



FCC Part 15C Test Report

FCC ID: 2AH32UPAIRONE

Product Name:	UPAIR
Trademark:	 , GTEN , 极天创新, UPAIR
Model Name :	UPAIR One
Prepared For :	ShenZhen GTEN Innovation Technology Co.,Ltd.
Address :	Room N&Q, 8th Floor, Tower A, TCL Building, NO.6,Gaoxin South 1st Ave., Nanshan District, Shenzhen,China
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Test Date:	Apr. 15 - Apr. 24, 2016
Date of Report :	Apr. 25, 2016
Report No.:	BCTC-160404093E



VERIFICATION OF COMPLIANCE

Applicant's name **ShenZhen GTEN Innovation Technology Co.,Ltd.**

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1st Ave., Nanshan District, Shenzhen,China

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Address..... Room N&Q, 8th Floor, Tower A, TCL Building, NO.6,Gaoxin South
1st Ave., Nanshan District, Shenzhen,China

Product description

Product name UPAIR



Model Name: UPAIR One

Test procedure FCC Part15.407

Standards ANSI C63.10-2013

KDB789033 D02 General UNII Test Procedures New Rules v01

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Result **Pass**

Testing Engineer :

(Eric Yang)

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(Sophia Lee)

Authorized Signatory :



(Carson. Zhang)



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1.TEST SUMMARY

Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Emissions	15.407(b), 15.209	PASS
6dB bandwidth and 99%dB Bandwidth	15.403(i) 15.407(e)	PASS
Power density	15.407 (a)	PASS
Maximum Peak Output Power	15.407 (a)	PASS
Emissions from out of band	15.407 (b)	PASS
Transmission in case of Absence of Information	15.407(c)	PASS
Frequency Stability	15.407(g)	PASS
Antenna Requirement	15.203	PASS



2.GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Product Name:	UPAIR
Model No.:	UPAIR One
Trade Name:	 , GTEN , 极天创新 , UPAIR
Operation Frequency:	5732-5843MHz
Receiver Frequency:	2409~2474MHz
Channel numbers:	See channel list
Modulation technology:	FM
Antenna Type:	External antenna
Antenna gain:	3.0dBi
Power supply:	DC 11.1V

Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5732	12	5790
2	5733	13	5800
3	5740	14	5805
4	5745	15	5806
5	5752	16	5809
6	5760	17	5825
7	5765	18	5820
8	5769	19	5828
9	5771	20	5840
10	5780	21	5843
11	5785		



2.3. Test Supporting System

None.

2.4. Independent Operation Modes

The basic operation modes are:

Frequency	
Low	5732MHz
Middle	5805MHz
High	5843MHz

2.5. Test Sites

2.5.1. Test Facilities

Lab Qualifications : FCC Registration No.:187086



2.6. List of Test and Measurement Instruments

Conduction test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	1166.5950K03-101165-ha	2015.07.06	2016.07.05	1 year
2	LISN	R&S	NSLK8126	8126466	2015.08.24	2016.08.23	1 year
3	LISN	R&S	NSLK8126	8126487	2015.08.24	2016.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.07.06	2016.07.05	1 year
5	RF cables	R&S	R204	R20X	2015.07.06	2016.07.05	1 year

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Kind of equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2015.07.06	2016.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.07.06	2016.07.05	1 year
3	Bilog Antenna	R&S	VULB 9168	VULB91 68-438	2015.07.06	2016.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.07.06	2016.07.05	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.07.06	2016.07.05	1 year
6	Horn Antenna	R&S	HF906	10027	2015.07.06	2016.07.05	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2015.07.06	2016.07.05	1 year
8	Amplifier	R&S	BBV9743	9743-019	2015.12.22	2016.12.21	1 year
9	Loop Antenna	ARA	PLA-1030/B	1029	2015.07.06	2016.07.05	1 year
10	RF cables	R&S	R203	R20X	2015.07.06	2016.07.05	1 year
11	Antenna connector	Florida RFLabs	Lab-Fle	RF 01#	2015.07.06	2016.07.05	1 year
12	Power Metter	ANRITSU	ML2487A	6K00001568	2015.07.06	2016.07.05	1 year
13	Power Sensor (AV)	ANRITSU	ML2491A	030989	2015.07.06	2016.07.05	1 year
14	Signal Analyzer	Agilent	N9010A	MY48030494	2015.07.06	2016.07.05	1 year



3. TEST SET-UP AND OPERATION MODES

3.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



(EUT: UPAIR)

3.3. Test Operation Mode and Test Software

None.

3.4. Special Accessories and Auxiliary Equipment

3.5. Countermeasures to Achieve EMC Compliance

None.



4. EMISSION TEST RESULTS

4.1. Conducted Emission Measurement

POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi -peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

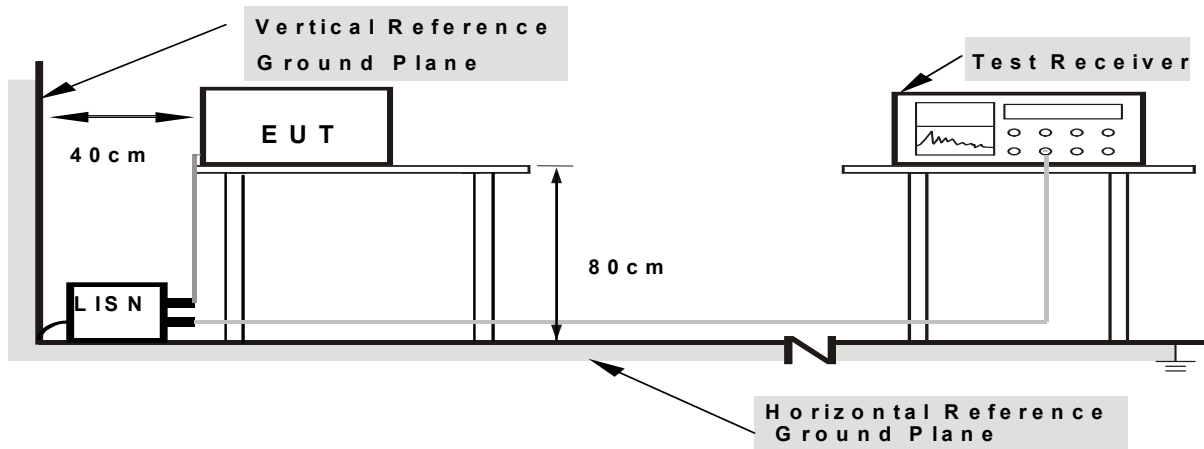
4.1.1. TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.2. DEVIATION FROM TEST STANDARD

No deviation

4.1.3. TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

4.1.4. EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.

4.1.5. TEST RESULTS

The EUT's power provide by battery, no requirement for this item.



