FCC TEST REPORT

For

Winner Wave Limited

EZCast Pro Dongle 2

Model No.: D10

Prepared For	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772
Report Number	:	SZAWW180821012-01
Date of Rceipt	:	Aug. 21, 2018
Date of Test	:	Aug. 21~Sept. 11, 2018
Date of Report	:	Sept. 11, 2018

Contents

TEST REPORT

Applicant	:	Winner Wave Limited
Manufacturer	:	Winner Wave Limited
Product Name	:	EZCast Pro Dongle 2
Model No.	:	D10
Trade Mark	:	EZCast
Rating(s)	:	Input: DC 5V, 1.5A
Test Standard(s)	**:**	**FCC Part15 Subpart E 2017, Paragraph 15.407**
Test Method(s)	**:**	**ANSI C63.10: 2013, KDB 789033 D02 General UNII Test Procedures New Rules v02r01**

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: Aug. 21~Sept. 11, 2018

Prepared by: Oliay Yang
(Engineer / Oliay Yang)

Reviewer: Snowy Meng
(Supervisor / Snowy Meng)

Approved & Authorized Signer: Sally Zhang
(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Manufacturer	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan
Factory	:	Winner Wave Limited
Address	:	4F-5, No.736, Jhongjheng Road, Jhonghe Dist., New Taipei City, Taiwan

1.2. Description of Device (EUT)

Product Name	:	EZCast Pro Dongle 2	
Model No.	:	D10	
Trade Mark	:	EZCast	
Test Power Supply	:	DC 5V by USB Port	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	5180MHz~5240MHz
		Number of Channel:	4 Channels for 802.11n(HT20) 4 Channels for 802.11ac(HT20) 2 Channels for 802.11n(HT40) 2 Channels for 802.11ac(HT40) 1 Channels for 802.11ac(HT80)
		Modulation Type:	OFDM with BPSK/QPSK/16QAM/64QAM/ 256QAM for 802.11ac
		Antenna Type:	PIFA Antenna
		Antenna Gain(Peak):	1.5 dBi (two antennas are the same)
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

TV	:	Manufacturer: SONY
		M/N: KDL-26EX550 S/N: 1012240 CE , FCC: DOC
Adapter	:	Manufacturer: Samsung
		M/N: ETA-U90CBC S/N: RT6FB17ZS/B-E Input: 100-240V~ 50-60Hz, 0.35A Output: DC 5V, 2A

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(802.11n(HT20))	CH 36	5180MHz
	CH 40	5200MHz
	CH 48	5240MHz
OFDM(802.11n(HT40))	CH 38	5190MHz
	CH 46	5230MHz

Mode	Test channel	Frequency (MHz)
OFDM(802.11ac(HT20))	CH 36	5180MHz
	CH 40	5200MHz
	CH 48	5240MHz
OFDM(802.11ac(HT40))	CH 38	5190MHz
	CH 46	5230MHz
OFDM(802.11ac(HT80))	CH 42	5210MHz

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

802.11n(HT20)/ac(HT20)

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

802.11n(HT40)/ac(HT40)

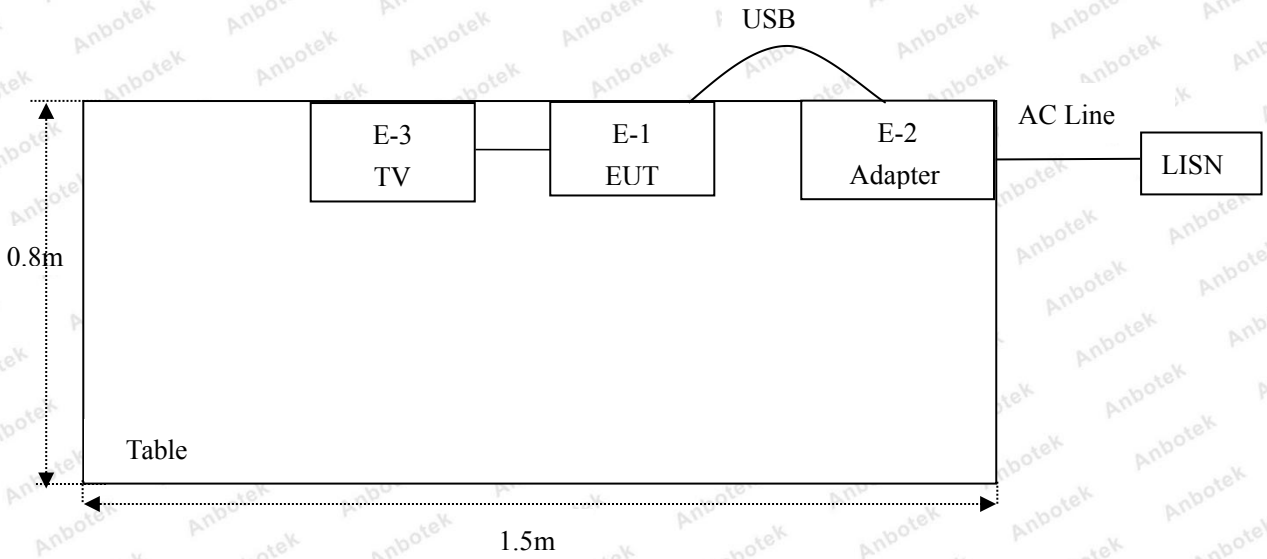
Channel	Freq. (MHz)	Channel	Freq. (MHz)
38	5190	46	5230

802.11ac(HT80)

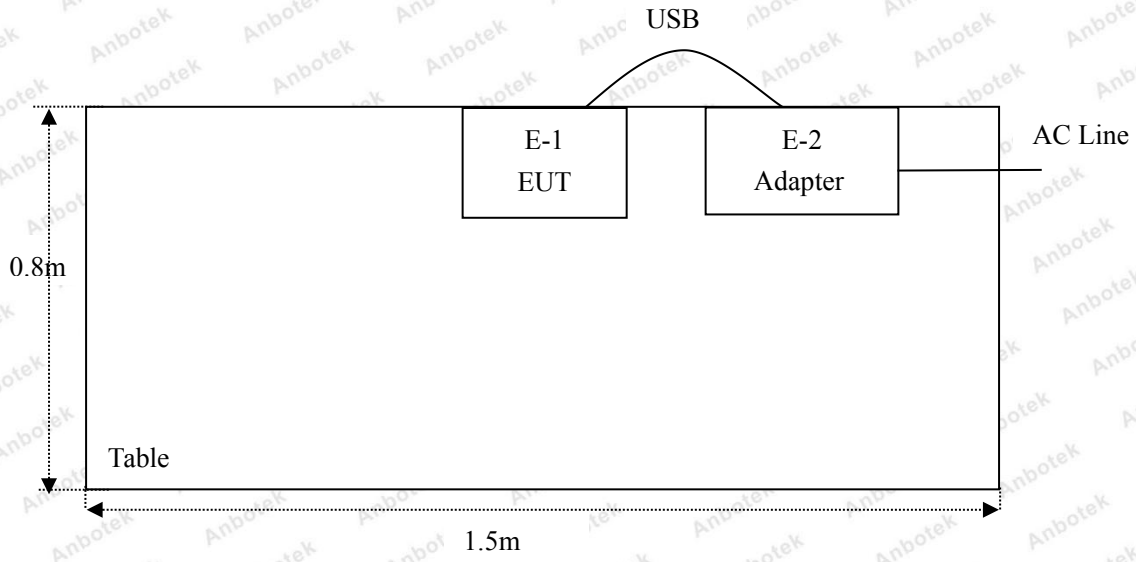
Channel	Freq. (MHz)
42	5210

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	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 17, 2017	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
10.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
19.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
20.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80B	ZJ-17042804	Nov. 01, 2017	1 Year
21	Power Meter	Agilent	E4419B	GB40202909	Nov. 17, 2017	1 Year

1.8. 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

Shenzhen Anbotek Compliance Laboratory Limited.

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

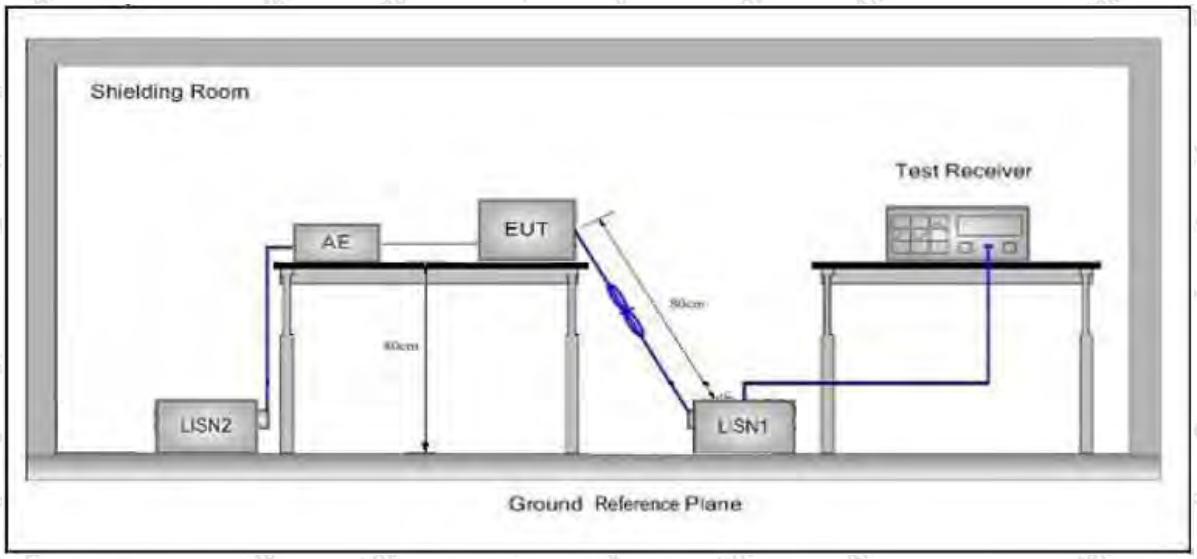
Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)(3)	Peak Power Spectral Density	PASS
15.203/15.407g	Antenna Requirement	PASS

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.

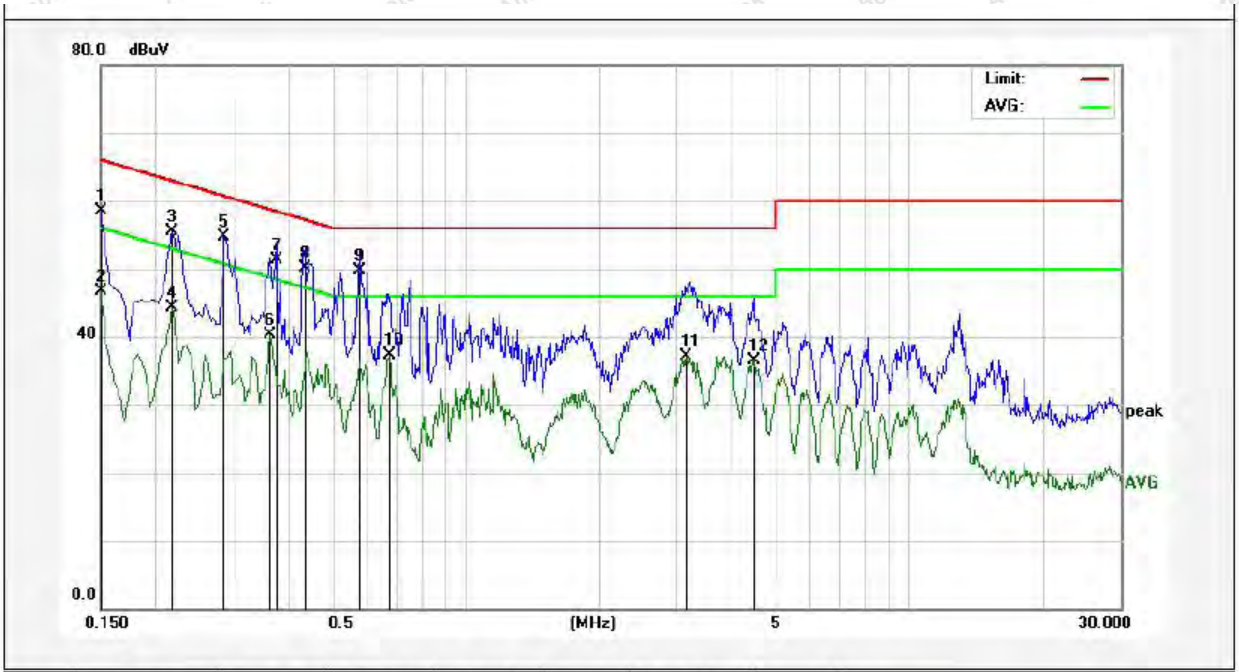
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

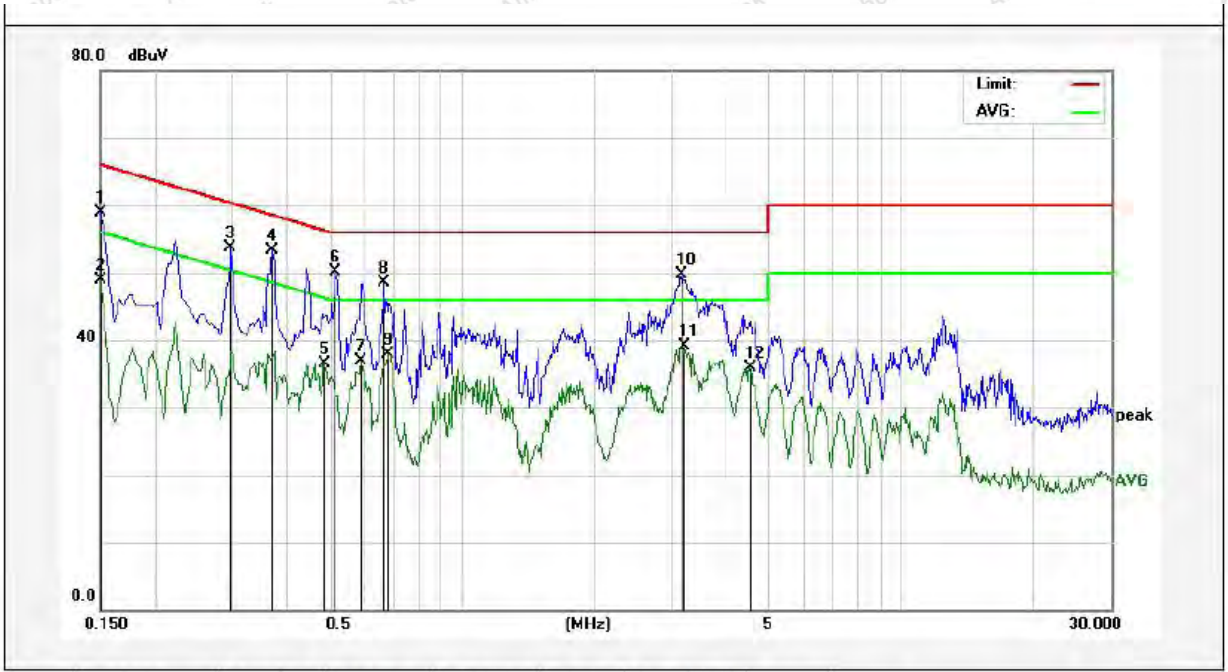
Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+Charging Mode
Test Specification:	DC 5V by USB Port
Comment:	Live Line
	Tem.: 25.4℃ Hum.: 54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	38.70	19.90	58.60	65.99	-7.39	QP	
2	0.1500	26.88	19.90	46.78	55.99	-9.21	AVG	
3	0.2180	35.67	19.90	55.57	62.89	-7.32	QP	
4	0.2180	24.32	19.90	44.22	52.89	-8.67	AVG	
5	0.2860	34.73	19.89	54.62	60.64	-6.02	QP	
6	0.3620	20.45	19.92	40.37	48.68	-8.31	AVG	
7	0.3740	31.32	19.92	51.24	58.41	-7.17	QP	
8	0.4340	30.17	19.95	50.12	57.18	-7.06	QP	
9	0.5780	29.64	20.00	49.64	56.00	-6.36	QP	
10	0.6740	17.28	20.03	37.31	46.00	-8.69	AVG	
11	3.1420	17.01	20.16	37.17	46.00	-8.83	AVG	
12	4.4380	16.25	20.19	36.44	46.00	-9.56	AVG	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+Charging Mode
Test Specification:	DC 5V by USB Port
Comment:	Neutral Line
	Tem.: 25.4℃ Hum.: 54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	39.06	19.90	58.96	65.99	-7.03	QP	
2	0.1500	29.07	19.90	48.97	55.99	-7.02	AVG	
3	0.2980	33.77	19.89	53.66	60.30	-6.64	QP	
4	0.3700	33.32	19.92	53.24	58.50	-5.26	QP	
5	0.4860	16.51	19.97	36.48	46.24	-9.76	AVG	
6	0.5180	30.02	19.99	50.01	56.00	-5.99	QP	
7	0.5899	16.82	20.01	36.83	46.00	-9.17	AVG	
8	0.6660	28.42	20.03	48.45	56.00	-7.55	peak	
9	0.6820	17.95	20.03	37.98	46.00	-8.02	AVG	
10	3.1700	29.57	20.16	49.73	56.00	-6.27	peak	
11	3.1900	19.01	20.16	39.17	46.00	-6.83	AVG	
12	4.5060	15.73	20.19	35.92	46.00	-10.08	AVG	

