TEST REPORT

Applicant:	Lifud Technology Co., Ltd.
Address of Applicant:	401-408, Block B, Building 1, Xingzhan Plaza, No.446, Nanhuan Rd., Shajing St., Bao'an Dist., Shenzhen, Guangdong 518104, China
Manufacturer:	Lifud Technology Co., Ltd.
Address of Manufacturer:	401-408, Block B, Building 1, Xingzhan Plaza, No.446, Nanhuan Rd., Shajing St., Bao'an Dist., Shenzhen, Guangdong 518104, China
Factory:	Sichuan Ledfriend Technology Co., Ltd.
Address of Factory:	Shigao Economic Renshou County, Sichuan Province, China

Equipment Under Test (EUT)

Product Name:	Remote Controller
Model No.:	LF-SCR001-433, LF-SCR002, LF-SCR003, LF-SCR004, LF-SCR002-1
FCC ID:	2BMEN-LFSCR001
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.231
Date of sample receipt:	November 19, 2024
Date of Test:	November 20-26, 2024
Date of report issued:	November 26, 2024
Test Result :	PASS *

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

Authorized Signature:

Robinson Luo
Laboratory Manager

This 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.

2 Version

Version No.	Date	Description
01	*November 26, 2024*	*Original*

Prepared By: ***Date:*** *November 26, 2024*

Project Engineer

Check By: ***Date:*** *November 26, 2024*

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203	Pass
Conduction Emission	15.207	N/A
Field strength of the Fundamental Signal	15.231 (b)	Pass
Spurious Emissions	15.231 (b)/15.209	Pass
20dB Bandwidth	15.231 (c)	Pass
Deactivation Testing	15.231 (a)(2)	Pass

Pass: The EUT complies with the essential requirements in the standard.

N/A: Not applicable.

4.1 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25\times10^{-8}$
2	Duty cycle	±0.37%
3	Occupied Bandwidth	±3%
4	RF conducted power	±0.75dB
5	RF power density	±3dB
6	Conducted Spurious emissions	±2.58dB
7	AC Power Line Conducted Emission	±3.44dB (0.15MHz~30MHz)
8	Radiated Spurious emission test	±3.1dB (9kHz-30MHz)
		±3.8039dB (30MHz-200MHz)
		±3.9679dB (200MHz-1GHz)
		±4.29dB (1GHz-18GHz)
		±3.30dB (18GHz-40GHz)
9	Temperature test	±1°C
10	Humidity test	±3%
11	Time	±3%

5 General Information

5.1 General Description of EUT

Product Name:	Remote Controller
Model No.:	LF-SCR001-433, LF-SCR002, LF-SCR003, LF-SCR004, LF-SCR002-1
Test Model No.:	LF-SCR001-433
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are silk screen and model name for commercial purpose.	
S/N:	N/A
Test sample(s) ID:	GTSL2024110410-1
Sample(s) Status:	Engineer sample
Operation Frequency:	433.92MHz
Modulation technology:	ASK
Antenna Type:	PCB Antenna
Antenna gain:	2dBi(declare by applicant)
Power supply:	DC 3V(2*1.5V Size"AAA" Battery)

Remark:
1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode
Remark: New battery is used during all test.	

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which only the worst case was shown in this test report(Only show the worst case:Y axis) and defined as follows:

433.92MHz	Axis	X	Y	Z
	Field Strength(dBuV/m)	80.31	81.81	79.54

5.3 Description of Support Units

None.

5.4 Test Facility

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

● **FCC —Registration No.: 381383**

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

● **ISED—Registration No.: 9079A**

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing.

