

GTS Global United Technology Services Co., Ltd.

Report No.: GTS202206000093F01

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/Factory:	Alpha Group Co., Ltd.
Address of Manufacturer/Factory:	Alpha Animation Industrial Area, Jinhong Road East & Fengxiang Road North, Chenghai District, Shantou, Guangdong, P.R.China
Equipment Under Test (E	EUT)
Product Name:	Terra Drone
Model No.:	858370, 858371
FCC ID:	2AIRP-858370
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247
Date of sample receipt:	June 10, 2022
Date of Test:	June 10-22, 2022
Date of report issued:	June 23, 2022
Test Result :	PASS *

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



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	June 23, 2022	Original

Prepared By:

por Chen

Date:

June 23, 2022

Project Engineer

Check By:

opinson (m) Reviewer

Date:

June 23, 2022

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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

Frequency Range Measurement Uncertainty		Notes			
9kHz-30MHz	3.1dB	(1)			
30MHz-200MHz	3.8039dB	(1)			
200MHz-1GHz	3.9679dB	(1)			
1GHz-18GHz	4.29dB	(1)			
18GHz-40GHz	3.30dB	(1)			
AC Power Line Conducted 0.15MHz ~ 30MHz 3.44dB					
	9kHz-30MHz 30MHz-200MHz 200MHz-1GHz 1GHz-18GHz 18GHz-40GHz	9kHz-30MHz 3.1dB 30MHz-200MHz 3.8039dB 200MHz-1GHz 3.9679dB 1GHz-18GHz 4.29dB 18GHz-40GHz 3.30dB			

5 General Information

5.1 General Description of EUT

Product Name:	Terra Drone
Model No.:	858370, 858371
Test Model No:	858370
	identical in the same PCB layout, interior structure and electrical opearance color and model name for commercial purpose.
Test sample(s) ID:	GTS202206000093-1
Sample(s) Status:	Engineer sample
S/N:	85837001
Hardware Version:	RX:2203RX-3
	TX:2203TX-1
Software Version:	RX:73121-99371
	TX:82629-0C829
Operation Frequency:	2420MHz~2470MHz
Channel Numbers:	51
Channel Separation:	1MHz
Modulation Type:	GFSK
Antenna Type:	wire Antenna
Antenna Gain:	0dBi(Declared by applicant)
Power Supply:	TX: DC 4.5V (3*1.5 Size "AAA" Battery)
Nister The new entire few TV devices and	

Note: The report is for TX device only.



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

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2420MHz
The middle channel	2450MHz
The Highest channel	2470MHz

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5.2 Test mode

Transmitting mode Keep the EUT in continuously transmitting mode. New battery used

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

Radi	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. 24 2021	June. 23 2022		
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 24 2021	June. 23 2022		
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 24 2021	June. 23 2022		
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 24 2021	June. 23 2022		
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A		
8	Coaxial Cable	GTS	N/A	GTS213	June. 24 2021	June. 23 2022		
9	Coaxial Cable	GTS	N/A	GTS211	June. 24 2021	June. 23 2022		
10	Coaxial cable	GTS	N/A	GTS210	June. 24 2021	June. 23 2022		
11	Coaxial Cable	GTS	N/A	GTS212	June. 24 2021	June. 23 2022		
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 24 2021	June. 23 2022		
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 24 2021	June. 23 2022		
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 24 2021	June. 23 2022		
15	Band filter	Amindeon	82346	GTS219	June. 24 2021	June. 23 2022		
16	Power Meter	Anritsu	ML2495A	GTS540	June. 24 2021	June. 23 2022		
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 24 2021	June. 23 2022		
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 24 2021	June. 23 2022		
19	Splitter	Agilent	11636B	GTS237	June. 24 2021	June. 23 2022		
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 24 2021	June. 23 2022		
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. 24 2021	June. 23 2022		



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	June. 24 2021	June. 23 2022			
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 24 2021	June. 23 2022			
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 24 2021	June. 23 2022			
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 24 2021	June. 23 2022			
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 24 2021	June. 23 2022			
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 24 2021	June. 23 2022			
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 24 2021	June. 23 2022			
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 24 2021	June. 23 2022			

