Global United Technology Services Co., Ltd.

Report No.: GTS2024110056F01

TEST REPORT

Applicant: ALPHA GROUP CO., LTD.

Address of Applicant: Alpha Animation Industrial Area, Jinhong Road East &

Fengxiang Road North, Chenghai District, Shantou,

Guangdong 515800, China

Manufacturer: ALPHA GROUP CO., LTD.

Address of Alpha Animation Industrial Area, Jinhong Road East &

Manufacturer: Fengxiang Road North, Chenghai District, Shantou,

Guangdong 515800, China

Equipment Under Test (EUT)

Product Name: RC RACE CAR

Model No.: 389177

FCC ID: 2AIRP-389177

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Date of sample receipt: November 06, 2024

Date of Test: November 07, 2024-January 06, 2025

Date of report issued: January 06, 2025

Test Result : PASS *

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.

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



2 Version

Version No.	Date	Description
00	January 06, 2025	Original

Prepared By:	Project Engineer	Date:	January 06, 2025
Check By:	Reviewer	Date:	January 06, 2025

GTS

Report No.: GTS2024110056F01

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	N/A
Conducted Output Power	15.247 (b)(3)	Pass
Channel Bandwidth	15.247 (a)(2)	Pass
Power Spectral Density	15.247 (e)	Pass
Band Edge	15.247(d)	Pass
Spurious Emission	15.205/15.209	Pass

Remarks:

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

2. Test according to ANSI C63.10:2013

Measurement Uncertainty

No.	Item	Measurement Uncertainty			
1	Radio Frequency	±7.25×10 ⁻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)			
		±3.1dB (9kHz-30MHz)			
	Radiated Spurious emission test	±3.8039dB (30MHz-200MHz)			
8		±3.9679dB (200MHz-1GHz)			
		±4.29dB (1GHz-18GHz)			
		±3.30dB (18GHz-40GHz)			
9	Temperature test	±1°C			
10	Humidity test	±3%			
11	Time ±3%				

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5 General Information

5.1 General Description of EUT

Product Name:	RC RACE CAR
Model No.:	389177
Test sample(s) ID:	GTS2024110056-1
Sample(s) Status:	Engineer sample
S/N:	389170RX-EMC_V2.0_03AA
Operation Frequency:	2413MHz~2472MHz
Channel Numbers:	60
Channel Separation:	1MHz
Modulation Type:	GFSK
Antenna Type:	Wire Antenna
Antenna Gain:	0.17dBi(Declared 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.



Operation F	Operation Frequency each of channel							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	
1	2413	16	2428	31	2443	46	2458	
2	2414	17	2429	32	2444	47	2459	
3	2415	18	2430	33	2445	48	2460	
4	2416	19	2431	34	2446	49	2461	
5	2417	20	2432	35	2447	50	2462	
6	2418	21	2433	36	2448	51	2463	
7	2419	22	2434	37	2449	52	2464	
8	2420	23	2435	38	2450	53	2465	
9	2421	24	2436	39	2451	54	2466	
10	2422	25	2437	40	2452	55	2467	
11	2423	26	2438	41	2453	56	2468	
12	2424	27	2439	42	2454	57	2469	
13	2425	28	2440	43	2455	58	2470	
14	2426	29	2441	44	2456	59	2471	
15	2427	30	2442	45	2457	60	2472	

The test frequencies are below:

Channel	Frequency
The lowest channel	2413MHz
The middle channel	2444MHz
The Highest channel	2472MHz



5.2 Test mode

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

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.

• 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).

5.7 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 software provided by manufacturer
Power level setup	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	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	1	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 C	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			
10	EXA Signal Analyzer	Keysight	N9010B	MY60241168	Nov. 02, 2024	Nov. 01, 2025			

Gen	eral 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 /247(c)

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.

E.U.T Antenna:

The antenna is wire antenna, reference to the appendix II for details

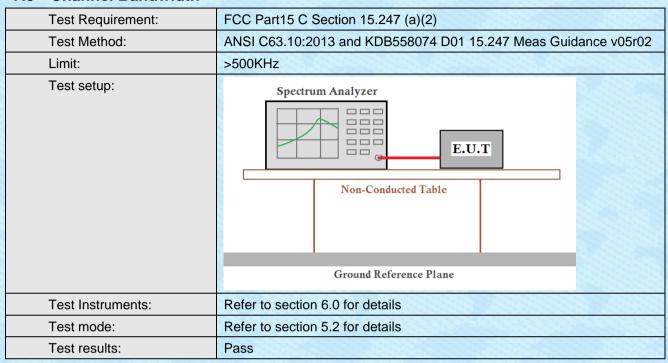


7.2 Conducted Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	30dBm
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



