FCC REPORT

Applicant:	Nuvyyo Inc.
Address of Applicant:	555 Legget Drive Tower B Suite 836 Kanata, ON K2K2X3, Canada
Manufacturer:	Nuvyyo Inc.
Address of Manufacturer:	555 Legget Drive Tower B Suite 836 Kanata, ON K2K2X3, Canada
Factory:	SHENZHEN GIEC DIGITAL CO., LTD
Address of Factory:	1 Building,Factory,.7 District,Dayang Development Areas, Fuyong Street, Bao'an, Shenzhen, Guangdong, China

Equipment Under Test (EUT)

Product Name:	OTA streamer
Model No.:	TABLO DUAL LITE DVR, TABLO DUAL 64 DVR
FCC ID:	2AOR7-TABLOBOX
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	January 30, 2018
Date of Test:	January 31, 2018-March 20, 2018
Date of report issue:	March 21, 2018
Test Result :	PASS *

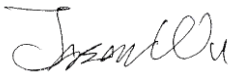
* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

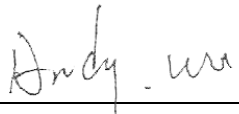
Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*March 21, 2018*	*Original*

Prepared By:  ***Date:*** *March 21, 2018*

Project Engineer

Check By:  ***Date:*** *March 21, 2018*

Reviewer

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4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	PASS
AC Power Line Conducted Emission	15.207	PASS
Peak Transmit Power	15.407(a)(1)	PASS
Power Spectral Density	15.407(a)(1)	PASS
Undesirable Emission	15.407(b)(6), 15.205/15.209	PASS
Radiated Emission	15.205/15.209	PASS
Band Edge	15.205	PASS
Frequency Stability	15.407(f)	PASS

Remark:

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%.			
Remark: Test according to ANSI C63.10:2013 and ANSI C63.4:2014			

5 General Information

5.1 General Description of EUT

Product Name:	OTA streamer
Model No.:	TABLO DUAL LITE DVR, TABLO DUAL 64 DVR
Test Model No:	TABLO DUAL LITE DVR
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. *The differences are color, model name and storage capacity for commercial purpose.* *All of the samples with different storage capacity (8GB and 64GB) have been tested, only the worst case 64GB was shown the report.*	
Serial No.:	GI-C02097152
Test sample(s) ID:	GTS201801000072-1
Sample(s) Status:	Engineer sample
Operation Frequency:	802.11a/802.11n(HT20)/802.11ac(HT20): 5180MHz ~ 5240MHz; 802.11n(HT40)/ 802.11ac(HT40): 5190MHz ~ 5230MHz 802.11ac(HT80): 5210MHz
Channel numbers:	802.11a/802.11n(HT20)/802.11ac(HT20): 4; 802.11n(HT40)/ 802.11ac(HT40): 2 802.11ac(HT80): 1
Channel separation:	802.11a/802.11n(HT20)/802.11ac(HT20): 20MHz; 802.11n(HT40)/ 802.11ac(HT40): 40MHz 802.11ac(HT80): 80MHz
Modulation technology:	OFDM
Antenna Type:	Integral antenna
Antenna gain:	Main Antenna: 6.43dBi Aux Antenna: 5.59dBi
Power supply:	Adapter Model:BSY018B120150U W Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 12V, 1.5A

Remark： 802.11a is SISO mode , All other modulations are MIMO mode
Directional gain of MIMO mode： =10 log[(10^G1 /20 + 10^G2 /20 + … + 10^GN /20)^2 /NANT] dBi
=10log[(10^6.43/20+10^5.59/20)^2/2]=9.03dBi

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting with modulation. EUT was test with 99% duty cycle at its maximum power control level.
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

5.3 Test Facility

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

● **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fuly 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.

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, sBaoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

5.5 Description of Support Units

None.

5.6 Deviation from Standards

None.

5.7 Abnormalities from Standard Conditions

None.

5.8 Other Information Requested by the Customer

None.

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 2017	June. 27 2018
4	Spectrum analyzer	Agilent	E4447A	GTS516	June. 28 2017	June. 27 2018
5	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 28 2017	June. 27 2018
6	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 28 2017	June. 27 2018
7	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June. 28 2017	June. 27 2018
8	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 28 2017	June. 27 2018
9	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
10	Coaxial Cable	GTS	N/A	GTS213	June. 28 2017	June. 27 2018
11	Coaxial Cable	GTS	N/A	GTS211	June. 28 2017	June. 27 2018
12	Coaxial cable	GTS	N/A	GTS210	June. 28 2017	June. 27 2018
13	Coaxial Cable	GTS	N/A	GTS212	June. 29 2017	June. 27 2018
14	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 28 2017	June. 27 2018
15	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June. 28 2017	June. 27 2018
16	Amplifier (18-40GHz)	MITEQ	AMF-6F-18004000-29-8P	GTS534	June. 28 2017	June. 27 2018
17	Band filter	Amindeon	82346	GTS219	June. 28 2017	June. 27 2018
18	Constant temperature and humidity box	Oregon Scientific	BA-888	GTS248	June. 28 2017	June. 27 2018
19	D.C. Power Supply	Instek	PS-3030	GTS232	June. 28 2017	June. 27 2018
20	Universal radio communication tester	Rohde & Schwarz	CMU200	GTS235	June. 28 2017	June. 27 2018
21	Splitter	Agilent	11636B	GTS237	June. 28 2017	June. 27 2018
22	Power Meter	Anritsu	ML2495A	GTS540	June. 28 2017	June. 27 2018
23	Power Sensor	Anritsu	MA2411B	GTS541	June. 28 2017	June. 27 2018

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 2017	June. 27 2018
3	Pulse Limiter	R&S	ESH3-Z2	GTS224	June. 28 2017	June. 27 2018
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 28 2017	June. 27 2018
5	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 28 2017	June. 27 2018
6	Coaxial Cable	GTS	N/A	GTS227	June. 28 2017	June. 27 2018
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Thermo meter	KTJ	TA328	GTS233	June. 28 2017	June. 27 2018

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June. 28 2017	June. 27 2018

7 Test results and Measurement Data

7.1 Antenna requirement:

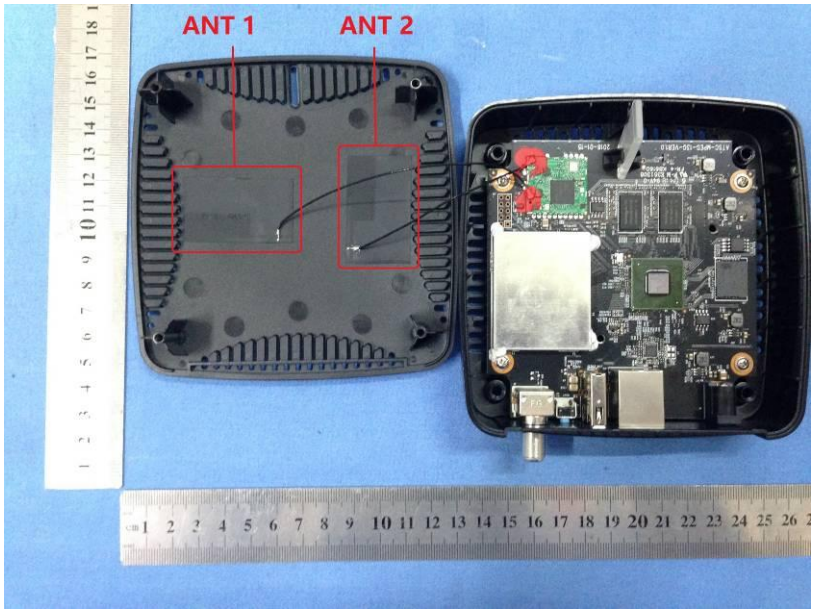
Standard requirement:	FCC Part15 C Section 15.203

15.203 requirement:

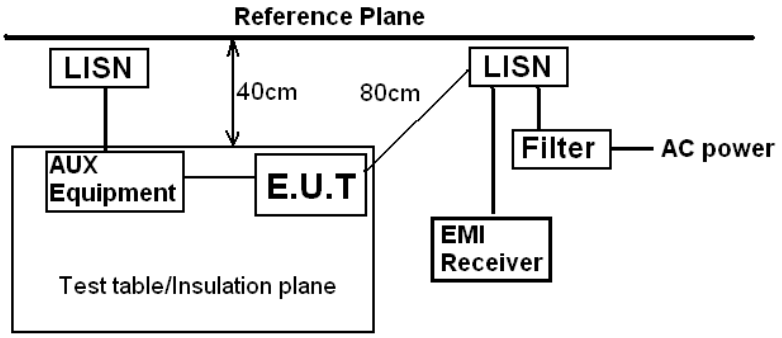
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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 antenna is integral antenna, the best case gain of the main antenna is 6.43dBi and aux antenna is 5.59dBi



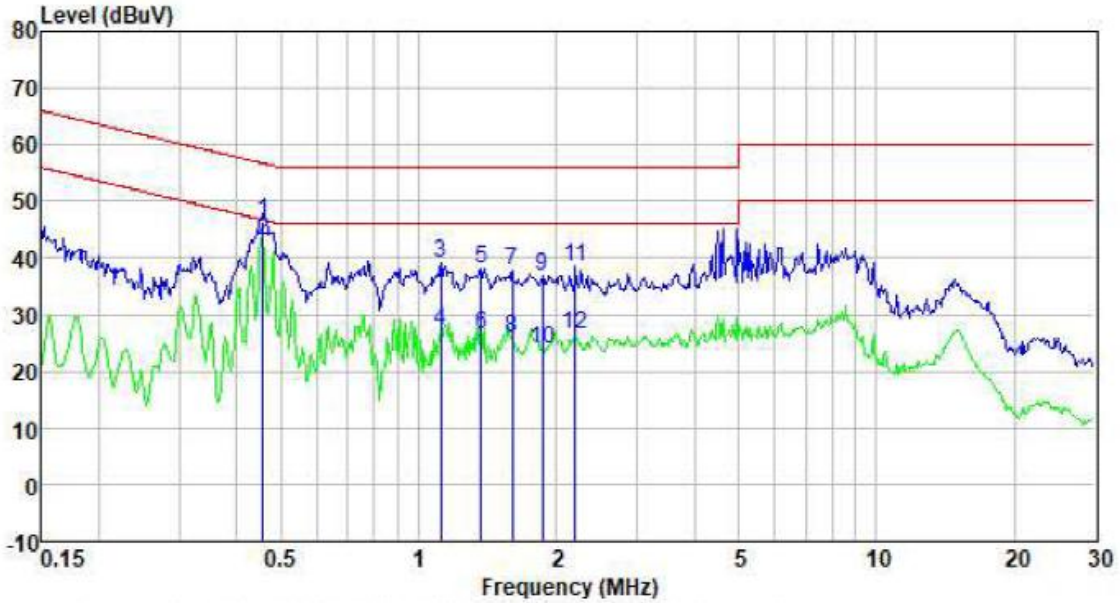
7.2 Conducted Emissions

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
Limit:	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 * Decreases with the logarithm of the frequency.
Test procedure	The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

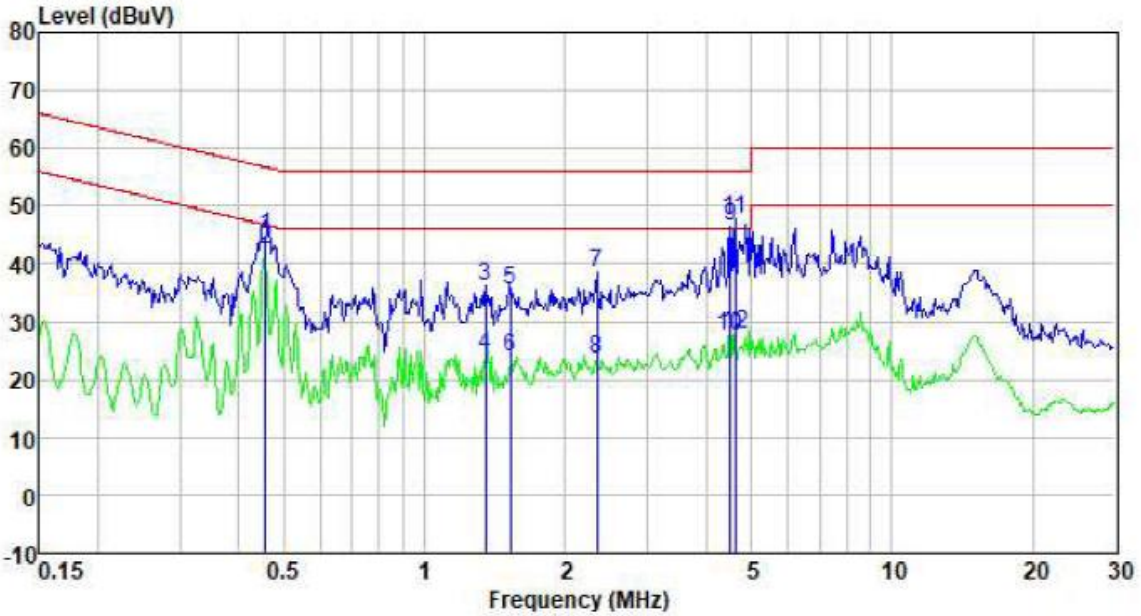
An initial pre-scan was performed on the line and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Line:



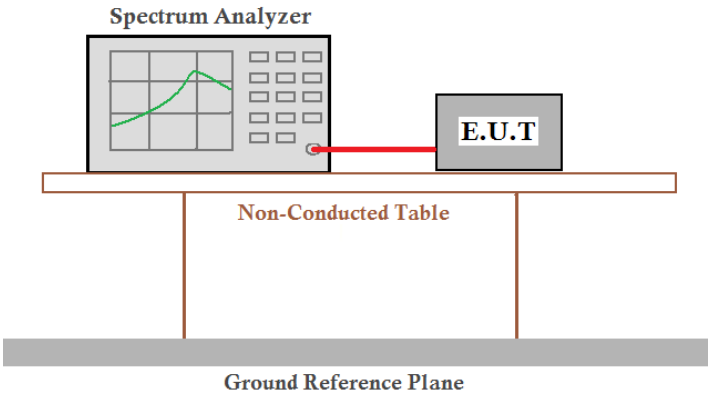
Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.456	46.40	0.00	0.00	46.40	56.76	-10.36	QP
0.456	43.10	0.00	0.00	43.10	46.76	-3.66	Average
1.117	39.04	0.00	0.00	39.04	56.00	-16.96	QP
1.117	27.10	0.00	0.00	27.10	46.00	-18.90	Average
1.367	38.31	0.00	0.00	38.31	56.00	-17.69	QP
1.367	26.41	0.00	0.00	26.41	46.00	-19.59	Average
1.602	37.80	0.00	0.00	37.80	56.00	-18.20	QP
1.602	25.83	0.00	0.00	25.83	46.00	-20.17	Average
1.858	36.86	0.00	0.00	36.86	56.00	-19.14	QP
1.858	23.83	0.00	0.00	23.83	46.00	-22.17	Average
2.201	38.37	0.00	0.00	38.37	56.00	-17.63	QP
2.201	26.40	0.00	0.00	26.40	46.00	-19.60	Average

