FCC Test Report

Client Name	:	Autel Intelligent Tech. Corp., Ltd.
Address	:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China
Product Name	:	ADVANCED DIAGNOSTICS & INFORMATION SYSTEM
Date	:	Aug. 06, 2021

Shenzhen Anbotek Compliance Laboratory Limited

Contents

TEST REPORT

Applicant	:	Autel Intelligent Tech. Corp., Ltd.
Manufacturer	:	Autel Intelligent Tech. Corp., Ltd.
Product Name	:	ADVANCED DIAGNOSTICS & INFORMATION SYSTEM
Model No.	:	MaxiSys MS906 Pro
Trade Mark	:	AUTEL
Rating(s)	:	Input: DC 12V, 3A (with DC 3.85V, 11600mAh battery inside)
Test Standard(s)	:	**FCC Part15 Subpart E, Paragraph 15.407**
Test Method(s)	:	**ANSI C63.10: 2013,** **KDB 789033 D02 General UNII Test Procedures New Rules v02r01** **KDB 662911 D01 Multiple Transmitter Output 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 Receipt	Apr. 16, 2021
Date of Test	Apr. 16~Jun. 18, 2021
Prepared By	Ella Liang (Ella Liang)
Approved & Authorized Signer	Kingkong Jin (Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	Autel Intelligent Tech. Corp., Ltd.
Address	:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China
Manufacturer	:	Autel Intelligent Tech. Corp., Ltd.
Address	:	7th-8th, 10th Floor, Bldg. B1, Zhiyuan,Xueyuan Rd. Xili, Nanshan Shenzhen China
Factory 1	:	Autel Intelligent Technology Corp., Ltd. Guangming Branch
Address	:	7F&6F, East Wing, Building 2, and 6F of Electronical Building, Yanxiang Industrial Zone, Gaoxin Rd, Dongzhou Community of Guangming New District, Shenzhen
Factory 2	:	AUTEL VIETNAM COMPANY LIMITED
Address	:	4th Floor, Factory#6, Land#CN1, An Duong Industrial Zone, Hong Phong Township, An Duong County, Hai Phong, Viet Nam

1.2. Description of Device (EUT)

Product Name	:	ADVANCED DIAGNOSTICS & INFORMATION SYSTEM	
Model No.	:	MaxiSys MS906 Pro	
Trade Mark	:	AUTEL	
Test Power Supply	:	AC 120V, 60Hz for adapter / AC 240V, 60Hz for adapter/ DC 3.85V Battery inside	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	BDR+EDR: 2402-2480MHz WiFi 2.4G: 802.11b/ g/ n(HT20): 2412-2462MHz WiFi 5.1G: 5180MHz~5240MHz WiFi 5.8G: 5745MHz~5825MHz
		Number of Channel:	BDR+EDR: 79 Channels WiFi 2.4G: 11 Channels for 802.11g/ n(HT20) WiFi 5.2G: 4 Channels for 802.11a/n(HT20)/ac(HT20) 2 Channels for 802.11n(HT40)/ac(HT40) 1 Channels for 802.11ac(HT80) WiFi 5.8G: 5 Channels for 802.11a/n(HT20)/ac(HT20) 2 Channels for 802.11n(HT40)/ac(HT40) 1 Channels for 802.11ac(HT80)
		Modulation Type:	BDR+EDR: GFSK, π/4-DQPSK, 8-DPSK WiFi 2.4G: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM

			WiFi 5G: OFDM with BPSK/QPSK/16QAM/64QAM/256QAM
		Antenna Type:	BDR+EDR: Ceramic antenna WiFi 2.4G&WiFi 5.1G&WiFi 5.8G ANT1: PIFA Antenna WiFi 2.4G&WiFi 5.1G&WiFi 5.8G ANT2: PIFA Antenna
		Antenna Gain(Peak):	BDR+EDR: 0dBi WiFi 2.4G ANT 1: 3.4dBi WiFi 2.4G ANT 2: 3.4dBi WiFi 5.1G ANT 1: 3.4dBi WiFi 5.1G ANT 2: 3.4dBi WiFi 5.8G ANT 1: 3.4 dBi WiFi 5.8G ANT 2: 3.4dBi
		Directional Gain:	WiFi 2.4G: 6.41dBi WiFi 5.1G: 6.41dBi WiFi 5.8G: 6.41dBi
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 5.8G WiFi module.			

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/ac20)	CH 149	5745MHz
	CH 157	5785MHz
	CH 165	5825MHz
OFDM(802.11n40/ac40)	CH 151	5755MHz
	CH 159	5795MHz
OFDM(802.11ac80)	CH 155	5775MHz

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/ac20

Channel	Freq. (MHz)	Channel	Freq. (MHz)
149	5745	153	5765
157	5785	161	5805
165	5825		

802.11n40/ac40

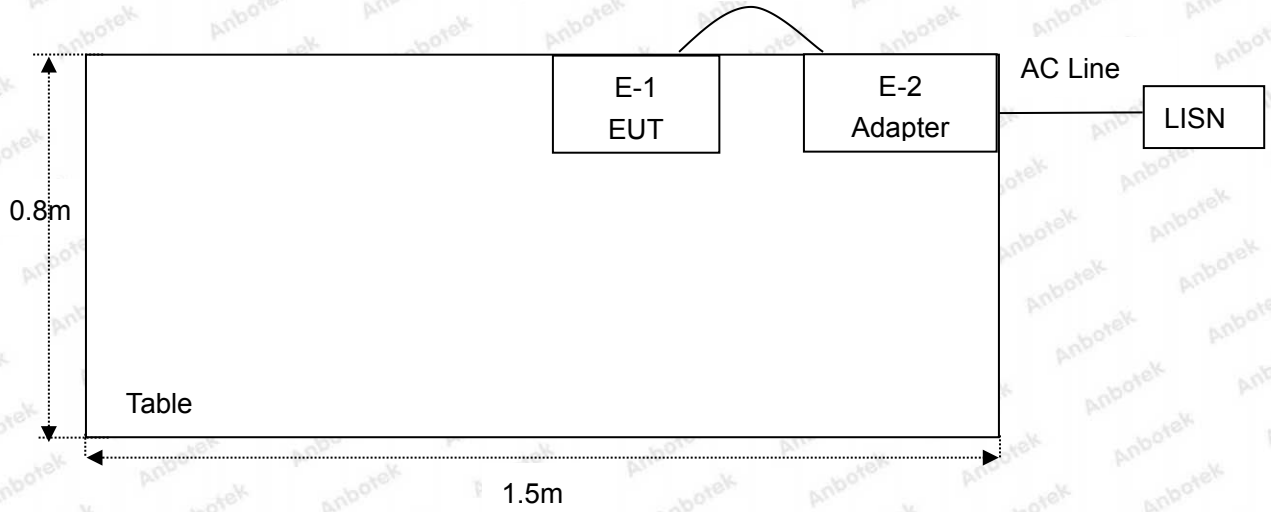
Channel	Freq. (MHz)	Channel	Freq. (MHz)
151	5755	159	5795

802.11ac80

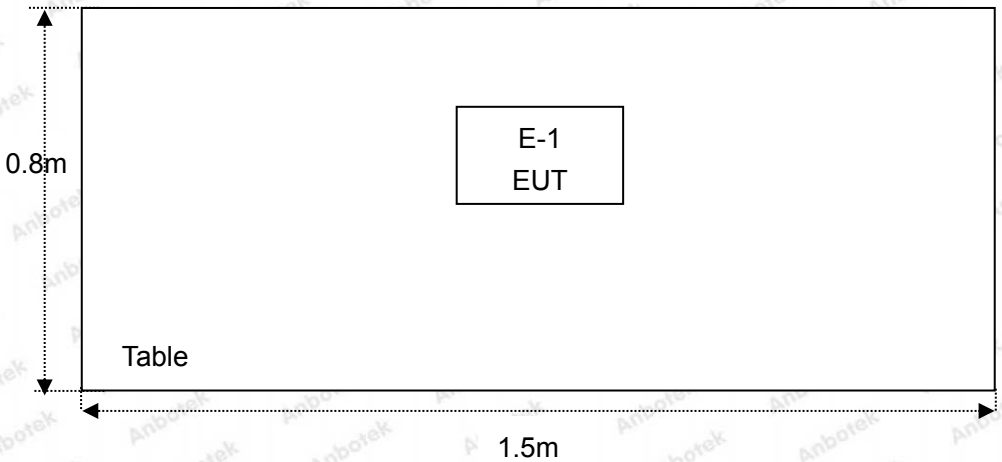
Channel	Freq. (MHz)
155	5775

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	Oct. 26, 2020	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 26, 2020	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 26, 2020	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 26, 2020	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 26, 2020	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 02, 2020	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 02, 2020	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 02, 2020	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 02, 2020	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 26, 2020	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	Oct. 26, 2020	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 26, 2020	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 26, 2020	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 26, 2020	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 26, 2020	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 26, 2020	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 26, 2020	1 Year

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500 www.anbotek.com

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

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 registered 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, September 30, 2020.

ISED-Registration No.: 8058A

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, September 30, 2020.

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

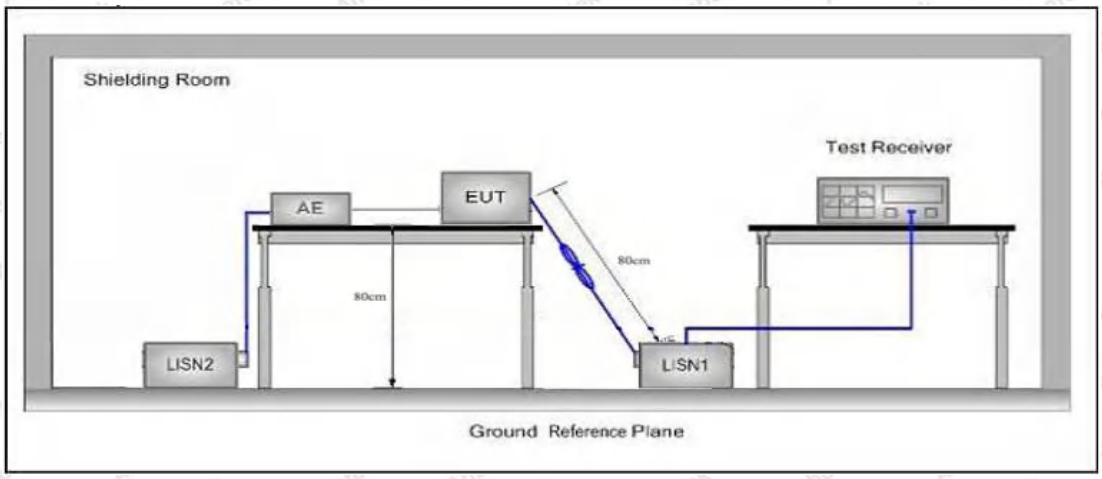
Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)&15.407(e)	Occupy Bandwidth	PASS
15.407(a)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)(3)	Peak Power Spectral Density	PASS
15.203	Antenna Requirement	PASS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

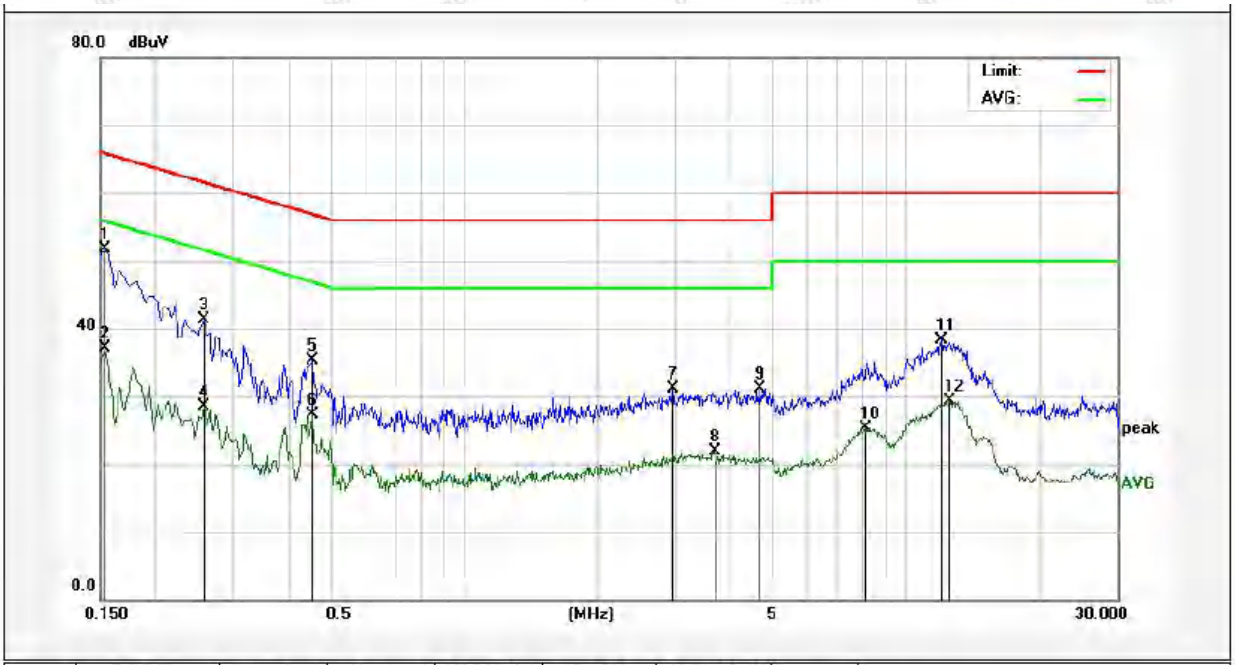
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

During the test, pre-scan all modes, and found the 802.11ac(HT40) CH 151 for ANT1+2 which is the worst case, only the worst case is recorded in the report.

Conducted Emission Test Data

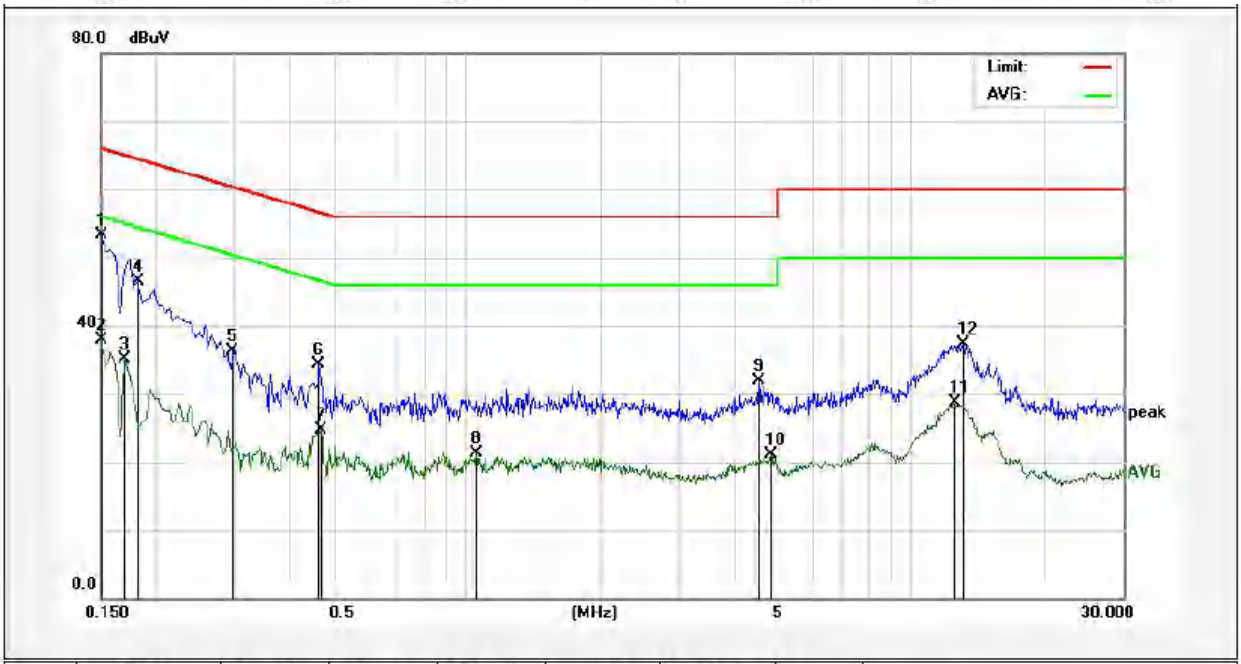
Test Site: 1# Shielded Room
Operating Condition: 802.11ac(HT40) CH 151 for ANT1+2
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.: 21.6℃ Hum.: 50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	31.80	19.90	51.70	65.78	-14.08	QP	
2	0.1539	17.27	19.90	37.17	55.78	-18.61	AVG	
3	0.2580	21.35	19.89	41.24	61.49	-20.25	QP	
4	0.2580	8.69	19.89	28.58	51.49	-22.91	AVG	
5	0.4540	15.31	19.96	35.27	56.80	-21.53	QP	
6	0.4540	7.43	19.96	27.39	46.80	-19.41	AVG	
7	2.9620	11.04	20.16	31.20	56.00	-24.80	QP	
8	3.6780	1.68	20.17	21.85	46.00	-24.15	AVG	
9	4.6860	11.00	20.20	31.20	56.00	-24.80	QP	
10	8.0940	4.98	20.29	25.27	50.00	-24.73	AVG	
11	12.0460	17.92	20.31	38.23	60.00	-21.77	QP	
12	12.5620	8.98	20.30	29.28	50.00	-20.72	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: 802.11ac(HT40) CH 151 for ANT1+2
Test Specification: AC 120V, 60Hz for adapter
Comment: Neutral Line
Tem.: 21.6℃ Hum.: 50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1500	33.50	19.90	53.40	65.99	-12.59	QP	
2	0.1500	17.93	19.90	37.83	55.99	-18.16	AVG	
3	0.1700	15.16	19.90	35.06	54.96	-19.90	AVG	
4	0.1819	26.66	19.90	46.56	64.39	-17.83	QP	
5	0.2980	16.48	19.89	36.37	60.30	-23.93	QP	
6	0.4660	14.33	19.96	34.29	56.58	-22.29	QP	
7	0.4700	4.67	19.97	24.64	46.51	-21.87	AVG	
8	1.0540	1.27	20.12	21.39	46.00	-24.61	AVG	
9	4.5300	11.75	20.19	31.94	56.00	-24.06	QP	
10	4.8340	0.99	20.20	21.19	46.00	-24.81	AVG	
11	12.4580	8.45	20.30	28.75	50.00	-21.25	AVG	
12	13.0620	16.95	20.29	37.24	60.00	-22.76	QP	

Conducted Emission Test Data

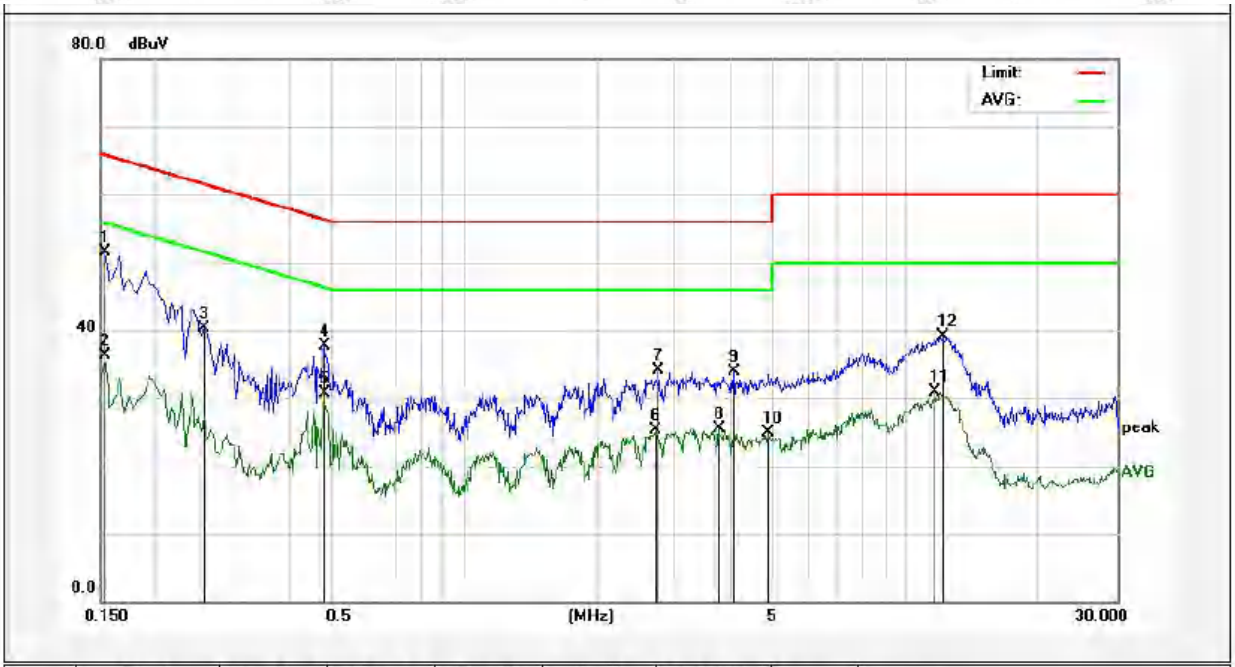
Test Site: 1# Shielded Room

Operating Condition: 802.11ac(HT40) CH 151 for ANT1+2

Test Specification: AC 240V, 60Hz for adapter

Comment: Live Line

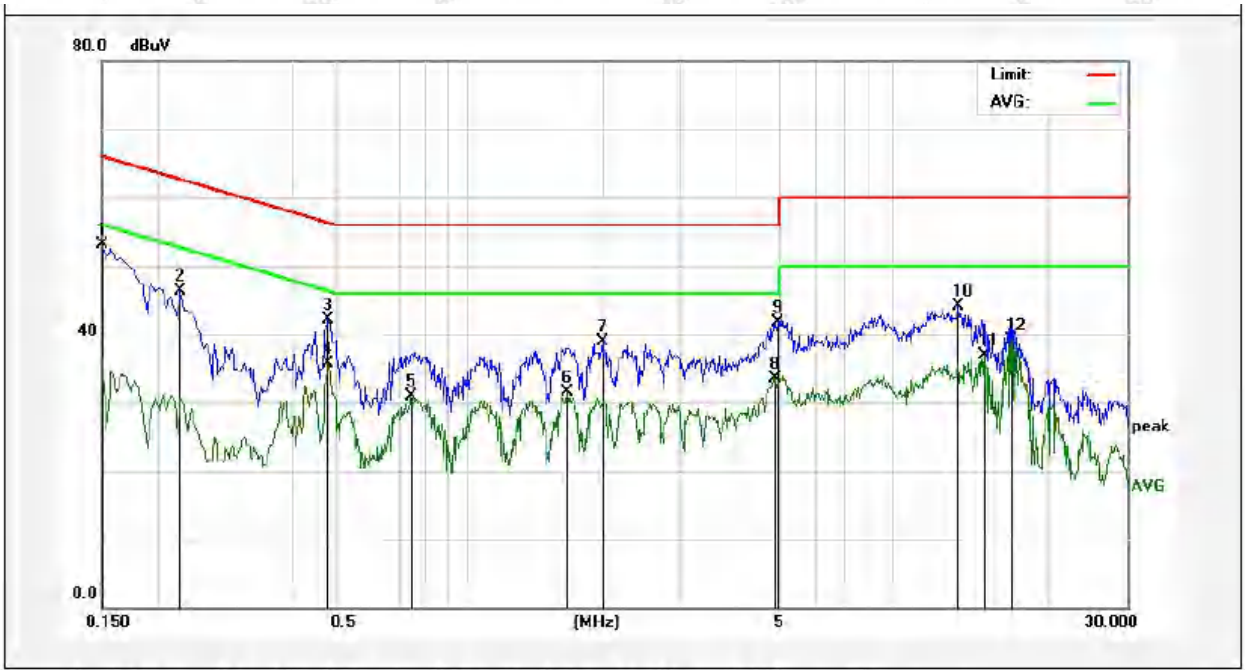
Tem.: 21.6℃ Hum.: 50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	31.69	19.90	51.59	65.78	-14.19	QP	
2	0.1539	16.38	19.90	36.28	55.78	-19.50	AVG	
3	0.2580	20.50	19.89	40.39	61.49	-21.10	QP	
4	0.4820	17.81	19.97	37.78	56.30	-18.52	QP	
5	0.4820	10.83	19.97	30.80	46.30	-15.50	AVG	
6	2.7180	5.22	20.15	25.37	46.00	-20.63	AVG	
7	2.7620	13.86	20.16	34.02	56.00	-21.98	QP	
8	3.7740	5.26	20.18	25.44	46.00	-20.56	AVG	
9	4.0899	13.63	20.18	33.81	56.00	-22.19	QP	
10	4.8659	4.64	20.20	24.84	46.00	-21.16	AVG	
11	11.6819	10.53	20.31	30.84	50.00	-19.16	AVG	
12	12.0899	18.86	20.31	39.17	60.00	-20.83	QP	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: 802.11ac(HT40) CH 151 for ANT1+2
Test Specification: AC 240V, 60Hz for adapter
Comment: Neutral Line
Tem.: 21.6℃ Hum.: 50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1500	33.28	19.90	53.18	65.99	-12.81	QP	
2	0.2260	26.48	19.89	46.37	62.59	-16.22	QP	
3	0.4860	22.20	19.97	42.17	56.24	-14.07	QP	
4	0.4860	15.69	19.97	35.66	46.24	-10.58	AVG	
5	0.7420	10.81	20.05	30.86	46.00	-15.14	AVG	
6	1.6660	11.43	20.13	31.56	46.00	-14.44	AVG	
7	1.9940	18.70	20.14	38.84	56.00	-17.16	QP	
8	4.8460	13.35	20.20	33.55	46.00	-12.45	AVG	
9	4.9420	21.42	20.20	41.62	56.00	-14.38	QP	
10	12.5540	23.77	20.30	44.07	60.00	-15.93	QP	
11	14.4060	16.64	20.27	36.91	50.00	-13.09	AVG	
12	16.5100	18.81	20.28	39.09	50.00	-10.91	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

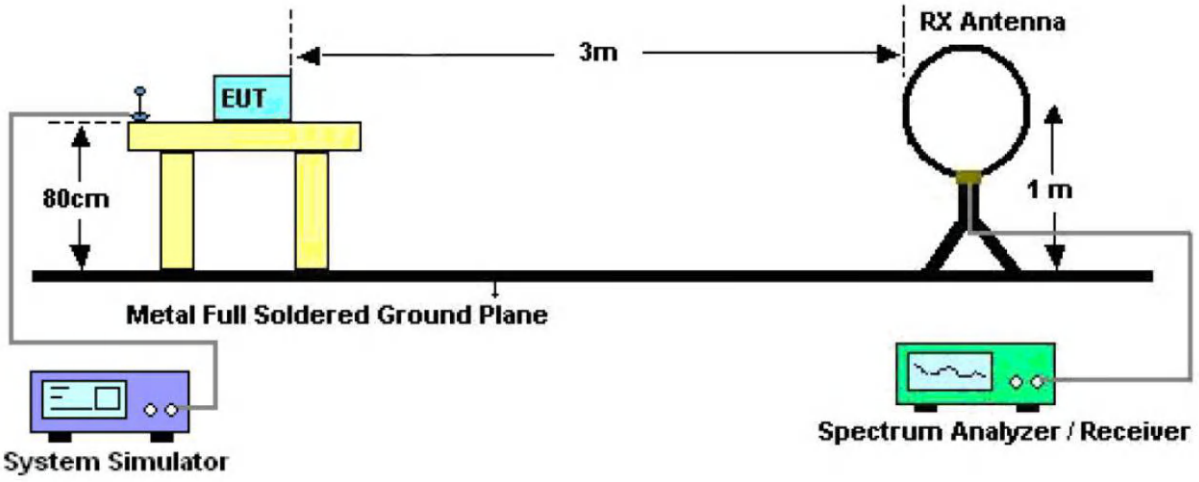


Figure 1. Below 30MHz

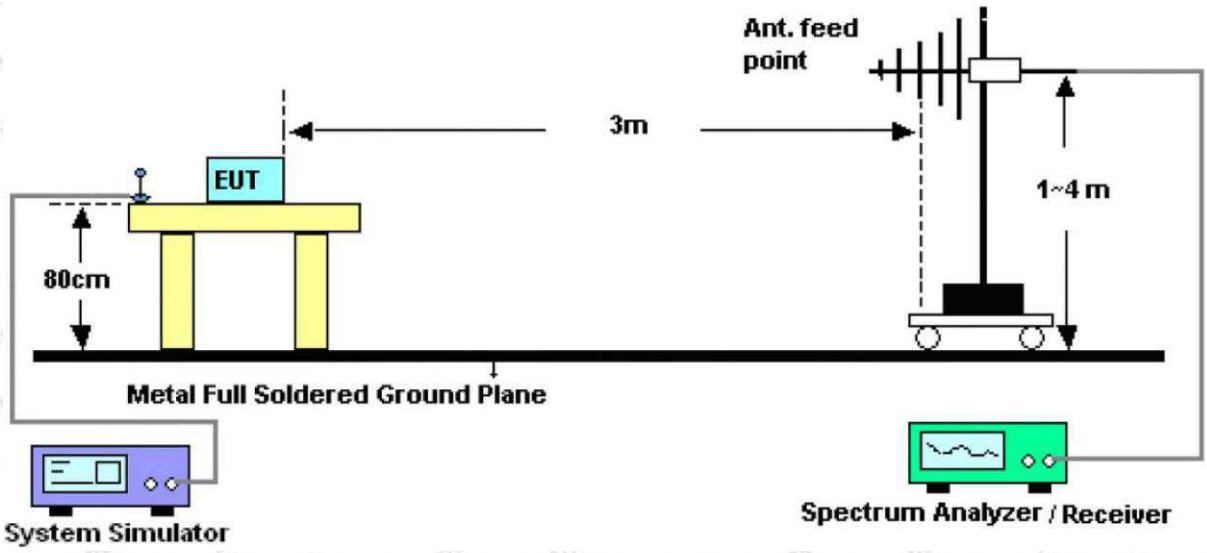


Figure 2. 30MHz to 1GHz

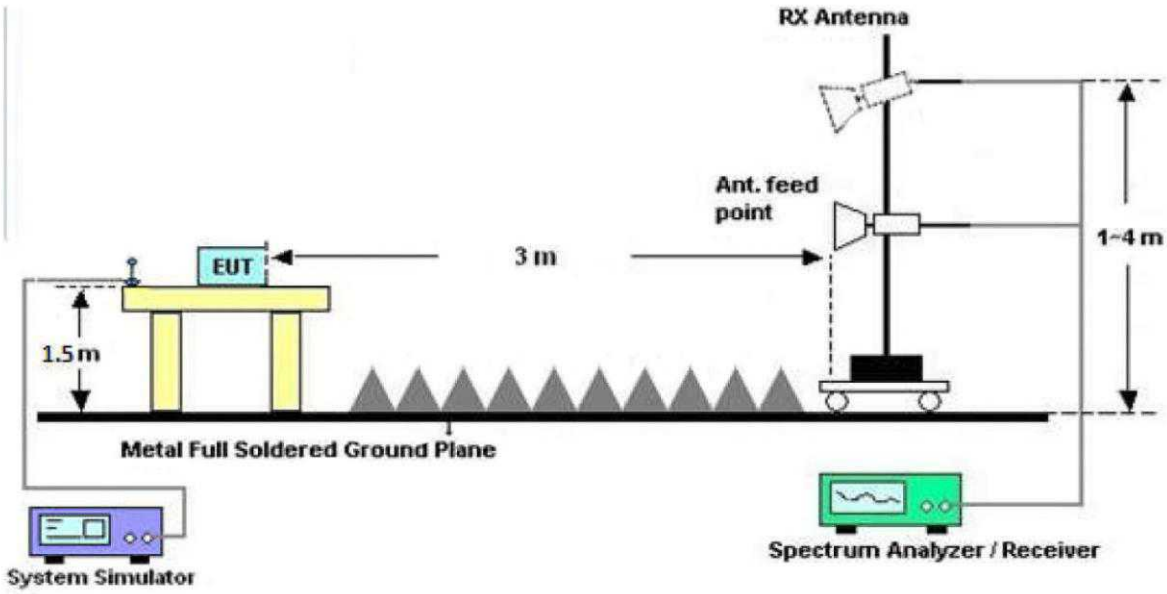


Figure 3. Above 1 GHz

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.

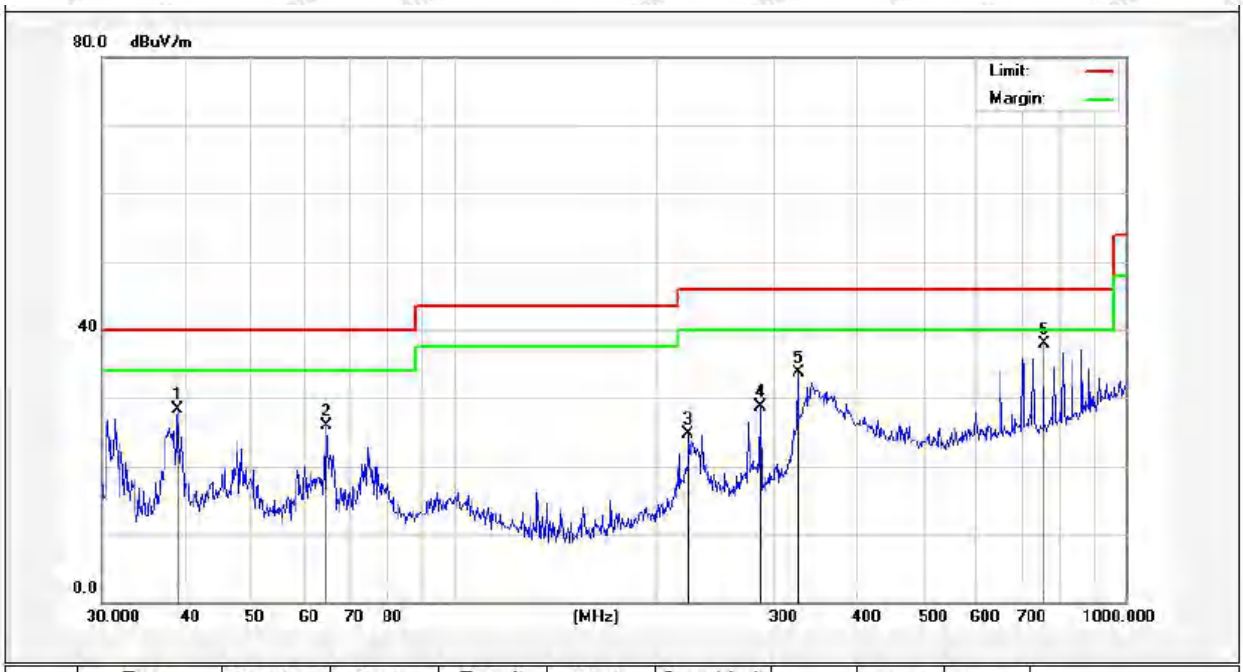
Test Results (30~1000MHz)

Test Mode:	802.11ac(HT40) CH 151 for ANT1+2
Power Source:	AC 120V, 60Hz for adapter
Polarization:	Vertical
Temp.(℃)/Hum.(%RH):	22.5℃/50%RH

No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	30.5306	49.47	-17.10	32.37	40.00	-7.63	QP	100	360	
2	39.4371	40.87	-13.88	26.99	40.00	-13.01	QP	100	0	
3	64.6594	44.61	-17.85	26.76	40.00	-13.24	QP	100	360	
4	651.9417	40.97	-6.79	34.18	46.00	-11.82	QP	100	0	
5	755.3873	39.15	-5.11	34.04	46.00	-11.96	QP	100	360	
6	860.0352	36.62	-2.88	33.74	46.00	-12.26	QP	100	0	

Test Results (30~1000MHz)

Test Mode:	802.11ac(HT40) CH 151 for ANT1+2
Power Source:	AC 120V, 60Hz for adapter
Polarization:	Horizontal
Temp.(℃)/Hum.(%RH):	22.5℃/50%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	38.8878	43.85	-15.61	28.24	40.00	-11.76	QP	100	360	
2	64.6594	43.75	-17.85	25.90	40.00	-14.10	QP	100	0	
3	223.7334	44.03	-19.38	24.65	46.00	-21.35	QP	100	360	
4	285.9778	44.21	-15.57	28.64	46.00	-17.36	QP	100	0	
5	325.5958	47.39	-13.63	33.76	46.00	-12.24	QP	100	360	
6	755.3873	42.98	-5.11	37.87	46.00	-8.13	QP	100	0	

Note: During the test, pre-scan all modes, and found the 802.11ac(HT40) CH 151 for ANT1+2 which is the worst case, only the worst case is recorded in the report.

