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# TEST REPORT

FCC ID: 2AR7Q-DF801

Product: Drone

Model No.: DF801

Additional Model No.: N/A

Trade Mark:

Report No.: FCC18080075A-U-NII

Issued Date: Dec. 24, 2018

## Issued for:

ShenZhen C-Fly Intelligent Technology Co.,Ltd  
6th Floor,A1 building,New Modern GongRong Industrial Zone,ShiHuan 2nd  
Rd,ShiLong commiunity,ShiYan street,Ban'an District,ShenZhen City

## Issued By:

World Standardization Certification & Testing Group Co., Ltd.  
Building A-B, Baoshi Science & Technology Park, Baoshi Road,  
Bao'an District, Shenzhen, Guangdong, China  
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## Table of Contents

1. GENERAL INFORMATION	3
1.1 GENERAL DESCRIPTION OF EUT	4
1.2 EUT SPECIFICATION:	5
2. FACILITIES AND ACCREDITATIONS	6
2.1 ACCREDITATIONS	6
3. TEST DESCRIPTION	7
3.1 MEASUREMENT UNCERTAINTY	7
3.2 DESCRIPTION OF TEST MODES	8
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	9
3.4 CONFIGURATION OF SYSTEM UNDER TEST	10
3.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	10
4. SUMMARY OF TEST RESULTS	11
5. MEASUREMENT INSTRUMENTS	12
6. EMC EMISSION TEST	13
6.1 CONDUCTED EMISSION MEASUREMENT	13
6.2 RADIATED EMISSION MEASUREMENT	16
7. ANTENNA APPLICATION	24
7.1 ANTENNA REQUIREMENT	24
7.2 RESULT	24
8. FCC PART 15.407 REQUIREMENTS FOR 802.11A/N SYSTEMS	25
8. 1 TEST EQUIPMENT	25
8. 2 TEST PROCEDURE	25
8. 3 LIMIT	27
8. 4 TEST RESULT	28
9. MAXIMUM CONDUCTED OUTPUT POWER	32
10. PEAK POWER SPECTRAL DENSITY	34
11. BAND EDGE EMISSIONS	36
11. 1 TEST EQUIPMENT	36
11. 2 TEST PROCEDURE	36
11. 3 LIMIT	37
11. 4 TEST RESULT	38
12. IN RESTRICTED BAND	41
13. FREQUENCY STABILITY	44
1.4 EUT TEST PHOTO	45

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## 1. GENERAL INFORMATION

<b>Product:</b>	Drone
<b>Model No.:</b>	DF801
<b>Trade Mark</b>	
<b>Additional Model:</b>	N/A
<b>Applicant:</b>	ShenZhen C-Fly Intelligent Technology Co.,Ltd
<b>Address:</b>	6th Floor,A1 building,New Modern GongRong Industrial Zone,ShiHuan 2nd Rd,ShiLong community,ShiYan street,Ban'an District,ShenZhen City
<b>Manufacturer:</b>	ShenZhen C-Fly Intelligent Technology Co.,Ltd
<b>Address:</b>	6th Floor,A1 building,New Modern GongRong Industrial Zone,ShiHuan 2nd Rd,ShiLong community,ShiYan street,Ban'an District,ShenZhen City
<b>Data of receipt:</b>	Sep. 10, 2018
<b>Date of Test:</b>	Nov. 10, 2018 to Dec. 21, 2018
<b>Applicable Standards:</b>	FCC Rules Part15 Subpart E

The above equipment has been tested by World Standardization Certification & Testing Group Co., Ltd. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

**Tested By:** Pu Shixi  
(Pu Shixi)

**Date:** Dec.24, 2018

**Check By:** Qin Shuiquan  
(Qin Shuiquan)

**Date:** Dec. 24, 2018

**Approved By:** Wang Fengbing  
(Wang Fengbing)

**Date:** Dec. 24, 2018



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## 1.1 GENERAL DESCRIPTION OF EUT

Equipment Type:	Drone
Test Model:	DF801
Additional Model:	N/A
Trade Mark	
Hardware version:	Dream-Main_Board-V1.6
Software version:	dream-v3.6-2018.7.28
Extreme Temp. Tolerance:	-10°C to +55°C
Battery information:	Secondary Lithium Battery Pack Model No: D01004 Nominal Voltage: 11.4V Rated Capacity: 1000mAh Max Charge Voltage: 13.05V
Adapter Information:	Adapter: H01002 Input: AC 110-220V~50/60Hz---0.6A Output: DC 13.5V---1.2A
Operating Frequency	5190Mhz
Channels	1
Modulation Type	OFDM
Antenna Type:	External antenna
Antenna gain:	2.2dBi
Deviation	None
Condition of Test Sample	Normal



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## 1.2 EUT SPECIFICATION:

Items	Description	
<b>Modulation</b>	IEEE 802.11n: see the below table	
<b>Data Modulation</b>	IEEE 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM)	
<b>Data Rate (Mbps)</b>	IEEE 802.11n: MCS 0-15 up to 150 Mbps	
<b>Frequency Range</b>	5190 MHz	
<b>Channel Number</b>	13 for 20MHz bandwidth ; 6 for 40MHz bandwidth ;	
<b>Communication Mode</b>	<input checked="" type="checkbox"/> IP Based (Load Based)	<input type="checkbox"/> Frame Based
<b>TPC Function</b>	<input type="checkbox"/> With TPC	<input checked="" type="checkbox"/> Without TPC
<b>Weather Band</b>	<input type="checkbox"/> With 5600~5650MHz	<input type="checkbox"/> Without 5600~5650MHz
<b>Beamforming Function</b>	<input type="checkbox"/> With beamforming	<input checked="" type="checkbox"/> Without beamforming
<b>Operating Mode</b>	<input type="checkbox"/> Outdoor access point	<input checked="" type="checkbox"/> Indoor access point
	<input type="checkbox"/> Fixed point-to-point access points	<input checked="" type="checkbox"/> Mobile and portable client devices
	<input type="checkbox"/> Master	<input type="checkbox"/> Slave with radar detection
	<input type="checkbox"/> Slave without radar detection	

<b>Antenna</b>	One (TX)	
<b>Band width Mode</b>		40 MHz
<b>IEEE 802.11n</b>		V

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
<b>802.11n (HT40)</b>	1	MCS 0-15

Note 1: IEEE Std. 802.11n modulation consists of HT40.  
Then EUT supports HT40.

Note 2: Modulation modes consist of below configuration:  
HT40: IEEE 802.11n



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## 2.FACILITIES AND ACCREDITATIONS

All measurement facilities used to collect the measurement data are located at

**Building A-B, Baoshi Science & Technology Park, Baoshi Road, Bao'an District, Shenzhen, Guangdong, China** of the World Standardization Certification & Testing Group Co., Ltd

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

**Registration Number: 366353**

### 2.1 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

**USA**

**Japan**

**Canada**

**China**

**NVLAP** (The certificate registration number is NVLAP LAB CODE:600142-0)

**VCCI** (The certificate registration number is C-4790, R-3684, G-837)

**INDUSTRY CANADA**

(The certificated registration number is 7700A-1)

**CNAS** (The certificated registration number is L3732)

Copies of granted accreditation certificates are available for downloading from our web site,

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### 3. TEST DESCRIPTION

#### 3.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 % .

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 3.2\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(<1G)	$\pm 4.7\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.7\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$





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### 3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	802.11n40

For Conducted Emission	
Final Test Mode	Description
Mode 1	802.11n40

For Radiated Emission	
Final Test Mode	Description
Mode 1	802.11n40

Note:

- (1) The measurements are performed at the highest, lowest available channels.
- (2) The EUT use new battery.
- (3) Record the worst case of each test item in this report.
- (4) When we test the equipment, duty cycle $\geq$ 98%.



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### 3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Test Software	N/A
W Mode	Test Frequency (MHz) NCB: 40MHz
802.11n MCS0 VHT40	5190MHz

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.





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### 3.4 CONFIGURATION OF SYSTEM UNDER TEST



I/O Port of EUT			
I/O Port Type	Q'TY	Cable	Tested with
Cable	1	Cable, unshielded	1
Power	1	1m	1

### 3.5 DESCRIPTION OF SUPPORT UNITS (CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	Adapter	/	H01002	/	/

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in『Length』column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".
- (4) The adapter supply by the applicant.