Neutral:



Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.456	44.38	0.33	0.11	44.82	56.76	-11.94	QP
0.456	42.12	0.33	0.11	42.56	46.76	-4.20	Average
1.352	36.21	0.00	0.00	36.21	56.00	-19.79	QP
1.352	24.30	0.00	0.00	24.30	46.00	-21.70	Average
1.527	35.34	0.00	0.00	35.34	56.00	-20.66	QP
1.527	24.00	0.00	0.00	24.00	46.00	-22.00	Average
2.334	38.55	0.00	0.00	38.55	56.00	-17.45	QP
2.334	23.55	0.00	0.00	23.55	46.00	-22.45	Average
4.501	46.62	0.00	0.00	46.62	56.00	-9.38	QP
4.501	27.50	0.00	0.00	27.50	46.00	-18.50	Average
4.622	47.92	0.00	0.00	47.92	56.00	-8.08	QP
4.622	27.93	0.00	0.00	27.93	46.00	-18.07	Average

7.3 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v01
Limit:	N/A
Test setup:	
Test procedure:	According to KDB 789033 D02 General UNII Test Procedures New Rules v01.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

Main Antenna:

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Occupied Bandwidth (MHz)		
		802.11a	802.11n(HT 20)	802.11ac(HT20)	802.11a	802.11n(HT 20)	802.11ac(HT20)
36	5180.00	16.5250	17.7625	17.7281	20.107	21.642	21.639
40	5200.00	16.5404	17.7481	17.6868	20.115	21.870	21.540
48	5240.00	16.5394	17.7847	17.7141	19.948	21.433	21.616

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT40)	802.11ac(HT40)	802.11n(HT40)	802.11ac(HT40)
38	5190.00	36.8621	36.2871	69.765	42.760
46	5230.00	37.5756	36.3602	75.370	42.161

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Occupied Bandwidth (MHz)
		802.11ac(HT80)	802.11ac(HT80)
42	5210.00	75.0708	79.844

AUX antenna

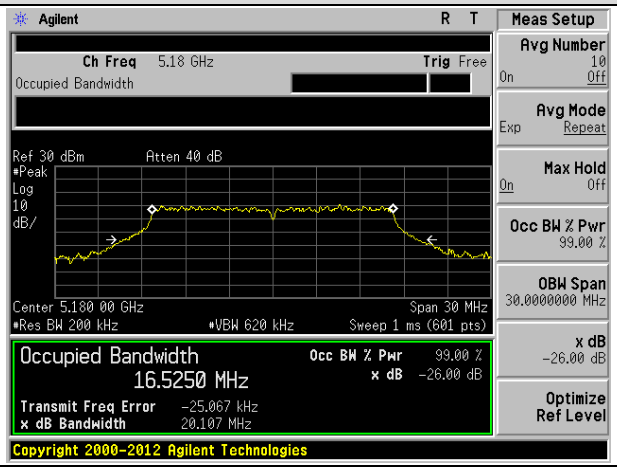
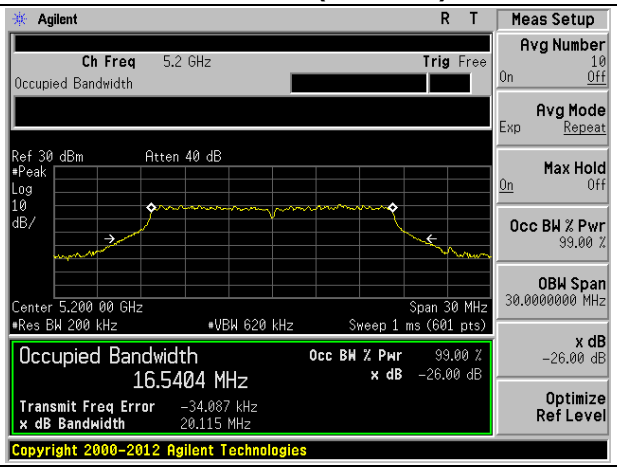
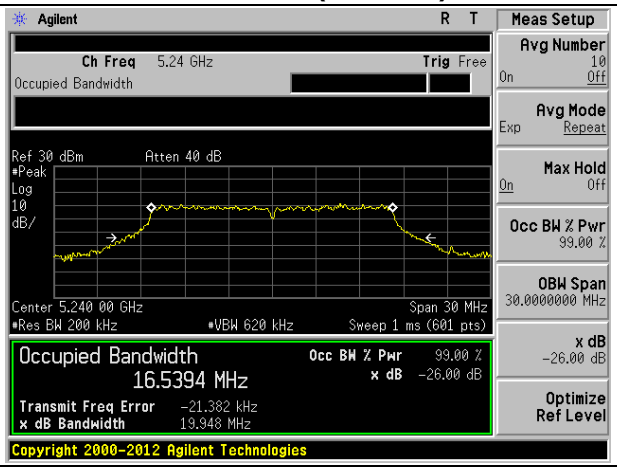
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)			26dB Occupied Bandwidth (MHz)		
		802.11a	802.11n(HT20)	802.11ac(HT20)	802.11a	802.11n(HT20)	802.11ac(HT20)
36	5180.00	16.4736	17.9353	17.6604	20.019	29.287	21.148
40	5200.00	16.4815	17.8567	17.6912	19.972	23.657	21.015
48	5240.00	16.4805	17.8527	17.7387	19.865	22.985	21.418

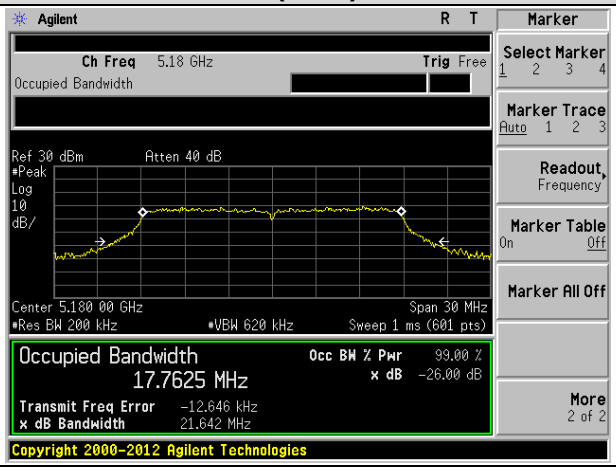
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n(HT40)	802.11ac(HT40)	802.11n(HT40)	802.11ac(HT40)
38	5190.00	36.4530	36.0947	62.459	41.214
46	5230.00	36.3002	36.1008	56.291	41.516

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Occupied Bandwidth (MHz)
		802.11ac(HT80)	802.11ac(HT80)
42	5210.00	75.0793	79.151

Test plots as followed:

Main Antenna:

802.11a mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11n(HT20) mode

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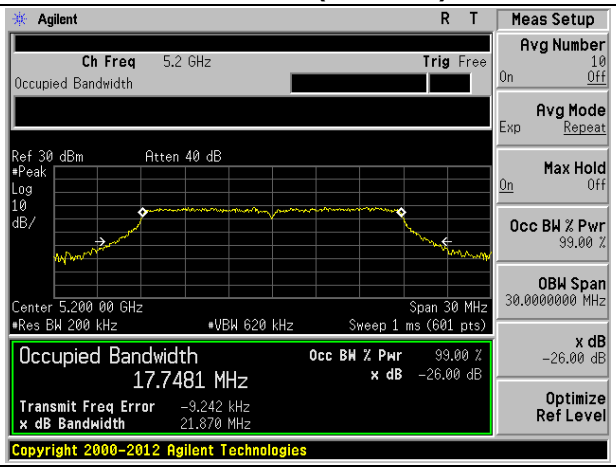
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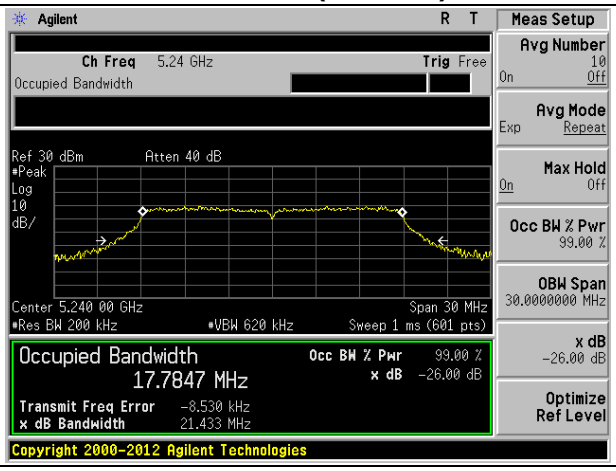
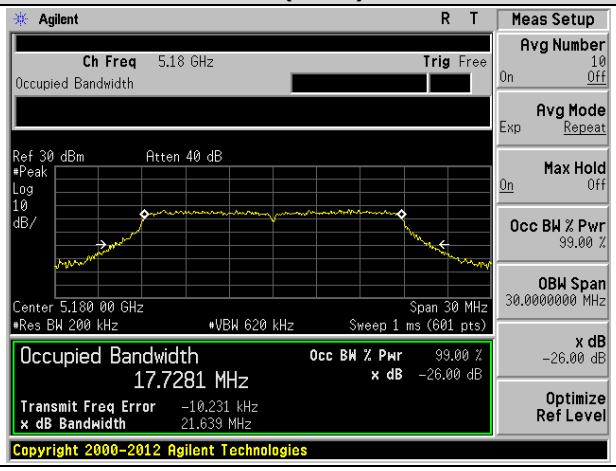
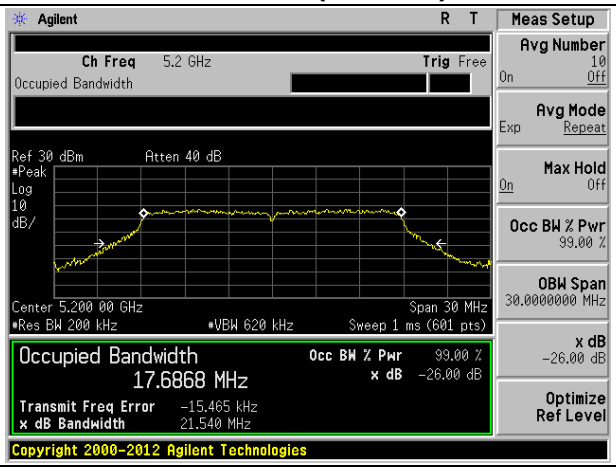
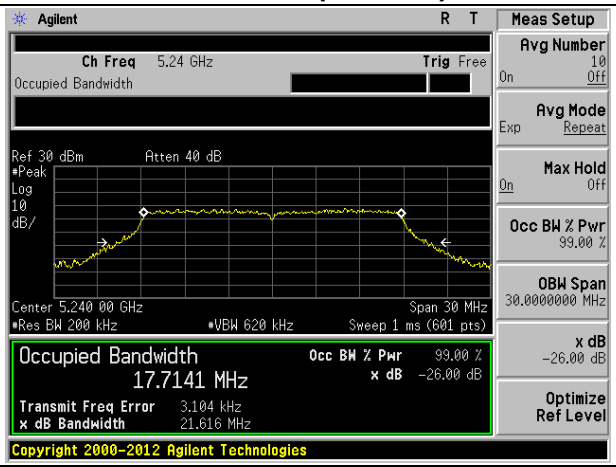
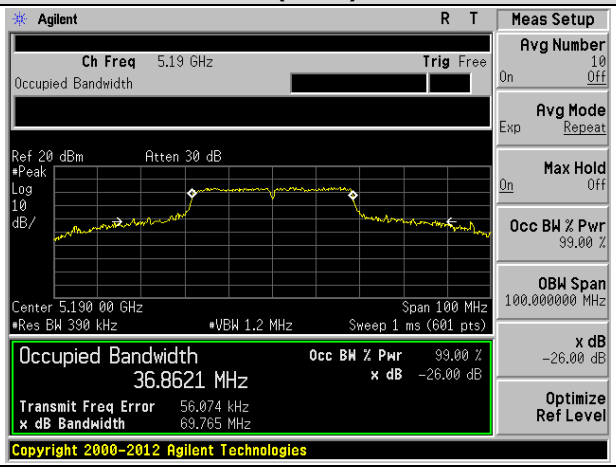
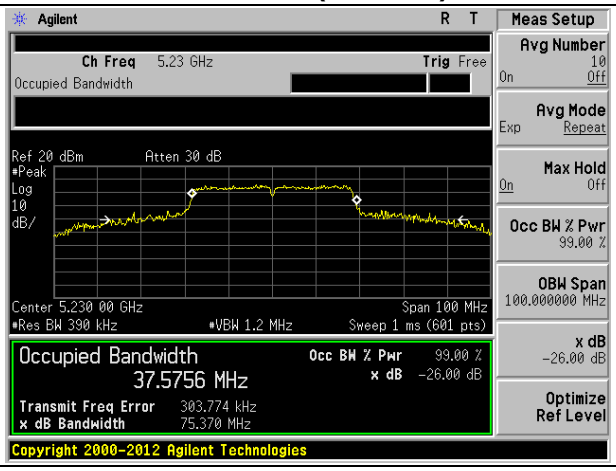
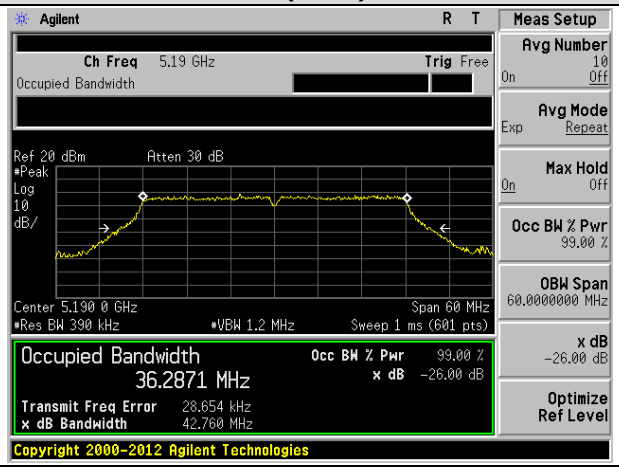
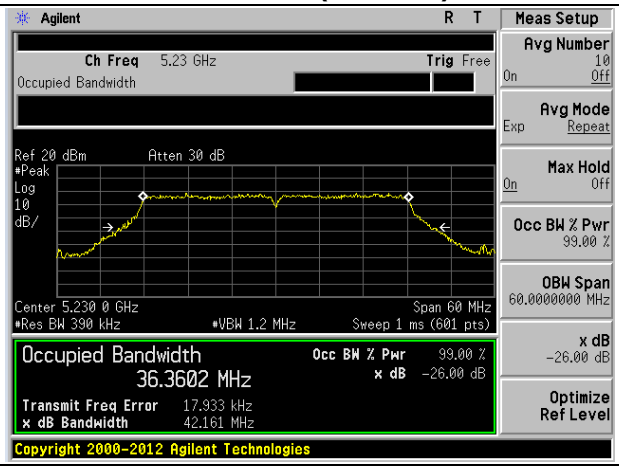
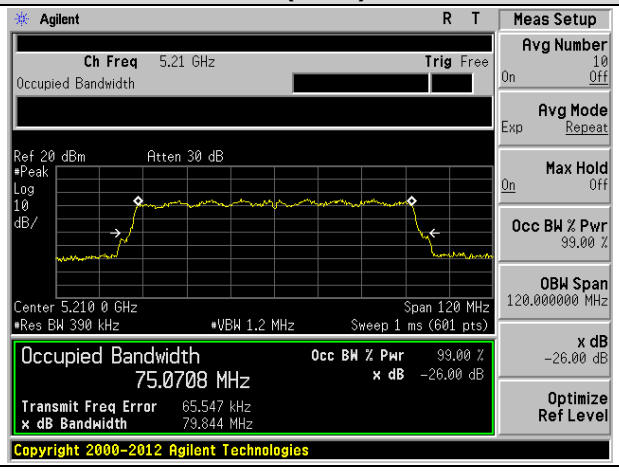

