

TEST REPORT

Applicant: Shenzhen Nuoguan Technology Co.,Ltd

Address of Applicant: 3 Floor, BLD A, Huilongda Industrial Park, Shilongzai, SHIYAN TOWN, Shenzhen, 518109, China

Manufacturer/Factory: Shenzhen Nuoguan Technology Co.,Ltd

Address of Manufacturer/Factory: 3 Floor, BLD A, Huilongda Industrial Park, Shilongzai, SHIYAN TOWN, Shenzhen, 518109, China

Equipment Under Test (EUT)

Product Name: NG-RF Controller

Model No.: NG-RF01

FCC ID: 2A7XE-NGRF01

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

Date of sample receipt: June 24, 2022

Date of Test: June 24, 2022-July 14, 2022

Date of report issued: July 14, 2022

Test Result : PASS *

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

Authorized Signature:



Robinson Luo

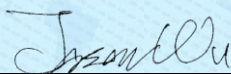
Laboratory Manager

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
00	July 14, 2022	Original

Prepared By:

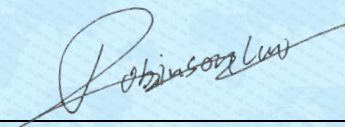


Date:

July 14, 2022

Project Engineer

Check By:



Date:

July 14, 2022

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	N/A
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Remarks:

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz-30MHz	3.1dB	(1)
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:	NG-RF Controller
Model No.:	NG-RF01
Serial No.:	01
Test sample(s) ID:	GTS202206000259-1
Sample(s) Status	Engineered sample
Operation Frequency:	2454MHz
Channel numbers:	1
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	0.5dBi(Declared by applicant)
Power supply:	TX: DC 3.0V (2*1.5V Size "AA" Battery)

Note:The report is only for TX device

5.2 Test mode

Transmitting mode	Keep the EUT in continuously 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 was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	66.34	67.30	65.21

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 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.

- **IC —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 Industry Canada 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).

5.7 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123- 128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	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	July. 02 2020	July. 01 2025
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	June. 23 2022	June. 22 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 23 2022	June. 22 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 23 2022	June. 22 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 23 2022	June. 22 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 23 2022	June. 22 2023
9	Coaxial Cable	GTS	N/A	GTS211	June. 23 2022	June. 22 2023
10	Coaxial cable	GTS	N/A	GTS210	June. 23 2022	June. 22 2023
11	Coaxial Cable	GTS	N/A	GTS212	June. 23 2022	June. 22 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 23 2022	June. 22 2023
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 23 2022	June. 22 2023
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 23 2022	June. 22 2023
15	Band filter	Amindeon	82346	GTS219	June. 23 2022	June. 22 2023
16	Power Meter	Anritsu	ML2495A	GTS540	June. 23 2022	June. 22 2023
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 23 2022	June. 22 2023
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 23 2022	June. 22 2023
19	Splitter	Agilent	11636B	GTS237	June. 23 2022	June. 22 2023
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 23 2022	June. 22 2023
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 17 2021	Oct. 16 2022
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 17 2021	Oct. 16 2022
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 17 2021	Oct. 16 2022
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 23 2022	June. 22 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	June. 23 2022	June. 22 2023
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 23 2022	June. 22 2023
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 23 2022	June. 22 2023
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 23 2022	June. 22 2023
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 23 2022	June. 22 2023
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 23 2022	June. 22 2023
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 23 2022	June. 22 2023
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 23 2022	June. 22 2023

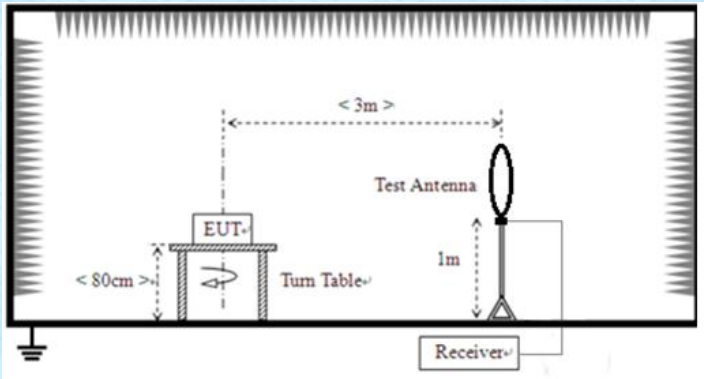
General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 23 2022	June. 22 2023
2	Barometer	ChangChun	DYM3	GTS255	June. 23 2022	June. 22 2023

