

FCC TEST REPORT

Product Name: R/C QUADCOPTER

Trade Mark: N/A

Model No.: FX-22C

Report Number: 171027002RFC-1

Test Standards: FCC 47 CFR Part 15 Subpart C

FCC ID: 2AFDJHKFX8GT

Test Result: PASS

Date of Issue: June 29, 2018

Prepared for:

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Prepared by:

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Shenzhen UnionTrust Quality and Technology Co., Ltd.



Version

Version No.	Date	Description
V1.0	October 30, 2017	Original
V2.0	June 29, 2018	Change FCC ID to 2AFDJHKFX8GT





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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant: HK TECH SCIENCE & TECHNOLOGY CO., LTD		
Address of Applicant: Xiehe Industrial B Zone, Laimei Road, Chenghai District, 515800, Sh Guangdong, China		
Manufacturer:	HK TECH SCIENCE & TECHNOLOGY CO., LTD	
Address of Manufacturer:	Xiehe Industrial B Zone, Laimei Road, Chenghai District, 515800, Shantou, Guangdong, China	

1.2 EUT INFORMATION

1.2.1 General Description of EUT

R/C QUADCOPTER		
FX-22C		
FX-2, FX-3, FX-3V, FX-4, FX-4VCI, FX-4V, FX-5, FX-5W, FX-6, FX-6C, FX-6CI, FX-7, FX-7C, FX-7CI, FX-7S, FX-8A, FX-8E, FX-8C, FX-8G, FX-9A, FX-9E, FX-9C, FX-11, FX-12V, FX-12, FX-13, FX-14, FX-15, FX-15C, FX-15CI, FX-16, FX-16CI, FX-16CI, FX-17, FX-18, FX-19, FX-20, FX-21, FX-22A, FX-22E, FX-23, FX-24, FX-25, FX-25CI, FX-26, FX-26CI, FX-27A, FX-27E, FX-27C, FX-28, FX-29, FX-29CI, FX-29A, FX-29E, FX-30, FX-31, FX-32, FX-33, FX-34, FX-35A, FX-35E, FX-35C, FX-36, FX-37, D2, D3, D3V, D4, D4VCI, D4V, D5, D5W, D6, D6C, D6CI, D7, D7C, D7CI, D7S, D8A, D8E, D8C, D8G, D9A, D9E, D9C, D11, D12V, D12, D13, D14, D15, D15C, D15CI, D16, D16C, D16CI, D17, D18, D19, D20, D21, D22A, D22E, D22C, D23, D24, D25, D25CI, D26, D27A, D27E, D27C, D28, D29, D29CI, D29A, D29E, D30, D31,		
N/A		
Identical Prototype		
n: General 2.4GHz Technique		
The EUT is supplied by 4x1.5V === AA batteries.		
e: October 27, 2017		
October 27, 2017 to October 30, 2017		

Note: That the product, FX-22C, is identical in construction including schematics, PCB layout and electronic components to the model FX-2, FX-3, FX-3V, FX-4, FX-4VCI, FX-4V, FX-5, FX-5W, FX-6, FX-6C, FX-6CI, FX-7, FX-7C, FX-7CI, FX-7S, FX-8A, FX-8E, FX-8C, FX-9A, FX-9E, FX-9C, FX-11, FX-12V, FX-12, FX-13, FX-14, FX-15, FX-15C, FX-15CI, FX-16, FX-16C, FX-16CI, FX-17, FX-18, FX-19, FX-20, FX-21, FX-22A, FX-22E, FX-23, FX-24, FX-25, FX-25CI, FX-26, FX-26CI, FX-27A, FX-27E, FX-27C, FX-28, FX-29, FX-29CI, FX-30, FX-31, FX-32, FX-33, FX-34, FX-35A, FX-35E, FX-35C, FX-36, FX-37, D2, D3, D3V, D4, D4VCI, D4V, D5, D5W, D6, D6C, D6CI, D7, D7C, D7CI, D7S, D8A, D8E, D8C, D9A, D9E, D9C, D11, D12V, D12, D13, D14, D15, D15C, D15CI, D16, D16C, D16CI, D17, D18, D19, D20, D21, D22A, D22E, D22C, D23, D24, D25, D25CI, D26, D27A, D27E, D27C, D28, D29, D29CI, D30, D31, D32, D33, D34, D35A, D35E, D35C, D36, D37 except a change in packaging.

