

FCC REPORT

Applicant: Audio Components International, Inc.
Address of Applicant: 716 Yarmouth Road, Suite 212 Palos Verdes Estates, CA 90274, USA
Manufacturer: Audio Components International, Inc.
Address of Manufacturer: 716 Yarmouth Road, Suite 212 Palos Verdes Estates, CA 90274, USA
Factory: Green Tech(DongGuan)Co.,Ltd.
Address of Factory: No.7 NanSi Street, XianMangXi Road, QingXi Town, Dongguan City, Guangdong Province, China

Equipment Under Test (EUT)

Product Name: NUVO Wireless 5.8G
Model No.: NV-SUBTXRX
Trade Mark: NUVO
FCC ID: 2AGTU-SUBTXRX
Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.407
Date of sample receipt: August 17, 2018
Date of Test: August 17, 2018- August 27, 2018
Date of report issued: August 27, 2018
Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo

Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	August 31, 2018	Original

Prepared By:

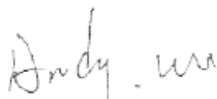


Date:

August 31, 2018

Project Engineer

Check By:



Date:

August 31, 2018

Reviewer

3 Contents

	Page
1 COVER PAGE.....	1
2 VERSION.....	2
3 CONTENTS.....	3
4 TEST SUMMARY.....	4
4.1 MEASUREMENT UNCERTAINTY.....	4
5 GENERAL INFORMATION.....	5
5.1 GENERAL DESCRIPTION OF EUT.....	5
5.2 TEST MODE.....	7
5.3 DESCRIPTION OF SUPPORT UNITS.....	7
5.4 TEST FACILITY.....	7
5.5 TEST LOCATION.....	7
5.6 ADDITIONAL INSTRUCTIONS.....	8
6 TEST INSTRUMENTS LIST.....	9
7 TEST RESULTS AND MEASUREMENT DATA.....	10
7.1 ANTENNA REQUIREMENT.....	10
7.2 CONDUCTED EMISSIONS.....	11
7.3 CONDUCTED PEAK OUTPUT POWER.....	14
7.4 CHANNEL BANDWIDTH.....	18
7.5 POWER SPECTRAL DENSITY.....	32
7.6 BAND EDGES.....	39
7.6.1 Radiated Emission Method.....	39
7.7 SPURIOUS EMISSION.....	45
7.7.1 Radiated Emission Method.....	45
7.8 FREQUENCY STABILITY.....	50
8 TEST SETUP PHOTO.....	52
9 EUT CONSTRUCTIONAL DETAILS.....	54

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.407(a)(3)	Pass
Channel Bandwidth	15.407(e)	Pass
Power Spectral Density	15.407(a)(3)	Pass
Band Edge	15.407(b)(4)	Pass
Spurious Emission	15.205/15.209/15.407(b)(4)	Pass
Frequency Stability	15.407(g)	Pass

Remark: Test according to ANSI C63.10:2013.

Pass: The EUT complies with the essential requirements in the standard.

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 40GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	NUVO Wireless 5.8G
Model No.:	NV-SUBTXRX
Remark:	NUVO
Test Model No:	NV-SUBTXRX
Remark:	/
Test sample(s) ID:	GTS201803000232-1
Sample(s) Status	Engineer sample
Hardware version:	HV1.0
Software version:	SV1.0
Operation Frequency:	5180.0MHz~5240.0MHz; 5736.0MHz~5814.0MHz
Channel numbers:	3 Channel for 5.2G, 3 Channel for 5.8G
Modulation technology:	QPSK(DSSS)
Antenna Type:	PCB ANT
Antenna gain:	ANTA: 0dBi ANTB: 0dBi MIMO Antenna Gain=10log ₂ +0=3.0dBi.
Power supply:	DC 5V from adapter.
Adapter:	Model:GQ05-050050-CU Input: AC100-240~, 50/60Hz, 0.3A Max Output: DC5V 500mA

Operation Frequency each of channel @ 5.2G & 5.8G Band							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	5180MHz	02	5210MHz	03	5240MHz	04	5736MHz
05	5762MHz	06	5814MHz				

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:

Test channel	Frequency (MHz)	
	5180~5240 Band	5736~5814 Band
Lowest channel	5180	5736
Middle channel	5210	5762
Highest channel	5240	5814

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
<i>Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, the duty cycle>98%, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i>	

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	Frequency(MHz)
TX Mode	5180
	5210
	5240
	5736
	5762
	5814

5.3 Description of Support Units

None.

5.4 Test Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC —Registration No.: 381383 Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383, January 08, 2018. ● Industry Canada (IC) —Registration No.: 9079A-2 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.
--

5.5 Test Location

All tests were performed at:
<p>Global United Technology Services Co., Ltd. No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China Tel: 0755-27798480 Fax: 0755-27798960</p>

5.6 Additional Instructions

EUT Software Settings:

Mode	Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.		
Test Software Name	DRTU Version 1.7.7-02972		
Mode	Channel	Frequency (MHz)	Soft Set
QPSK(DSSS)	CH01	5180	TX level : default
	CH02	5210	
	CH03	5240	
	CH04	5736	
	CH05	5762	
	CH06	5814	

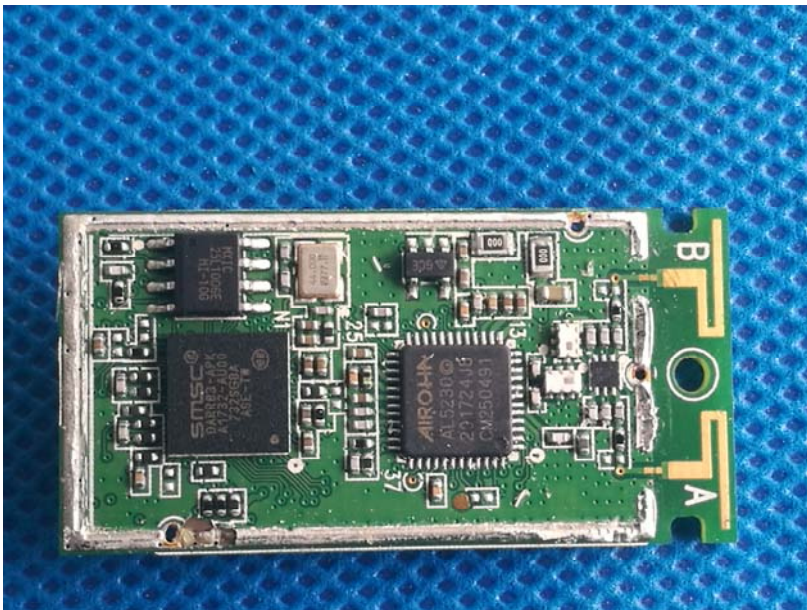
6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 28 2018	June 27 2019
4	Spectrum analyzer	Agilent	E4447A	GTS516	June 28 2018	June 27 2019
5	Spectrum Analyzer	Agilent	E4440A	GTS533	June 28 2018	June 27 2019
6	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 28 2018	June 27 2019
7	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2018	June 27 2019
8	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 28 2018	June 27 2019
9	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
10	Coaxial Cable	GTS	N/A	GTS213	June 28 2018	June 27 2019
11	Coaxial Cable	GTS	N/A	GTS211	June 28 2018	June 27 2019
12	Coaxial cable	GTS	N/A	GTS210	June 28 2018	June 27 2019
13	Coaxial Cable	GTS	N/A	GTS212	June 28 2018	June 27 2019
14	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 28 2018	June 27 2019
15	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 28 2018	June 27 2019
16	Amplifier (18-40GHz)	MITEQ	AMF-6F-18004000-29-8P	GTS534	June 28 2018	June 27 2019
17	Band filter	Amindeon	82346	GTS219	June 28 2018	June 27 2019
18	Constant temperature and humidity box	Oregon Scientific	BA-888	GTS248	June 28 2018	June 27 2019
19	D.C. Power Supply	Instek	PS-3030	GTS232	June 28 2018	June 27 2019
20	Universal radio communication tester	Rohde & Schwarz	CMU200	GTS235	June 28 2018	June 27 2019
21	Splitter	Agilent	11636B	GTS237	June 28 2018	June 27 2019
22	Power Meter	Anritsu	ML2495A	GTS540	June 28 2018	June 27 2019
23	Power Sensor	Anritsu	MA2411B	GTS541	June 28 2018	June 27 2019

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May 16 2014	May 15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June 28 2018	June 27 2019
3	Pulse Limiter	R&S	ESH3-Z2	GTS224	June 28 2018	June 27 2019
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 28 2018	June 27 2019
5	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June 28 2018	June 27 2019
6	Coaxial Cable	GTS	N/A	GTS227	June 28 2018	June 27 2019
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Thermo meter	KTJ	TA328	GTS233	June 28 2018	June 27 2019

7 Test results and Measurement Data

7.1 Antenna requirement

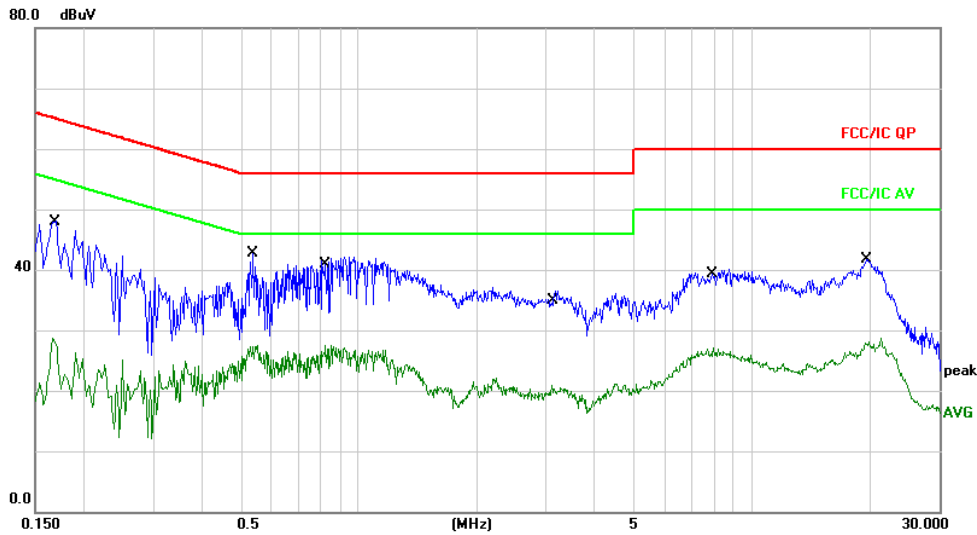
Standard requirement:	FCC Part15 C Section 15.203
<p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique 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 antenna A and antenna B is PCB antenna, the best case gain of the antenna is 0dBi.</p> 	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Test Frequency Range:	150KHz to 30MHz														
Class / Severity:	Class B														
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto														
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBuV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>* Decreases with the logarithm of the frequency.</p>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test setup:	<p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p>														
Test 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 Instruments:	Refer to section 6.0 for details														
Test mode:	Refer to section 5.2 for details														
Test results:	Pass														

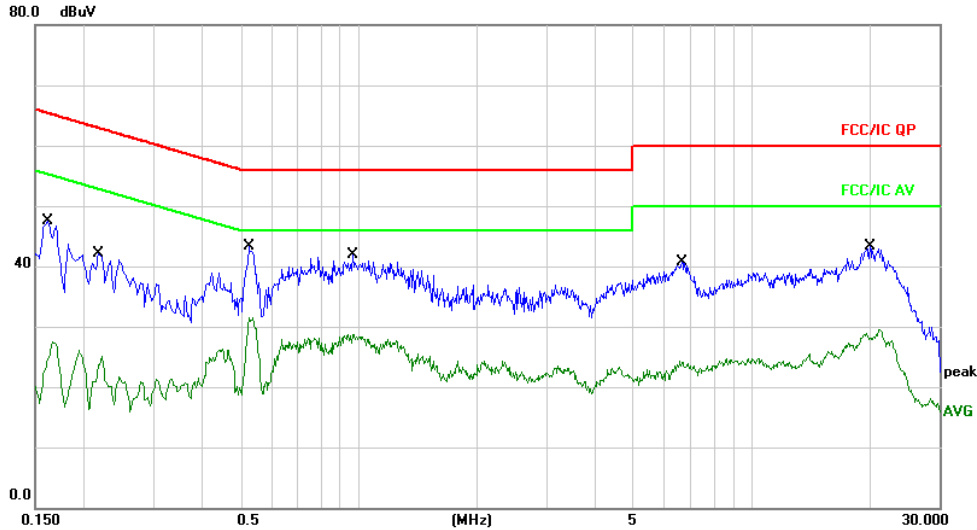
Measurement data

Line:



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit		Over dB	Detector	Comment
					dBuV	dB			
1	0.1660	38.38	9.66	48.04	65.15	-17.11	QP		
2	0.1660	19.03	9.66	28.69	55.15	-26.46	AVG		
3 *	0.5380	32.95	9.68	42.63	56.00	-13.37	QP		
4	0.5380	17.85	9.68	27.53	46.00	-18.47	AVG		
5	0.8260	32.44	9.69	42.13	56.00	-13.87	QP		
6	0.8260	17.88	9.69	27.57	46.00	-18.43	AVG		
7	3.1020	26.75	9.72	36.47	56.00	-19.53	QP		
8	3.1020	11.16	9.72	20.88	46.00	-25.12	AVG		
9	7.9940	30.32	9.81	40.13	60.00	-19.87	QP		
10	7.9940	17.24	9.81	27.05	50.00	-22.95	AVG		
11	19.5780	31.94	9.85	41.79	60.00	-18.21	QP		
12	19.5780	18.80	9.85	28.65	50.00	-21.35	AVG		

Neutral:

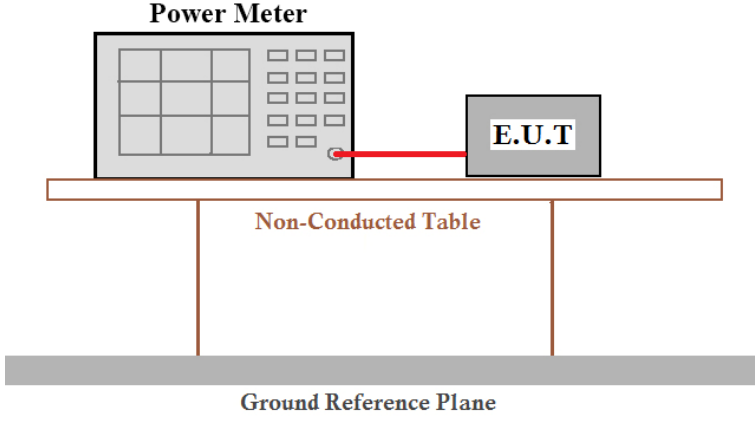


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.1620	37.84	9.67	47.51	65.36	-17.85	QP	
2		0.1620	17.81	9.67	27.48	55.36	-27.88	AVG	
3		0.2180	32.46	9.65	42.11	62.89	-20.78	QP	
4		0.2180	15.35	9.65	25.00	52.89	-27.89	AVG	
5	*	0.5260	33.54	9.68	43.22	56.00	-12.78	QP	
6		0.5260	21.88	9.68	31.56	46.00	-14.44	AVG	
7		0.9660	32.28	9.69	41.97	56.00	-14.03	QP	
8		0.9660	19.11	9.69	28.80	46.00	-17.20	AVG	
9		6.5740	30.98	9.79	40.77	60.00	-19.23	QP	
10		6.5740	14.58	9.79	24.37	50.00	-25.63	AVG	
11		19.9700	33.42	9.84	43.26	60.00	-16.74	QP	
12		19.9700	19.59	9.84	29.43	50.00	-20.57	AVG	