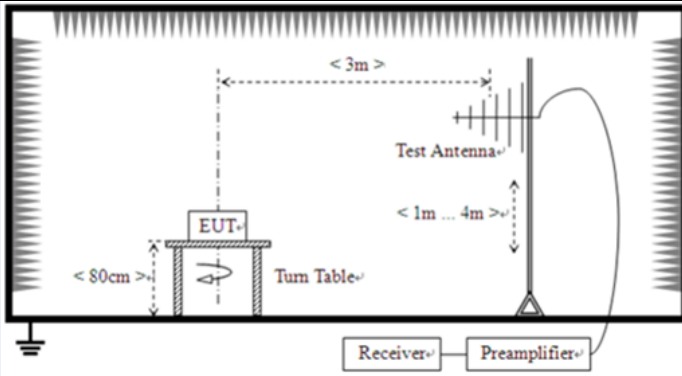
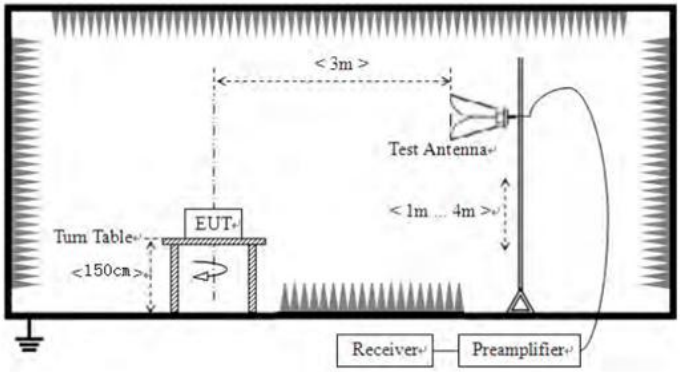
7 Test results and Measurement Data

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. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.	
EUT Antenna:	
<i>The antenna is PCB antenna, the best case gain of the are antennas 0.5dBi, reference to the appendix II for details</i>	

7.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.10:2013				
Test Frequency Range:	9kHz to 25GHz				
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)	Frequency		Limit (dBuV/m @3m)		Remark
	2400MHz-2483.5MHz		94.00		Average Value
			114.00		Peak Value
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 	Report No.: CTS2022000002007-01				
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 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 3.0V					
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)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2454.00	63.40	27.55	2.96	38.98	54.93	114.00	-59.07	Vertical
2454.00	75.77	27.55	2.96	38.98	67.30	114.00	-46.70	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2454.00	54.79	27.55	2.96	38.98	46.32	94.00	-47.68	Vertical
2454.00	66.67	27.55	2.96	38.98	58.20	94.00	-35.80	Horizontal

Note: RBW>20dB BW, VBW> RBW, PK detector is for PK value, AV detector is for AV value .