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## 4. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 Subpart C&E			
Standard Section	Test Item	Judgment	Remark
2.1049 15.403(i)	26dB & 99% Bandwidth	PASS	Complies
15.407(e)	6dB Spectrum Bandwidth	PASS	Complies
15.407(a)	Maximum Conducted Output Power	PASS	Complies
15.407(a)	Power Spectral Density	PASS	Complies
15.407(b)	Unwanted Emissions	PASS	Complies
15.207	AC Conducted Emission	N/A	N/A
15.407(g)	Frequency Stability	PASS	Complies
15.203 & 15.407(a)	Antenna Requirement	PASS	Complies

NOTE:

(1)" N/A" denotes test is not applicable in this test report.





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## 5. MEASUREMENT INSTRUMENTS

NAME OF EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CALIBRATION DATE	CALIBRATION DUE
EMI Test Receiver	R&S	ESCI	100005	10/28/2018	10/29/2019
LISN	AFJ	LS16	16010222119	10/28/2018	10/29/2019
LISN(EUT)	Mestec	AN3016	04/10040	10/28/2018	10/29/2019
Universal Radio Communication Tester	R&S	CMU 200	1100.0008.02	10/28/2018	10/29/2019
Coaxial cable	Megalon	LMR400	N/A	10/28/2018	10/29/2019
GPIB cable	Megalon	GPIB	N/A	10/28/2018	10/29/2019
Spectrum Analyzer	R&S	FSU	100114	10/28/2018	10/29/2019
Pre Amplifier	H.P.	HP8447E	2945A02715	03/24/2018	03/23/2019
Pre-Amplifier	CDSI	PAP-1G18-38	--	03/24/2018	03/23/2019
Bi-log Antenna	SUNOL Sciences	JB3	A021907	10/28/2018	10/29/2019
9*6*6 Anechoic	--	--	--	06/04/2018	06/03/2019
Horn Antenna	COMPLIANCE ENGINEERING	CE18000	--	10/28/2018	10/29/2019
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-631	10/28/2018	10/29/2019
Cable	TIME MICROWAVE	LMR-400	N-TYPE04	10/28/2018	10/29/2019
System-Controller	CCS	N/A	N/A	10/28/2018	10/29/2019
Turn Table	CCS	N/A	N/A	10/28/2018	10/29/2019
Antenna Tower	CCS	N/A	N/A	10/28/2018	10/29/2019
RF cable	Murata	MXHQ87WA3000	-	10/28/2018	10/29/2019
Loop Antenna	EMCO	6502	00042960	10/28/2018	10/29/2019
Horn Antenna	SCHWARZBECK	BBHA 9170	1123	10/28/2018	10/29/2019
Power meter	Anritsu	ML2487A	6K00003613	10/28/2018	10/29/2019
Power sensor	Anritsu	MX248XD	--	10/28/2018	10/29/2019



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## 6. EMC EMISSION TEST

### 6.1 CONDUCTED EMISSION MEASUREMENT

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

FREQUENCY (MHz)	Conducted limit (dB $\mu$ V)		Conducted limit (dB $\mu$ V)
	Quasi-peak	Quasi-peak	
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



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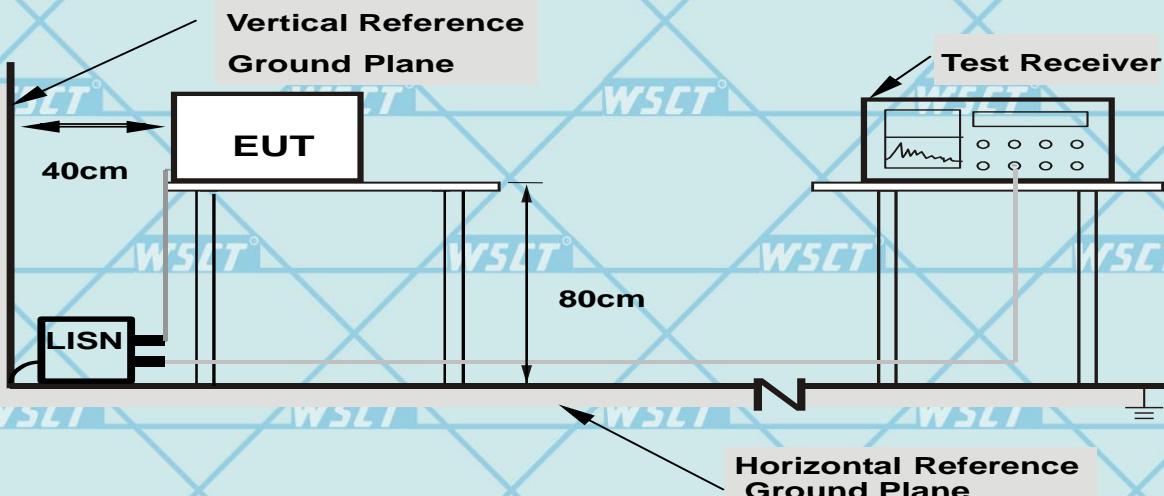
### 6.1.2 TEST PROCEDURE

- The EUT was placed 0.4 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

### 6.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 6.1.4 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**

### 6.1.5 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.



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## 6.1.6 TEST RESULTS

Not applicable. Due to this product is supplied by battery.



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## 6.2 RADIATED EMISSION MEASUREMENT

### 6.2.1 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)	Limit (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).

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





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## 6.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 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.
- d. 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.
- e. 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.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

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

## 6.2.3 DEVIATION FROM TEST STANDARD

No deviation

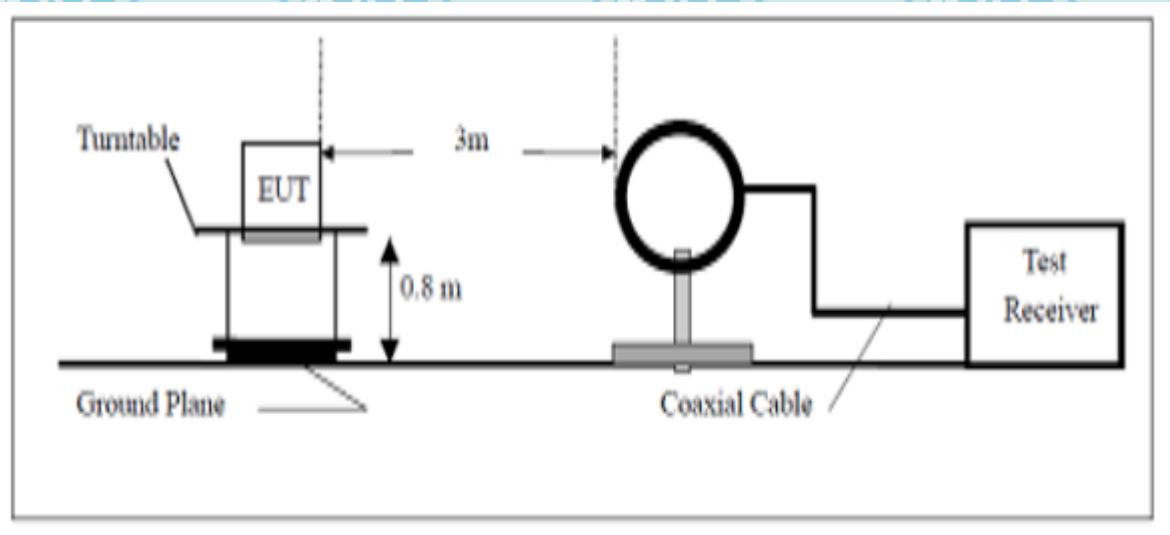




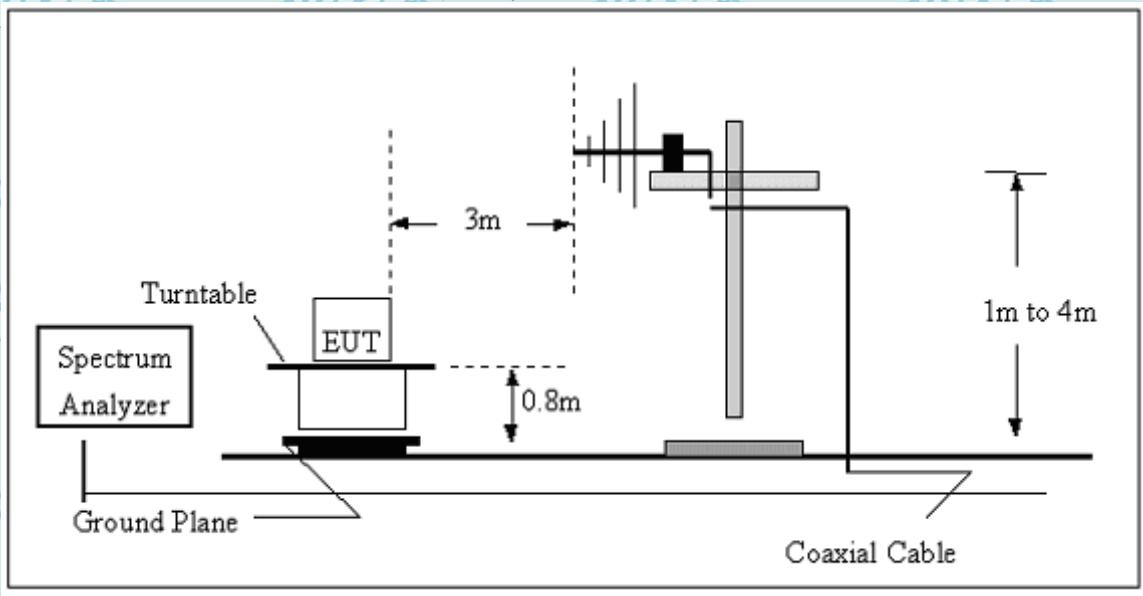
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#### 6.2.4 TEST SETUP

