

TEST REPORT

FCC ID: 2AJ55HOLYSTONEGS

Product: quadcopter wifi camera

Model No.: HS100G

Additional Model No.: See annex C at page 2

Trade Mark: Holy Stone

Report No.: TCT180507E015

Issued Date: April 27, 2018

Issued for:

**Xiamen Huoshiquan Import & Export CO., LTD
Room 703, No. 813-2 Xiahe Road, Siming District,
XIAMEN, China**

Issued By:

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Appendix A: Photographs of Test Setup

Appendix B: Photographs of EUT

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HS161G/HS162/HS162G/HS163/HS163G/HS164/HS164G/HS166/HS166G/HS167/HS167G/HS168
HS168G/HS169/HS169G/HS150G/HS150M/HS150S/HS150PRO/HS150P/HS230/HS230G/HS230C
HS230W/HS230B/HS230S/HS230U/HS230PRO/HS230P/HS700/HS700G/HS700PRO/HS700W
HS700U/HS700C/HS700B/HS700S/HS710/HS710G/HS710S/HS710W/HS710C/HS710B/HS710B
HS710PRO/HS720/HS720G/HS730/HS730G/HS740/HS740G/HS750/HS750G/HS760/HS760G/HS770
HS770G/HS780/HS780G/HS790/HS790G/HS500/HS500G/HS510/HS510G/HS520/HS520G/HS530
HS530G/HS540/HS540G/HS600/HS600G/HS610/HS610G/HS620/HS620G/HS630/HS630G/HS640
HS640G/HS120D/HS120G/HS120PRO/HS130D/HS130G/HS130PRO/HS210/HS240/HS280/HS310
HS350/HS360/HS380/HS410/HS440/HS480/HS490/HS510/HS530/HS550/HS620/HS640/HS650
HS660/HS670/HS710/HS760HS770/HS800/HS830/HS840/HS850/HS870/HS880/HS900/HS920
HS950/HS960

1. Test Certification

Product:	quadcopter wifi camera
Model No.:	HS100G
Additional Model No.:	See annex C at page 2
Trade Mark:	Holy Stone
Applicant:	Xiamen Huoshiquan Import & Export CO., LTD
Address:	Room 703, No. 813-2 Xiahe Road, Siming District, XIAMEN, China
Manufacturer:	Xiamen Huoshiquan Import & Export CO., LTD
Address:	Room 703, No. 813-2 Xiahe Road, Siming District, XIAMEN, China
Date of Test:	April 18, 2018 - April 27, 2018
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407: 2017 ANSI C63.10-2013 KDB789033 D02 General U-NII Test Procedures New Rules v02

The above equipment has been tested by Shenzhen Tongce Testing Lab. 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:

Brews Xu

Date: April 27, 2018

Reviewed By:

Beryl Zhao

Date: April 27, 2018

Approved By:



Date: April 27, 2018

2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Maximum Conducted Output Power	§15.407(a) §2.1046	PASS
6dB Emission Bandwidth	§15.407(a) §2.1049	PASS
26dB Emission Bandwidth& 99% Occupied Bandwidth	§15.407(a) §2.1049	PASS
Power Spectral Density	§15.407(a)	PASS
Band edge	§15.407(a)	PASS
Radiated Emission	§15.407(a) §2.1053	PASS
Frequency Stability	§15.407(g) §2.1055	PASS

Note:

1. PASS: Test item meets the requirement.
2. Fail: Test item does not meet the requirement.
3. N/A: Test case does not apply to the test object.
4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product:	quadcopter wifi camera
Model No.:	HS100G
Additional Model No.:	-
Trade Mark:	Holy Stone
Operation Frequency:	Band I: 5180MHz-5240MHz; Band IV: 5745MHz-5825MHz;
Channel Bandwidth:	802.11a: 20MHz 802.11n (HT20): 20MHz
Modulation Technology:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type	BPSK, QPSK, 16QAM, 64QAM
Antenna Type:	Integral Antenna
Antenna Gain:	1.5 dBi
Power Supply:	DC 7.4V for internal battery
Adapter:	-

Operation Frequency each of channel

20MHz	
Channel	Frequency
36	5180
40	5200
44	5220
48	5240
149	5745
153	5765
157	5785
161	5805
165	5825

Note:

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

For 802.11a/n (HT20)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
44	Mid	5220	157	Mid	5785
48	High	5240	165	High	5825

4. General Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 100%)
<p>The sample was placed 0.8m/1.5m for below/above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.</p>	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.

Mode	Data rate
802.11a	6 Mbps
802.11n(HT20)	MCS0

Final Test Mode:

Operation mode:	Keep the EUT in continuous transmitting with modulation
-----------------	---

4.2. Description of Support Units

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.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. 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	MU
1	Conducted Emission	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^\circ\text{C}$
7	Humidity	$\pm 1.0\%$

6. Test Results and Measurement Data

6.1. Antenna requirement

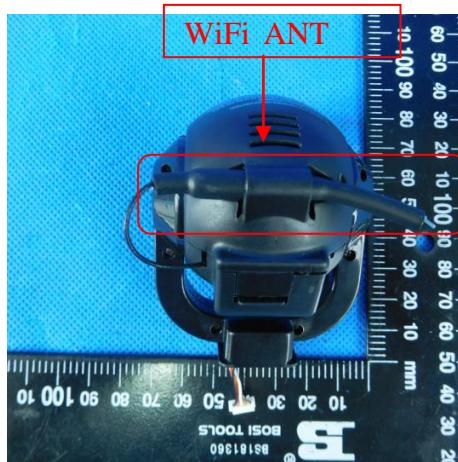
Standard requirement:	FCC Part15 C Section 15.203
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15.203 requirement:

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.

E.U.T Antenna:

The directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	<p><i>Remark:</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
Test Mode:	Tx Mode														
Test Procedure:	<ol style="list-style-type: none"> The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement. 														
Test Result:	PASS														

6.2.2. Test Instruments

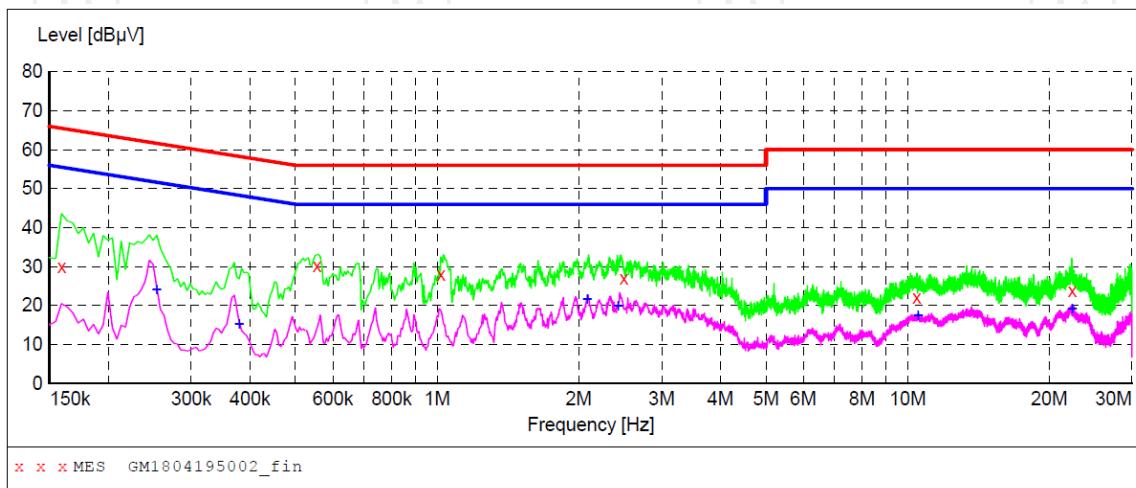
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line

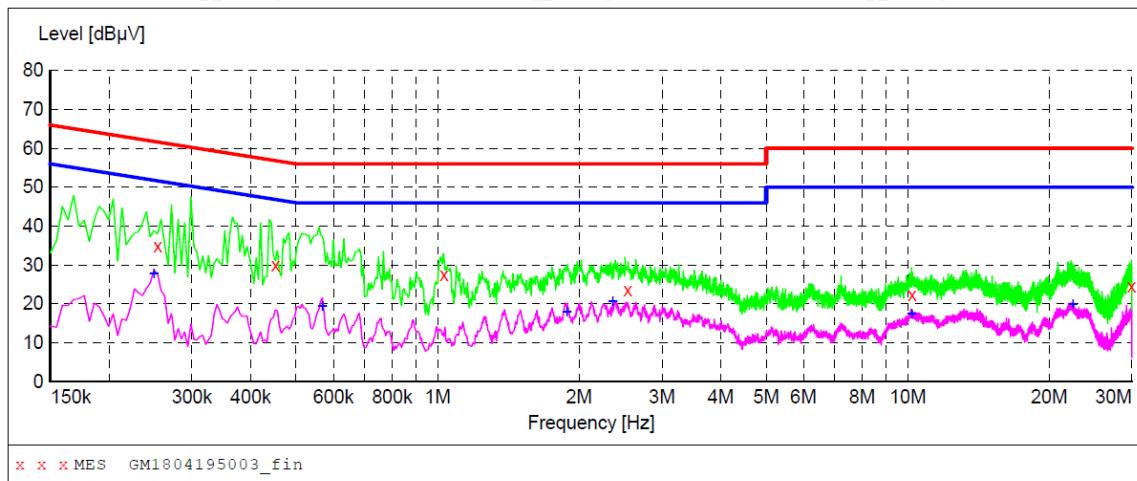


Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.159000	30.00	10.0	66	35.5	QP	L1	GND
0.555000	30.20	10.0	56	25.8	QP	L1	GND
1.018500	27.90	10.1	56	28.1	QP	L1	GND
2.490000	27.00	10.1	56	29.0	QP	L1	GND
10.459500	22.10	10.4	60	37.9	QP	L1	GND
22.380000	23.70	10.7	60	36.3	QP	L1	GND
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.253500	24.00	9.9	52	27.6	AV	L1	GND
0.379500	15.30	9.9	48	33.0	AV	L1	GND
2.085000	21.70	10.1	46	24.3	AV	L1	GND
2.422500	19.80	10.1	46	26.2	AV	L1	GND
10.522500	17.30	10.4	50	32.7	AV	L1	GND
22.393500	19.20	10.7	50	30.8	AV	L1	GND

Remark:

Transd = Cable loss + PULSE LIMITER factor + ARTIFICIAL MAINS factor; Margin = Limit - Level

Conducted Emission on Neutral Terminal of the power line



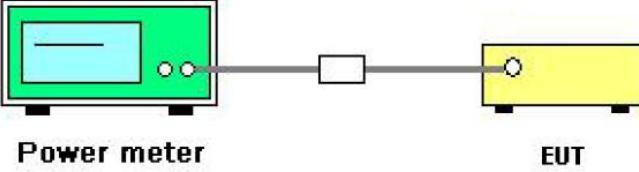
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.253500	34.90	9.9	62	26.7	QP	N	GND
0.451500	30.00	9.9	57	26.8	QP	N	GND
1.032000	27.40	10.1	56	28.6	QP	N	GND
2.535000	23.60	10.1	56	32.4	QP	N	GND
10.221000	22.20	10.4	60	37.8	QP	N	GND
29.931000	24.60	10.9	60	35.4	QP	N	GND
Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.249000	27.80	9.9	52	24.0	AV	N	GND
0.568500	19.40	10.0	46	26.6	AV	N	GND
1.882500	17.80	10.1	46	28.2	AV	N	GND
2.355000	20.70	10.1	46	25.3	AV	N	GND
10.198500	17.30	10.4	50	32.7	AV	N	GND
22.456500	19.90	10.7	50	30.1	AV	N	GND

