

TEST REPORT

FCC ID: Y3HCP3039

Product: FREESTREAM Receiver

Model No.: CP3039

Additional Model No.: N/A

Trade Mark:  freestream

Report No.: TCT170615E026

Issued Date: Jul. 09, 2017

Issued for:

Shenzhen Crystal Video Technology Co., LTD.

F13, F518 Idea Land, Baoyuan Road, Baoan Central Area, Shenzhen, China

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	FREESTREAM Receiver
Model No.:	CP3039
Additional Model No.:	N/A
Trade Mark:	
Applicant:	Shenzhen Crystal Video Technology Co., LTD.
Address:	F13, F518 Idea Land, Baoyuan Road, Baoan Central Area, Shenzhen, China
Manufacturer:	Shenzhen Crystal Video Technology Co., LTD.
Address:	F13, F518 Idea Land, Baoyuan Road, Baoan Central Area, Shenzhen, China
Date of Test:	Jun. 16, 2017 – Jul. 08, 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:



Jin Wang

Date:

Jul. 08, 2017

Reviewed By:



Joe Zhou

Date:

Jul. 09, 2017

Approved By:



Tomsin

Date:

Jul. 09, 2017


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:	FREESTREAM Receiver
Model No.:	CP3039
Additional Model No.:	N/A
Trade Mark:	
Operation Frequency:	Band I: 5180MHz~5240MHz Band IV: 5745MHz~5825MHz
Channel Bandwidth:	802.11n: 20MHz, 40MHz
Modulation Technology:	Orthogonal Frequency Division Multiplexing(OFDM)
Modulation Type	64QAM, 16QAM, BPSK, QPSK
Antenna Type:	R-SMA antenna
Antenna Gain:	2dBi
Power Supply:	Adapter Information: Model: GPE012A-050200-2 Input: AC 100-240V, 50/60Hz, 0.3A Output: 5V, 2000mA

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
11n(HT40)	CH38	5190	40
11n(HT40)	CH46	5230	40

Band IV (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
11n (HT40)	CH151	5755	45
11n (HT40)	CH159	5795	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		40MHz	
Channel	Frequency	Channel	Frequency
36	5180	38	5190
40	5200	46	5230
44	5220	151	5755
48	5240	159	5790
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 802.11n (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
40	Mid	5200	157	Mid	5785
48	High	5240	165	High	5805

For 802.11n (HT40)

Band I (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	151	Low	5755
46	High	5230	159	High	5795

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 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.</p>	

<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:</p>	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11n(HT20)	6.5 Mbps
802.11n(HT40)	13.5 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.: 572331

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 expanded 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)
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 EUT two antennas are R-SMA antennas which is only the antenna type used, and the best case gain of the antennas all are 2dBi.	
	

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:	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"> 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

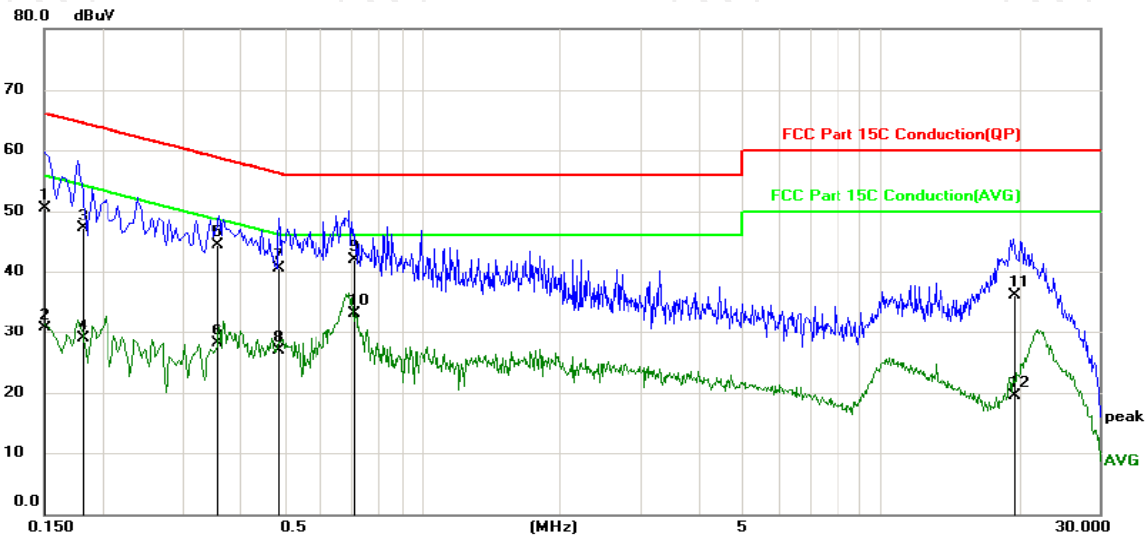
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Oct. 13, 2017
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Oct. 13, 2017
EMI Test Software	Shurple Technology	EZ-EMC	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)



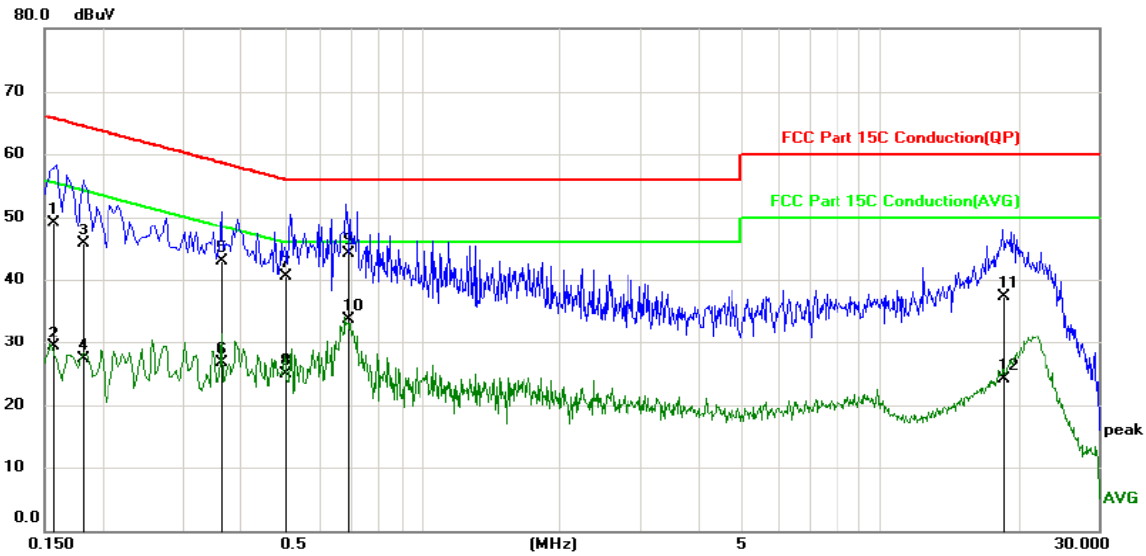
Site: Phase: **L1** Temperature: 25
Limit: FCC Part 15C Conduction(QP) Power: AC 120V/60Hz Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1503	39.06	11.49	50.55	65.98	-15.43	QP	
2		0.1503	19.25	11.49	30.74	55.98	-25.24	AVG	
3		0.1806	35.53	11.48	47.01	64.46	-17.45	QP	
4		0.1806	17.48	11.48	28.96	54.46	-25.50	AVG	
5		0.3591	32.83	11.38	44.21	58.75	-14.54	QP	
6		0.3591	16.79	11.38	28.17	48.75	-20.58	AVG	
7		0.4851	29.11	11.32	40.43	56.25	-15.82	QP	
8		0.4851	15.58	11.32	26.90	46.25	-19.35	AVG	
9		0.7095	30.69	11.22	41.91	56.00	-14.09	QP	
10	*	0.7095	21.92	11.22	33.14	46.00	-12.86	AVG	
11		19.5231	25.46	10.70	36.16	60.00	-23.84	QP	
12		19.5231	8.82	10.70	19.52	50.00	-30.48	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: Phase: **N** Temperature: 25
Limit: FCC Part 15C Conduction(QP) Power: AC 120V/60Hz Humidity: 55 %

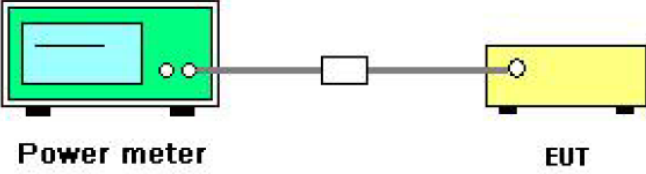
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1567	37.57	11.49	49.06	65.64	-16.58	QP	
2		0.1567	17.86	11.49	29.35	55.64	-26.29	AVG	
3		0.1813	34.32	11.48	45.80	64.43	-18.63	QP	
4		0.1813	15.91	11.48	27.39	54.43	-27.04	AVG	
5		0.3645	31.45	11.38	42.83	58.63	-15.80	QP	
6		0.3645	15.38	11.38	26.76	48.63	-21.87	AVG	
7		0.5041	29.16	11.31	40.47	56.00	-15.53	QP	
8		0.5041	13.58	11.31	24.89	46.00	-21.11	AVG	
9	*	0.6923	32.82	11.23	44.05	56.00	-11.95	QP	
10		0.6923	22.41	11.23	33.64	46.00	-12.36	AVG	
11		18.5861	26.44	10.91	37.35	60.00	-22.65	QP	
12		18.5861	13.19	10.91	24.10	50.00	-25.90	AVG	

Note:

- Freq. = Emission frequency in MHz
- Reading level (dBuV) = Receiver reading
- Corr. Factor (dB) = attenuator 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.