Gene	General used equipment:							
Item Test Equipment Manufacturer Mo				Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 24 2021	June. 23 2022		
2	Barometer	ChangChun	DYM3	GTS255	June. 24 2021	June. 23 2022		



7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement:	
responsible party shall be use antenna that uses a unique of	be designed to ensure that no antenna other than that furnished by the ed with the device. The use of a permanently attached antenna or of an coupling to the intentional radiator, the manufacturer may design the unit in be replaced by the user, but the use of a standard antenna jack or ited.
15.247(c) (1)(i) requirement	
operations may employ trans	2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point mitting antennas with directional gain greater than 6dBi provided the power of the intentional radiator is reduced by 1 dB for every 3 dB that the a exceeds 6dBi.
E.U.T Antenna:	
The antennas are wire anten	na, 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

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 15.247 Meas Guidance v05r02
Limit:	>500KHz
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



7.4 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

GTS

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 Meth	100							
Test Requirement:	FCC Part15 C Section	on 15	5.209					
Test Method:	ANSI C63.10:2013							
Test Frequency Range:	9kHz to 25GHz							
Test site:	Measurement Distar	nce: 3	3m					
Receiver setup:	Frequency	C	Detector	RBV	V	VBW	3	Value
	9KHz-150KHz	Qu	lasi-peak	200H	łz	600Hz	z	Quasi-peak
	150KHz-30MHz		lasi-peak	9KH	z	30KH:	z	Quasi-peak
	30MHz-1GHz	Qu	lasi-peak	120K	Hz	300KH	lz	Quasi-peak
	Above 1GHz		Peak	1MH	z	3MHz	z	Peak
	Above TOTIZ		Peak	1MH	z	10Hz	1.5	Average
Limit:	Frequency		Limit (u∖	//m)	V	alue	N	leasurement Distance
	0.009MHz-0.490M	Hz	2400/F(k	(Hz)		QP		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		200			QP		3m
	960MHz-1GHz		500			QP	741	
	Above 1GHz		500			erage		
			5000		P	Peak		
Test setup:	For radiated emiss	ions	from 9kH	z to 30	MH	z		
	Turn Table Kale	united and a second	< 3m > Test A ım Table+'	ntenna 1m Receiver				

7.5.2 Radiated Emission Method

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 518102 Telephone: +86 (0) 755 2779 8480 Fax: +86 (0) 755 2779 8960 GTS Report No.: GTS202206000093F01 For radiated emissions from 30MHz to1GHz < 3m Test Antenna < 1m ... 4m > EUT. Tum Table. < 80cm > Turn Table+ 1 Receiver. Preamplifier+ For radiated emissions above 1GHz ******* < 3m > Test Antenna-< 1m ... 4m > EUT. Tum Tables <150cm AP Receiver+ Preamplifier+ **Test Procedure:** The EUT was placed on the top of a rotating table (0.8m for below 1G 1. 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. 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.



				Report No.:	GTS202206	000093F01
Test Instruments:	Refer to see	ction 6.0 for c	details			
Test mode:	Refer to see	ction 5.2 for c	details			
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	DC 4.5V					
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.

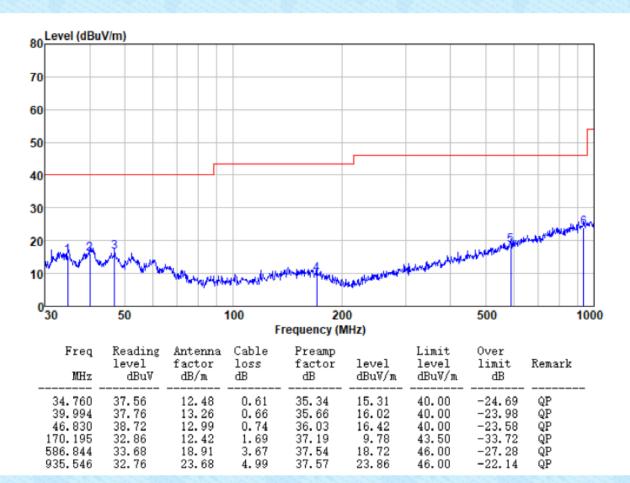
■ 9kHz~30MHz

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.