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



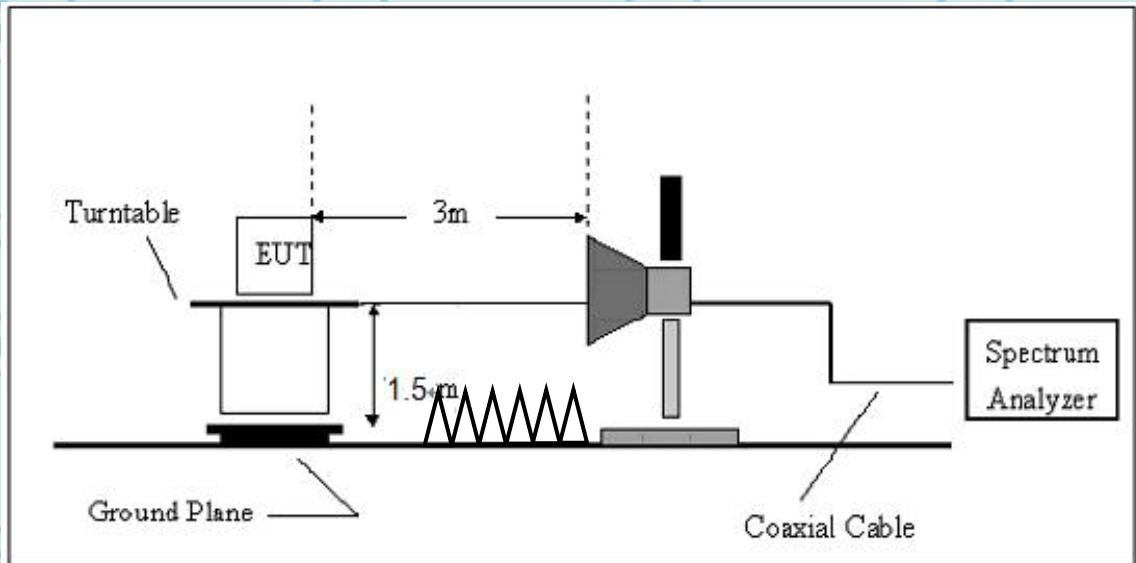
##### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz





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



#### 6.2.5 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.





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### 6.2.5.1 RESULTS (Below 30 MHz)

Temperature	20 °C	Relative Humidity	48%
Pressure	1010 hPa	Polarization	---
Test Mode	Mode 1		

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

#### NOTE:

No result in this part for margin above 20dB.

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

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.

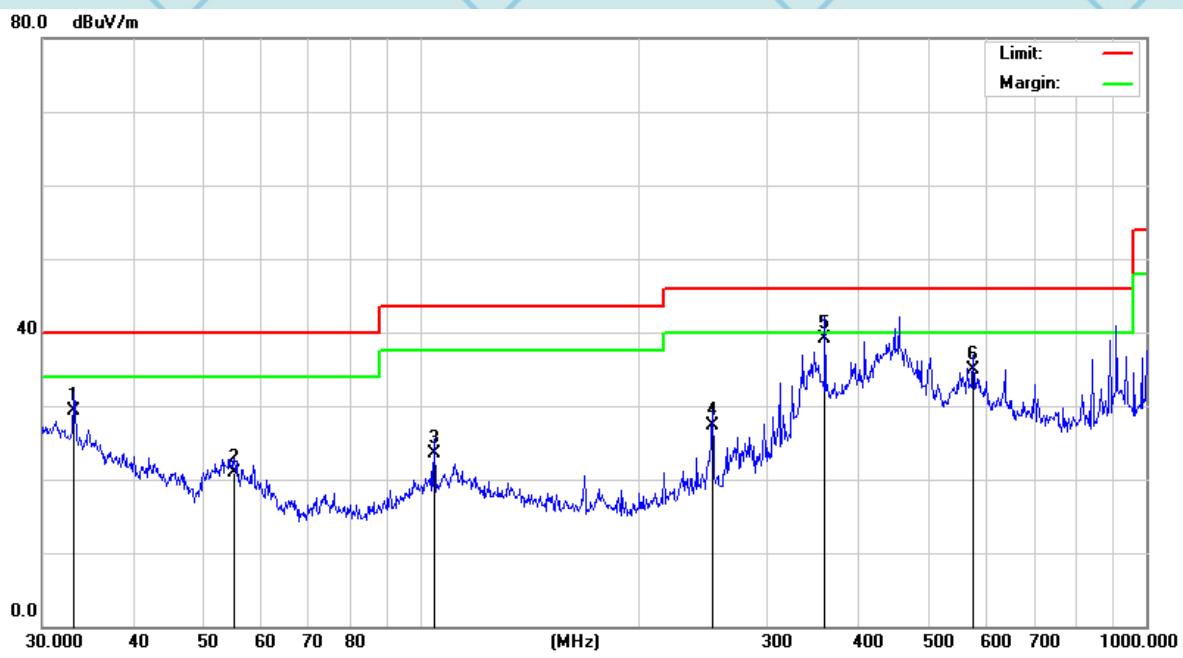




## 6.2.5.2 TEST RESULTS (Between 30M – 1000 MHz)

Temperature	20 °C	Relative Humidity	48%
Pressure	1010 hPa	Polarization :	Horizontal
Test Mode	Mode 1		

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No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV	dBuV	dB
1	*	0.1780	43.09	10.45	53.54	64.57	-11.03
2		0.1780	28.49	10.45	38.94	54.57	-15.63
3		0.2420	20.82	10.46	31.28	52.02	-20.74
4		0.2589	33.01	10.46	43.47	61.46	-17.99
5		0.5180	33.96	10.52	44.48	56.00	-11.52
6		0.5260	18.34	10.52	28.86	46.00	-17.14
7		2.5660	13.88	10.72	24.60	46.00	-21.40
8		2.6060	25.75	10.72	36.47	56.00	-19.53
9		4.8540	25.42	10.74	36.16	56.00	-19.84
10		5.1900	14.57	10.74	25.31	50.00	-24.69
11		13.8700	19.21	11.12	30.33	50.00	-19.67
12		13.9260	29.65	11.12	40.77	60.00	-19.23

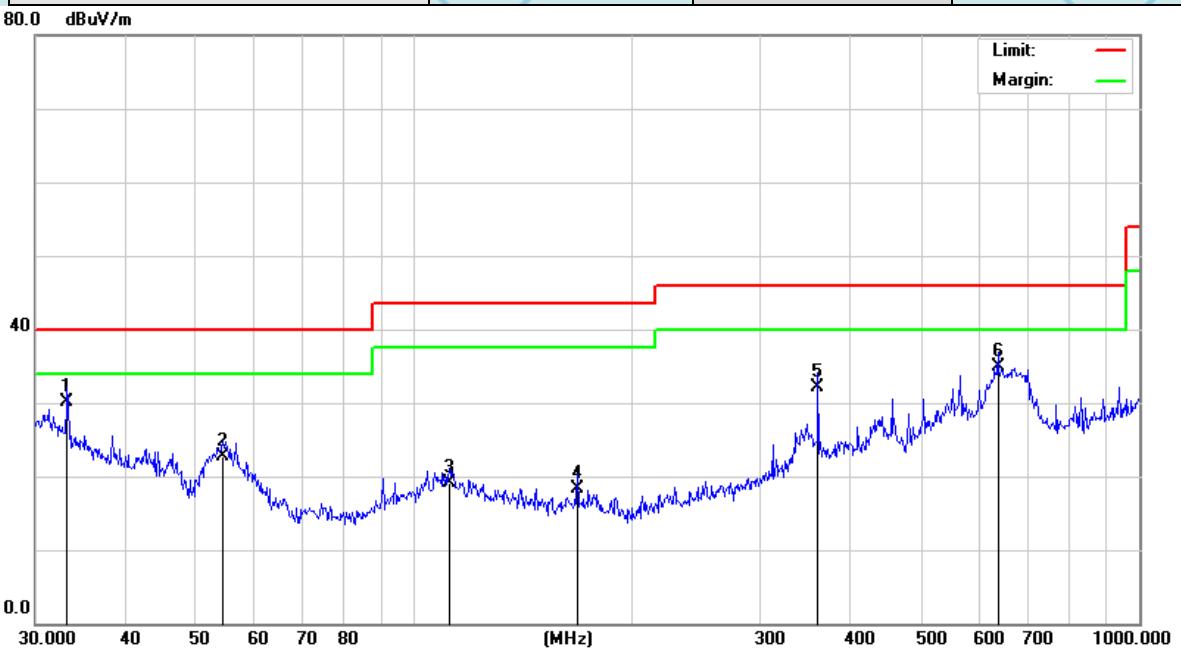
Remark: All the modes have been investigated, and only worst mode is presented in this report.