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

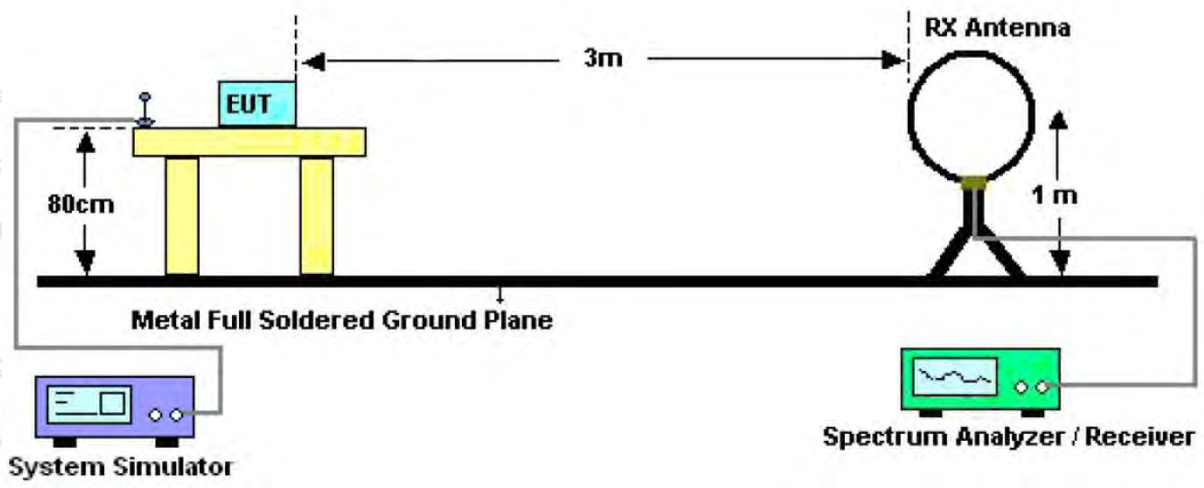


Figure 1. Below 30MHz

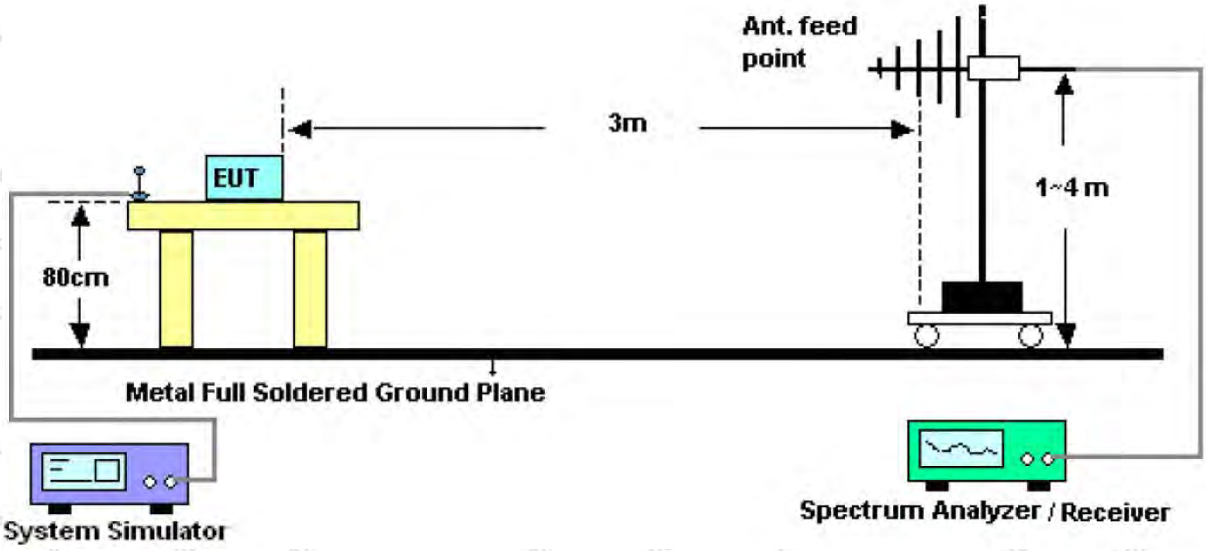


Figure 2. 30MHz to 1GHz

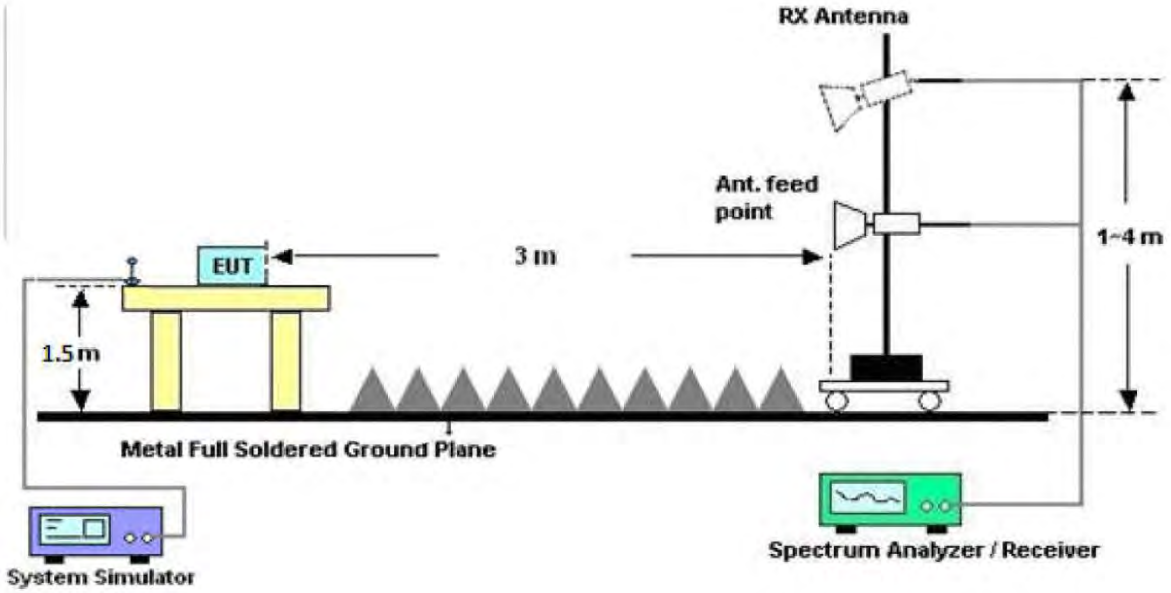


Figure 3. Above 1 GHz

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.

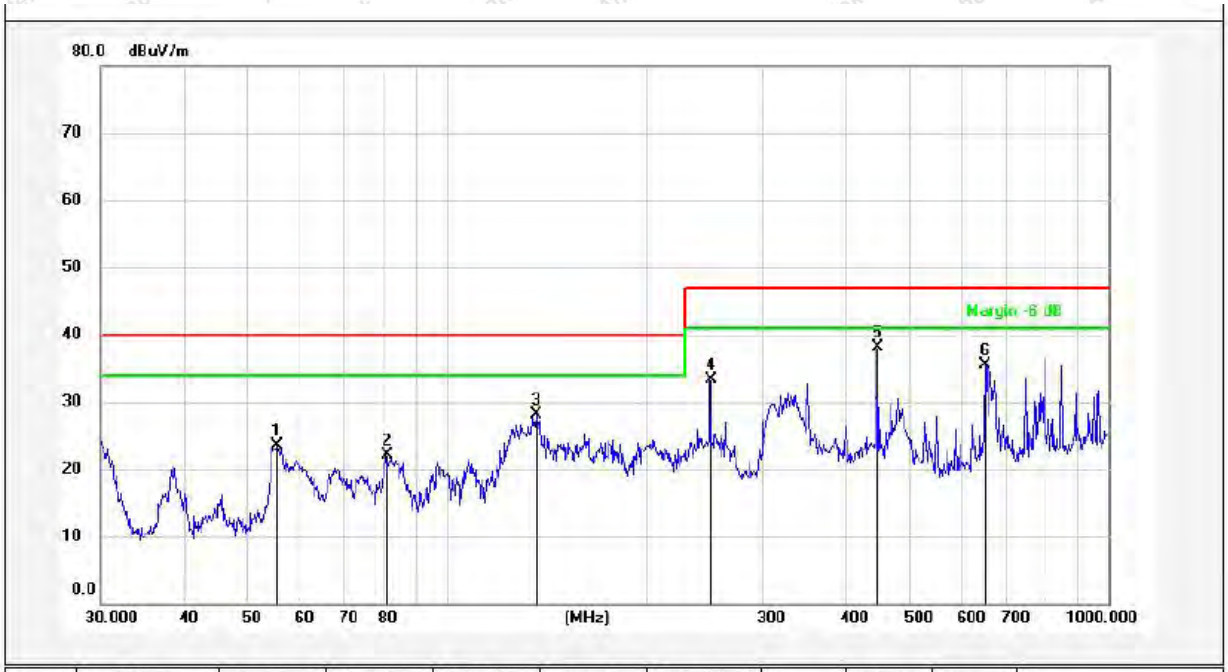
4.4. Test Data

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.

Test Results (30~1000MHz)

Job No.:	SZAWW180821012-01	Temp.(℃)/Hum.(%RH):	24.9℃/57%RH
Standard:	FCC PART 15C	Power Source:	DC 5V by USB Port
Test Mode:	Keeping TX+Charging Mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	55.4147	40.21	-16.75	23.46	40.00	-16.54	peak			
2	80.9275	44.61	-22.44	22.17	40.00	-17.83	peak			
3	136.9391	49.71	-21.55	28.16	40.00	-11.84	peak			
4	250.3012	51.29	-18.07	33.22	47.00	-13.78	peak			
5	446.4141	50.36	-12.17	38.19	47.00	-8.81	peak			
6	651.9417	45.22	-9.79	35.43	47.00	-11.57	peak			

Test Results (30~1000MHz)

Job No.:	SZAWW180821012-01	Temp.(℃)/Hum.(%RH):	24.9℃/57%RH
Standard:	FCC PART 15C	Power Source:	DC 5V by USB Port
Test Mode:	Keeping TX+Charging Mode	Polarization:	Vertical

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	56.1974	46.47	-15.80	30.67	40.00	-9.33	peak			
2	136.4598	45.22	-17.25	27.97	40.00	-12.03	peak			
3	250.3012	42.96	-13.55	29.41	47.00	-17.59	peak			
4	332.5187	43.59	-13.66	29.93	47.00	-17.07	peak			
5	445.4941	52.81	-11.45	41.36	47.00	-5.64	QP	100	0	
6	668.1423	39.79	-8.71	31.08	47.00	-15.92	peak			

Test Results (Above 1000MHz)

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	39.81	31.98	17.08	33.91	54.96	68.20	-13.24	V
15540.00	36.21	32.65	20.03	34.85	54.04	68.20	-14.16	V
10360.00	37.15	31.98	17.08	33.91	52.30	68.20	-15.90	H
15540.00	36.25	32.65	20.03	34.85	54.08	68.20	-14.12	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	31.12	31.98	17.08	33.91	46.27	54.00	-7.73	V
15540.00	28.32	32.65	20.03	34.85	46.15	54.00	-7.85	V
10360.00	30.57	31.98	17.08	33.91	45.72	54.00	-8.28	H
15540.00	28.35	32.65	20.03	34.85	46.18	54.00	-7.82	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	40.35	32.44	17.18	33.91	56.06	68.20	-12.14	V
15600.00	39.12	32.78	20.12	34.86	57.16	68.20	-11.04	V
10400.00	38.35	32.44	17.18	33.91	54.06	68.20	-14.14	H
15600.00	36.12	32.78	20.12	34.86	54.16	68.20	-14.04	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	29.13	32.44	17.18	33.91	44.84	54.00	-9.16	V
15600.00	27.32	32.78	20.12	34.86	45.36	54.00	-8.64	V
10400.00	29.03	32.44	17.18	33.91	44.74	54.00	-9.26	H
15600.00	28.36	32.78	20.12	34.86	46.40	54.00	-7.60	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	41.21	32.59	18.02	33.92	57.90	68.20	-10.30	V
15720.00	38.35	32.87	20.15	34.88	56.49	68.20	-11.71	V
10480.00	36.23	32.59	18.02	33.92	52.92	68.20	-15.28	H
15720.00	38.13	32.87	20.15	34.88	56.27	68.20	-11.93	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	31.25	32.59	18.02	33.92	47.94	54.00	-6.06	V
15720.00	32.41	32.87	20.15	34.88	50.55	54.00	-3.45	V
10480.00	29.32	32.59	18.02	33.92	46.01	54.00	-7.99	H
15720.00	28.74	32.87	20.15	34.88	46.88	54.00	-7.12	H

Test mode:	IEEE 802.11ac(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	41.87	31.98	17.08	33.91	57.02	68.20	-11.18	V
15540.00	35.23	32.65	20.03	34.85	53.06	68.20	-15.14	V
10360.00	38.46	31.98	17.08	33.91	53.61	68.20	-14.59	H
15540.00	35.05	32.65	20.03	34.85	52.88	68.20	-15.32	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	32.16	31.98	17.08	33.91	47.31	54.00	-6.69	V
15540.00	29.34	32.65	20.03	34.85	47.17	54.00	-6.83	V
10360.00	30.25	31.98	17.08	33.91	45.40	54.00	-8.60	H
15540.00	27.22	32.65	20.03	34.85	45.05	54.00	-8.95	H

Test mode:	IEEE 802.11ac(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	40.73	32.44	17.18	33.91	56.44	68.20	-11.76	V
15600.00	37.41	32.78	20.12	34.86	55.45	68.20	-12.75	V
10400.00	39.22	32.44	17.18	33.91	54.93	68.20	-13.27	H
15600.00	36.10	32.78	20.12	34.86	54.14	68.20	-14.06	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	30.35	32.44	17.18	33.91	46.06	54.00	-7.94	V
15600.00	27.49	32.78	20.12	34.86	45.53	54.00	-8.47	V
10400.00	29.42	32.44	17.18	33.91	45.13	54.00	-8.87	H
15600.00	27.15	32.78	20.12	34.86	45.19	54.00	-8.81	H

Test mode:	IEEE 802.11ac(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	40.34	32.59	18.02	33.92	57.03	68.20	-11.17	V
15720.00	38.56	32.87	20.15	34.88	56.70	68.20	-11.50	V
10480.00	39.22	32.59	18.02	33.92	55.91	68.20	-12.29	H
15720.00	37.25	32.87	20.15	34.88	55.39	68.20	-12.81	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	30.17	32.59	18.02	33.92	46.86	54.00	-7.14	V
15720.00	28.14	32.87	20.15	34.88	46.28	54.00	-7.72	V
10480.00	28.85	32.59	18.02	33.92	45.54	54.00	-8.46	H
15720.00	27.42	32.87	20.15	34.88	45.56	54.00	-8.44	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	37.76	31.98	17.08	33.91	52.91	68.20	-15.29	V
15570.00	35.87	32.65	20.03	34.85	53.70	68.20	-14.50	V
10380.00	37.63	31.98	17.08	33.91	52.78	68.20	-15.42	H
15570.00	35.74	32.65	20.03	34.85	53.57	68.20	-14.63	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.
10380.00	30.11	31.98	17.08	33.91	45.26	54.00	-8.74	V
15570.00	28.83	32.65	20.03	34.85	46.66	54.00	-7.34	V
10380.00	30.11	31.98	17.08	33.91	45.26	54.00	-8.74	H
15570.00	27.34	32.65	20.03	34.85	45.17	54.00	-8.83	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	42.25	32.59	18.02	33.92	58.94	68.20	-9.26	V
15690.00	39.12	32.87	20.15	34.88	57.26	68.20	-10.94	V
10460.00	37.41	32.59	18.02	33.92	54.10	68.20	-14.10	H
15690.00	38.53	32.87	20.15	34.88	56.67	68.20	-11.53	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	32.13	32.59	18.02	33.92	48.82	54.00	-5.18	V
15690.00	29.49	32.87	20.15	34.88	47.63	54.00	-6.37	V
10460.00	31.47	32.59	18.02	33.92	48.16	54.00	-5.84	H
15690.00	28.41	32.78	20.12	34.86	46.45	54.00	-7.55	H

Test mode:	IEEE 802.11ac(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	37.48	31.98	17.08	33.91	52.63	68.20	-15.57	V
15570.00	35.27	32.65	20.03	34.85	53.10	68.20	-15.10	V
10380.00	37.21	31.98	17.08	33.91	52.36	68.20	-15.84	H
15570.00	35.53	32.65	20.03	34.85	53.36	68.20	-14.84	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	35.21	31.98	17.08	33.91	50.36	54.00	-3.64	V
15570.00	30.24	32.65	20.03	34.85	48.07	54.00	-5.93	V
10380.00	32.50	31.98	17.08	33.91	47.65	54.00	-6.35	H
15570.00	28.24	32.65	20.03	34.85	46.07	54.00	-7.93	H

Test mode:	IEEE 802.11ac(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	41.78	32.59	18.02	33.92	58.47	68.20	-9.73	V
15690.00	38.47	32.87	20.15	34.88	56.61	68.20	-11.59	V
10460.00	39.27	32.59	18.02	33.92	55.96	68.20	-12.24	H
15690.00	37.42	32.87	20.15	34.88	55.56	68.20	-12.64	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	31.78	32.59	18.02	33.92	48.47	54.00	-5.53	V
15690.00	28.89	32.87	20.15	34.88	47.03	54.00	-6.97	V
10460.00	30.27	32.59	18.02	33.92	46.96	54.00	-7.04	H
15690.00	28.35	32.78	20.12	34.86	46.39	54.00	-7.61	H

Test mode:	IEEE 802.11ac(HT80)	Test channel:	

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.
10420.00	41.29	32.44	17.18	33.91	57.00	68.20	-11.20	V
15630.00	36.49	32.78	20.12	34.86	54.53	68.20	-13.67	V
10420.00	38.73	32.44	17.18	33.91	54.44	68.20	-13.76	H
15630.00	35.47	32.78	20.12	34.86	53.51	68.20	-14.69	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.
10420.00	30.19	32.44	17.18	33.91	45.90	54.00	-8.10	V
15630.00	28.25	32.78	20.12	34.86	46.29	54.00	-7.71	V
10420.00	30.04	32.44	17.18	33.91	45.75	54.00	-8.25	H
15630.00	27.93	32.78	20.12	34.86	45.97	54.00	-8.03	H

Note:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. This data is under mimo mode.