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
No.123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone,
Xixiang Road, Baoan District, Shenzhen, Guangdong, China
Tel: 0755-27798480
Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

5.7 Additional Instructions

EUT Software Settings:

Mode	Continuously transmitter by manufacturer, power set default

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Jun. 22, 2024	Jun. 21, 2027
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Apr. 11, 2024	Apr. 10, 2025
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	Mar. 19, 2023	Mar. 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	Apr. 17, 2023	Apr. 16, 2025
6	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	Apr. 11, 2024	Apr. 10, 2025
7	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov.12, 2024	Nov.11, 2025
8	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	Apr. 11, 2024	Apr. 10, 2025
9	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	Apr. 11, 2024	Apr. 10, 2025
10	Horn Antenna (15GH-40GHz)	SCHWARZBECK	01296	GTS691	Mar. 07, 2024	Mar. 06, 2025
11	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	Mar. 12, 2024	Mar. 11, 2025
12	Amplifier	/	LNA-1000-30S	GTS650	Apr. 11, 2024	Apr. 10, 2025
13	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS692	Nov. 07, 2024	Nov. 06, 2025
14	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	Apr. 11, 2024	Apr. 10, 2025
15	Thermo meter	JINCHUANG	GSP-8A	GTS643	Apr. 18, 2024	Apr. 17, 2025
16	RE cable 1	GTS	N/A	GTS675	Jul. 02, 2024	Jul. 01, 2025
17	RE cable 2	GTS	N/A	GTS676	Jul. 02, 2024	Jul. 01, 2025
18	RE cable 3	GTS	N/A	GTS677	Jul. 02, 2024	Jul. 01, 2025
19	RE cable 4	GTS	N/A	GTS678	Jul. 02, 2024	Jul. 01, 2025
20	RE cable 5	GTS	N/A	GTS679	Jul. 02, 2024	Jul. 01, 2025
21	RE cable 6	GTS	N/A	GTS680	Jul. 02, 2024	Jul. 01, 2025
22	RE cable 7	GTS	N/A	GTS681	Jul. 05, 2024	Jul. 04, 2025
23	RE cable 8	GTS	N/A	GTS682	Jul. 05, 2024	Jul. 04, 2025
24	EMI Test Software	AUDIX	E3-6.100614a	GTS725	N/A	N/A

RF Conducted Test:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	Apr. 13, 2024	Apr. 12, 2025
2	EMI Test Receiver	R&S	ESCI 7	GTS552	Apr. 13, 2024	Apr. 12, 2025
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	Apr. 13, 2024	Apr. 12, 2025
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	Apr. 13, 2024	Apr. 12, 2025
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	Apr. 13, 2024	Apr. 12, 2025
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	Apr. 13, 2024	Apr. 12, 2025
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	Apr. 13, 2024	Apr. 12, 2025
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	Apr. 13, 2024	Apr. 12, 2025
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	Apr. 18, 2024	Apr. 17, 2025

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	KUMAO	SF132	GTS647	Apr. 18, 2024	Apr. 17, 2025

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
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.	
EUT Antenna:	
The antenna is PCB antenna, reference to the appendix II for details.	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.231 (b)& Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	9kHz to 6000MHz
Test site:	Measurement Distance: 3m

Receiver setup:

Frequency	Detector	RBW	VBW	Value
9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak
150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:
(Field strength of the fundamental signal)

Frequency	Limit (dBuV/m @3m)	Remark
433.92MHz	100.83	Peak Value
	80.83	Average Value

Limit:
(Spurious Emissions)

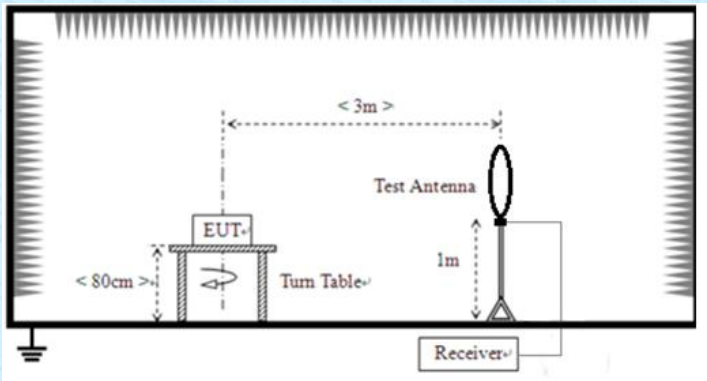
Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 735
174-260	3750	375
260-470	3750 to12500	375 to 1250
Above 470	12500	1250

