

TEST REPORT

FCC ID: 2AKPYCWV100

Product: TiTAN VR

Model No.: CWV-100

Additional Model No.: CWV-101, CWV-102, CWV-103

Trade Mark: N/A

Report No.: TCT170925E039

Issued Date: Oct. 30, 2017

Issued for:

TiTANplatform Corp.
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Issued By:

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Appendix A: Photographs of Test Setup

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1. Test Certification

Product:	TITAN VR
Model No.:	CWV-100
Additional Model No.:	CWV-101, CWV-102, CWV-103
Trade Mark:	N/A
Applicant:	TiTANplatform Corp.
Address:	7th floor, Hyunik Bldg., 146 Teheran-ro P.O. Box 06236, Gangnam-gu, Seoul, 06236 South Korea
Manufacturer:	Shenzhen Sunchip Technology Co., Ltd
Address:	2nd-3rd Floor, Building 4, Fuan Industry Area Phase 2, Dayang Development Zone, Fuyong, Baoan, Shenzhen.
Date of Test:	Sep. 26, 2017 – Oct. 27, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407: 2016 KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General U-NII Test Procedures New Rules v01r04

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:



Date:

Oct. 27, 2017

Brews Xu

Reviewed By:



Date:

Oct. 30, 2017

Joe Zhou

Approved By:



Date:

Oct. 30, 2017

Tomsin

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
Restricted Bands around fundamental frequency	§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:	TiTAN VR
Model No.:	CWV-100
Additional Model No.:	CWV-101, CWV-102, CWV-103
Trade Mark:	N/A
Operation Frequency:	Band I: 5180MHz~5240MHz Band III: 5745MHz~5825MHz
Channel Bandwidth:	802.11a: 20MHz 802.11n: 20MHz
Modulation Technology:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type	64QAM, 16QAM, BPSK, QPSK
Antenna Type:	Internal Antenna
Antenna Gain:	4.86dBi
Power Supply:	Adapter Information: Model: FLD0710-5.0V2.50A Input: AC 100-240V, 50/60Hz, 0.3A Output: DC5.0V, 2.5A
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Band I (5150MHz~5250MHz) Power level setup in software

Mode	Channel	Frequency	Soft set
11n(HT20)	CH36	5180	40
11n(HT20)	CH40	5200	40
11n(HT20)	CH48	5240	40

Band III (5725 - 5850 MHz) Power level setup in software

Mode	Channel	Frequency	Soft set
11n (HT20)	CH149	5745	45
11n (HT20)	CH157	5785	45
11n (HT20)	CH165	5825	45

Note: The Soft set value is the internal setting required to meet the requirements and does not necessarily mean the 'dBm' value

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 III (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	149	Low	5745
40	Mid	5200	157	Mid	5785
48	High	5240	165	High	5805

4. Genera 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%)
-------------------	--

The sample was placed 0.8m/1.5m for blow/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.

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/n(HT20)	6.5 Mbps

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

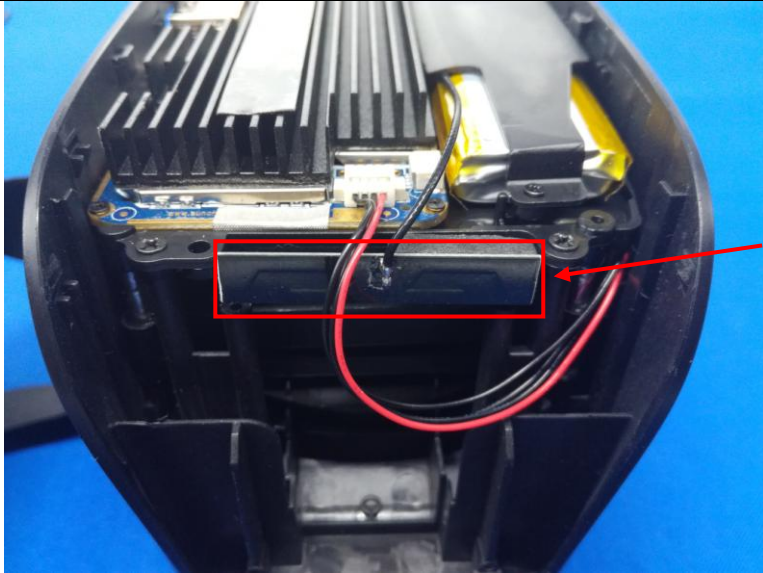
5.3. Measurement Uncertainty

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	$\pm 1.0\%$

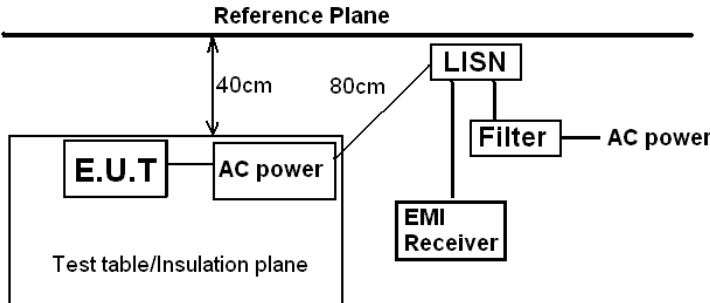
6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>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.</p>	
E.U.T Antenna:	
<p>The WIFI antenna is internal antenna which is only the antenna type used, and the best case gain of the antenna all is 4.86dBi.</p>	
	

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><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><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></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:	<div><p>Reference Plane</p><p>Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>														
Test Mode:	Tx Mode														
Test Procedure:	<ol style="list-style-type: none">1. 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.2. 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).3. 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

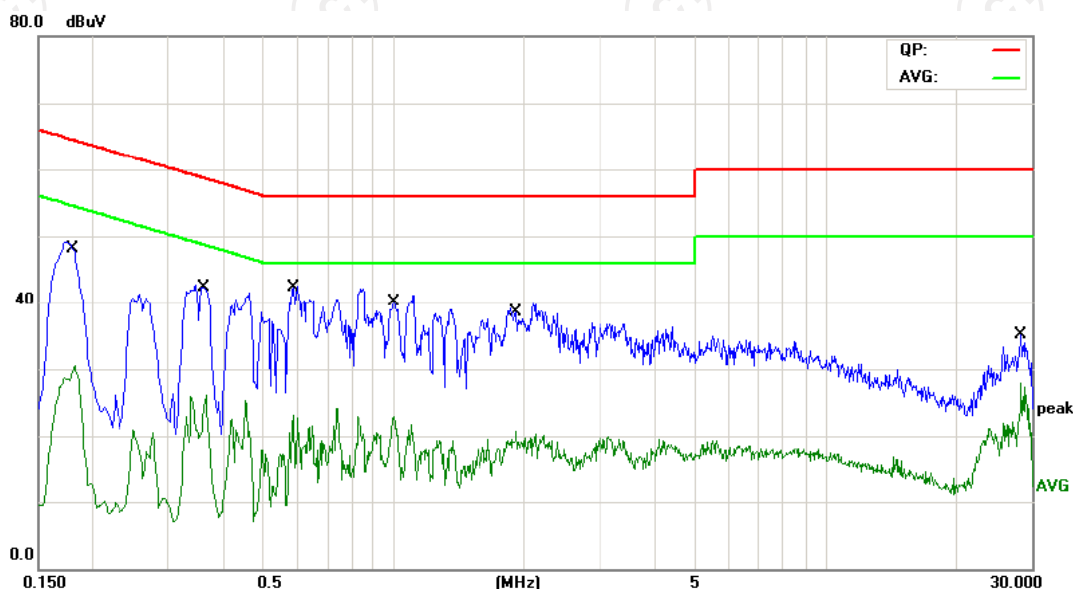
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	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 (150 kHz to 30MHz)



Site Chamber #2					Phase: L1			Temperature: 25 (C)	
Limit: FCC Part 15B Class B Conduction(QP)					Power: AC 120V/60Hz			Humidity: 55 %	
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1815	37.74	11.46	49.20	64.41	-15.21	QP	
2		0.1815	18.99	11.46	30.45	54.41	-23.96	AVG	
3		0.3660	30.96	11.37	42.33	58.59	-16.26	QP	
4		0.3660	14.73	11.37	26.10	48.59	-22.49	AVG	
5	*	0.5864	31.18	11.27	42.45	56.00	-13.55	QP	
6		0.5864	11.83	11.27	23.10	46.00	-22.90	AVG	
7		1.0048	29.85	11.20	41.05	56.00	-14.95	QP	
8		1.0048	11.64	11.20	22.84	46.00	-23.16	AVG	
9		1.9274	28.30	11.65	39.95	56.00	-16.05	QP	
10		1.9274	9.15	11.65	20.80	46.00	-25.20	AVG	
11		28.3920	24.43	10.65	35.08	60.00	-24.92	QP	
12		28.3920	17.15	10.65	27.80	50.00	-22.20	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBuV) = Reading level (dBuV) + Corr. Factor (dB)

Limit (dBuV) = Limit stated in standard

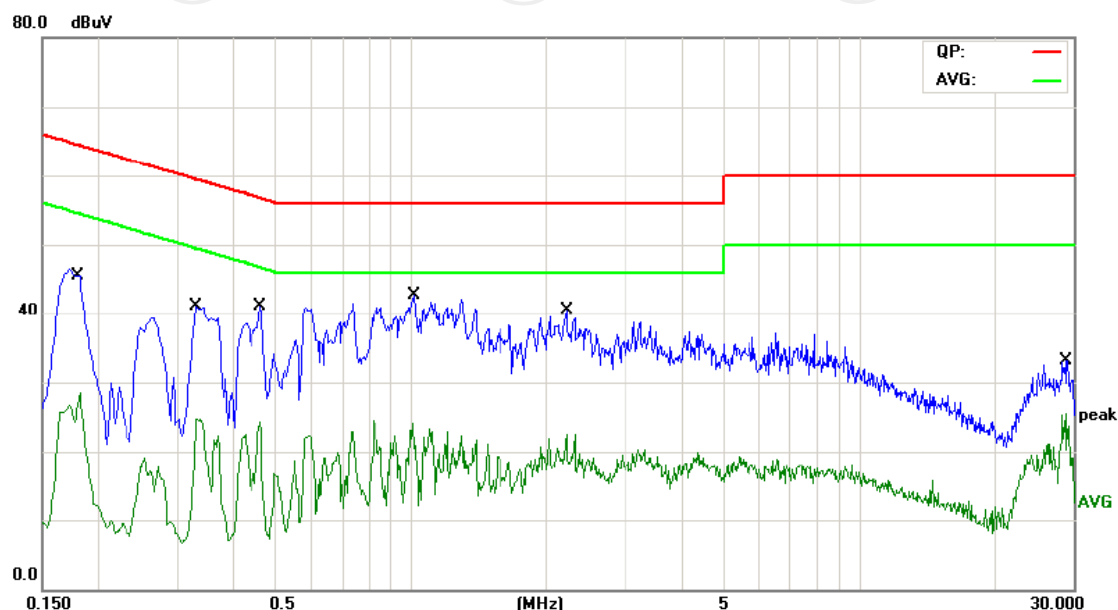
Margin (dB) = Measurement (dBuV) – Limits (dBuV)

Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: **N** Temperature: 25 (C)
 Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
1		0.1814	34.97	11.46	46.43	64.42	-17.99	QP	
2		0.1814	16.99	11.46	28.45	54.42	-25.97	AVG	
3		0.3300	29.74	11.38	41.12	59.45	-18.33	QP	
4		0.3300	13.28	11.38	24.66	49.45	-24.79	AVG	
5		0.4605	29.76	11.32	41.08	56.68	-15.60	QP	
6		0.4605	13.04	11.32	24.36	46.68	-22.32	AVG	
7	*	1.0094	31.50	11.20	42.70	56.00	-13.30	QP	
8		1.0094	12.82	11.20	24.02	46.00	-21.98	AVG	
9		2.2153	28.93	11.61	40.54	56.00	-15.46	QP	
10		2.2153	10.87	11.61	22.48	46.00	-23.52	AVG	
11		28.7744	22.42	10.64	33.06	60.00	-26.94	QP	
12		28.7744	14.90	10.64	25.54	50.00	-24.46	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBμV) = Receiver reading