Remark:

Transd = Cable loss + PULSE LIMITER factor + ARTIFICIAL MAINS factor; Margin = Limit - Level

6.3. Maximum Conducted Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407(a)& Part 2 J Section 2.1046	
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02 Section E	
Limit:	Frequency Band (MHz)	Limit
	5150-5250	250mW for client devices
	5725-5850	1 W
	Note: For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6 dBi, the output power effective limit shall be calculated as follows in Equation: $P_{out} = P_{limit} - (\text{directional gain} - 6)$	
Test Setup:	 Power meter EUT	
Test Mode:	Transmitting mode with modulation	
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02 Section E, 3, a 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 5. Measure the conducted output power and record the results in the test report.	
Test Result:	PASS	
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power	

6.3.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Power Meter	Agilent	N1911A	MY45101557	Sep. 27, 2018
Power Sensor	Agilent	N1922A	MY44124432	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.3.3. Test Data

Configuration Band I (5150 - 5250 MHz)

Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
11a	CH36	16.77	24	PASS
11a	CH40	17.89	24	PASS
11a	CH48	17.25	24	PASS
11n(HT20)	CH36	15.87	24	PASS
11n(HT20)	CH40	16.73	24	PASS
11n(HT20)	CH48	16.31	24	PASS

Configuration Band IV (5725 - 5850 MHz)

Mode	Test channel	Maximum Conducted Output Power (dBm)	FCC Limit (dBm)	Result
11a	CH149	14.45	30	PASS
11a	CH157	15.21	30	PASS
11a	CH165	16.39	30	PASS
11n(HT20)	CH149	13.25	30	PASS
11n(HT20)	CH157	13.94	30	PASS
11n(HT20)	CH165	15.28	30	PASS

6.4. 6dB Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407(e)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02 Section C
Limit:	>500kHz
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. KDB789033 D02 General UNII Test Procedures New Rules v02 Section C 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

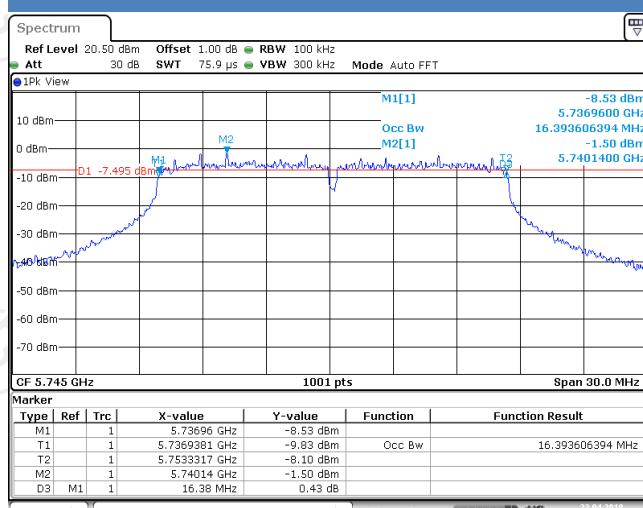
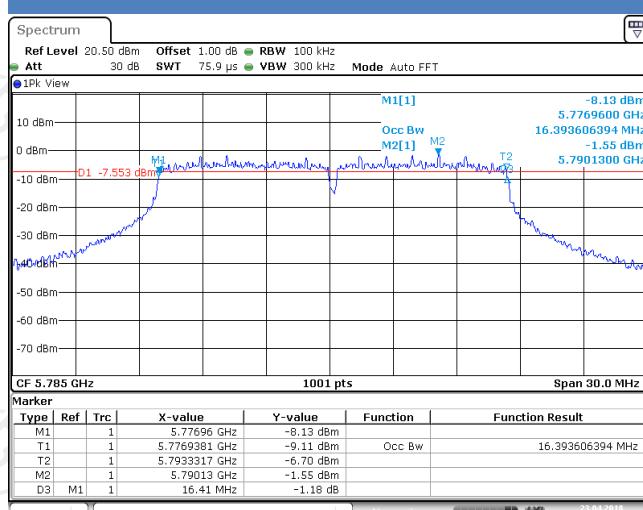
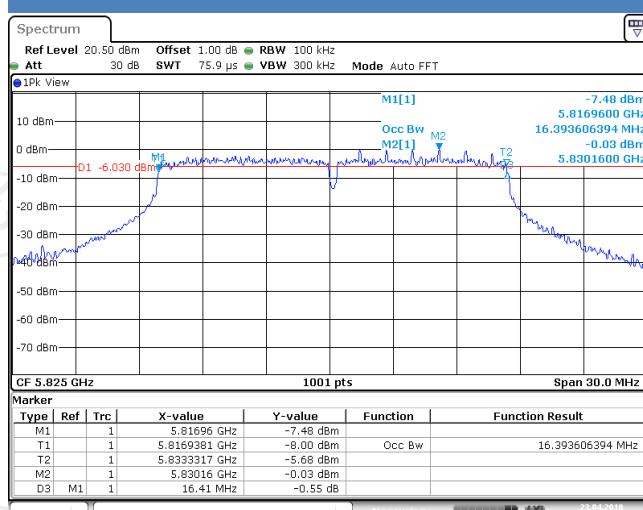
6.4.3. Test data

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11a	CH149	5745	16.38	0.5	PASS
11a	CH157	5785	16.41	0.5	PASS
11a	CH161	5825	16.41	0.5	PASS
11n(HT20)	CH149	5745	17.25	0.5	PASS
11n(HT20)	CH157	5785	16.89	0.5	PASS
11n(HT20)	CH161	5825	17.64	0.5	PASS

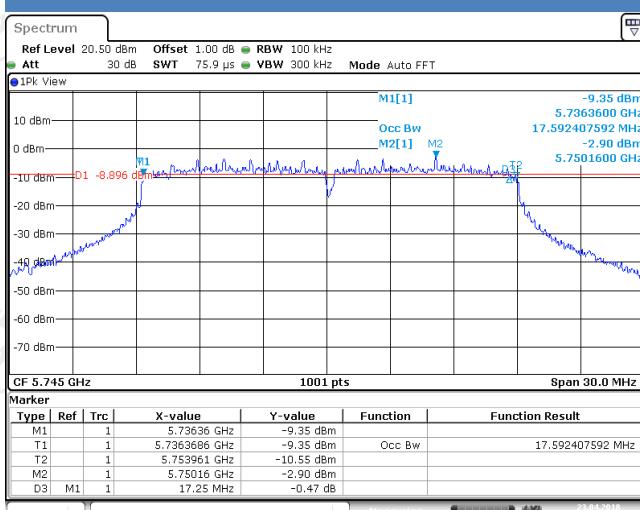
Test plots as follows:

Band IV (5725 – 5850 MHz)

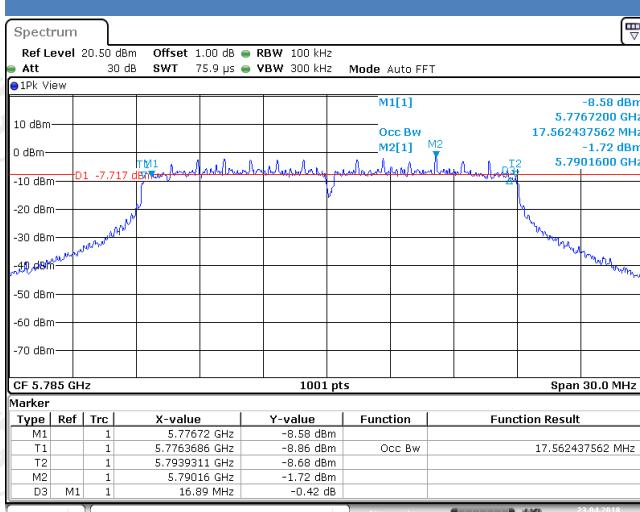
802.11a


Low

Mid

High

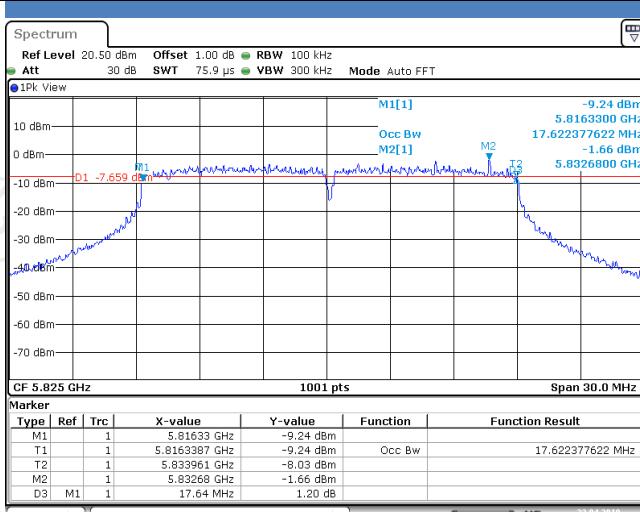
802.11n(HT20)



Low



Mid



High

6.5. 26dB Bandwidth and 99% Occupied Bandwidth

6.5.1. Test Specification

Test Requirement:	47 CFR Part 15C Section 15.407 (a)& Part 2 J Section 2.1049
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02 Section D
Limit:	No restriction limits
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. KDB789033 D02 General UNII Test Procedures New Rules v02 Section D 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. 4. Measure and record the results in the test report.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.5.3. Test data**Band I**

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	20.82	16.51
11a	CH44	5220	20.91	16.60
11a	CH48	5240	20.64	16.54
11n(HT20)	CH36	5180	21.21	17.62
11n(HT20)	CH44	5220	21.66	17.68
11n(HT20)	CH48	5240	21.33	17.65

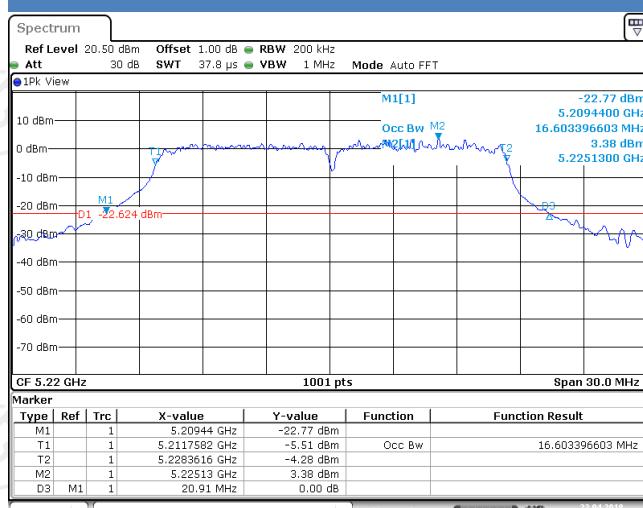
Test plots as follows:

Band I (5150 – 5250 MHz)

