Test Report

Applicant:	simplehuman
Address of Applicant:	19850 Magellan Drive, Torrance, California 90502, United States
Manufacturer/Factory:	simplehuman
Address of Manufacturer/Factory:	19850 Magellan Drive, Torrance, California 90502, United States

Equipment Under Test (EUT)

Product Name:	Sensor Mirror hi-fi
Model No.:	ST3044
Trade Mark:	simplehuman
FCC ID:	2AF9Q-ST3044
Applicable standards:	FCC CFR Title 47 Part 15 Subpart E Section 15.407
Date of sample receipt:	April 29, 2019
Date of Test:	June 30, 2019-July 31, 2019
Date of report issue:	August 01, 2019
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	*August 01, 2019*	*Original*

Prepared By: *Tiger Chen* ***Date:*** *August 01, 2019*

Project Engineer

Check By: *Robinson Lo* ***Date:*** *August 01, 2019*

Reviewer

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4 Test Summary

Test Item	Section	Result
Antenna requirement	FCC part 15.203	PASS
AC Power Line Conducted Emission	FCC part 15.207	PASS
Peak Transmit Power	FCC part 15.407(a)(1)	PASS
Power Spectral Density	FCC part 15.407(a)(1)	PASS
Undesirable Emission	FCC part 15.407(b)(6), 15.205/15.209	PASS
Radiated Emission	FCC part 15.205/15.209	PASS
Band Edge	FCC part 15.407(b)(1)	PASS
Frequency Stability	FCC part 15.407(g)	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	30MHz-200MHz	3.80dB	(1)
Radiated Emission	200MHz-1GHz	3.97dB	(1)
Radiated Emission	1GHz-18GHz	4.29dB	(1)
Radiated Emission	18GHz-40GHz	3.30dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	3.44dB	(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:	Sensor Mirror hi-fi
Model No.:	ST3044
Serial No.:	T20256210
Hardware Version:	REV4
Software Version:	0.0.76.0xe937ccc
Test sample(s) ID:	GTS201904000196-1
Sample(s) Status:	Engineer sample
Operation Frequency:	Mode / Frequency Range(MHz) / Number of channels IEEE 802.11n/ac 20MHz / 5180-5240 / 4 IEEE 802.11n/ac 40MHz / 5190-5230 / 2 IEEE 802.11ac 80MHz / 5210 / 1
Modulation technology:	OFDM [MIMO mode only]
Antenna Type:	Integral Antenna
Antenna gain:	ANT 1: 2.88dBi ANT 2: 2.88dBi
Power supply:	Adapter Model No: W18-033N1A Input: AC 100-240V-1.1A, 50-60Hz Output: DC 16.5V, 2 A

Note: The 2 transmit signals are completely uncorrelated with each other,Directional gain = G ANT=2.88dBi

Channel list for 802.11n/ac(HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200MHz	44	5220MHz	48	5240MHz

Channel list for 802.11n(HT40)/ac(HT40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz				

Channel list for 802.11ac(HT80)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
42	5210MHz						

5.2 Test mode

Transmitting mode	Keep the EUT in transmitting with modulation..

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.

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:

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

Mode	Data rate
802.11a/n/ac(HT20)	6/6.5 Mbps
802.11n/ac(HT40)	13.5 Mbps
802.11ac(HT80)	29.3 Mbps

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 fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383.

● **NVLAP (LAB CODE:600179-0)**

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). LAB CODE:600179-0

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

Manufacturer	Description	Model	Serial Number
Lenovo	Notebook PC	E40-80	N/A

5.6 Deviation from Standards

None.

5.7 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default
Version	Ver 1.0

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. 26 2019	June. 25 2020
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June. 26 2019	June. 25 2020
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June. 26 2019	June. 25 2020
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June. 26 2019	June. 25 2020
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	June. 26 2019	June. 25 2020
9	Coaxial Cable	GTS	N/A	GTS211	June. 26 2019	June. 25 2020
10	Coaxial cable	GTS	N/A	GTS210	June. 26 2019	June. 25 2020
11	Coaxial Cable	GTS	N/A	GTS212	June. 26 2019	June. 25 2020
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June. 26 2019	June. 25 2020
13	Amplifier(2GHz-20GHz)	HP	84722A	GTS206	June. 26 2019	June. 25 2020
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June. 26 2019	June. 25 2020
15	Band filter	Amindeon	82346	GTS219	June. 26 2019	June. 25 2020
16	Power Meter	Anritsu	ML2495A	GTS540	June. 26 2019	June. 25 2020
17	Power Sensor	Anritsu	MA2411B	GTS541	June. 26 2019	June. 25 2020
18	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	June. 26 2019	June. 25 2020
19	Splitter	Agilent	11636B	GTS237	June. 26 2019	June. 25 2020
20	Loop Antenna	ZHINAN	ZN30900A	GTS534	June. 26 2019	June. 25 2020
21	Breitband hornantenne	SCHWARZBECK	BBHA 9170	GTS579	Oct. 20 2018	Oct. 19 2019
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 20 2018	Oct. 19 2019
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 20 2018	Oct. 19 2019
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June. 26 2019	June. 25 2020

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.15 2019	May.14 2022
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 26 2019	June. 25 2020
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 26 2019	June. 25 2020
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 26 2019	June. 25 2020
8	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	June. 26 2019	June. 25 2020
9	ISN	SCHWARZBECK	NTFM 8158	GTD565	June. 26 2019	June. 25 2020

RF Conducted Test:

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	June. 26 2019	June. 25 2020
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 26 2019	June. 25 2020
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June. 26 2019	June. 25 2020
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	June. 26 2019	June. 25 2020
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	June. 26 2019	June. 25 2020
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	June. 26 2019	June. 25 2020
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	June. 26 2019	June. 25 2020
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	June. 26 2019	June. 25 2020

General used equipment:

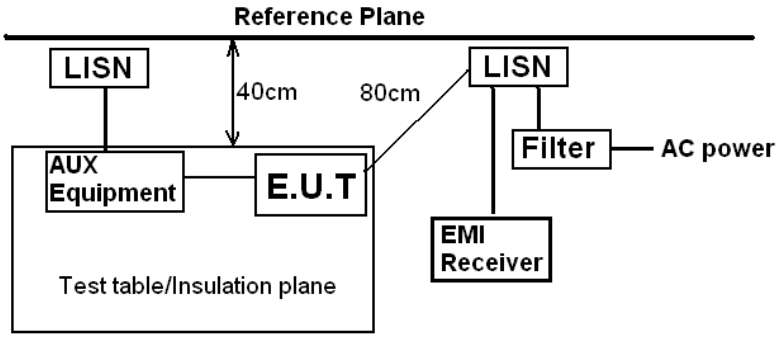
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	June. 26 2019	June. 25 2020
2	Barometer	ChangChun	DYM3	GTS255	June. 26 2019	June. 25 2020

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 antennas are 2.88dBi, reference to the appendix II for details	

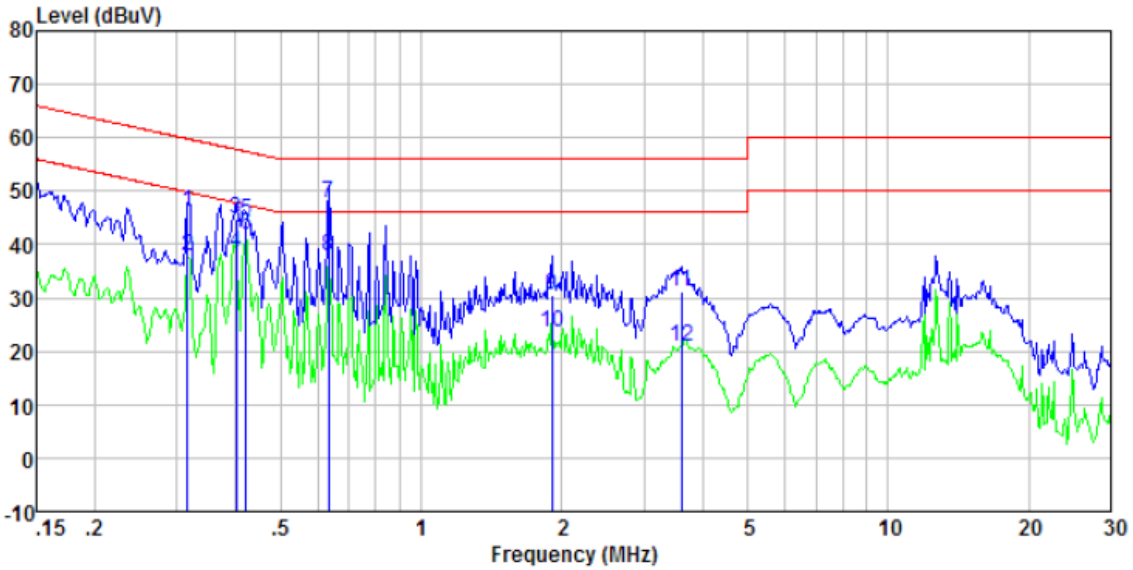
7.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td colspan="6">FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td colspan="6">ANSI C63.10:2013</td></tr>
<tr><td>Test Frequency Range:</td><td colspan="6">150KHz to 30MHz</td></tr>
<tr><td>Class / Severity:</td><td colspan="6">Class B</td></tr>
<tr><td>Receiver setup:</td><td colspan="6">RBW=9KHz, VBW=30KHz</td></tr>
<tr><td>Limit:</td><td colspan="6"><table><tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr><tr><td>Quasi-peak</td><td>Average</td></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table>* Decreases with the logarithm of the frequency.</td></tr>
<tr><td>Test procedure</td><td colspan="6">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.</td></tr>
<tr><td>Test setup:</td><td colspan="6"> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Instruments:</td><td colspan="6">Refer to section 5.10 for details</td></tr>
<tr><td>Test mode:</td><td colspan="6">Refer to section 5.2 for details</td></tr>
<tr><td>Test environment:</td><td>Temp.:</td><td>25 °C</td><td>Humid.:</td><td>52%</td><td>Press.:</td><td>1012mbar</td></tr>
<tr><td>Test voltage:</td><td colspan="6">AC 120V, 60Hz</td></tr>
<tr><td>Test results:</td><td colspan="6">Pass</td></tr>
</table>

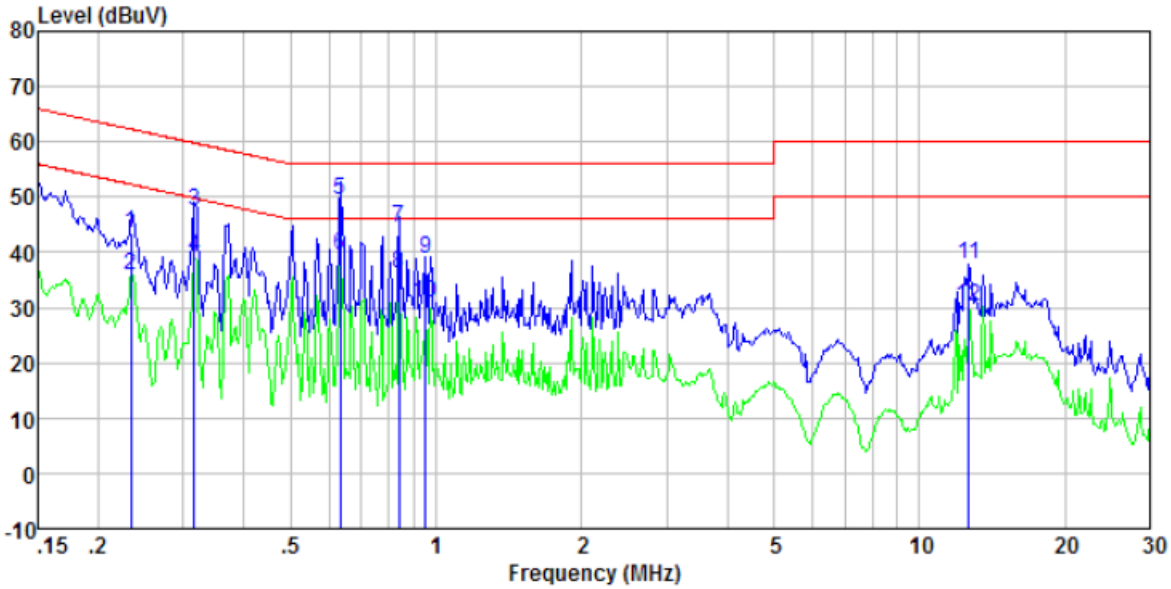
Measurement data:

Line:



Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.32	45.73	0.39	0.10	46.22	59.80	-13.58	QP
0.32	37.26	0.39	0.10	37.75	49.80	-12.05	Average
0.40	44.41	0.35	0.11	44.87	57.81	-12.94	QP
0.40	37.94	0.35	0.11	38.40	47.81	-9.41	Average
0.42	43.96	0.34	0.11	44.41	57.42	-13.01	QP
0.42	41.29	0.34	0.11	41.74	47.42	-5.68	Average
0.63	47.43	0.28	0.12	47.83	56.00	-8.17	QP
0.63	37.46	0.28	0.12	37.86	46.00	-8.14	Average
1.91	30.02	0.20	0.17	30.39	56.00	-25.61	QP
1.91	23.20	0.20	0.17	23.57	46.00	-22.43	Average
3.60	30.73	0.20	0.18	31.11	56.00	-24.89	QP
3.60	20.48	0.20	0.18	20.86	46.00	-25.14	Average

Neutral:

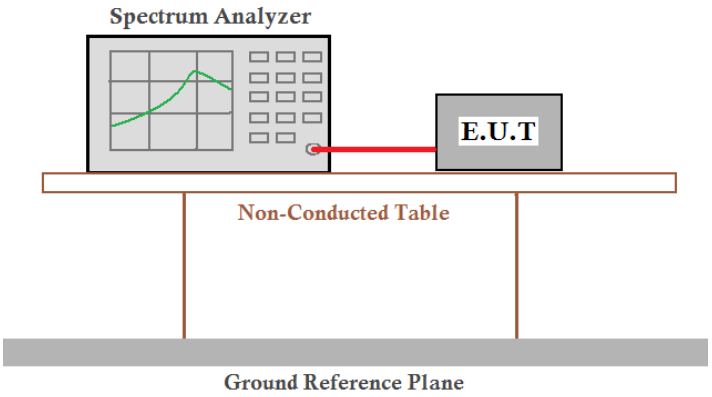


Freq MHz	Reading level dBuV	LISN/ISN factor dB/m	Cable loss dB	Level dBuV	Limit level dBuV	Over limit dB	Remark
0.23	43.11	0.40	0.11	43.62	62.30	-18.68	QP
0.23	35.28	0.40	0.11	35.79	52.30	-16.51	Average
0.32	47.12	0.39	0.10	47.61	59.80	-12.19	QP
0.32	38.63	0.39	0.10	39.12	49.80	-10.68	Average
0.63	49.01	0.28	0.12	49.41	56.00	-6.59	QP
0.63	39.01	0.28	0.12	39.41	46.00	-6.59	Average
0.84	44.07	0.23	0.14	44.44	56.00	-11.56	QP
0.84	35.93	0.23	0.14	36.30	46.00	-9.70	Average
0.95	38.50	0.21	0.15	38.86	56.00	-17.14	QP
0.95	30.55	0.21	0.15	30.91	46.00	-15.09	Average
12.65	37.42	0.20	0.21	37.83	60.00	-22.17	QP
12.65	29.66	0.20	0.21	30.07	50.00	-19.93	Average

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*

7.3 Emission Bandwidth and 99% Occupied Bandwidth

Test Requirement :	FCC Part15 E Section 15.407
Test Method :	KDB 789033 D02 v02r01
Limit:	N/A
Test setup:	
Test procedure:	According to KDB 789033 D02 General U-NII Test Procedures New Rules v02r01.
Test Instruments:	Refer to section 5.10 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

ANT 1:

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n (HT20)	802.11ac (HT20)	802.11n (HT20)	802.11ac (HT20)
36	5180	17.6532	17.6270	20.253	19.776
40	5200	17.6399	17.6402	19.889	19.649
48	5240	17.6365	17.6497	19.915	20.182

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	36.1372	36.2275	40.814	41.367
46	5230	36.0976	36.3078	43.372	41.312

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Occupied Bandwidth (MHz)
		802.11ac(HT80)	802.11ac(HT80)
42	5210	76.1023	101.564

ANT 2:

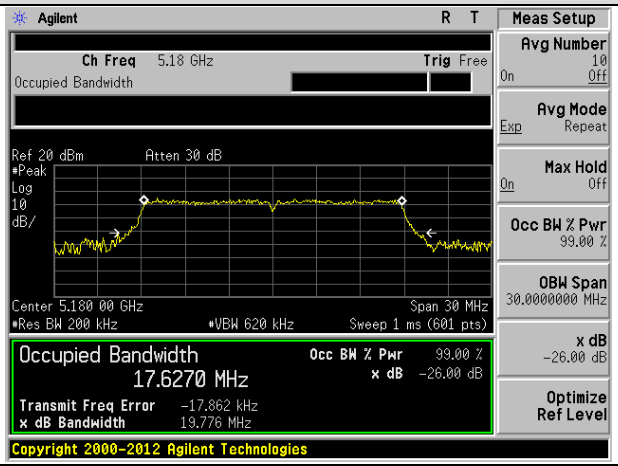
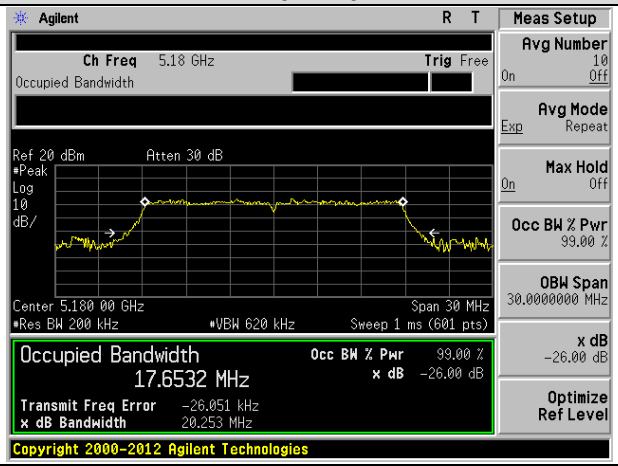
CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)		26dB Occupied Bandwidth (MHz)	
		802.11n (HT20)	802.11ac (HT20)	802.11n (HT20)	802.11ac (HT20)
36	5180	17.6497	17.6475	20.868	19.874
40	5200	17.6201	17.6584	20.079	19.632
48	5240	17.6444	17.6169	20.235	20.072

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	36.2750	36.3273	39.959	40.735
46	5230	36.0539	36.2146	39.264	40.819

CH. No.	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26dB Occupied Bandwidth (MHz)
		802.11ac(HT80)	802.11ac(HT80)
42	5210	75.9686	99.728

Test plots as followed:

ANT 1:

802.11ac mode	802.11n(HT20) mode
	
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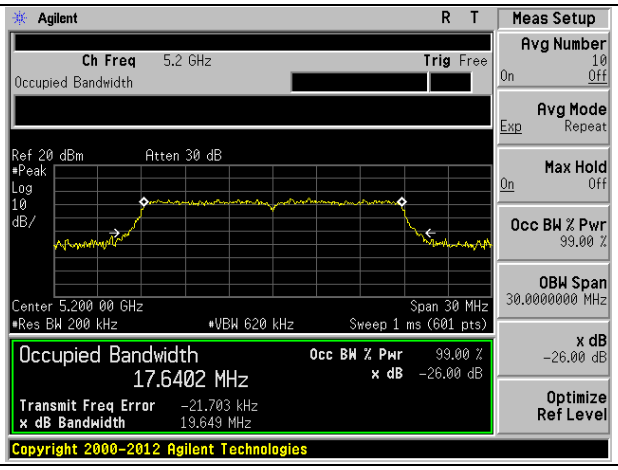
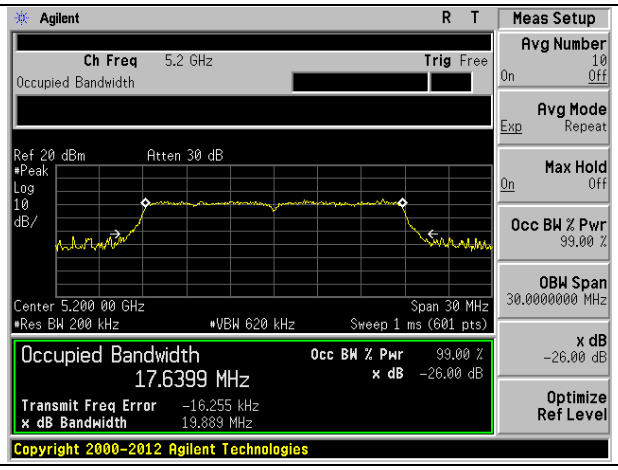
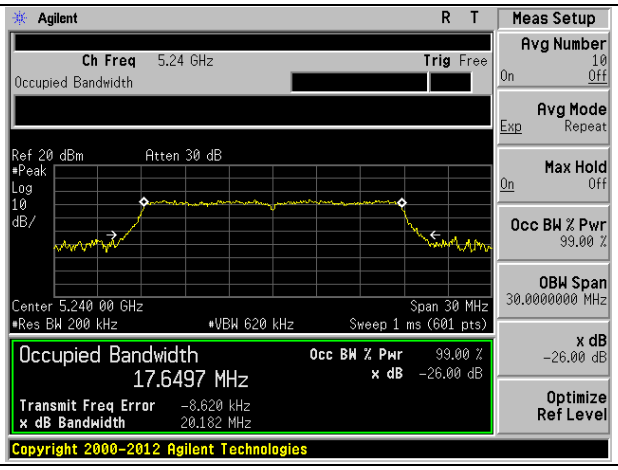
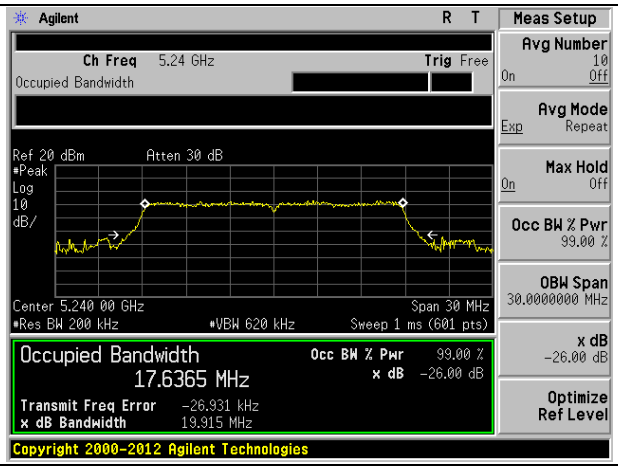
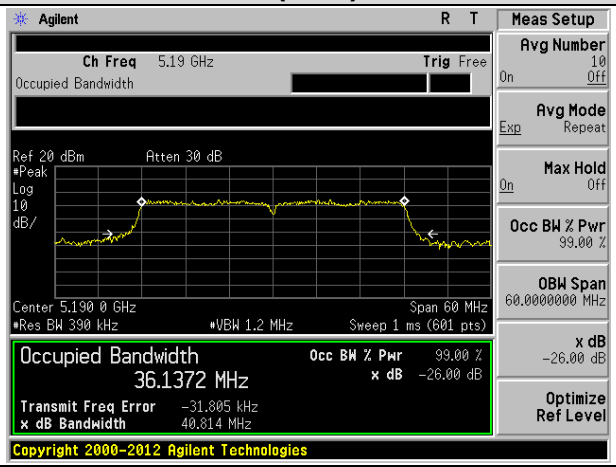
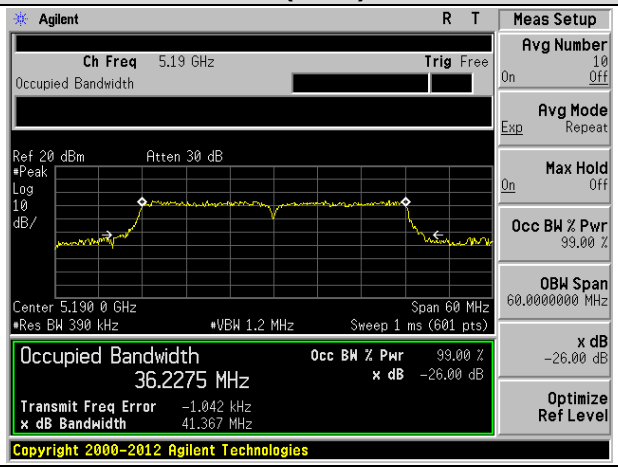
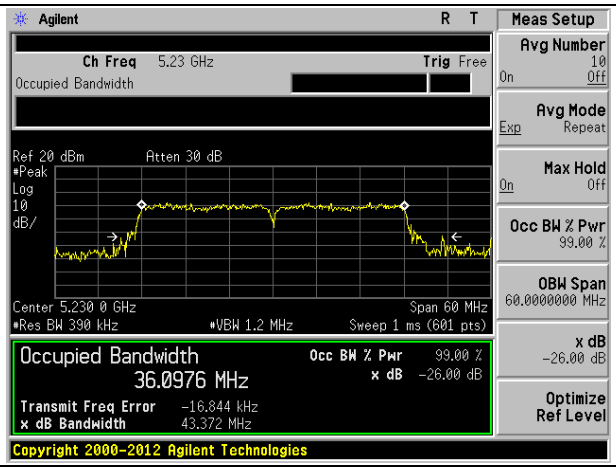
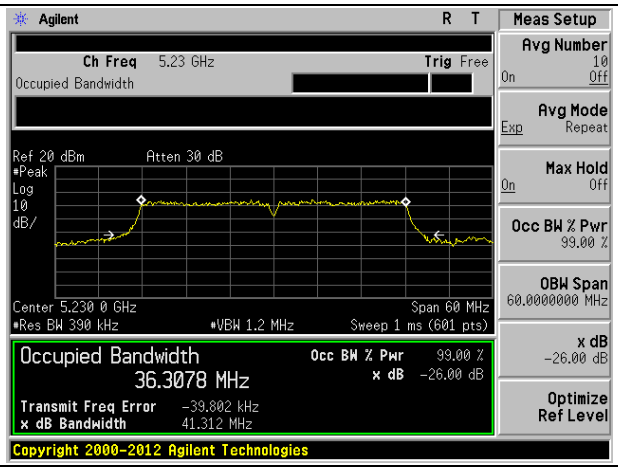
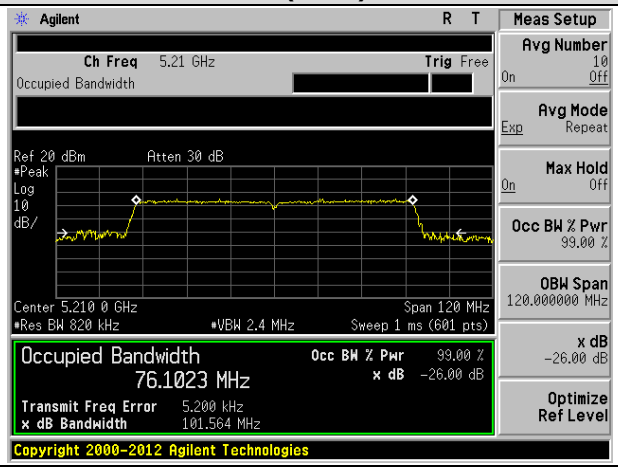
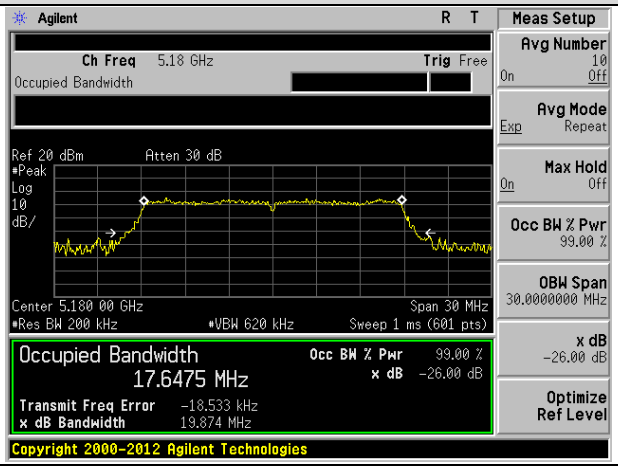
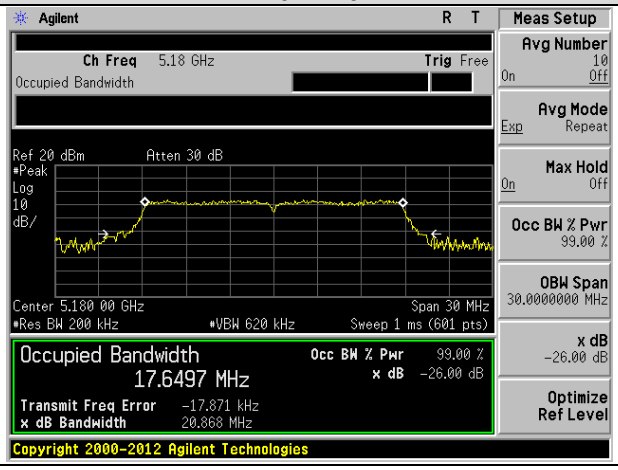
	
5200	**5200**
	
5240	**5240**

802.11n(HT40) mode	802.11ac(HT40) mode
	
5190	5190
	
5230	5230

802.11ac(HT80) mode

5210

ANT 2:

802.11ac mode	802.11n(HT20) mode
	
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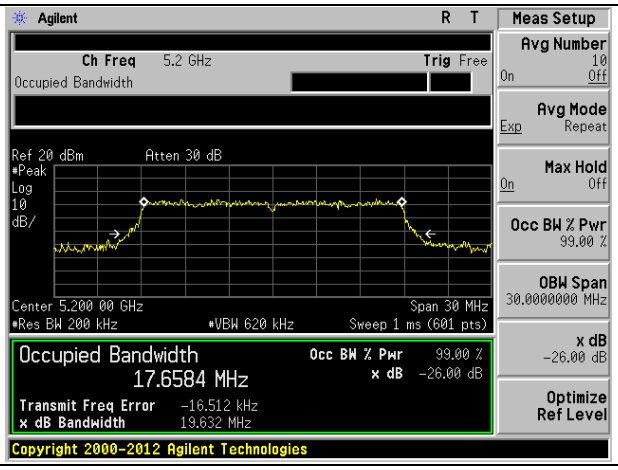
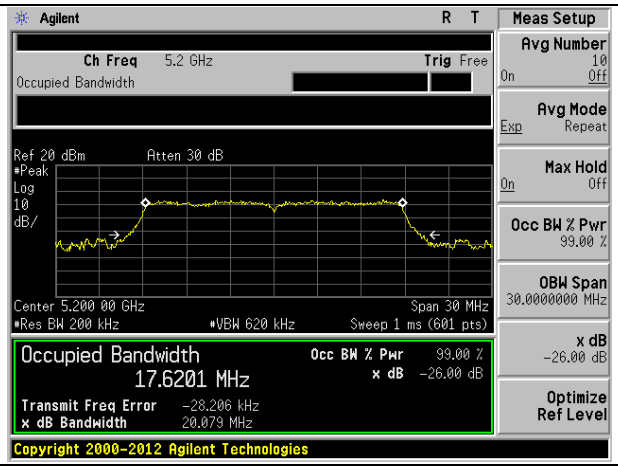
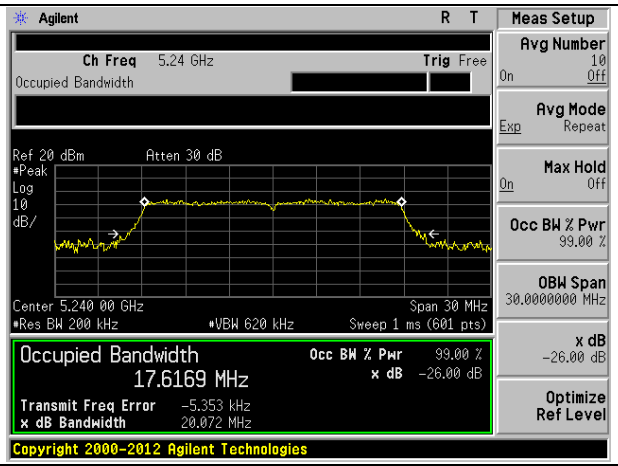
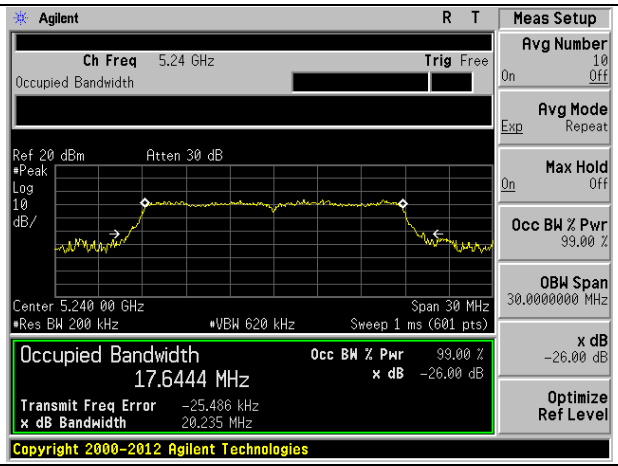
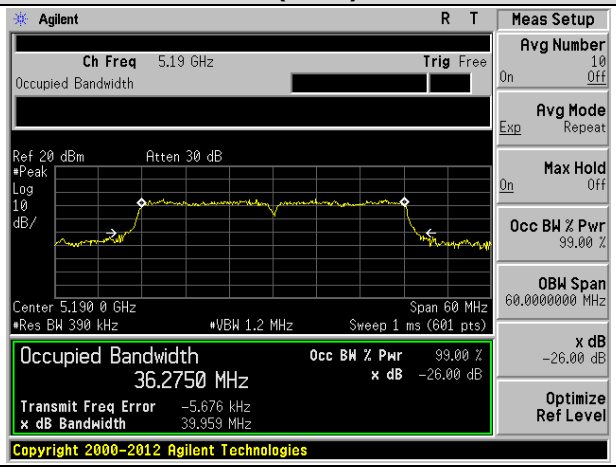
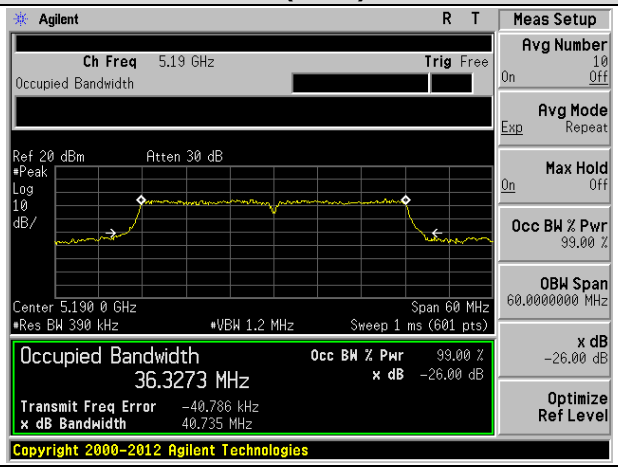
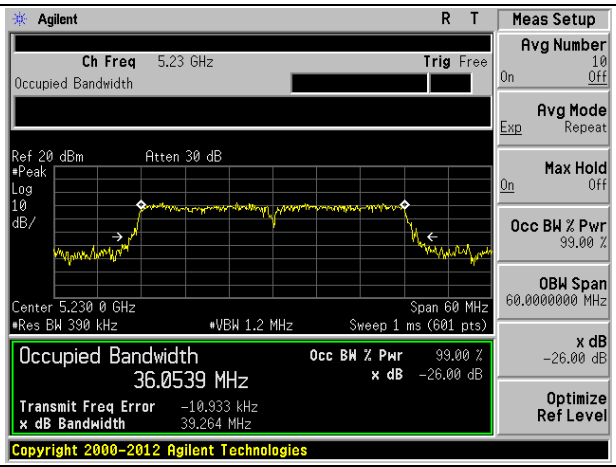
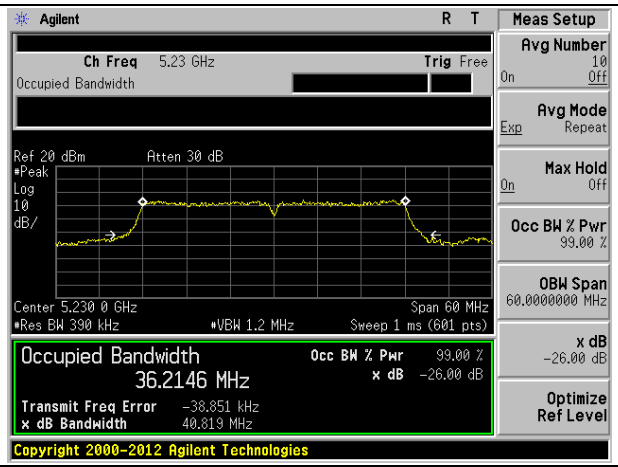
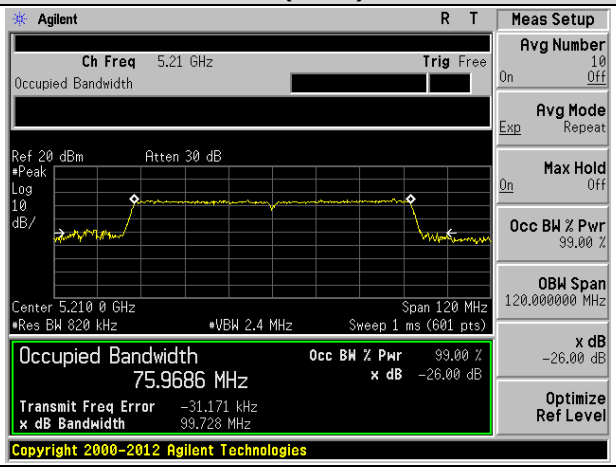
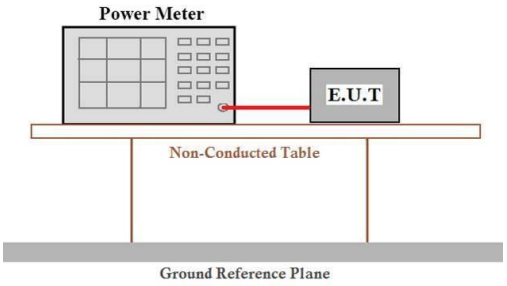
	