Frequency (MHz)	Class B(dBuV/m @3m)	
	Peak	Average
Above 1000	74	54

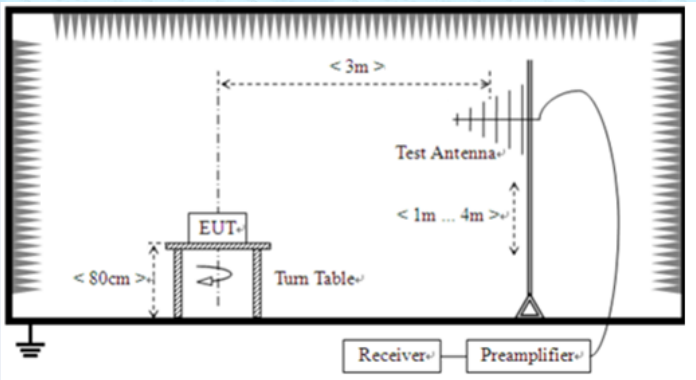
Or The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level whichever limit permits higher field strength.

Test setup:

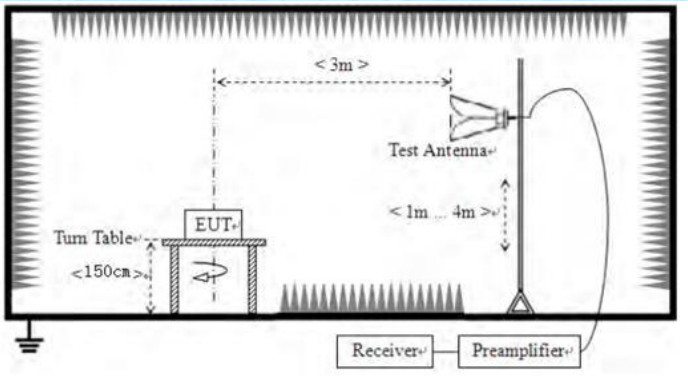
Below 30MHz



Below 1GHz



Above 1GHz



Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	50%	Press.:	1 010mbar
Test results:	Pass					

Measurement data:

7.2.1 Field Strength of The Fundamental Signal

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
433.92	88.89	15.58	3.99	32.23	76.23	100.83	-24.60	Vertical
433.92	94.47	15.58	3.99	32.23	81.81	100.83	-19.02	Horizontal

Average value:

Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	76.23	-7.65	68.58	80.83	-12.25	Horizontal
433.92	81.81	-7.65	74.16	80.83	-6.67	Vertical

Remarks:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

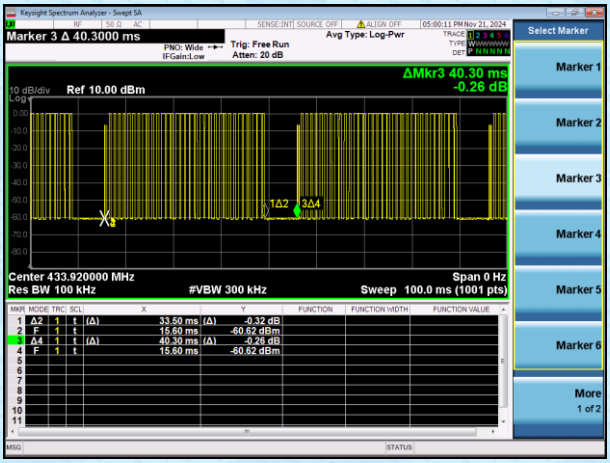
Average value:	
Calculate Formula:	Average value=Peak value + Duty Cycle Factor
	Duty cycle factor=20 log(Duty cycle)
	Duty cycle=on time/100 milliseconds or period, whichever is less
Test data:	T on time =16.71(ms)
	T period =40.30(ms)
	Duty cycle=0.415
	duty cycle factor=-7.65