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:	<table border="1"> <thead> <tr> <th>Frequency Band (MHz)</th> <th>Limit</th> </tr> </thead> <tbody> <tr> <td>5150-5250</td> <td>1W for indoor access point</td> </tr> <tr> <td>5725-5850</td> <td>1 W</td> </tr> </tbody> </table> <p>Note: Where “B” is the 26 dB emissions bandwidth in MHz.</p>	Frequency Band (MHz)	Limit	5150-5250	1W for indoor access point	5725-5850	1 W
Frequency Band (MHz)	Limit						
5150-5250	1W for indoor access point						
5725-5850	1 W						
Test Setup:	 <p>The diagram illustrates the test setup. On the left is a green Power meter. A cable connects it to a small white rectangular attenuator. Another cable connects the attenuator to a yellow EUT (Equipment Under Test) on the right.</p>						
Test Mode:	Transmitting mode with modulation						
Test Procedure:	<ol style="list-style-type: none"> 1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v01r04 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	Oct. 13, 2017
Power Meter	Agilent	N1911A	MY45101557	Oct. 13, 2017
Power Sensor	Agilent	N1922A	MY44124432	Oct. 13, 2017
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Oct. 13, 2017
Antenna Connector	TCT	RFC-03	N/A	Oct. 13, 2017

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) / Antenna 0+Antenna 1						
Mode	Test channel	Maximum Conducted (Average) Output Power (dBm)			FCC Limit (dBm)	Result
		Ant0	Ant1	Total		
11n(HT20)	CH36	2.80	2.62	5.72	30	PASS
11n(HT20)	CH40	2.87	2.50	5.70	30	PASS
11n(HT20)	CH48	2.75	2.56	5.67	30	PASS
11n(HT40)	CH38	2.24	2.59	5.43	30	PASS
11n(HT40)	CH46	2.66	2.62	5.65	30	PASS

Note : $G_{ANT}=2dBi$, $Array\ Gain=10\log(N_{ANT}/N_{SS})=3.01dBi$, $Directional\ Gain=G_{ANT} + Array\ Gain=5.01dBi$,
 $5.01dBi < 6dBi$ so limit=30dBm/MHz

Configuration Band IV (5725 - 5850 MHz) / Antenna 0+Antenna 1						
Mode	Test channel	Maximum Conducted (Average) Output Power (dBm)			FCC Limit (dBm)	Result
		Ant0	Ant1	Total		
11n (HT20)	CH149	2.85	2.57	5.72	30	PASS
11n (HT20)	CH157	2.56	2.55	5.57	30	PASS
11n (HT20)	CH165	2.36	2.61	5.50	30	PASS
11n (HT40)	CH151	2.20	2.81	5.53	30	PASS
11n (HT40)	CH159	2.36	2.36	5.37	30	PASS

Note : $G_{ANT}=2dBi$, $Array\ Gain=10\log(N_{ANT}/N_{SS})=3.01dBi$, $Directional\ Gain=G_{ANT} + Array\ Gain=5.01dBi$,
 $5.01dBi < 6dBi$ so limit=30dBm/MHz

6.4.3. Test data

ANT 0

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11n(HT20)	CH149	5745	17.56	0.5	PASS
11n(HT20)	CH157	5785	17.55	0.5	PASS
11n(HT20)	CH161	5825	17.15	0.5	PASS
11n(HT40)	CH151	5755	36.28	0.5	PASS
11n(HT40)	CH159	5795	36.03	0.5	PASS

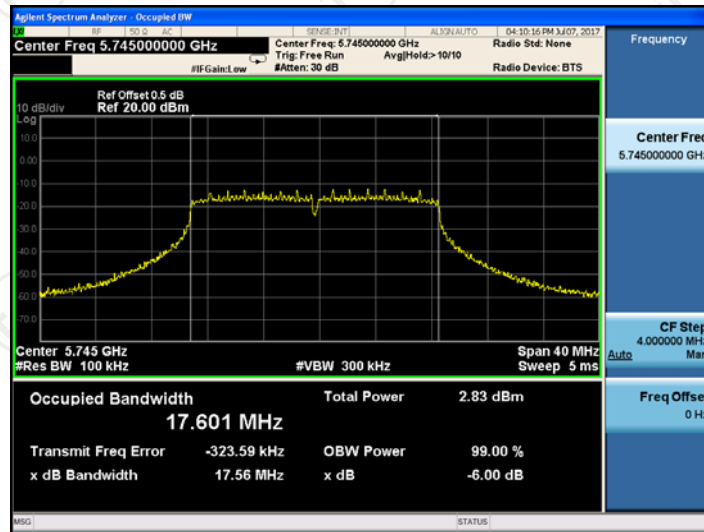
ANT 1

Band IV (5725 - 5850 MHz)					
Mode	Test channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Result
11n(HT20)	CH149	5745	17.54	0.5	PASS
11n(HT20)	CH157	5785	17.55	0.5	PASS
11n(HT20)	CH161	5825	17.53	0.5	PASS
11n(HT40)	CH151	5755	36.27	0.5	PASS
11n(HT40)	CH159	5795	36.25	0.5	PASS

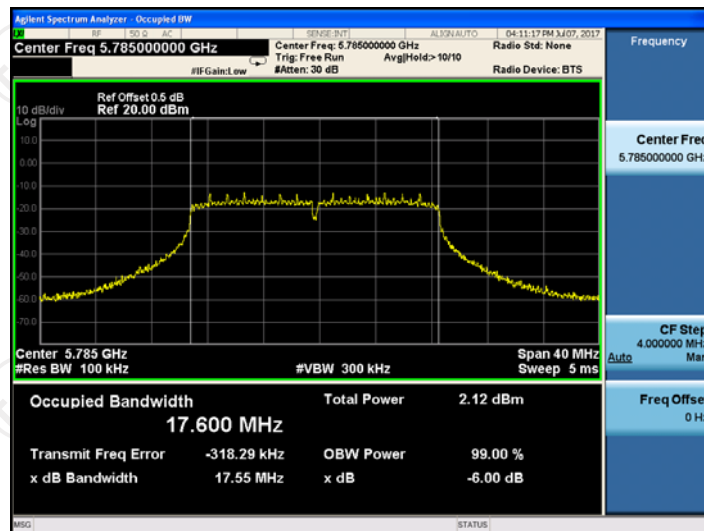
Test plots as follows:

ANT 0
Band IV (5725 – 5850 MHz)
 11n(HT20)

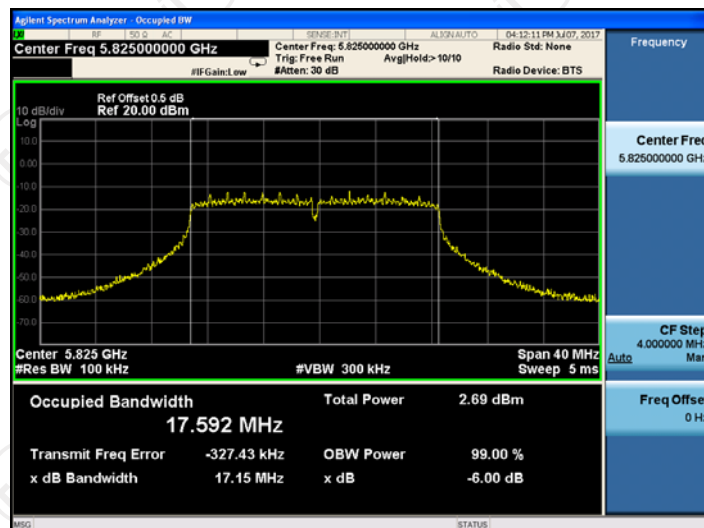
CH149



CH157

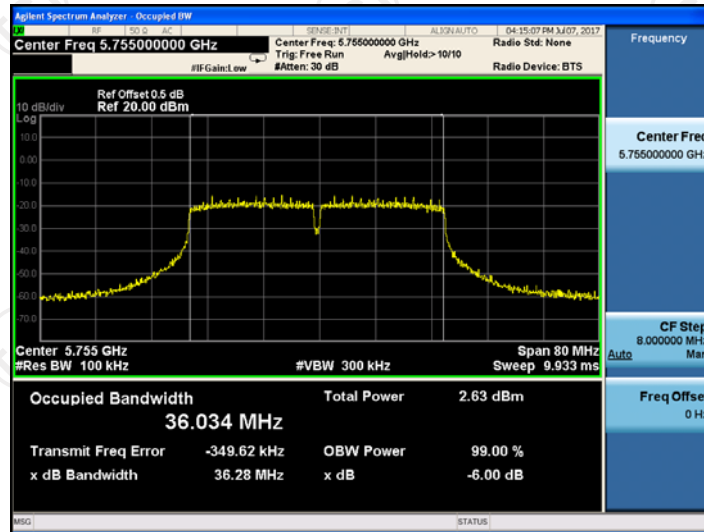


CH161

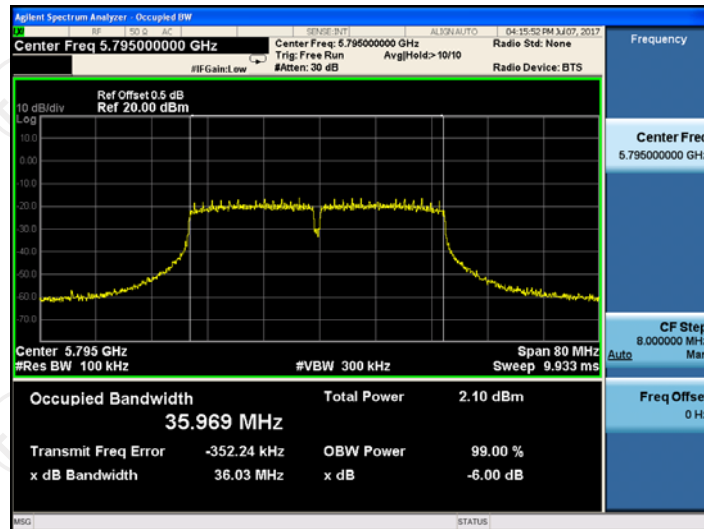


11n(HT40)

CH151

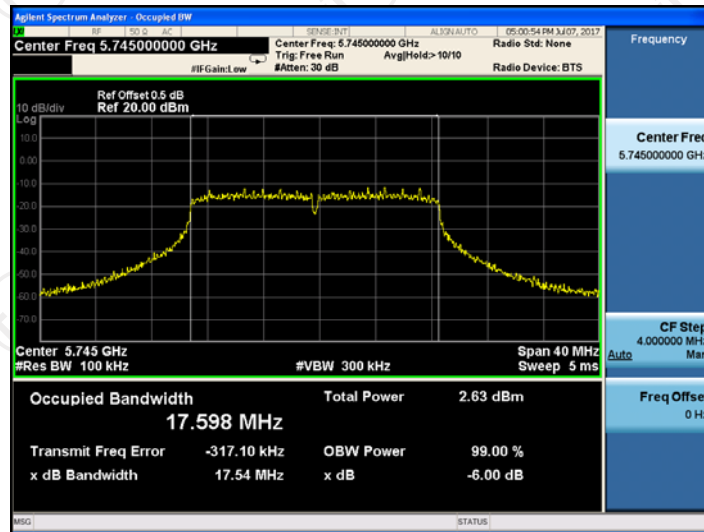


CH159

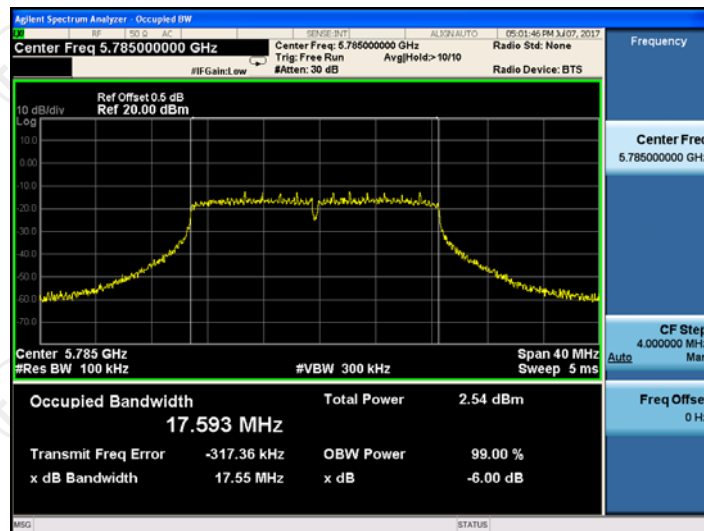


ANT 1
Band IV (5725 – 5850 MHz)
 11n(HT20)