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Range: 2450 MHz to 2475 MHz		
Type of Modulation:	GFSK	
Number of Channels:	3 (Client confirm only have 3 channel)	
Antenna Type: Integral Antenna		
Antenna Gain: 2 dBi		
Maximum Field Strength: 81.14 dBμV/m		
Normal Test Voltage: 6.0 Vdc		



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1.4 OTHER INFORMATION

None.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested independently

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua

New District, Shenzhen, China 518109 Telephone: +86 (0) 755 2823 0888 Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases						
Test Item	Test Requirement	Test Method	Result			
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS			
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A ^(Note1)			
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209	ANSI C63.10-2013	PASS			
Restricted bands around fundamental frequency (Radiated Emission)	FCC 47 CFR Part 15 Subpart C Section 15.249(a)/15.205	ANSI C63.10-2013	PASS			
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c)	ANSI C63.10-2013	N/A ^(Note1)			
Note:						

N/A: In this whole report not application.



3. EQUIPMENT LIST

	Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)	
V	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018	
>	Receiver	R&S	ESIB26	100114	Dec. 22, 2016	Dec. 22, 2017	
	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017	
>	Loop Antenna	ETS-LINDGREN	6502	00202525	Jun. 24, 2015	Jun. 23, 2018	
>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Jul. 24, 2015	Jul. 23, 2018	
~	Preamplifier	HP	8447F	2805A02960	Dec. 22, 2016	Dec. 22, 2017	
	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Dec. 30, 2016	Dec. 30, 2017	
	Horn Antenna	ETS-LINDGREN	3117	00164202	Jul. 24, 2015	Jul. 23, 2018	
V	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Dec. 30, 2016	Dec. 30, 2017	
	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jul. 28, 2015	Jul. 27, 2018	
V	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jul. 29, 2015	Jul. 28, 2018	
>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A	
>	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G248	Jun. 21, 2017	Jun. 20, 2018	
	Band Rejection Filter (5150MHz~5880MHz)	Micro-Tronics	BRM50716	G1868	Jun. 15, 2017	Jun. 14, 2018	
>	Test Software	Audix	e3	Sof	tware Version: 9.16	0323	



4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests				
Test Condition	Ambient				
rest Condition	Temperature (°C)	Voltage (Vdc)	Relative Humidity (%)		
NT/NV	+15 to +35 6 20 to 75				
Remark: 1) NV: Normal Voltage; NT: Normal Temperature					

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)	Tested by
Radiated Emission	24.6	53	99.96	Terence Chen
Restricted bands around fundamental frequency (Radiated Emission)	24.6	53	99.96	Terence Chen

4.2TEST CHANNELS

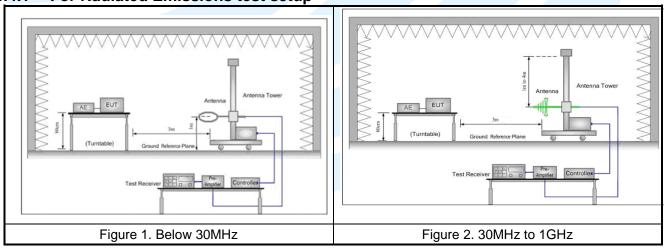
Type of Modulation	Tx Frequency	To	est RF Channel List	ts
		Lowest(L)	Middle(M)	Highest(H)
GFSK	2450 MHz to 2475 MHz	Channel 1	Channel 2	Channel 3
		2450 MHz	2460 MHz	2475 MHz

4.3 EUT TEST STATUS

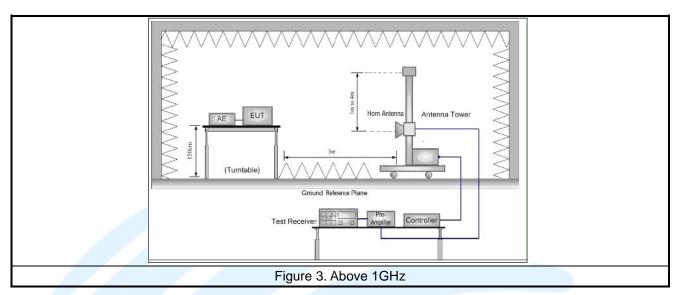
Modulation Mode	Tx Function	Description
GFSK	1Tx	Keep the EUT in continuously transmitting with modulation test single.