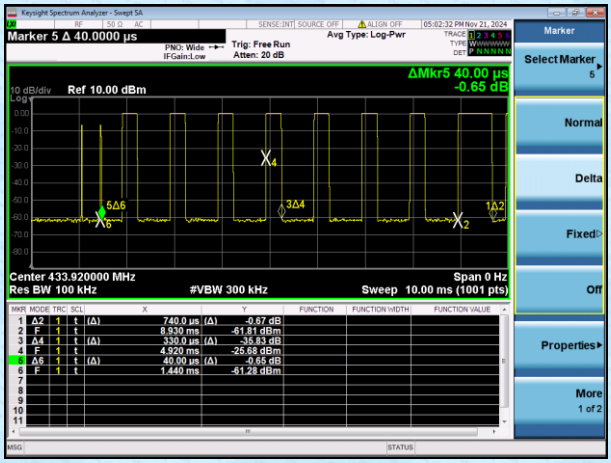
The formula as below:

T on time=(0.04*2)+(0.33*19)+(0.74*14)=0.08+6.27+10.36=16.71

Duty cycle= T on time/ T period=16.71/40.30=0.415

Test plot as follows:





7.2.2 Spurious Emissions

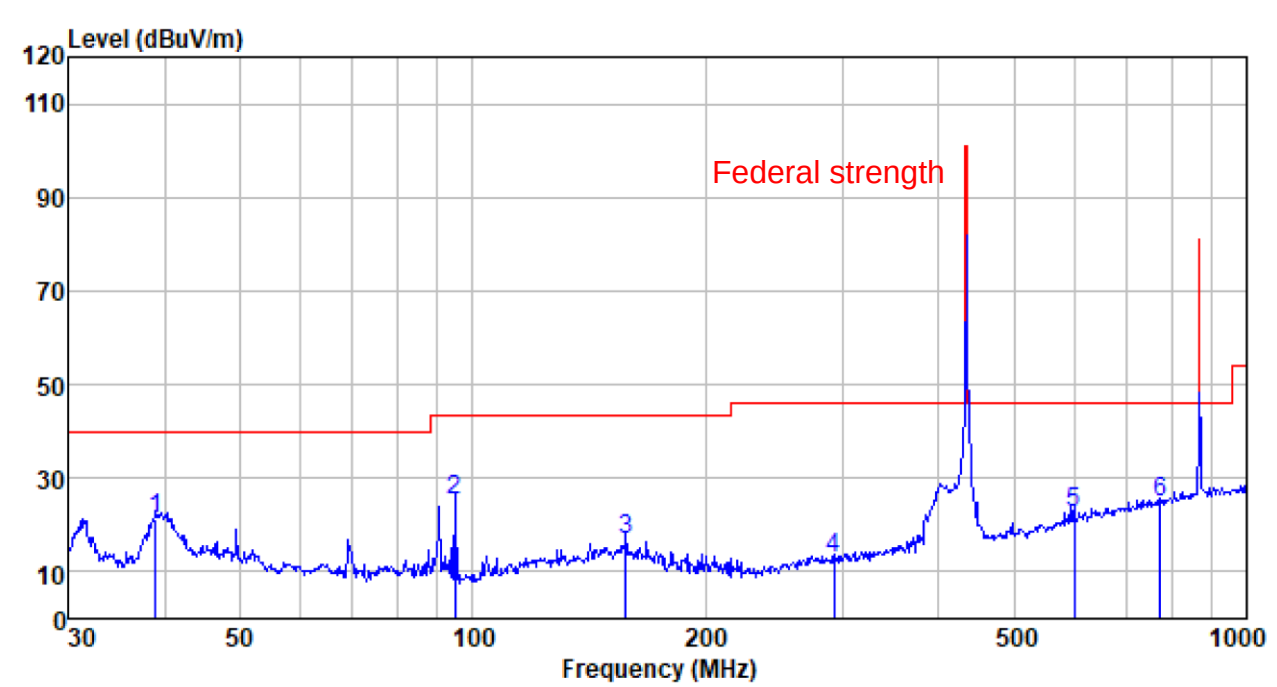
Measurement data:

9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

Below 1GHz:

Mode:	**Transmitting mode**	**Polarization:**	**Horizontal**



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
38.888	37.98	14.17	1.24	32.30	21.09	40.00	-18.91	QP
94.760	46.84	8.88	1.85	32.48	25.09	43.50	-18.41	QP
157.559	31.84	14.74	2.53	32.44	16.67	43.50	-26.83	QP
293.084	29.34	12.22	3.39	32.31	12.64	46.00	-33.36	QP
599.321	30.76	18.97	4.63	31.84	22.52	46.00	-23.48	QP
774.158	29.08	21.58	5.37	31.19	24.84	46.00	-21.16	QP

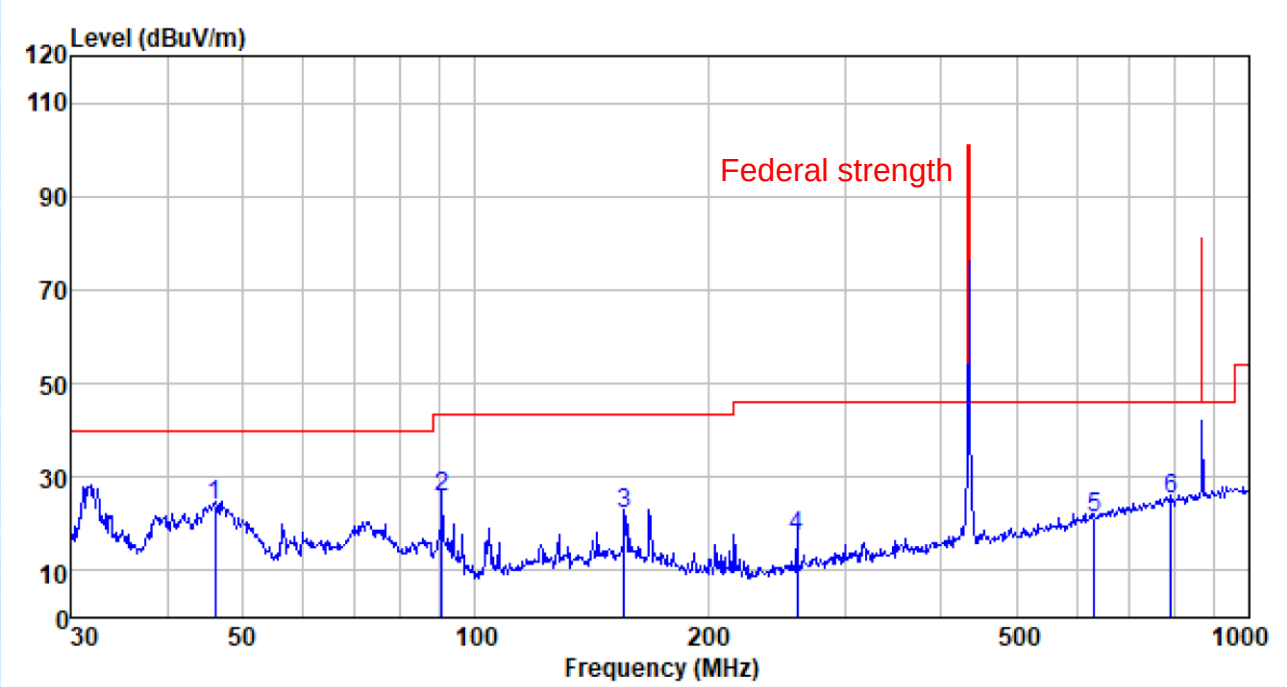
Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	49.98	22.76	5.65	31.10	47.29	80.83	-33.54	Horizontal

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cylcle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	47.29	-7.65	39.64	60.83	-21.19	Horizontal

Mode:	Transmitting mode	Polarization:	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
46.178	41.50	13.38	1.34	32.30	23.92	40.00	-16.08	QP
90.537	47.61	8.65	1.78	32.46	25.58	43.50	-17.92	QP
155.910	37.14	14.80	2.52	32.44	22.02	43.50	-21.48	QP
260.144	35.54	10.91	3.22	32.34	17.33	46.00	-28.67	QP
631.688	28.54	19.70	4.78	31.72	21.30	46.00	-24.70	QP
793.396	29.04	21.87	5.45	31.12	25.24	46.00	-20.76	QP

Peak value:

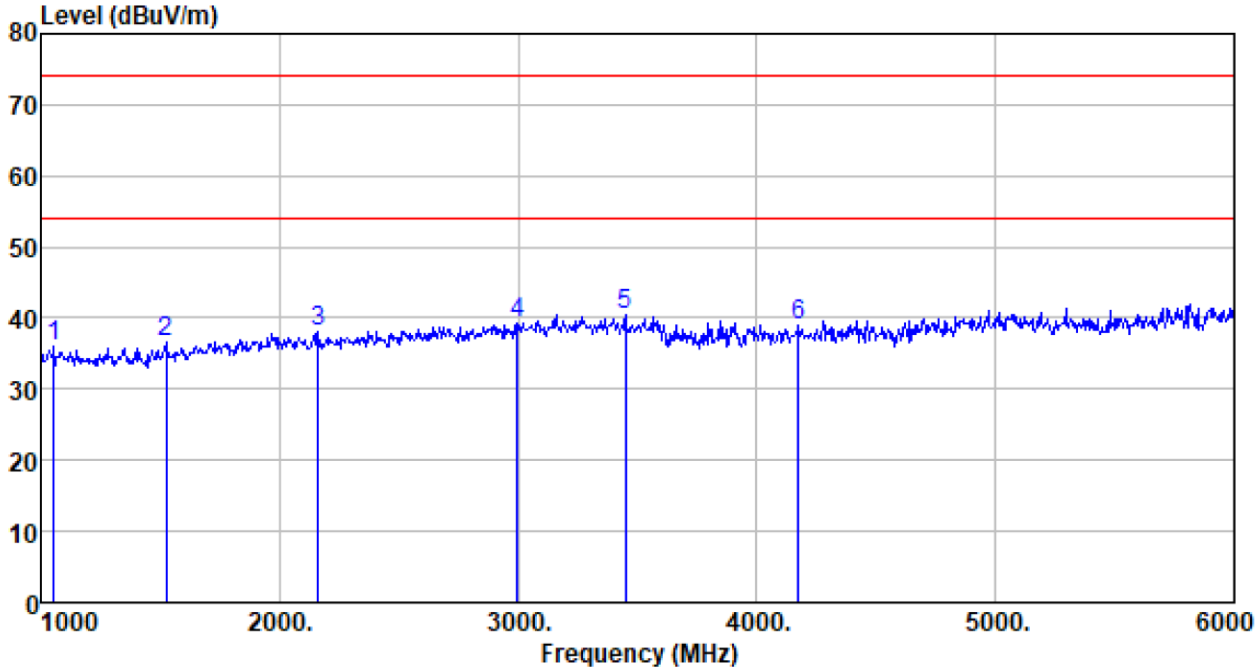
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	45.94	22.76	5.65	31.10	43.25	80.83	-37.58	Vertical

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cylcle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	43.25	-7.65	35.60	60.83	-25.23	Vertical