Radiated Band Edge:

Test Mode: 802.11n(HT20)								
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	41.67	28.65	13.58	31.04	52.86	68.20	-15.34	H
5350.00	42.15	29.16	14.68	31.96	54.03	68.20	-14.17	H
5150.00	42.35	28.65	13.58	31.04	53.54	68.20	-14.66	V
5350.00	43.07	29.16	14.68	31.96	54.95	68.20	-13.25	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	34.25	28.65	13.58	31.04	45.44	54.00	-8.56	H
5350.00	35.78	29.16	14.68	31.96	47.66	54.00	-6.34	H
5150.00	34.74	28.65	13.58	31.04	45.93	54.00	-8.07	V
5350.00	36.05	29.16	14.68	31.96	47.93	54.00	-6.07	V

Test Mode: 802.11ac(HT20)								
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	41.29	28.65	13.58	31.04	52.48	68.20	-15.72	H
5350.00	42.64	29.16	14.68	31.96	54.52	68.20	-13.68	H
5150.00	43.31	28.65	13.58	31.04	54.50	68.20	-13.70	V
5350.00	42.77	29.16	14.68	31.96	54.65	68.20	-13.55	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	33.78	28.65	13.58	31.04	44.97	54.00	-9.03	H
5350.00	34.64	29.16	14.68	31.96	46.52	54.00	-7.48	H
5150.00	34.12	28.65	13.58	31.04	45.31	54.00	-8.69	V
5350.00	35.44	29.16	14.68	31.96	47.32	54.00	-6.68	V

Test Mode: 802.11n(HT40)								
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	41.47	28.65	13.58	31.04	52.66	68.20	-15.54	H
5350.00	42.61	29.16	14.68	31.96	54.49	68.20	-13.71	H
5150.00	41.77	28.65	13.58	31.04	52.96	68.20	-15.24	V
5350.00	43.81	29.16	14.68	31.96	55.69	68.20	-12.51	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	33.53	28.65	13.58	31.04	44.72	54.00	-9.28	H
5350.00	34.25	29.16	14.68	31.96	46.13	54.00	-7.87	H
5150.00	33.78	28.65	13.58	31.04	44.97	54.00	-9.03	V
5350.00	35.13	29.16	14.68	31.96	47.01	54.00	-6.99	V

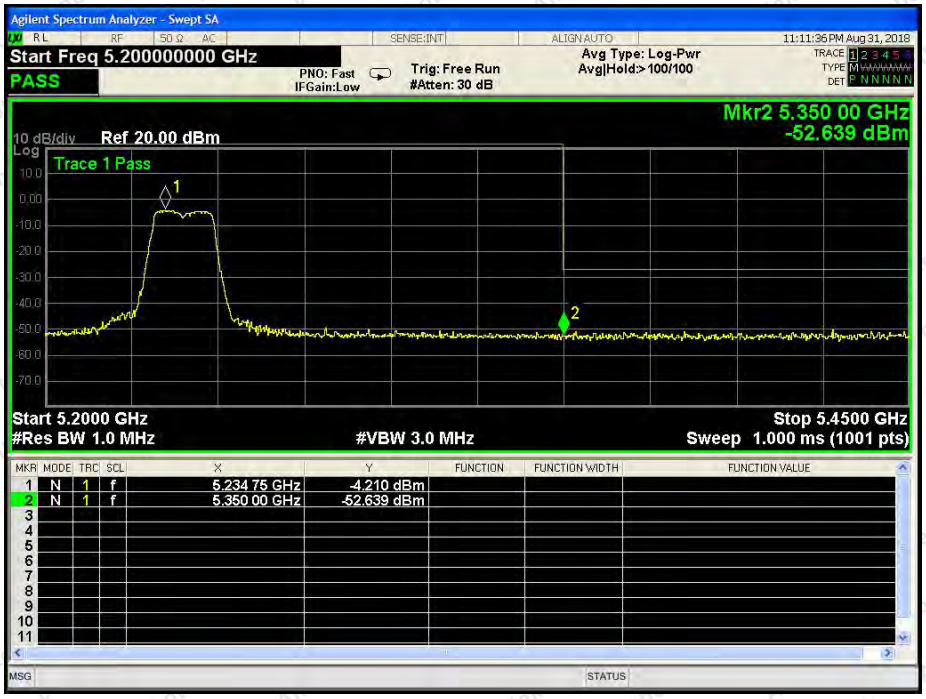
Test Mode: 802.11ac(HT40)								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5150.00	41.25	28.65	13.58	31.04	52.44	68.20	-15.76	H
5350.00	42.37	29.16	14.68	31.96	54.25	68.20	-13.95	H
5150.00	41.54	28.65	13.58	31.04	52.73	68.20	-15.47	V
5350.00	43.41	29.16	14.68	31.96	55.29	68.20	-12.91	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	33.47	28.65	13.58	31.04	44.66	54.00	-9.34	H
5350.00	34.61	29.16	14.68	31.96	46.49	54.00	-7.51	H
5150.00	33.62	28.65	13.58	31.04	44.81	54.00	-9.19	V
5350.00	35.01	29.16	14.68	31.96	46.89	54.00	-7.11	V

Test Mode: 802.11ac(HT80)								
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	41.63	28.65	13.58	31.04	52.82	68.20	-15.38	H
5350.00	42.49	29.16	14.68	31.96	54.37	68.20	-13.83	H
5150.00	41.21	28.65	13.58	31.04	52.40	68.20	-15.80	V
5350.00	43.82	29.16	14.68	31.96	55.70	68.20	-12.50	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	33.65	28.65	13.58	31.04	44.84	54.00	-9.16	H
5350.00	34.45	29.16	14.68	31.96	46.33	54.00	-7.67	H
5150.00	33.72	28.65	13.58	31.04	44.91	54.00	-9.09	V
5350.00	35.31	29.16	14.68	31.96	47.19	54.00	-6.81	V

For conducted test:

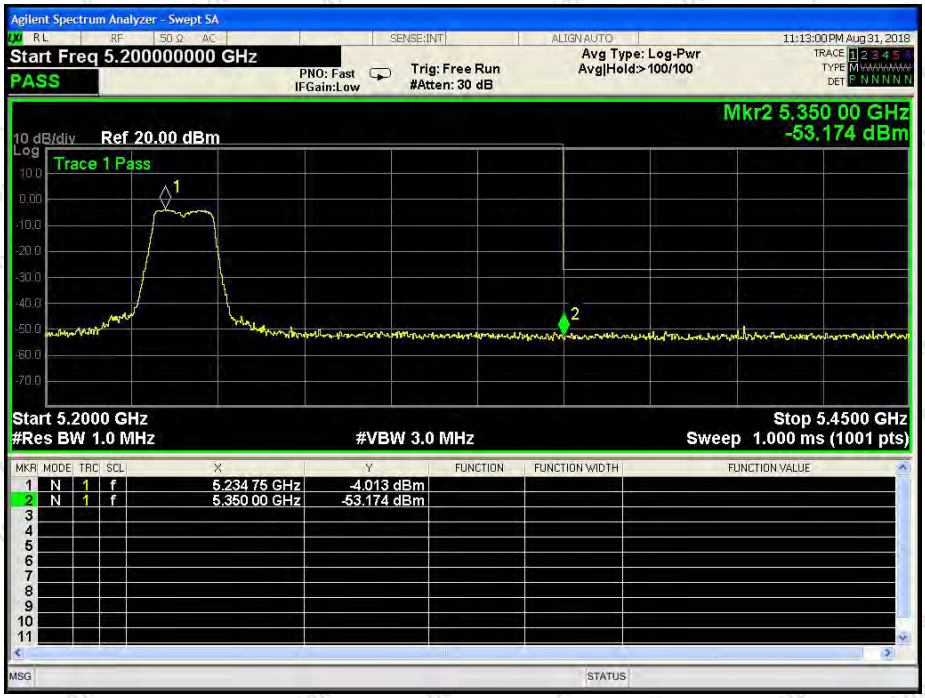
ANT A

802.11n(HT20): Band Edge, Left Side



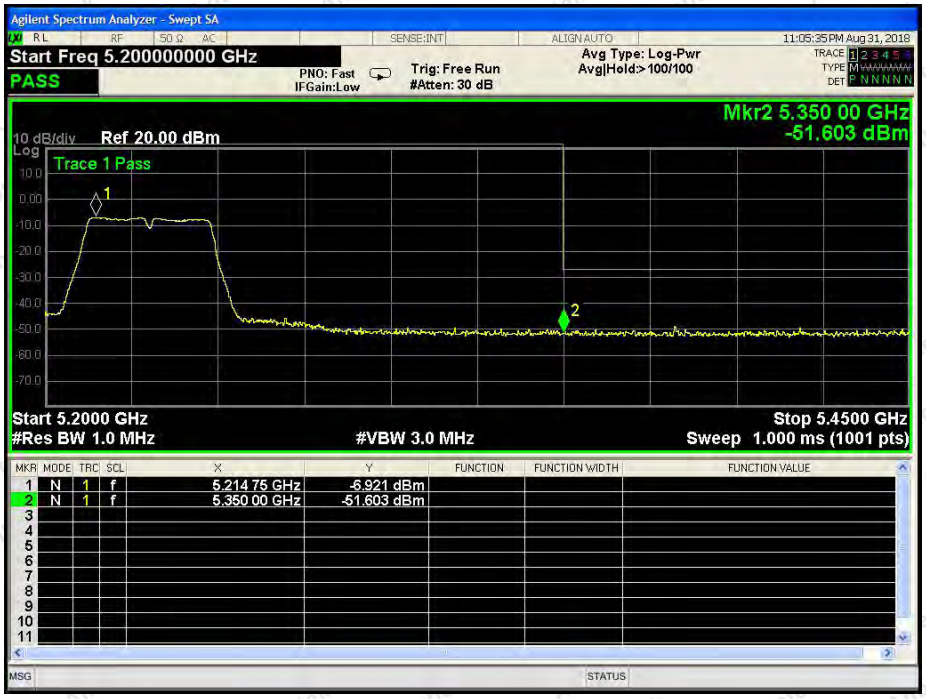
802.11n(HT20): Band Edge, Right Side

802.11ac(HT20): Band Edge, Left Side



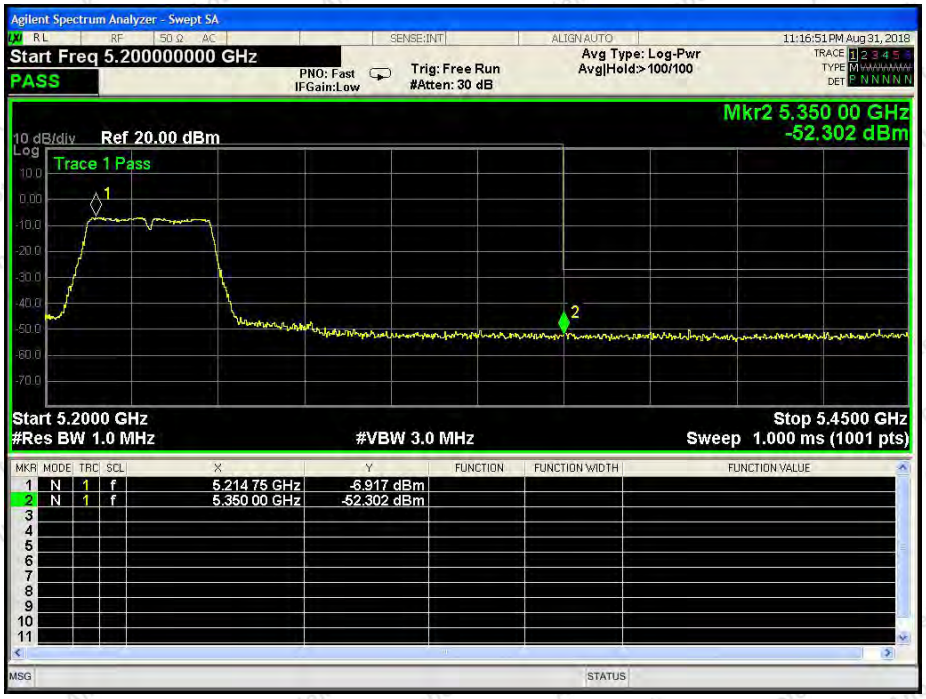
802.11ac(HT20): Band Edge, Right Side

802.11n(HT40): Band Edge, Left Side



802.11n(HT40): Band Edge, Right Side

802.11ac(HT40): Band Edge, Left Side



802.11ac(HT40): Band Edge, Right Side

802.11ac(HT80): Band Edge, Left Side

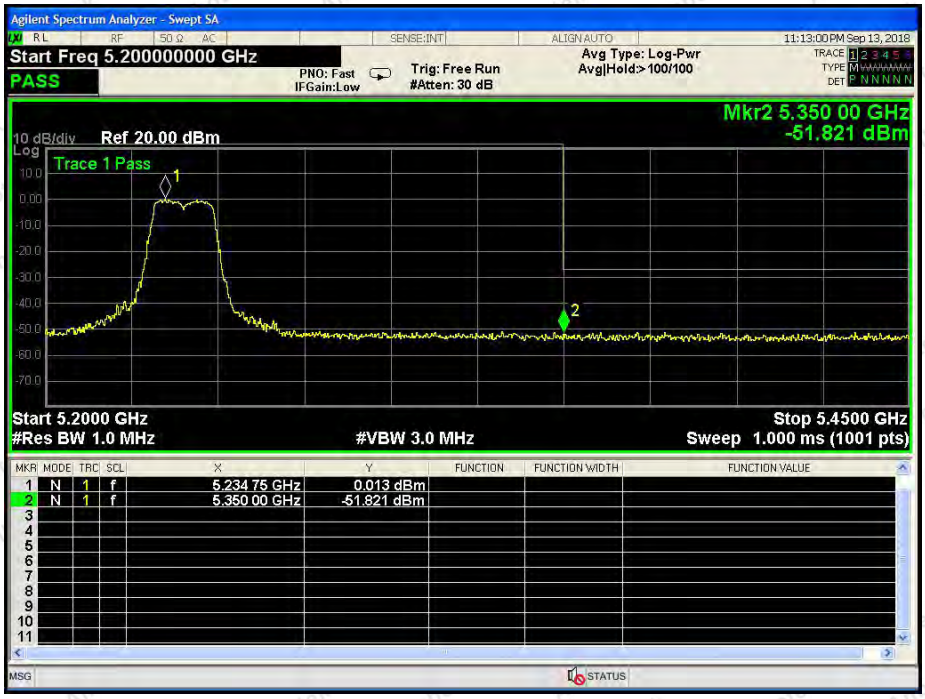
802.11ac(HT80): Band Edge, Right Side

ANTB

802.11n(HT20): Band Edge, Left Side

802.11n(HT20): Band Edge, Right Side

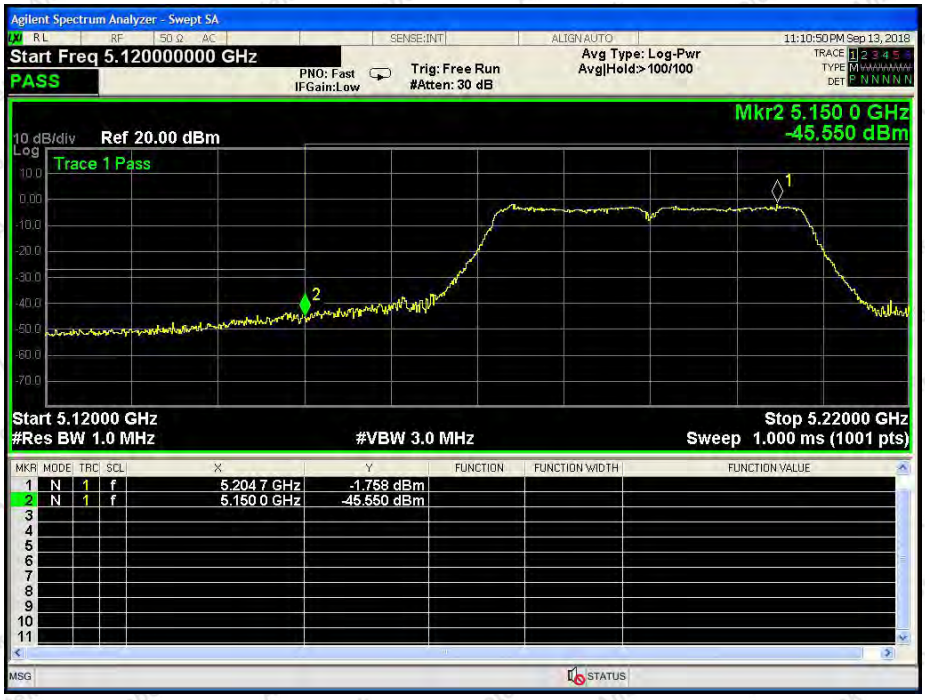
802.11ac(HT20): Band Edge, Left Side



802.11ac(HT20): Band Edge, Right Side

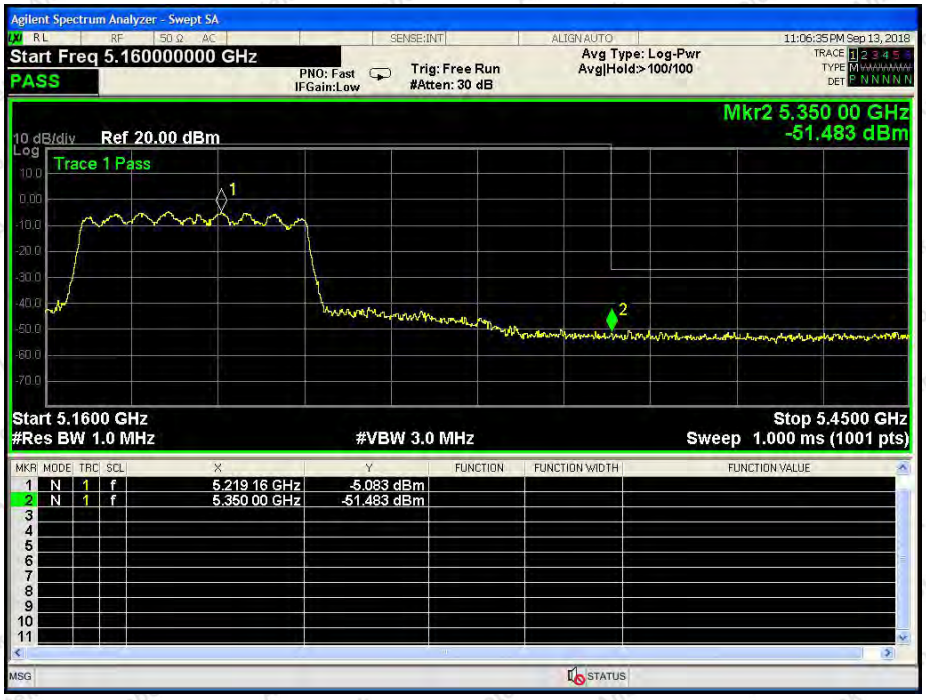
802.11n(HT40): Band Edge, Left Side

802.11n(HT40): Band Edge, Right Side

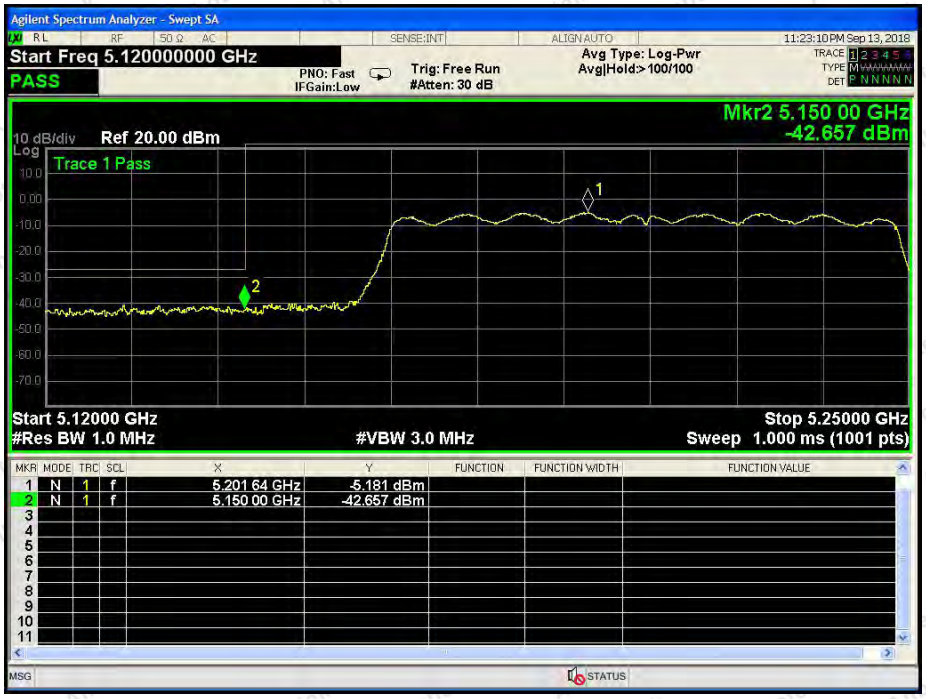


802.11ac(HT40): Band Edge, Left Side

802.11ac(HT40): Band Edge, Right Side



802.11ac(HT80): Band Edge, Left Side



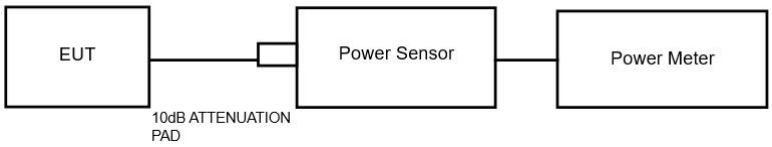
802.11ac(HT80): Band Edge, Right Side

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a)(1) (3)
Test Limit	29.99 dBm

5.2. Test Setup



5.3. Test Procedure

1. The Transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the power value.
3. Repeat above procedures on all channels needed to be tested.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 5V by USB Port	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

ANT A

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11n(HT20)	5180	8.72	24.00	PASS
	5200	8.55	24.00	PASS
	5240	8.40	24.00	PASS
802.11ac(HT20)	5180	8.72	24.00	PASS
	5200	8.28	24.00	PASS
	5240	8.38	24.00	PASS
802.11n(HT40)	5190	**8.98**	24.00	PASS
	5230	8.25	24.00	PASS
802.11ac(HT40)	5190	8.80	24.00	PASS
	5230	8.19	24.00	PASS
802.11ac(HT80)	5210	7.74	24.00	PASS

ANT B

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11n(HT20)	5180	7.17	24.00	PASS
	5200	**9.84**	24.00	PASS
	5240	9.49	24.00	PASS
802.11ac(HT20)	5180	9.71	24.00	PASS
	5200	9.21	24.00	PASS
	5240	7.03	24.00	PASS
802.11n(HT40)	5190	7.62	24.00	PASS
	5230	9.77	24.00	PASS
802.11ac(HT40)	5190	8.80	24.00	PASS
	5230	8.19	24.00	PASS
802.11ac(HT80)	5210	7.65	24.00	PASS

SUM

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
802.11n(HT20)	5180	11.02	29.99	PASS
	5200	12.25	29.99	PASS
	5240	11.99	29.99	PASS
802.11ac(HT20)	5180	12.25	29.99	PASS
	5200	11.78	29.99	PASS
	5240	10.77	29.99	PASS
802.11n(HT40)	5190	11.36	29.99	PASS
	5230	12.09	29.99	PASS
802.11ac(HT40)	5190	11.81	29.99	PASS
	5230	11.20	29.99	PASS
802.11ac(HT80)	5210	10.71	29.99	PASS

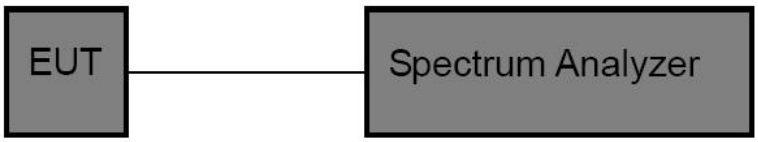
Directional Gain=Gant + 10log（Nant）=6.01dBi
Calculation Limit=Original Limit -（Directional Gain - 6）=30-0.01= 29.99 dBm

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	:	DC 5V by USB Port	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

ANT A

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11n(HT20)	5180	17.67	>0.5MHz	PASS
	5200	17.63		PASS
	5240	17.69		PASS
802.11ac(HT20)	5180	17.71		PASS
	5200	17.68		PASS
	5240	17.66		PASS
802.11n(HT40)	5190	36.59		PASS
	5230	36.55		PASS
802.11ac(HT40)	5190	36.56		PASS
	5230	36.57		PASS
802.11ac(HT80)	5210	76.26		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11n(HT20)	5180	21.05	17.657
	5200	21.00	17.648
	5240	20.82	17.657
802.11ac(HT20)	5180	21.10	17.670
	5200	20.84	17.654
	5240	20.94	17.671
802.11n(HT40)	5190	42.85	36.410
	5230	42.80	36.442
802.11ac(HT40)	5190	42.84	36.402
	5230	42.42	36.399
802.11ac(HT80)	5210	80.97	75.449

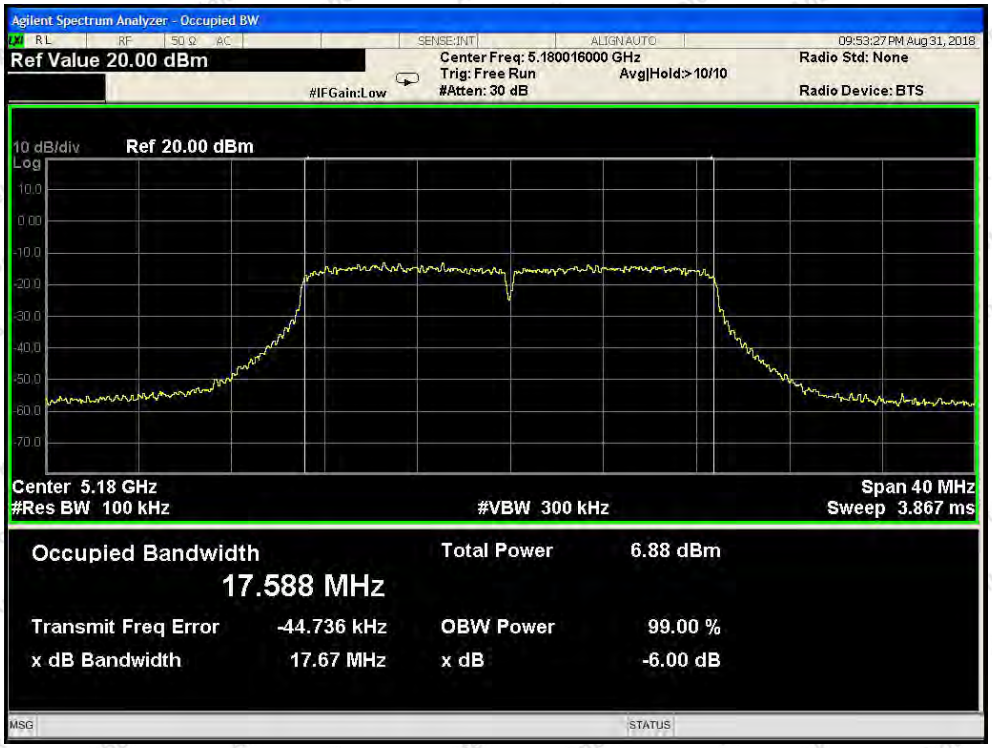
ANT B

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11n(HT20)	5180	16.97	>0.5MHz	PASS
	5200	17.07		PASS
	5240	16.70		PASS
802.11ac(HT20)	5180	17.08		PASS
	5200	17.08		PASS
	5240	16.95		PASS
802.11n(HT40)	5190	35.66		PASS
	5230	35.96		PASS
802.11ac(HT40)	5190	35.82		PASS
	5230	35.76		PASS
802.11ac(HT80)	5210	75.27		PASS

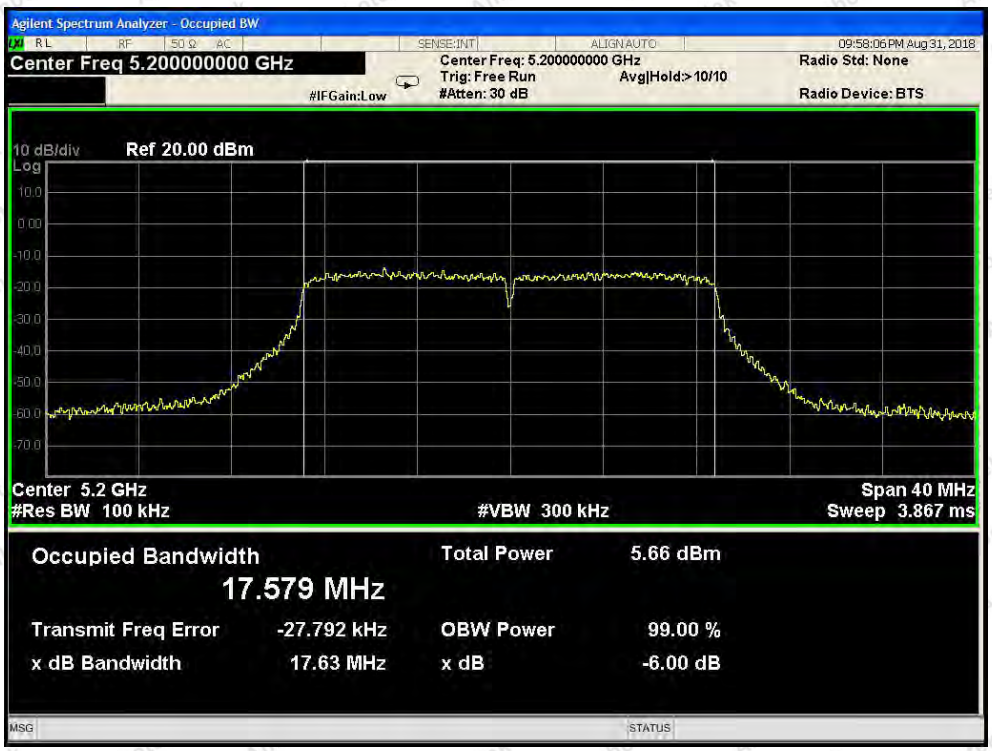
Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11n(HT20)	5180	21.12	17.644
	5200	21.29	17.680
	5240	20.84	17.633
802.11ac(HT20)	5180	20.98	17.641
	5200	20.76	17.600
	5240	20.93	17.647
802.11n(HT40)	5190	42.60	36.408
	5230	42.69	36.365
802.11ac(HT40)	5190	42.62	36.424
	5230	42.04	36.355
802.11ac(HT80)	5210	81.91	75.401