Channel 48 (5240MHz)

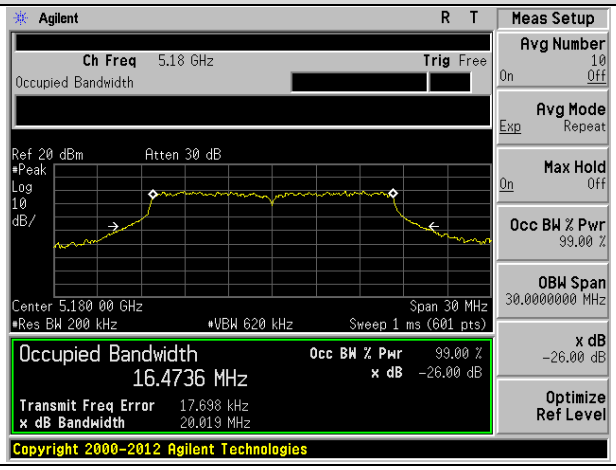
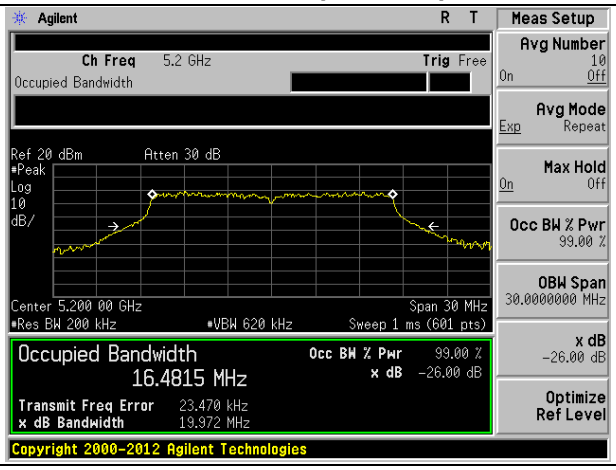
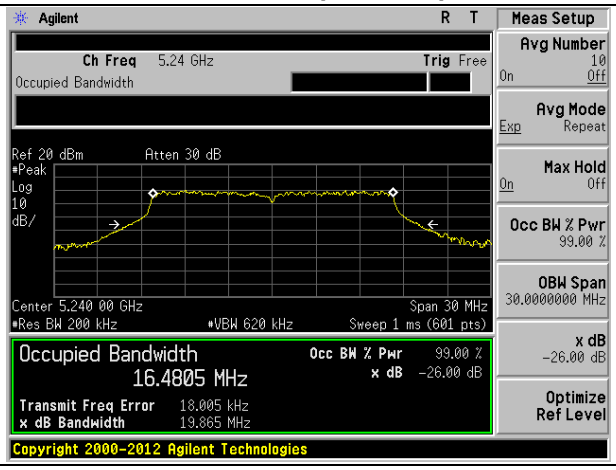
802.11ac(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

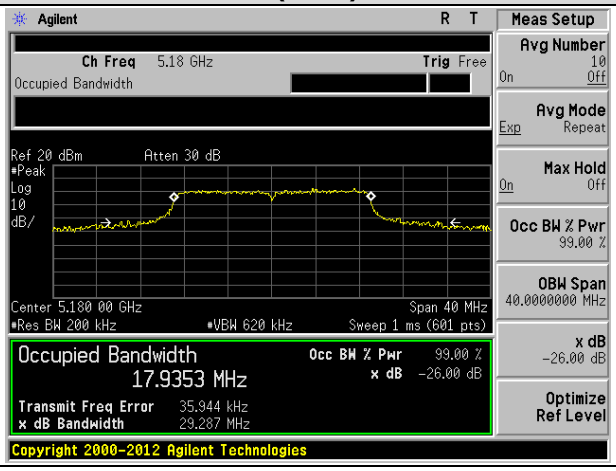
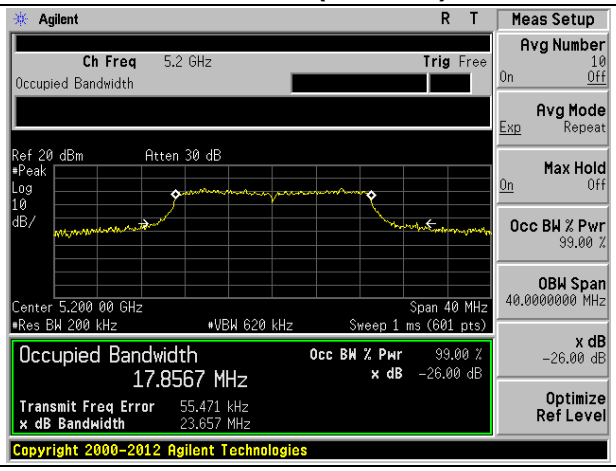
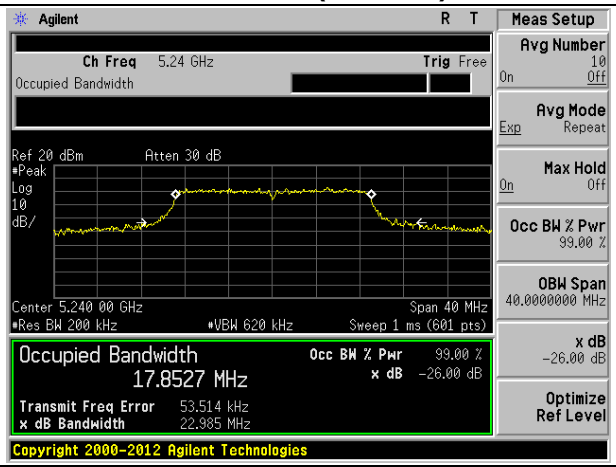
802.11n(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

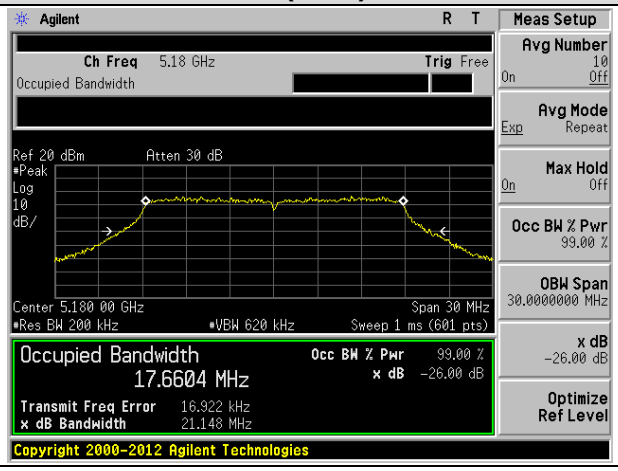
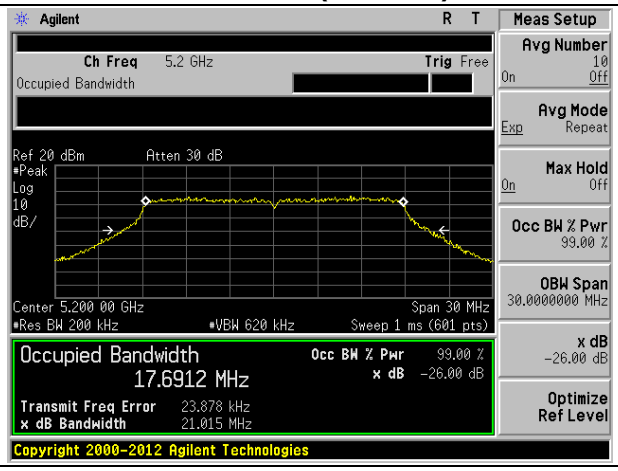
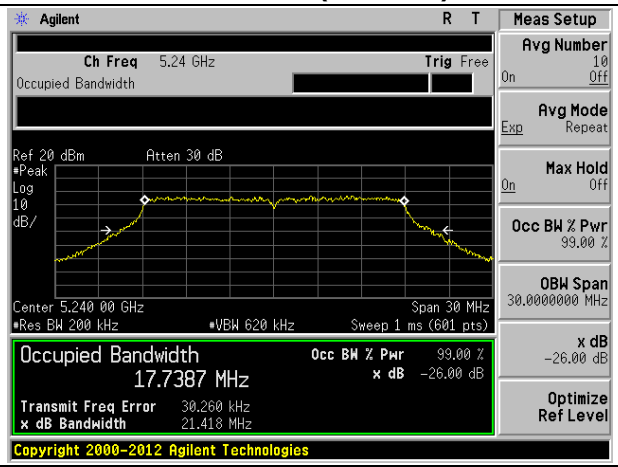
802.11ac(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

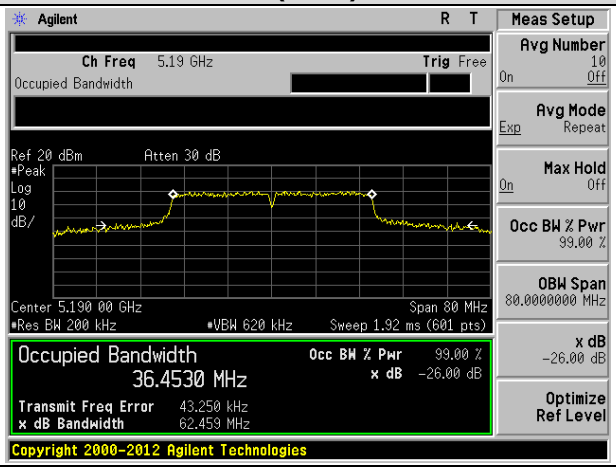
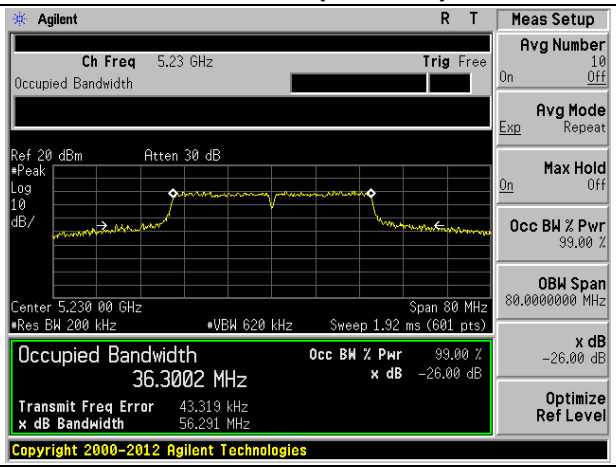
802.11ac(HT80) mode

Channel 40 (5210MHz)

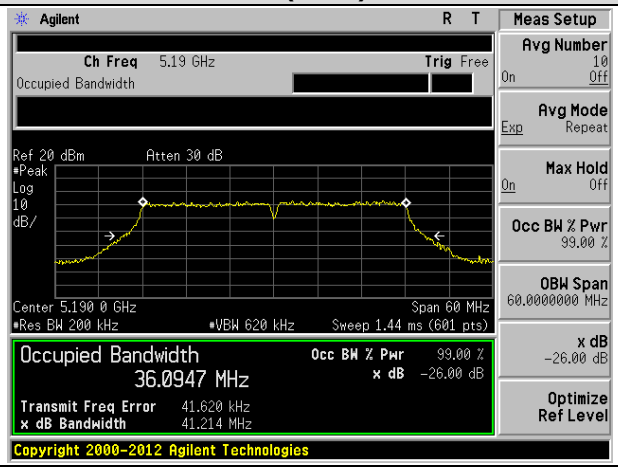
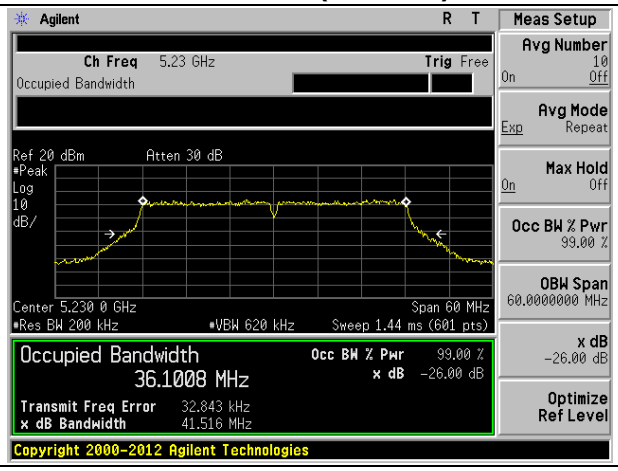
Aux Antenna:

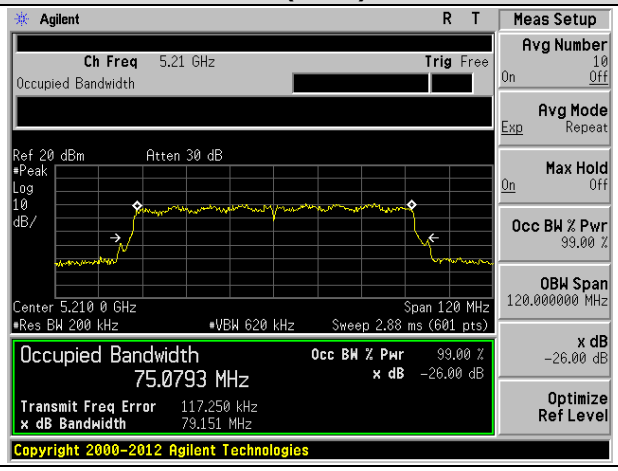
802.11a mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11n(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

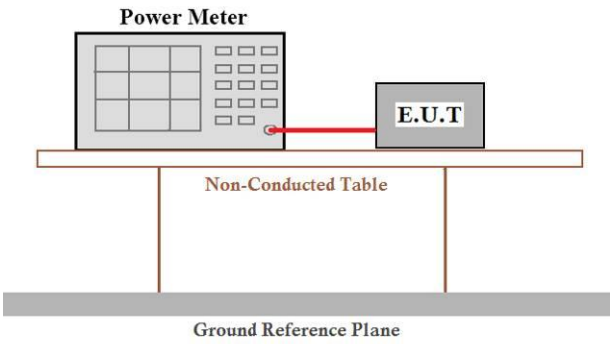
802.11ac(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11n(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

802.11ac(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

802.11ac(HT80) mode

Channel 40 (5210MHz)

7.4 Output Power

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v01
Limit:	For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency bands of operation shall not exceed 250mW.
Test setup:	
Test procedure:	**Measurement using an RF average power meter** (i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied a) The EUT is configured to transmit continuously or to transmit with a constant duty cycle. b) At all times when the EUT is transmitting, it must be transmitting at its maximum power control level. c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five. (ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section B). (iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter. (iv) Adjust the measurement in dBm by adding 10 log(1/x) where x is the duty cycle (e.g., 10log(1/0.25) if the duty cycle is 25 percent).
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Main Antenna:

802.11a mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	11.50	0.04	11.54	23.55	Pass
40	5200.00	11.82	0.04	11.86	23.55	Pass
48	5240.00	11.55	0.04	11.59	23.55	Pass

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	11.77	0.04	11.81	23.55	Pass
40	5200.00	11.93	0.04	11.97	23.55	Pass
48	5240.00	11.10	0.04	11.14	23.55	Pass

802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	10.82	0.04	10.86	23.55	Pass
40	5200.00	10.60	0.04	10.64	23.55	Pass
48	5240.00	10.57	0.04	10.61	23.55	Pass

802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190.00	18.25	0.04	18.29	23.55	Pass
46	5230.00	19.26	0.04	19.30	23.55	Pass

802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190.00	12.07	0.04	12.11	23.55	Pass
46	5230.00	12.45	0.04	12.49	23.55	Pass

802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
42	5210.00	10.58	0.04	10.62	23.55	Pass

Note: Output Power = Measured Power + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

Antenna gain=6.43dBi

Limit=23.98-(6.43-6)=23.55dBm

Aux Antenna:

802.11a mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	9.89	0.04	9.93	23.98	Pass
40	5200.00	10.25	0.04	10.29	23.98	Pass
48	5240.00	10.81	0.04	10.85	23.98	Pass

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	9.95	0.04	9.99	23.98	Pass
40	5200.00	14.60	0.04	14.64	23.98	Pass
48	5240.00	15.75	0.04	15.79	23.98	Pass

802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180.00	7.69	0.04	7.73	23.98	Pass
40	5200.00	8.41	0.04	8.45	23.98	Pass
48	5240.00	9.76	0.04	9.80	23.98	Pass

802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190.00	14.02	0.04	14.06	23.98	Pass
46	5230.00	14.67	0.04	14.71	23.98	Pass

802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190.00	7.40	0.04	7.44	23.98	Pass
46	5230.00	9.34	0.04	9.38	23.98	Pass

802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
42	5210.00	7.77	0.04	7.81	23.98	Pass

Note: Output Power = Measured Power + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

MIMO:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm)	Result
36	5180.00	11.81	9.99	14.00	20.95	Pass
40	5200.00	11.97	14.64	16.52	20.95	Pass
48	5240.00	11.14	15.79	17.07	20.95	Pass

802.11ac(HT20) mode						
CH No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm)	Result
36	5180.00	10.86	7.73	12.58	20.95	Pass
40	5200.00	10.64	8.45	12.69	20.95	Pass
48	5240.00	10.61	9.80	13.23	20.95	Pass

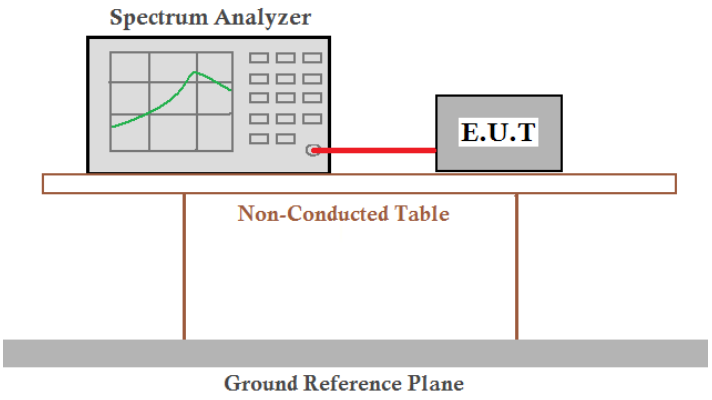
802.11n(HT40) mode						
CH No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm)	Result
38	5190.00	18.29	14.06	19.68	20.95	Pass
46	5230.00	19.30	14.71	20.60	20.95	Pass

802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm)	Result
38	5190.00	12.11	7.44	13.38	20.95	Pass
46	5230.00	12.49	9.38	14.22	20.95	Pass

802.11 ac(HT80)						
CH No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm)	Result
42	5210.00	10.62	7.81	12.45	20.95	Pass

NOTE: MIMO output power = ANT main Power+ANT AUX Power
Directional gain=9.03dBi
Limit=23.98-(9.03-6)=20.95dBm

7.5 Power Spectral Density

Test Requirement:	FCC Part15 E Section 15.407
Test Method:	KDB 789033 D02 General UNII Test Procedures New Rules v01
Limit:	11dBm/MHz
Test setup:	
Test procedure:	1) Create an average power spectrum for the EUT operating mode being tested by following the instructions in section E)2) for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, “Compute power…”. 2) Use the peak search function on the instrument to find the peak of the spectrum. 3) Make the following adjustments to the peak value of the spectrum, if applicable: a) If Method SA-2 or SA-2 Alternative was used, add 10 log(1/x), where x is the duty cycle, to the peak of the spectrum. b) If Method SA-3 Alternative was used and the linear mode was used in step E)2)g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging. 4) The result is the PSD.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Main Antenna:

802.11a mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	4.56	0.04	4.60	10.57	Pass
40	5200.00	4.82	0.04	4.86	10.57	Pass
48	5240.00	4.50	0.04	4.54	10.57	Pass

802.11n(HT20) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	4.03	0.04	4.07	10.57	Pass
40	5200.00	4.32	0.04	4.36	10.57	Pass
48	5240.00	3.93	0.04	3.97	10.57	Pass

802.11ac(HT20) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	0.61	0.04	0.65	10.57	Pass
40	5200.00	0.49	0.04	0.53	10.57	Pass
48	5240.00	0.67	0.04	0.71	10.57	Pass

802.11n(HT40) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5190.00	5.39	0.04	5.43	10.57	Pass
46	5230.00	5.58	0.04	5.62	10.57	Pass

802.11ac(HT40) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5190.00	-0.31	0.04	-0.27	10.57	Pass
46	5230.00	-1.01	0.04	-0.97	10.57	Pass

802.11ac(HT80) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5210.00	-4.98	0.04	-4.94	10.57	Pass

Note: Total PSD = Measured PSD + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

Antenna gain=6.43dBi
Limit=11-(6.43-6)=10.57dBm

Aux Antenna:

802.11a mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	1.03	0.04	1.07	11	Pass
40	5200.00	1.48	0.04	1.52	11	Pass
48	5240.00	3.45	0.04	3.49	11	Pass

802.11n(HT20) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	-0.42	0.04	-0.38	11	Pass
40	5200.00	3.50	0.04	3.54	11	Pass
48	5240.00	4.83	0.04	4.87	11	Pass

802.11ac(HT20) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
36	5180.00	-3.81	0.04	-3.77	11	Pass
40	5200.00	-1.41	0.04	-1.37	11	Pass
48	5240.00	2.81	0.04	2.85	11	Pass

802.11n(HT40) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5190.00	0.56	0.04	0.60	11	Pass
46	5230.00	0.98	0.04	1.02	11	Pass

802.11ac(HT40) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5190.00	-2.32	0.04	-2.28	11	Pass
46	5230.00	-0.77	0.04	-0.73	11	Pass

802.11ac(HT80) mode						
Channel No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Result
38	5210.00	-8.15	0.04	-8.11	11	Pass

Note: Total PSD = Measured PSD + Duty Factor

Duty Factor = 10 log (1/Duty Cycle)

MIMO:

802.11n(HT20) mode						
Channel No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm/MHz)	Result
36	5180.00	4.07	-0.38	5.40	7.97	Pass
40	5200.00	4.36	3.54	6.98	7.97	Pass
48	5240.00	3.97	4.87	7.45	7.97	Pass

802.11ac(HT20) mode						
Channel No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm/MHz)	Result
36	5180.00	0.65	-3.77	1.99	7.97	Pass
40	5200.00	0.53	-1.37	2.69	7.97	Pass
48	5240.00	0.71	2.85	4.92	7.97	Pass

802.11n(HT40) mode						
Channel No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm/MHz)	Result
38	5190.00	5.43	0.60	6.66	7.97	Pass
46	5230.00	5.62	1.02	6.91	7.97	Pass

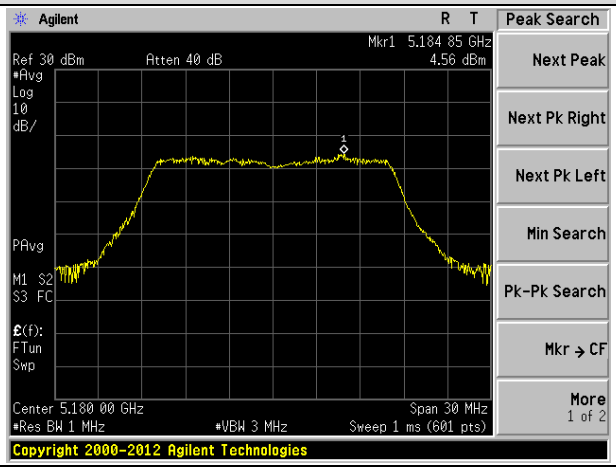
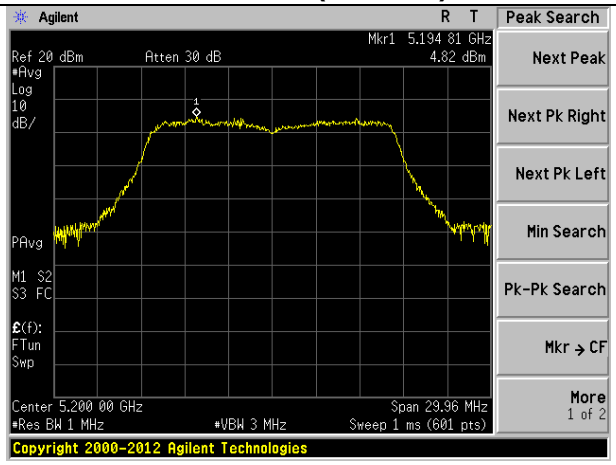
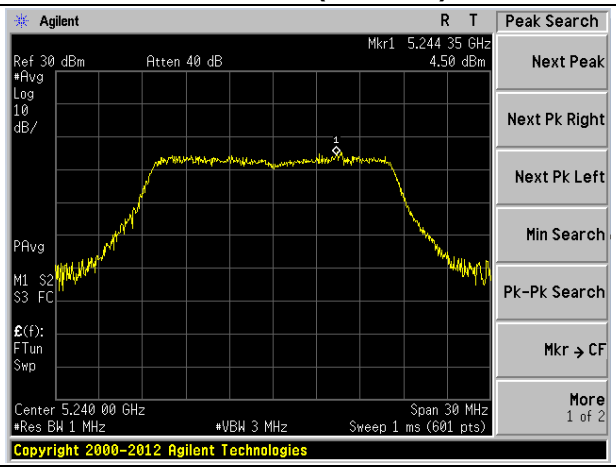
802.11ac(HT40) mode						
Channel No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm/MHz)	Result
38	5190.00	-0.27	-2.28	1.85	7.97	Pass
46	5230.00	-0.97	-0.73	2.16	7.97	Pass