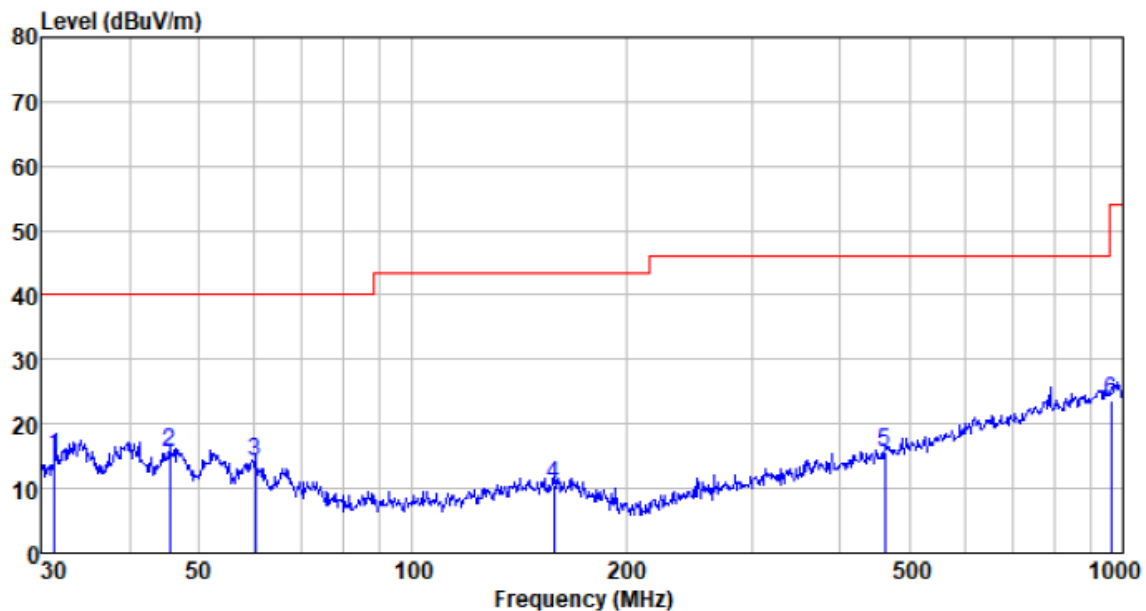
7.2.2 Spurious emissions

■ Below 30MHz

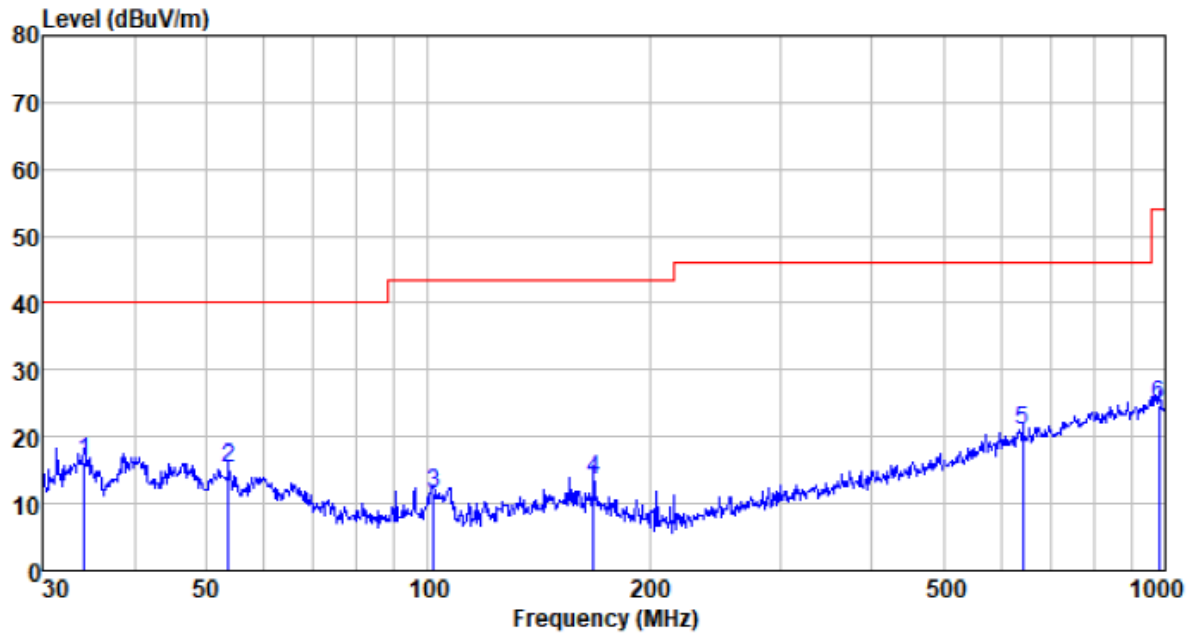
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

