FCC TEST REPORT

For

ChongQing Lavid Industrial Co., Ltd.

1200M Dual-band Wireless Router

Model No.: LV-AC09, LV-AC05, LV-AC06

Prepared For	:	ChongQing Lavid Industrial Co., Ltd.
Address	:	No 6 Building Lianhe road, Economic and Technological Development Zone, Wanzhou, China
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	SZAWW171228001-02
Date of Test	:	Dec. 28, 2017~Jan. 04, 2018
Date of Report	:	Jan. 04, 2018

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TEST REPORT

Applicant	:	ChongQing Lavid Industrial Co., Ltd.
Manufacturer	:	ShenZhen Lavid Technology Co., Ltd.
Product Name	:	1200M Dual-band Wireless Router
Model No.	:	LV-AC09, LV-AC05, LV-AC06
Trade Mark	:	N/A
Rating(s)	:	Input: AC120V/60Hz

Test Standard(s)	**:**	**FCC Part15 Subpart E 2016, Paragraph 15.407**
Test Method(s)	**:**	**ANSI C63.10: 2013**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart E requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test : : Dec. 28, 2017~Jan. 04, 2018

Prepared by : : Winkey Wang

(Tested Engineer / Winkey Wang)

Reviewer : : Tangcy. T.

(Project Manager / Tangcy. T)

Approved & Authorized Signer : : Tom Chen

(Manager / Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	ChongQing Lavid Industrial Co., Ltd.
Address	:	No 6 Building Lianhe road, Economic and Technological Development Zone, Wanzhou, China
Manufacturer	:	ShenZhen Lavid Technology Co., Ltd.
Address	:	3F No. A3-B building, Silicon Valley Power New Material Industrial Park, ShenZhen, China

1.2. Description of Device (EUT)

Product Name	:	1200M Dual-band Wireless Router	
Model No.	:	LV-AC09, LV-AC05, LV-AC06 (Note: All samples are the same except the model number and Colour, so we prepare "LV-AC09" for test only.)	
Trade Mark	:	N/A	
Test Power Supply	:	AC 120V, 60Hz for adapter	
Product Description	:	Operation Frequency:	WIFI 5G: 5180MHz~5240MHz / 5190MHz~5230MHz
		Number of Channel:	WIFI 5G: 4 Channels for 802.11a 4 Channels for 802.11n(HT20) 2 Channels for 802.11n(HT40)
		Modulation Type:	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n;
		Antenna Type:	PIFA Antenna
		Antenna Gain(Peak):	2 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2)This report is for WIFI 5G			

Note: EUT only support 802.11 n(HT20)/n(HT40) for MIMO mode, not support 802.11 a for MIMO mode.802.11 a only support uses divestity (ant 2 and ant 1).

1.3. Auxiliary Equipment Used During Test

		N/A

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Mode	Test channel	Frequency (MHz)
OFDM(802.11a/n20)	CH 36	5180MHz
	CH 40	5200MHz
	CH 48	5240MHz
OFDM(802.11n40)	CH 38	5190MHz
	CH 46	5230MHz

Note:

1. The measurements are performed at the highest, middle, lowest available channels.
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω, Cable Loss: 1.0 dB
4. The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is more than 98%

1.5. List of channels

802.11a/n20

Channel	Freq. (MHz)	Channel	Freq. (MHz)
36	5180	44	5220
40	5200	48	5240

802.11n40

Channel	Freq. (MHz)	Channel	Freq. (MHz)
38	5190	46	5230

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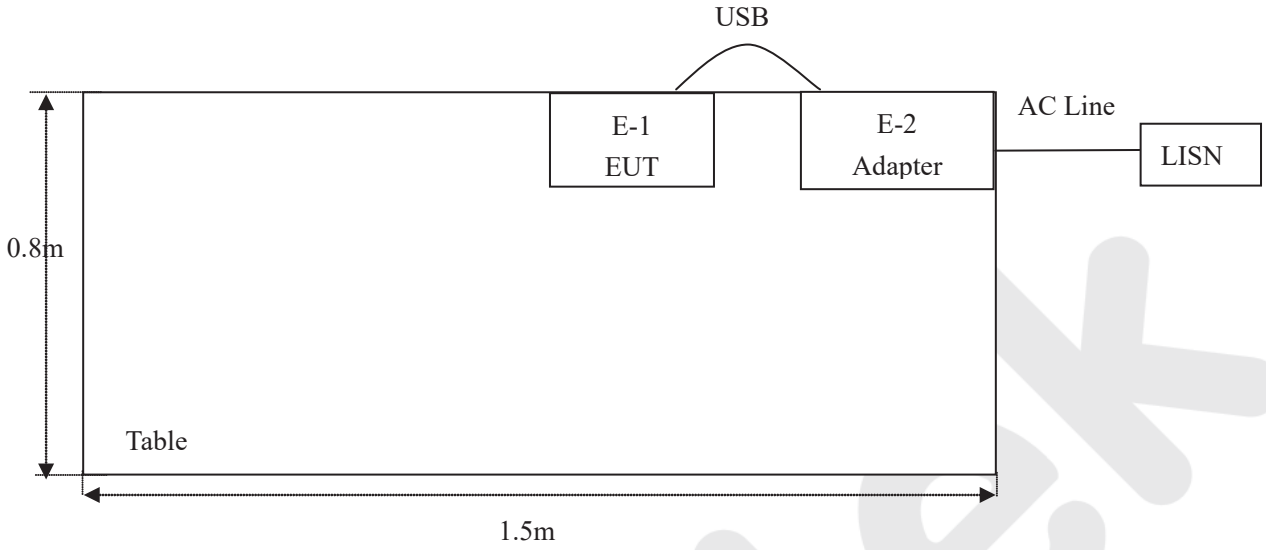
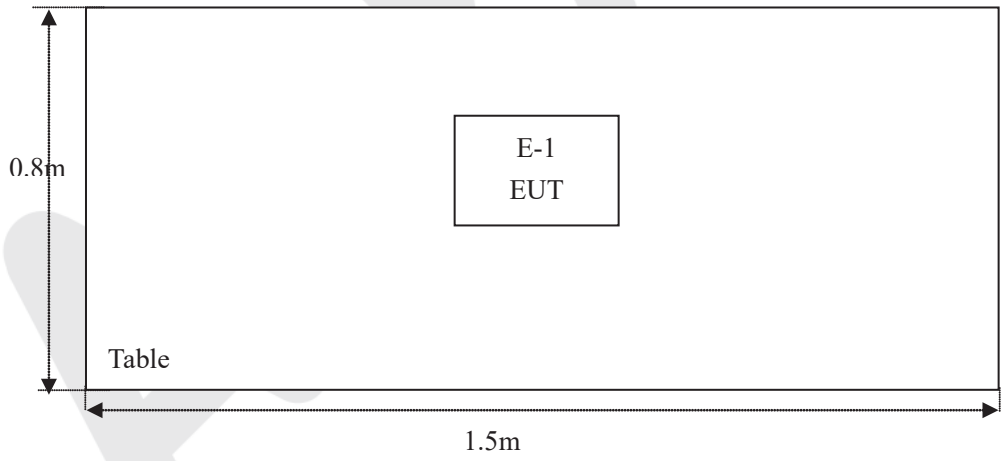
1.6. Description Of Test Setup

CE



RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	May 27, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	May 27, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	May 27, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	May 27, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	May 27, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	May 27, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	May 27, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	May 31, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	May 31, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Apr. 03, 2017	1 Year
11.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	May 27, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	May 27, 2017	1 Year
13.	Pre-amplifier	SKET Electronic	BK1G40G50 A	KD25352	May 27, 2017	1 Year
14.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	May 27, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	May 27, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	May 27, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	May 27, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	May 27, 2017	1 Year
20.	DC Power supply	IVYTECH	IV6003	1601D6030007	May 26, 2017	1 Year
21.	TEMP&HUMI PROGRAMMABLE CHAMBER	Sertep	ZJ-HWHS80 B	ZJ-17042804	Mar. 03, 2017	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 4.1 dB (Horizontal)
		Ur = 4.3 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4dB

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

All Emissions tests were performed at

Shenzhen Anbotek Compliance Laboratory Limited. at 1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)(3)	Peak Power Spectral Density	PASS
15.203/15.407g	Antenna Requirement	PASS
§ 15.407(g) § 2.1055	Frequency Stability	PASS

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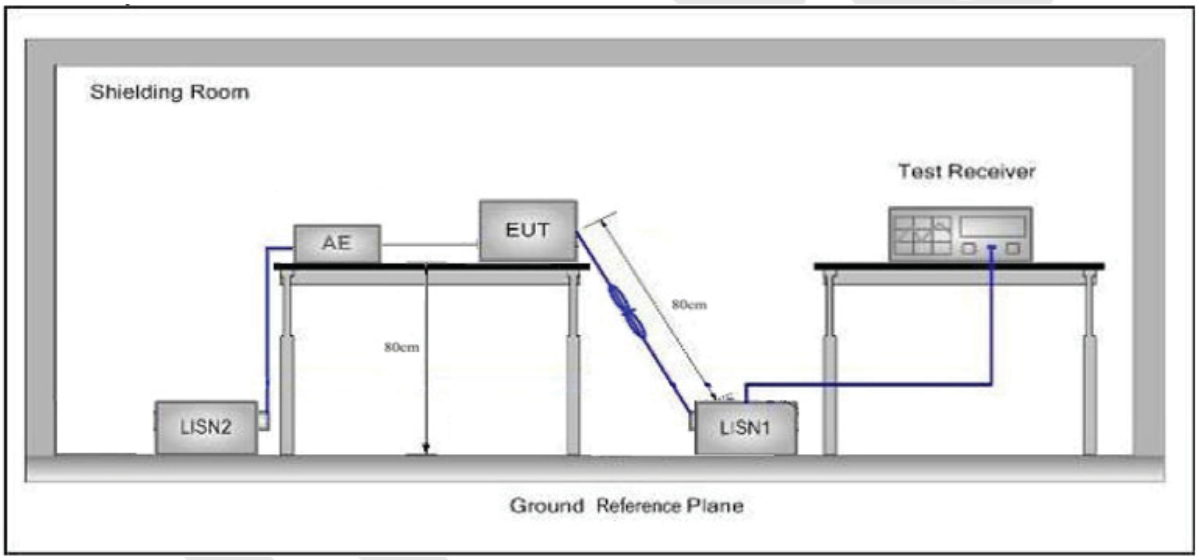
3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207&15.407		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

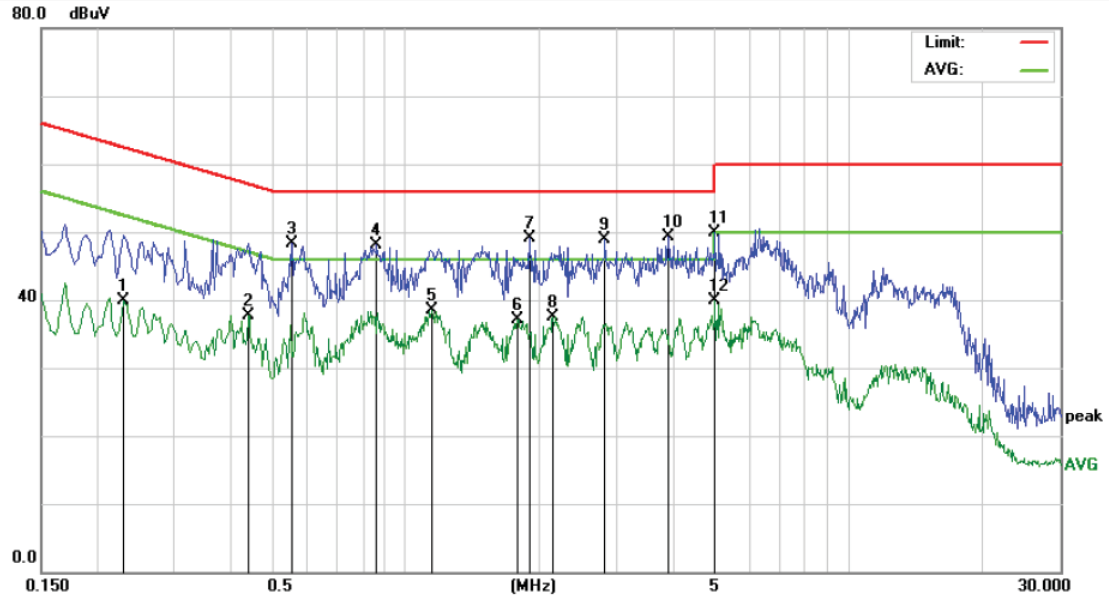
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

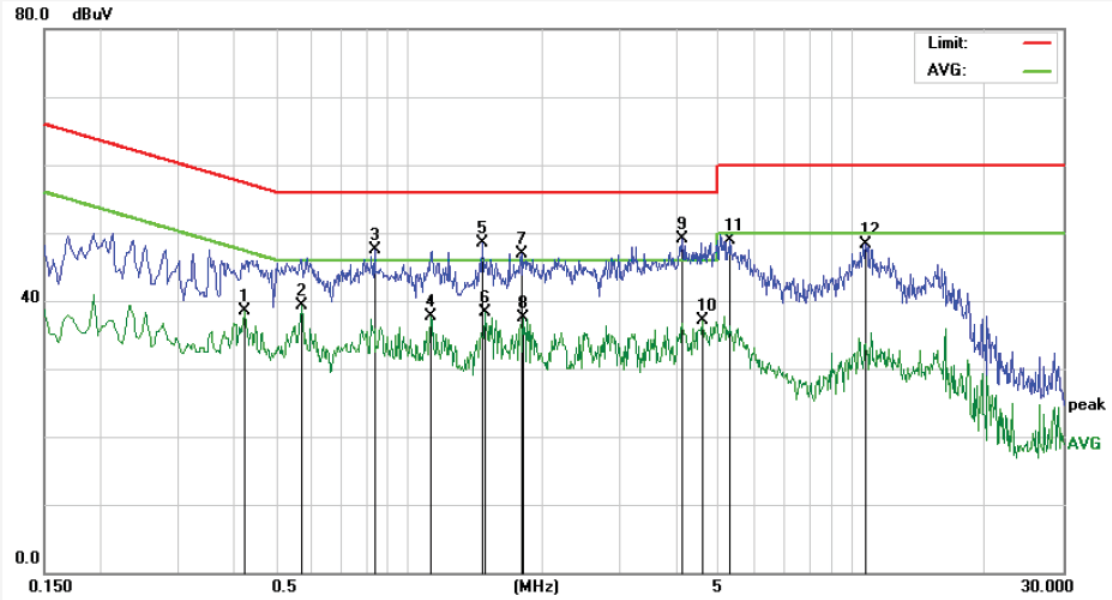
Test Site: 1# Shielded Room
Operating Condition: TX Mode
Test Specification: AC 120V, 60Hz via adapter
Comment: Live Line
Tem.:25°C Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2300	20.10	19.89	39.99	52.45	-12.46	AVG	
2	0.4420	17.83	19.95	37.78	47.02	-9.24	AVG	
3	0.5540	28.28	20.00	48.28	56.00	-7.72	QP	
4	0.8578	28.03	20.08	48.11	56.00	-7.89	QP	
5	1.1415	18.40	20.12	38.52	46.00	-7.48	AVG	
6	1.7820	16.95	20.14	37.09	46.00	-8.91	AVG	
7	1.8975	28.97	20.14	49.11	56.00	-6.89	QP	
8	2.1499	17.35	20.14	37.49	46.00	-8.51	AVG	
9	2.8140	28.69	20.16	48.85	56.00	-7.15	QP	
10	3.9020	29.20	20.18	49.38	56.00	-6.62	QP	
11	4.9818	29.63	20.21	49.84	56.00	-6.16	QP	
12	4.9818	19.67	20.21	39.88	46.00	-6.12	AVG	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	TX Mode
Test Specification:	AC 120V, 60Hz via adapter
Comment:	Neutral Line
	Tem.:25℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4259	18.56	19.95	38.51	47.33	-8.82	AVG	
2	0.5735	19.31	20.00	39.31	46.00	-6.69	AVG	
3	0.8377	27.43	20.08	47.51	56.00	-8.49	QP	
4	1.1220	17.50	20.12	37.62	46.00	-8.38	AVG	
5	1.4657	28.35	20.13	48.48	56.00	-7.52	QP	
6	1.4858	18.21	20.13	38.34	46.00	-7.66	AVG	
7	1.7940	26.84	20.14	46.98	56.00	-9.02	QP	
8	1.8180	17.35	20.14	37.49	46.00	-8.51	AVG	
9	4.1539	28.97	20.18	49.15	56.00	-6.85	QP	
10	4.6219	16.89	20.20	37.09	46.00	-8.91	AVG	
11	5.3178	28.63	20.21	48.84	60.00	-11.16	QP	
12	10.7416	28.02	20.33	48.35	60.00	-11.65	QP	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.407				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	68.2	Peak	3

Remark:

(1)The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

(3) Above 1GHz limit: E[dBμV/m] = EIRP[dBm] + 95.2=68.2 dBuV/m, for EIPR[dBm]=-27dBm.

4.2. Test Setup

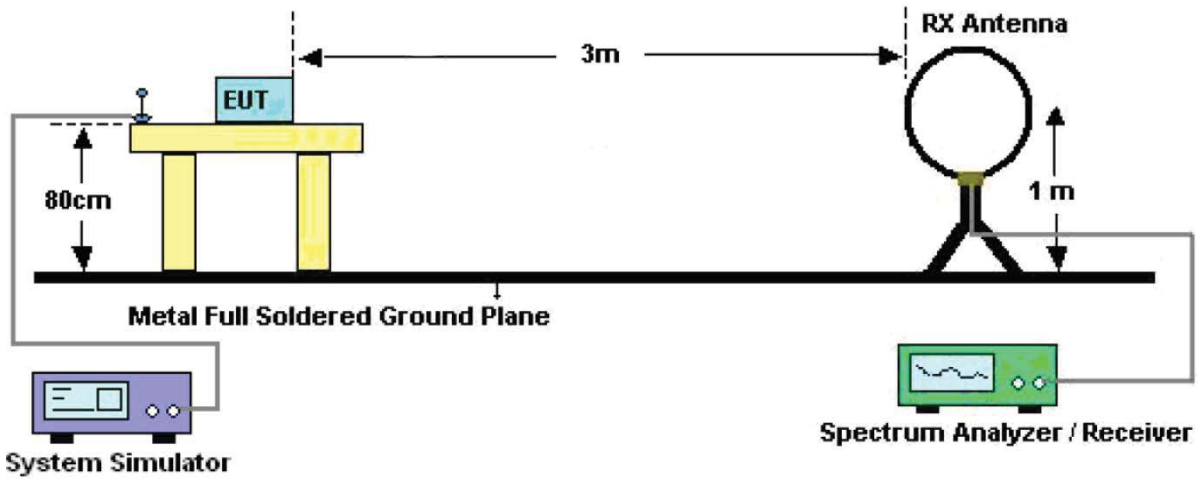


Figure 1. Below 30MHz

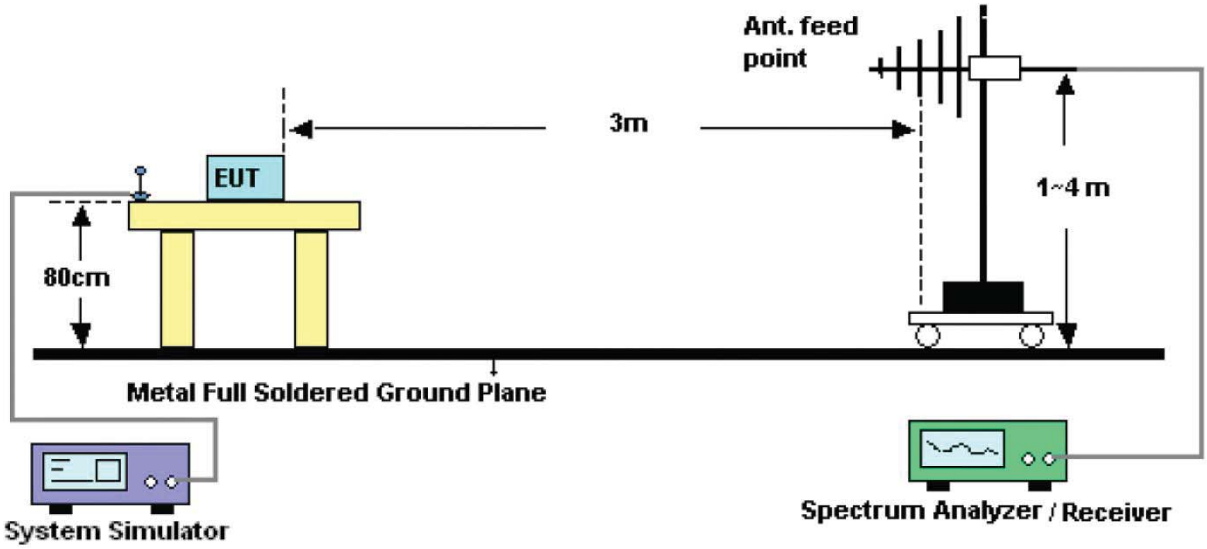


Figure 2. 30MHz to 1GHz

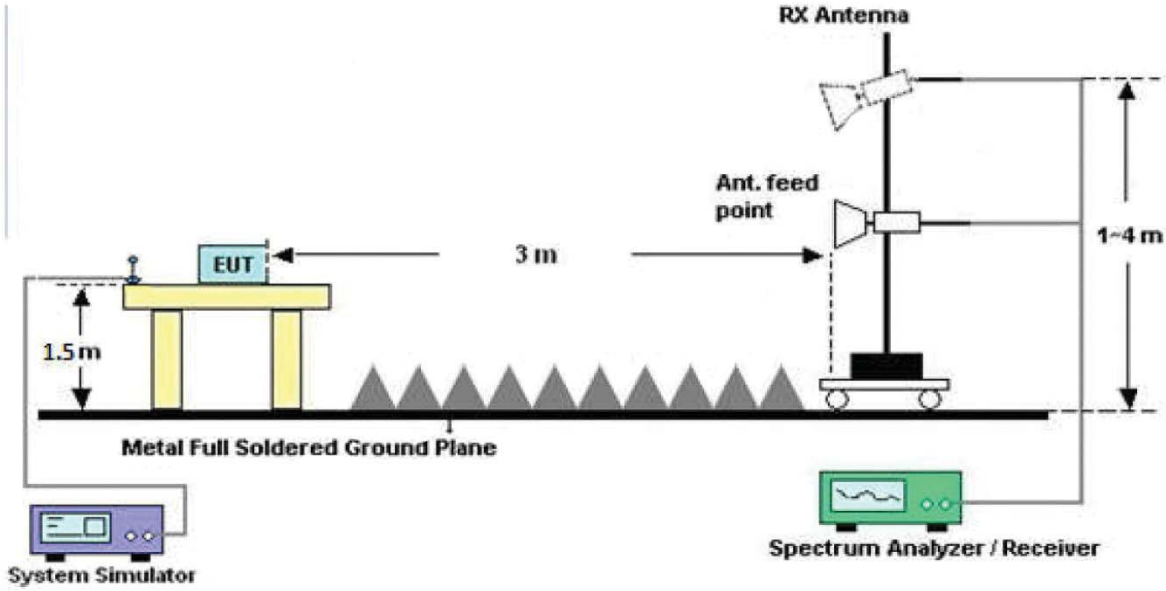


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying

aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.
.
For above 1GHz, Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

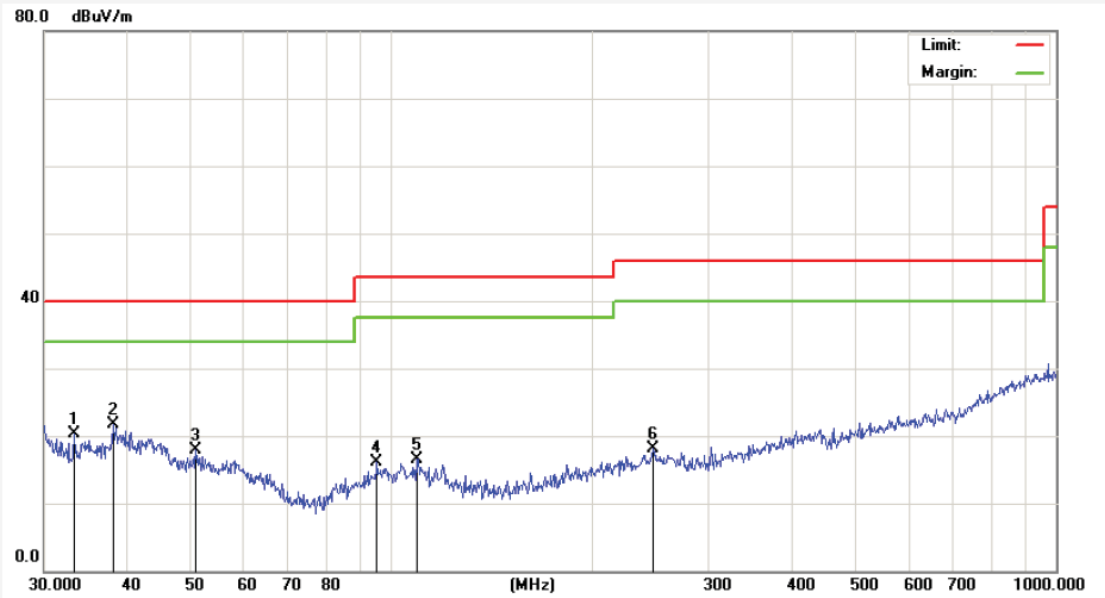
PASS

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

For the 30MHz-1GHz all the test modes completed for test. The worst case is antenna port 1 IEEE 802.11a Low CH mode of Radiated Emission; the test data of this mode was reported.