Corr. Factor (dB) = attenuator factor + Cable loss

Measurement (dBμV) = Reading level (dBμV) + Corr. Factor (dB)

Limit (dBμV) = Limit stated in standard

Margin (dB) = Measurement (dBμV) – Limits (dBμV)

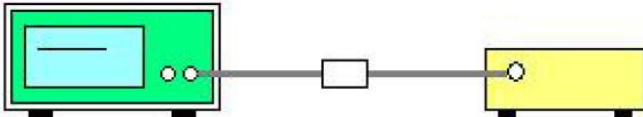
Q.P. =Quasi-Peak

AVG =average

* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

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:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section E		
Limit:	Frequency Band (MHz)	Limit	
	5150-5250	1W for indoor access point	
	5725-5850	1 W	
	Note: Where “B” is the 26 dB emissions bandwidth in MHz.		
Test Setup:	<div><p>Power meterEUT</p></div>		
Test Mode:	Transmitting mode with modulation		
Test Procedure:	<div>1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section E, 3, a</div> <div>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.</div> <div>3. Set to the maximum power setting and enable the EUT transmit continuously.</div> <div>5. Measure the conducted output power and record the results in the test report.</div>		
Test Result:	PASS		
Remark:	<div>Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0</div> <div>Conducted output power= measurement power</div>		

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 (Average) Output Power (dBm)		FCC Limit (dBm)	Result
		802.11a	802.11n		
11n(HT20)	CH36	6.32	6.07	30	PASS
11n(HT20)	CH40	6.25	5.73	30	PASS
11n(HT20)	CH48	4.92	5.40	30	PASS

Configuration Band III (5725 - 5850 MHz)					
Mode	Test channel	Maximum Conducted (Average) Output Power (dBm)		FCC Limit (dBm)	Result
		802.11a	802.11n		
11n (HT20)	CH149	6.05	5.23	30	PASS
11n (HT20)	CH157	6.01	4.75	30	PASS
11n (HT20)	CH165	5.97	5.61	30	PASS

Note : $G_{ANT} = 4.86\text{dBi} < 6\text{dBi}$ so limit=30dBm/MHz

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:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r04 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 v01r04 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

802.11a

Band III (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11n(HT20)	CH149	5745	15.12	0.5	PASS
11n(HT20)	CH157	5785	15.04	0.5	PASS
11n(HT20)	CH161	5825	15.29	0.5	PASS

802.11n

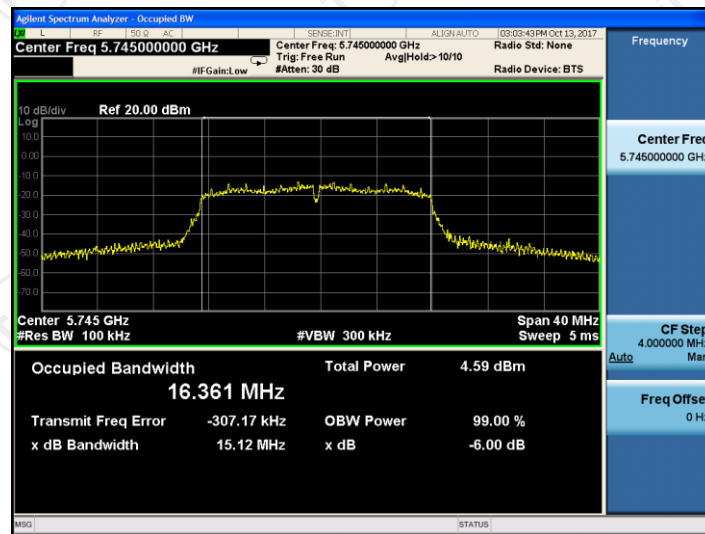
Band III (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11n(HT20)	CH149	5745	15.08	0.5	PASS
11n(HT20)	CH157	5785	16.03	0.5	PASS
11n(HT20)	CH161	5825	13.89	0.5	PASS

Test plots as follows:

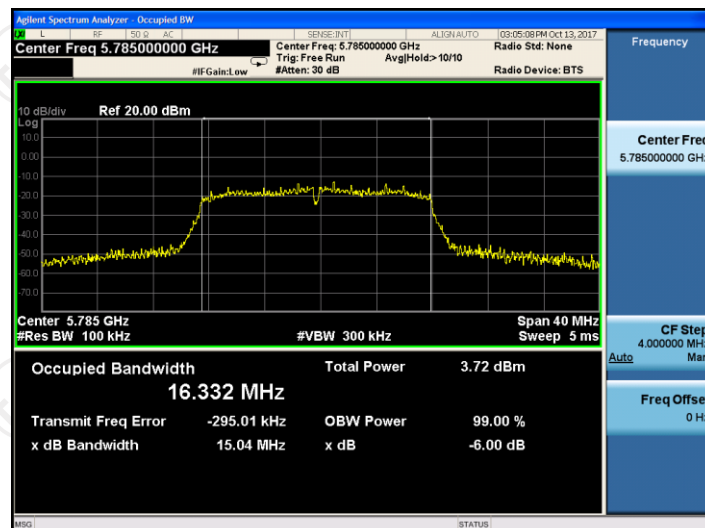
Band III (5725 – 5850 MHz)

11a(HT20)

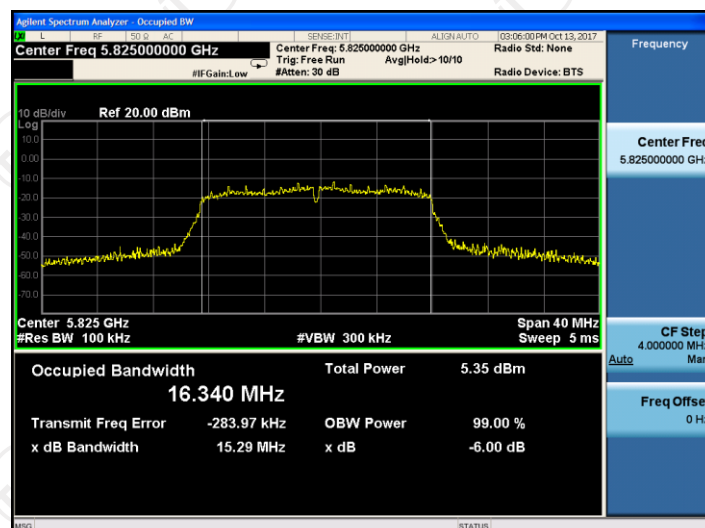
CH149



CH157

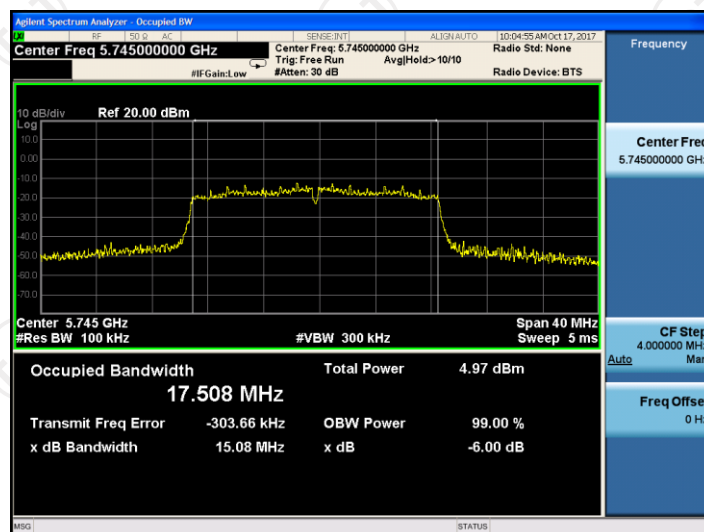


CH161

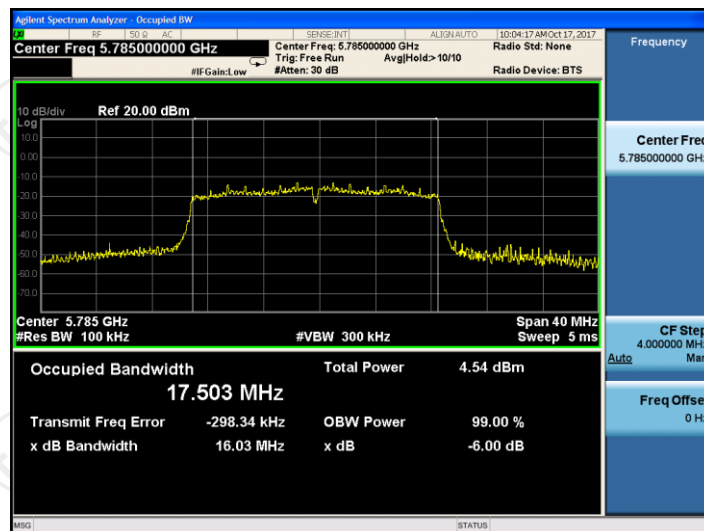


11n(HT20)

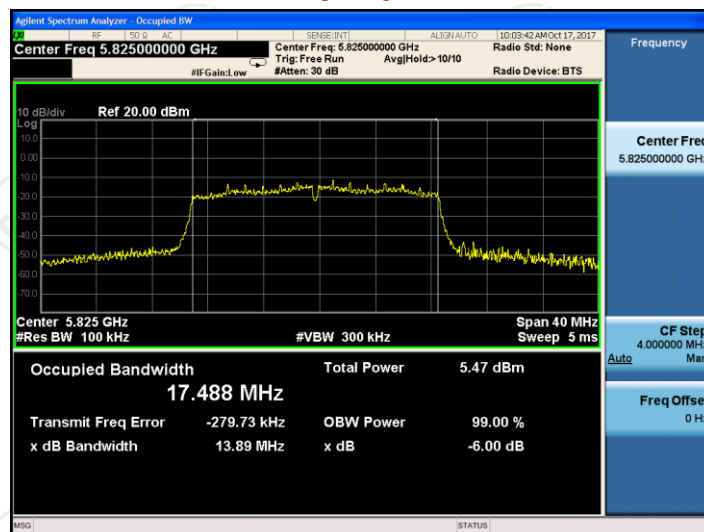
CH149



CH157




CH161



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:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r04 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 v01r04 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**802.11a****Band I**

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a(HT20)	CH36	5180	18.78	16.494
11a(HT20)	CH40	5200	18.85	16.467
11a(HT20)	CH48	5240	18.77	16.464

Band III

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11a(HT20)	CH149	5745	16.619
11a(HT20)	CH157	5785	16.501
11a(HT20)	CH161	5825	16.533

**802.11n
Band I**

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH36	5180	19.12	17.483
11n(HT20)	CH40	5200	19.14	17.493
11n(HT20)	CH48	5240	19.04	17.491