4.2. Radiated Emission Measurement

4.2.1. Radiated Emission Limits (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower



Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2.2. TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 1.5 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.
- For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.
The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

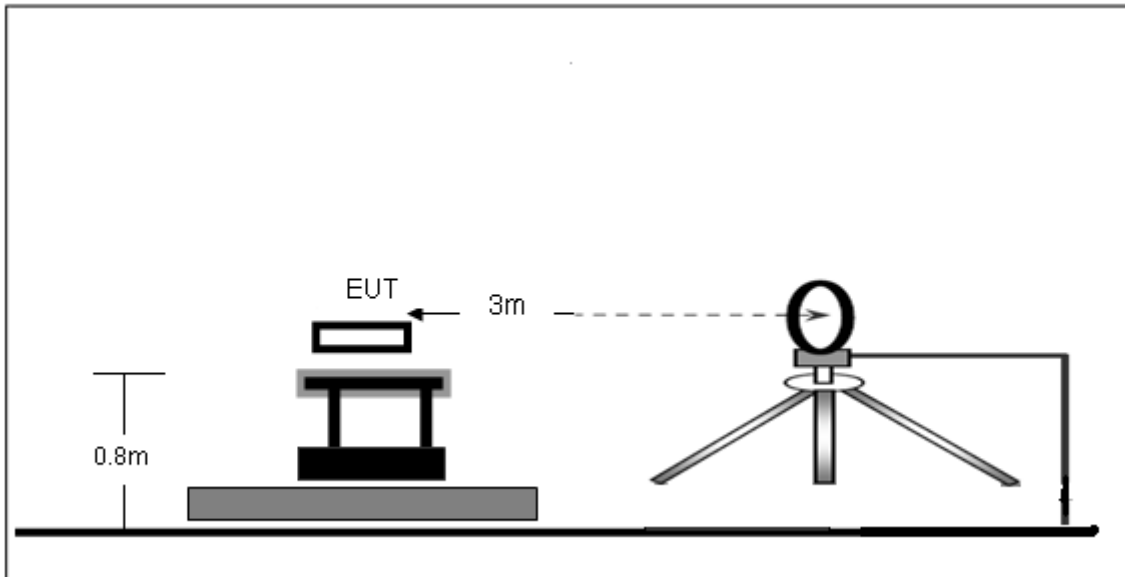
We pretest AC 120V and AC 240V, the worst voltage was AC 120V and the data recording in the report.

4.2.3. DEVIATION FROM TEST STANDARD

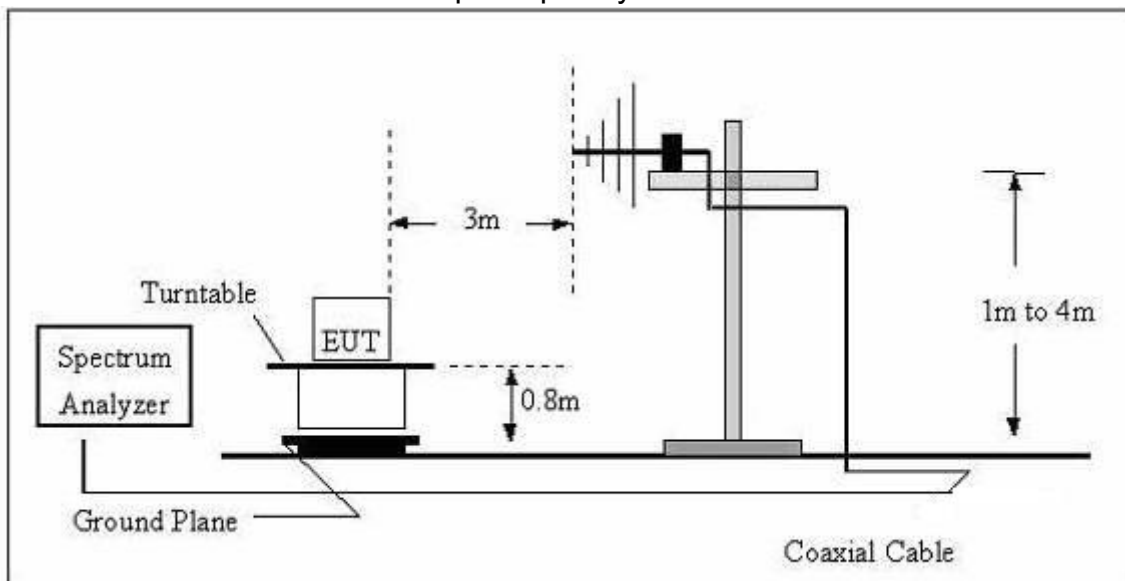
No deviation

4.2.4. TEST SETUP

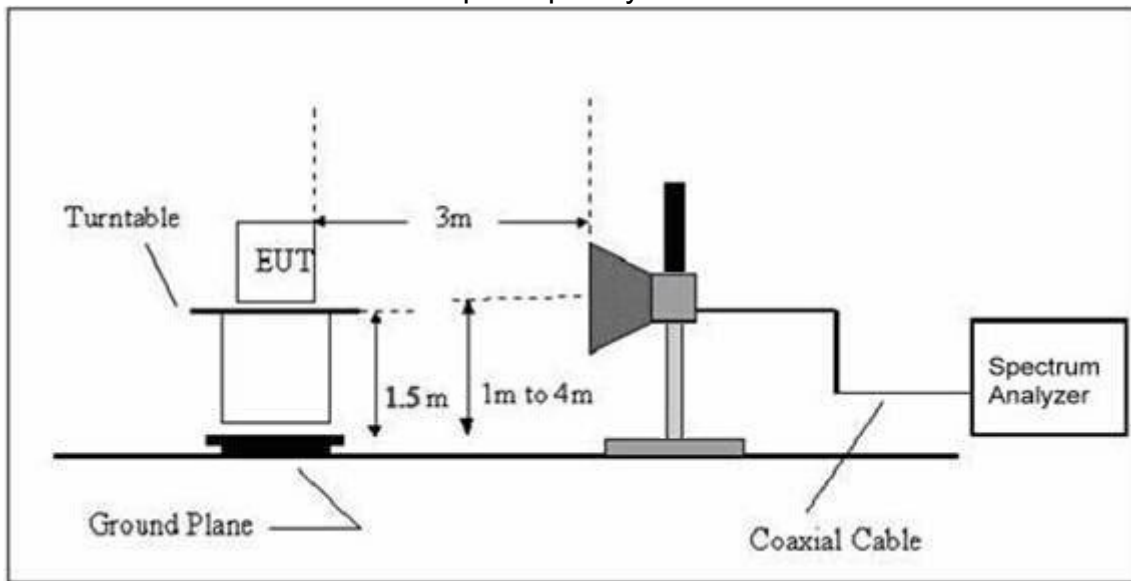
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



4.2.5. EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

We pretest all adapter's emission, only the adapter 1's data was worst and the data was recording in the report.

