



Report No.: ET-24111742E02

TEST REPORT

Applicant: KEYDIY
Address of Applicant: Room 201, Building A, 5#, Chuangwei Innovation Valley,
Tangtou No.1 Road, Shiyan Subdistrict, Bao'an Shenzhen
Manufacturer/Factory: SHENZHEN YI CHE TECHNOLOGY CO.,LTD
Address of
Manufacturer/Factory: Room 201, Building A, 5#, Chuangwei Innovation Valley,
Tangtou No.1 Road, Shiyan Subdistrict, Bao'an Shenzhen
Product Name: Automotive Keys System
Model No.: X4
Trade Mark: KEYDIY
FCC ID: 2A3LS-X4
Applicable standards: FCC Part 15.231
Test procedure: ANSI C63.10-2013
Date of Test: Nov.04, 2024-Dec.07, 2024
Date of report issued: Dec.08, 2024

Remark:

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

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ET-24111742E02	Original	Dec.08, 2024

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1 Test Summary

Test Item	Section in CFR 47	Result	Test by
Antenna requirement	15.203	Pass	/
Conducted emission	15.207	N/A	/
Transmitter field strength	15.231(b)	Pass	Yvan
Radiated emission and Restricted band	15.205 and 15.209	Pass	Jason Huang
Occupied Bandwidth	15.215	Pass	Yvan
Release time	15.231(a)(2)	Pass	Yvan

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. Test according to ANSI C63.10:2013
3. Note: Compliance determination rules
 - 1).The Compliance determination of test results does not take into account measurement uncertainty. Measurement results are determined based on regulatory limitations or requirements specified by the applicant/manufacturer. If measurement uncertainty is taken into account, the applicant/manufacturer will bear all possible risks of non-compliance.
 - 2).The measurement uncertainty please refer to each test result in the "Measurement Uncertainty"

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	± 2.64dB	(1)
Radiated emissions Below 1GHz	±6dB	±4.32 dB	(1)
Radiated emissions Above 1GHz	±6dB	±4.56 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:	Automotive Keys System
Model No.:	X4
Model of difference:	N/A
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:	ASK
Antenna Type:	PCB Antenna
Antenna gain:	-11.89dBi Max (Declare by applicant)
Battery:	DC 3.7V 3500mAh
Power supply:	DC 3.7V
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

Equipment	Model	S/N	Manufacturer
/	/	/	/

2.4 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

2.5 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

2.6 Additional Instructions

None.

3 Test Instruments list

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESC17	100605	2024.3.12	2025.3.11
2	EMI Test Receiver	Rohde&schwarz	ESC13	102696	2024.3.12	2025.3.11
3	Loop Antenna	schwarabeck	FMZB 1519 B	FMZB 1519 B	2024.3.19	2026.3.18
4	Broadband antenna	schwarabeck	VULB9168	1064	2024.3.19	2026.3.18
5	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2024.3.19	2026.3.18
6	amplifier	EMtrace	RP01A	50117	2024.3.12	2025.3.11
7	Artificial power network	schwarabeck	NSLK8127	8127483	2024.3.12	2025.3.11
8	Artificial power network	ETS	3186/2NM	1132	2024.3.12	2025.3.11
9	10dB attenuator	HUBER+SUHNER	10dB	/	2024.3.12	2025.3.11
10	amplifier	Space-Dtronics	EVLAN0118 G-P40	19113001	2024.3.12	2025.3.11
11	Filter	Xingbo	XBLBQ-GTA19	210410-3-1	2024.3.12	2025.3.11
12	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2024.3.12	2025.3.11
13	Power detector box	MWRFtest	MW100-PSB	MW201020JYT	2024.3.12	2025.3.11