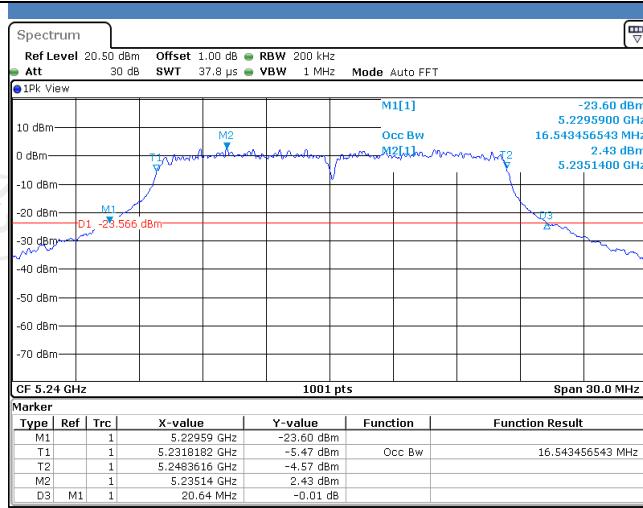
802.11a



Low

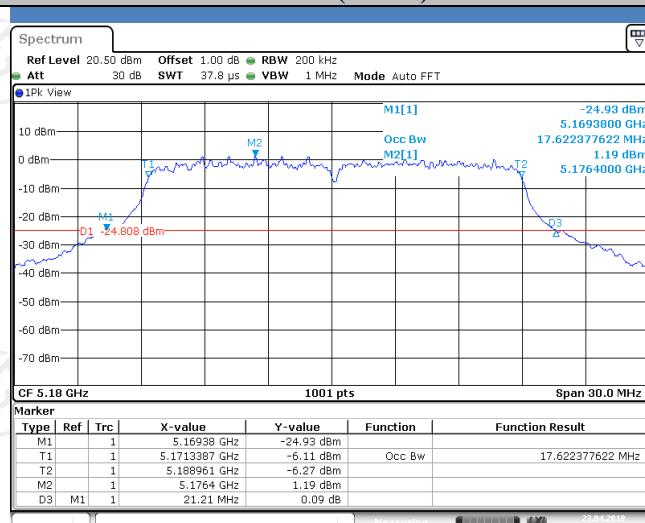


Mid

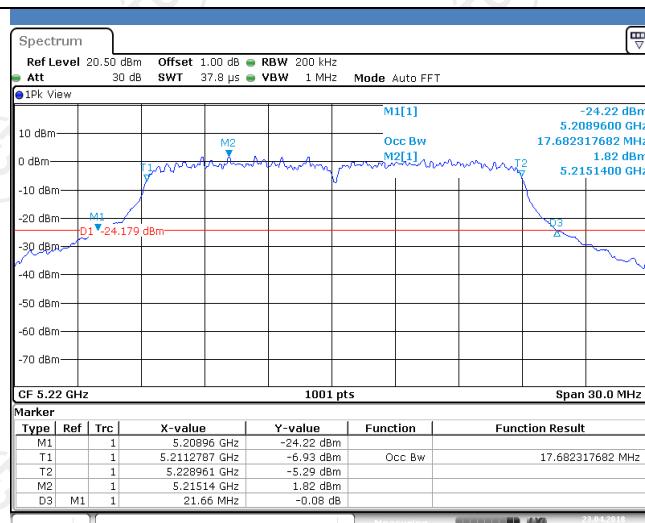


High

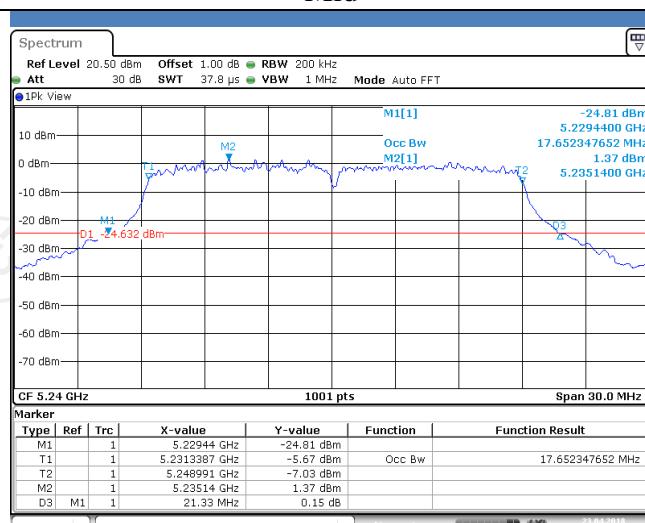
802.11n(HT20)



Low



Mid



High

6.6. Power Spectral Density

6.6.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02 Section F
Limit:	<p>$\leq 11.00 \text{dBm/MHz}$ for Band I 5150MHz-5250MHz $\leq 30.00 \text{dBm/500KHz}$ for Band IV 5725MHz-5850MHz</p> <p>The e.i.r.p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz</p> <p>Note: For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6 dBi, the PSD effective limit shall be calculated as follows in Equation: $\text{PSDout} = \text{PSDLimit} - (\text{directional gain} - 6)$</p>
Test Setup:	<p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 2. Set RBW = 500 kHz/1 MHz, VBW $\geq 3 \times \text{RBW}$, Sweep time = Auto, Detector = RMS. 3. Allow the sweeps to continue until the trace stabilizes. 4. Use the peak marker function to determine the maximum amplitude level. 5. The E.I.R.P spectral density used radiated test method. At a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment.
Test Result:	PASS

6.6.2. Test Instruments

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSP40	100056	Sep. 27, 2018
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-03	N/A	Sep. 27, 2018

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.6.3. Test data

Configuration Band I (5150 - 5250 MHz)

Mode	Test channel	Power Spectral Density	Limit (dBm/MHz)	Result
11a	CH36	5.96	11	PASS
11a	CH44	7.04	11	PASS
11a	CH48	6.54	11	PASS
11n(HT20)	CH36	4.93	11	PASS
11n(HT20)	CH44	5.73	11	PASS
11n(HT20)	CH48	5.30	11	PASS

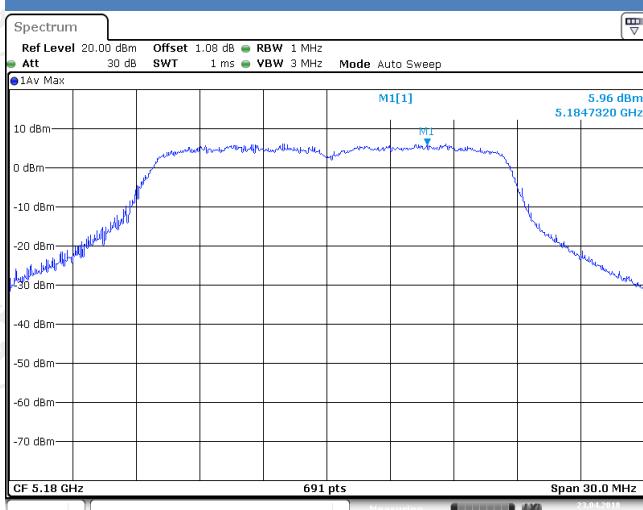
Configuration Band IV (5725 - 5850 MHz)

Mode	Test channel	Power Spectral Density	Limit (dBm/MHz)	Result
11a	CH149	2.79	30	PASS
11a	CH157	3.79	30	PASS
11a	CH161	4.51	30	PASS
11n(HT20)	CH149	1.43	30	PASS
11n(HT20)	CH157	1.76	30	PASS
11n(HT20)	CH161	3.61	30	PASS

Test plots as follows:

Band I (5150 – 5250 MHz)

802.11a



Low

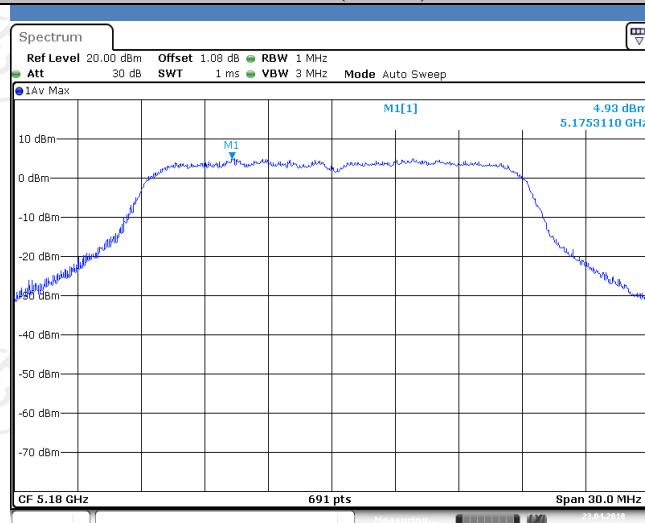


Mid

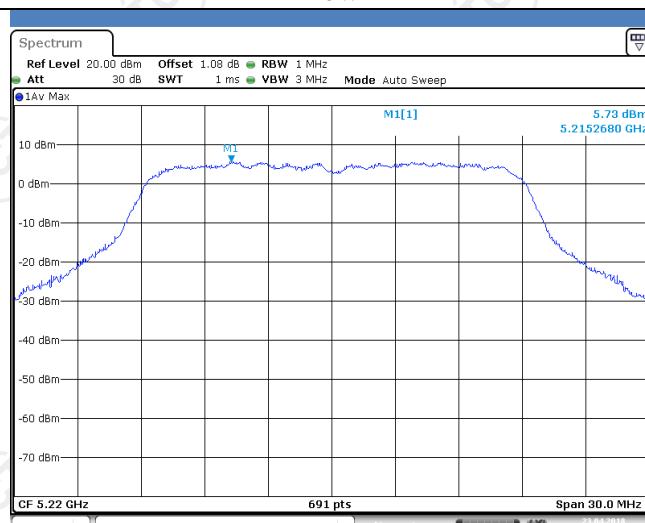


High

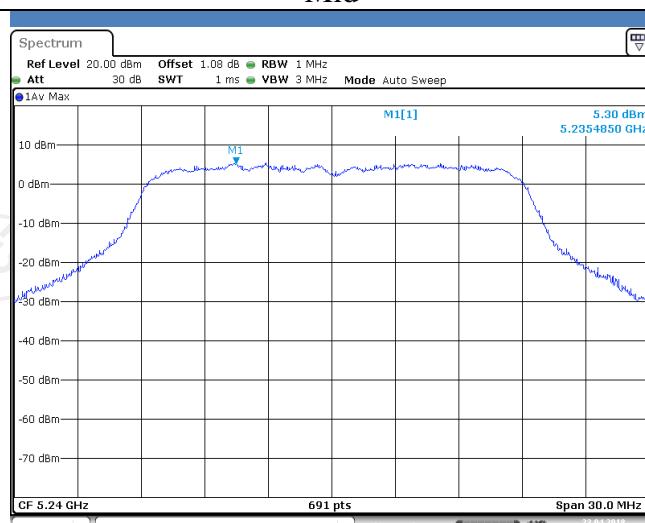
802.11n(HT20)