Test Results (Above 1000MHz)

ANT 1+2:

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.
11490.00	40.20	31.98	17.08	33.91	55.35	68.20	-12.85	V
17235.00	40.72	32.65	20.03	34.85	58.55	68.20	-9.65	V
11490.00	41.96	31.98	17.08	33.91	57.11	68.20	-11.09	H
17235.00	40.11	32.65	20.03	34.85	57.94	68.20	-10.26	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.
11490.00	29.96	31.98	17.08	33.91	45.11	54.00	-8.89	V
17235.00	28.41	32.65	20.03	34.85	46.24	54.00	-7.76	V
11490.00	28.29	31.98	17.08	33.91	43.44	54.00	-10.56	H
17235.00	27.63	32.65	20.03	34.85	45.46	54.00	-8.54	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.
11650.00	41.84	32.59	18.02	33.92	58.53	68.20	-9.67	V
17475.00	40.82	32.87	20.15	34.88	58.96	68.20	-9.24	V
11650.00	40.28	32.59	18.02	33.92	56.97	68.20	-11.23	H
17475.00	41.71	32.87	20.15	34.88	59.85	68.20	-8.35	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.
11650.00	29.20	32.59	18.02	33.92	45.89	54.00	-8.11	V
17475.00	29.46	32.87	20.15	34.88	47.60	54.00	-6.40	V
11650.00	28.52	32.59	18.02	33.92	45.21	54.00	-8.79	H
17475.00	28.59	32.87	20.15	34.88	46.73	54.00	-7.27	H

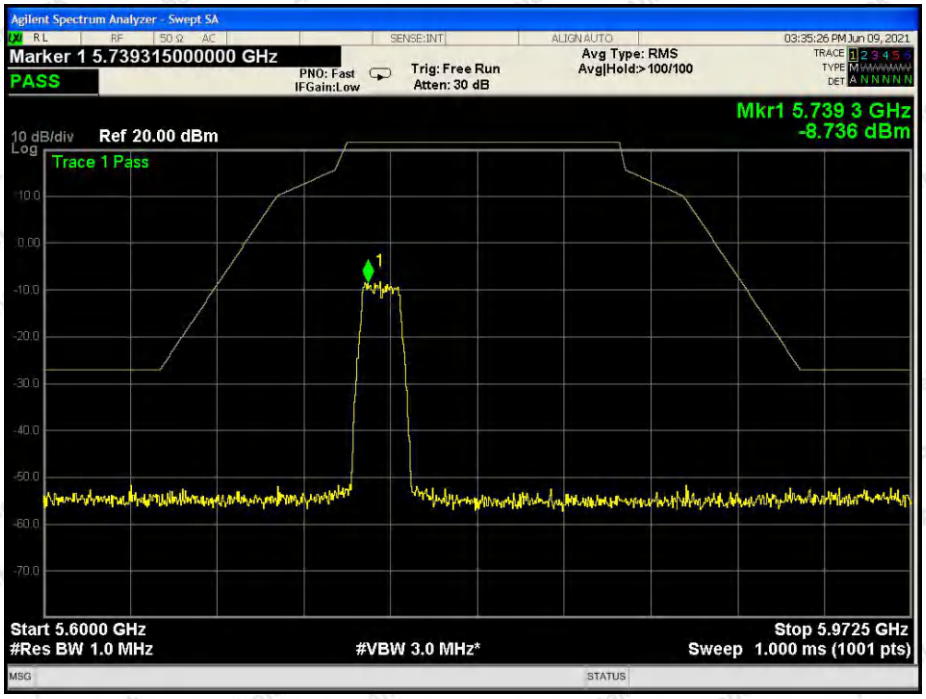
Remark:

1. During the test, pre-scan the 802.11a,n(HT20),ac(HT20),n(HT40),ac(HT40),ac(HT80) mode, and found the 802.11ac(HT40) (ANT1+ANT2) mode is worse case , the report only record this mode.

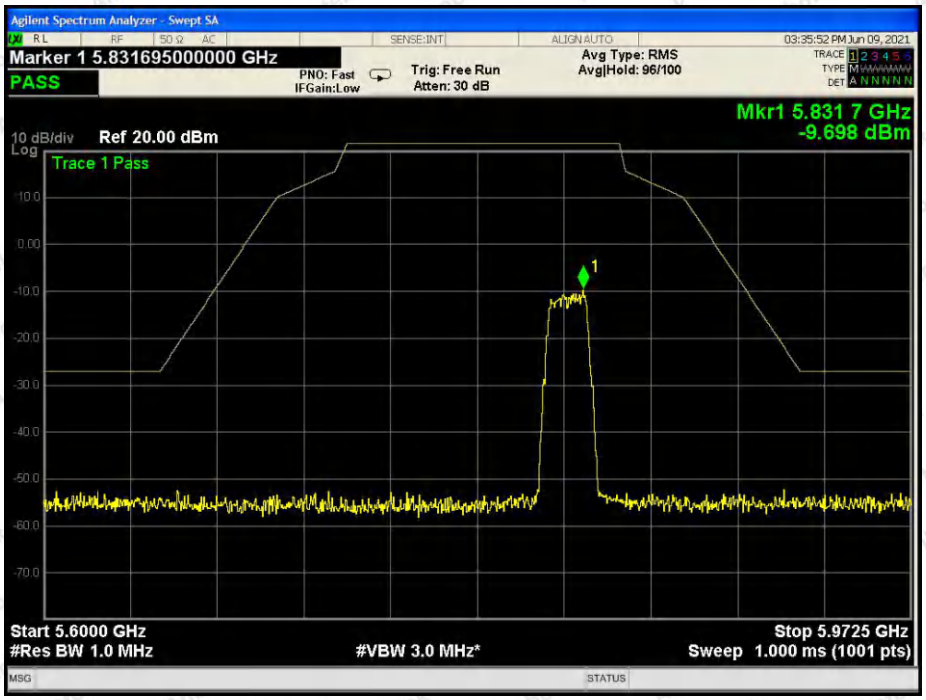
2. Final Level =Receiver Read level + Antenna Factor + Cable Loss–Preamplifier Factor

ANT1

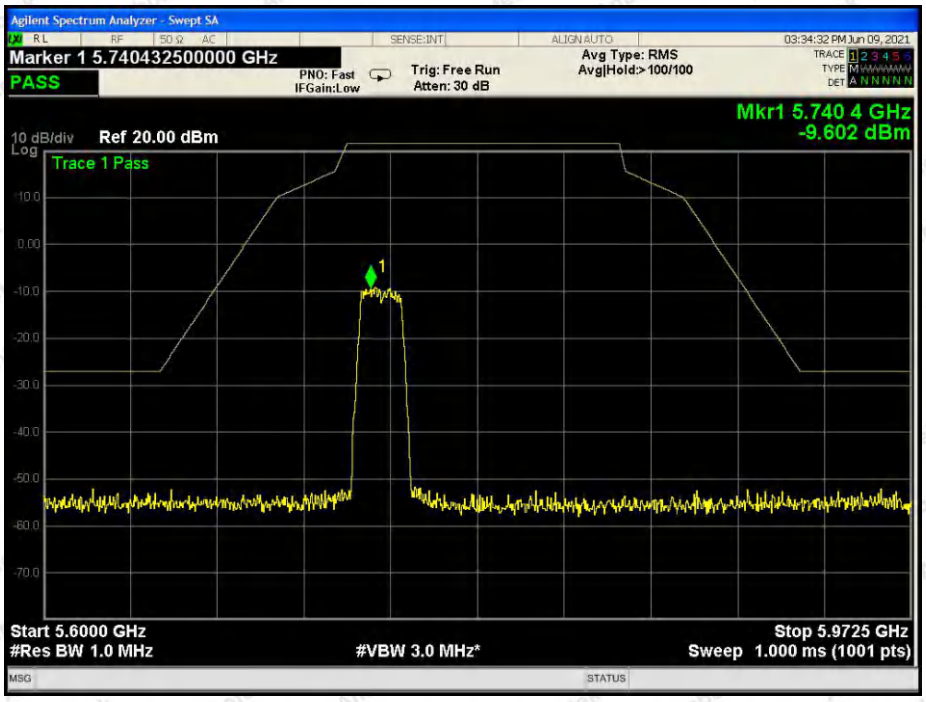
Band Edge test:



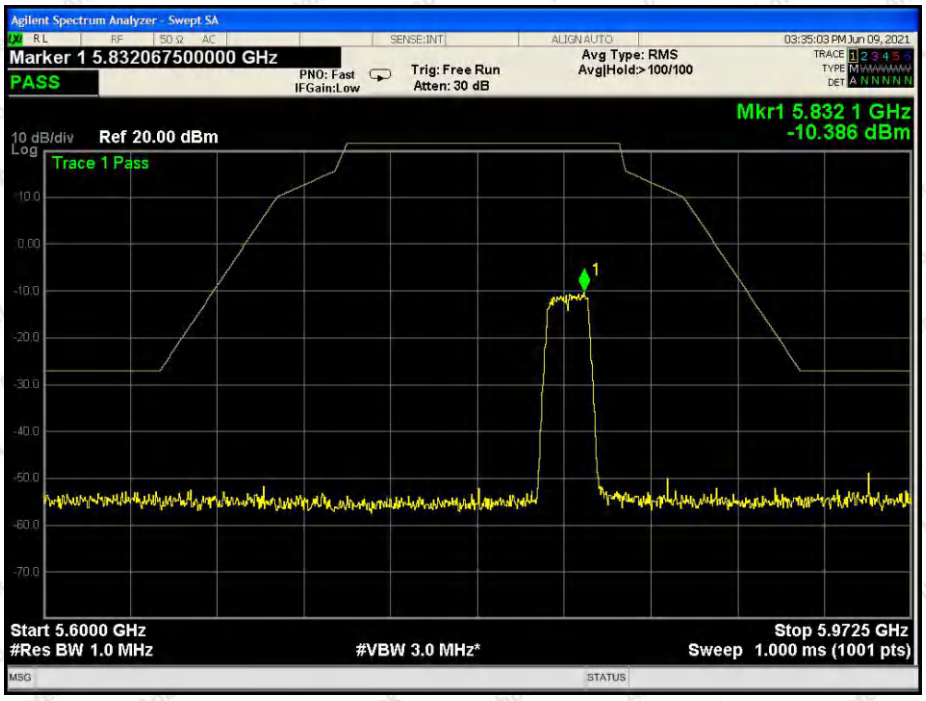
802.11a: Band Edge, Left Side



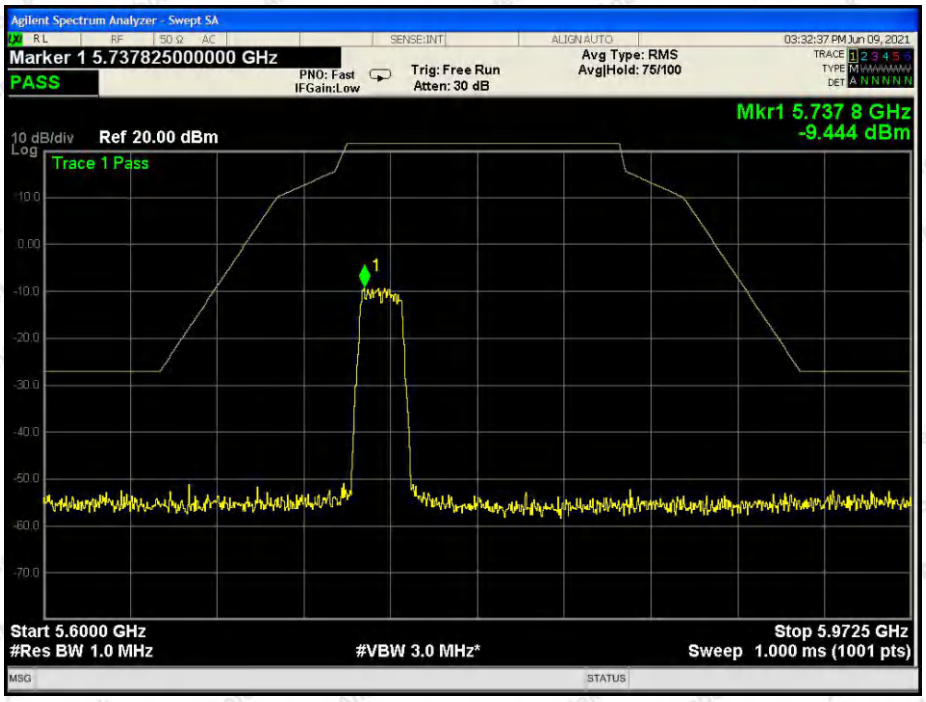
802.11a: Band Edge, Right Side



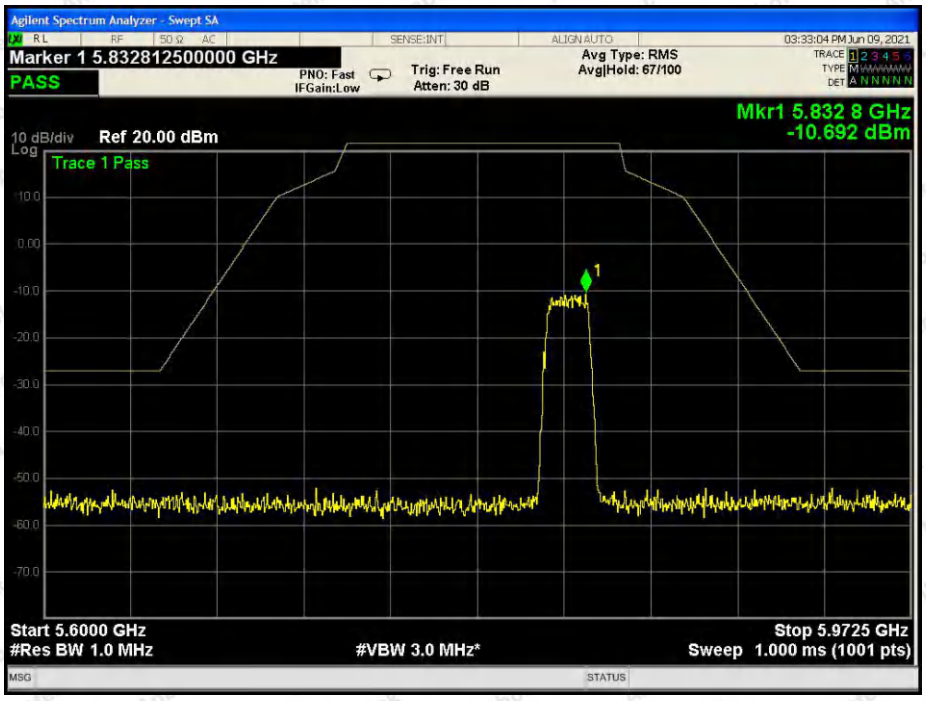
802.11n(20): Band Edge, Left Side



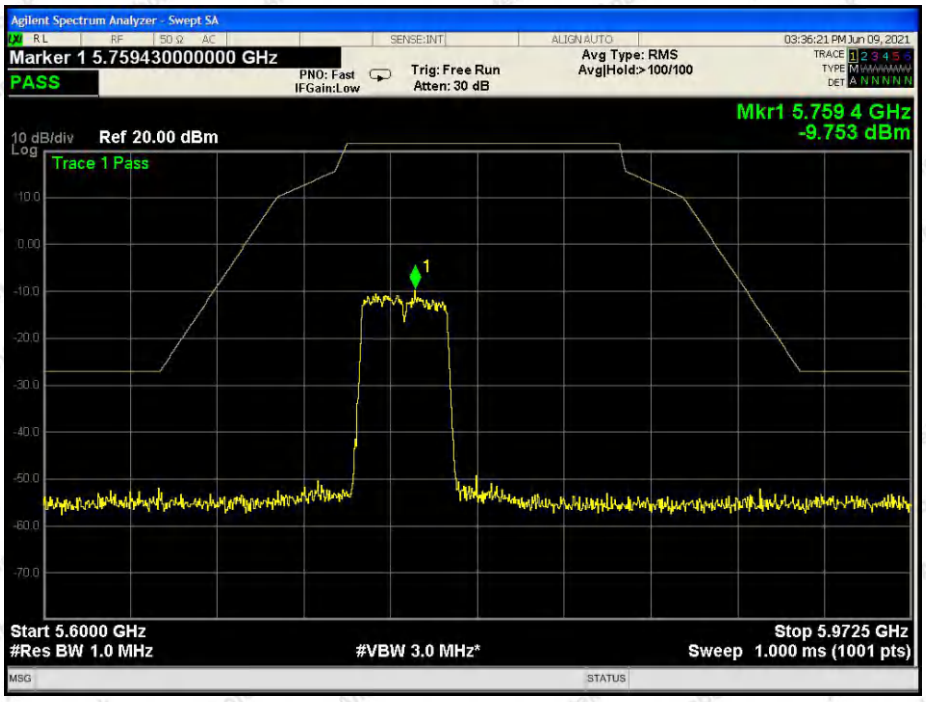
802.11n(20): Band Edge, Right Side



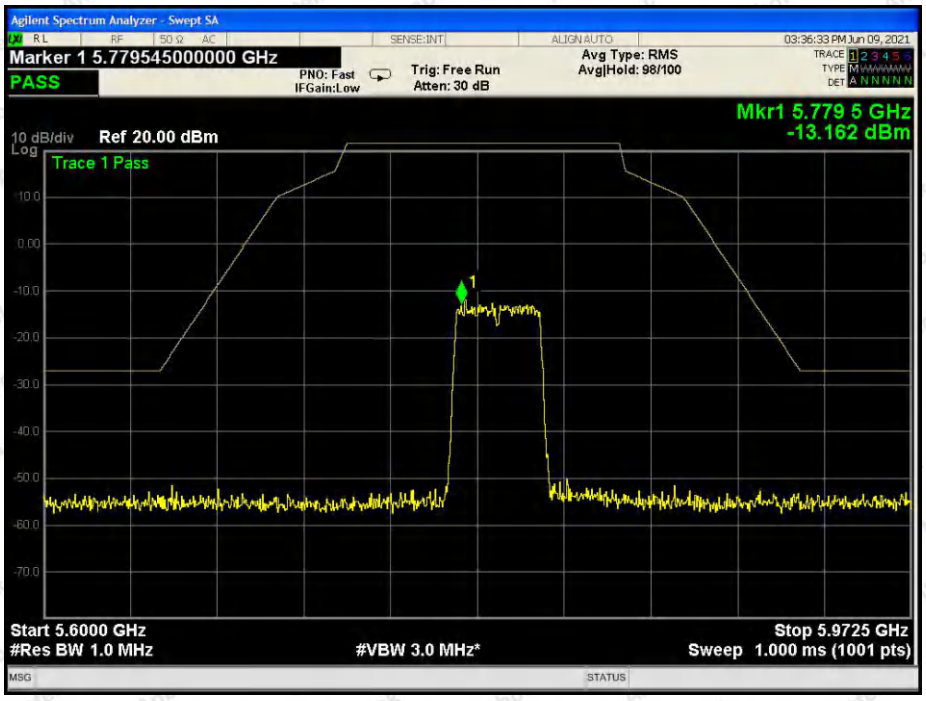
802.11ac(20): Band Edge, Left Side



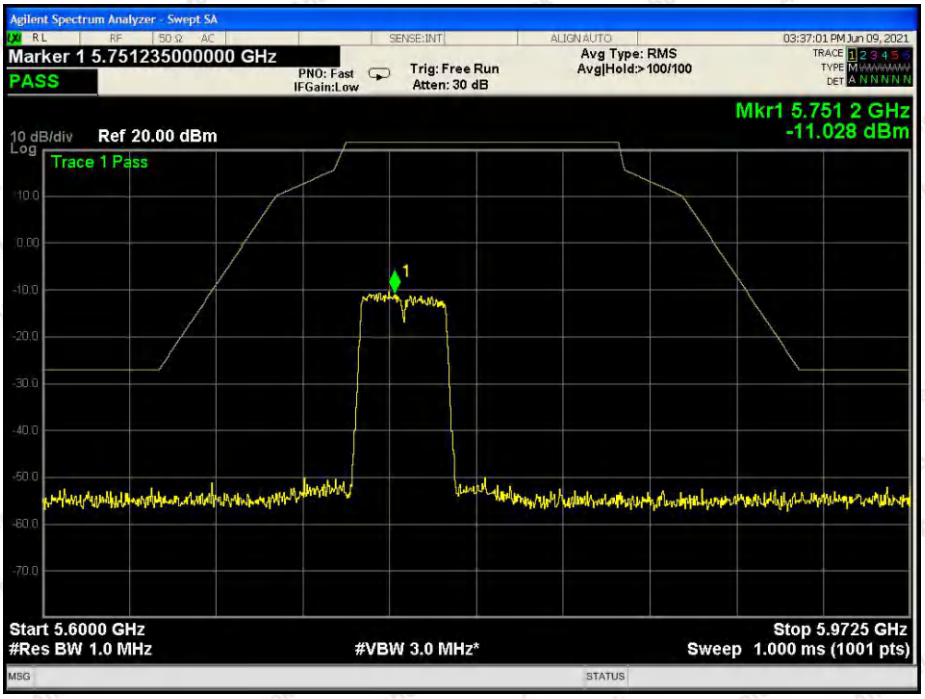
802.11ac(20): Band Edge, Right Side



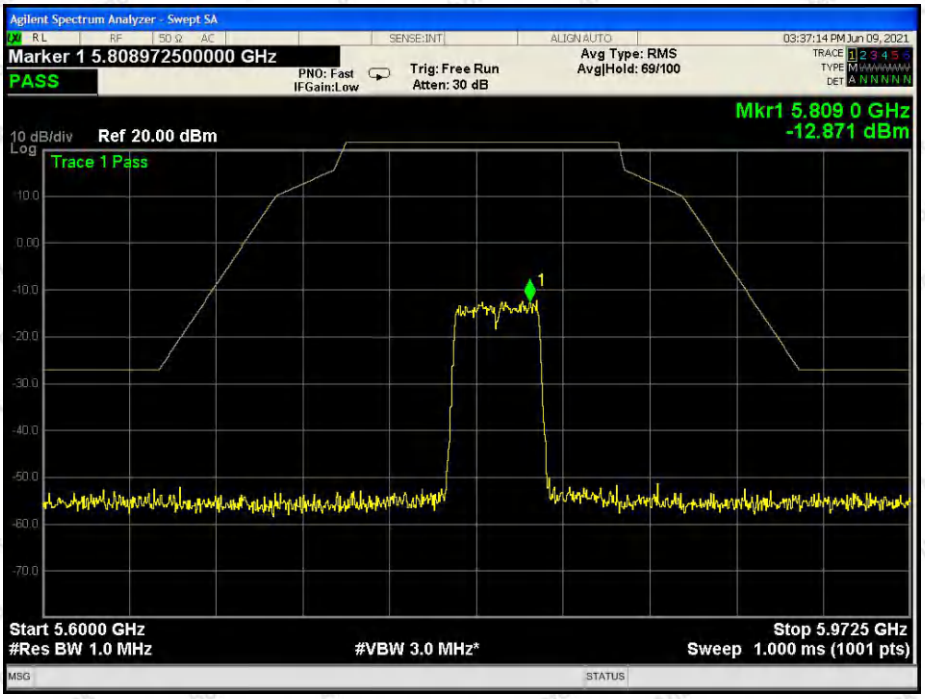
802.11n(40): Band Edge, Left Side



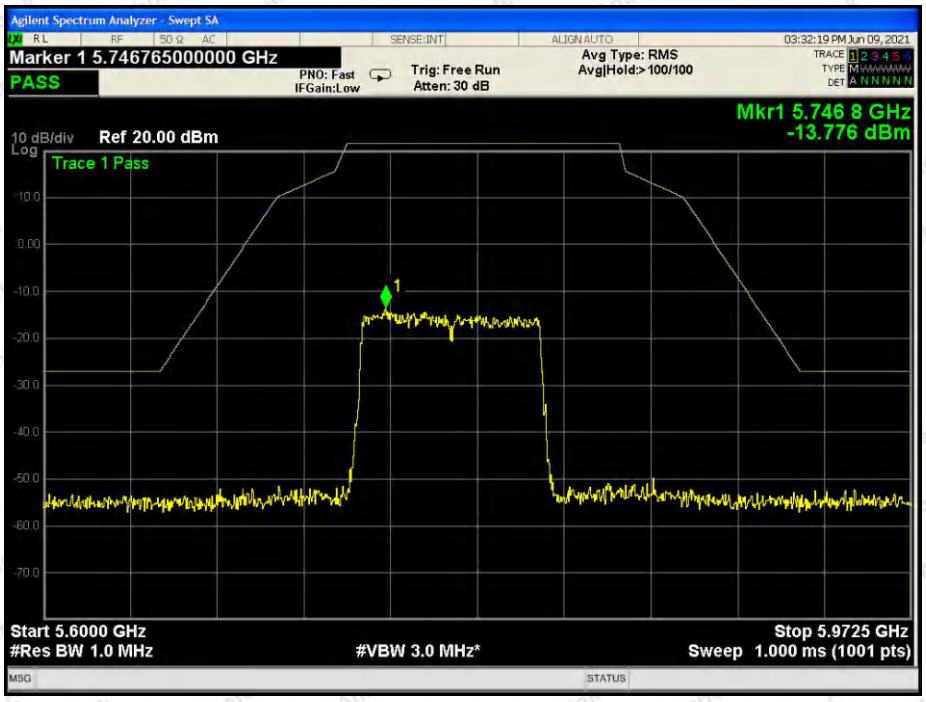
802.11n(40): Band Edge, Right Side



802.11ac(40): Band Edge, Left Side



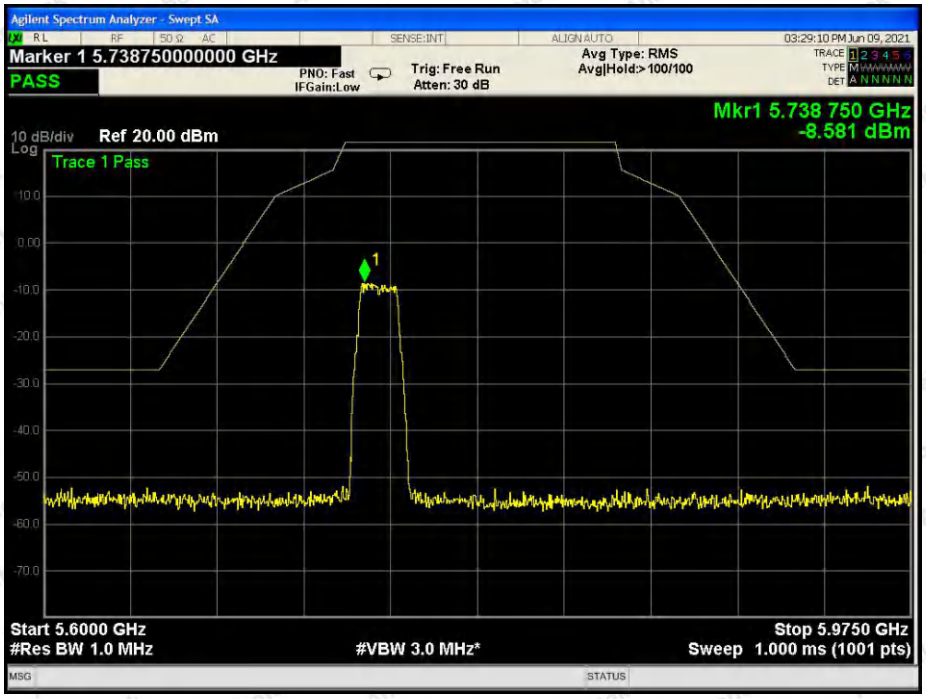
802.11ac(40): Band Edge, Right Side



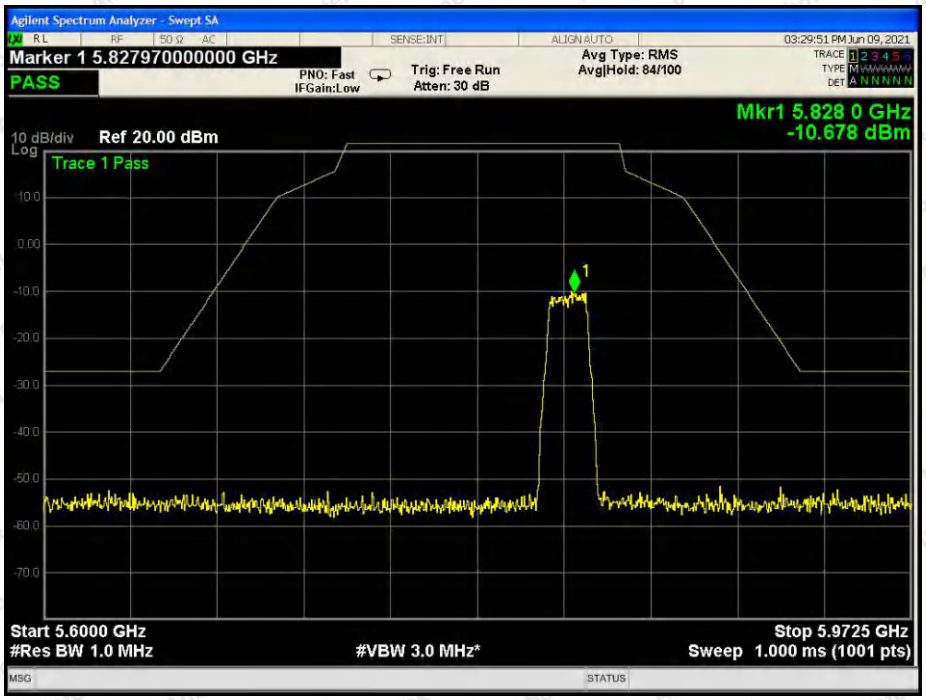
802.11ac(80): Band Edge

ANT2

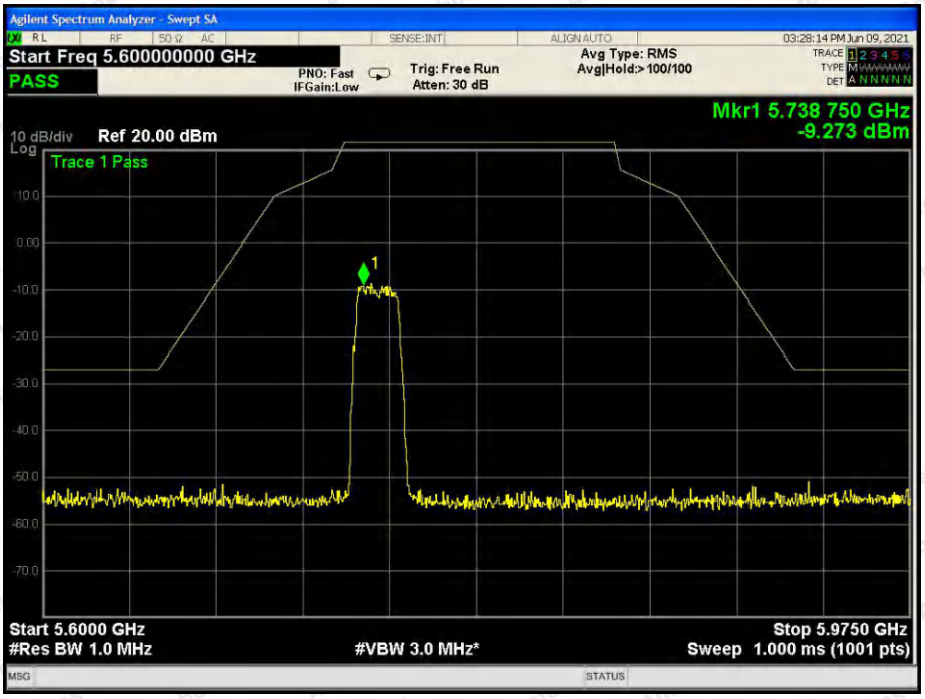
Band Edge test:



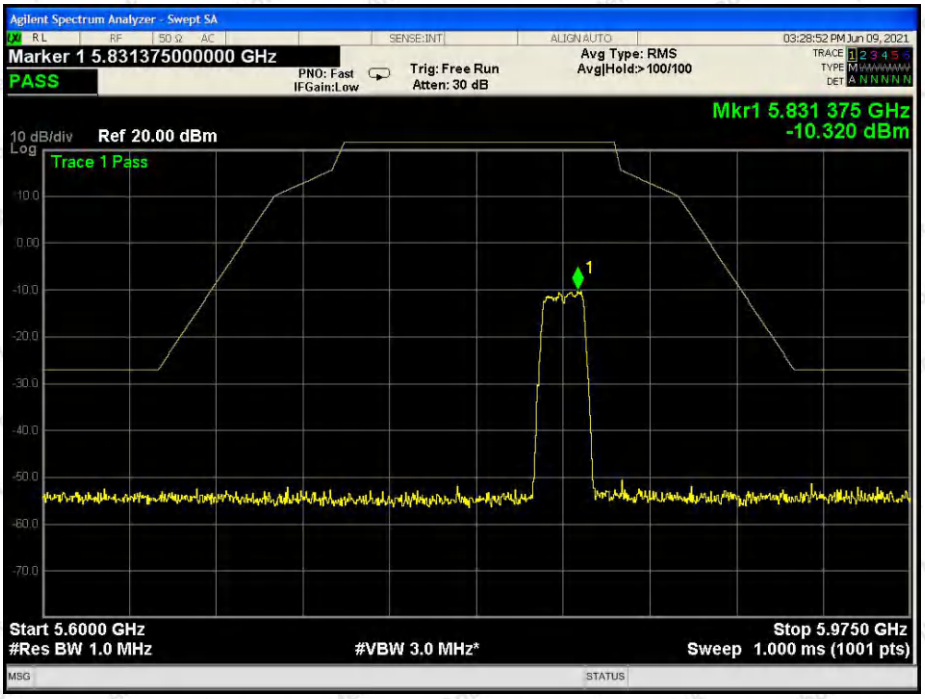
802.11a: Band Edge, Left Side



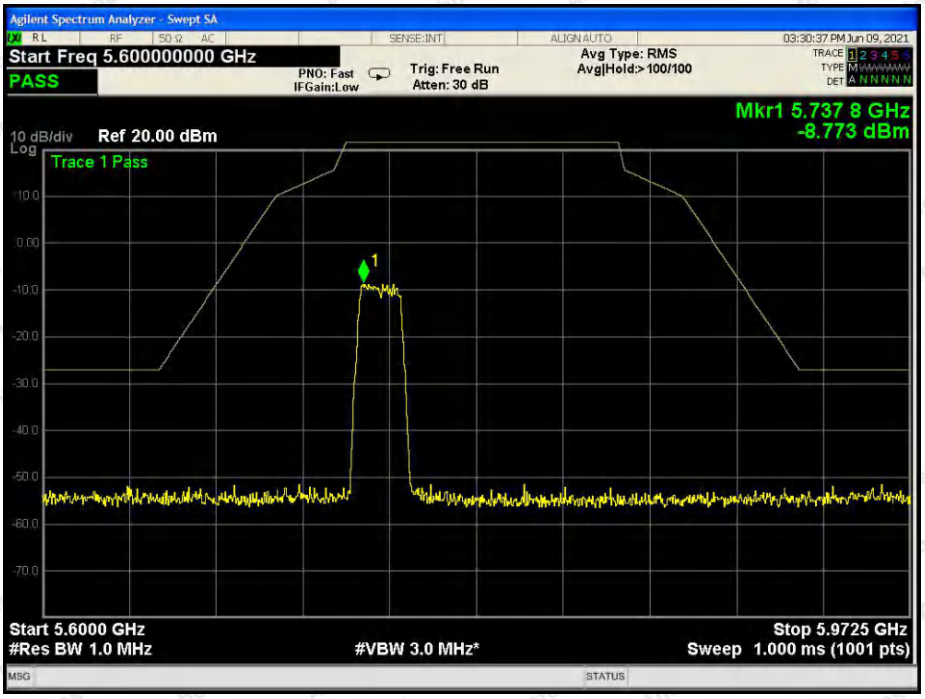
802.11a: Band Edge, Right Side



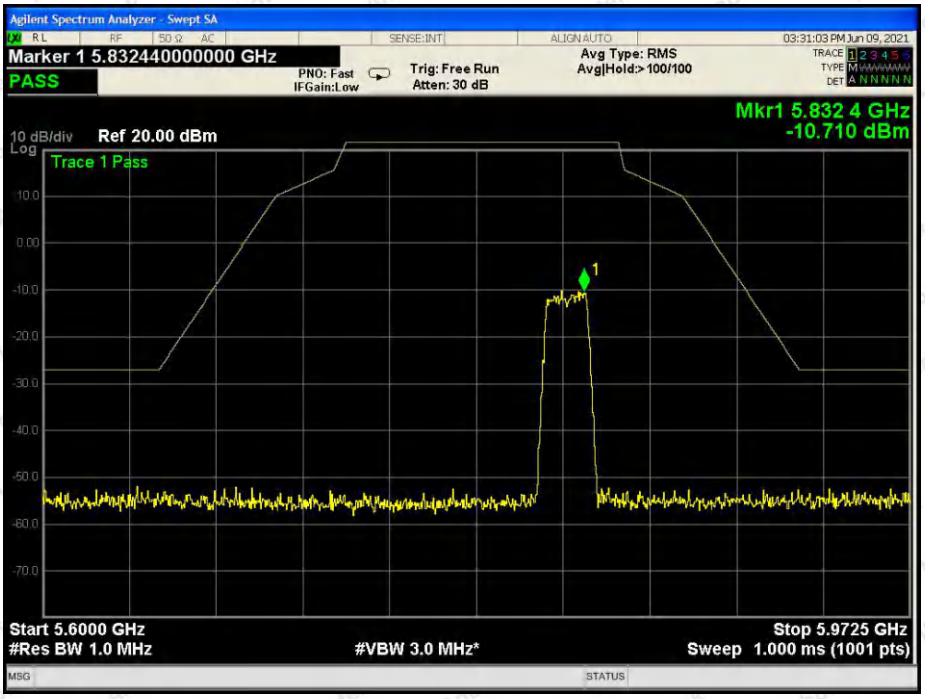
802.11n(20): Band Edge, Left Side



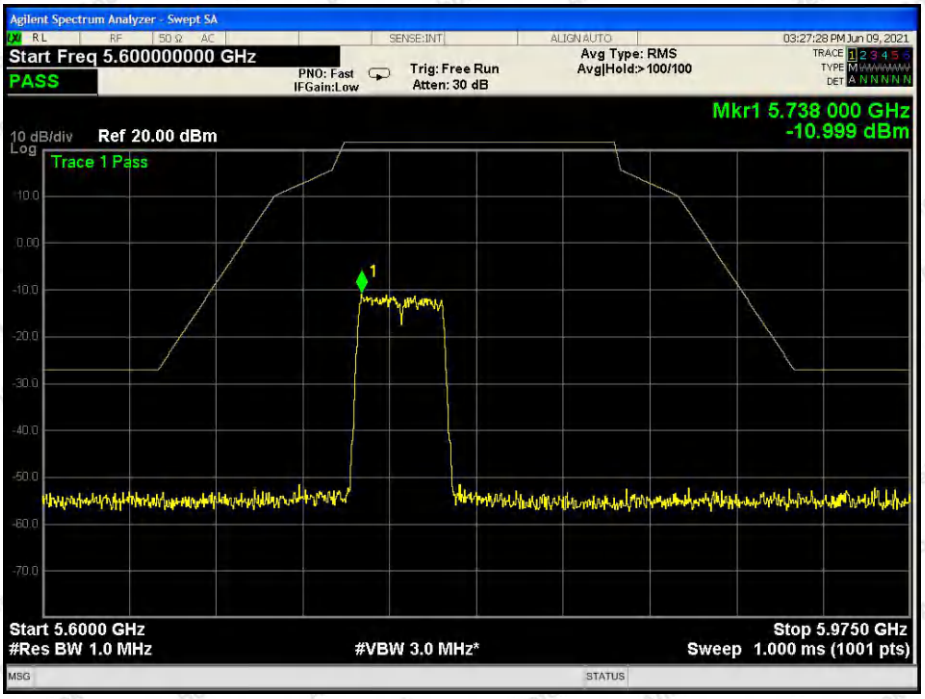
802.11n(20): Band Edge, Right Side



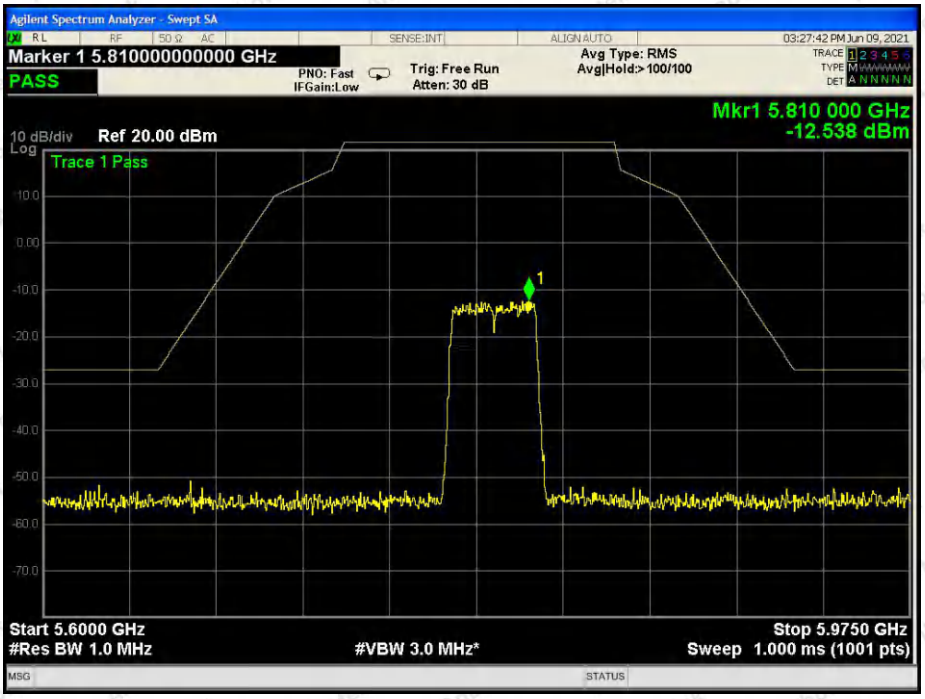
802.11ac(20): Band Edge, Left Side



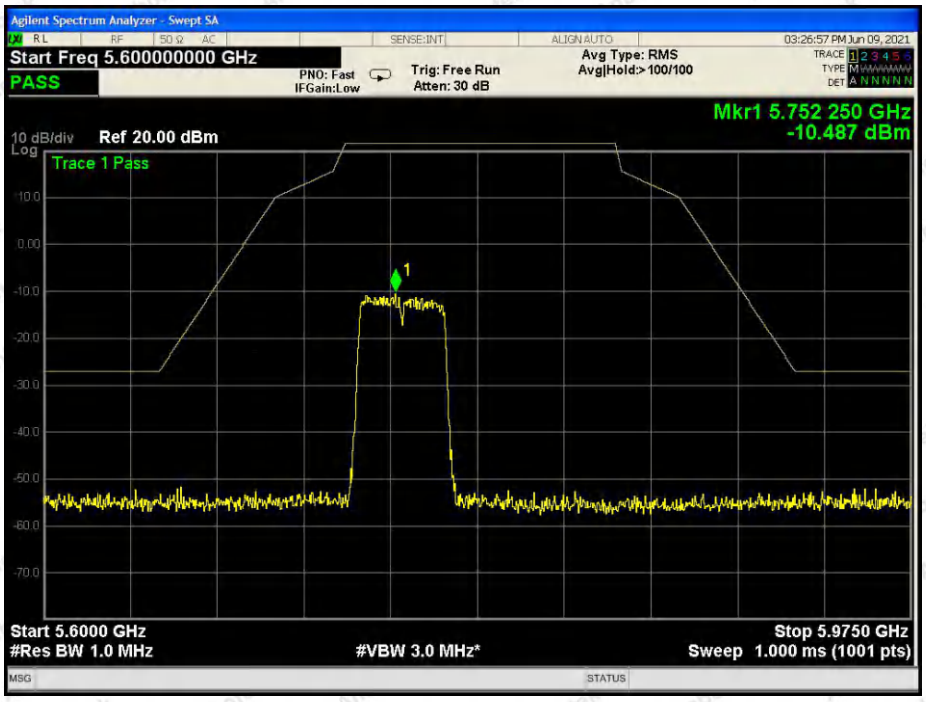
802.11ac(20): Band Edge, Right Side



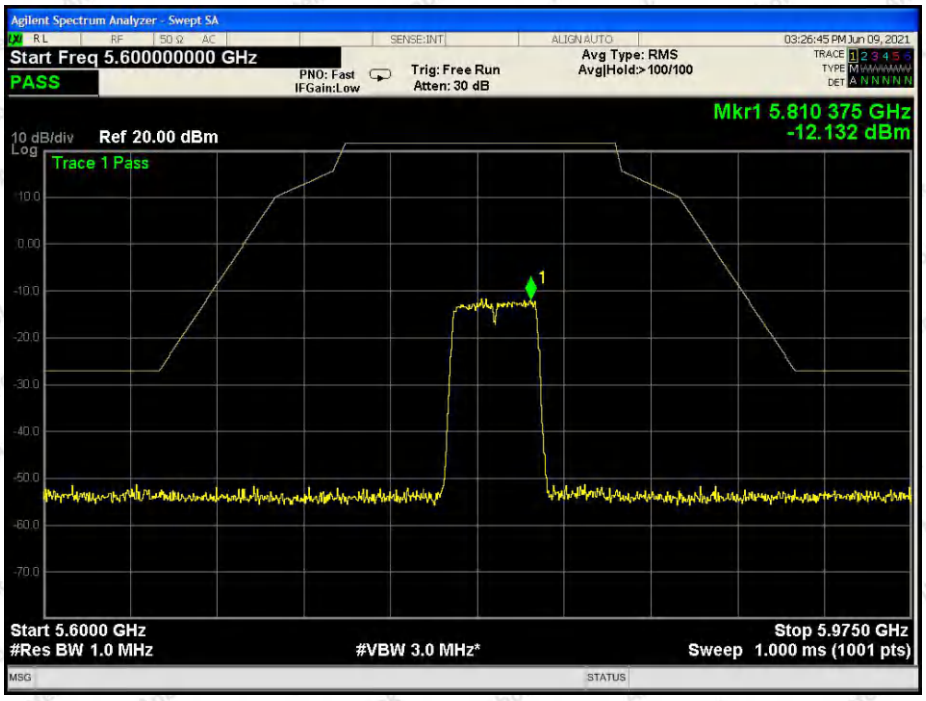
802.11n(40): Band Edge, Left Side



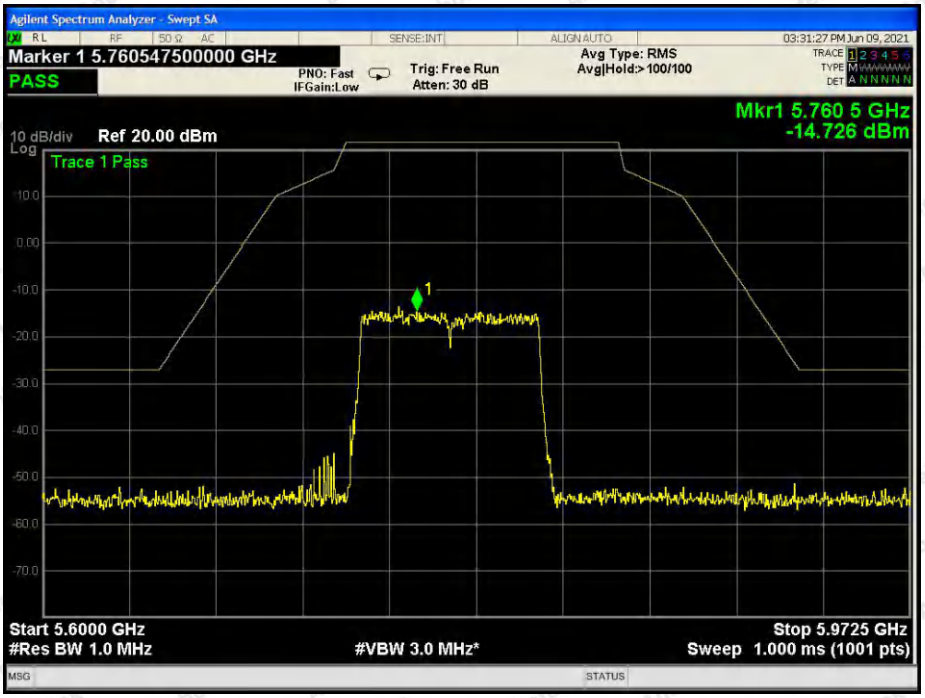
802.11n(40): Band Edge, Right Side



802.11ac(40): Band Edge, Left Side



802.11ac(40): Band Edge, Right Side



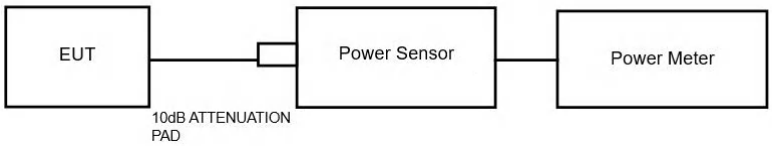
802.11ac(80): Band Edge

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a) (3)
Test Limit	30dBm

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 3.85V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

ANT1:

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Correctional Limit (dBm)	Results
802.11a	5745	4.14	30	PASS
	5785	2.81	30	PASS
	5825	2.92	30	PASS
802.11n20	5745	4.03	30	PASS
	5785	2.46	30	PASS
	5825	2.74	30	PASS
802.11ac20	5745	4.16	30	PASS
	5785	2.64	30	PASS
	5825	2.46	30	PASS
802.11n40	5755	4.50	30	PASS
	5795	4.06	30	PASS
802.11ac40	5755	4.74	30	PASS
	5795	4.27	30	PASS
802.11ac80	5775	4.69	30	PASS

ANT2:

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Correctional Limit (dBm)	Results
802.11a	5745	3.86	30	PASS
	5785	2.96	30	PASS
	5825	3.19	30	PASS
802.11n20	5745	3.56	30	PASS
	5785	2.62	30	PASS
	5825	2.50	30	PASS
802.11ac20	5745	3.94	30	PASS
	5785	2.95	30	PASS
	5825	3.29	30	PASS
802.11n40	5755	4.78	30	PASS
	5795	4.08	30	PASS
802.11ac40	5755	3.79	30	PASS
	5795	4.10	30	PASS
802.11ac80	5775	4.10	30	PASS

ANT1+B:

Mode	Channel Frequency (MHz)	Peak Power output (dBm)	Correctional Limit (dBm)	Results
802.11n20	5745	6.81	29.59	PASS
	5785	5.55	29.59	PASS
	5825	5.63	29.59	PASS
802.11ac20	5745	7.06	29.59	PASS
	5785	5.81	29.59	PASS
	5825	5.91	29.59	PASS
802.11n40	5755	**7.65**	29.59	PASS
	5795	7.08	29.59	PASS
802.11ac40	5755	7.30	29.59	PASS
	5795	7.20	29.59	PASS
802.11ac80	5775	7.42	29.59	PASS

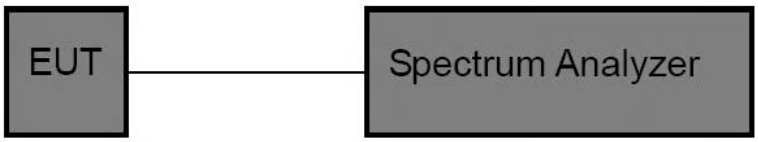
Note: As Directional gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$) 2 /N_{ANT}] dBi=6.41>6dBi,
so limit=30-(6.41-6.00)=29.59dBm.

6. Occupy Bandwidth Test

6.1. Test Standard

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

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 3.85V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

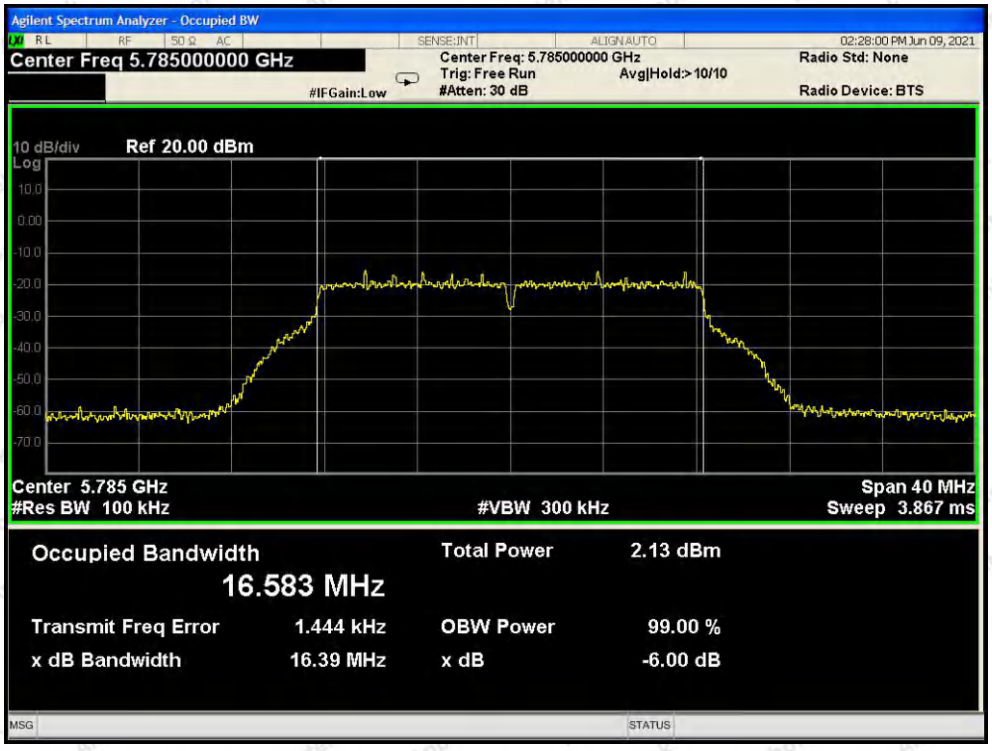
Mode	Channel Frequency (MHz)	6dB BW(MHz)		Limit	Results
		ANT1	ANT2		
802.11a	5745	16.34	16.42	>0.5MHz	PASS
	5785	16.39	16.39		PASS
	5825	16.36	16.39		PASS
802.11ac20	5745	17.61	17.59		PASS
	5785	17.61	17.60		PASS
	5825	17.61	17.61		PASS
802.11ac40	5755	36.17	35.77		PASS
	5795	36.36	36.01		PASS
802.11ac80	5775	76.07	76.50		PASS
802.11n20	5745	17.60	17.63		PASS
	5785	17.62	17.59		PASS
	5825	17.41	17.21		PASS
802.11n40	5755	36.04	35.98		PASS
	5795	36.34	36.19		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)		99% Bandwidth (MHz)	
		ANT1	ANT2	ANT1	ANT2
802.11a	5745	21.44	21.58	16.806	16.857
	5785	21.45	21.57	16.809	16.841
	5825	21.35	21.50	16.846	16.841
802.11ac20	5745	21.69	21.80	17.934	17.950
	5785	21.83	21.84	17.923	17.914
	5825	21.65	21.70	17.961	17.946
802.11ac40	5755	39.94	40.18	36.345	36.340
	5795	39.80	39.91	36.425	36.446
802.11ac80	5775	90.01	81.90	76.043	76.053
802.11n20	5745	21.46	21.45	17.881	17.841
	5785	21.49	21.61	17.919	17.937
	5825	21.69	21.74	17.994	17.964
802.11n40	5755	39.94	40.09	36.326	36.397
	5795	40.33	40.22	36.419	36.423