Test Results (30~1000MHz)

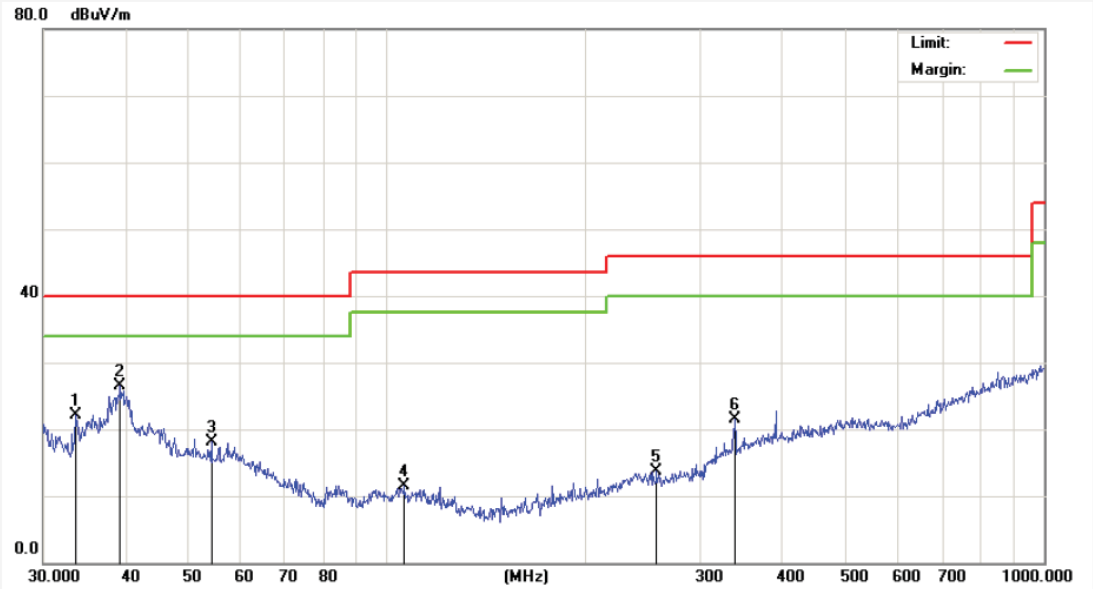
Job No.:	SZAWW171228001-02	Temp.(°C)/Hum.(%RH):	24.3°C/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V/60Hz
Test Mode:	TX Mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	33.3279	35.56	-15.35	20.21	40.00	-19.79	QP	300	13	
2	38.2120	33.84	-12.18	21.66	40.00	-18.34	QP	300	24	
3	50.7637	32.51	-14.63	17.88	40.00	-22.12	QP	300	64	
4	95.0930	37.14	-21.00	16.14	43.50	-27.36	QP	300	101	
5	109.0286	37.12	-20.63	16.49	43.50	-27.01	QP	300	134	
6	247.6819	36.61	-18.44	18.17	46.00	-27.83	QP	300	201	

Test Results (30~1000MHz)

Job No.:	SZAWW171228001-02	Temp.(°C)/Hum.(%RH):	24.3°C/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V/60Hz
Test Mode:	TX Mode	Polarization:	Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	33.5624	37.39	-15.24	22.15	40.00	-17.85	QP	300	34	
2	39.2991	37.93	-11.39	26.54	40.00	-13.46	QP	300	69	
3	54.0711	32.91	-14.87	18.04	40.00	-21.96	QP	300	102	
4	106.3850	27.15	-15.68	11.47	43.50	-32.03	QP	300	164	
5	257.4222	27.65	-14.00	13.65	46.00	-32.35	QP	300	203	
6	338.4001	34.89	-13.37	21.52	46.00	-24.48	QP	300	254	

Test Results (Above 1000MHz)

All the test modes completed for test. The worst case is antenna port 1 mode of Radiated Emission; the test data of this mode was reported.

For antenna port 1 above 1 GHz Test Results:

Test mode:	IEEE 802.11a	Test channel:	Low CH

Peak value:

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)	Pol.
10360.00	43.55	31.98	17.08	33.91	58.70	68.20	-9.50	V
15540.00	34.67	32.65	20.03	34.85	52.50	68.20	-15.70	V
10360.00	35.46	31.98	17.08	33.91	50.61	68.20	-17.59	H
15540.00	36.74	32.65	20.03	34.85	54.57	68.20	-13.63	H

Average value:

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)	Pol.
10360.00	32.95	31.98	17.08	33.91	48.10	54.00	-5.90	V
15540.00	29.66	32.65	20.03	34.85	47.49	54.00	-6.51	V
10360.00	27.68	31.98	17.08	33.91	42.83	54.00	-11.17	H
15540.00	29.63	32.65	20.03	34.85	47.46	54.00	-6.54	H

Test mode:	IEEE 802.11a	Test channel:	Mid CH

Peak value:

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)	Pol.
10400.00	41.69	32.44	17.18	33.91	57.40	68.20	-10.80	V
15600.00	37.48	32.78	20.12	34.86	55.52	68.20	-12.68	V
10400.00	37.63	32.44	17.18	33.91	53.34	68.20	-14.86	H
15600.00	36.55	32.78	20.12	34.86	54.59	68.20	-13.61	H

Average value:

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)	Pol.
10400.00	29.88	32.44	17.18	33.91	45.59	54.00	-8.41	V
15600.00	29.01	32.78	20.12	34.86	47.05	54.00	-6.95	V
10400.00	30.41	32.44	17.18	33.91	46.12	54.00	-7.88	H
15600.00	28.56	32.78	20.12	34.86	46.60	54.00	-7.40	H

Test mode:	IEEE 802.11a	Test channel:	High CH

Peak value:

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)	Pol.
10480.00	42.24	32.59	18.02	33.92	58.93	68.20	-9.27	V
15720.00	38.93	32.87	20.15	34.88	57.07	68.20	-11.13	V
10480.00	39.12	32.59	18.02	33.92	55.81	68.20	-12.39	H
15720.00	38.47	32.87	20.15	34.88	56.61	68.20	-11.59	H

Average value:

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)	Pol.
10480.00	32.87	32.59	18.02	33.92	49.56	54.00	-4.44	V
15720.00	29.50	32.87	20.15	34.88	47.64	54.00	-6.36	V
10480.00	29.00	32.59	18.02	33.92	45.69	54.00	-8.31	H
15720.00	31.27	32.87	20.15	34.88	49.41	54.00	-4.59	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	Low CH

Peak value:

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)	Pol.
10360.00	41.64	31.98	17.08	33.91	56.79	68.20	-11.41	V
15540.00	37.15	32.65	20.03	34.85	54.98	68.20	-13.22	V
10360.00	39.77	31.98	17.08	33.91	54.92	68.20	-13.28	H
15540.00	38.52	32.65	20.03	34.85	56.35	68.20	-11.85	H

Average value:

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)	Pol.
10360.00	31.63	31.98	17.08	33.91	46.78	54.00	-7.22	V
15540.00	30.49	32.65	20.03	34.85	48.32	54.00	-5.68	V
10360.00	31.55	31.98	17.08	33.91	46.70	54.00	-7.30	H
15540.00	31.08	32.65	20.03	34.85	48.91	54.00	-5.09	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	Mid CH

Peak value:

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)	Pol.
10400.00	42.27	32.44	17.18	33.91	57.98	68.20	-10.22	V
15600.00	39.19	32.78	20.12	34.86	57.23	68.20	-10.97	V
10400.00	39.34	32.44	17.18	33.91	55.05	68.20	-13.15	H
15600.00	39.76	32.78	20.12	34.86	57.80	68.20	-10.40	H

Average value:

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)	Pol.
10400.00	32.51	32.44	17.18	33.91	48.22	54.00	-5.78	V
15600.00	31.72	32.78	20.12	34.86	49.76	54.00	-4.24	V
10400.00	29.16	32.44	17.18	33.91	44.87	54.00	-9.13	H
15600.00	30.70	32.78	20.12	34.86	48.74	54.00	-5.26	H

Test mode:	IEEE 802.11n(HT20)	Test channel:	High CH

Peak value:

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)	Pol.
10480.00	42.59	32.59	18.02	33.92	59.28	68.20	-8.92	V
15720.00	39.98	32.87	20.15	34.88	58.12	68.20	-10.08	V
10480.00	37.64	32.59	18.02	33.92	54.33	68.20	-13.87	H
15720.00	39.66	32.87	20.15	34.88	57.80	68.20	-10.40	H

Average value:

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)	Pol.
10480.00	31.63	32.59	18.02	33.92	48.32	54.00	-5.68	V
15720.00	30.74	32.87	20.15	34.88	48.88	54.00	-5.12	V
10480.00	29.79	32.59	18.02	33.92	46.48	54.00	-7.52	H
15720.00	31.75	32.87	20.15	34.88	49.89	54.00	-4.11	H

Test mode:	IEEE 802.11n(HT40)	Test channel:	Low CH

Peak value:

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)	Pol.
10380.00	42.76	31.98	17.08	33.91	57.91	68.20	-10.29	V
15570.00	39.40	32.65	20.03	34.85	57.23	68.20	-10.97	V
10380.00	38.13	31.98	17.08	33.91	53.28	68.20	-14.92	H
15570.00	37.61	32.65	20.03	34.85	55.44	68.20	-12.76	H

Average value:

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)	Pol.
10380.00	31.58	31.98	17.08	33.91	46.73	54.00	-7.27	V
15570.00	30.73	32.65	20.03	34.85	48.56	54.00	-5.44	V
10380.00	31.62	31.98	17.08	33.91	46.77	54.00	-7.23	H
15570.00	30.21	32.65	20.03	34.85	48.04	54.00	-5.96	H

Test mode:	IEEE 802.11n(HT40)	Test channel:	High CH

Peak value:

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)	Pol.
10460.00	42.16	32.59	18.02	33.92	58.85	68.20	-9.35	V
15690.00	38.20	32.87	20.15	34.88	56.34	68.20	-11.86	V
10460.00	38.89	32.59	18.02	33.92	55.58	68.20	-12.62	H
15690.00	39.33	32.87	20.15	34.88	57.47	68.20	-10.73	H

Average value:

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)	Pol.
10460.00	31.88	32.59	18.02	33.92	48.57	54.00	-5.43	V
15690.00	29.25	32.87	20.15	34.88	47.39	54.00	-6.61	V
10460.00	31.37	32.59	18.02	33.92	48.06	54.00	-5.94	H
15690.00	29.29	32.78	20.12	34.86	47.33	54.00	-6.67	H

Note:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

Radiated Band Edge:

All the test modes completed for test. The worst case is antenna port 1 mode of Radiated Emission; the test data of this mode was reported.

Test Mode: 802.11a								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	42.05	28.65	13.58	31.04	53.24	68.20	-14.96	H
5350.00	41.58	29.16	14.68	31.96	53.46	68.20	-14.74	H
5150.00	41.83	28.65	13.58	31.04	53.02	68.20	-15.18	V
5350.00	42.84	29.16	14.68	31.96	54.72	68.20	-13.48	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	34.80	28.65	13.58	31.04	45.99	54.00	-8.01	H
5350.00	34.72	29.16	14.68	31.96	46.60	54.00	-7.40	H
5150.00	34.62	28.65	13.58	31.04	45.81	54.00	-8.19	V
5350.00	34.61	29.16	14.68	31.96	46.49	54.00	-7.51	V

Test Mode: 802.11n20								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.77	28.65	13.58	31.04	52.96	68.20	-15.24	H
5350.00	41.53	29.16	14.68	31.96	53.41	68.20	-14.79	H
5150.00	42.52	28.65	13.58	31.04	53.71	68.20	-14.49	V
5350.00	41.56	29.16	14.68	31.96	53.44	68.20	-14.76	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	35.22	28.65	13.58	31.04	46.41	54.00	-7.59	H
5350.00	35.41	29.16	14.68	31.96	47.29	54.00	-6.71	H
5150.00	34.30	28.65	13.58	31.04	45.49	54.00	-8.51	V
5350.00	35.69	29.16	14.68	31.96	47.57	54.00	-6.43	V

Test Mode: 802.11n40								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.61	28.65	13.58	31.04	52.80	68.20	-15.40	H
5350.00	41.51	29.16	14.68	31.96	53.39	68.20	-14.81	H
5150.00	42.14	28.65	13.58	31.04	53.33	68.20	-14.87	V
5350.00	42.36	29.16	14.68	31.96	54.24	68.20	-13.96	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	34.60	28.65	13.58	31.04	45.79	54.00	-8.21	H
5350.00	35.80	29.16	14.68	31.96	47.68	54.00	-6.32	H
5150.00	35.18	28.65	13.58	31.04	46.37	54.00	-7.63	V
5350.00	35.06	29.16	14.68	31.96	46.94	54.00	-7.06	V

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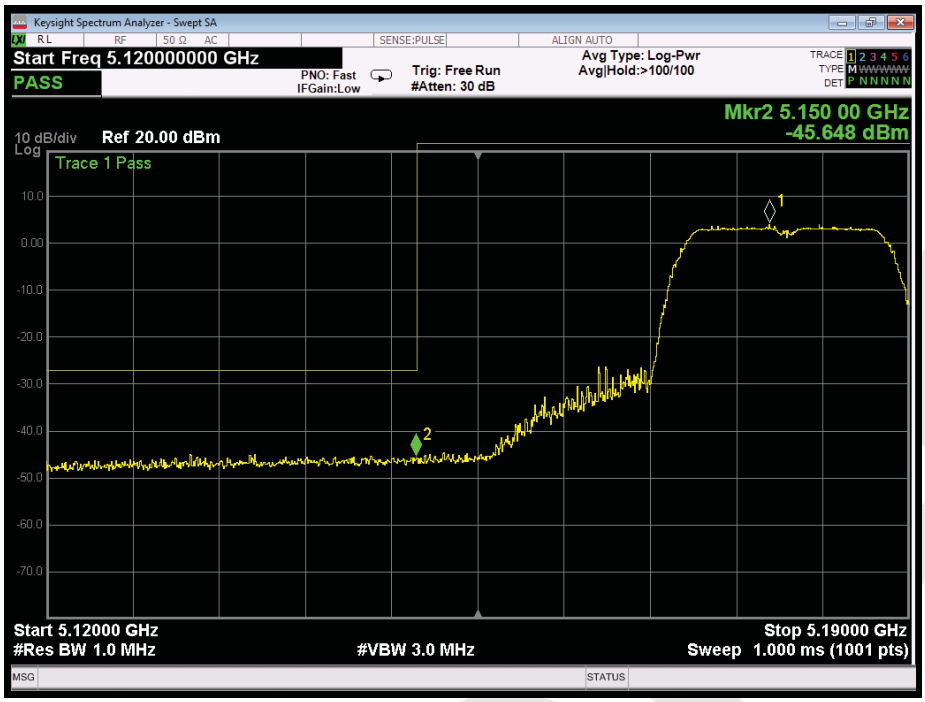
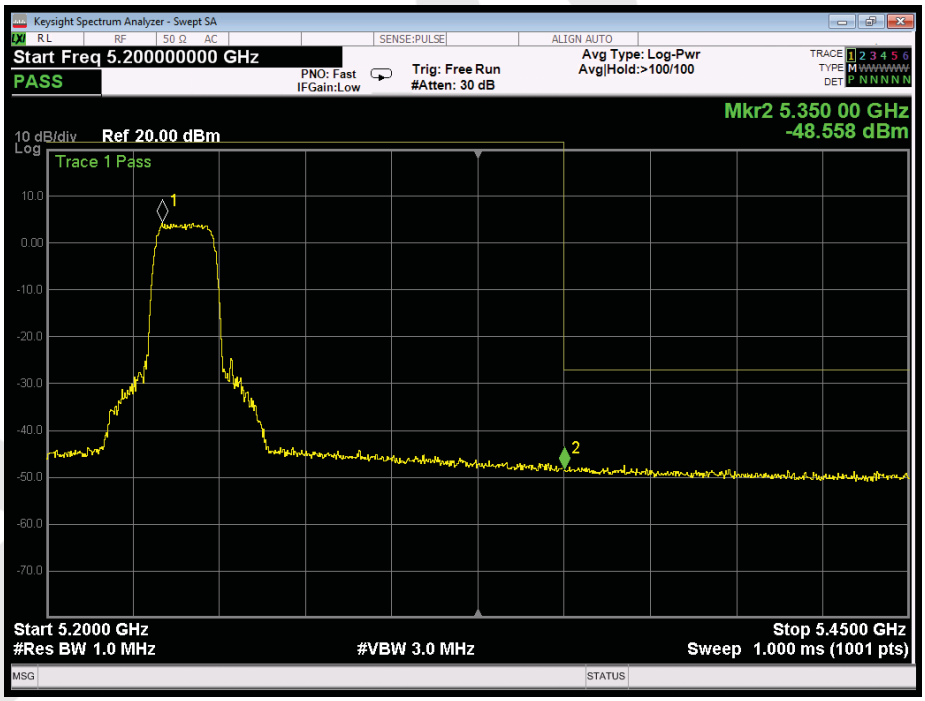
For conducted test:

Antenna 1

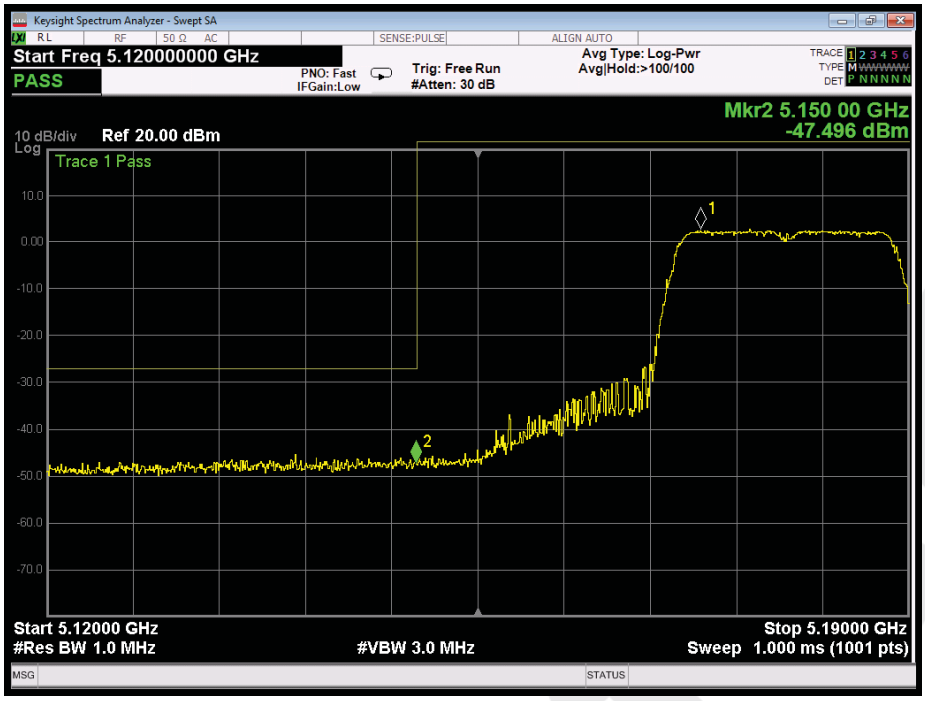
802.11a: Band Edge, Left Side



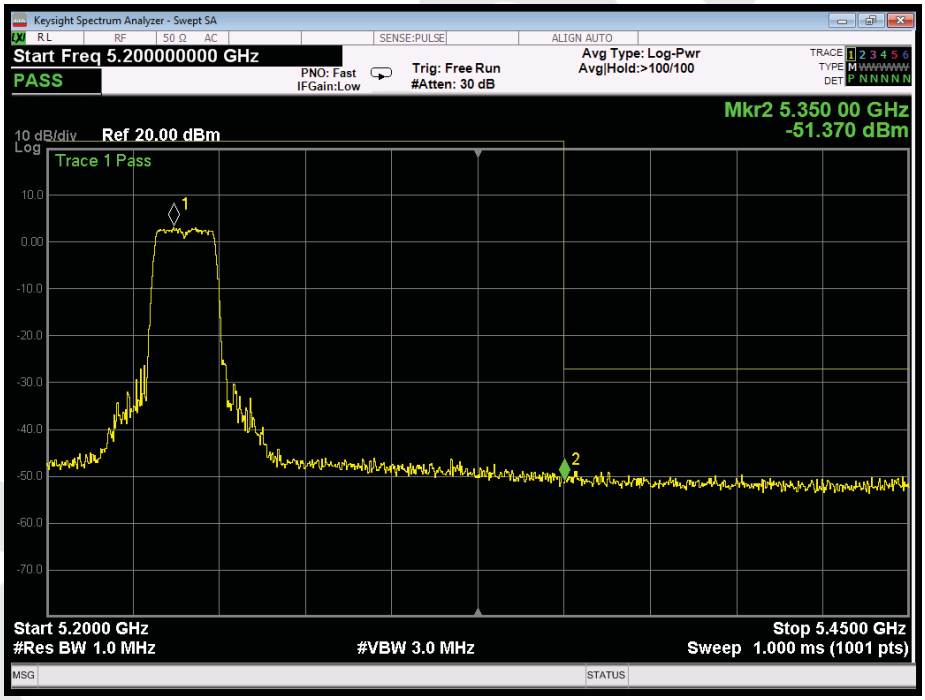
802.11a: Band Edge, Right Side



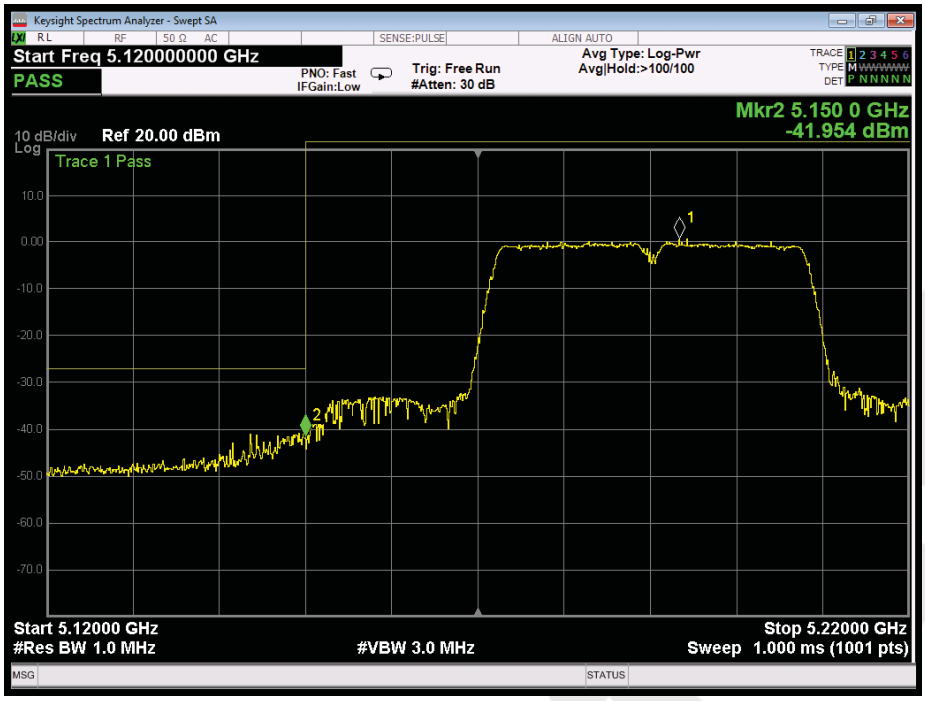
802.11n(20): Band Edge, Left Side



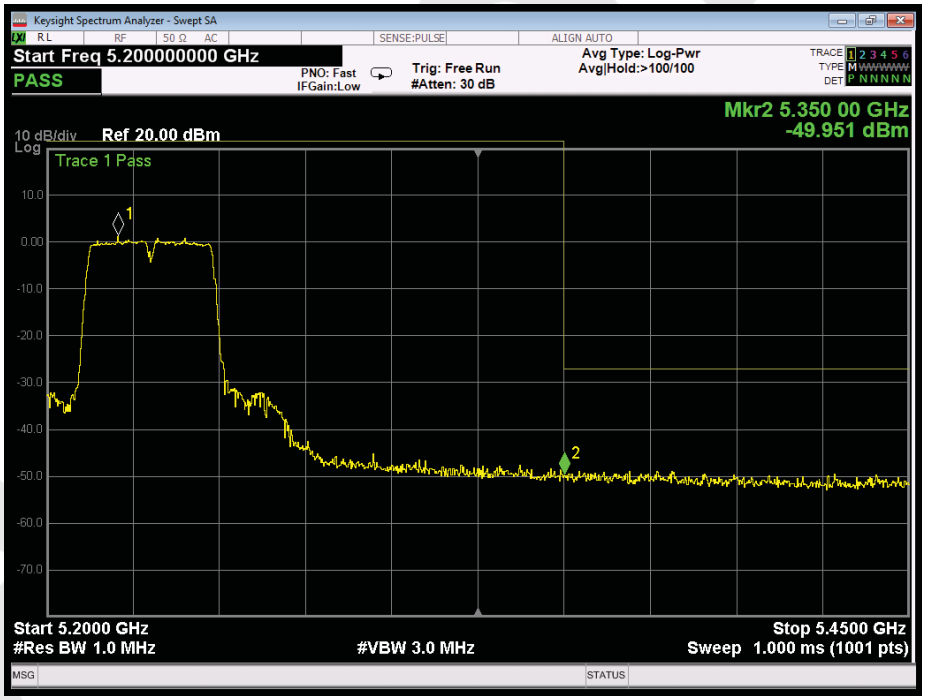
802.11n(20): Band Edge, Right Side



802.11n(40): Band Edge, Left Side

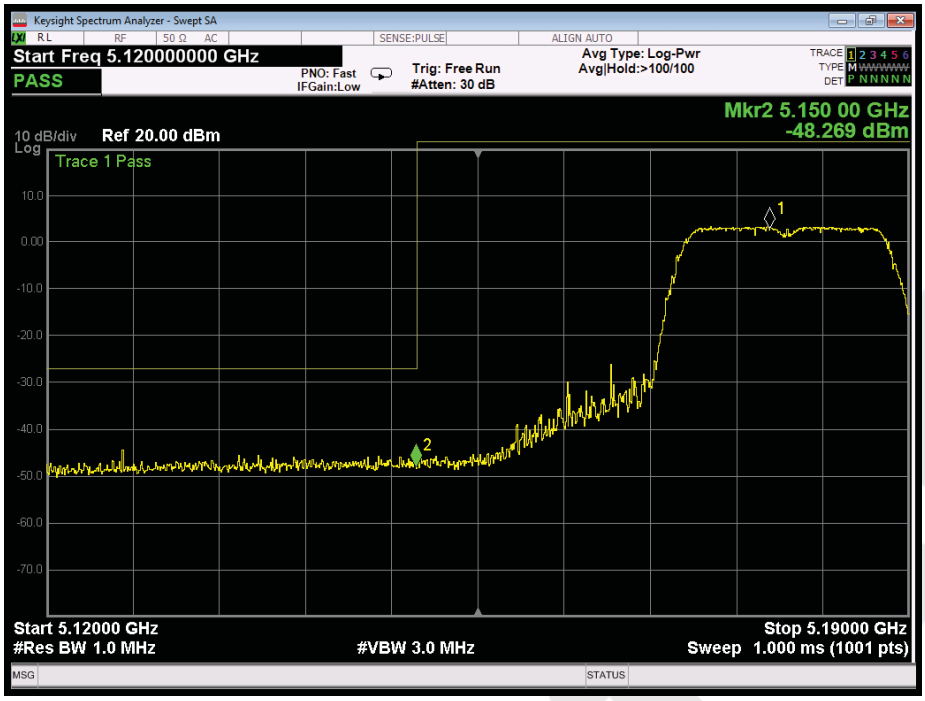


802.11n(40): Band Edge, Right Side

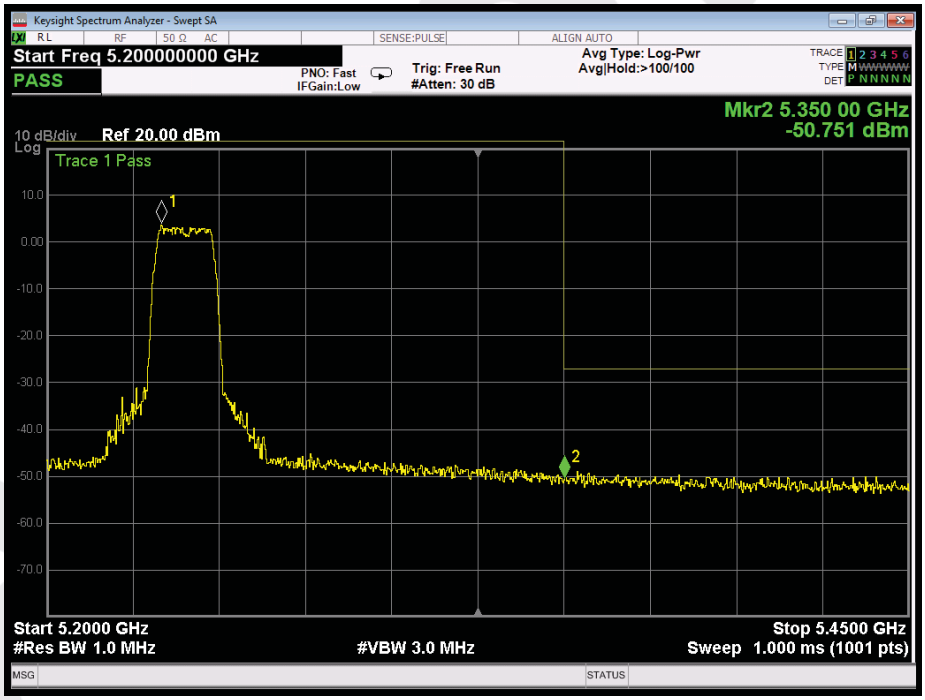


Antenna 2

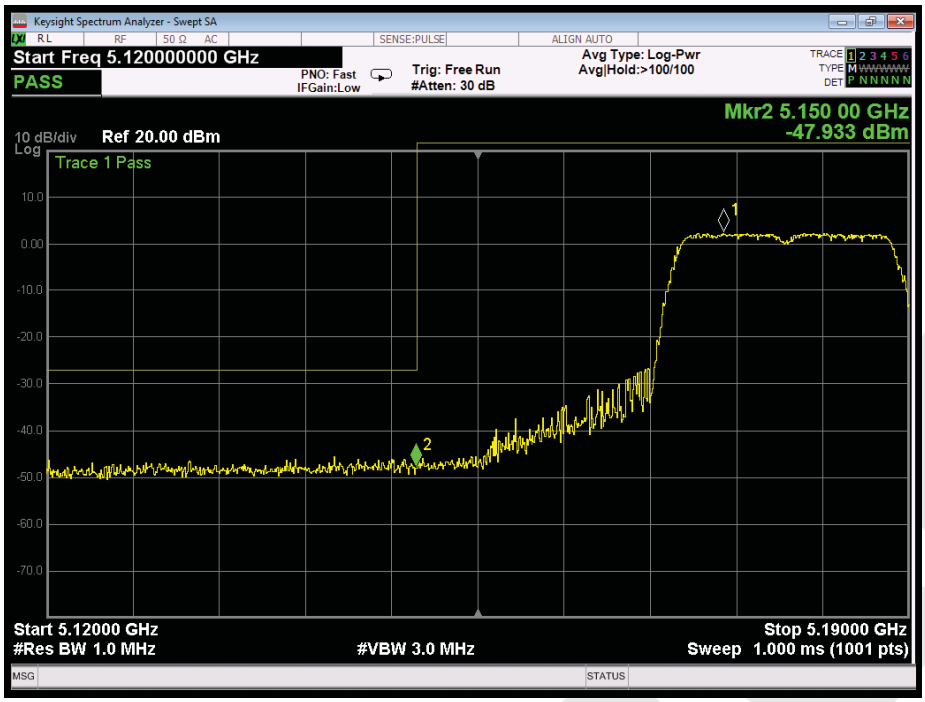
802.11a: Band Edge, Left Side



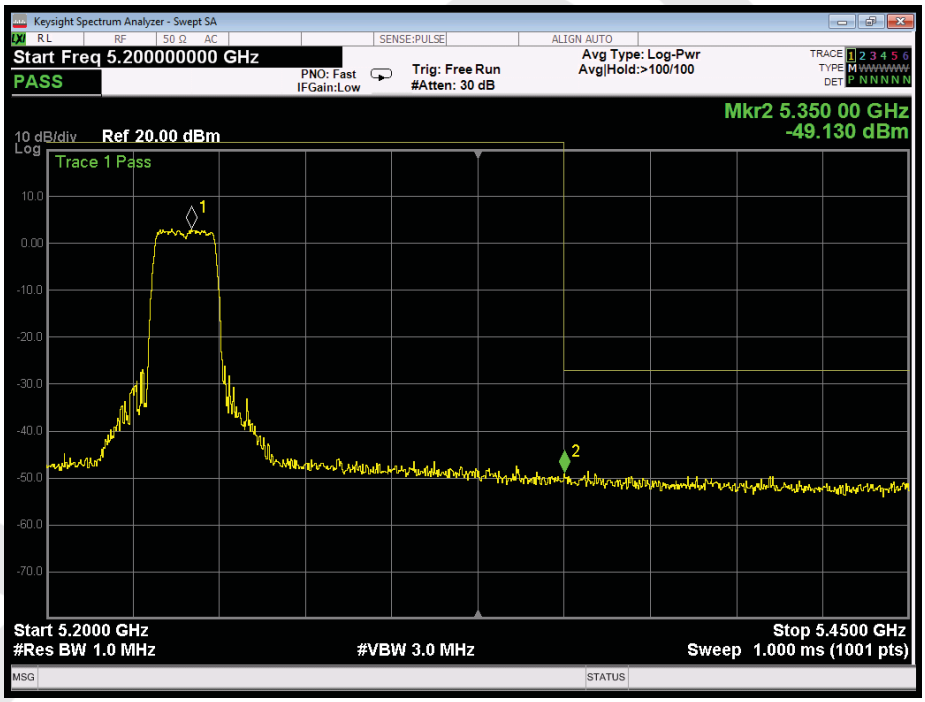
802.11a: Band Edge, Right Side



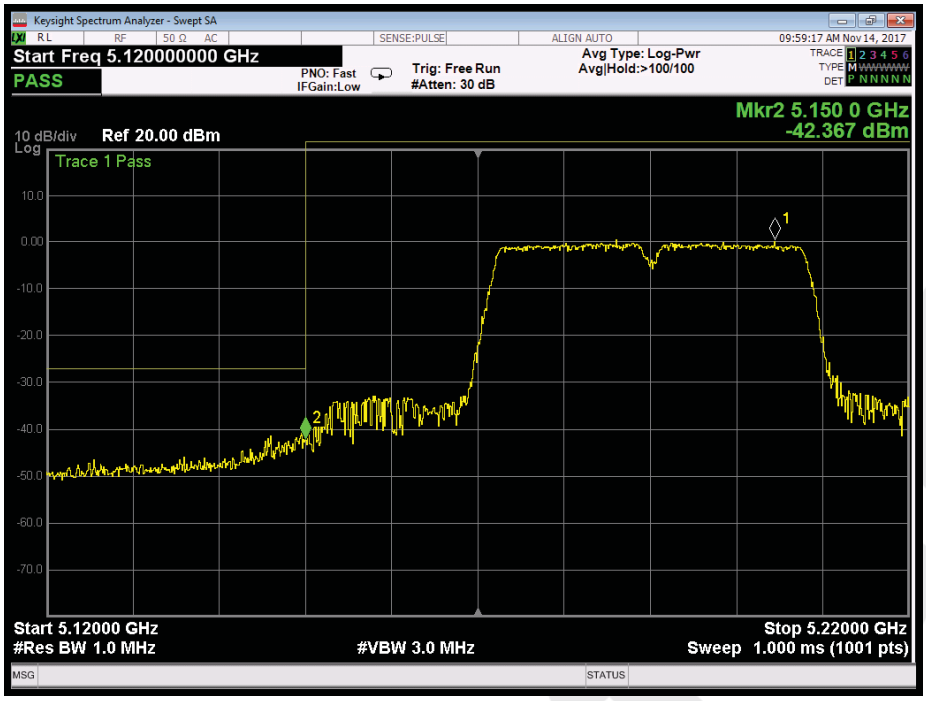
802.11n(20): Band Edge, Left Side



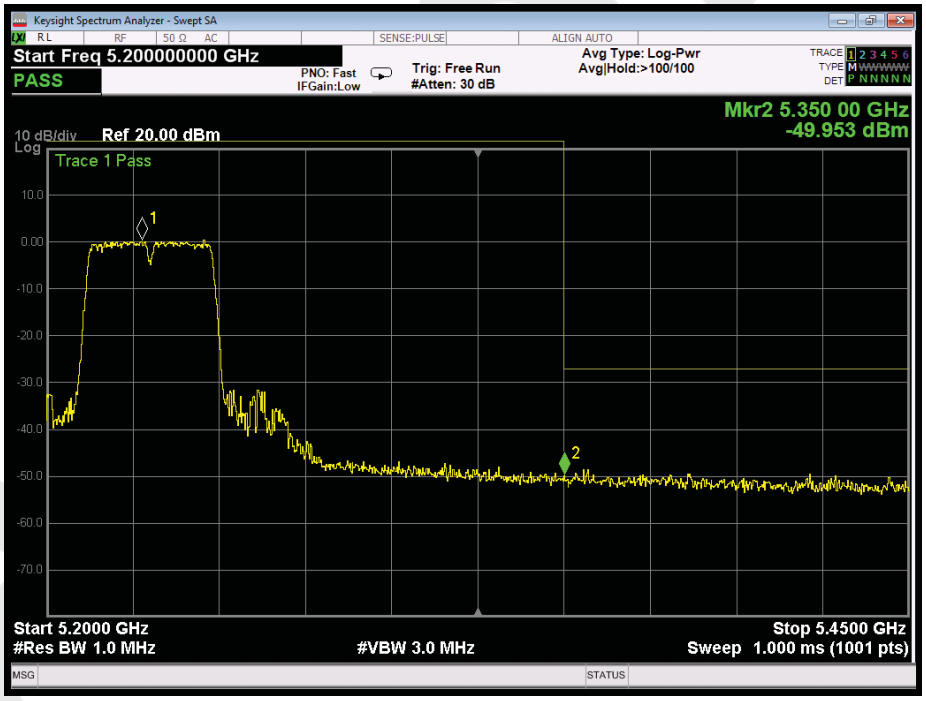
802.11n(20): Band Edge, Right Side



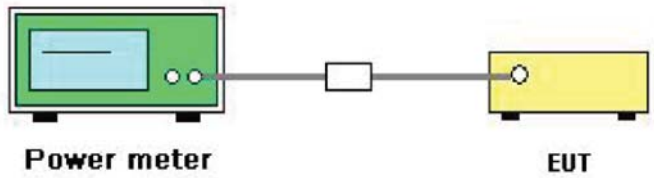
802.11n(40): Band Edge, Left Side



802.11n(40): Band Edge, Right Side



5. Maximum Output Power Test

Test Requirement:	FCC Part15 E Section 15.407(a)& Part 2 J Section 2.1046
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E
Limit:	Frequency Band (MHz) / Limit 5150-5250 / 250mW for client devices 5725-5850 / 1 W
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section E, 3, a 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 5. Measure the conducted output power and record the results in the test report.
Test Result:	PASS
Remark:	Conducted output power= measurement power +10log(1/x) X is duty cycle=1, so 10log(1/1)=0 Conducted output power= measurement power

5.2. Test Data

Test Item	:	Max. avg output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V/60Hz	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Configuration Band I (5150 - 5250 MHz)						
Mode	Test channel	Maximum Conducted average Output Power (dBm)			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
11a	CH36	15.31	14.82	/	24	PASS
11a	CH40	15.13	13.61	/	24	PASS
11a	CH48	16.32	12.41	/	24	PASS
11n(HT20)	CH36	15.93	13.83	18.02	24	PASS
11n(HT20)	CH40	15.92	14.21	18.16	24	PASS
11n(HT20)	CH48	15.13	14.71	17.94	24	PASS
11n(HT40)	CH38	16.92	13.42	18.52	24	PASS
11n(HT40)	CH46	16.91	12.51	18.26	24	PASS

Note: EUT only support n20 and n40 for MIMO mode.

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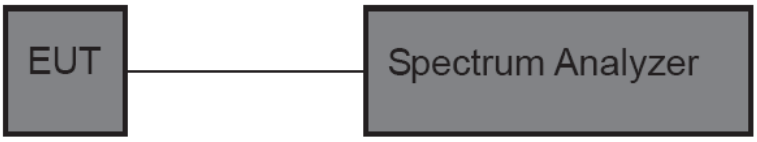
6. Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.407 (a)(5)

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3. Set the spectrum analyzer as:

26 dB &99%bandwidth

RBW = approximately 1% of the emission bandwidth;
Set the VBW＞RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

6 dB bandwidth

RBW = 100kHz;
Set the video bandwidth (VBW) ≥ 3 RBW;
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.

4. Measure the maximum width of the emission that is 26dB /6dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer.

5. Repeat until all the rest channels are investigated.

6.4. Test Data

Test Item	:	6dB &26dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V/60Hz	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Antenna 1

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5180	16.38	>0.5MHz	PASS
	5200	16.40		PASS
	5240	16.40		PASS
802.11n20	5180	17.62		PASS
	5200	17.63		PASS
	5240	17.65		PASS
802.11n40	5190	36.11		PASS
	5230	36.34		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11a	5180	19.86	16.821
	5200	19.73	16.818
	5240	19.86	16.809
802.11n20	5180	20.22	17.772
	5200	20.10	17.780
	5240	20.12	17.814
802.11n40	5190	40.06	36.268
	5230	39.94	36.235

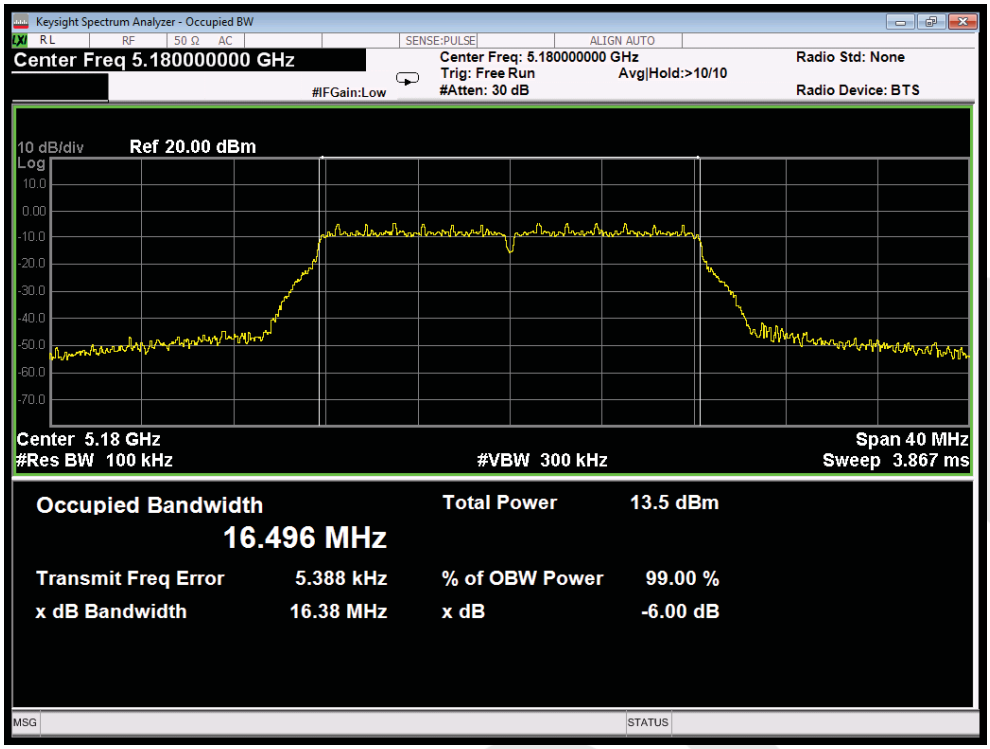
Antenna 2

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5180	16.39	>0.5MHz	PASS
	5200	16.38		PASS
	5240	16.39		PASS
802.11n20	5180	17.62		PASS
	5200	17.61		PASS
	5240	17.65		PASS
802.11n40	5190	35.99		PASS
	5230	36.15		PASS