Low



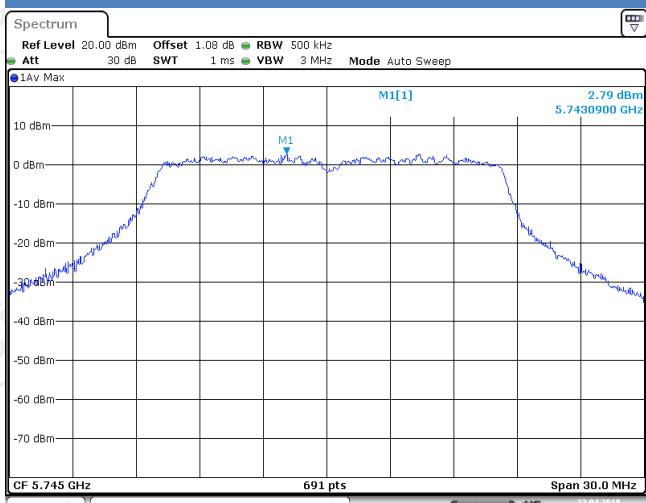
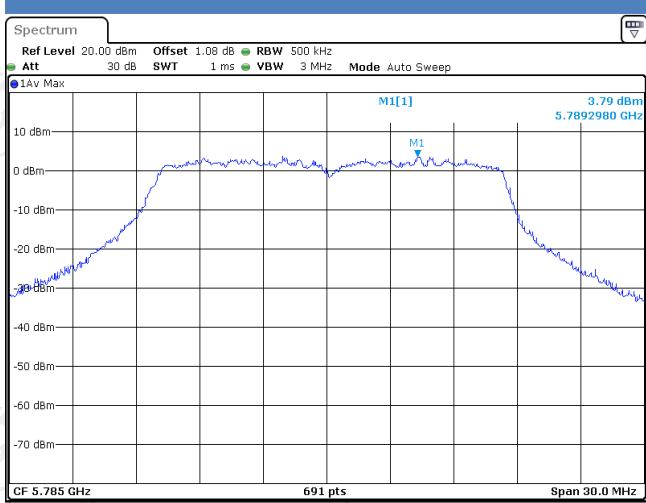
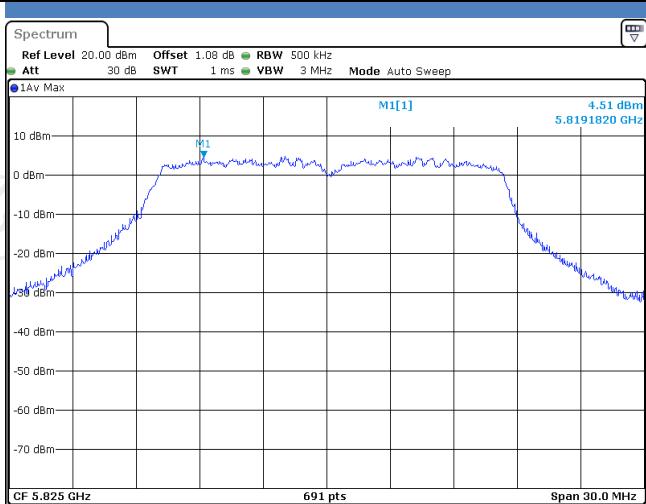
Mid



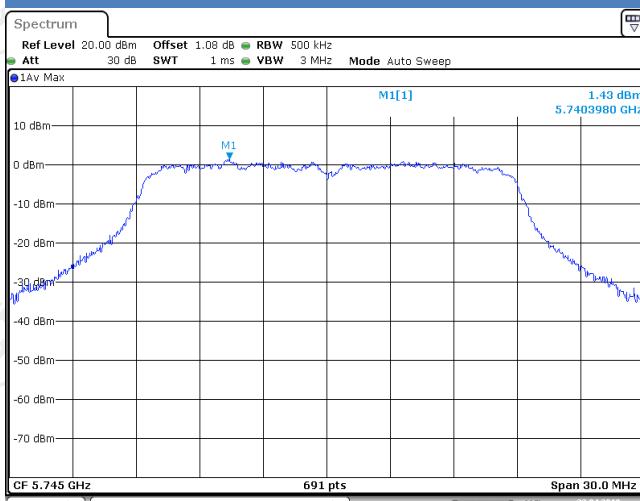
High

Band IV (5725 – 5850 MHz)

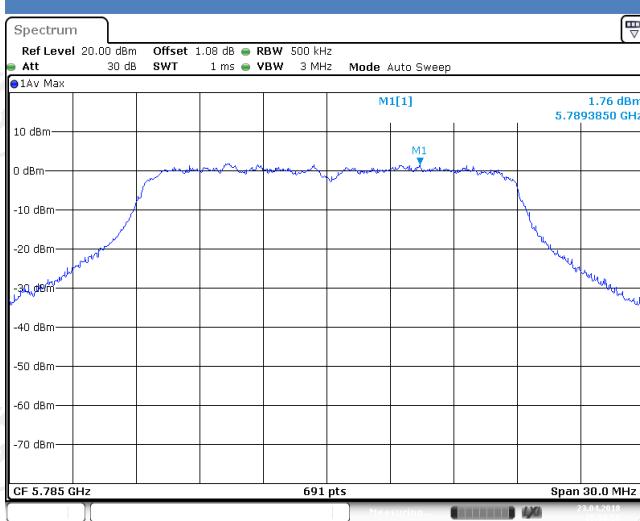
802.11a


Low

Mid

High

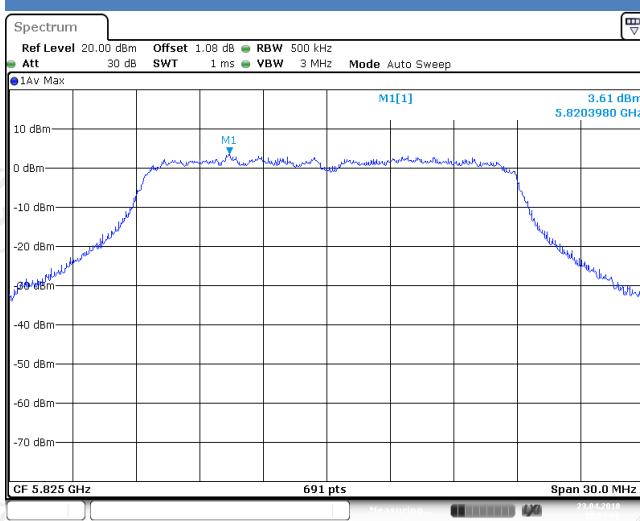
802.11n(HT20)



Low



Mid



High

6.7. Band edge

6.7.1. Test Specification

Test Requirement:	FCC CFR47 Part 15E Section 15.407
Test Method:	ANSI C63.10 2013
Limit:	<p>For band I&II&III: $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}$, for EIRP(dBm)= -27dBm</p> <p>For band IV(5715-5725MHz&5850-5860MHz): $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 78.2 \text{ dB}\mu\text{V}/\text{m}$, for EIRP(dBm)= -17dBm;</p> <p>For band IV(other un-restricted band): $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2 \text{ dB}\mu\text{V}/\text{m}$, for EIRP(dBm)= -27dBm</p>
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable 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. 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, quasipeak or average method as specified and then

	reported in a data sheet.
Test Result:	PASS

6.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSP40	100056	Sep. 27, 2018
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
EMI Test Software	Shurples Technology	EZ-EMC	N/A	N/A

Note: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.7.3. Test Data

Band I for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11a		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5150.00	18.54	31.70	9.30	0.00	59.54	68.20	-8.66	Vertical	Peak
5350.00	17.60	31.40	10.04	0.00	59.04	68.20	-9.16	Vertical	Peak
5150.00	17.11	31.70	9.30	0.00	58.11	68.20	-10.09	Horizontal	Peak
5350.00	16.32	31.40	10.04	0.00	57.76	68.20	-10.44	Horizontal	Peak
5150.00	8.40	31.70	9.30	0.00	49.40	54.00	-4.60	Vertical	Average
5350.00	7.62	31.40	10.04	0.00	49.06	54.00	-4.94	Vertical	Average
5150.00	8.73	31.70	9.30	0.00	49.73	54.00	-4.27	Horizontal	Average
5350.00	7.39	31.40	10.04	0.00	48.83	54.00	-5.17	Horizontal	Average

Band I for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11a		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5725.00	17.78	30.70	9.30	0.00	57.78	68.20	-10.42	Vertical	Peak
5850.00	15.60	31.38	10.04	0.00	57.02	68.20	-11.18	Vertical	Peak
5725.00	14.11	30.70	9.30	0.00	54.11	68.20	-14.09	Horizontal	Peak
5850.00	15.32	31.38	10.04	0.00	56.74	68.20	-11.46	Horizontal	Peak
5725.00	9.40	30.70	9.30	0.00	49.40	54.00	-4.60	Vertical	Average
5850.00	7.62	31.38	10.04	0.00	49.04	54.00	-4.96	Vertical	Average
5725.00	9.73	30.70	9.30	0.00	49.73	54.00	-4.27	Horizontal	Average
5850.00	8.39	31.38	10.04	0.00	49.81	54.00	-4.19	Horizontal	Average

Band I for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11a		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5150.00	19.07	30.70	9.30	0.00	59.07	68.20	-9.13	Vertical	Peak
5350.00	17.69	31.38	10.04	0.00	59.11	68.20	-9.09	Vertical	Peak
5150.00	17.15	30.70	9.30	0.00	57.15	68.20	-11.05	Horizontal	Peak
5350.00	15.38	31.38	10.04	0.00	56.80	68.20	-11.40	Horizontal	Peak
5150.00	9.01	30.70	9.30	0.00	49.01	54.00	-4.99	Vertical	Average
5350.00	7.58	31.38	10.04	0.00	49.00	54.00	-5.00	Vertical	Average
5150.00	10.27	30.70	9.30	0.00	50.27	54.00	-3.73	Horizontal	Average
5350.00	7.79	31.38	10.04	0.00	49.21	54.00	-4.79	Horizontal	Average

Band I for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11a		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5725.00	18.53	30.70	9.30	0.00	58.53	68.20	-9.67	Vertical	Peak
5850.00	17.59	31.38	10.04	0.00	59.01	68.20	-9.19	Vertical	Peak
5725.00	17.11	30.70	9.30	0.00	57.11	68.20	-11.09	Horizontal	Peak
5850.00	15.32	31.38	10.04	0.00	56.74	68.20	-11.46	Horizontal	Peak
5725.00	10.40	30.70	9.30	0.00	50.40	54.00	-3.60	Vertical	Average
5850.00	9.62	31.38	10.04	0.00	51.04	54.00	-2.96	Vertical	Average
5725.00	9.73	30.70	9.30	0.00	49.73	54.00	-4.27	Horizontal	Average
5850.00	7.39	31.38	10.04	0.00	48.81	54.00	-5.19	Horizontal	Average

Band IV for Band edge emission										
Bandwidth:		20MHz		Worst mode:		802.11n		Test channel:		Low
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector	
5150.00	19.54	30.70	9.30	0.00	59.54	68.20	-8.66	Vertical	Peak	
5350.00	17.60	31.38	10.04	0.00	59.02	68.20	-9.18	Vertical	Peak	
5150.00	16.11	30.70	9.30	0.00	56.11	68.20	-12.09	Horizontal	Peak	
5350.00	14.32	31.38	10.04	0.00	55.74	68.20	-12.46	Horizontal	Peak	
5150.00	8.40	30.70	9.30	0.00	48.40	54.00	-5.60	Vertical	Average	
5350.00	7.62	31.38	10.04	0.00	49.04	54.00	-4.96	Vertical	Average	
5150.00	9.73	30.70	9.30	0.00	49.73	54.00	-4.27	Horizontal	Average	
5350.00	7.39	31.38	10.04	0.00	48.81	54.00	-5.19	Horizontal	Average	