4.4TEST SETUP

4.4.1 For Radiated Emissions test setup











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4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 6Vdc. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	Z axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.



4.6 DUTY CYCLE

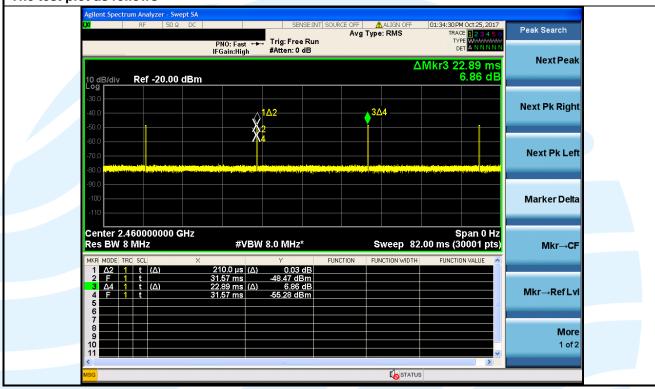
Type of Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Average Factor (dB)
GFSK	0.210	22.89	0.01	0.92	-40.75

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Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = 10 * log(1/ Duty cycle);
- 3) Average factor = 20 log₁₀ Duty Cycle.

The test plot as follows





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5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION 5.1 REFERENCE DOCUMENTS FOR TESTING

No. Identity		Document Title		
1	FCC 47 CFR Part 15	Radio Frequency Devices		
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices		

5.2 ANTENNA REQUIREMENT

Standard Requirement

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:

Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 2 dBi

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.249 **Test Method:** ANSI C63.10-2013 Section 6.6.4.3

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009 MHz-0.090 MHz	Peak	10 kHz	30 KHz	Peak
0.009 MHz-0.090 MHz	Average	10 kHz	30 KHz	Average
0.090 MHz-0.110 MHz	Quasi-peak	10 kHz	30 KHz	Quasi-peak
0.110 MHz-0.490 MHz	Peak	10 kHz	30 KHz	Peak
0.110 MHz-0.490 MHz	Average	10 kHz	30 KHz	Average
0.490 MHz -30 MHz	Quasi-peak	10 kHz	30 kHz	Quasi-peak
30 MHz-1 GHz	Quasi-peak	100 kHz	300 KHz	Quasi-peak
Above 1 GHz	Peak	1 MHz	3 MHz	Peak
ADOVE I GHZ	Peak	1 MHz	10 Hz	Average

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBµV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	-		300
0.490 MHz-1.705 MHz	24000/F(kHz)			30
1.705 MHz-30 MHz	30			30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Field strength of the fundamental signal

Frequency	Limit (dBµV/m @3m)	Remark
2400 MHz-2483.5 MHz	94.0	Average
	114.0	Peak



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Remark:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

- 1. From 30 MHz to 1GHz test procedure as below:
- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table 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.
- Above 1GHz test procedure as below:
- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter (Above 18GHz the distance is 1 meter and table is 1.5 meter).
- 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
- 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Z axis positioning which it is worse case.
- 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