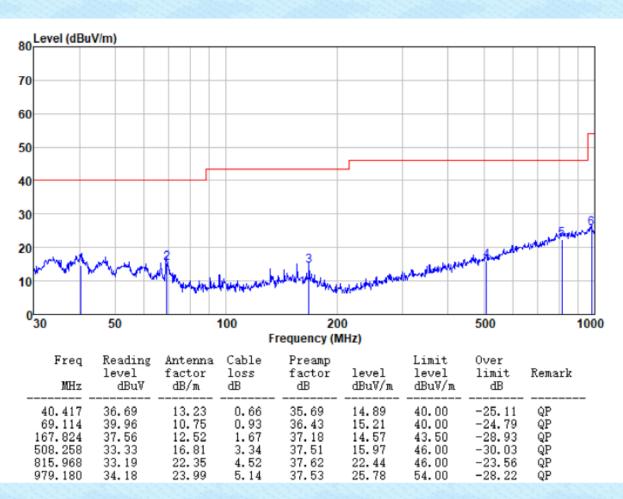
Below 1GHz

Pre-scan all test modes, found worst case at 2420MHz, and so only show the test result of 2420MHz **Horizontal:**



Vertical:

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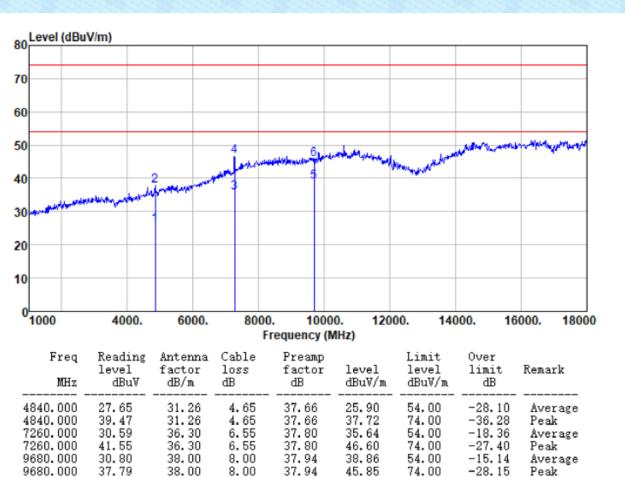


Above 1GHz

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Unwanted Emissions in Restricted Frequency Bands

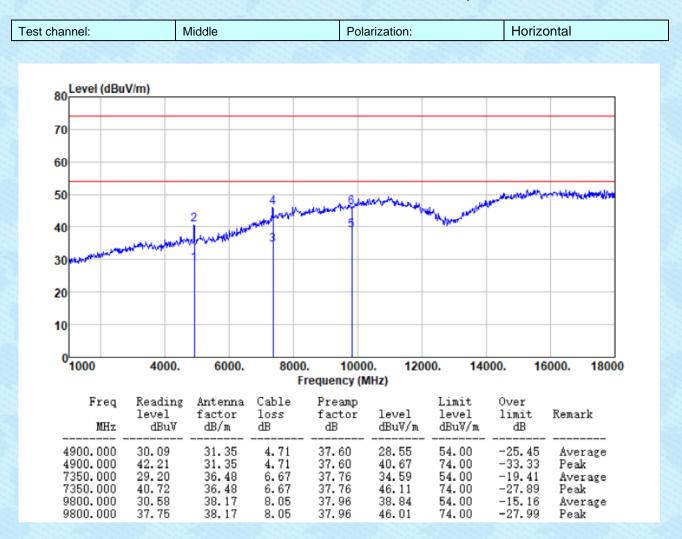
- Onwanted Emissions	o in Restricted Frequency	Dunus	a the second
Test channel:	Lowest	Polarization:	Horizontal



