FCC TEST REPORT

For

ChongQing Lavid Industrial Co., Ltd.

1200M Dual-band Wireless Router

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

Prepared For	:	ChongQing Lavid Industrial Co., Ltd.
Address	:	No 6 Building Lianhe road, Economic and Technological Development Zone, Wanzhou, China
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	SZAWW171228001-03
Date of Test	:	Dec. 28, 2017~Jan. 04, 2018
Date of Report	:	Jan. 04, 2018

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TEST REPORT

Applicant	:	ChongQing Lavid Industrial Co., Ltd.
Manufacturer	:	ShenZhen Lavid Technology Co., Ltd.
Product Name	:	1200M Dual-band Wireless Router
Model No.	:	LV-AC09, LV-AC05, LV-AC06
Trade Mark	:	N/A
Rating(s)	:	Input: AC120V/60Hz
Test Standard(s)	**:**	**FCC Part15 Subpart E 2016, Paragraph 15.407**
Test Method(s)	**:**	**ANSI C63.10: 2013**

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

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

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

Prepared by : : (Tested Engineer / Winkey Wang)

Reviewer : : (Project Manager / Tangcy. T)

Approved & Authorized Signer : : (Manager / Tom Chen)

1. General Information

1.1. Client Information

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

1.2. Description of Device (EUT)

Product Name	:	1200M Dual-band Wireless Router	
Model No.	:	LV-AC09, LV-AC05, LV-AC06 (Note: All samples are the same except the model number and Colour, so we prepare "LV-AC09" for test only.)	
Trade Mark	:	N/A	
Test Power Supply	:	AC 120V, 60Hz for adapter	
Product Description	:	Operation Frequency:	WIFI 5G: 5745MHz~5825MHz / 5755MHz~5795MHz
		Number of Channel:	WIFI 5G: 5 Channels for 802.11a 5 Channels for 802.11n(HT20) 2 Channels for 802.11n(HT40)
		Modulation Type:	OFDM with BPSK/QPSK/16QAM/64QAM for 802.11a/n;
		Antenna Type:	PIFA Antenna
		Antenna Gain(Peak):	2 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for WIFI 5G			

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

1.3. Auxiliary Equipment Used During Test

Adapter	:	N/A

1.4. Description of Test Modes

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

Mode	Test channel	Frequency (MHz)
OFDM(802.11a/n20)	CH 149	5745MHz
	CH 157	5785MHz
	CH 165	5825MHz
OFDM(802.11n40)	CH 151	5755MHz
	CH159	5795MHz

Note:

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

1.5. List of channels

802.11a/n20

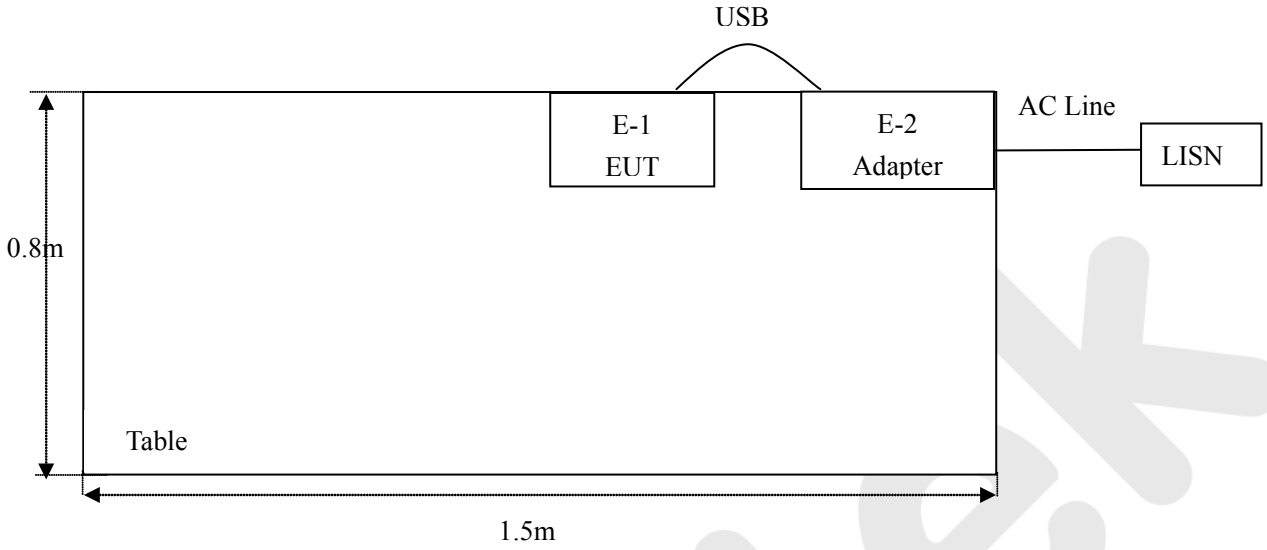
Channel	Freq. (MHz)	Channel	Freq. (MHz)
149	5745	153	5765
157	5785	161	5805
165	5825		

802.11n40

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

1.6. Description Of Test Setup

CE



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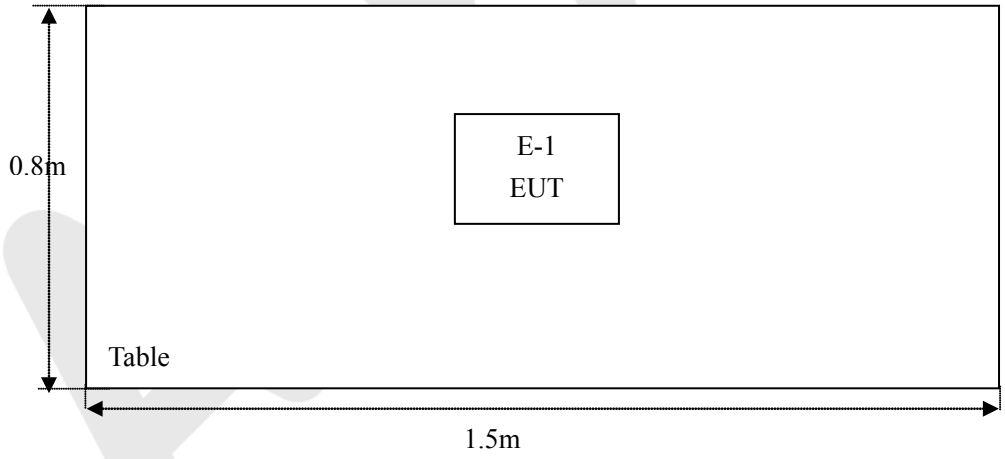


1.7. Test Equipment List

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

1.8. Measurement Uncertainty

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

1.9. Description of Test Facility

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

FCC-Registration No.: 184111

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

ISED-Registration No.: 8058A-1

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

Test Location

All Emissions tests were performed at

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

2. Summary of Test Results

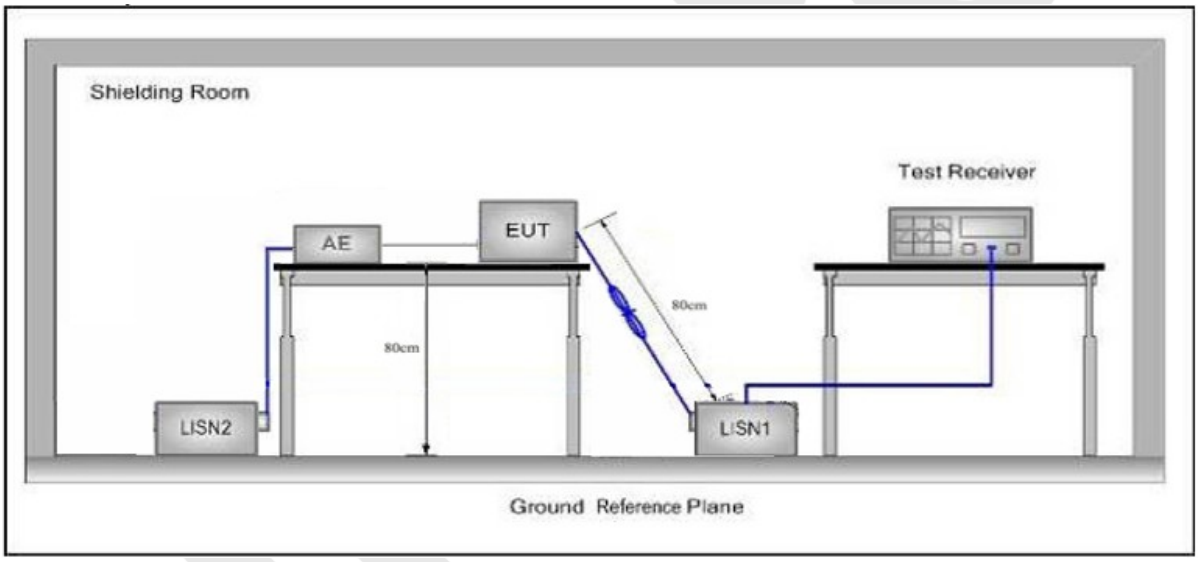
Standard	Test Type	Result
15.207 & 15.407	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.407(b)	Band Edge	PASS
15.407(a)(5)	Occupy Bandwidth	PASS
15.407(a)(1)(3)	Maximum Conducted Output Power	PASS
15.407(a)(1)(3)	Peak Power Spectral Density	PASS
15.203/15.407g	Antenna Requirement	PASS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

3. Conducted Emission Test

3.1. Test Standard and Limit

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

3.2. Test Setup



3.3. Test Procedure

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

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

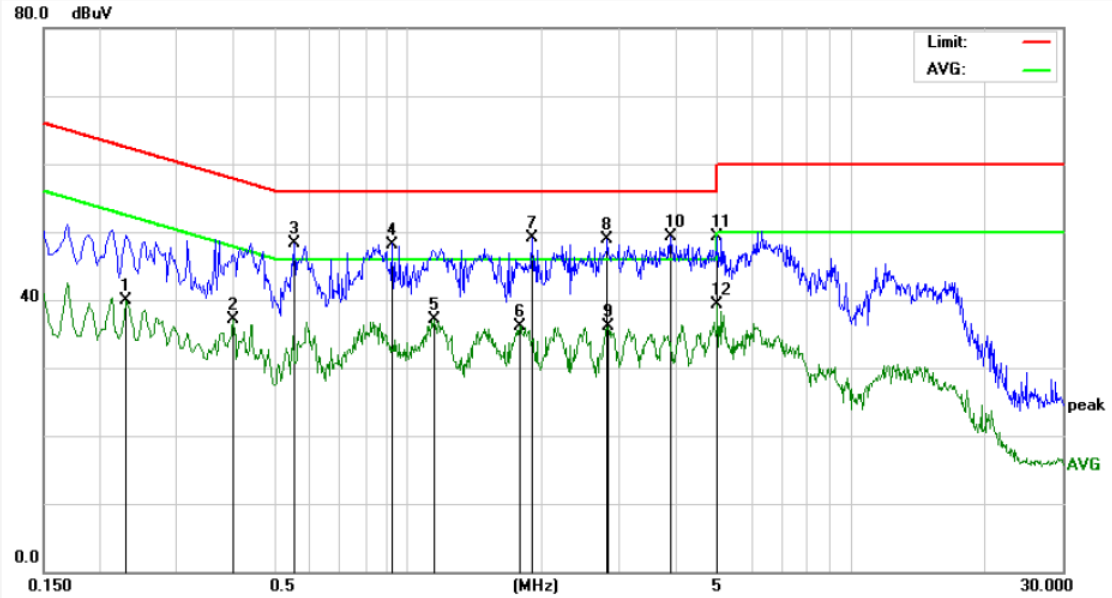
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages

Conducted Emission Test Data

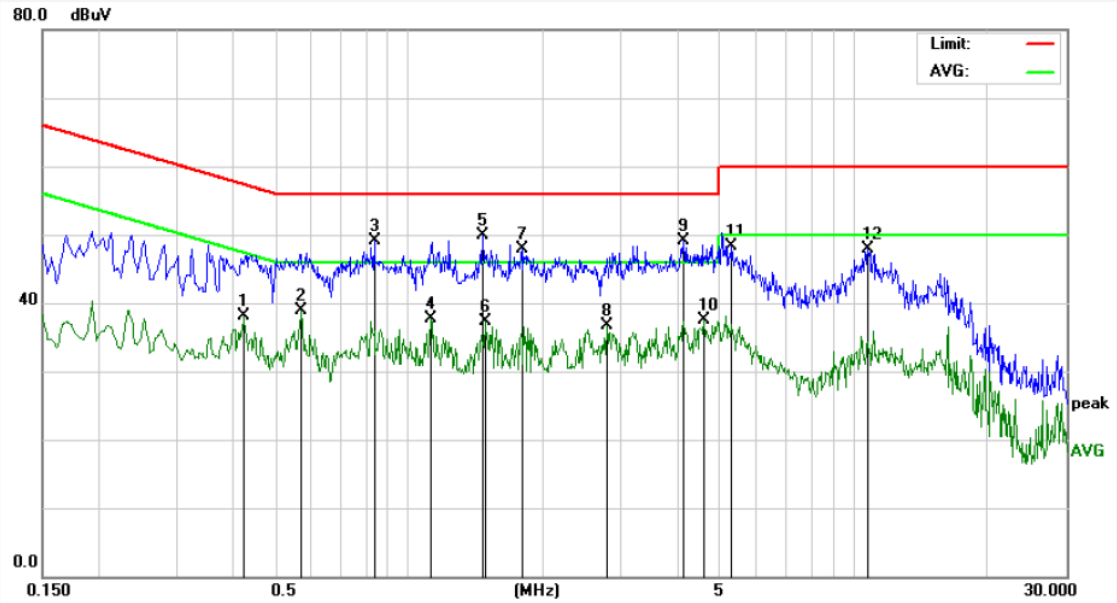
Test Site: 1# Shielded Room
Operating Condition: TX Mode
Test Specification: AC 120V, 60Hz for adapter
Comment: Live Line
Tem.:25℃ Hum.:50%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2300	20.10	19.89	39.99	52.45	-12.46	AVG	
2	0.4020	17.23	19.94	37.17	47.81	-10.64	AVG	
3	0.5540	28.28	20.00	48.28	56.00	-7.72	QP	
4	0.9220	28.10	20.10	48.20	56.00	-7.80	QP	
5	1.1412	16.90	20.12	37.02	46.00	-8.98	AVG	
6	1.7820	15.95	20.14	36.09	46.00	-9.91	AVG	
7	1.8972	28.97	20.14	49.11	56.00	-6.89	QP	
8	2.8140	28.69	20.16	48.85	56.00	-7.15	QP	
9	2.8380	15.88	20.16	36.04	46.00	-9.96	AVG	
10	3.9020	29.20	20.18	49.38	56.00	-6.62	QP	
11	4.9818	29.13	20.21	49.34	56.00	-6.66	QP	
12	4.9818	19.17	20.21	39.38	46.00	-6.62	AVG	

Conducted Emission Test Data

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



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.4259	18.06	19.95	38.01	47.33	-9.32	AVG	
2	0.5735	18.81	20.00	38.81	46.00	-7.19	AVG	
3	0.8377	28.93	20.08	49.01	56.00	-6.99	QP	
4	1.1220	17.50	20.12	37.62	46.00	-8.38	AVG	
5	1.4657	29.85	20.13	49.98	56.00	-6.02	QP	
6	1.4858	17.21	20.13	37.34	46.00	-8.66	AVG	
7	1.7940	27.84	20.14	47.98	56.00	-8.02	QP	
8	2.7860	16.61	20.16	36.77	46.00	-9.23	AVG	
9	4.1539	28.97	20.18	49.15	56.00	-6.85	QP	
10	4.6219	17.39	20.20	37.59	46.00	-8.41	AVG	
11	5.3178	28.13	20.21	48.34	60.00	-11.66	QP	
12	10.7416	27.52	20.33	47.85	60.00	-12.15	QP	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.407, KDB 789033 D02 General UNII Test Procedures New Rules v02r01

Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
Test Limit	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

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.

For transmitters operating in the 5.725-5.85GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27dBm/MHz at 75MHz or more above or below the band edge increasing linearly to 10dBm/MHz at 25MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6dBm/MHz at 5MHz above or below the band edge, and from 5MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

KDB789033 D02 v02r01 (G)(2)(c)

(i) Sections 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27dBm/MHz.[3]

(ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.[4]

Note 3: An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

Note 4: Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

4.2. Test Setup

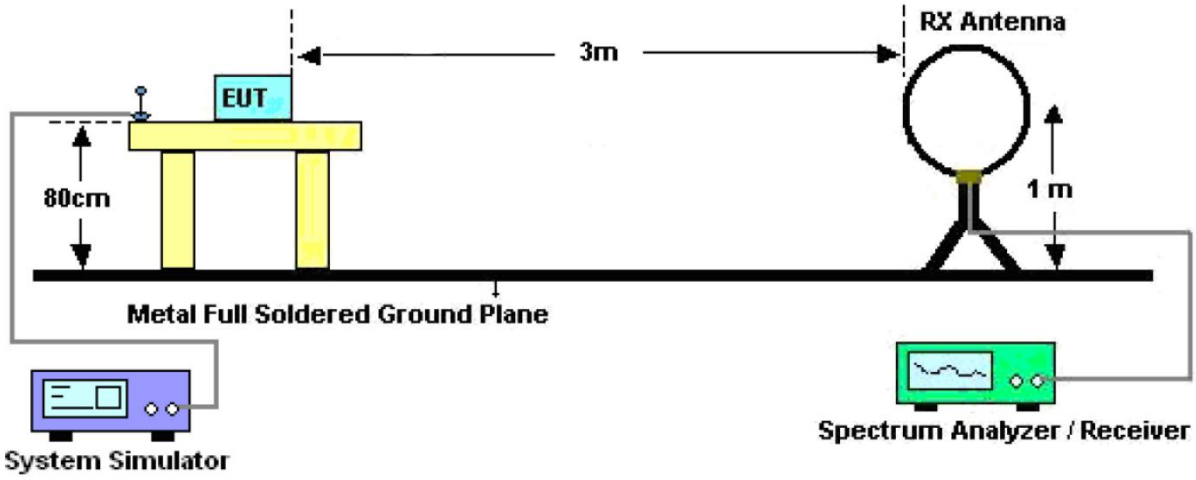


Figure 1. Below 30MHz

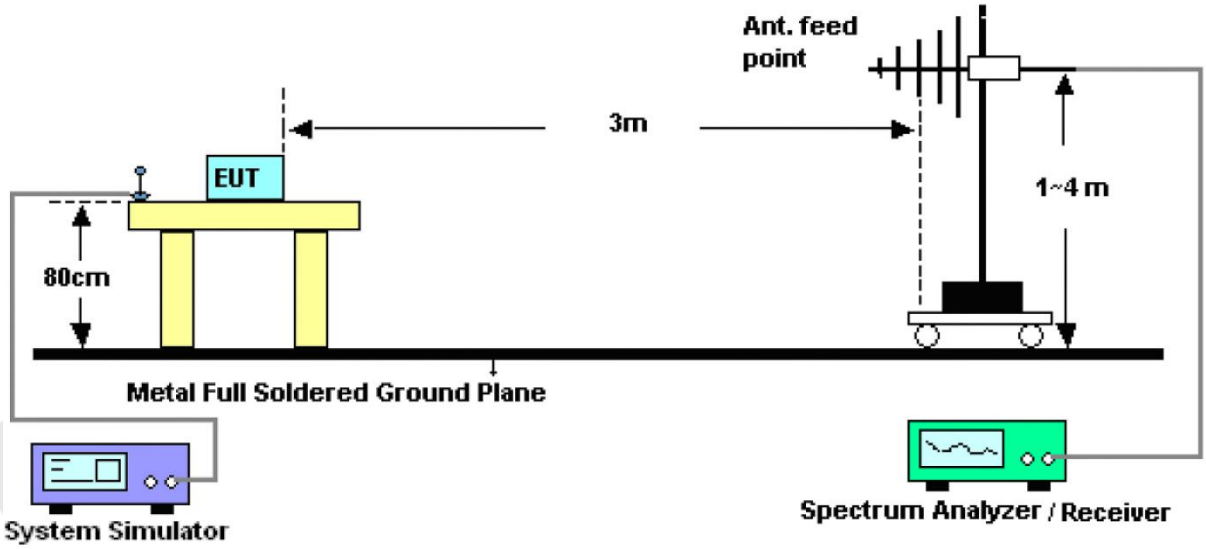


Figure 2. 30MHz to 1GHz

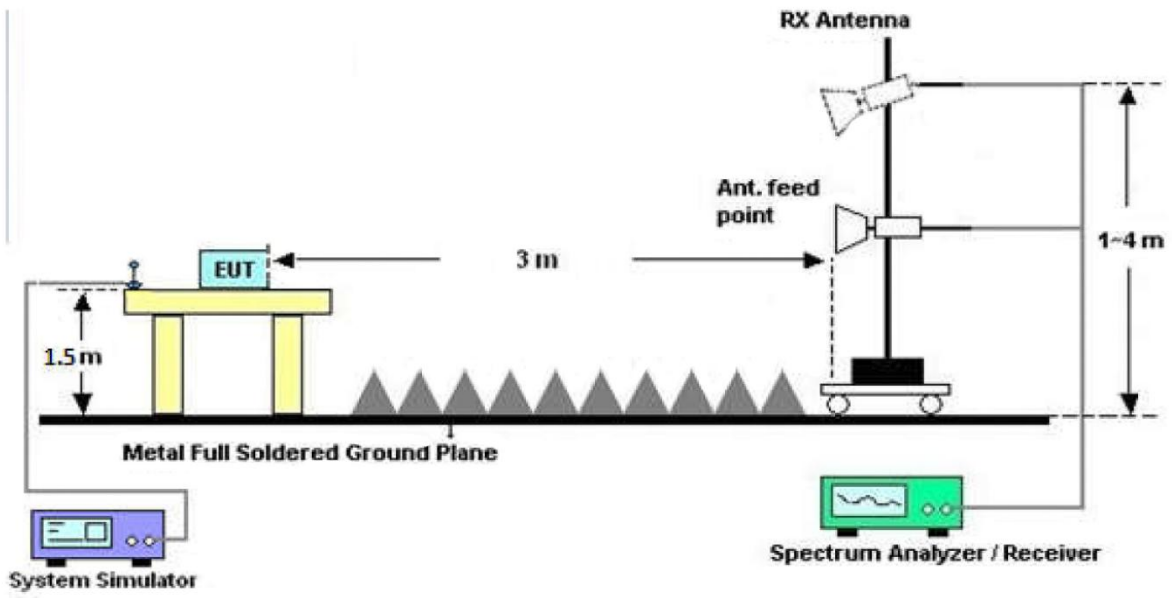


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.
For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