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

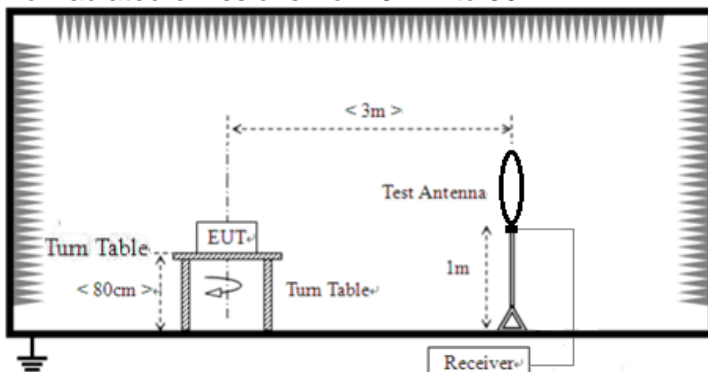
Standard requirement:
<p>FCC part 15.203 requirement:</p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to 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.</p>
<p>RSS-Gen 6.8:</p> <p>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.</p> <p>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).</p>
EUT Antenna:
<p><i>The antenna is PCB antenna, the best case gain of the antenna is -11.89dBi, reference to the appendix II for details</i></p>

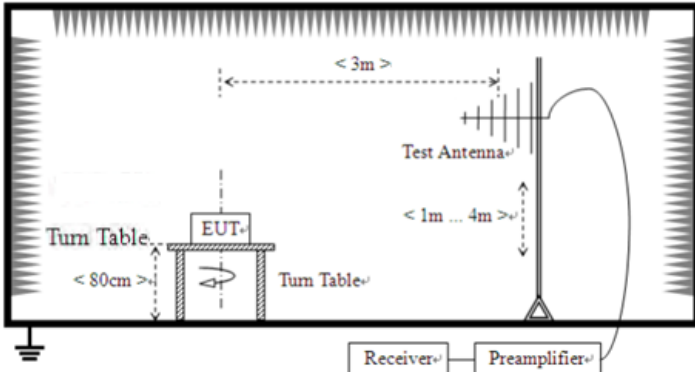
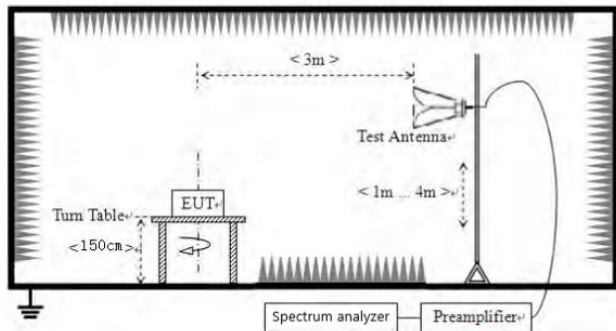
4.2 Conducted Emissions

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:	<div><div><div>Reference Plane</div><div>40cm</div><div><div>LISN</div><div><div>AUX Equipment</div><div>E.U.T</div></div><div>80cm</div><div><div>LISN</div><div>Filter</div><div>AC power</div></div><div>EMI Receiver</div></div><div>Test table/Insulation plane</div></div><div><div>Remark:</div><div>E.U.T: Equipment Under Test</div><div>LISN: Line Impedance Stabilization Network</div><div>Test table height=0.8m</div></div></div>						
Test procedure:	<div>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.</div> <div>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).</div> <div>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.</div>						
Test Instruments:	Refer to section 3.0 for details						
Test mode:	Refer to section 2.2 for details						
Test environment:	Temp.:	24.0 °C	Humid.:	42%	Press.:	1012mbar	
Test voltage:	AC 120V						
Test results:	Pass						

EUT without charging interface, powered by DC 3.7V battery. This project is 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 				

	<p>For radiated emissions from 30MHz to1GHz</p>  <p>For radiated emissions above 1GHz</p> 					
Test Procedure:	<ol style="list-style-type: none">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.:	28.1 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 3.7V					
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	103.20	-16.01	87.19	100.83	-13.64	Vertical
433.92	105.10	-16.01	89.09	100.83	-11.74	Horizontal

Average value:

Frequency (MHz)	Peak Level (dBuV/m)	DC Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
433.92	87.19	-12.16	75.03	80.83	-5.80	Vertical
433.92	89.09	-12.16	76.93	80.83	-3.90	Horizontal