Band III

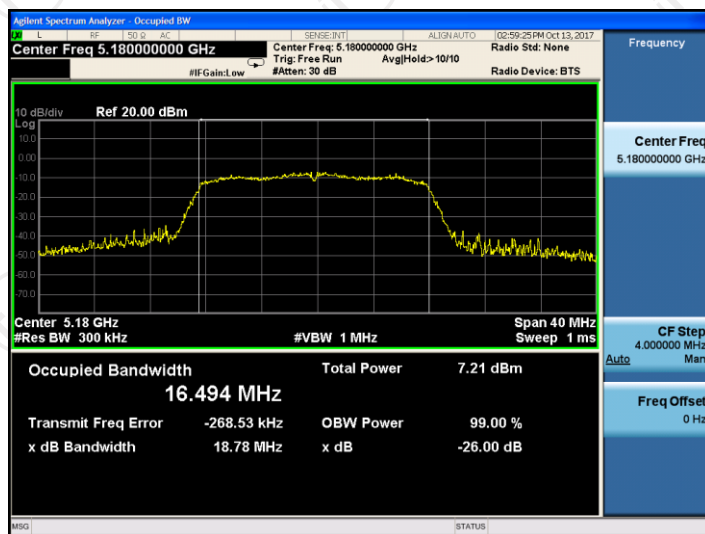
Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH149	5745	17.531
11n(HT20)	CH157	5785	17.519
11n(HT20)	CH161	5825	17.500

Test plots as follows:

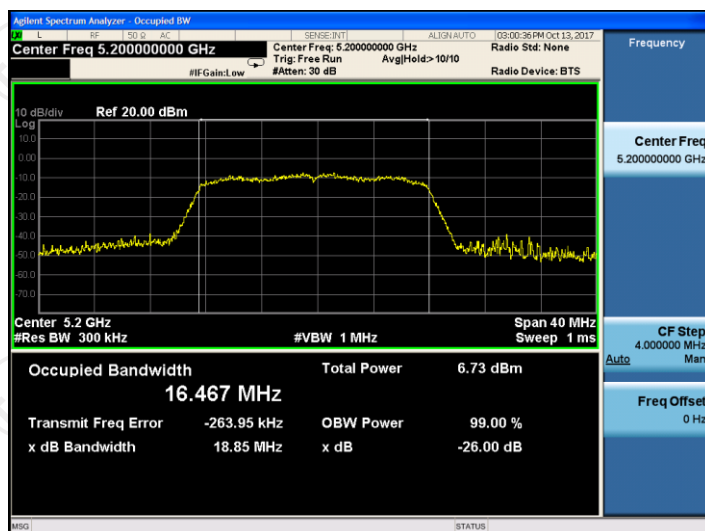
Band I (5150 – 5250 MHz)

11a(HT20)

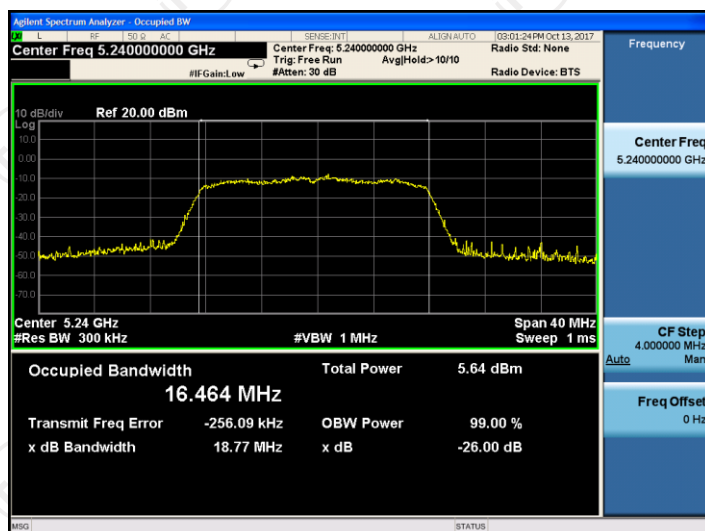
CH36



CH40



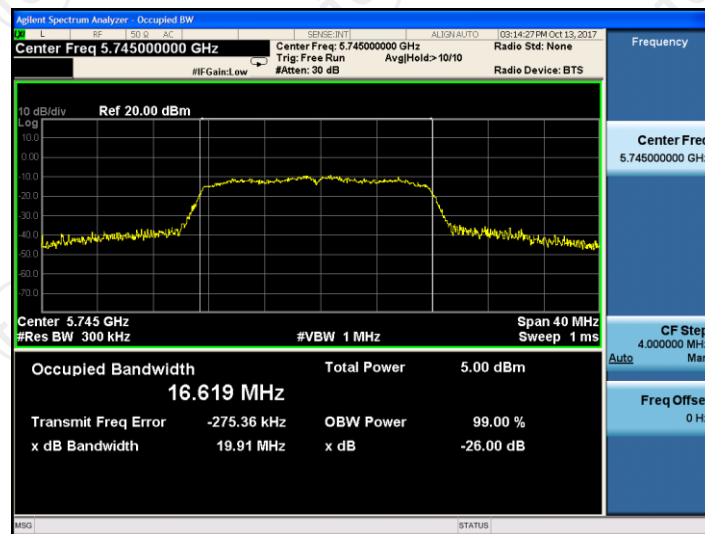
CH48



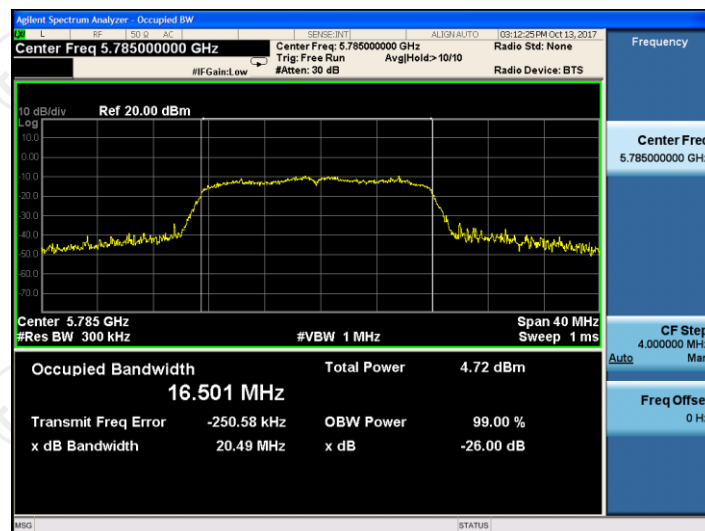
Band III (5725 – 5850 MHz)

11a(HT20)

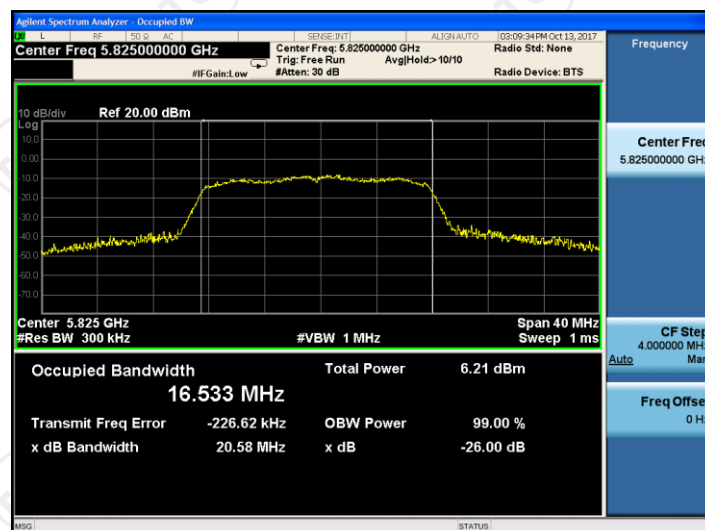
CH149



CH157



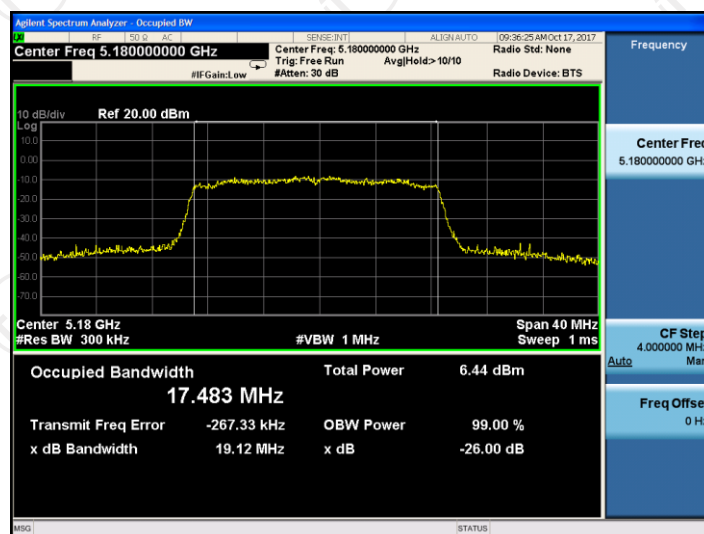
CH161



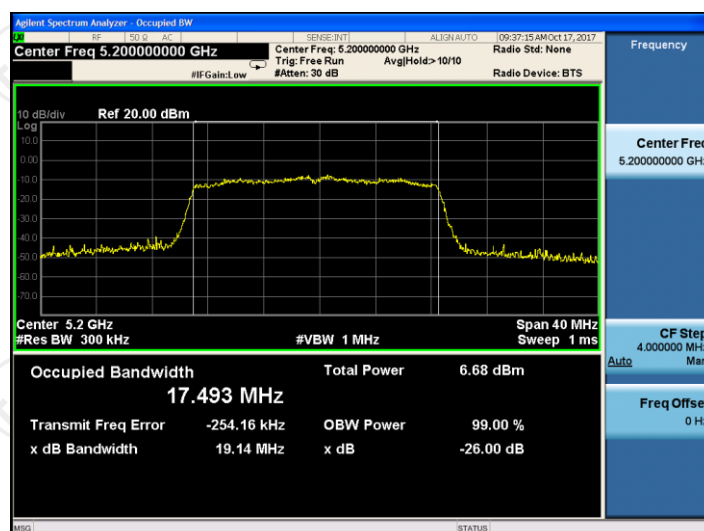
Band I (5150 – 5250 MHz)

11n(HT20)