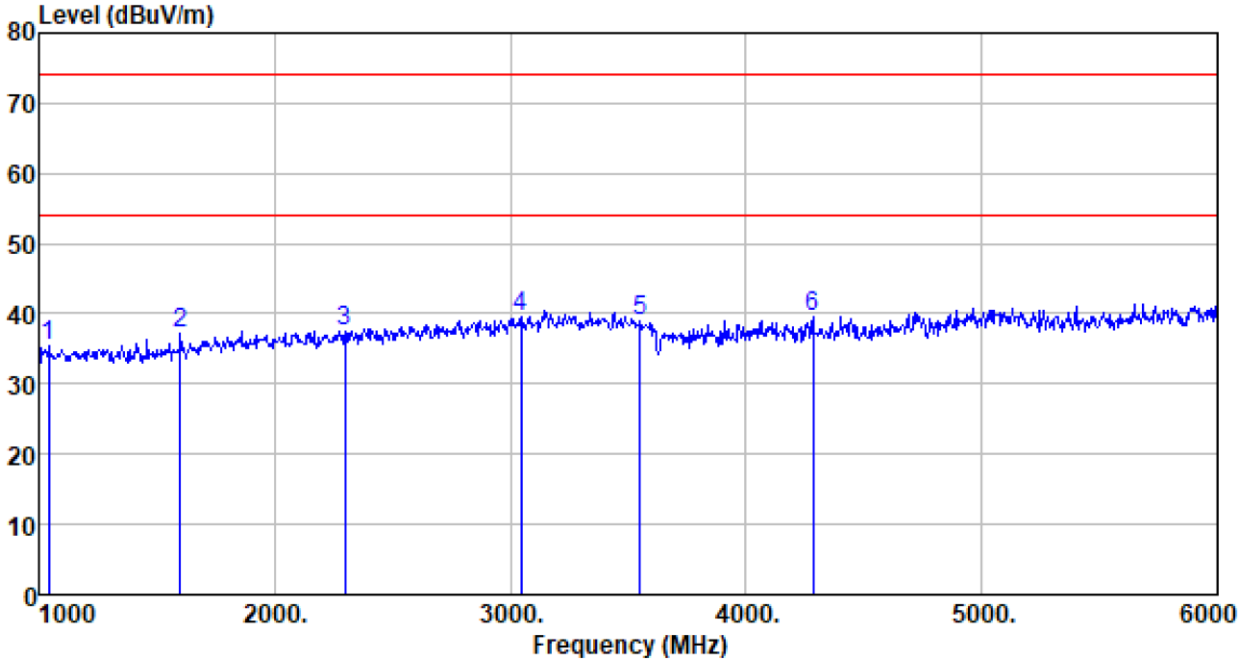
Above 1G:

Mode:	**Transmitting mode**	**Polarization:**	**Horizontal**



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
1055.000	49.31	24.52	2.02	39.78	36.07	74.00	-37.93	Peak
1525.000	48.13	24.90	2.30	38.78	36.55	74.00	-37.45	Peak
2160.000	46.98	26.99	2.65	38.46	38.16	74.00	-35.84	Peak
2995.000	45.76	28.59	3.40	38.60	39.15	74.00	-34.85	Peak
3450.000	46.53	28.60	3.69	38.51	40.31	74.00	-33.69	Peak
4175.000	43.51	29.61	4.00	38.24	38.88	74.00	-35.12	Peak

Mode:	Transmitting mode	Polarization:	Vertical

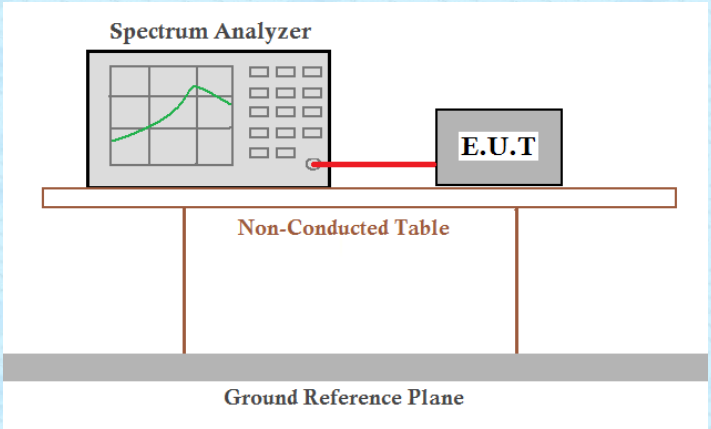


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
1040.000	48.63	24.54	2.01	39.81	35.37	74.00	-38.63	Peak
1600.000	48.31	25.20	2.33	38.72	37.12	74.00	-36.88	Peak
2300.000	46.03	27.16	2.79	38.52	37.46	74.00	-36.54	Peak
3045.000	46.20	28.60	3.45	38.59	39.66	74.00	-34.34	Peak
3550.000	45.05	28.67	3.79	38.47	39.04	74.00	-34.96	Peak
4285.000	43.84	29.81	4.15	38.26	39.54	74.00	-34.46	Peak

Remarks:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *Average value=Peak value + Duty cycle factor*