7.3 Channel Bandwidth





7.4 Power Spectral Density

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	8dBm/3kHz
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



7.5 Spurious Emission in Non-restricted & restricted Bands

7.5.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass



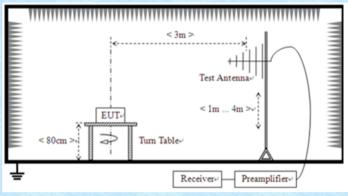
7.5.2 Radiated Emission Method

noa				
FCC Part15 C Section	on 15.209			
ANSI C63.10:2013				
9kHz to 25GHz				
Measurement Distar	nce: 3m			
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 10Hz	Peak	1MHz	3MHz	Peak
Above IGHZ	Peak	1MHz	10Hz	Average
		The state of the s		
Frequency	Limit (u\	//m)	Value	Measurement Distance
0.009MHz-0.490M	Hz 2400/F(F	(Hz) QI	P/PK/AV	300m
0.490MHz-1.705M	Hz 24000/F(KHz)	QP	30m
1.705MHz-30MH	z 30		QP	30m
30MHz-88MHz	100		QP	
88MHz-216MHz	150		QP	
216MHz-960MH	z 200		QP	3m
960MHz-1GHz	500		QP	SIII
Abovo 1GHz	500	Α	verage	
Above 1G112	5000		Peak	
For radiated emiss	sions from 9kH	z to 30MH	Z	
		Te lm Receiver	st Antenna	
	ANSI C63.10:2013 9kHz to 25GHz Measurement Distar Frequency 9KHz-150KHz 150KHz-30MHz 30MHz-1GHz Above 1GHz Note: For Duty cycle cycle < 98%, average Frequency 0.009MHz-0.490M 0.490MHz-1.705M 1.705MHz-30MH 30MHz-88MHz 88MHz-216MHz 216MHz-960MH 960MHz-1GHz Above 1GHz For radiated emiss	Measurement Distance: 3m Frequency Detector 9KHz-150KHz Quasi-peak 150KHz-30MHz Quasi-peak 30MHz-1GHz Quasi-peak Above 1GHz Peak Note: For Duty cycle ≥ 98%, average cycle < 98%, average detector set at a set of the set of th	ANSI C63.10:2013 9kHz to 25GHz Measurement Distance: 3m Frequency Detector RBW 9KHz-150KHz Quasi-peak 200Hz 150KHz-30MHz Quasi-peak 9KHz 30MHz-1GHz Quasi-peak 120KHz Above 1GHz Peak 1MHz Note: For Duty cycle ≥ 98%, average detector cycle < 98%, average detector set as below: VE Frequency Limit (uV/m) 0.009MHz-0.490MHz 2400/F(KHz) QE 0.490MHz-1.705MHz 24000/F(KHz) 1.705MHz-30MHz 30 30MHz-88MHz 100 88MHz-216MHz 150 216MHz-960MHz 200 960MHz-1GHz 500 Above 1GHz 500 For radiated emissions from 9kHz to 30MH	ANSI C63.10:2013 9kHz to 25GHz Measurement Distance: 3m Frequency Detector RBW VBW 9KHz-150KHz Quasi-peak 200Hz 600Hz 150KHz-30MHz Quasi-peak 9KHz 30KHz 30MHz-1GHz Quasi-peak 120KHz 300KHz Above 1GHz Peak 1MHz 10Hz Note: For Duty cycle ≥ 98%, average detector set as abocycle < 98%, average detector set as below: VBW ≥ 1 / 1 Frequency Limit (uV/m) Value 0.009MHz-0.490MHz 2400/F(KHz) QP/PK/AV 0.490MHz-1.705MHz 24000/F(KHz) QP 1.705MHz-30MHz 30 QP 30MHz-88MHz 100 QP 88MHz-216MHz 150 QP 216MHz-960MHz 200 QP 960MHz-1GHz 500 Average 500 Average 500 Peak For radiated emissions from 9kHz to 30MHz

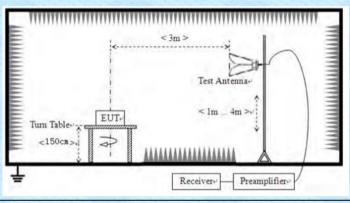
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For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:

- 1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) 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.
- 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.
- 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 see	ction 6.0 for o	details			
Test mode:	Refer to sec	ction 5.2 for o	details			
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 3V					
Test results:	Pass					

Measurement data:

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

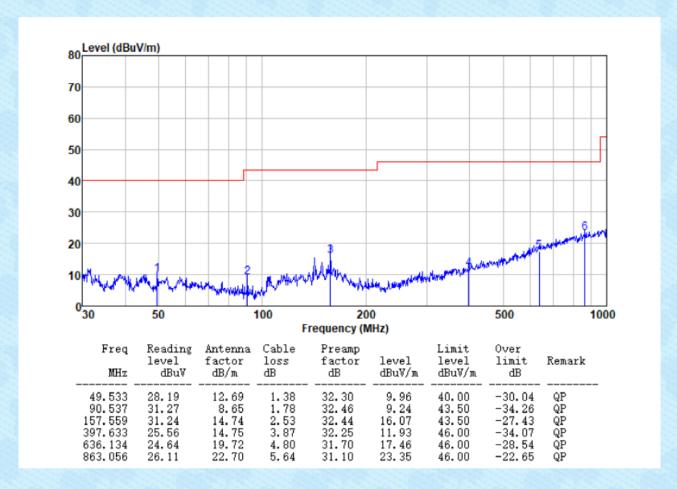
■ 9kHz~30MHz

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

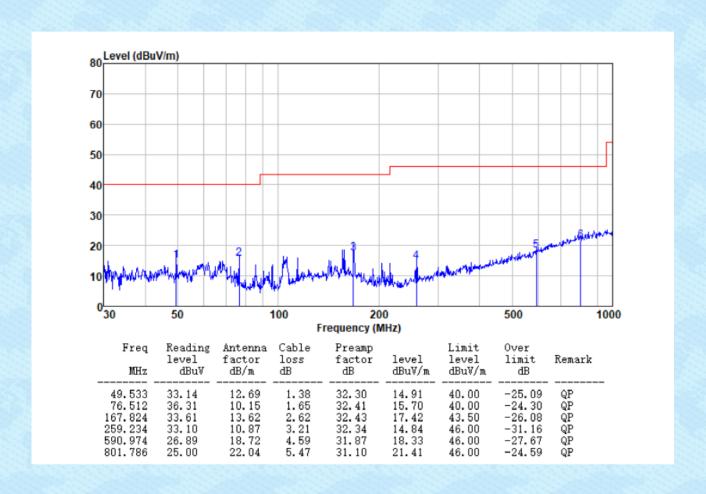
Pre-scan all test modes, found worst case at 2402MHz, and so only show the test result of it. **Horizontal:**



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Vertical:

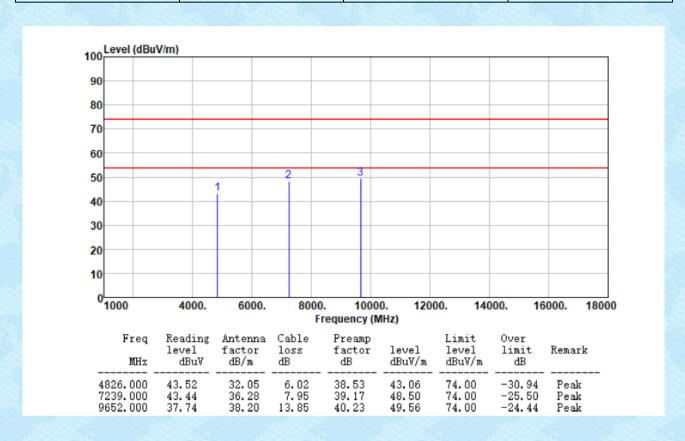




■ Above 1GHz

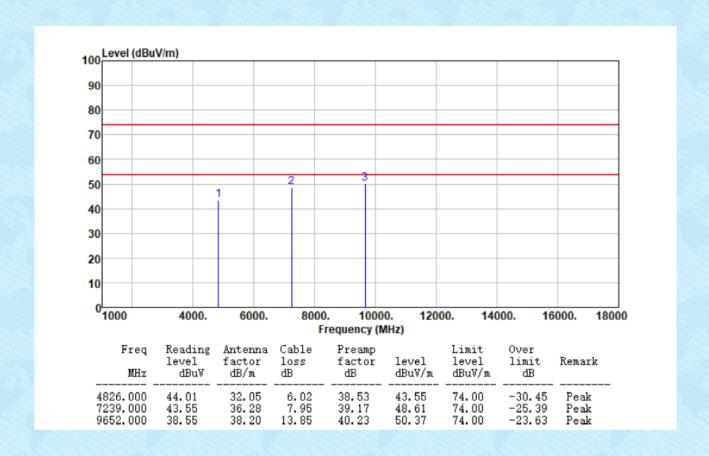
■ Unwanted Emissions in Non-restricted Frequency Bands