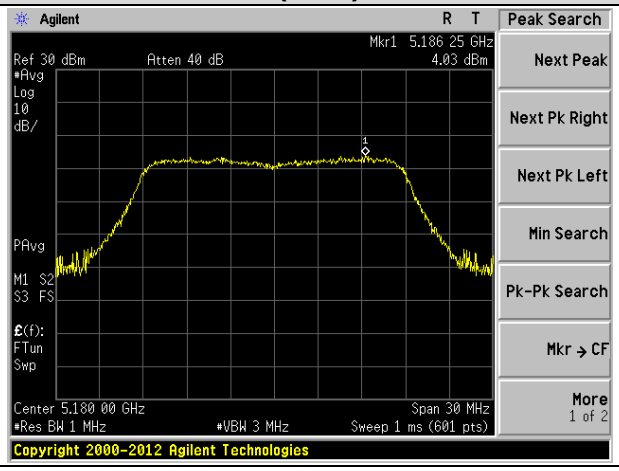
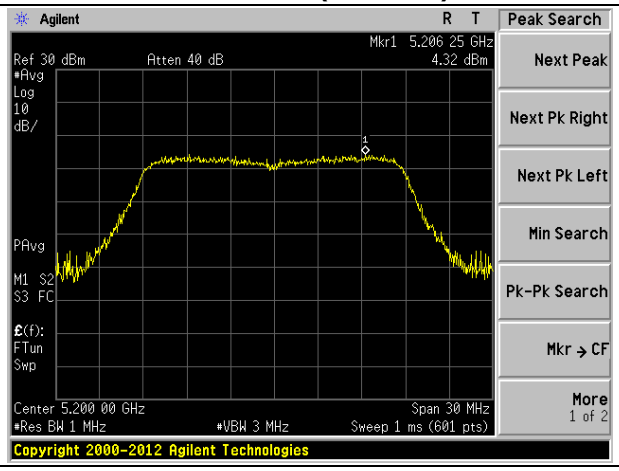
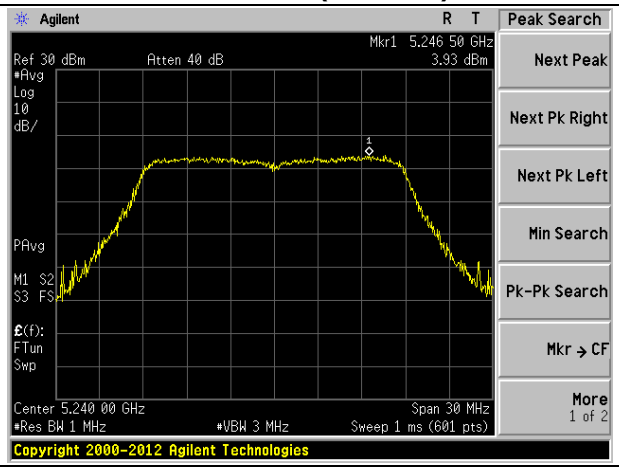
802.11ac(HT80) mode						
Channel No.	Frequency (MHz)	ANT main Power (dBm)	ANT AUX Power (dBm)	MIMO Output Power (dBm)	Limit (dBm/MHz)	Result
38	5210.00	-4.94	-8.11	-3.23	7.97	Pass

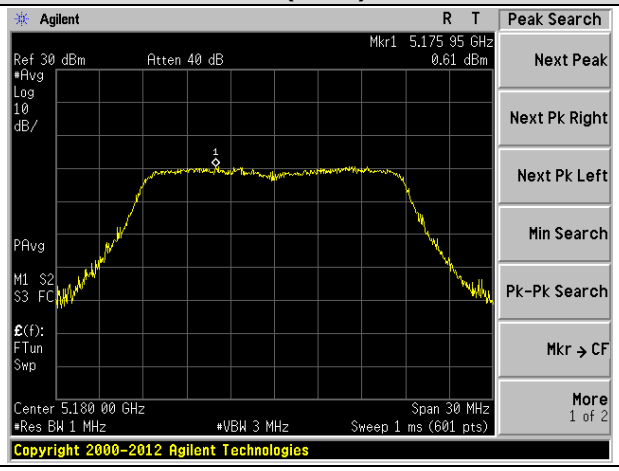
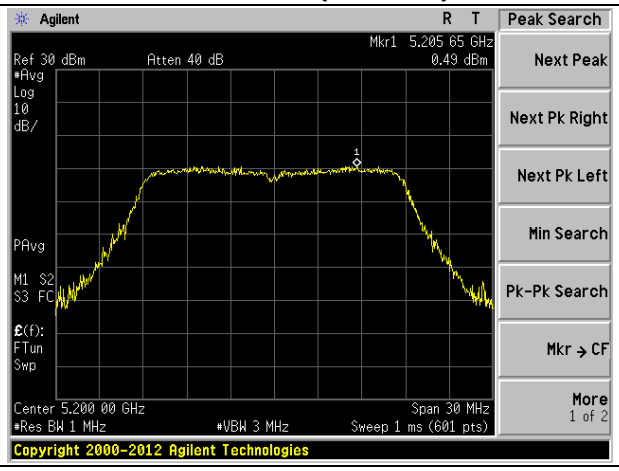
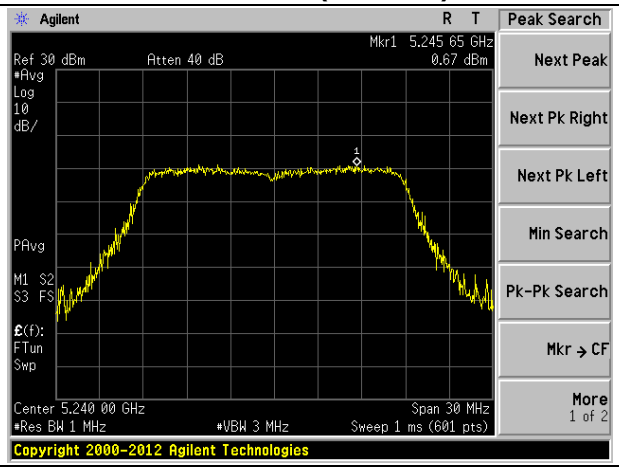
NOTE: MIMO output power = ANT main Power+ANT AUX Power
Directional gain=9.03dBi
Limit=11-(9.03-6)=7.97dBm

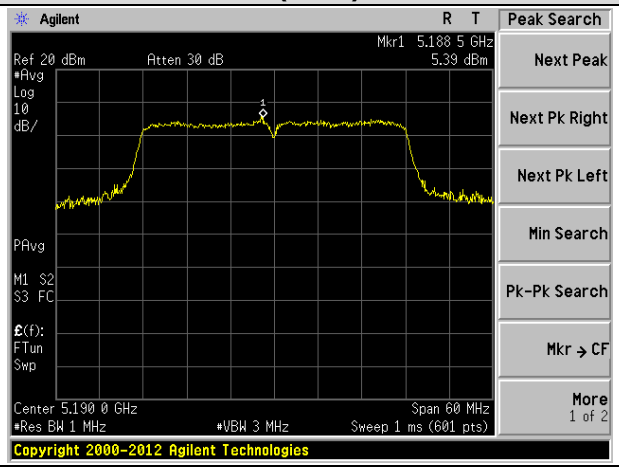
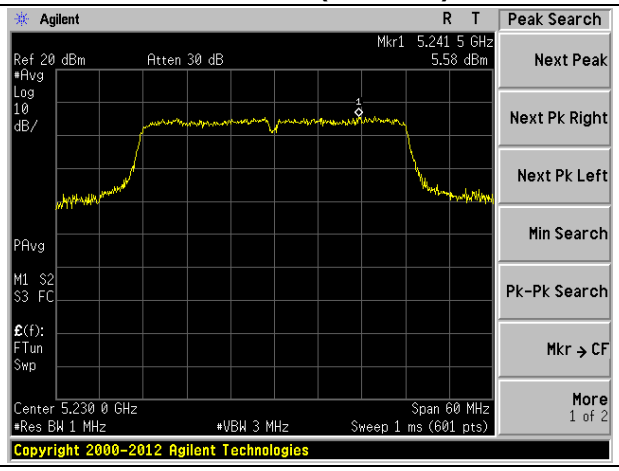
Test plots as followed:

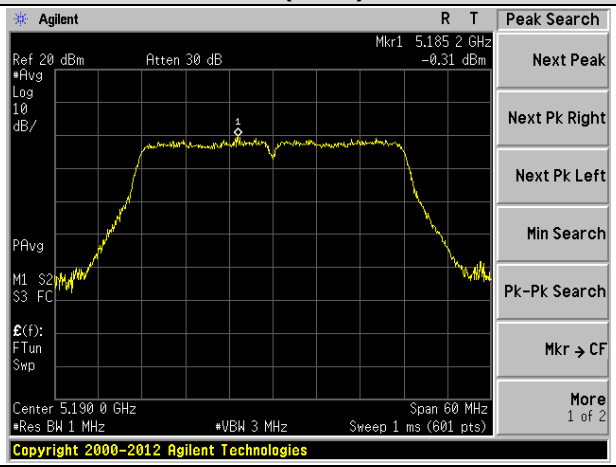
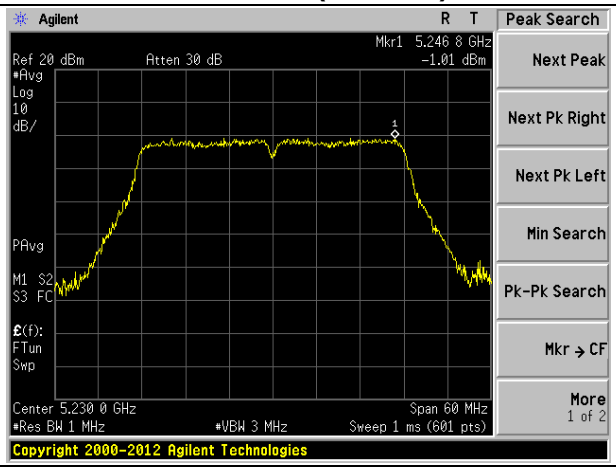
Main Antenna:

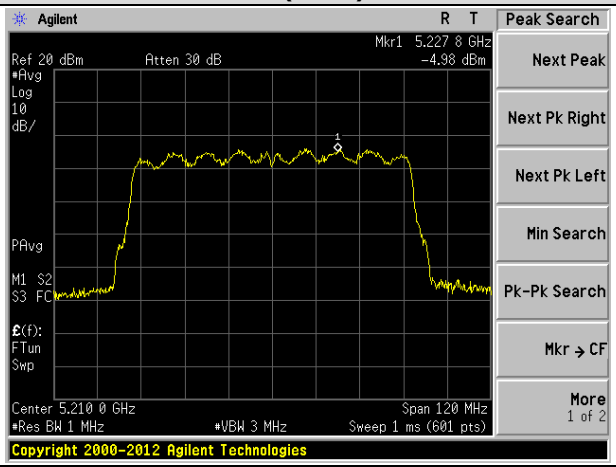
802.11a mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11n(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

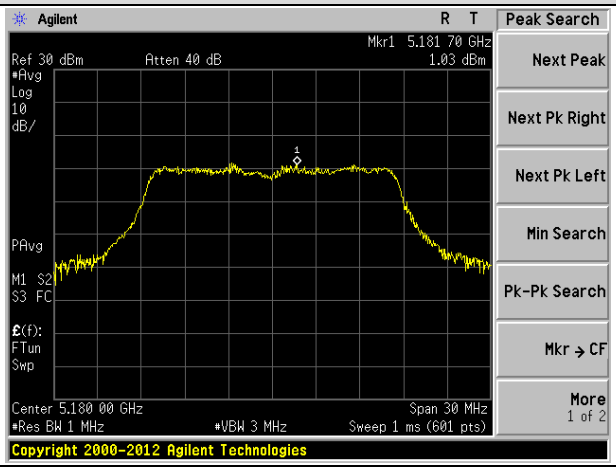
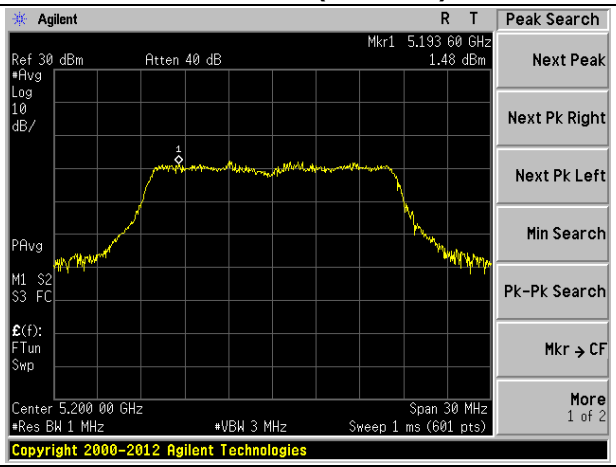
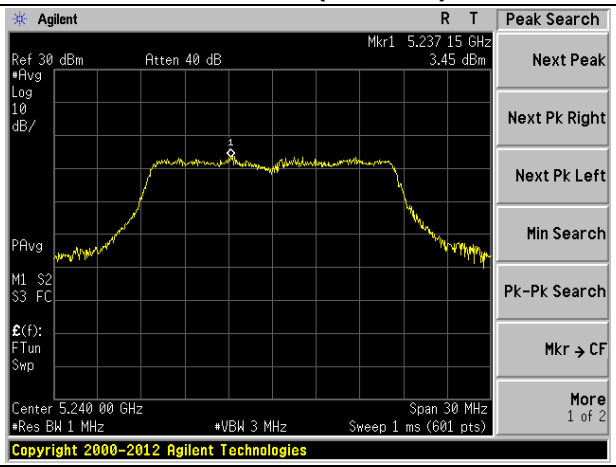
802.11ac(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

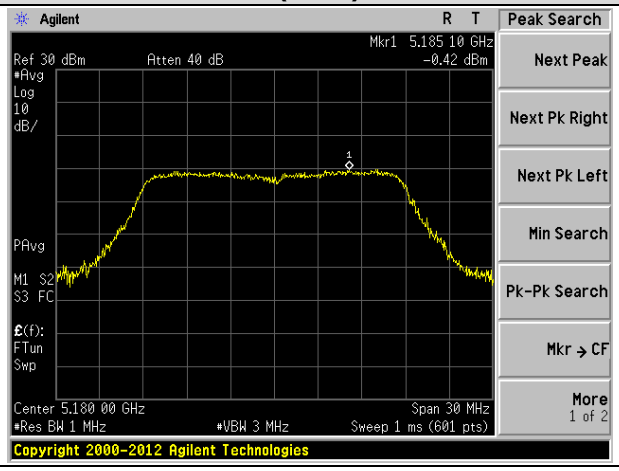
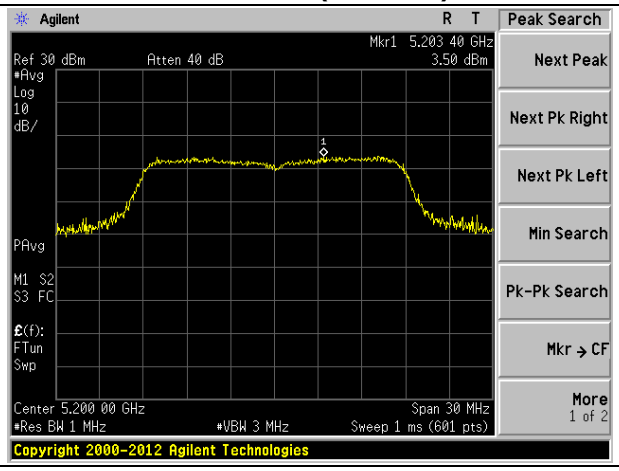
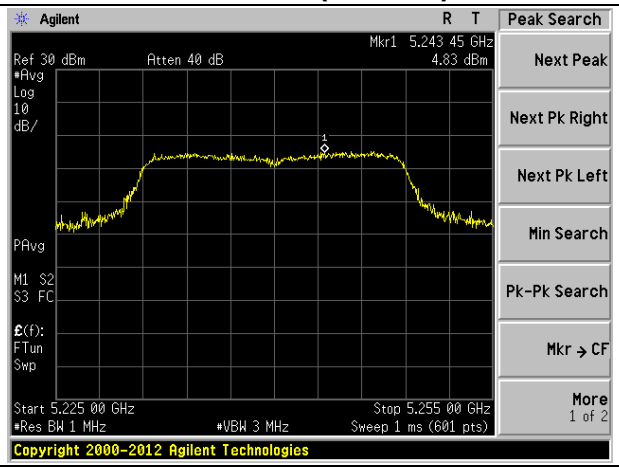
802.11n(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