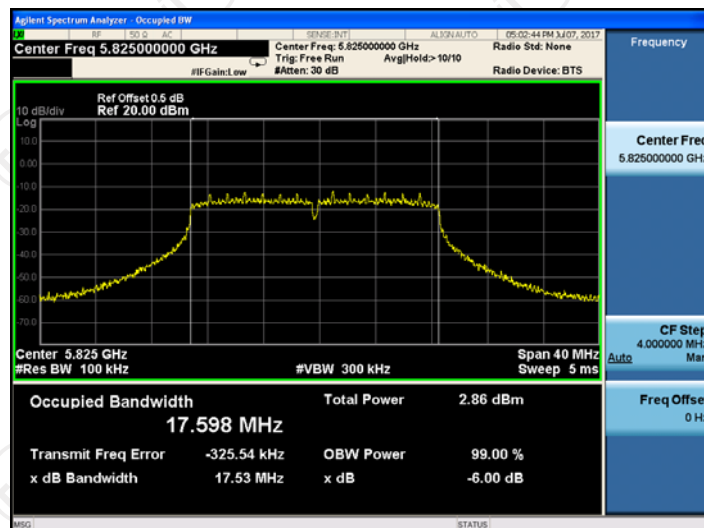
CH149



CH157

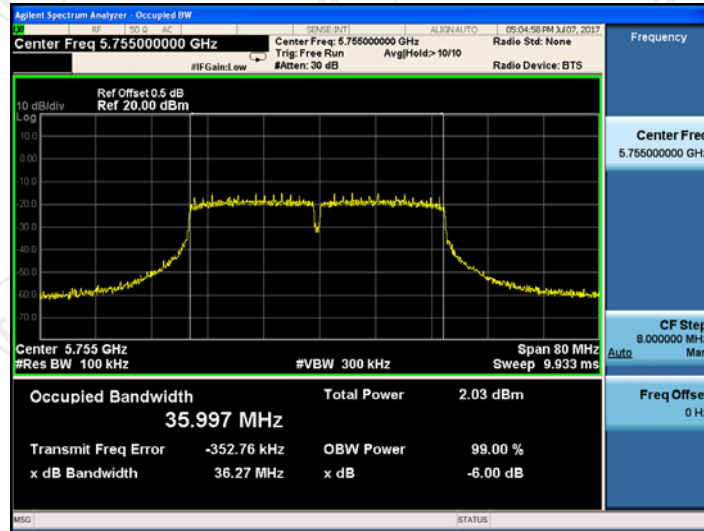


CH161

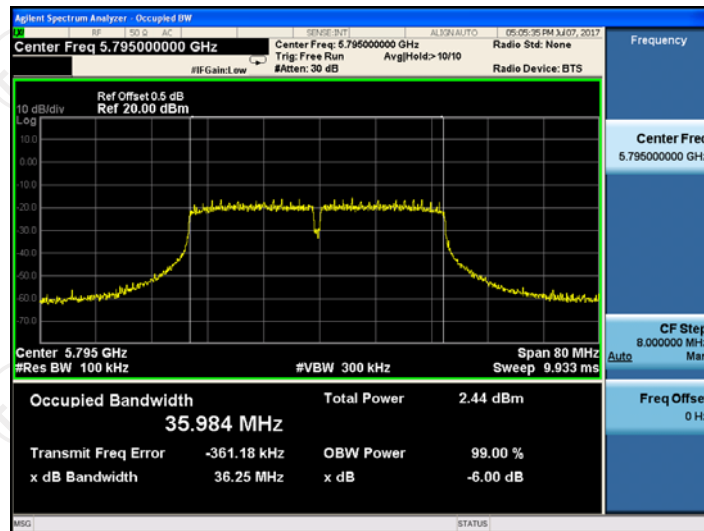


11n(HT40)

CH151

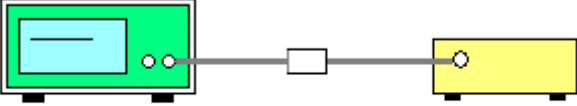


CH159



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	Oct. 13, 2017
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Oct. 13, 2017
Antenna Connector	TCT	RFC-01	N/A	Oct. 13, 2017

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

ANT 0

Band I

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH36	5180	22.54	17.781
11n(HT20)	CH40	5200	22.26	17.781
11n(HT20)	CH48	5240	22.71	17.732
11n(HT40)	CH38	5190	42.68	36.040
11n(HT40)	CH46	5230	41.73	36.064

Band IV

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH149	5745	17.785
11n(HT20)	CH157	5785	17.786
11n(HT20)	CH161	5825	17.788
11n(HT40)	CH151	5755	36.111
11n(HT40)	CH159	5795	36.136

**ANT 1
Band I**

Mode	Test channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH36	5180	23.00	17.750
11n(HT20)	CH40	5200	23.03	17.788
11n(HT20)	CH48	5240	22.85	17.771
11n(HT40)	CH38	5190	42.04	36.063
11n(HT40)	CH46	5230	41.56	36.065

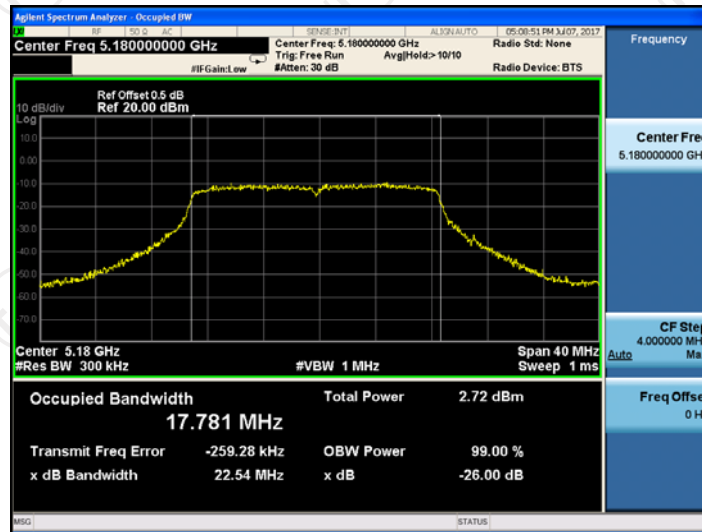
Band IV

Mode	Test channel	Frequency (MHz)	99% Bandwidth (MHz)
11n(HT20)	CH149	5745	17.774
11n(HT20)	CH157	5785	17.875
11n(HT20)	CH161	5825	17.793
11n(HT40)	CH151	5755	36.075
11n(HT40)	CH159	5795	36.158

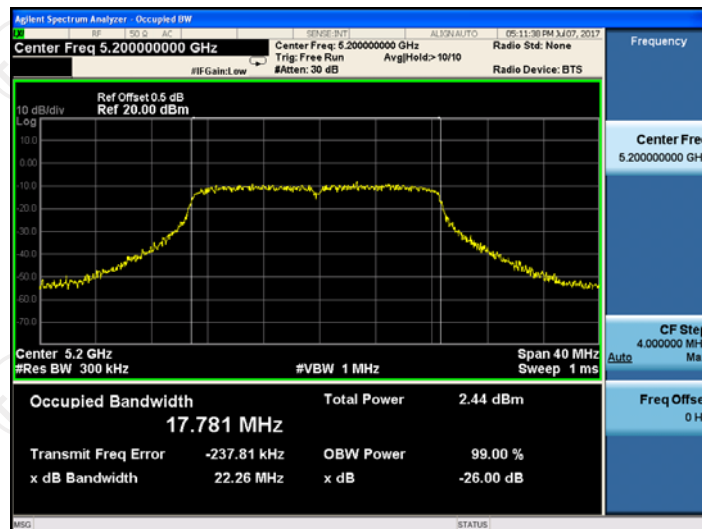
Test plots as follows:

ANT 0
Band I (5150 – 5250 MHz)
 11n(HT20)