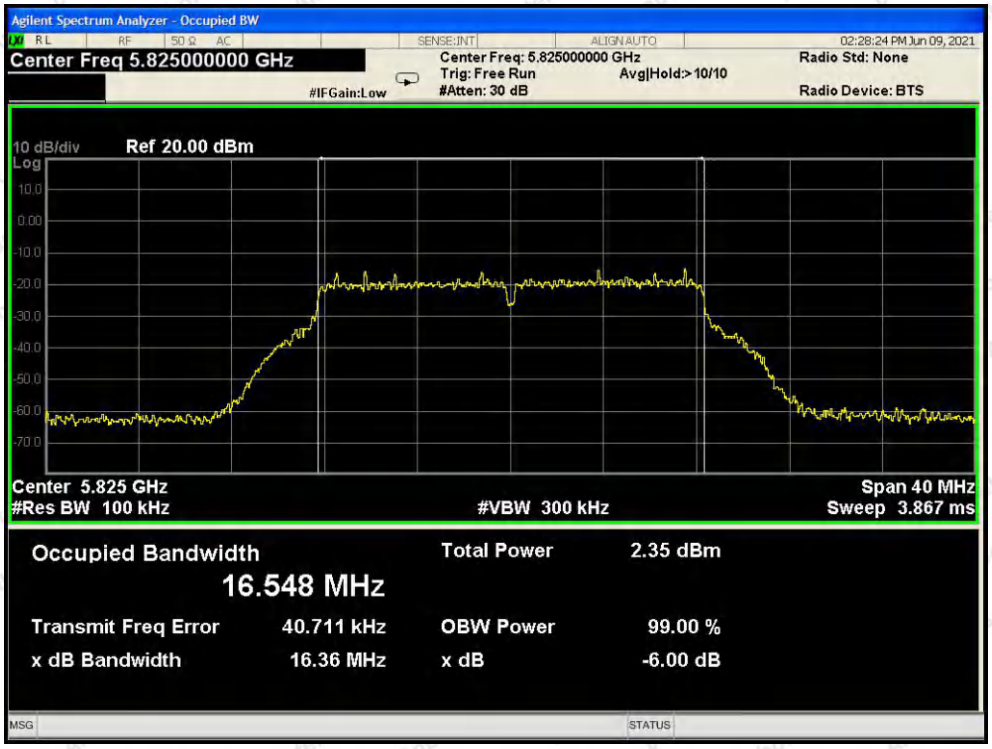
ANT1

6dB Bandwidth

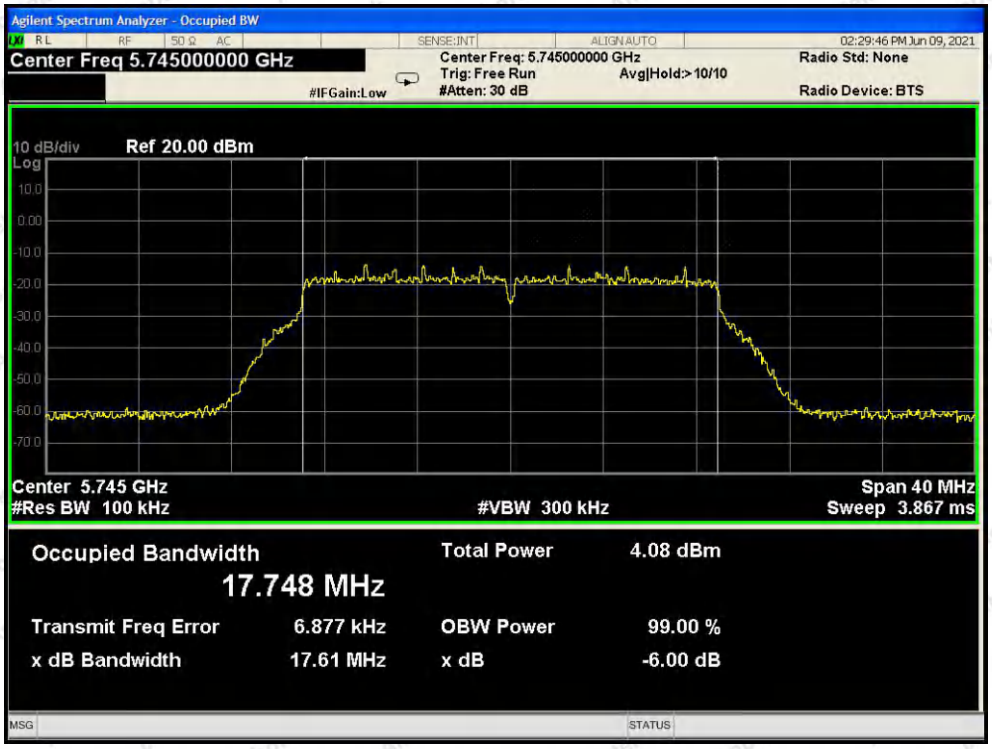
Test Mode: 802.11a--Low



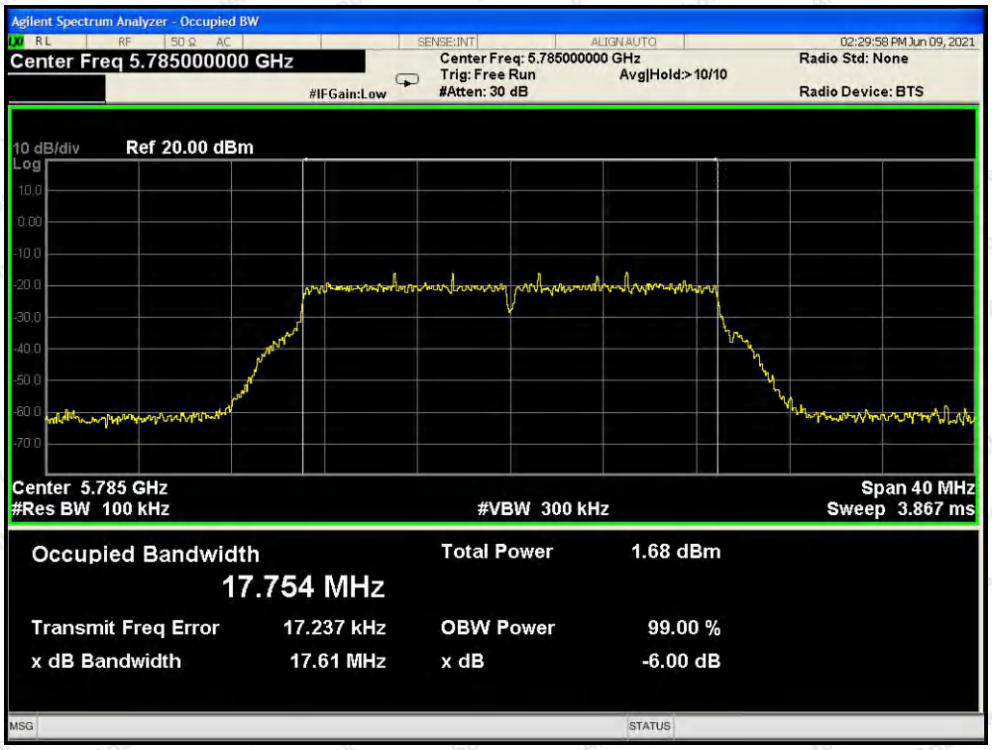
Test Mode: 802.11a---Middle



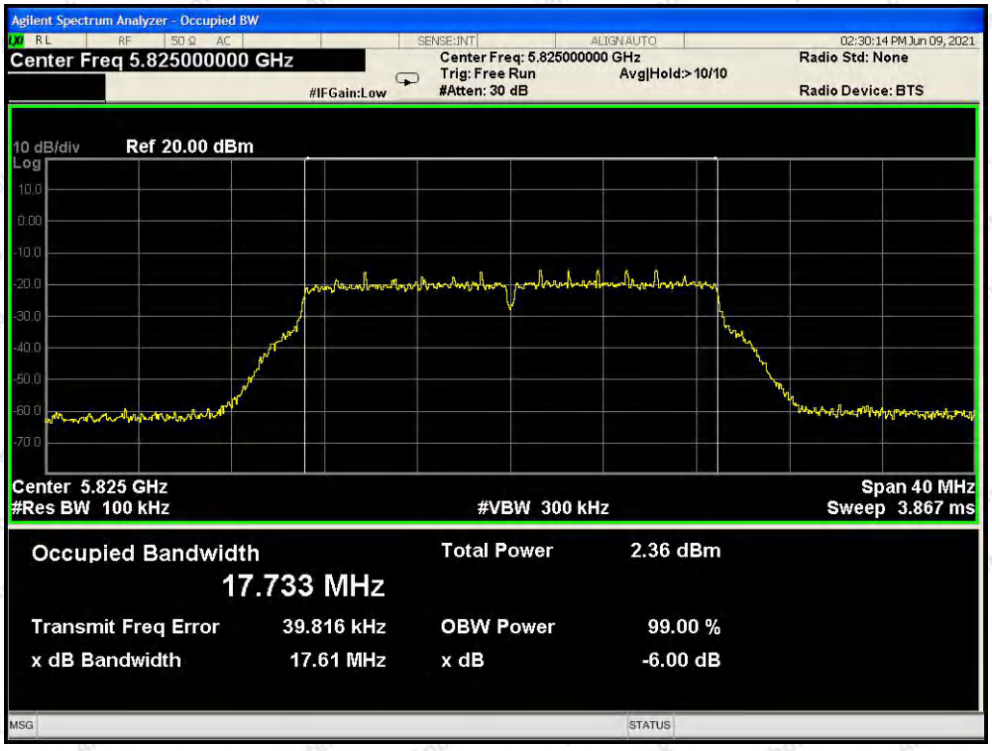
Test Mode: 802.11a---High



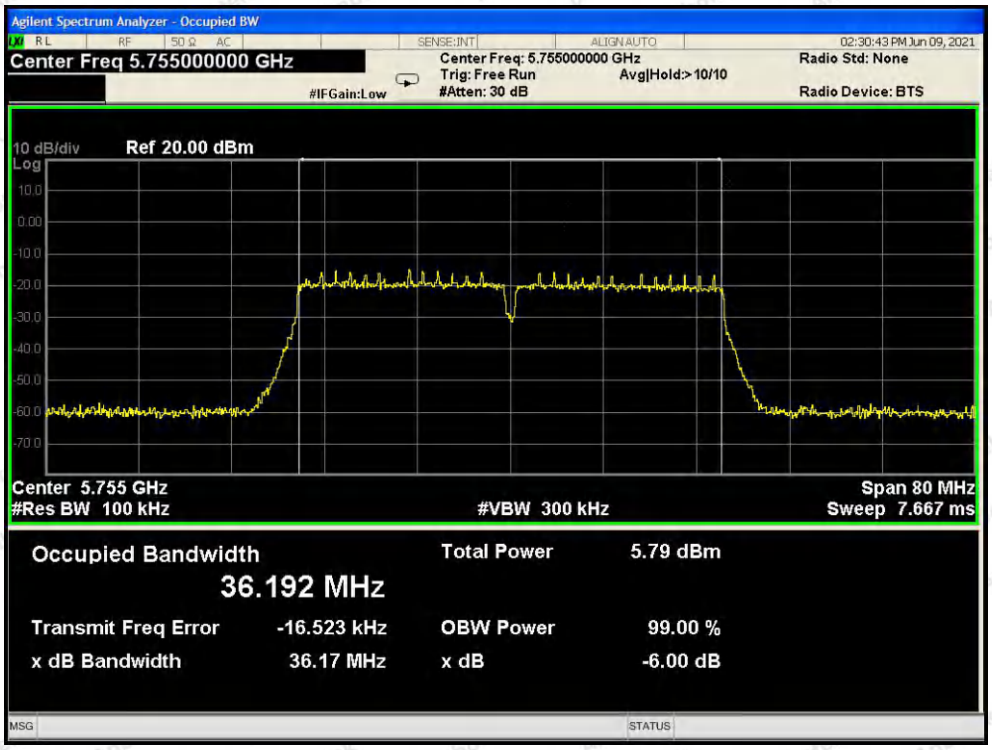
Test Mode: 802.11ac20---Low



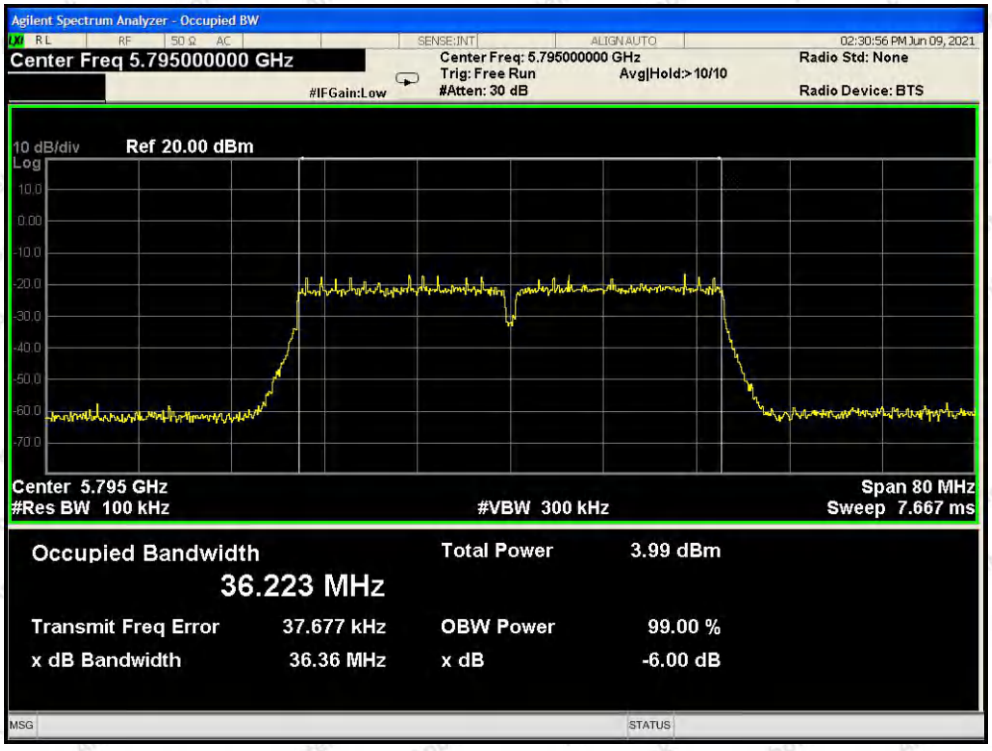
Test Mode: 802.11ac20---Middle



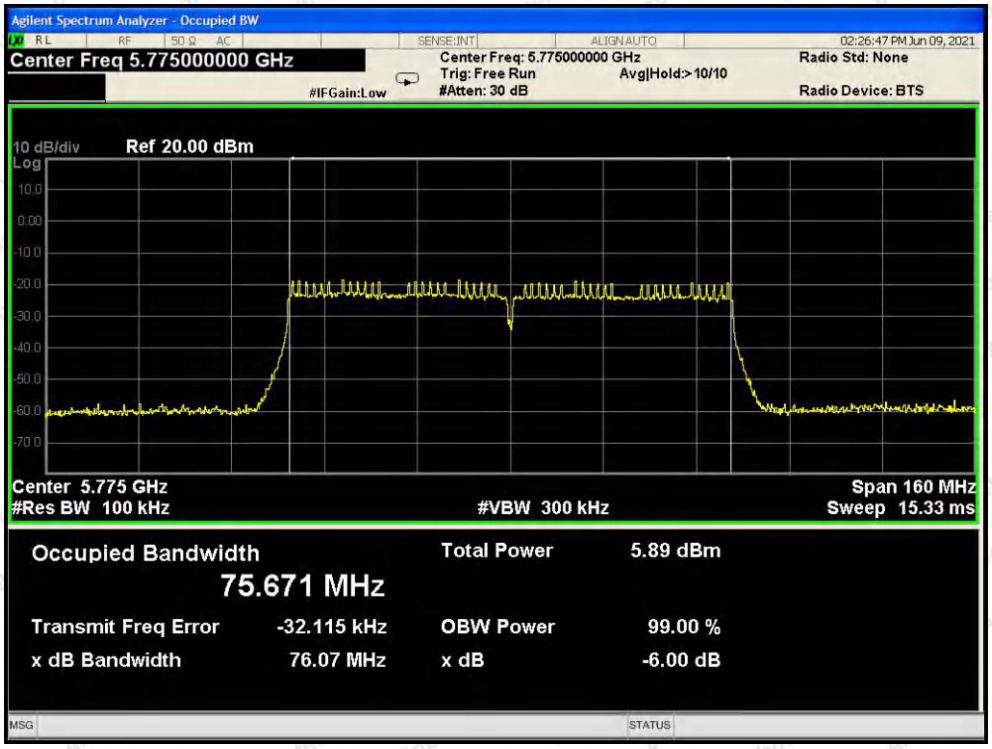
Test Mode: 802.11ac20---High



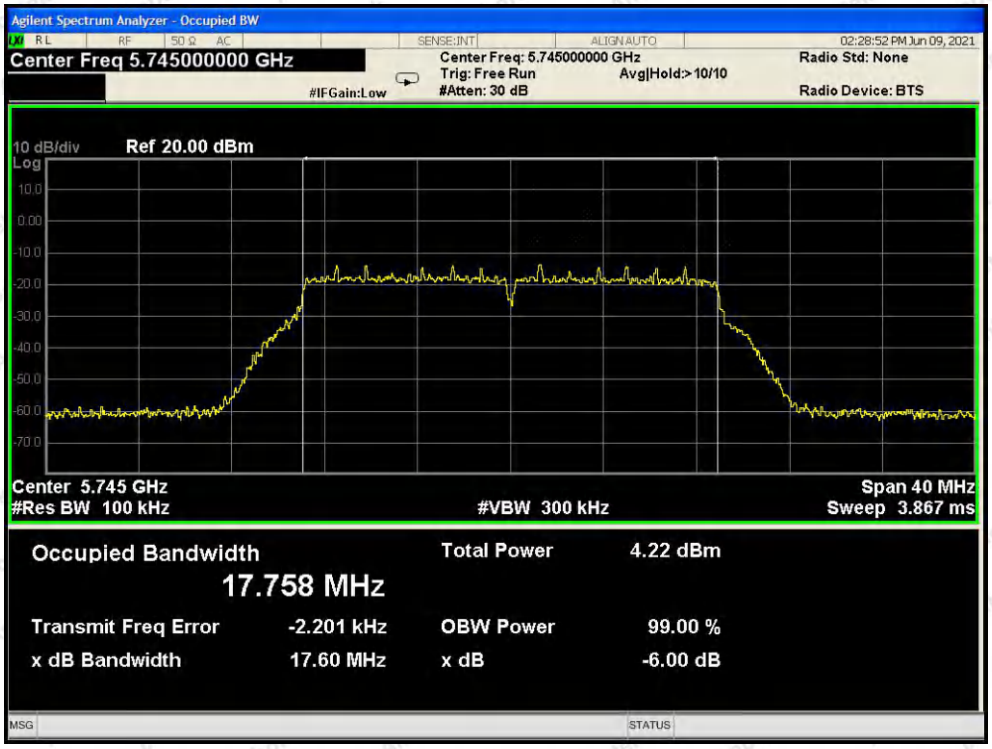
Test Mode: 802.11ac40--Low



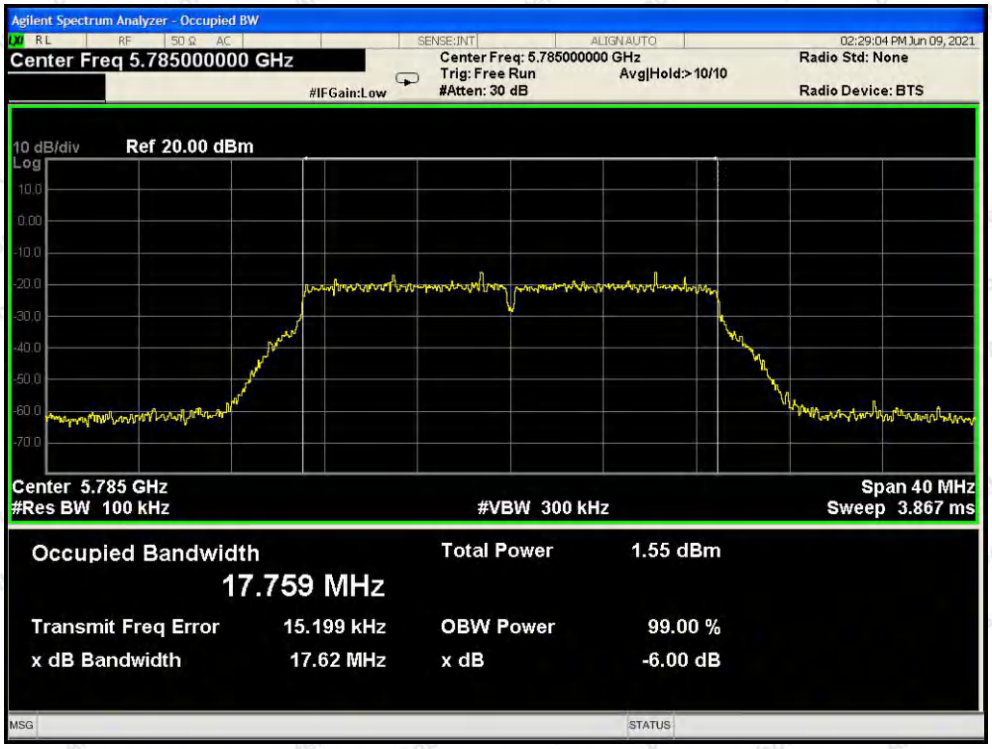
Test Mode: 802.11ac40---High



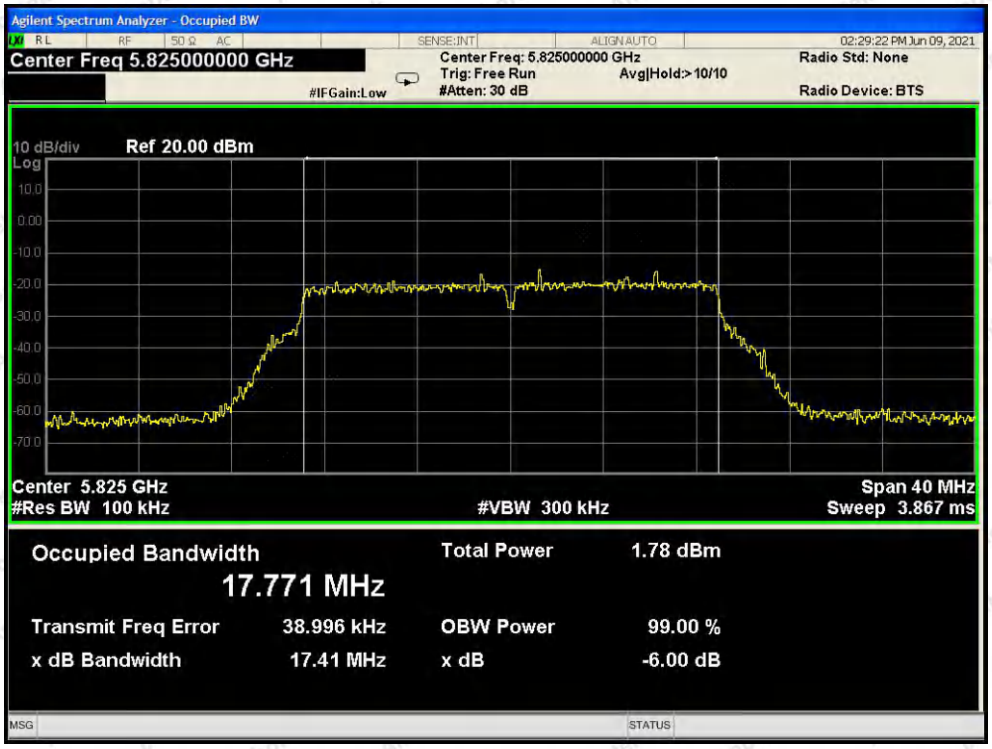
Test Mode: 802.11ac80



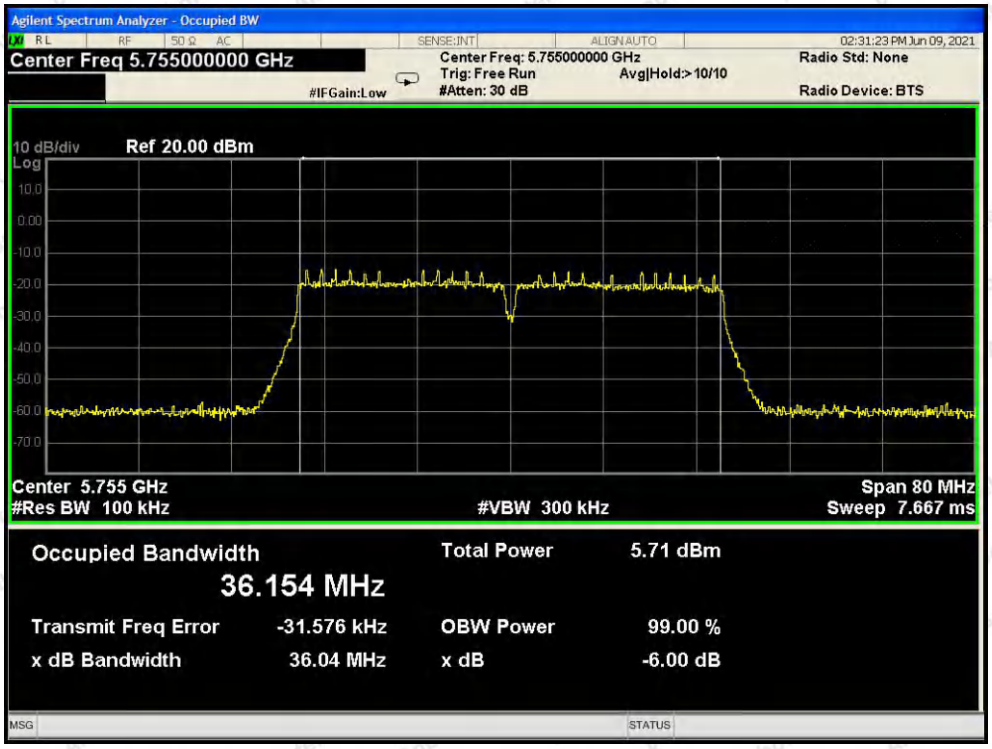
Test Mode: 802.11n20---Low



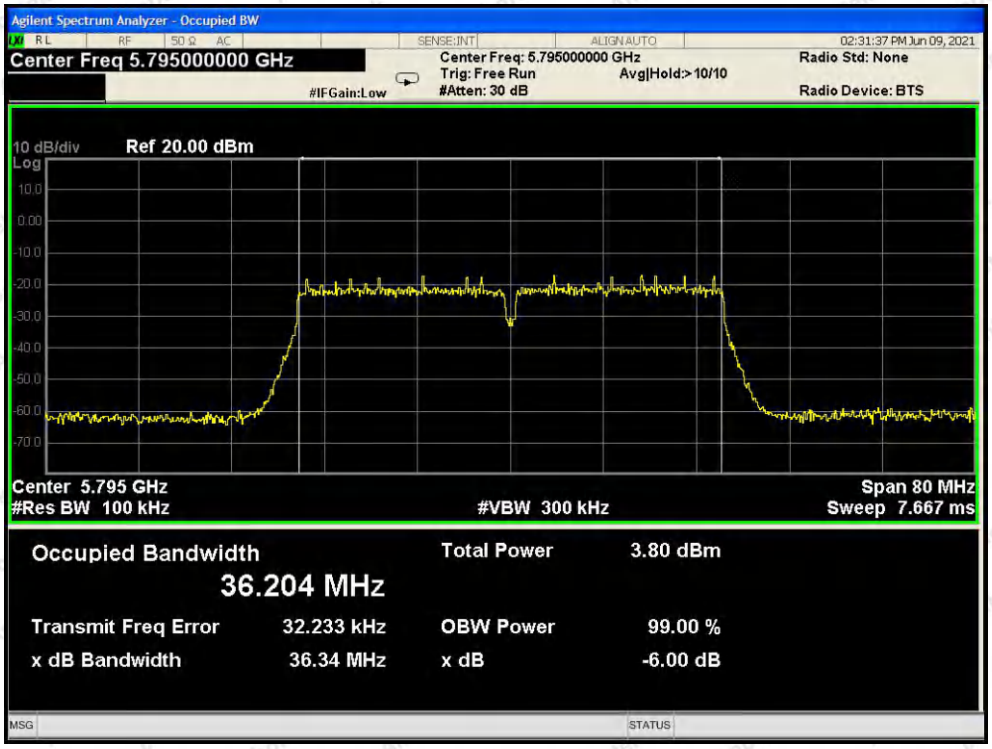
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