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

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

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

RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

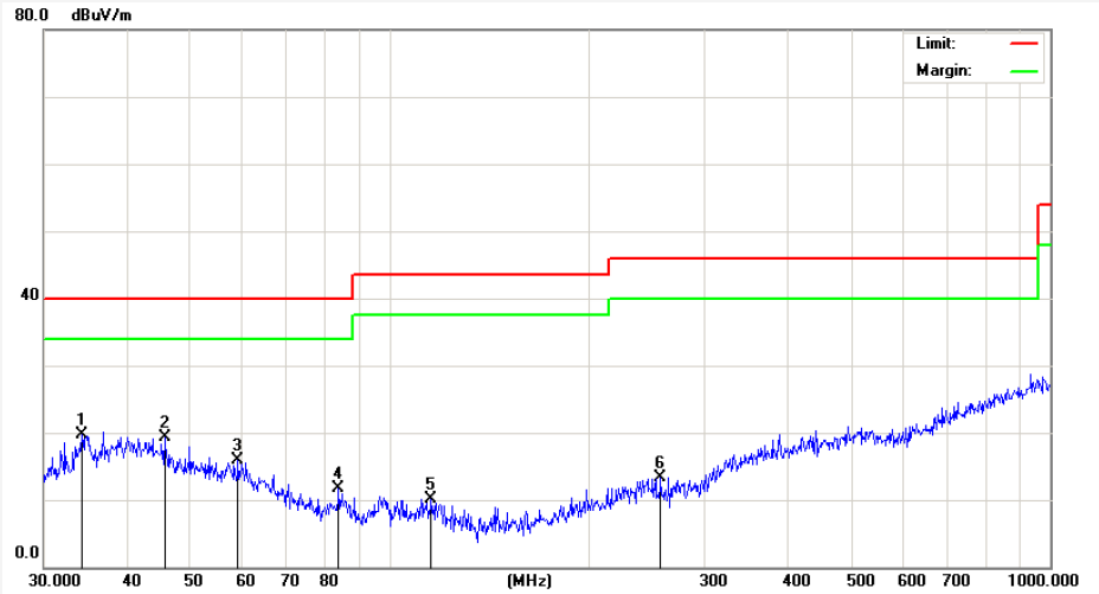
PASS

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

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

Test Results (30~1000MHz)

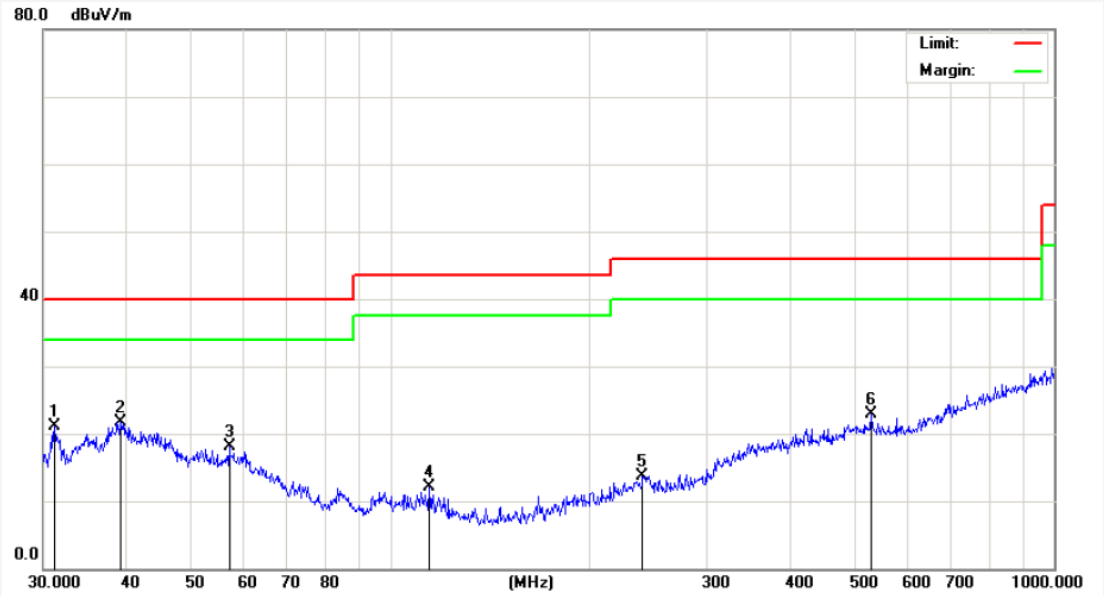
Job No.:	SZAWW171228001-03	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V/60Hz
Test Mode:	TX Mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	34.2760	34.62	-14.89	19.73	40.00	-20.27	QP	300	13	
2	45.6948	32.19	-12.85	19.34	40.00	-20.66	QP	300	54	
3	59.0251	31.28	-15.31	15.97	40.00	-24.03	QP	300	101	
4	83.8156	32.38	-20.73	11.65	40.00	-28.35	QP	300	134	
5	115.7256	31.23	-21.03	10.20	43.50	-33.30	QP	300	200	
6	257.4222	32.26	-18.88	13.38	46.00	-32.62	QP	300	267	

Test Results (30~1000MHz)

Job No.:	SZAWW171228001-03	Temp.(°C)/Hum.(%RH):	24.3°C/55%RH
Standard:	FCC PART 15C	Power Source:	AC 120V/60Hz
Test Mode:	TX Mode	Polarization:	Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	31.1798	37.42	-16.39	21.03	40.00	-18.97	QP	300	14	
2	39.1616	33.25	-11.48	21.77	40.00	-18.23	QP	300	63	
3	57.1914	33.27	-15.13	18.14	40.00	-21.86	QP	300	110	
4	114.5146	28.10	-15.95	12.15	43.50	-31.35	QP	300	134	
5	239.9874	27.74	-14.09	13.65	46.00	-32.35	QP	300	201	
6	530.1014	33.36	-10.44	22.92	46.00	-23.08	QP	300	264	

Test Results (Above 1000MHz)

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

For antenna port 1 above 1 GHz Test Results:

Test mode:	IEEE 802.11a	Test channel:	Low CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
11490.00	43.62	32.66	18.21	34.01	60.48	74.00	-13.52	V
17235.00	37.12	33.42	20.20	35.00	55.74	68.20	-12.46	V
11490.00	41.77	32.66	18.21	34.01	58.63	74.00	-15.37	H
17235.00	39.89	33.42	20.20	35.00	58.51	68.20	-9.69	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.
11490.00	31.52	32.66	18.21	34.01	48.38	54.00	-5.62	V
17235.00	28.14	33.42	20.20	35.00	46.76	54.00	-7.24	V
11490.00	29.55	32.66	18.21	34.01	46.41	54.00	-7.59	H
17235.00	26.17	33.42	20.20	35.00	44.79	54.00	-9.21	H

Test mode:	IEEE 802.11a	Test channel:	Mid CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
11570.00	42.96	32.67	18.24	34.02	59.85	74.00	-14.15	V
17355.00	37.55	33.44	20.22	35.01	56.20	68.20	-12.00	V
11570.00	37.49	32.67	18.24	34.02	54.38	74.00	-19.62	H
17355.00	35.96	33.44	20.22	35.01	54.61	68.20	-13.59	H

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
11570.00	30.04	32.67	18.24	34.02	46.93	54.00	-7.07	V
17355.00	27.86	33.44	20.22	35.01	46.51	54.00	-7.49	V
11570.00	29.14	32.67	18.24	34.02	46.03	54.00	-7.97	H
17355.00	27.66	33.44	20.22	35.01	46.31	54.00	-7.69	H

Test mode:	IEEE 802.11a	Test channel:	High CH

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
11650.00	42.33	32.69	18.26	34.04	59.24	74.00	-14.76	V
17475.00	39.24	33.46	20.23	35.02	57.91	68.20	-10.29	V
11650.00	41.52	32.69	18.26	34.04	58.43	74.00	-15.57	H
17475.00	39.61	33.46	20.23	35.02	58.28	68.20	-9.92	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	29.45	32.69	18.26	34.04	46.36	54.00	-7.64	V
17475.00	28.00	33.46	20.23	35.02	46.67	54.00	-7.33	V
11650.00	26.55	32.69	18.26	34.04	43.46	54.00	-10.54	H
17475.00	25.98	33.46	20.23	35.02	44.65	54.00	-9.35	H

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

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Pol.
11490.00	39.74	32.66	18.21	34.01	56.60	74.00	-17.40	V
17235.00	37.16	33.42	20.20	35.00	55.78	68.20	-12.42	V
11490.00	37.58	32.66	18.21	34.01	54.44	74.00	-19.56	H
17235.00	38.41	33.42	20.20	35.00	57.03	68.20	-11.17	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	30.52	32.66	18.21	34.01	47.38	54.00	-6.62	V
17235.00	28.23	33.42	20.20	35.00	46.85	54.00	-7.15	V
11490.00	29.66	32.66	18.21	34.01	46.52	54.00	-7.48	H
17235.00	27.55	33.42	20.20	35.00	46.17	54.00	-7.83	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.
11570.00	43.64	32.67	18.24	34.02	60.53	74.00	-13.47	V
17355.00	39.77	33.44	20.22	35.01	58.42	68.20	-9.78	V
11570.00	40.15	32.67	18.24	34.02	57.04	74.00	-16.96	H
17355.00	35.86	33.44	20.22	35.01	54.51	68.20	-13.69	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.
11570.00	31.54	32.67	18.24	34.02	48.43	54.00	-5.57	V
17355.00	28.45	33.44	20.22	35.01	47.10	54.00	-6.90	V
11570.00	29.11	32.67	18.24	34.02	46.00	54.00	-8.00	H
17355.00	27.56	33.44	20.22	35.01	46.21	54.00	-7.79	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.
11650.00	42.36	32.69	18.26	34.04	59.27	74.00	-14.73	V
17475.00	40.84	33.46	20.23	35.02	59.51	68.20	-8.69	V
11650.00	37.51	32.69	18.26	34.04	54.42	74.00	-19.58	H
17475.00	38.64	33.46	20.23	35.02	57.31	68.20	-10.89	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	31.63	32.69	18.26	34.04	48.54	54.00	-5.46	V
17475.00	30.55	33.46	20.23	35.02	49.22	54.00	-4.78	V
11650.00	28.74	32.69	18.26	34.04	45.65	54.00	-8.35	H
17475.00	28.95	33.46	20.23	35.02	47.62	54.00	-6.38	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.
11510.00	41.92	32.66	18.21	34.01	58.78	74.00	-15.22	V
17265.00	37.85	33.43	20.21	35.00	56.49	68.20	-11.71	V
11510.00	39.77	32.66	18.21	34.01	56.63	74.00	-17.37	H
17265.00	39.21	33.43	20.21	35.00	57.85	68.20	-10.35	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.
11510.00	31.07	32.66	18.21	34.01	47.93	54.00	-6.07	V
17265.00	29.13	33.43	20.21	35.00	47.77	54.00	-6.23	V
11510.00	30.96	32.66	18.21	34.01	47.82	54.00	-6.18	H
17265.00	28.65	33.43	20.21	35.00	47.29	54.00	-6.71	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.
11590.00	42.63	32.68	18.24	34.03	59.52	74.00	-14.48	V
17385.00	39.06	33.45	20.22	35.02	57.71	68.20	-10.49	V
11590.00	38.55	32.68	18.24	34.03	55.44	74.00	-18.56	H
17385.00	39.53	33.45	20.22	35.02	58.18	68.20	-10.02	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.
11590.00	31.2	32.68	18.24	34.03	48.09	54.00	-5.91	V
17385.00	28.66	33.45	20.22	35.02	47.31	54.00	-6.69	V
11590.00	30.58	32.68	18.24	34.03	47.47	54.00	-6.53	H
17385.00	28.41	33.45	20.22	35.02	47.06	54.00	-6.94	H

Note:

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

Radiated Band Edge:

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

Test Mode: 802.11a								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5725.00	41.54	29.78	15.69	31.08	55.93	68.20	-12.27	H
5850.00	39.75	30.01	16.82	32.09	54.49	68.20	-13.71	H
5725.00	42.11	29.78	15.69	31.08	56.50	68.20	-11.70	V
5850.00	40.86	30.01	16.82	32.09	55.60	68.20	-12.60	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.
5725.00	31.55	29.78	15.69	31.08	45.94	54.00	-8.06	H
5850.00	32.56	30.01	16.82	32.09	47.30	54.00	-6.70	H
5725.00	33.96	29.78	15.69	31.08	48.35	54.00	-5.65	V
5850.00	32.11	30.01	16.82	32.09	46.85	54.00	-7.15	V

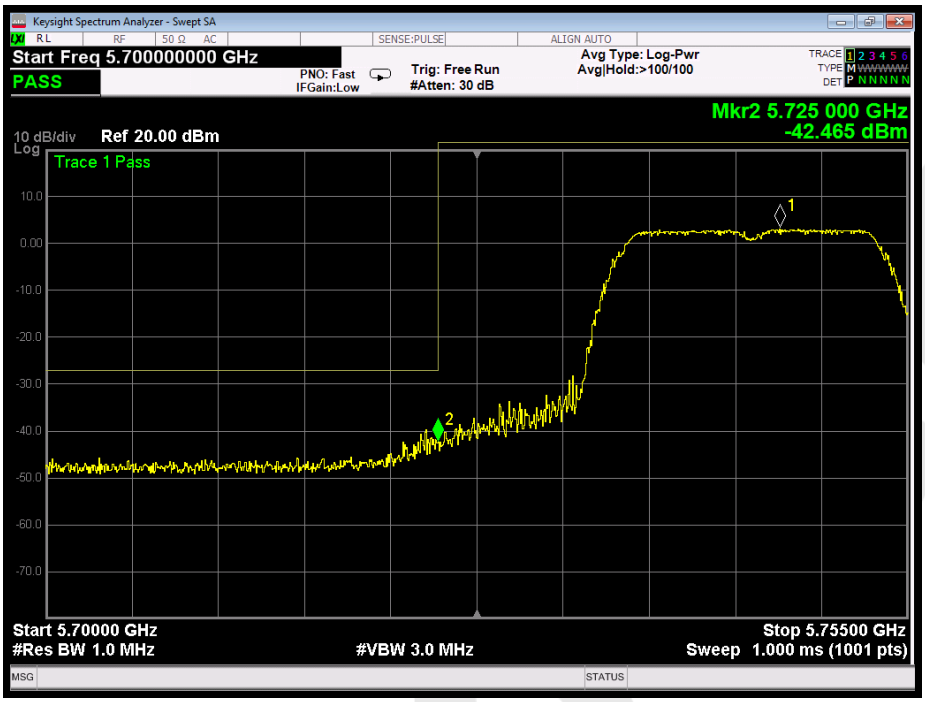
Test Mode: 802.11n20								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5725.00	42.01	29.78	15.69	31.08	56.40	68.20	-11.80	H
5850.00	41.65	30.01	16.82	32.09	56.39	68.20	-11.81	H
5725.00	43.62	29.78	15.69	31.08	58.01	68.20	-10.19	V
5850.00	41.70	30.01	16.82	32.09	56.44	68.20	-11.76	V
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5725.00	32.71	29.78	15.69	31.08	47.10	54.00	-6.90	H
5850.00	33.56	30.01	16.82	32.09	48.30	54.00	-5.70	H
5725.00	33.41	29.78	15.69	31.08	47.80	54.00	-6.20	V
5850.00	31.47	30.01	16.82	32.09	46.21	54.00	-7.79	V

Test Mode: 802.11n40								
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
5725.00	41.63	29.78	15.69	31.08	56.02	68.20	-12.18	H
5850.00	42.86	30.01	16.82	32.09	57.60	68.20	-10.60	H
5725.00	41.84	29.78	15.69	31.08	56.23	68.20	-11.97	V
5850.00	40.63	30.01	16.82	32.09	55.37	68.20	-12.83	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.
5725.00	31.85	29.78	15.69	31.08	46.24	54.00	-7.76	H
5850.00	30.47	30.01	16.82	32.09	45.21	54.00	-8.79	H
5725.00	32.05	29.78	15.69	31.08	46.44	54.00	-7.56	V
5850.00	30.75	30.01	16.82	32.09	45.49	54.00	-8.51	V

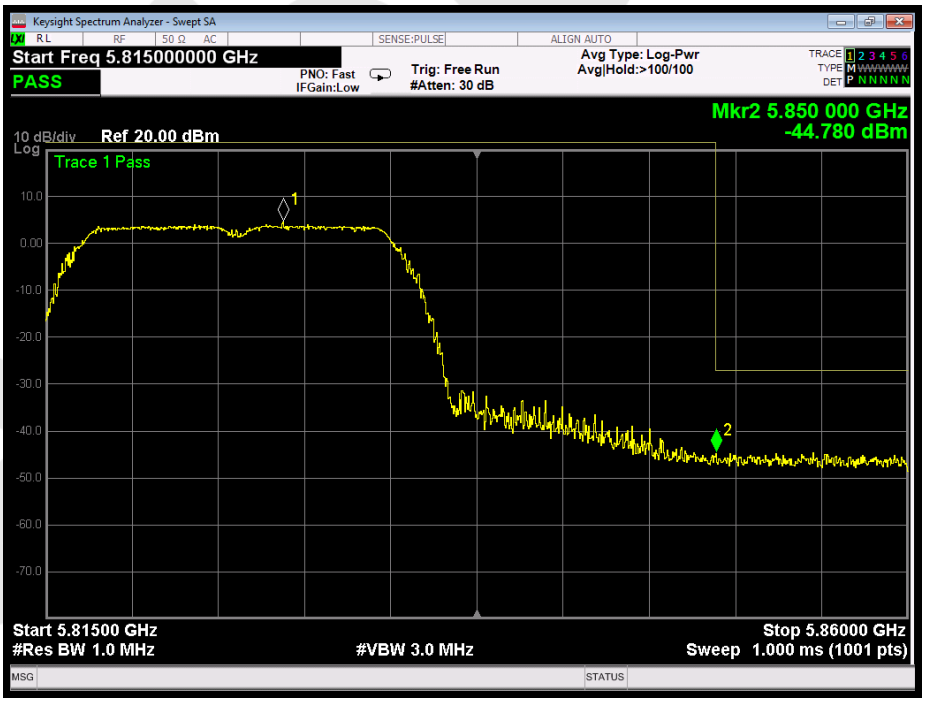
For conducted test:

Antenna 1

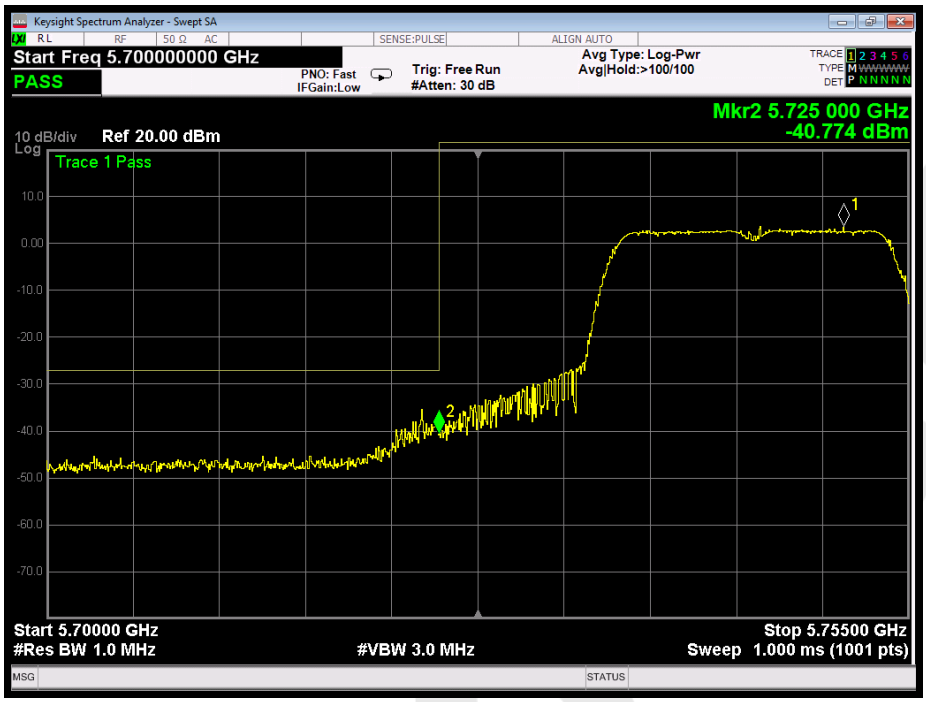
802.11a: Band Edge, Left Side



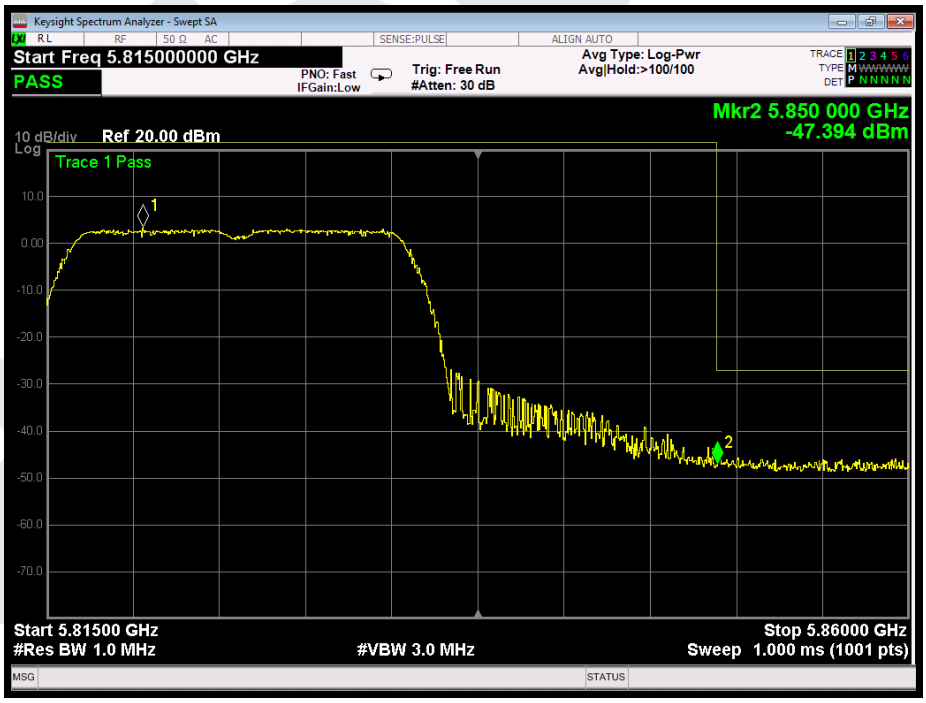
802.11a: Band Edge, Right Side



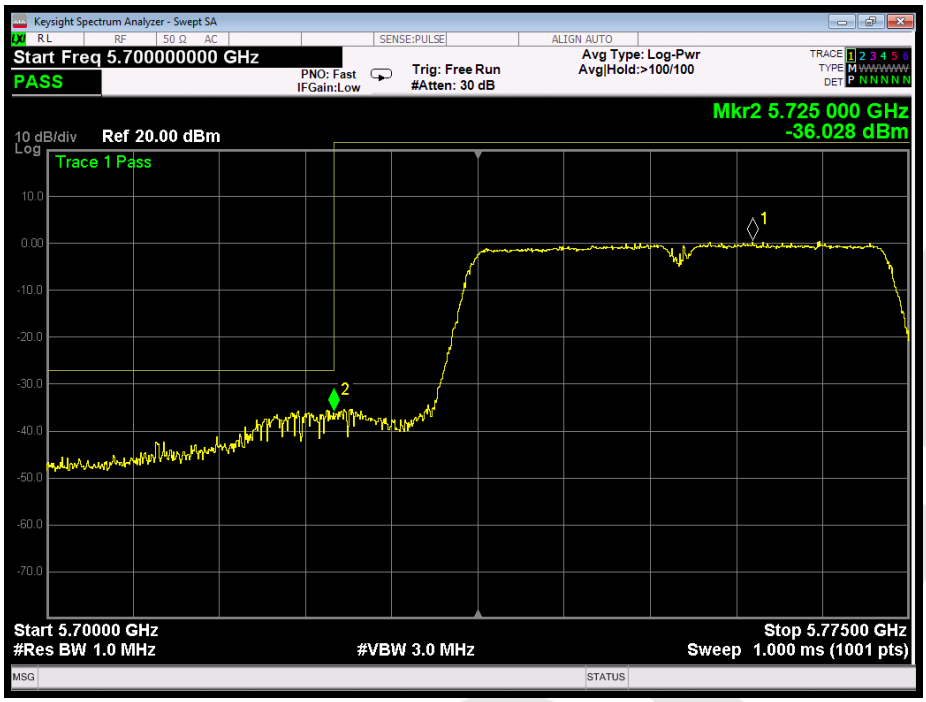
802.11n(20): Band Edge, Left Side



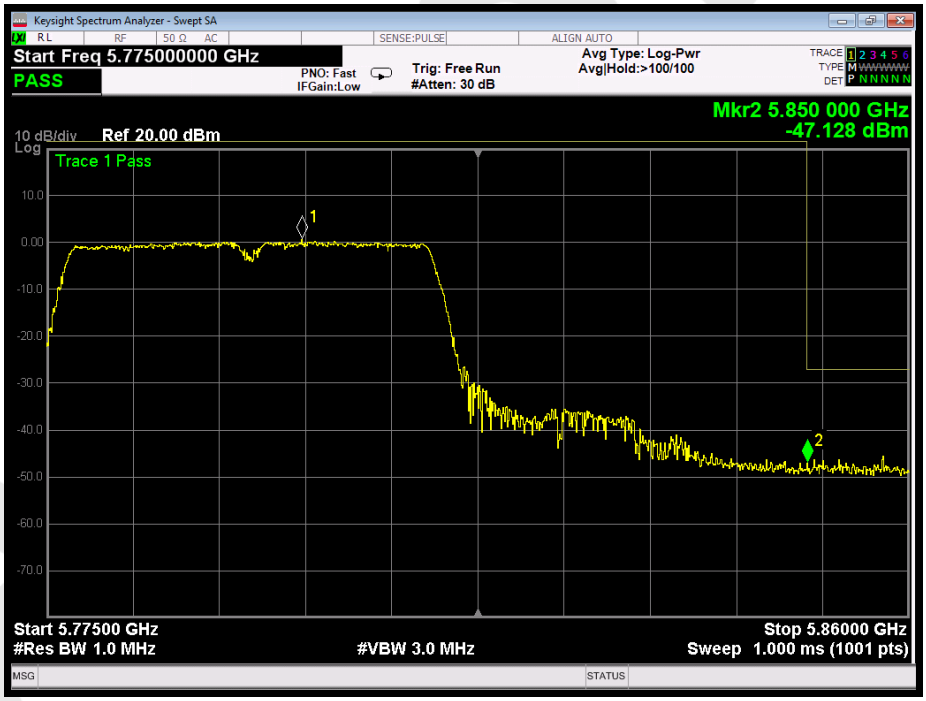
802.11n(20): Band Edge, Right Side



802.11n(40): Band Edge, Left Side

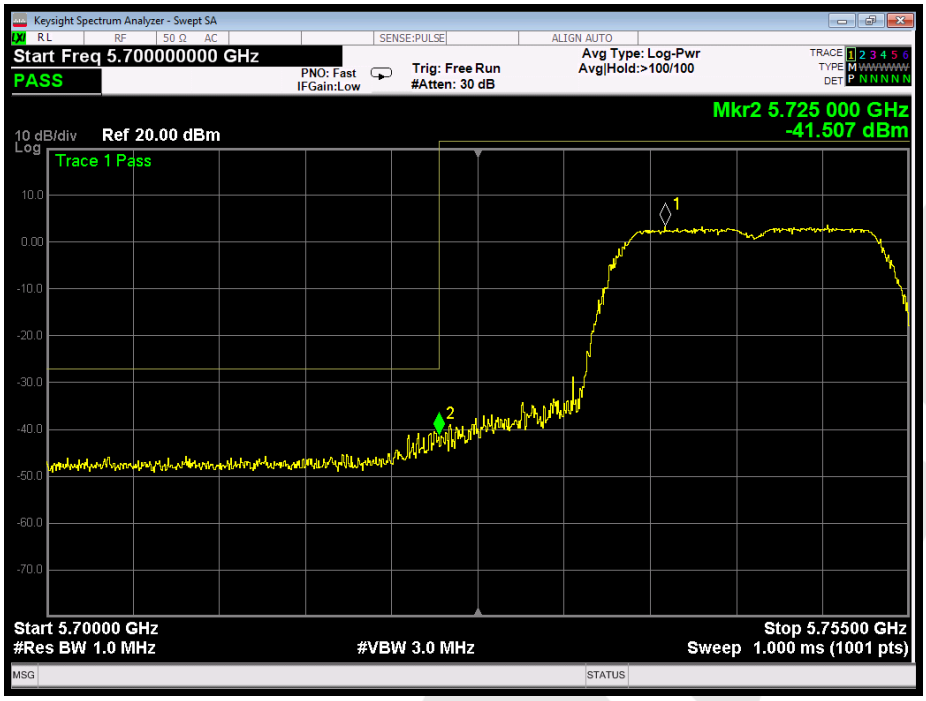


802.11n(40): Band Edge, Right Side

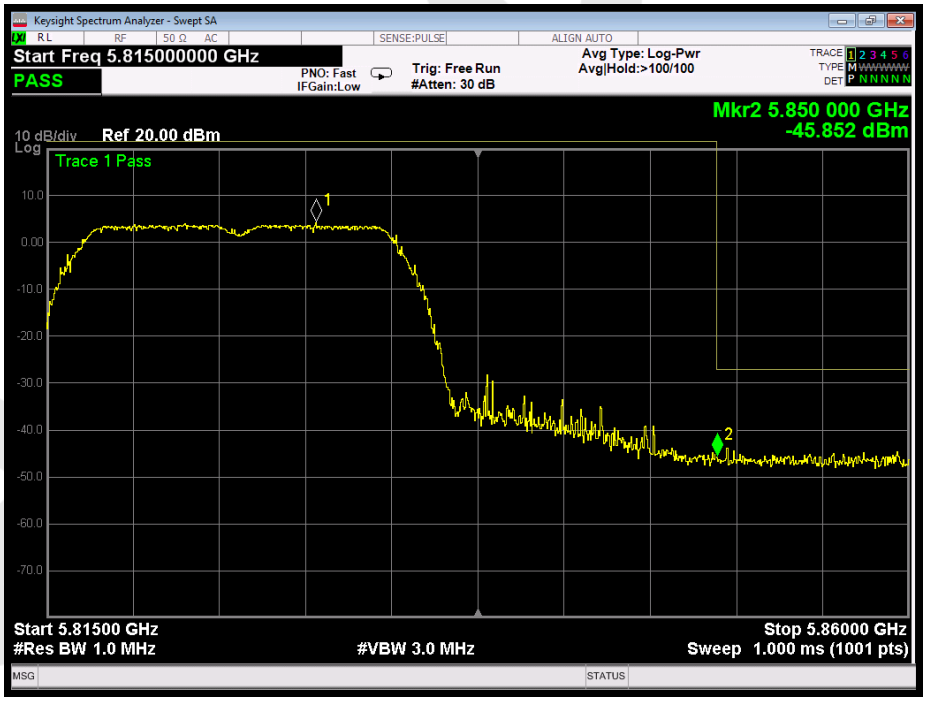


Antenna 2

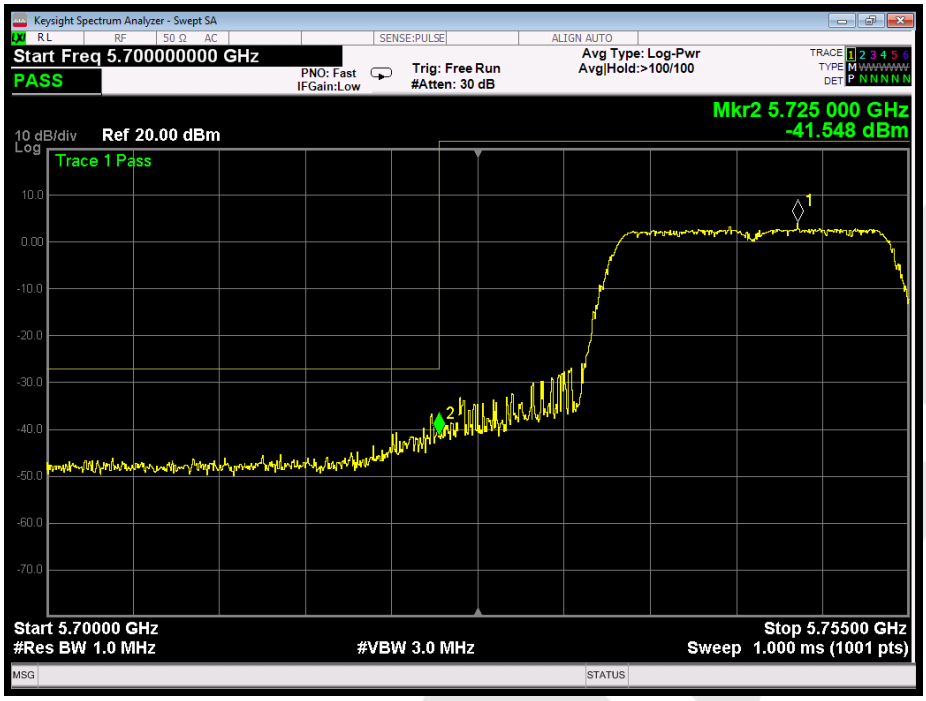
802.11a: Band Edge, Left Side



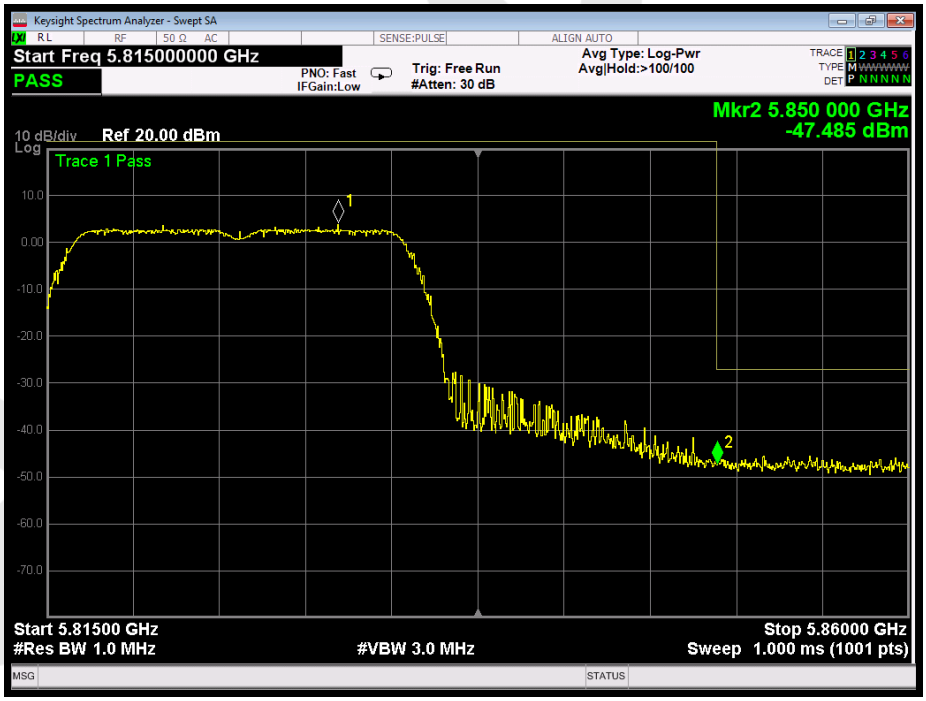
802.11a: Band Edge, Right Side



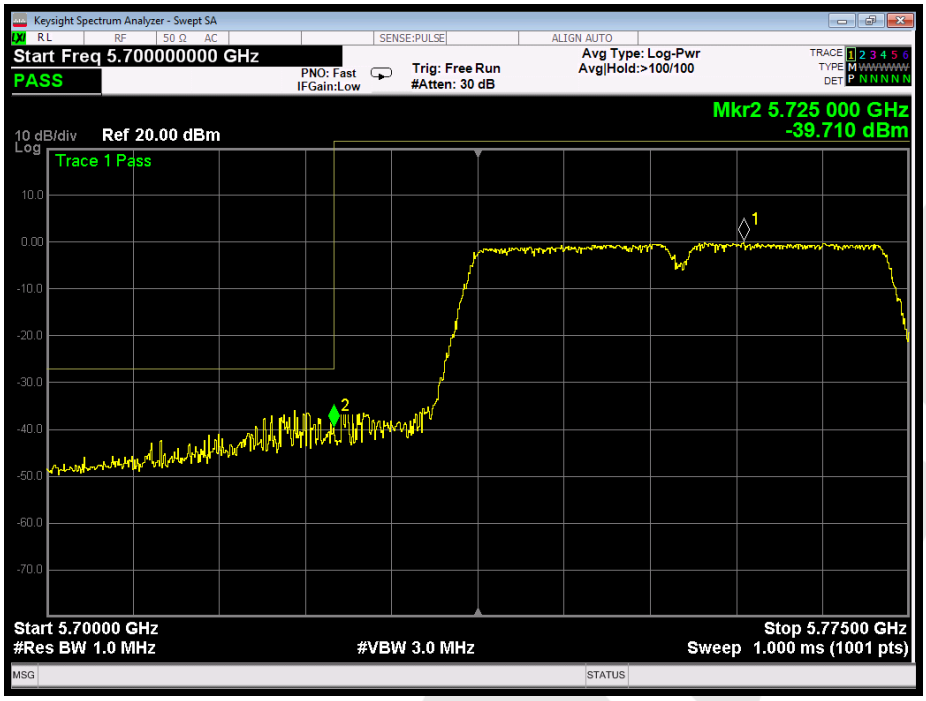
802.11n(20): Band Edge, Left Side



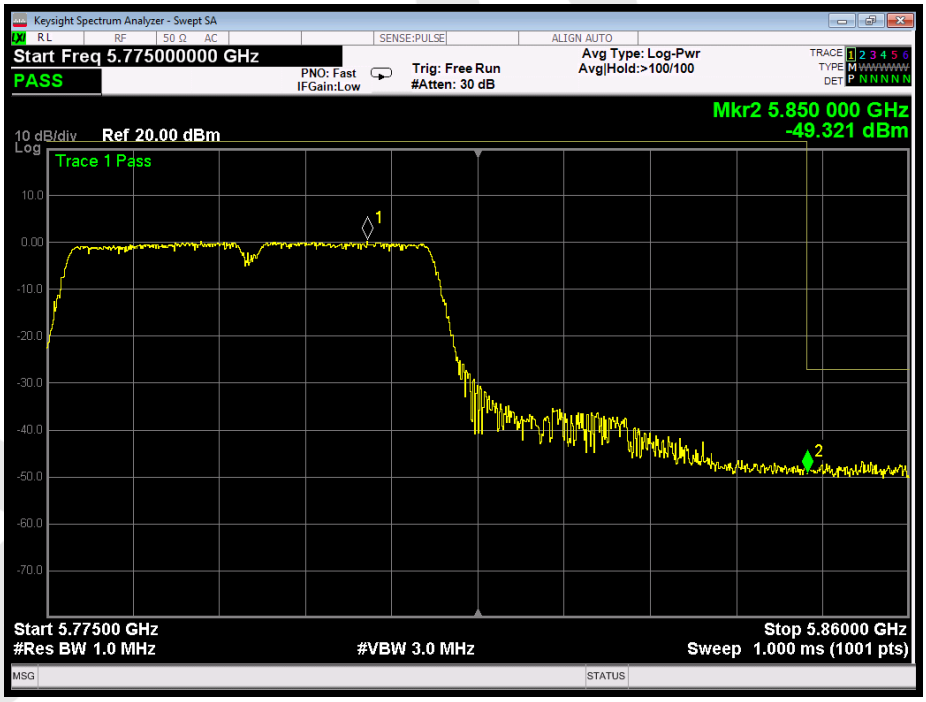
802.11n(20): Band Edge, Right Side



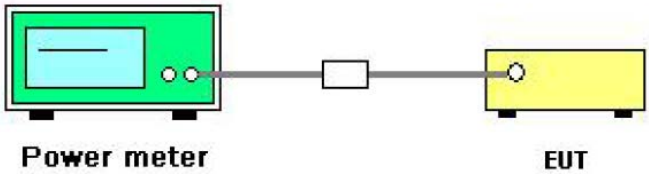
802.11n(40): Band Edge, Left Side



802.11n(40): Band Edge, Right Side



5. Maximum Output Power Test

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

5.2. Test Data

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

Configuration Band IV (5725 - 5850 MHz)						
Mode	Test channel	Maximum Conducted average Output Power (dBm)			FCC Limit (dBm)	Result
		Antenna port 1	Antenna port 2	MIMO		
11a	CH149	16.92	13.13	/	30	PASS
11a	CH157	15.72	12.61	/	30	PASS
11a	CH165	15.91	12.33	/	30	PASS
11n (HT20)	CH149	15.82	12.93	17.62	30	PASS
11n (HT20)	CH157	15.62	12.63	17.39	30	PASS
11n (HT20)	CH165	16.41	13.31	18.14	30	PASS
11n (HT40)	CH151	15.12	14.71	17.93	30	PASS
11n (HT40)	CH159	15.21	13.11	17.30	30	PASS

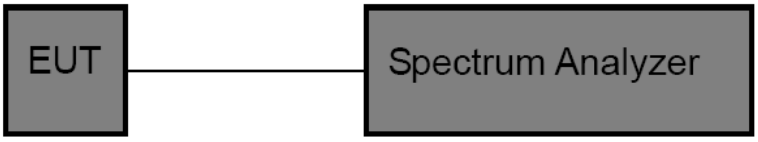
Note: EUT only support n20 and n40 for MIMO mode.

6. Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.403(i), 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	:	AC 120V/60Hz	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Antenna 1

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5745	16.41	>0.5MHz	PASS
	5785	16.41		PASS
	5825	16.40		PASS
802.11n20	5745	17.61		PASS
	5785	17.66		PASS
	5825	17.64		PASS
802.11n40	5755	36.37		PASS
	5795	36.19		PASS

Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11a	5745	19.98	16.730
	5785	19.58	16.761
	5825	19.93	16.832
802.11n20	5745	20.14	17.805
	5785	20.04	17.771
	5825	20.03	17.766
802.11n40	5755	40.03	36.217
	5795	40.02	36.257

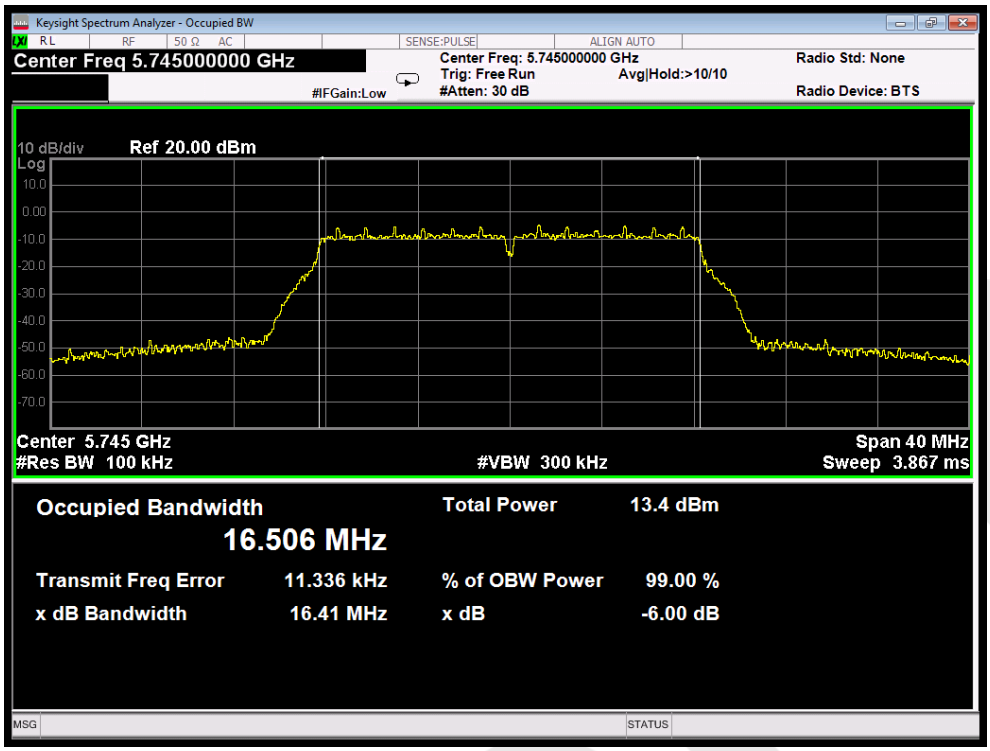
Antenna 2

Mode	Channel Frequency (MHz)	6dB BW(MHz)	Limit	Results
802.11a	5745	16.43	>0.5MHz	PASS
	5785	16.41		PASS
	5825	16.44		PASS
802.11n20	5745	17.65		PASS
	5785	17.65		PASS
	5825	17.64		PASS
802.11n40	5755	36.37		PASS
	5795	36.37		PASS

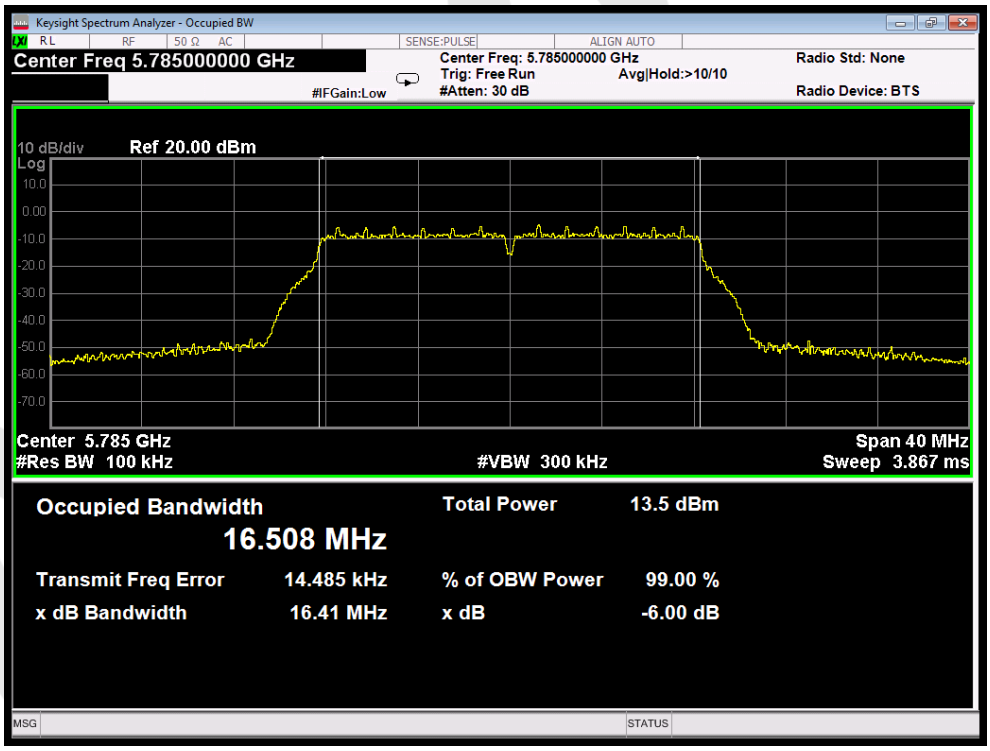
Mode	Channel Frequency (MHz)	26dB BW(MHz)	99% Bandwidth (MHz)
802.11a	5745	19.80	16.750
	5785	19.65	16.776
	5825	19.94	16.834
802.11n20	5745	20.06	17.804
	5785	20.08	17.770
	5825	20.07	17.803
802.11n40	5755	40.06	36.228
	5795	40.01	36.246

6dB Bandwidth

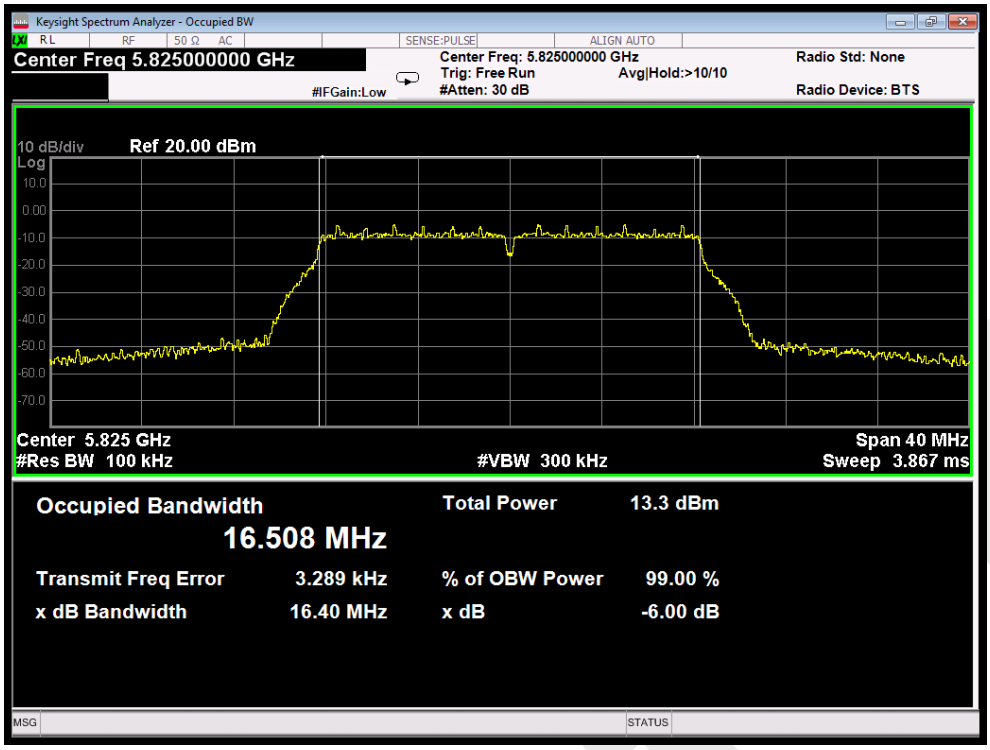
Antenna 1



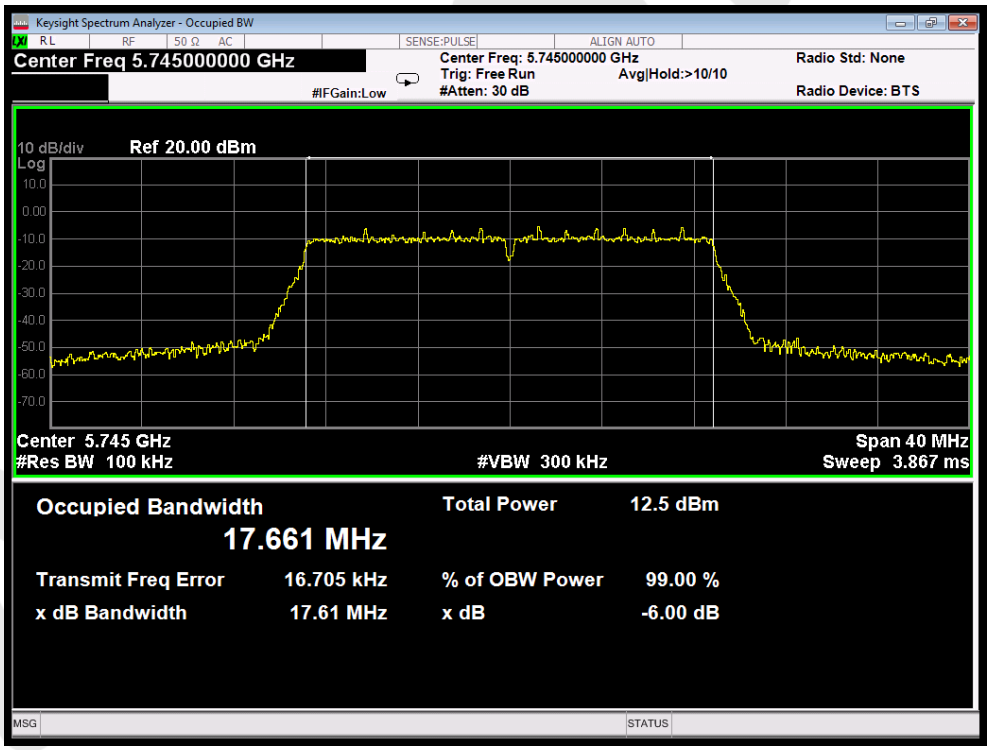
Test Mode: 802.11a--Low



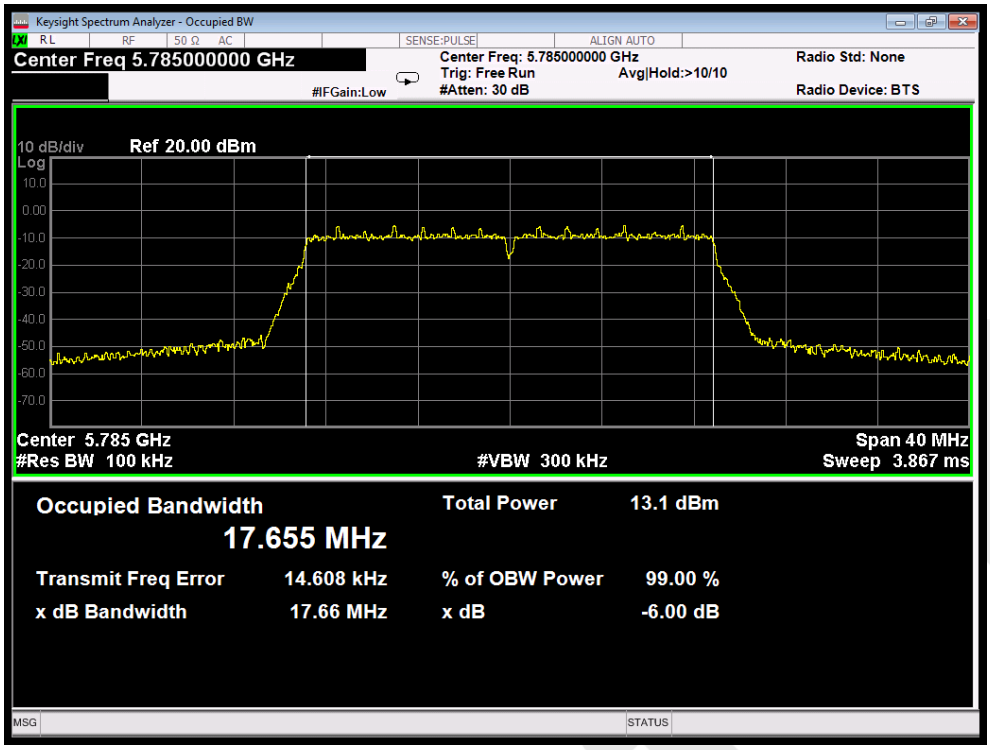
Test Mode: 802.11a---Middle



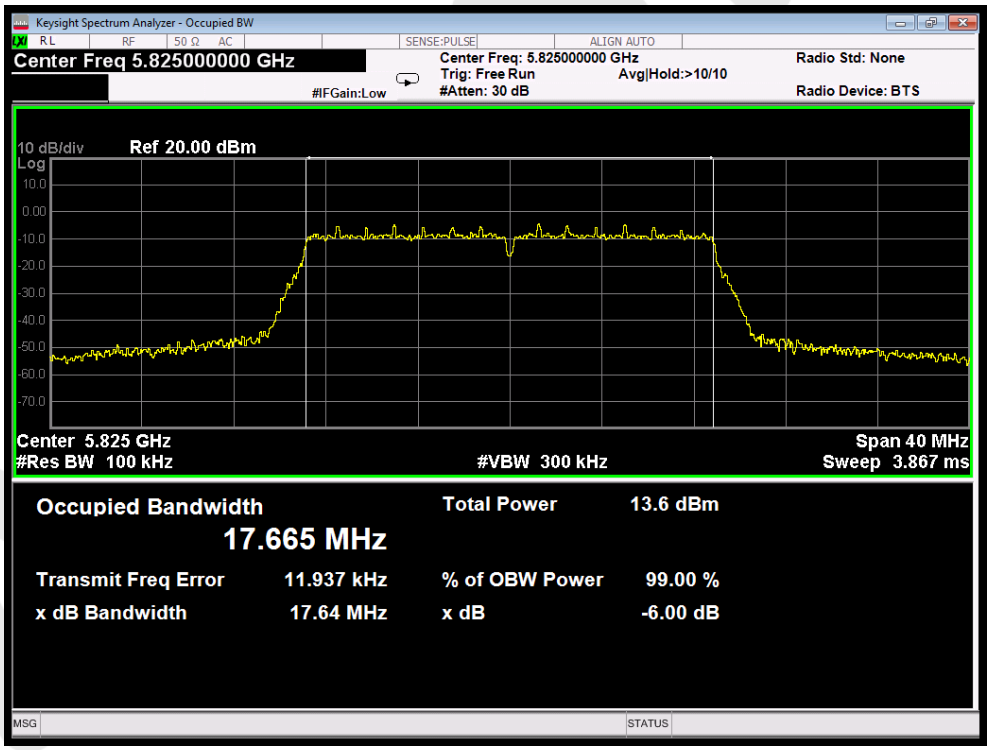
Test Mode: 802.11a---High



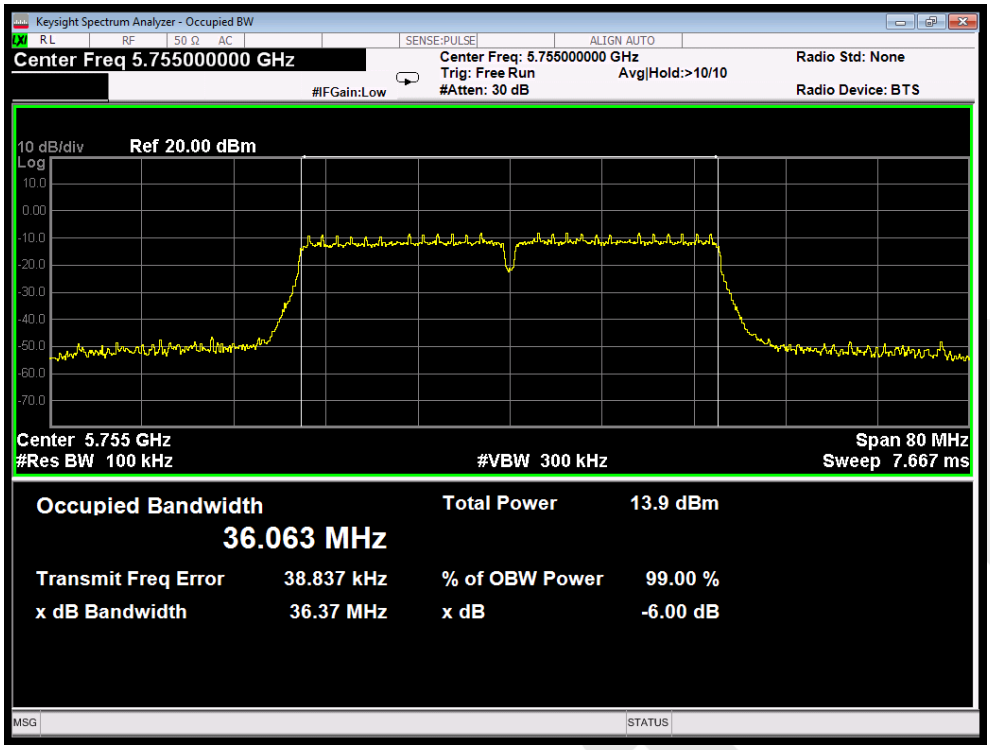
Test Mode: 802.11n20---Low



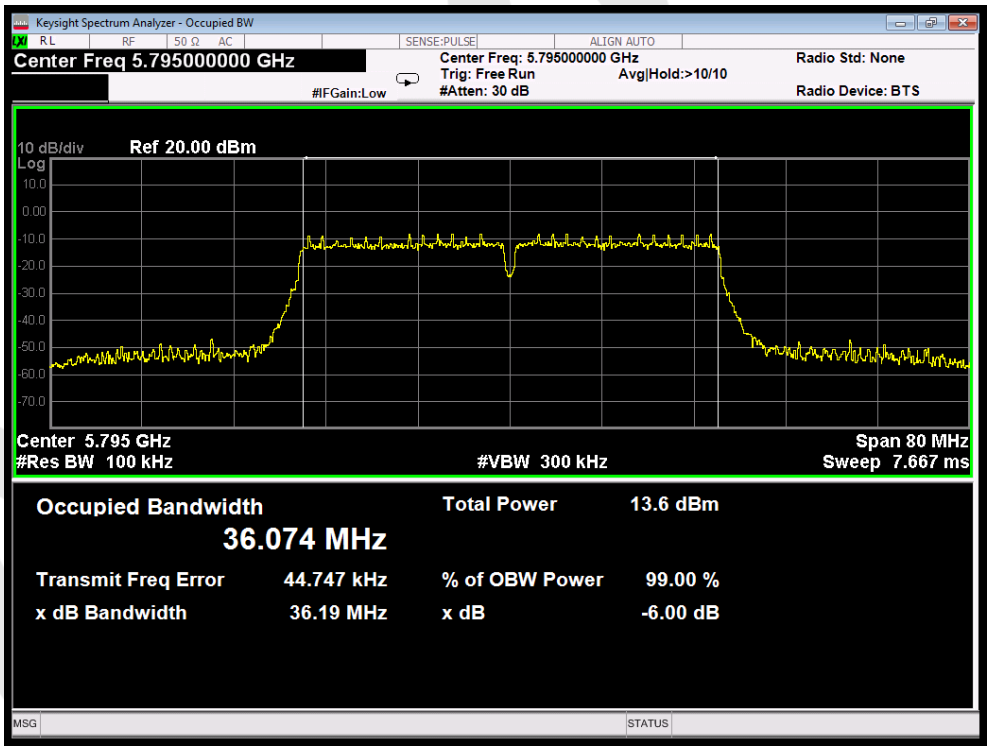
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