ANT A

6dB Bandwidth



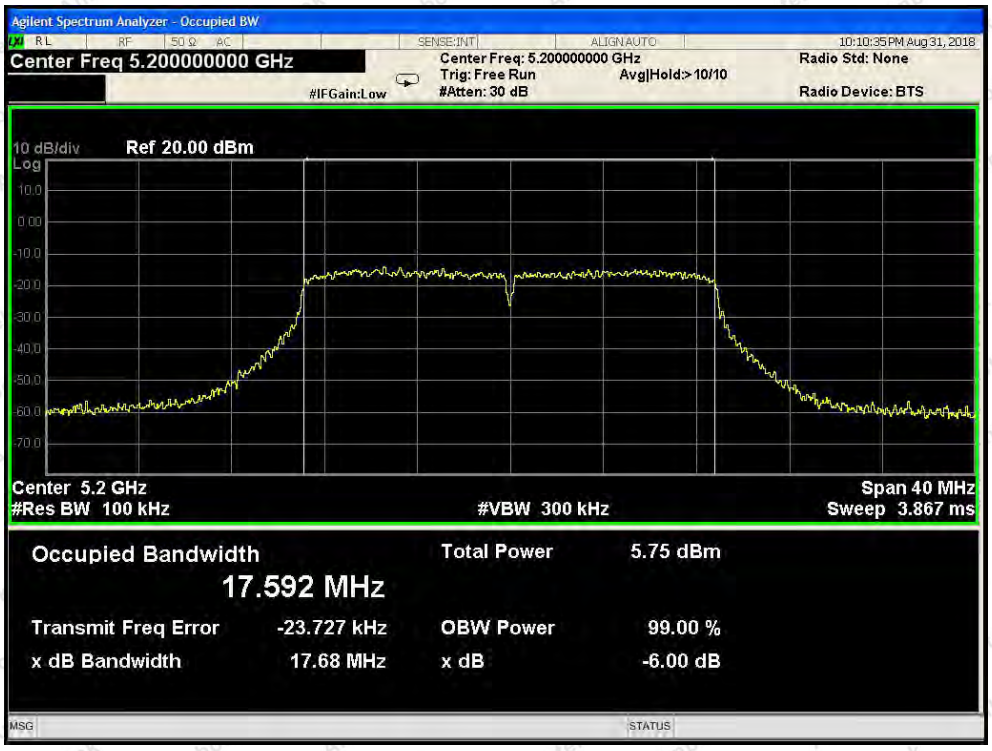
Test Mode: 802.11n(HT20)---Low



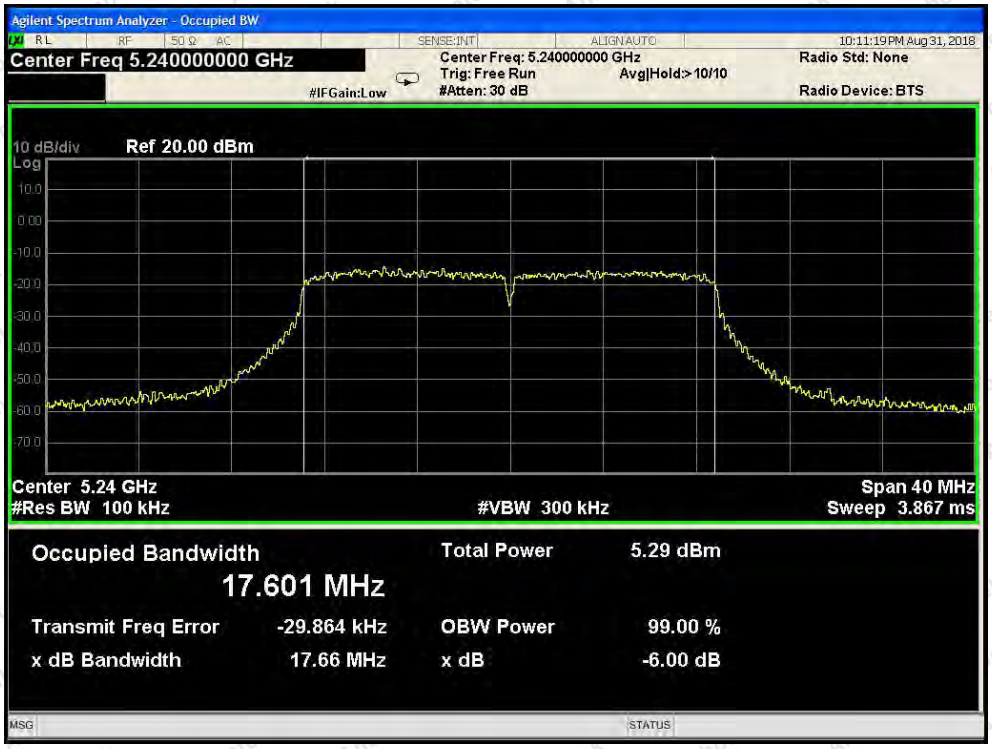
Test Mode: 802.11n(HT20)---Middle

Test Mode: 802.11n(HT20)---High

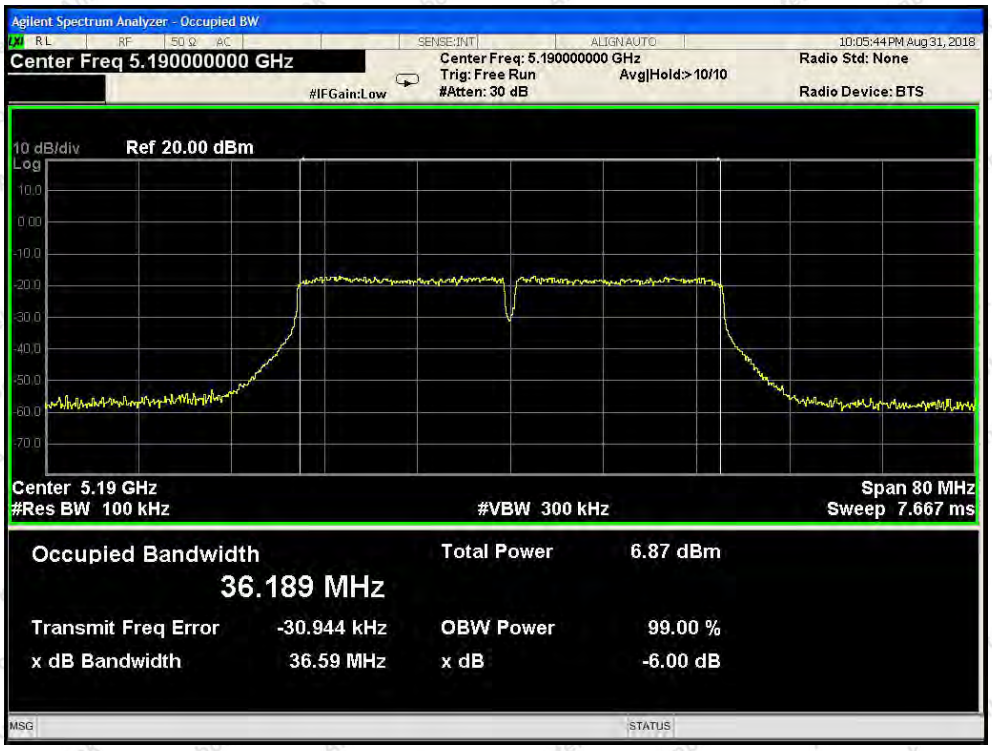
Test Mode: 802.11ac(HT20)--Low



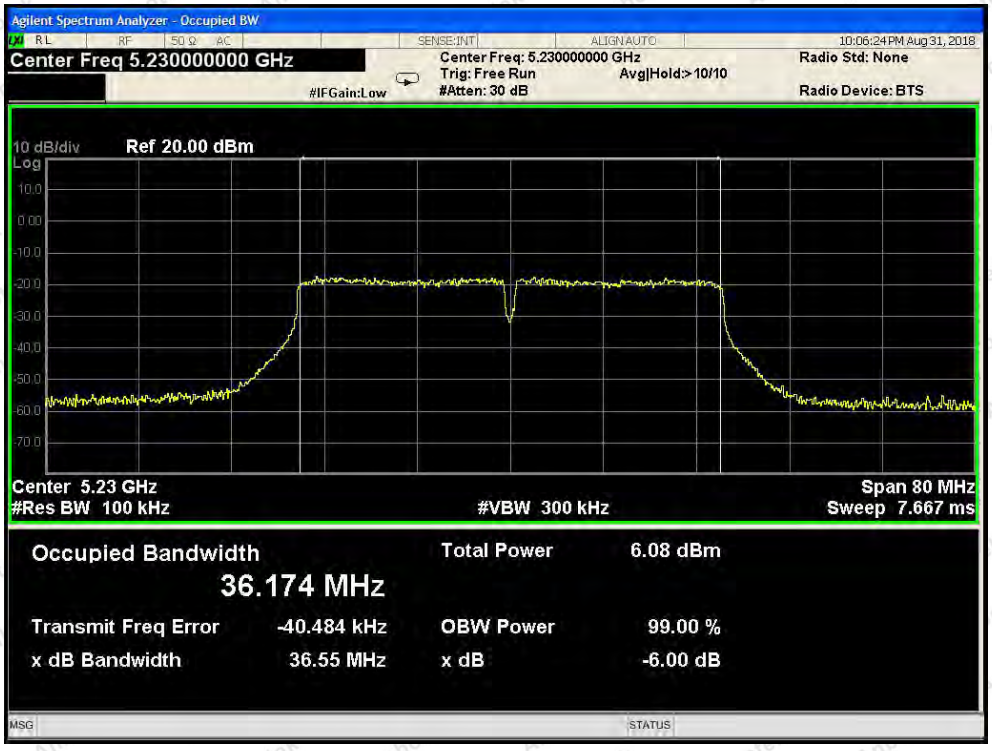
Test Mode: 802.11ac(HT20)---Middle



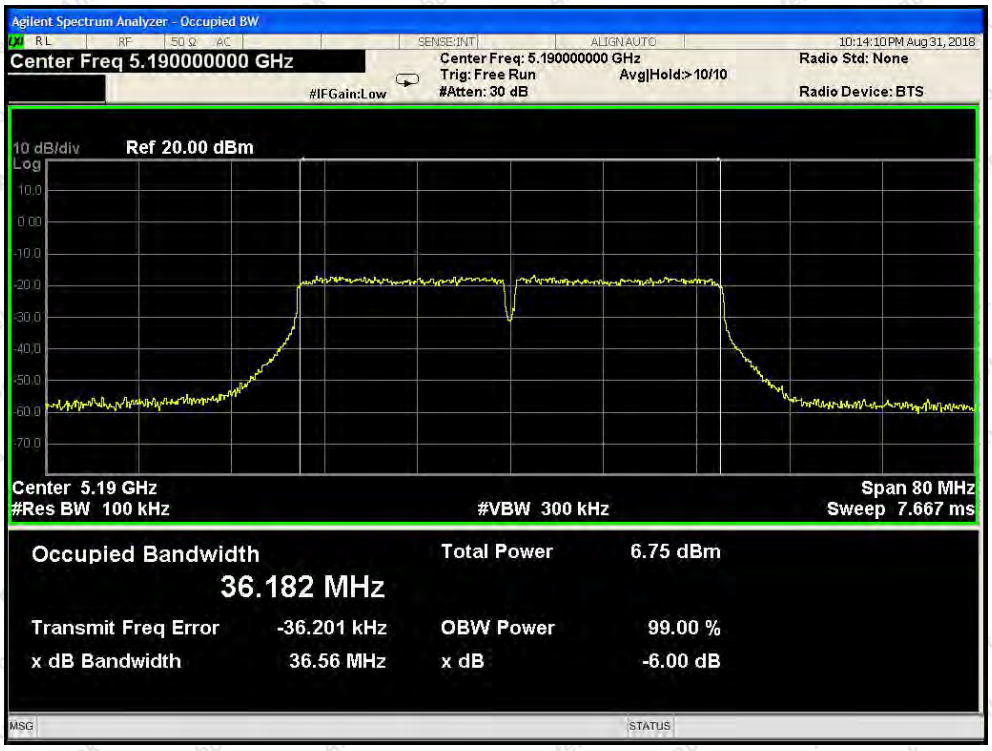
Test Mode: 802.11ac(HT20)---High



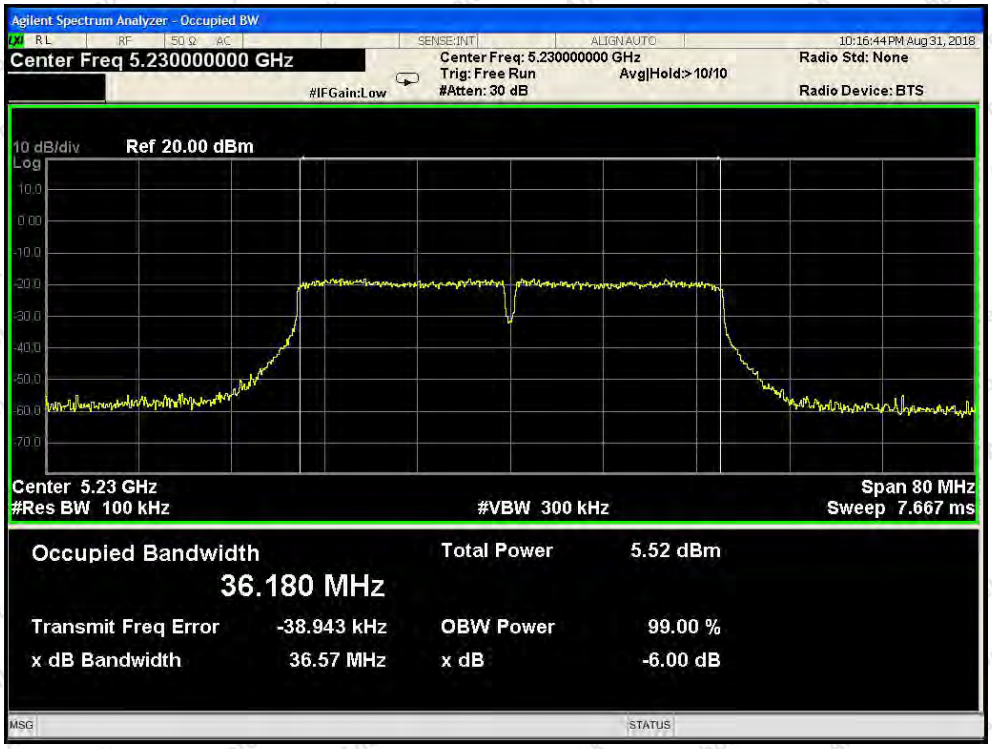
Test Mode: 802.11n(HT40)---Low



Test Mode: 802.11n(HT40)---High



Test Mode: 802.11ac(HT40)---Low



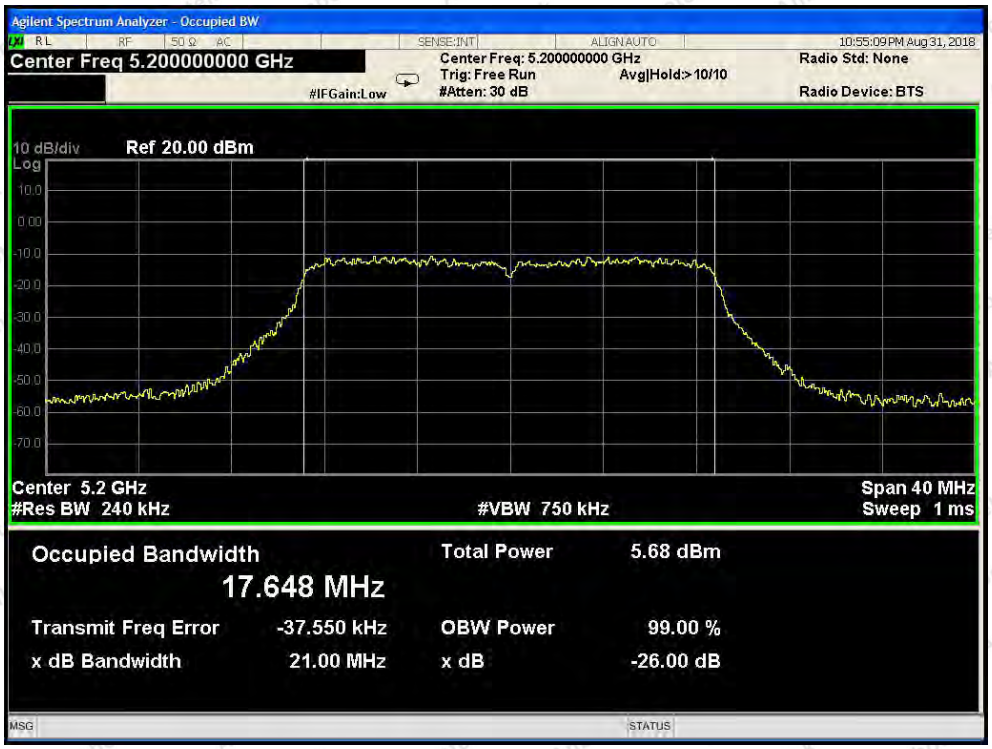
Test Mode: 802.11ac(HT40)---High

Test Mode: 802.11ac(HT80)