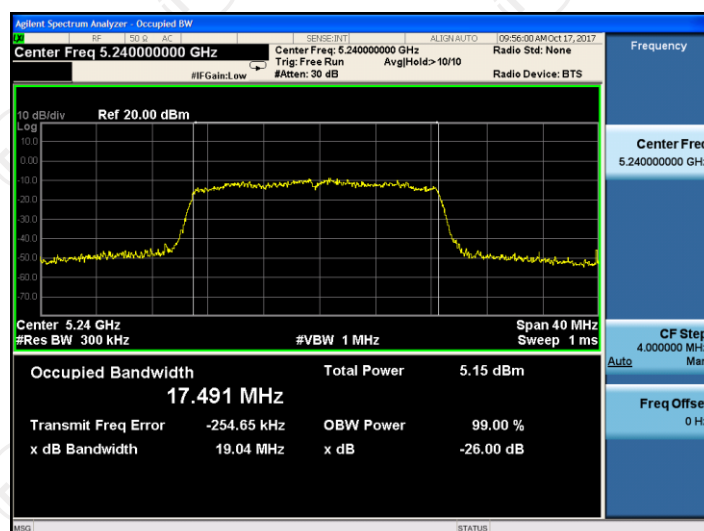
CH36



CH40



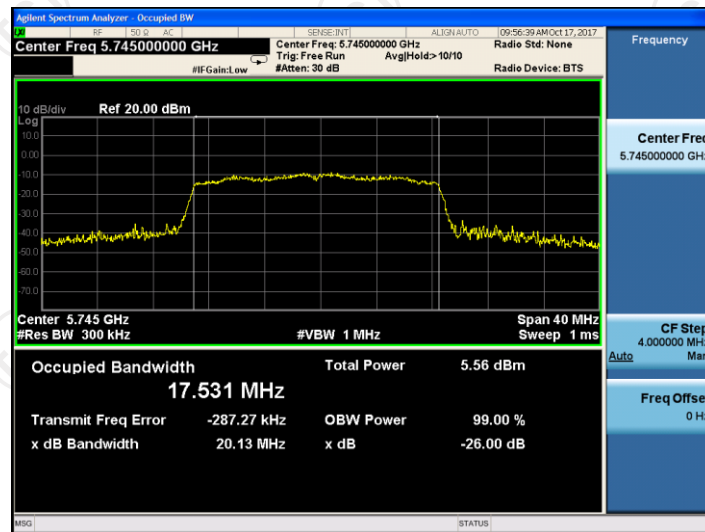
CH48



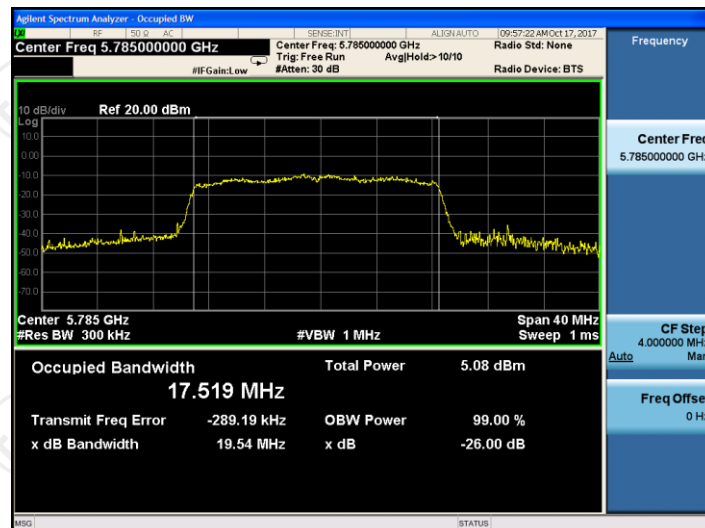
Band III (5725 – 5850 MHz)

11n(HT20)

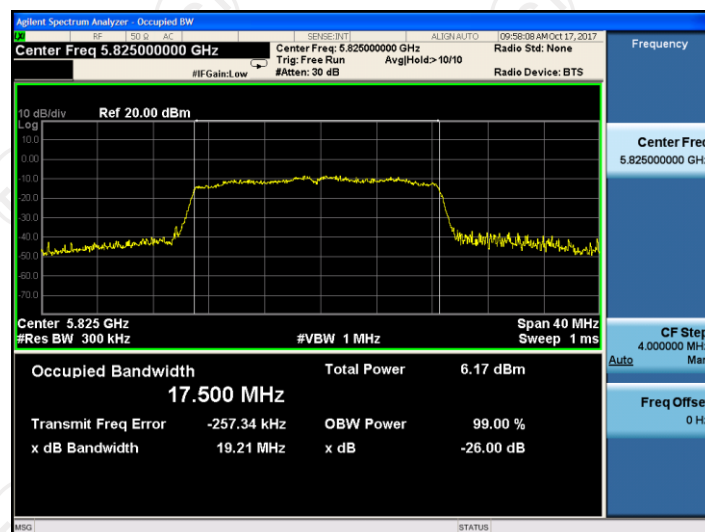
CH149



CH157




CH161



6.6. Power Spectral Density

6.6.1. Test Specification

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB662911 D01 Multiple Transmitter Output v02r01 KDB789033 D02 General UNII Test Procedures New Rules v01r04 Section F
Limit:	≤17.00dBm/MHz for Band I 5150MHz-5250MHz ≤30.00dBm/500KHz for Band III 5725MHz-5850MHz The e.i.r.p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz
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. 1. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS. 2. Allow the sweeps to continue until the trace stabilizes. 3. Use the peak marker function to determine the maximum amplitude level. 4. 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
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
		802.11a	802.11n		
11n(HT20)	CH36	-0.882	-1.385	17	PASS
11n(HT20)	CH40	-0.700	-1.352	17	PASS
11n(HT20)	CH48	-1.642	-1.824	17	PASS

Note: 1. All antennas have the same gain. $G_{ANT}=2\text{dBi}$, Array Gain= $10\log(N_{ANT}/N_{SS})=3.01\text{dBi}$

Directional Gain= $G_{ANT} + \text{Array Gain}=5.01\text{dBi}$, $5.01\text{dBi} < 6\text{dBi}$ so limit= 17dBm/MHz

2. The total PSD method used the sum spectra maxima across the outputs.

Configuration Band III (5725 - 5850 MHz)					
Mode	Test channel	Power Spectral Density		Limit (dBm/500kHz)	Result
		802.11a	802.11n		
11n(HT20)	CH149	-4.940	-6.012	30	PASS
11n(HT20)	CH157	-6.007	-6.391	30	PASS
11n(HT20)	CH161	-5.632	-6.040	30	PASS

Note: 1. All antennas have the same gain. $G_{ANT}=2\text{dBi}$, Array Gain= $10\log(N_{ANT}/N_{SS})=3.01\text{dBi}$

Directional Gain= $G_{ANT} + \text{Array Gain}=5.01\text{dBi}$, $5.01\text{dBi} < 6\text{dBi}$ so limit= 30dBm/MHz

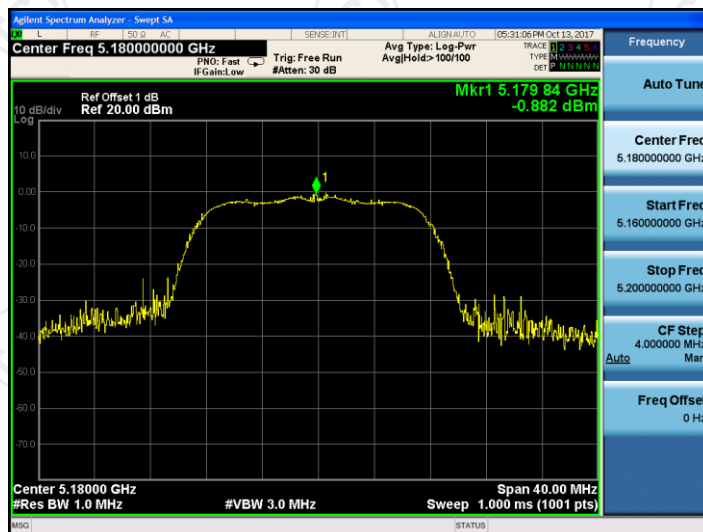
2. The total PSD method used the sum spectra maxima across the outputs.

Test plots as follows:

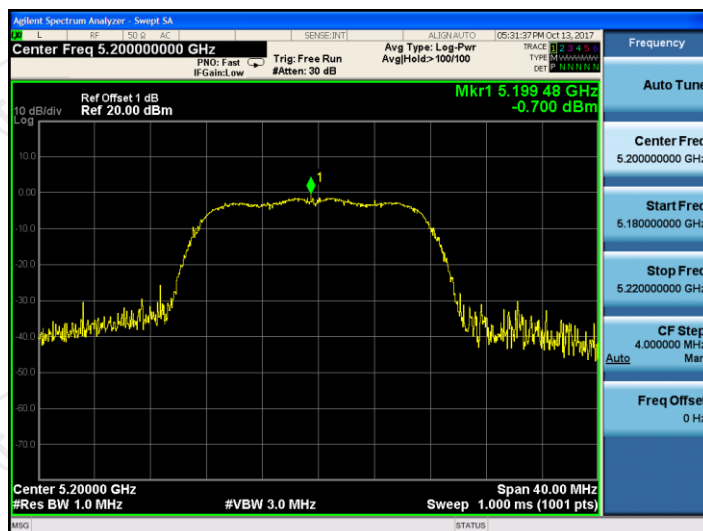
Band I (5150 – 5250 MHz)

11a(HT20)

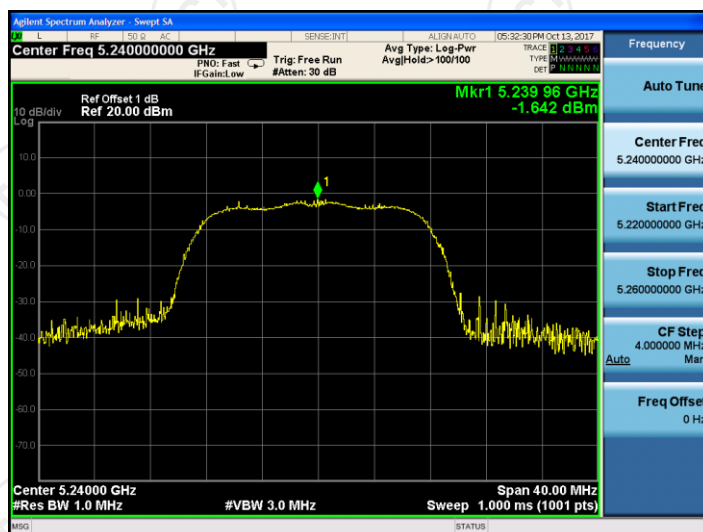
CH36



CH40



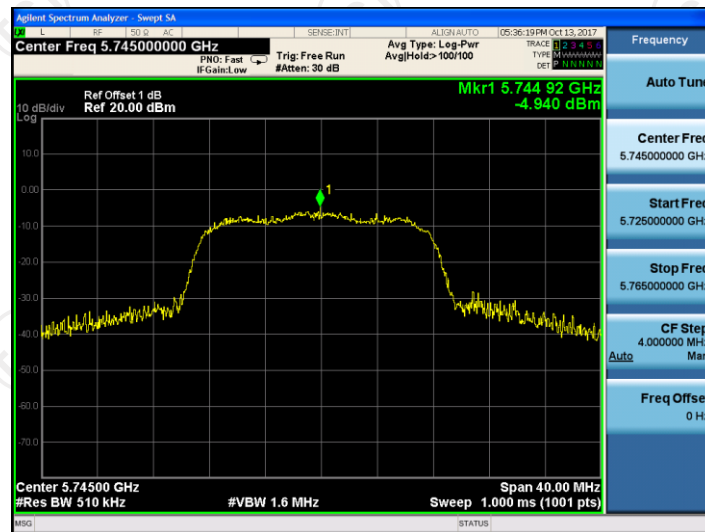
CH48



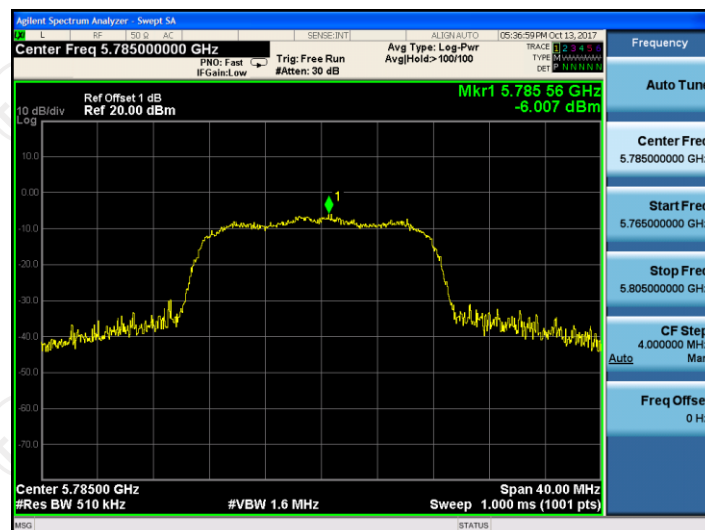
Band III (5725 – 5850 MHz)

11a(HT20)

