

TEST REPORT

Applicant: SHENZHEN QIAOHUA INDUSTRIES LIMITED

Address of Applicant: Room 301, No.1 building, Qiaohua Industrial Park, Luotian forestry center, Yanchuan, Yanluo, town, Bao An, Shenzhen, 518127, China

Manufacturer/Factory: SHENZHEN QIAOHUA INDUSTRIES LIMITED

Address of Manufacturer/Factory: Room 301, No.1 building, Qiaohua Industrial Park, Luotian forestry center, Yanchuan, Yanluo, town, Bao An, Shenzhen, 518127, China

Equipment Under Test (EUT)

Product Name: Wireless Driveway Alert Alarm

Model No.: See section 5.1

FCC ID: 2AAV8QKP3

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.231

Date of sample receipt: April 27, 2023

Date of Test: April 28, 2023-June 20, 2023

Date of report issued: June 20, 2023

Test Result : PASS *

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

Authorized Signature:



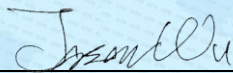
Robinson Luo
Laboratory Manager

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	June 20, 2023	Original

Prepared By:

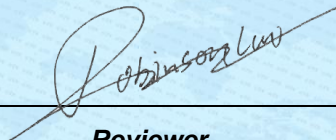


Date:

June 20, 2023

Project Engineer

Check By:



Date:

June 20, 2023

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

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	30MHz-200MHz	3.8039dB	(1)
Radiated Emission	200MHz-1GHz	3.9679dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(1)

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

5 General Information

5.1 General Description of EUT

Product Name:	Wireless Driveway Alert Alarm
Model No.:	QH-9821A-2T, QH-9821A , QH-9821, QK-P3, QH-9820A, QH-9820A-2, QH-9820A-2T, QH-9820A-2R, QH-9820A-2P, QH-9820M, QH-9820M-2, QH-9820M-2T, QH-9820M-2M, QH-9820M-2P, QH-9820G, QH-9820G-2, QH-9820G-2T, QH-9820G-2R, QH-9820G-2P, QH-9821A-2, QH-9821A-2R, QH-9821A-2P, QH-9821M, QH-9821M-2, QH-9821M-2T, QH-9821M-2M, QH-9821M-2P, QH-9821G, QH-9821G-2, QH-9821G-2T, QH-9821G-2R, QH-9821G-2P, QH-9822A, QH-9822A-2, QH-9822A-2T, QH-9822A-2R, QH-9822A-2P, QH-9822M, QH-9822M-2, QH-9822M-2T, QH-9822M-2M, QH-9822M-2P, QH-9822M-2R, QH-9822G, QH-9822G-2, QH-9822G-2T, QH-9822G-2R, QH-9822G-2P, QK-P1, QK-P2, QK-P4, QK-P5, QK-P6, QK-R1, QK-M1, QK-A1
Test Model No:	TX:QH-9821A RX:QK-P3
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is the model name for commercial purpose.	
S/N:	1602140615
Test sample(s) ID:	GTS2023040521-1
Sample(s) Status:	Engineer sample
Operation Frequency:	433.92MHz
Modulation technology:	ASK
Antenna Type:	PCB Antenna
Antenna gain:	-9.39dBi(declare by applicant)
Power supply:	DC 4.5V(3*1.5V Size“AAA” Battery)

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting mode. The new battery used
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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 and defined as follows:

433.92MHz	Axis	X	Y	Z
	Field Strength(dBuV/m)	85.34	86.26	84.27

5.3 Description of Support Units

None.

5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC —Registration No.: 381383 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. Registration 381383. ● IC —Registration No.: 9079A The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A. ● NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0
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5.5 Test Location

All tests were performed at:
<p>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</p>

5.6 Other Information Requested by the Customer

None.