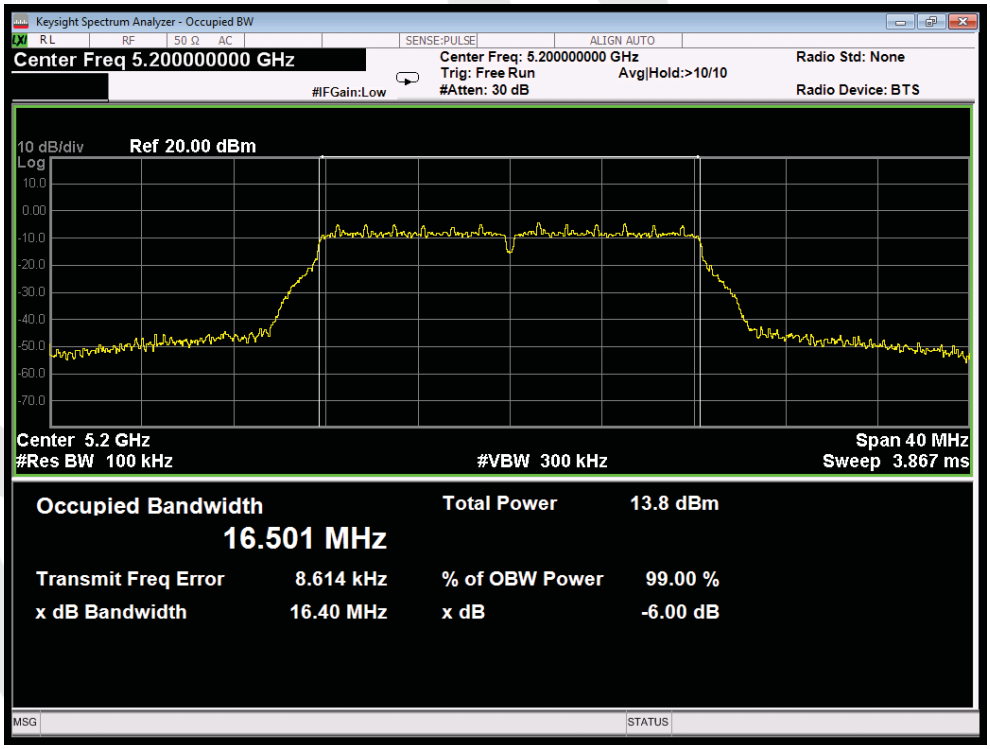
Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11a	5180	19.94	16.831
	5200	19.92	16.843
	5240	19.98	16.809
802.11n20	5180	20.22	17.785
	5200	20.12	17.823
	5240	20.12	17.809
802.11n40	5190	40.14	36.253
	5230	39.99	36.215

6dB Bandwidth

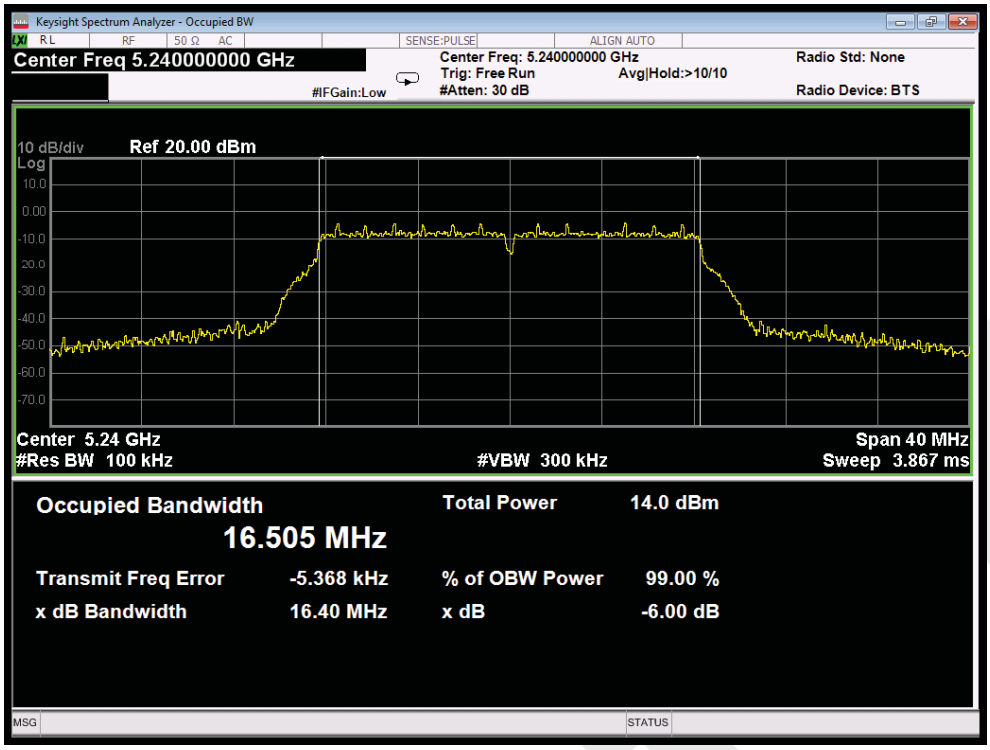
Antenna 1



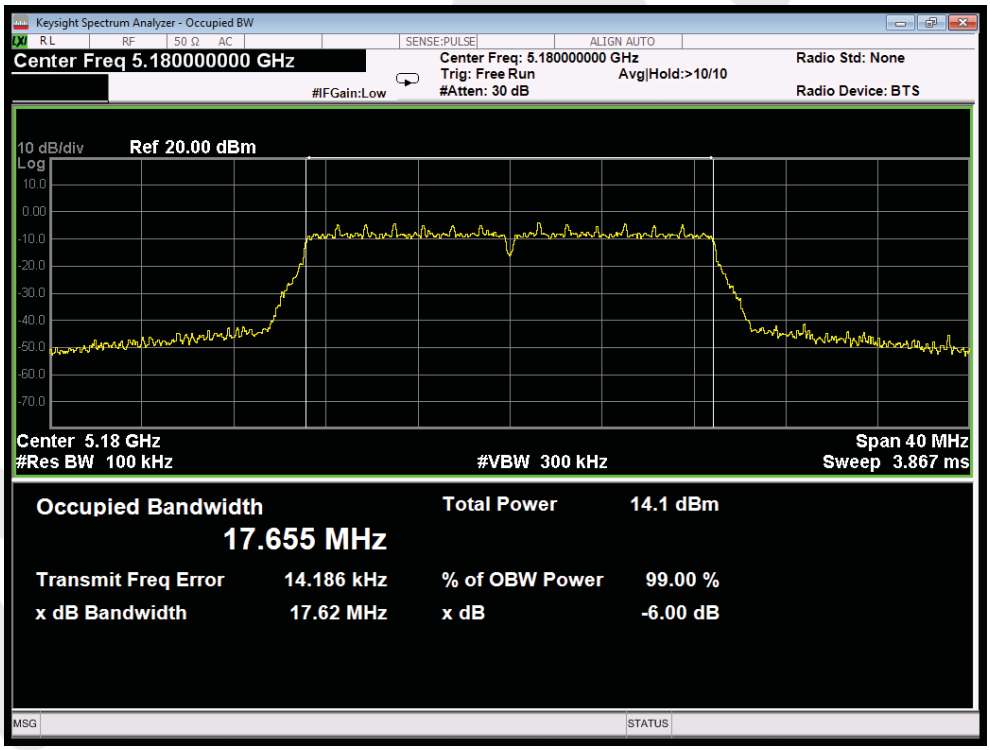
Test Mode: 802.11a--Low



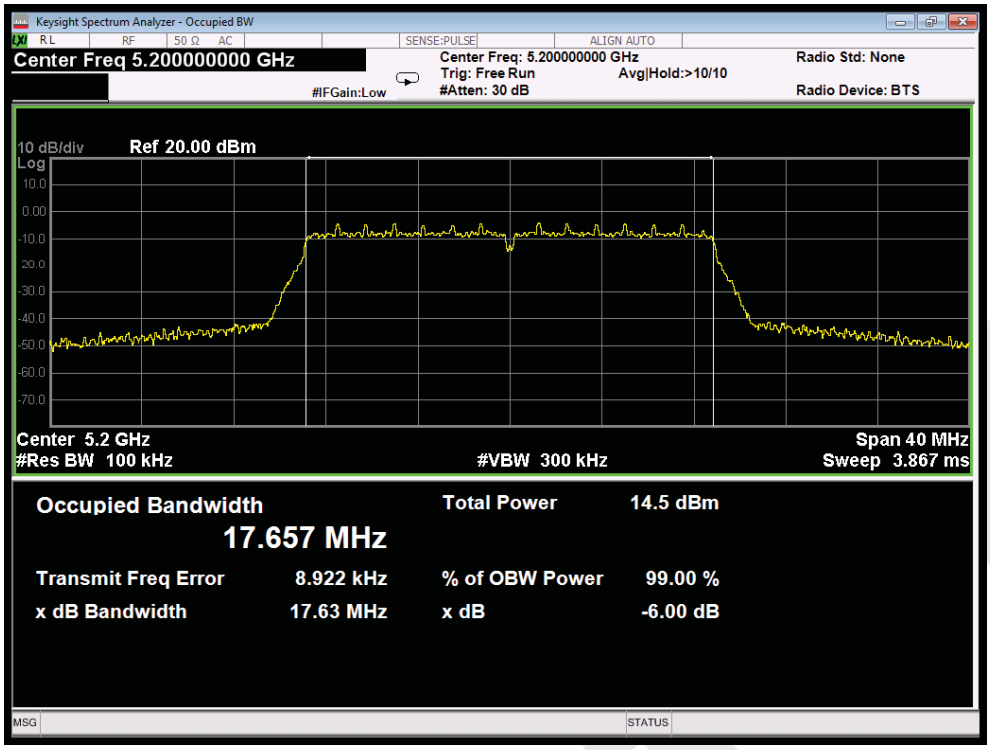
Test Mode: 802.11a---Middle



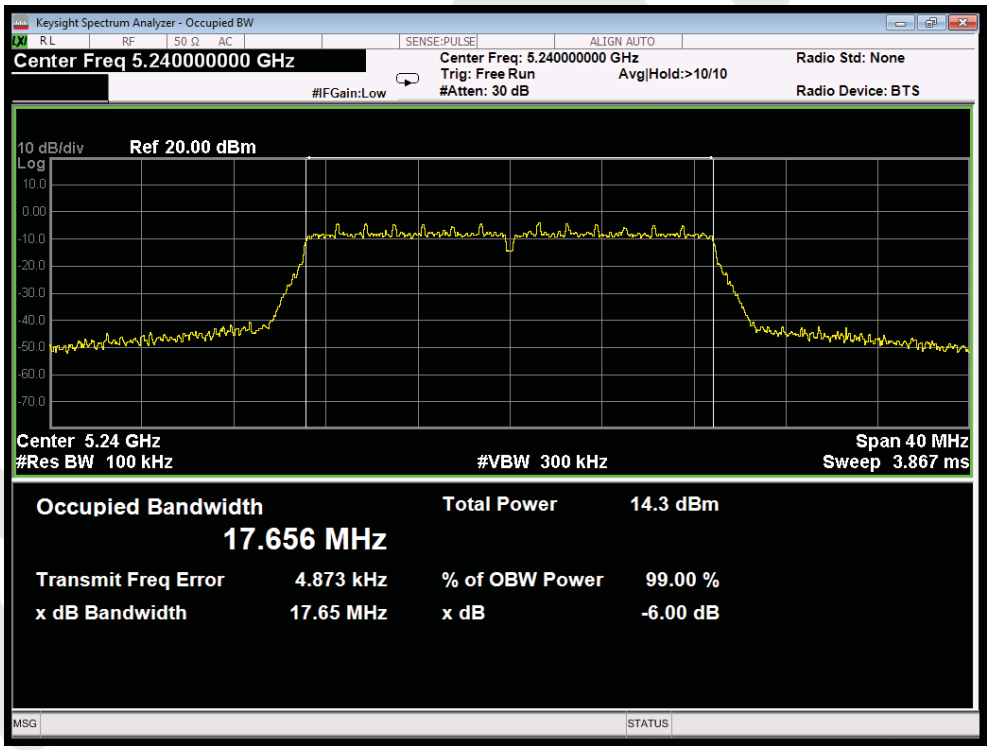
Test Mode: 802.11a---High



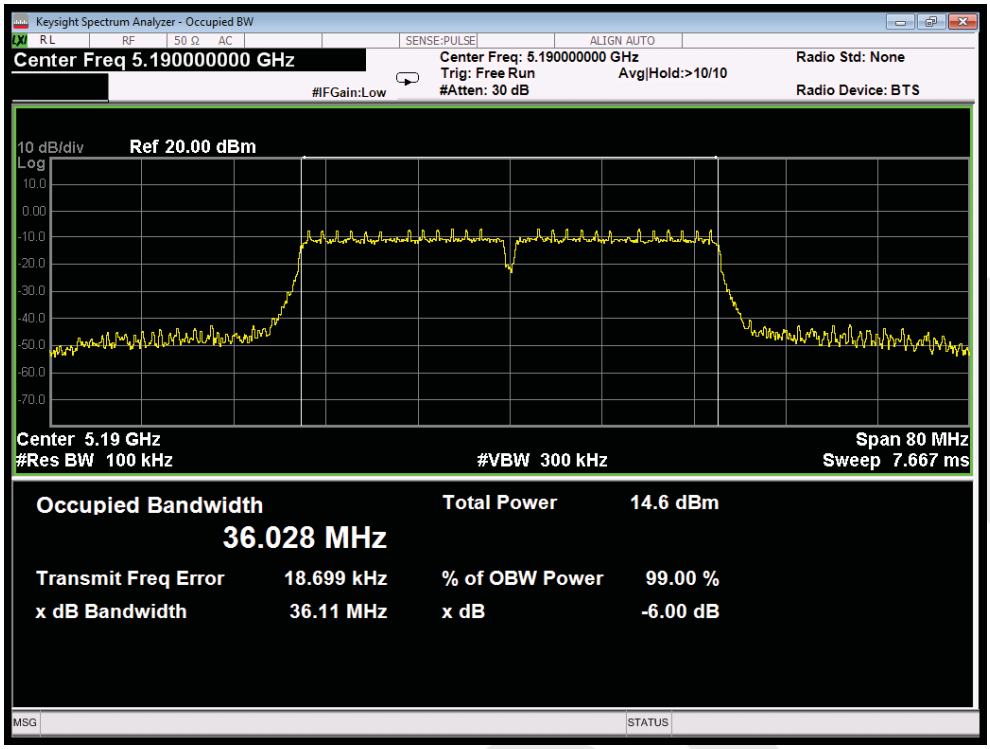
Test Mode: 802.11n20---Low



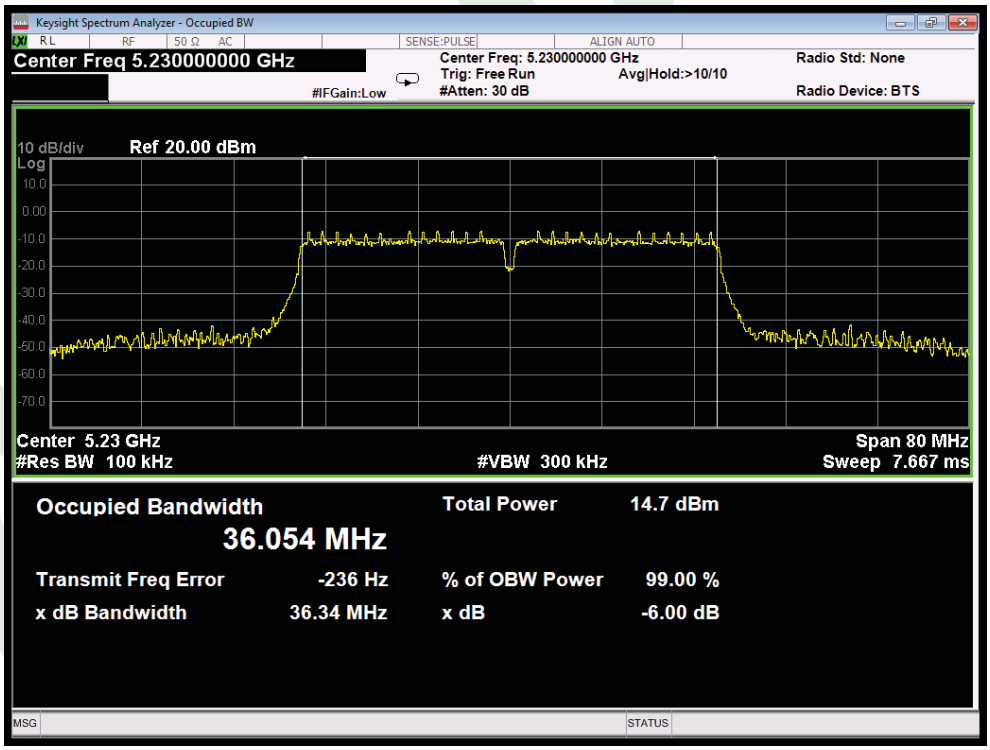
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