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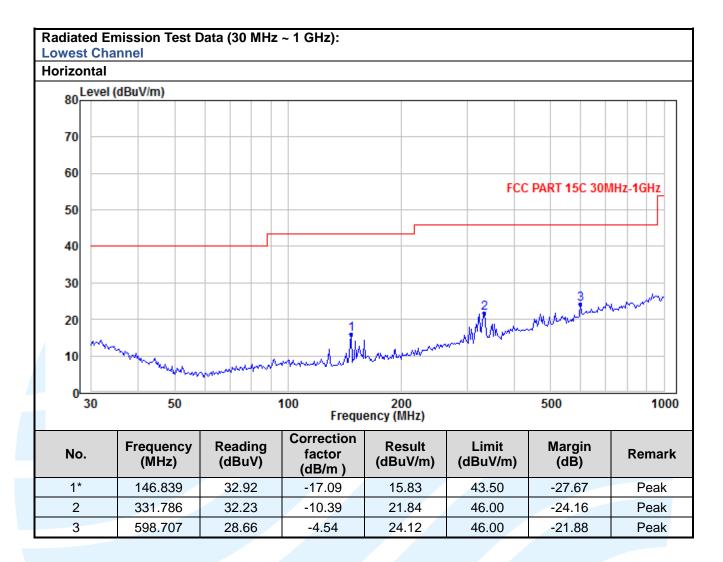
The measurement data as follows:

Field Strength of th	ne Fundamental Si	gnal	•	·		
Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Antenna Polaxis	Pass/Fail	
Lowest Channel						
48.88	94.00	-45.12	Average	Horizontal	Pass	
89.63	114.00	-24.37	Peak	Horizontal	Pass	
40.89	94.00	-53.11	Average	Vertical	Pass	
81.64	114.00	-32.36	Peak	Vertical	Pass	
Middle Channel						
45.71	94.00	-48.29	Average	Horizontal	Pass	
86.46	114.00	-27.54	Peak	Horizontal	Pass	
40.15	94.00	-53.85	Average	Vertical	Pass	
80.85	114.00	-33.15	Peak	Vertical	Pass	
Highest Channel						
46.63	94.00	-47.37	Average	Horizontal	Pass	
87.38	114.00	-26.62	Peak	Horizontal	Pass	
40.89	94.00	-53.11	Average	Vertical	Pass	
81.64	114.00	-32.36	Peak	Vertical	Pass	

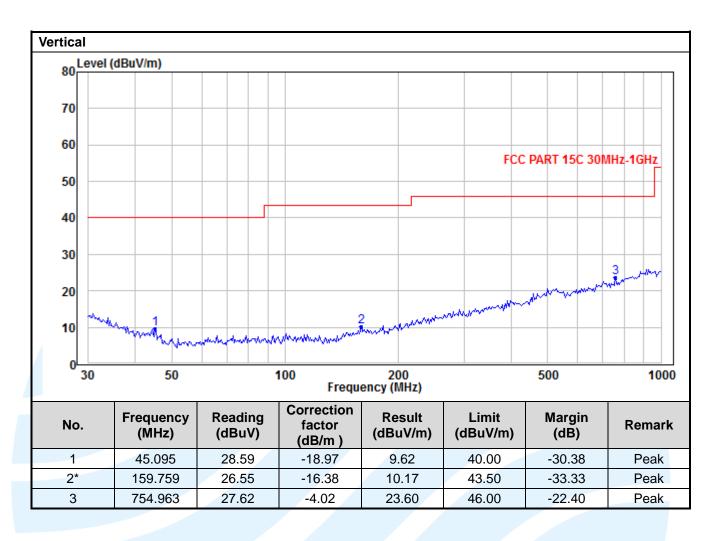
Radiated Emission Test Data (9 KHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