■ Below 1GHz

Test Frequency:	2454MHz	Polarization:	Horizontal
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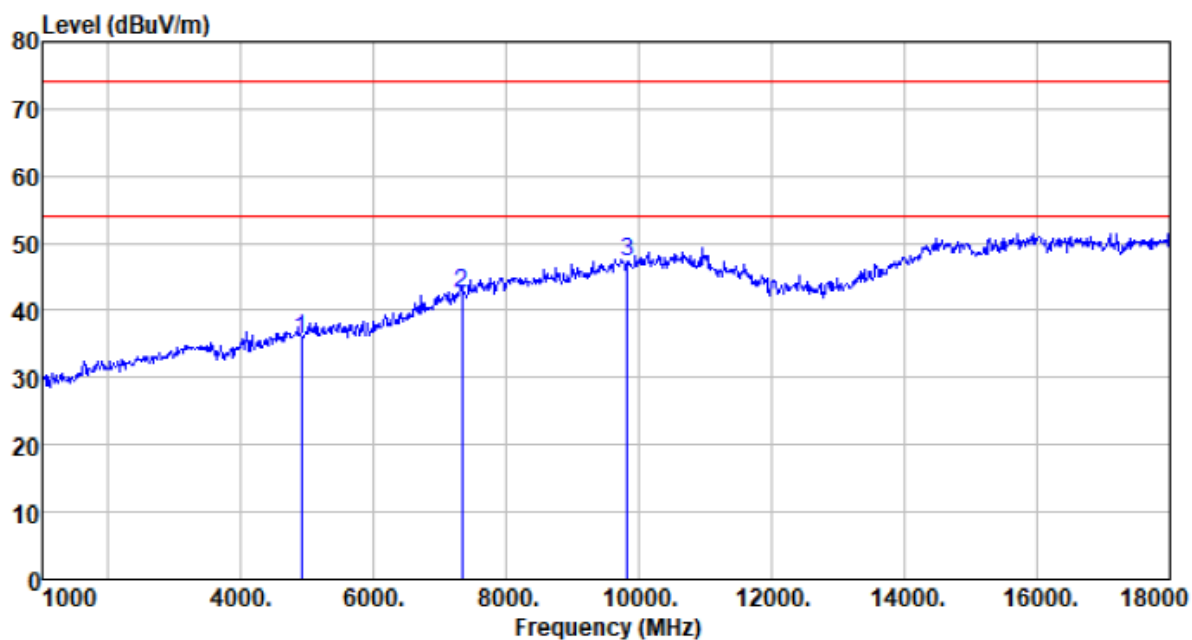
Test Frequency:	2454MHz	Polarization:	Vertical
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Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
34.156	38.47	12.44	0.60	35.30	16.21	40.00	-23.79	QP
53.693	38.06	12.68	0.81	36.24	15.31	40.00	-24.69	QP
101.644	37.81	9.25	1.21	36.73	11.54	43.50	-31.96	QP
167.824	36.71	12.52	1.67	37.18	13.72	43.50	-29.78	QP
640.611	34.80	19.85	3.87	37.58	20.94	46.00	-25.06	QP
979.180	33.13	23.99	5.14	37.53	24.73	54.00	-29.27	QP