Band IV for Band edge emission										
Bandwidth:		20MHz		Worst mode:		802.11n		Test channel:		HIGH
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector	
5725.00	18.54	30.70	9.30	0.00	58.54	68.20	-9.66	Vertical	Peak	
5850.00	16.60	31.38	10.04	0.00	58.02	68.20	-10.18	Vertical	Peak	
5725.00	16.11	30.70	9.30	0.00	56.11	68.20	-12.09	Horizontal	Peak	
5850.00	14.32	31.38	10.04	0.00	55.74	68.20	-12.46	Horizontal	Peak	
5725.00	10.40	30.70	9.30	0.00	50.40	54.00	-3.60	Vertical	Average	
5850.00	8.62	31.38	10.04	0.00	50.04	54.00	-3.96	Vertical	Average	
5725.00	10.73	30.70	9.30	0.00	50.73	54.00	-3.27	Horizontal	Average	
5850.00	8.39	31.38	10.04	0.00	49.81	54.00	-4.19	Horizontal	Average	

Band IV for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11n		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5150.00	17.23	31.70	9.79	0.00	58.72	68.20	-9.48	Vertical	Peak
5350.00	17.68	31.40	10.06	0.00	59.14	68.20	-9.06	Vertical	Peak
5150.00	17.74	31.70	9.79	0.00	59.23	68.20	-8.97	Horizontal	Peak
5350.00	17.18	31.40	10.06	0.00	58.64	68.20	-9.56	Horizontal	Peak
5150.00	7.62	31.70	9.79	0.00	49.11	54.00	-4.89	Vertical	Average
5350.00	7.11	31.40	10.06	0.00	48.57	54.00	-5.43	Vertical	Average
5150.00	7.09	31.70	9.79	0.00	48.58	54.00	-5.42	Horizontal	Average
5350.00	7.56	31.40	10.06	0.00	49.02	54.00	-4.98	Horizontal	Average

Band IV for Band edge emission									
Bandwidth:		20MHz		Worst mode:		802.11n		Test channel:	
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Detector
5725.00	18.88	31.73	10.47	0.00	61.08	68.20	-7.12	Vertical	Peak
5850.00	17.62	32.2	10.61	0.00	60.43	68.20	-7.77	Vertical	Peak
5725.00	16.13	31.73	10.47	0.00	58.33	68.20	-9.87	Horizontal	Peak
5850.00	17.97	32.2	10.61	0.00	60.78	68.20	-7.42	Horizontal	Peak
5725.00	6.75	31.73	10.47	0.00	48.95	54.00	-5.05	Vertical	Average
5850.00	7.28	32.2	10.61	0.00	50.09	54.00	-3.91	Vertical	Average
5725.00	6.13	31.73	10.47	0.00	48.33	54.00	-5.67	Horizontal	Average
5850.00	7.66	32.2	10.61	0.00	50.47	54.00	-3.53	Horizontal	Average

6.8. Spurious Emission

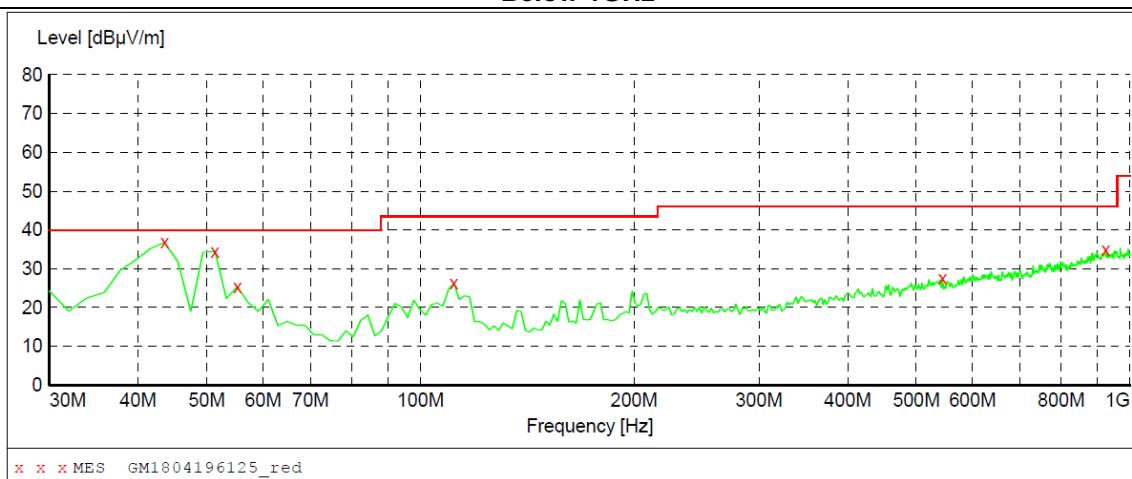
6.8.1.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205																																					
Test Method:	KDB 789033 D02 v02r01																																					
Frequency Range:	9kHz to 40GHz																																					
Measurement Distance:	3 m																																					
Antenna Polarization:	Horizontal & Vertical																																					
Operation mode:	Transmitting mode with modulation																																					
Receiver Setup:	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Detector</th> <th>RBW</th> <th>VBW</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>9kHz- 150kHz</td> <td>Quasi-peak</td> <td>200Hz</td> <td>1kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>150kHz- 30MHz</td> <td>Quasi-peak</td> <td>9kHz</td> <td>30kHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>30MHz-1GHz</td> <td>Quasi-peak</td> <td>120KHz</td> <td>300KHz</td> <td>Quasi-peak Value</td> </tr> <tr> <td>Above 1GHz</td> <td>Peak</td> <td>1MHz</td> <td>3MHz</td> <td>Peak Value</td> </tr> <tr> <td></td> <td>RMS</td> <td>1MHz</td> <td>3MHz</td> <td>Average Value</td> </tr> </tbody> </table>				Frequency	Detector	RBW	VBW	Remark	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value		RMS	1MHz	3MHz	Average Value				
Frequency	Detector	RBW	VBW	Remark																																		
9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value																																		
150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value																																		
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value																																		
Above 1GHz	Peak	1MHz	3MHz	Peak Value																																		
	RMS	1MHz	3MHz	Average Value																																		
Limit:	<p>Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,</p> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Field Strength (microvolts/meter)</th> <th>Measurement Distance (meters)</th> </tr> </thead> <tbody> <tr> <td>0.009-0.490</td> <td>2400/F(KHz)</td> <td>300</td> </tr> <tr> <td>0.490-1.705</td> <td>24000/F(KHz)</td> <td>30</td> </tr> <tr> <td>1.705-30</td> <td>30</td> <td>30</td> </tr> <tr> <td>30-88</td> <td>100</td> <td>3</td> </tr> <tr> <td>88-216</td> <td>150</td> <td>3</td> </tr> <tr> <td>216-960</td> <td>200</td> <td>3</td> </tr> <tr> <td>Above 960</td> <td>500</td> <td>3</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Frequency</th> <th>Limit (dBuV/m @3m)</th> <th>Detector</th> </tr> </thead> <tbody> <tr> <td>Above 1G</td> <td>74.0</td> <td>Peak</td> </tr> <tr> <td></td> <td>54.0</td> <td>Average</td> </tr> </tbody> </table>					Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	0.009-0.490	2400/F(KHz)	300	0.490-1.705	24000/F(KHz)	30	1.705-30	30	30	30-88	100	3	88-216	150	3	216-960	200	3	Above 960	500	3	Frequency	Limit (dBuV/m @3m)	Detector	Above 1G	74.0	Peak		54.0	Average
Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)																																				
0.009-0.490	2400/F(KHz)	300																																				
0.490-1.705	24000/F(KHz)	30																																				
1.705-30	30	30																																				
30-88	100	3																																				
88-216	150	3																																				
216-960	200	3																																				
Above 960	500	3																																				
Frequency	Limit (dBuV/m @3m)	Detector																																				
Above 1G	74.0	Peak																																				
	54.0	Average																																				
Test setup:	<p>For radiated emissions below 30MHz</p> <p>Distance = 3m</p> <p>EUT</p> <p>Turn table</p> <p>Ground Plane</p> <p>Computer</p> <p>Pre -Amplifier</p> <p>Receiver</p>																																					

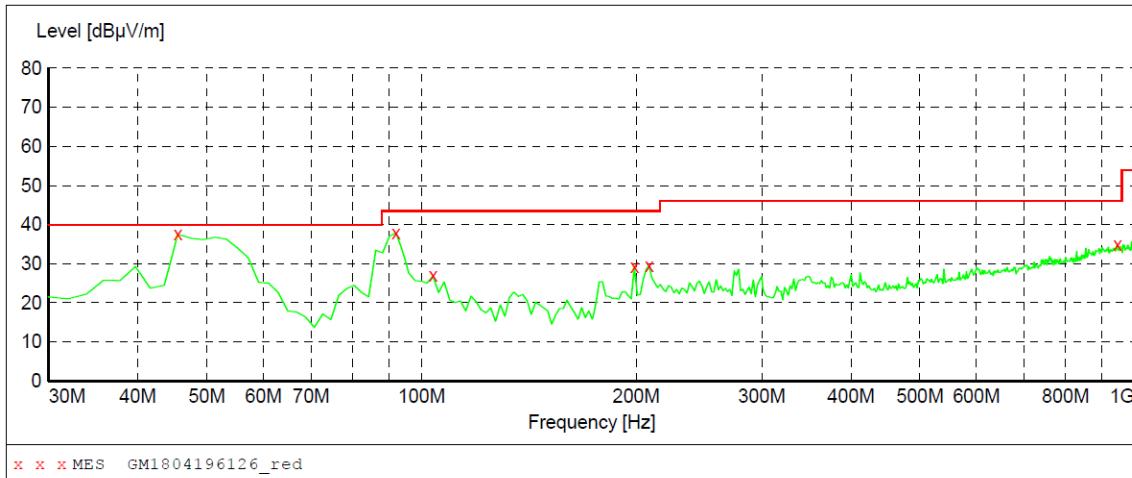
	<p>30MHz to 1GHz</p>
	<p>Above 1GHz</p>
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test results:	PASS

6.8.2. Test Data

Please refer to following diagram for individual
Below 1GHz



Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
43.580000	36.80	-9.1	40.0	3.2	QP	100.0	254.00	VERTICAL
51.340000	34.50	-8.8	40.0	5.5	QP	100.0	309.00	VERTICAL
55.220000	25.40	-9.2	40.0	14.6	QP	100.0	201.00	VERTICAL
111.480000	26.30	-11.0	43.5	17.2	QP	100.0	201.00	VERTICAL
544.100000	27.40	-0.9	46.0	18.6	QP	100.0	53.00	VERTICAL
924.340000	34.90	7.0	46.0	11.1	QP	100.0	0.00	VERTICAL



Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	37.50	-8.8	40.0	2.5	QP	300.0	168.00	HORIZONTAL
92.080000	37.90	-12.2	43.5	5.6	QP	300.0	155.00	HORIZONTAL
103.720000	26.90	-10.5	43.5	16.6	QP	300.0	155.00	HORIZONTAL
198.780000	29.30	-9.8	43.5	14.2	QP	100.0	107.00	HORIZONTAL
208.480000	29.50	-10.5	43.5	14.0	QP	100.0	93.00	HORIZONTAL
945.680000	34.80	7.2	46.0	11.2	QP	100.0	239.00	HORIZONTAL

Remark:

1. Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level
2. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported
3. Pre-scan the 802.11a and 802.11n test mode, found that 802.11a and band 1 mode for low channel was the worst mode, and the report showed only the test results of the worst mode.

