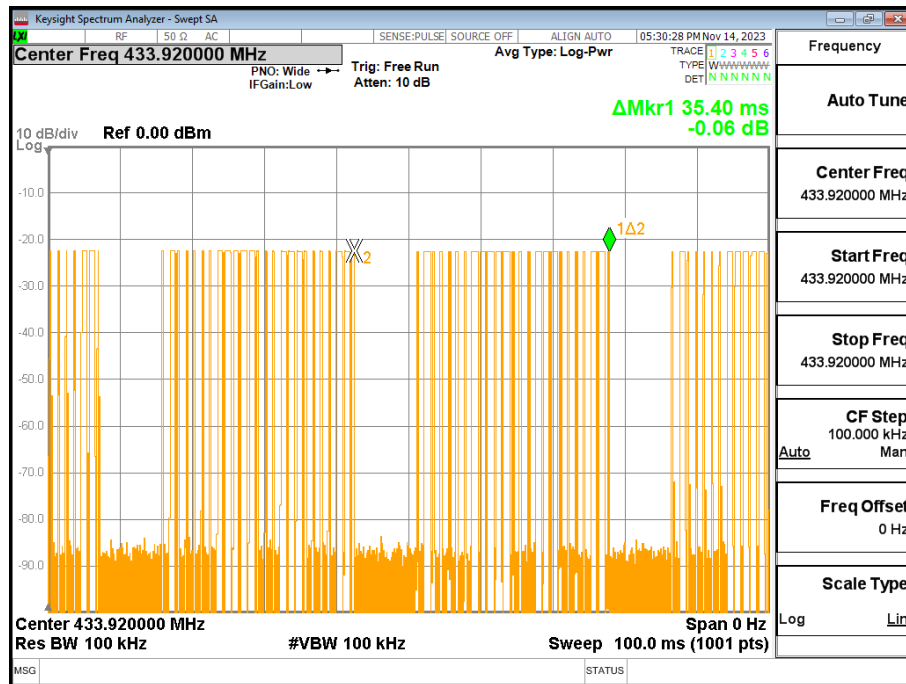
Test data:

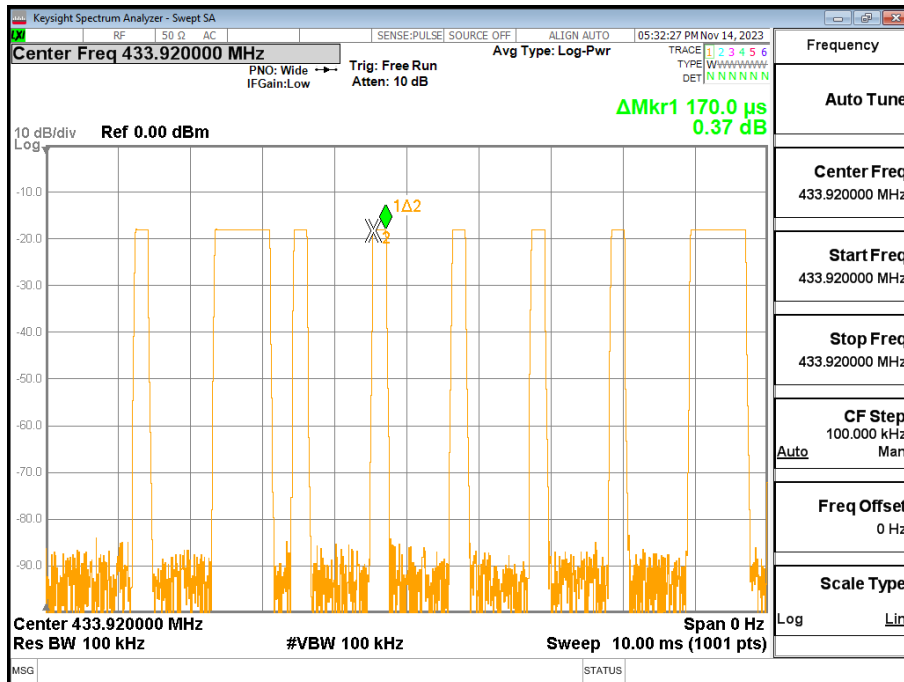
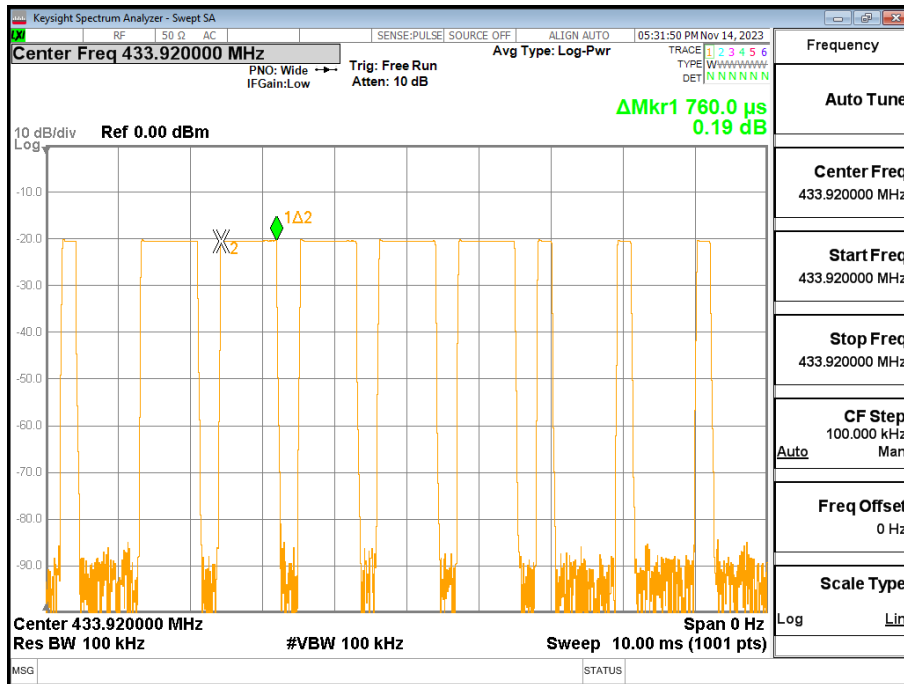
$$T_{on} = (0.17 \times 14 + 0.76 \times 11) \text{ms} = 10.74 \text{(ms)}$$

$$T_p = 35.40 \text{(ms)}$$

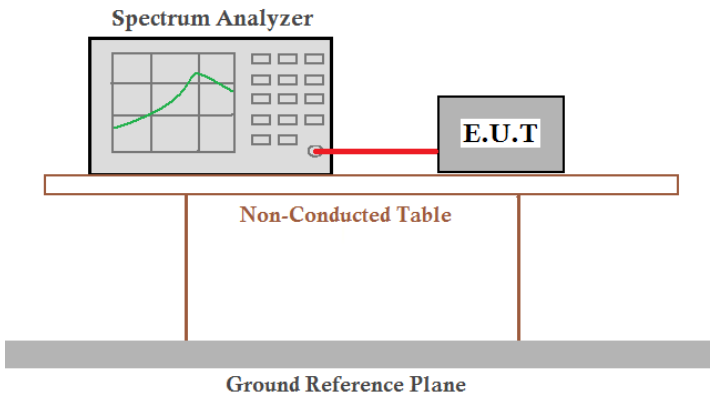
$$\text{Duty cycle} = T_{on} / T_p \times 100\% = 10.74 / 35.40 \times 100\% = 30.34\%$$

$$\text{DC Correction Factor} = 20 \log (T_{on} / T_p) = 20 \log (10.74 / 35.40) = -10.36 \text{dB}$$