5.7 Additional Instructions

EUT Software Settings:

Mode	Continuously transmitter by manufacturer, power set default
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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	June 23, 2021	June 22, 2024
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	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Coaxial Cable	GTS	N/A	GTS213	April 21, 2023	April 20, 2024
8	Coaxial Cable	GTS	N/A	GTS211	April 21, 2023	April 20, 2024
9	Coaxial cable	GTS	N/A	GTS210	April 21, 2023	April 20, 2024
10	Coaxial Cable	GTS	N/A	GTS212	April 21, 2023	April 20, 2024
11	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
12	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
13	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
14	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
15	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
16	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
17	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
18	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
19	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20,2022	Dec.19,2023

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	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Nov. 04, 2022	Nov. 03, 2023

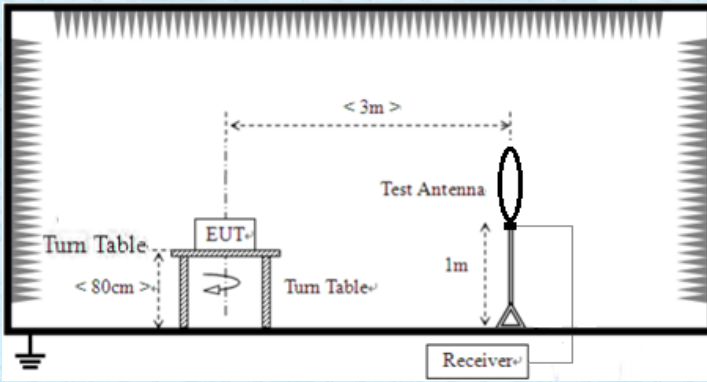
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 18, 2023	April 17, 2024
2	Barometer	KUMAO	SF132	GTS647	April 19, 2023	April 18, 2024