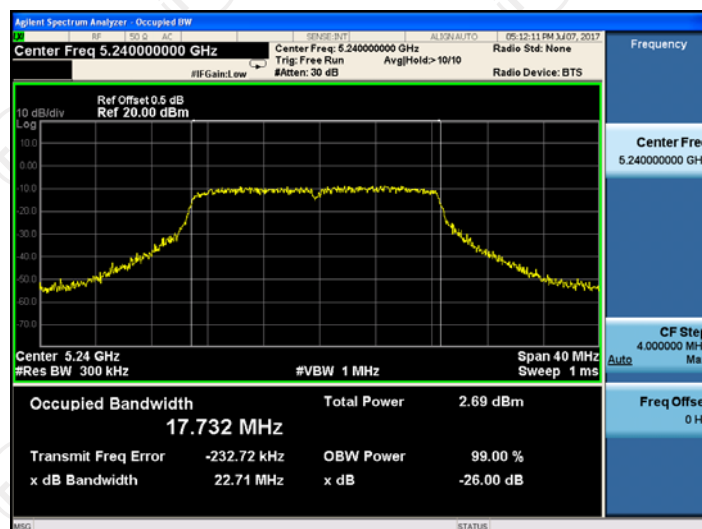
CH36



CH40

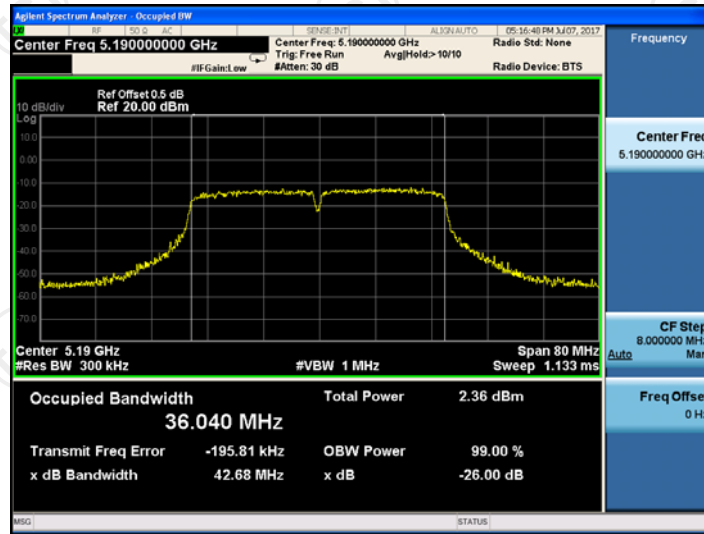


CH48

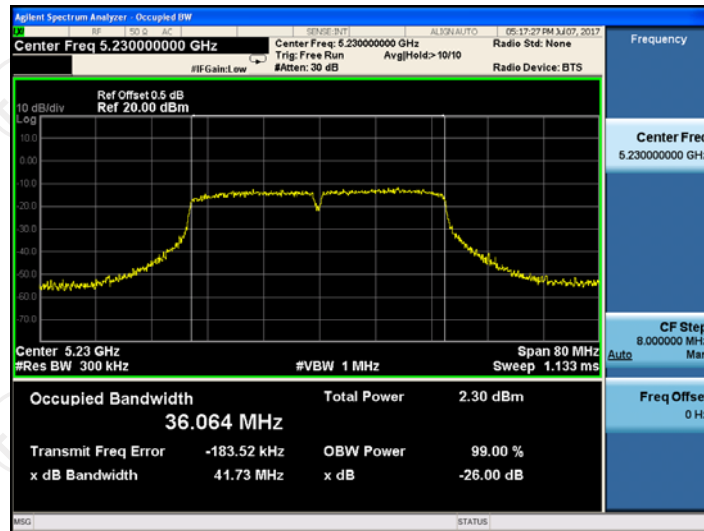


11n(HT40)

CH38

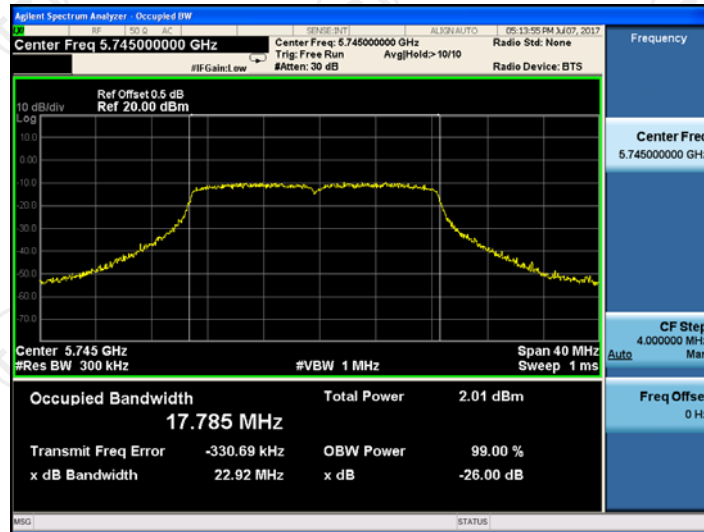


CH46

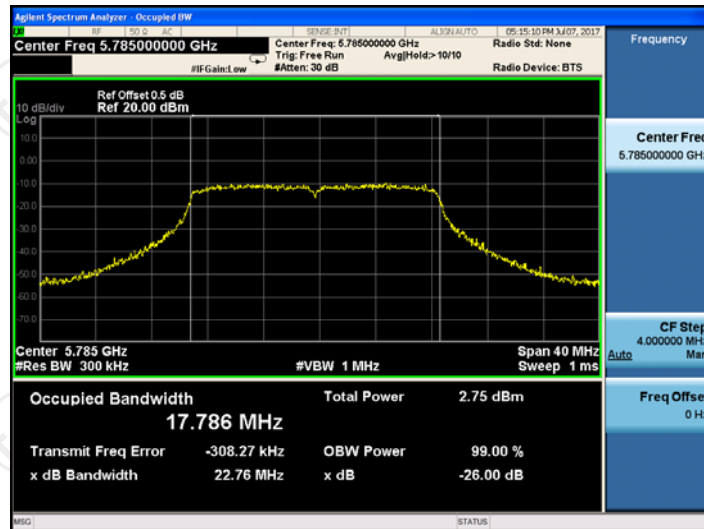


Band IV (5725 – 5850 MHz)
11n(HT20)

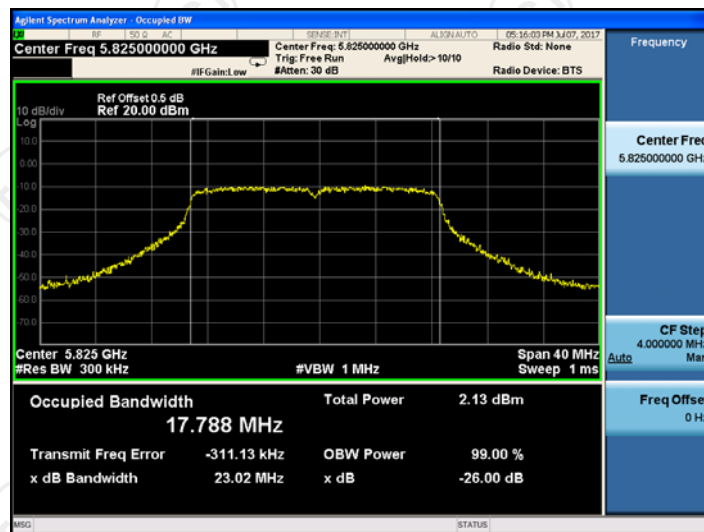
CH149



CH157

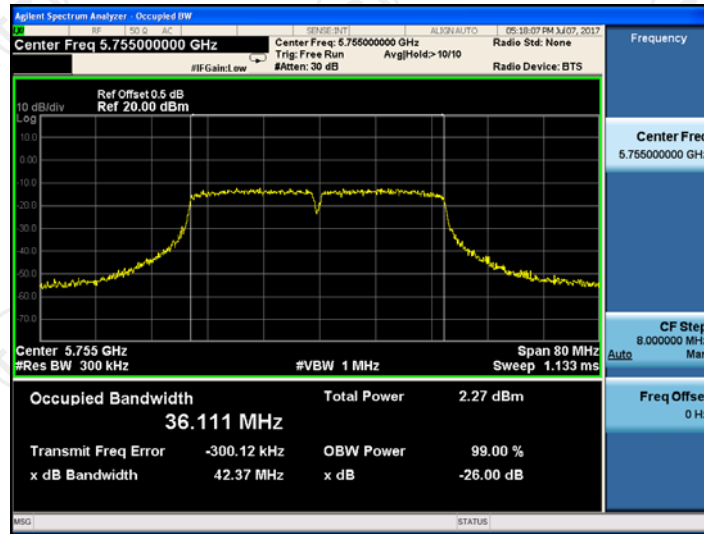


CH161

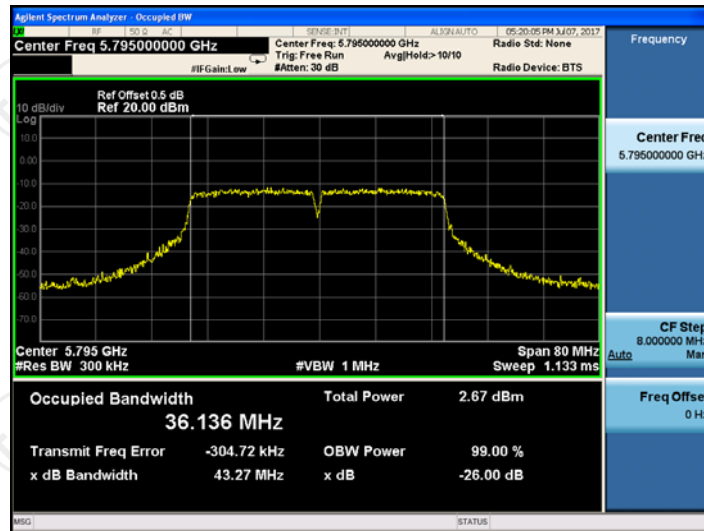


11n(HT40)

CH151



CH159

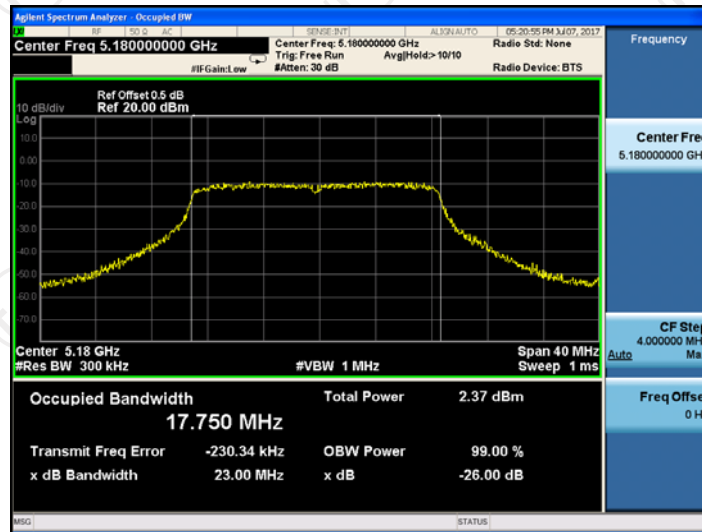


ANT 1

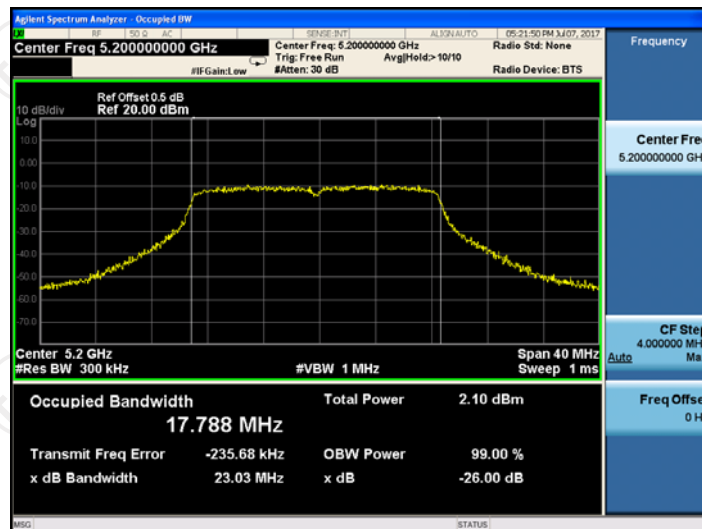
Band I (5150 – 5250 MHz)