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Temperature	20 °C	Relative Humidity	48%
Pressure	1010 hPa	Polarization :	Vertical
Test Mode	Mode 1		



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over
			Level	Factor	ment		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB
1	*	33.2112	26.55	3.57	30.12	40.00	-9.88 QP
2		54.4516	28.33	-5.55	22.78	40.00	-17.22 QP
3		111.7380	21.08	-2.03	19.05	43.50	-24.45 QP
4		167.8243	24.68	-6.32	18.36	43.50	-25.14 QP
5		360.4476	33.49	-1.44	32.05	46.00	-13.95 QP
6		638.3686	33.21	1.71	34.92	46.00	-11.08 QP

Remark: All the modes have been investigated, and only worst mode is presented in this report.



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## 6.2.5.3 TEST RESULTS (1GHz to 40GHz)

Temperature	20 °C	Relative Humidity	48%
Pressure	1010 hPa	Test Mode	Mode 1TX
Frequency	5190MHz		

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Freq. (MHz)	Ant.Pol.	Emission Level(dBuV)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
				H/V			
10380	V	60.13	39.04	68.2	54	-8.07	-14.96
15570	V	59.70	39.81	68.2	54	-8.50	-14.19
10380	H	59.65	39.01	68.2	54	-8.55	-14.99
15570	H	58.41	40.15	68.2	54	-9.79	-13.85

## Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.

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

All the x/y/z orientation has been investigated, and only worst case is presented in this report.



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## 7. ANTENNA APPLICATION

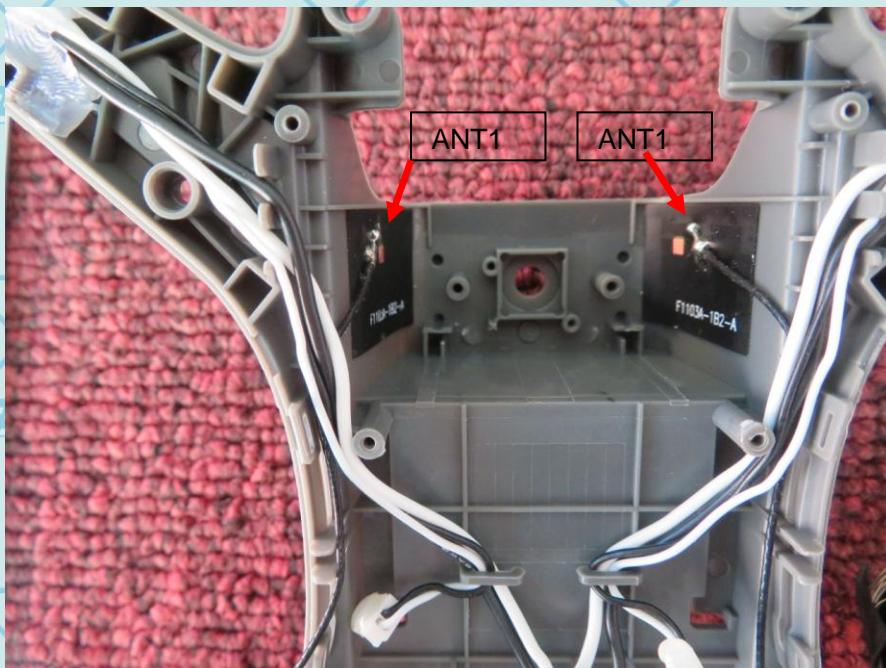
### 7.1 ANTENNA REQUIREMENT

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and FCC part 15C section 15.407.

FCC part 15C section 15.203 and FCC part 15C section 15.407 requirements: Systems operating in the 5150~5850MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

### 7.2 RESULT

The EUT's antenna Integral Antenna, The antenna's gain is 2.2dBi and meets the requirement.



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**8 FCC PART 15.407 REQUIREMENTS FOR 802.11AN SYSTEMS****8. 1 TEST EQUIPMENT**

Please refer to Section 5 this report.

**8. 2 TEST PROCEDURE****26dB Bandwidth and 99% Occupied Bandwidth:**

Test Method:	a)The transmitter was radiated to the spectrum analyzer in peak hold mode. b)Measure the maximum width of the emission that is 26 dB down from the peak of the emission Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement asneeded until the RBW/EBW ratio is approximately 1%.
--------------	---

Test Equipment Setting – 26dB Bandwidth:	Test Equipment Setting – 99% Bandwidth:
a)Attenuation: Auto b)Span Frequency: > 26dB Bandwidth c)RBW: Approximately 1% of the emission bandwidth d)VBW: VBW > RBW e)Detector: Peak f)Trace: Max Hold g)Sweep Time: Auto	a)Span: 1.5 times to 5.0 times the OBW b)RBW: 1 % to 5 % of the OBW c)VBW: $\geq 3 \times$ RBW d)Detector: Peak e)Trace: Max Hold

6 dB Bandwidth:	Test Method:
	a)The transmitter was radiated to the spectrum analyzer in peak hold mode. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth. c)Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band. d)Measured the spectrum width with power higher than 6dB below carrier.

Test Equipment Setting:	a)Attenuation: Auto b)Span Frequency: > 6dB Bandwidth c)RBW: 100kHz d)VBW: $\geq 3 \times$ RBW	e)Detector: Peak f)Trace: Max Hold g)Sweep Time: Auto
-------------------------	---	---

Maximum Conducted Output Power Measurement:	Test Method:
	a)The transmitter output (antenna port) was connected to the power meter. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter). c)Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band. d)When measuring maximum conducted output power with multiple antenna systems,add every resultof the values by mathematic formula.

Test Equipment Setting: Detector - Average	
--	--

Power Spectral Density:	Test Method:
	a)The transmitter output (antenna port) was connected RF switch to the spectrum analyzer. b)Test was performed in accordance with KDB789033 D02 v01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD). c)Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements (a) Measure and sum the spectra across the outputs. d)When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.

Test Equipment Setting:	a)Attenuation: Auto b)Span Frequency: Encompass the entire emissions bandwidth (EBW) of the signal c)RBW: 1000 kHz	e)Detector: RMS f)Trace: AVERAGE g)Sweep Time: Auto h)Trace Average: 100 times
-------------------------	--	---





d)VBW: 3000 kHz

Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add  $10\log(500\text{kHz}/\text{RBW})$  to the measured result, whereas RBW (< 500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.

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#### Frequency Stability Measurement:

Test Method:

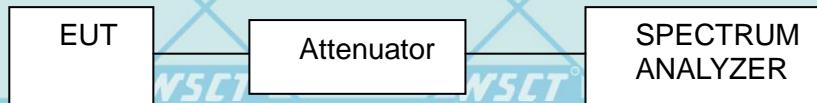
- The transmitter output (antenna port) was connected to the spectrum analyzer.
- EUT have transmitted absence of modulation signal and fixed channelize.
- Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
- Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
- fc is declaring of channel frequency. Then the frequency error formula is  $(f_c - f) / f_c \times 100$  ppm and the limit is less than  $\pm 20$  ppm (IEEE 802.11 specification).
- The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
- Extreme temperature is 0°C~40°C

Test Equipment Setting:

- Attenuation: Auto
- Span Frequency: Entire absence of modulation emissions bandwidth
- RBW: 10 kHz
- VBW: 10 kHz

- Sweep Time: Auto

#### 8.2.1 Test Setup



#### 8.2.2 Configuration of the EUT

Same as section 3.4 of this report

#### 8.2.3 EUT Operating Condition

Same as section 3.2 of this report.