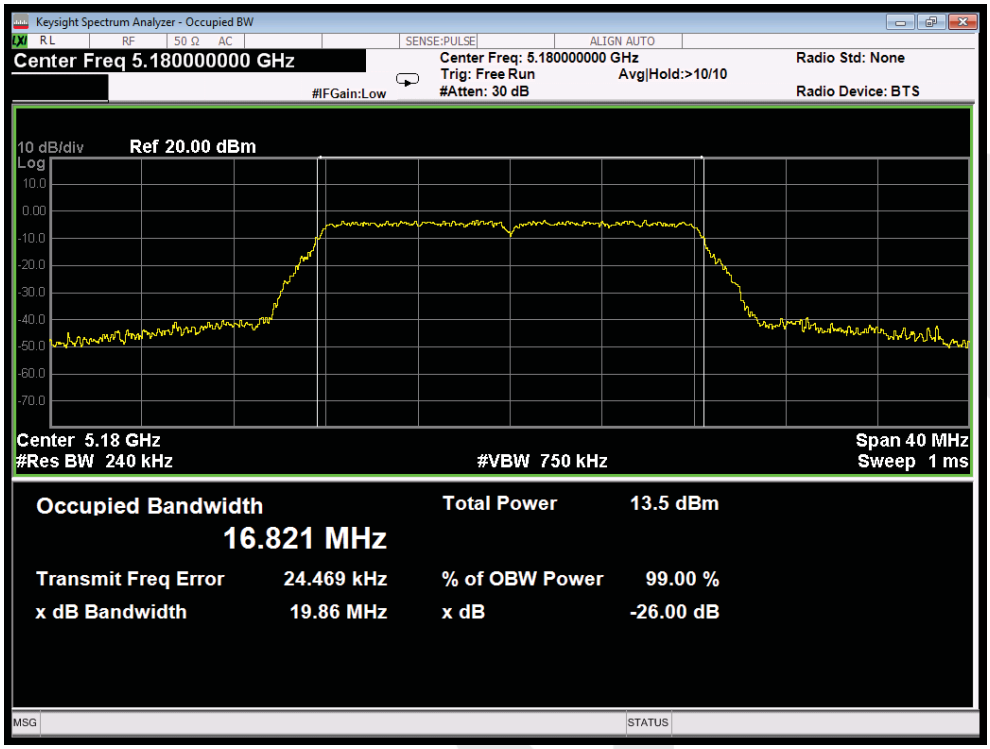


Test Mode: 802.11n40---Low

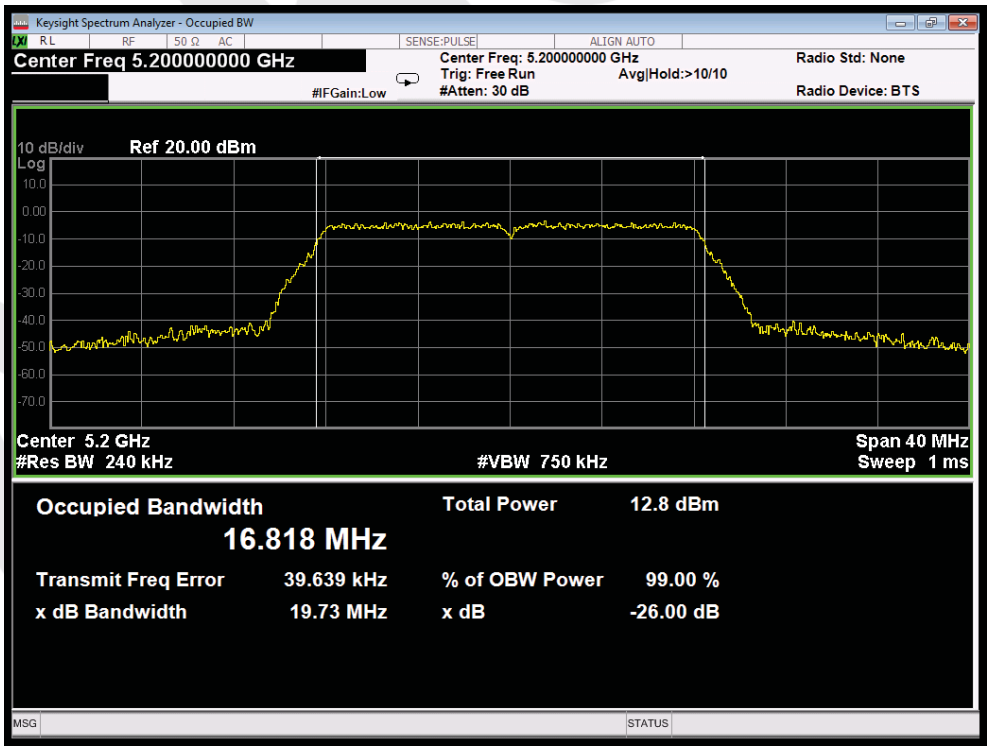


Test Mode: 802.11n40---High

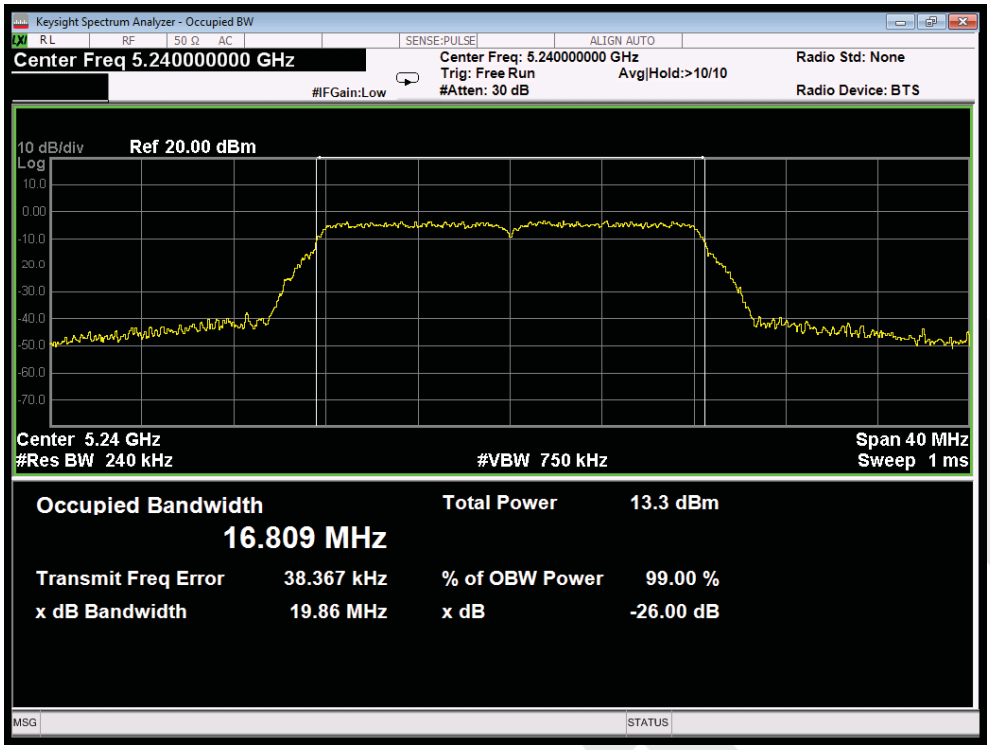
26dB &99% Bandwidth



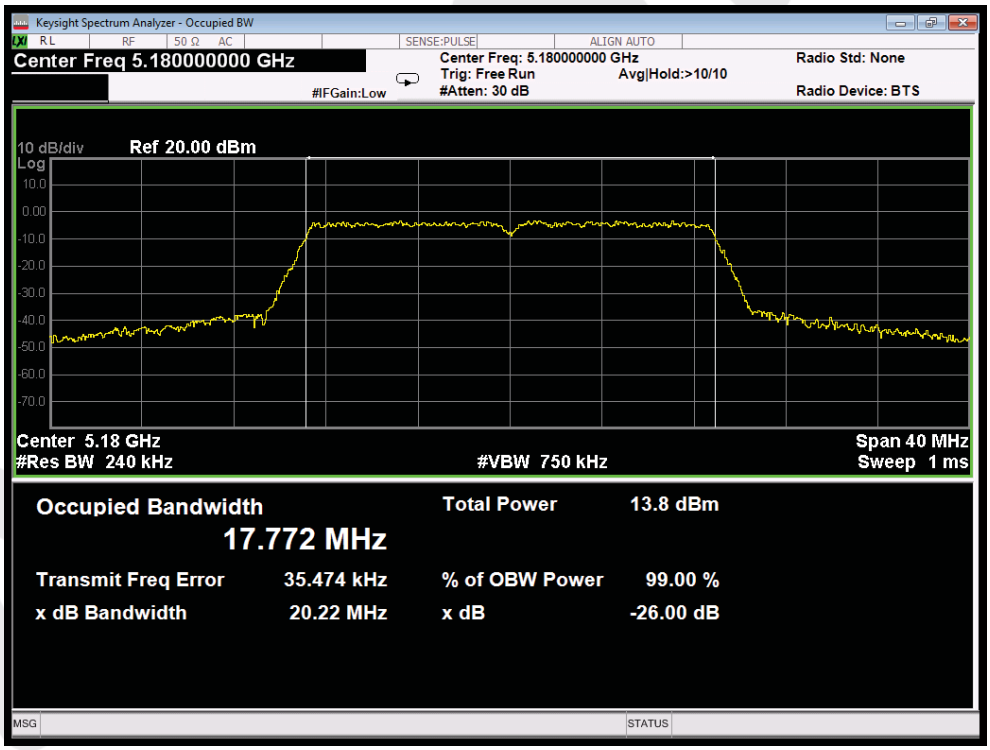
Test Mode: 802.11a--Low



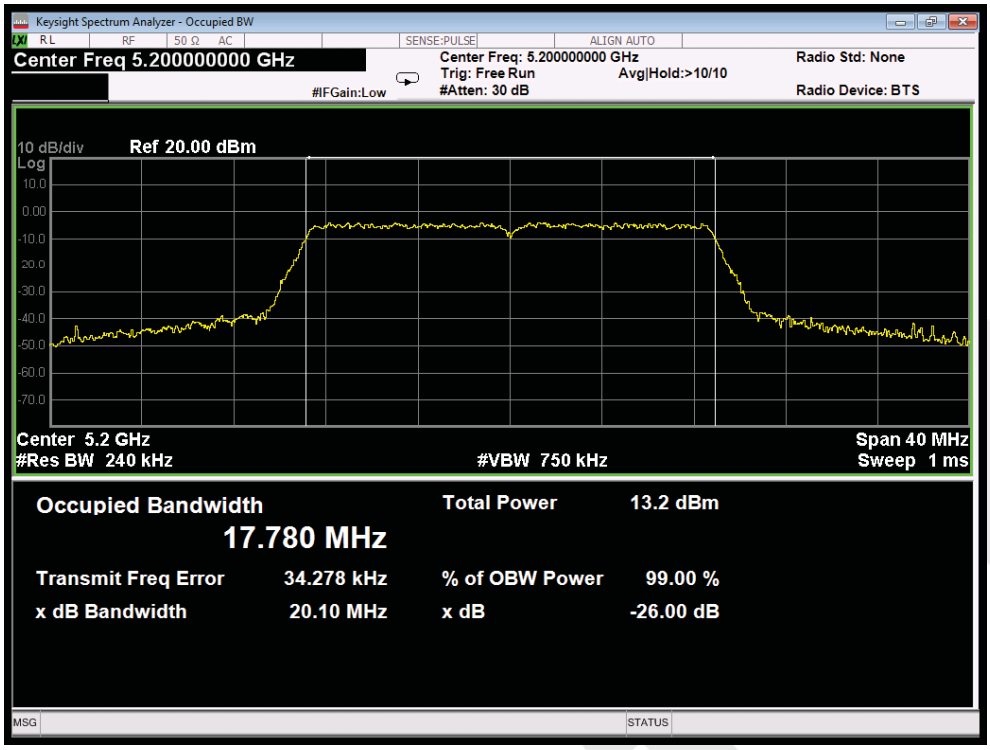
Test Mode: 802.11a---Middle



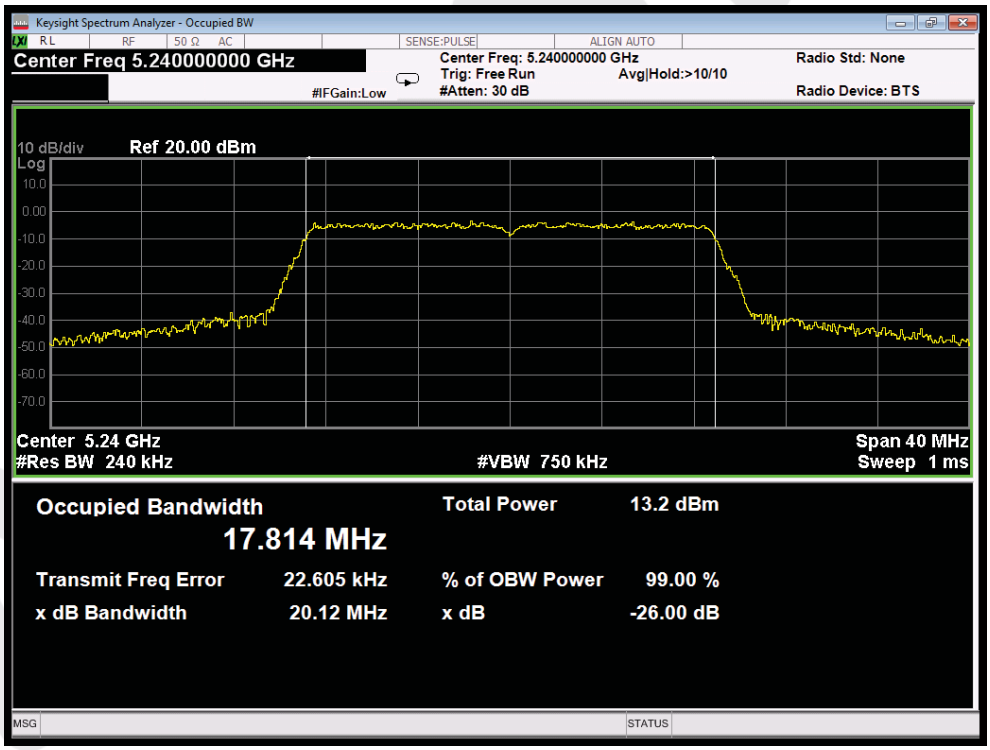
Test Mode: 802.11a---High



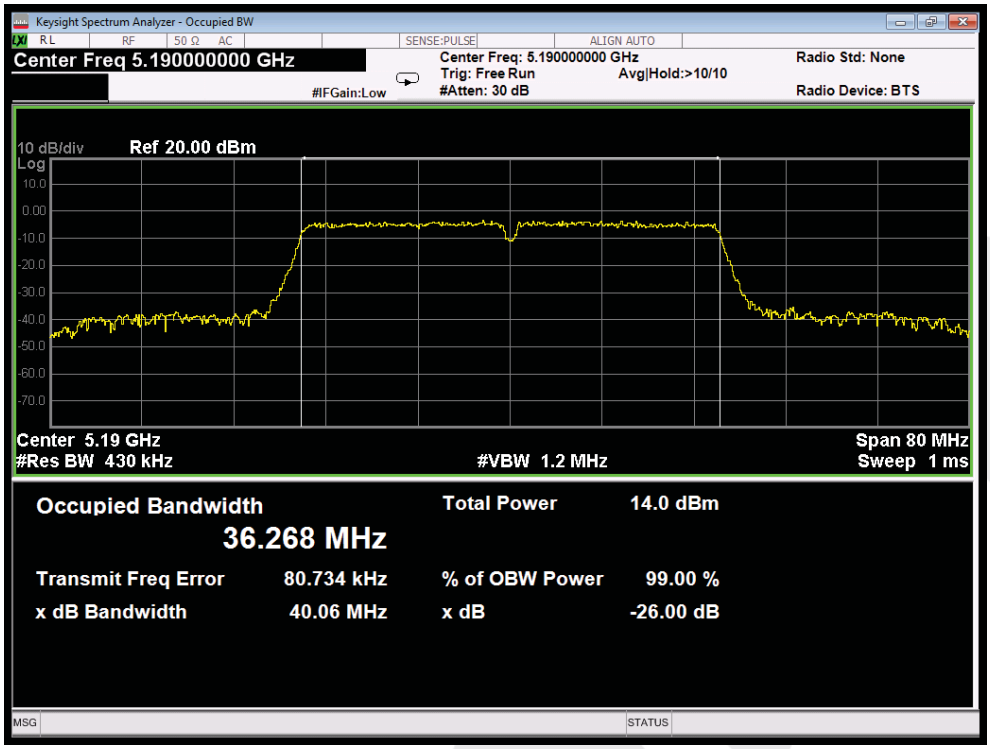
Test Mode: 802.11n20---Low



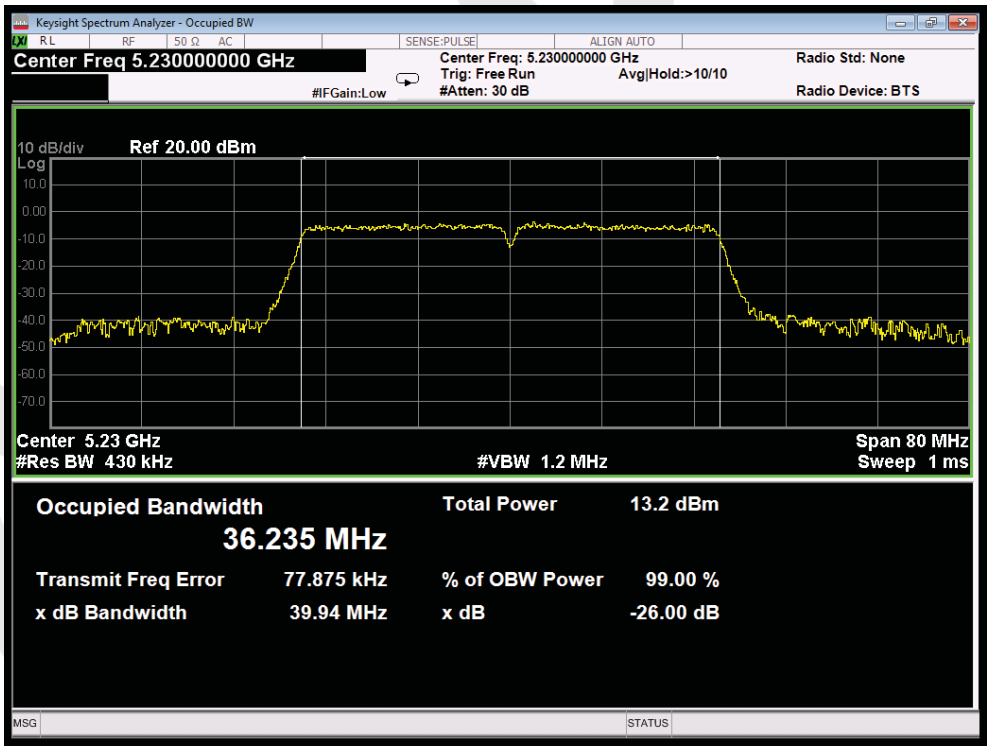
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