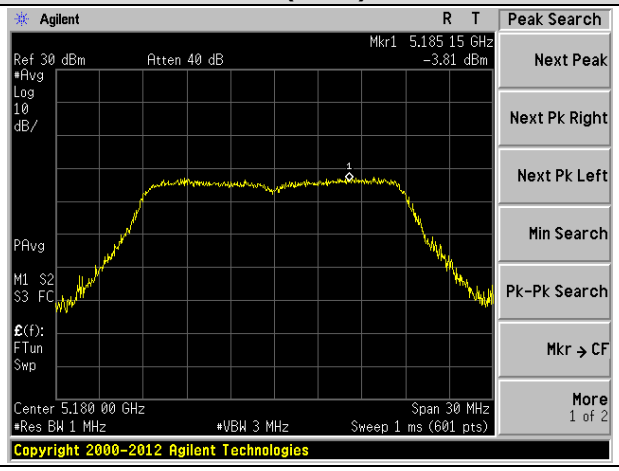
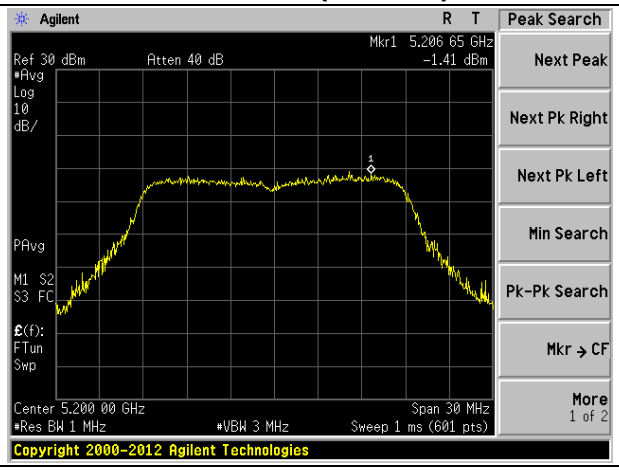
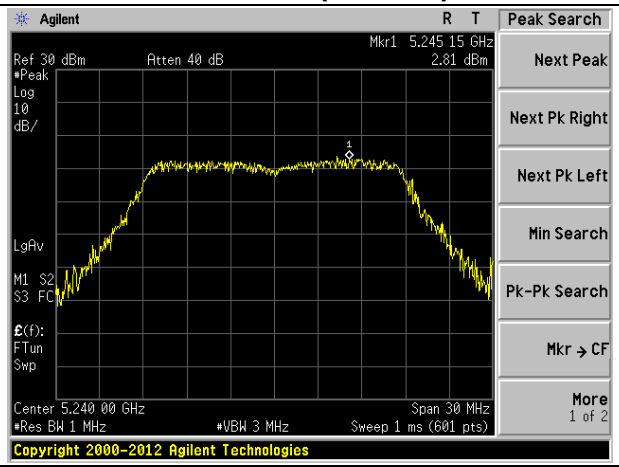
802.11ac(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

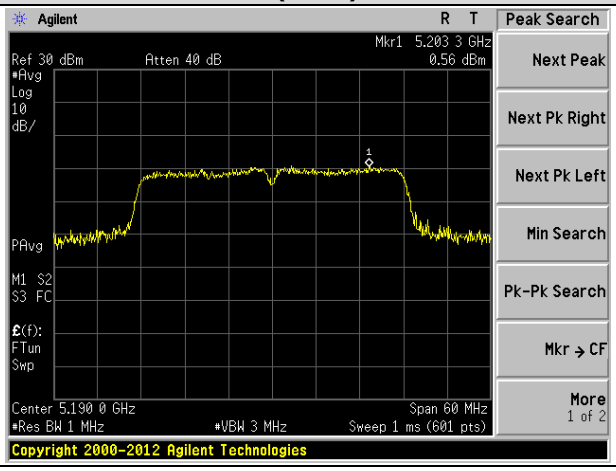
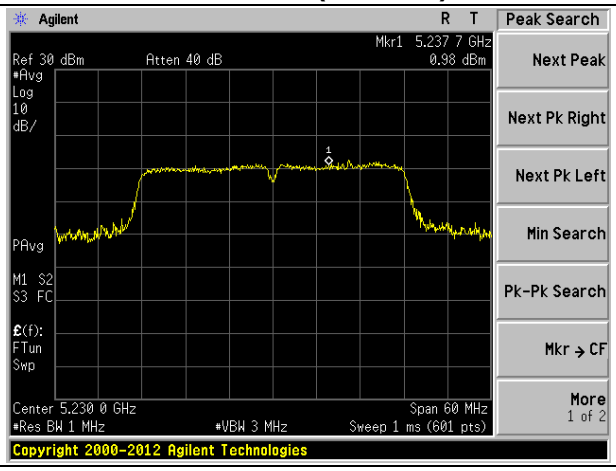
802.11ac(HT80) mode

Channel 40 (5210MHz)

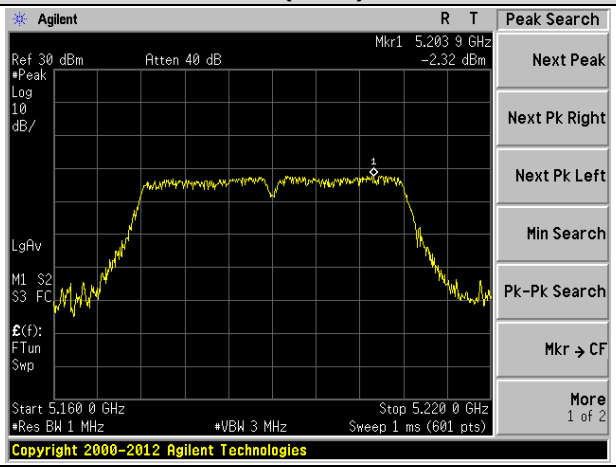
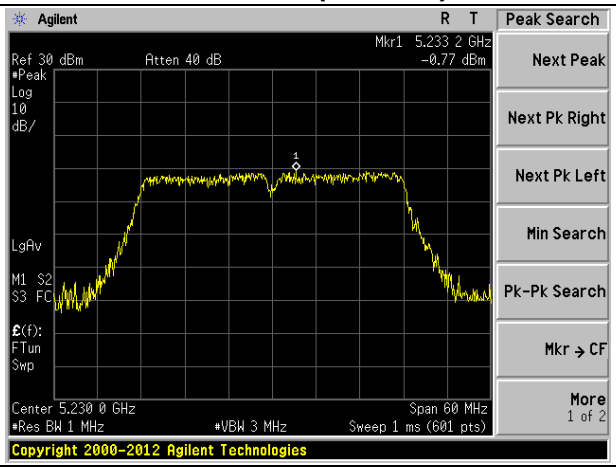
Aux Antenna:

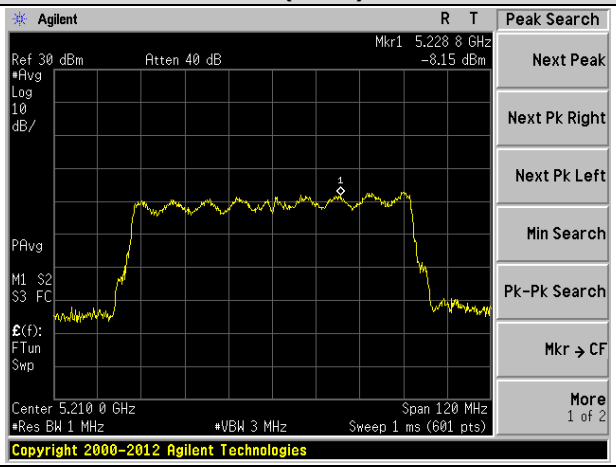
802.11a mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11n(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

802.11ac(HT20) mode

Channel 36 (5180MHz)

Channel 40 (5200MHz)

Channel 48 (5240MHz)

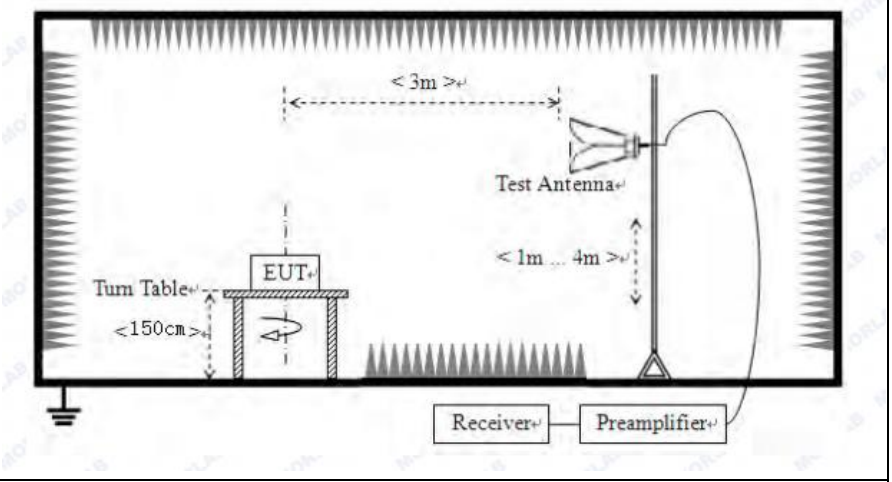
802.11n(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

802.11ac(HT40) mode

Channel 38 (5190MHz)

Channel 46 (5230MHz)

802.11ac(HT80) mode

Channel 40 (5210MHz)

7.6 Band Edge

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407 and 5.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td 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>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>68.2</td><td>Peak Value</td></tr>
</table>
Undesirable emission limits:
(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
(3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.
</td></tr>
<tr><td>Test Procedure:</td><td>
a. The EUT was placed on the top of a rotating table 1.5 m above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
d. 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 rotable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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
</td></tr>
</table>

	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 setup:	Above 1GHz 
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

According to KDB 789033 D02V01 section G) 1) (d), for For measurements above 1000 MHz @ 3m distance, the limit of field strength is computed as follows:

E[dBuV/m] = EIRP[dBm] + 95.2;

For example, if EIRP = -27dBm

E[dBuV/m] = -27 + 95.2 = 68.2dBuV/m.

Measurement Data:

Main Antenna:

802.11a(HT20)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	47.10	32.07	8.99	37.49	50.67	68.20	-17.53	Vertical	PK
5150.00	41.25	32.07	8.99	37.49	44.82	54.00	-9.18	Vertical	AV
5150.00	44.51	32.07	8.99	37.49	48.08	68.20	-20.12	Horizontal	PK
5150.00	39.36	32.07	8.99	37.49	42.93	54.00	-11.07	Horizontal	AV

802.11a(HT20)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	46.51	31.75	9.29	37.20	50.35	68.20	-17.85	Vertical	PK
5350.00	38.78	31.75	9.29	37.20	42.62	54.00	-11.38	Vertical	AV
5350.00	47.41	31.75	9.29	37.20	51.25	68.20	-16.95	Horizontal	PK
5350.00	40.11	31.75	9.29	37.20	43.95	54.00	-10.05	Horizontal	AV

Aux Antenna:

802.11a(HT20)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	46.74	32.07	8.99	37.49	50.31	68.20	-17.89	Vertical	PK
5150.00	38.02	32.07	8.99	37.49	41.59	54.00	-12.41	Vertical	AV
5150.00	47.68	32.07	8.99	37.49	51.25	68.20	-16.95	Horizontal	PK
5150.00	41.61	32.07	8.99	37.49	45.18	54.00	-8.82	Horizontal	AV

802.11a(HT20)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	44.87	31.75	9.29	37.20	48.71	68.20	-19.49	Vertical	PK
5350.00	37.14	31.75	9.29	37.20	40.98	54.00	-13.02	Vertical	AV
5350.00	46.48	31.75	9.29	37.20	50.32	68.20	-17.88	Horizontal	PK
5350.00	40.24	31.75	9.29	37.20	44.08	54.00	-9.92	Horizontal	AV

MIMO (AC 20M)

802.11ac(HT20)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	45.27	32.07	8.99	37.49	48.84	68.20	-19.36	Vertical	PK
5150.00	38.30	32.07	8.99	37.49	41.87	54.00	-12.13	Vertical	AV
5150.00	44.92	32.07	8.99	37.49	48.49	68.20	-19.71	Horizontal	PK
5150.00	40.86	32.07	8.99	37.49	44.43	54.00	-9.57	Horizontal	AV

802.11ac(HT20)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	47.20	31.75	9.29	37.20	51.04	68.20	-17.16	Vertical	PK
5350.00	42.83	31.75	9.29	37.20	46.67	54.00	-7.33	Vertical	AV
5350.00	46.19	31.75	9.29	37.20	50.03	68.20	-18.17	Horizontal	PK
5350.00	38.94	31.75	9.29	37.20	42.78	54.00	-11.22	Horizontal	AV

MIMO (AC 40M)

802.11ac(HT40)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	45.83	32.07	8.99	37.49	49.40	68.20	-18.80	Vertical	PK
5150.00	38.52	32.07	8.99	37.49	42.09	54.00	-11.91	Vertical	AV
5150.00	45.81	32.07	8.99	37.49	49.38	68.20	-18.82	Horizontal	PK
5150.00	39.52	32.07	8.99	37.49	43.09	54.00	-10.91	Horizontal	AV

802.11ac(HT40)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	47.19	31.75	9.29	37.20	51.03	68.20	-17.17	Vertical	PK
5350.00	42.13	31.75	9.29	37.20	45.97	54.00	-8.03	Vertical	AV
5350.00	46.92	31.75	9.29	37.20	50.76	68.20	-17.44	Horizontal	PK
5350.00	37.65	31.75	9.29	37.20	41.49	54.00	-12.51	Horizontal	AV

MIMO (AC 80M)

802.11ac(HT80)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	47.12	32.07	8.99	37.49	50.69	68.20	-17.51	Vertical	PK
5150.00	38.44	32.07	8.99	37.49	42.01	54.00	-11.99	Vertical	AV
5150.00	47.99	32.07	8.99	37.49	51.56	68.20	-16.64	Horizontal	PK
5150.00	42.38	32.07	8.99	37.49	45.95	54.00	-8.05	Horizontal	AV