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**8. 3 LIMIT****26dB Bandwidth and 99% Occupied Bandwidth:**

Limit: No restriction limits.

**6 dB Bandwidth:**

Limit: For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

**Test Equipment Setting:**

a)Attenuation: Auto  
b)Span Frequency: > 6dB Bandwidth  
c)RBW: 100kHz  
d)VBW:  $\geq 3 \times$  RBW

e)Detector: Peak  
f)Trace: Max Hold  
g)Sweep Time: Auto

**Maximum Conducted Output Power Measurement:**

5.15~5.25 GHz

 Limit of Outdoor access point:

The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

 Limit of Fixed point-to-point access points:

The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

 Limit of Indoor access point:

The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

 Limit of Mobile and portable client devices:

The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.25-5.35 GHz &  5.470-5.725 GHz

The maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm  $10 \log B$ , where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.725~5.85 GHz

The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power.

**Power Spectral Density**

5.15~5.25 GHz

 Limit of Outdoor access point:17 dBm/MHz Limit of Indoor access point:17 dBm/MHz Limit of Fixed point-to-point access points: 17 dBm/MHz Limit of Mobile and portable client devices: 11 dBm/MHz 5.25-5.35 GHz

11 dBm/MHz

 5.470-5.725 GHz

11 dBm/MHz

 5.725~5.85 GHz

30 dBm/500kHz

**Frequency Stability Measurement:**

## Limit:

In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual. The transmitter center frequency tolerance shall be  $\pm 20$  ppm maximum for the 5 GHz band (IEEE 802.11n specification).



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## 8.4 TEST RESULT

## 26dB Bandwidth&amp;6dB Spectrum Bandwidth and 99% Occupied Bandwidth

Product	: Mobile phone	Test Mode	: See section 2.2
Test Item	: 26dB Bandwidth and 99% Occupied Bandwidth	Temperature	: 25°C
Test Voltage	: DC 11.4V	Humidity	: 56%RH
Test Result	: PASS		

## 26dB Bandwidth

IEEE 802.11n 5G 40MHz

Channel	Frequency (MHz)	26dB Bandwidth (MHz)	FCC Limit (kHz)	Result	ANT
38	5190	71.154	--	PASS	1
38	5190	67.179	--	PASS	2

## 99% Occupied

IEEE 802.11n 5G 40MHz

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	FCC Limit (kHz)	Result	ANT
38	5190	40.385	--	PASS	1
38	5190	38.978	--	PASS	2



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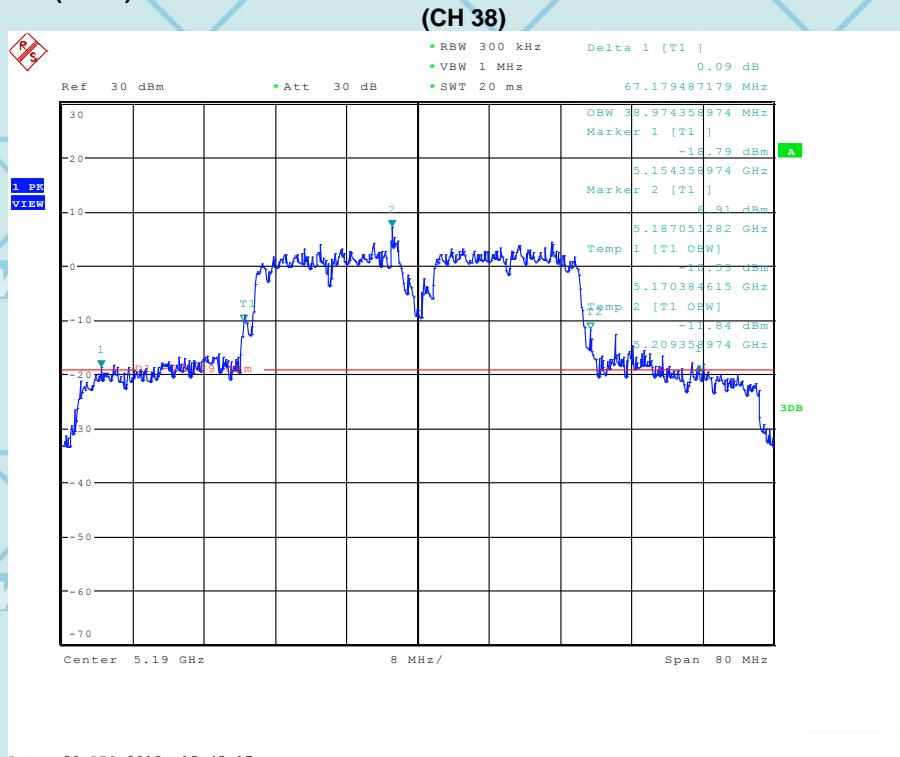


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## IEEE 802.11n 5G 40MHz(ANT1)



## IEEE 802.11n 5G 40MHz(ANT2)



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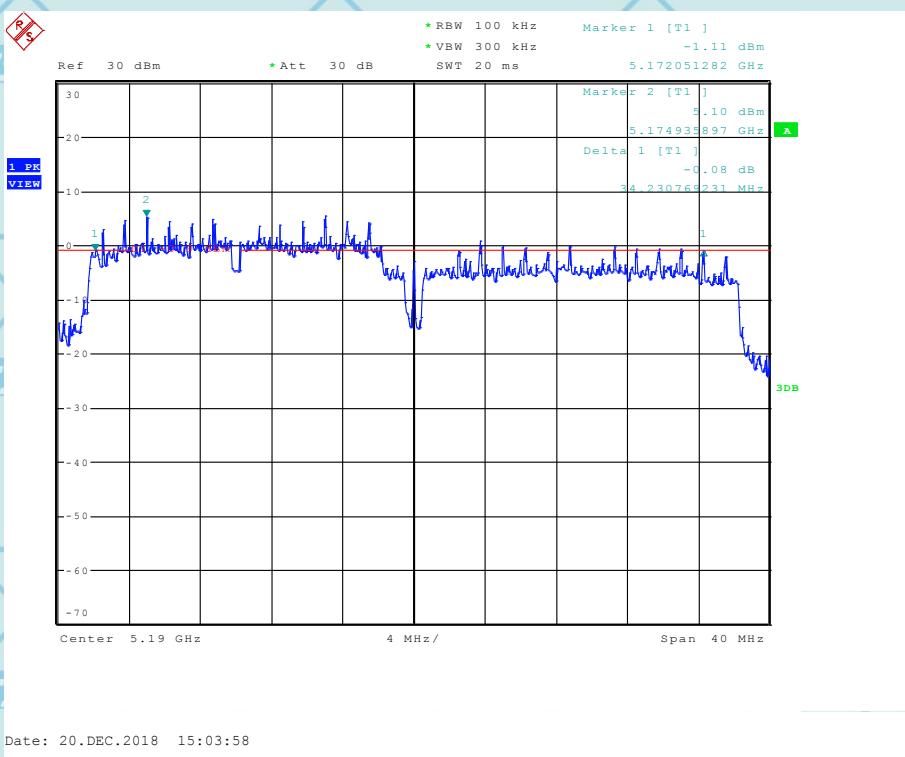
## 6 dB Bandwidth

Product	: Mobile phone	Test Mode	: See Section 2.2
Test Item	: 6 dB BW	Temperature	: 25°C
Test Voltage	: DC 11.4V	Humidity	: 56%RH
Test Result	: PASS		

IEEE802.11n 40MHz

Channel	Measured Frequency (MHz)	6 dB Bandwidth (MHz)	Limit	ANT
38	5190	34.23	> 0.5MHz	1
38	5190	35.77	> 0.5MHz	2

Channel 38(ANT1)