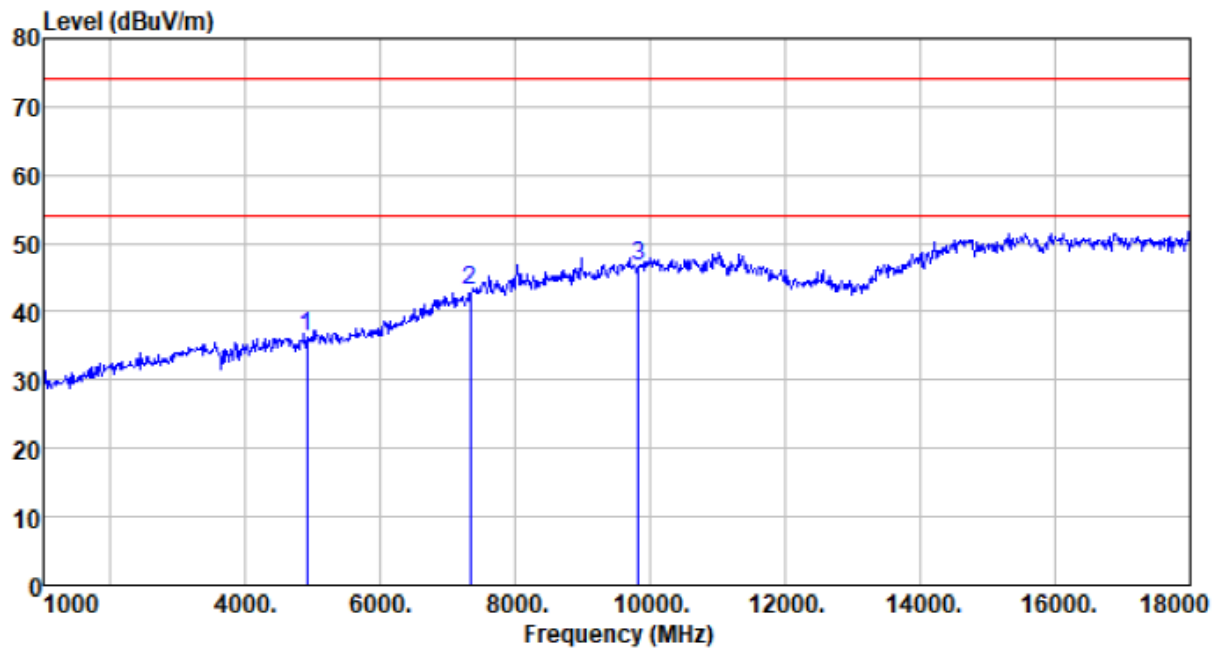
■ Above 1GHz

Test Frequency:	2454MHz	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
4908.000	37.33	31.35	4.73	37.59	35.82	74.00	-38.18	Peak
7326.000	37.24	36.43	6.63	37.77	42.53	74.00	-31.47	Peak
9816.000	38.98	38.17	8.05	37.96	47.24	74.00	-26.76	Peak

Test Frequency:	2454MHz	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
4908.000	37.69	31.35	4.73	37.59	36.18	74.00	-37.82	Peak
7326.000	37.95	36.43	6.63	37.77	43.24	74.00	-30.76	Peak
9816.000	38.49	38.17	8.05	37.96	46.75	74.00	-27.25	Peak

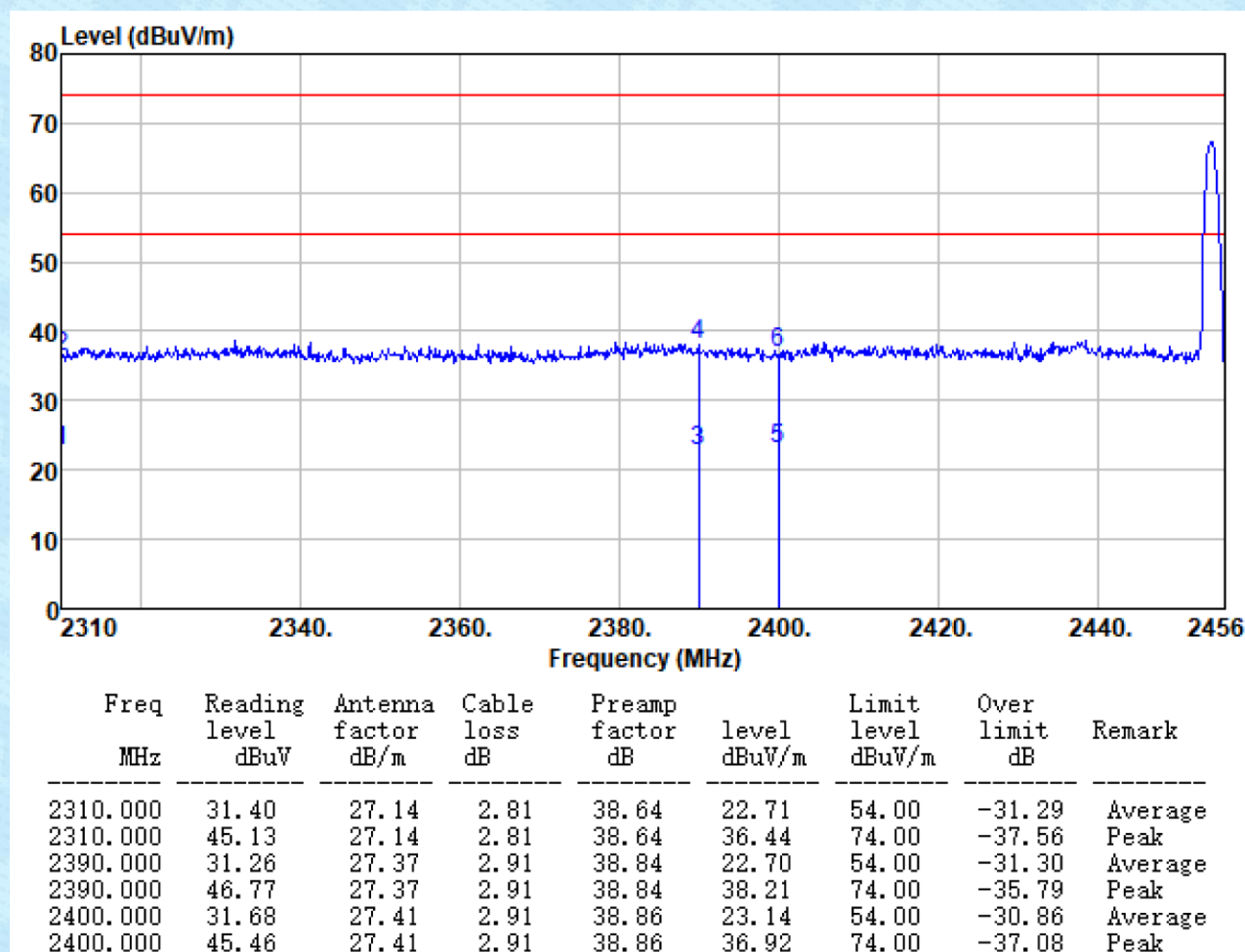
Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. For above 18GHz, no emission found.