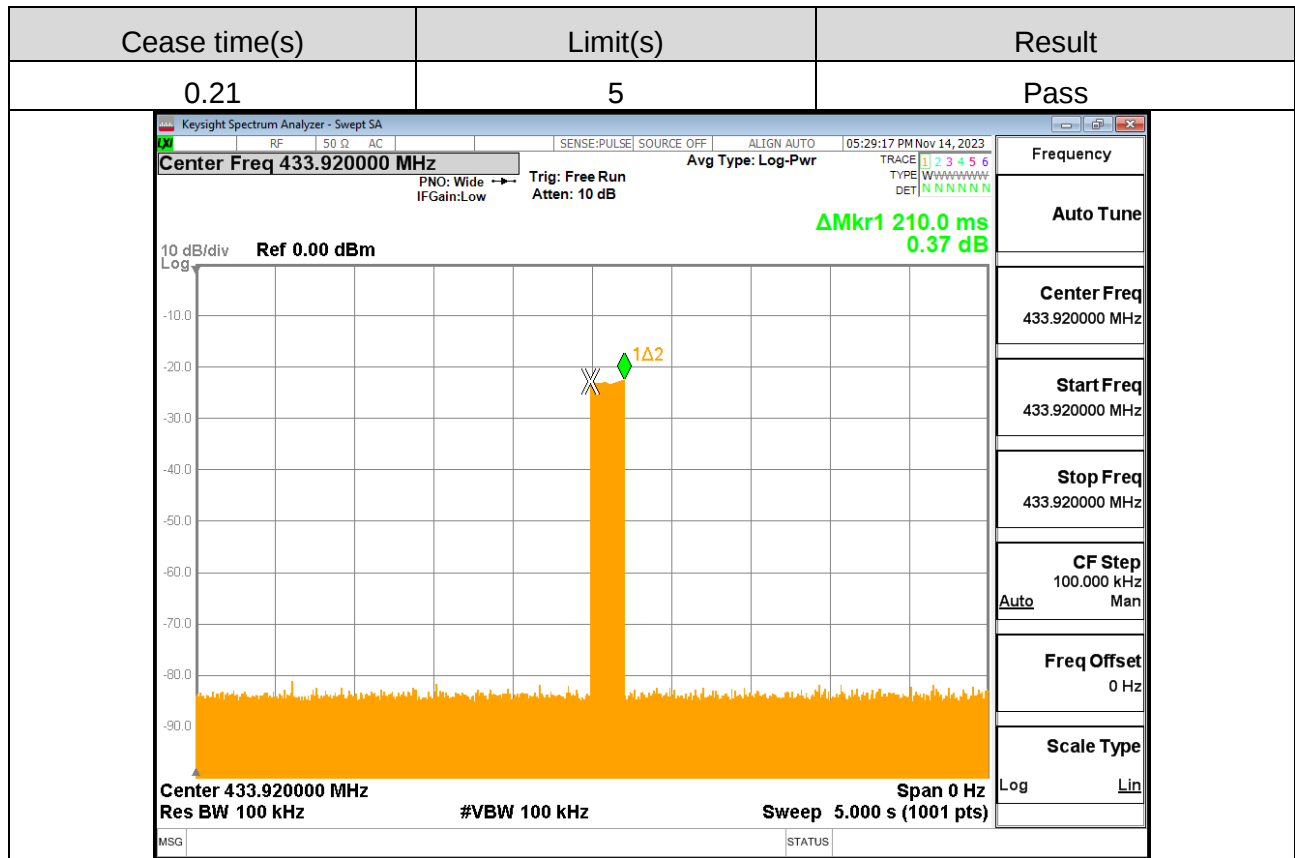




4.6 Release time

Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Limit:	.
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.
Test Procedure:	The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum Setting: RBW= 1MHz, VBW=3MHz, Sweep time = 10s. Note: (1)Refer to the plot (As Below), We find a manumotive operated transmitter shall employ a switch that will automatically deactivate the transmitteri immediately, within not more than 5 seconds of being released. (2)The EUT is comply with FCC PART 15 clause 15.231(a)(1). Manumotive working mode are pre-tested. and only the worst result is reported
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

Test Result:



5 Test Setup Photo

Reference to the **appendix I** for details.

6 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----