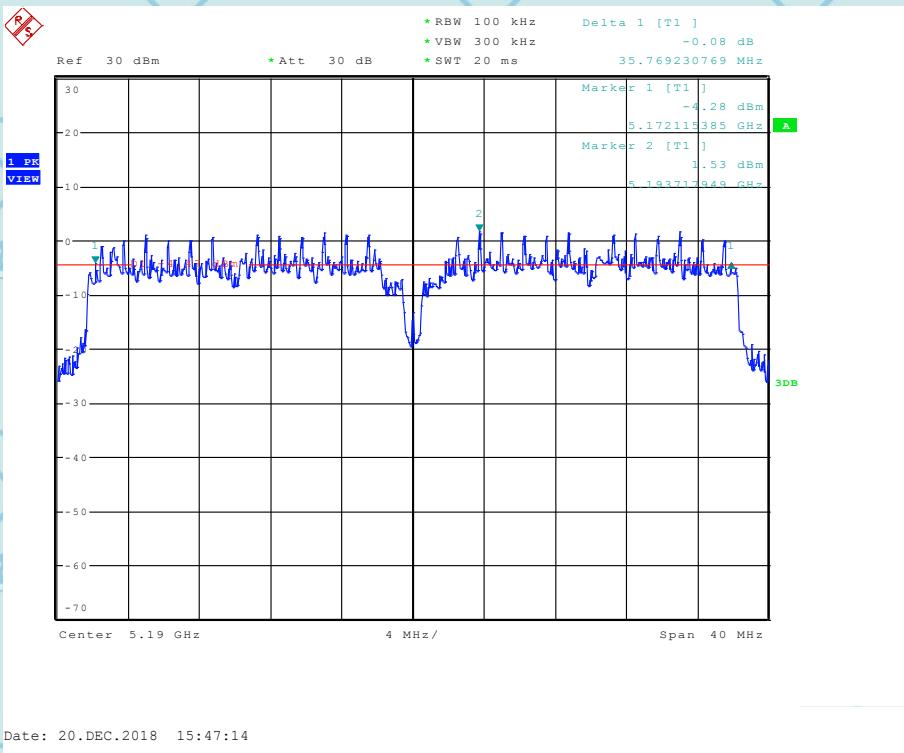
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## Channel 38(ANT2)



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## 9. MAXIMUM CONDUCTED OUTPUT POWER

### The test method

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (a)(1)(2)(3)

Test Method: KDB 789033 D02 v01r04 Section E.3.a(Method PM)

#### Limits:

(1) For the band 5.15-5.25 GHz.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3) For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

#### Test Procedure:

1. Connected the EUT's antenna port to measure device by 10dB attenuator.
2. Method PM is used to perform output power measurement, trigger and gating function of wide band powermeter is enabled to measure max output power of Tx on burst.

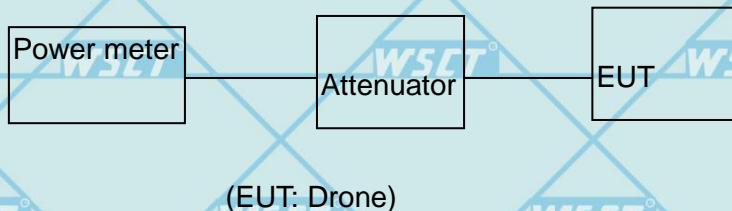
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.





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## For Conducted RF test setup



### Test Data:

Band 1: 5150 MHz ~ 5250 MHz

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)	Limit(dBm)	Pass / Fail	ANT
		Meas Power			
802.11n(HT40)	38 (5190)	20.92	24	Pass	1
802.11n(HT40)	38 (5190)	20.77	24	Pass	2

### Power and value:

Mode	Channel/ Frequency (MHz)	Maximum conducted output power (dBm)	Limit(dBm)	Pass / Fail
		Meas Power		
802.11n(HT40)	38 (5190)	23.86	24	Pass

Note: Power and value are the values of ANT 1 + ANT 2





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## 10. PEAK POWER SPECTRAL DENSITY

Humidity	: 56%RH	Test Mode	: See Section 2.2
Test Item	: Peak Power Spectral Density	Temperature	: 25°C
Test Voltage	: DC 11.4V	Test Result	: PASS

IEEE 802.11n 5G 40MHz

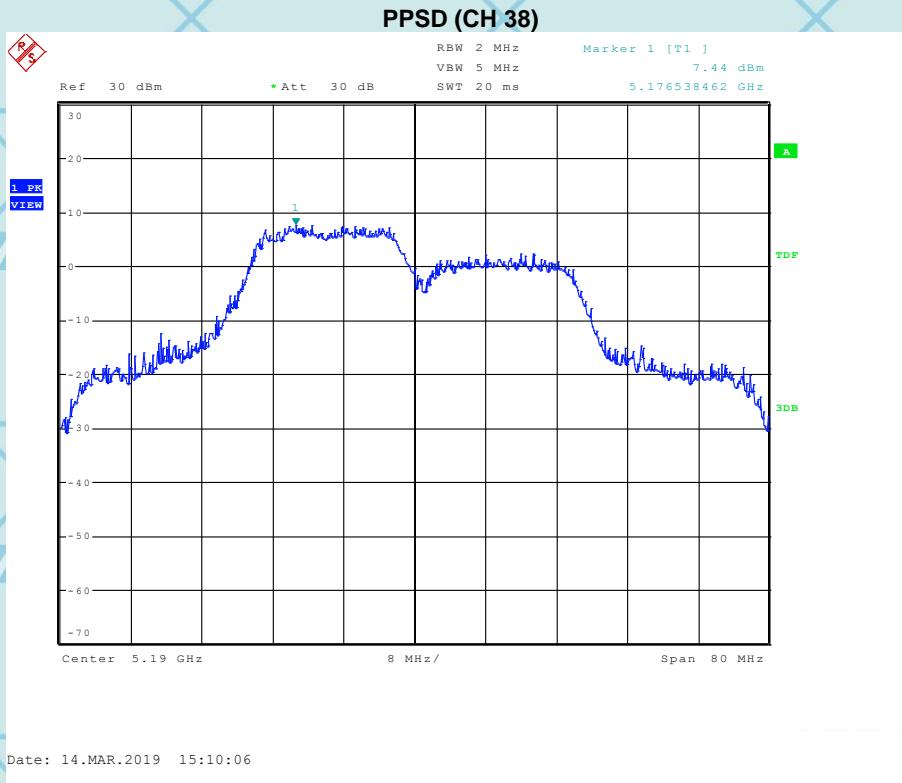
Channel	Frequency (MHz)	PPSD (dBm)	FCC Limit (kHz)	Result	ANT
38	5190	7.44	11dBm/MHz	PASS	1
38	5190	7.44	11dBm/MHz	PASS	2
The sum of the two antennas					
38	5190	10.45	11dBm/MHz	PASS	

Remark: And the value is the value of ANT 1 + ANT 2

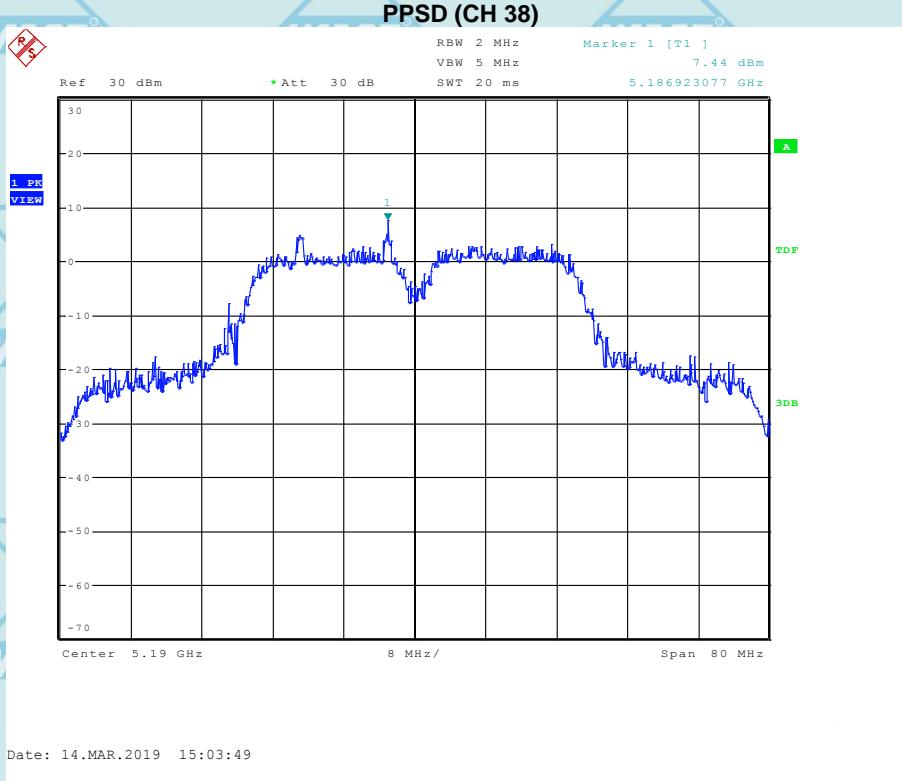




IEEE 802.11n 5G 40MHz(ANT1)



IEEE 802.11n 5G 40MHz(ANT2)



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## 11. BAND EDGE EMISSIONS

### 11. 1 TEST EQUIPMENT

Please refer to Section 5 this report.