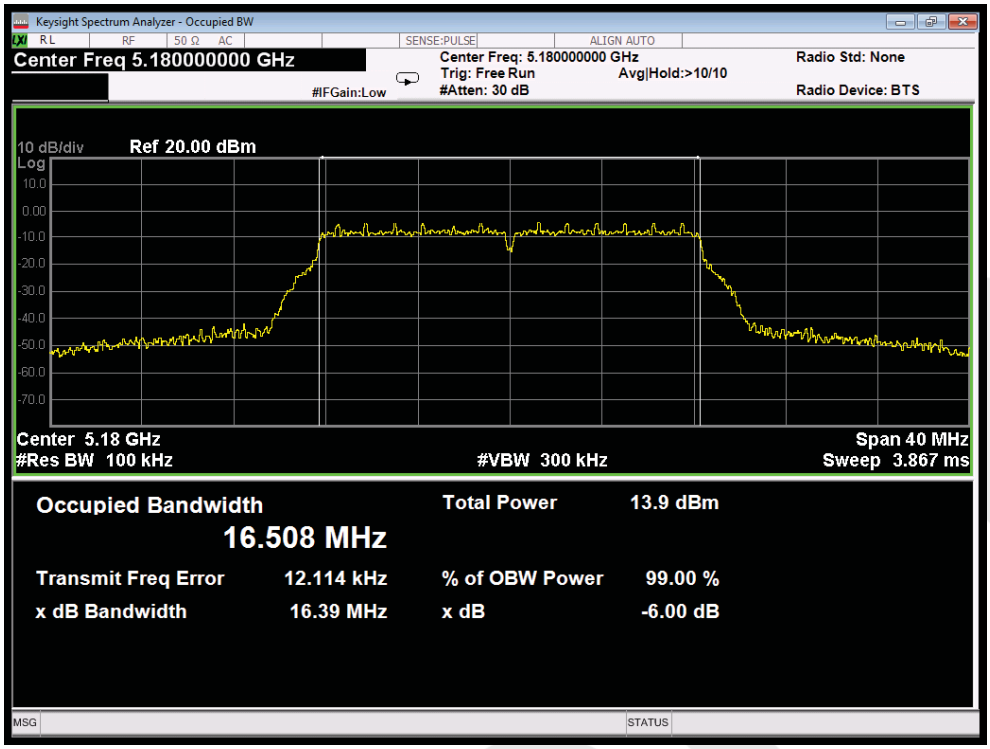
Test Mode: 802.11n40---Low



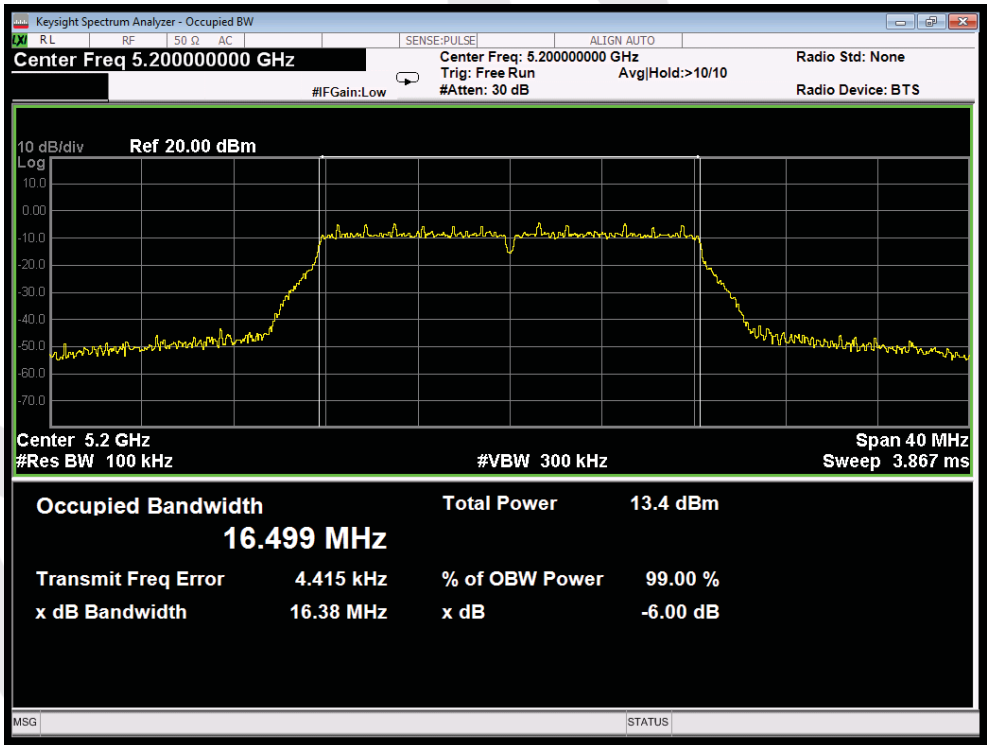
Test Mode: 802.11n40---High

6dB Bandwidth

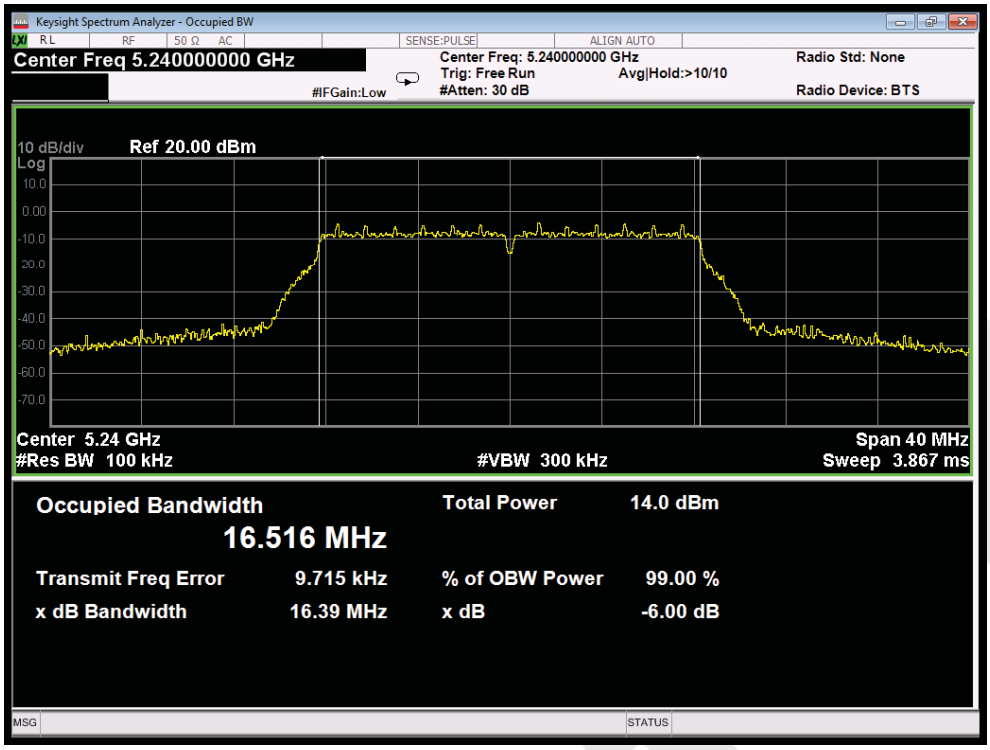
Antenna 2



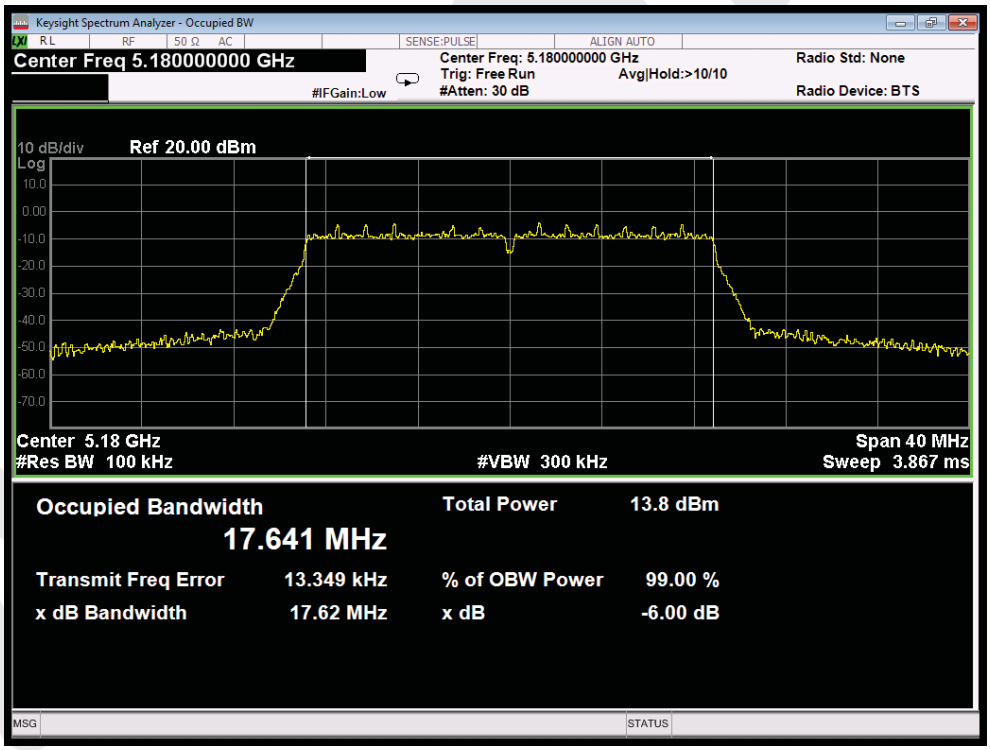
Test Mode: 802.11a--Low



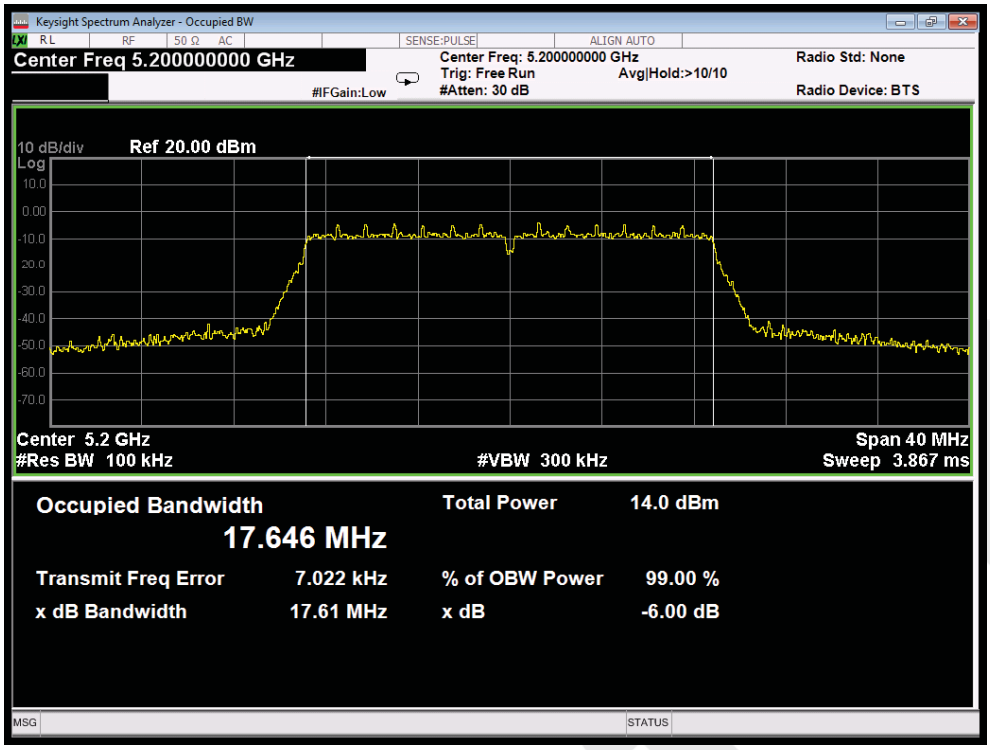
Test Mode: 802.11a---Middle



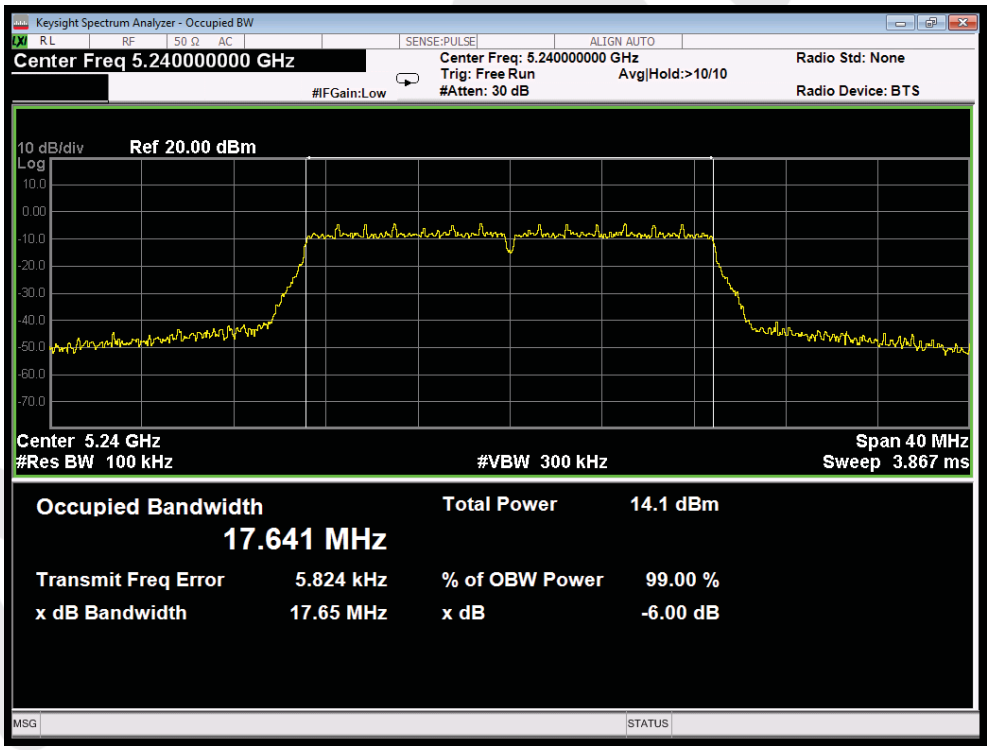
Test Mode: 802.11a---High



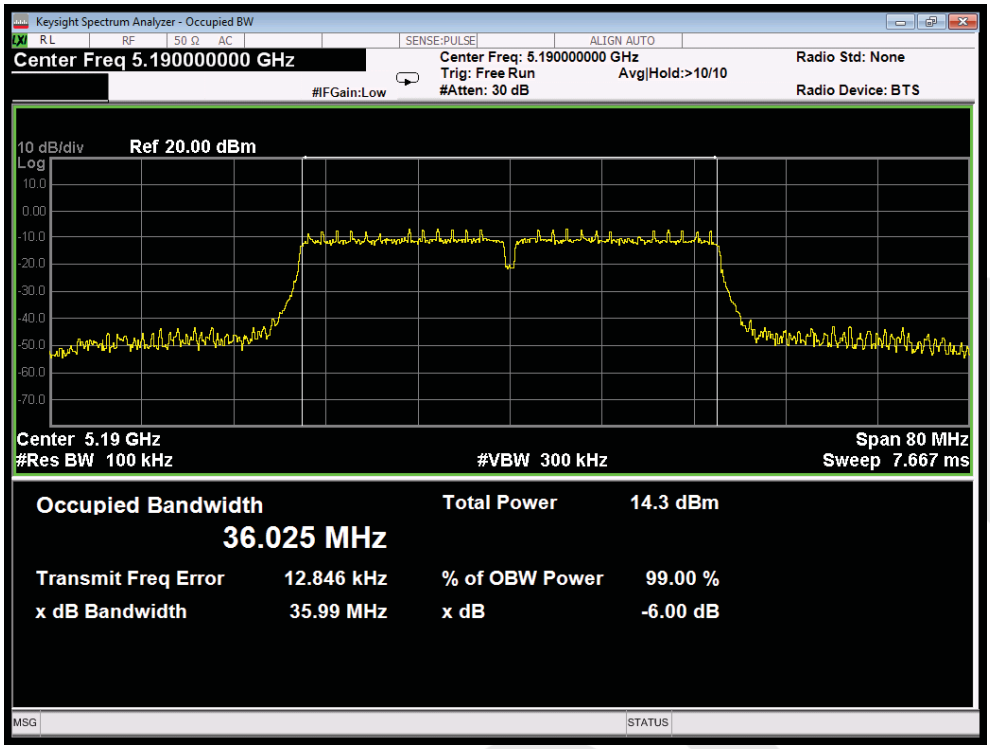
Test Mode: 802.11n20---Low



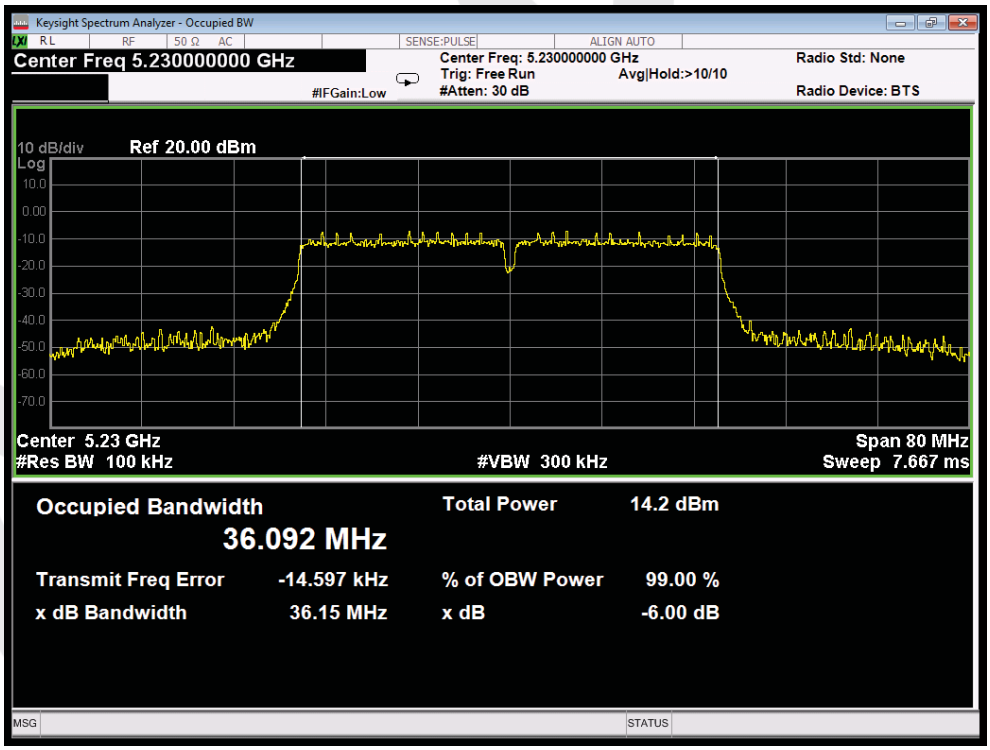
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