The data only show the worst mode.



Radiated Spurious Emission (Below 30MHz)

EUT :	UPAIR	Model Name :	UPAIR One
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Polarization :	---
Test Voltage :	DC 11.1V		
Test Mode :	TX		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.



Radiated Spurious Emission (Between 30MHz – 1GHz)

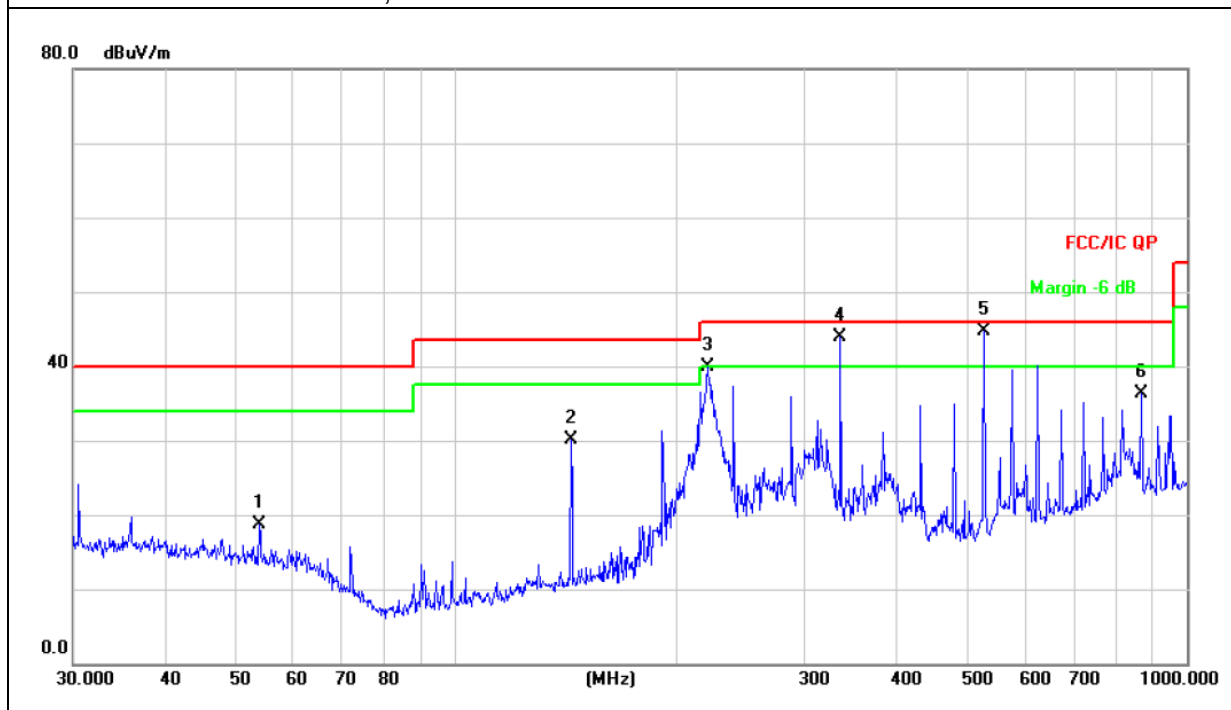
EUT :	UPAIR	Model Name :	UPAIR One
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Voltage :	DC 11.1V		
Test Mode : (Worst)	Low channel		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		53.8818	29.58	-10.93	18.65	40.00	-21.35	QP		
2		143.8295	43.20	-13.18	30.02	43.50	-13.48	QP		
3		221.3921	55.46	-15.54	39.92	46.00	-6.08	QP		
4	!	336.0352	55.52	-11.66	43.86	46.00	-2.14	QP		
5	*	528.2458	52.39	-7.65	44.74	46.00	-1.26	QP		
6		866.0879	38.37	-2.05	36.32	46.00	-9.68	QP		

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and BT TX mode was link.





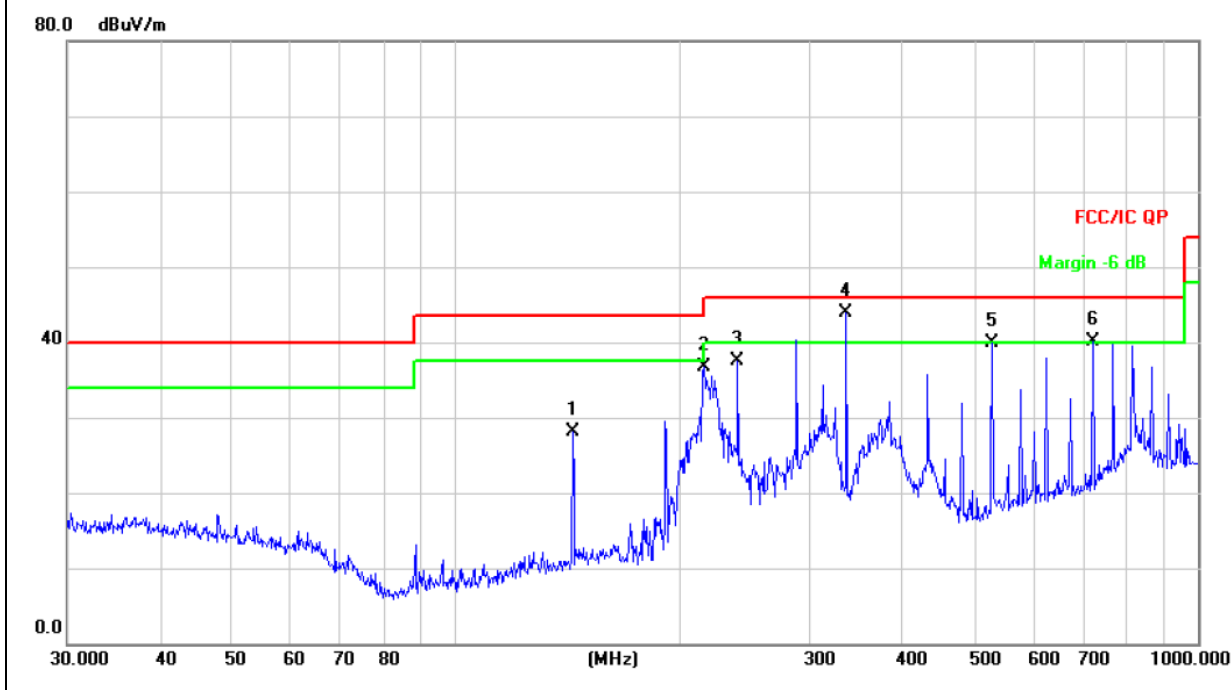
EUT :	UPAIR	Model Name :	UPAIR One
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Voltage :	DC 11.1V		
Test Mode : (Worst)	Low channel		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		143.8295	41.26	-13.18	28.08	43.50	-15.42	QP		
2		216.0240	52.43	-15.75	36.68	46.00	-9.32	QP		
3		239.9874	52.04	-14.49	37.55	46.00	-8.45	QP		
4	*	336.0352	55.63	-11.66	43.97	46.00	-2.03	QP		
5		528.2458	47.59	-7.65	39.94	46.00	-6.06	QP		
6	!	721.7259	43.95	-3.93	40.02	46.00	-5.98	QP		