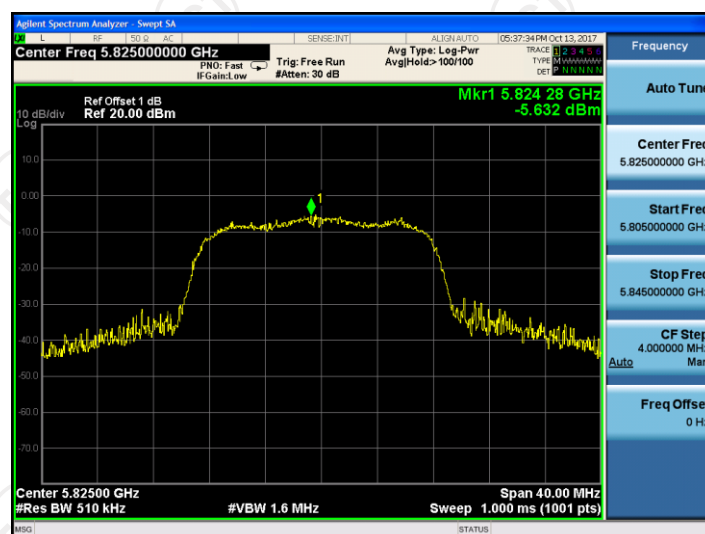
CH149



CH157



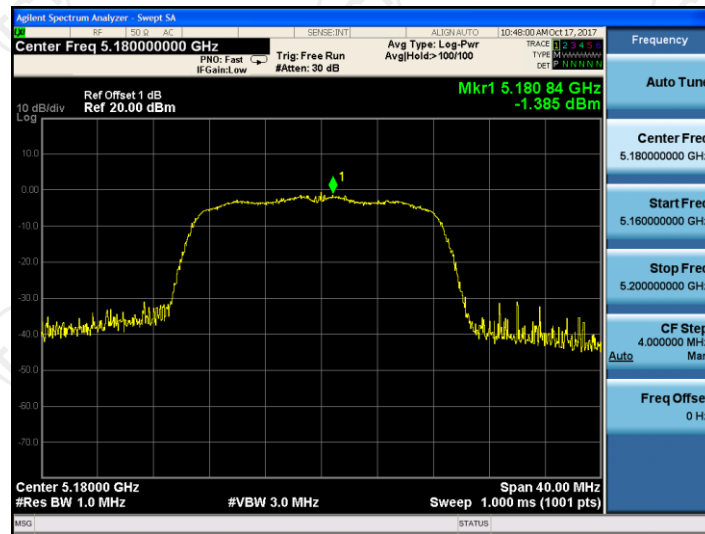
CH161



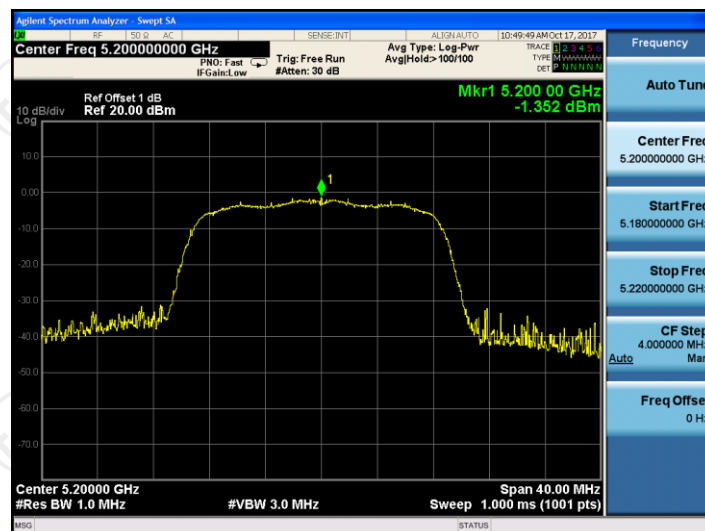
Band I (5150 – 5250 MHz)

11n(HT20)

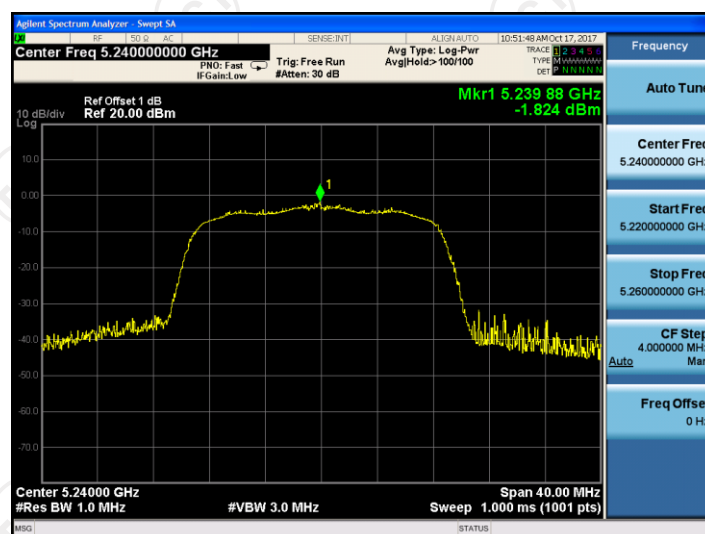
CH36



CH40



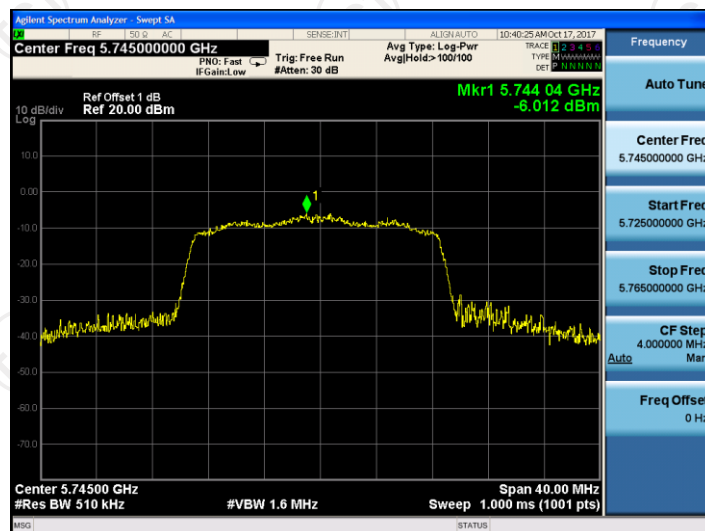
CH48



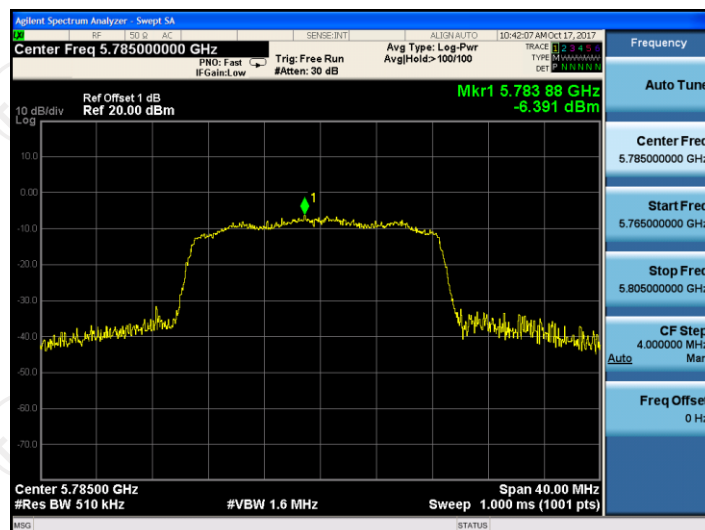
Band III (5725 – 5850 MHz)

11n(HT20)

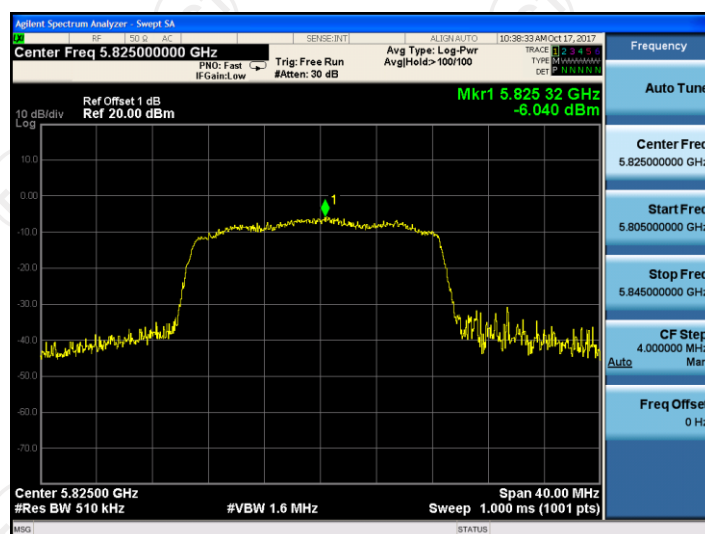
CH149



CH157

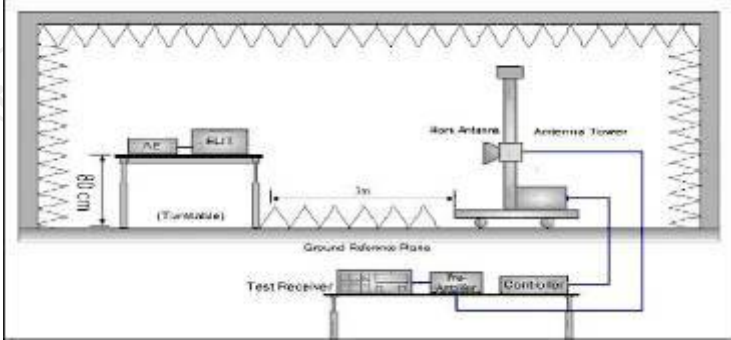


CH161



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:	For band I&II&III: $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB $\mu V/m$, for EIRP(dBm)= -27dBm For Band III(5715-5725MHz&5850-5860MHz): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 78.2$ dB $\mu V/m$, for EIRP(dBm)= -17dBm ; For Band III(other un-restricted band): $E[dB\mu V/m] = EIRP[dBm] + 95.2 = 68.2$ dB $\mu V/m$, for EIRP(dBm)= -27dBm
Test Setup:	 <p>The diagram illustrates the test setup. An Equipment Under Test (EUT) is placed on a rotating table (Turntable) at a height of 0.8m. The table is rotated 360 degrees. A 3m camber is indicated between the turntable and the antenna tower. The antenna tower is a variable-height structure. A Ground Reference Plane is shown. The test receiver system consists of a Test Receiver, an Antenna, and a Controller, all connected to the antenna tower.</p>
Test Mode:	Transmitting mode with modulation
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have

	10dB margin would be re-tested one by one using peak, 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	Shurple 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).