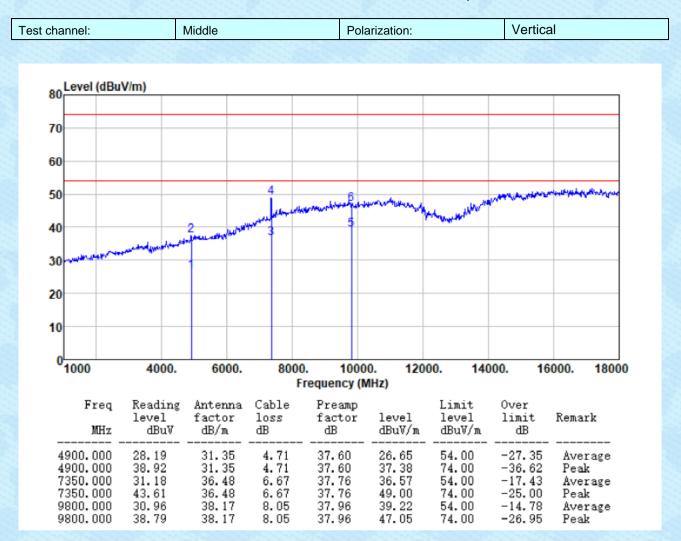
Report No.: GTS202206000093F01

channel:		Lowest		Po	olarization:		Vert	tical
80 Level (dBu	V/m)							
80								
70								
60								
50			4	6.1	he die		Loughtering	Maria Maria Maria San P
40			Marchan	den in the first	and the states	Halan and Marine Marine and	r	
		2 mar mar and a strategy	~	Ĭ				
. Units	States and a state of the second	T I						
30 makerin solution	and the second	1						
20								
30								
20	4000.	6000.	8000 F). 1000 Trequency (N		00. 140	00. 16	6000. 1800
20 10		6000. Antenna factor dB/m				00. 140 Limit level dBuV/m	00. 16 Over limit dB	6000. 1800 Remark
30 20 10 0 1000 Freq	4000. Reading level	Antenna factor	F Cable loss	requency (N Preamp factor	IHZ) level	Limit level	Over limit	

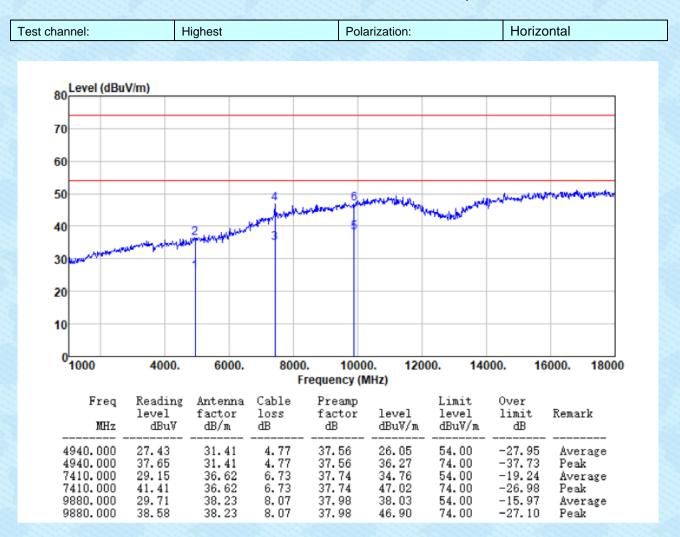
Report No.: GTS202206000093F01

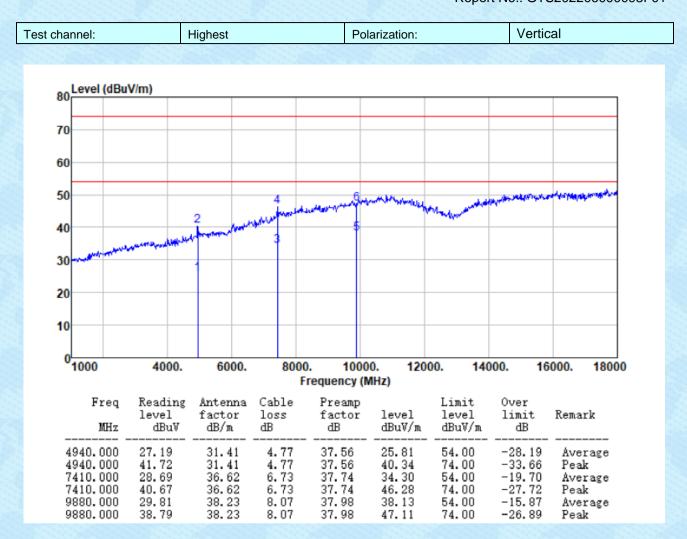


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Report No.: GTS202206000093F01