5200	**5200**
	
5240	**5240**

802.11n(HT40) mode	802.11ac(HT40) mode
	
5190	5190
	
5230	5230

802.11ac(HT80) mode

5210

7.4 Peak Transmit Power

<table>
<tr><td>Test Requirement</td><td>FCC Part15 E Section 15.407</td></tr>
<tr><td>Test Method :</td><td>KDB 789033 D02 v02r01</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency band (MHz)</th><th>Limit</th></tr>
<tr><td rowspan="2">5150-5250</td><td>≤1W(30dBm) for master device</td></tr>
<tr><td>≤250mW(23.98dBm) for client device</td></tr>
<tr><td>5250-5350</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr>
<tr><td>5470-5725</td><td>≤250mW(23.98dBm) for client device or 11dBm+10logB*</td></tr>
<tr><td colspan="2">Remark: *Where B is the 26dB emission bandwidth in MHz.
The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test procedure:</td><td>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).</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 5.10 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 5.2 for details</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Measurement Data

Modulation	Duty cycle	Duty Factor
802.11n(HT20)	98.8%	0.05
802.11n(HT40)	97.5%	0.11
802.11ac(HT20)	98.9%	0.05
802.11ac(HT40)	97.4%	0.11
802.11ac(HT80)	95.2%	0.21

ANT 1:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	10.95	0.05	11.00	23.98	Pass
40	5200	10.51	0.05	10.56	23.98	Pass
48	5240	9.96	0.05	10.01	23.98	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	11.94	0.05	11.99	23.98	Pass
40	5200	11.45	0.05	11.50	23.98	Pass
48	5240	10.96	0.05	11.01	23.98	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190	10.53	0.11	10.64	23.98	Pass
46	5230	10.39	0.11	10.50	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	10.67	0.11	10.78	23.98	Pass
46	5230	9.93	0.11	10.04	23.98	Pass
802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
42	5210	11.40	0.21	11.61	23.98	Pass

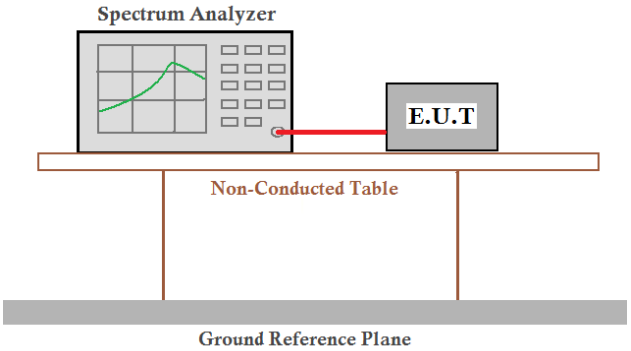
ANT 2:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	10.94	0.05	10.99	23.98	Pass
40	5200	10.39	0.05	10.44	23.98	Pass
48	5240	9.75	0.05	9.80	23.98	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
36	5180	12.15	0.05	12.20	23.98	Pass
40	5200	11.25	0.05	11.30	23.98	Pass
48	5240	10.81	0.05	10.86	23.98	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
38	5190	10.36	0.11	10.47	23.98	Pass
46	5230	10.43	0.11	10.54	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	10.32	0.11	10.43	23.98	Pass
46	5230	9.67	0.11	9.78	23.98	Pass
802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured Power (dBm)	Duty Factor	Output Power (dBm)	Limit (dBm)	Result
42	5210	11.19	0.21	11.40	23.98	Pass

MIMO without beam forming:

Test mode	Frequency (MHz)	ANT 1 power (dBm)	ANT 2 power (dBm)	MIMO power (dBm)	Limit (dBm)	Result
802.11n(HT20)	5180	11.00	10.99	14.09	23.98	Pass
	5200	10.56	10.44	13.60		
	5240	10.01	9.8	13.00		
802.11ac(HT20)	5180	11.99	12.20	15.19		
	5200	11.50	11.30	14.50		
	5240	11.01	10.86	14.03		
802.11n(HT40)	5190	10.64	10.47	13.65		
	5230	10.50	10.54	13.62		
802.11ac(HT40)	5190	10.78	10.43	13.71		
	5230	10.04	9.78	13.01		
802.11ac(HT80)	5210	11.61	11.40	14.60		

7.5 Power Spectral Density

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 E Section 15.407</td></tr>
<tr><td>Test Method :</td><td>KDB 789033 D02 v02r01</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency band (MHz)</td><td>Limit</td></tr>
<tr><td rowspan="2">5150-5250</td><td>≤17dBm in 1MHz for master device</td></tr>
<tr><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td>5250-5350</td><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td>5470-5725</td><td>≤11dBm in 1MHz for client device</td></tr>
<tr><td colspan="2">Remark: The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test procedure:</td><td>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.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 5.10 for details</td></tr>
<tr><td>Test mode:</td><td>Refer to section 5.2 for details</td></tr>
<tr><td>Test results:</td><td>Pass</td></tr>
</table>

Measurement Data

Modulation	Duty cycle	Duty Factor
802.11n(HT20)	98.8%	0.05
802.11n(HT40)	97.5%	0.11
802.11ac(HT20)	98.9%	0.05
802.11ac(HT40)	97.4%	0.11
802.11ac(HT80)	95.2%	0.21

ANT 1:

802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	-1.81	0.05	-1.76	11	Pass
40	5200	-2.92	0.05	-2.87	11	Pass
48	5240	-2.51	0.05	-2.46	11	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	-0.75	0.05	-0.70	11	Pass
40	5200	-1.85	0.05	-1.80	11	Pass
48	5240	-2.5	0.05	-2.45	11	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
38	5190	-3.39	0.11	-3.28	11	Pass
46	5230	-5.76	0.11	-5.65	11	Pass
802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
38	5190	-4.03	0.11	-3.92	11	Pass
46	5230	-3.86	0.11	-3.75	11	Pass
802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
42	5210	-7.88	0.21	-7.67	11	Pass

ANT 2:

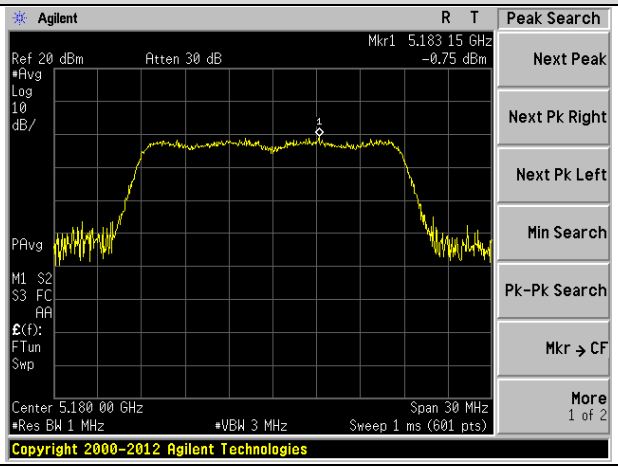
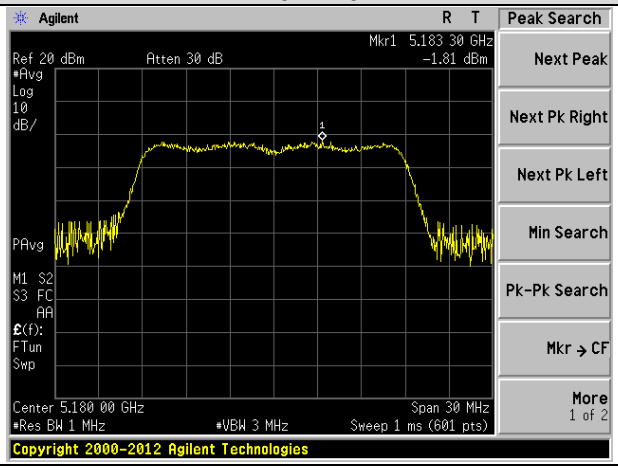
802.11n(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	-1.23	0.05	-1.18	11	Pass
40	5200	-2.06	0.05	-2.01	11	Pass
48	5240	-3.27	0.05	-3.22	11	Pass
802.11ac(HT20) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
36	5180	-1.14	0.05	-1.09	11	Pass
40	5200	-1.89	0.05	-1.84	11	Pass
48	5240	-2.33	0.05	-2.28	11	Pass
802.11n(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
38	5190	-4.30	0.11	-4.19	11	Pass
46	5230	-6.05	0.11	-5.94	11	Pass
802.11 ac(HT40) mode						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
38	5190	-3.47	0.11	-3.36	11	Pass
46	5230	-5.15	0.11	-5.04	11	Pass
802.11 ac(HT80)						
CH No.	Frequency (MHz)	Measured PSD (dBm/MHz)	Duty Factor	Total PSD Power(dBm/MHz)	Limit (dBm/MHz)	Result
42	5210	-7.49	0.21	-7.28	11	Pass

MIMO without beam forming:

worse case:
-0.70dBm+10log2=2.31dBm<11dBm

Test plots as followed:

ANT 1:

802.11ac mode	802.11n(HT20) mode
	
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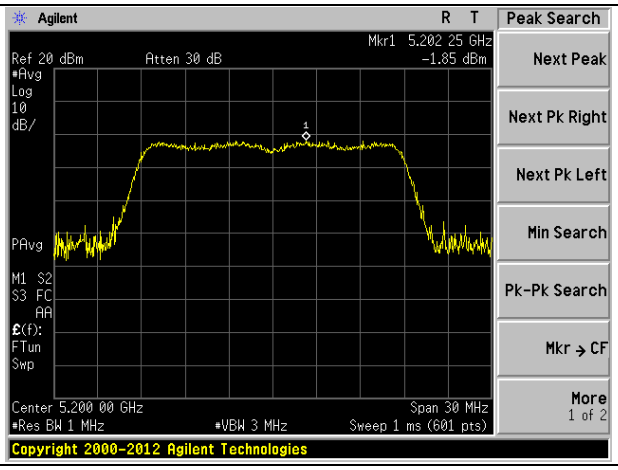
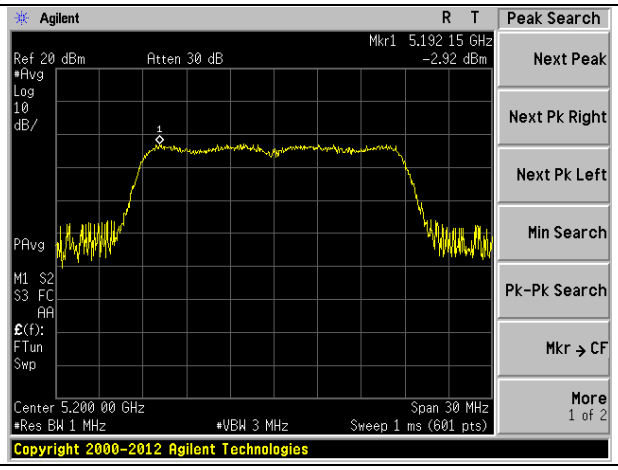
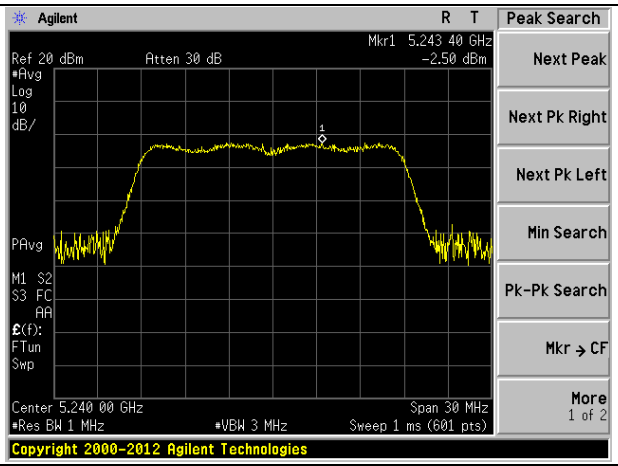
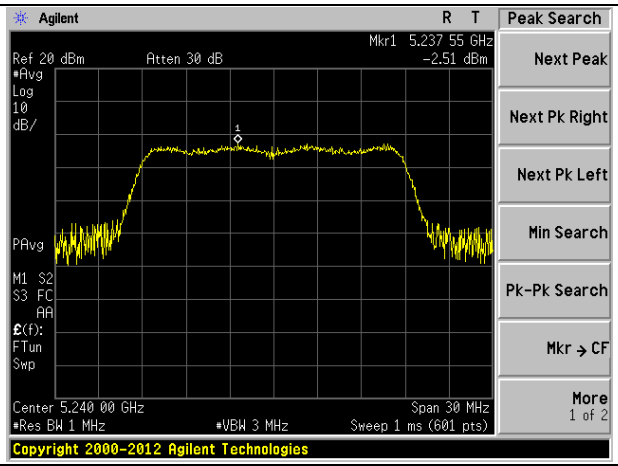
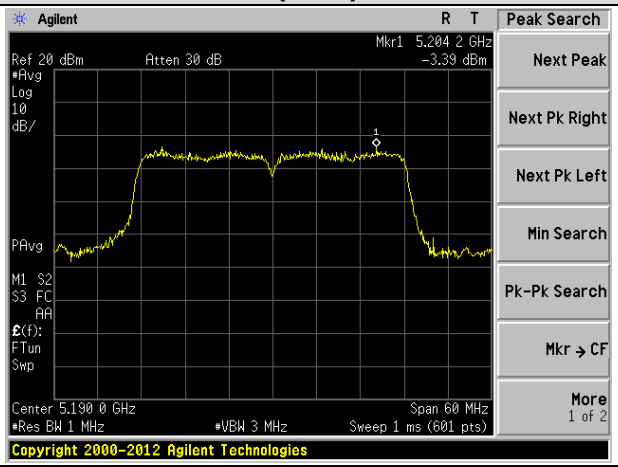
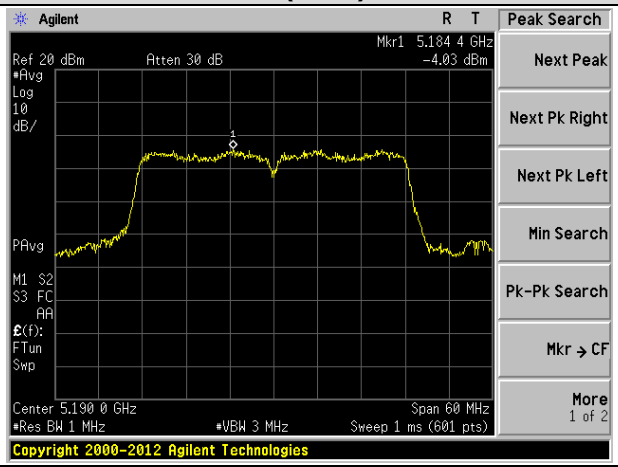
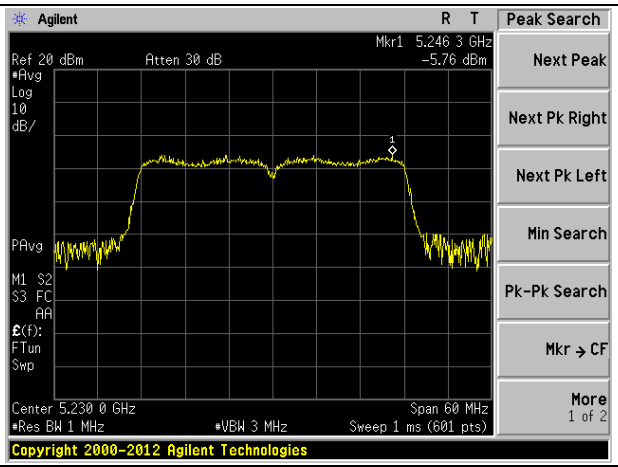
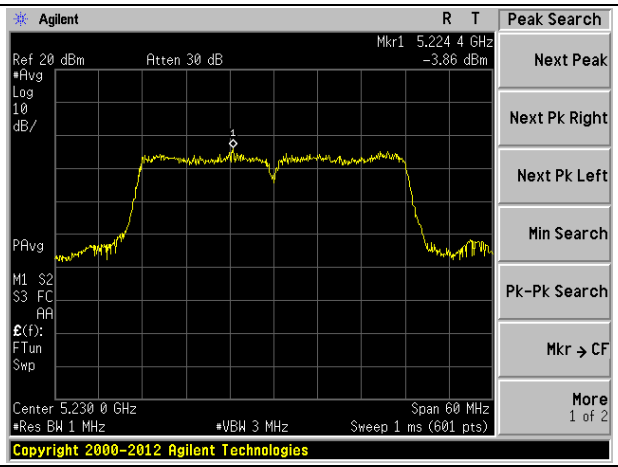
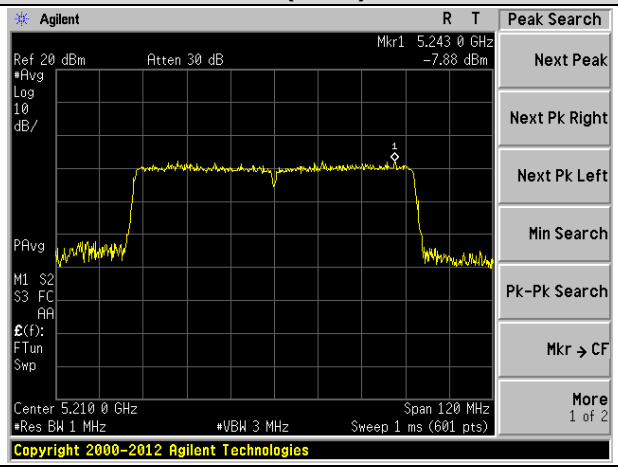
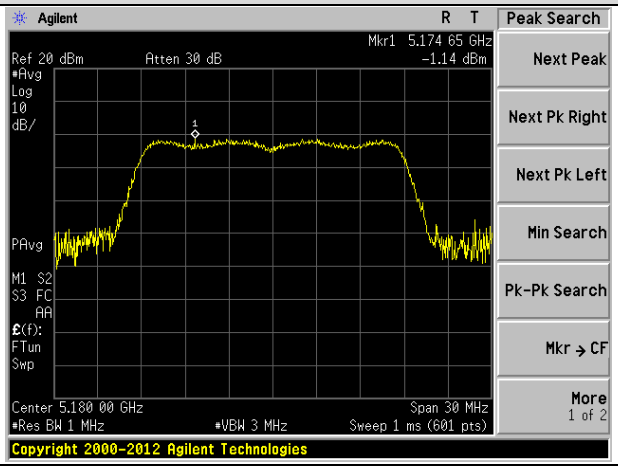
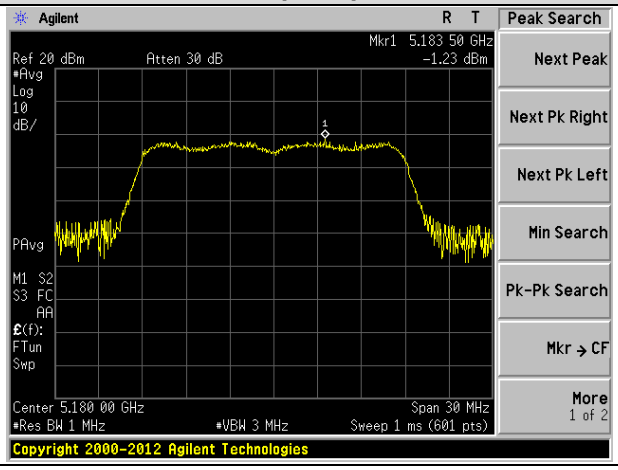
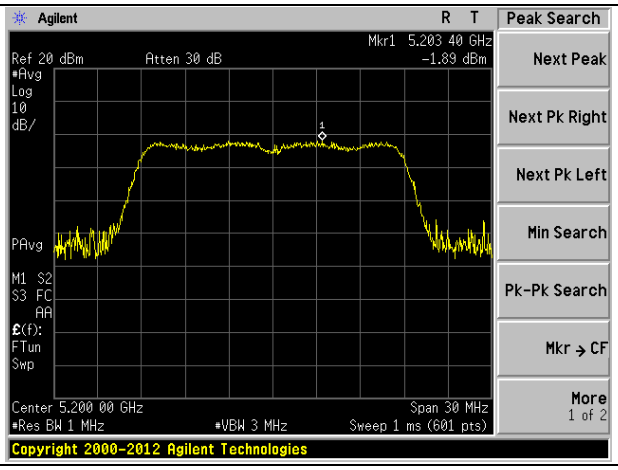
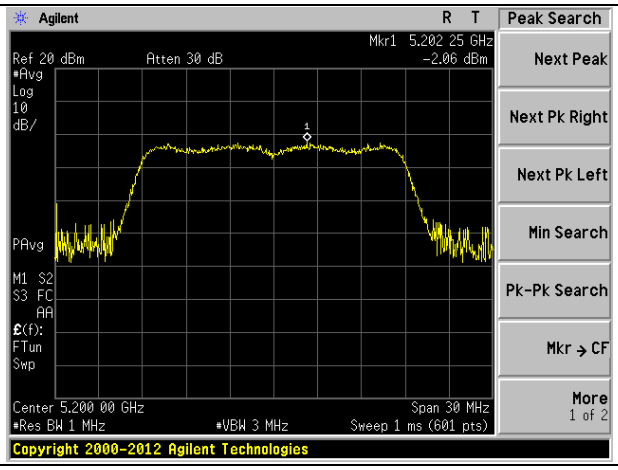
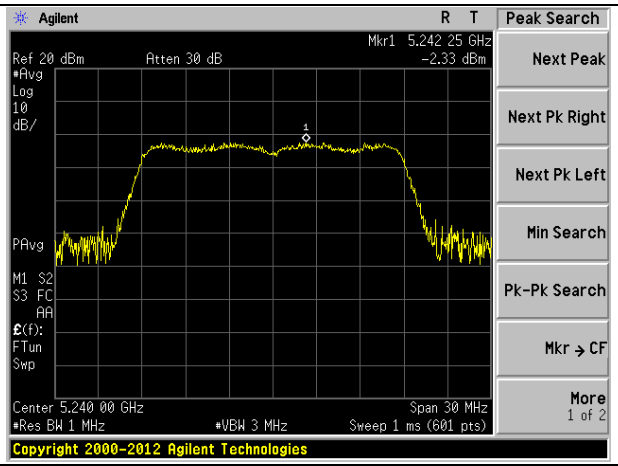
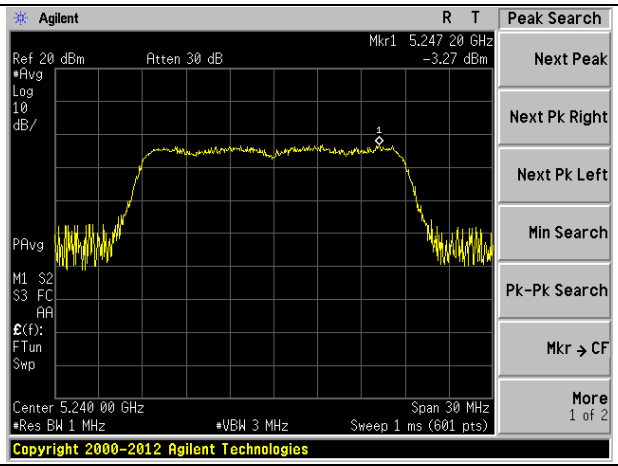
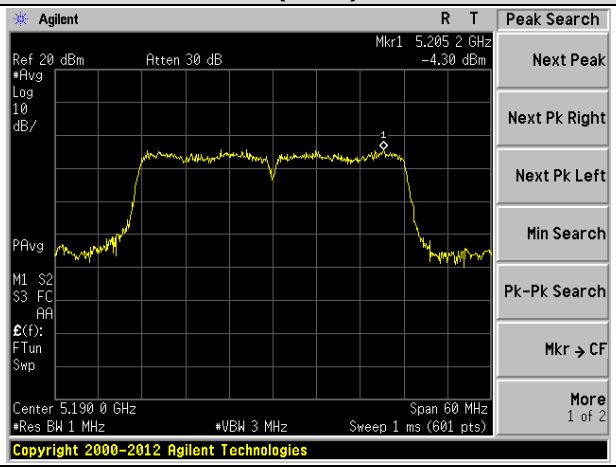
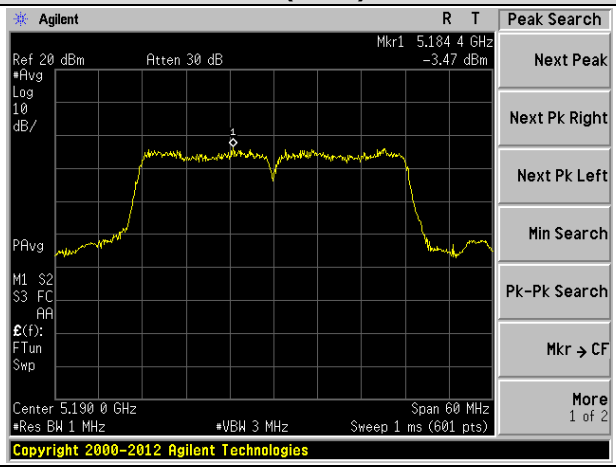
	