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

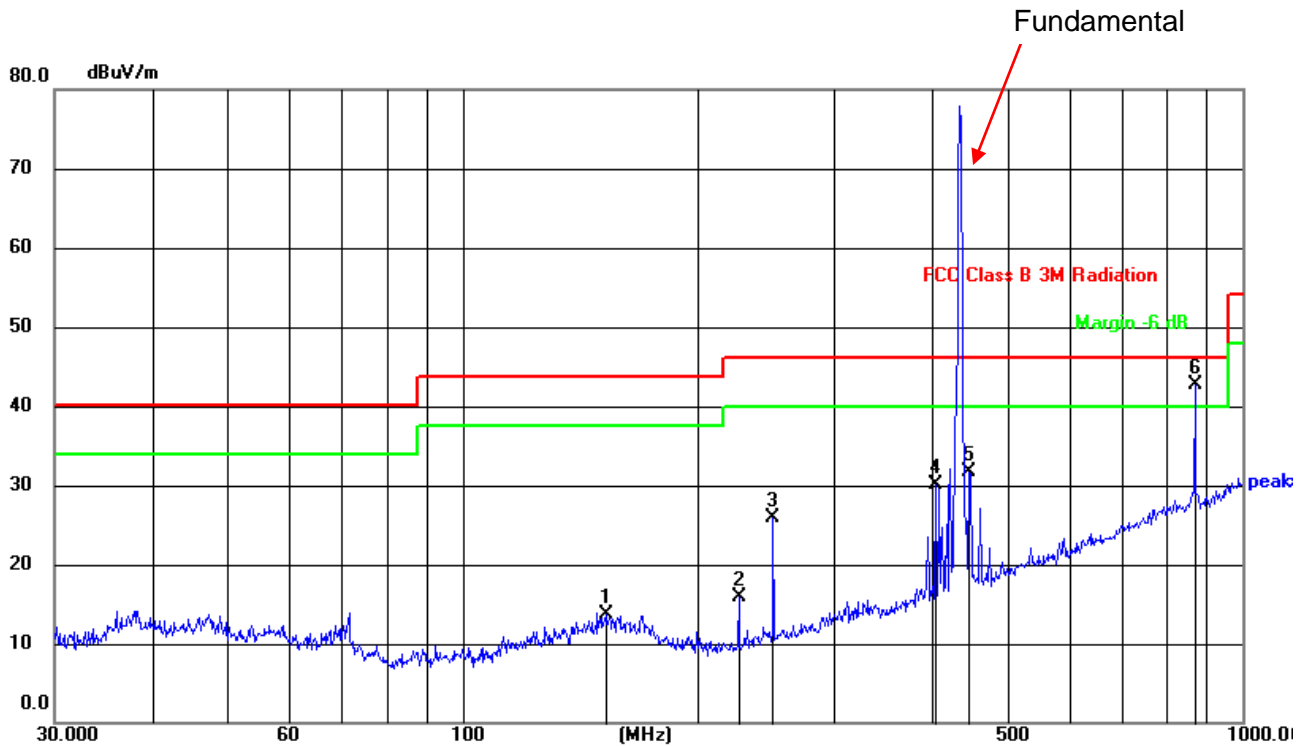
4.3.2 Spurious emissions and Bandedge

■ 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.