11n(HT20)

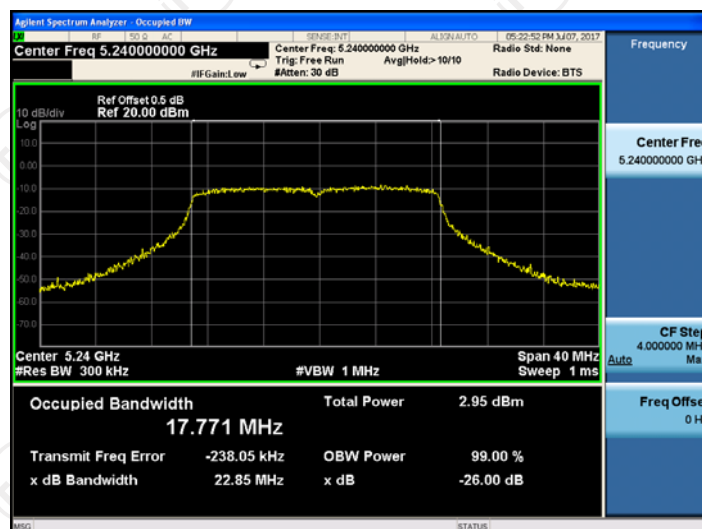
CH36



CH40

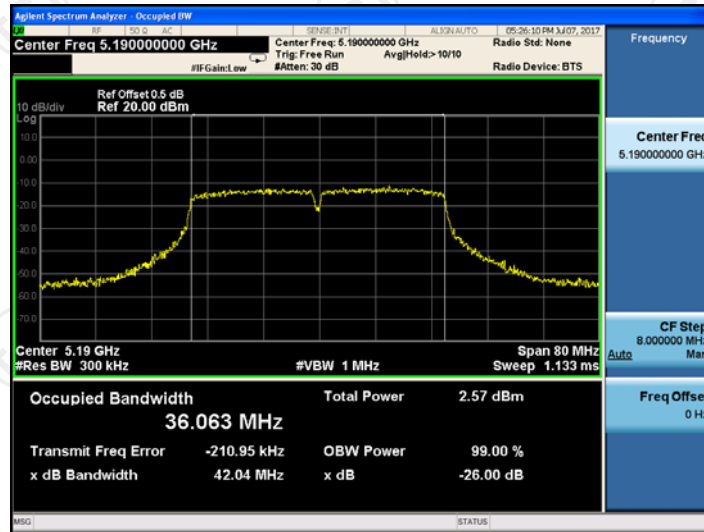


CH48

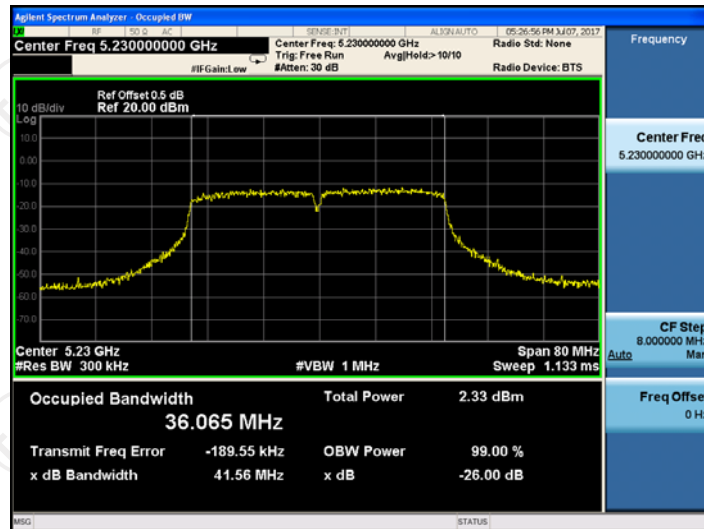


11n(HT40)

CH38

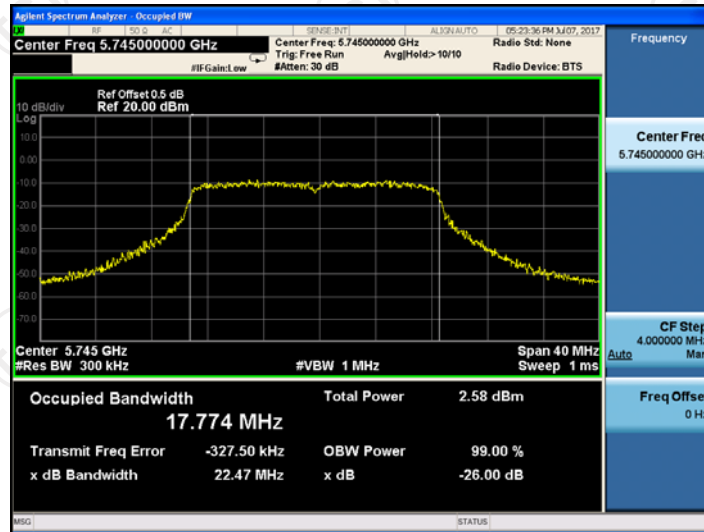


CH46

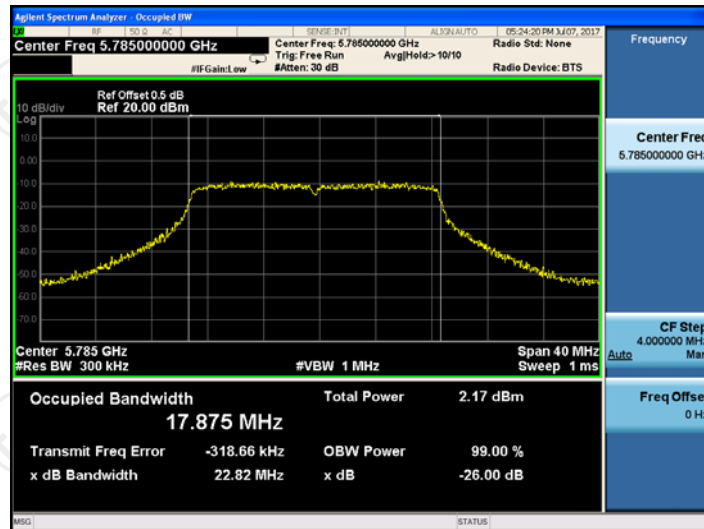


Band IV (5725 – 5850 MHz)
11n(HT20)

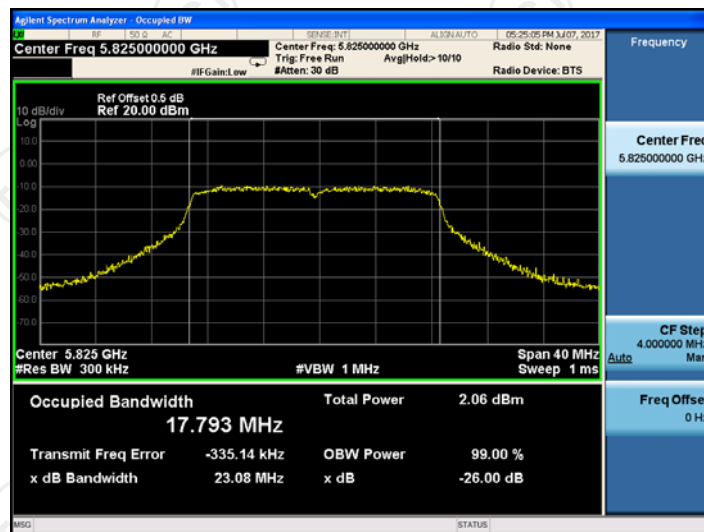
CH149



CH157

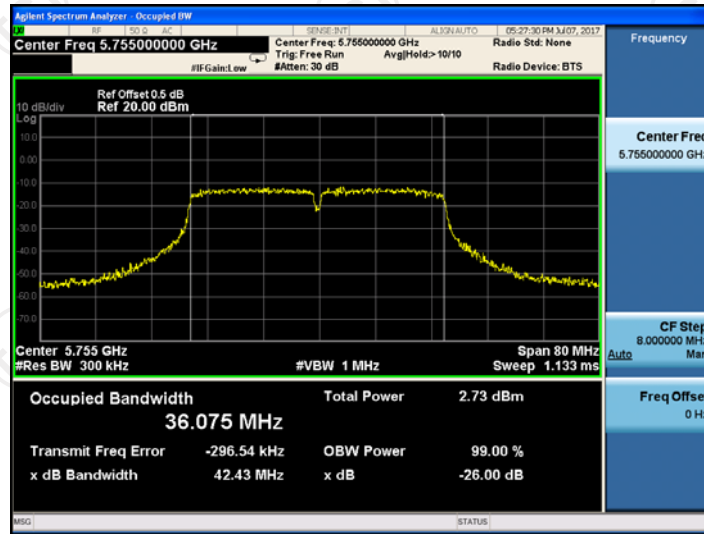


CH161

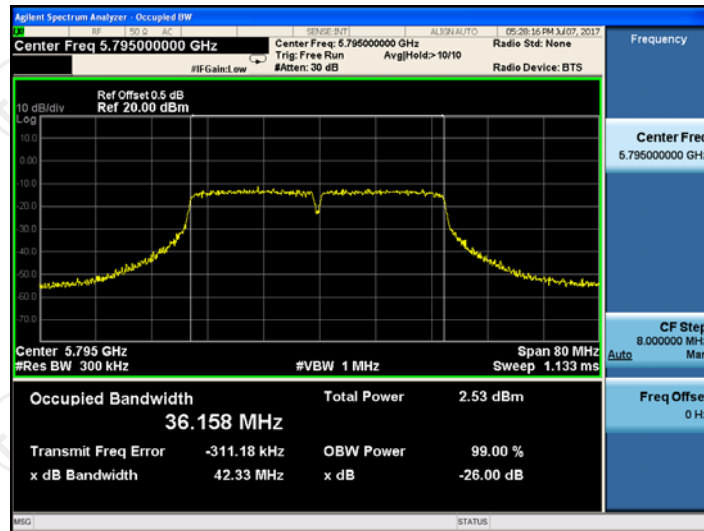


11n(HT40)