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

All interfaces was connected, and BT TX mode was link.





Radiated Spurious Emission (1GHz to 5th harmonics)

	Freq.	Receiver Reading	Detector	Polar	Corrected Factor	Emission Level	Limit	Result
	(MHz)	(dBμV)	(PK/QP/Ave)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	
Lower Channel 5732MHz	11464.00	57.82	PK	H	2.19	60.01	74.00	Pass
	11464.00	47.79	Ave	H	2.19	49.98	54.00	Pass
	17196.00	59.47	PK	H	-2.05	57.42	74.00	Pass
	17196.00	48.76	Ave	H	-2.05	46.71	54.00	Pass
	11464.00	57.67	PK	V	2.19	59.86	74.00	Pass
	11464.00	48.61	Ave	V	2.19	50.80	54.00	Pass
	17196.00	58.89	PK	V	-2.05	56.84	74.00	Pass
	17196.00	48.97	Ave	V	-2.05	46.92	54.00	Pass
Middle Channel 5805MHz	11610.00	56.52	PK	H	2.38	58.90	74.00	Pass
	11610.00	47.53	Ave	H	2.38	49.91	54.00	Pass
	17415.00	59.03	PK	H	-2.21	56.82	74.00	Pass
	17415.00	47.54	Ave	H	-2.21	45.33	54.00	Pass
	11610.00	57.32	PK	V	2.38	59.70	74.00	Pass
	11610.00	48.51	Ave	V	2.38	50.89	54.00	Pass
	17415.00	58.78	PK	V	-2.21	56.57	74.00	Pass
	17415.00	47.83	Ave	V	-2.21	45.62	54.00	Pass
Upper Channel 5843MHz	11686.00	56.70	PK	H	2.43	59.13	74.00	Pass
	11686.00	47.35	Ave	H	2.43	49.78	54.00	Pass
	17529.00	59.02	PK	H	-2.37	56.65	74.00	Pass
	17529.00	47.84	Ave	H	-2.37	45.47	54.00	Pass
	11686.00	57.71	PK	V	2.43	60.14	74.00	Pass
	11686.00	47.16	Ave	V	2.43	49.59	54.00	Pass
	17529.00	59.06	PK	V	-2.37	56.69	74.00	Pass
	17529.00	47.99	Ave	V	-2.37	45.62	54.00	Pass

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Emission Level = Meter Reading + Factor

Margin = Emission Level - Limit

Other harmonics emissions are lower than 20dB below the allowable limit.



5. BAND EDGE COMPLIANCE TEST

5.1. Limits

(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an e.i.r.p. of -27 dBm/MHz.

5.2. Test setup

Test method: FCC KDB 789033 G)& Parts 15.407(b)(4) & 15.209(a)

Same as Clause 4.2.

5.3. Test Data

Please see data as below:

Note: we pretest horizontal and vertical, the worst was horizontal and show in the report.

Modulation	Test Frequency (MHz)	Max Level (dBμV/m)	EIRP[dBm]	Limit[dBm]	Result
FM	5732	52.75	-42.45	-27.00	Pass
	5805	51.84	-43.36	-27.00	Pass
	5843	51.57	-43.63	-27.00	Pass

Remark: 1. According to KDB 789033 D02 section H) d) (iii), for measurement above 1000MHz@3m distance, the limit of EIRP is calculated as follows: $EIRP[dBm] = E[dBμV/m] - 95.2$



6. 26DB AND 99% BANDWIDTH TEST

6.1. Measurement Procedure

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum power control level, as defined in KDB 789033, at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26 dB bandwidth.

The 26 dB bandwidth is used to determine the conducted power limits.

There is no limit bandwidth for U-NII-1, U-NII-2-A and U-NII-2-C.