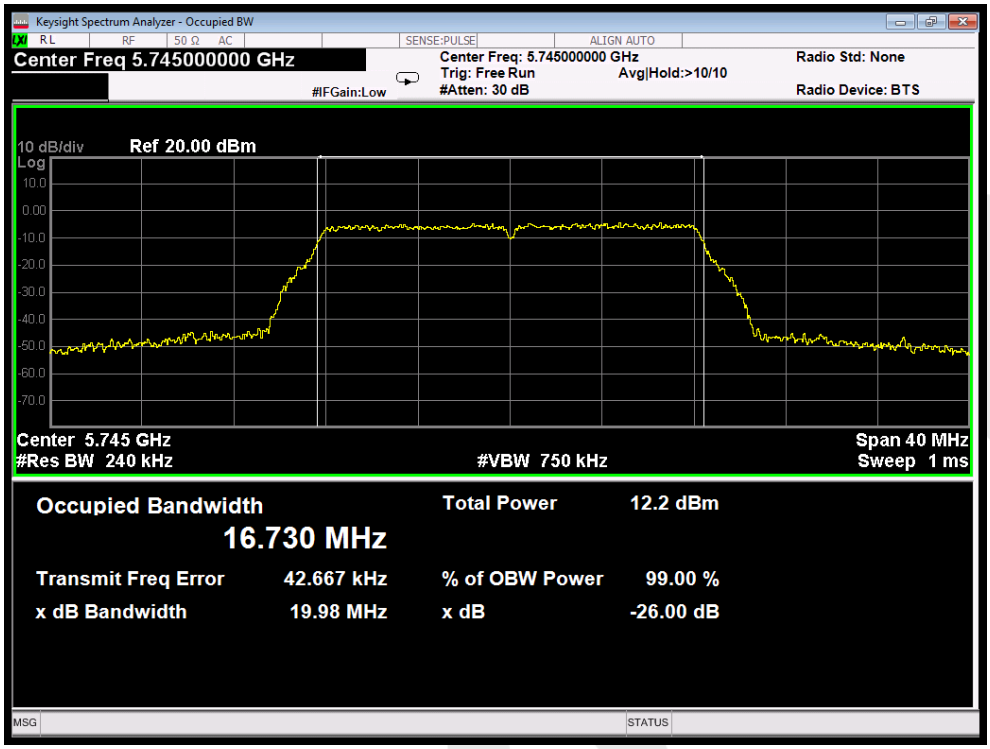


Test Mode: 802.11n40---Low

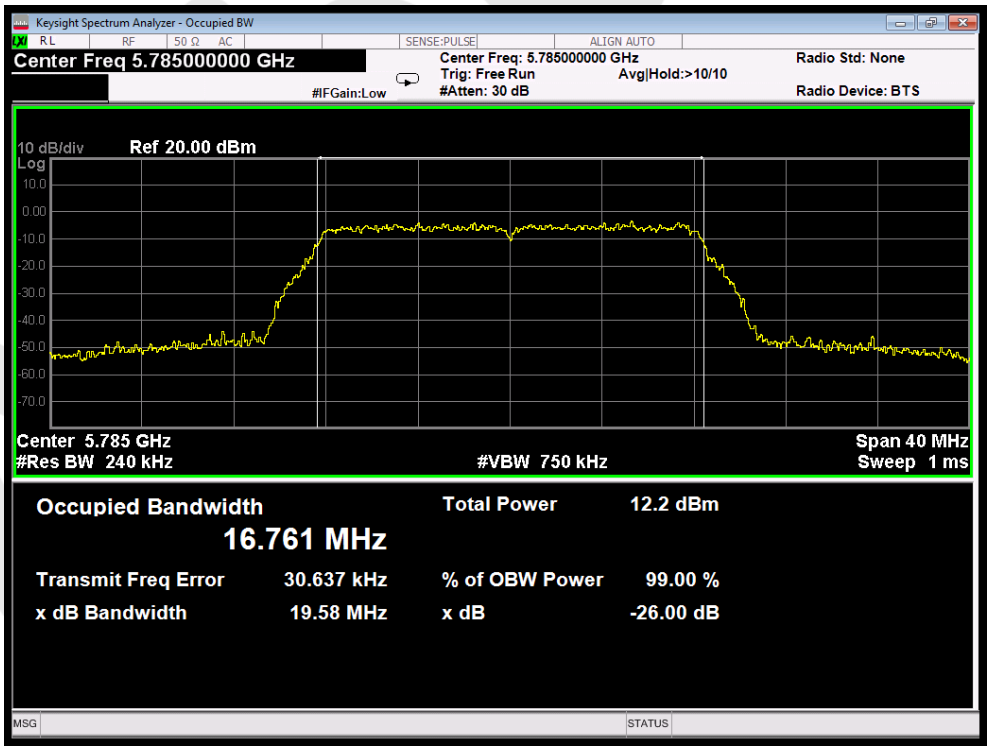


Test Mode: 802.11n40---High

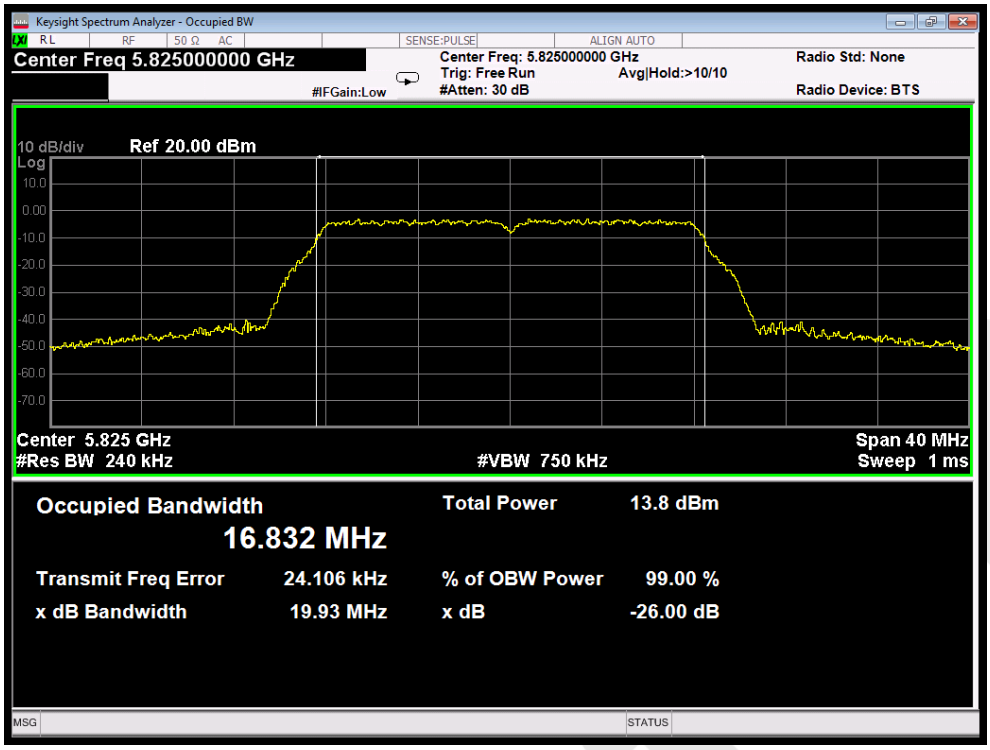
26dB &99% Bandwidth



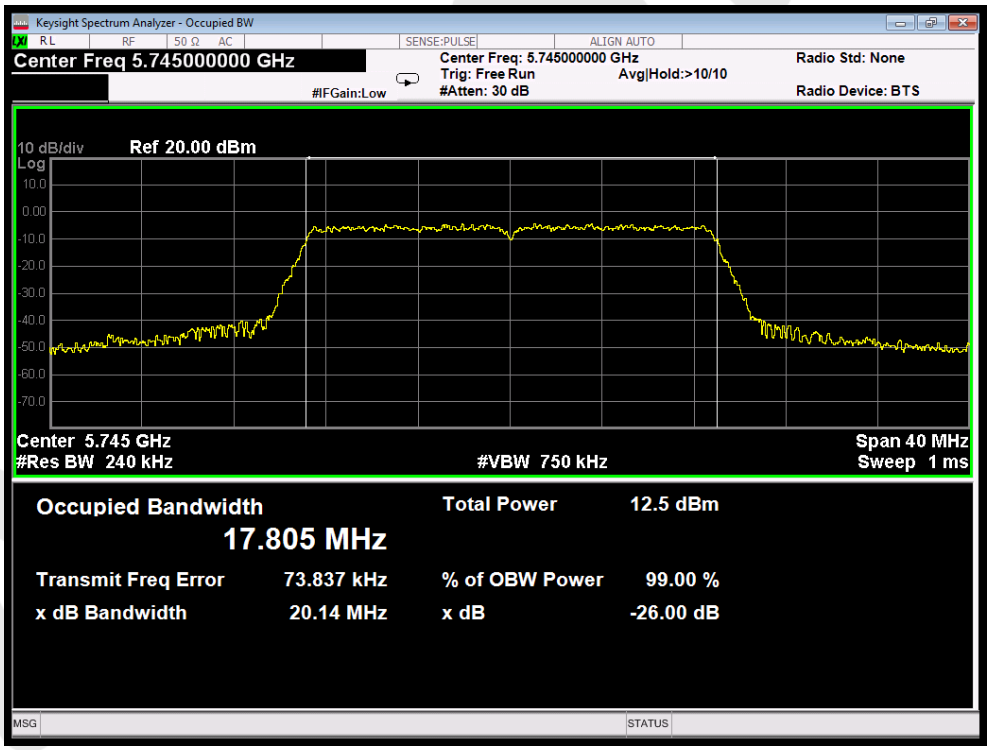
Test Mode: 802.11a--Low



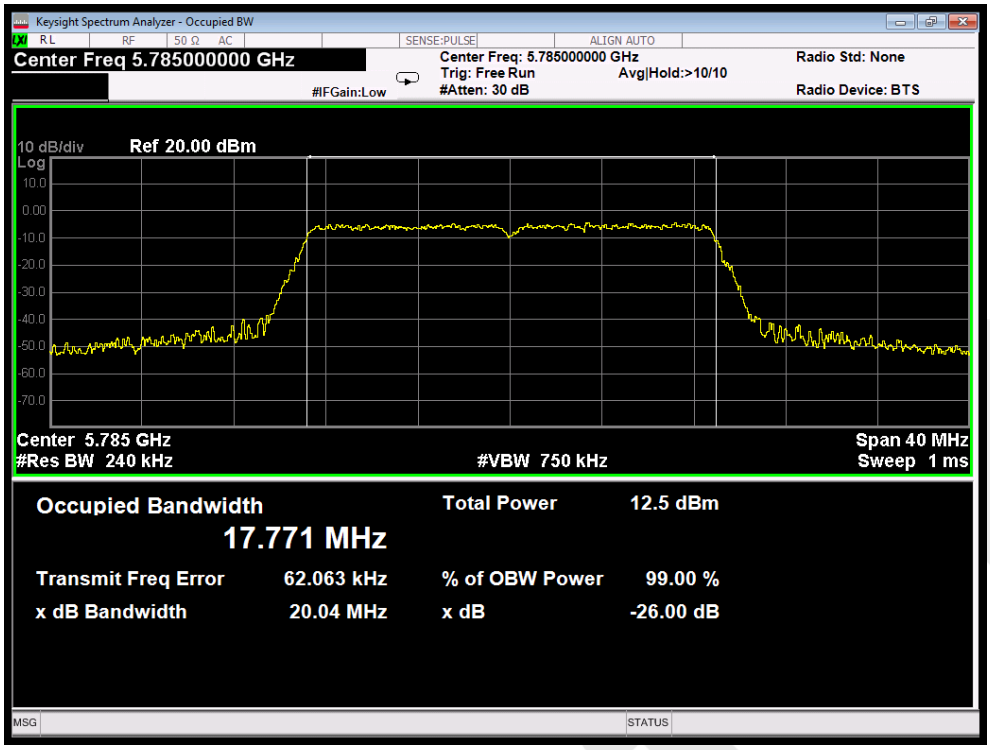
Test Mode: 802.11a---Middle



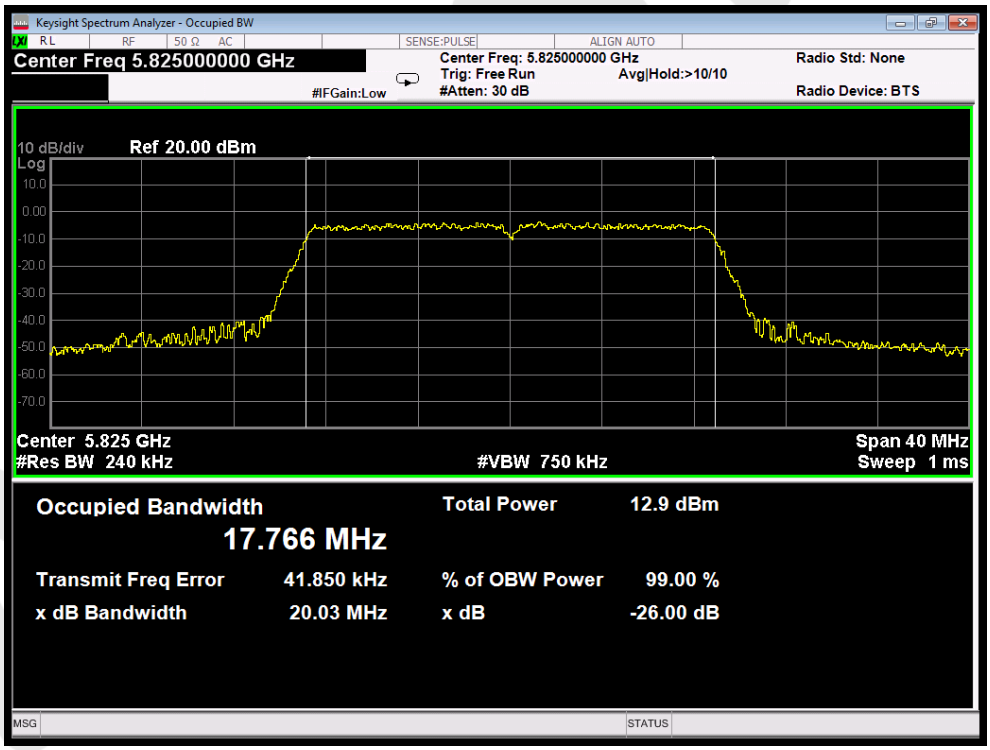
Test Mode: 802.11a---High



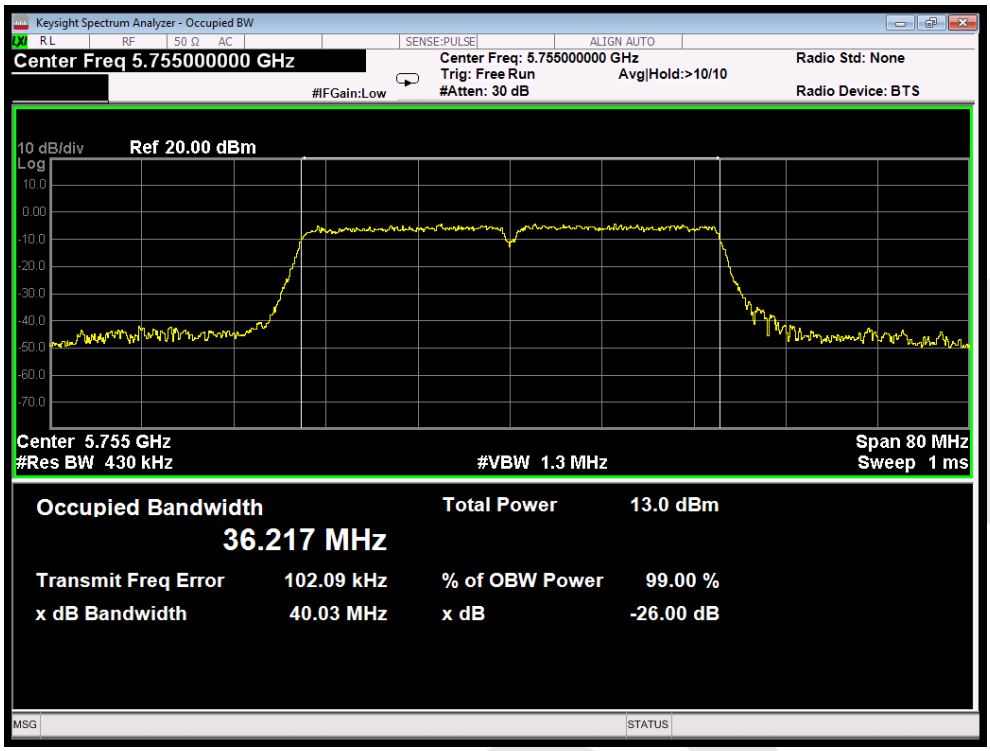
Test Mode: 802.11n20---Low



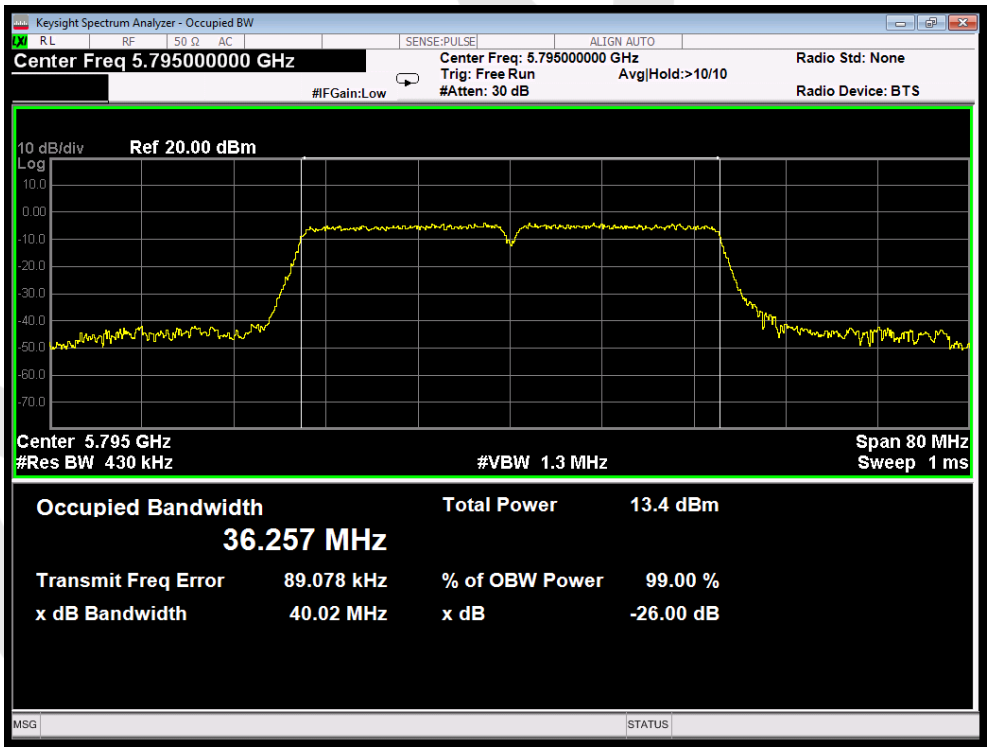
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