CH151




CH159



6.6. Power Spectral Density

6.6.1. Test Specification

Test Requirement:	FCC Part 15 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:	$\leq 17.00\text{dBm/MHz}$ for Band I 5150MHz-5250MHz $\leq 30.00\text{dBm}/500\text{KHz}$ for Band IV 5725MHz-5850MHz The e.i.r.p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz
Test Setup:	 Spectrum Analyzer EUT
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 $\geq 3*$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	Oct. 13, 2017
RF Cable (9KHz-40GHz)	TCT	RE-03	N/A	Oct. 13, 2017
Antenna Connector	TCT	RFC-03	N/A	Oct. 13, 2017

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) / Antenna 0+Antenna 1						
Mode	Test channel	Power Spectral Density			Limit (dBm/MHz)	Result
		Ant0	Ant1	Total		
11n(HT20)	CH36	-6.79	-6.03	-3.38	17	PASS
11n(HT20)	CH40	-7.16	-6.78	-3.96	17	PASS
11n(HT20)	CH48	-6.63	-7.17	-3.88	17	PASS
11n(HT40)	CH38	-8.99	-9.21	-6.09	17	PASS
11n(HT40)	CH46	-9.57	-9.50	-6.52	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 IV (5725 - 5850 MHz) / Antenna 0+Antenna 1						
Mode	Test channel	Power Spectral Density			Limit (dBm/500kHz)	Result
		Ant0	Ant1	Total		
11n(HT20)	CH149	-8.55	-8.71	-5.62	30	PASS
11n(HT20)	CH157	-8.78	-8.93	-5.84	30	PASS
11n(HT20)	CH161	-8.27	-8.57	-5.41	30	PASS
11n(HT40)	CH151	-10.79	-11.98	-8.33	30	PASS
11n(HT40)	CH159	-11.87	-11.32	-8.58	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.

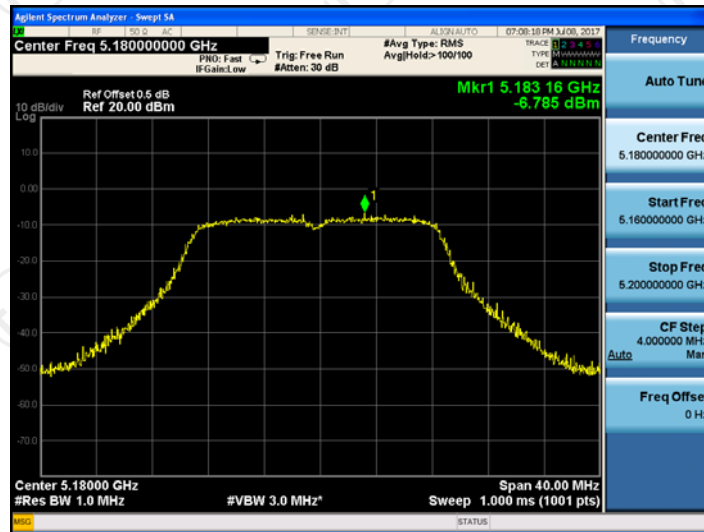
Test plots as follows:

ANT 0

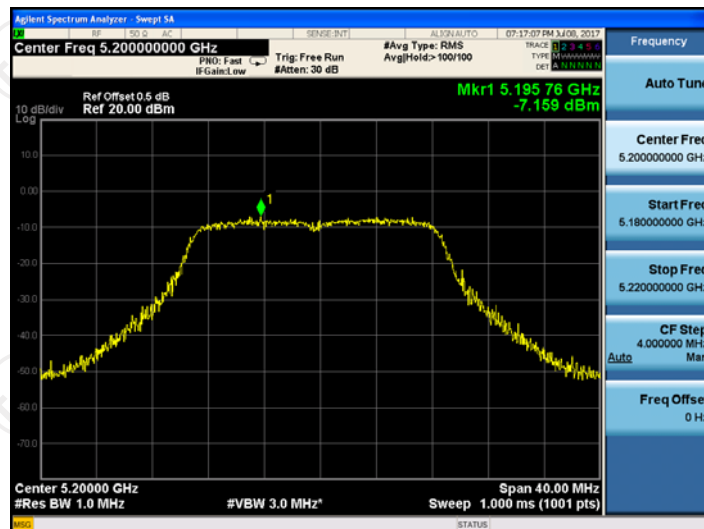
Band I (5150 – 5250 MHz)

11n(HT20)

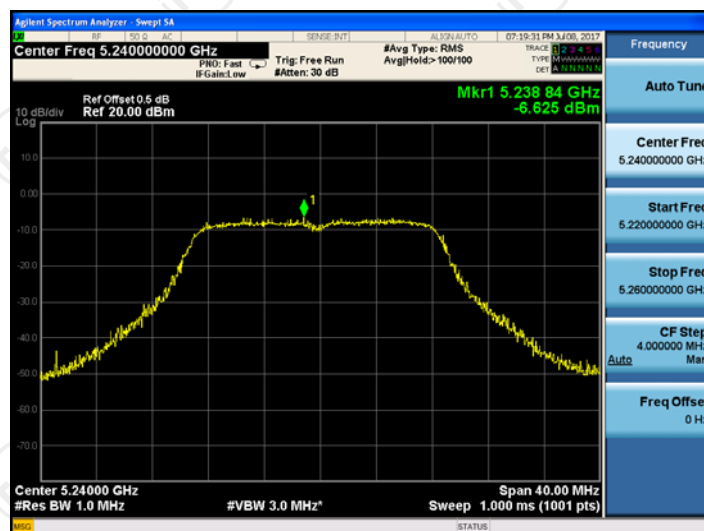
CH36



CH40

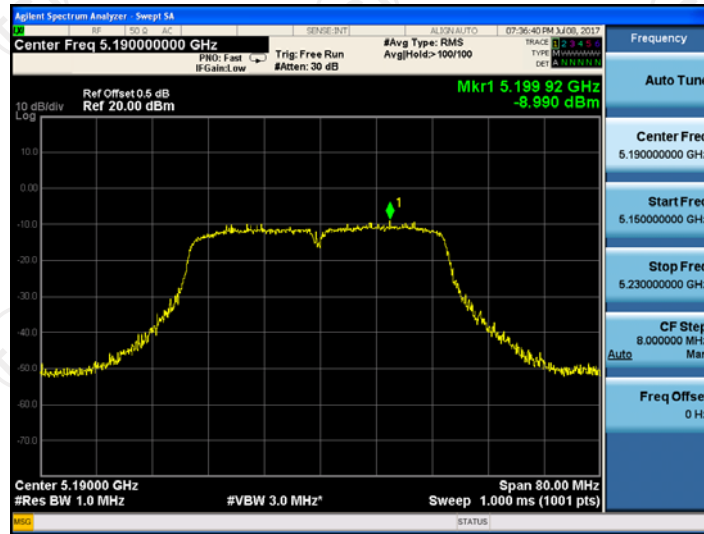


CH48

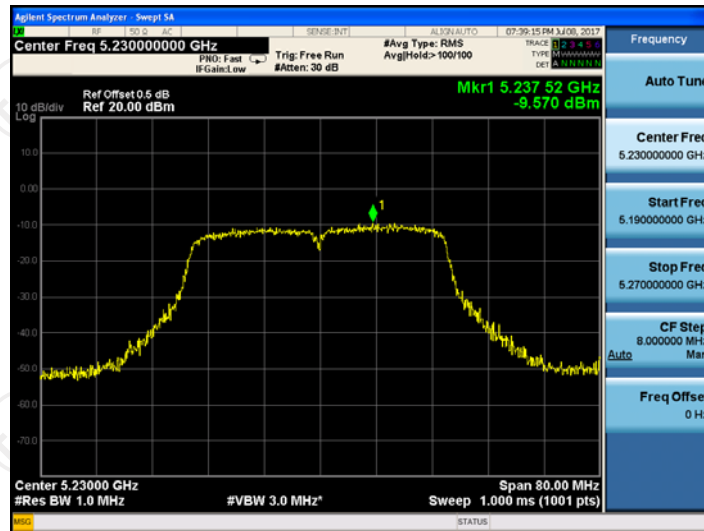


11n(HT40)

CH38

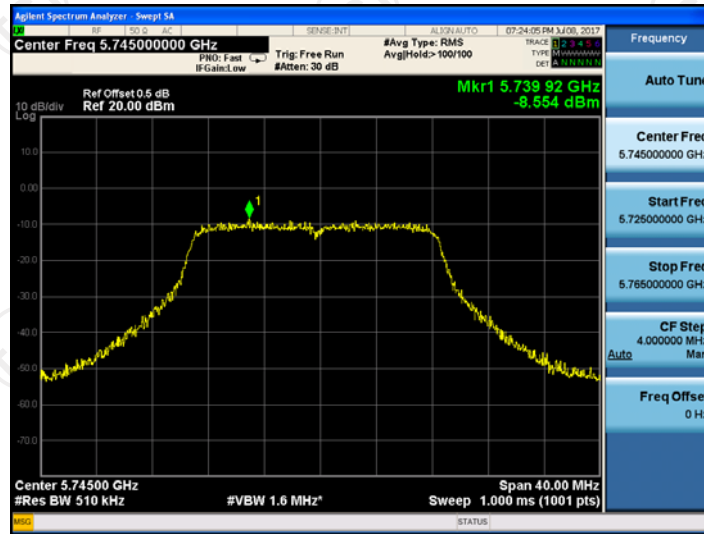


CH46

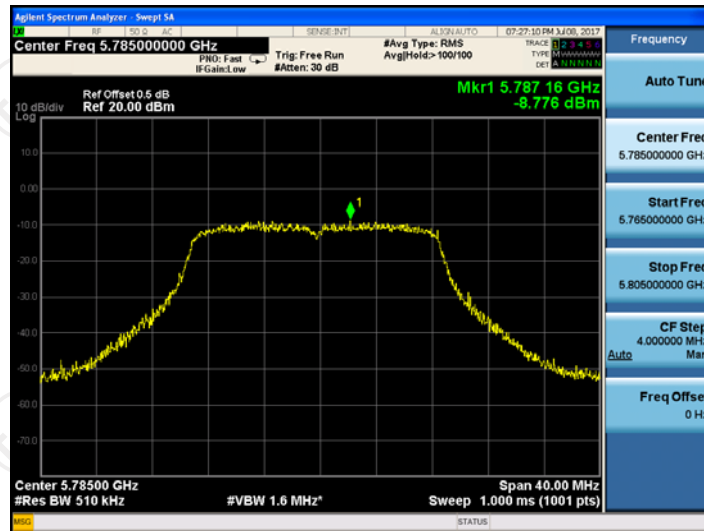


Band IV (5725 – 5850 MHz)
11n(HT20)