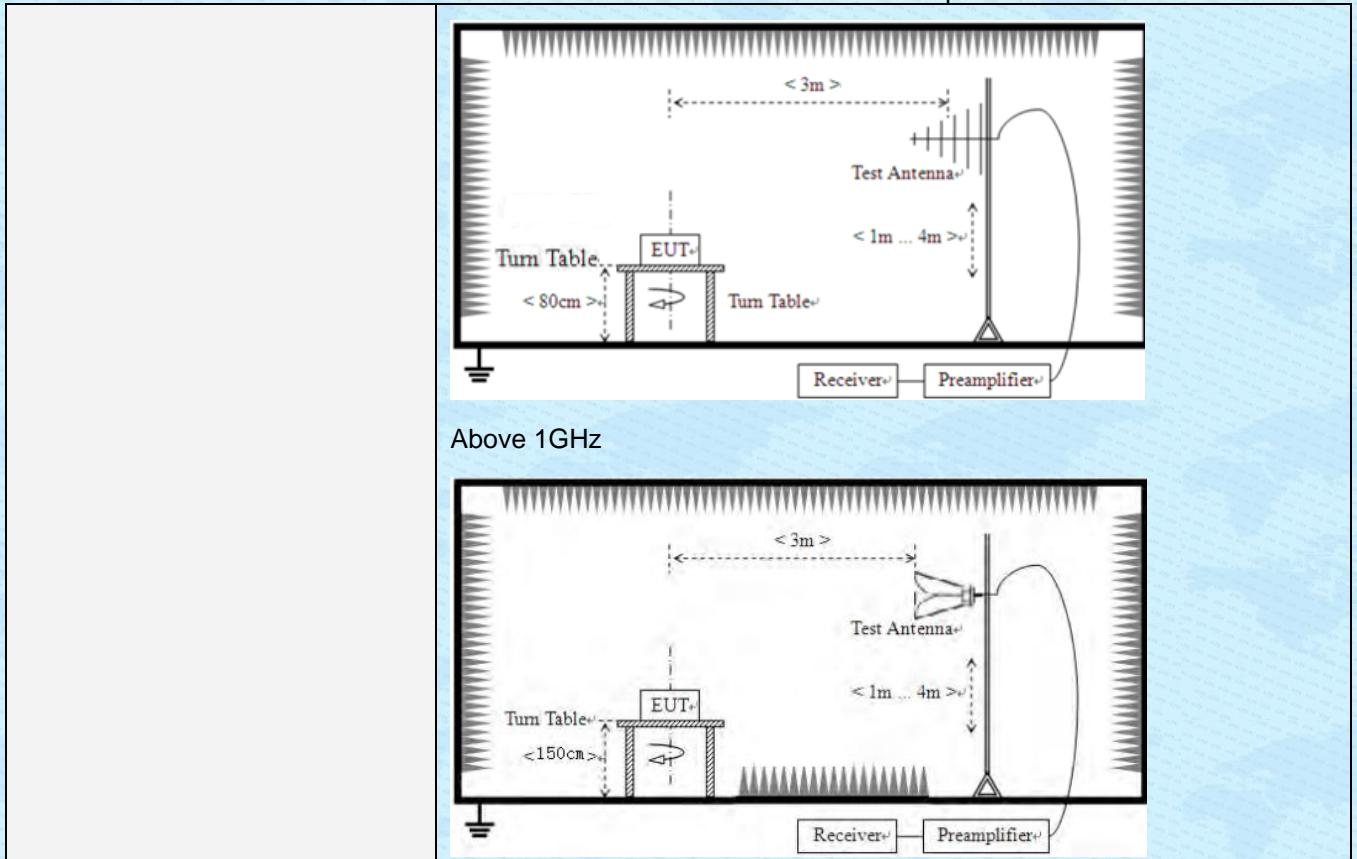
7 Test results and Measurement Data

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 to 12500	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	96.84	16.40	3.02	30.00	86.26	100.83	-14.57	Horizontal
433.92	90.01	16.40	3.02	30.00	79.43	100.83	-21.40	Vertical

Average value:

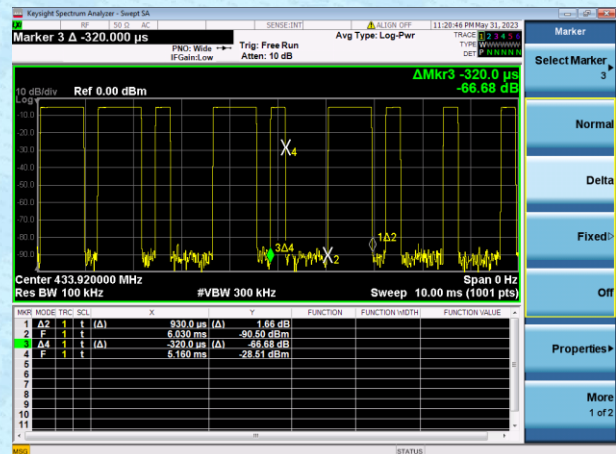
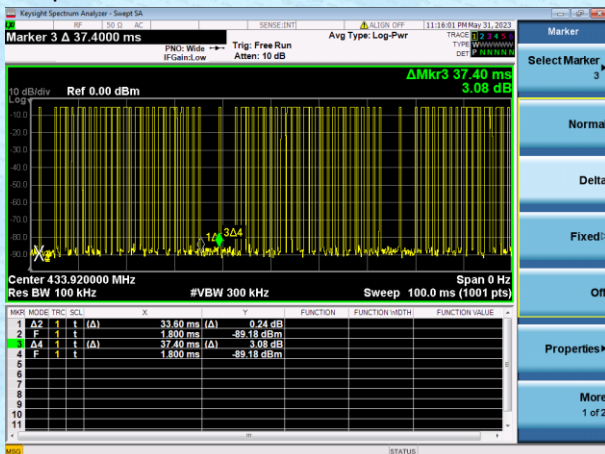
Frequency (MHz)	Peak Value (dBuV/m)	Duty cycle factor	Average value (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	86.26	-8.45	77.81	80.83	-3.02	Horizontal
433.92	79.43	-8.45	70.98	80.83	-9.85	Vertical

Remarks:

- 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 =14.13(ms)
	T period =37.4(ms)
	Duty cycle=0.378
	duty cycle factor=-8.45

Test plot as follows:



7.2.2 Spurious Emissions

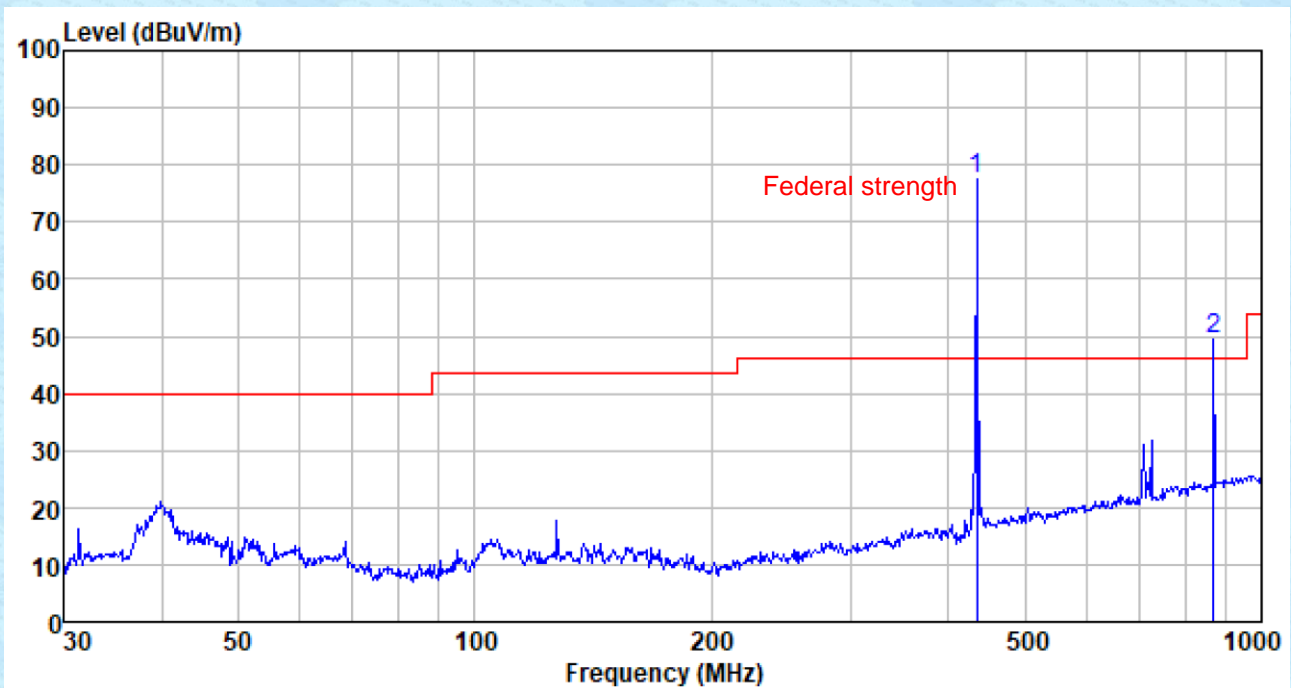
Measurement data:

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
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Peak value:

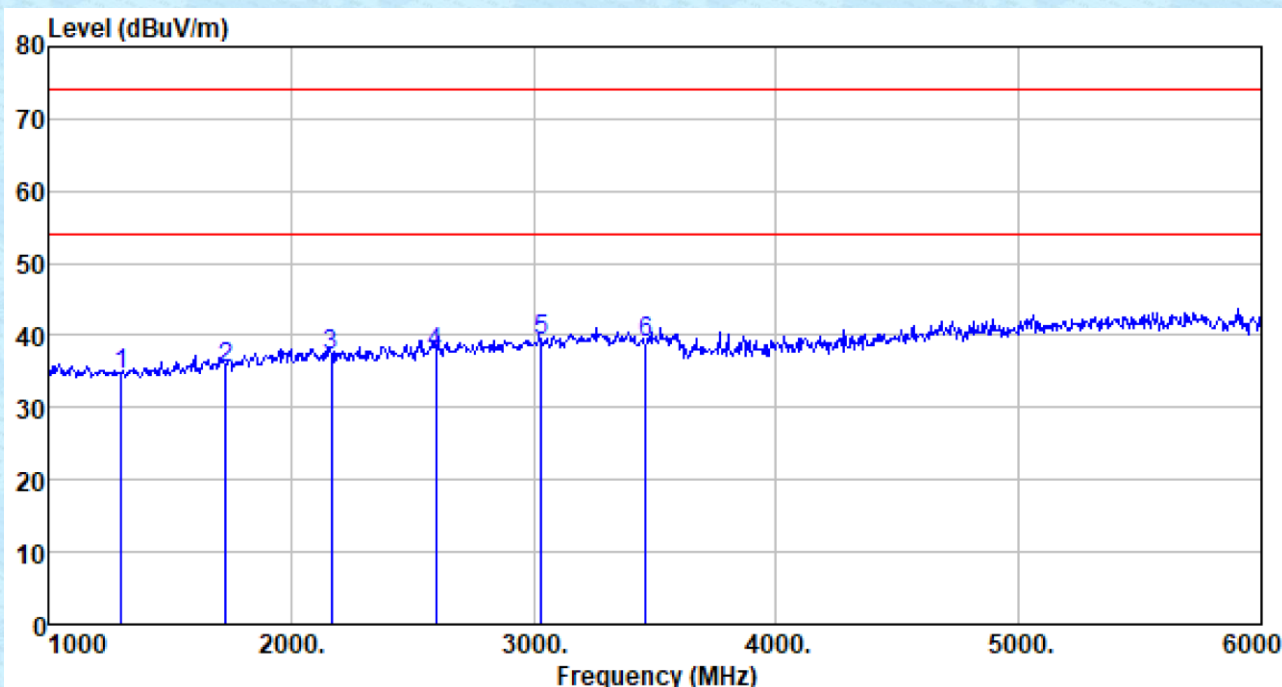
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	51.29	23.54	4.74	30.00	49.57	80.83	-31.26	Horizontal

Average value:

Frequency (MHz)	Level (dBuV/m)	Duty cycle factor	Average Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
867.84	49.57	-8.45	41.12	60.83	-19.71	Horizontal

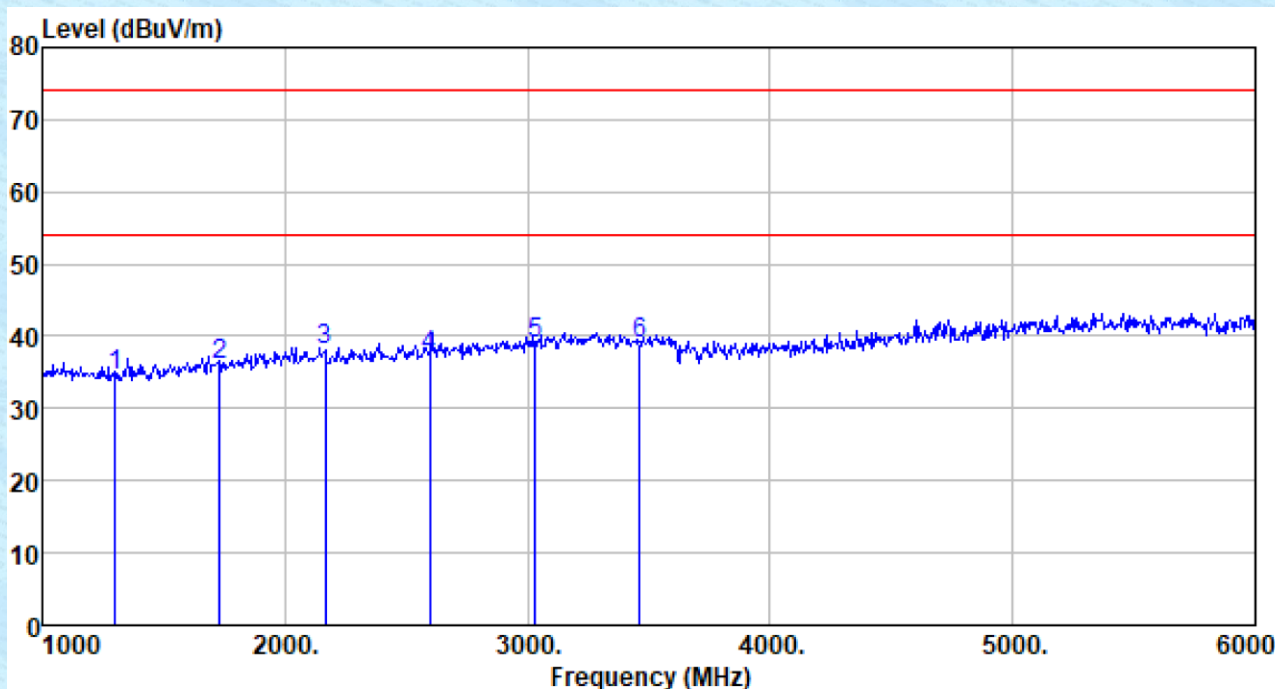
Above 1G:

Mode:	Transmitting mode	Polarization:	Horizontal
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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
1299.000	47.12	24.35	2.20	39.24	34.43	74.00	-39.57	Peak
1732.000	46.04	25.60	2.43	38.61	35.46	74.00	-38.54	Peak
2165.000	46.08	27.00	2.66	38.47	37.27	74.00	-36.73	Peak
2598.000	45.36	27.64	3.11	38.60	37.51	74.00	-36.49	Peak
3031.000	45.88	28.60	3.44	38.59	39.33	74.00	-34.67	Peak
3464.000	45.30	28.60	3.71	38.51	39.10	74.00	-34.90	Peak

Mode:	Transmitting mode	Polarization:	Vertical
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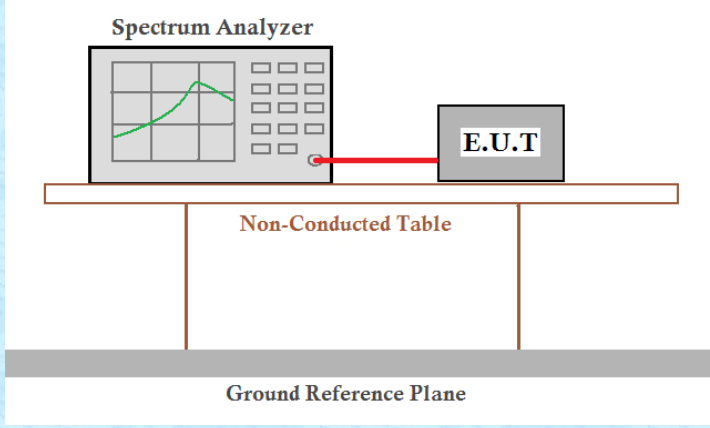


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
1299.000	47.18	24.35	2.20	39.24	34.49	74.00	-39.51	Peak
1732.000	46.52	25.60	2.43	38.61	35.94	74.00	-38.06	Peak
2165.000	46.94	27.00	2.66	38.47	38.13	74.00	-35.87	Peak
2598.000	44.99	27.64	3.11	38.60	37.14	74.00	-36.86	Peak
3031.000	45.52	28.60	3.44	38.59	38.97	74.00	-35.03	Peak
3464.000	45.06	28.60	3.71	38.51	38.86	74.00	-35.14	Peak

Remarks:

2. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor*

7.3 20dB Occupy Bandwidth

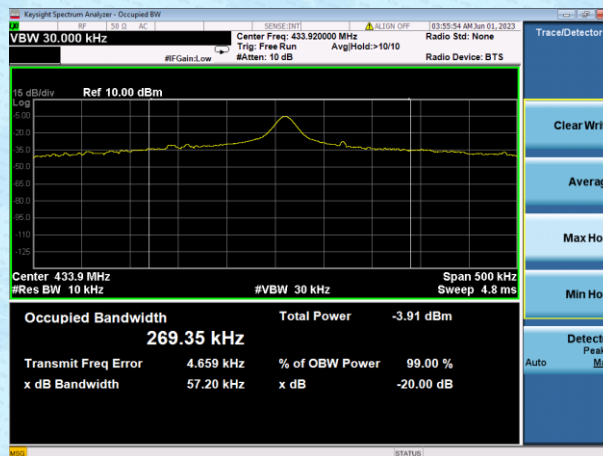
Test Requirement:	FCC Part15 C Section 15.231 (c)
Test Method:	ANSI C63.10:2013
Limit:	The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% 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

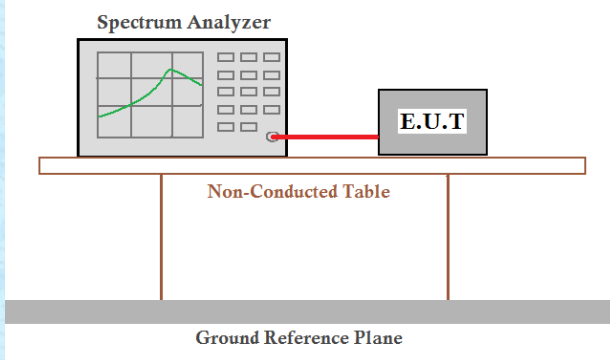
Test Frequency (MHz)	20dB bandwidth (kHz)	Limit (MHz)	Result
433.92	57.2	1.0848	Pass

Note: Limit= Fundamental frequency×0.25%
 $433.92 \times 0.25\% = 1.0848 \text{ MHz}$

Test plot as follows:



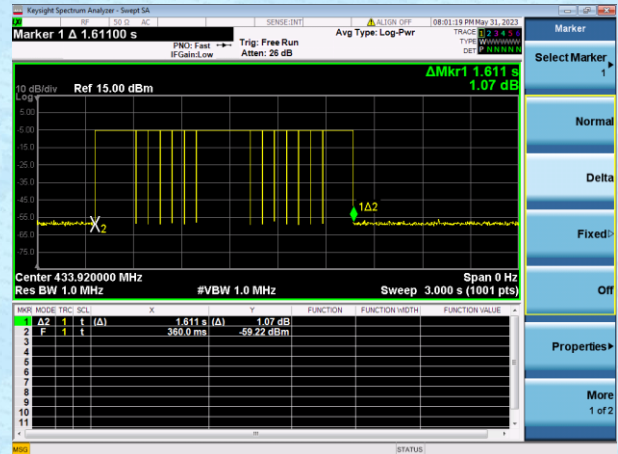
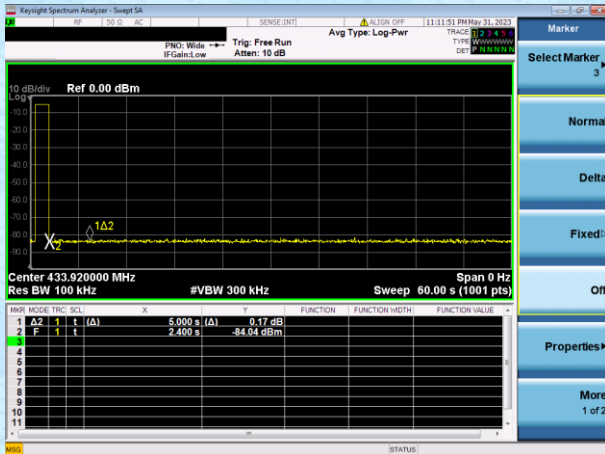
7.4 Deactivation Testing

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 (s)	Limit (second)	Result
433.92	1.6	<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 -----