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

7.3 Conducted Peak Output Power

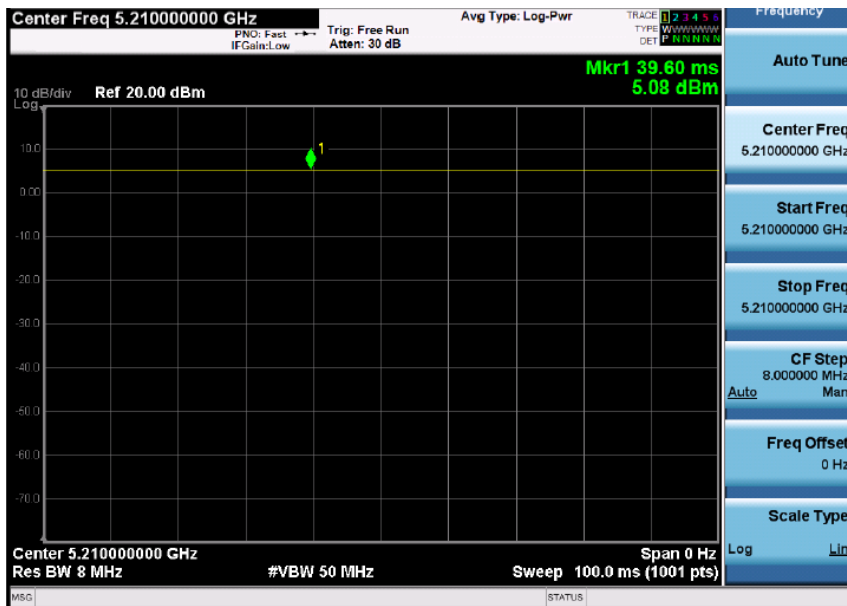
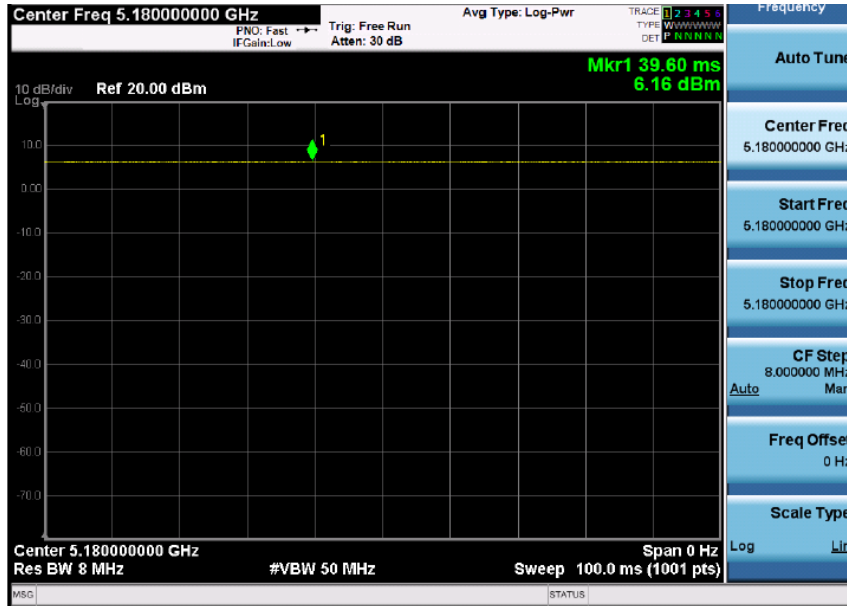
Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	For 5150~5250MHz, the limit= 250 mW(24dBm) For 5725~5825MHz, the limit= 1W(30dBm)
Test setup:	 <p>The diagram illustrates the test setup. A Power Meter is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

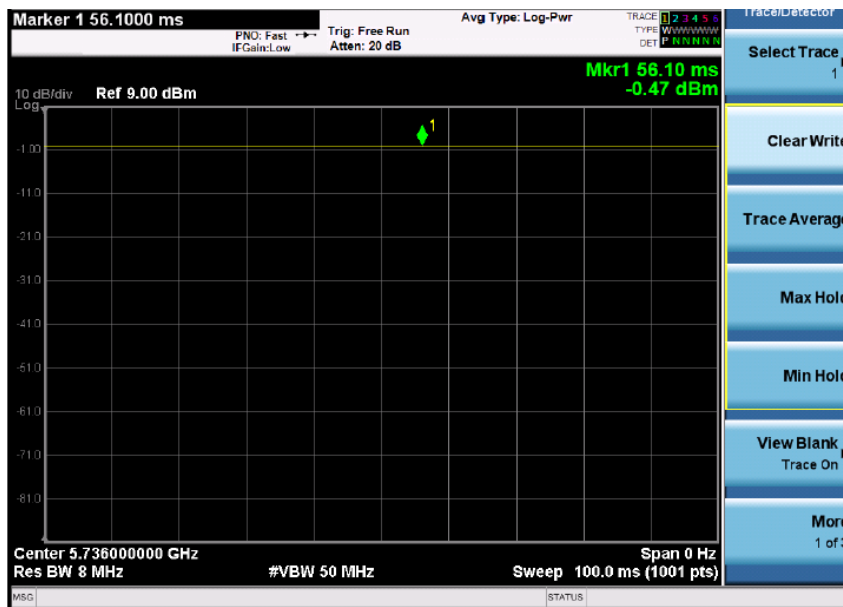
Measurement Data

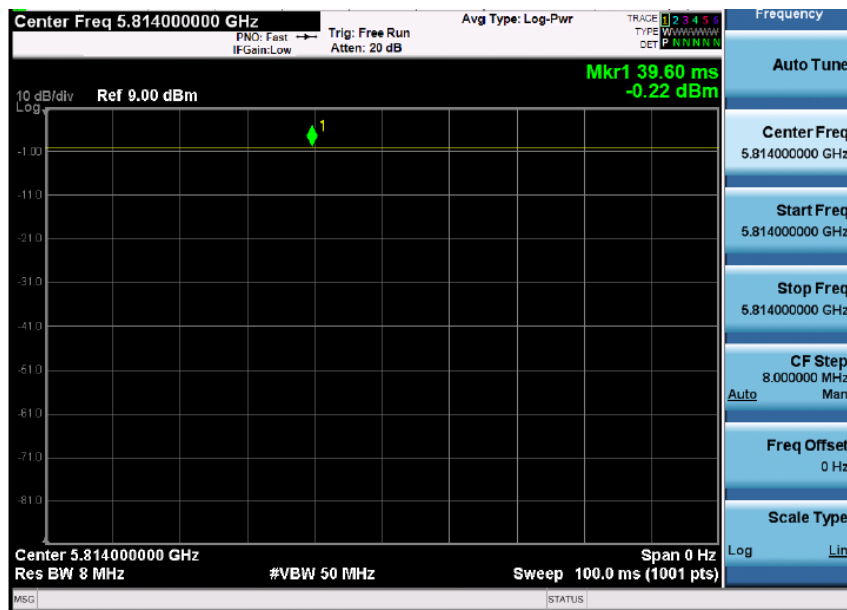
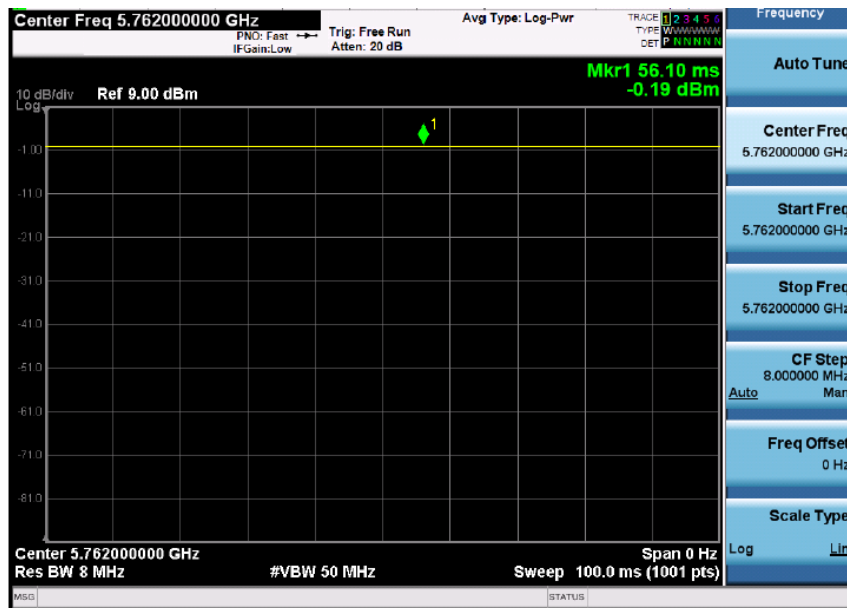
Test CH (MHz)	Peak Output Power (dBm)			Limit (dBm)	Result
	ANT A (dBm)	ANT B (dBm)	Total power (dBm)		
5180	1.98	2.52	4.50	24	Pass
5210	1.86	2.43	4.29	24	
5240	1.94	2.67	4.61	24	
5736	-5.61	-6.19	-2.88	30	
5762	-5.38	-6.56	-2.92	30	
5814	-5.95	-6.42	-3.17	30	

Note: During the test the EUT is in 100% duty cycle transmitting.

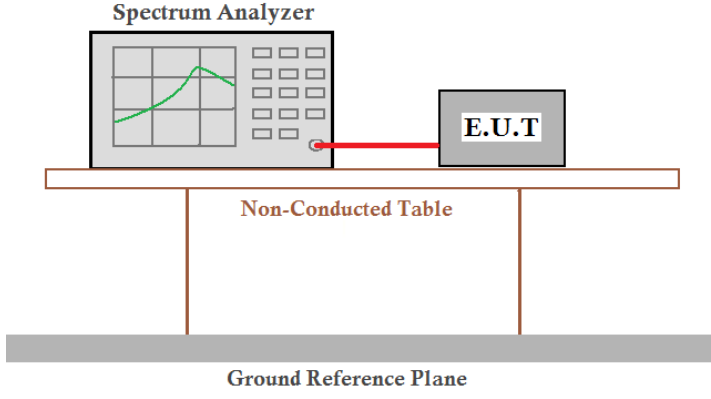
Test plot of Duty cycle







7.4 Channel Bandwidth

Test Requirement:	FCC Part15 E Section 15.407(e)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	>500KHz
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by two legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Measurement Data

Frequency (MHz)	Channel Bandwidth (MHz)				Limit (KHz)	Result
	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	26dB Bandwidth (MHz)	99% Bandwidth (MHz)		
	ANT A	ANT A	ANT B	ANT B		
5180	16.28	15.078	15.08	15.073	>500	Pass
5210	16.28	15.078	15.08	15.068		
5240	16.29	15.088	15.09	15.078		

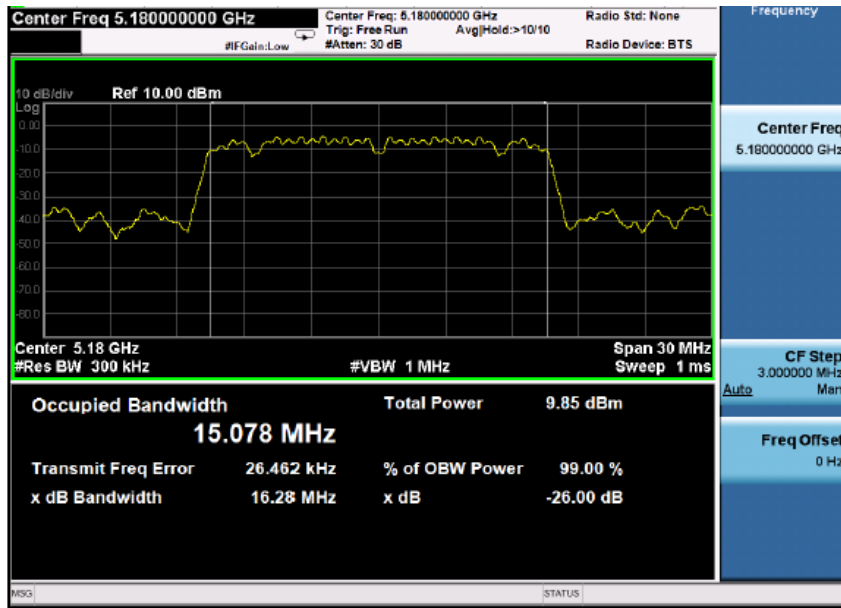
Frequency (MHz)	Channel Bandwidth (MHz)				Limit (KHz)	Result
	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)		
	ANT A	ANT A	ANT B	ANT B		
5736	9.842	13.835	9.841	13.837	>500	Pass
5762	9.841	13.841	9.843	13.833		
5814	9.841	13.833	9.841	13.832		

Frequency (MHz)	Channel Bandwidth (MHz)		Limit (KHz)	Result
	26dB Bandwidth(MHz)	26dB Bandwidth(MHz)		
	ANT A	ANT B		
5736	14.25	14.25	>500	Pass
5762	14.62	14.62		
5814	14.28	14.28		

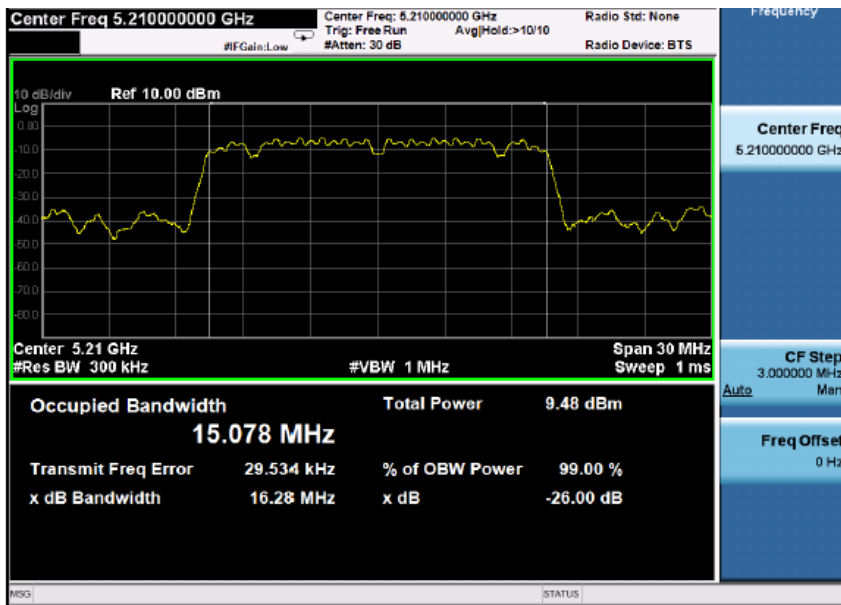
Test plot as follows:

5150~5250MHz

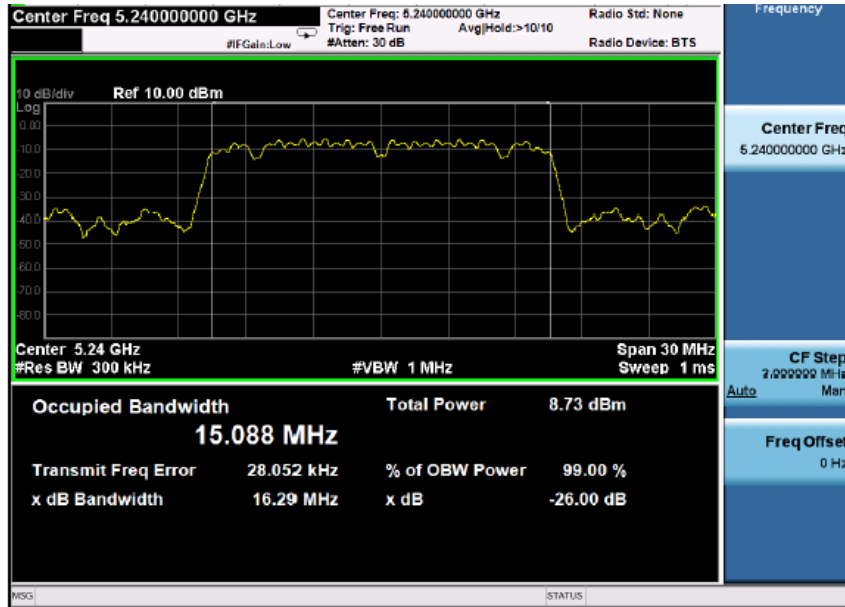
5180-Antenna A



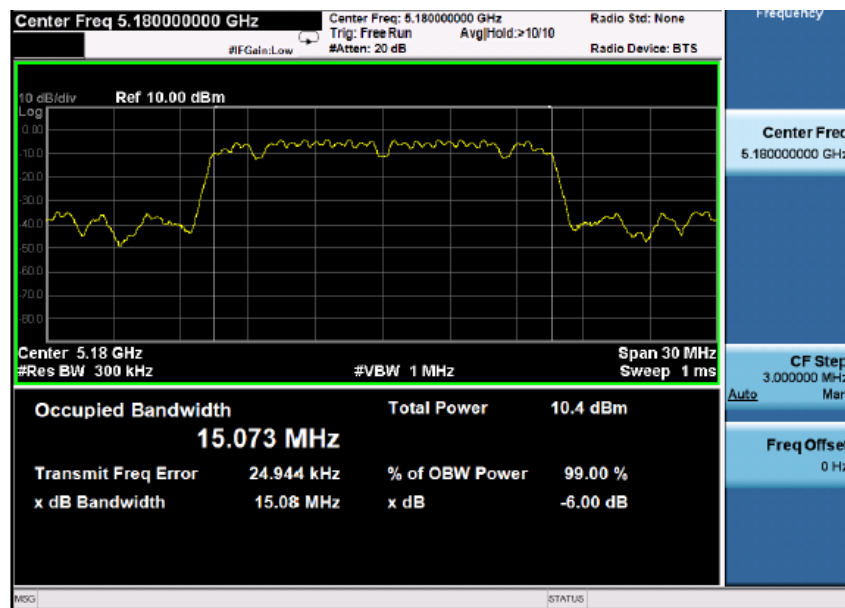
5210-Antenna A



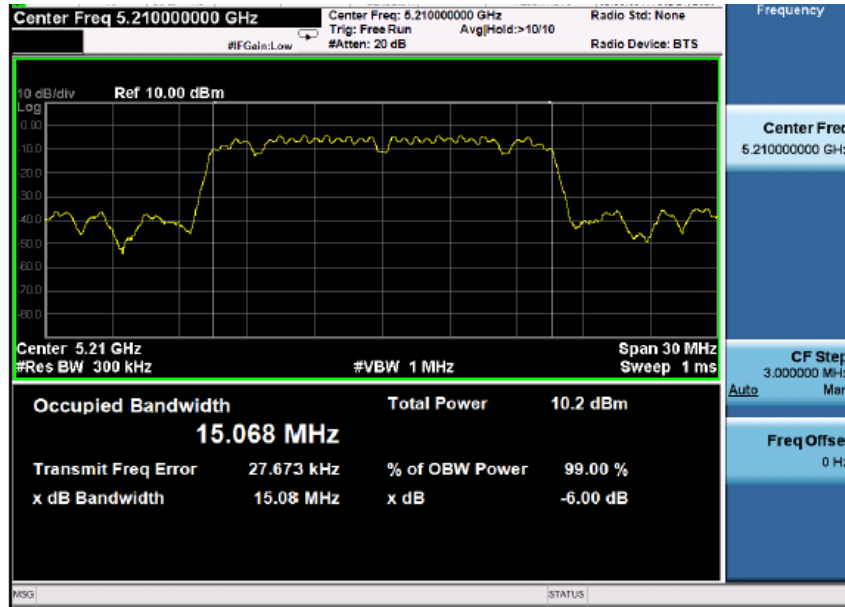
5240-Antenna A



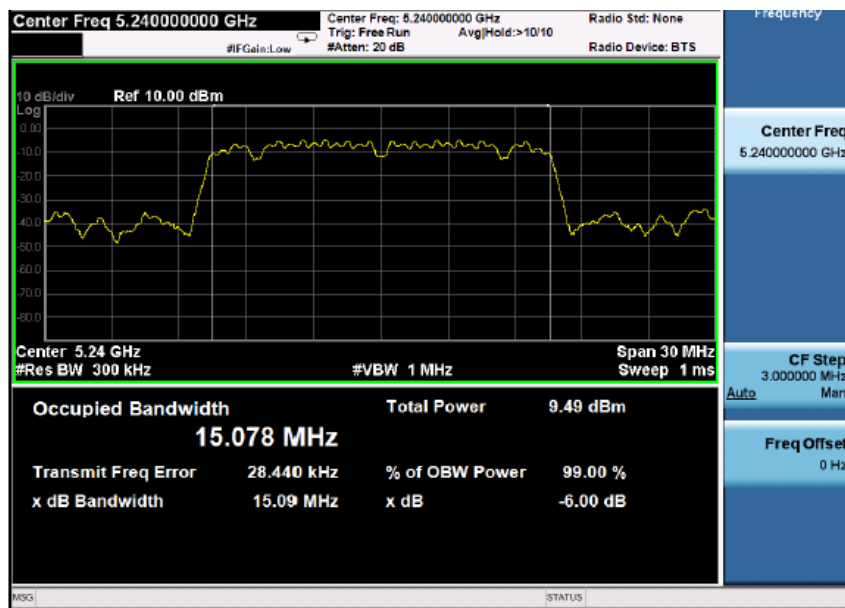
5180-Antenna B



5210-Antenna B



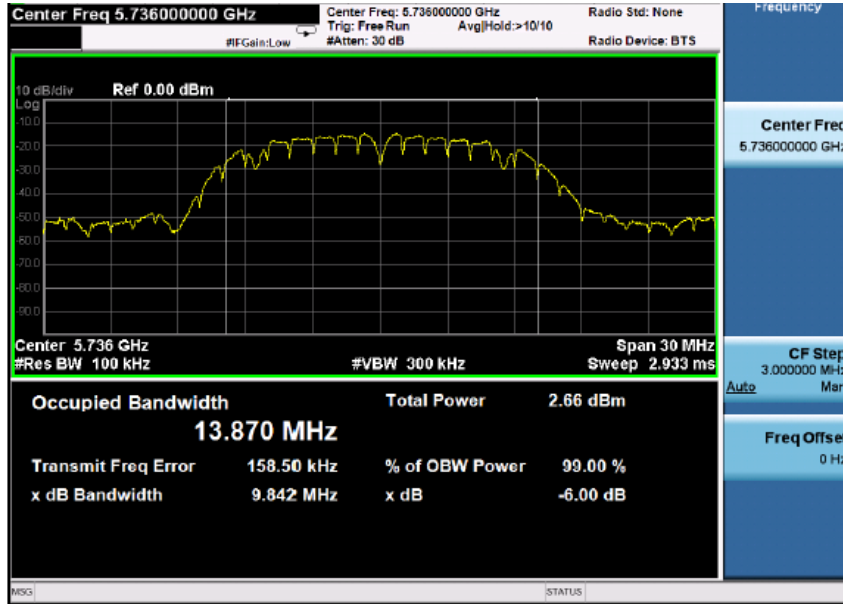
5240-Antenna B



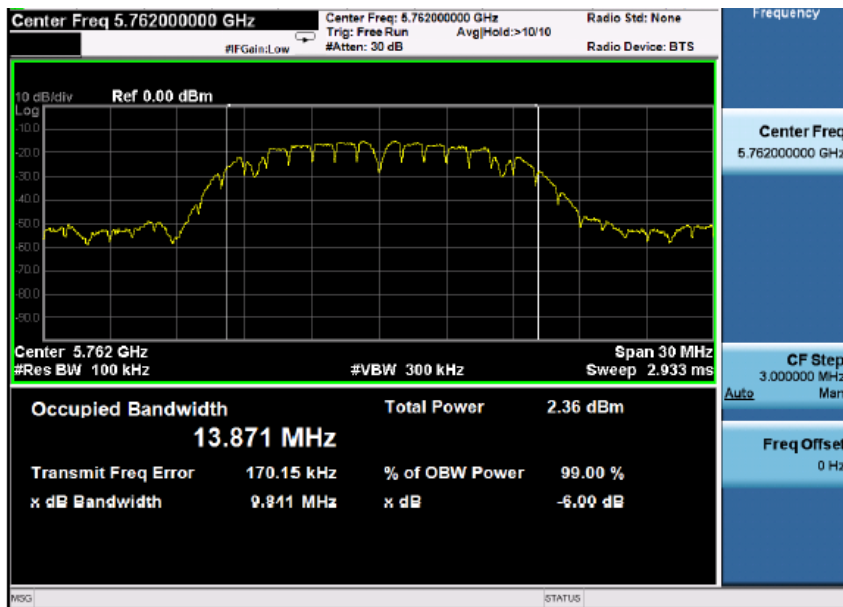
5725~5850MHz

-6dB Bandwidth

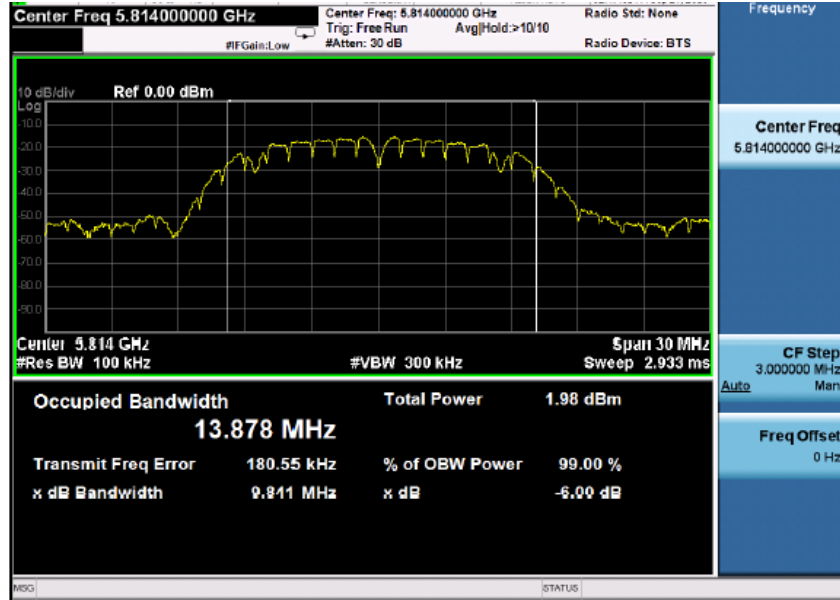
5736-Antenna A



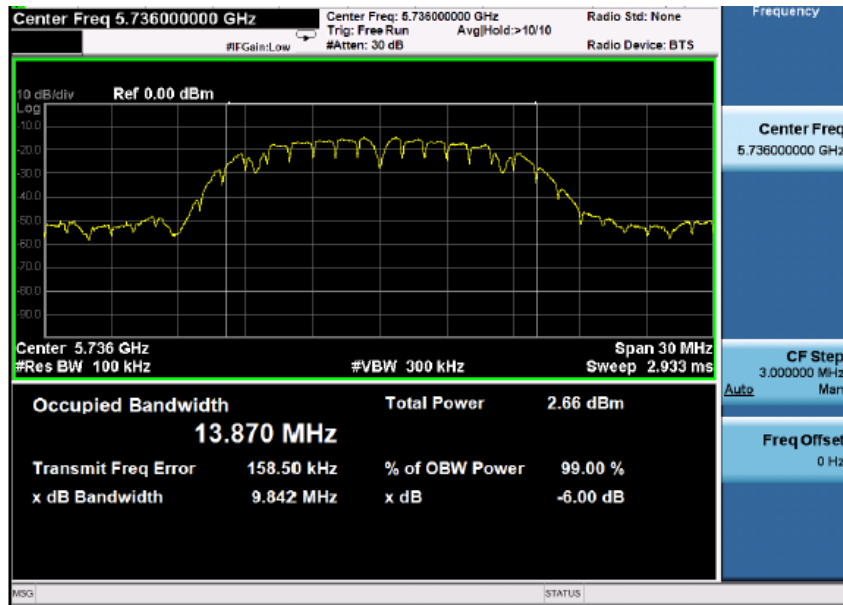
5762-Antenna A



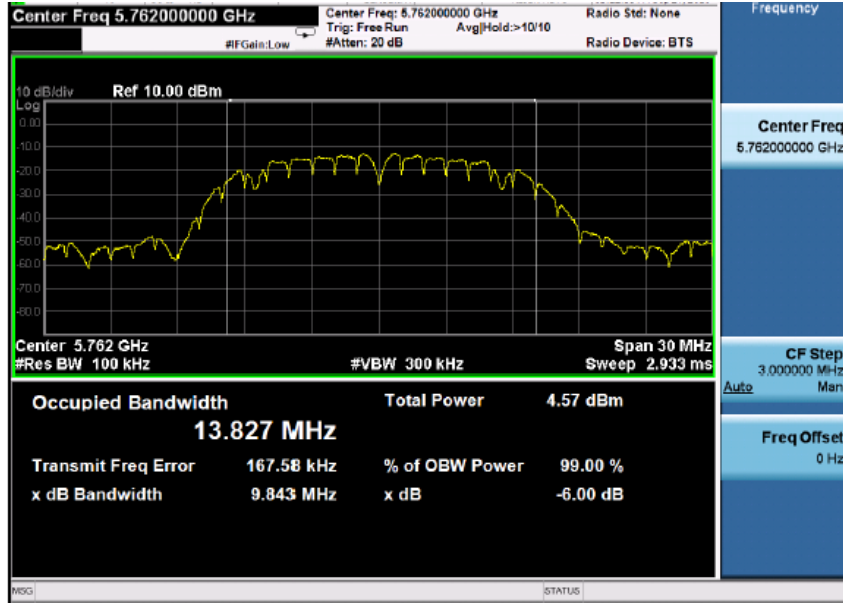
5814-Antenna A



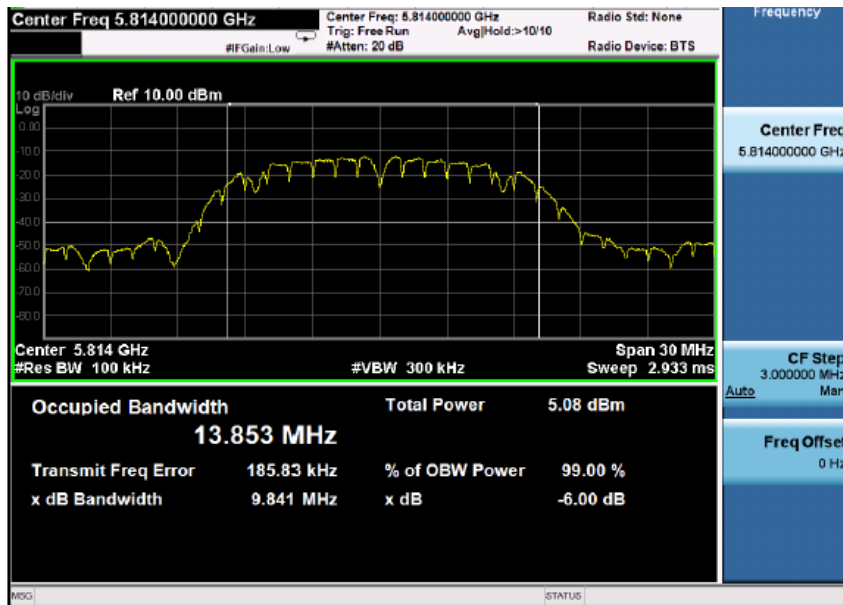
5736-Antenna B



5762-Antenna B

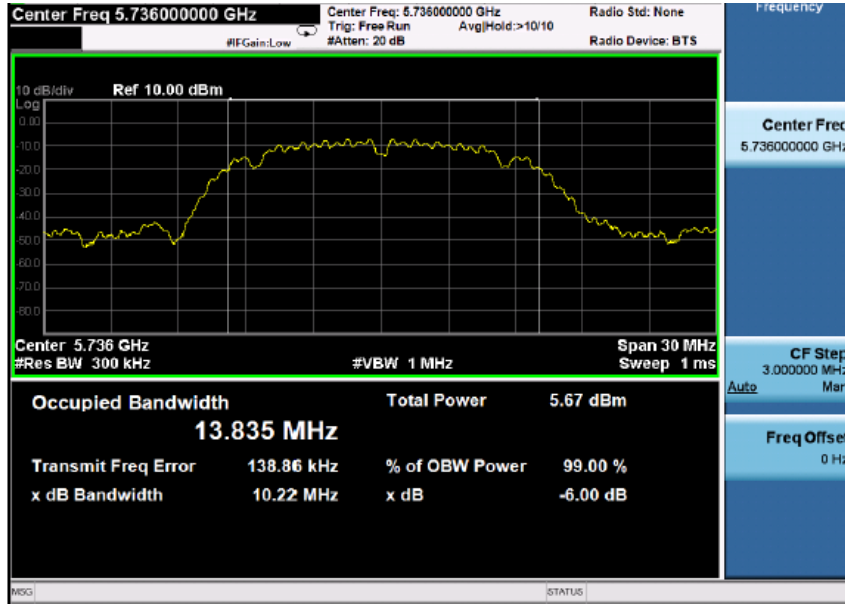


5814-Antenna B

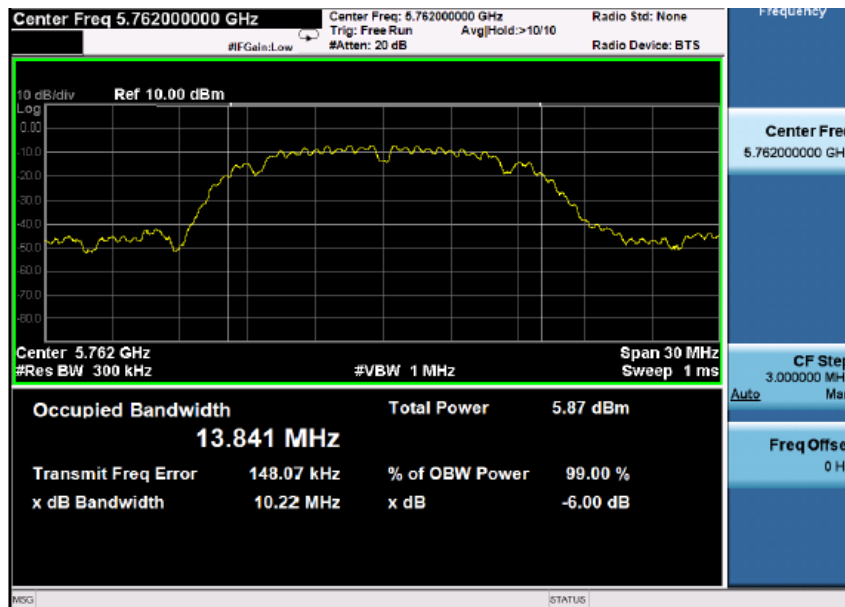


5725~5825MHz	99% Bandwidth
--------------	---------------