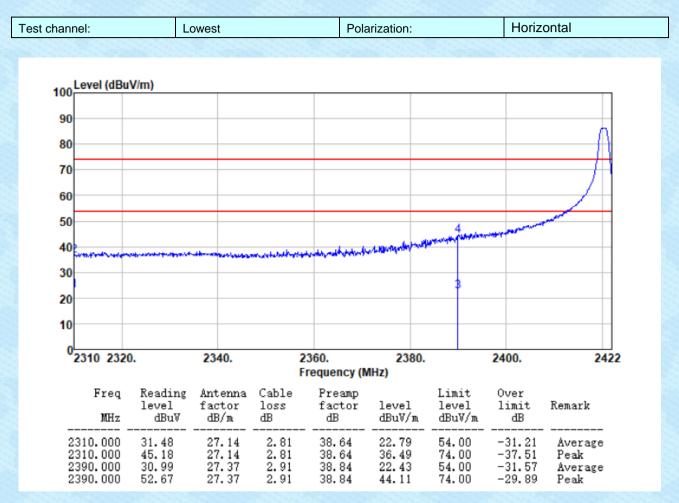


Remarks:

- 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 Non-restricted Frequency Bands





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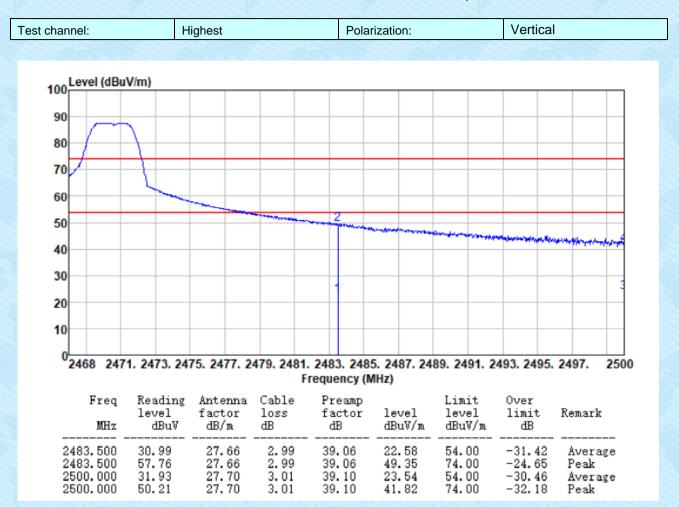
t channel:	L	owest		Pol	arization:		Verti	cal
100 Level (dBu)	V/m)							
90								Λ
80								
70								-
60								
50						4	and the second second	
	والأفريقية والمتحد	-	an life of the same	for the series	part and the			
40			a and the second se					
30								
						3		
20						3		
20						3		
10						3		
).	2340.		60. equency (N	2380. IHZ)	3	2400.	2422
10 0 2310 2320				60. equency (N Preamp		Limit	2400. Over	2422
10 0 2310 2320 Freq	Reading level	Antenna factor	Fre Cable loss	e quency (N Preamp factor	l Hz) level	level	Over limit	2422 Remark
10 0 2310 2320 Freq MHz	Reading level dBuV	Antenna factor dB/m	Fro Cable loss dB	equency (N Preamp factor dB	level dBu∛/m	level dBu∛/m	Over limit dB	Remark
10 0 2310 2320 Freq	Reading level	Antenna factor	Fre Cable loss	e quency (N Preamp factor	l Hz) level	level	Over limit	



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st channel:	Highest		Polar	ization:		Horizor	ntal
100 Level (dBuV/	m)						
90							
80							
70							
60							
		Non-real of the local diversion of the local	2				
50		a second a s	and the second second			and the second second	and the local bull
40							
30							
20							
10							
0 ²⁴⁶⁸ 2471.	2473. 2475. 2477.		2483. 2483 equency (N		39. 2491. 24	493. 2495.	2497. 2500
	Reading Antenn level factor dBuV dB/m		Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
2483.500	32.63 27.66 56.01 27.66 31.54 27.70 51.46 27.70	2.99 3.01	39.06 39.06 39.10 39.10	24.22 47.60 23.15 43.07	54.00 74.00 54.00 74.00 74.00	-29.78 -26.40 -30.85 -30.93	Average Peak Average Peak

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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-----