5200	**5200**
	
5240	**5240**

802.11n(HT40) mode	802.11ac(HT40) mode
	
5190	5190
	
5230	5230

802.11ac(HT80) mode

5210

ANT 2:

802.11ac mode	802.11n(HT20) mode
	
5180	5180
	
5200	5200
	
5240	5240

802.11n(HT40) mode	802.11ac(HT40) mode
	
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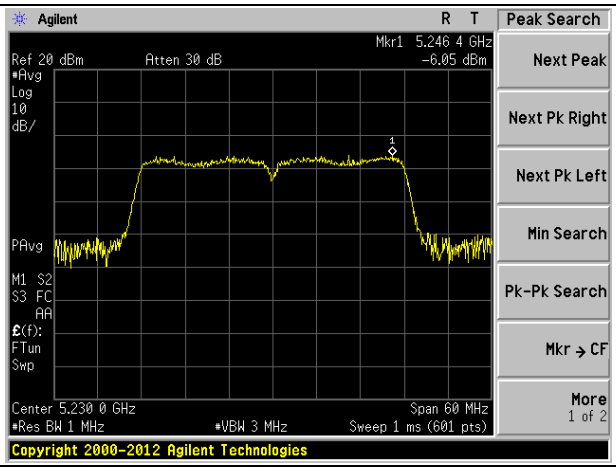
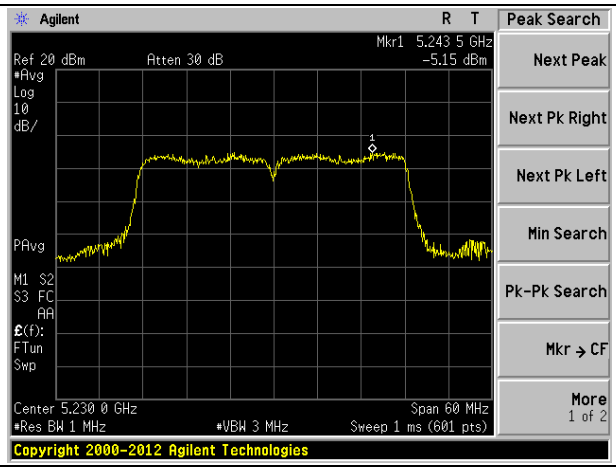
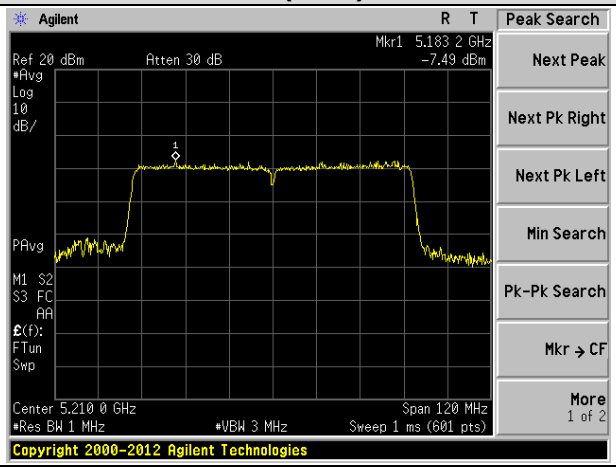
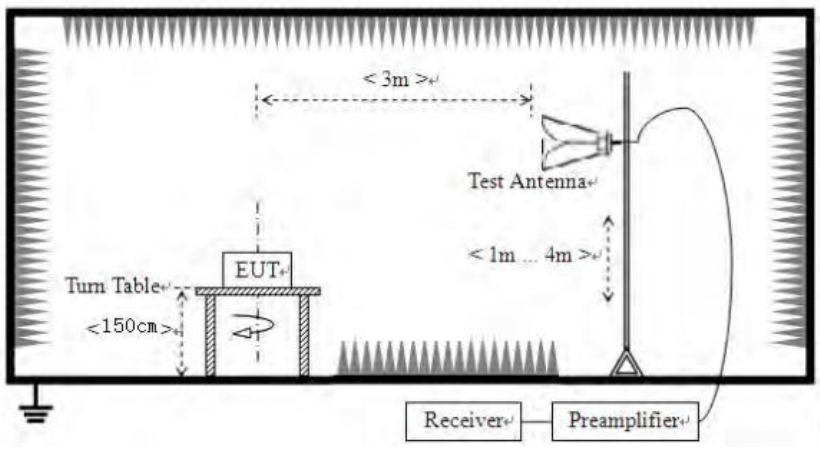
	
5230	5230

802.11ac(HT80) mode

5210

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 setup:</td><td>For radiated emissions above 1GHz
 

</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 5.10 for details</td></tr>
</table>

Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
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 D02 v02r01 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:

802.11n(HT20)				PK				
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	44.91	32.07	8.99	37.49	48.48	68.2	-19.72	Horizontal
5350.00	45.71	31.75	9.29	37.2	49.55	68.2	-18.65	Horizontal
5150.00	43.57	32.07	8.99	37.49	47.14	68.2	-21.06	Vertical
5350.00	44.86	31.75	9.29	37.2	48.7	68.2	-19.5	Vertical

802.11n(HT20)				AV				
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	32.91	32.07	8.99	37.49	36.48	54	-17.52	Horizontal
5350.00	33.56	31.75	9.29	37.2	37.4	54	-16.6	Horizontal
5150.00	33.1	32.07	8.99	37.49	36.67	54	-17.33	Vertical
5350.00	35.97	31.75	9.29	37.2	39.81	54	-14.19	Vertical

802.11ac(HT20)				PK				
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	44.21	32.07	8.99	37.49	47.78	68.2	-20.42	Horizontal
5350.00	45.32	31.75	9.29	37.2	49.16	68.2	-19.04	Horizontal
5150.00	45.45	32.07	8.99	37.49	49.02	68.2	-19.18	Vertical
5350.00	43.13	31.75	9.29	37.2	46.97	68.2	-21.23	Vertical

802.11ac(HT20)				AV				
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	33.23	32.07	8.99	37.49	36.8	54	-17.2	Horizontal
5350.00	32.7	31.75	9.29	37.2	36.54	54	-17.46	Horizontal
5150.00	35.06	32.07	8.99	37.49	38.63	54	-15.37	Vertical
5350.00	33.41	31.75	9.29	37.2	37.25	54	-16.75	Vertical

802.11n(HT40)					PK			
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	46.2	32.07	8.99	37.49	49.77	68.2	-18.43	Horizontal
5350.00	46.46	31.75	9.29	37.2	50.3	68.2	-17.9	Horizontal
5150.00	46.58	32.07	8.99	37.49	50.15	68.2	-18.05	Vertical
5350.00	44.23	31.75	9.29	37.2	48.07	68.2	-20.13	Vertical

802.11n(HT40)					AV			
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	32.78	32.07	8.99	37.49	36.35	54	-17.65	Horizontal
5350.00	34.98	31.75	9.29	37.2	38.82	54	-15.18	Horizontal
5150.00	34.86	32.07	8.99	37.49	38.43	54	-15.57	Vertical
5350.00	32.34	31.75	9.29	37.2	36.18	54	-17.82	Vertical

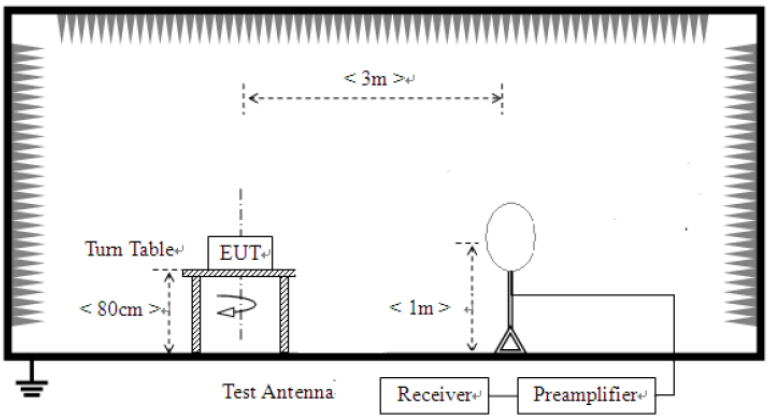
802.11ac(HT40)					PK			
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
5150.00	46.56	32.07	8.99	37.49	50.13	68.2	-18.07	Horizontal
5350.00	45.64	31.75	9.29	37.2	49.48	68.2	-18.72	Horizontal
5150.00	45.56	32.07	8.99	37.49	49.13	68.2	-19.07	Vertical
5350.00	45.39	31.75	9.29	37.2	49.23	68.2	-18.97	Vertical