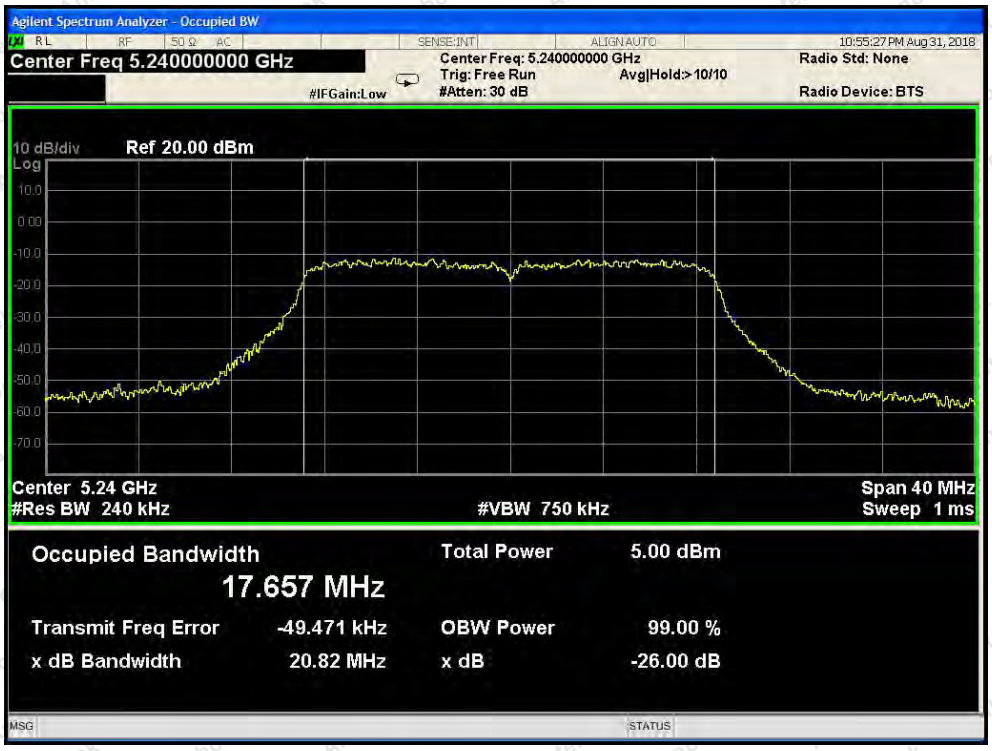
ANT A

26dB & 99% Bandwidth

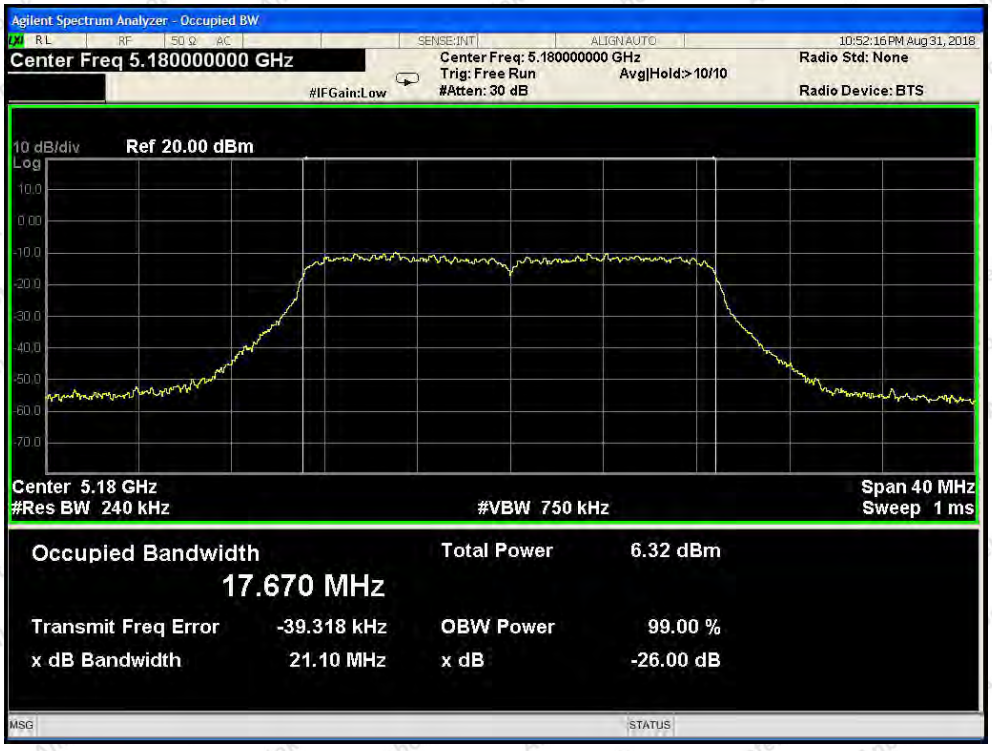
Test Mode: 802.11n(HT20)---Low



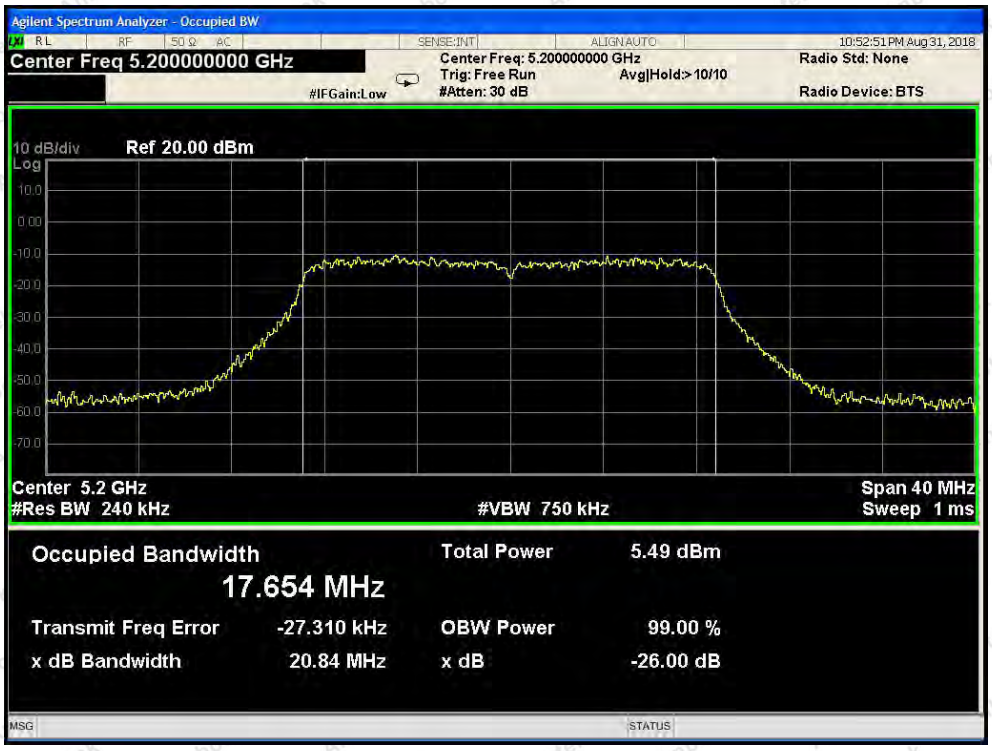
Test Mode: 802.11n(HT20)---Middle



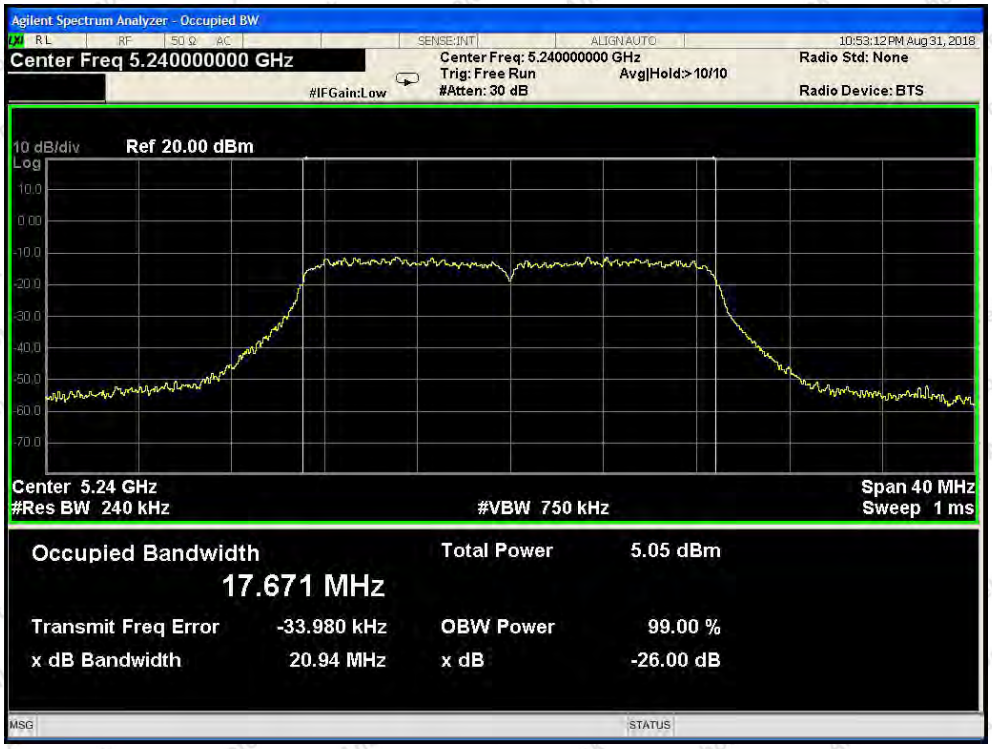
Test Mode: 802.11n(HT20)---High



Test Mode: 802.11ac(HT20)--Low



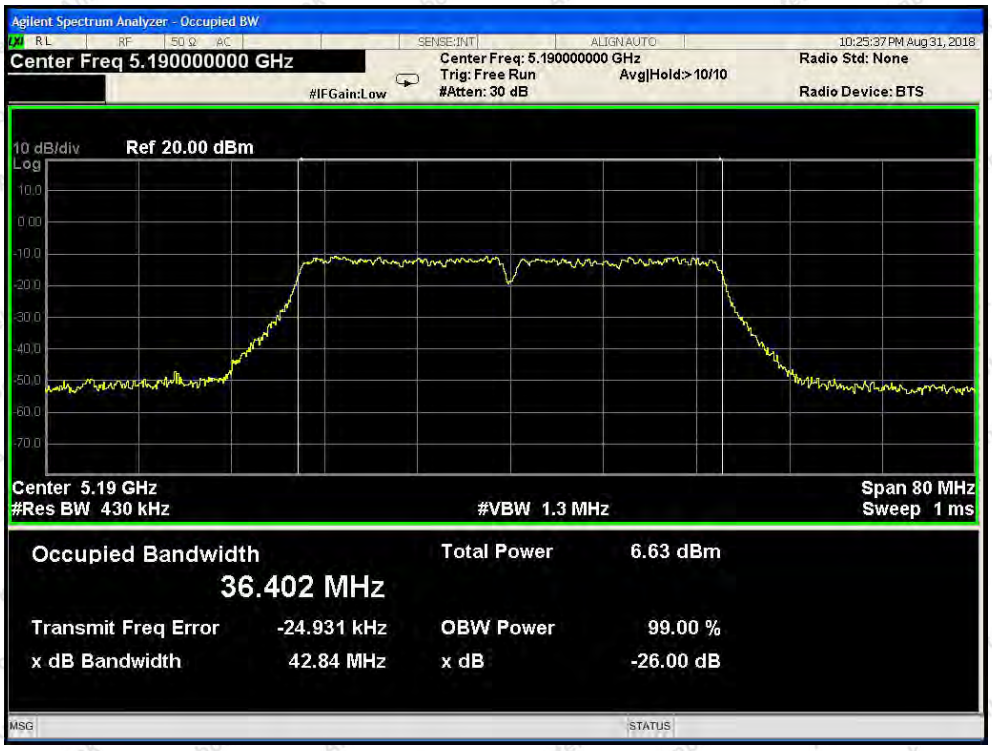
Test Mode: 802.11ac(HT20)---Middle



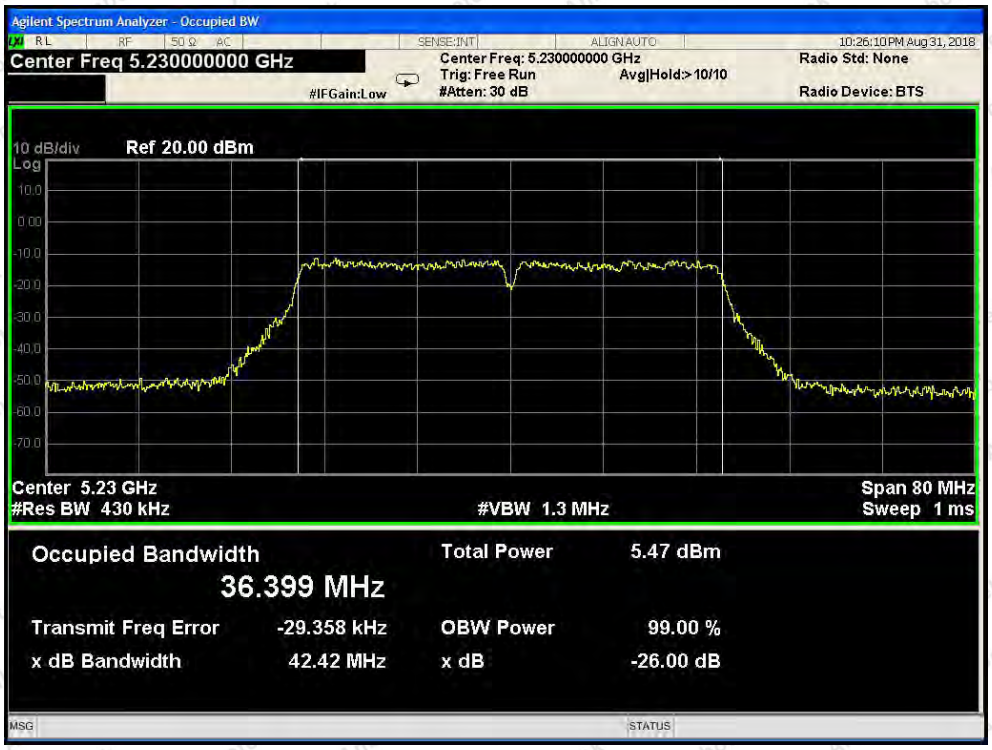
Test Mode: 802.11ac(HT20)---High

Test Mode: 802.11n(HT40)---Low

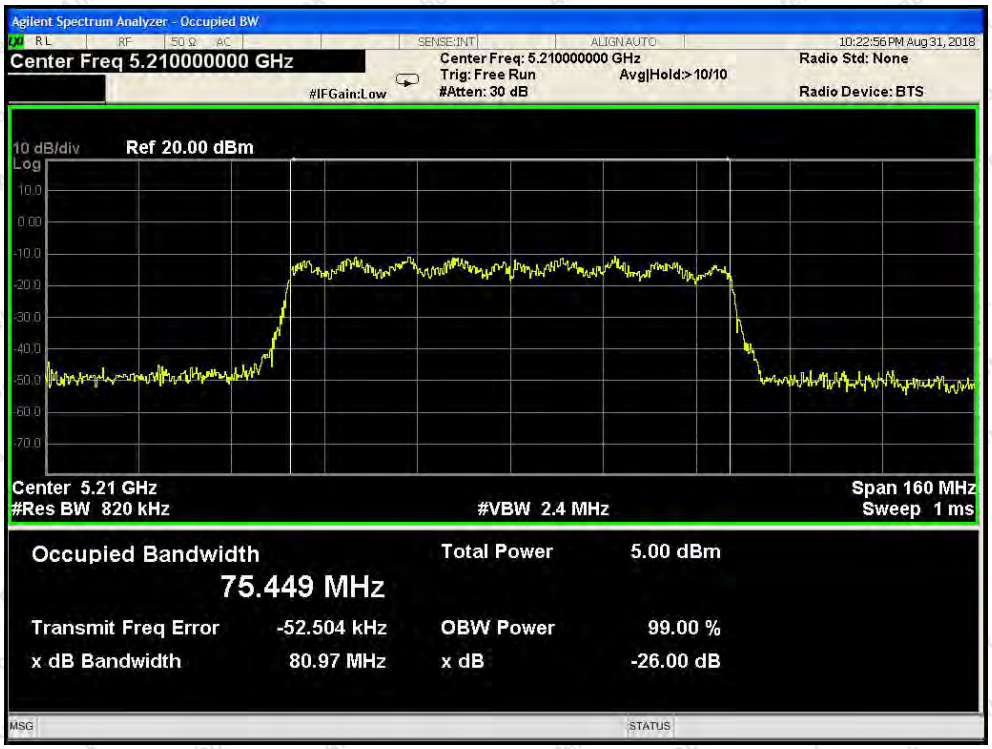
Test Mode: 802.11n(HT40)---High



Test Mode: 802.11ac(HT40)---Low



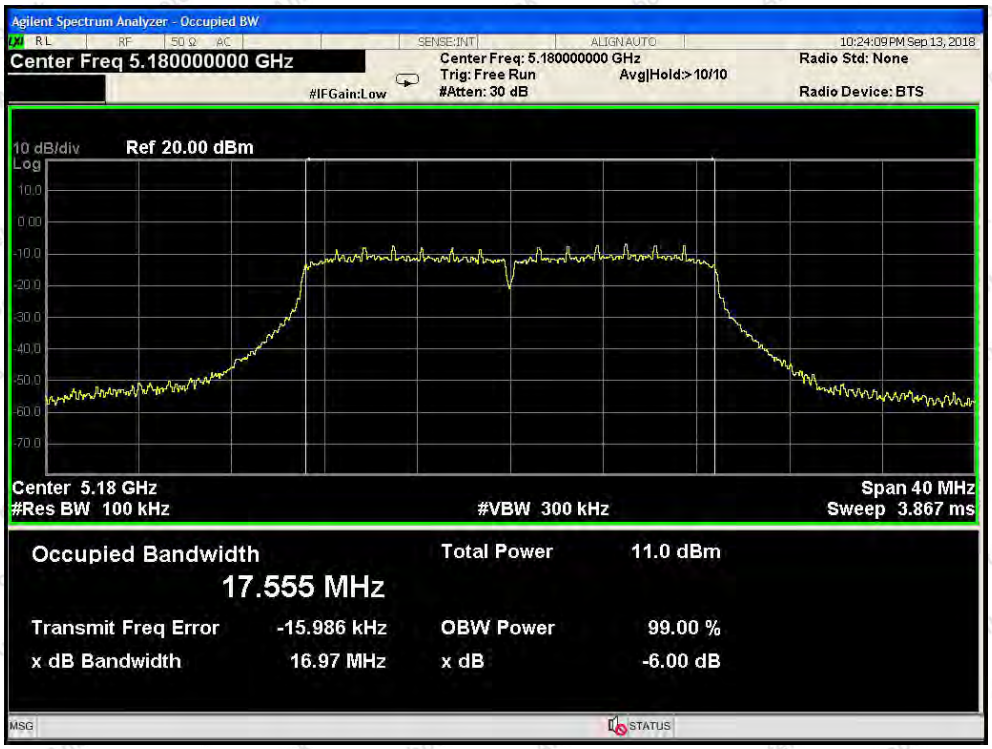
Test Mode: 802.11ac(HT40)---High



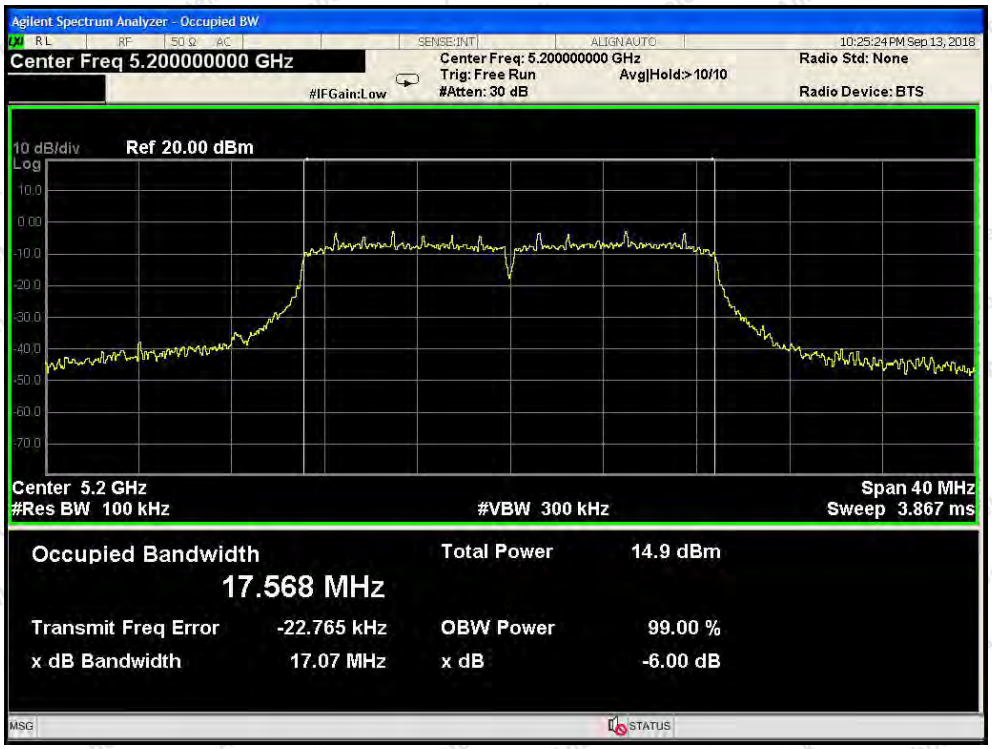
Test Mode: 802.11ac(HT80)