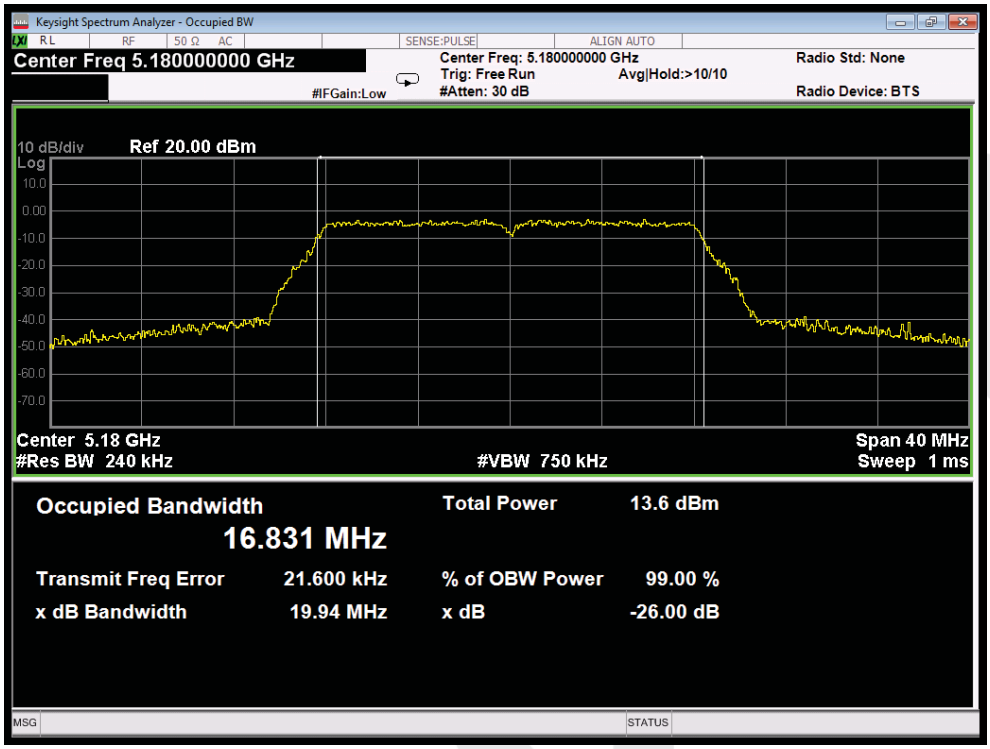


Test Mode: 802.11n40---Low

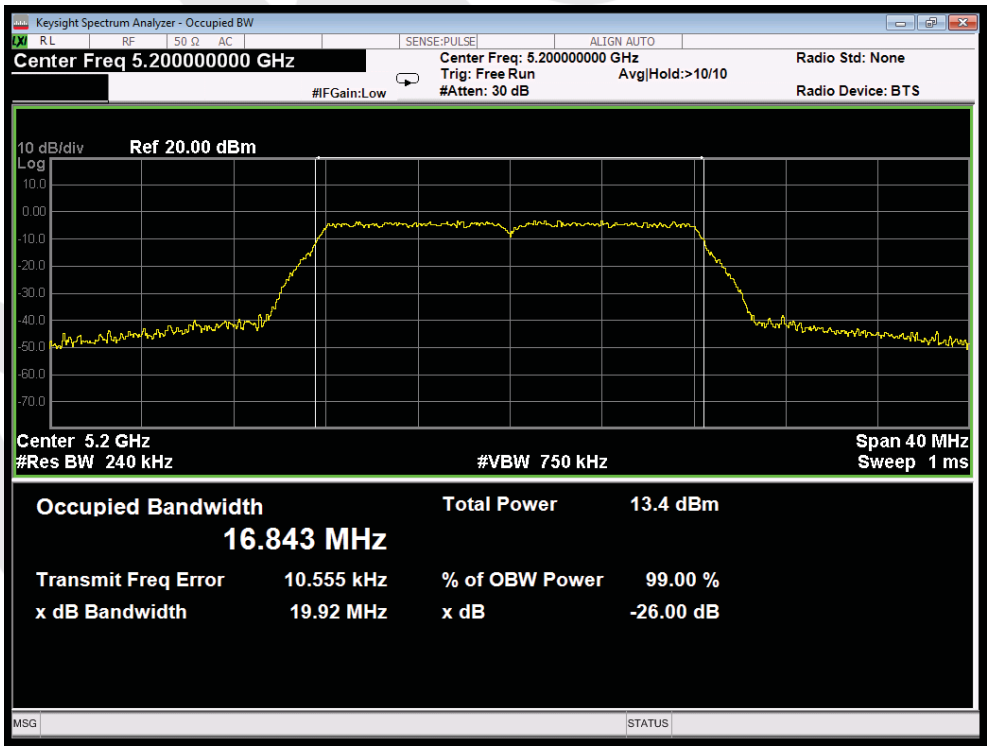


Test Mode: 802.11n40---High

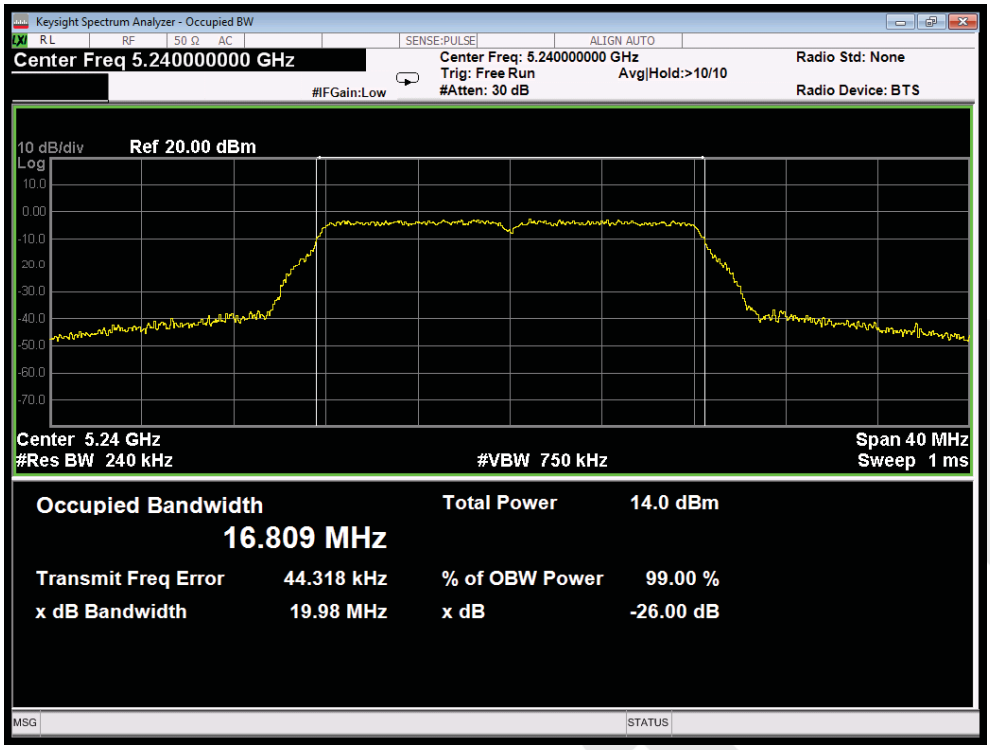
26dB &99% Bandwidth



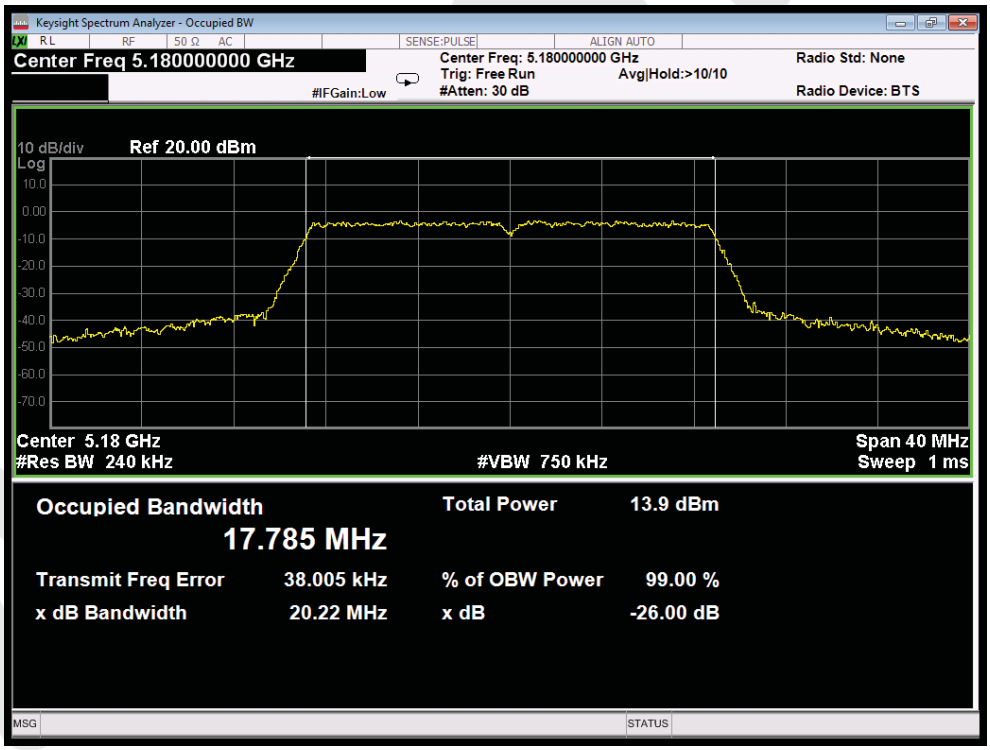
Test Mode: 802.11a--Low



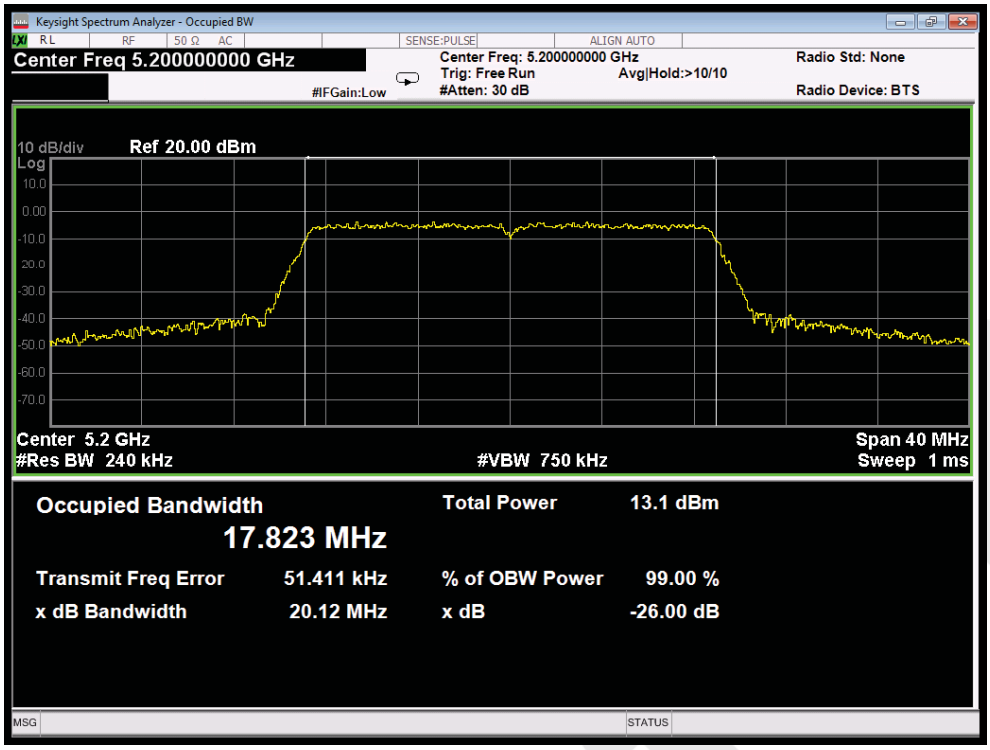
Test Mode: 802.11a---Middle



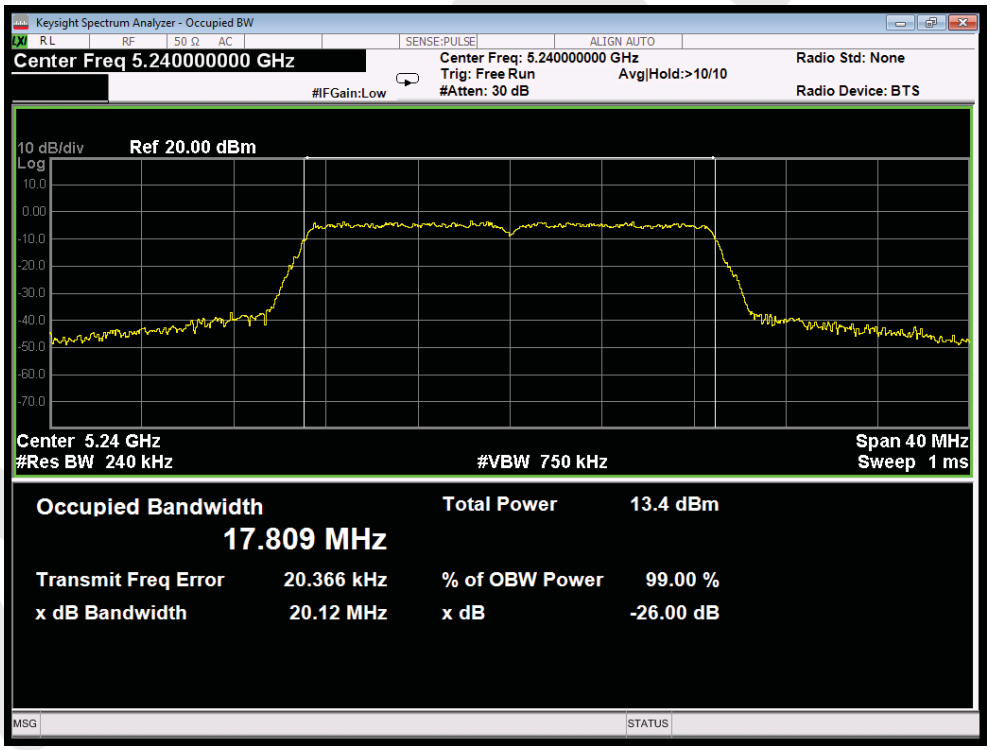
Test Mode: 802.11a---High



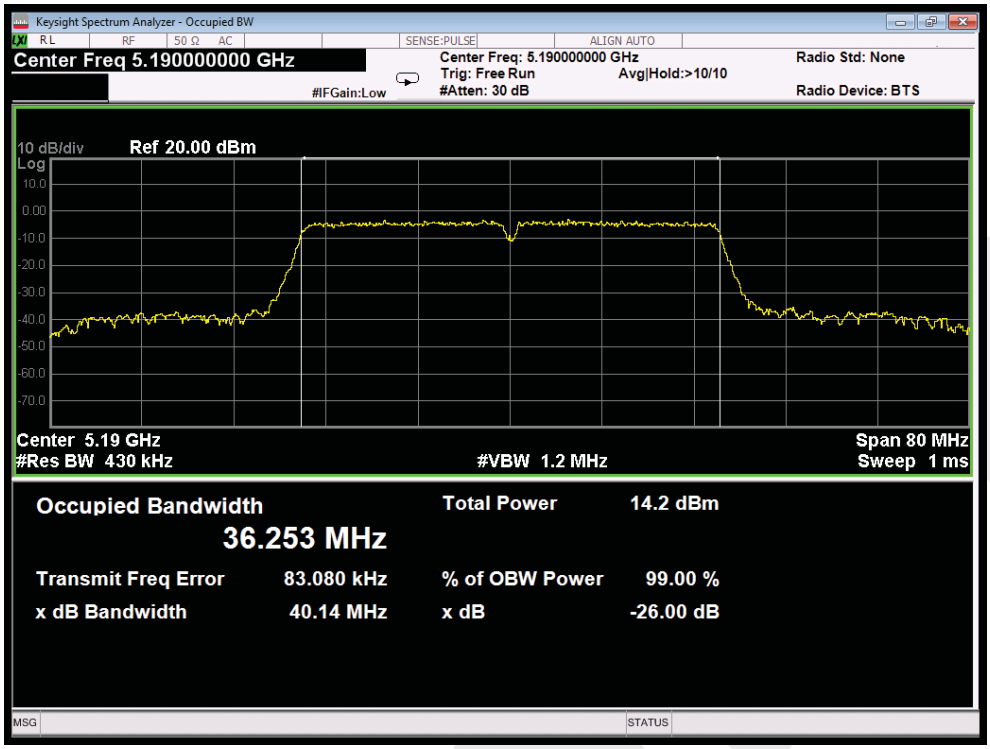
Test Mode: 802.11n20---Low



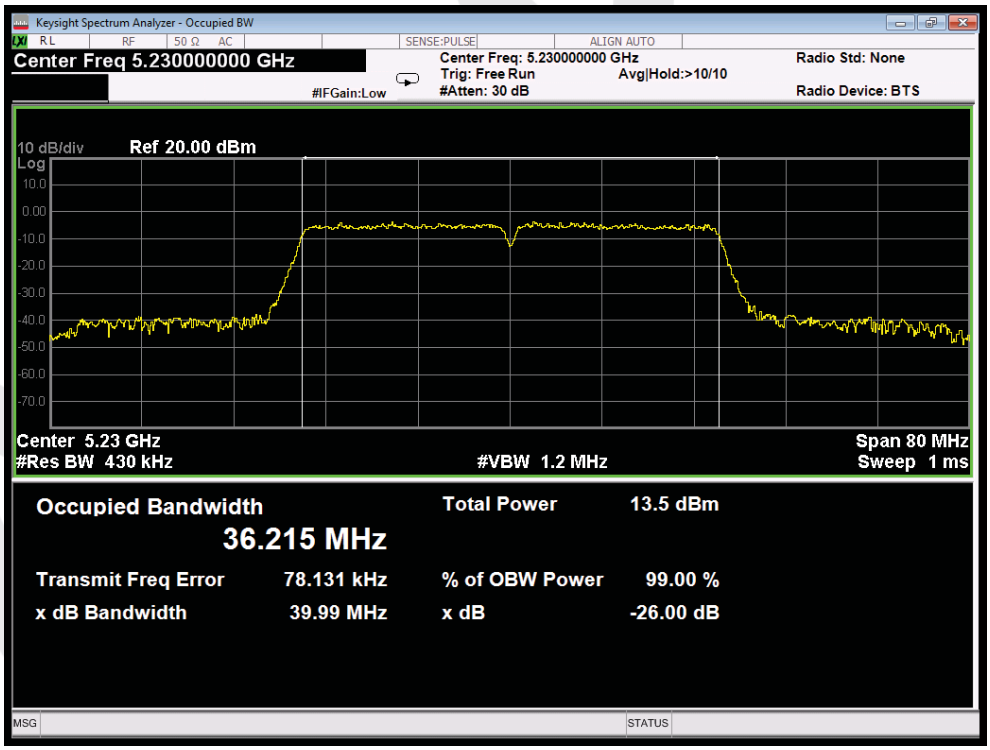
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

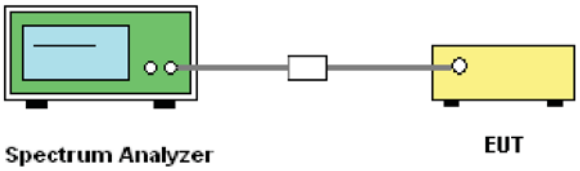


Test Mode: 802.11n40---Low



Test Mode: 802.11n40---High

7. Power Spectral Density Test

Test Requirement:	FCC Part15 E Section 15.407 (a)
Test Method:	KDB789033 D02 General UNII Test Procedures New Rules v02r01 Section F
Limit:	≤11.00dBm/MHz for Band I 5150MHz-5250MHz ≤30.00dBm/500KHz for Band IV 5725MHz-5850MHz The e.i,r,p spectral density for Band I 5150MHz – 5250 MHz should not exceed 10dBm/MHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth. 1. Set RBW = 510 kHz/1 MHz, VBW ≥ 3*RBW, Sweep time = Auto, Detector = RMS. 2. Allow the sweeps to continue until the trace stabilizes. 3. Use the peak marker function to determine the maximum amplitude level.
Test Result:	PASS

7.1. Test Date

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	AC 120V/60HZ	Temperature	:	24°C
Test Result	:	PASS	Humidity	:	55%RH

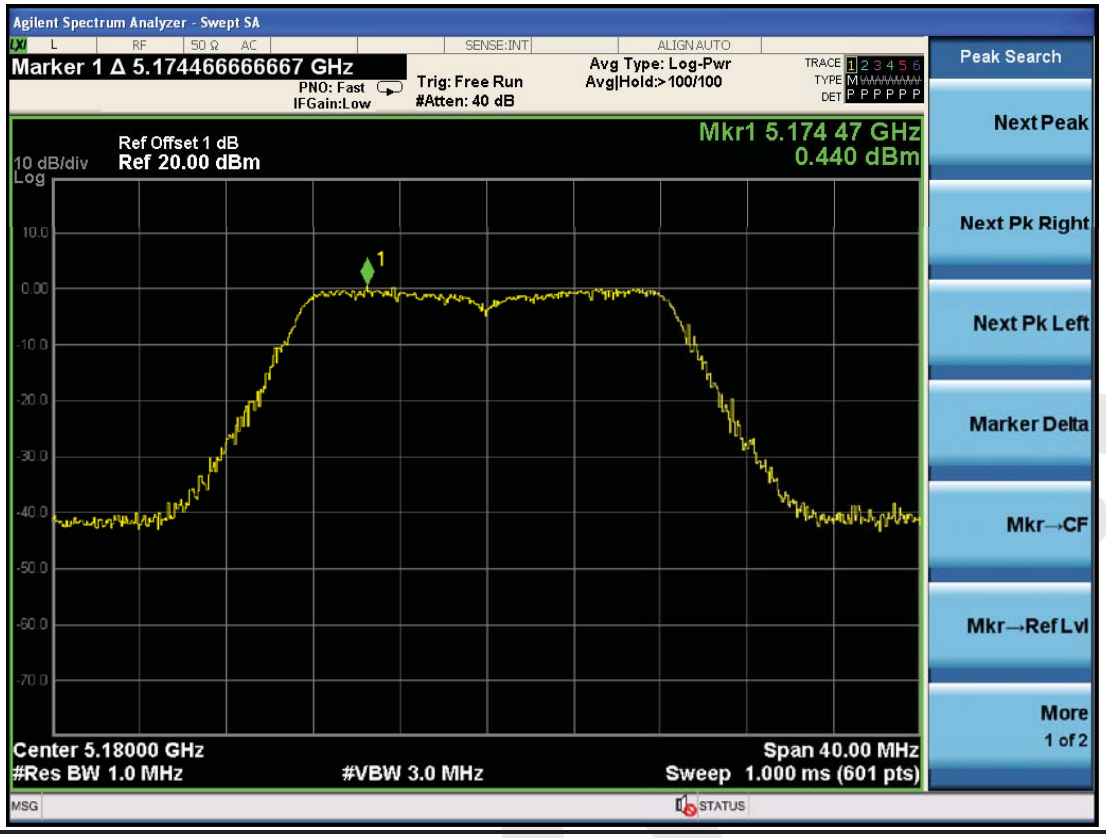
Configuration Band I (5150 - 5250 MHz)						
Mode	Test channel	Power Spectral Density			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
11a	CH149	0.440	-0.085	/	11	PASS
11a	CH157	0.685	0.767	/	11	PASS
11a	CH165	1.460	1.494	/	11	PASS
11n (HT20)	CH149	-0.053	-0.122	2.923	11	PASS
11n (HT20)	CH157	0.944	0.690	3.829	11	PASS
11n (HT20)	CH165	1.881	1.543	4.726	11	PASS
11n (HT40)	CH151	-1.895	-1.841	1.142	11	PASS
11n (HT40)	CH159	-1.568	-1.601	1.426	11	PASS

Note: EUT only support n20 and n40 for MIMO mode.

Anbotek

Band I （5150 – 5250 MHz）For Antenna 1

802.11a

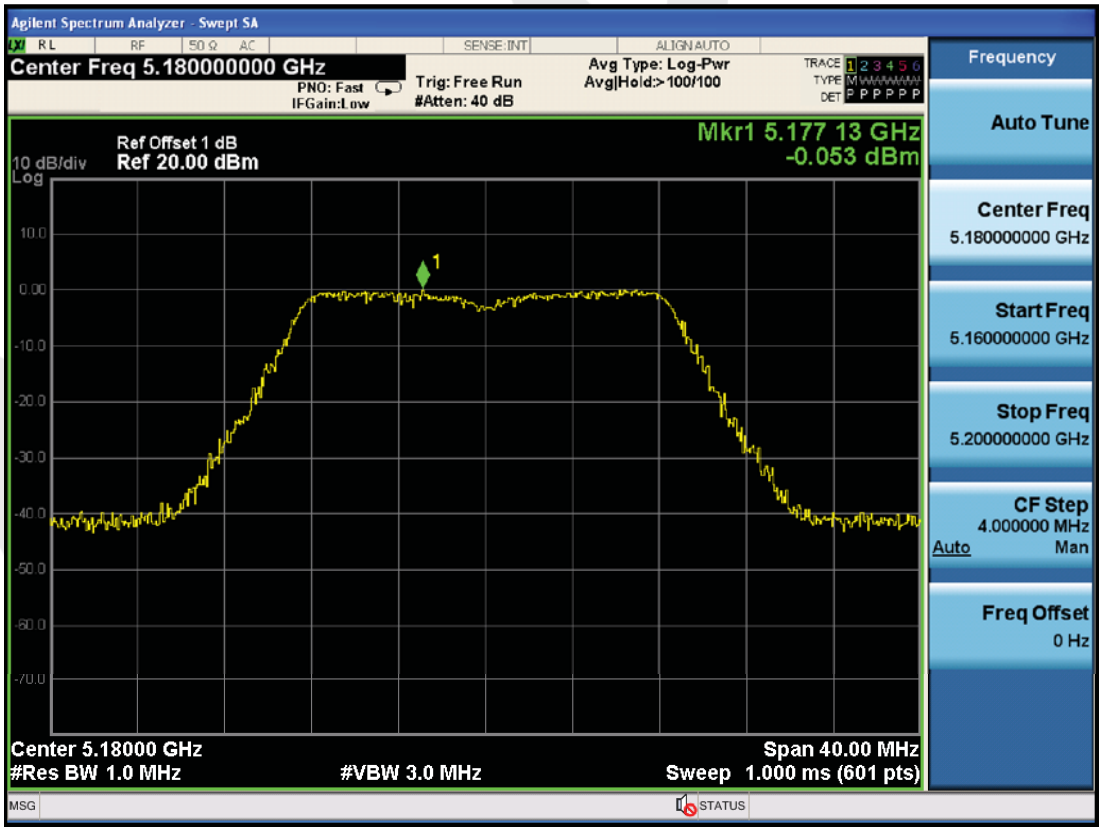


Low

Mid

High

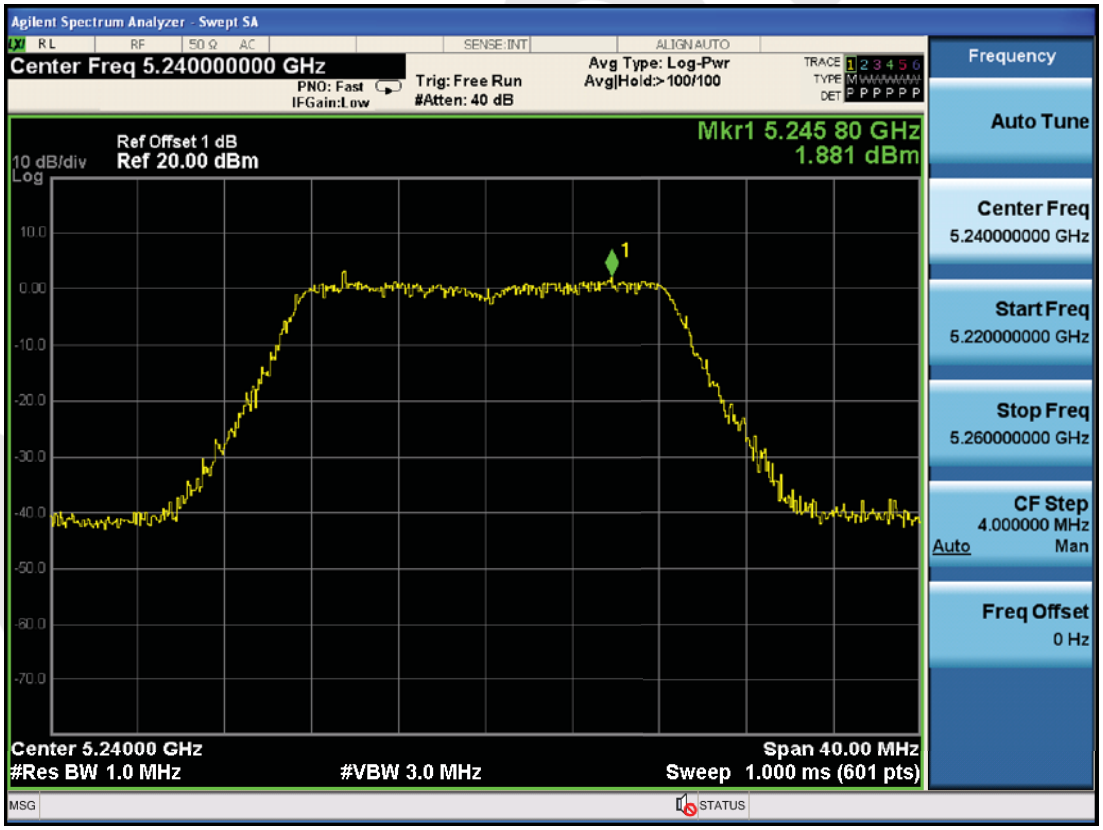
802.11n(HT20)



Low

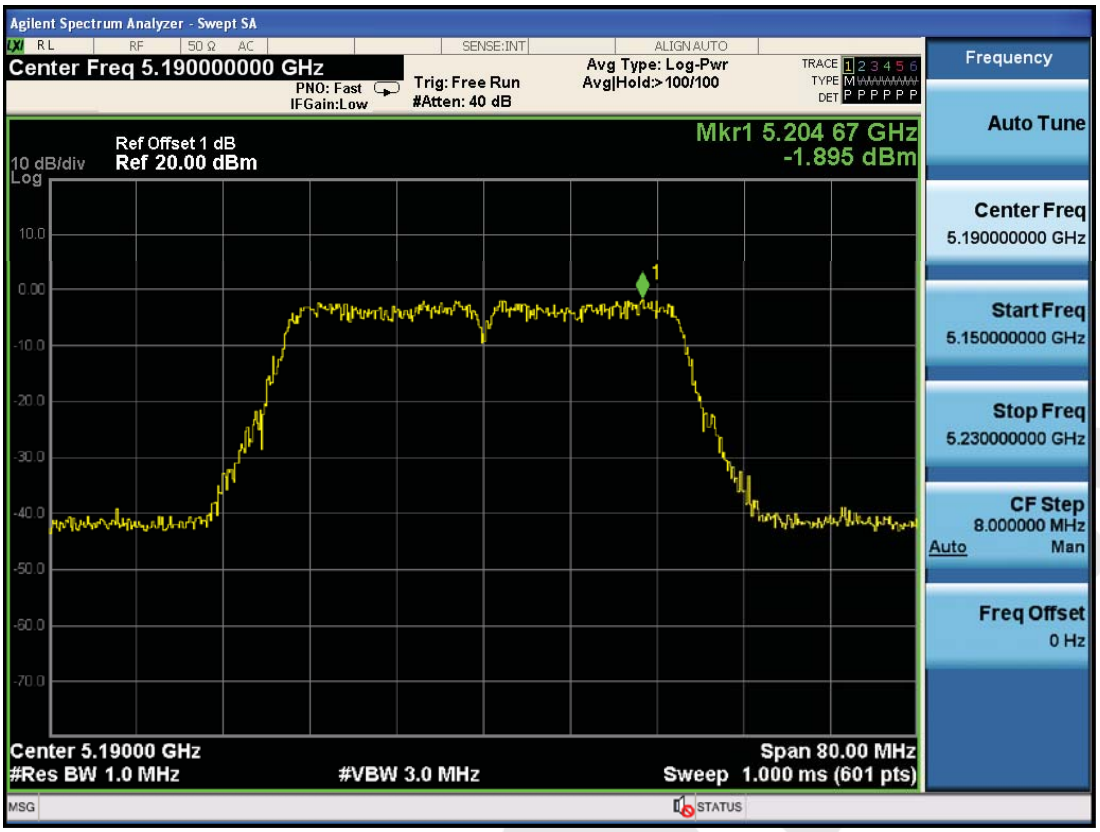
Agilent Spectrum Analyzer - Swept SA
Center Freq 5.200000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.204 93 GHz
0.944 dBm
Center 5.20000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 40.00 MHz
Sweep 1.000 ms (601 pts)
Frequency
Auto Tune
Center Freq
5.200000000 GHz
Start Freq
5.180000000 GHz
Stop Freq
5.220000000 GHz
CF Step
4.000000 MHz
Auto
Man
Freq Offset
0 Hz

Mid

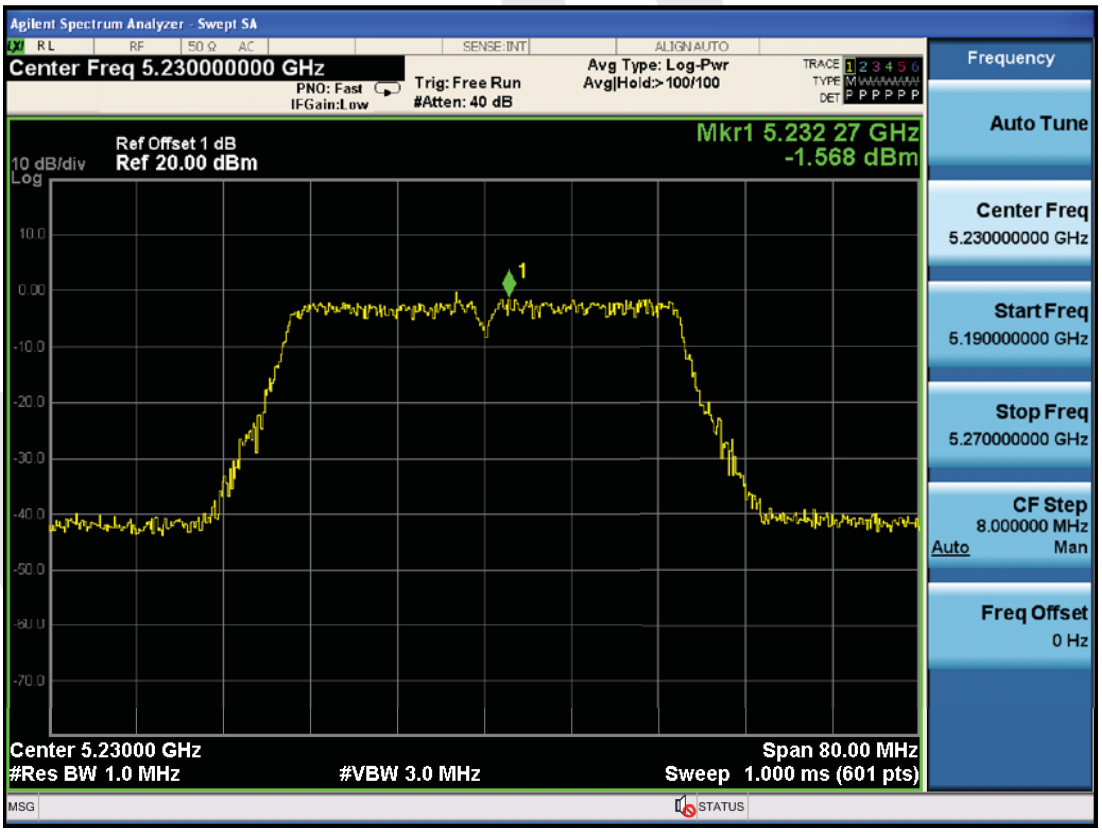

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.240000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.245 80 GHz
1.881 dBm
Center 5.24000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 40.00 MHz
Sweep 1.000 ms (601 pts)
Frequency
Auto Tune
Center Freq
5.240000000 GHz
Start Freq
5.220000000 GHz
Stop Freq
5.260000000 GHz
CF Step
4.000000 MHz
Auto
Man
Freq Offset
0 Hz

High

802.11n(HT40)