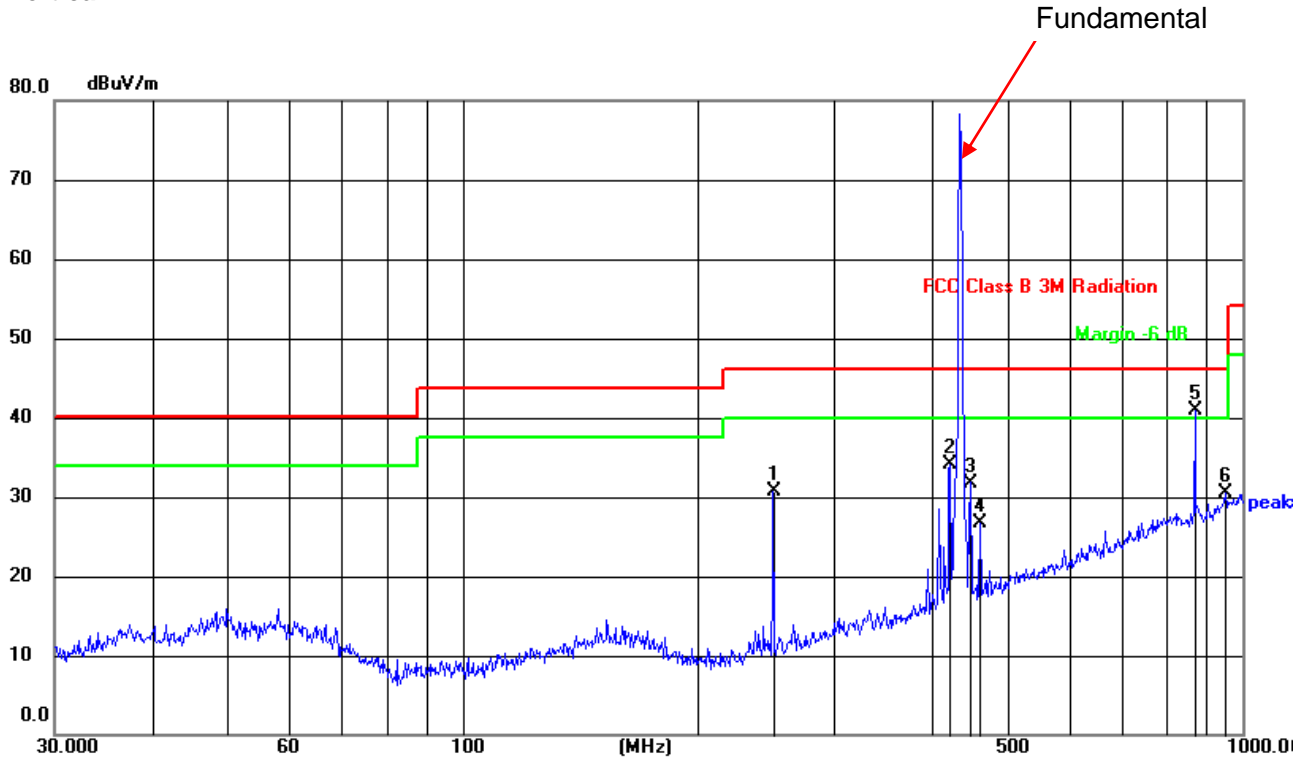
■ Below 1GHz

Horizontal:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	153.2003	34.31	-20.52	13.79	43.50	-29.71	QP
2	226.0994	39.20	-23.23	15.97	46.00	-30.03	QP
3	250.3011	48.22	-22.25	25.97	46.00	-20.03	QP
4	404.6665	47.18	-17.10	30.08	46.00	-15.92	QP
5	446.4140	47.41	-15.65	31.76	46.00	-14.24	QP
6	869.1302	48.64	-5.95	42.69	46.00	-3.31	QP

Vertical:



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	250.3012	52.96	-22.25	30.71	46.00	-15.29	QP
2	422.0577	50.53	-16.39	34.14	46.00	-11.86	QP
3	447.9822	47.40	-15.60	31.80	46.00	-14.20	QP
4	460.7271	42.33	-15.54	26.79	46.00	-19.21	QP
5	869.1302	46.81	-5.95	40.86	46.00	-5.14	QP
6	952.0937	34.20	-3.79	30.41	46.00	-15.59	QP

■ 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	67.34	-15.66	51.68	74.00	-22.32	Horizontal
2	1736.483	67.32	-15.9	51.42	80.83	-29.41	Horizontal
3	2168.510	61.64	-15.38	46.26	80.83	-34.57	Horizontal
4	2603.351	62.86	-13.64	49.22	80.83	-31.61	Horizontal
1	1301.174	59.69	-15.66	44.03	80.83	-36.8	Vertical
2	1736.273	60.14	-15.9	44.24	80.83	-36.59	Vertical
3	2168.247	61.29	-15.38	45.91	80.83	-34.92	Vertical
4	2608.020	69.36	-13.63	55.73	80.83	-25.10	Vertical

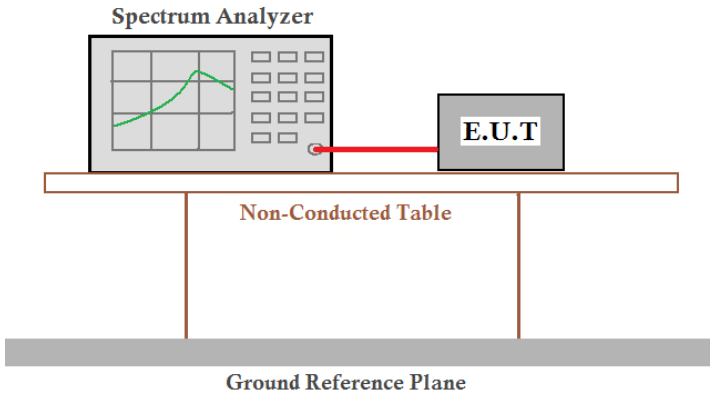
Average value:

No.	Frequency	Peak	DC Factor	Result	Limits	Margin	Polar
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(H/V)
1	1301.332	51.68	-12.16	39.52	54.00	-14.48	Horizontal
2	1736.483	51.42	-12.16	39.26	60.83	-21.57	Horizontal
3	2168.510	46.26	-12.16	34.10	60.83	-26.73	Horizontal
4	2603.351	49.22	-12.16	37.06	60.83	-23.77	Horizontal
1	1301.174	44.03	-12.16	31.87	60.83	-28.96	Vertical
2	1736.273	44.24	-12.16	32.08	60.83	-28.75	Vertical
3	2168.247	45.91	-12.16	33.75	60.83	-27.08	Vertical
4	2608.020	55.73	-12.16	43.57	60.83	-17.26	Vertical

Remark:

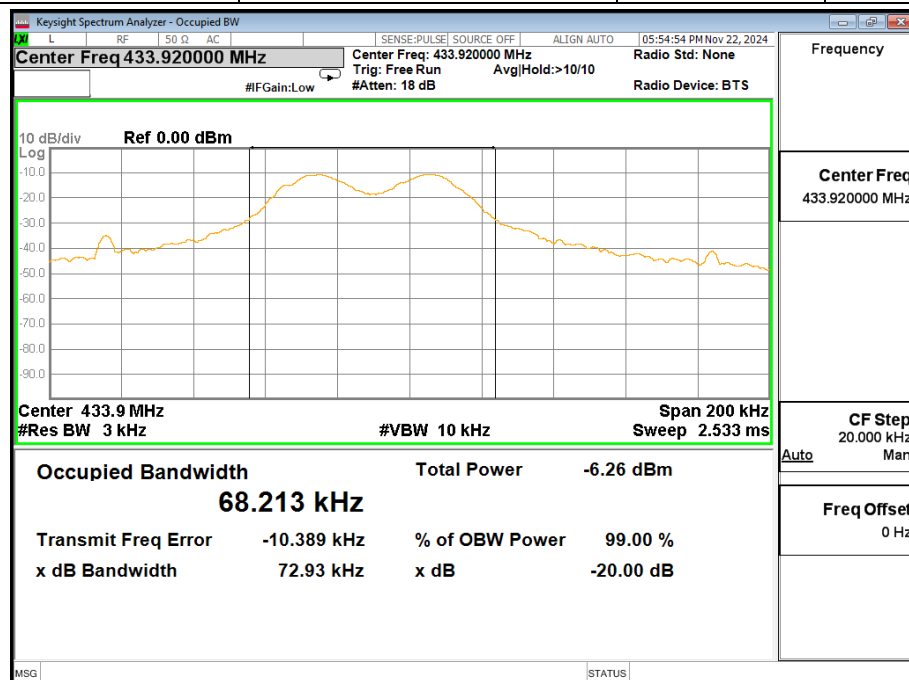
1. Final Level = Receiver Read level + Correction Factor (Antenna Factor + Cable Loss – Preamplifier Factor)
2. The emission levels of other frequencies are more than 20 dB below the limit and not show in test report.
3. “*”, means this data is the too weak instrument of signal is unable to test.
4.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

4.4 20dB Occupy Bandwidth

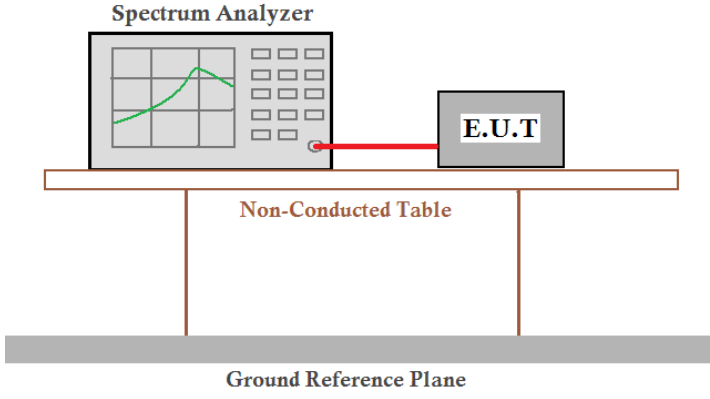
Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Limit:	20dB bandwidth of the emissions shall not exceed 0.25% of the center frequency
Test setup:	
Test Procedure:	With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected 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	72.93	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:	 <p>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.</p>
Test Procedure:	<ol style="list-style-type: none"> 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