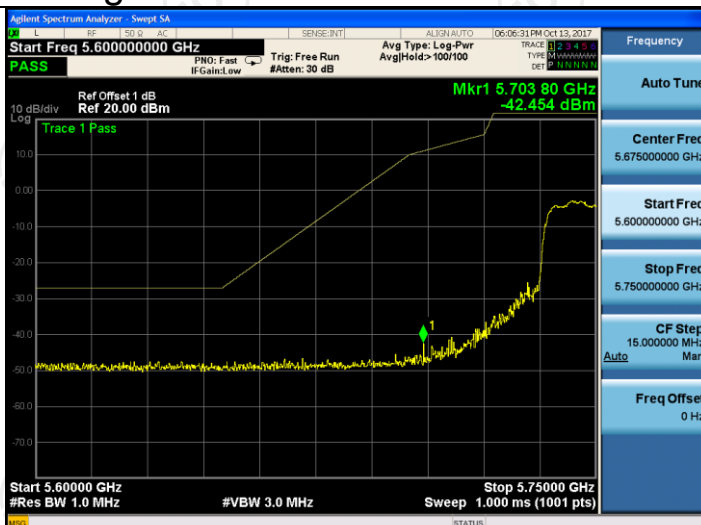
6.7.3. Test Data

802.11a HT20	CH	Freq. (MHz)	Read_level (dBuV/m)	Factor (dB)	Peak (dBuV/m)	Limit (dBuV/m) (Peak)	Limit (dBuV/m) (Avg)	Over	Ant. Pol. H/V
Band I	Lowest	5150	45.21	5.82	51.03	68.2	54	-2.97	H
		5150	41.37	5.82	47.19	68.2	54	-6.81	V
	Highest	5250	43.18	6.17	49.35	68.2	54	-4.65	H
		5250	39.32	6.17	45.49	68.2	54	-8.51	V
Band III	Lowest	5725	43.25	8.21	51.46	78.2	54	-2.54	H
		5725	43.21	8.21	51.42	78.2	54	-2.58	V
	Highest	5850	42.27	8.87	51.14	78.2	54	-2.86	H
		5850	40.23	8.87	49.1	78.2	54	-4.9	V
Remark: Factor(dB)=Ant. Factor+Cable Loss-Amp. Factor									

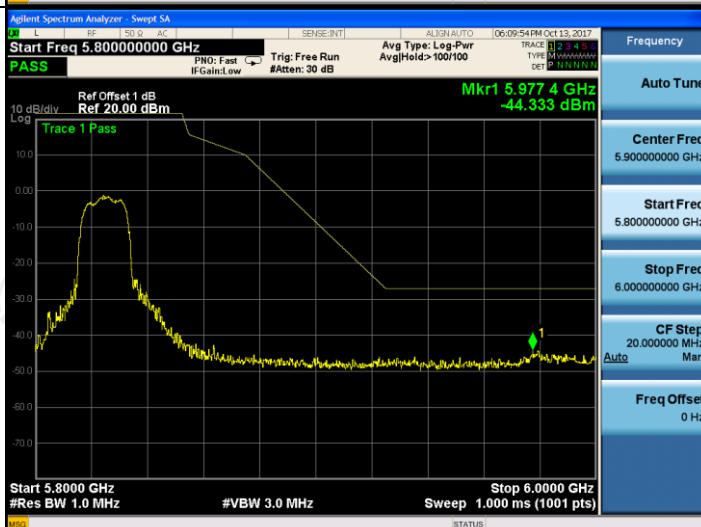
802.11n HT20	CH	Freq. (MHz)	Read_level (dBuV/m)	Factor (dB)	Peak (dBuV/m)	Limit (dBuV/m) (Peak)	Limit (dBuV/m) (Avg)	Over	Ant. Pol. H/V
Band I	Lowest	5150	43.83	5.82	49.65	68.2	54	-4.35	H
		5150	38.35	5.82	44.17	68.2	54	-9.83	V
	Highest	5250	45.34	6.17	51.51	68.2	54	-2.49	H
		5250	42.77	6.17	48.94	68.2	54	-5.06	V
Band III	Lowest	5725	43.68	8.21	51.89	78.2	54	-2.11	H
		5725	43.63	8.21	51.84	78.2	54	-2.16	V
	Highest	5850	41.77	8.87	50.64	78.2	54	-3.36	H
		5850	39.45	8.87	48.32	78.2	54	-5.68	V
Remark: Factor(dB)=Ant. Factor+Cable Loss-Amp. Factor									

Band III Band-edge for RF Conducted Emissions

802.11a
/LCH

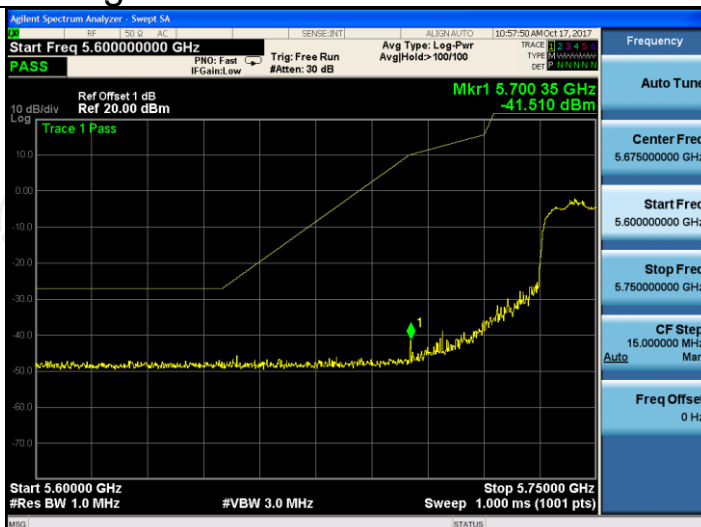


802.11a
/HCH

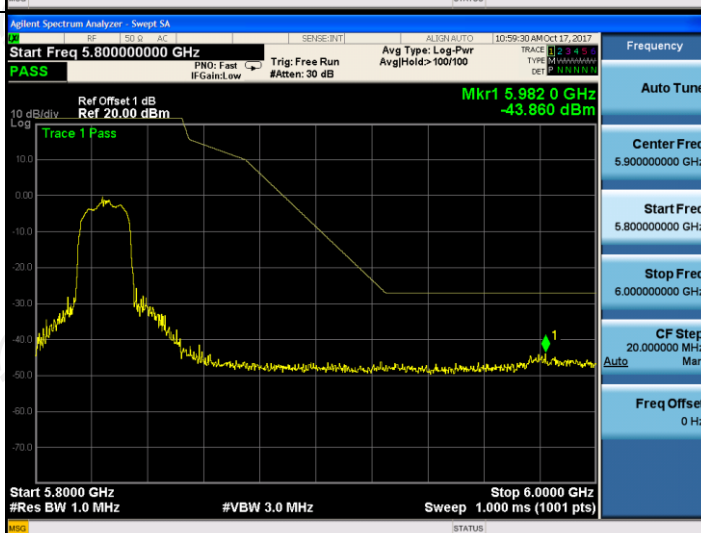


Band III Band-edge for RF Conducted Emissions

802.11n
/LCH



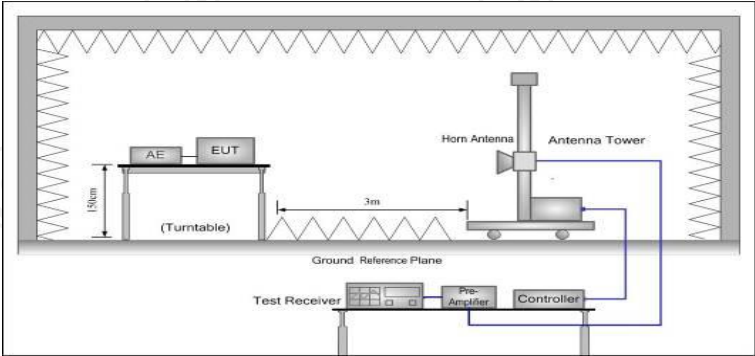
802.11n
/HCH



6.8. Spurious Emission

6.8.1. Restrict Bands Measurement

6.8.1.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205																		
Test Method:	KDB 789033 D02 v01r04																		
Frequency Range:	Band I & II: 4.5 GHz to 5.15 GHz and 5.35GHz to 5.46GHz Band III &IV: 5.35 GHz to 5.46 GHz																		
Measurement Distance:	3 m																		
Antenna Polarization:	Horizontal & Vertical																		
Operation mode:	Transmitting mode with modulation																		
Receiver Setup:	<table><tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr><tr><td>RMS</td><td>1MHz</td><td>3MHz</td><td>Average Value</td></tr></table>					Frequency	Detector	RBW	VBW	Remark	Above 1GHz	Peak	1MHz	3MHz	Peak Value	RMS	1MHz	3MHz	Average Value
Frequency	Detector	RBW	VBW	Remark															
Above 1GHz	Peak	1MHz	3MHz	Peak Value															
	RMS	1MHz	3MHz	Average Value															
Limit:	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td rowspan="2">Above 1GHz</td><td>74</td><td>Peak Value</td></tr><tr><td>54</td><td>Average Value</td></tr></table>					Frequency	Limit (dBuV/m @3m)	Remark	Above 1GHz	74	Peak Value	54	Average Value						
Frequency	Limit (dBuV/m @3m)	Remark																	
Above 1GHz	74	Peak Value																	
	54	Average Value																	
Test setup:	<p>Above 1GHz</p> 																		
Test Procedure:	<p>1. The testing follows FCC KDB Publication No. 789033 D02 General UNII Test Procedures New Rules v01r04. Section G) Unwanted emissions measurement.</p> <p>2. For the radiated emission test below 1GHz: The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The EUT was arranged to its worst case and then tune</p>																		

	<p>the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high PASS filter are used for the test in order to get better signal level.</p> <p>For the radiated emission test above 1GHz: Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p> <p>4. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.</p> <p>5. Use the following spectrum analyzer settings:</p> <ul style="list-style-type: none"> (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for $f < 1$ GHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for $f > 1$ GHz for peak measurement. <p>For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</p> <p>(4) A 5.8GHz high -PASS filter is used during radiated emissions above 1GHz measurement.</p>
Test results:	PASS

6.8.1.1 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	Shurple 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).

6.8.1.2 Test Data

Restrict band around fundamental

Band I

11a (HT20) CH36: 5180MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (dBuV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5142.20	H	42.41	---	5.79	48.2	---	74	54	-5.8
5150.00	H	40.27	---	5.82	46.09	---	74	54	-7.91
5142.20	V	41.86	---	5.79	47.65	---	74	54	-6.35
5150.00	V	43.53	---	5.82	49.35	---	74	54	-4.65
11a (HT20) CH40: 5200MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (DbμV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5135.50	H	43.27	---	5.78	49.05	---	74	54	-4.95
5150.00	H	42.55	---	5.82	48.37	---	74	54	-5.63
5135.50	V	40.44	---	5.78	46.22	---	74	54	-7.78
5150.00	V	41.46	---	5.82	47.28	---	74	54	-6.72
11a(HT20) CH48: 5240MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBrμV)	AV reading (dBrμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBrμV/m)	AV limit (dBrμV/m)	Margin (dB)
					Peak (dBrμV/m)	AV (dBrμV/m)			
5128.60	H	42.28	---	5.75	48.03	---	74	54	-5.97
5150.00	H	40.32	---	5.82	46.14	---	74	54	-7.86
5128.60	V	42.87	---	5.75	48.62	---	74	54	-5.38
5150.00	V	41.62	---	5.82	47.44	---	74	54	-6.56

Band III

11a (HT20) CH149: 5745MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (dBuV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5448.15	H	42.36	---	6.87	49.23	---	74	54	-4.77
5460.00	H	43.55	---	6.90	50.45	---	74	54	-3.55
5448.15	V	40.13	---	6.87	47	---	74	54	-7
5460.00	V	42.67	---	6.90	49.57	---	74	54	-4.43
11a (HT20) CH157: 5785MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (DbμV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5439.61	H	41.27	---	6.83	48.1	---	74	54	-5.9
5460.00	H	42.15	---	6.90	49.05	---	74	54	-4.95
5439.61	V	40.28	---	6.83	47.11	---	74	54	-6.89
5460.00	V	42.73	---	6.90	49.63	---	74	54	-4.37
11a(HT20) CH165: 5825MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBrμV)	AV reading (dBrμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBrμV/m)	AV limit (dBrμV/m)	Margin (dB)
					Peak (dBrμV/m)	AV (dBrμV/m)			
5446.24	H	42.65	---	6.85	49.5	---	74	54	-4.5
5460.00	H	43.73	---	6.90	50.63	---	74	54	-3.37
5446.24	V	41.17	---	6.85	48.02	---	74	54	-5.98
5460.00	V	42.66	---	6.90	49.56	---	74	54	-4.44