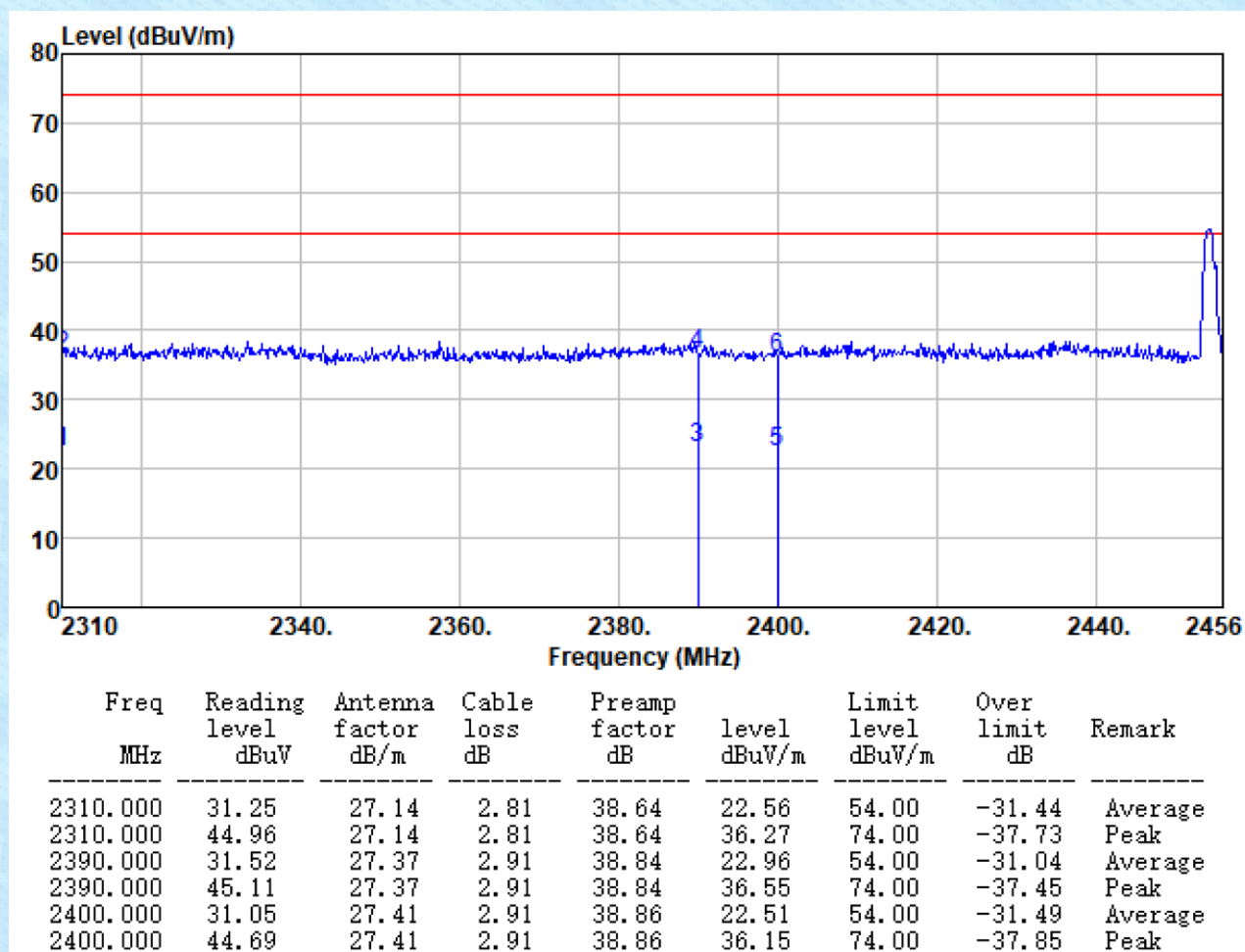
7.2.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case was exhibited.