Above 1GHz

Band I for Low									
Bandwidth: 20MHz			Worst mode: 802.11a						
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
4405.09	-7.72	30.51	9.14	0.00	31.93	74.00	-42.07	Vertical	Peak
6776.27	-5.10	34.05	11.57	0.00	40.52	74.00	-33.48	Vertical	Peak
7829.86	-5.01	36.28	13.12	0.00	44.39	74.00	-29.61	Vertical	Peak
10698.51	-3.67	39.90	13.59	0.00	49.82	74.00	-24.18	Vertical	Peak
5164.10	-3.33	31.64	9.80	0.00	38.11	74.00	-35.89	Horizontal	Peak
7497.65	-4.97	36.10	12.39	0.00	43.52	74.00	-30.48	Horizontal	Peak
8465.38	-4.30	36.80	12.86	0.00	45.36	74.00	-28.64	Horizontal	Peak
12651.13	-3.03	38.77	14.47	0.00	50.21	74.00	-23.79	Horizontal	Peak

Band I for Mid									
Bandwidth: 20MHz			Worst mode: 802.11a						
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
4573.76	-6.61	30.85	9.42	0.00	33.66	74.00	-40.34	Vertical	Peak
6526.37	-5.13	34.05	11.22	0.00	40.14	74.00	-33.86	Vertical	Peak
10185.53	-5.50	39.19	13.56	0.00	47.25	74.00	-26.75	Vertical	Peak
11906.07	-4.95	39.70	14.43	0.00	49.18	74.00	-24.82	Vertical	Peak
5984.31	-4.02	32.47	10.66	0.00	39.11	74.00	-34.89	Horizontal	Peak
8295.82	-4.21	36.41	12.81	0.00	45.01	74.00	-28.99	Horizontal	Peak
9530.43	-4.23	39.04	13.72	0.00	48.53	74.00	-25.47	Horizontal	Peak
11012.25	-5.29	40.43	13.57	0.00	48.71	74.00	-25.29	Horizontal	Peak

Band I for High									
Bandwidth: 20MHz			Worst mode: 802.11a						
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5194.04	-4.80	31.52	9.83	0.00	36.55	74.00	-37.45	Vertical	Peak
6640.54	-4.67	34.20	11.41	0.00	40.94	74.00	-33.06	Vertical	Peak
7784.73	-5.68	36.10	13.22	0.00	43.64	74.00	-30.36	Vertical	Peak
8514.46	-3.68	36.96	12.87	0.00	46.15	74.00	-27.85	Vertical	Peak
4748.89	-6.28	31.40	9.52	0.00	34.64	74.00	-39.36	Horizontal	Peak
6195.51	-5.38	32.88	11.00	0.00	38.50	74.00	-35.50	Horizontal	Peak
7476.01	-3.99	36.15	12.32	0.00	44.48	74.00	-29.52	Horizontal	Peak
8489.88	-4.49	36.87	12.87	0.00	45.25	74.00	-28.75	Horizontal	Peak

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

Band I for Low									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5503.14	-5.93	31.90	10.20	0.00	36.17	74.00	-37.83	Vertical	Peak
8295.82	-4.77	36.41	12.81	0.00	44.45	74.00	-29.55	Vertical	Peak
9838.31	-4.04	39.10	13.62	0.00	48.68	74.00	-25.32	Vertical	Peak
11533.48	-3.54	40.21	13.56	0.00	50.23	74.00	-23.77	Vertical	Peak
5915.52	-4.60	32.33	10.64	0.00	38.37	74.00	-35.63	Horizontal	Peak
8764.15	-4.14	37.77	13.06	0.00	46.69	74.00	-27.31	Horizontal	Peak
10363.71	-4.81	39.52	13.58	0.00	48.29	74.00	-25.71	Horizontal	Peak
11667.60	-3.48	40.12	13.81	0.00	50.45	74.00	-23.55	Horizontal	Peak

Band I for Mid									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5797.03	-5.15	32.09	10.59	0.00	37.53	74.00	-36.47	Vertical	Peak
8343.92	-4.83	36.49	12.83	0.00	44.49	74.00	-29.51	Vertical	Peak
9205.54	-5.07	38.63	13.51	0.00	47.07	74.00	-26.93	Vertical	Peak
10791.69	-4.75	40.22	13.58	0.00	49.05	74.00	-24.95	Vertical	Peak
5664.53	-4.60	31.67	10.37	0.00	37.44	74.00	-36.56	Horizontal	Peak
8416.58	-3.78	36.65	12.85	0.00	45.72	74.00	-28.28	Horizontal	Peak
9232.19	-3.78	38.79	13.53	0.00	48.54	74.00	-25.46	Horizontal	Peak
10791.69	-5.02	40.22	13.58	0.00	48.78	74.00	-25.22	Horizontal	Peak

Band I for High									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5104.74	-4.66	31.88	9.75	0.00	36.97	74.00	-37.03	Vertical	Peak
7158.81	-5.24	35.95	11.86	0.00	42.57	74.00	-31.43	Vertical	Peak
8995.12	-4.20	37.90	13.30	0.00	47.00	74.00	-27.00	Vertical	Peak
11204.90	-4.78	40.30	13.49	0.00	49.01	74.00	-24.99	Vertical	Peak
5680.92	-5.04	31.64	10.40	0.00	37.00	74.00	-37.00	Horizontal	Peak
8588.61	-3.34	37.25	12.89	0.00	46.80	74.00	-27.20	Horizontal	Peak
9697.15	-3.62	39.10	13.69	0.00	49.17	74.00	-24.83	Horizontal	Peak
12009.76	-3.70	39.70	14.66	0.00	50.66	74.00	-23.34	Horizontal	Peak

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

Band IV for Low									
Bandwidth: 20MHz					Worst mode: 802.11a				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5361.83	-6.29	31.42	10.07	0.00	35.20	74.00	-38.80	Vertical	Peak
7347.47	-4.77	36.30	12.01	0.00	43.54	74.00	-30.46	Vertical	Peak
10545.01	-4.41	39.98	13.59	0.00	49.16	74.00	-24.84	Vertical	Peak
11237.33	-4.39	40.30	13.48	0.00	49.39	74.00	-24.61	Vertical	Peak
4804.11	-6.79	31.59	9.54	0.00	34.34	74.00	-39.66	Horizontal	Peak
6106.62	-4.96	32.53	10.85	0.00	38.42	74.00	-35.58	Horizontal	Peak
7519.35	-4.65	36.12	12.46	0.00	43.93	74.00	-30.07	Horizontal	Peak
10453.97	-4.48	39.84	13.59	0.00	48.95	74.00	-25.05	Horizontal	Peak

Band IV for Mid									
Bandwidth: 20MHz					Worst mode: 802.11a				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
4748.89	-5.85	31.40	9.52	0.00	35.07	74.00	-38.93	Vertical	Peak
7158.81	-5.24	35.95	11.86	0.00	42.57	74.00	-31.43	Vertical	Peak
8738.85	-3.92	37.82	13.04	0.00	46.94	74.00	-27.06	Vertical	Peak
10948.78	-4.53	40.53	13.57	0.00	49.57	74.00	-24.43	Vertical	Peak
5392.92	-6.64	31.49	10.12	0.00	34.97	74.00	-39.03	Horizontal	Peak
7390.07	-4.45	36.30	12.06	0.00	43.91	74.00	-30.09	Horizontal	Peak
9448.15	-3.74	39.02	13.70	0.00	48.98	74.00	-25.02	Horizontal	Peak
11940.54	-4.70	39.70	14.52	0.00	49.52	74.00	-24.48	Horizontal	Peak

Band IV for High									
Bandwidth: 20MHz					Worst mode: 802.11a				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5239.27	-5.88	31.42	9.89	0.00	35.43	74.00	-38.57	Vertical	Peak
8295.82	-4.77	36.41	12.81	0.00	44.45	74.00	-29.55	Vertical	Peak
9669.16	-3.05	39.09	13.71	0.00	49.75	74.00	-24.25	Vertical	Peak
12469.61	-3.58	38.96	14.40	0.00	49.78	74.00	-24.22	Vertical	Peak
5664.53	-4.60	31.67	10.37	0.00	37.44	74.00	-36.56	Horizontal	Peak
8368.07	-4.20	36.54	12.84	0.00	45.18	74.00	-28.82	Horizontal	Peak
9895.35	-3.23	39.10	13.59	0.00	49.46	74.00	-24.54	Horizontal	Peak
11237.33	-3.62	40.30	13.48	0.00	50.16	74.00	-23.84	Horizontal	Peak

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

Band IV for Low									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5551.07	-5.82	31.85	10.24	0.00	36.27	74.00	-37.73	Vertical	Peak
8036.21	-4.38	37.06	12.39	0.00	45.07	74.00	-28.93	Vertical	Peak
8764.15	-3.88	37.77	13.06	0.00	46.95	74.00	-27.05	Vertical	Peak
11204.90	-4.78	40.30	13.49	0.00	49.01	74.00	-24.99	Vertical	Peak
5599.41	-5.46	31.80	10.27	0.00	36.61	74.00	-37.39	Horizontal	Peak
7898.05	-4.76	36.69	12.79	0.00	44.72	74.00	-29.28	Horizontal	Peak
10333.80	-4.97	39.42	13.58	0.00	48.03	74.00	-25.97	Horizontal	Peak
12044.52	-3.43	39.68	14.64	0.00	50.89	74.00	-23.11	Horizontal	Peak

Band IV for Mid									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
4874.04	-6.93	31.45	9.59	0.00	34.11	74.00	-39.89	Vertical	Peak
5680.92	-5.53	31.64	10.40	0.00	36.51	74.00	-37.49	Vertical	Peak
7966.83	-4.40	36.97	12.46	0.00	45.03	74.00	-28.97	Vertical	Peak
11237.33	-4.39	40.30	13.48	0.00	49.39	74.00	-24.61	Vertical	Peak
5664.53	-4.60	31.67	10.37	0.00	37.44	74.00	-36.56	Horizontal	Peak
7739.86	-5.28	36.10	13.10	0.00	43.92	74.00	-30.08	Horizontal	Peak
8764.15	-4.14	37.77	13.06	0.00	46.69	74.00	-27.31	Horizontal	Peak
10097.60	-2.71	39.10	13.55	0.00	49.94	74.00	-24.06	Horizontal	Peak

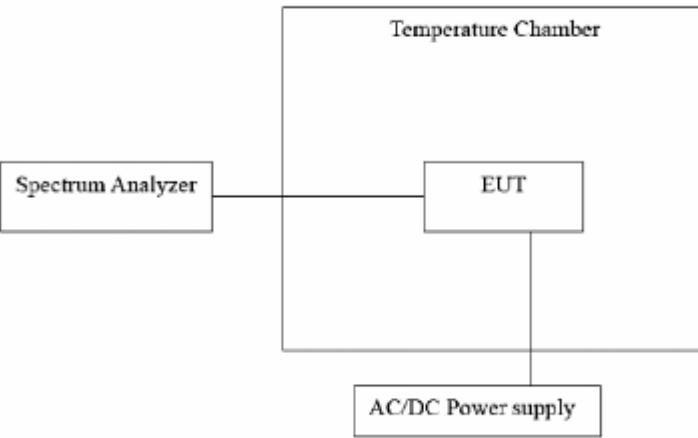
Band IV for High									
Bandwidth: 20MHz					Worst mode: 802.11n				
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Margin Limit (dB)	Polarization	Test value
5377.35	-6.83	31.46	10.10	0.00	34.73	74.00	-39.27	Vertical	Peak
7035.73	-5.13	35.41	11.85	0.00	42.13	74.00	-31.87	Vertical	Peak
8891.73	-4.56	37.79	13.20	0.00	46.43	74.00	-27.57	Vertical	Peak
10822.92	-4.11	40.33	13.58	0.00	49.80	74.00	-24.20	Vertical	Peak
5615.62	-4.71	31.77	10.29	0.00	37.35	74.00	-36.65	Horizontal	Peak
7056.09	-5.18	35.47	11.85	0.00	42.14	74.00	-31.86	Horizontal	Peak
8738.85	-4.43	37.82	13.04	0.00	46.43	74.00	-27.57	Horizontal	Peak
10760.54	-4.37	40.11	13.58	0.00	49.32	74.00	-24.68	Horizontal	Peak

Remark:

- Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measuring frequencies from 1 GHz to 40GHz of highest fundamental frequency.