Band I

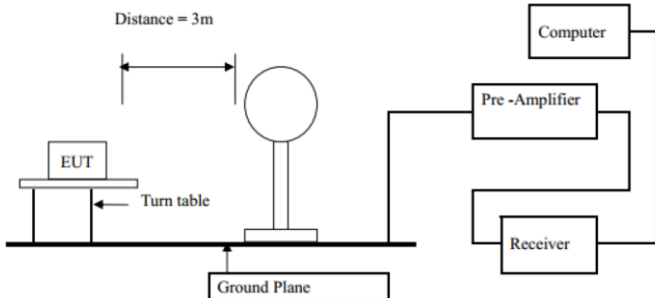
11n (HT20) CH36: 5180MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (dBuV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5142.20	H	42.94	---	5.79	48.73	---	74	54	-5.27
5150.00	H	40.05	---	5.82	45.87	---	74	54	-8.13
5142.20	V	41.86	---	5.79	47.65	---	74	54	-6.35
5150.00	V	43.73	---	5.82	49.55	---	74	54	-4.45
11n (HT20) CH40: 5200MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (DbμV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5135.50	H	43.16	---	5.78	48.94	---	74	54	-5.06
5150.00	H	42.57	---	5.82	48.39	---	74	54	-5.61
5135.50	V	40.24	---	5.78	46.02	---	74	54	-7.98
5150.00	V	41.77	---	5.82	47.59	---	74	54	-6.41
11n(HT20) CH48: 5240MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
5128.60	H	42.54	---	5.75	48.29	---	74	54	-5.71
5150.00	H	40.72	---	5.82	46.54	---	74	54	-7.46
5128.60	V	42.86	---	5.75	48.61	---	74	54	-5.39
5150.00	V	41.84	---	5.82	47.66	---	74	54	-6.34

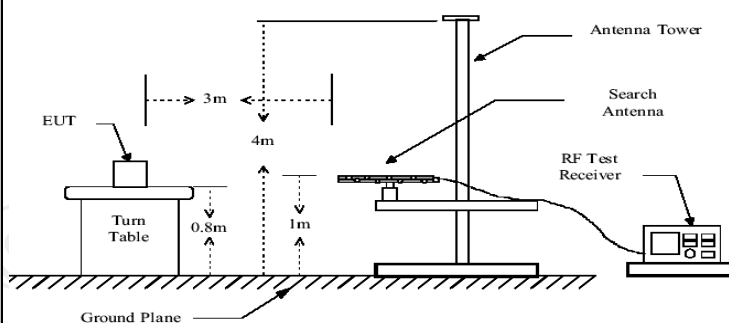
Band III

11n (HT20) CH149: 5745MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (dBuV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5448.15	H	42.47	---	6.87	49.34	---	74	54	-4.66
5460.00	H	43.64	---	6.90	50.54	---	74	54	-3.46
5448.15	V	40.13	---	6.87	47	---	74	54	-7
5460.00	V	42.67	---	6.90	49.57	---	74	54	-4.43
11n (HT20) CH157: 5785MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (DbμV)	AV reading (DbμV)	Correction Factor (Db/m)	Emission Level		Peak limit (DbμV/m)	AV limit (DbμV/m)	Margin (Db)
					Peak (DbμV/m)	AV (DbμV/m)			
5439.61	H	41.68	---	6.83	48.51	---	74	54	-5.49
5460.00	H	42.61	---	6.90	49.51	---	74	54	-4.49
5439.61	V	40.75	---	6.83	47.58	---	74	54	-6.42
5460.00	V	42.43	---	6.90	49.33	---	74	54	-4.67
11n(HT20) CH165: 5825MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
5446.24	H	42.11	---	6.85	48.96	---	74	54	-5.04
5460.00	H	43.16	---	6.90	50.06	---	74	54	-3.94
5446.24	V	41.38	---	6.85	48.23	---	74	54	-5.77
5460.00	V	42.82	---	6.90	49.72	---	74	54	-4.28

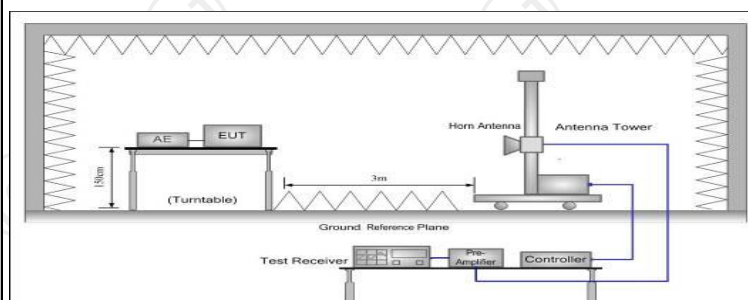
6.8.2. Unwanted Emissions out of the Restricted Bands

6.8.2.1. Test Specification

Test Requirement:	FCC CFR47 Part 15 Section 15.407 & 15.209 & 15.205				
Test Method:	KDB 789033 D02 v01r04				
Frequency Range:	9kHz to 40GHz				
Measurement Distance:	3 m				
Antenna Polarization:	Horizontal & Vertical				
Operation mode:	Transmitting mode with modulation				
Receiver Setup:	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	100KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Peak	1MHz	10Hz	Average Value
Limit:	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,				
	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:	For radiated emissions below 30MHz				
					
	30MHz to 1GHz				



Above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 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 rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

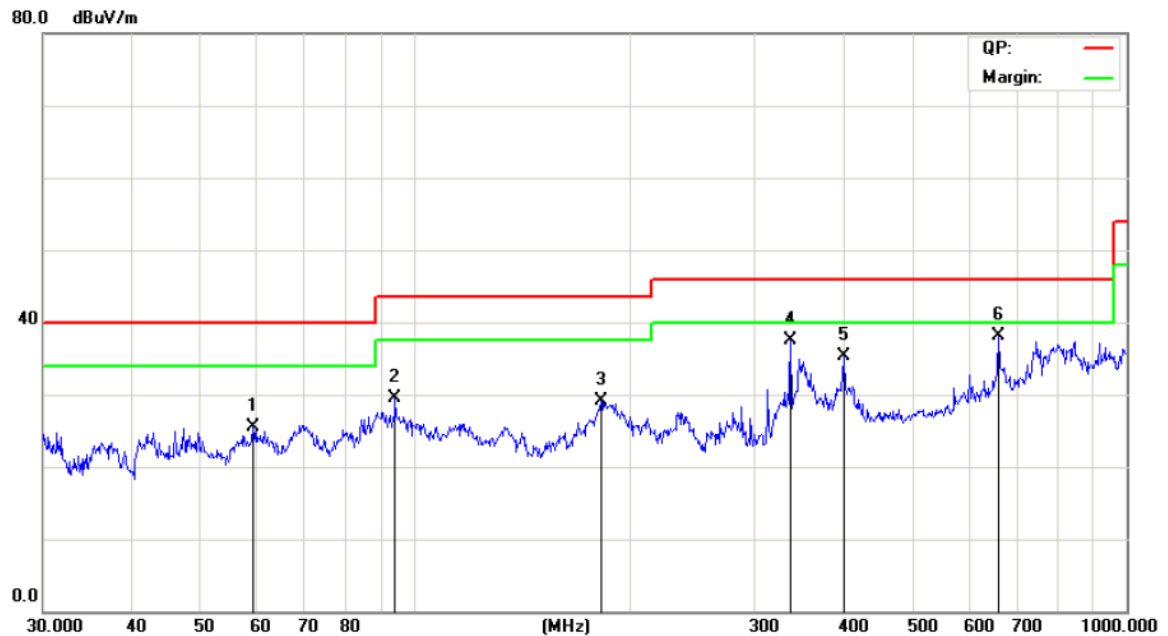
Test results:

PASS

6.8.3. Test Data

Please refer to following diagram for individual
Below 1GHz

Horizontal:



Site Chamber #2

Polarization: **Horizontal**

Temperature: 25 (C)

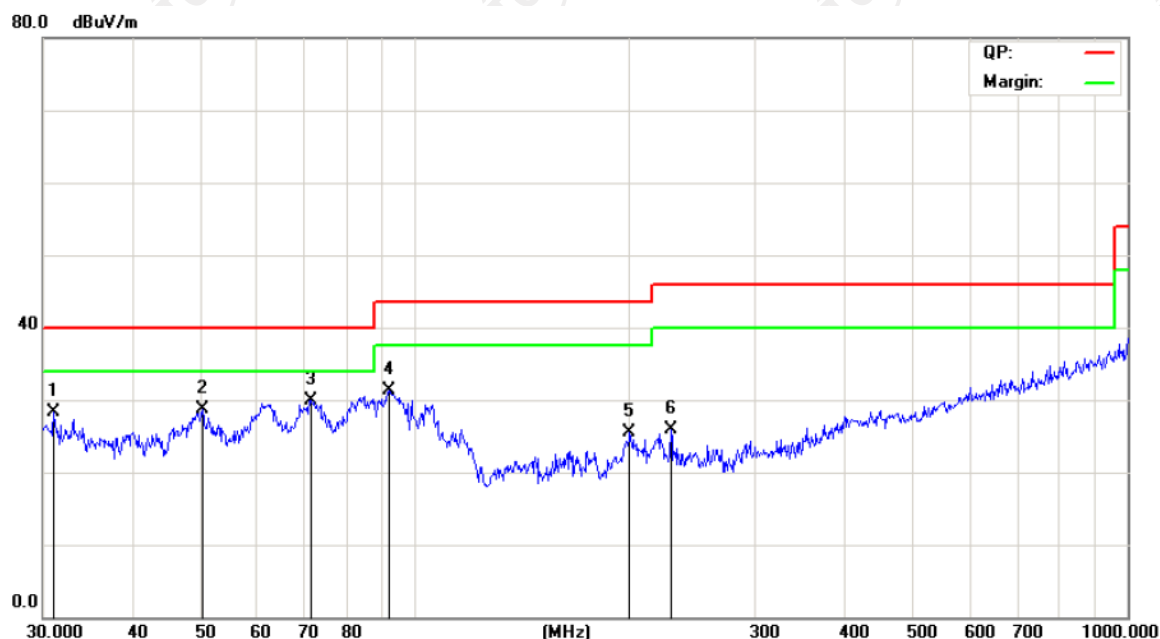
Limit: FCC Part 15B Class B 3M Radiation

Power: AC 120V/60Hz

Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		59.2325	32.93	-7.39	25.54	40.00	-14.46	QP	
2		93.7685	36.85	-7.31	29.54	43.50	-13.96	QP	
3		182.5592	38.90	-9.88	29.02	43.50	-14.48	QP	
4		337.2155	41.30	-3.84	37.46	46.00	-8.54	QP	
5		400.4318	36.86	-1.47	35.39	46.00	-10.61	QP	
6	*	661.1503	35.02	3.01	38.03	46.00	-7.97	QP	

Vertical:



Site Chamber #2

Polarization: **Vertical**

Temperature: 25 (C)

Limit: FCC Part 15B Class B 3M Radiation

Power: AC 120V/60Hz

Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		31.0702	36.12	-7.91	28.21	40.00	-11.79	QP	
2		50.2324	35.43	-6.78	28.65	40.00	-11.35	QP	
3	*	71.3298	41.01	-11.10	29.91	40.00	-10.09	QP	
4		91.8161	38.95	-7.58	31.37	43.50	-12.13	QP	
5		199.9856	34.55	-9.08	25.47	43.50	-18.03	QP	
6		228.4901	34.93	-9.07	25.86	46.00	-20.14	QP	

Note: 1. 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

2. Measurements were conducted in all three channels (high, middle, low) and all modulation (802.11a), and the worst case Mode (Low channel and 11n(HT20)) was submitted only.