802.11ac(HT80)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	46.79	31.75	9.29	37.20	50.63	68.20	-17.57	Vertical	PK
5350.00	39.92	31.75	9.29	37.20	43.76	54.00	-10.24	Vertical	AV
5350.00	44.06	31.75	9.29	37.20	47.90	68.20	-20.30	Horizontal	PK
5350.00	38.47	31.75	9.29	37.20	42.31	54.00	-11.69	Horizontal	AV

MIMO (N 20M)

802.11n(HT20)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	45.37	32.07	8.99	37.49	48.94	68.20	-19.26	Vertical	PK
5150.00	38.88	32.07	8.99	37.49	42.45	54.00	-11.55	Vertical	AV
5150.00	44.18	32.07	8.99	37.49	47.75	68.20	-20.45	Horizontal	PK
5150.00	39.08	32.07	8.99	37.49	42.65	54.00	-11.35	Horizontal	AV

802.11n(HT20)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	47.19	31.75	9.29	37.20	51.03	68.20	-17.17	Vertical	PK
5350.00	39.24	31.75	9.29	37.20	43.08	54.00	-10.92	Vertical	AV
5350.00	47.23	31.75	9.29	37.20	51.07	68.20	-17.13	Horizontal	PK
5350.00	38.42	31.75	9.29	37.20	42.26	54.00	-11.74	Horizontal	AV

MIMO (N 40M)

802.11n(HT40)				Lowest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5150.00	45.98	32.07	8.99	37.49	49.55	68.20	-18.65	Vertical	PK
5150.00	40.73	32.07	8.99	37.49	44.30	54.00	-9.70	Vertical	AV
5150.00	47.51	32.07	8.99	37.49	51.08	68.20	-17.12	Horizontal	PK
5150.00	38.65	32.07	8.99	37.49	42.22	54.00	-11.78	Horizontal	AV

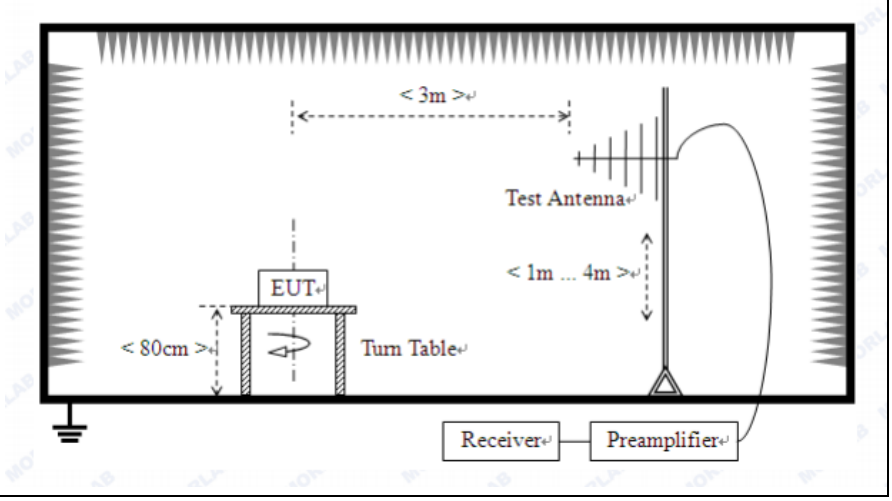
802.11n(HT40)				Highest					
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization	
5350.00	47.46	31.75	9.29	37.20	51.30	68.20	-16.90	Vertical	PK
5350.00	38.55	31.75	9.29	37.20	42.39	54.00	-11.61	Vertical	AV
5350.00	44.97	31.75	9.29	37.20	48.81	68.20	-19.39	Horizontal	PK
5350.00	39.57	31.75	9.29	37.20	43.41	54.00	-10.59	Horizontal	AV

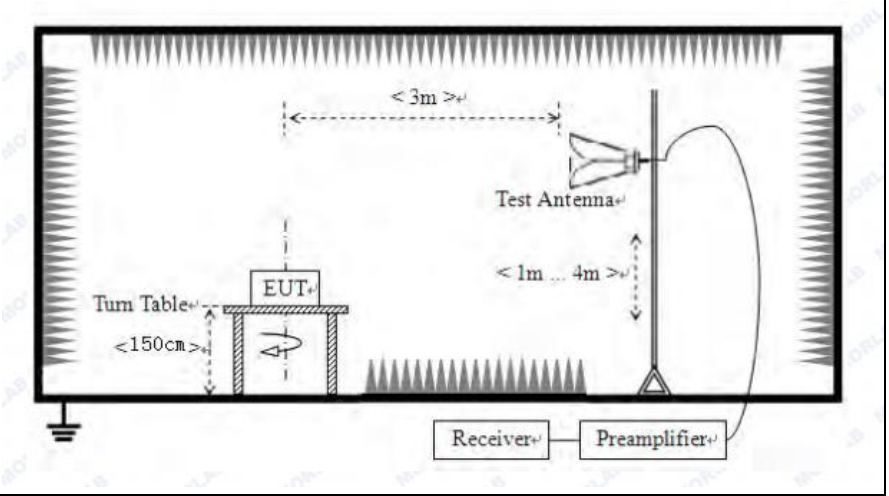
7.7 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209 and 15.205</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 40GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Value</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</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>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td>Above 1GHz</td><td>68.2</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>
Substitution method was performed to determine the actual ERP emission levels of the EUT.
The following test procedure as below:

1>.Below 1GHz test procedure:
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 rotable 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.

2>.Above 1GHz test procedure:
1. On the test site as test setup graph above,the EUT shall be placed at the 0.8m support on the turntable and in the position closest to normal use as declared by the provider.
2. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter.The
</td></tr>
</table>

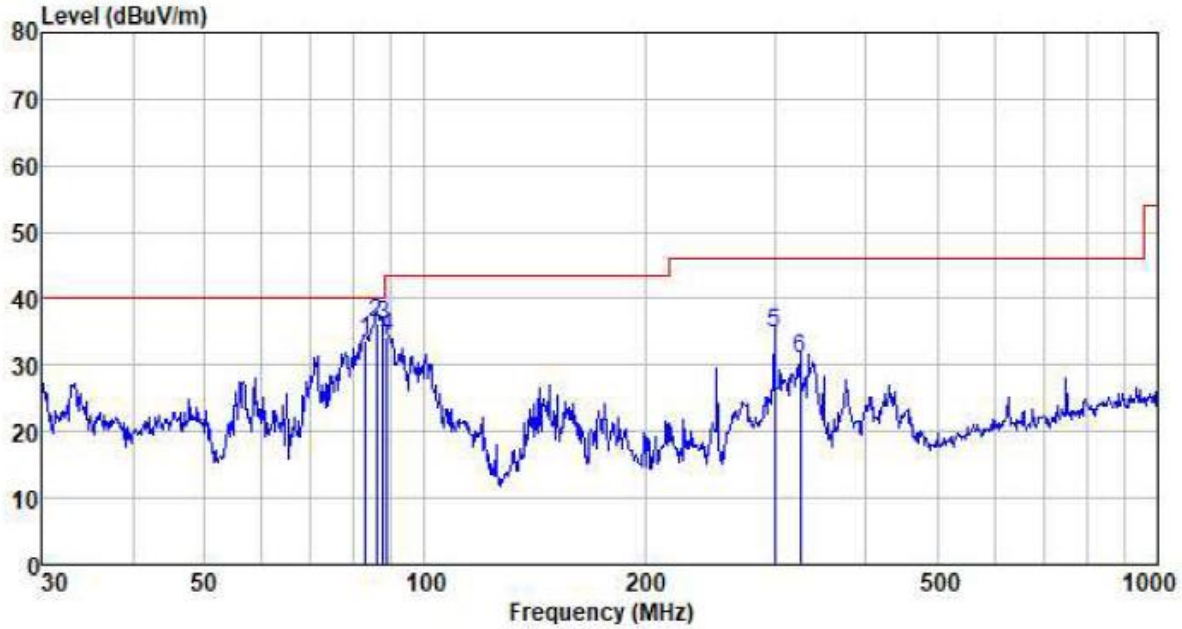
	output of the test antenna shall be connected to the measuring receiver. 3. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test. 4. The test antenna shall be raised and lowered from 1m to 4m until a maximum signal level is detected by the measuring receiver. Then the turntable should be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver. 5. Repeat step 4 for test frequency with the test antenna polarized horizontally. 6. Remove the transmitter and replace it with a substitution antenna 7. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends vertically polarized, and with the signal generator tuned to a particular test frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output. 8. Repeat step 7 with both antennas horizontally polarized for each test frequency. 9. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps 7 and 8 by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula: EIRP(dBm) = Pg(dBm) – cable loss (dB) + antenna gain (dBi) where: Pg is the generator output power into the substitution antenna.
Test setup:	Below 1GHz 

	Above 1GHz 
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

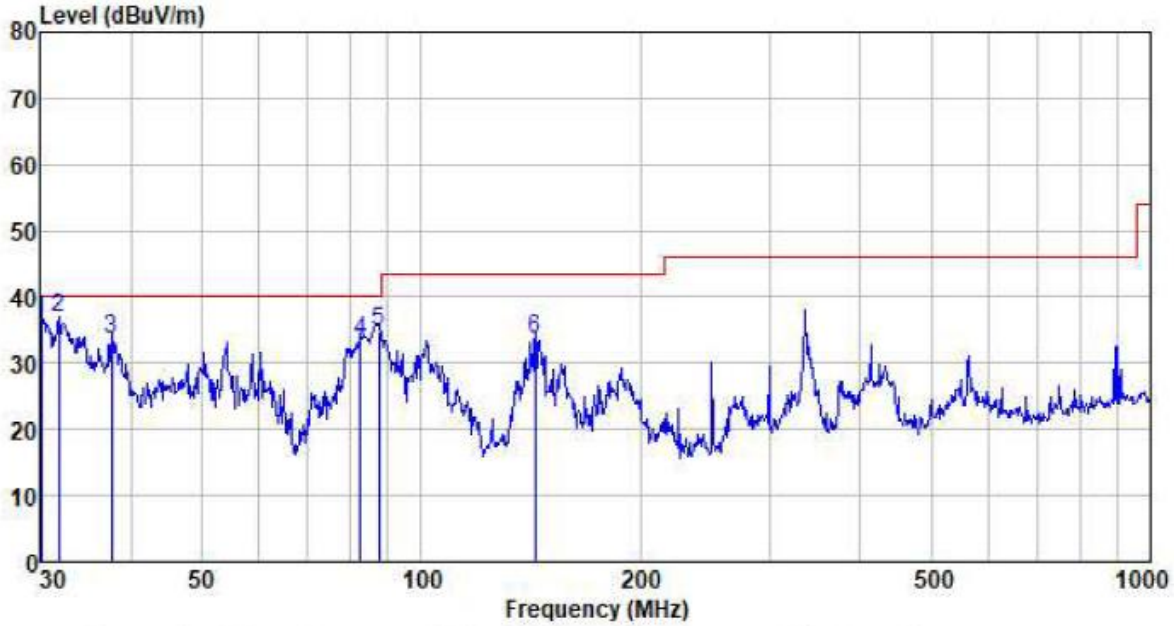
Below 1GHz

Horizontal:



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV	Limit level dBuV/m	Over limit dB	Remark
82.938	60.75	8.42	1.05	36.57	33.65	40.00	-6.35	QP
85.898	62.44	9.30	1.08	36.60	36.22	40.00	-3.78	QP
87.725	61.62	9.94	1.09	36.62	36.03	40.00	-3.97	QP
88.964	59.32	10.32	1.10	36.63	34.11	43.50	-9.39	QP
300.367	56.25	13.60	2.36	37.42	34.79	46.00	-11.21	QP
325.596	51.83	14.09	2.49	37.45	30.96	46.00	-15.04	QP

Vertical:



Freq	Reading level	Antenna factor	Cable loss	Preamp factor	level	Limit level	Over limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV	dBuV/m	dB	
30.105	59.94	11.20	0.55	35.01	36.68	40.00	-3.32	QP
31.843	60.33	11.24	0.57	35.14	37.00	40.00	-3.00	QP
37.680	56.62	11.80	0.64	35.53	33.53	40.00	-6.47	QP
82.648	60.64	8.29	1.05	36.57	33.41	40.00	-6.59	QP
87.418	60.59	9.81	1.09	36.62	34.87	40.00	-5.13	QP
143.326	61.70	7.47	1.53	37.04	33.66	43.50	-9.84	QP

Above 1GHz:

Main Antenna: PK VALUE

802.11a(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	31.25	39.67	14.62	32.65	52.89	74.00	-21.11	Vertical
15540.00	29.84	38.60	17.66	34.46	53.05	74.00	-20.95	Vertical
10360.00	32.50	39.67	14.62	32.65	52.89	74.00	-21.11	Horizontal
15540.00	32.81	38.60	17.66	34.46	53.05	74.00	-20.95	Horizontal

802.11a(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	32.01	39.75	14.63	32.71	52.92	74.00	-21.08	Vertical
15600.00	30.31	38.33	17.67	34.17	53.08	74.00	-20.92	Vertical
10400.00	28.87	39.75	14.63	32.71	52.92	74.00	-21.08	Horizontal
15600.00	29.48	38.33	17.67	34.17	53.08	74.00	-20.92	Horizontal

802.11a(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	28.45	39.82	14.68	32.86	52.89	74.00	-21.11	Vertical
15720.00	29.60	38.09	17.73	33.66	53.41	74.00	-20.59	Vertical
10480.00	32.97	39.82	14.68	32.86	52.89	74.00	-21.11	Horizontal
15720.00	32.87	38.09	17.73	33.66	53.41	74.00	-20.59	Horizontal

Aux Antenna: PK VALUE

802.11a(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	31.66	39.67	14.62	32.65	53.30	74.00	-20.70	Vertical
15540.00	29.10	38.60	17.66	34.46	53.46	74.00	-20.54	Vertical
10360.00	31.28	39.67	14.62	32.65	53.30	74.00	-20.70	Horizontal
15540.00	28.52	38.60	17.66	34.46	53.46	74.00	-20.54	Horizontal

802.11a(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	29.91	39.75	14.63	32.71	53.33	74.00	-20.67	Vertical
15600.00	29.80	38.33	17.67	34.17	53.49	74.00	-20.51	Vertical
10400.00	30.49	39.75	14.63	32.71	53.33	74.00	-20.67	Horizontal
15600.00	29.98	38.33	17.67	34.17	53.49	74.00	-20.51	Horizontal