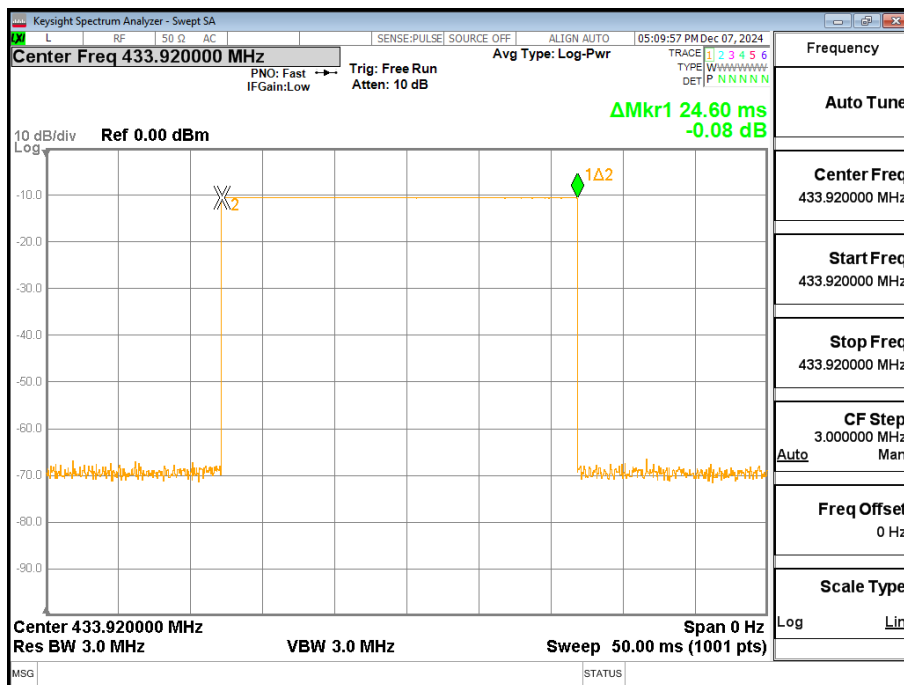
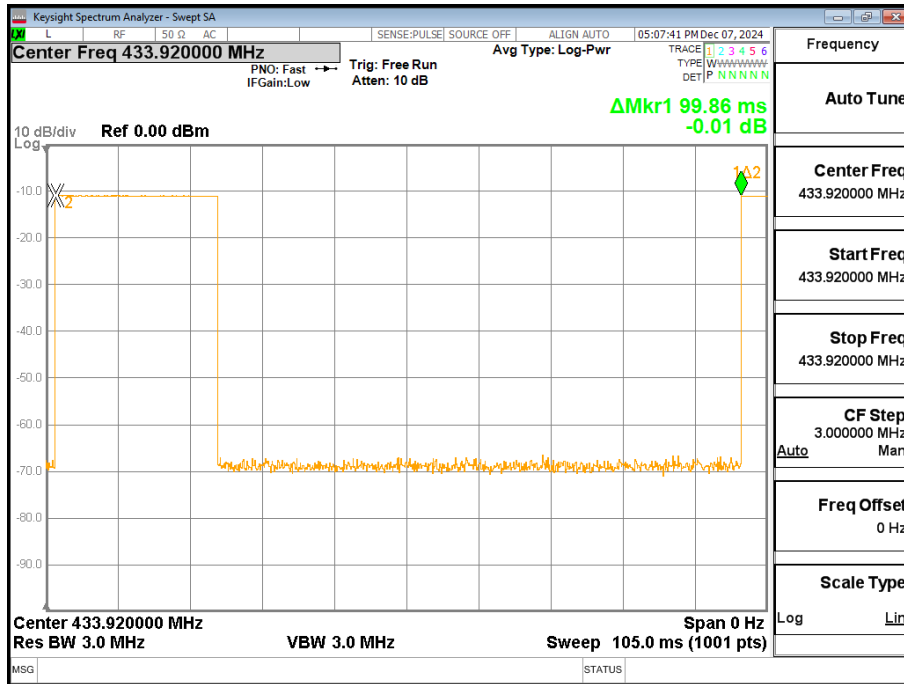
Test data:

$$T_{on} = (1 \times 24.6\text{ms}) = 24.6\text{ms}$$

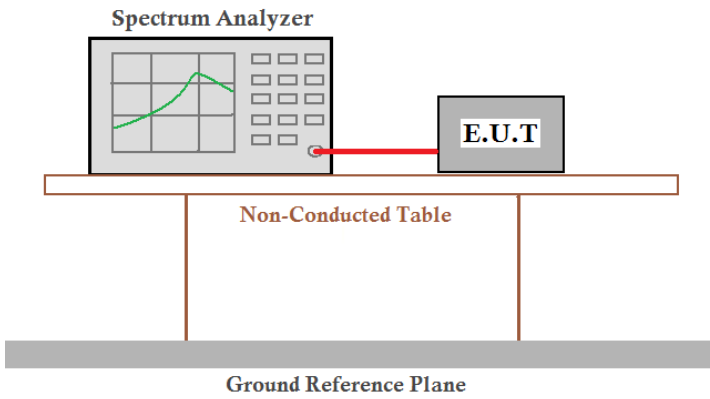
$$T_p = 99.86\text{ms}$$

$$\text{Duty cycle} = T_{on} / T_p \times 100\% = 24.6 / 99.86 \times 100\% = 24.63\%$$

$$\text{DC Correction Factor} = 20\log(\text{Duty cycle}) = 20\log(0.2463) = -12.16$$

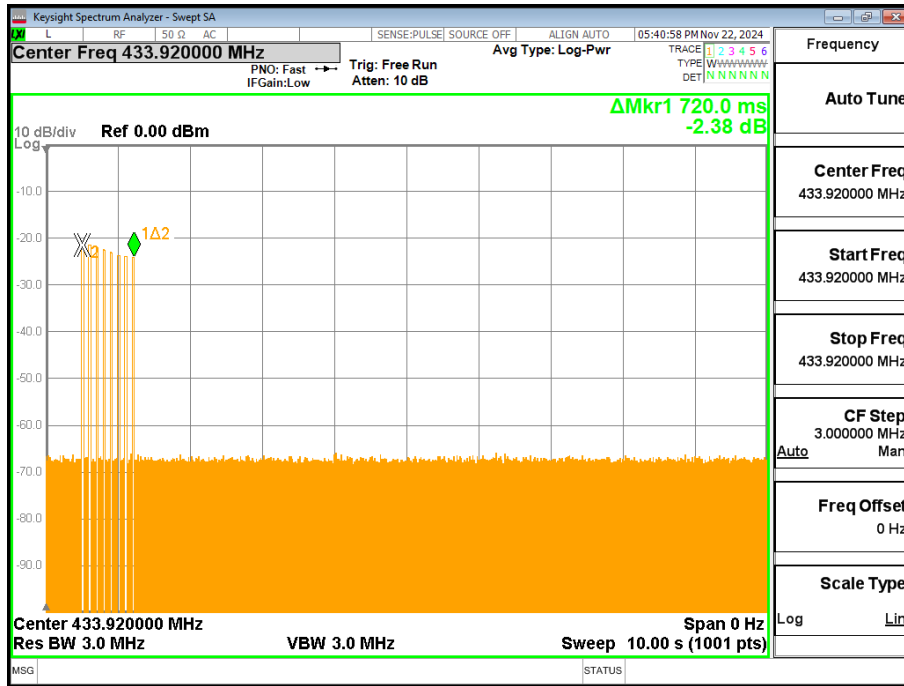


4.6 Release time

Test Requirement:	FCC Part15 C Section 15.231
Test Method:	ANSI C63.10:2013
Limit:	5s
Test setup:	 <p>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.</p>
Test Procedure:	<p>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:</p> <p>(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.</p> <p>(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</p>
Test Instruments:	Refer to section 3.0 for details
Test mode:	Refer to section 2.2 for details
Test results:	Pass

Test Result:

Cease time(s)	Limit(s)	Result
0.72	5	Pass



5 Test Setup Photo

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

6 EUT Constructional Details

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

-----End-----