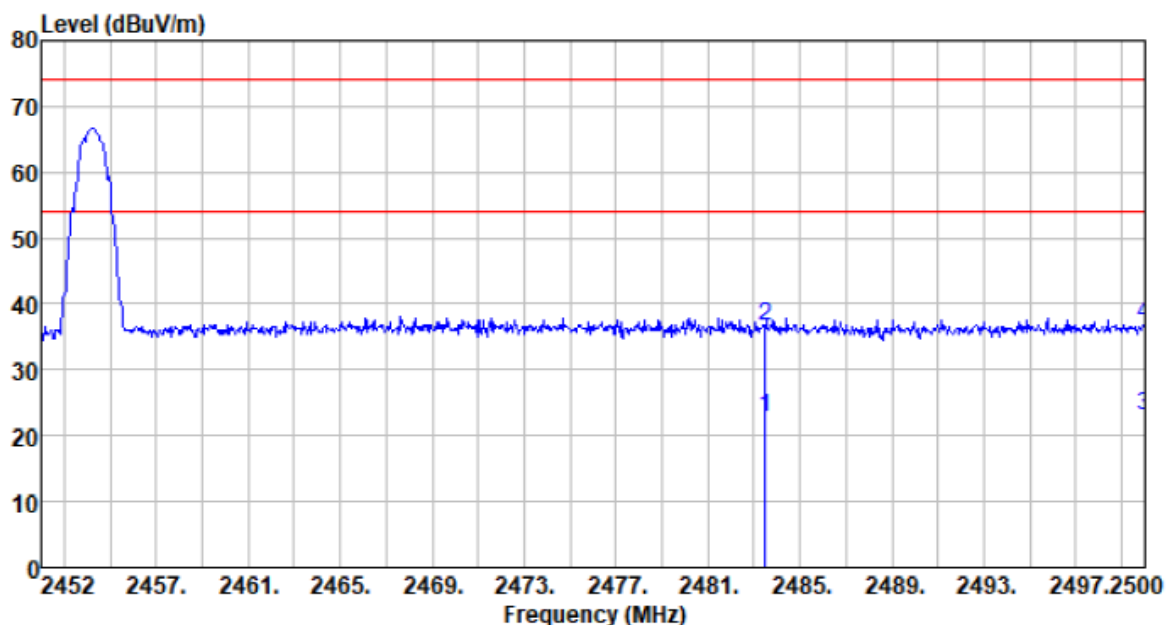
Test Frequency:	2454MHz	Polarization:	Horizontal
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Test Frequency:	2454MHz	Polarization:	Vertical
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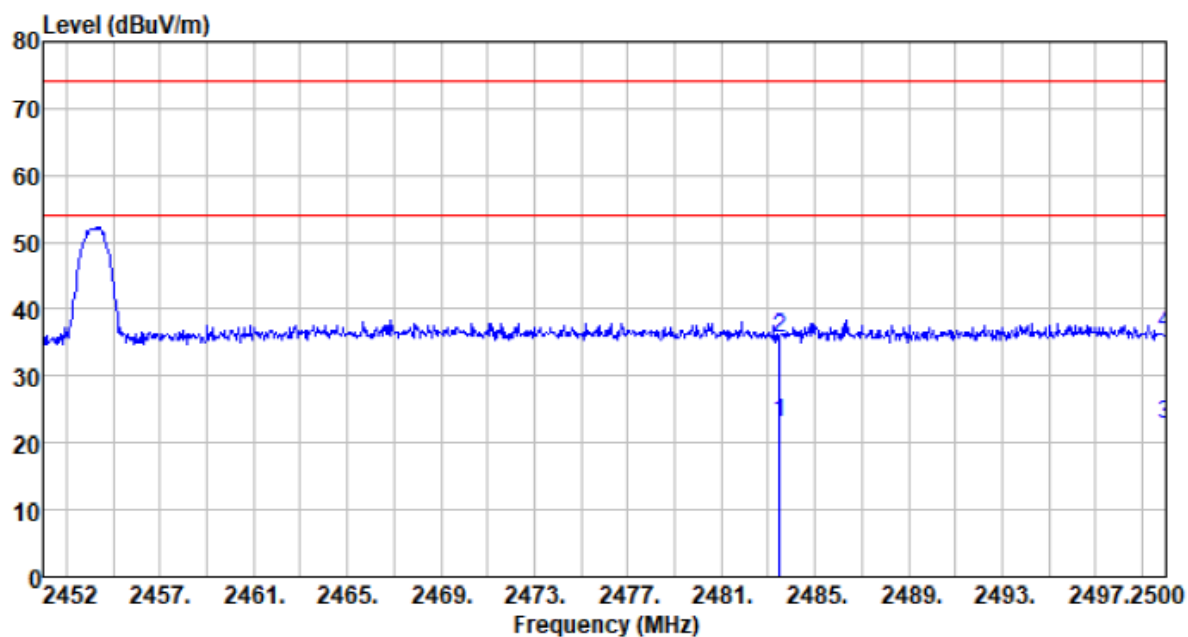