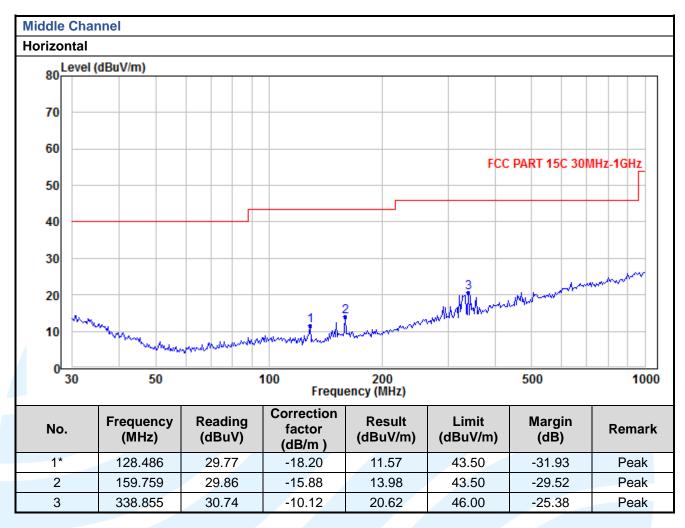




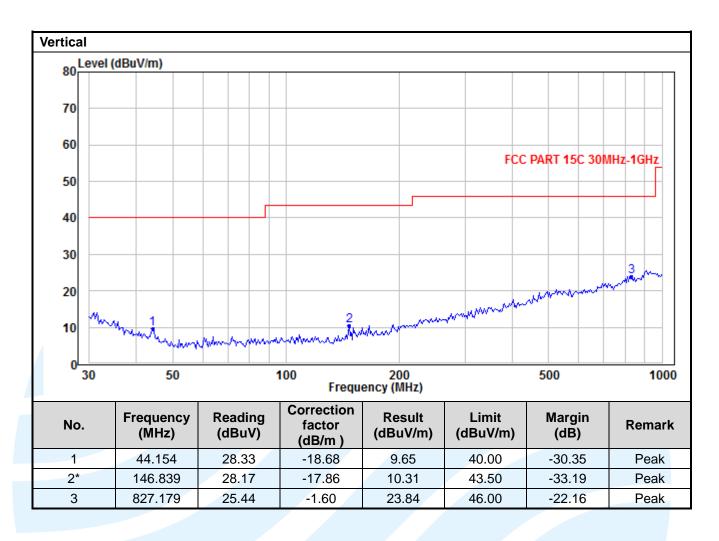




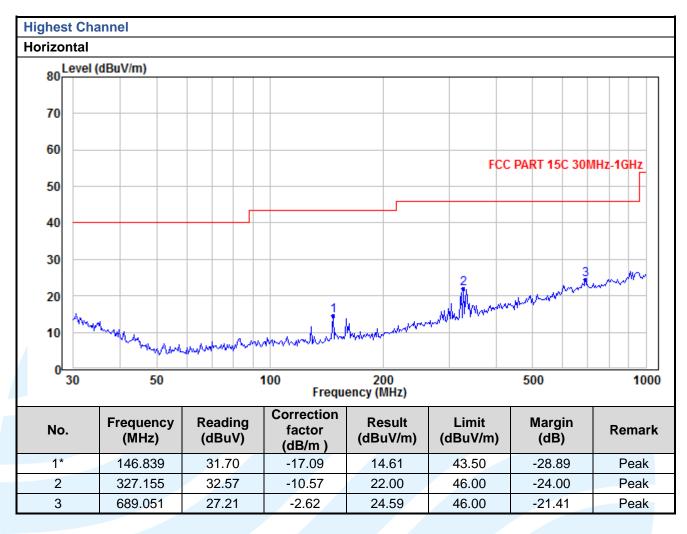




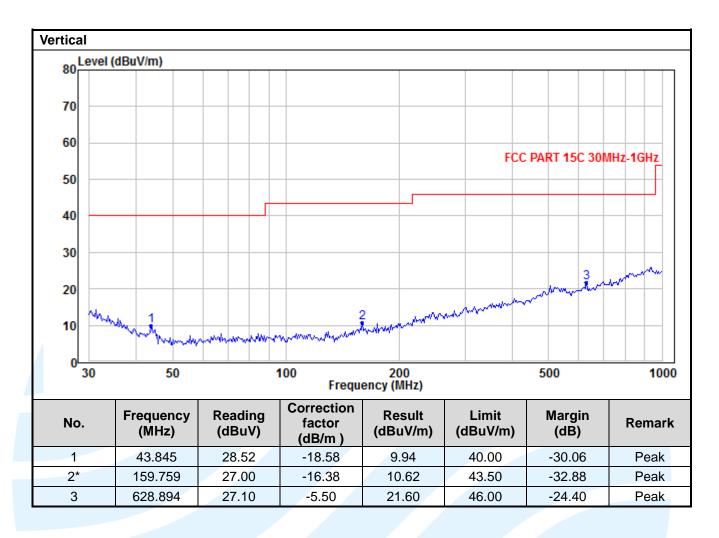












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Radiated Emission Test Data (Above 1GHz):