Modulation Type: Band I									
11a (HT20) CH36: 5180MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10360	H	41.64	---	8.02	49.66	---	74	54	-4.34
15540	H	42.58	---	9.87	52.45	---	74	54	-1.55
---	H	---	---	---	---	---	---	---	---
10360	V	40.37	---	8.02	48.39	---	74	54	-5.61
15540	V	42.31	---	9.87	52.18	---	74	54	-1.82
---	V	---	---	---	---	---	---	---	---
11a (HT20) CH40: 5200MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10400	H	40.73	---	7.97	48.7	---	74	54	-5.3
15660	H	41.98	---	9.83	51.81	---	74	54	-2.19
---	H	---	---	---	---	---	---	---	---
10400	V	41.46	---	7.97	49.43	---	74	54	-4.57
15660	V	40.34	---	9.83	50.17	---	74	54	-3.83
---	V	---	---	---	---	---	---	---	---
11a (HT20) CH48: 5240MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10480	H	41.24	---	9.18	50.42	---	74	54	-3.58
15720	H	40.63	---	10.07	50.7	---	74	54	-3.3
---	H	---	---	---	---	---	---	---	---
10480	V	40.51	---	9.18	49.69	---	74	54	-4.31
15720	V	42.68	---	10.07	52.75	---	74	54	-1.25
---	V	---	---	---	---	---	---	---	---

Modulation Type: Band III									
11a(HT20) CH149: 5745MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11490	H	42.75	---	7.66	50.41	---	74	54	-3.59
17235	H	38.72	---	9.5	48.22	---	74	54	-5.78
---	H	---	---	---	---	---	---	---	---
11490	V	41.96	---	7.66	49.62	---	74	54	-4.38
17235	V	37.63	---	9.5	47.13	---	74	54	-6.87
---	V	---	---	---	---	---	---	---	---

11a(HT20) CH157: 5785MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11570	H	41.07	---	7.99	49.06	---	74	54	-4.94
17355	H	35.38	---	9.85	45.23	---	74	54	-8.77
---	H	---	---	---	---	---	---	---	---
11570	V	43.26	---	7.99	51.25	---	74	54	-2.75
17355	V	36.67	---	9.85	46.52	---	74	54	-7.48
---	V	---	---	---	---	---	---	---	---

11a(HT20) CH161: 5825MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11650	H	42.89	---	8.12	51.01	---	74	54	-2.99
17475	H	37.55	---	9.5	47.05	---	74	54	-6.95
---	H	---	---	---	---	---	---	---	---
11650	V	40.93	---	8.12	49.05	---	74	54	-4.95
17475	V	35.61	---	9.5	45.11	---	74	54	-8.89
---	V	---	---	---	---	---	---	---	---

Modulation Type: Band I									
11n (HT20) CH36: 5180MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10360	H	41.15	---	8.02	49.17	---	74	54	-4.83
15540	H	42.57	---	9.87	52.44	---	74	54	-1.56
---	H	---	---	---	---	---	---	---	---
10360	V	40.82	---	8.02	48.84	---	74	54	-5.16
15540	V	42.08	---	9.87	51.95	---	74	54	-2.05
---	V	---	---	---	---	---	---	---	---
11n (HT20) CH40: 5200MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10400	H	40.86	---	7.97	48.83	---	74	54	-5.17
15660	H	41.93	---	9.83	51.76	---	74	54	-2.24
---	H	---	---	---	---	---	---	---	---
10400	V	41.47	---	7.97	49.44	---	74	54	-4.56
15660	V	40.34	---	9.83	50.17	---	74	54	-3.83
---	V	---	---	---	---	---	---	---	---
11n (HT20) CH48: 5240MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
10480	H	41.38	---	9.18	50.56	---	74	54	-3.44
15720	H	40.61	---	10.07	50.68	---	74	54	-3.32
---	H	---	---	---	---	---	---	---	---
10480	V	40.55	---	9.18	49.73	---	74	54	-4.27
15720	V	42.42	---	10.07	52.49	---	74	54	-1.51
---	V	---	---	---	---	---	---	---	---

Modulation Type: Band III									
11n(HT20) CH149: 5745MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11490	H	42.52	---	7.66	50.18	---	74	54	-3.82
17235	H	38.77	---	9.5	48.27	---	74	54	-5.73
---	H	---	---	---	---	---	---	---	---
11490	V	41.97	---	7.66	49.63	---	74	54	-4.37
17235	V	37.27	---	9.5	46.77	---	74	54	-7.23
---	V	---	---	---	---	---	---	---	---

11n(HT20) CH157: 5785MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11570	H	41.74	---	7.99	49.73	---	74	54	-4.27
17355	H	35.36	---	9.85	45.21	---	74	54	-8.79
---	H	---	---	---	---	---	---	---	---
11570	V	43.49	---	7.99	51.48	---	74	54	-2.52
17355	V	36.26	---	9.85	46.11	---	74	54	-7.89
---	V	---	---	---	---	---	---	---	---

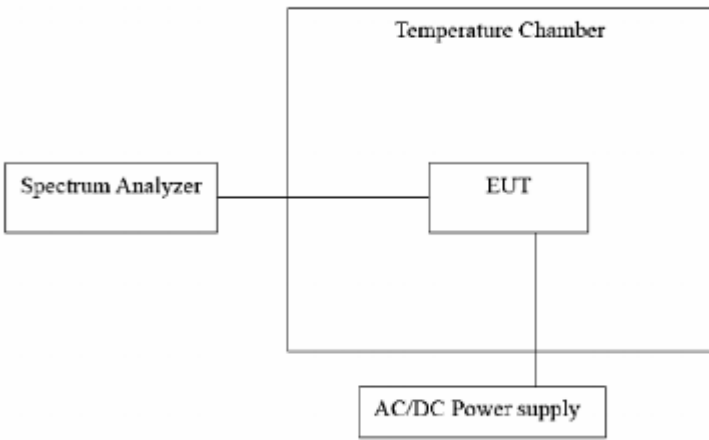
11n(HT20) CH161: 5825MHz									
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
11650	H	42.86	---	8.12	50.98	---	74	54	-3.02
17475	H	37.52	---	9.5	47.02	---	74	54	-6.98
---	H	---	---	---	---	---	---	---	---
11650	V	40.97	---	8.12	49.09	---	74	54	-4.91
17475	V	35.62	---	9.5	45.12	---	74	54	-8.88
---	V	---	---	---	---	---	---	---	---

Note:

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 40GHz.
5. Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

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 0 degrees to 35 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] subgraph TC [Temperature Chamber] EUT end EUT --- P[AC/DC Power supply] </pre>
Test Procedure:	The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. 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 Antenna 0 and Antenna 1, the worst case was found. Only the test data of Antenna 0 was shown in this report.

Test plots as follows:

Test mode:		802.11a(HT20)	Frequency(MHz):	5180
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	5	5180.0083	8300	PASS
35		5180.0066	6600	PASS
25		5179.9873	-12700	PASS
15		5179.9986	-1400	PASS
5		5180.0033	3300	PASS
0		5180.0047	4700	PASS
20	5.5	5179.9832	-16800	PASS
	5	5180.0032	3200	PASS
	4.5	5179.9825	-17500	PASS

Test mode:		802.11a(HT20)	Frequency(MHz):	5200
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	5	5200.0094	9400	PASS
35		5200.0087	8700	PASS
25		5200.0073	7300	PASS
15		5200.0043	4300	PASS
5		5199.9985	-1500	PASS
0		5199.9876	-12400	PASS
20	5.5	5199.9952	-4800	PASS
	5	5200.0034	3400	PASS
	4.5	5200.0026	2600	PASS

Test mode:		802.11a(HT20)	Frequency(MHz):	5240
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	5	5240.0042	4200	PASS
35		5240.0021	2100	PASS
25		5240.0024	2400	PASS
15		5239.9995	-500	PASS
5		5239.9984	-1600	PASS
0		5239.9976	-2400	PASS
20	5.5	5240.0033	3300	PASS
	5	5240.0011	1100	PASS
	4.5	5239.9984	-1600	PASS

Test mode:		802.11a(HT20)	Frequency(MHz):	5745
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5745.0117	11700	PASS
35		5745.0082	8200	PASS
25		5745.0074	7400	PASS
15		5745.0031	3100	PASS
5		5744.9962	-3800	PASS
0		5744.9986	-1400	PASS
20	8.4	5745.0013	1300	PASS
	7.4	5745.0014	1400	PASS
	6.4	5745.0026	2600	PASS

Test mode:		802.11a(HT20)	Frequency(MHz):	5785
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5785.0086	8600	PASS
35		5785.0025	2500	PASS
25		5785.0021	2100	PASS
15		5785.0007	700	PASS
5		5785.0021	2100	PASS
0		5785.0038	3800	PASS
20	8.4	5785.0037	3700	PASS
	7.4	5785.0013	1300	PASS
	6.4	5784.9976	-2400	PASS

Test mode:		802.11a(HT20)	Frequency(MHz):	5825
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5825.0095	9500	PASS
35		5825.0047	4700	PASS
25		5825.0022	2200	PASS
15		5824.9989	-1100	PASS
5		5824.9977	-2300	PASS
0		5824.9965	-3500	PASS
20	8.4	5825.0038	3800	PASS
	7.4	5825.0013	1300	PASS
	6.4	5825.0024	2400	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5180
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5180.0085	8500	PASS
35		5180.0064	6400	PASS
25		5179.9877	-12300	PASS
15		5179.9984	-1600	PASS
5		5180.0038	3800	PASS
0		5180.0042	4200	PASS
20	8.4	5179.9837	-16300	PASS
	7.4	5180.0034	3400	PASS
	6.4	5179.9824	-17600	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5200
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5200.0090	9000	PASS
35		5200.0082	8200	PASS
25		5200.0077	7700	PASS
15		5200.0043	4300	PASS
5		5199.9980	-2000	PASS
0		5199.9874	-12600	PASS
20	8.4	5199.9958	-4200	PASS
	7.4	5200.0033	3300	PASS
	6.4	5200.0020	2000	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5240
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5240.0047	4700	PASS
35		5240.0029	2900	PASS
25		5240.0024	2400	PASS
15		5239.9992	-800	PASS
5		5239.9987	-1300	PASS
0		5239.9976	-2400	PASS
20	8.4	5240.0035	3500	PASS
	7.4	5240.0012	1200	PASS
	6.4	5239.9981	-1900	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5745
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5745.0117	11700	PASS
35		5745.0082	8200	PASS
25		5745.0079	7900	PASS
15		5745.0032	3200	PASS
5		5744.9965	-3500	PASS
0		5744.9981	-1900	PASS
20	8.4	5745.0012	1200	PASS
	7.4	5745.0014	1400	PASS
	6.4	5745.0026	2600	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5785
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5785.0084	8400	PASS
35		5785.0027	2700	PASS
25		5785.0021	2100	PASS
15		5785.0005	500	PASS
5		5785.0028	2800	PASS
0		5785.0032	3200	PASS
20	8.4	5785.0037	3700	PASS
	7.4	5785.0014	1400	PASS
	6.4	5784.9972	-2800	PASS

Test mode:		802.11n(HT20)	Frequency(MHz):	5825
Temperature (°C)	Voltage(VAC)	Measurement Frequency(MHz)	Delta Frequency(Hz)	Result
45	7.4	5825.0096	9600	PASS
35		5825.0048	4800	PASS
25		5825.0023	2300	PASS
15		5824.9987	-1300	PASS
5		5824.9971	-2900	PASS
0		5824.9964	-3600	PASS
20	8.4	5825.0035	3500	PASS
	7.4	5825.0013	1300	PASS
	6.4	5825.0022	2200	PASS

Appendix B: Photographs of Test Setup

Refer to test report TCT170925E037

Appendix C: Photographs of EUT

Refer to test report TCT170925E037

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