### 11. 2 TEST PROCEDURE

#### Band Edge Emissions Measurement:

Test Method:	<p>a.) The EUT was tested according to ANSI C63.10.</p> <p>b) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 1.5m. All set up is according to ANSI C63.10.</p> <p>c) The frequency spectrum from 9kHz to 40 GHz was investigated. All readings from 9kHz to 150kHz are quasi-peak values with a resolution bandwidth of 200 Hz. All readings from 150kHz to 30MHz are quasi-peak values with a resolution bandwidth of 9 KHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.</p> <p>d) The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The Receiving antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency. Emissions below 30MHz were measured with a loop antenna while emission above 30MHz were measured using a broadband E-field antenna.</p> <p>e) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings were performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.</p> <p>f) Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.10.</p>
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#### Band Edge Emissions Measurement:

##### Test Equipment Setting:

a) Attenuation: Auto	d) RBW/VBW(Emission in non-restricted band) 1MHz / 3MHz for peak
b) Span Frequency: 100 MHz	
c) RBW/VBW (Emission in restricted band): 1MHz / 3MHz for Peak, 1MHz / 1/T for Average	

### 11.2. 1 Test Setup

Same as section 3.2 of this report

### 11. 2.2 Configuration of the EUT

Same as section 3.2 of this report

### 11. 2.3 EUT Operating Condition

Same as section 3.2 of this report.



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## 11. 3 LIMIT

### Spurious Radiated Emission & Band Edge Emissions Measurement:

Limit:

Part 15.407(b)

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.

(4) For transmitters operating in the 5.725-5.85 GHz band:

- (i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
- (ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

Note:

Applies to harmonics/spurious emissions that fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

47 CFR § 15.237(c): The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.





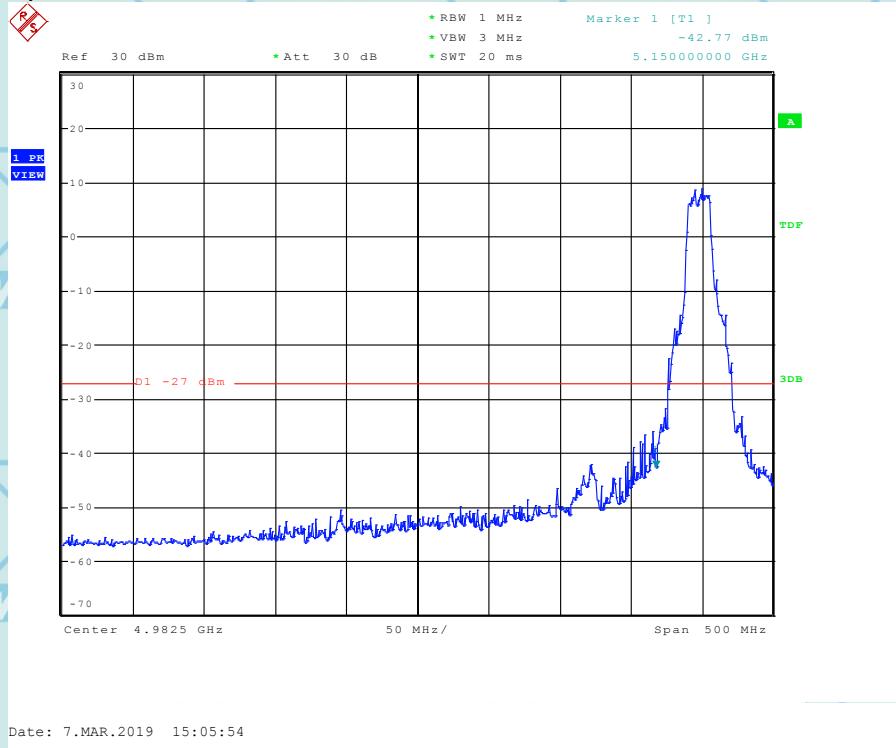
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## 11.4 TEST RESULT

Humidity:	56%RH	Test Mode:	IEEE 802.11n 5G
Test Item:	Band Edge and Fundamental Emissions	Temperatur e:	25°C
Test Voltage:	11.4V	Test Result:	PASS

## IEEE 802.11n 40MHz(ANT1)

Channel 38 (5190MHz)

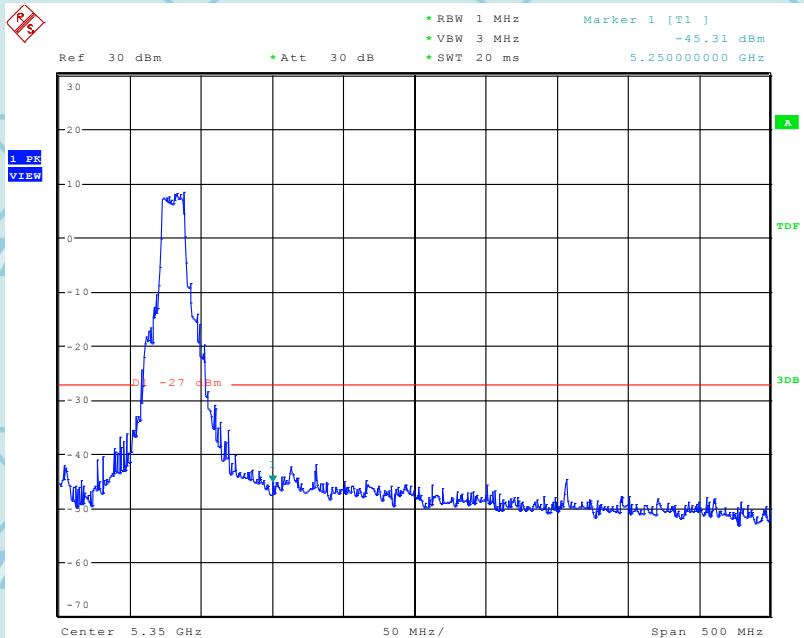


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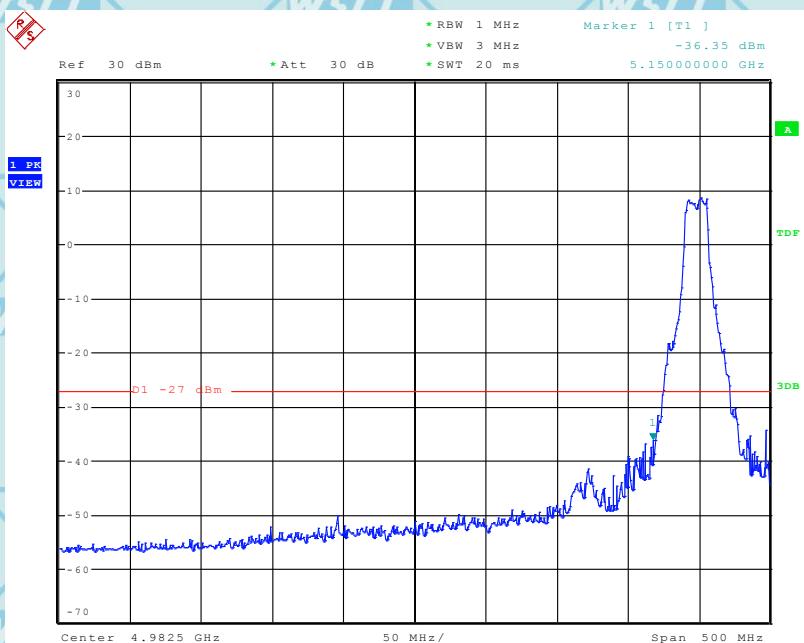
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Date: 7.MAR.2019 15:11:54