802.11ac(HT40)					AV			
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	33.24	32.07	8.99	37.49	36.81	54	-17.19	Horizontal
5350.00	33.32	31.75	9.29	37.2	37.16	54	-16.84	Horizontal
5150.00	33.65	32.07	8.99	37.49	37.22	54	-16.78	Vertical
5350.00	34.85	31.75	9.29	37.2	38.69	54	-15.31	Vertical

802.11ac(HT80)				PK				
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	42.47	32.07	8.99	37.49	46.04	68.2	-22.16	Horizontal
5350.00	45.1	31.75	9.29	37.2	48.94	68.2	-19.26	Horizontal
5150.00	45.06	32.07	8.99	37.49	48.63	68.2	-19.57	Vertical
5350.00	44.81	31.75	9.29	37.2	48.65	68.2	-19.55	Vertical

802.11ac(HT80)				AV				
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	34.19	32.07	8.99	37.49	37.76	54	-16.24	Horizontal
5350.00	35.49	31.75	9.29	37.2	39.33	54	-14.67	Horizontal
5150.00	35.12	32.07	8.99	37.49	38.69	54	-15.31	Vertical
5350.00	32.32	31.75	9.29	37.2	36.16	54	-17.84	Vertical

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>9kHz 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>9kHz-150KHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td 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 (uV/m)</th><th>Value</th><th>Measurement Distance</th></tr>
<tr><td>0.009MHz-0.490MHz</td><td>2400/F(KHz)</td><td>QP</td><td>300m</td></tr>
<tr><td>0.490MHz-1.705MHz</td><td>24000/F(KHz)</td><td>QP</td><td>30m</td></tr>
<tr><td>1.705MHz-30MHz</td><td>30</td><td>QP</td><td>30m</td></tr>
<tr><td>30MHz-88MHz</td><td>100</td><td>QP</td><td rowspan="6">3m</td></tr>
<tr><td>88MHz-216MHz</td><td>150</td><td>QP</td></tr>
<tr><td>216MHz-960MHz</td><td>200</td><td>QP</td></tr>
<tr><td>960MHz-1GHz</td><td>500</td><td>QP</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>Average</td></tr>
<tr><td>5000</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions from 9kHz to 30MHz
 

For radiated emissions from 30MHz to1GHz</td></tr>
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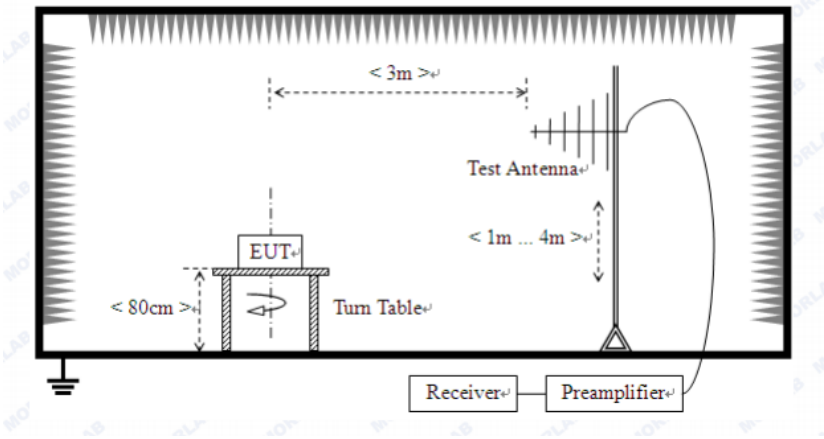
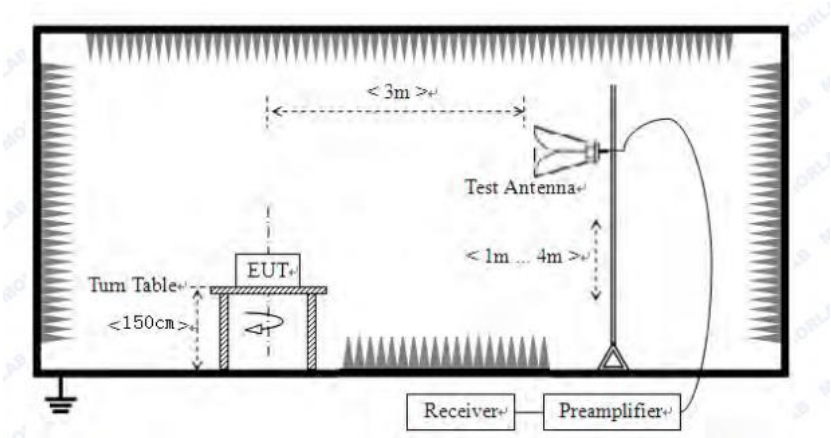


For radiated emissions above 1GHz



Test Instruments:	Refer to section 5.10 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Remarks:

1. *Only the worst case Main Antenna test data.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

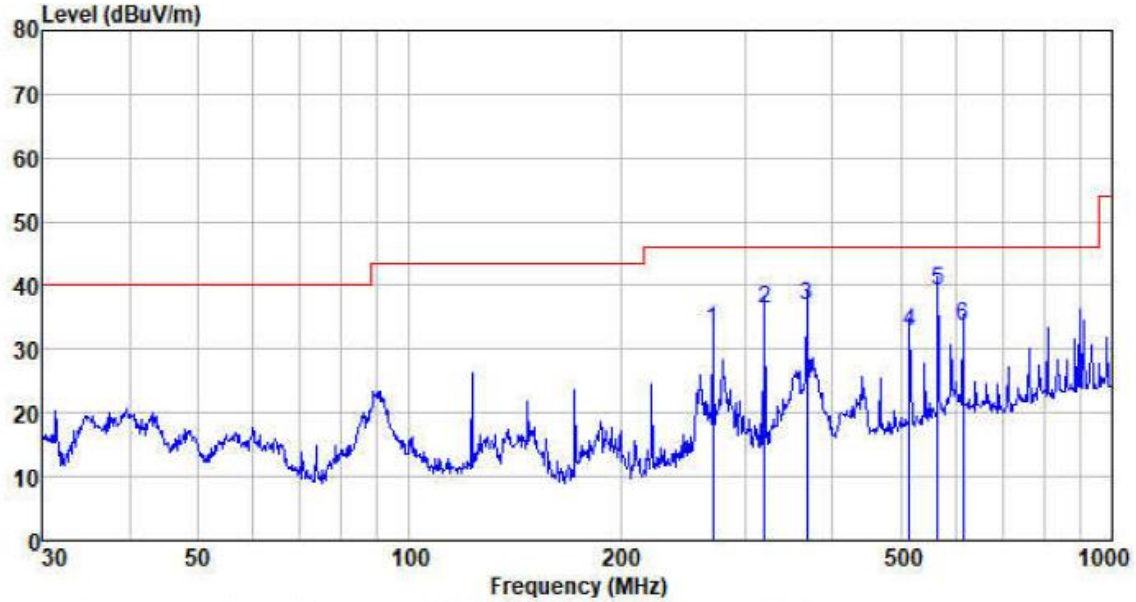
Measurement Data:

9 kHz ~ 30 MHz

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.

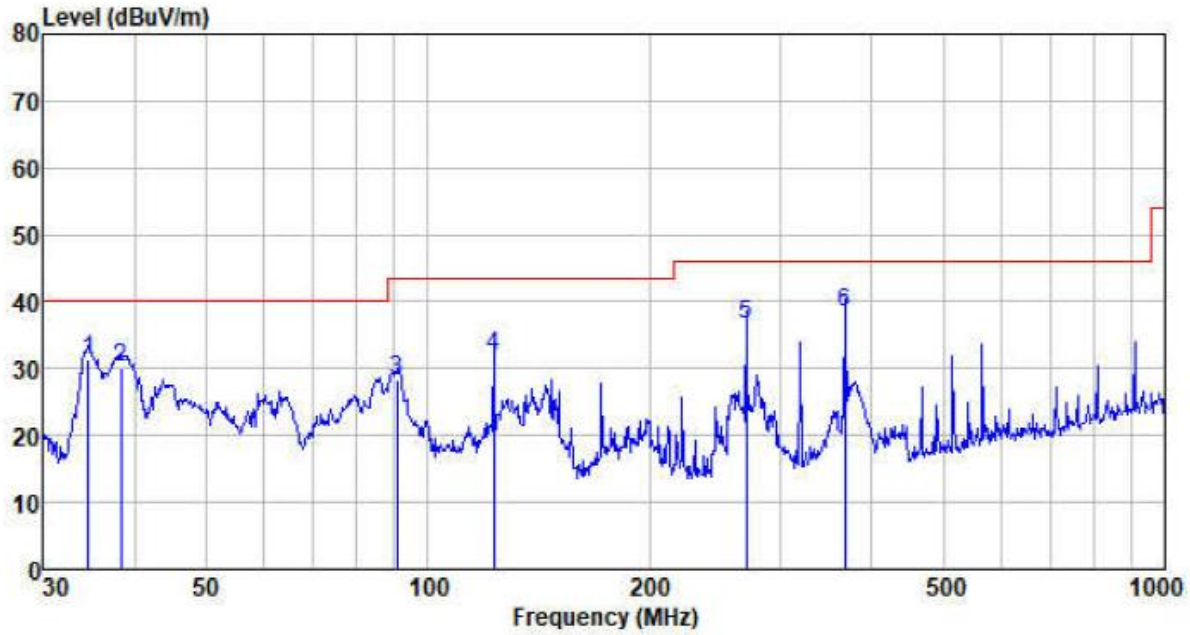
30MHz~ 1GHz

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
270.375	55.51	12.76	2.22	37.40	33.09	46.00	-12.91	QP
319.937	57.43	13.98	2.47	37.44	36.44	46.00	-9.56	QP
368.112	57.01	14.81	2.71	37.49	37.04	46.00	-8.96	QP
515.437	49.18	17.68	3.37	37.52	32.71	46.00	-13.29	QP
564.639	54.45	18.73	3.58	37.53	39.23	46.00	-6.77	QP
614.214	47.82	19.52	3.77	37.55	33.56	46.00	-12.44	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	
34.639	54.75	11.29	0.61	35.33	31.32	40.00	-8.68	QP
38.346	53.07	11.92	0.64	35.57	30.06	40.00	-9.94	QP
90.855	52.92	10.84	1.12	36.65	28.23	43.50	-15.27	QP
122.834	58.36	9.12	1.38	36.90	31.96	43.50	-11.54	QP
270.375	59.09	12.76	2.22	37.40	36.67	46.00	-9.33	QP
368.112	58.39	14.81	2.71	37.49	38.42	46.00	-7.58	QP

Above 1GHz:

802.11n(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	31.42	39.67	14.62	32.65	53.06	74	-20.94	Vertical
15540.00	33.95	38.6	17.66	34.46	55.75	74	-18.25	Vertical
10360.00	31.26	39.67	14.62	32.65	52.9	74	-21.1	Horizontal
15540.00	32.6	38.6	17.66	34.46	54.4	74	-19.6	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	20.28	39.67	14.62	32.65	41.92	54	-12.08	Vertical
15540.00	21.49	38.6	17.66	34.46	43.29	54	-10.71	Vertical
10360.00	21.58	39.67	14.62	32.65	43.22	54	-10.78	Horizontal
15540.00	20.34	38.6	17.66	34.46	42.14	54	-11.86	Horizontal

802.11n(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	32.63	39.75	14.63	32.71	54.3	74	-19.7	Vertical
15600.00	33.32	38.33	17.67	34.17	55.15	74	-18.85	Vertical
10400.00	32.18	39.75	14.63	32.71	53.85	74	-20.15	Horizontal
15600.00	31.99	38.33	17.67	34.17	53.82	74	-20.18	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	21.17	39.75	14.63	32.71	42.84	54	-11.16	Vertical
15600.00	22.56	38.33	17.67	34.17	44.39	54	-9.61	Vertical
10400.00	20.78	39.75	14.63	32.71	42.45	54	-11.55	Horizontal
15600.00	23.77	38.33	17.67	34.17	45.6	54	-8.4	Horizontal