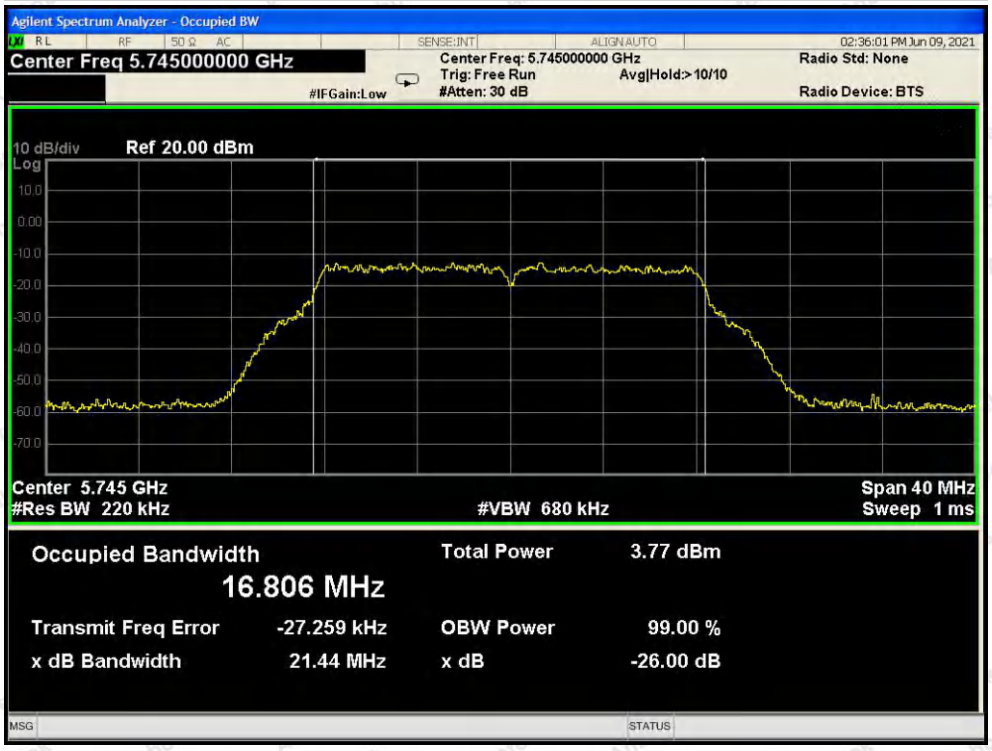
Test Mode: 802.11n40---Low



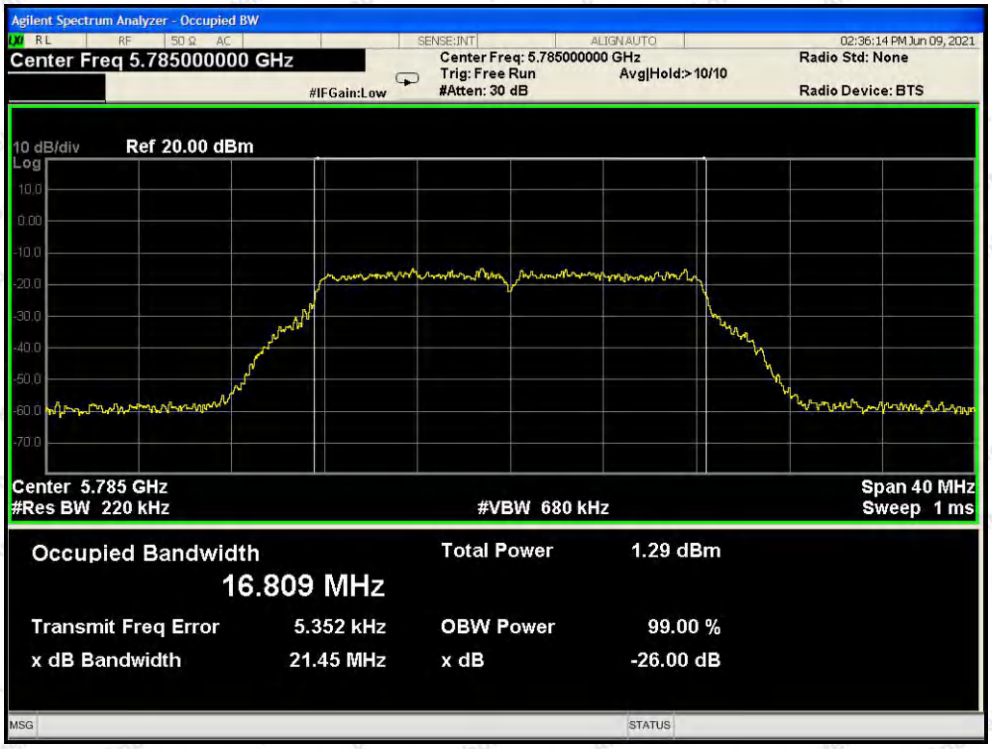
Test Mode: 802.11n40---High

ANT1

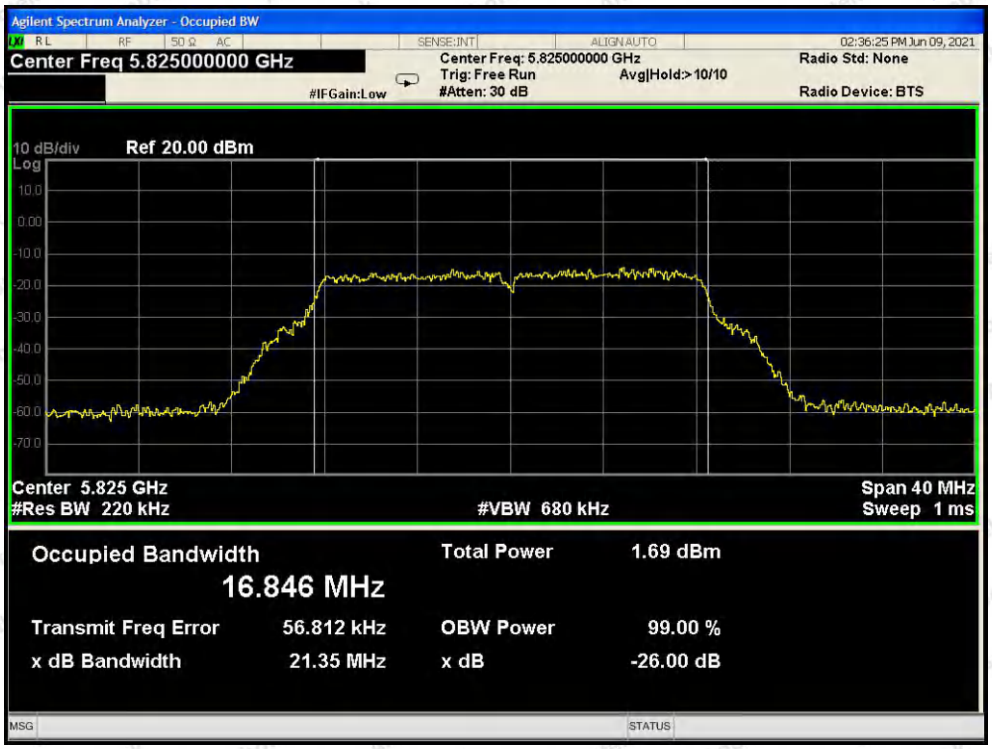
26dB & 99% Bandwidth



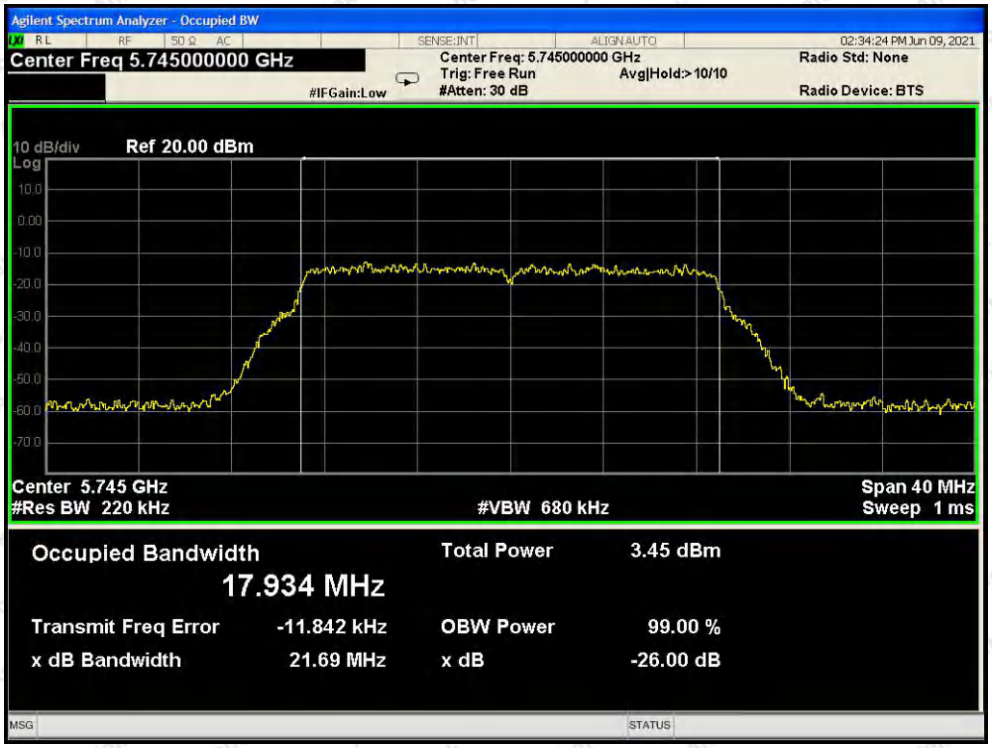
Test Mode: 802.11a--Low



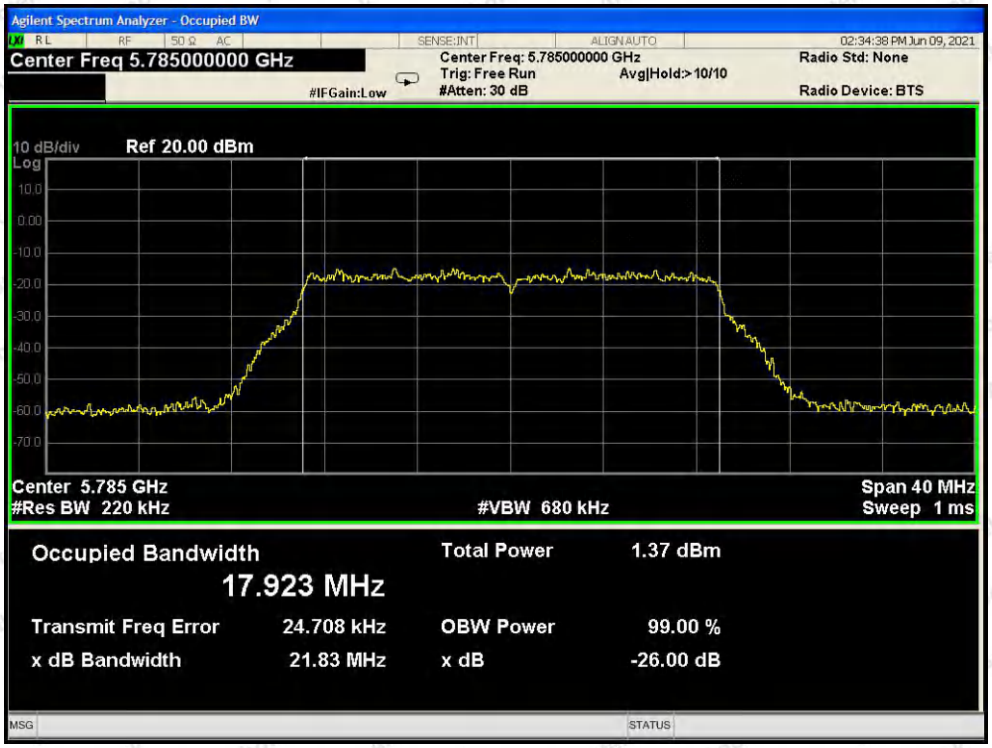
Test Mode: 802.11a---Middle



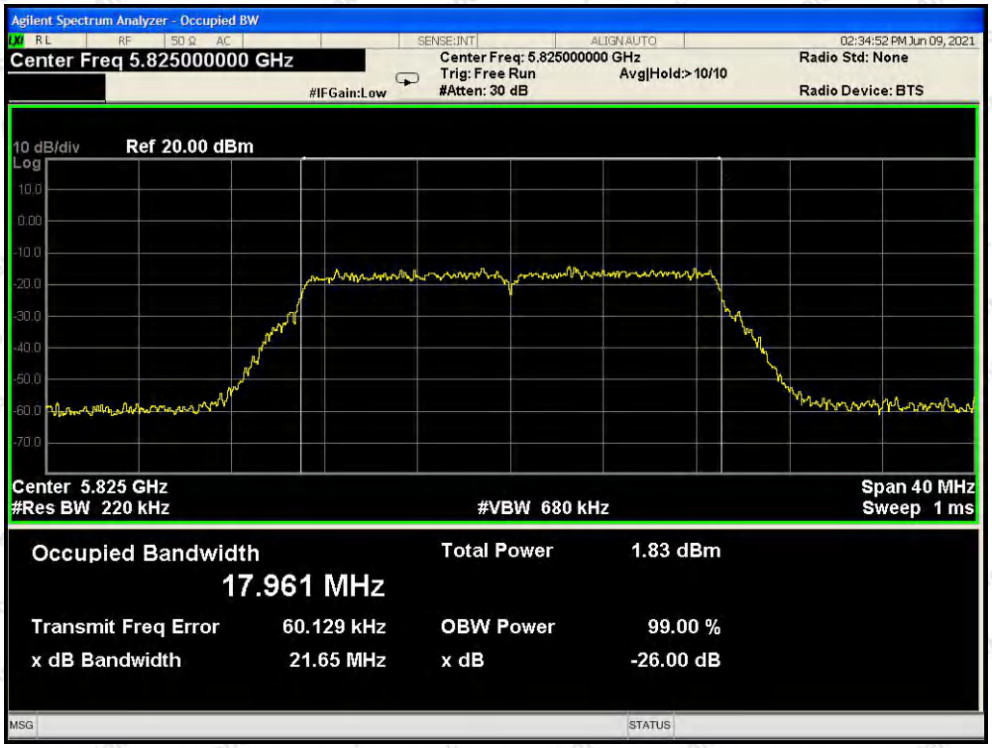
Test Mode: 802.11a---High



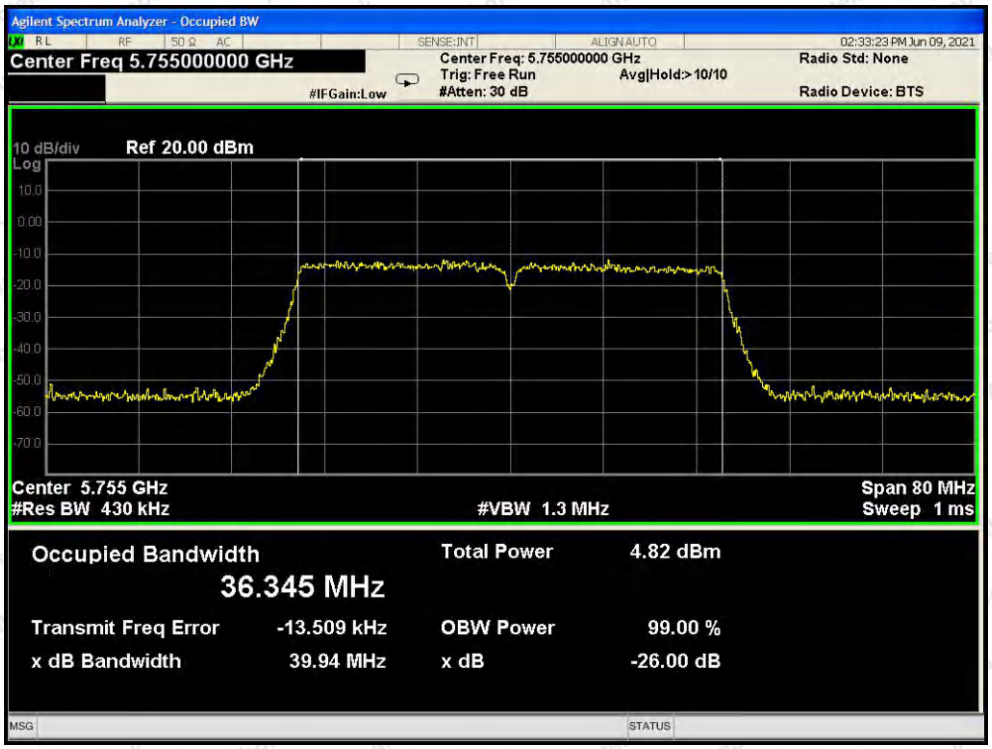
Test Mode: 802.11ac20--Low



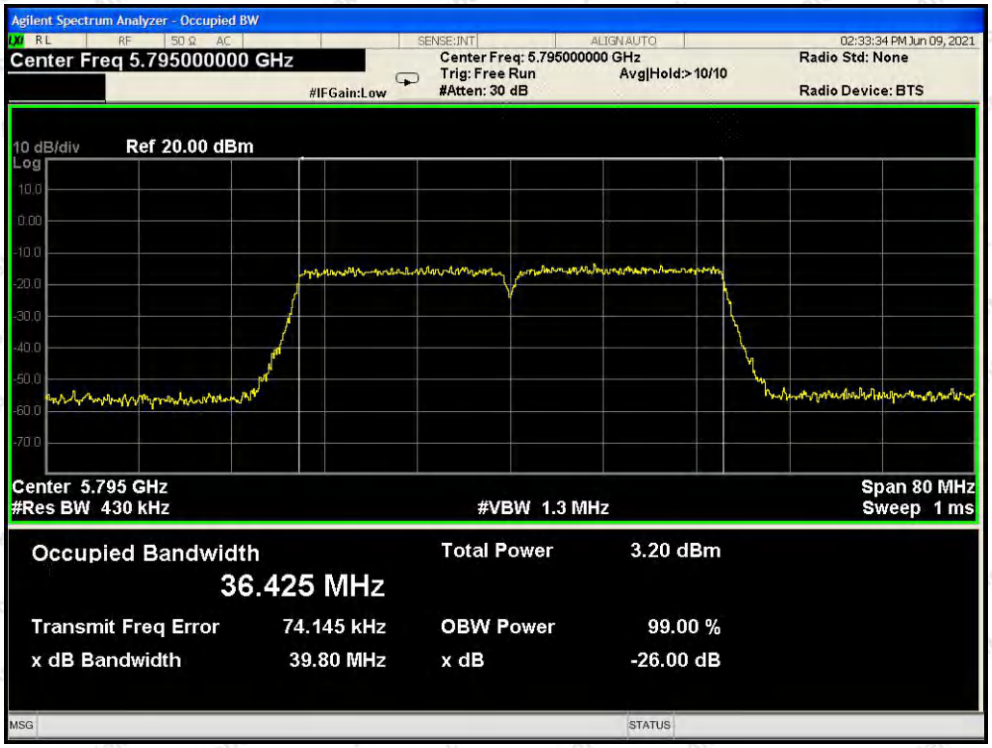
Test Mode: 802.11ac20---Middle



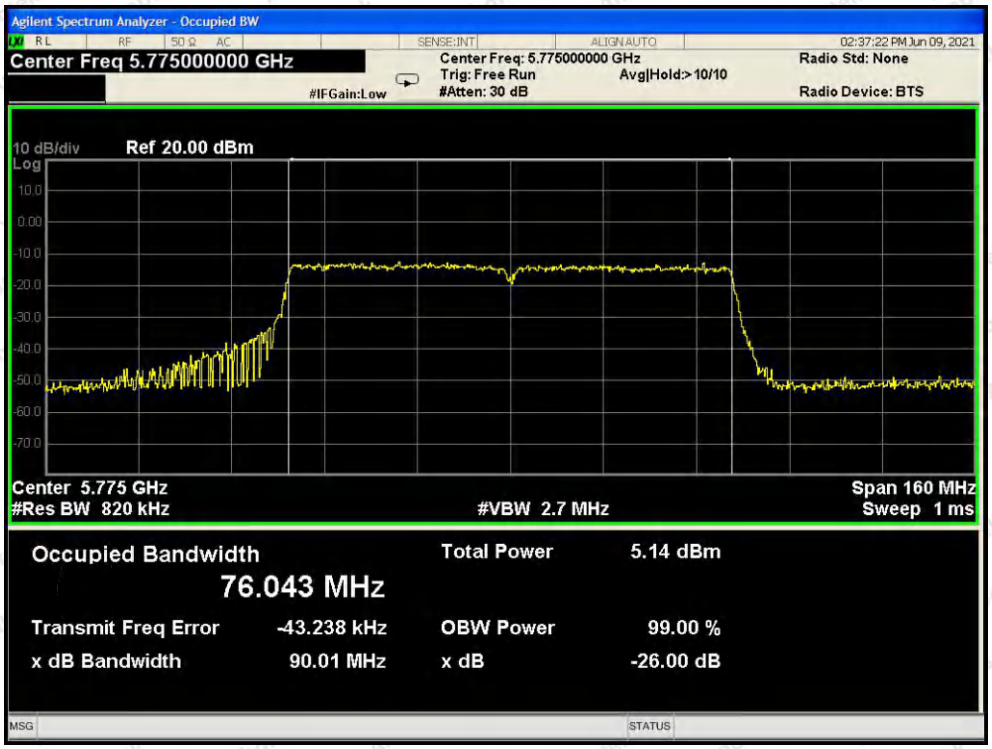
Test Mode: 802.11ac20---High



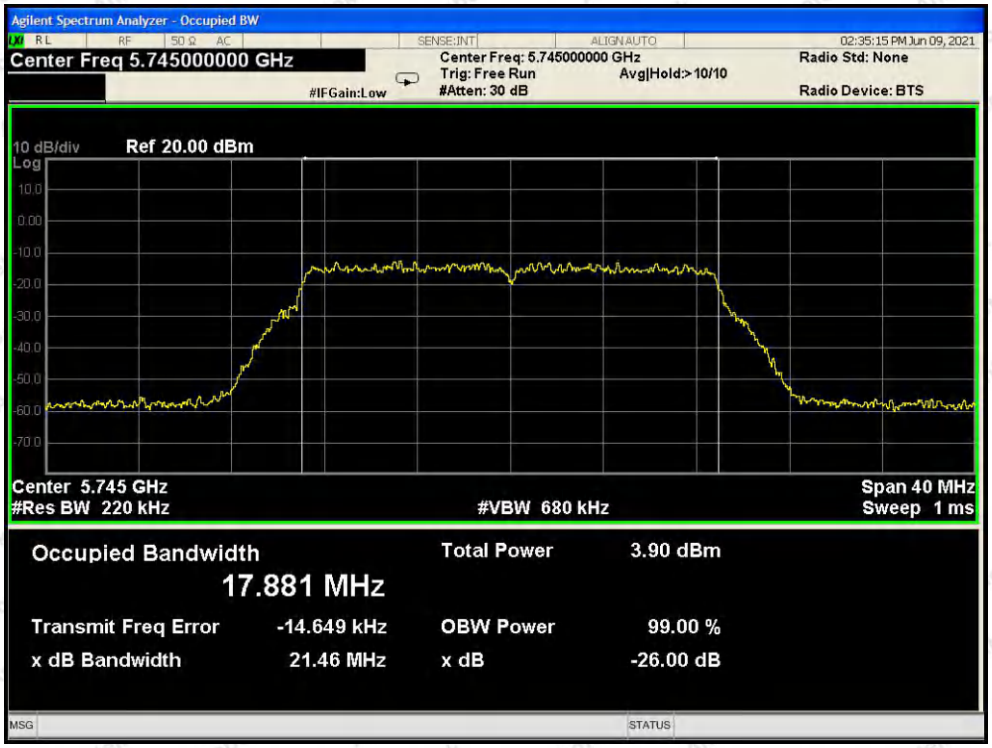
Test Mode: 802.11ac40---Low



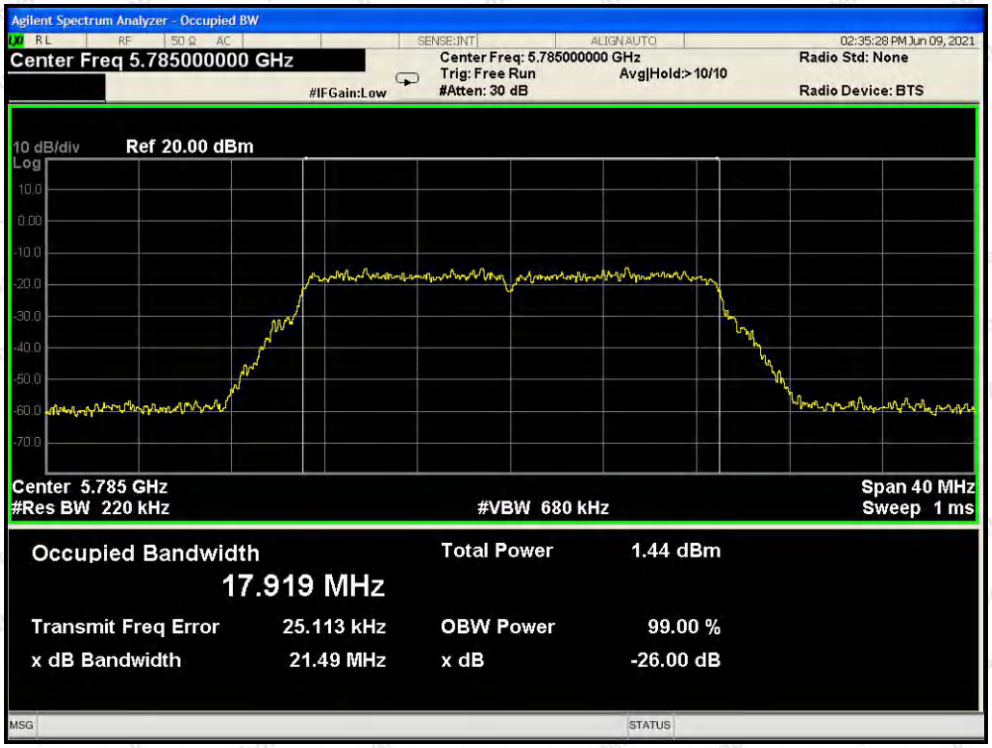
Test Mode: 802.11ac40---High



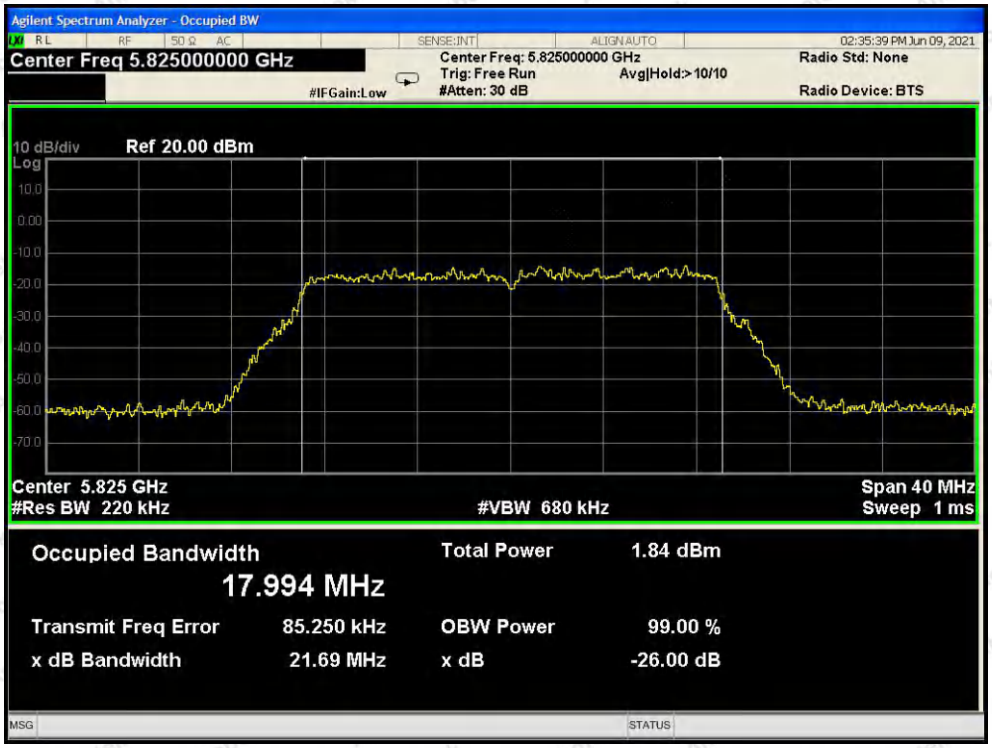
Test Mode: 802.11ac80



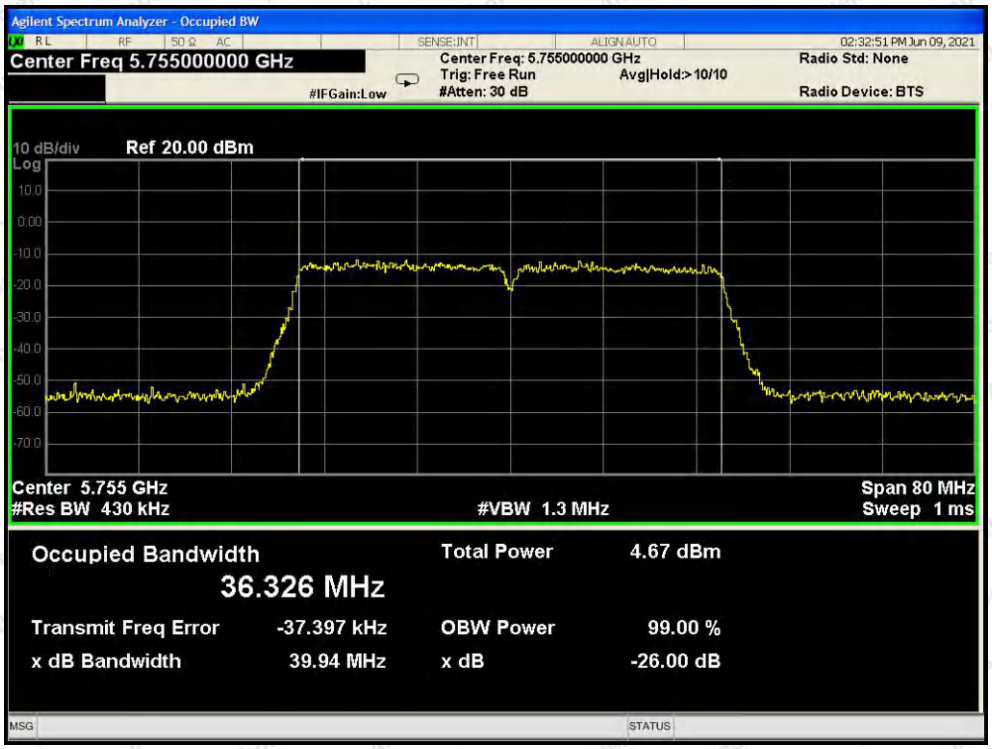
Test Mode: 802.11n20---Low



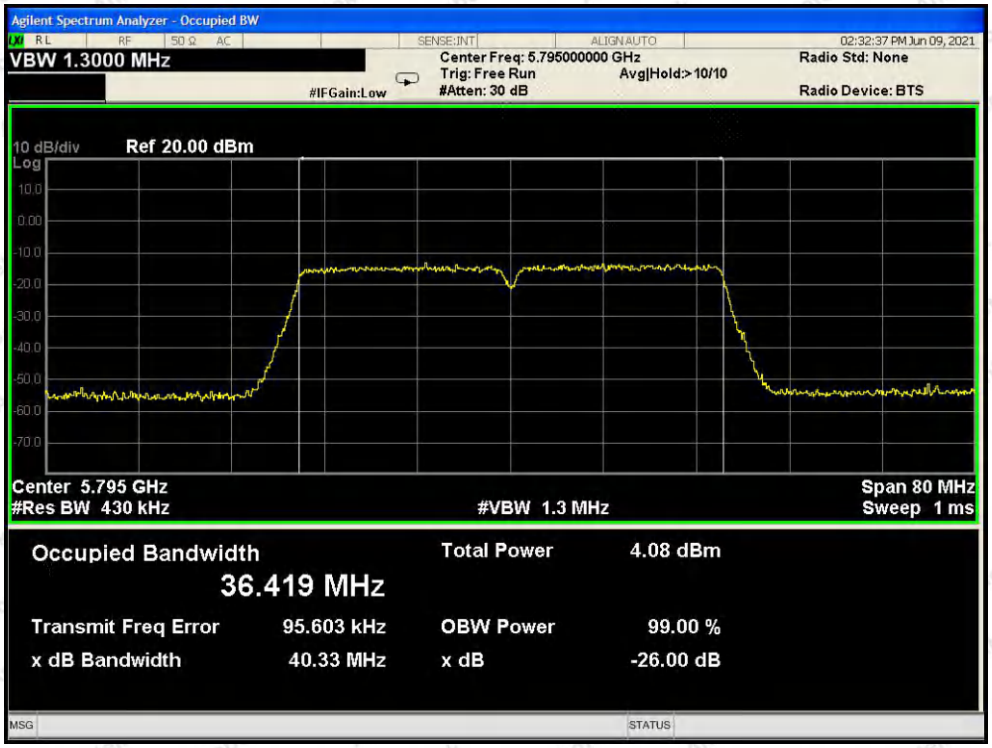
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



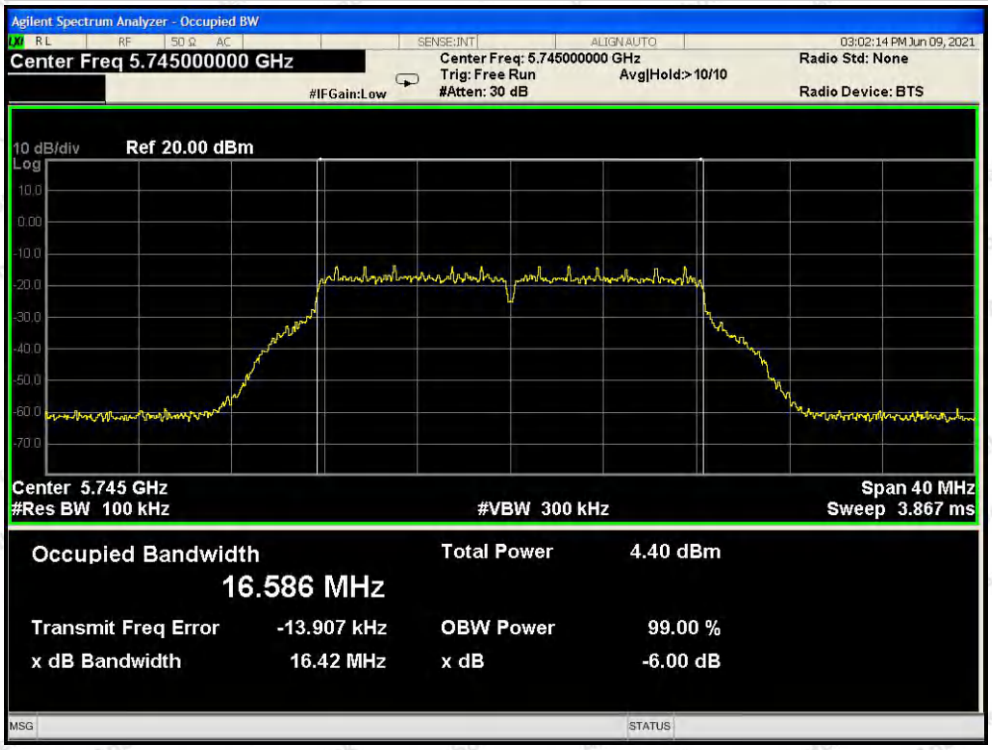
Test Mode: 802.11n40---Low



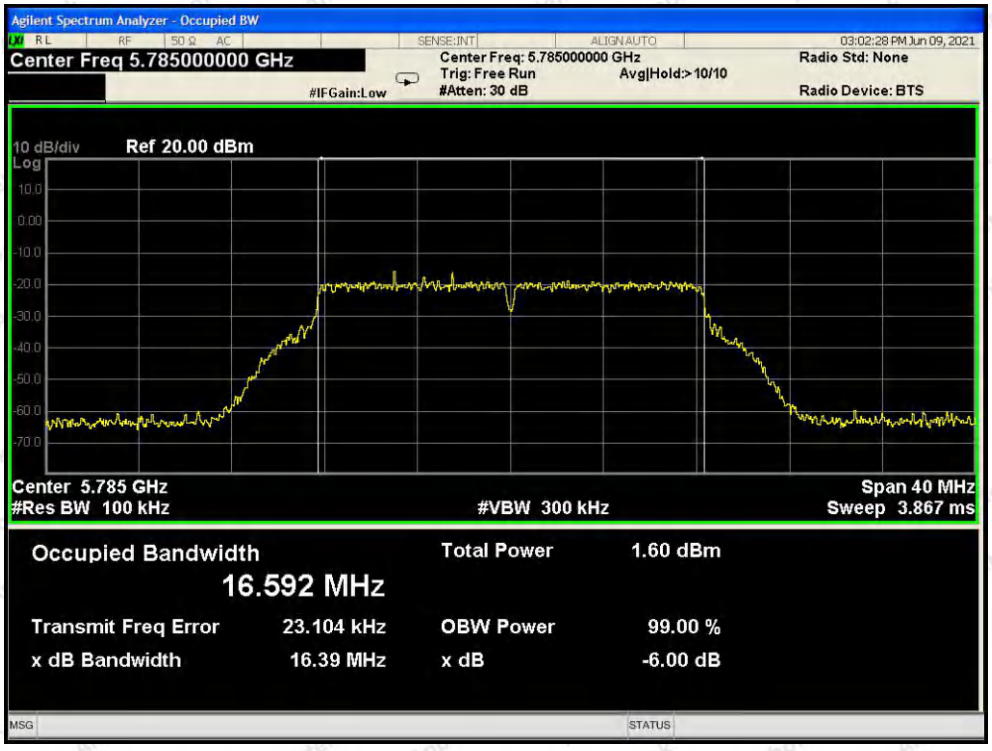
Test Mode: 802.11n40---High

ANT2

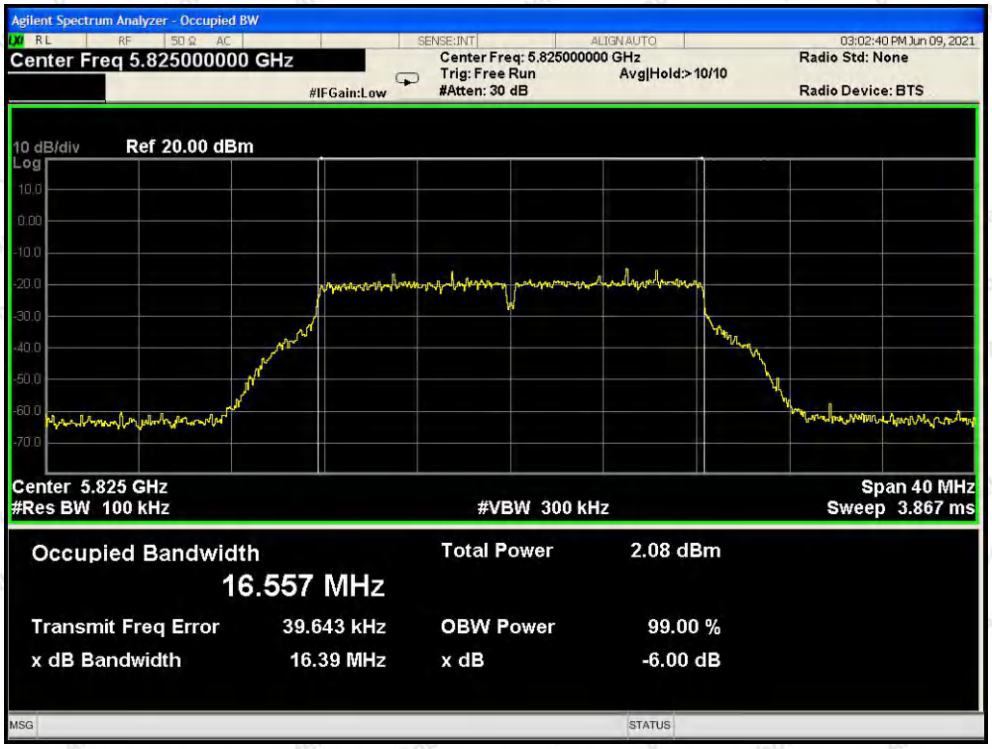
6dB Bandwidth



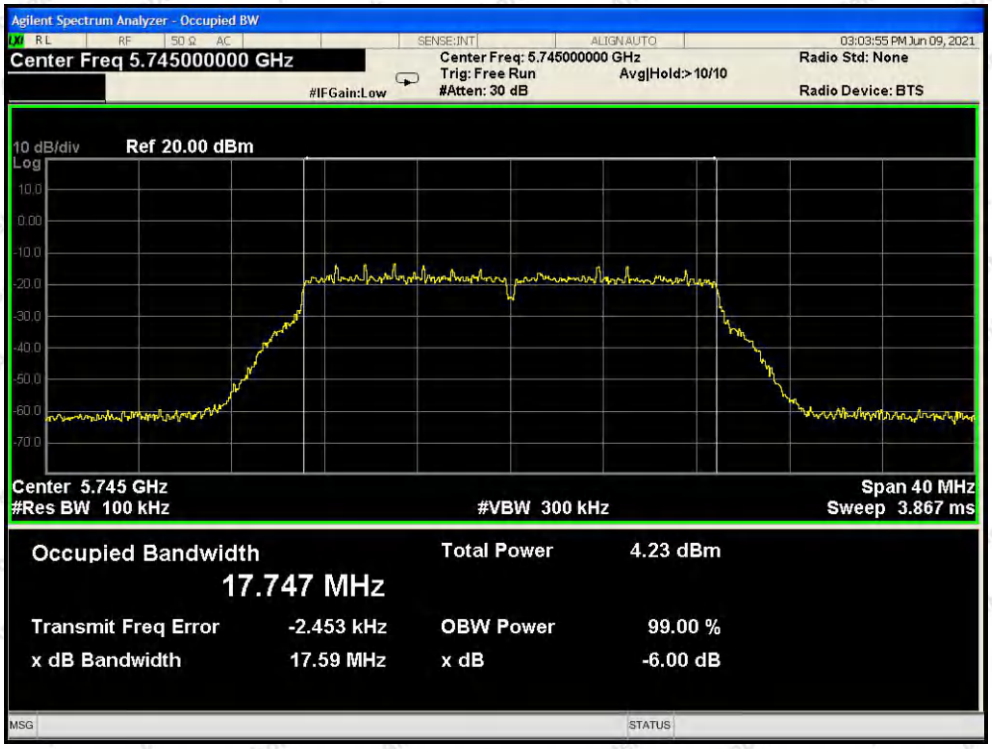
Test Mode: 802.11a--Low



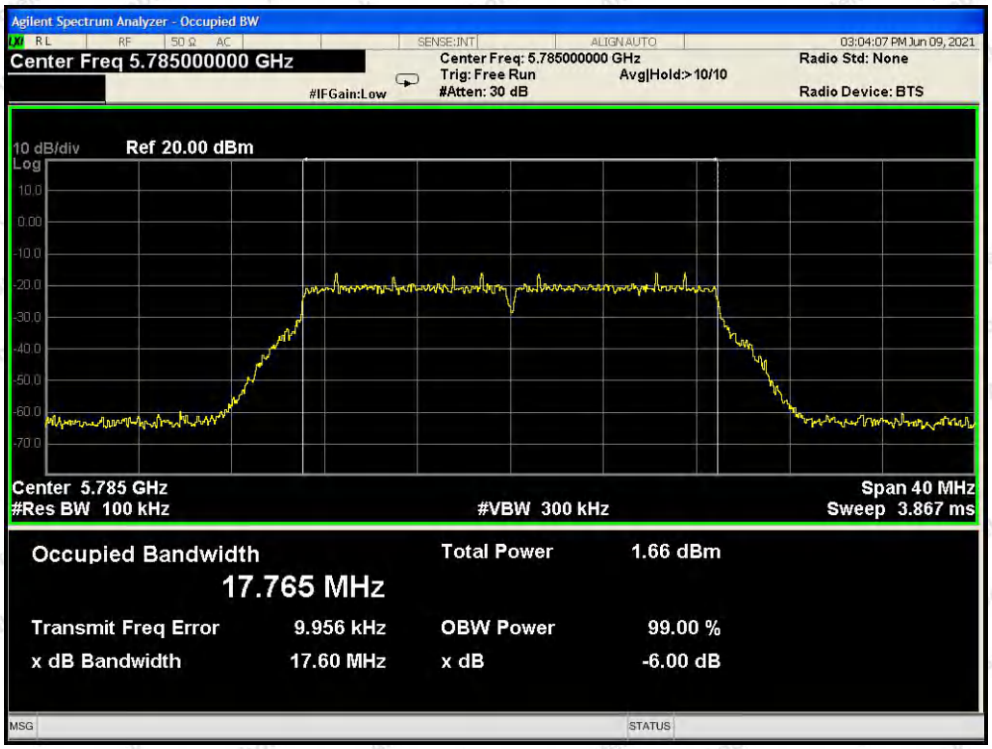
Test Mode: 802.11a---Middle



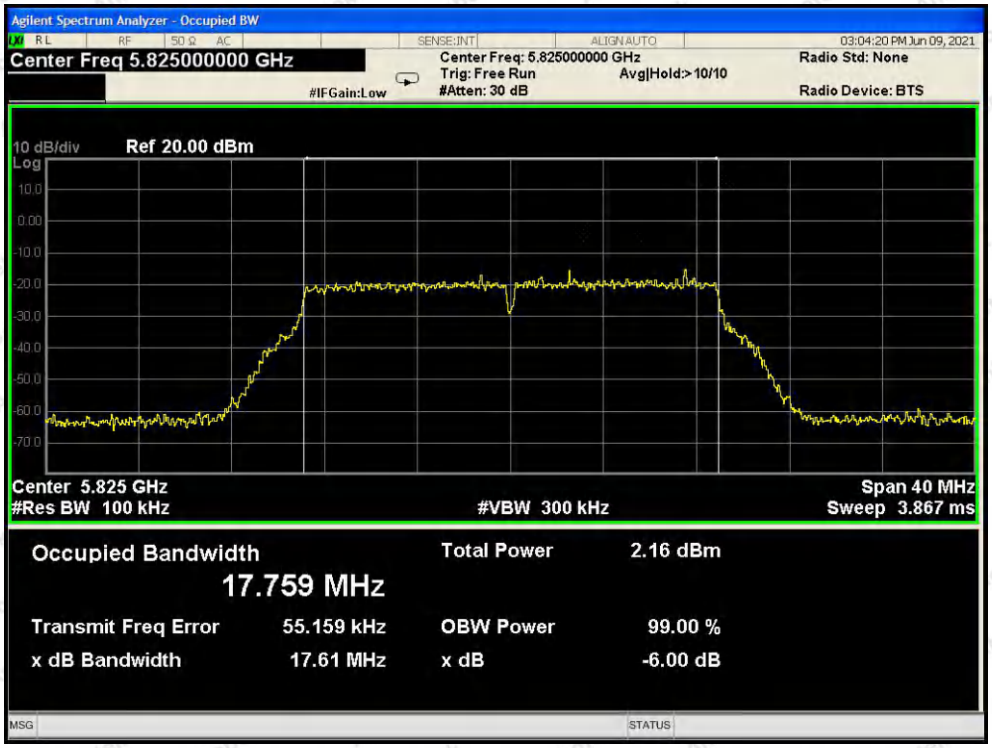
Test Mode: 802.11a---High



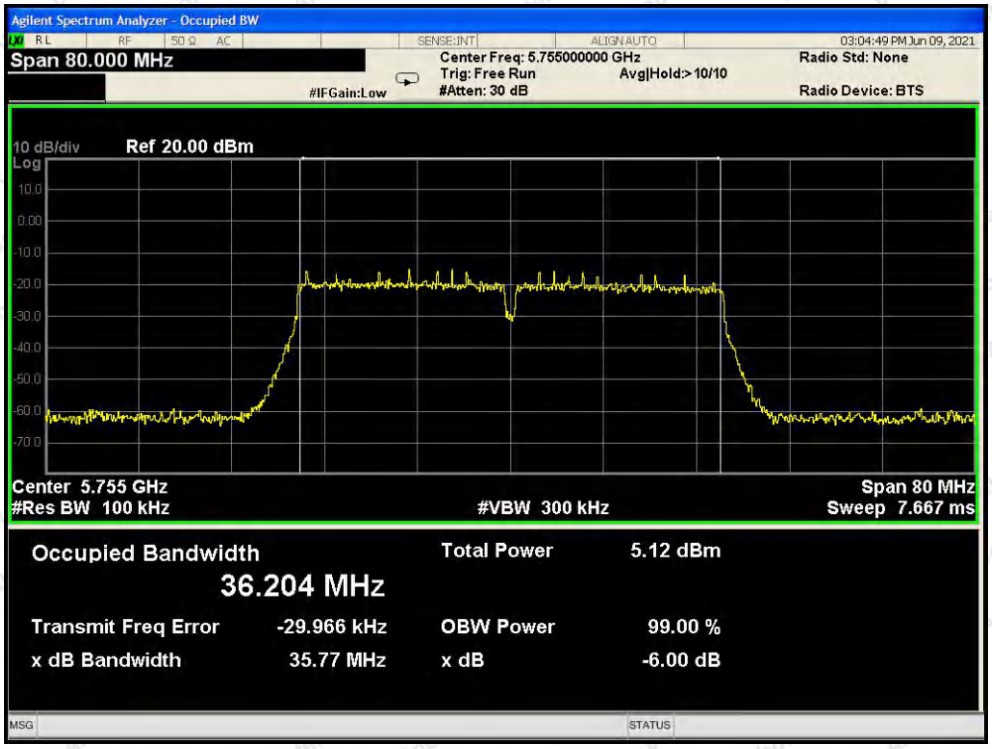
Test Mode: 802.11ac20--Low



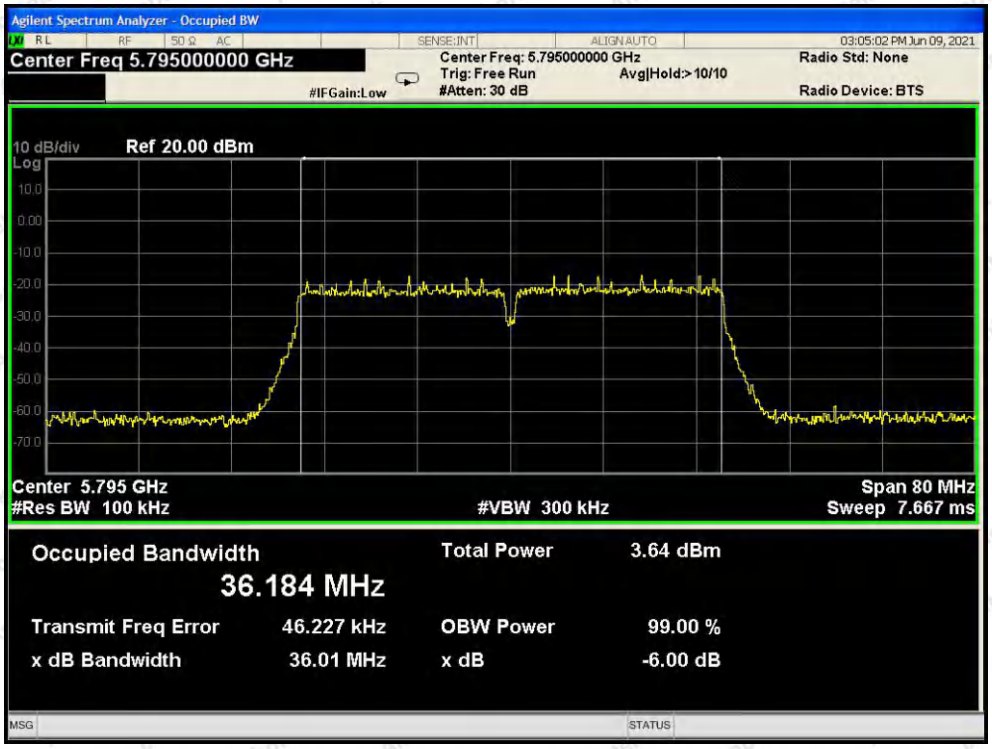
Test Mode: 802.11ac20---Middle



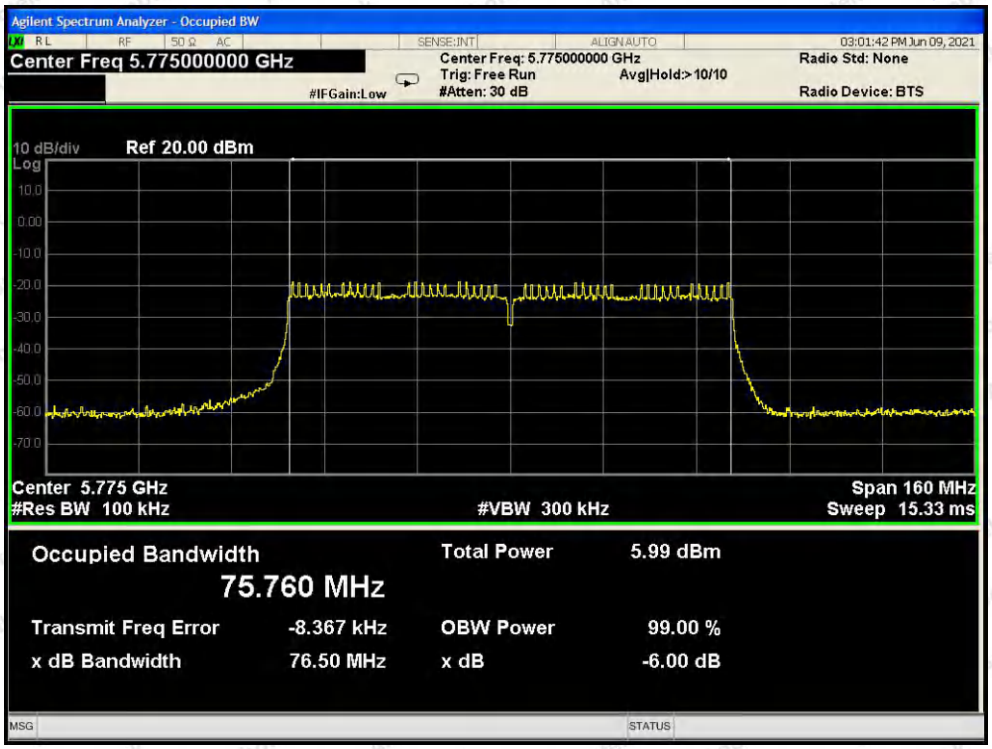
Test Mode: 802.11ac20---High



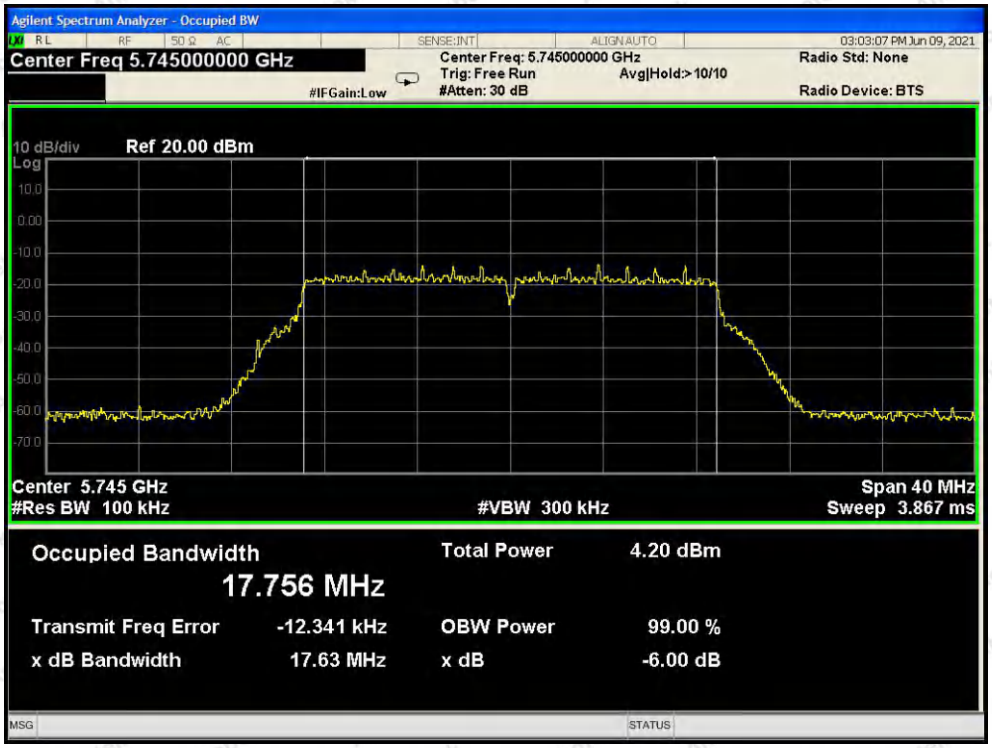
Test Mode: 802.11ac40---Low



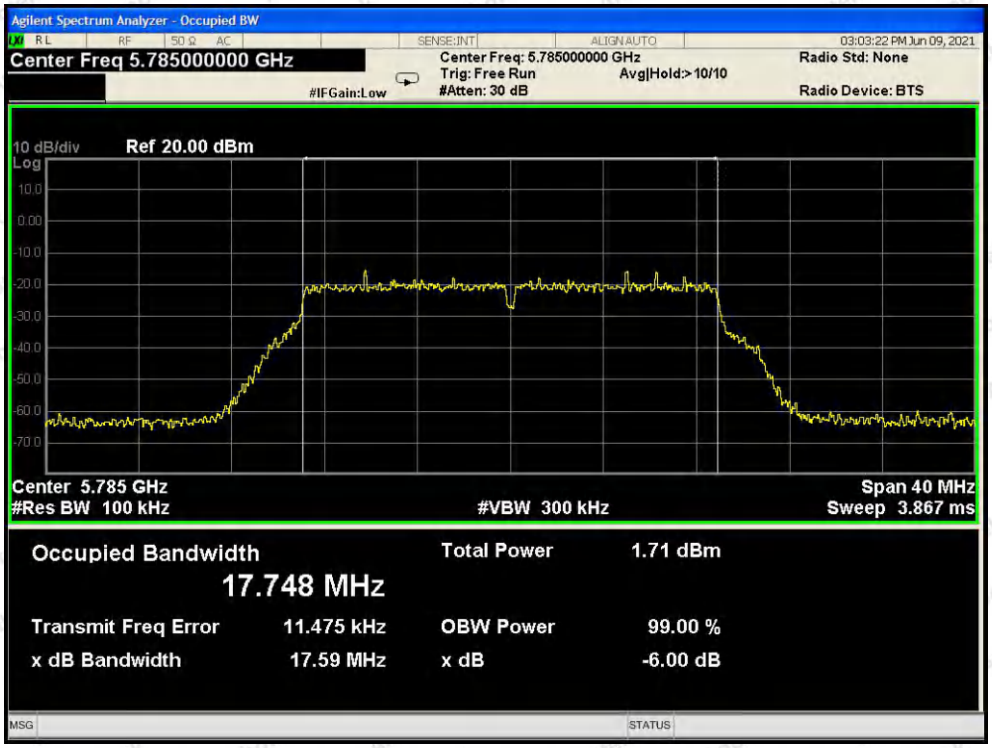
Test Mode: 802.11ac40---High



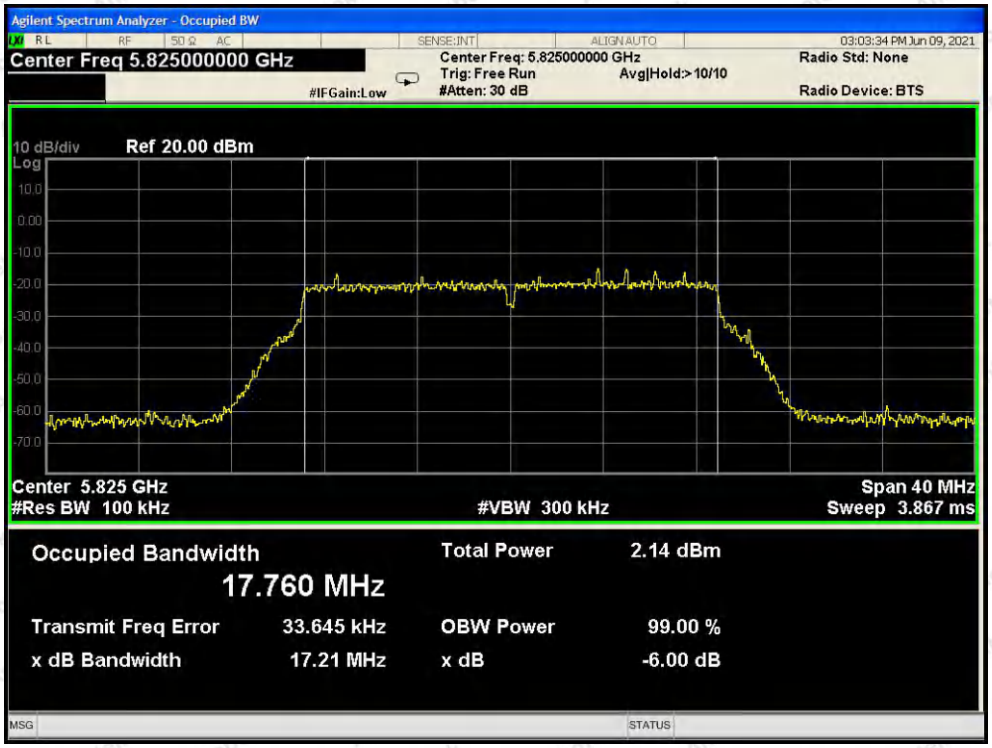
Test Mode: 802.11ac80



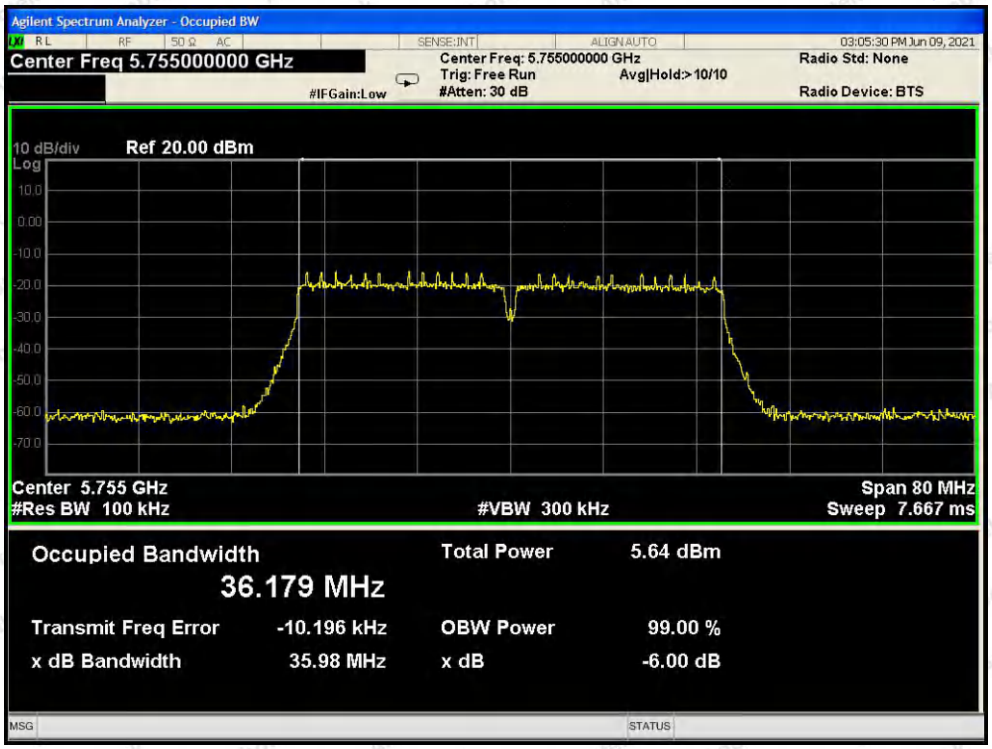
Test Mode: 802.11n20---Low



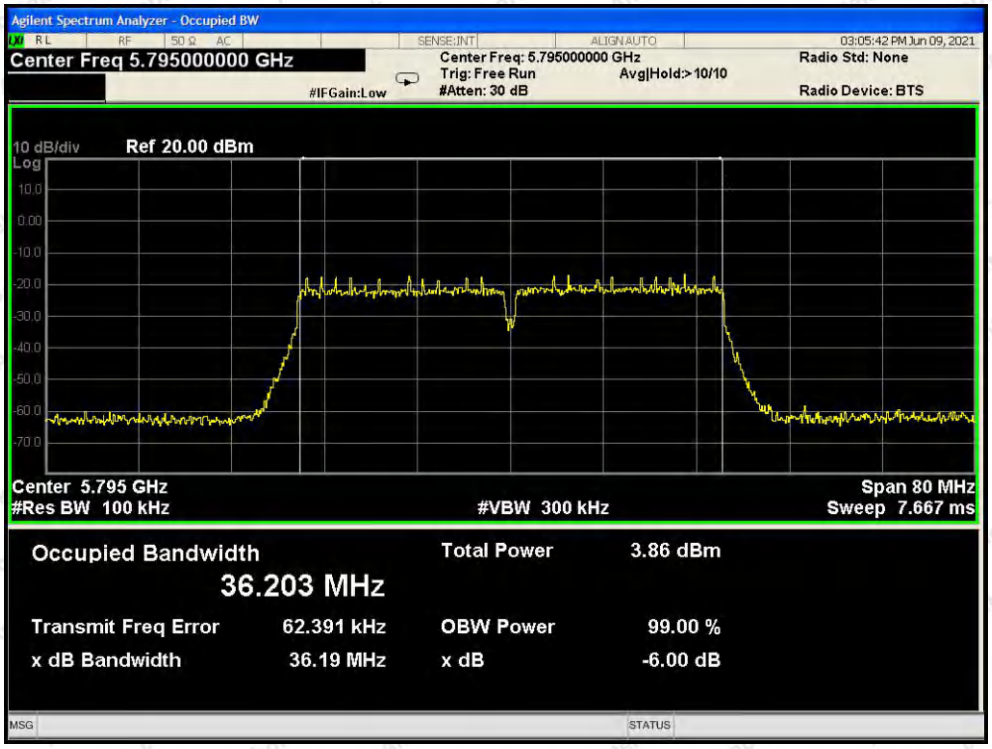
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