ANT B

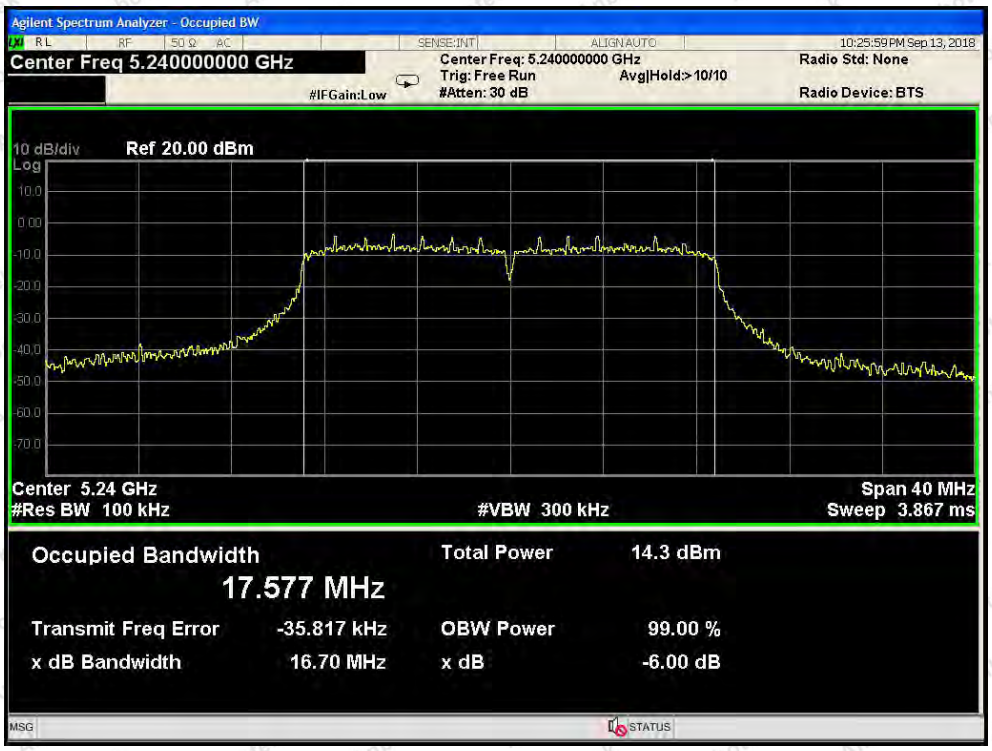
6dB Bandwidth



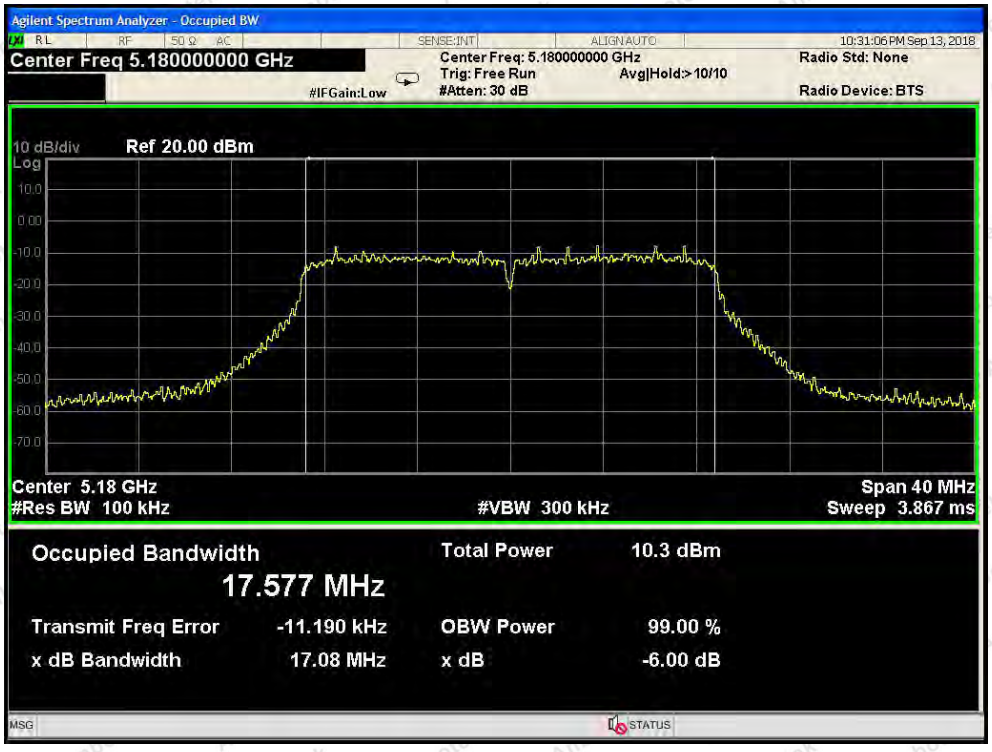
Test Mode: 802.11n(HT20)---Low



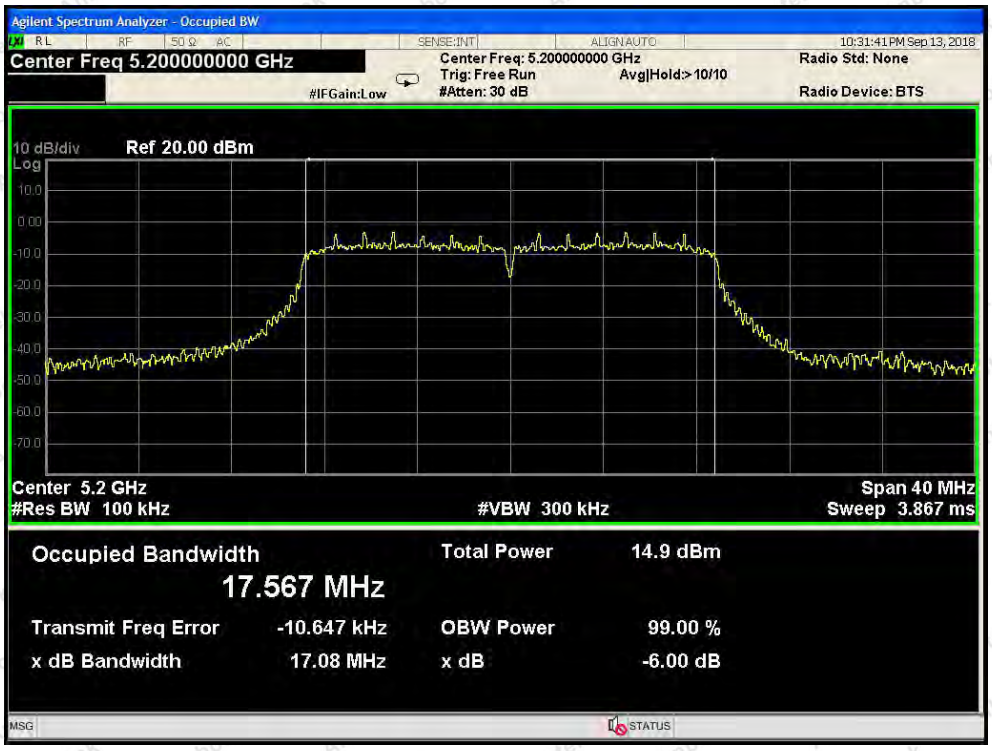
Test Mode: 802.11n(HT20)---Middle



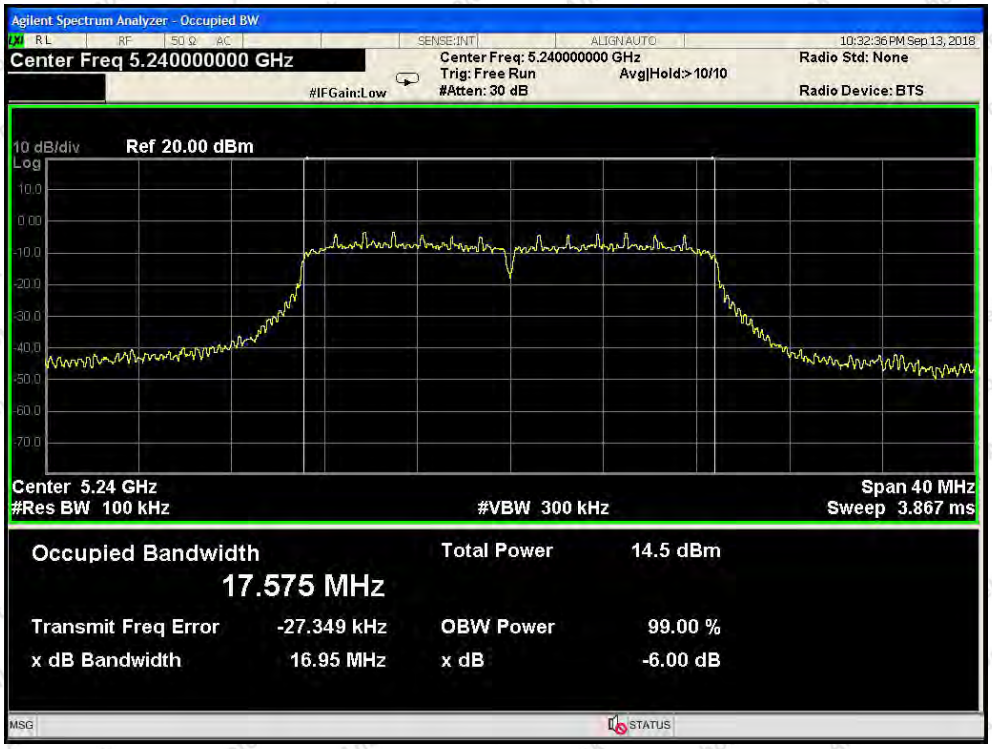
Test Mode: 802.11n(HT20)---High



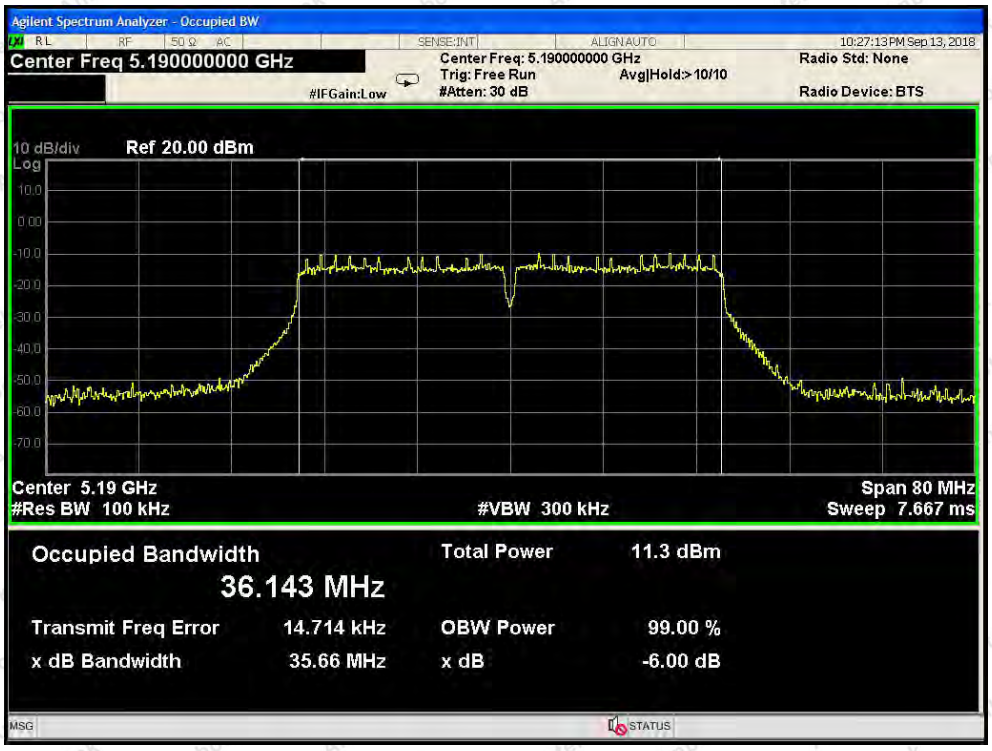
Test Mode: 802.11ac(HT20)--Low



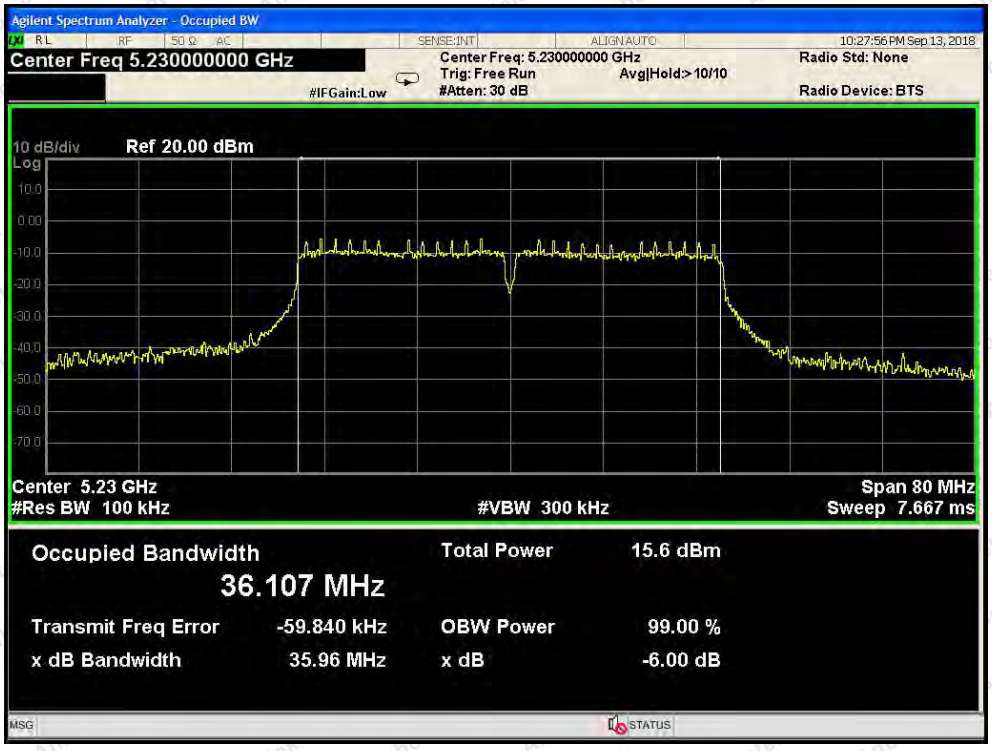
Test Mode: 802.11ac(HT20)---Middle



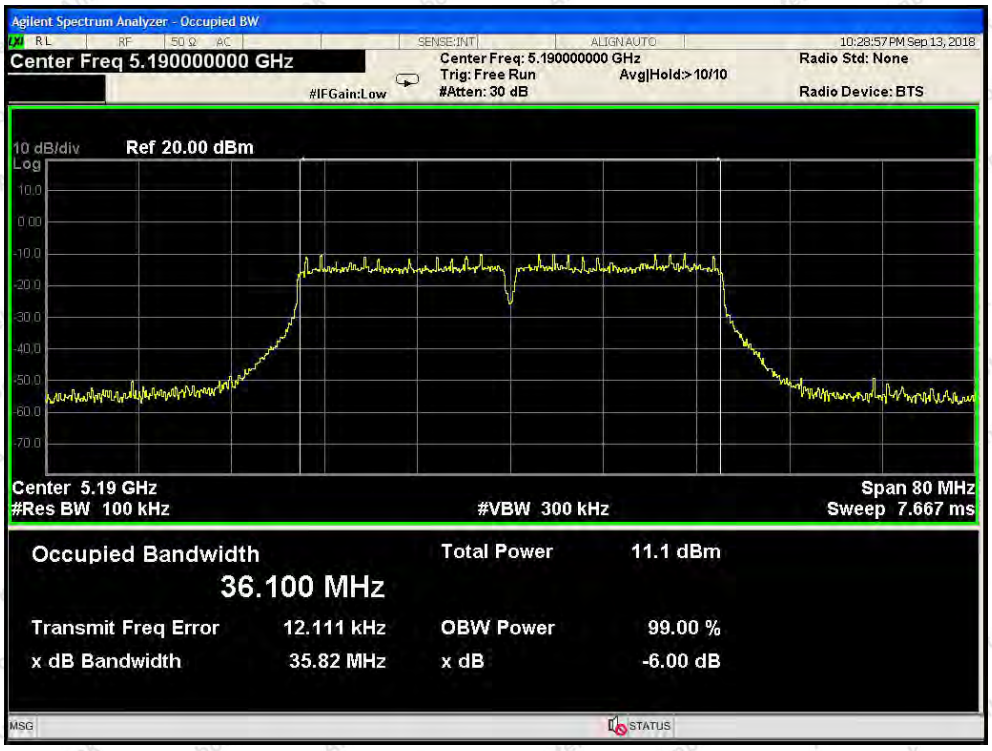
Test Mode: 802.11ac(HT20)---High



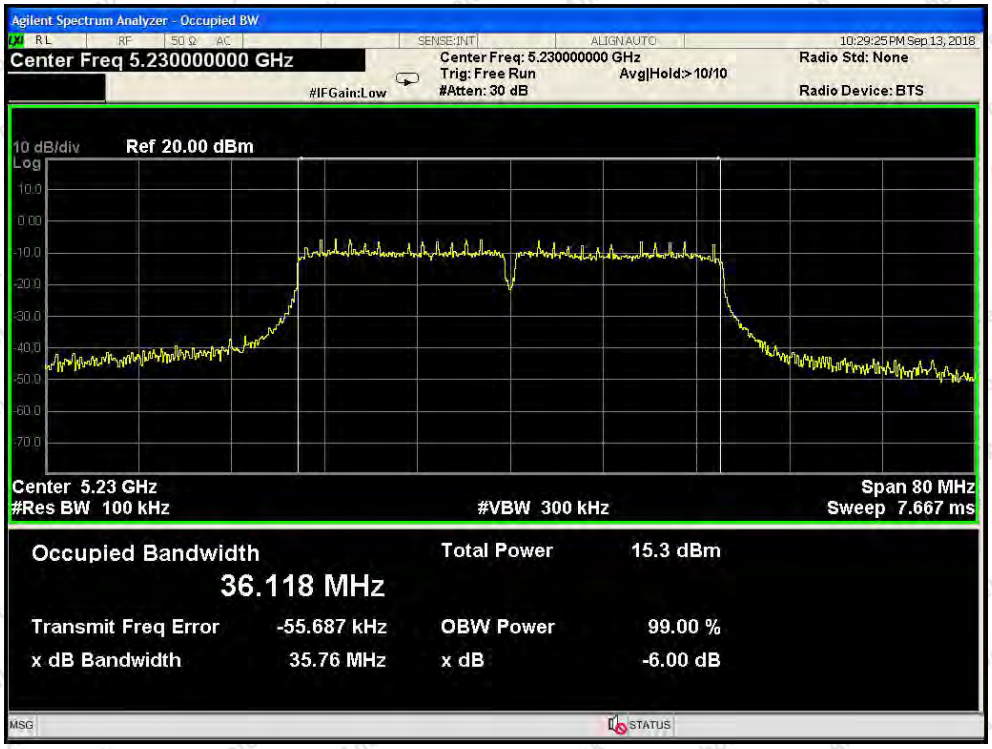
Test Mode: 802.11n(HT40)---Low



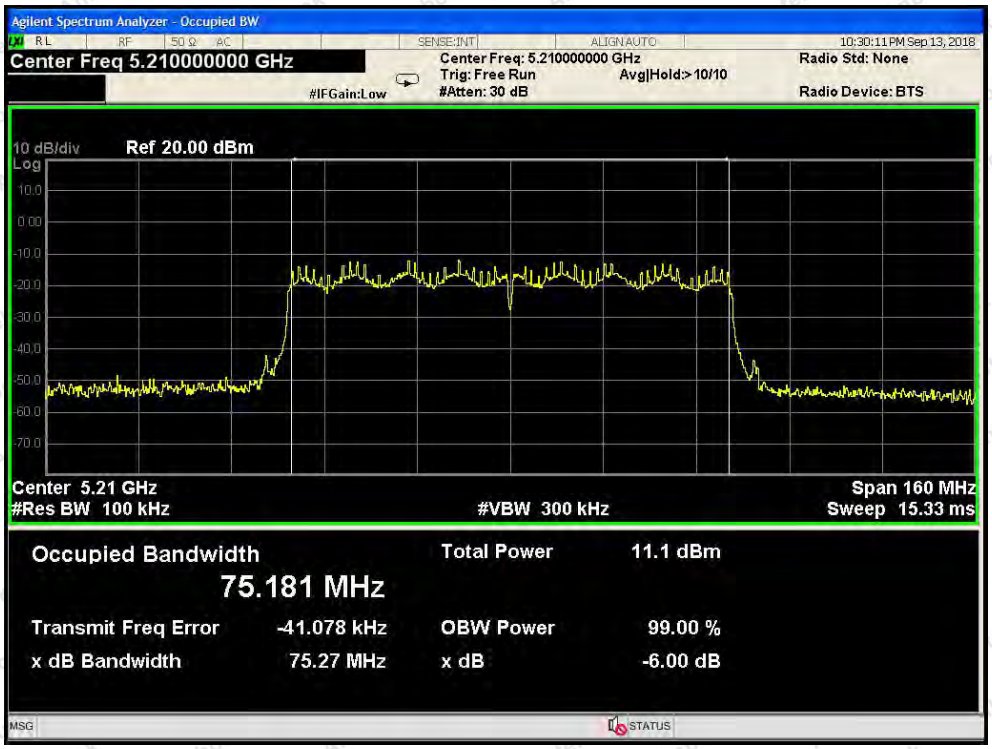
Test Mode: 802.11n(HT40)---High



Test Mode: 802.11ac(HT40)---Low



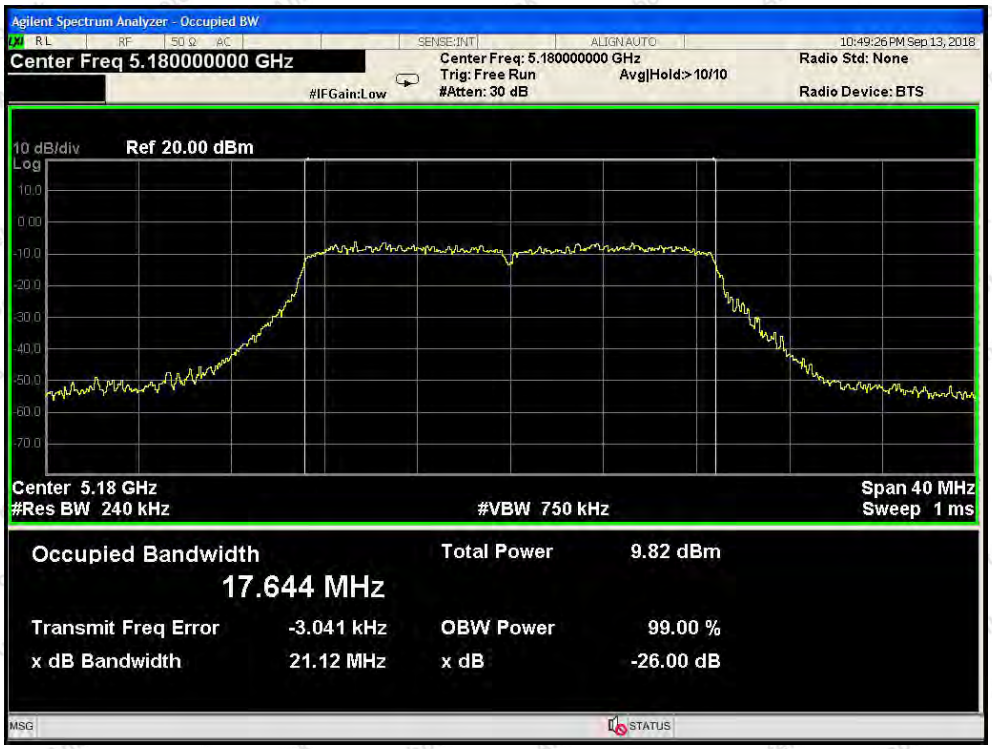