6.9. Frequency Stability Measurement

6.9.1. Test Specification

Test Requirement:	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
Test Method:	ANSI C63.10: 2013
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
Test Setup:	 <pre> graph LR SA[Spectrum Analyzer] --- EUT[EUT] EUT --- AC[AC/DC Power supply] EUT --- TC[Temperature Chamber] </pre>
Test Procedure:	<p>The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.</p> <ol style="list-style-type: none"> Turn the EUT on and couple its output to a spectrum analyzer. Turn the EUT off and set the chamber to the highest temperature specified. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
Test Result:	PASS
Remark:	Pre-scan was performed at Low/ Mid /High channel, the worst case was found. Only the test data of Low channel was shown in this report.

Test plots as follows:

Band I for 802.11a Low					
Voltage(%)	Power(VDC)	TEMP(°C)	Test Frequency (MHz)	Freq.Dev (Hz)	Deviation (ppm)
100%	7.40	-20	5180	-9000.00	-1.73745
100%		-10	5180	-9000.00	-1.73745
100%		0	5180	-10000.00	-1.93050
100%		10	5180	-10000.00	-1.93050
100%		20	5180	-10000.00	-1.93050
100%		30	5180	-9000.00	-1.73745
100%		40	5180	-10000.00	-1.93050
100%		50	5180	-10000.00	-1.93050
85%		25	5180	-9000.00	-1.73745
115%	8.51	25	5180	-9000.00	-1.73745

Band IV for 802.11a Low					
Voltage(%)	Power(VDC)	TEMP(°C)	Test Frequency (MHz)	Freq.Dev (Hz)	Deviation (ppm)
100%	7.40	-20	5745	-7000.00	-1.21845
100%		-10	5745	-6000.00	-1.04439
100%		0	5745	-5000.00	-0.87032
100%		10	5745	-4000.00	-0.69626
100%		20	5745	-3000.00	-0.52219
100%		30	5745	-2000.00	-0.34813
100%		40	5745	-1000.00	-0.17406
100%		50	5745	-1000.00	-0.17406
85%		25	5745	-11000.00	-1.91471
115%	8.51	25	5745	-9000.00	-1.56658

Appendix A: Photographs of Test Setup

Radiated Emission



CE



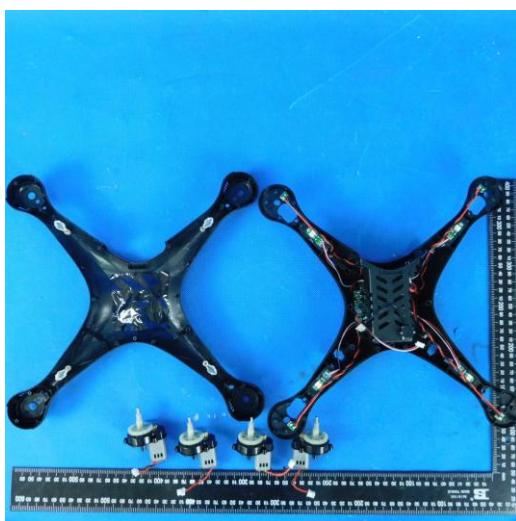
Appendix B: Photographs of EUT External Photos of the EUT

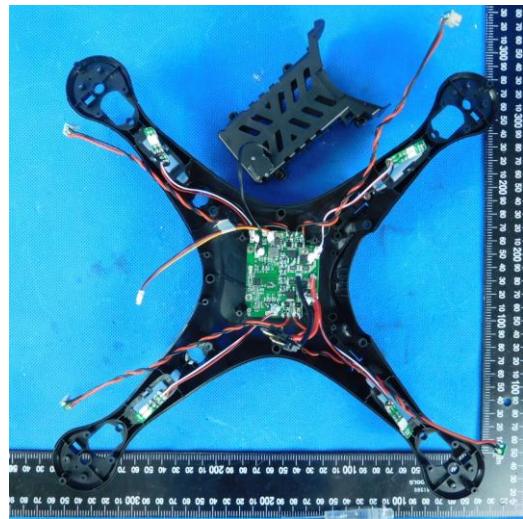
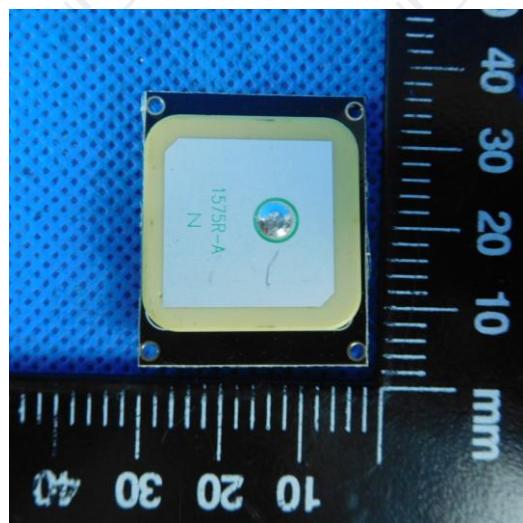
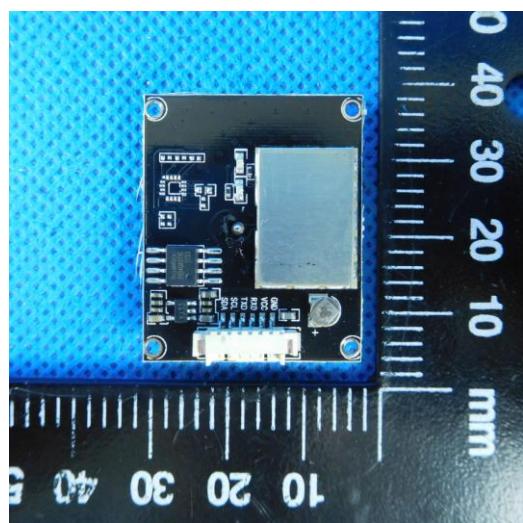


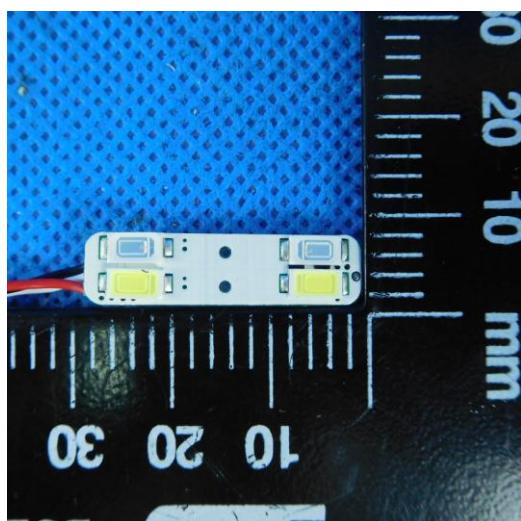
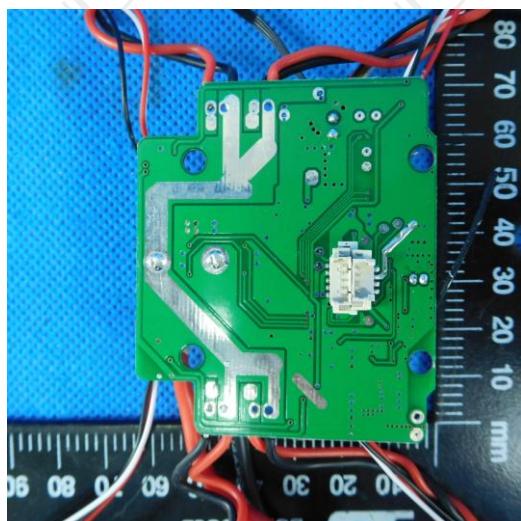
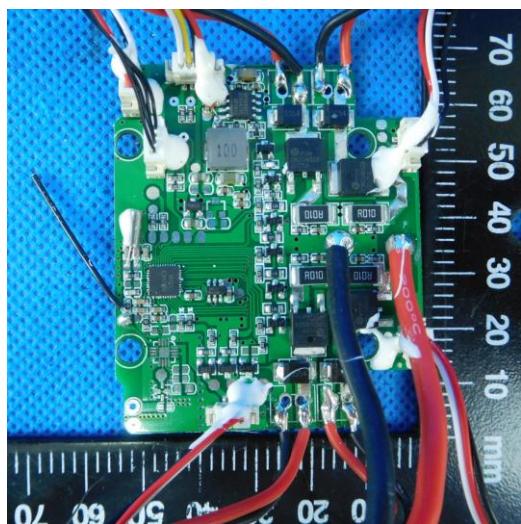


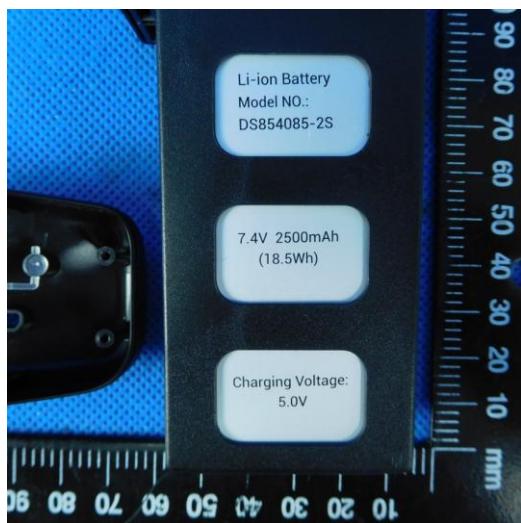
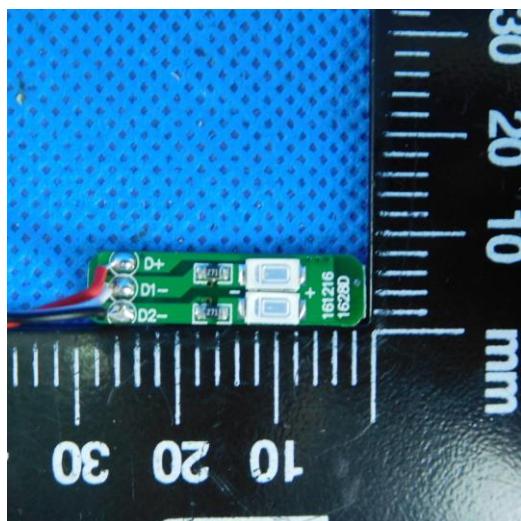