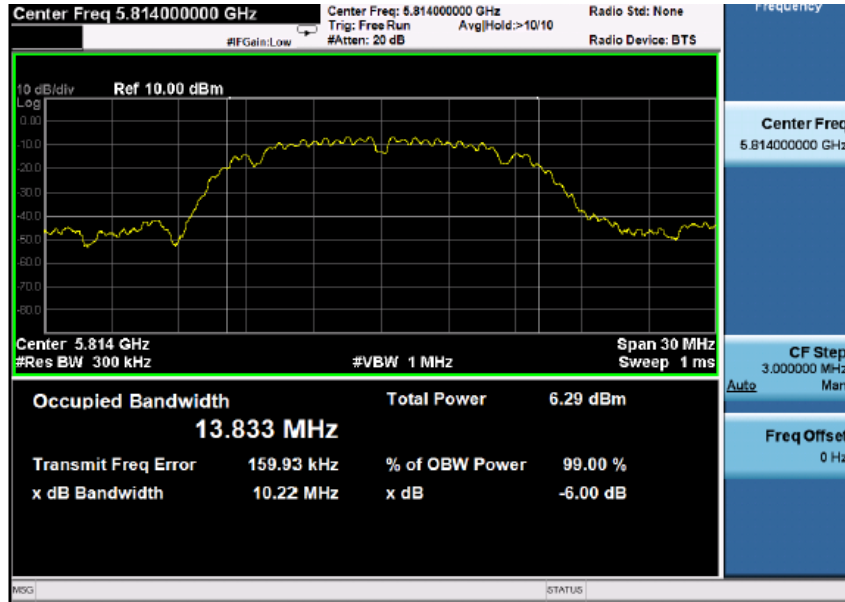
5736-Antenna A



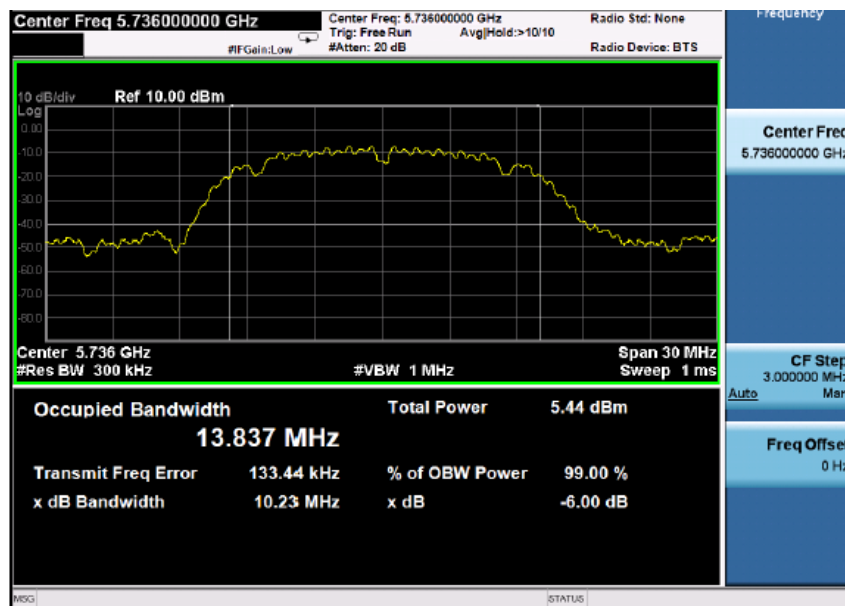
5762-Antenna A



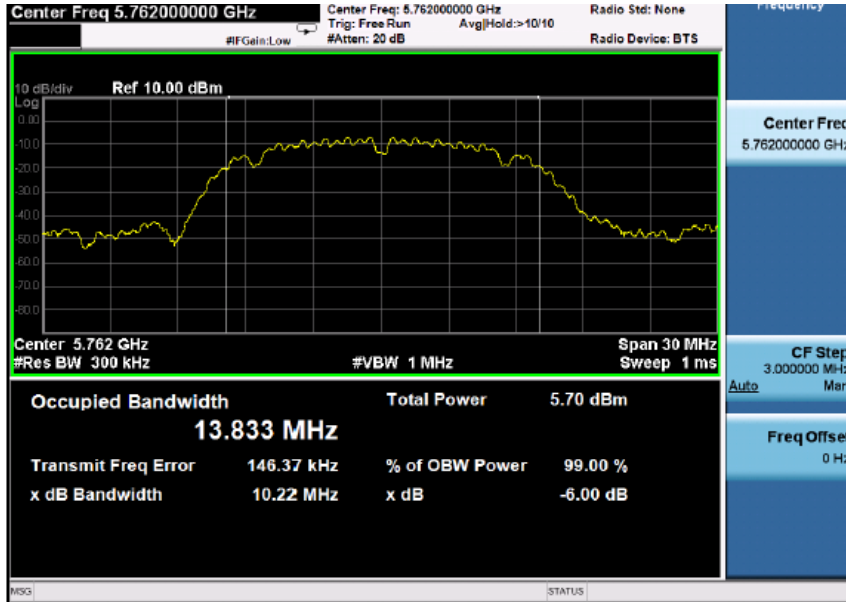
5814-Antenna A



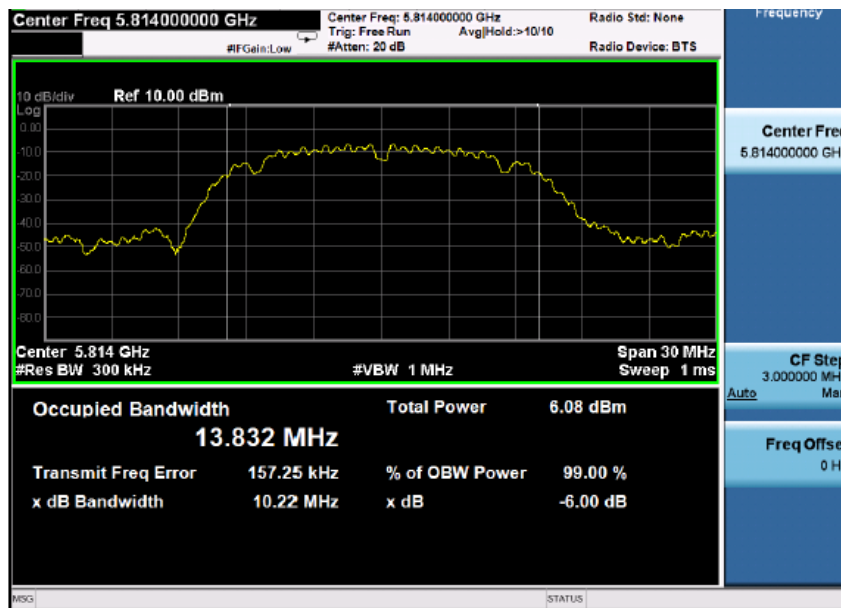
5736-Antenna B



5762-Antenna B

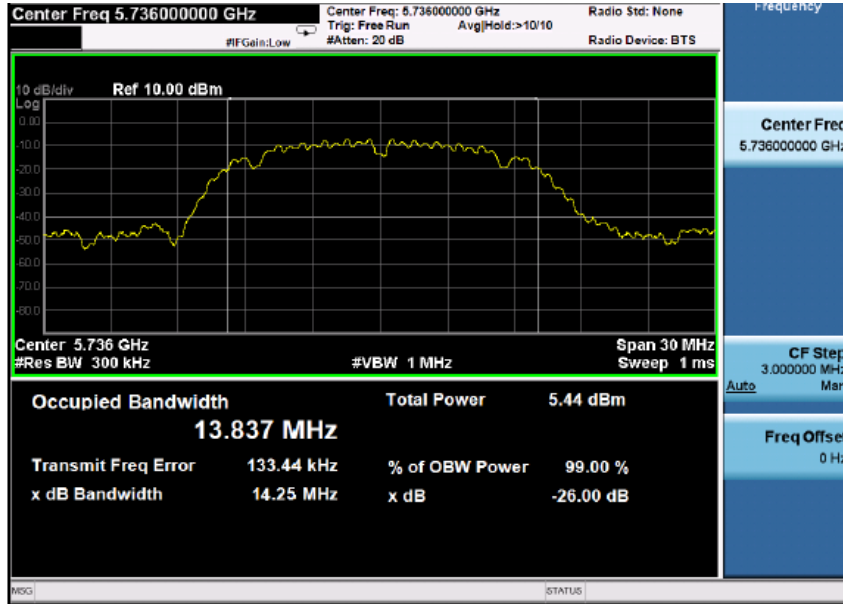


5814-Antenna B

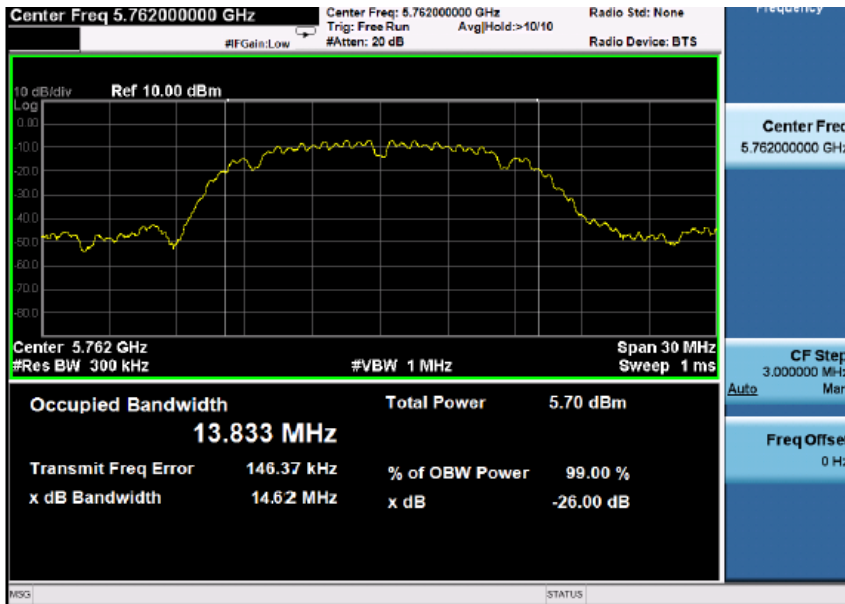


5725~5850MHz	-26dB Bandwidth
--------------	-----------------

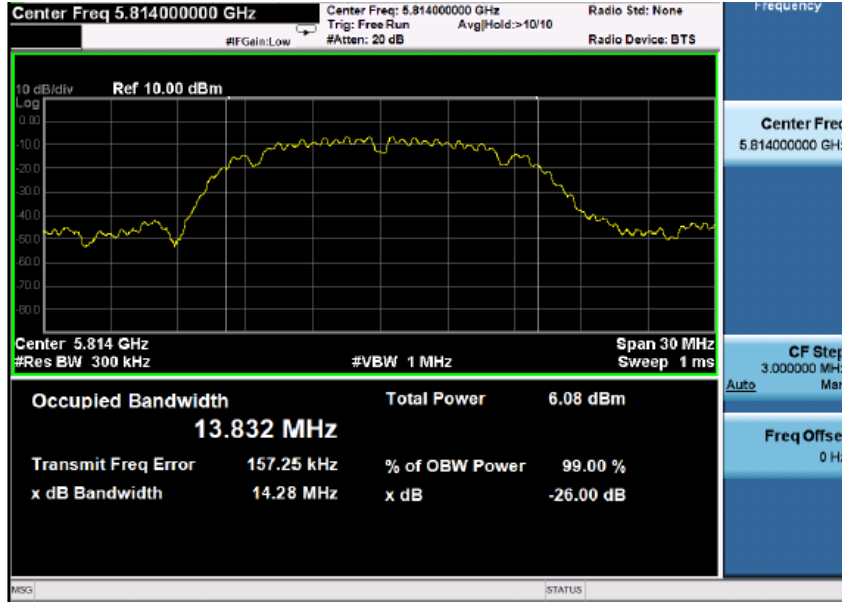
5736-Antenna A



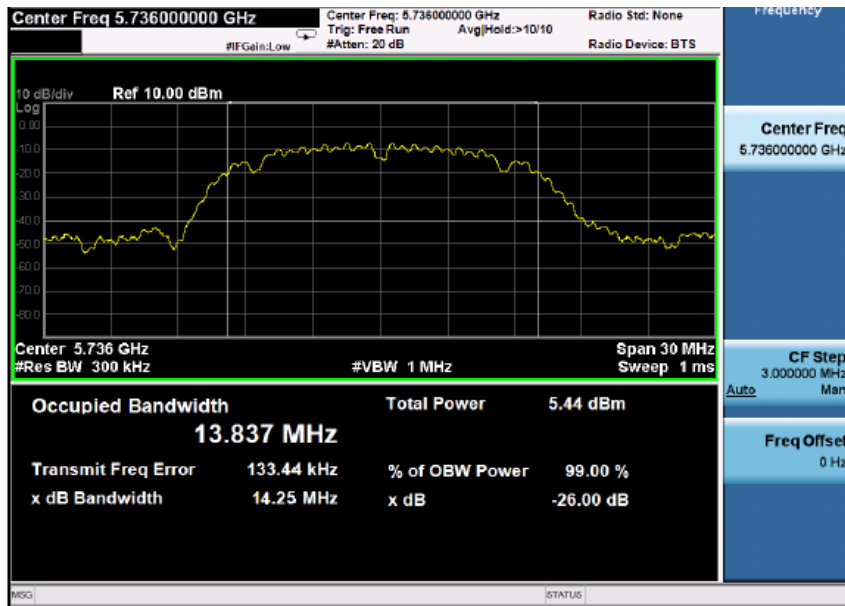
5762-Antenna A



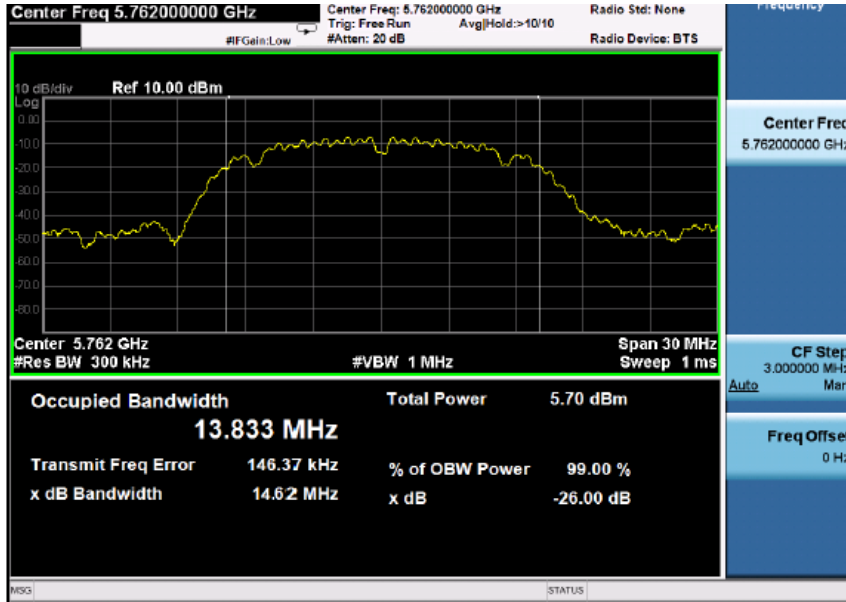
5814-Antenna A



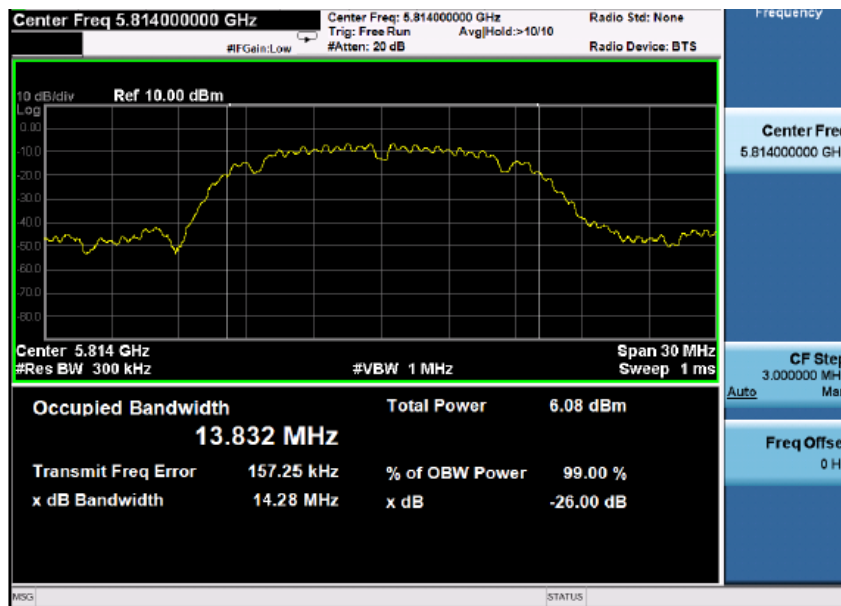
5736-Antenna B



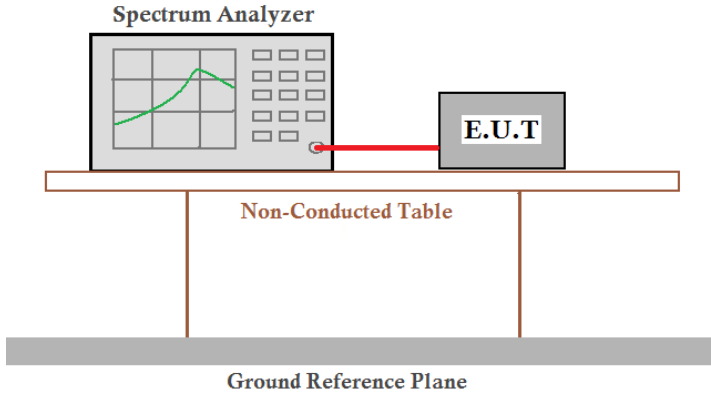
5762-Antenna B



5814-Antenna B



7.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407(a)(3)