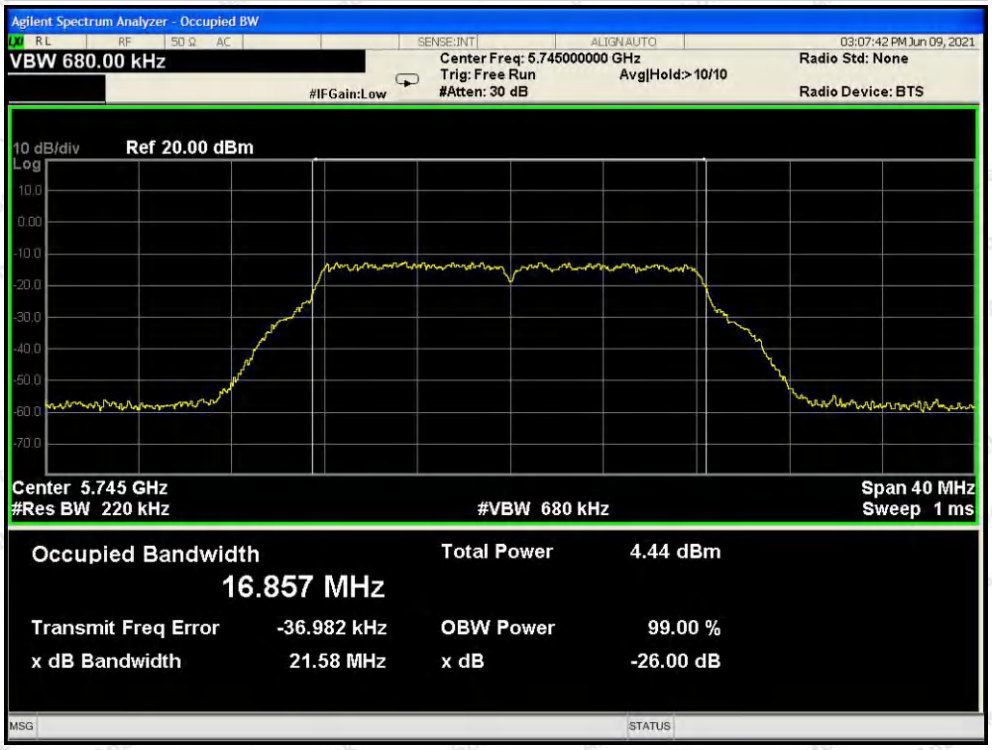
Test Mode: 802.11n40---Low



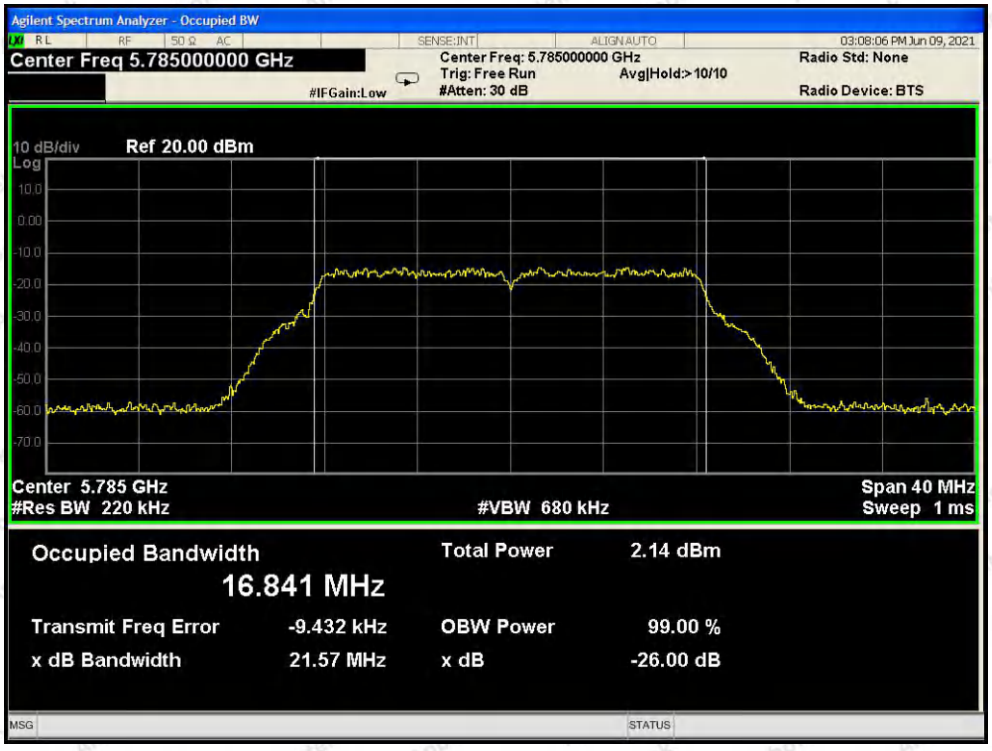
Test Mode: 802.11n40---High

ANT2

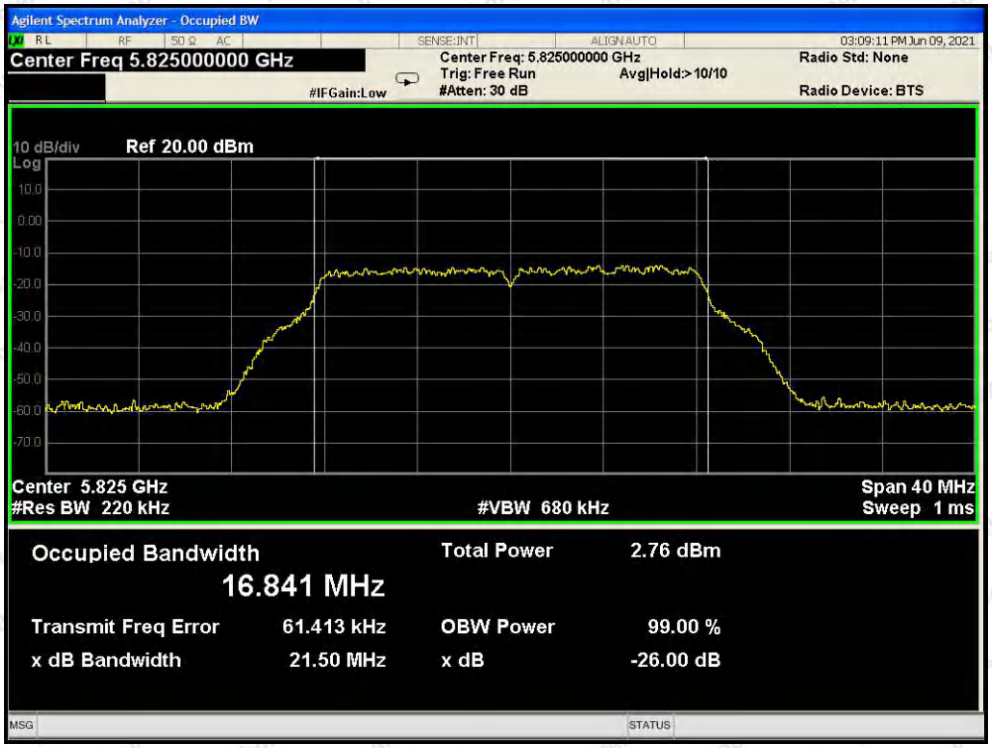
26dB & 99% Bandwidth



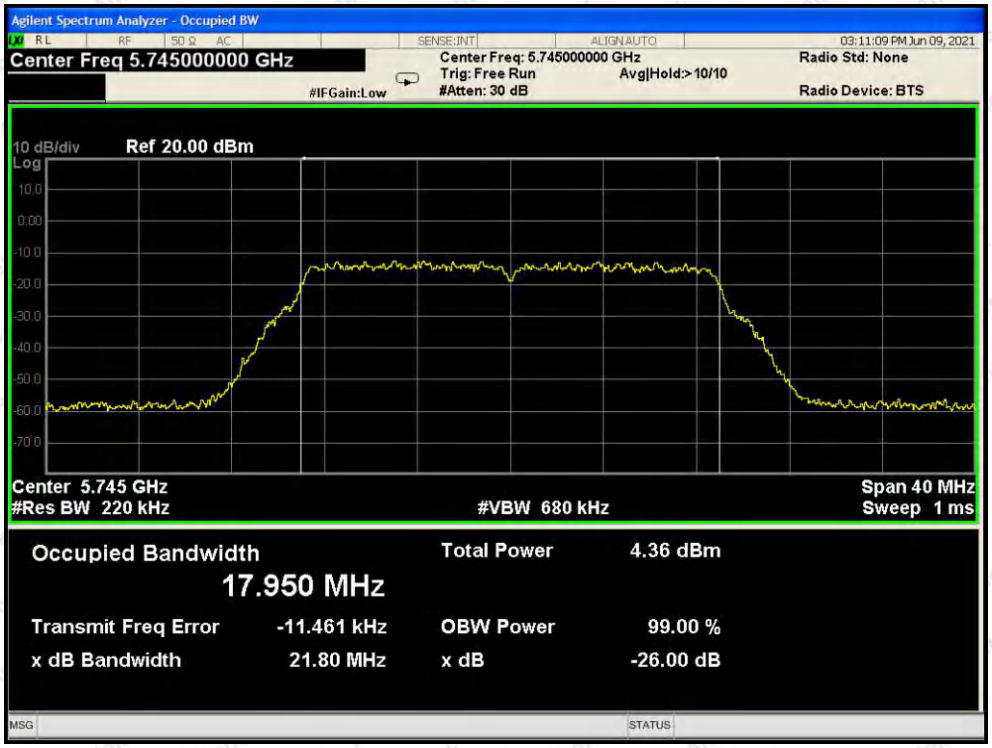
Test Mode: 802.11a--Low



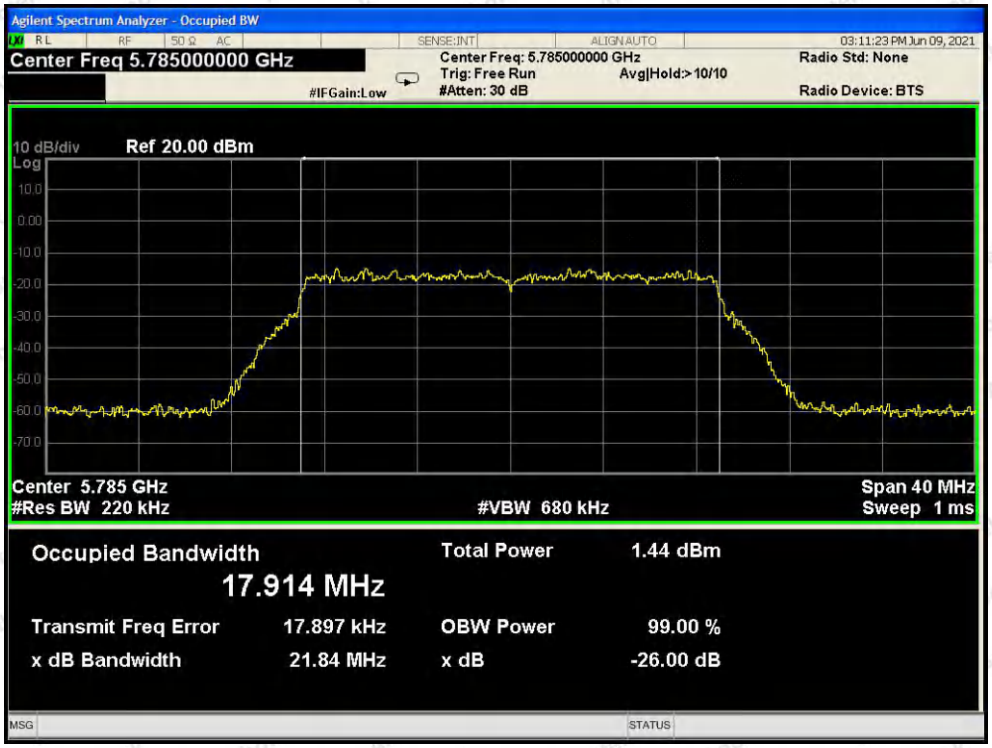
Test Mode: 802.11a---Middle



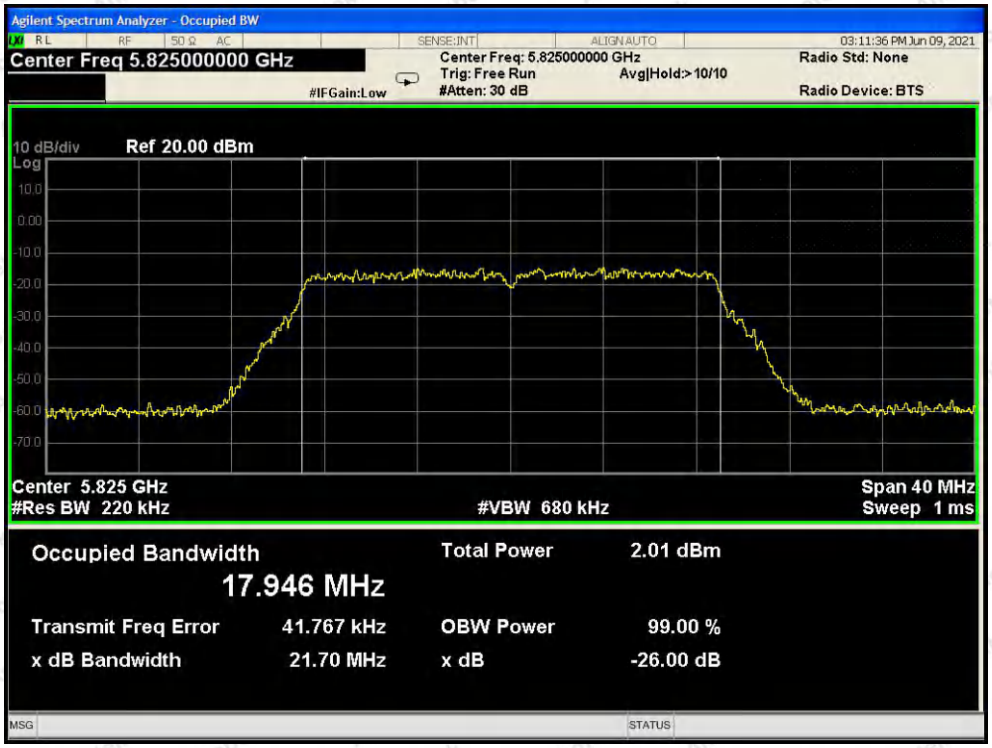
Test Mode: 802.11a---High



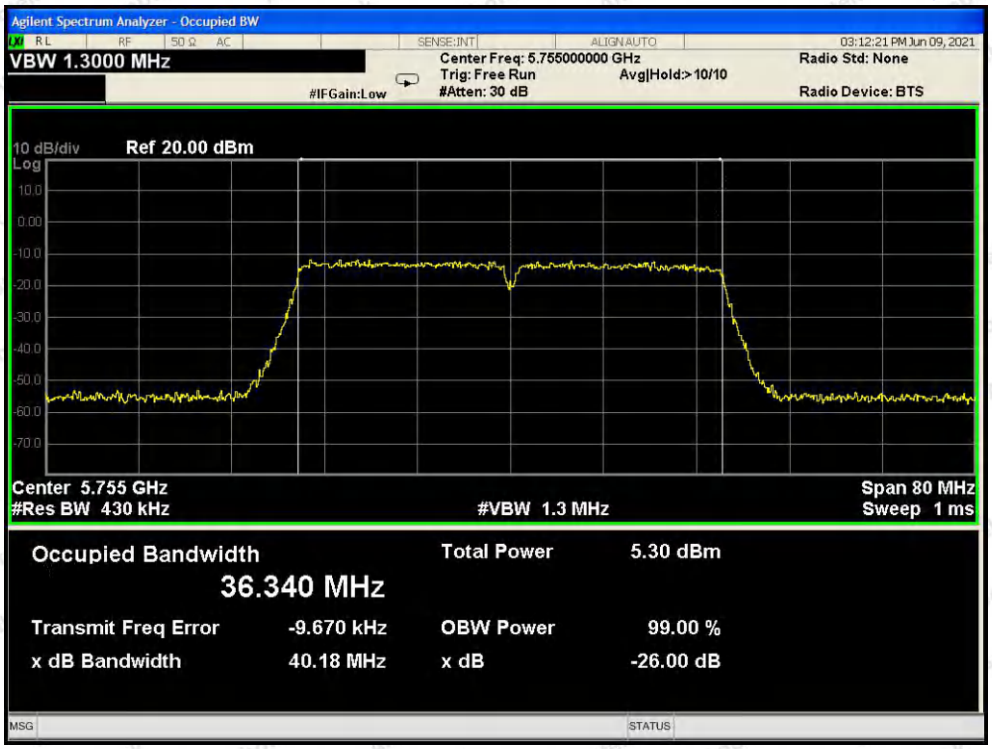
Test Mode: 802.11ac20--Low



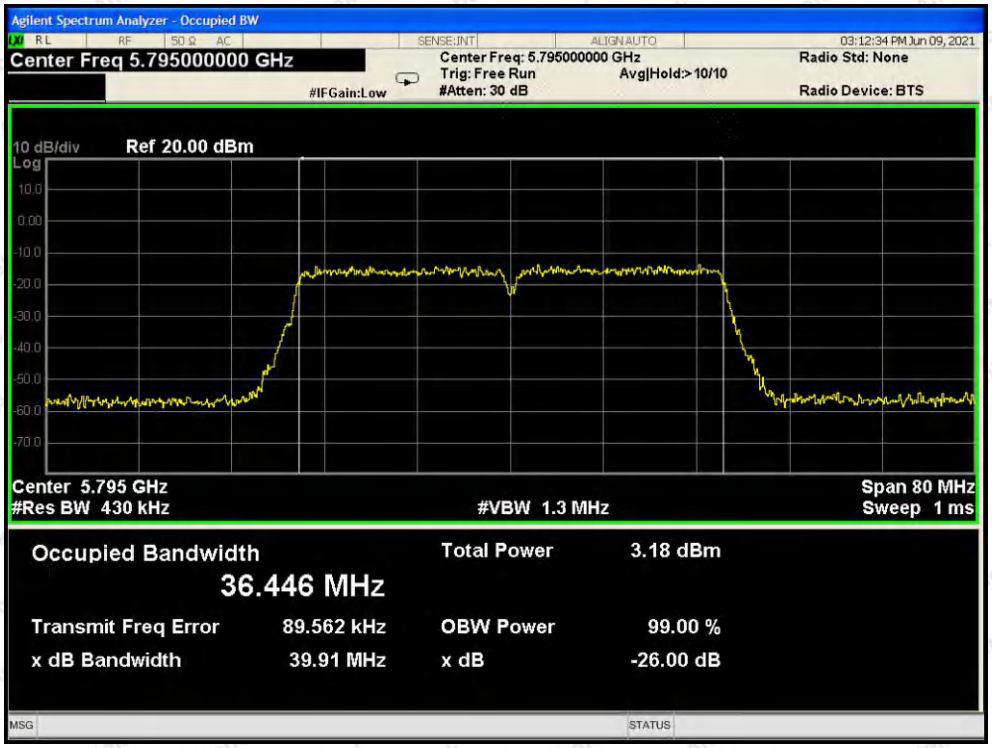
Test Mode: 802.11ac20---Middle



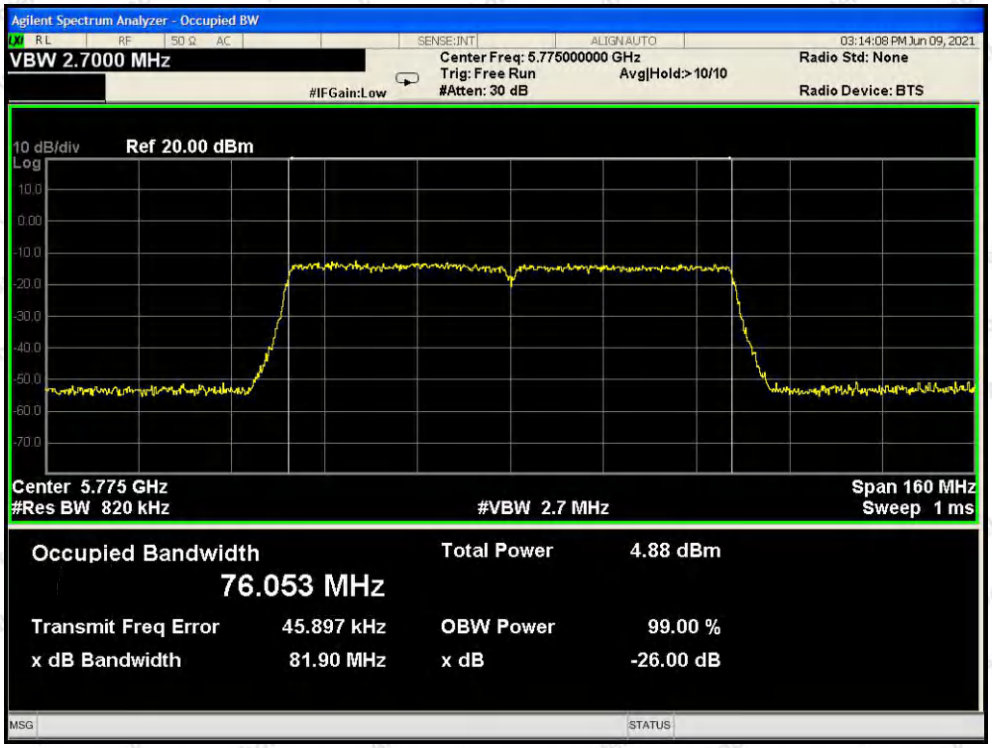
Test Mode: 802.11ac20---High



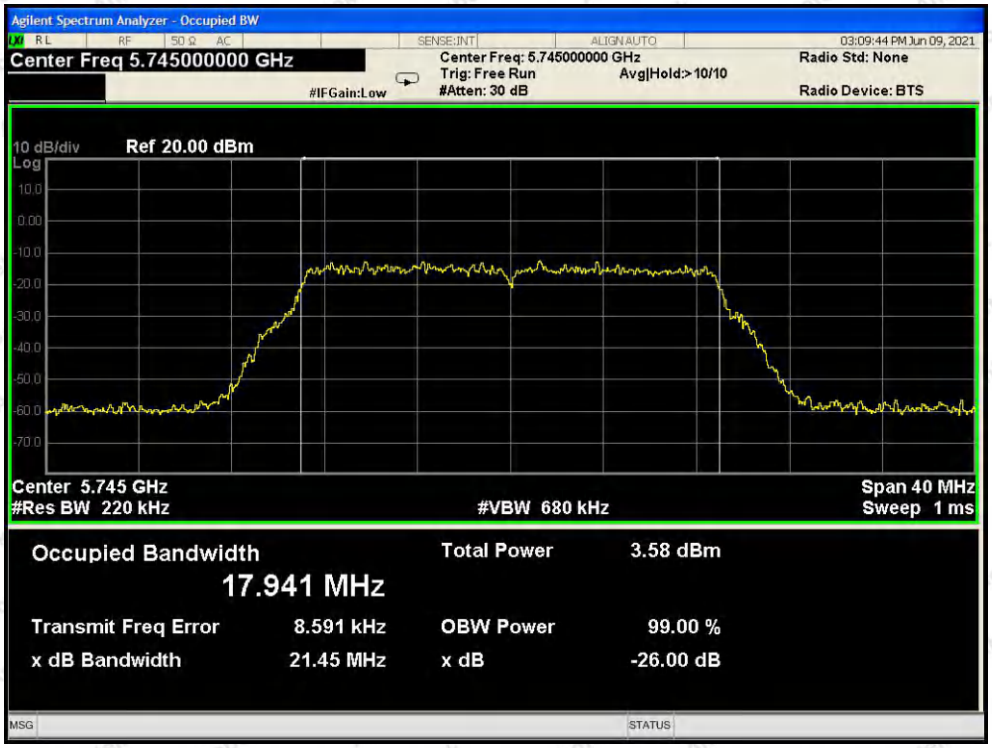
Test Mode: 802.11ac40---Low



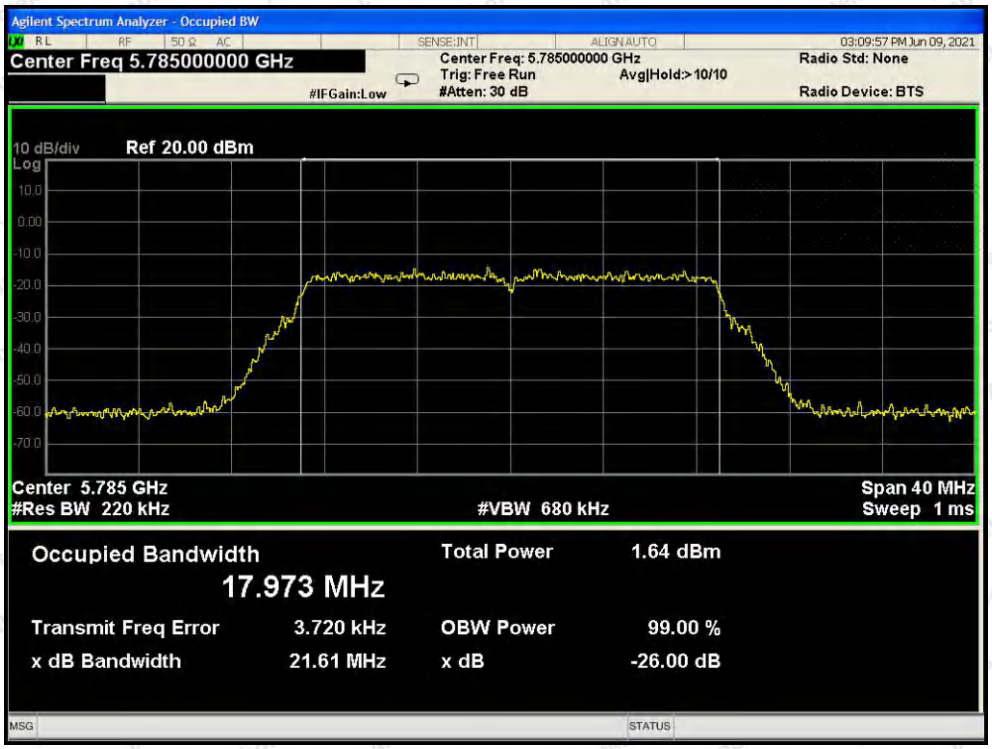
Test Mode: 802.11ac40---High



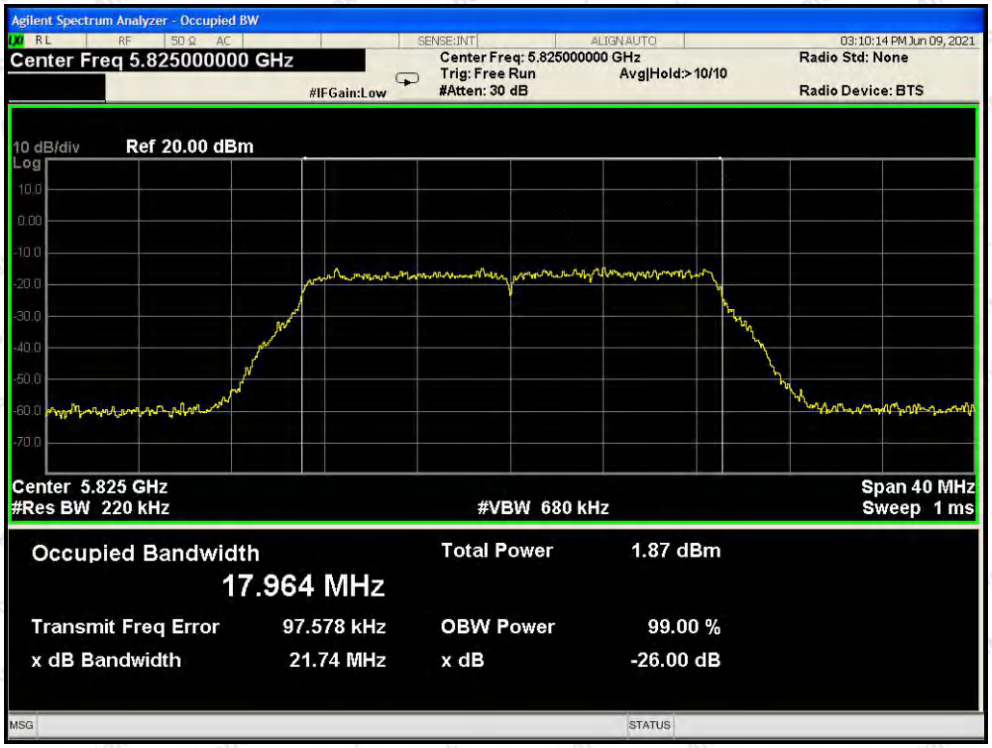
Test Mode: 802.11ac80



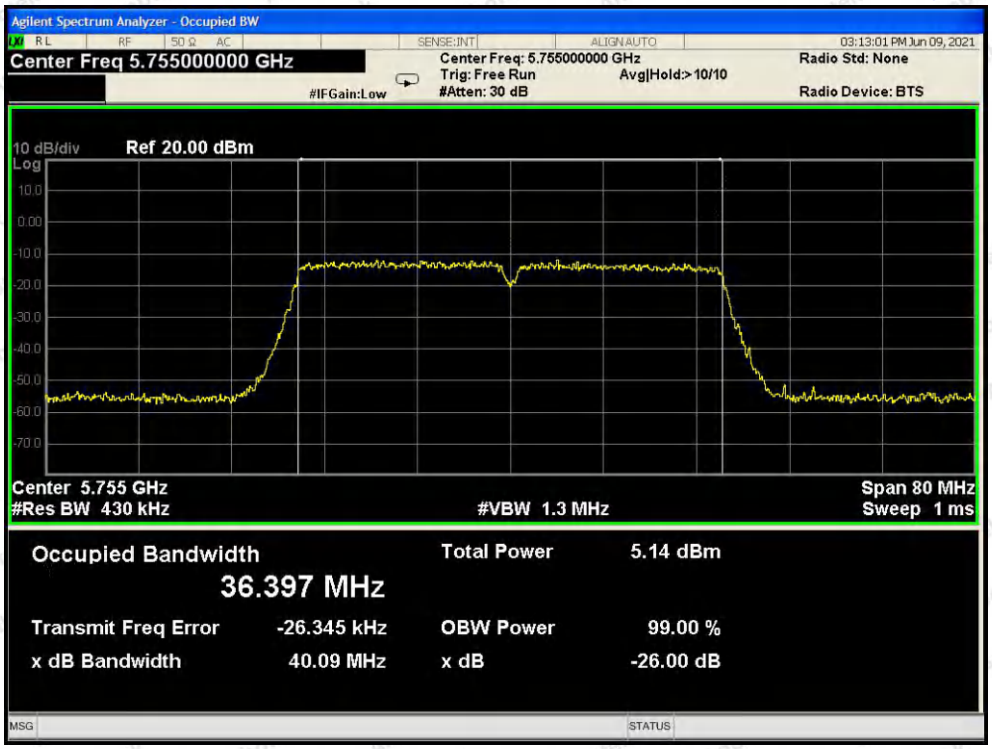
Test Mode: 802.11n20---Low



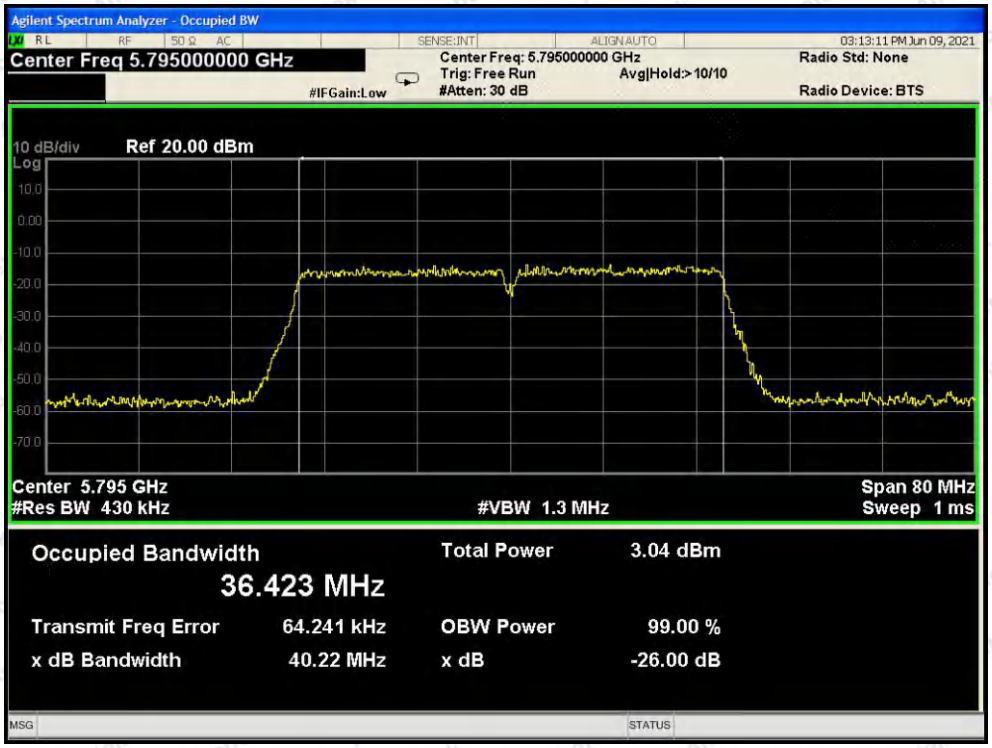
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



Test Mode: 802.11n40---Low



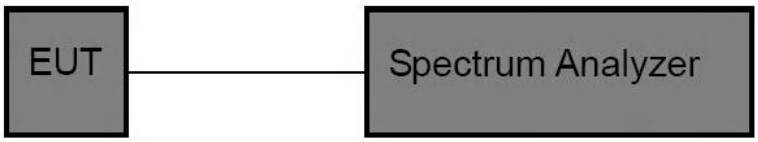
Test Mode: 802.11n40---High

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a) (3)
Test Limit	30 dBm/500KHz

7.2. Test Setup



7.3. Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz).