### IEEE 802.11n 40MHz(ANT1)

#### Channel 38 (5190MHz)



Date: 7.MAR.2019 15:33:22



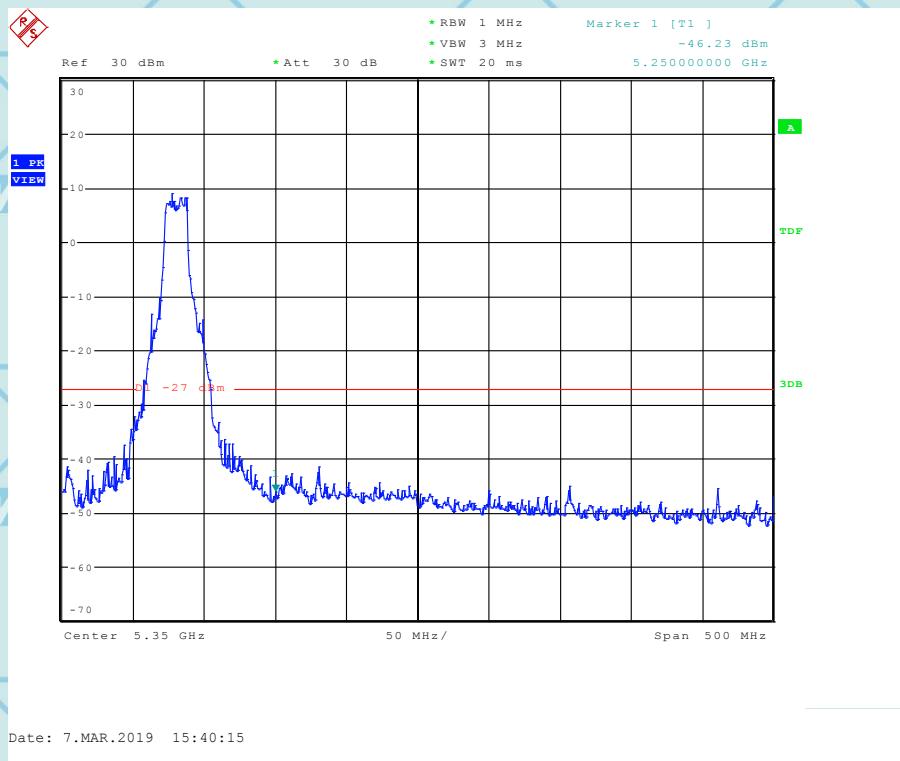
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## 12. IN RESTRICTED BAND

Test Requirement: FCC 47 CFR Part 15 Subpart E Section 15.407 (b)(1)(2)(3)(4)(6)  
FCC 47 CFR Part 15 Subpart C Section 15.209/205

Test Method: KDB 789033 D02 v01r04 Section G.2

- a) For all measurements, follow the requirements in II.G.3. "General Requirements for Unwanted Emissions Measurements."
- b) At frequencies below 1000 MHz, use the procedure described in II.G.4. "Procedure for Unwanted Emissions Measurements Below 1000 MHz."
- c) At frequencies above 1000 MHz, use the procedure for maximum emissions described in II.G.5., "Procedure for Unwanted Emissions Measurements Above 1000 MHz."
- (i) Sections 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of 27 dBm/MHz.3
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.4
- d) If radiated measurements are performed, field strength is then converted to EIRP as follows:
- (i)  $EIRP = ((Exd)^2) / 30$  where:  
E is the field strength in V/m;  
d is the measurement distance in meters;  
EIRP is the equivalent isotropically radiated power in watts.
- (ii) Working in dB units, the above equation is equivalent to:  
 $EIRP[dBm] = E[dB\mu V/m] + 20 \log (d[meters]) - 104.77$
- (iii) Or, if d is 3 meters:  
 $EIRP[dBm] = E[dB\mu V/m] - 95.2$



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### §15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
<sup>1</sup> 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	( <sup>2</sup> )
13.36-13.41			

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6





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## Test result

802.11n/H40  
Band1:5190MHz

Indicated		result (PK/AV)	Antenna Polar (H/V)	Correction Factor					
Frequency (MHz)	Receiver Reading (dB $\mu$ V/m)			Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
<hr/>									
5150	30.17	AV	V	30.3	4.1	33.1	31.47	54	22.53
5150	29.31	AV	H	30.3	4.1	33.1	30.61	54	23.39
5150	41.62	PK	V	30.3	4.1	33.1	42.92	74	31.08
5150	41.31	PK	H	30.3	4.1	33.1	42.61	74	31.39
<hr/>									
5050	30.50	AV	V	31	4.4	32.7	33.20	54	20.80
5050	29.58	AV	H	31	4.4	32.7	32.28	54	21.72
5050	41.54	PK	V	31	4.4	32.7	44.24	74	29.76
5050	40.72	PK	H	31	4.4	32.7	43.42	74	30.58

### Remark:

All emissions not reported were more than 20dB below the specified limit or in the noise floor.

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

And only worst case is presented in this report.



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## 13. FREQUENCY STABILITY

Humidity:	56%RH	Test Mode:	Mode: IEEE 802.11n 40MHz
Test Item:	Frequency Stability	Temperature:	25 °C
Test Voltage:	DC 11.4V	Test Result:	PASS

## Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	5190 MHz
126.50	5189.9521
110.00	5189.9521
93.50	5189.9521
Max. Deviation (MHz)	-0.0479
Max. Deviation (ppm)	-9.23

## Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	5190 MHz
0	5189.9582
10	5189.9582
20	5189.9582
30	5189.9582
40	5189.9582
Max. Deviation (MHz)	-0.0418
Max. Deviation (ppm)	-8.05

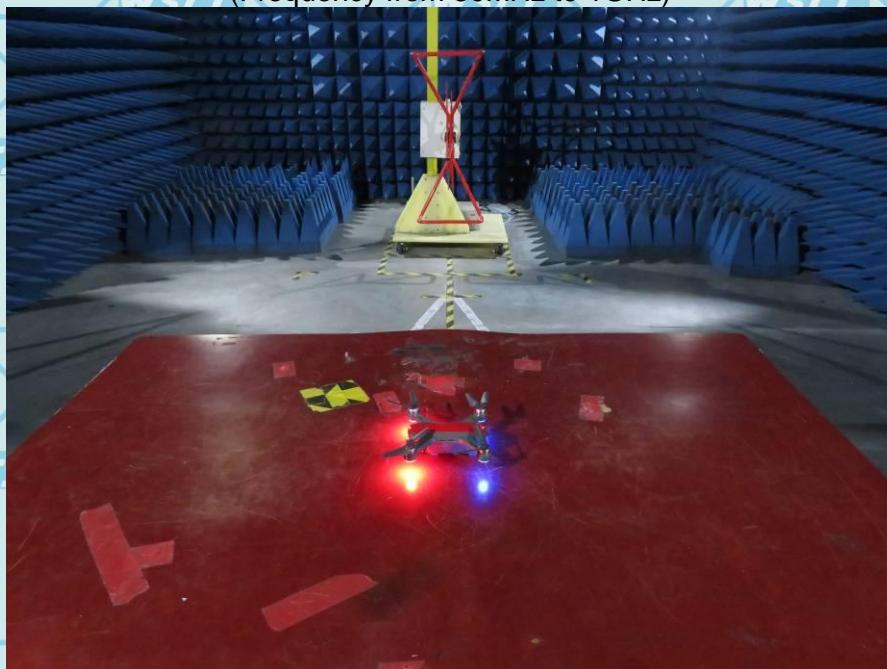




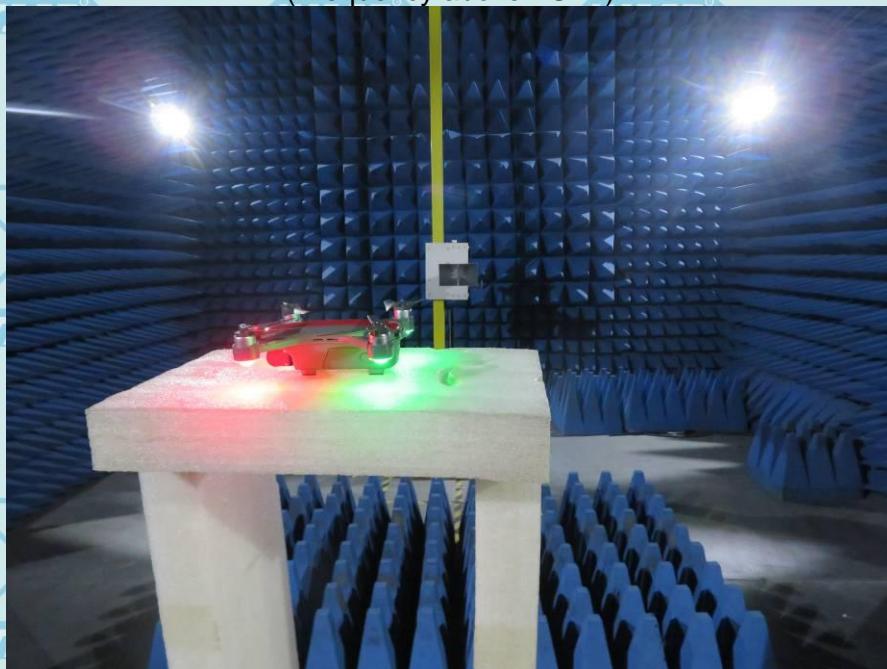
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## 1.4 EUT TEST PHOTO

RADIATED EMISSION TEST  
(Frequency from 30MHz to 1GHz)



RADIATED EMISSION TEST  
(Frequency above 1GHz)



For PHOTOGRAPHS OF EUT, Please refer to the 15B report.

**---END OF REPORT---**



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