Test Method:	KDB 789033 D02 General U-NII Test Procedures New Rules v02r01
Limit:	For 5150~5250MHz, the limit= 11 dBm/MHz For 5725~5825MHz, the limit= 30 dBm/500KHz
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

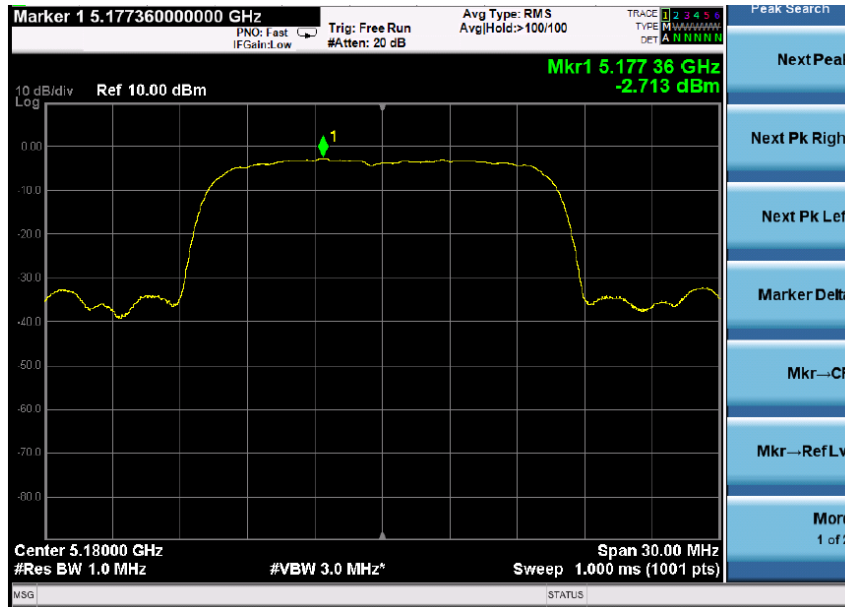
Frequency	Power Density ANT A	Power Density ANT B	Total power	Directional gain	e.i.r.p Spectral Density	Limit
(MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBi)	(dBm/MHz)	(dBm/MHz)
5180	-2.713	-2.305	0.51	3	3.51	11
5210	-2.694	-2.304	0.52	3	3.52	
5240	-4.069	-2.514	-0.21	3	2.79	

Frequency	Power Density ANT A	Power Density ANT B	Total power	Limit
(MHz)	(dBm/500kHz)	(dBm/500kHz)	(dBm/500kHz)	(dBm/500KHz)
5736	-9.053	-6.648	-4.68	30
5762	-9.332	-6.649	-4.78	
5814	-9.628	-5.643	-4.18	

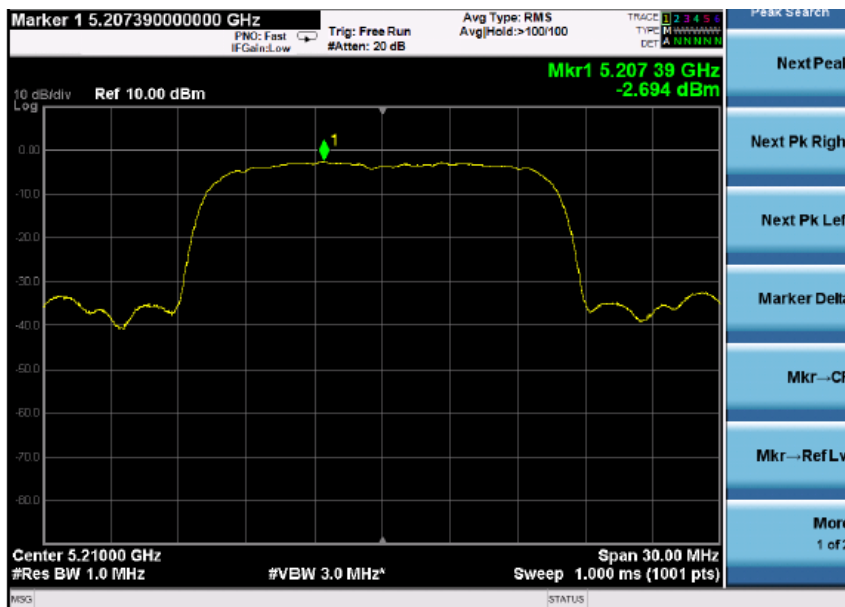
Test plot as follows:

5150~5250MHz

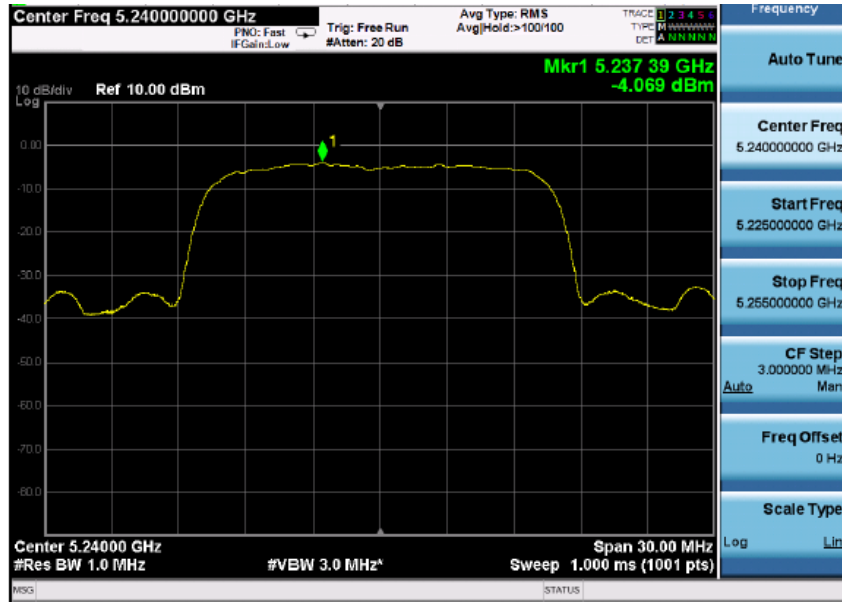
5180-Antenna A



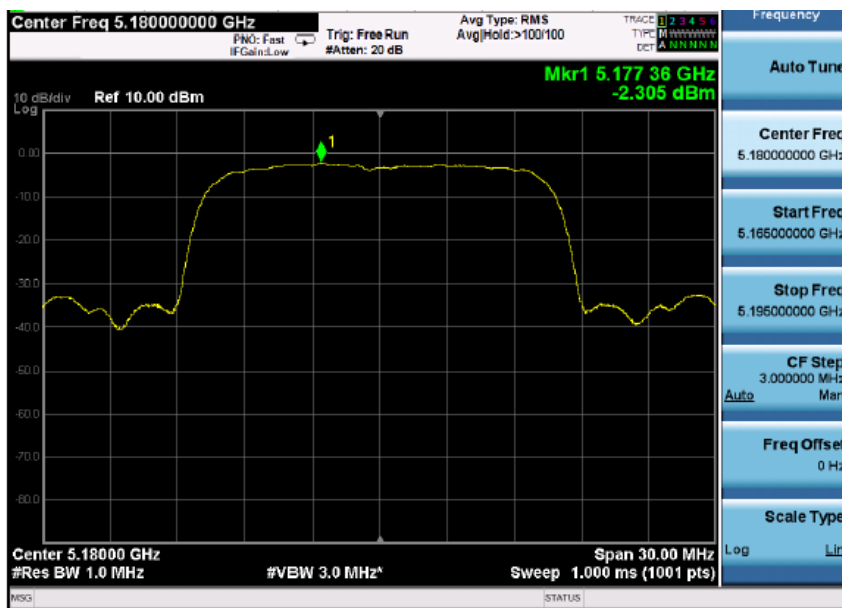
5210-Antenna A



5240-Antenna A



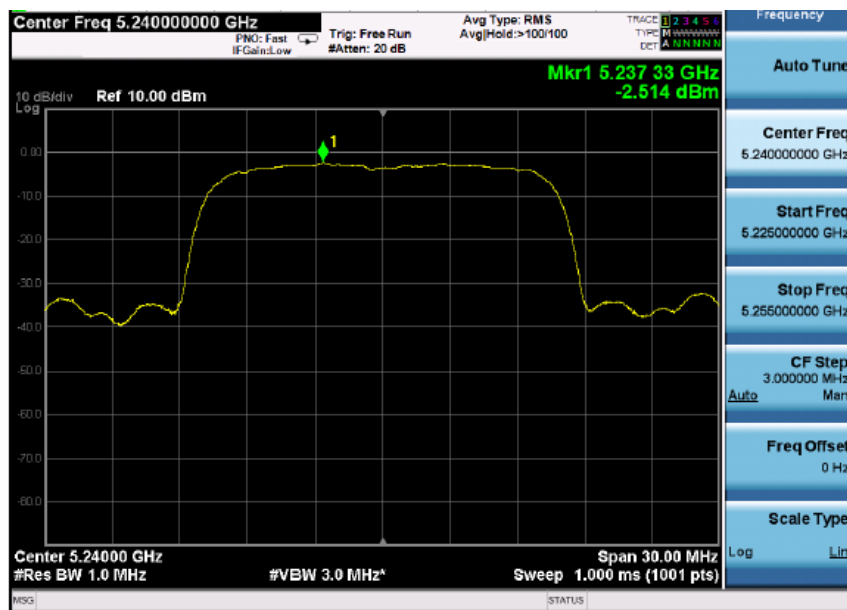
5180-Antenna B



5210-Antenna B



5240-Antenna B

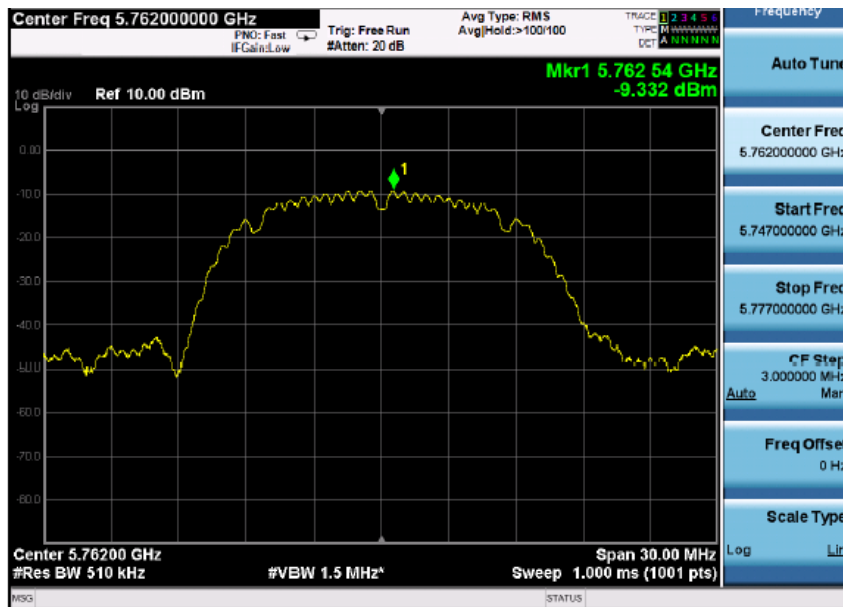


5725~5825MHz

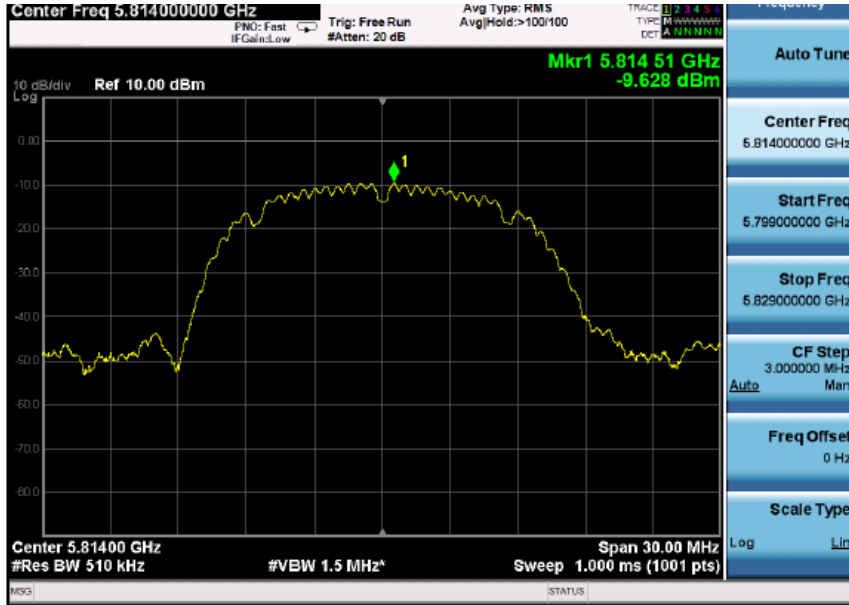
5736-Antenna A



5762-Antenna A



5814-Antenna A



5736-Antenna B



7.6 Band edges

7.6.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013				
Test Frequency Range:	9kHz to 40GHz, only worse case is reported				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Value
	Above 1GHz	Peak RMS	1MHz 1MHz	3MHz 3MHz	Peak RMS
Limit:	All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.				
Test setup:					
Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 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, quasi- 				

	<p>peak or average method as specified and then reported in a data sheet.</p> <p>7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.</p>
Test Procedure(conducted):	<p>1. The EUT was directly connected to the Spectrum, the power level was set to the maximum level.</p> <p>2. Set the RBW = 1MHz.</p> <p>3. Set the VBW ≥ 3MHz</p> <p>4. Number of points in sweep ≥ 2 × span / RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)</p> <p>5. Manually set sweep time ≥ 10 × (number of points in sweep) × (total on/off period of the transmitted signal).</p> <p>6. Set detector = power averaging (rms).</p> <p>7. Sweep time = auto couple.</p> <p>8. Trace mode = max hold.</p> <p>9. Allow trace to fully stabilize.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

1. *Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
3. *Two antennas are tested, only the worst case's (Main Antenna) data was showed.*
4. *The pre-test were performed on lowest, middle and highest frequencies, only the worst case's (lowest and highest frequencies) data was showed.*
5. *According to KDB 789033 D02v02r01 section G) 1) d), for measurements above 1000 MHz @3m distance, the limit of field strength is computed as follows:*

$$E[\text{dBuV/m}] = \text{EIRP}[\text{dBm}] + 95.2;$$
For example, if EIRP = -27dBm

$$E[\text{dBuV/m}] = -27 + 95.2 = 68.2\text{dBuV/m.}$$

$$E[\text{dBuV/m}] = 10 + 95.2 = 105.2\text{dBuV/m.}$$

$$E[\text{dBuV/m}] = 15.6 + 95.2 = 111.1\text{dBuV/m.}$$

$$E[\text{dBuV/m}] = 27 + 95.2 = 122.2\text{dBuV/m}$$

Measurement data:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	EIRP (dBm)	Limit (dBm)	Result
5.2G								
5150	49.85	32.53	9.83	35.86	56.35	-38.85	-27.00	Pass
5350	48.72	32.70	9.99	36.05	55.36	-39.84	-27.00	Pass
5.8G								
5650.00	45.56	32.72	9.99	36.07	52.20	-43.00	-27.00	Pass
5700.00	46.73	32.74	10.04	36.09	53.42	-41.78	10.00	Pass
5720.00	46.82	32.80	10.11	36.18	53.55	-41.65	15.60	Pass
5725.00	49.46	32.53	9.83	35.86	55.96	-39.24	27.00	Pass
5736.00	49.11	32.70	9.99	36.05	55.75	-39.45	27.00	Pass
5850.00	46.52	32.70	9.99	36.05	53.16	-42.04	27.00	Pass
5855.00	45.48	32.72	9.99	36.07	52.12	-43.08	15.60	Pass
5875.00	46.17	32.74	10.04	36.09	52.86	-42.34	10.00	Pass
5925.00	47.09	32.80	10.11	36.18	53.82	-41.38	-27.00	Pass

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

For conducted test:

5.2G

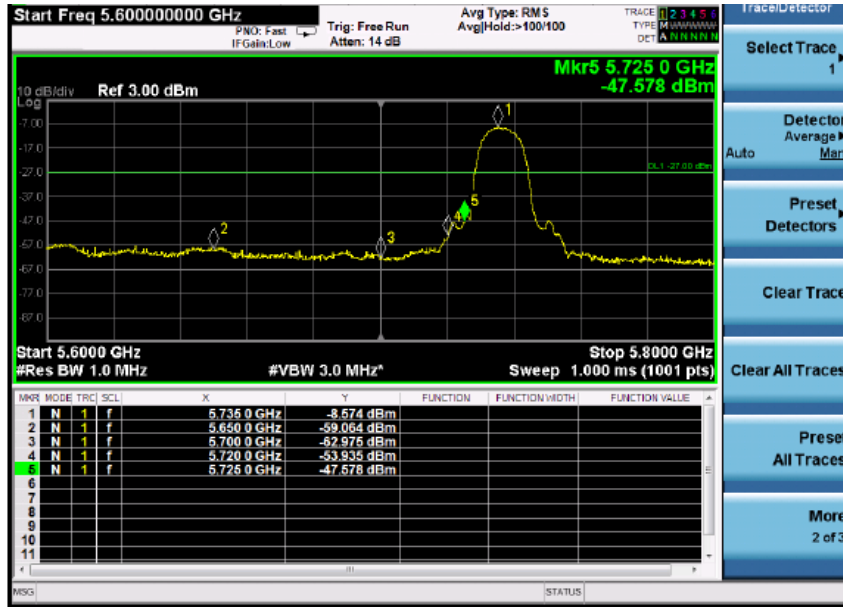
Band edge, Left Side



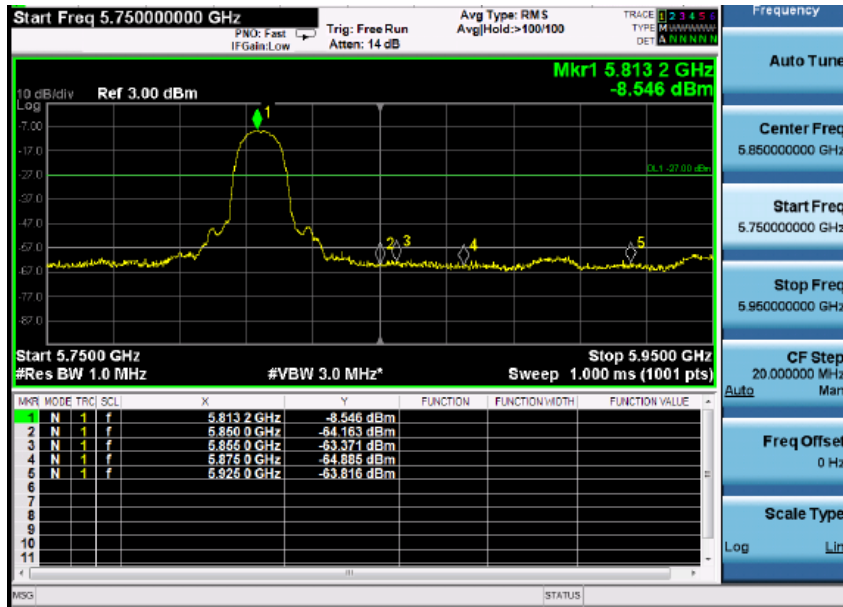
Band edge, Right Side



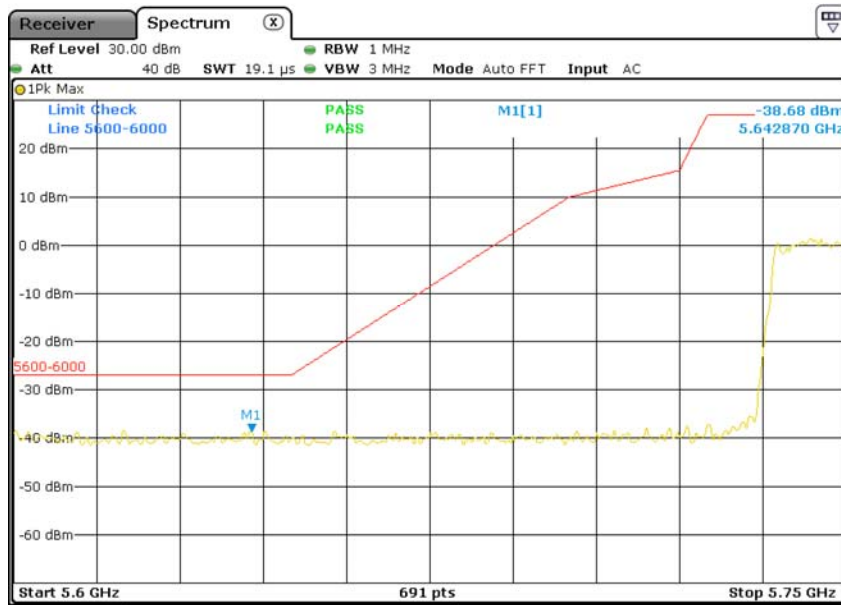
5.8G Band edge, Left Side



Band edge, Right Side

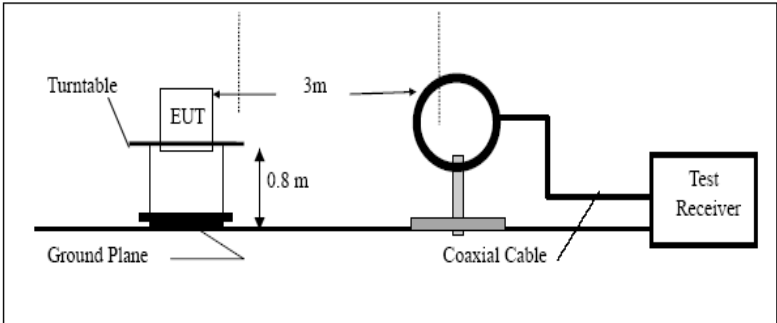


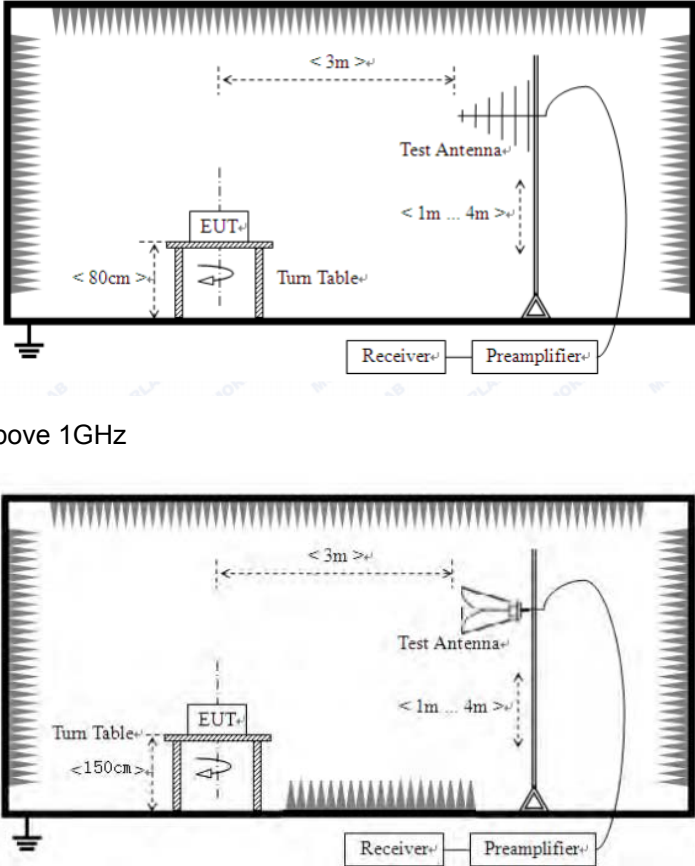
NOTE: EIRP BAND EDGE= Reading Level + antenna gain



7.7 Spurious Emission

7.7.1 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209, Part 15E Section 15.407(b)(4)			
Test Method:	ANSI C63.10:2013			
Test Frequency Range:	9kHz to 40GHz			
Test site:	Measurement Distance: 3m			
Receiver setup:	Frequency	Detector	RBW	VBW
	30MHz-1GHz	Quasi-peak	120KHz	300KHz
	Above 1GHz	Peak	1MHz	3MHz
		Peak	1MHz	3MHz
Value	Quasi-peak Value			
	Peak Value			
	RMS Value			
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance
	0.009MHz-0.490MHz	2400/F(KHz)	QP	300m
	0.490MHz-1.705MHz	24000/F(KHz)	QP	300m
	1.705MHz-30MHz	30	QP	30m
	30MHz-88MHz	100	QP	3m
	88MHz-216MHz	150	QP	
	216MHz-960MHz	200	QP	
	960MHz-1GHz	500	QP	
	Frequency	Limit (dBm/MHz)	Remark	
Above 1GHz	-27.0	Peak Value		
Test setup:	Below 30MHz			
				
	Below 1GHz			

	 <p>Above 1GHz</p>
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) 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, quasi-peak or

	average method as specified and then reported in a data sheet. 7. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Two antennas are tested, only the worst case's (Main Antenna) data was showed.

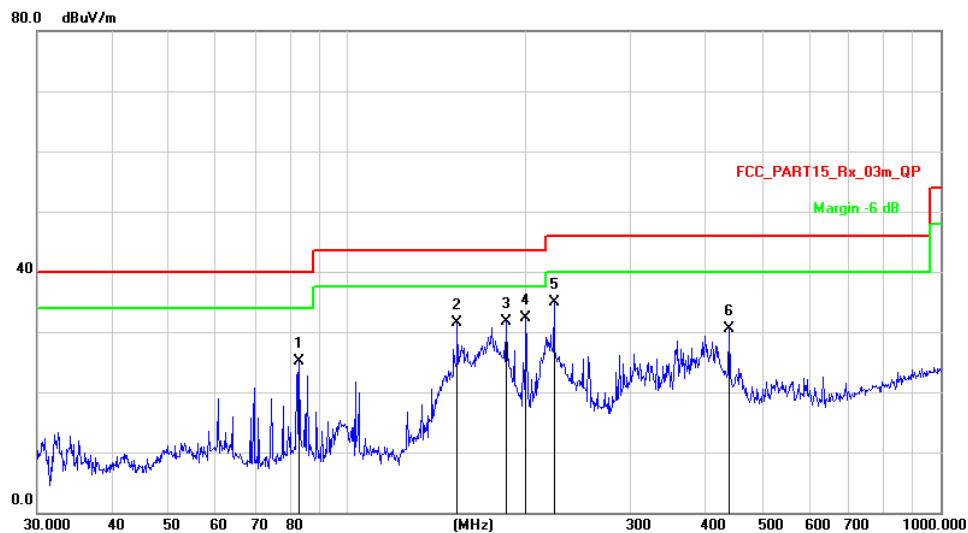
Measurement Data

■ 9kHz~30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

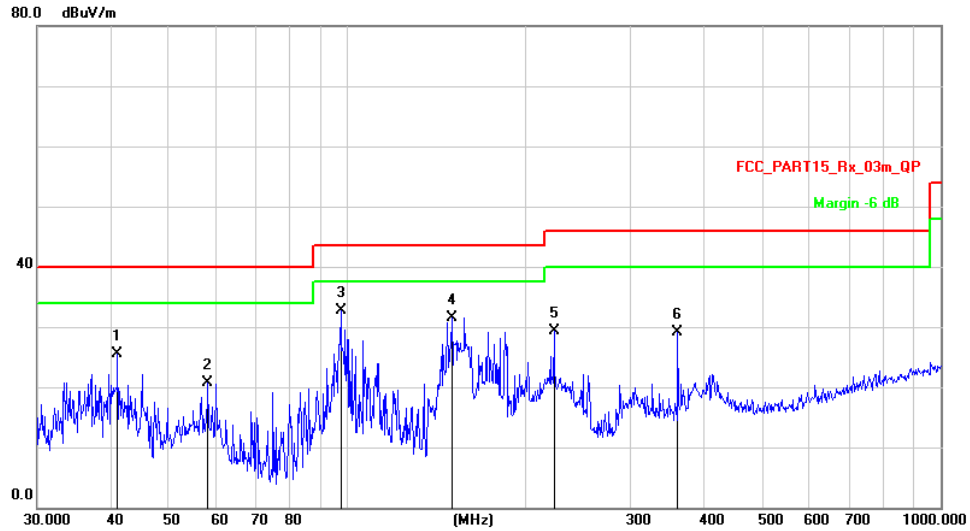
■ Below 1GHz

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB	dBuV/m	dB/m	dB	
1		82.9385	45.26	-20.11	25.15	40.00	-14.85	QP
2		153.2004	50.96	-19.45	31.51	43.50	-11.99	QP
3		185.1379	48.93	-17.25	31.68	43.50	-11.82	QP
4	*	199.9856	48.00	-15.63	32.37	43.50	-11.13	QP
5		222.9502	49.97	-15.13	34.84	46.00	-11.16	QP
6		440.1963	39.03	-8.55	30.48	46.00	-15.52	QP

Vertical:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		40.9881	41.01	-15.45	25.56	40.00	-14.44	QP
2		58.2030	36.78	-15.99	20.79	40.00	-19.21	QP
3	*	97.4560	49.72	-17.06	32.66	43.50	-10.84	QP
4		150.0108	51.14	-19.64	31.50	43.50	-12.00	QP
5		222.9502	44.42	-15.13	29.29	46.00	-16.71	QP
6		360.4476	39.42	-10.40	29.02	46.00	-16.98	QP

■ Above 1GHz

Test channel:5180MHz							
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit (dB)	Detector
V	10360	23.96	21.64	44.17	54(Note3)	-9.83	PK
V	15540	24.43	21.80	44.96	54(Note3)	-9.04	PK
H	10360	24.28	21.83	45.37	54(Note3)	-8.63	PK
H	15540	23.11	21.67	44.08	54(Note3)	-9.92	PK

■

Test channel:5210MHz							
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit (dB)	Detector
V	10420	22.35	21.64	42.71	54(Note3)	-11.29	PK
V	15630	22.12	21.80	43.47	54(Note3)	-10.53	PK
H	10420	22.72	21.83	43.53	54(Note3)	-10.47	PK
H	15630	24.81	21.67	44.88	54(Note3)	-9.12	PK

■

Test channel:5240MHz							
Antenna Pol.	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dBuV/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over limit (dB)	Detector
V	10480	23.45	21.64	44.37	54(Note3)	-9.63	PK
V	15720	23.63	21.80	44.23	54(Note3)	-9.77	PK
H	10480	22.47	21.83	43.24	54(Note3)	-10.76	PK
H	15720	23.87	21.67	43.85	54(Note3)	-10.15	PK

7.8 Frequency stability

Test Requirement:	FCC Part15 C Section 15.407(g)
Test Method:	ANSI C63.10:2013, FCC Part 2.1055
Limit:	Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified
Test Procedure:	<p>a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.</p> <p>b. Turn the EUT on and couple its output to a spectrum analyzer.</p> <p>c. Turn the EUT off and set the chamber to the highest temperature specified.</p> <p>d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 Minutes.</p> <p>e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.</p> <p>f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 Minute</p> <p>s. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.</p>
Test setup:	<div style="text-align: center;"> <p>The diagram shows a block diagram of the measurement setup. On the left is a 'Spectrum analyzer' box containing a small graph. A line connects it to an 'Att.' (Attenuator) box. From the 'Att.' box, a line goes to the 'EUT' (Equipment Under Test) box, which is located inside a larger 'Temperature Chamber' box. Below the 'EUT' box, another line connects to a 'Variable Power Supply' box.</p> </div> <p>Note : Measurement setup for testing on Antenna connector</p>
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

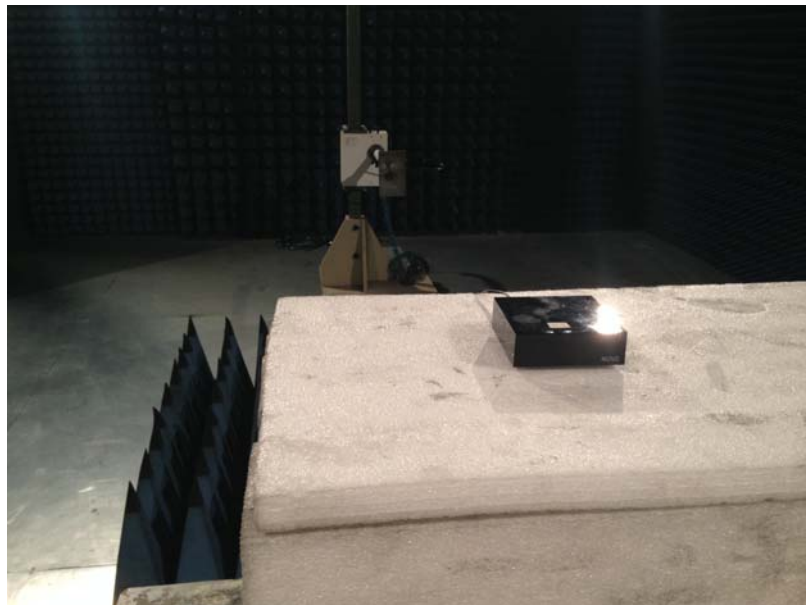
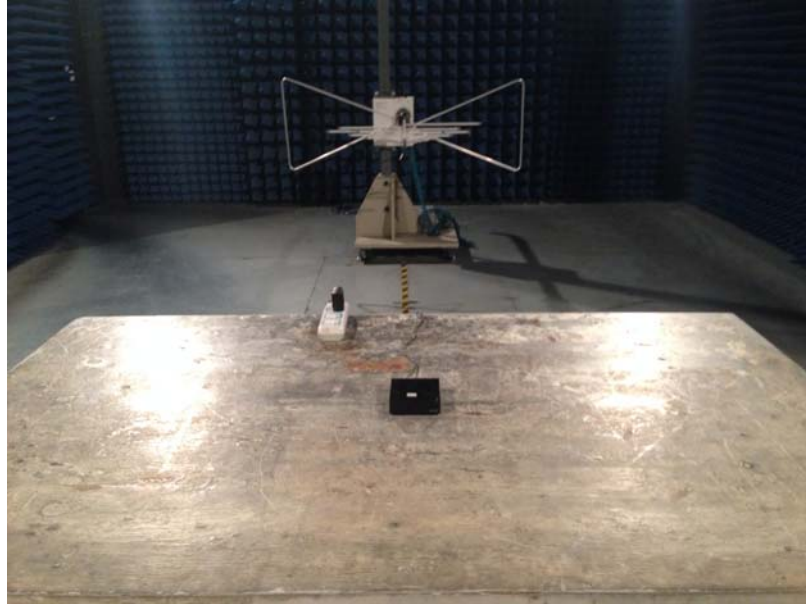
Remark: Set the EUT transmits at un-modulation mode to test frequency stability.