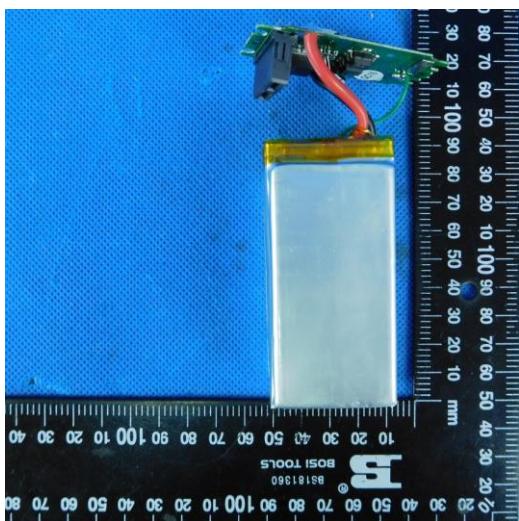
Internal Photos of the EUT

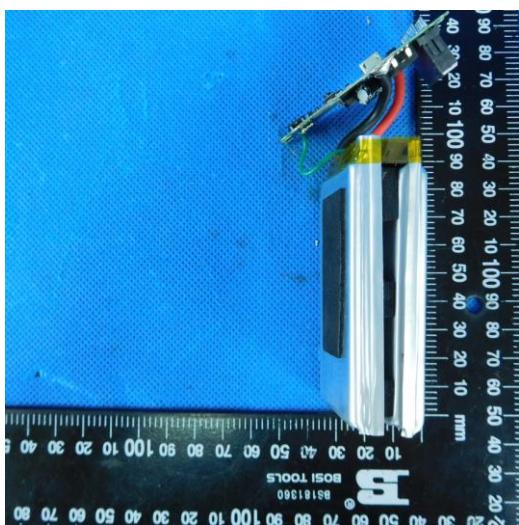
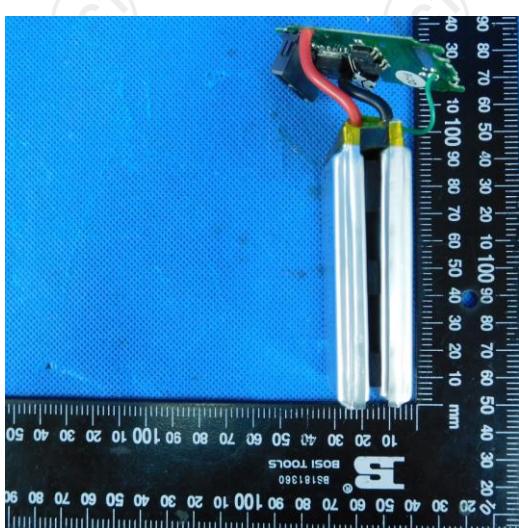
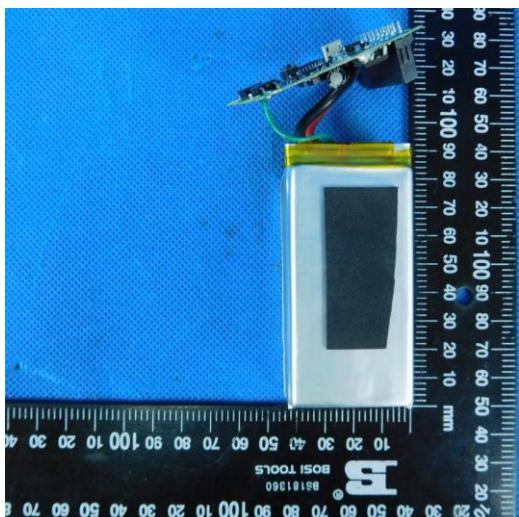


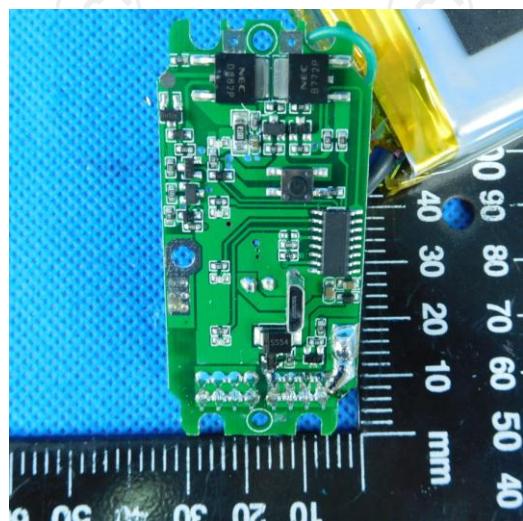
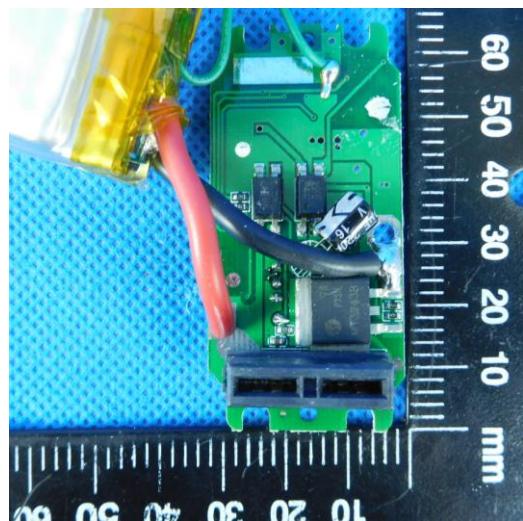




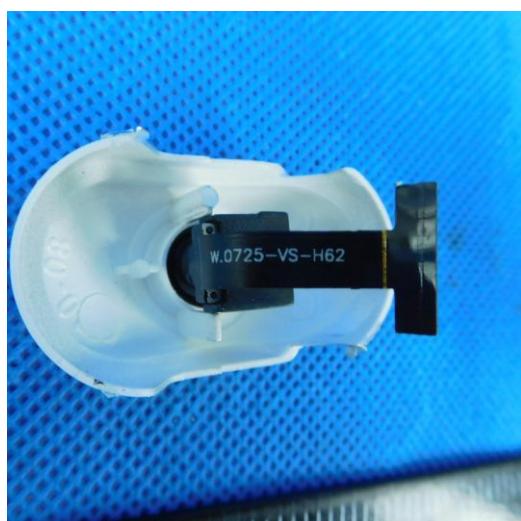
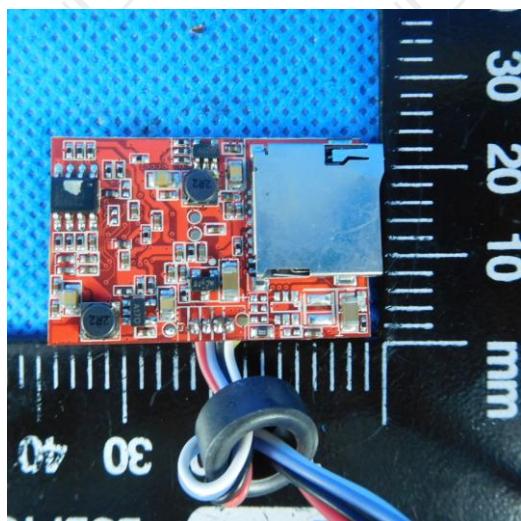
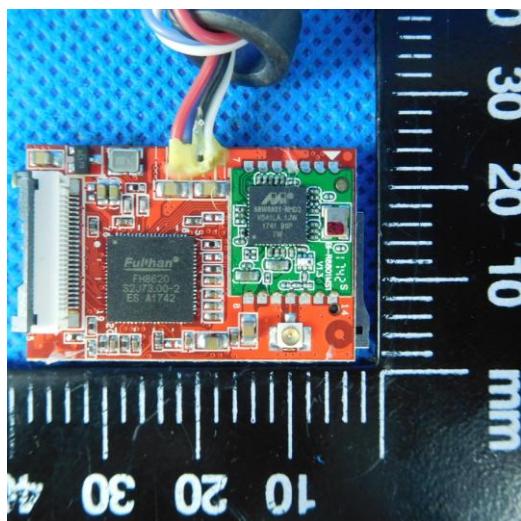


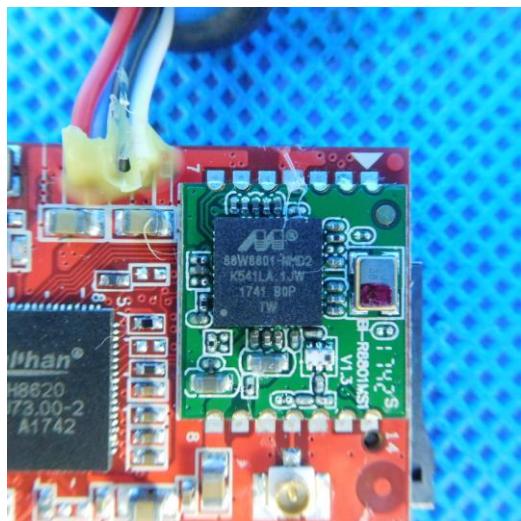
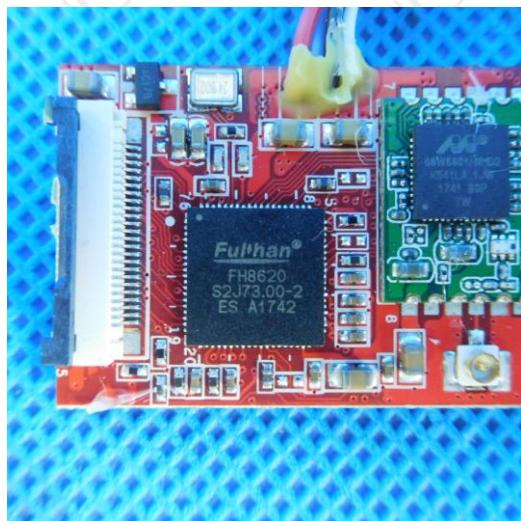
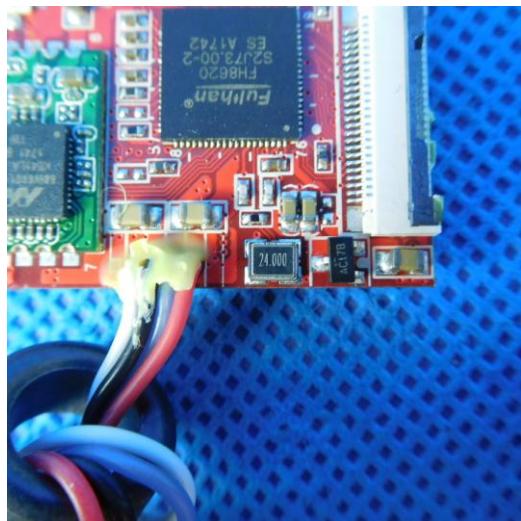














*******END OF REPORT*******