802.11n(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	32.52	39.82	14.68	32.86	54.16	74	-19.84	Vertical
15720.00	31.66	38.09	17.73	33.66	53.82	74	-20.18	Vertical
10480.00	32.7	39.82	14.68	32.86	54.34	74	-19.66	Horizontal
15720.00	33.94	38.09	17.73	33.66	56.1	74	-17.9	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	21.01	39.82	14.68	32.86	42.65	54	-11.35	Vertical
15720.00	22.62	38.09	17.73	33.66	44.78	54	-9.22	Vertical
10480.00	20.54	39.82	14.68	32.86	42.18	54	-11.82	Horizontal
15720.00	23.44	38.09	17.73	33.66	45.6	54	-8.4	Horizontal

802.11ac(HT20) 5180MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	32.7	39.67	14.62	32.65	54.34	74	-19.66	Vertical
15540.00	31.11	38.6	17.66	34.46	52.91	74	-21.09	Vertical
10360.00	32.44	39.67	14.62	32.65	54.08	74	-19.92	Horizontal
15540.00	32.95	38.6	17.66	34.46	54.75	74	-19.25	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10360.00	20.97	39.67	14.62	32.65	42.61	54	-11.39	Vertical
15540.00	21.96	38.6	17.66	34.46	43.76	54	-10.24	Vertical
10360.00	22.89	39.67	14.62	32.65	44.53	54	-9.47	Horizontal
15540.00	23.52	38.6	17.66	34.46	45.32	54	-8.68	Horizontal

802.11ac(HT20) 5200MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	32.48	39.75	14.63	32.71	54.15	74	-19.85	Vertical
15600.00	32.93	38.33	17.67	34.17	54.76	74	-19.24	Vertical
10400.00	32.9	39.75	14.63	32.71	54.57	74	-19.43	Horizontal
15600.00	33.77	38.33	17.67	34.17	55.6	74	-18.4	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10400.00	23.44	39.75	14.63	32.71	45.11	54	-8.89	Vertical
15600.00	23.18	38.33	17.67	34.17	45.01	54	-8.99	Vertical
10400.00	20.21	39.75	14.63	32.71	41.88	54	-12.12	Horizontal
15600.00	21.27	38.33	17.67	34.17	43.1	54	-10.9	Horizontal

802.11ac(HT20) 5240MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	31.52	39.82	14.68	32.86	53.16	74	-20.84	Vertical
15720.00	31.28	38.09	17.73	33.66	53.44	74	-20.56	Vertical
10480.00	32.11	39.82	14.68	32.86	53.75	74	-20.25	Horizontal
15720.00	33.94	38.09	17.73	33.66	56.1	74	-17.9	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10480.00	22.38	39.82	14.68	32.86	44.02	54	-9.98	Vertical
15720.00	21.94	38.09	17.73	33.66	44.1	54	-9.9	Vertical
10480.00	21.51	39.82	14.68	32.86	43.15	54	-10.85	Horizontal
15720.00	21.31	38.09	17.73	33.66	43.47	54	-10.53	Horizontal

802.11n(HT40) 5190MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	31.67	39.71	14.63	32.68	53.33	74	-20.67	Vertical
15570.00	33.92	38.46	17.67	34.32	55.73	74	-18.27	Vertical
10380.00	31.14	39.71	14.63	32.68	52.8	74	-21.2	Horizontal
15570.00	32.35	38.46	17.67	34.32	54.16	74	-19.84	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	21.4	39.71	14.63	32.68	43.06	54	-10.94	Vertical
15570.00	20.89	38.46	17.67	34.32	42.7	54	-11.3	Vertical
10380.00	22.09	39.71	14.63	32.68	43.75	54	-10.25	Horizontal
15570.00	21.78	38.46	17.67	34.32	43.59	54	-10.41	Horizontal

802.11n(HT40) 5230MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	31.67	39.75	14.65	32.74	53.33	74	-20.67	Vertical
15690.00	31.93	38.33	17.69	34.03	53.92	74	-20.08	Vertical
10460.00	32.75	39.75	14.65	32.74	54.41	74	-19.59	Horizontal
15690.00	31.09	38.33	17.69	34.03	53.08	74	-20.92	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	20.64	39.75	14.65	32.74	42.3	54	-11.7	Vertical
15690.00	19.95	38.33	17.69	34.03	41.94	54	-12.06	Vertical
10460.00	21.39	39.75	14.65	32.74	43.05	54	-10.95	Horizontal
15690.00	20.88	38.33	17.69	34.03	42.87	54	-11.13	Horizontal

802.11ac(HT40) 5190MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	33.4	39.71	14.63	32.68	55.06	74	-18.94	Vertical
15570.00	32.06	38.46	17.67	34.32	53.87	74	-20.13	Vertical
10380.00	32.21	39.71	14.63	32.68	53.87	74	-20.13	Horizontal
15570.00	32.64	38.46	17.67	34.32	54.45	74	-19.55	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10380.00	20.72	39.71	14.63	32.68	42.38	54	-11.62	Vertical
15570.00	20.18	38.46	17.67	34.32	41.99	54	-12.01	Vertical
10380.00	21.63	39.71	14.63	32.68	43.29	54	-10.71	Horizontal
15570.00	21.6	38.46	17.67	34.32	43.41	54	-10.59	Horizontal

802.11ac(HT40) 5230MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	33.71	39.75	14.65	32.74	55.37	74	-18.63	Vertical
15690.00	32.38	38.33	17.69	34.03	54.37	74	-19.63	Vertical
10460.00	31.74	39.75	14.65	32.74	53.4	74	-20.6	Horizontal
15690.00	31.36	38.33	17.69	34.03	53.35	74	-20.65	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10460.00	21.36	39.75	14.65	32.74	43.02	54	-10.98	Vertical
15690.00	20.36	38.33	17.69	34.03	42.35	54	-11.65	Vertical
10460.00	20.84	39.75	14.65	32.74	42.5	54	-11.5	Horizontal
15690.00	19.14	38.33	17.69	34.03	41.13	54	-12.87	Horizontal

802.11ac(HT80) 5210MHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	PK Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10420.00	31.3	39.82	14.66	32.8	52.98	74	-21.02	Vertical
15630.00	32.05	38.09	17.71	33.81	54.04	74	-19.96	Vertical
10420.00	31.41	39.82	14.66	32.8	53.09	74	-20.91	Horizontal
15630.00	32	38.09	17.71	33.81	53.99	74	-20.01	Horizontal

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	AV Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
10420.00	20.87	39.82	14.66	32.8	42.55	54	-11.45	Vertical
15630.00	21.21	38.09	17.71	33.81	43.2	54	-10.8	Vertical
10420.00	21.72	39.82	14.66	32.8	43.4	54	-10.6	Horizontal
15630.00	20.55	38.09	17.71	33.81	42.54	54	-11.46	Horizontal

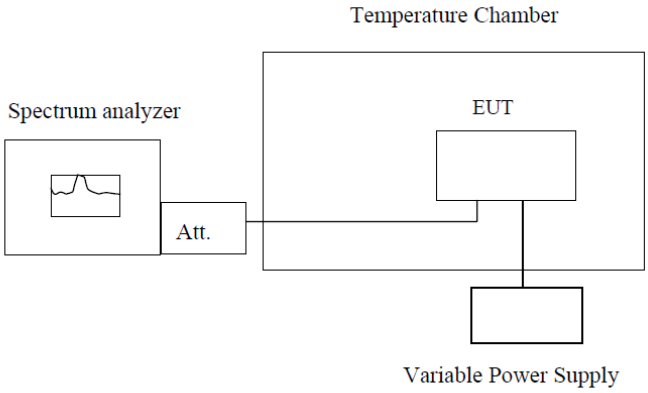
Notes:

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, 2014; 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

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

Measurement data:

Frequency stability versus Temp.									
Worse Case Operating Frequency：5180MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
-30	120	5180.8808	Pass	5180.7034	Pass	5180.6464	Pass	5180.4153	Pass
-20	120	5180.1174	Pass	5180.9933	Pass	5180.7541	Pass	5180.7048	Pass
-10	120	5180.4805	Pass	5180.9512	Pass	5180.4507	Pass	5180.3228	Pass
0	120	5180.2448	Pass	5180.5746	Pass	5180.6010	Pass	5180.5202	Pass
10	120	5180.2690	Pass	5180.0202	Pass	5180.5237	Pass	5180.7506	Pass
20	120	5180.9306	Pass	5180.8198	Pass	5180.4432	Pass	5180.9571	Pass
30	120	5180.3116	Pass	5180.8702	Pass	5180.1931	Pass	5180.9695	Pass
40	120	5180.3003	Pass	5180.9223	Pass	5180.8752	Pass	5180.7999	Pass
50	120	5180.3959	Pass	5180.4936	Pass	5180.8347	Pass	5180.3355	Pass
Frequency stability versus Temp.									
Worse Case Operating Frequency：5180MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
25	102	5180.4129	Pass	5180.0519	Pass	5180.2345	Pass	5180.9074	Pass
25	120	5180.4798	Pass	5180.7903	Pass	5180.9196	Pass	5180.6220	Pass
25	138	5180.9022	Pass	5180.3113	Pass	5180.0657	Pass	5180.8237	Pass

Frequency stability versus Temp.									
Worse Case Operating Frequency：5190MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
-30	120	5190.5746	Pass	5190.3027	Pass	5190.6784	Pass	5190.2775	Pass
-20	120	5190.4790	Pass	5190.4577	Pass	5190.1860	Pass	5190.6120	Pass
-10	120	5190.3956	Pass	5190.7353	Pass	5190.7155	Pass	5190.4951	Pass
0	120	5190.4019	Pass	5190.4975	Pass	5190.3818	Pass	5190.5548	Pass
10	120	5190.3297	Pass	5190.4135	Pass	5190.7394	Pass	5190.2681	Pass
20	120	5190.4992	Pass	5190.1998	Pass	5190.1536	Pass	5190.9299	Pass
30	120	5190.3987	Pass	5190.5582	Pass	5190.3831	Pass	5190.1334	Pass
40	120	5190.3028	Pass	5190.5428	Pass	5190.1326	Pass	5190.6790	Pass
50	120	5190.2474	Pass	5190.8505	Pass	5190.5149	Pass	5190.1892	Pass
Frequency stability versus Temp.									
Worse Case Operating Frequency：5190MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
25	102	5190.0719	Pass	5190.4837	Pass	5190.4591	Pass	5190.0074	Pass
25	120	5190.7230	Pass	5190.9916	Pass	5190.4714	Pass	5190.6540	Pass
25	138	5190.3399	Pass	5190.7671	Pass	5190.5050	Pass	5190.3269	Pass

Frequency stability versus Temp.									
Worse Case Operating Frequency：5210MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
-30	120	5210.5608	Pass	5210.5289	Pass	5210.6929	Pass	5210.2126	Pass
-20	120	5210.9297	Pass	5210.4333	Pass	5210.8296	Pass	5210.0410	Pass
-10	120	5210.4189	Pass	5210.4298	Pass	5210.6106	Pass	5210.3003	Pass
0	120	5210.4039	Pass	5210.3572	Pass	5210.7084	Pass	5210.5466	Pass
10	120	5210.0539	Pass	5210.9700	Pass	5210.1597	Pass	5210.4969	Pass
20	120	5210.6260	Pass	5210.2467	Pass	5210.3334	Pass	5210.5977	Pass
30	120	5210.8780	Pass	5210.5172	Pass	5210.2543	Pass	5210.9967	Pass
40	120	5210.0028	Pass	5210.0342	Pass	5210.4682	Pass	5210.3000	Pass
50	120	5210.8531	Pass	5210.4286	Pass	5210.9432	Pass	5210.2846	Pass
Frequency stability versus Temp.									
Worse Case Operating Frequency：5210MHz									
Temp. (°C)	Power Supply (VAC)	0 minute		2 minute		5 minute		10 minute	
		Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail	Measured Frequency (MHz)	Pass /Fail
25	102	5210.9019	Pass	5210.4449	Pass	5210.6580	Pass	5210.6468	Pass
25	120	5210.8387	Pass	5210.9113	Pass	5210.6624	Pass	5210.1508	Pass
25	138	5210.2038	Pass	5210.0744	Pass	5210.0717	Pass	5210.0134	Pass

8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

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