802.11a(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	28.32	39.82	14.68	32.86	53.30	74.00	-20.70	Vertical
15720.00	32.53	38.09	17.73	33.66	53.82	74.00	-20.18	Vertical
10480.00	28.70	39.82	14.68	32.86	53.30	74.00	-20.70	Horizontal
15720.00	30.98	38.09	17.73	33.66	53.82	74.00	-20.18	Horizontal

MIMO (AC 20M) PK VALUE

802.11ac(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	31.32	39.71	14.63	32.68	53.32	74.00	-20.68	Vertical
15540.00	29.10	38.46	17.67	34.32	53.47	74.00	-20.53	Vertical
10360.00	29.43	39.71	14.63	32.68	53.32	74.00	-20.68	Horizontal
15540.00	29.16	38.46	17.67	34.32	53.47	74.00	-20.53	Horizontal

802.11ac(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	29.94	39.75	14.63	32.71	53.33	74.00	-20.67	Vertical
15600.00	30.57	38.33	17.67	34.17	53.49	74.00	-20.51	Vertical
10400.00	28.08	39.75	14.63	32.71	53.33	74.00	-20.67	Horizontal
15600.00	29.66	38.33	17.67	34.17	53.49	74.00	-20.51	Horizontal

802.11ac(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	30.67	39.82	14.68	32.86	53.30	74.00	-20.70	Vertical
15720.00	31.37	38.09	17.73	33.66	53.82	74.00	-20.18	Vertical
10480.00	32.77	39.82	14.68	32.86	53.30	74.00	-20.70	Horizontal
15720.00	29.71	38.09	17.73	33.66	53.82	74.00	-20.18	Horizontal

MIMO (AC 40M) PK VALUE

802.11ac(HT40) 5190MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	30.21	39.71	14.63	32.68	53.32	74.00	-20.68	Vertical
15570.00	32.11	38.46	17.67	34.32	53.47	74.00	-20.53	Vertical
10380.00	30.96	39.71	14.63	32.68	53.32	74.00	-20.68	Horizontal
15570.00	30.20	38.46	17.67	34.32	53.47	74.00	-20.53	Horizontal

802.11ac(HT40) 5230MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	28.18	39.75	14.65	32.74	53.32	74.00	-20.68	Vertical
15690.00	30.64	38.33	17.69	34.03	53.65	74.00	-20.35	Vertical
10460.00	29.46	39.75	14.65	32.74	53.32	74.00	-20.68	Horizontal
15690.00	29.50	38.33	17.69	34.03	53.65	74.00	-20.35	Horizontal

MIMO (AC 80M) PK VALUE

802.11ac(HT80) 5210MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10420.00	28.36	39.82	14.66	32.80	53.34	74.00	-20.66	Vertical
15630.00	31.38	38.09	17.71	33.81	53.65	74.00	-20.35	Vertical
10420.00	32.27	39.82	14.66	32.80	53.34	74.00	-20.66	Horizontal
15630.00	30.71	38.09	17.71	33.81	53.65	74.00	-20.35	Horizontal

MIMO (N 20M) PK VALUE

802.11n(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	28.39	39.67	14.62	32.65	53.30	74.00	-20.70	Vertical
15540.00	30.81	38.60	17.66	34.46	53.46	74.00	-20.54	Vertical
10360.00	30.24	39.67	14.62	32.65	53.30	74.00	-20.70	Horizontal
15540.00	29.91	38.60	17.66	34.46	53.46	74.00	-20.54	Horizontal

802.11n(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	30.55	39.75	14.63	32.71	53.33	74.00	-20.67	Vertical
15600.00	29.72	38.33	17.67	34.17	53.49	74.00	-20.51	Vertical
10400.00	28.87	39.75	14.63	32.71	53.33	74.00	-20.67	Horizontal
15600.00	28.94	38.33	17.67	34.17	53.49	74.00	-20.51	Horizontal

802.11n(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	30.91	39.82	14.68	32.86	53.30	74.00	-20.70	Vertical
15720.00	28.42	38.09	17.73	33.66	53.82	74.00	-20.18	Vertical
10480.00	29.42	39.82	14.68	32.86	53.30	74.00	-20.70	Horizontal
15720.00	29.97	38.09	17.73	33.66	53.82	74.00	-20.18	Horizontal

MIMO (N 40M) PK VALUE

802.11n(HT40) 5190MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	30.33	39.71	14.63	32.68	53.32	74.00	-20.68	Vertical
15570.00	32.14	38.46	17.67	34.32	53.47	74.00	-20.53	Vertical
10380.00	29.81	39.71	14.63	32.68	53.32	74.00	-20.68	Horizontal
15570.00	31.21	38.46	17.67	34.32	53.47	74.00	-20.53	Horizontal

802.11n(HT40) 5230MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	31.03	39.82	14.66	32.80	53.34	74.00	-20.66	Vertical
15690.00	31.40	38.09	17.71	33.81	53.65	74.00	-20.35	Vertical
10460.00	31.62	39.82	14.66	32.80	53.34	74.00	-20.66	Horizontal
15690.00	30.30	38.09	17.71	33.81	53.65	74.00	-20.35	Horizontal

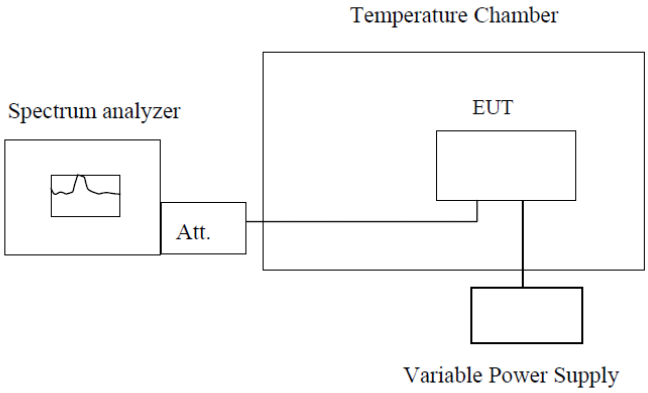
Note:

1. Level = Read Level + Antenna Factor+ Cable loss- Preamp Factor.

2. The test trace is same as the ambient noise (the test frequency range: 18GHz~40GHz), therefore no data appear in the report.

3. This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

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:	The EUT was setup to ANSI C63.4, 2003; tested to 2.1055 for compliance to FCC Part 15.407(g) requirements.
Test setup:	 **Note :** Measurement setup for testing on Antenna connector
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

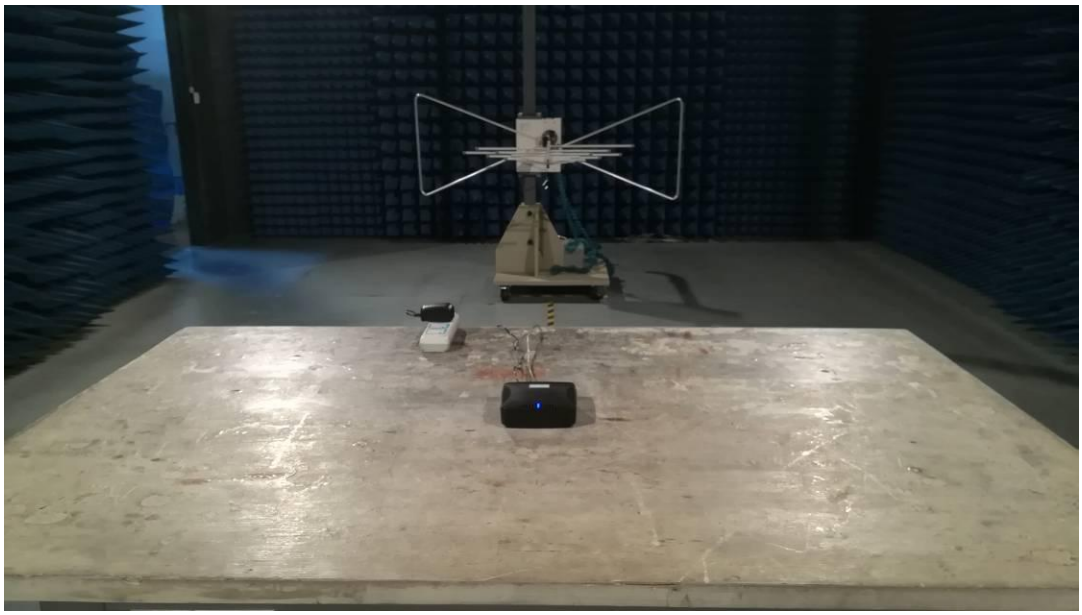
Frequency stability versus Temp.					
Power Supply: AC120V					
Temp. (°C)	Operating Frequency (MHz)	0 minute	2 minute	5 minute	10 minute
		Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)
-30	5180	5176.0081	5183.6423	5180.3353	5177.8732
	5200	5199.3577	5200.4712	5201.4083	5197.0733
	5220	5219.7127	5220.6279	5220.4045	5219.5719
	5240	5239.7409	5240.7432	5240.1206	5239.9416
-20	5180	5179.2484	5180.3728	5180.4709	5179.3481
	5200	5199.4775	5200.7999	5200.0554	5199.5622
	5220	5219.3627	5220.9615	5220.5281	5219.7092
	5240	5239.4606	5240.5686	5240.1714	5239.9075
-10	5180	5179.1630	5180.3055	5180.8138	5179.8899
	5200	5199.5793	5200.2348	5200.5650	5199.0451
	5220	5219.2243	5220.9650	5220.3472	5219.5010
	5240	5239.3397	5240.2643	5240.5179	5239.1454
0	5180	5179.7494	5180.4045	5180.9774	5179.2384
	5200	5199.0197	5200.6263	5200.6225	5199.5594
	5220	5219.2889	5220.9497	5220.4833	5219.5893
	5240	5239.8283	5240.1711	5240.8772	5239.2752
10	5180	5179.3328	5180.3444	5180.8311	5179.9680
	5200	5199.2398	5200.9708	5200.6843	5199.7545
	5220	5219.8141	5220.3020	5220.8903	5219.0930
	5240	5239.4821	5240.1553	5240.9986	5239.1626
20	5180	5179.6161	5180.3573	5180.0591	5179.8244
	5200	5199.7867	5200.2679	5200.4956	5199.8058
	5220	5219.4375	5220.1634	5220.2582	5219.4319
	5240	5239.0625	5240.7567	5240.2645	5239.4386
30	5180	5179.8942	5180.6096	5180.7447	5179.8444
	5200	5199.1571	5200.9631	5200.0791	5199.6078
	5220	5219.1509	5220.7071	5220.0245	5219.2835
	5240	5239.6266	5240.8914	5240.5910	5239.1500
40	5180	5179.8320	5180.2877	5180.8759	5179.6877
	5200	5199.2488	5200.6266	5200.0402	5199.1625
	5220	5219.0115	5220.4268	5220.5893	5219.6149
	5240	5239.6059	5240.4635	5240.6797	5239.3817
50	5180	5179.3894	5180.2767	5180.2660	5179.5472
	5200	5199.8170	5200.5019	5200.5309	5199.5960
	5220	5219.4341	5220.4913	5220.3480	5219.0073
	5240	5239.9388	5240.2217	5240.5626	5239.3235

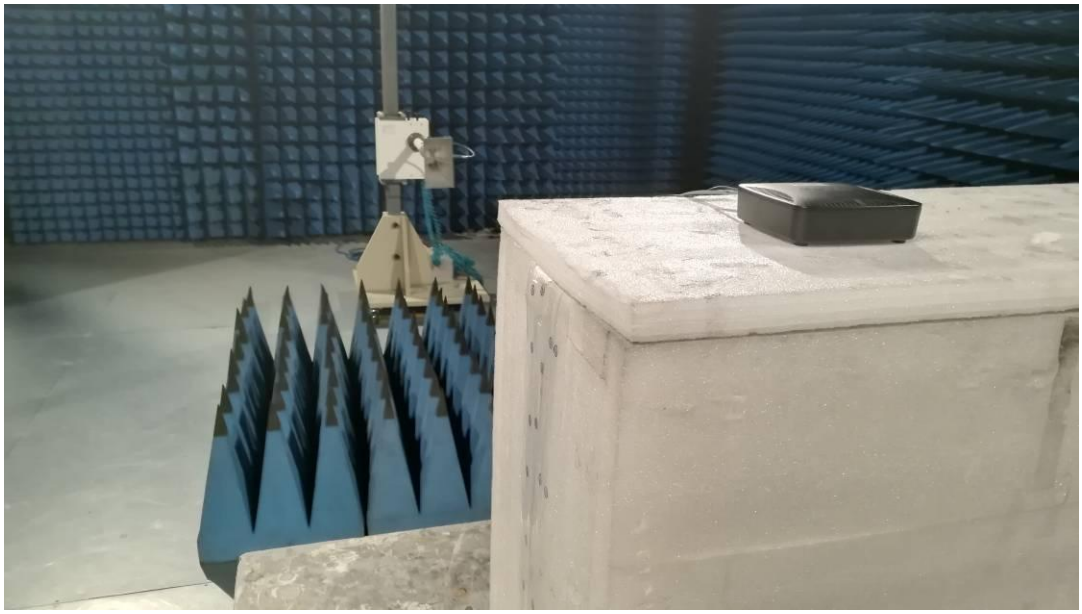
Frequency stability versus Voltage					
Temperature: 25°C					
Power Supply (VAC)	Operating Frequency (MHz)	0 minute	2 minute	5 minute	10 minute
		Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)	Measured Frequency (MHz)
108	5180	5182.8613	5180.5212	5179.3707	5179.9947
	5200	5200.5305	5200.8579	5199.8019	5199.5169
	5220	5220.4864	5220.4811	5219.5703	5219.4405
	5240	5240.9405	5240.8888	5239.9431	5239.6025
120	5180	5180.3907	5180.3724	5179.4221	5179.6572
	5200	5200.7176	5200.9180	5199.6956	5199.5226
	5220	5220.1910	5220.5316	5219.3555	5219.7138
	5240	5240.3662	5240.2358	5239.1817	5239.8312
132	5180	5180.6651	5180.8495	5179.9638	5179.7121
	5200	5200.9612	5200.0498	5199.2645	5199.2879
	5220	5220.2697	5220.1567	5219.7230	5219.6046
	5240	5240.8045	5240.1082	5239.8479	5239.4257

Note: The worst case is FL=5176.0081MHz, FH=5240.9986MHz

8 Test Setup Photo

Radiated Emission





Conducted Emission

9 EUT Constructional Details

Reference to the test report No. GTS201801000072E01

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