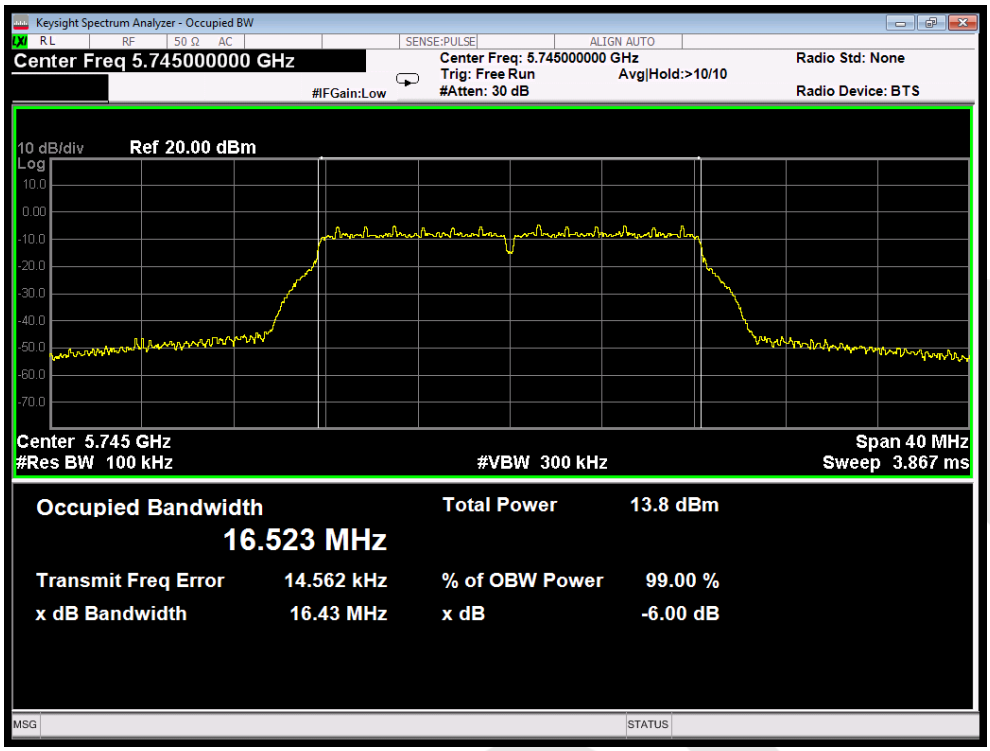
Test Mode: 802.11n40---Low



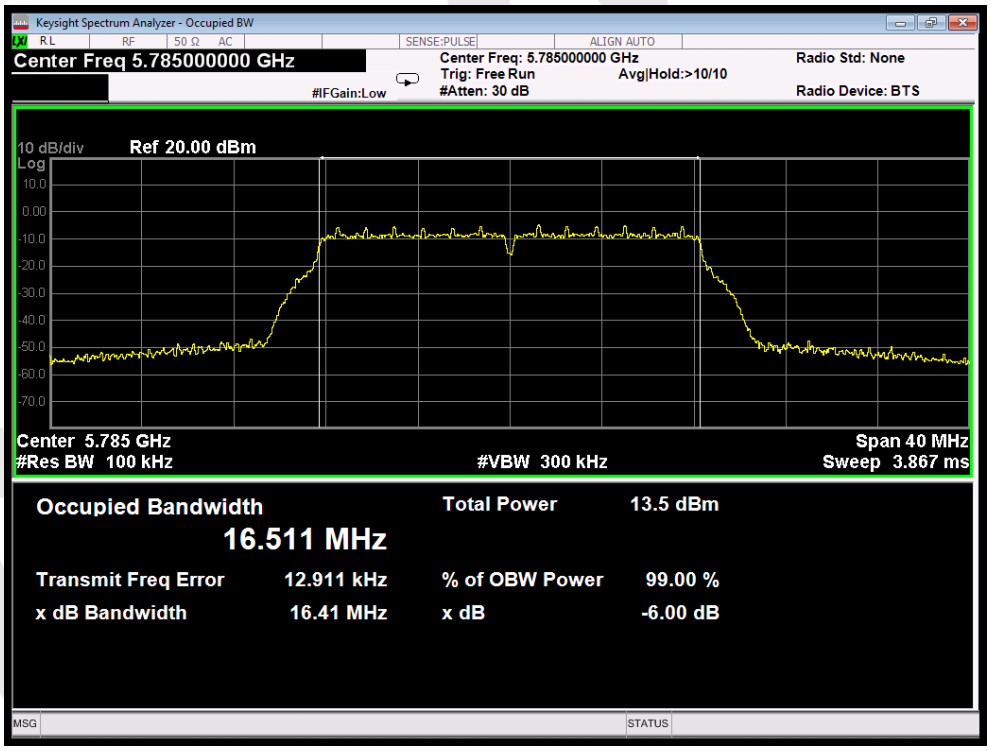
Test Mode: 802.11n40---High

6dB Bandwidth

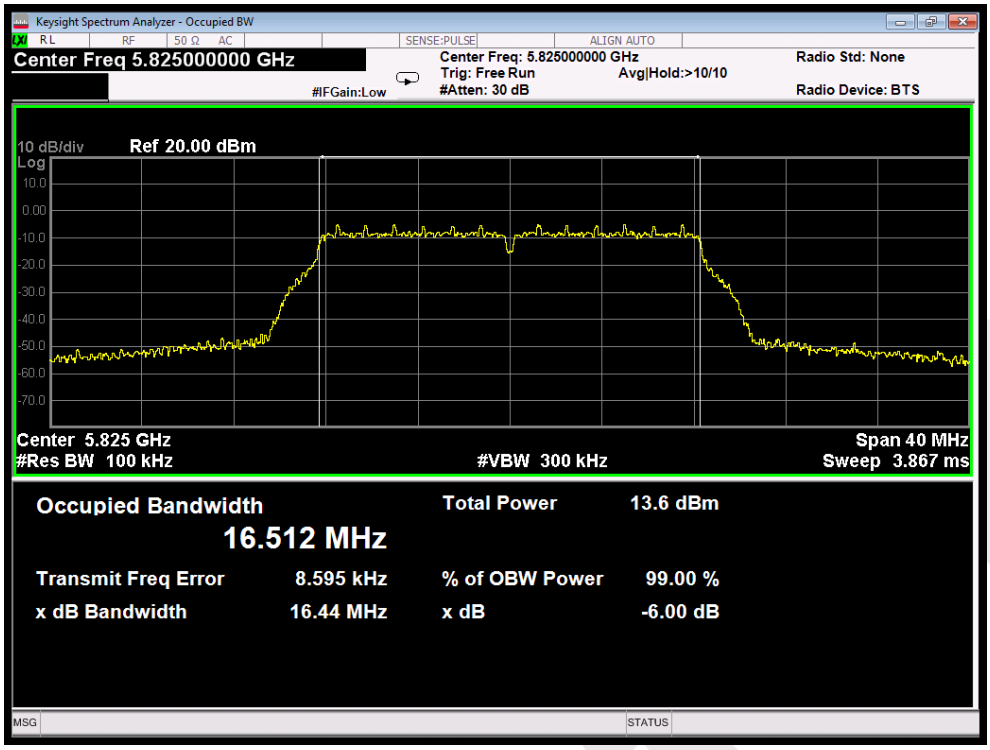
Antenna 2



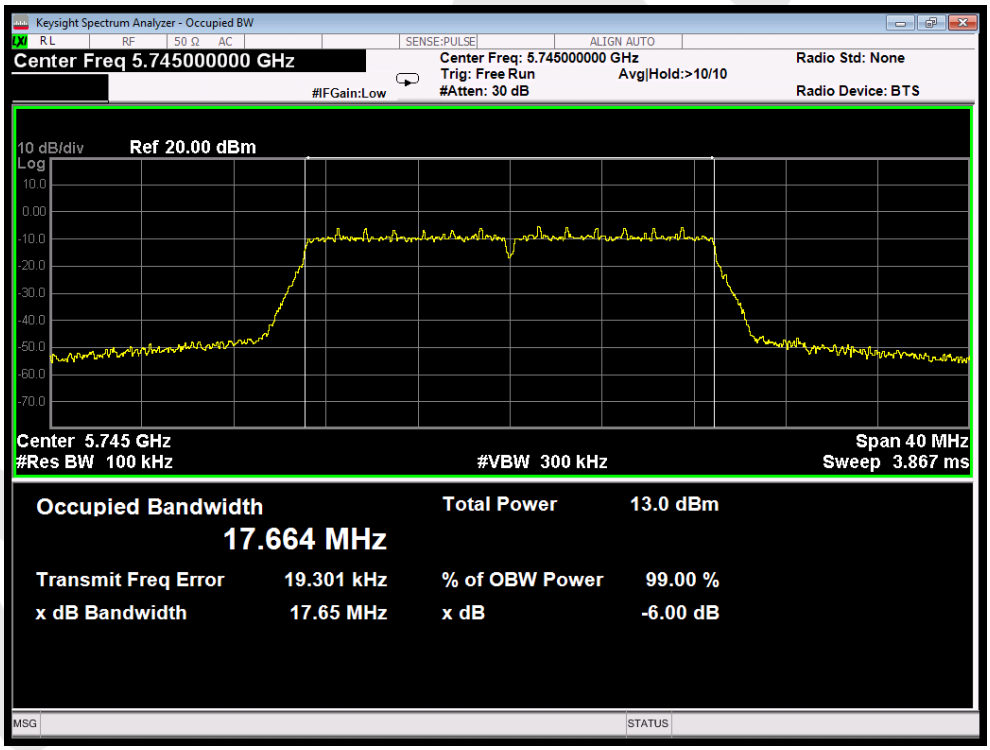
Test Mode: 802.11a--Low



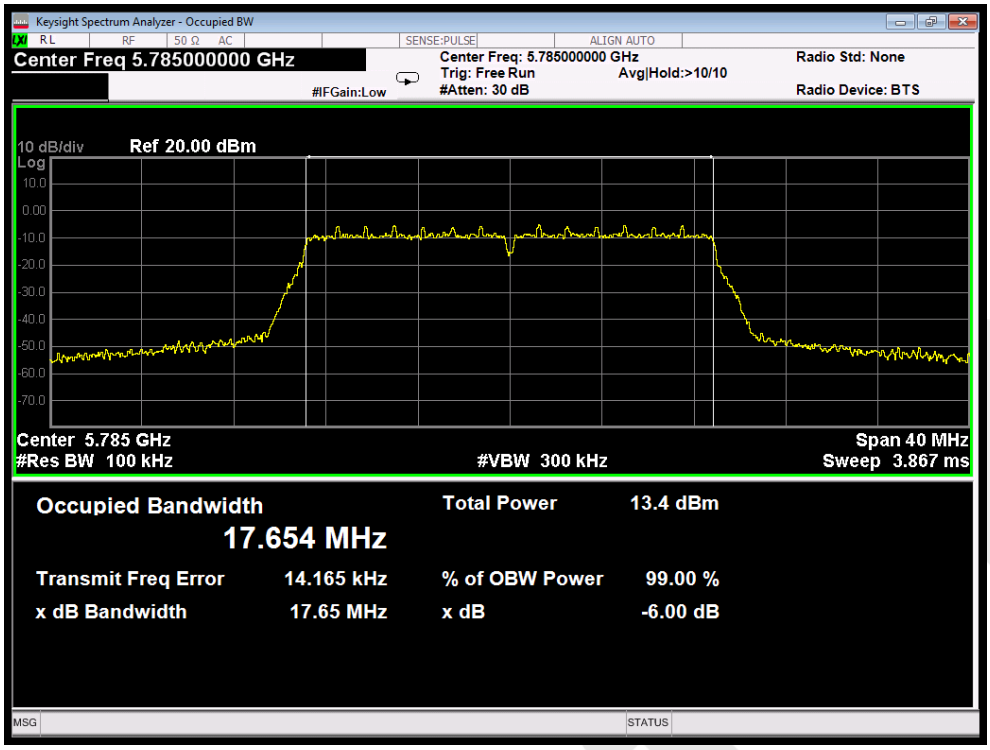
Test Mode: 802.11a---Middle



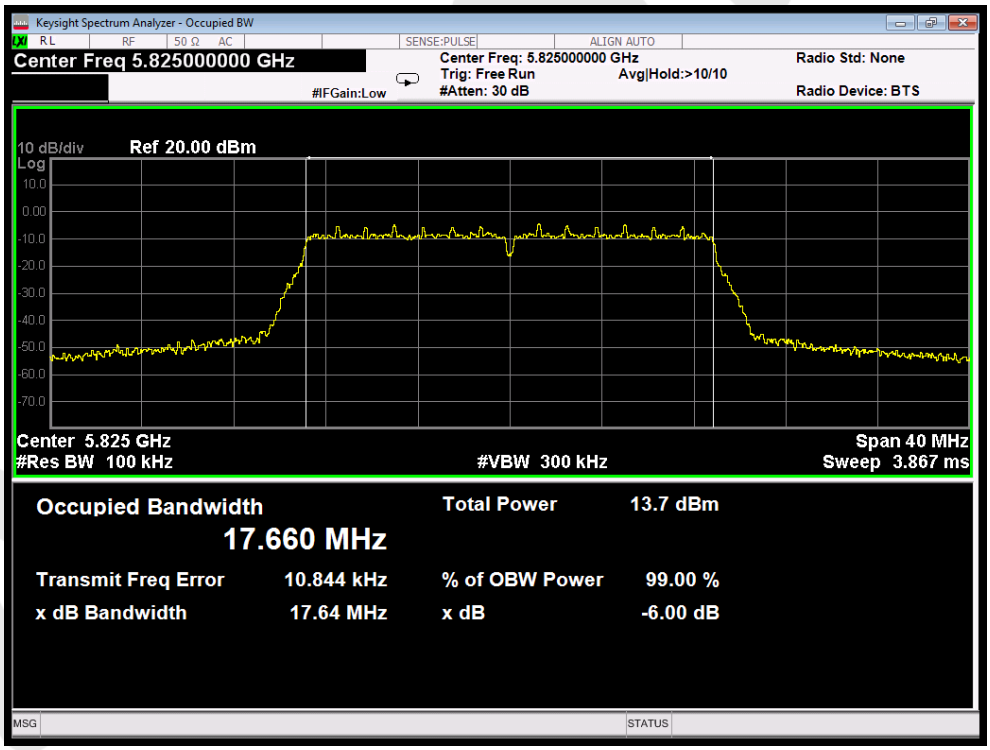
Test Mode: 802.11a---High



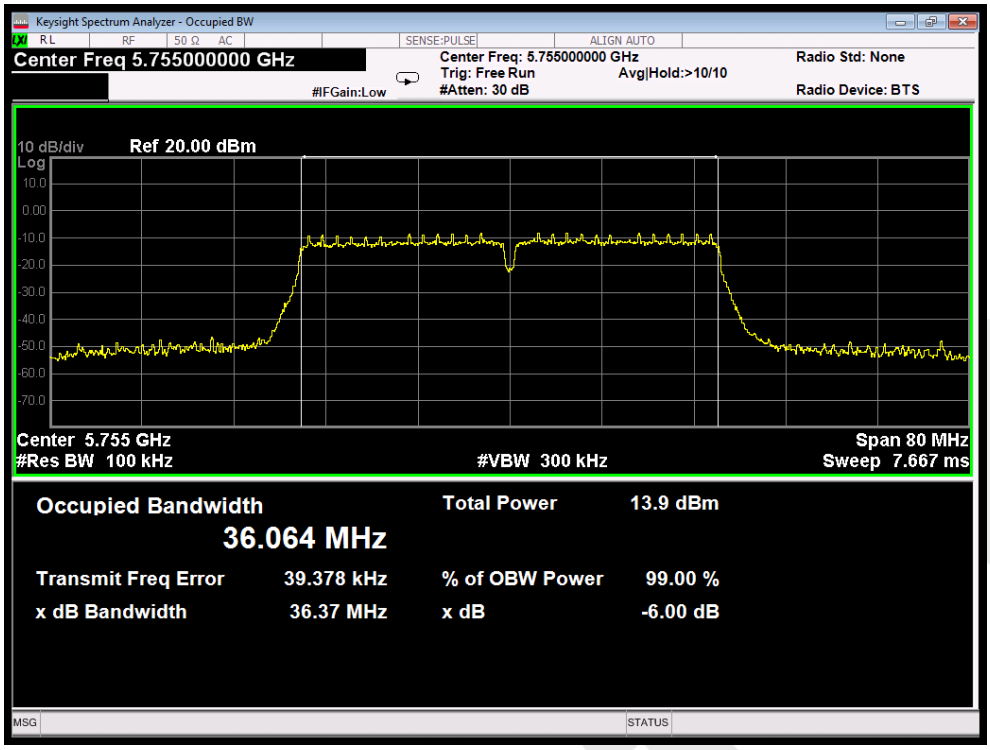
Test Mode: 802.11n20---Low



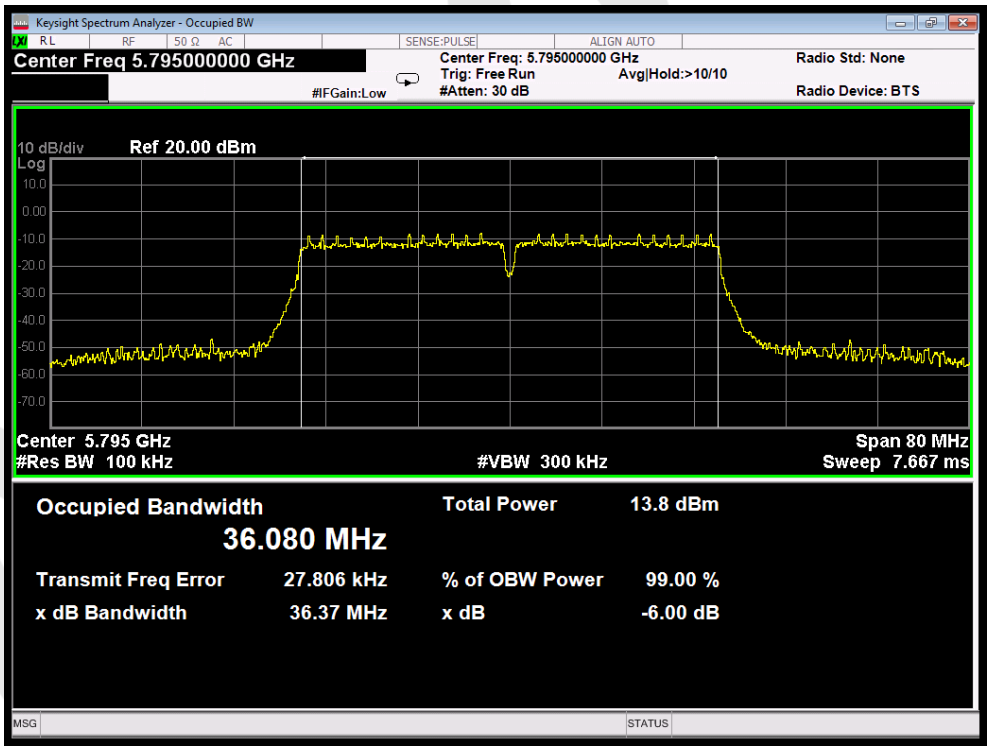
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