1. The EUT is directly connected to the spectrum analyzer;
2. Set RBW =510KHz;
3. Set VBW ≥ 3 RBW=2MHz;
3. Set the span to encompass the entire emissions bandwidth (EBW) of the signal;
5. Detector=RMS;
6. Sweep time= auto couple;
7. Trace mode=max. hold;

7.4. Test Data

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 3.85V Battery inside	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

ANT1:

Mode	Channel Frequency (MHz)	Test Power Spectral Density (dBm/510KHz)	Final Power Spectral Density (dBm/500KHz)	Limit	Results
802.11a	5745	-9.966	-10.052	30	PASS
	5785	-11.942	-12.028	30	PASS
	5825	-11.523	-11.609	30	PASS
802.11ac20	5745	-8.916	-9.002	30	PASS
	5785	-11.444	-11.530	30	PASS
	5825	-11.909	-11.995	30	PASS
802.11ac40	5755	-11.648	-11.734	30	PASS
	5795	-13.392	-13.478	30	PASS
802.11ac80	5775	-14.916	-15.002	30	PASS
802.11n20	5745	-10.128	-10.214	30	PASS
	5785	-12.370	-12.456	30	PASS
	5825	-12.328	-12.414	30	PASS
802.11n40	5755	-11.290	-11.376	30	PASS
	5795	-13.016	-13.102	30	PASS

Remark: Final Power Spectral Density=Test Power Spectral Density+10log10(500/510)

ANT2:

Mode	Channel Frequency (MHz)	Test Power Spectral Density (dBm/510KHz)	Final Power Spectral Density (dBm/500KHz)	Limit	Results
802.11a	5745	-9.737	-9.823	30	PASS
	5785	-12.154	-12.240	30	PASS
	5825	-11.268	-11.354	30	PASS
802.11ac20	5745	-9.157	-9.243	30	PASS
	5785	-12.027	-12.113	30	PASS
	5825	-11.734	-11.820	30	PASS
802.11ac40	5755	-12.203	-12.289	30	PASS
	5795	-13.413	-13.499	30	PASS
802.11ac80	5775	-15.769	-15.855	30	PASS
802.11n20	5745	-9.480	-9.566	30	PASS
	5785	-11.532	-11.618	30	PASS
	5825	-12.114	-12.200	30	PASS
802.11n40	5755	-11.835	-11.921	30	PASS
	5795	-13.701	-13.787	30	PASS

Remark: Final Power Spectral Density=Test Power Spectral Density+10log10(500/510)

ANT1+B:

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm/510KHz)	Final Power Spectral Density (dBm/500KHz)	Limit	Results
802.11ac20	5745	-6.02	-6.106	29.59	PASS
	5785	-8.72	-8.806	29.59	PASS
	5825	-8.81	-8.896	29.59	PASS
802.11ac40	5755	-8.91	-8.996	29.59	PASS
	5795	-10.39	-10.476	29.59	PASS
802.11ac80	5775	-12.31	-12.396	29.59	PASS
802.11n20	5745	-6.78	-6.866	29.59	PASS
	5785	-8.92	-9.006	29.59	PASS
	5825	-9.21	-9.296	29.59	PASS
802.11n40	5755	-8.54	-8.626	29.59	PASS
	5795	-10.33	-10.416	29.59	PASS

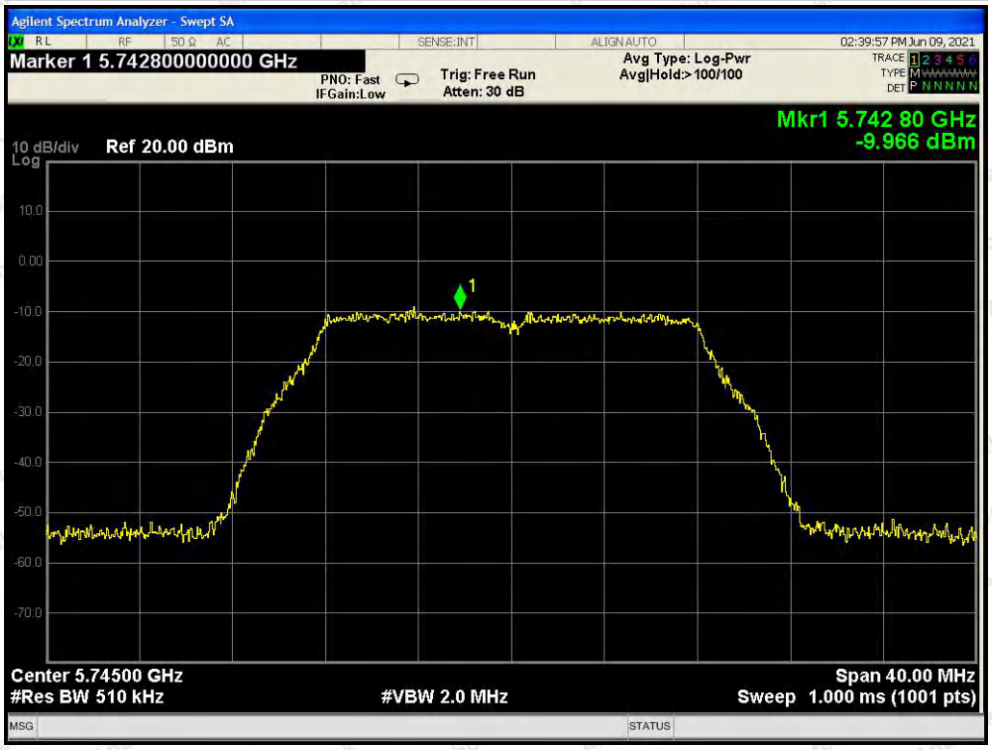
Remark: 1. Final Power Spectral Density=Test Power Spectral Density+10log10(500/510)

2. As Directional gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$) 2 /N_{ANT}] dBi=6.41>6dBi,

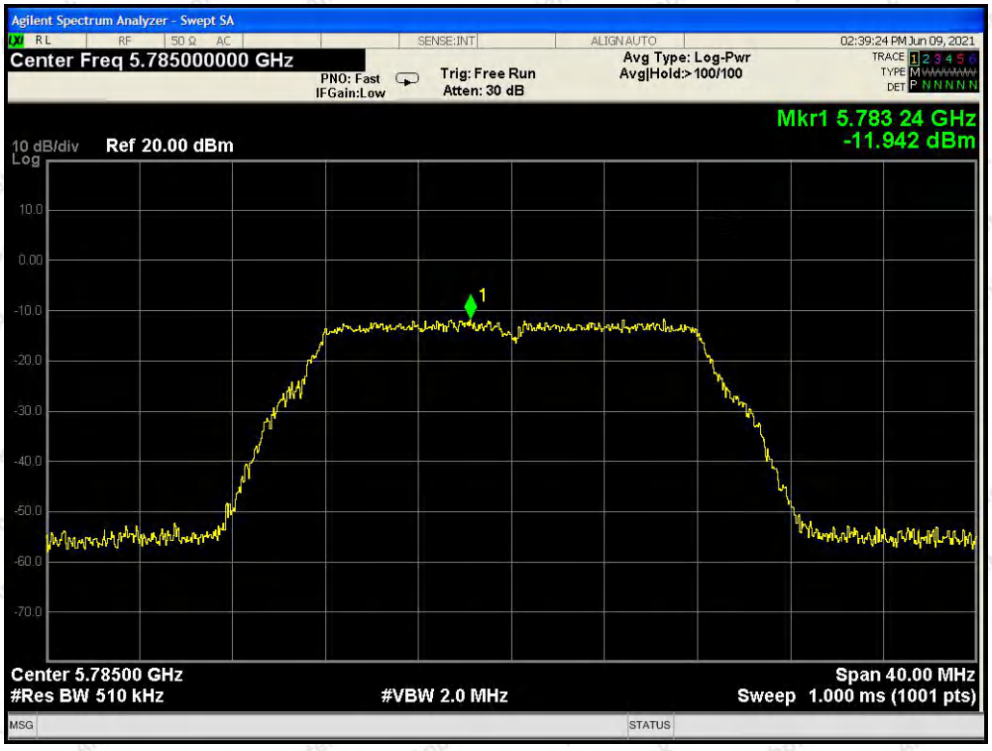
so limit=30-6.41-6.00)=29.59dBm.

ANT1

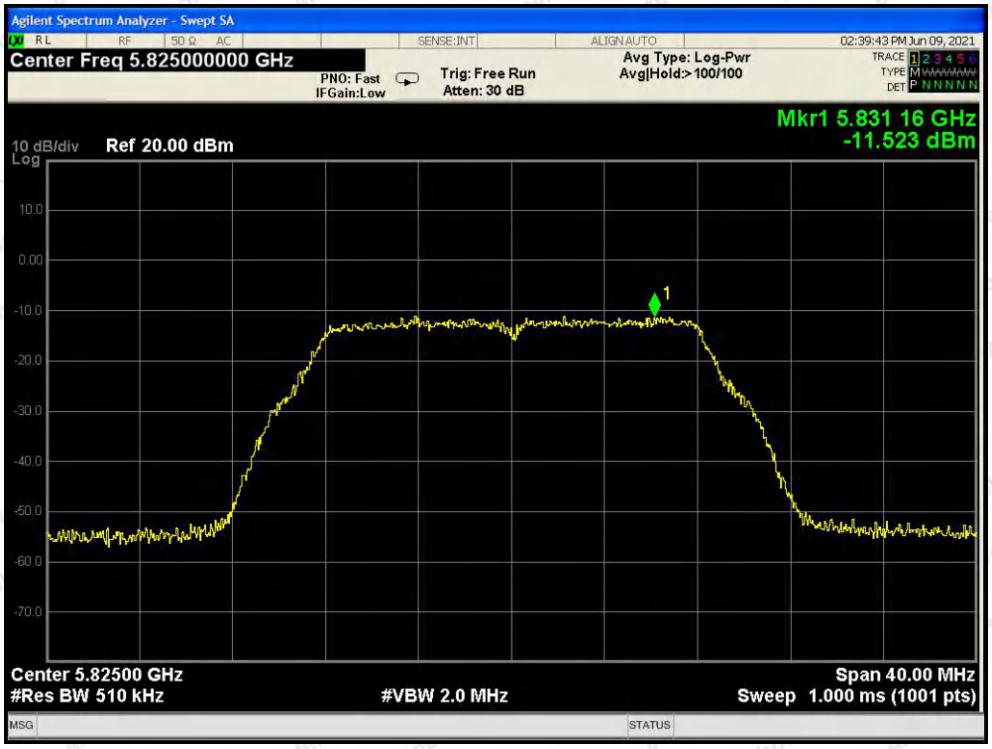
Power Spectral Density



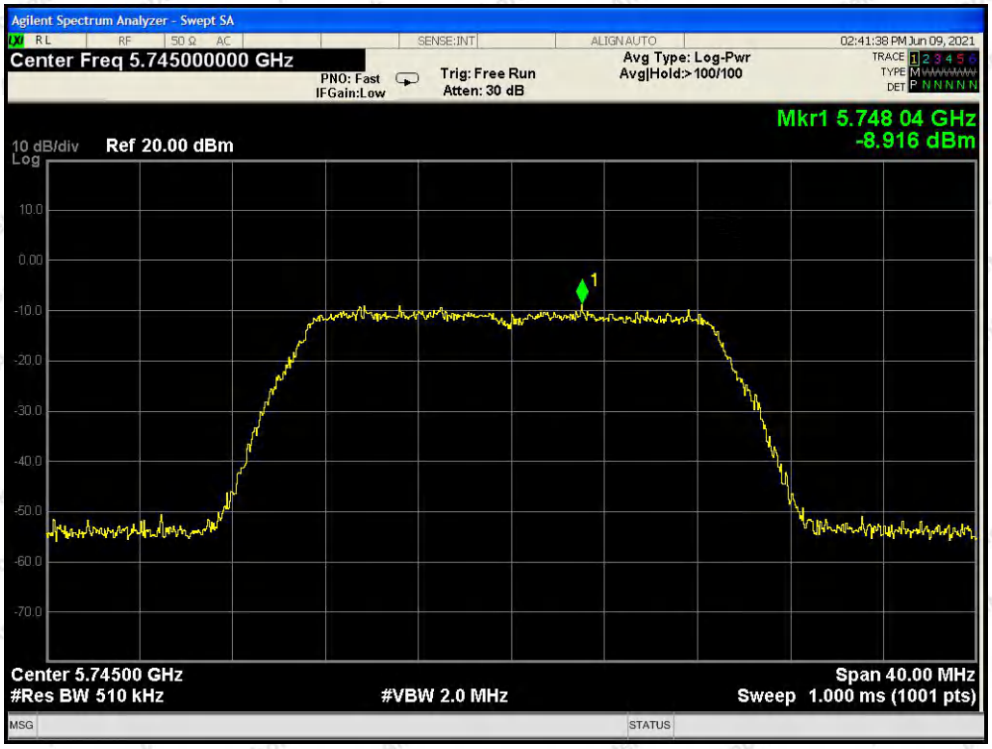
Test Mode: 802.11a--Low



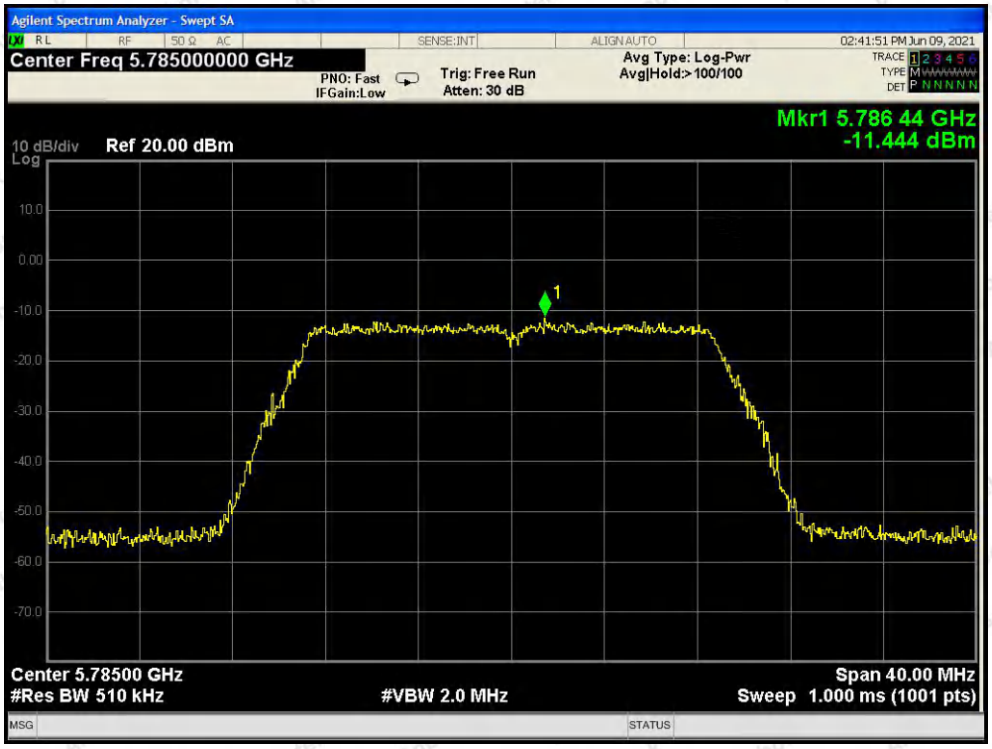
Test Mode: 802.11a---Middle



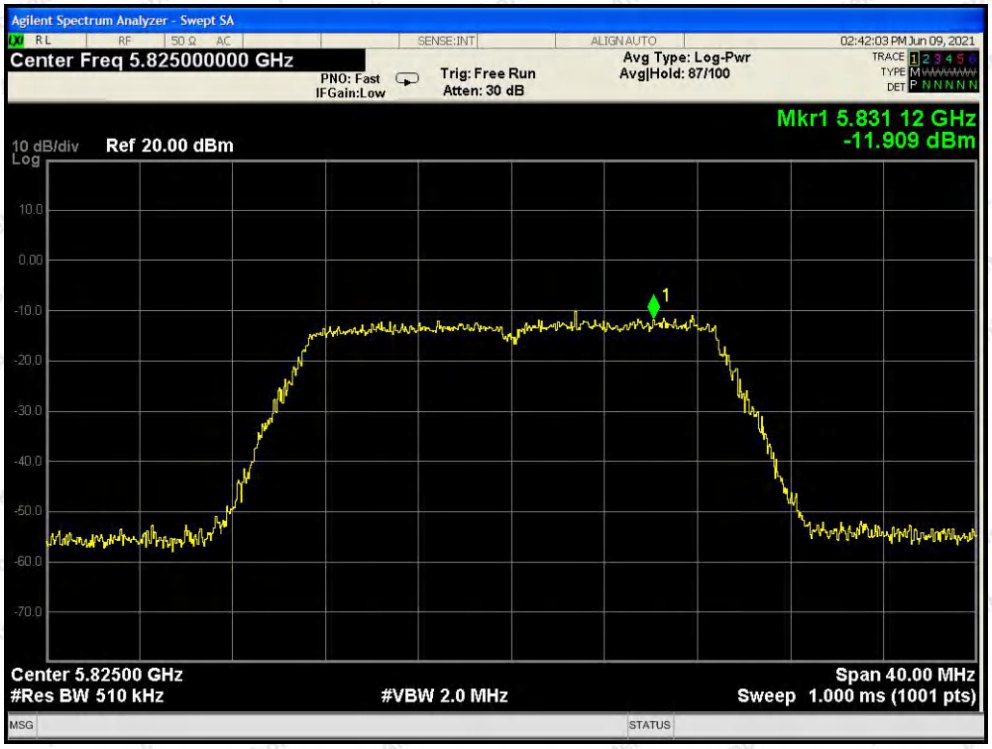
Test Mode: 802.11a---High



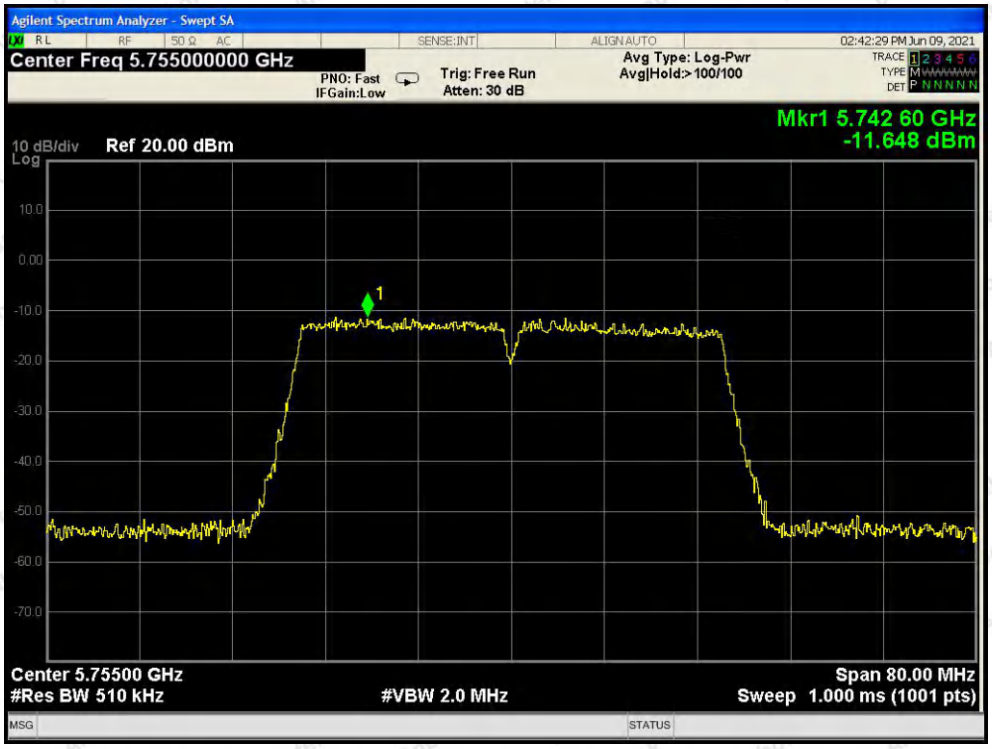
Test Mode: 802.11ac20---Low



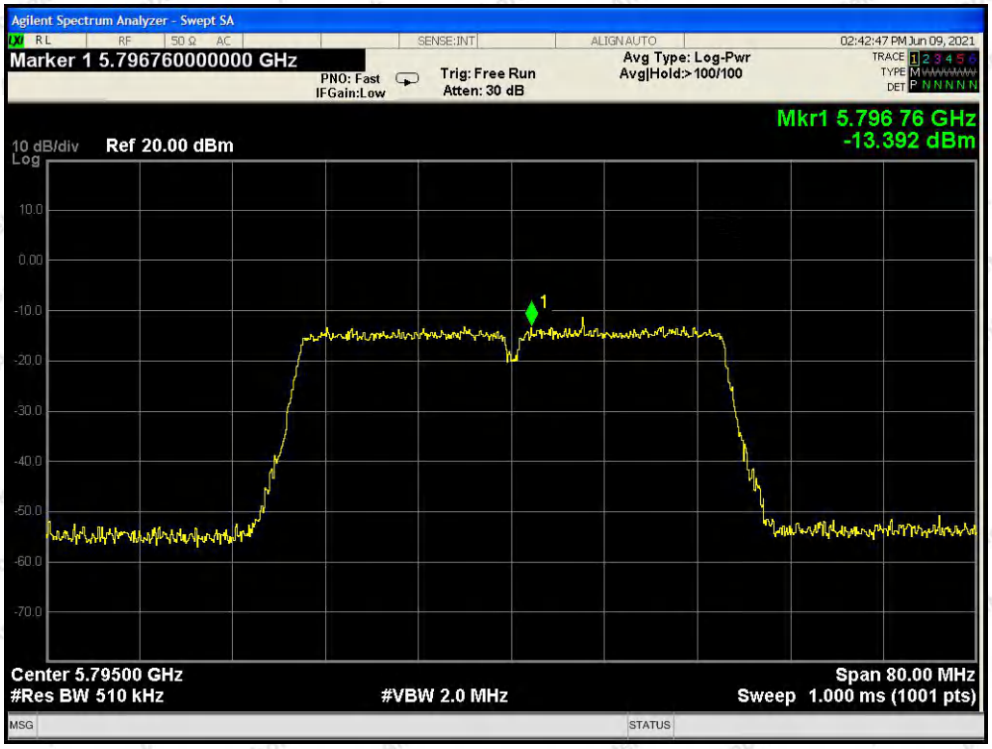
Test Mode: 802.11ac20---Middle



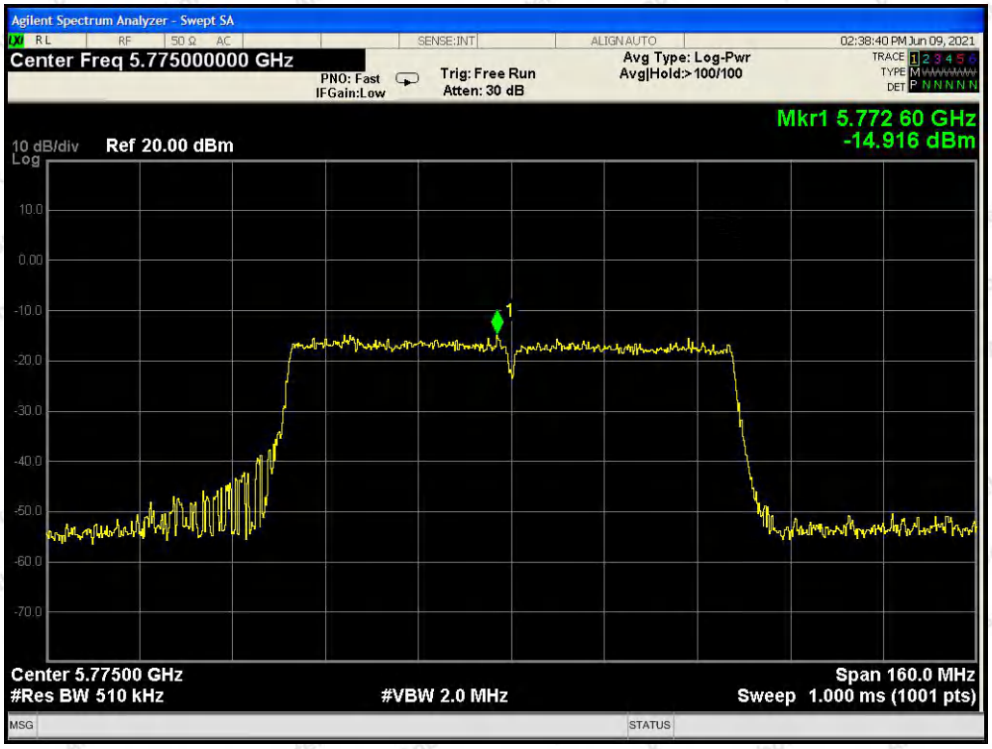
Test Mode: 802.11ac20---High



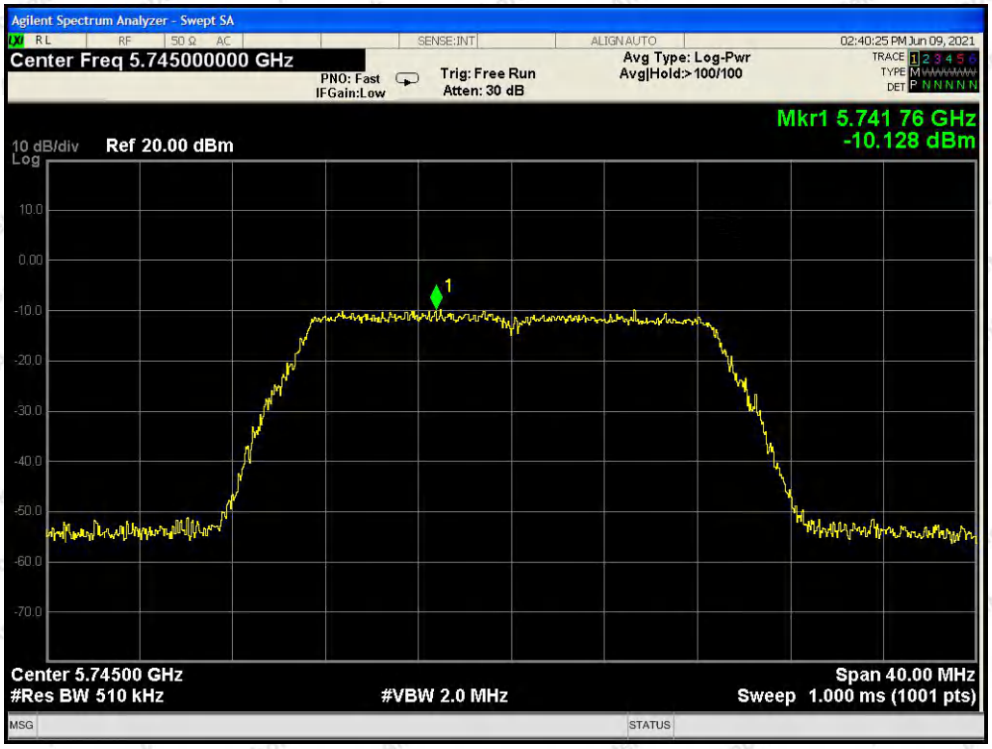
Test Mode: 802.11ac40--Low



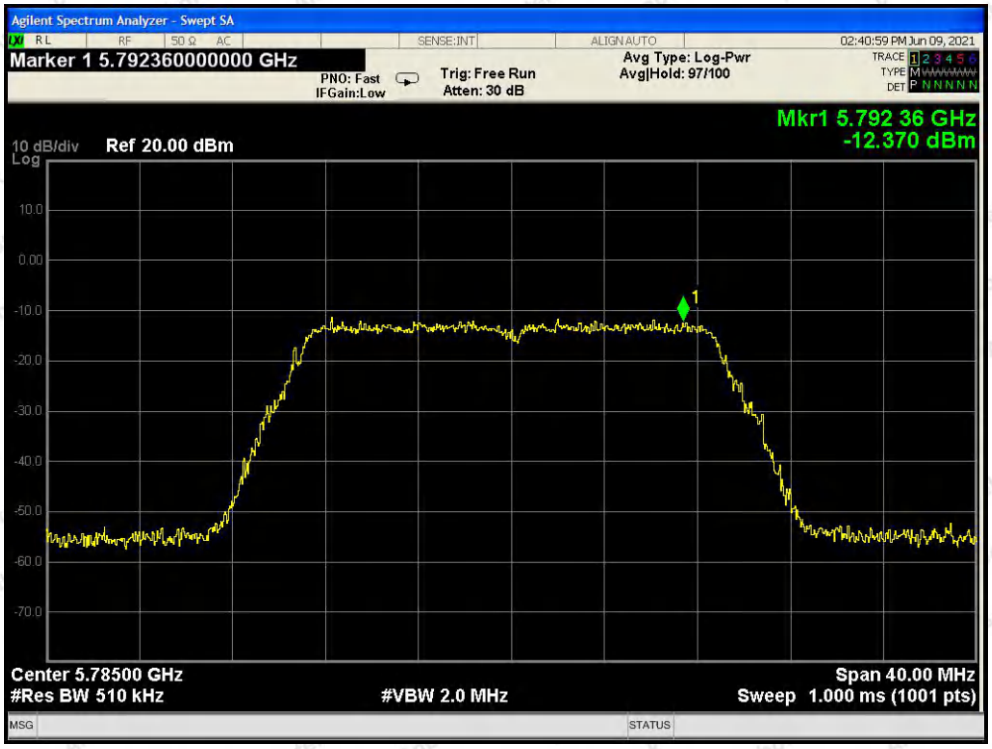
Test Mode: 802.11ac40---High



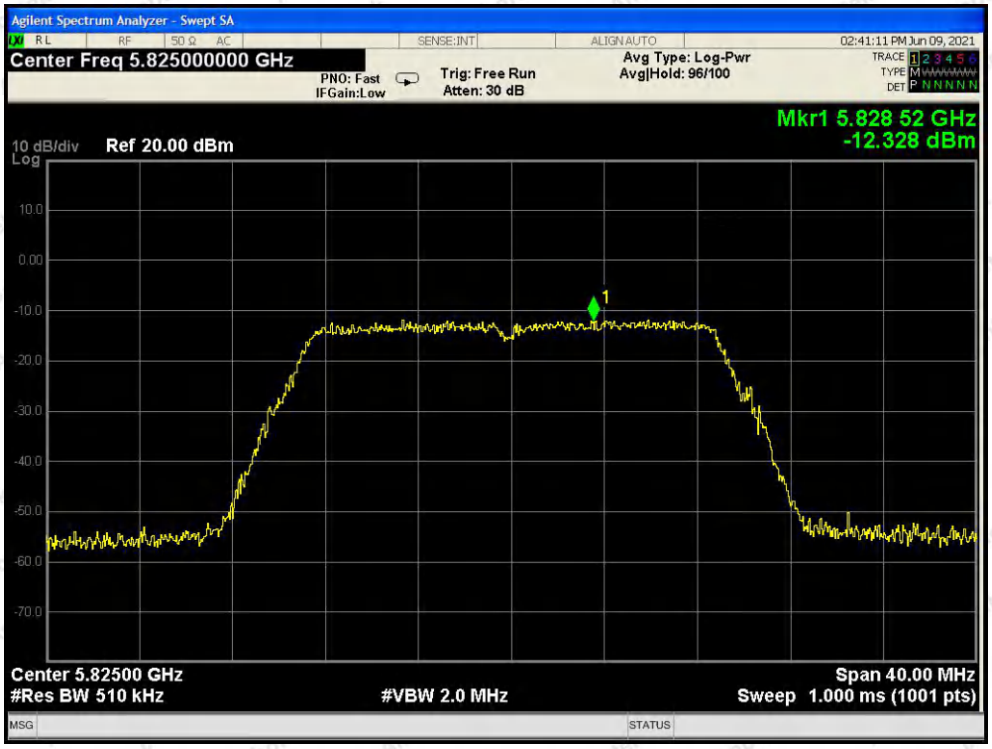
Test Mode: 802.11ac80



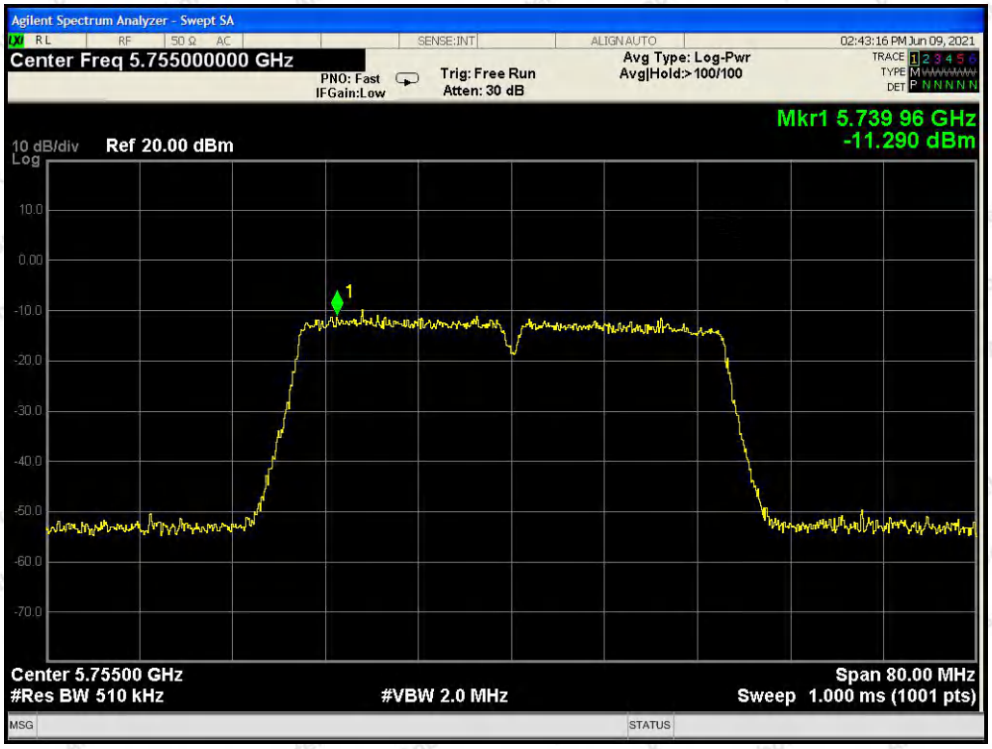
Test Mode: 802.11n20---Low



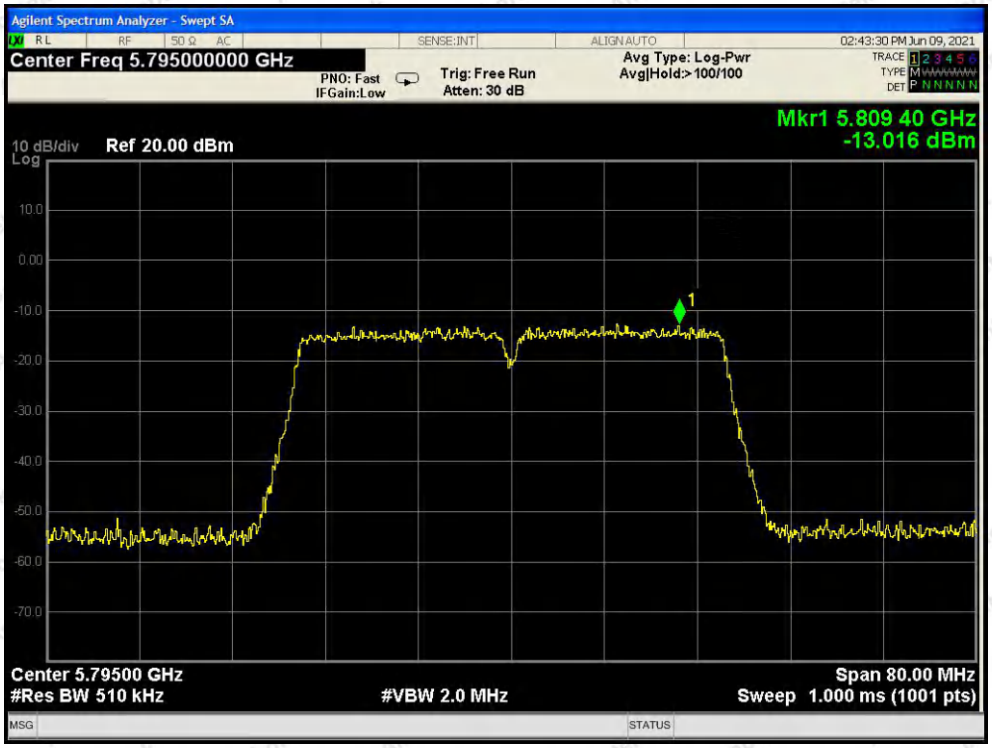
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