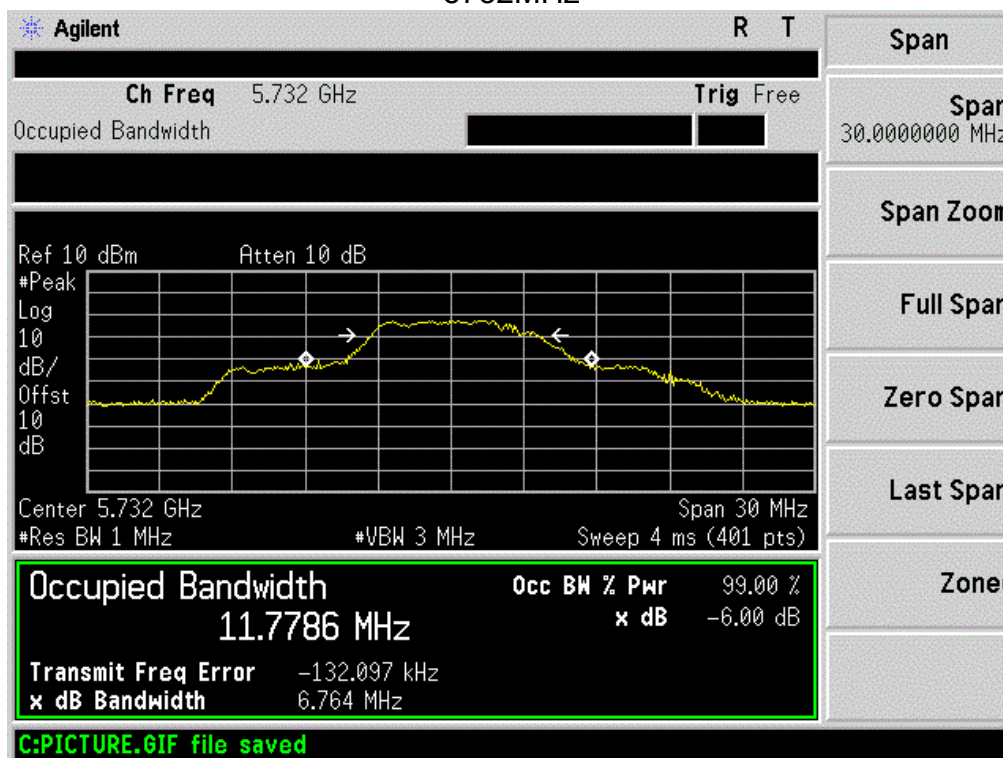
The minimum of 6dB Bandwidth measurement is 0.5 MHz for U-NII-3

6dB bandwidth

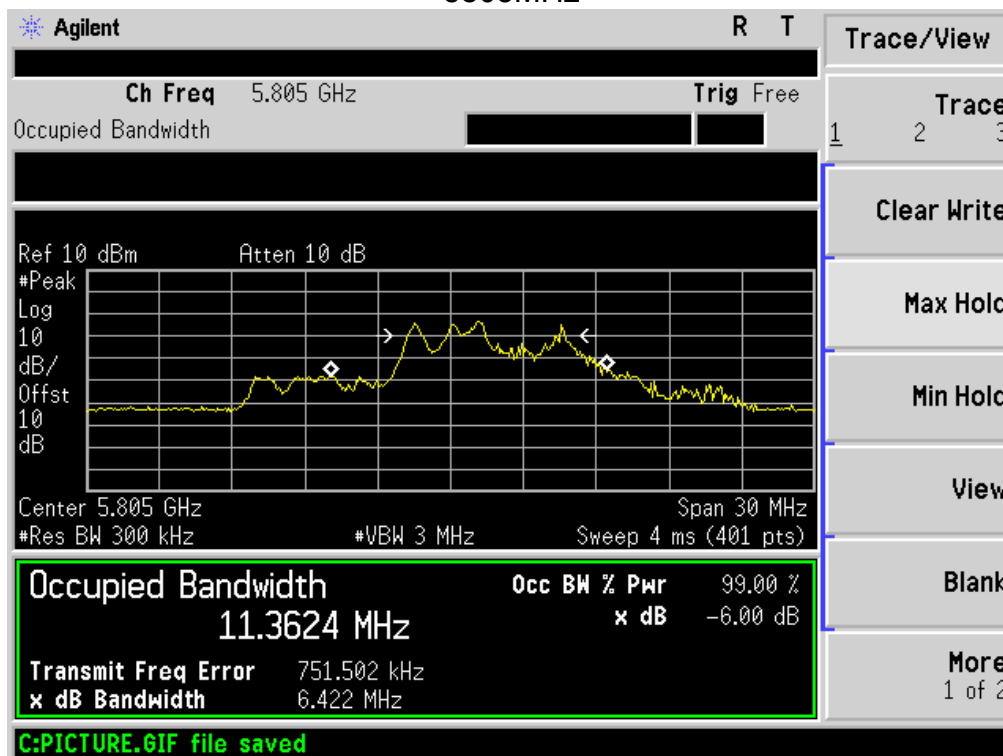
	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)
802.11a	5732	6.764	11.778	>0.5
	5805	6.422	11.362	>0.5
	5843	7.286	13.040	>0.5



5732MHz

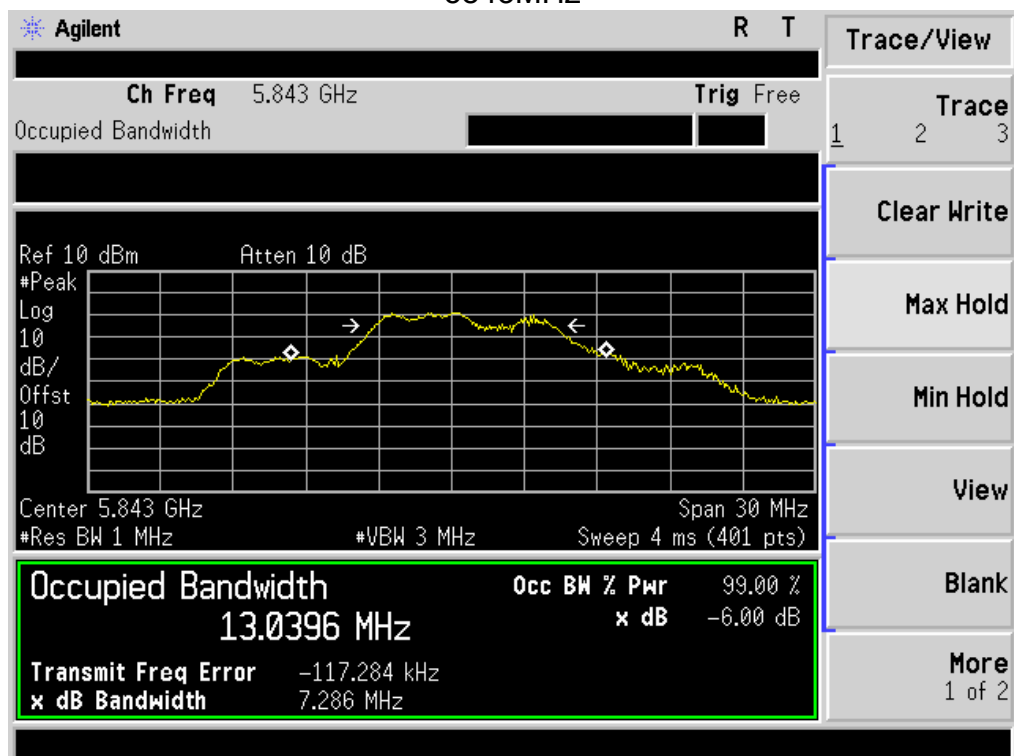


5805MHz





5843MHz





7. OUTPUT POWER TEST

7.1. Limits

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

7.2. Test setup

1. The maximum average conducted output power can be measured using Method PM-G (Measurement using a gated RF average power meter):
2. Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
 - a. The Transmitter output (antenna port) was connected to the power meter.
 - b. Turn on the EUT and power meter and then record the power value.
 - c. Repeat above procedures on all channels needed to be tested.