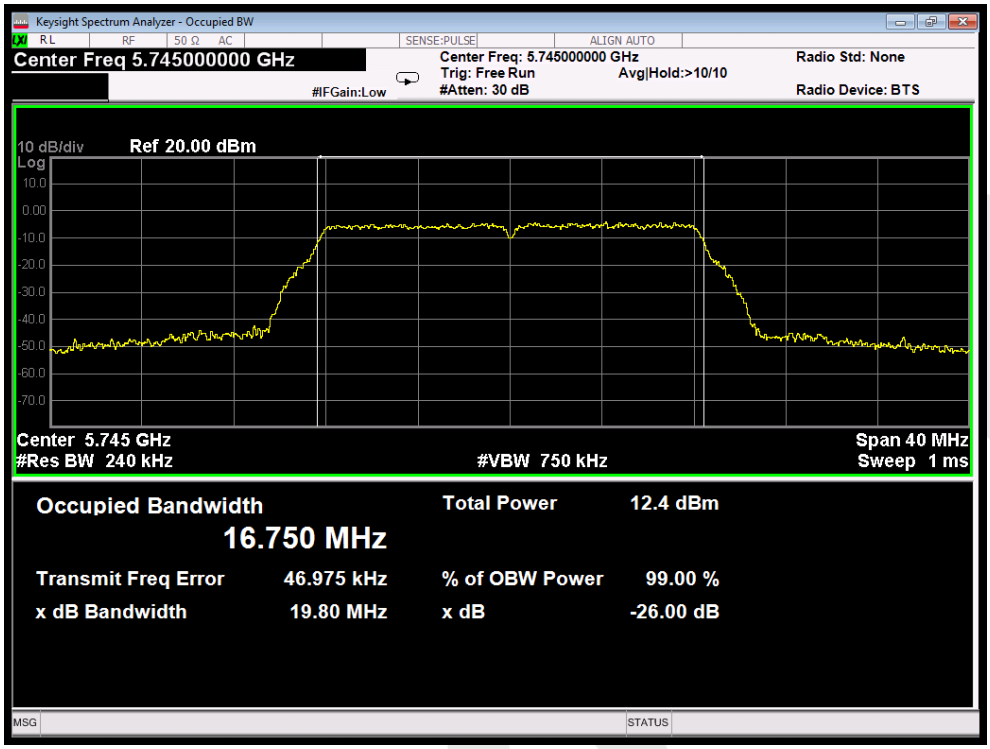


Test Mode: 802.11n40---Low

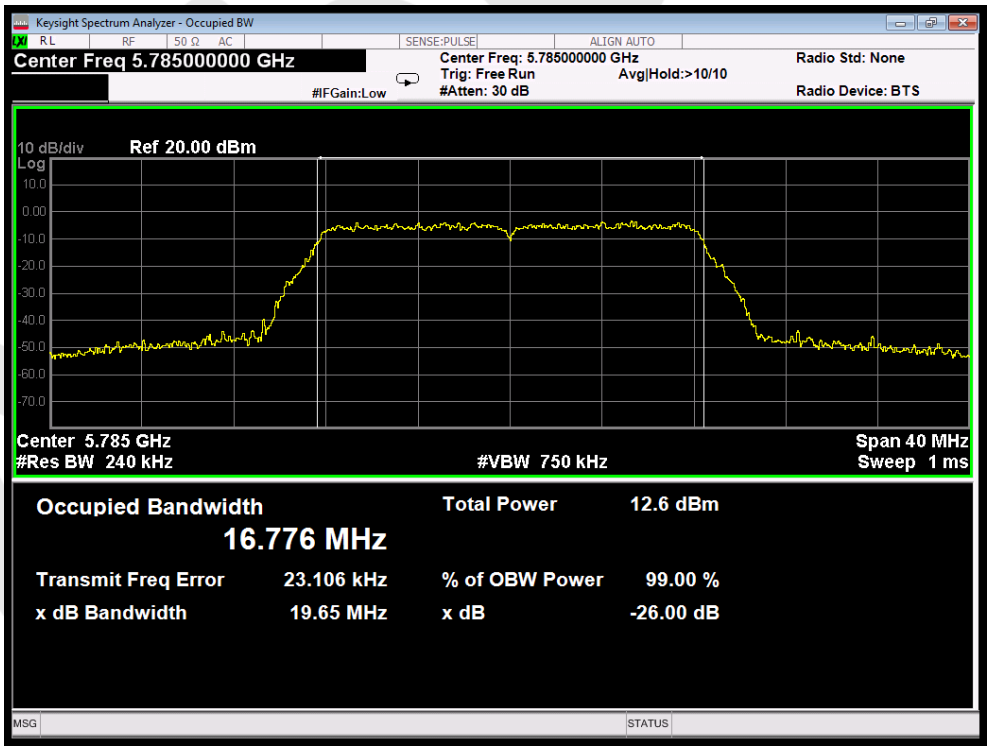


Test Mode: 802.11n40---High

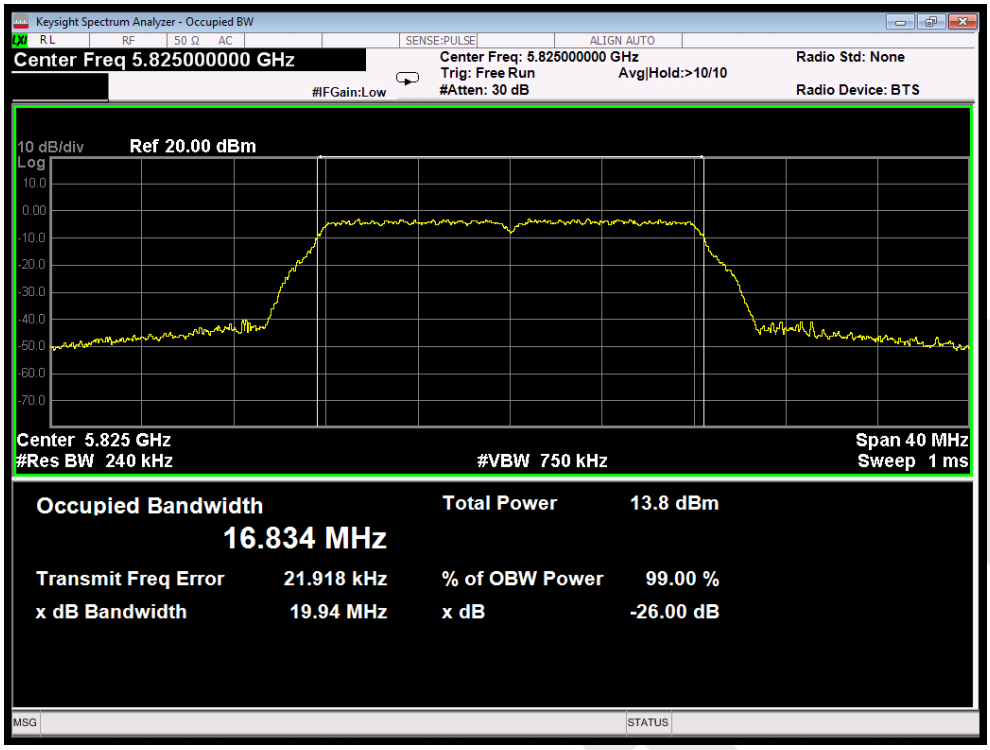
26dB &99% Bandwidth



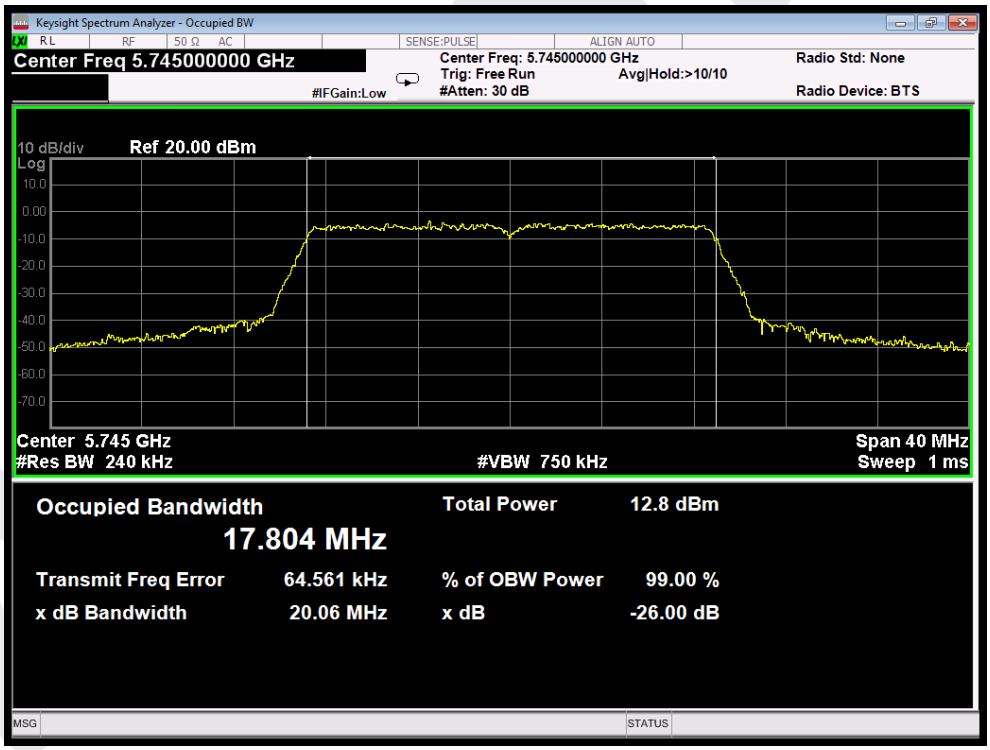
Test Mode: 802.11a--Low



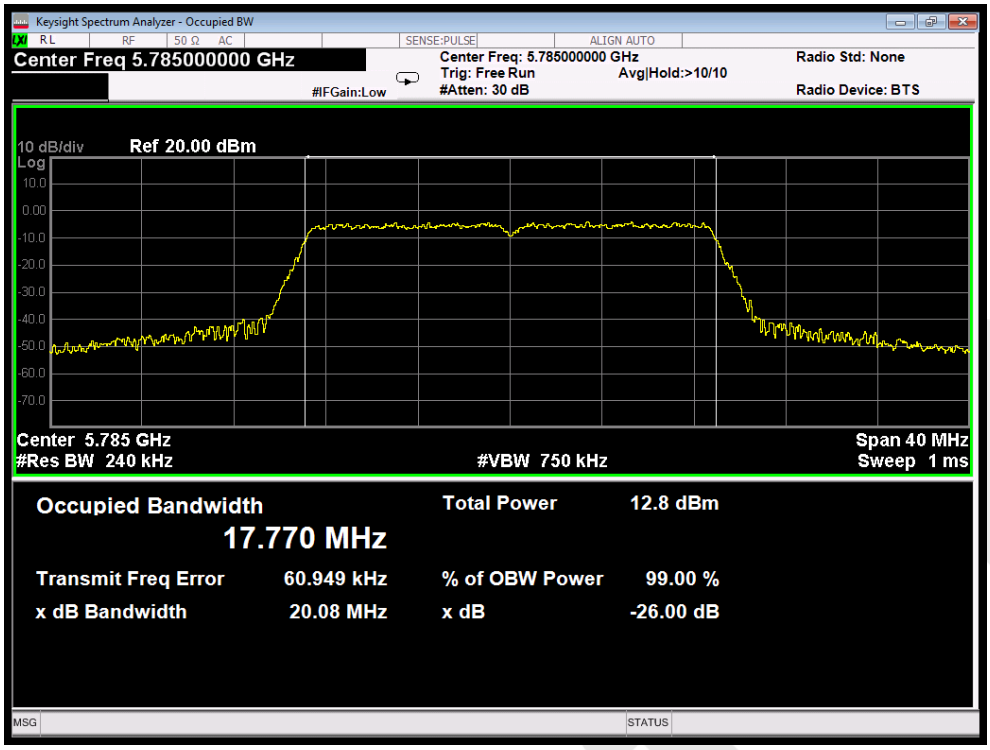
Test Mode: 802.11a---Middle



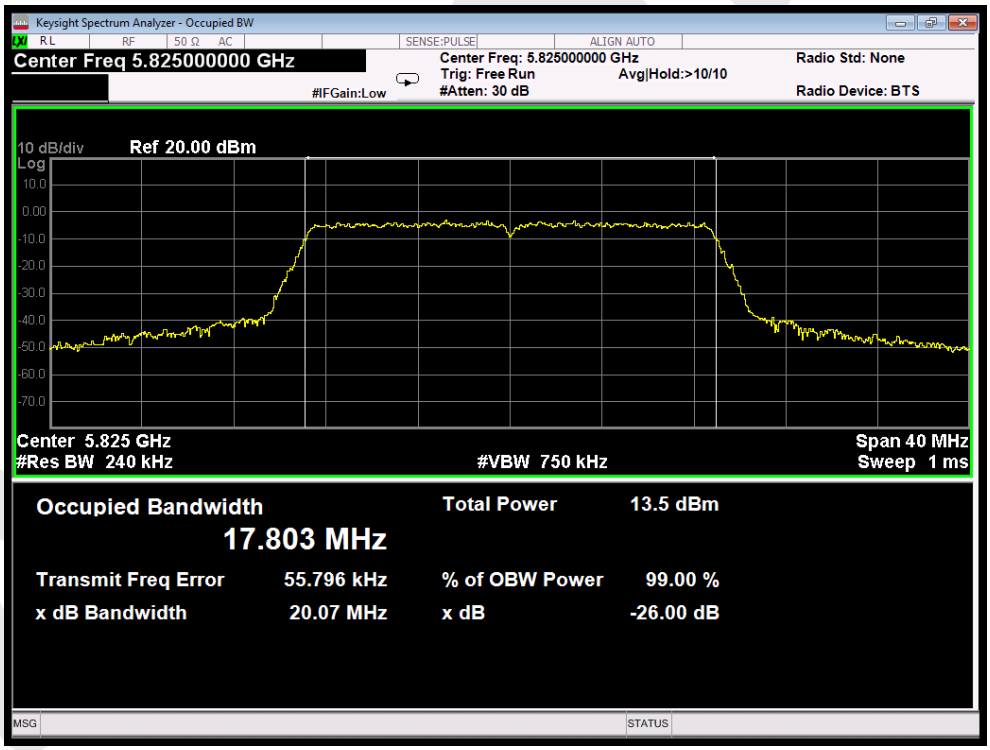
Test Mode: 802.11a---High



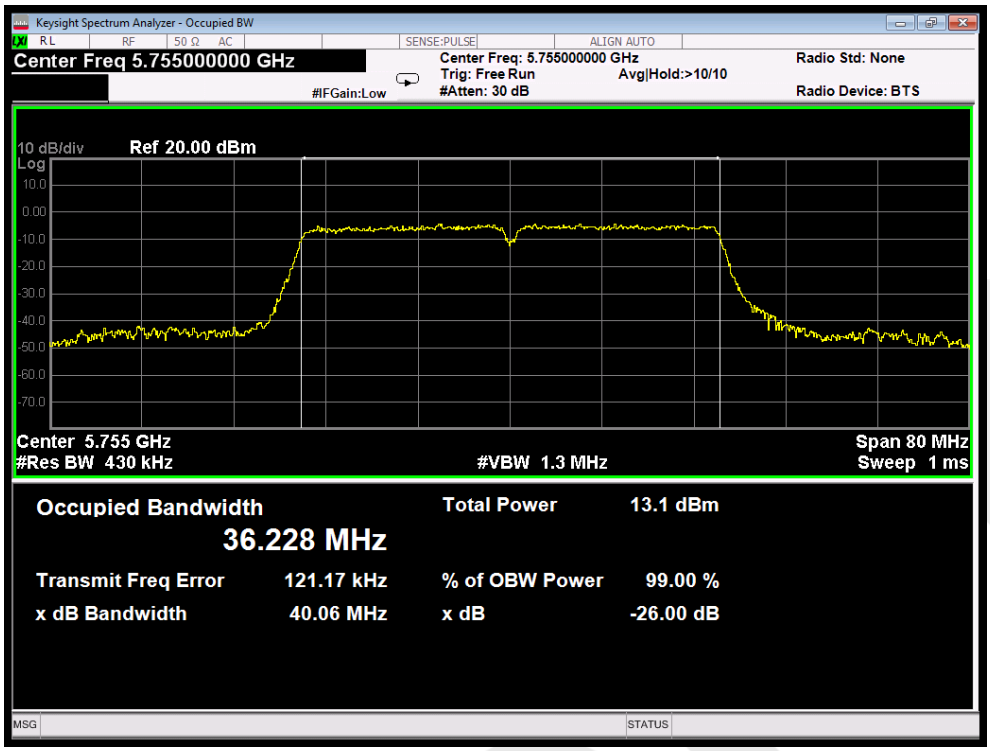
Test Mode: 802.11n20---Low



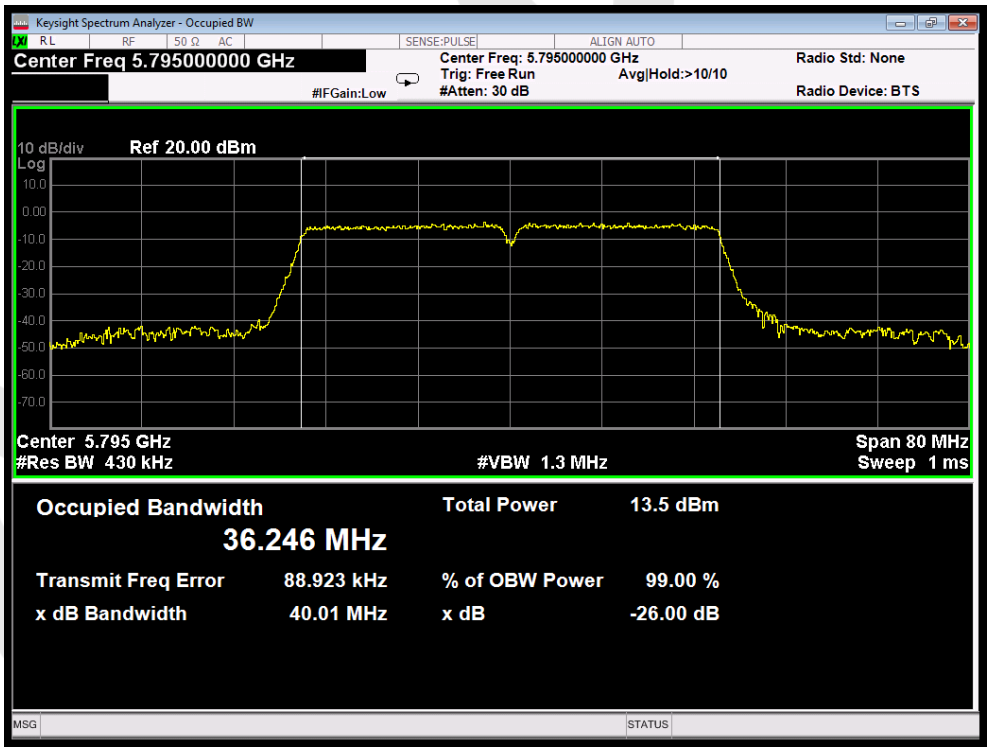
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



Test Mode: 802.11n40---Low



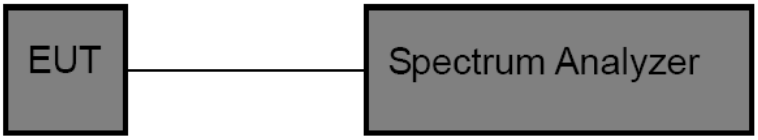
Test Mode: 802.11n40---High

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.407 (a) (3)
Test Limit	not exceed 30dBm/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;
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	:	AC 120V/60HZ	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Antenna 1

Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11a	5745	-1.917	30 dBm	PASS
	5785	-0.689		PASS
	5825	-1.427		PASS
802.11n20	5745	-1.056		PASS
	5785	-1.524		PASS
	5825	-1.291		PASS
802.11n40	5755	-4.389		PASS
	5795	-4.664		PASS

Antenna 2

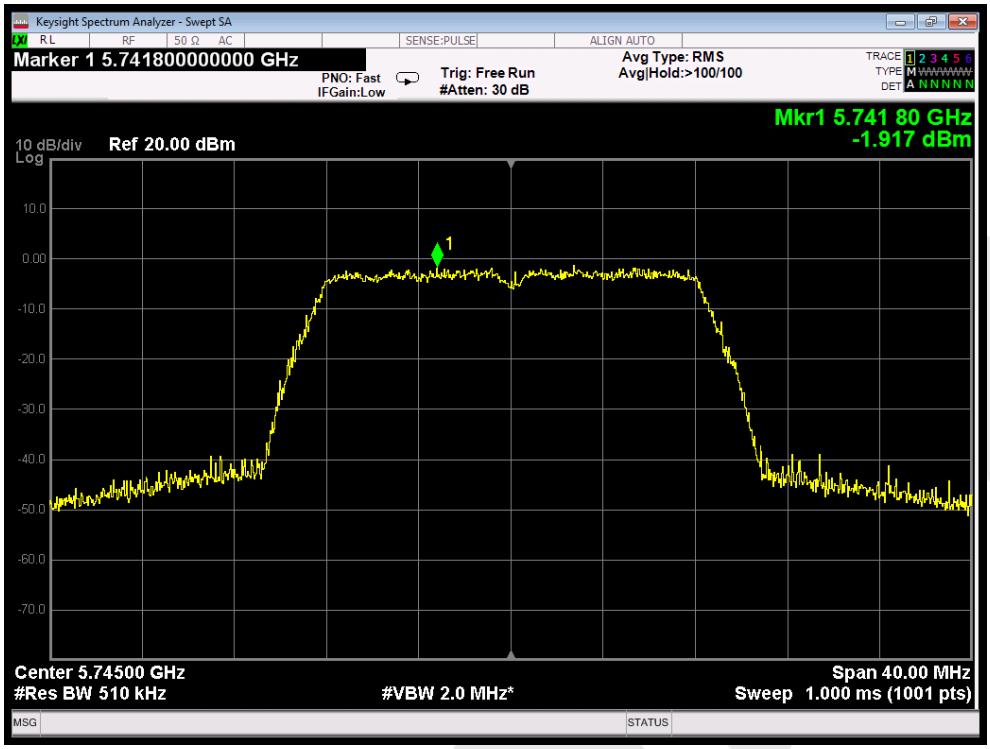
Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11a	5745	-0.899	30 dBm	PASS
	5785	-0.835		PASS
	5825	-0.848		PASS
802.11n20	5745	-1.056		PASS
	5785	-1.982		PASS
	5825	-1.253		PASS
802.11n40	5755	-4.669		PASS
	5795	-2.769		PASS