Test channel: Lowest Polarization: Horizontal



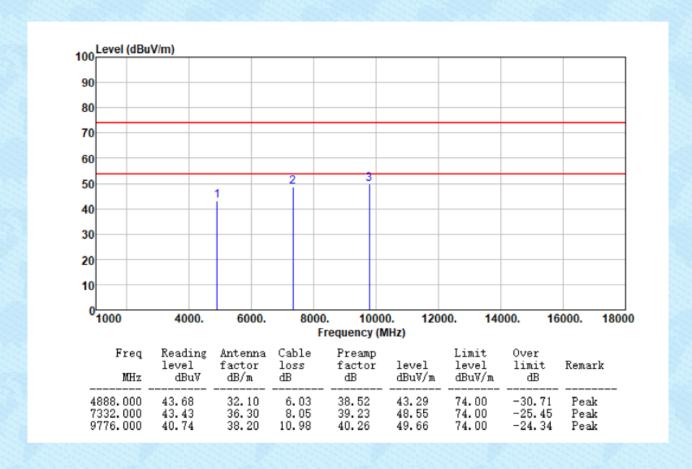


Test channel: Lowest Polarization: Vertical





Test channel: Middle Polarization: Horizontal



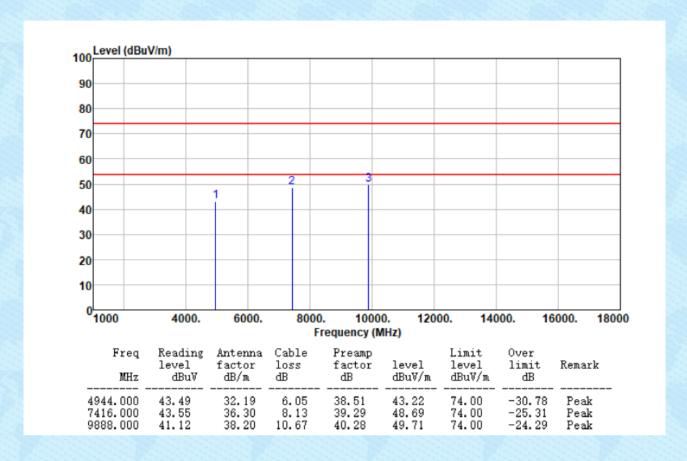


Test channel: Middle Polarization: Vertical





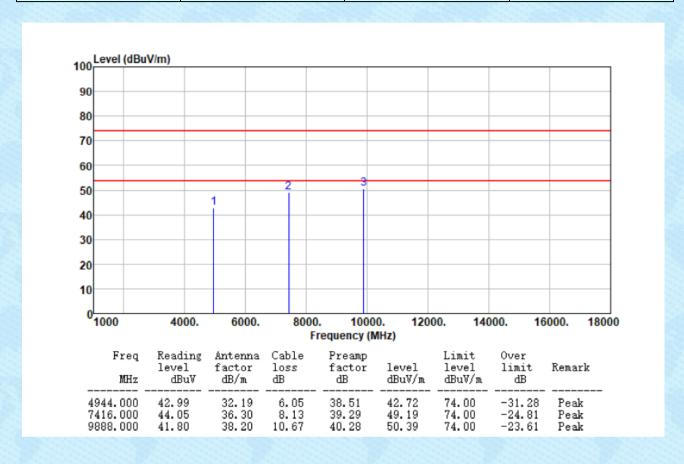
Test channel: Highest Polarization: Horizontal	
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Test channel: Highest Polarization: Vertical
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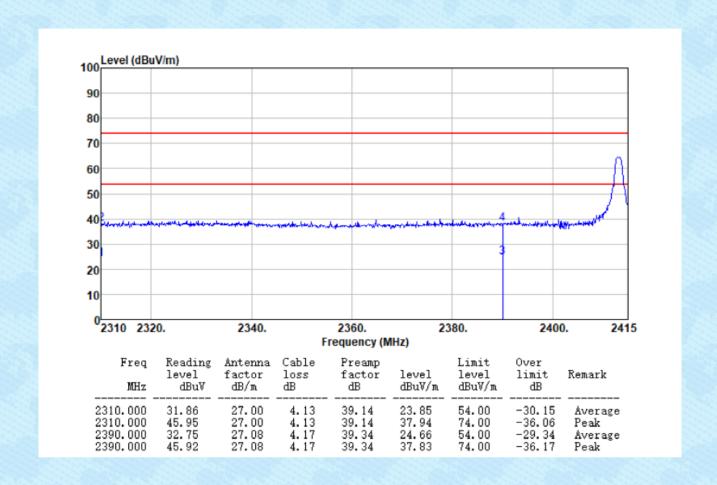
Remarks:

- 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.