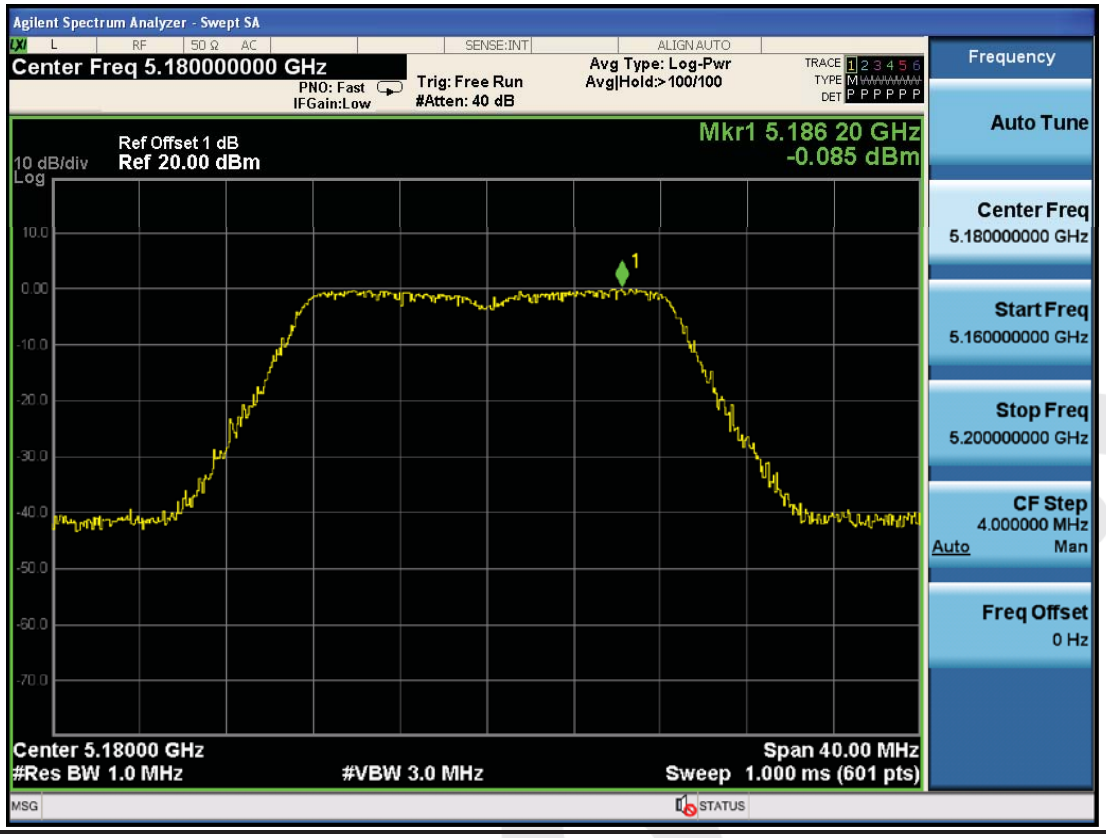
Low



High

Band I （5150 – 5250 MHz）For Antenna 2

802.11a

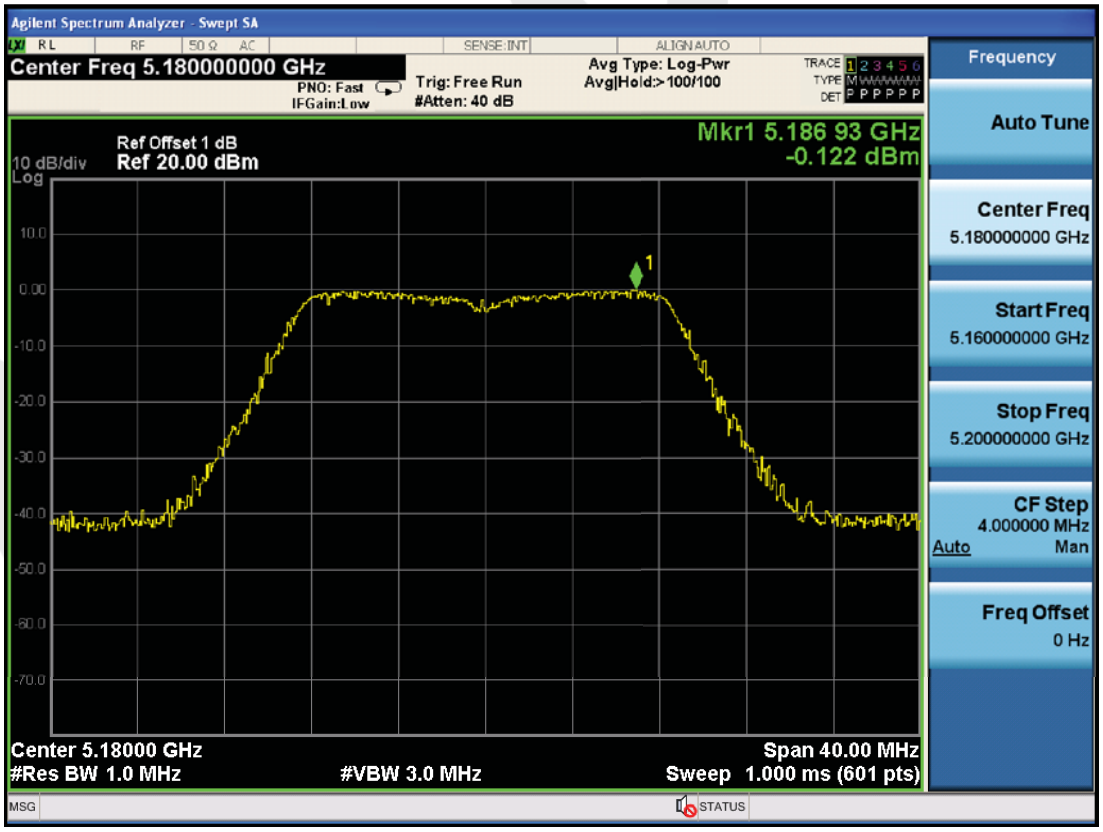


Low

Mid

High

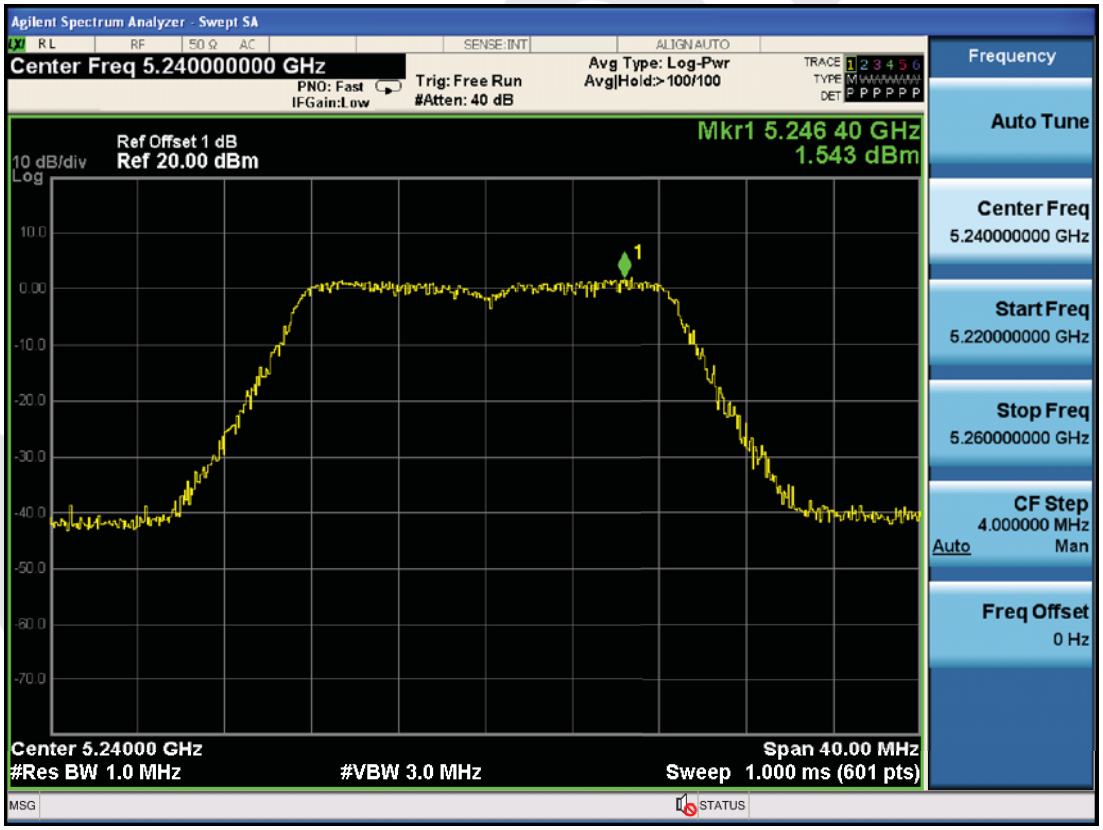
802.11n(HT20)



Low

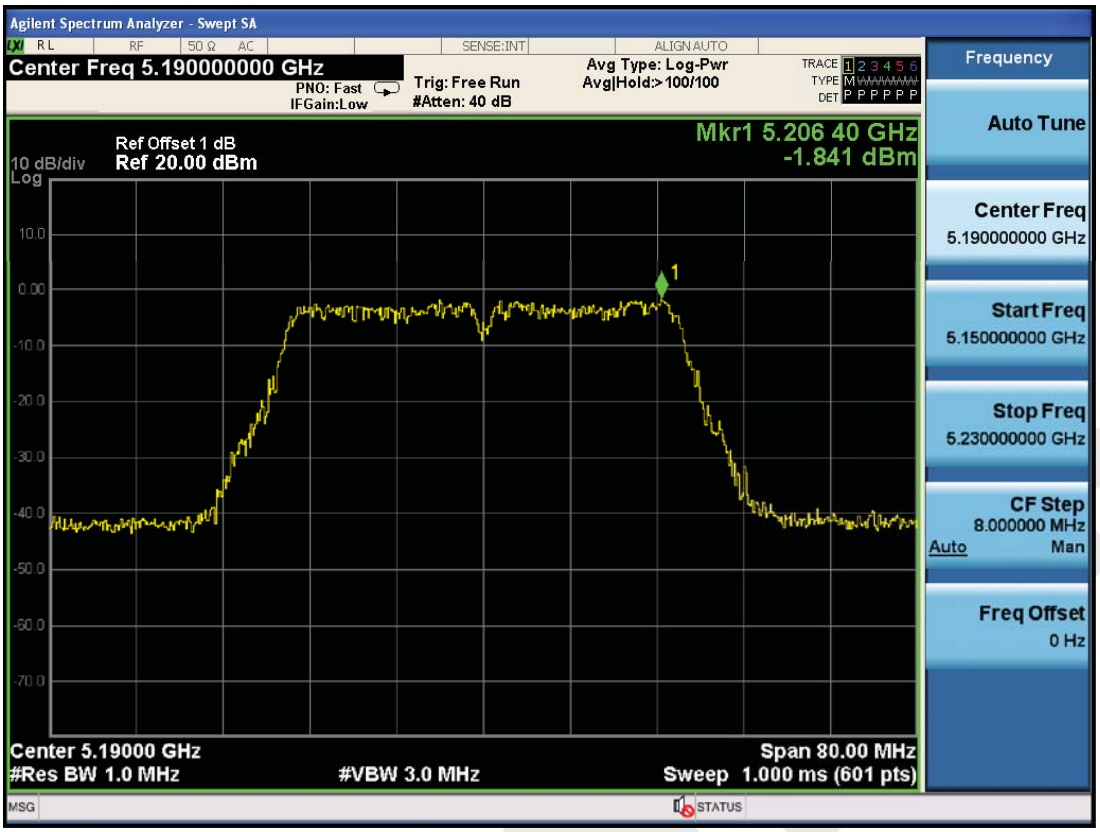
Agilent Spectrum Analyzer - Swept SA
Center Freq 5.200000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.205 47 GHz
0.690 dBm
Center 5.20000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 40.00 MHz
Sweep 1.000 ms (601 pts)
Frequency
Auto Tune
Center Freq
5.200000000 GHz
Start Freq
5.180000000 GHz
Stop Freq
5.220000000 GHz
CF Step
4.000000 MHz
Auto
Man
Freq Offset
0 Hz

Mid

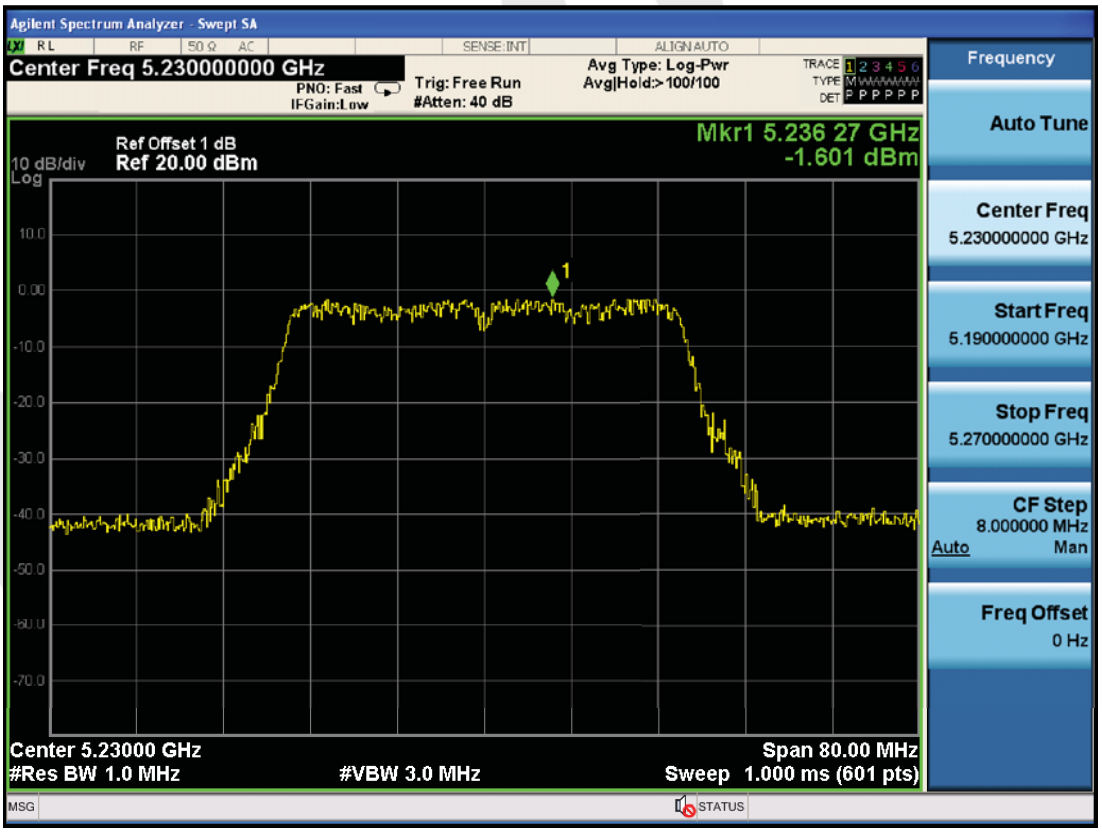

Agilent Spectrum Analyzer - Swept SA
Center Freq 5.240000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
Ref Offset 1 dB
10 dB/div
Ref 20.00 dBm
Mkr1 5.246 40 GHz
1.543 dBm
Center 5.24000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 40.00 MHz
Sweep 1.000 ms (601 pts)
Frequency
Auto Tune
Center Freq
5.240000000 GHz
Start Freq
5.220000000 GHz
Stop Freq
5.260000000 GHz
CF Step
4.000000 MHz
Auto
Man
Freq Offset
0 Hz

High

802.11n(HT40)



Low



High

8. Antenna Requirement

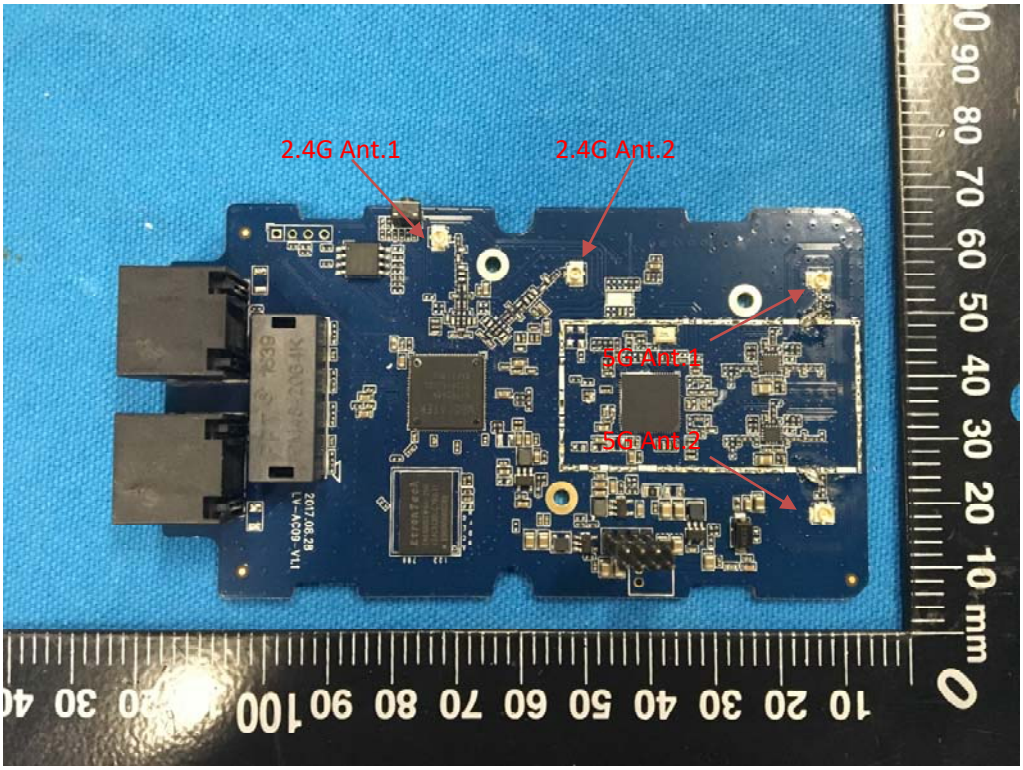
8.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /15.407
Requirement	1) 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. 2) 15.407 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

8.2. Antenna Connected Construction

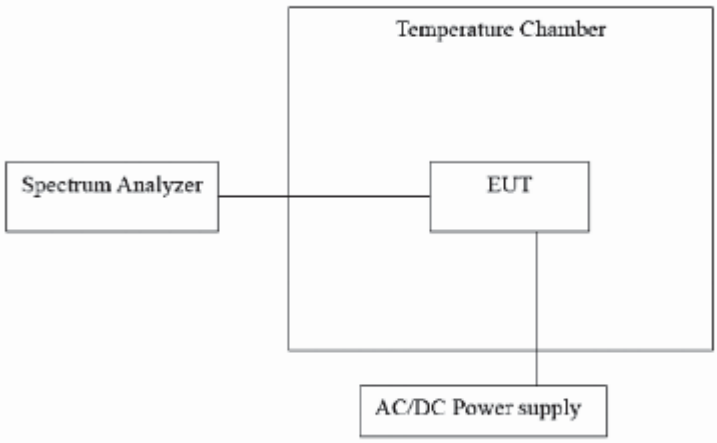
The WIFI antenna is a PIFA antenna which permanently attached, and the best case gain of the antenna is 2 dBi. It complies with the standard requirement.

WIFI Antenna



9.Frequency Stability Measurement

9.1 Test Specification

Test Requirement:	FCC Part15 Section 15.407(g) &Part2 J Section 2.1055
Test Method:	ANSI C63.10: 2013
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of 0 degrees to 35 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.
Test Setup:	
Test Procedure:	The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage. b. Turn the EUT on and couple its output to a spectrum analyzer. c. Turn the EUT off and set the chamber to the highest temperature specified. d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. e. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature. f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
Test Result:	PASS
Remark:	Pre-scan was performed at Antenna 2 and Antenna 1, the worst case was found. Only the test data of Antenna 1 was shown in this report.

Test result as follows:

For antenna 1

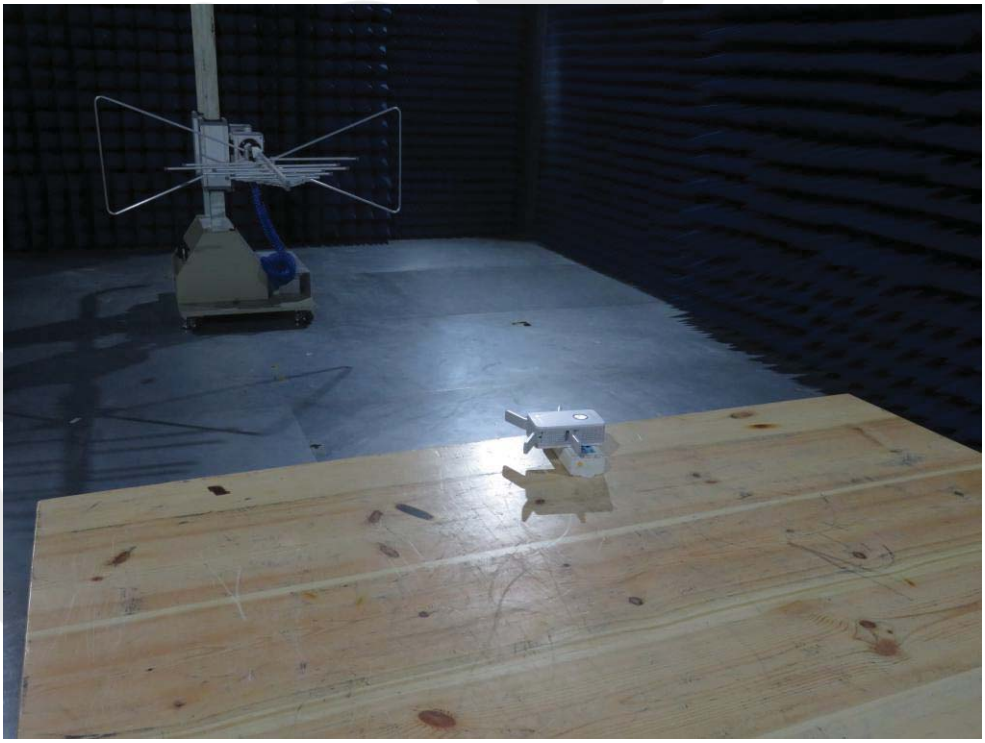
Mode	Voltage (V)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
5.2G Band	132 V	5179.985	15	5239.989	11
	120 V	5179.988	12	5239.984	16
	108 V	5179.986	14	5239.988	12

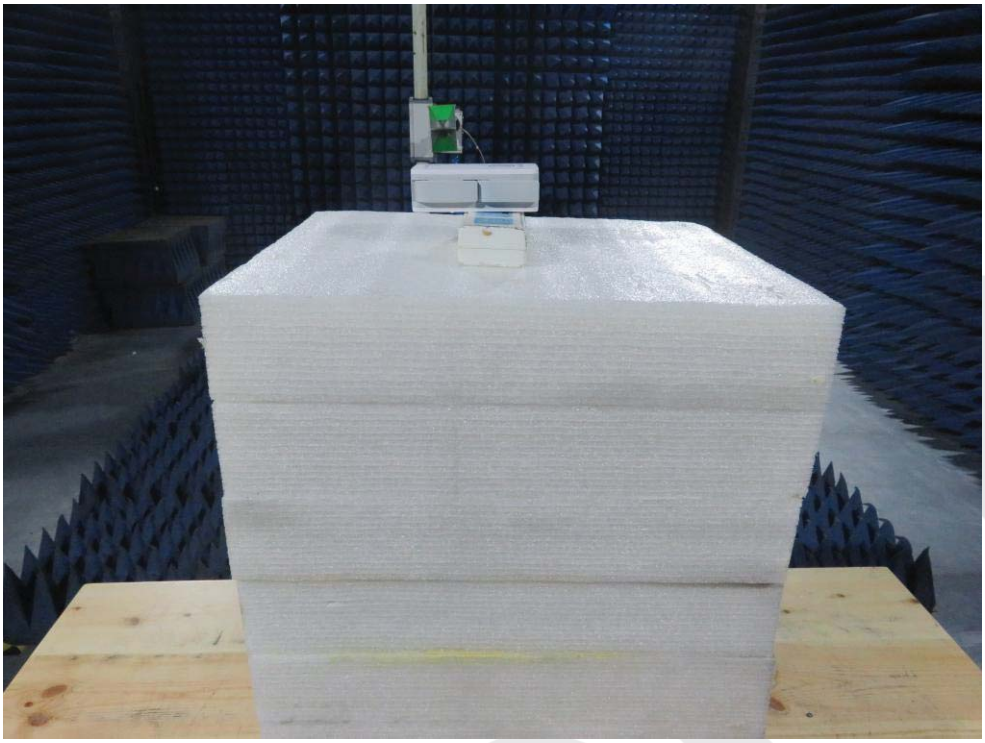
Mode	Temperature (℃)	FHL (5180MHz)	Deviation (KHz)	FHH (5240MHz)	Deviation (KHz)
5.2G Band	-30	5179.963	37	5239.961	39
	-20	5179.965	35	5239.958	42
	-10	5179.978	22	5239.973	27
	0	5179.972	28	5239.969	31
	10	5179.974	26	5239.984	16
	20	5179.979	21	5239.985	15
	30	5179.981	19	5239.975	25
	40	5179.983	17	5239.980	20
	50	5179.970	30	5239.972	28

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement

Photo of Radiation Emission Test





APPENDIX II -- EXTERNAL PHOTOGRAPH

Please see the test report of SZAWW171228001-01

Anbotek

APPENDIX III -- INTERNAL PHOTOGRAPH

Please see the test report of SZAWW171228001-01

End of Report