7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

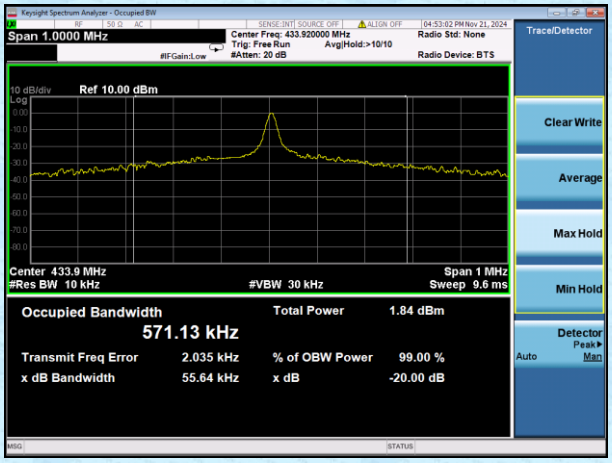
Measurement Data

Test Frequency (MHz)	20dB bandwidth (kHz)	Limit (MHz)	Result
433.92	55.64	1.0848	Pass

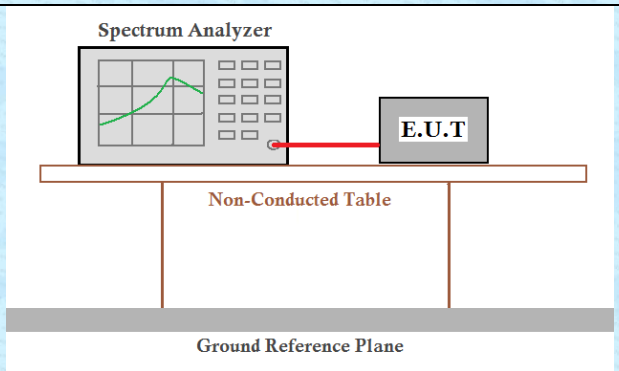
Note: Limit= Fundamental frequency×0.25%

433.92×0.25%=1.0848MHz

Test plot as follows:



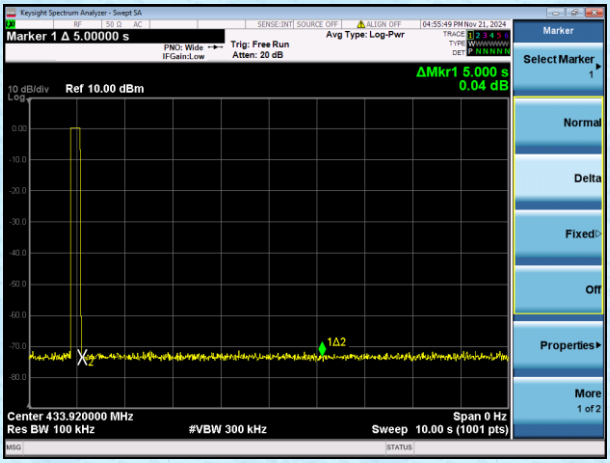
7.4 Deactivation Testing

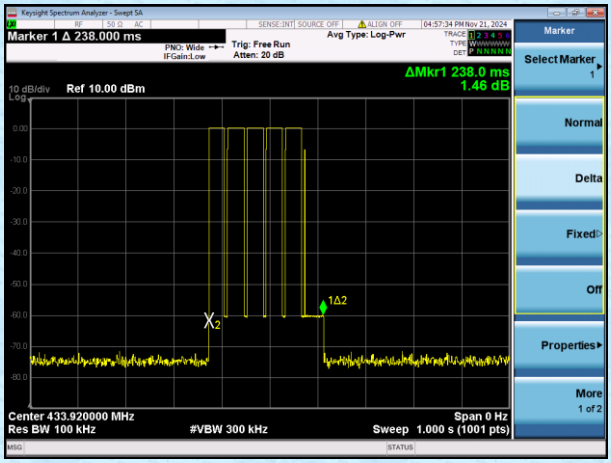
Test Requirement:	FCC Part15 C Section 15.231 (a)(2)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, span=0Hz, detector: Peak
Limit:	Not more than 5 seconds
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

Frequency (MHz)	Duration of each TX (ms)	Limit (second)	Result
433.92	238.0	<5.0	Pass

Test plot as follows:





8 Test Setup Photo

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

9 EUT Constructional Details

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

------ End ------