7.3. Test result

Frequency (MHz)	Average Output Power(dBm)	Average Output Power(mW)	FCC Limit (dBm)	Result
5732	15.75	37.58	30.00	Pass
5800	15.71	37.24	30.00	Pass
5832	15.74	37.50	30.00	Pass



8. PEAK POWER SPECTRAL DENSITY TEST

8.1. Limits

For the band 5.725-5.85 GHz

In addition, the maximum power spectral density shall not exceed 30 dBm in any 500 kHz band.

8.2. Test setup

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.

For U-NII-3 Band:

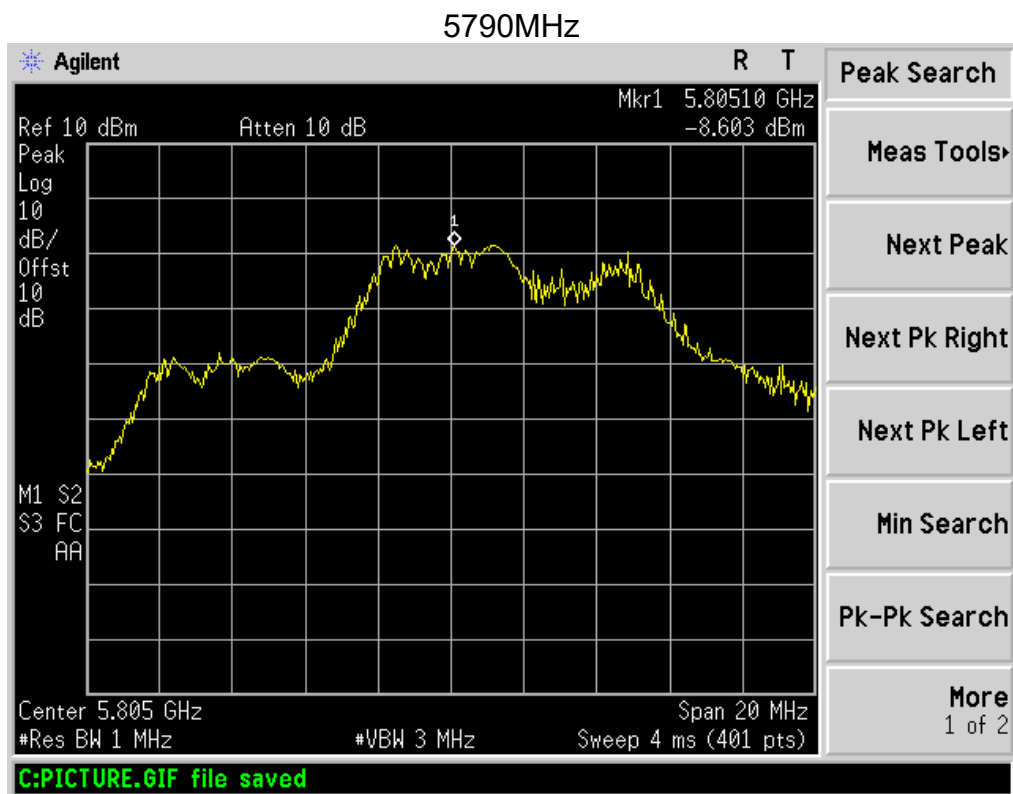
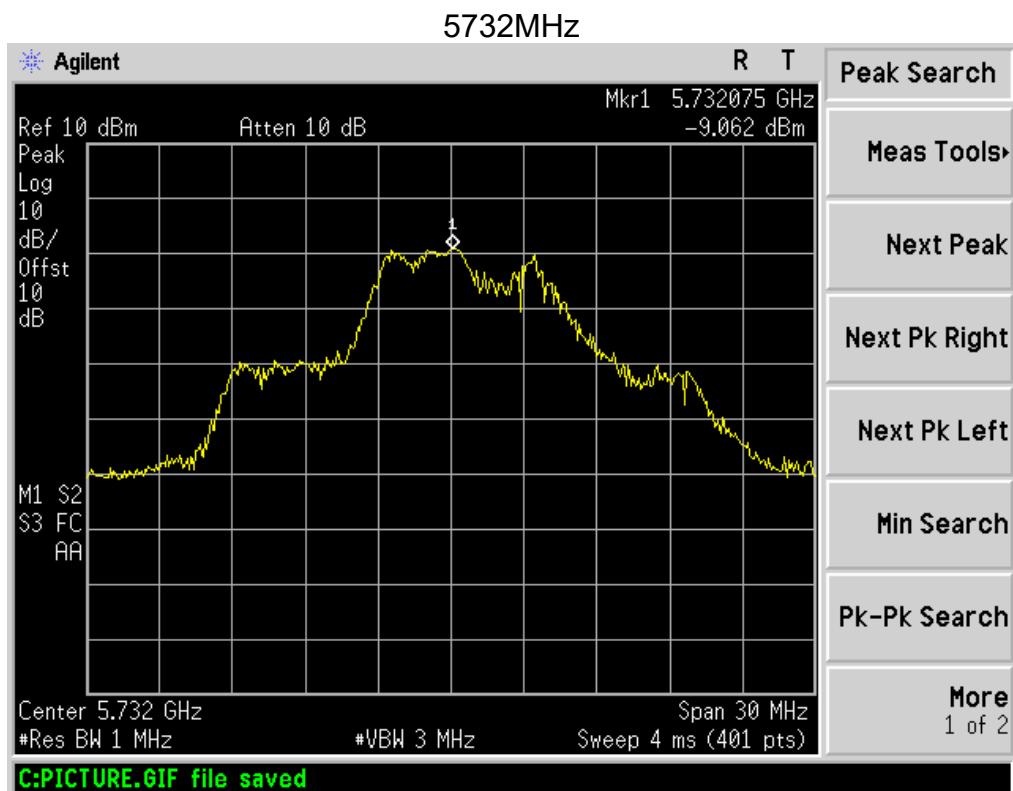
Set RBW=1MHz, VBW=3*RBW, where span is enough to capture the entire bandwidth, Sweep time = Auto (601 pts), detector = sample, traces 100 sweeps of video averaging. (SA-2 with the omission of procedure x, the integration with 26dB EBW bandwidth)