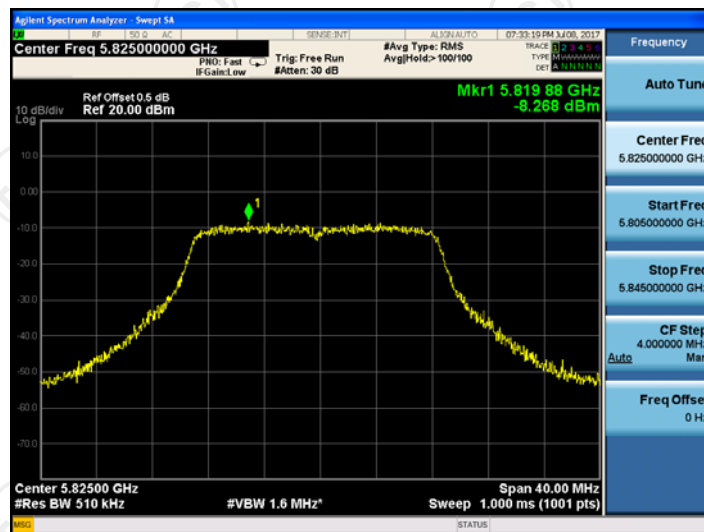
CH149



CH157

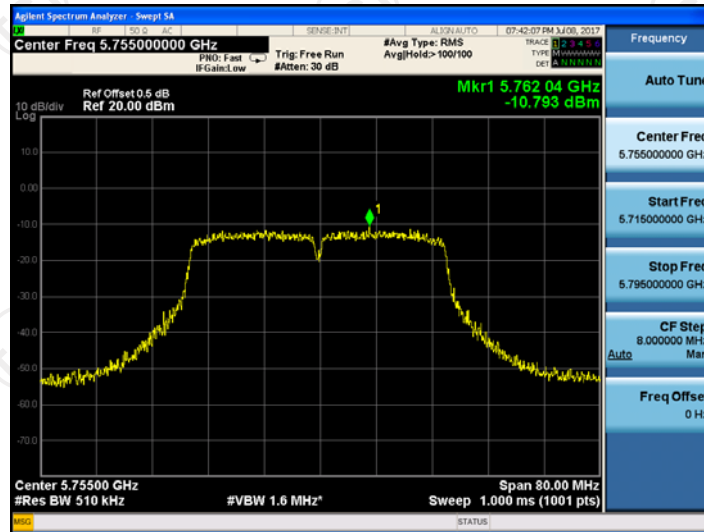


CH161

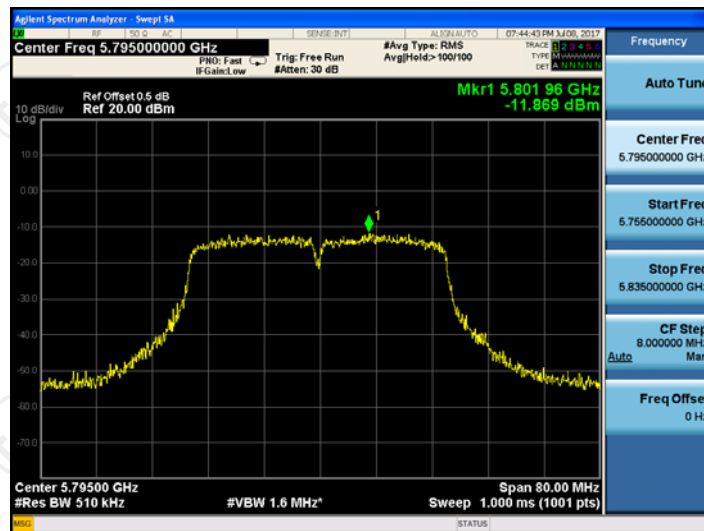


11n(HT40)

CH151

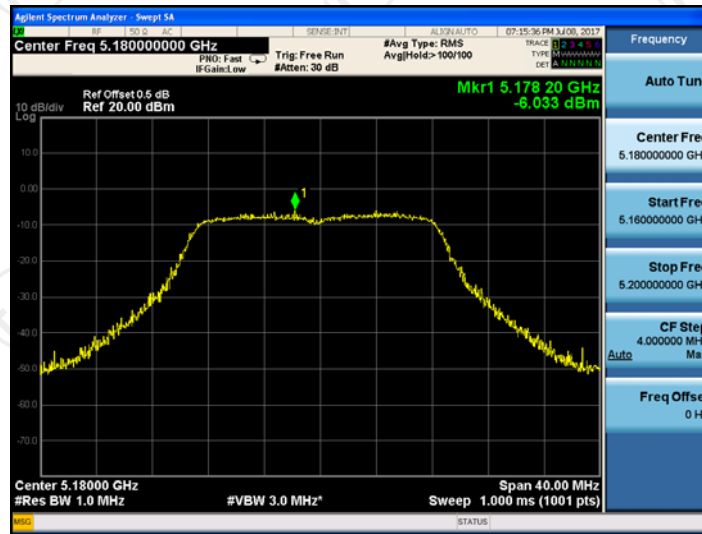


CH159

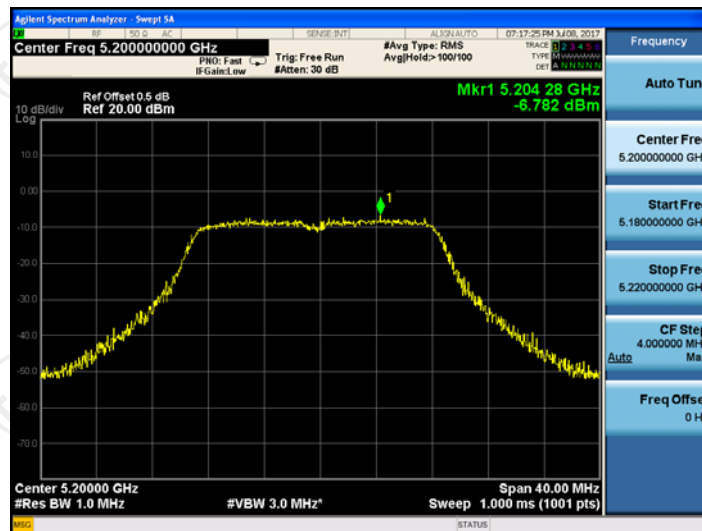


ANT 1
Band I (5150 – 5250 MHz)
11n(HT20)

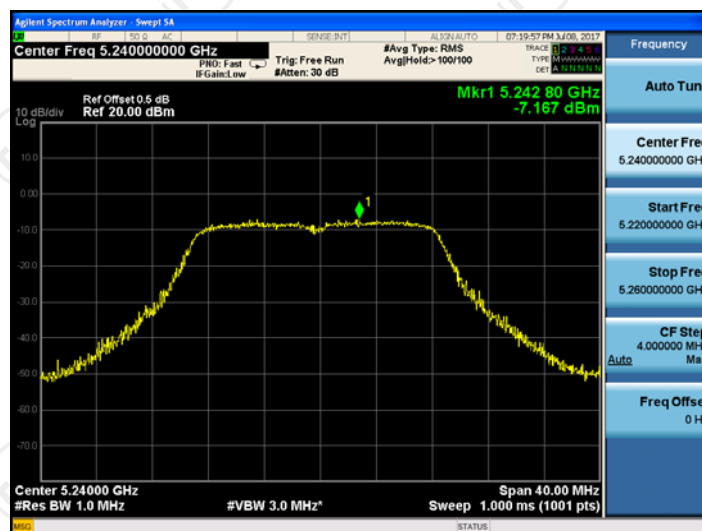
CH36



CH40

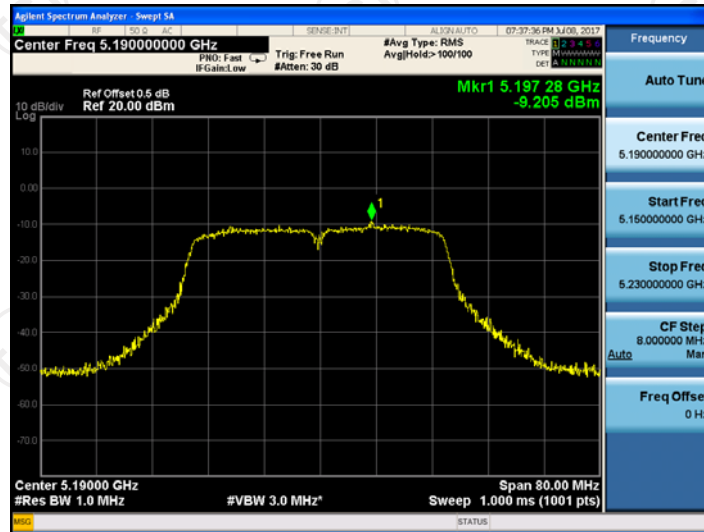


CH48

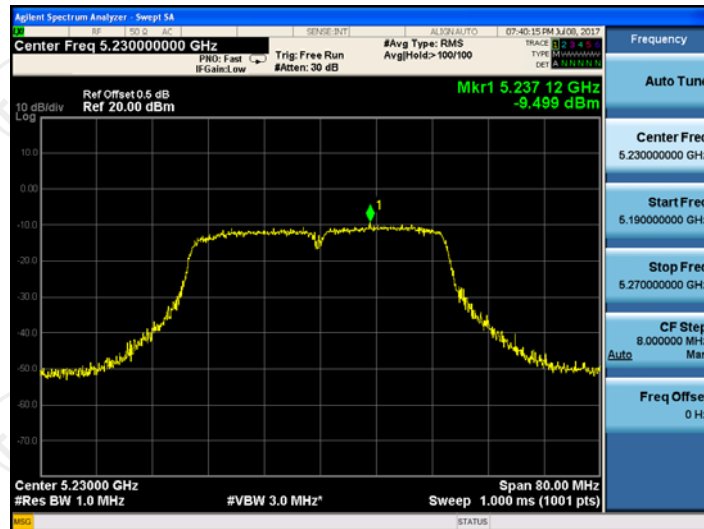


11n(HT40)