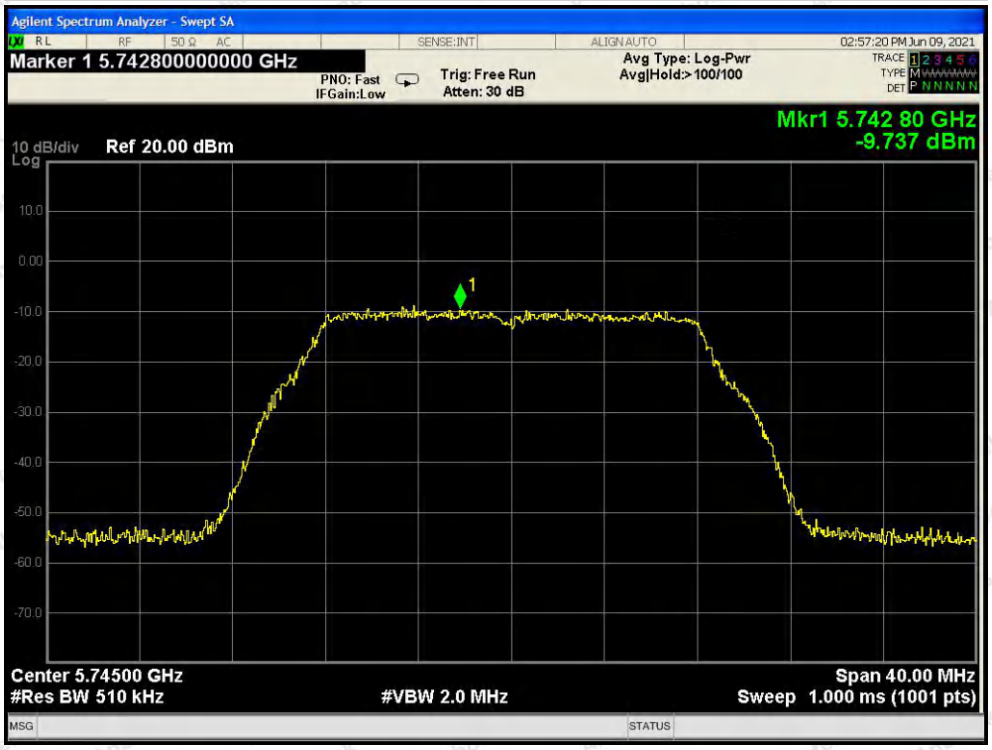
Test Mode: 802.11n40---Low



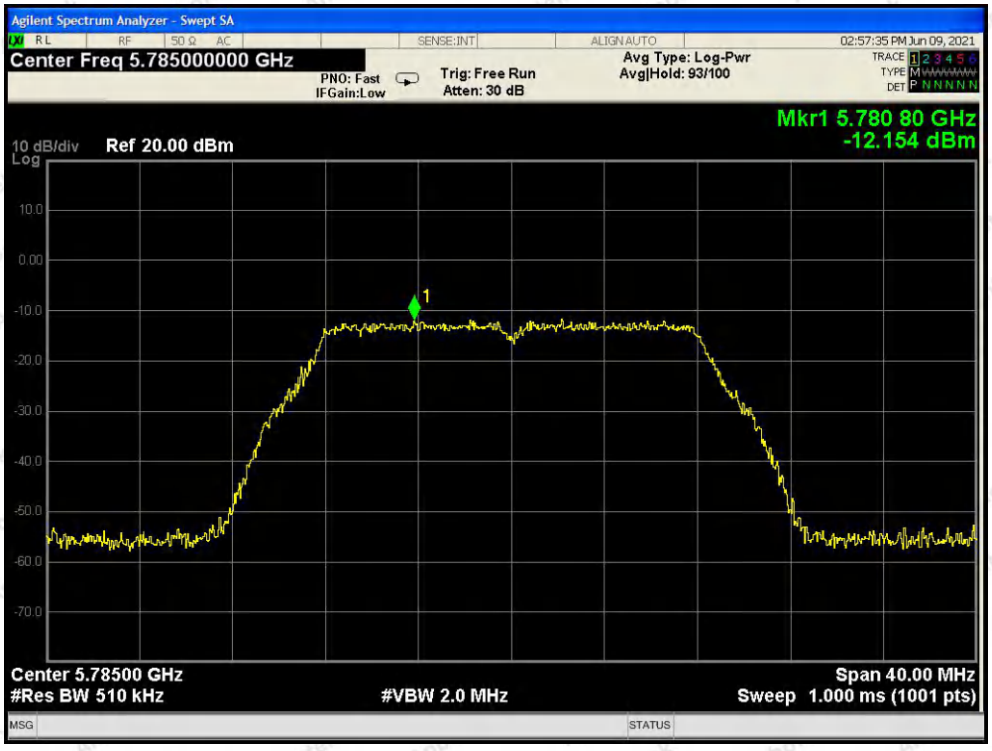
Test Mode: 802.11n40---High

ANT2

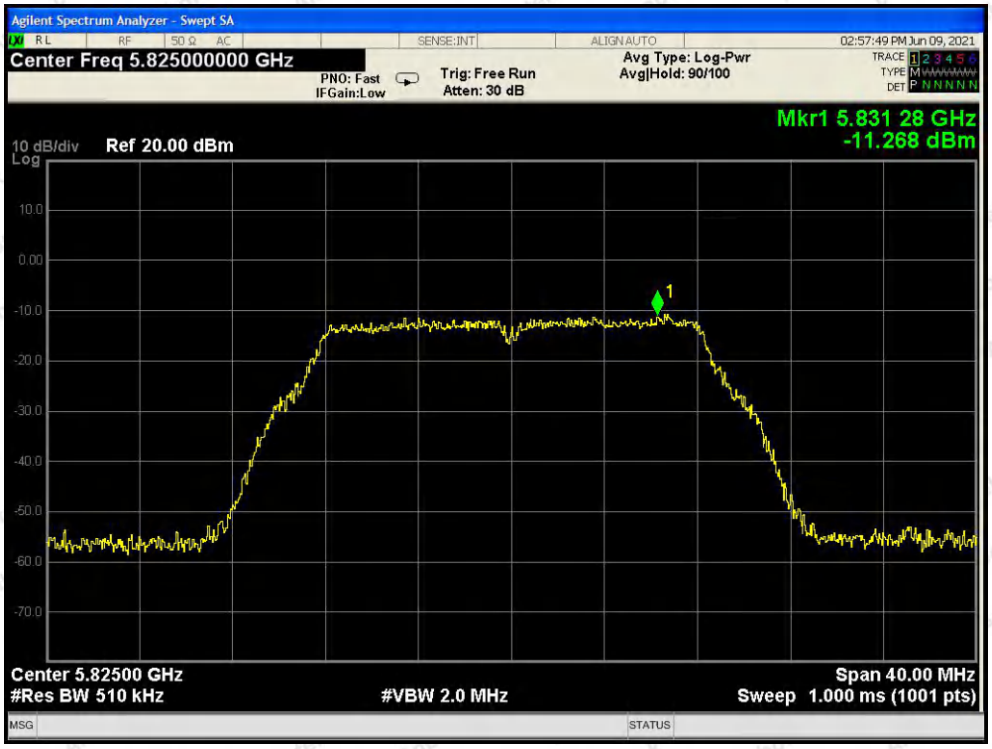
Power Spectral Density



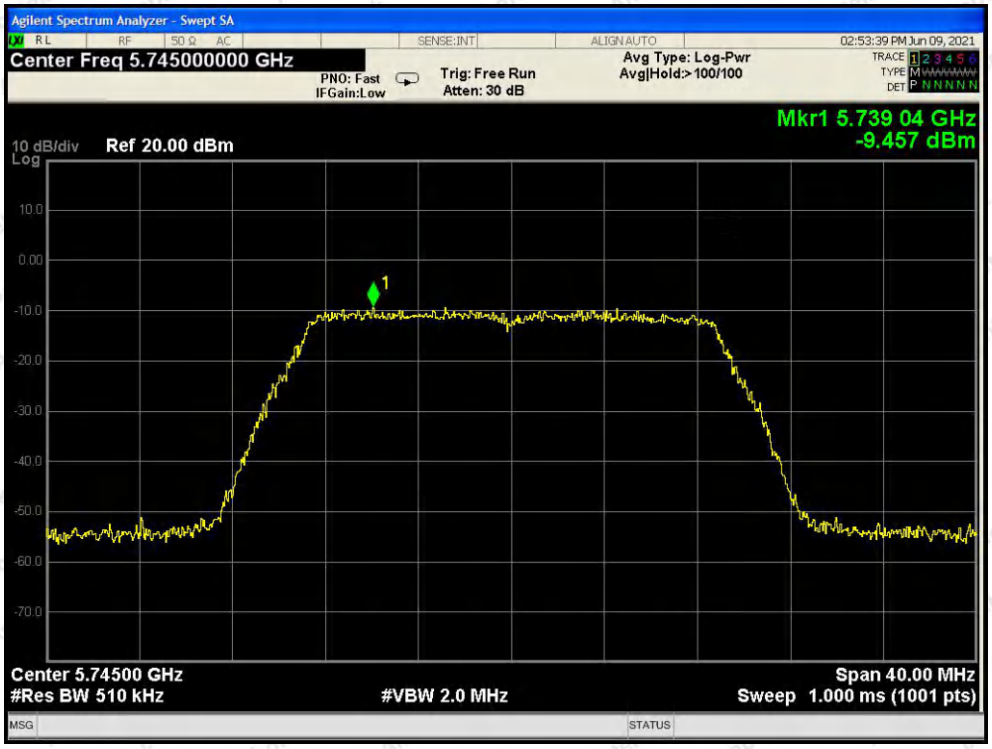
Test Mode: 802.11a--Low



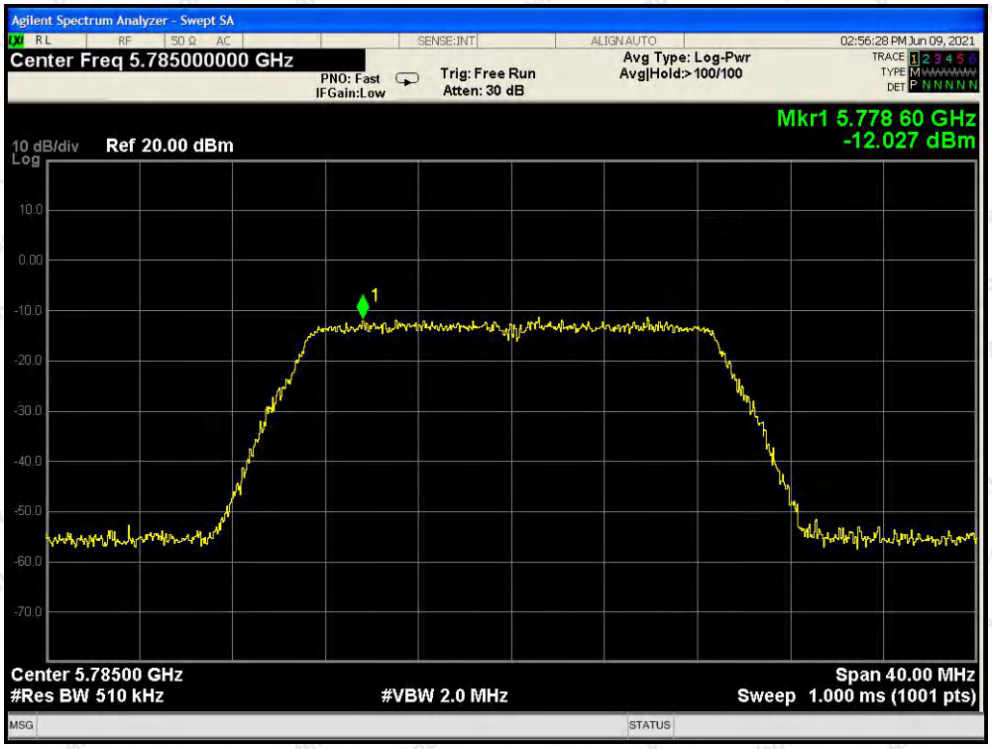
Test Mode: 802.11a---Middle



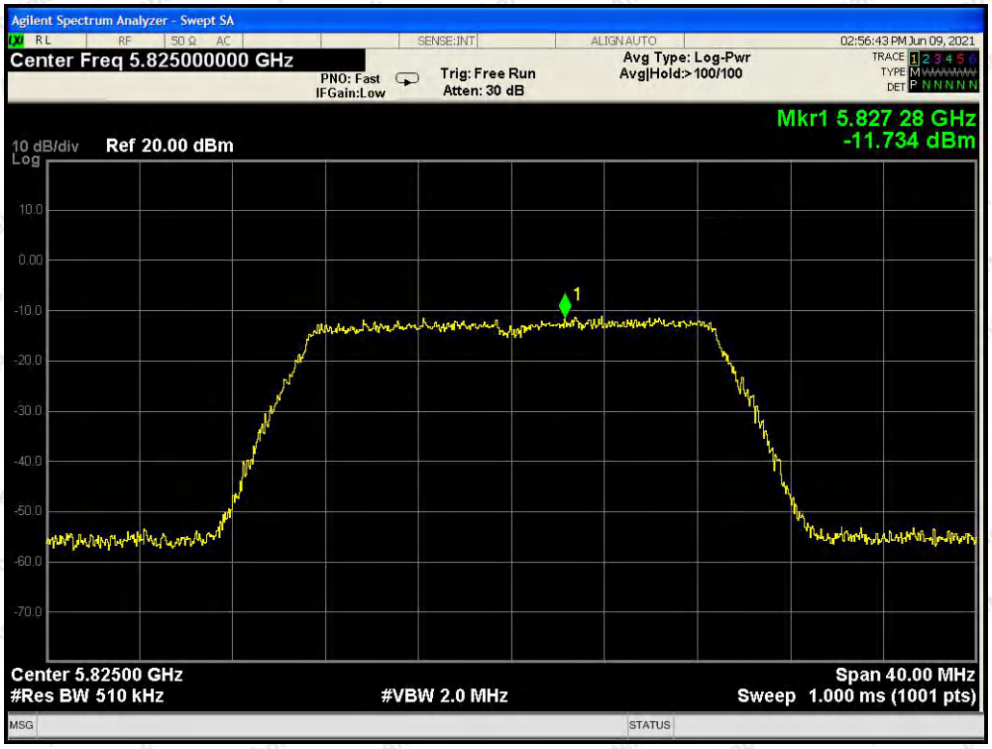
Test Mode: 802.11a---High



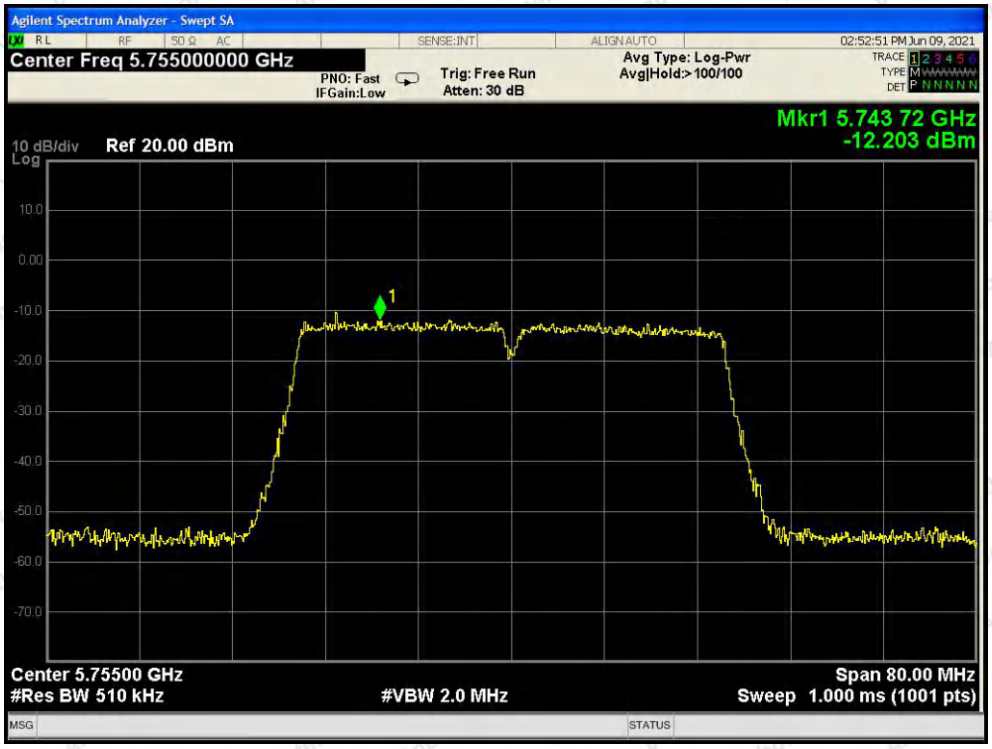
Test Mode: 802.11ac20---Low



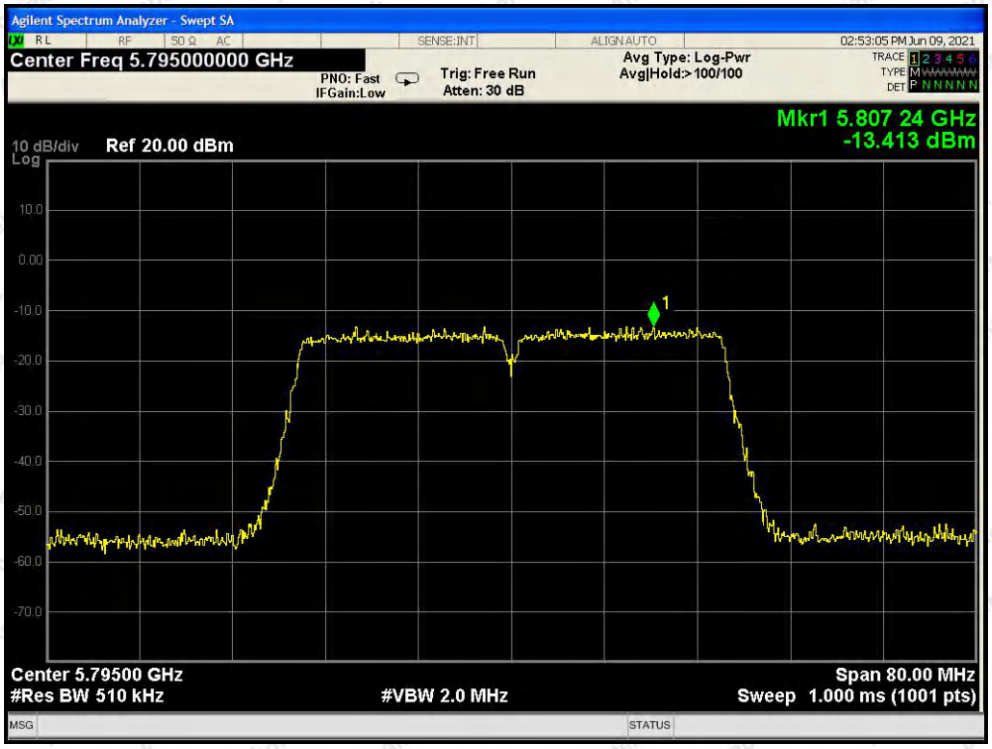
Test Mode: 802.11ac20---Middle



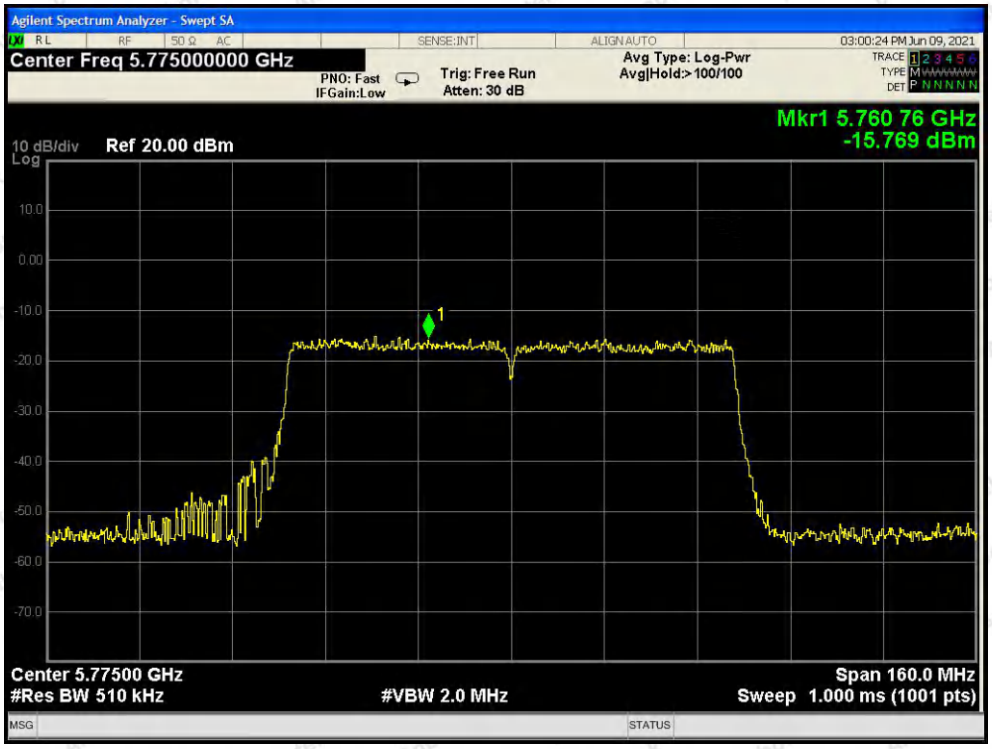
Test Mode: 802.11ac20---High



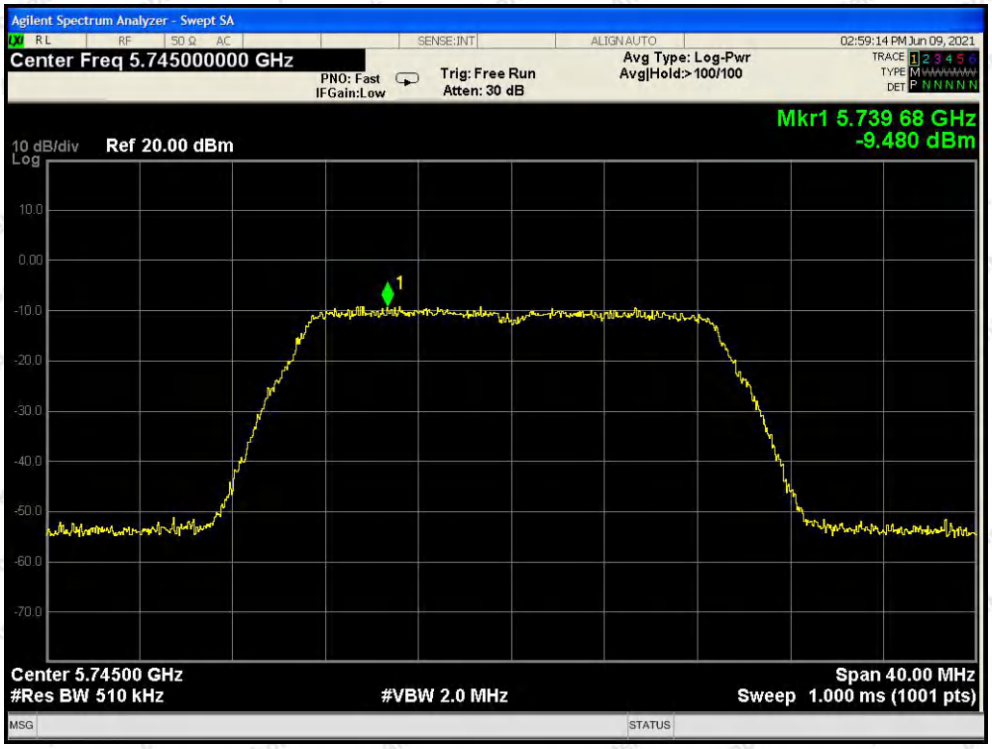
Test Mode: 802.11ac40--Low



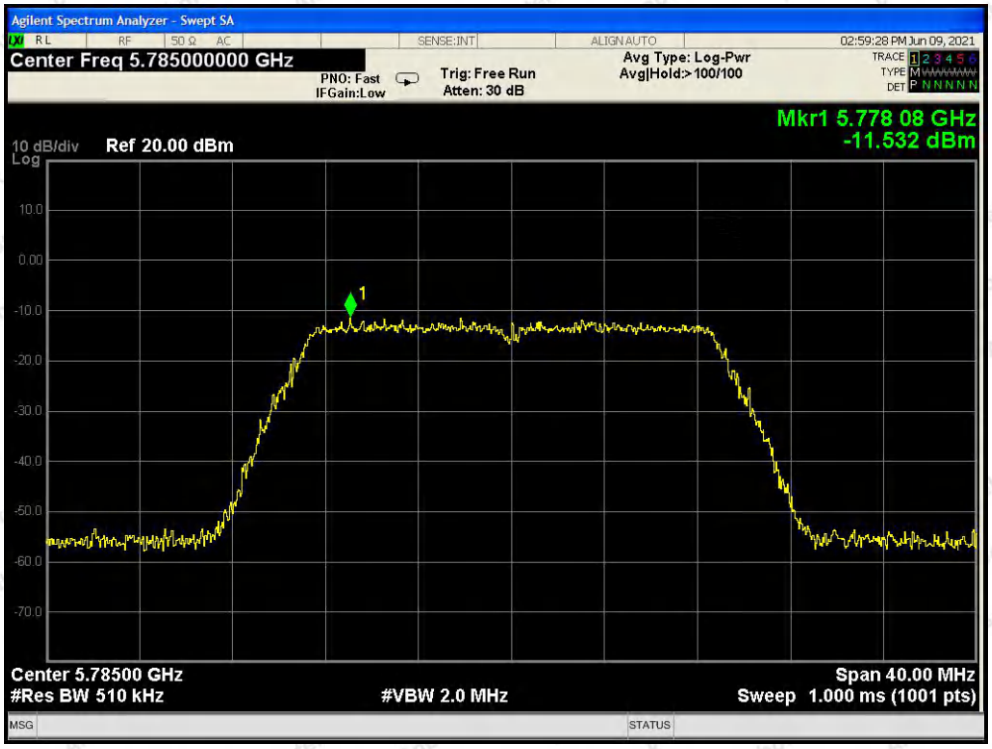
Test Mode: 802.11ac40---High



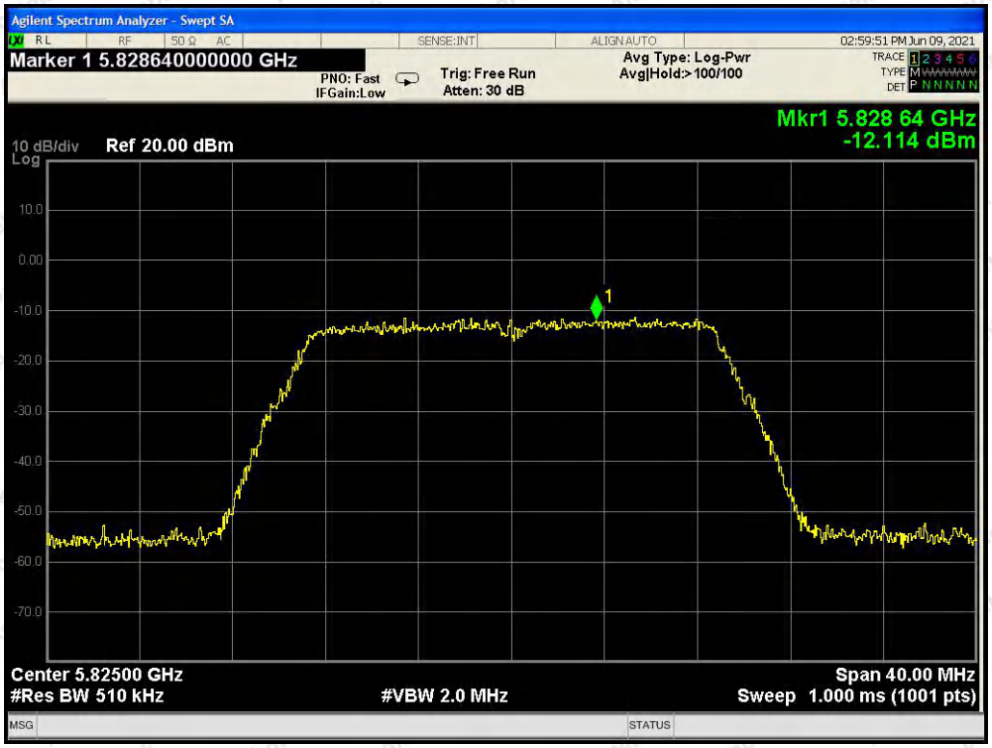
Test Mode: 802.11ac80



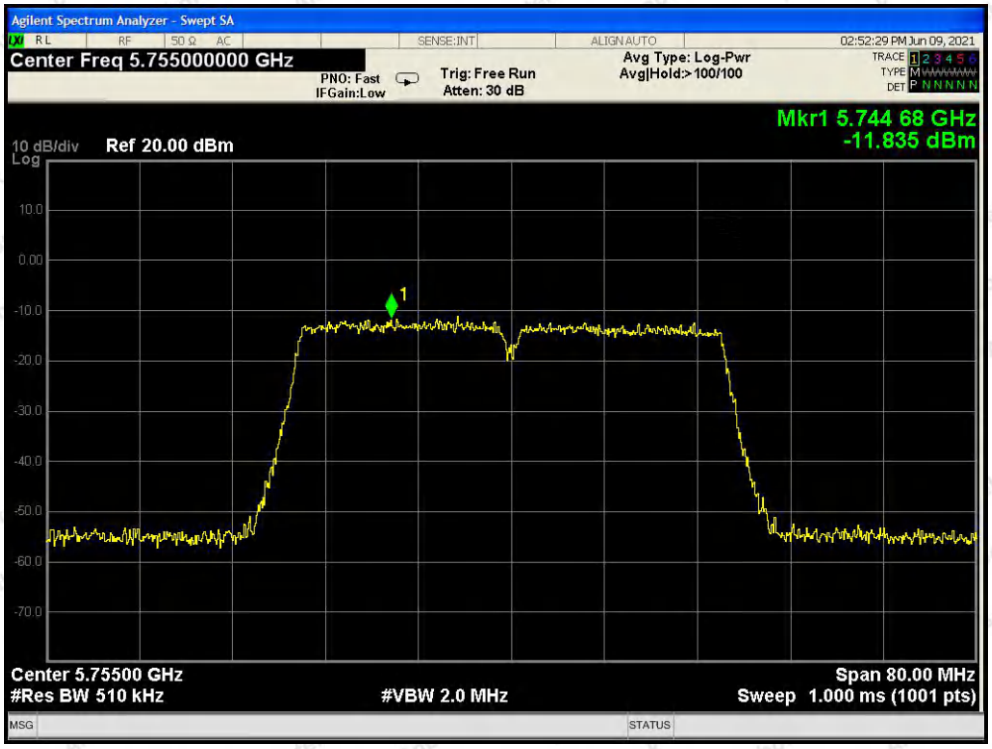
Test Mode: 802.11n20---Low



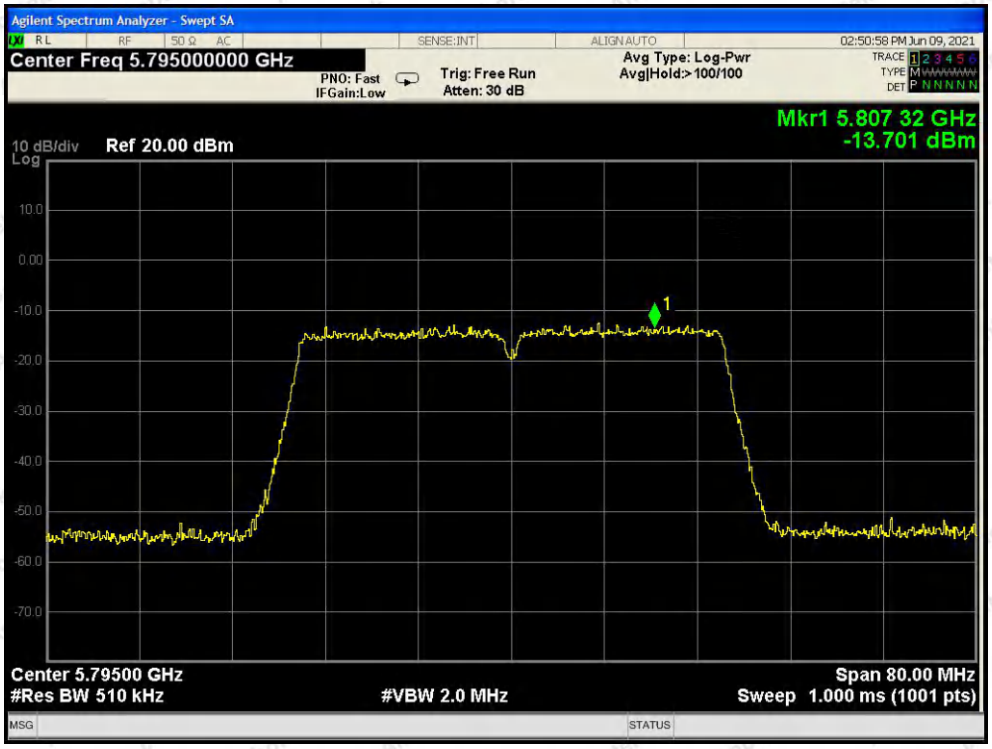
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



Test Mode: 802.11n40---Low



Test Mode: 802.11n40---High

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 antenna is a PIFA Antenna which permanently attached, and the best case gain of the 3.4 dBi. It complies with the standard requirement.

9. Frequency Stability

According to the manufacturer, under any normal operating conditions, the working frequency of the product is in the range of 5725-5850MHz.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Power Line Conducted Emission Test

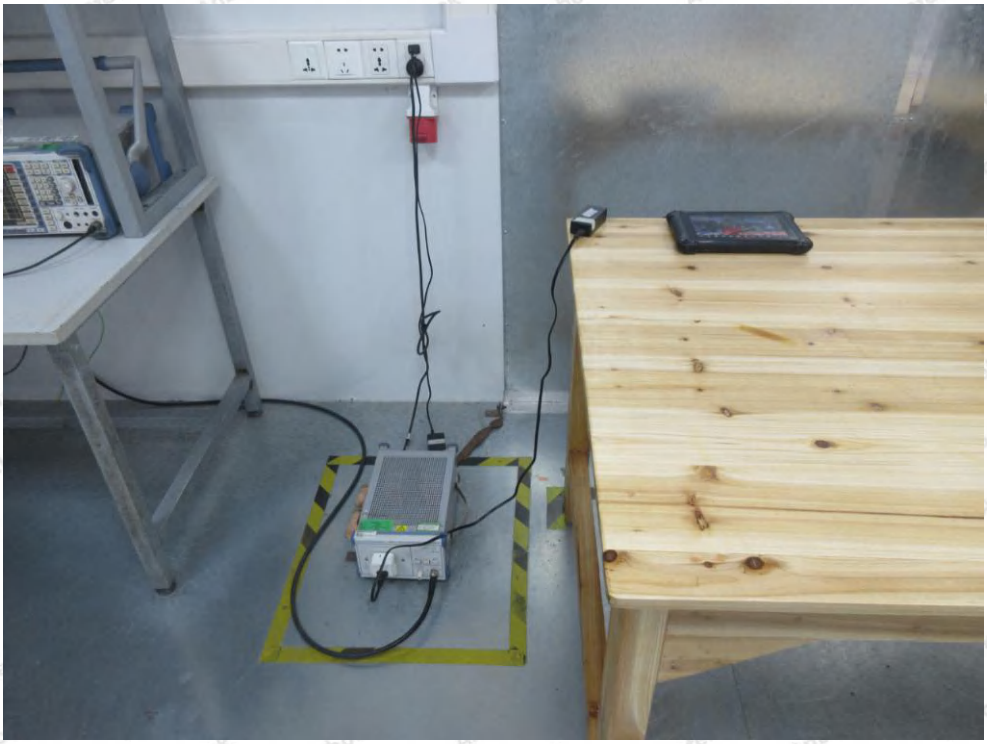
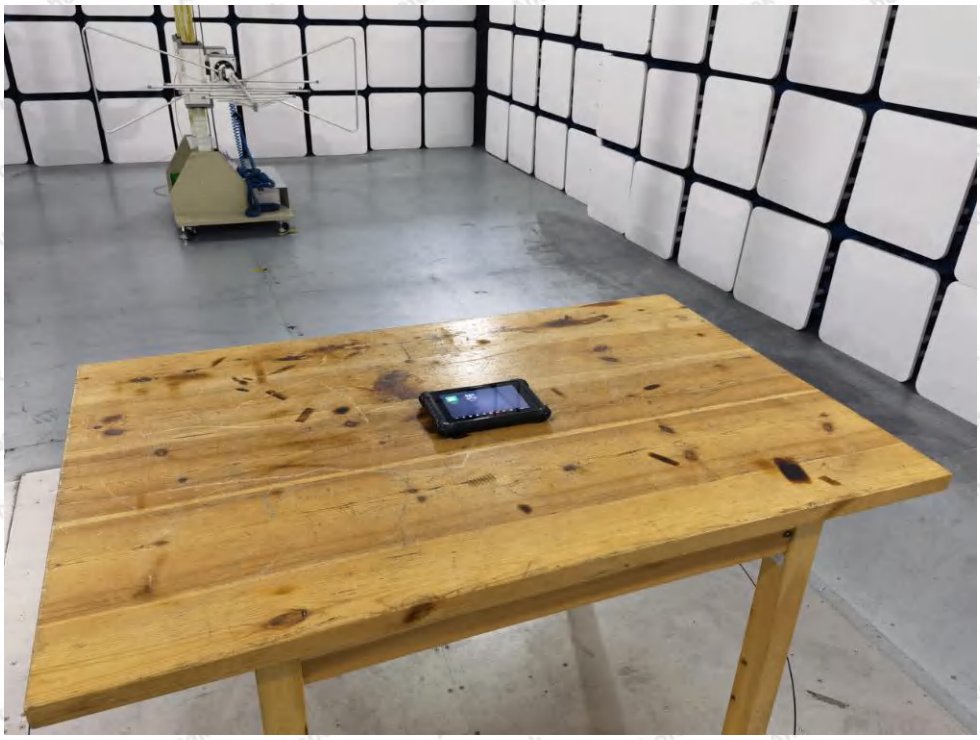


Photo of Radiation Emission Test



APPENDIX II -- EXTERNAL PHOTOGRAPH

Reference to the test report 18220WC10069301.

APPENDIX III -- INTERNAL PHOTOGRAPH

Reference to the test report 18220WC10069301.

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