5. Use the cursor on spectrum to peak search the highest level of trace

8.3. Test data

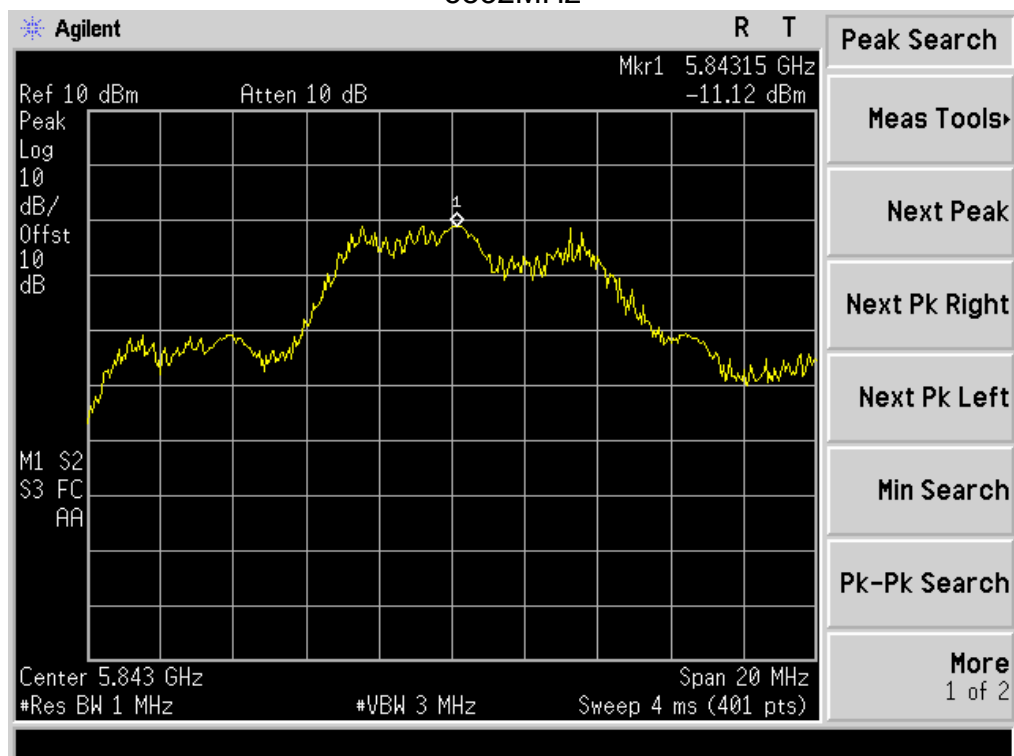
Test data as below

Frequency (MHz)	Reading Level (dBm)	FCC Limit (dBm)	Result
5732	-9.062	11.00	Pass
5800	-8.063	11.00	Pass
5832	-11.12	11.00	Pass





5832MHz





9. FREQUENCY STABILITY

9.1. Limits

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

9.2. Test setup

1. The EUT was placed inside temperature chamber and powered and powered by nominal DC voltage.
2. Set EUT as normal operation.
3. Turn the EUT on and couple its output to spectrum.
4. Turn the EUT off and set the chamber to the highest temperature specified.
5. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT and measure the operating frequency.
6. Repeat step with the temperature chamber set to the lowest temperature.



9.3. Test data

Test data as below

	Test Voltage	Test Temp.	Measured Frequency (MHz)	Spectrum Frequency (MHz)	Δ Frequency (MHz)
FM	4.255V	-20℃	5732.000	5732.0428	7.47
			5805.000	5805.0347	5.98
			5843.000	5843.0248	4.24
	3.145V		5732.000	5732.0248	4.33
			5805.000	5805.0318	5.48
			5843.000	5843.0276	4.72
	3.70V	25℃	5732.000	5732.0517	9.02
			5805.000	5805.0249	4.29
			5843.000	5843.0361	6.18
	4.255V	50℃	5732.000	5732.0347	6.05
			5805.000	5805.0264	4.55
			5843.000	5843.0318	5.44
	3.145V		5732.000	5732.0336	5.86
			5805.000	5805.0275	4.74
			5843.000	5843.0361	6.18