CH38

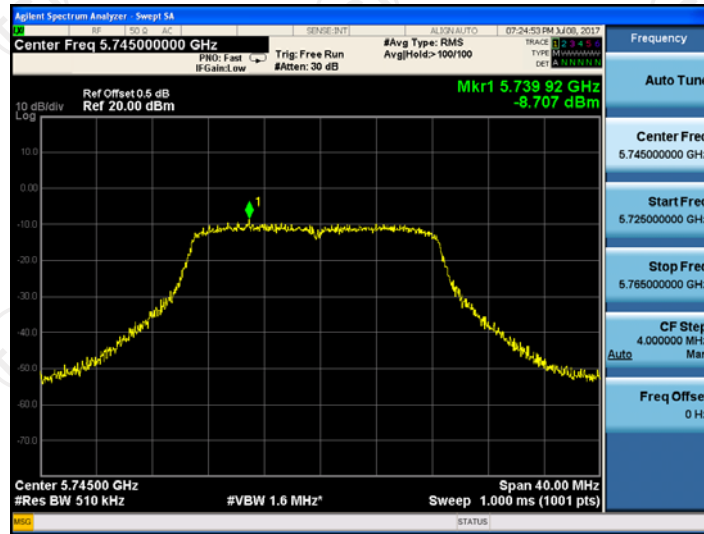


CH46

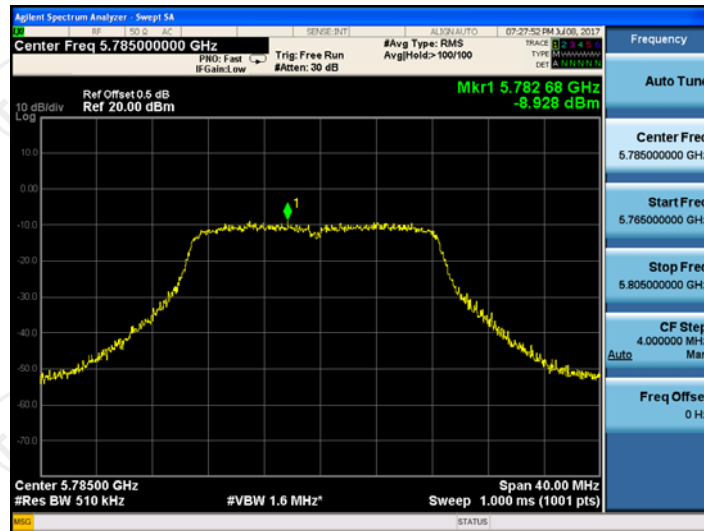


Band IV (5725 – 5850 MHz)
11n(HT20)

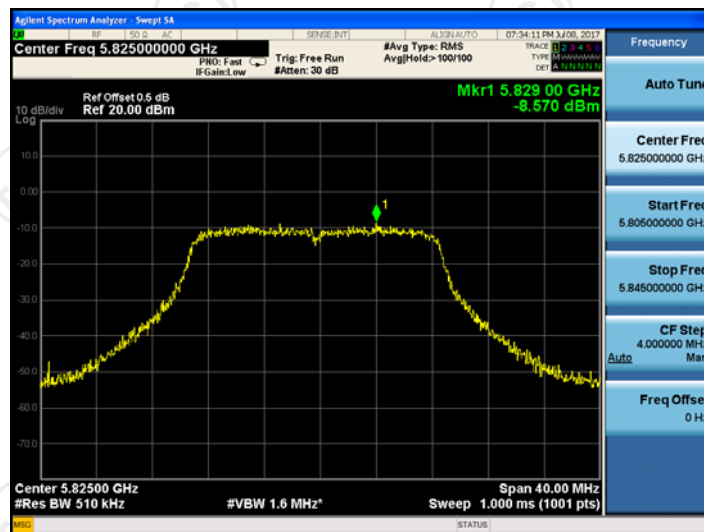
CH149



CH157

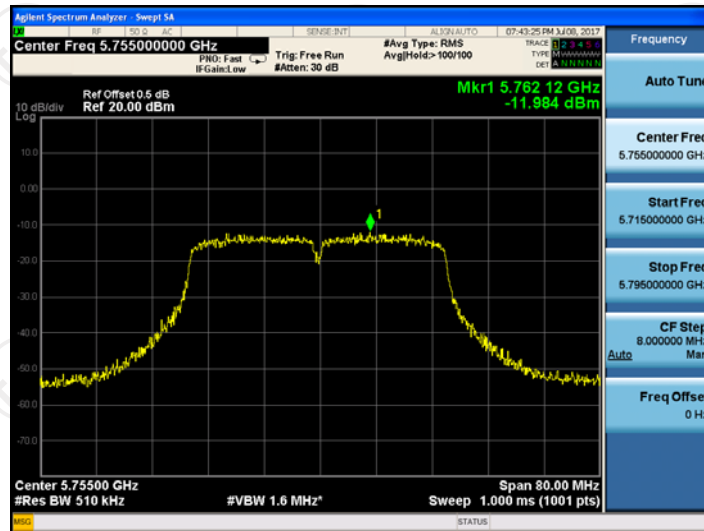


CH161

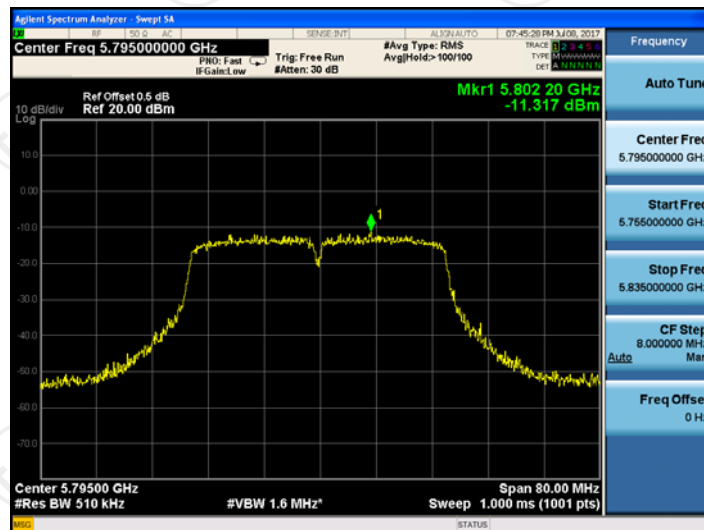


11n(HT40)

CH151

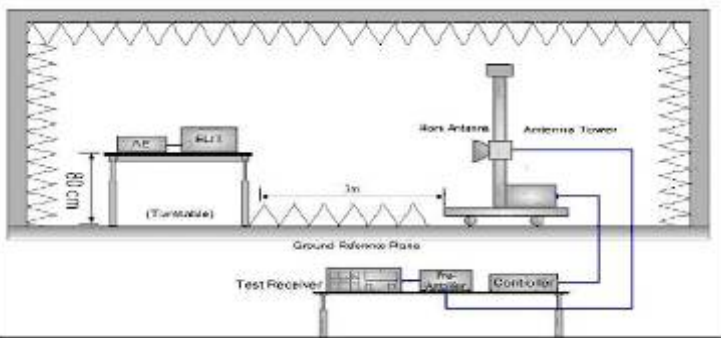


CH159



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: $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2$ dB $\mu\text{V}/\text{m}$, for EIRP(dBm)= -27dBm For band IV(5715-5725MHz&5850-5860MHz): $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 78.2$ dB $\mu\text{V}/\text{m}$, for EIRP(dBm)= -17dBm ; For band IV(other un-restricted band): $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2 = 68.2$ dB $\mu\text{V}/\text{m}$, for EIRP(dBm)= -27dBm
Test Setup:	
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	Oct. 13, 2017
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Oct. 13, 2017
Spectrum Analyzer	ROHDE&SCHW ARZ	FSP40	100056	Oct. 13, 2017
Spectrum Analyzer	Agilent	N9020A	MY49100060	Oct. 13, 2017
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Oct. 13, 2017
Pre-amplifier	HP	8447D	2727A05017	Oct. 13, 2017
Loop antenna	ZHINAN	ZN30900A	12024	Oct. 13, 2017
Broadband Antenna	Schwarzbeck	VULB9163	340	Oct. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Oct. 13, 2017
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Oct. 13, 2017
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Oct. 13, 2017
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Oct. 13, 2017
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Oct. 13, 2017
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).

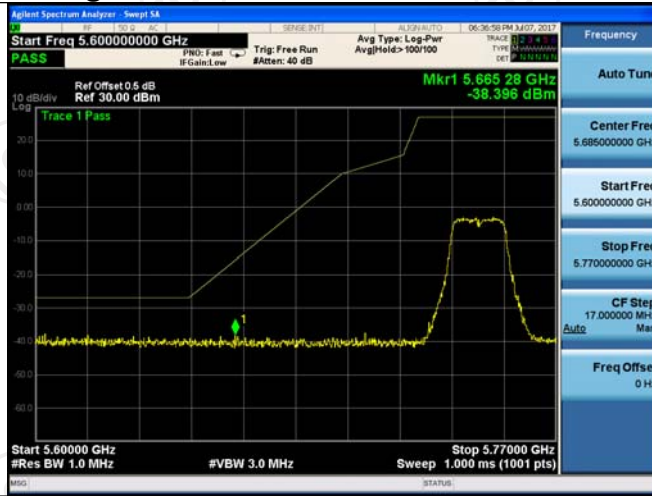
6.7.3. Test Data

802.11n 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	45.26	5.82	51.08	68.2	54	-2.92	H
		5150	41.35	5.82	47.17	68.2	54	-6.83	V
	Highest	5250	43.24	6.17	49.41	68.2	54	-4.59	H
		5250	39.25	6.17	45.42	68.2	54	-8.58	V
Band IV	Lowest	5725	43.24	8.21	51.45	78.2	54	-2.55	H
		5725	43.24	8.21	51.45	78.2	54	-2.55	V
	Highest	5850	42.26	8.87	51.13	78.2	54	-2.87	H
		5850	40.28	8.87	49.15	78.2	54	-4.85	V
Remark: Factor(dB)=Ant. Factor+Cable Loss-Amp. Factor									

802.11n HT40	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	43.81	5.82	49.63	68.2	54	-4.37	H
		5150	38.33	5.82	44.15	68.2	54	-9.85	V
	Highest	5250	45.36	6.17	51.53	68.2	54	-2.47	H
		5250	42.78	6.17	48.95	68.2	54	-5.05	V
Band IV	Lowest	5725	43.67	8.21	51.88	78.2	54	-2.12	H
		5725	43.67	8.21	51.88	78.2	54	-2.12	V
	Highest	5850	41.79	8.87	50.66	78.2	54	-3.34	H
		5850	39.45	8.87	48.32	78.2	54	-5.68	V
Remark: Factor(dB)=Ant. Factor+Cable Loss-Amp. Factor									

Band IV Band-edge for RF Conducted Emissions

802.11n
HT20 / LCH



802.11n
HT20 / HCH