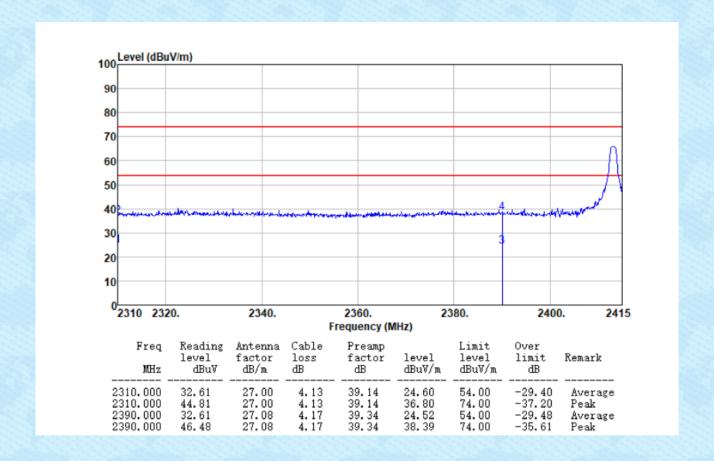
Unwanted Emissions in Restricted Frequency Bands

Test channel:	Lowest	Polarization:	Horizontal	
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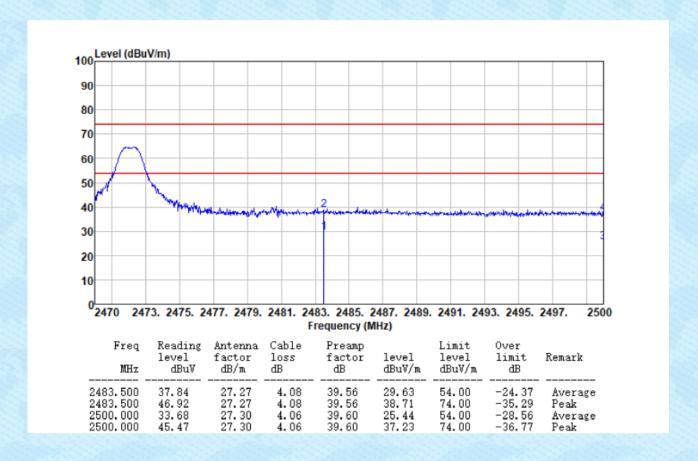
Test channel: Lowest Polarization: Vertical



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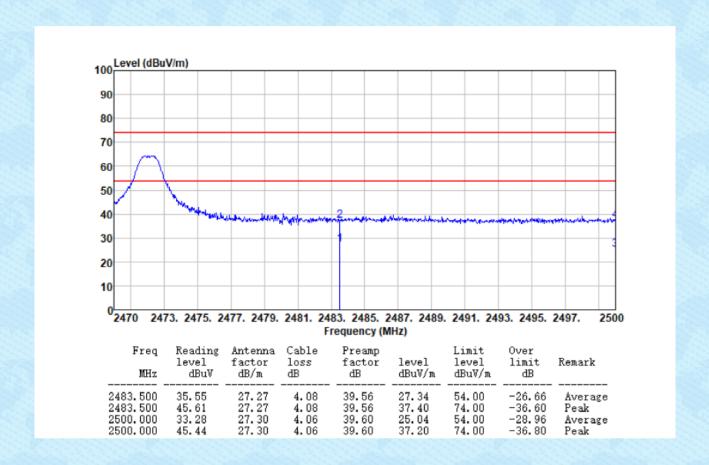


lest channel: Highest Polarization: Horizontal		Test channel:	Highest	Polarization:	Horizontal
--	--	---------------	---------	---------------	------------





Test channel: Highest Polarization: Vertical	Test channel:	Highest	Polarization:	Vertical	
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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.



8 Test Setup Photo

Reference to the appendix I for details.

9 EUT Constructional Details

Reference to the appendix II for details.

-----End-----