10. TRANSMISSION IN THE ABSENCE OF DATA

10.1. Limits

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

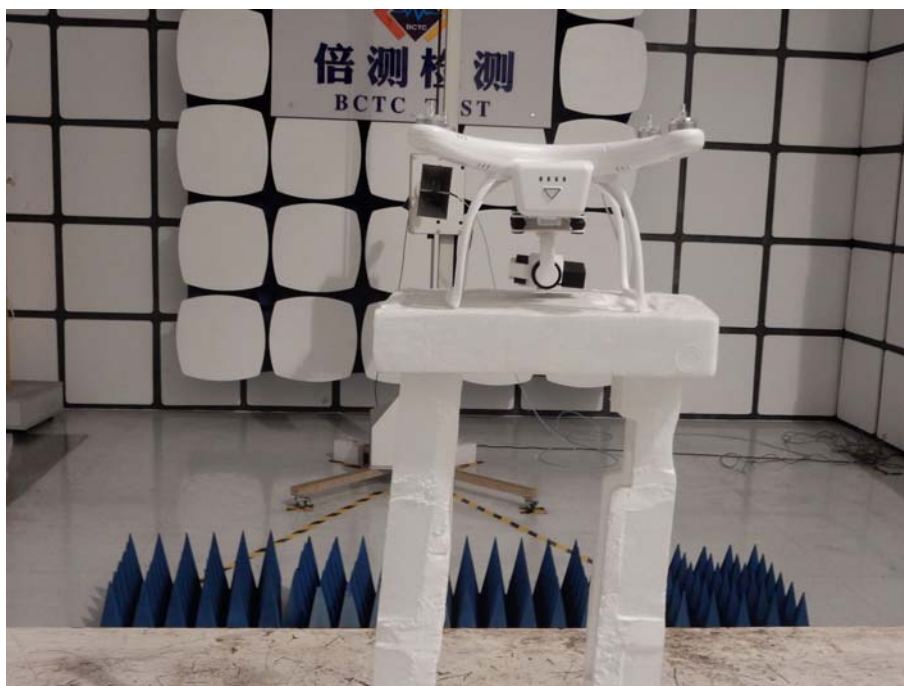
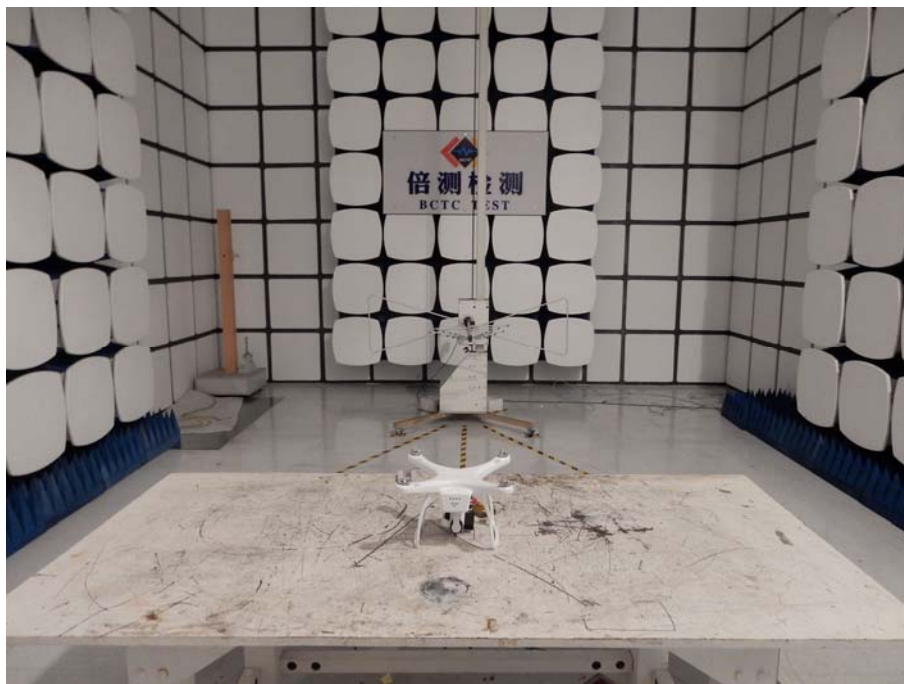
10.2. Test result

No non-compliance noted:

Refer to the theory of operation.

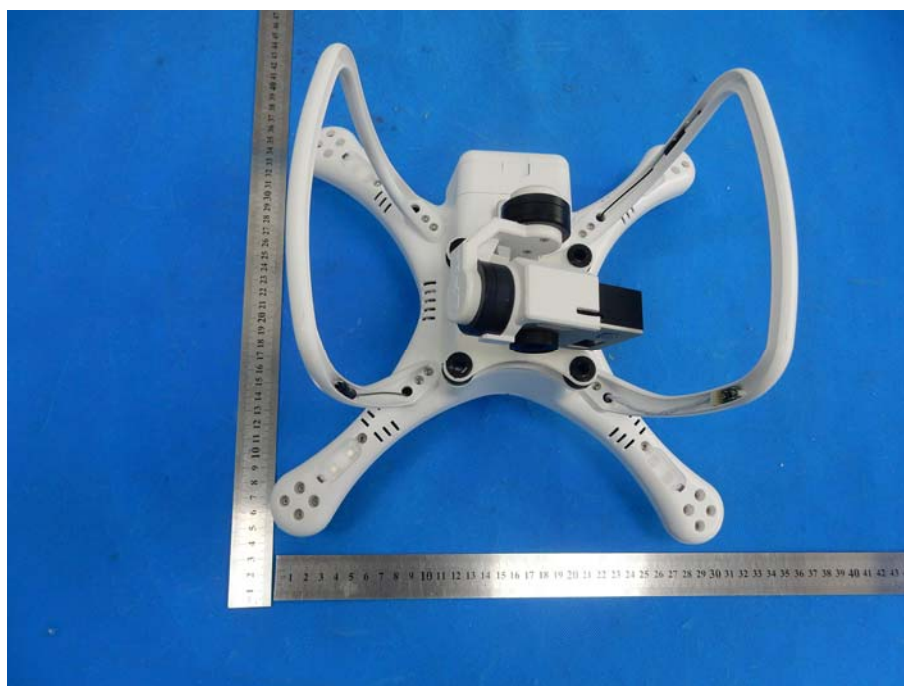
11. PHOTOGRAPHS OF TEST SET-UP

Radiated Emission Test

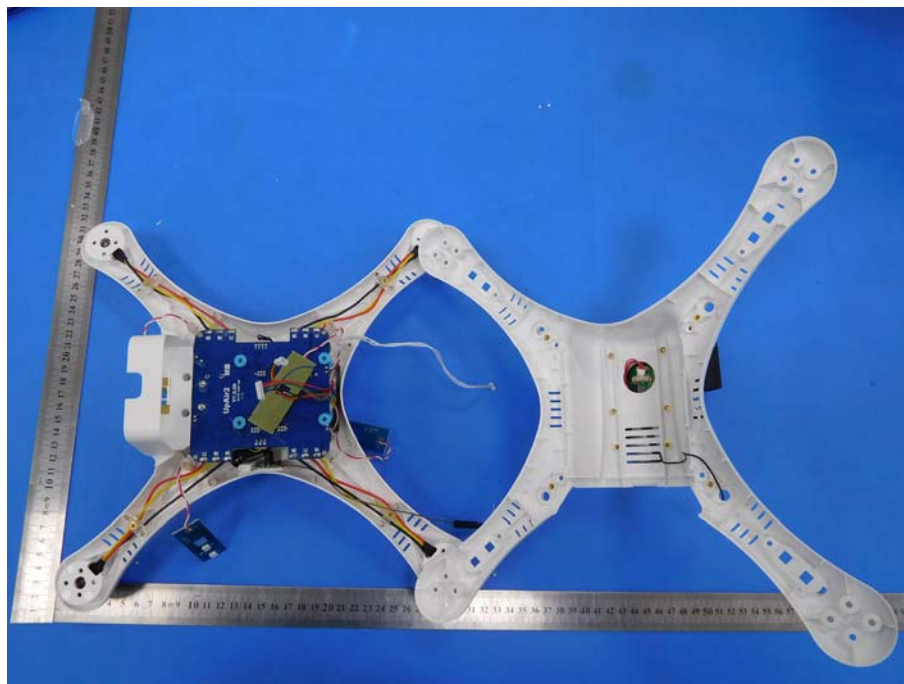


12. PHOTOGRAPHS OF THE EUT









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