Lowest Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4900.00	51.45	74.00	-22.55	Peak	Horizontal
2	4900.00	45.34	74.00	-28.66	Peak	Horizontal
3	7350.00	44.92	74.00	-29.08	Peak	Vertical
4	7350.00	43.22	74.00	-30.78	Peak	Vertical

Middle Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4920.00	49.30	74.00	-24.70	Peak	Horizontal
2	4920.00	45.06	74.00	-28.94	Peak	Horizontal
3	7380.00	49.77	74.00	-24.23	Peak	Vertical
4	7380.00	43.67	74.00	-30.33	Peak	Vertical

Highest Channel:

	No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
	1	4950.00	51.21	74.00	-22.79	Peak	Horizontal
	2	4950.00	44.57	74.00	-29.43	Peak	Horizontal
I	3	7425.00	48.82	74.00	-25.18	Peak	Vertical
	4	7425.00	43.44	74.00	-30.56	Peak	Vertical

Remark:

As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.



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5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY

Test Requirement: FCC 47 CFR Part 15.209 and 15.205

Test Method: ANSI C63.10-2013

Limits:

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.

Frequency	Limit (dBµV/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
Above I GHZ	74.0	Peak Value

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

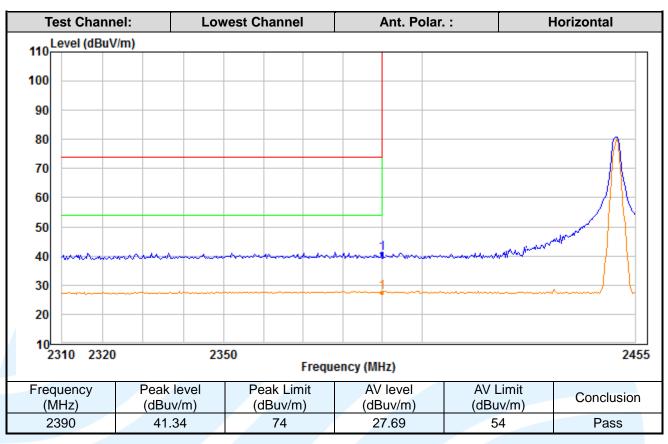
Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

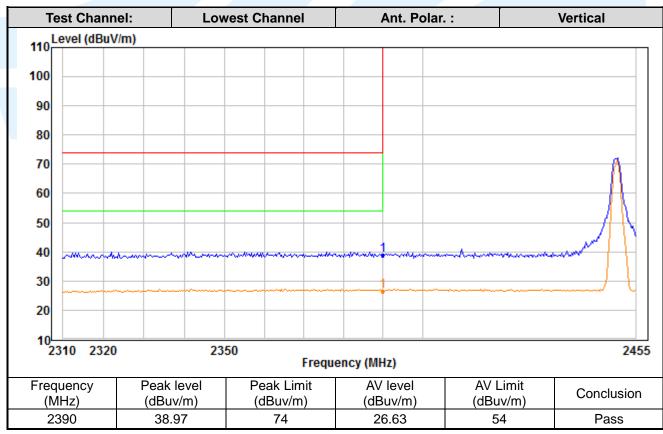
- 1. Use radiated spurious emission test procedure described in clause 5.3. The transmitter output (antenna port) was connected to the test receiver.
- 2. Set the PK and AV limit line.
- 3. Record the fundamental emission and emissions out of the band-edge.
- 4. Determine band-edge compliance as required. **Equipment Used:** Refer to section 3 for details.