Measurement data:

Frequency stability versus Temp.			
Power Supply: DC 5V			
Temp. (°C)	Operating Frequency (MHz)	Test Result (MHz)	Max.Deviation (ppm)
-30	5180	5180.0108	2.0849
	5210	5210.0165	3.1670
	5240	5240.0174	3.3206
-20	5180	5180.0122	2.3552
	5210	5210.0136	2.6104
	5240	5240.0127	2.4237
-10	5180	5180.0114	2.2008
	5210	5210.0136	2.6104
	5240	5240.0158	3.0153
0	5180	5180.0176	3.3977
	5210	5210.0116	2.2265
	5240	5240.0125	2.3855
10	5180	5180.0135	2.6062
	5210	5210.0129	2.4760
	5240	5240.0147	2.8053
20	5180	5180.0115	2.2201
	5210	5210.0138	2.6488
	5240	5240.0152	2.9008
30	5180	5180.0167	3.2239
	5210	5210.0149	2.8599
	5240	5240.0133	2.5382
40	5180	5180.0112	2.1622
	5210	5210.0188	3.6084
	5240	5240.0161	3.0725
50	5180	5180.0143	2.7606
	5210	5210.0157	3.0134
	5240	5240.0124	2.3664
Frequency stability versus Voltage			
Temperature: 25°C			
Power Supply (VDC)	Operating Frequency (MHz)	Test Result (MHz)	Max.Deviation (ppm)
4.5	5180	5180.0117	2.2587
	5210	5210.0145	2.7831
	5240	5240.0133	2.5382
5.0	5180	5180.0110	2.1236
	5210	5210.0104	1.9962
	5240	5240.0142	2.7099
5.5	5180	5180.0131	2.5290
	5210	5210.0157	3.0134
	5240	5240.0192	3.6641

8 Test Setup Photo

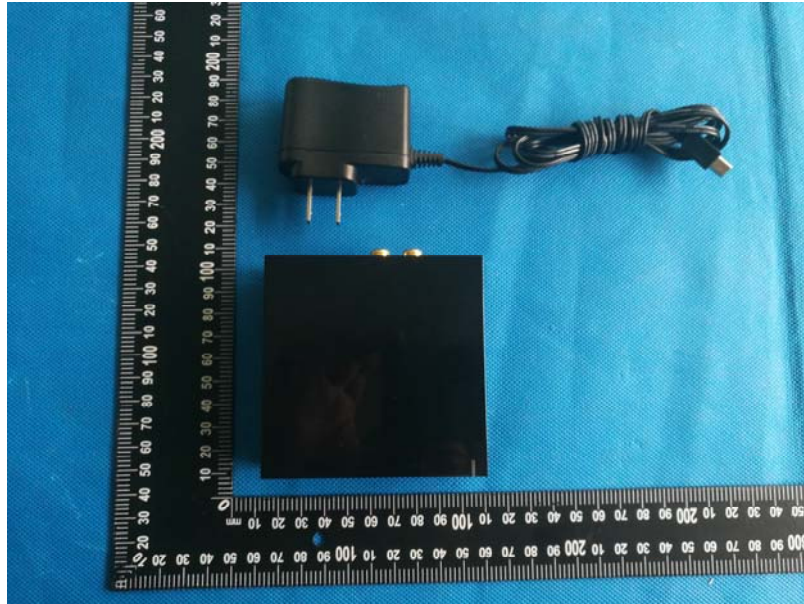
Radiated Emission

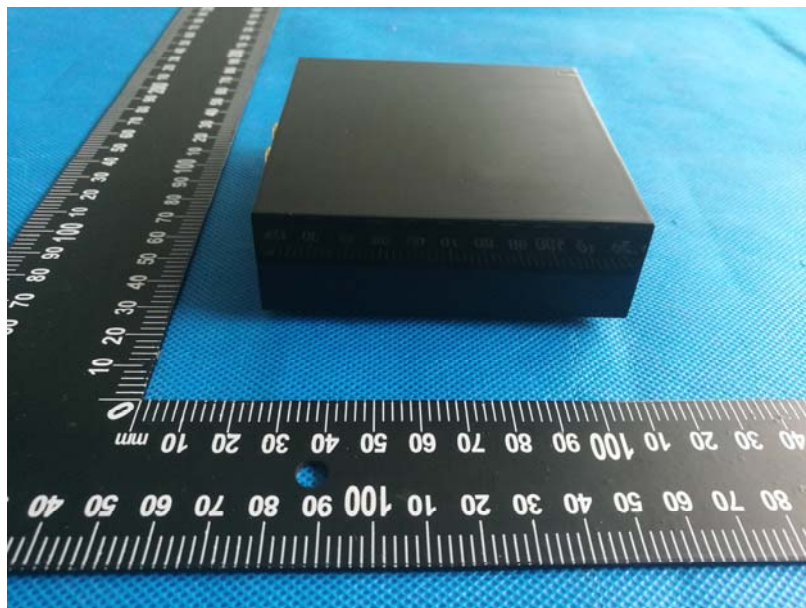


Conducted Emission

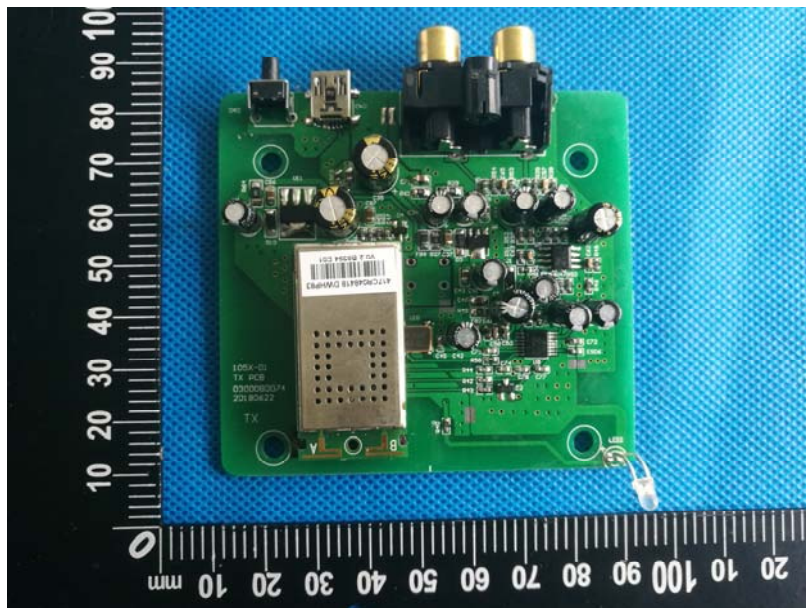


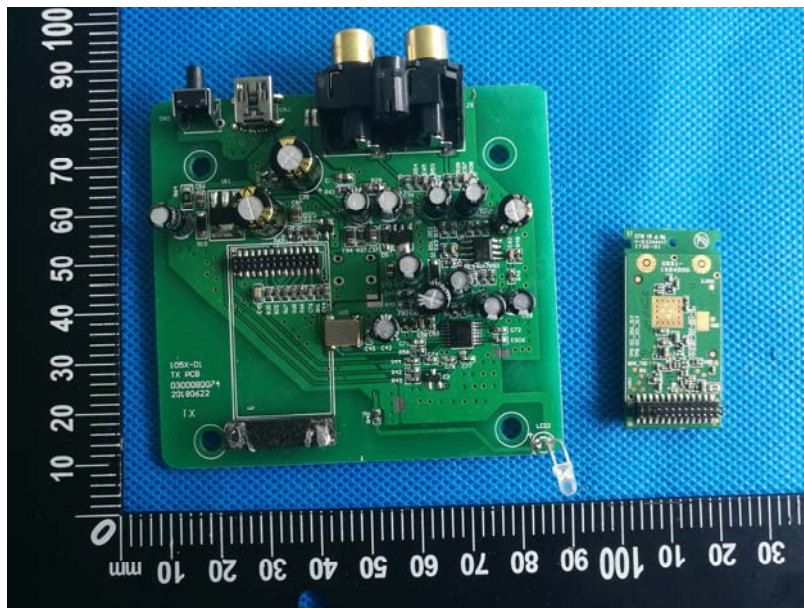
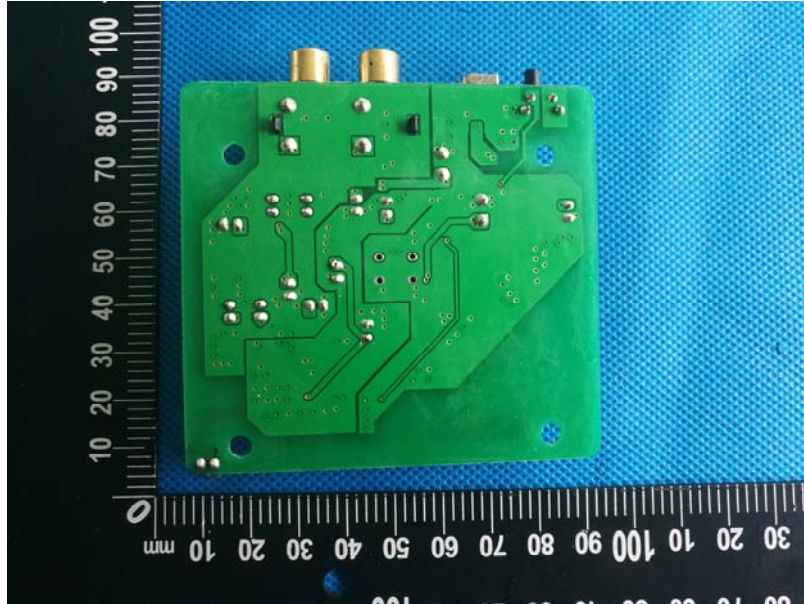
9 EUT Constructional Details

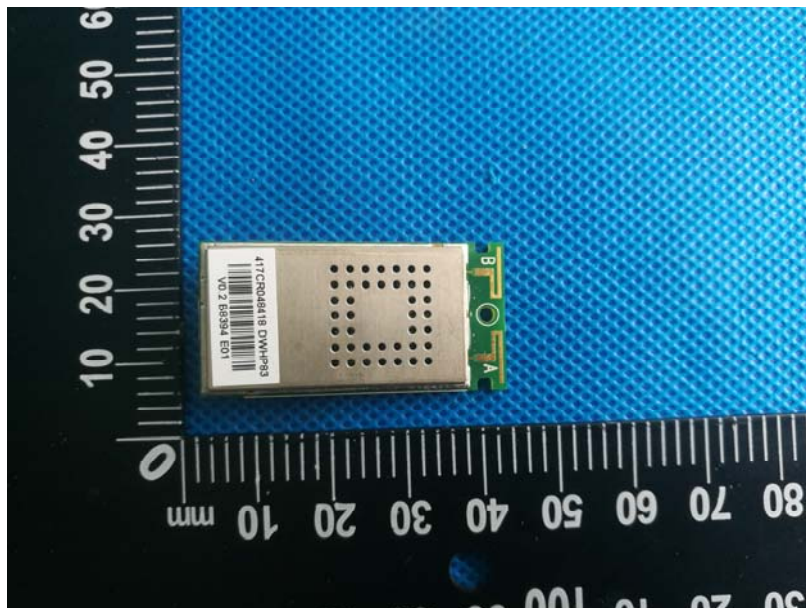


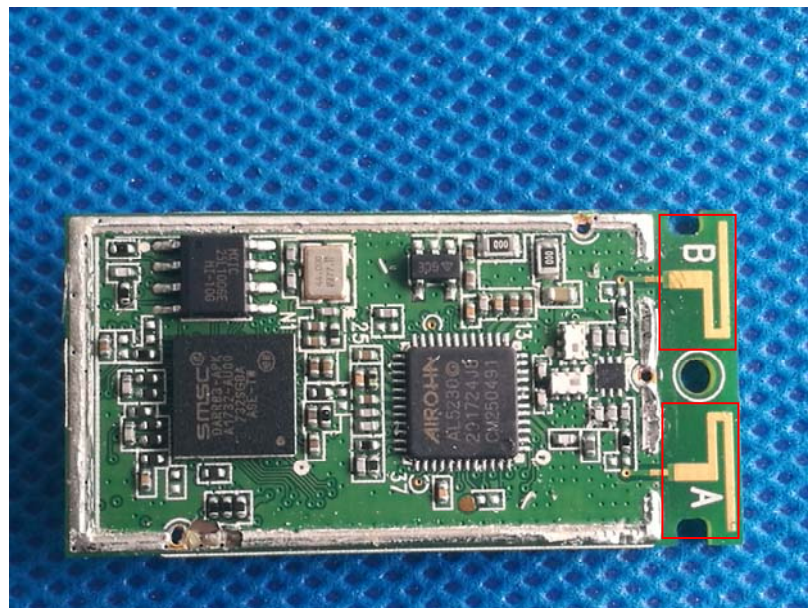
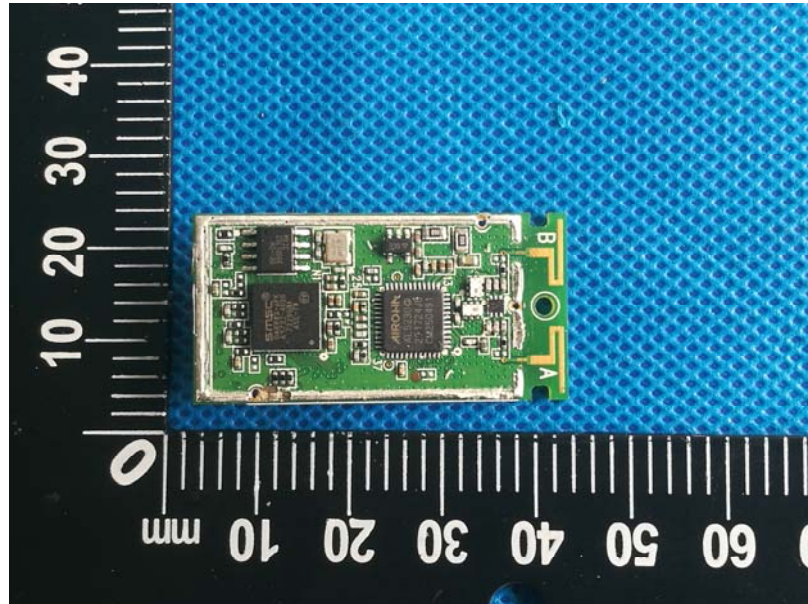












-----END-----