Test Mode: 802.11ac(HT40)---High



Test Mode: 802.11ac(HT80)

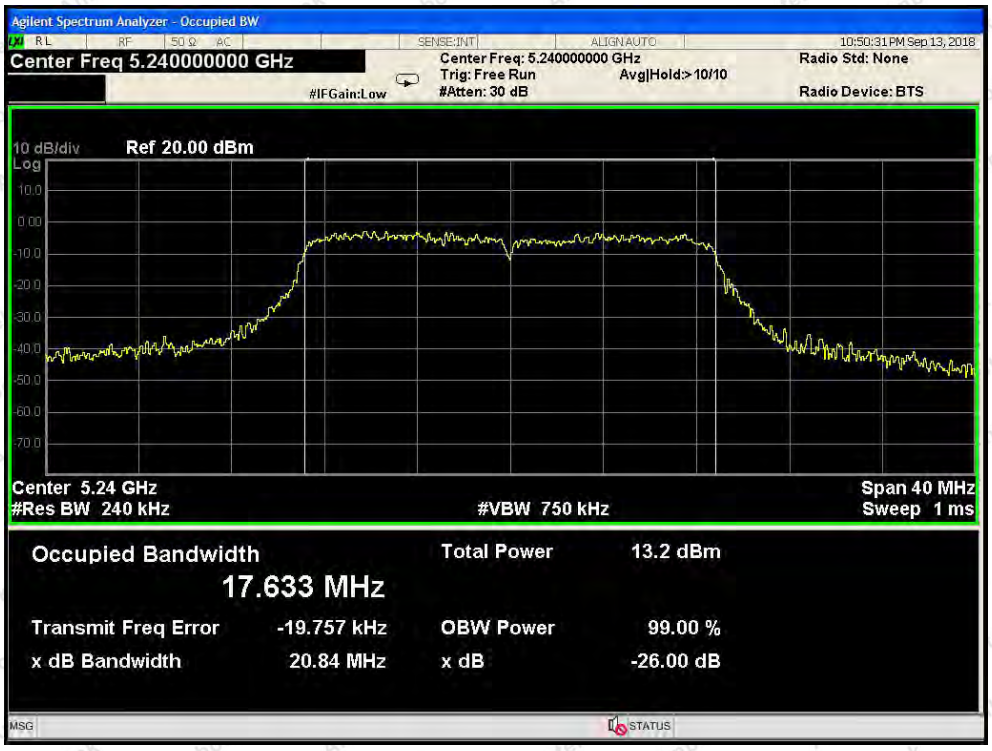
ANT B

26dB & 99% Bandwidth

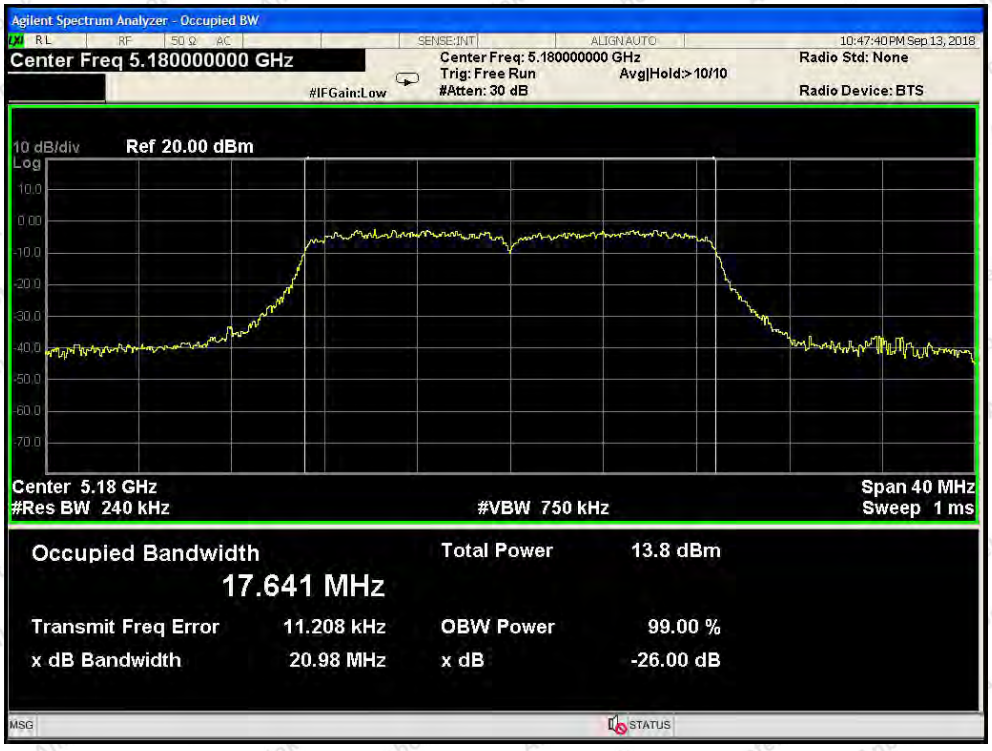


Test Mode: 802.11n(HT20)---Low

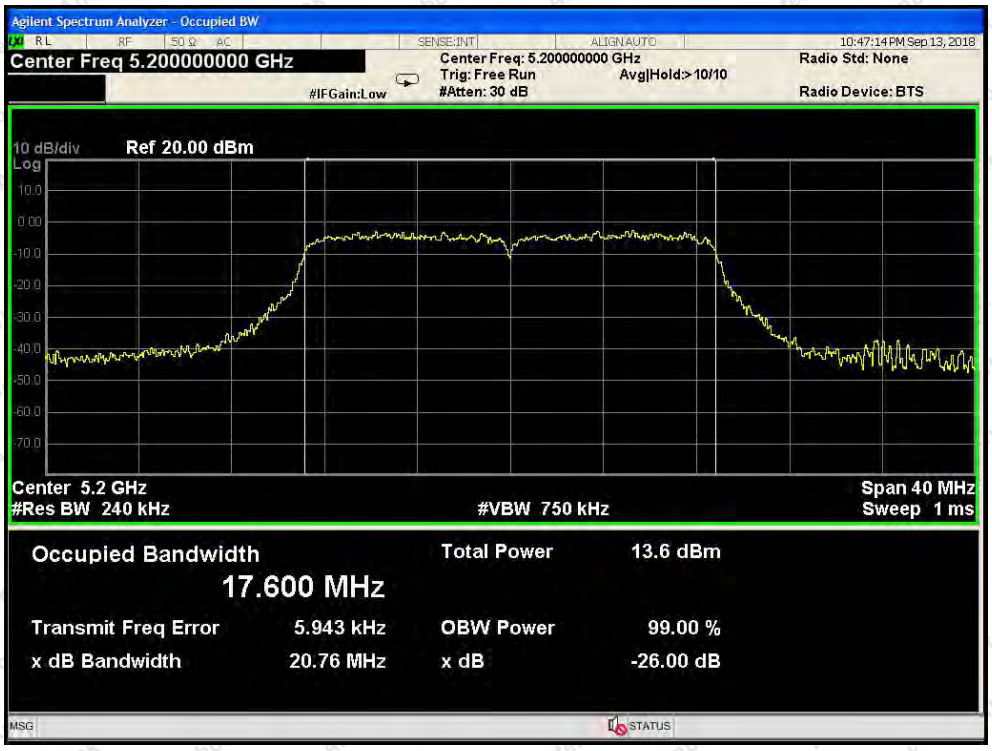
Test Mode: 802.11n(HT20)---Middle



Test Mode: 802.11n(HT20)---High

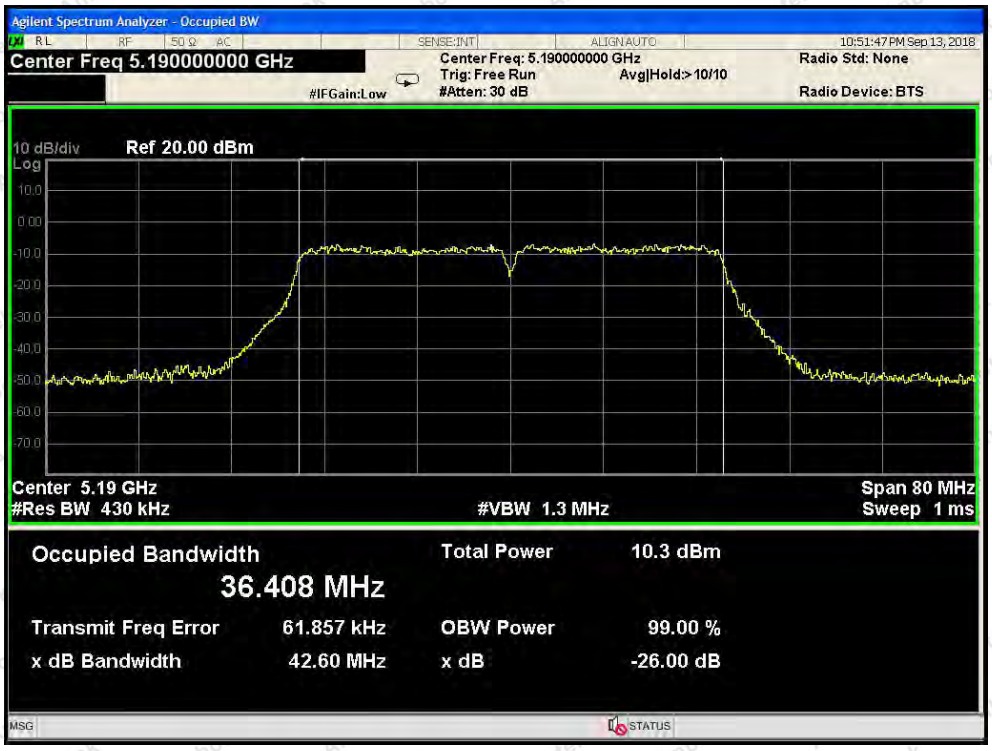


Test Mode: 802.11ac(HT20)--Low



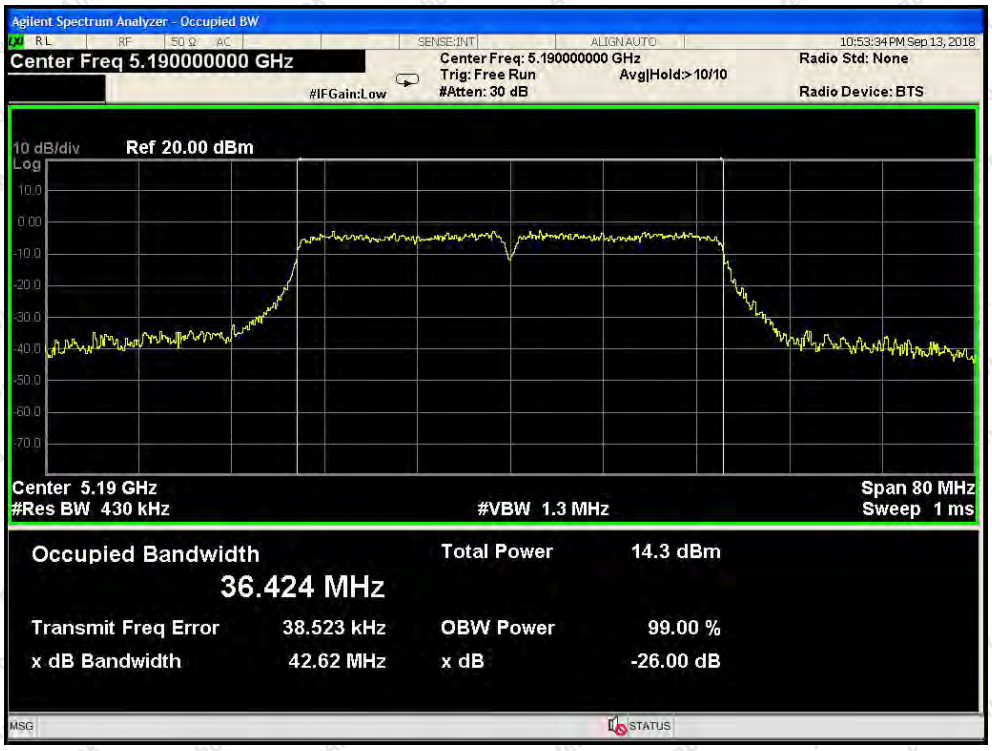
Test Mode: 802.11ac(HT20)---Middle

Test Mode: 802.11ac(HT20)---High



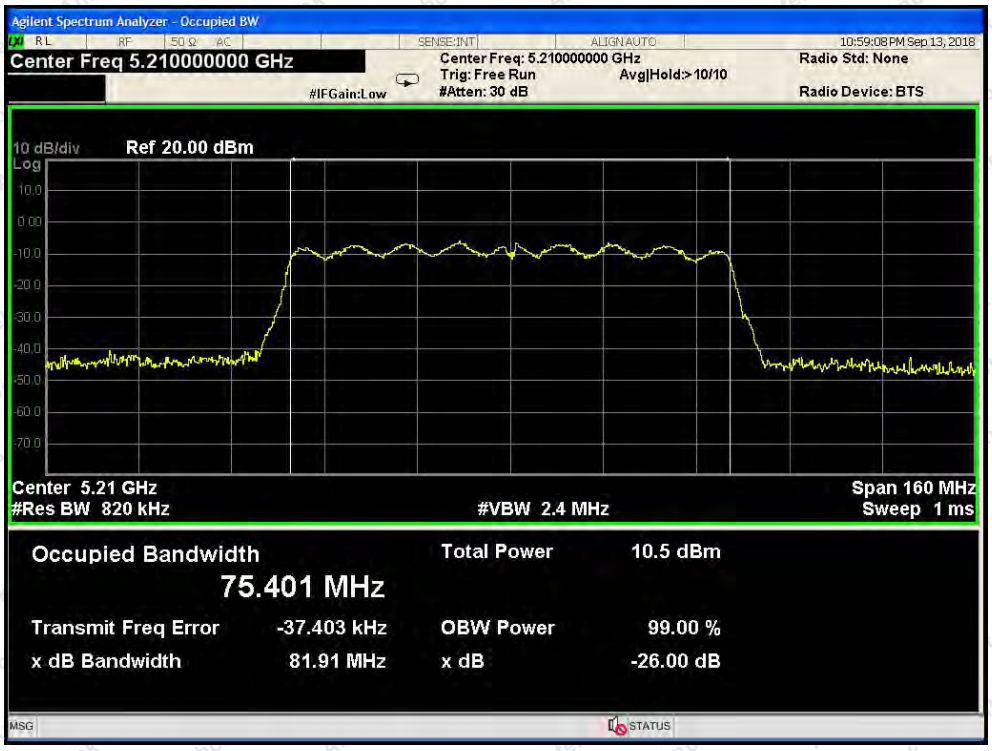
Test Mode: 802.11n(HT40)---Low

Test Mode: 802.11n(HT40)---High



Test Mode: 802.11ac(HT40)---Low

Test Mode: 802.11ac(HT40)---High



Test Mode: 802.11ac(HT80)

---------- End of Report ----------