Test Result: Pass

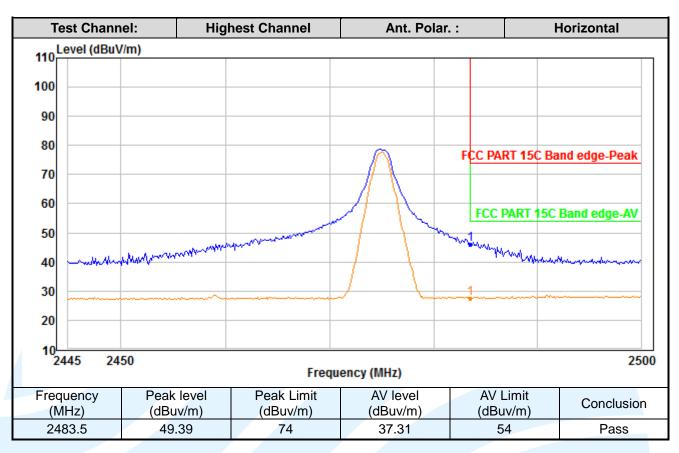
The measurement data as follows:

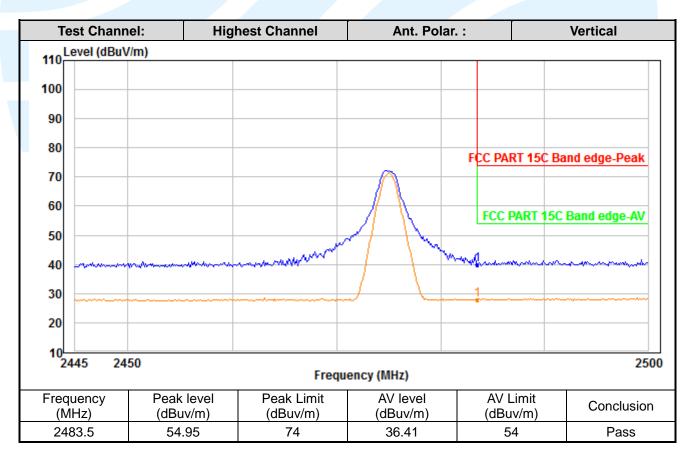






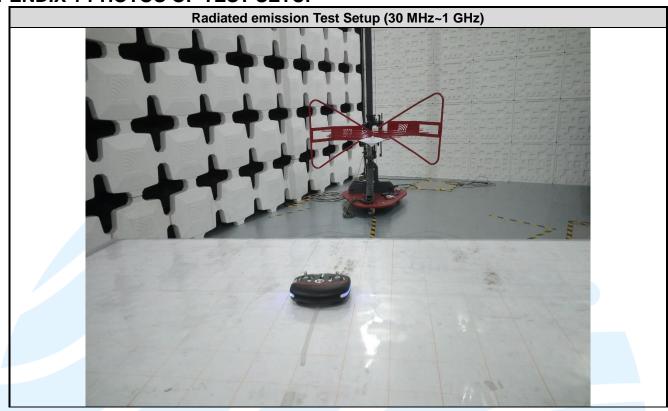




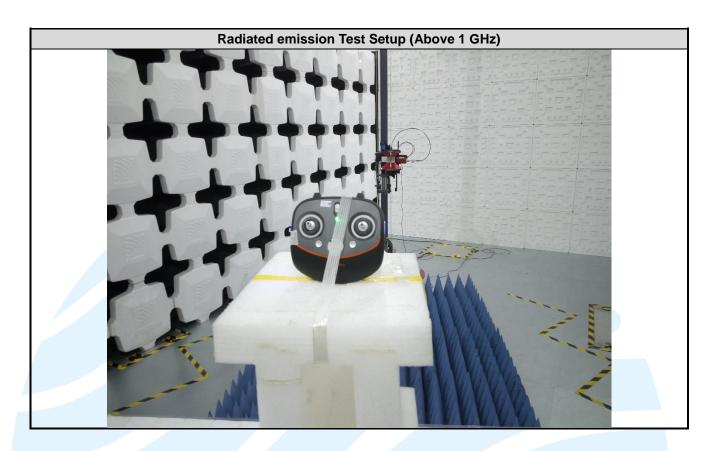




APPENDIX 1 PHOTOS OF TEST SETUP







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APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