Test Frequency:	2454MHz	Polarization:	Horizontal
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Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	31.26	27.66	2.99	39.06	22.85	54.00	-31.15	Average
2483.500	45.03	27.66	2.99	39.06	36.62	74.00	-37.38	Peak
2500.000	31.56	27.70	3.01	39.10	23.17	54.00	-30.83	Average
2500.000	45.16	27.70	3.01	39.10	36.77	74.00	-37.23	Peak

Test Frequency:	2454MHz	Polarization:	Vertical
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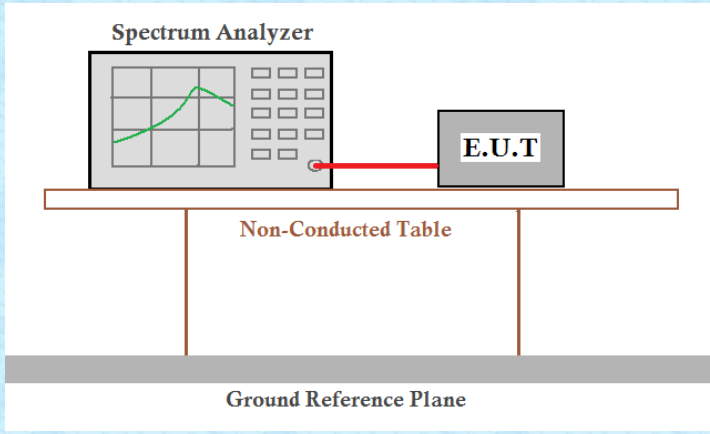


Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	31.45	27.66	2.99	39.06	23.04	54.00	-30.96	Average
2483.500	44.05	27.66	2.99	39.06	35.64	74.00	-38.36	Peak
2500.000	31.12	27.70	3.01	39.10	22.73	54.00	-31.27	Average
2500.000	44.61	27.70	3.01	39.10	36.22	74.00	-37.78	Peak

Remark:

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

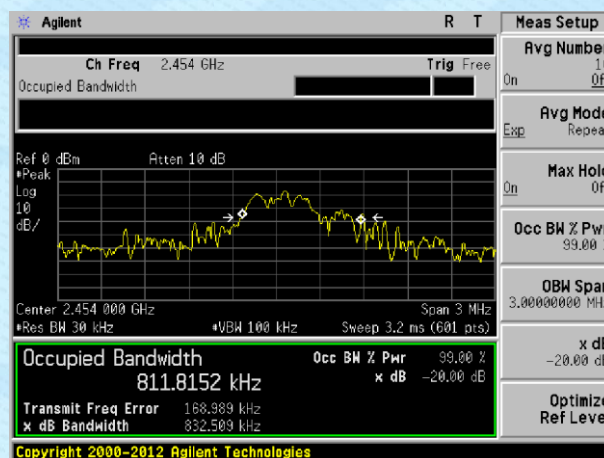
7.3 20dB Occupy Bandwidth

Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
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	20dB bandwidth(kHz)	Result
2454MHz	832.509	Pass

Test plot as follows:



2454MHz

8 Test Setup Photo

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

9 EUT Constructional Details

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

-----End-----