MIMO for Antenna 1 and Antenna 2

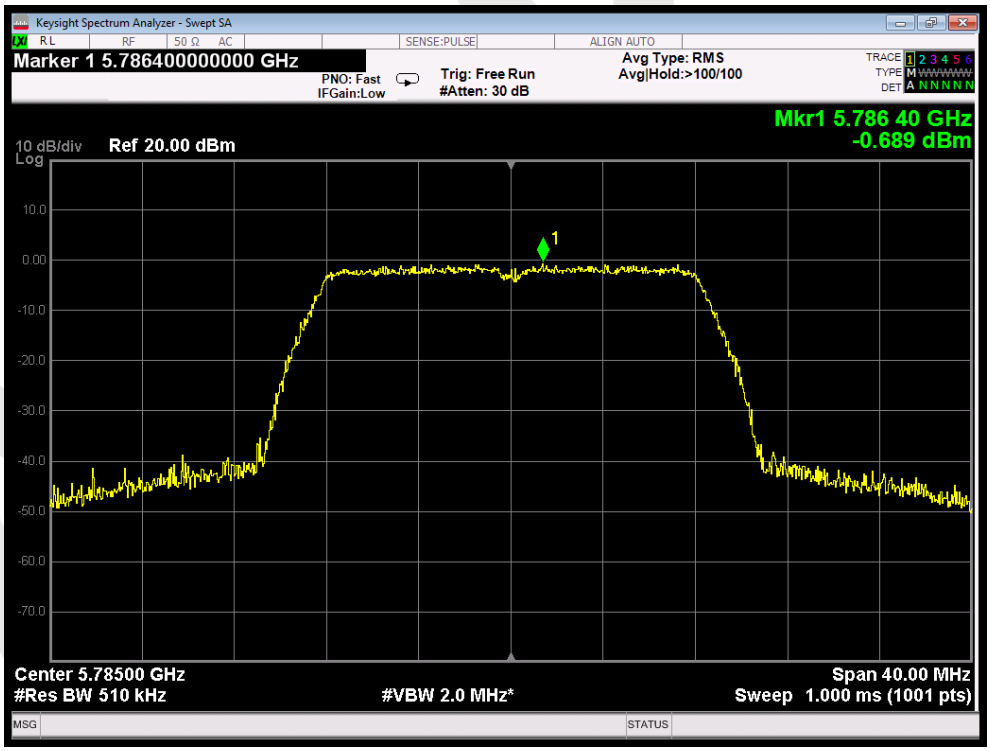
Mode	Channel Frequency (MHz)	Final Power Spectral Density (dBm)	Limit	Results
802.11a	5180	/	11dBm	PASS
	5200	/		PASS
	5240	/		PASS
802.11n20	5180	1.954		PASS
	5200	1.263		PASS
	5240	1.738		PASS
802.11n40	5190	-1.516		PASS
	5230	-0.604		PASS

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

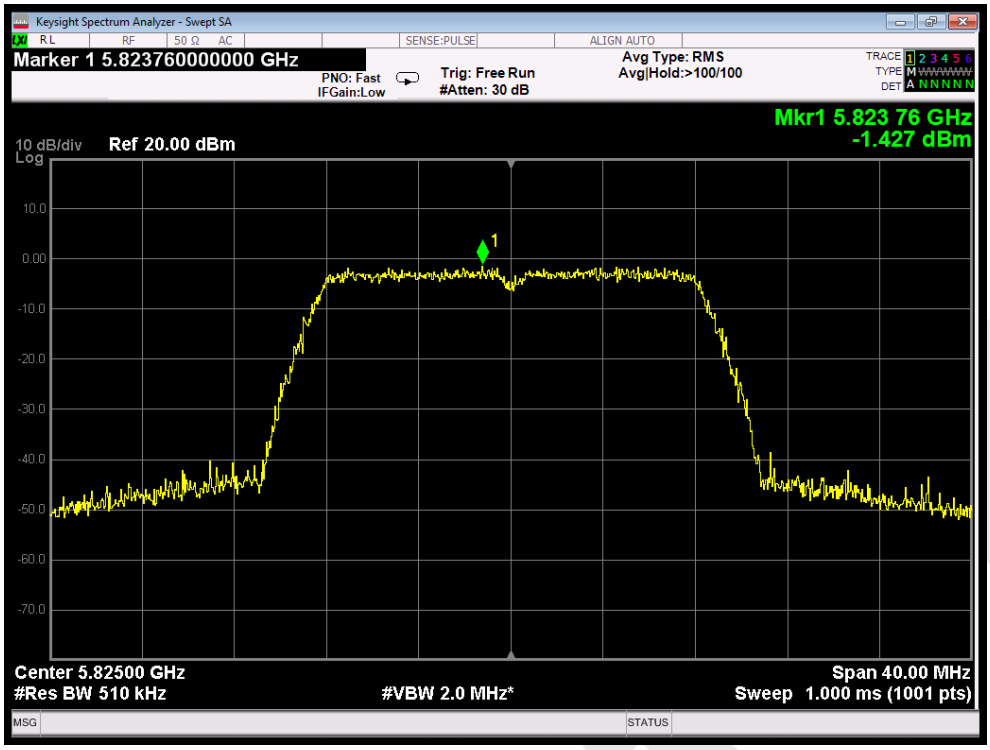
Antenna 1



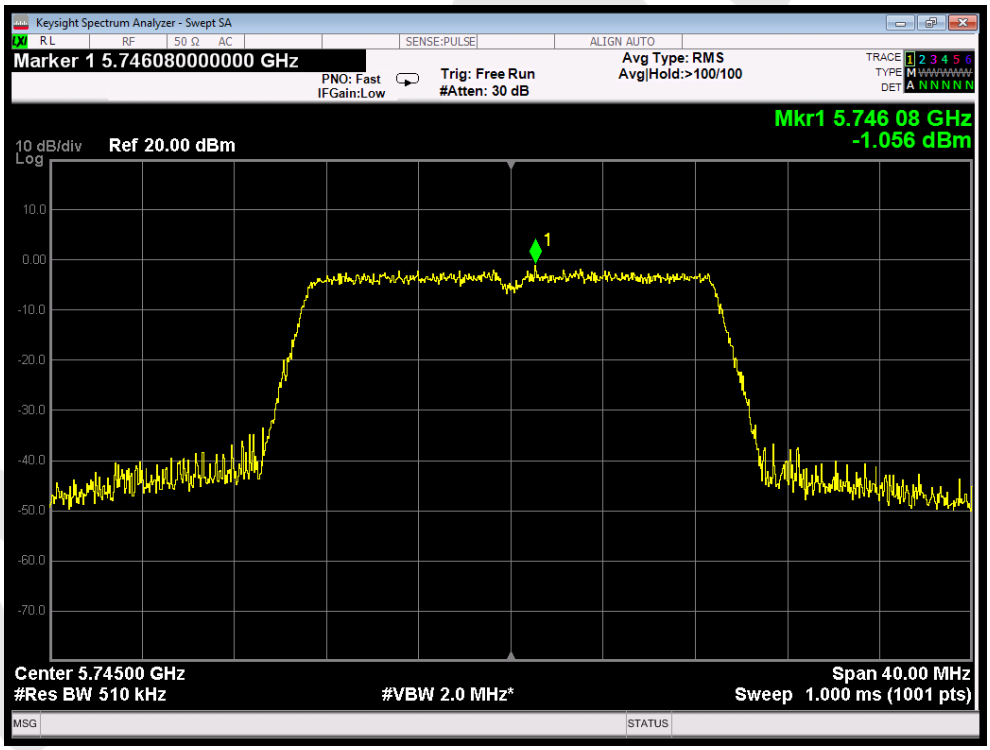
Test Mode: 802.11a--Low



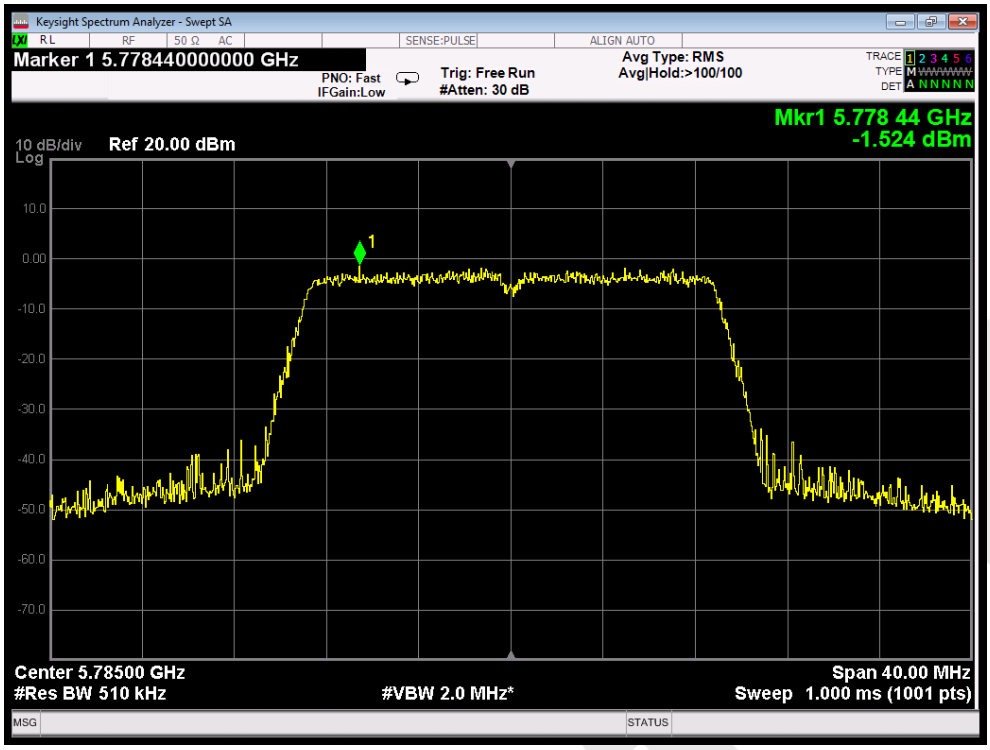
Test Mode: 802.11a---Middle



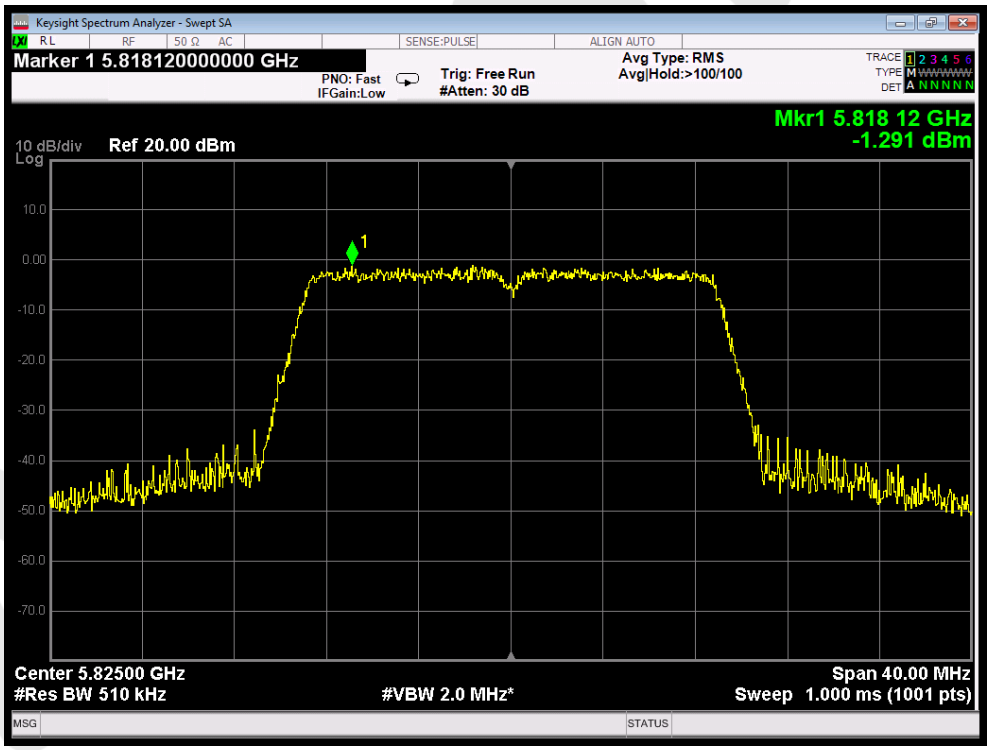
Test Mode: 802.11a---High



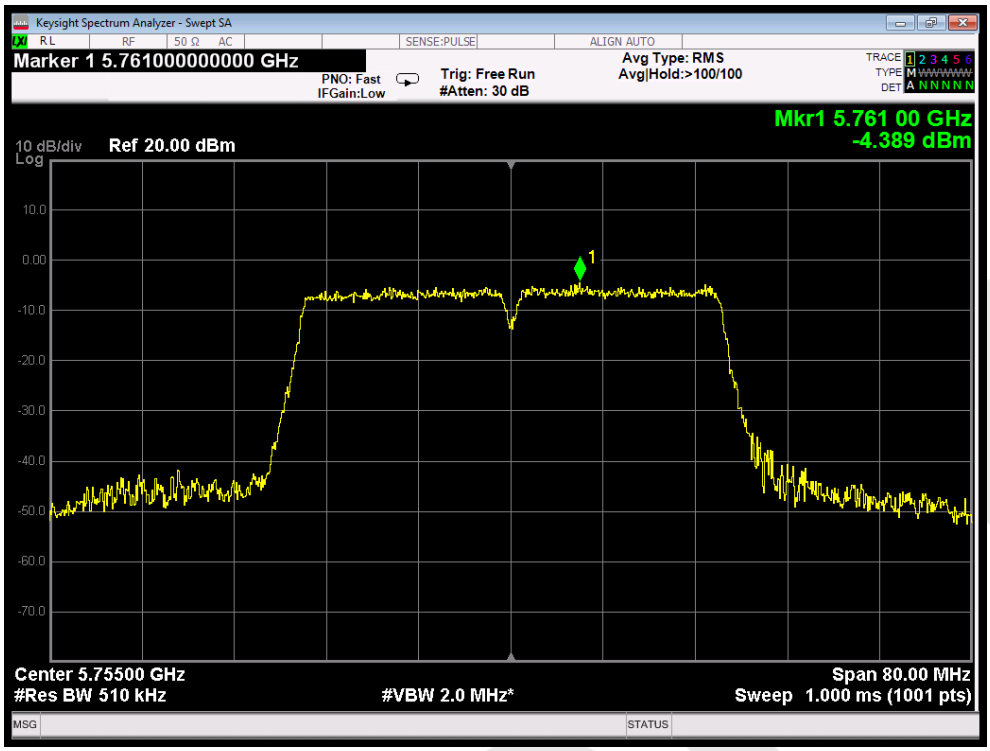
Test Mode: 802.11n20---Low



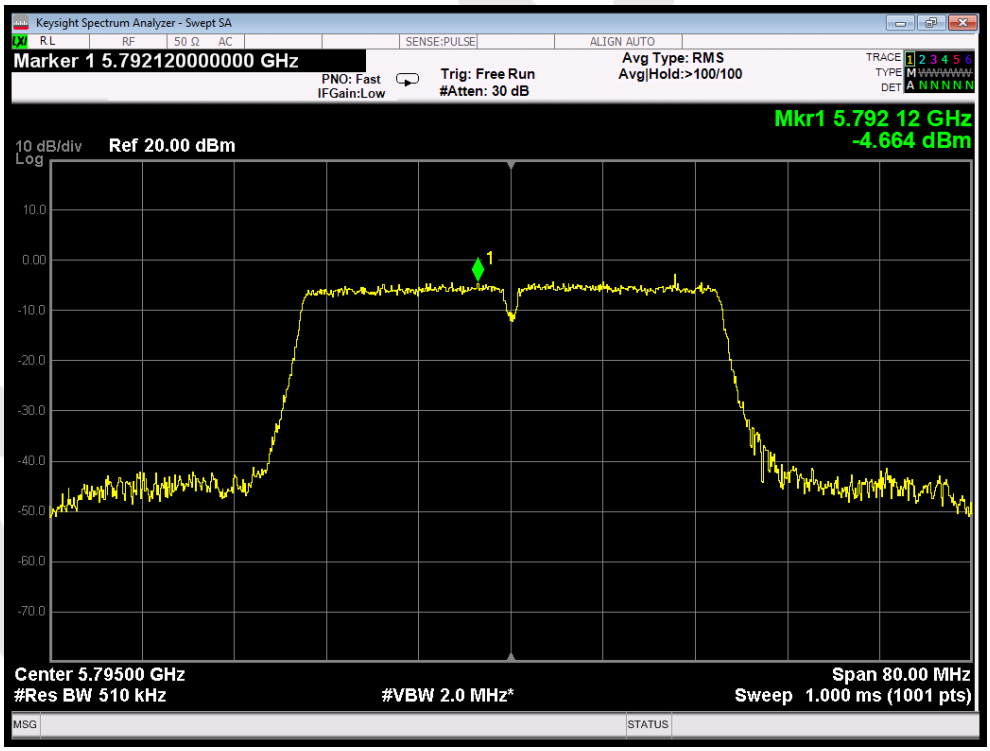
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High

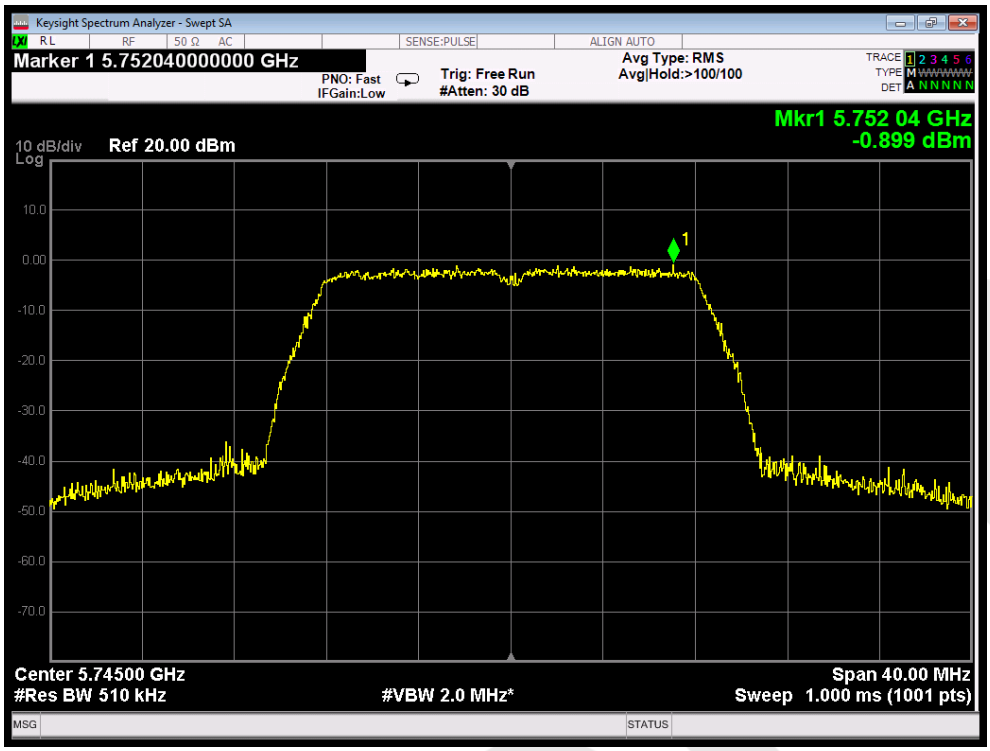


Test Mode: 802.11n40---Low

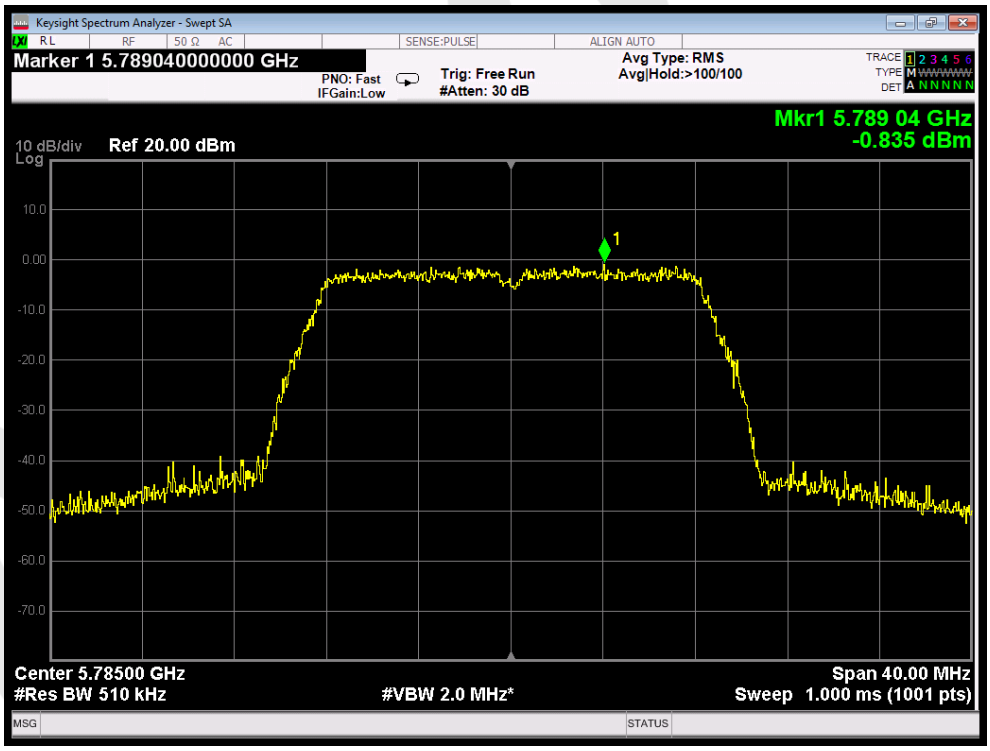


Test Mode: 802.11n40---High

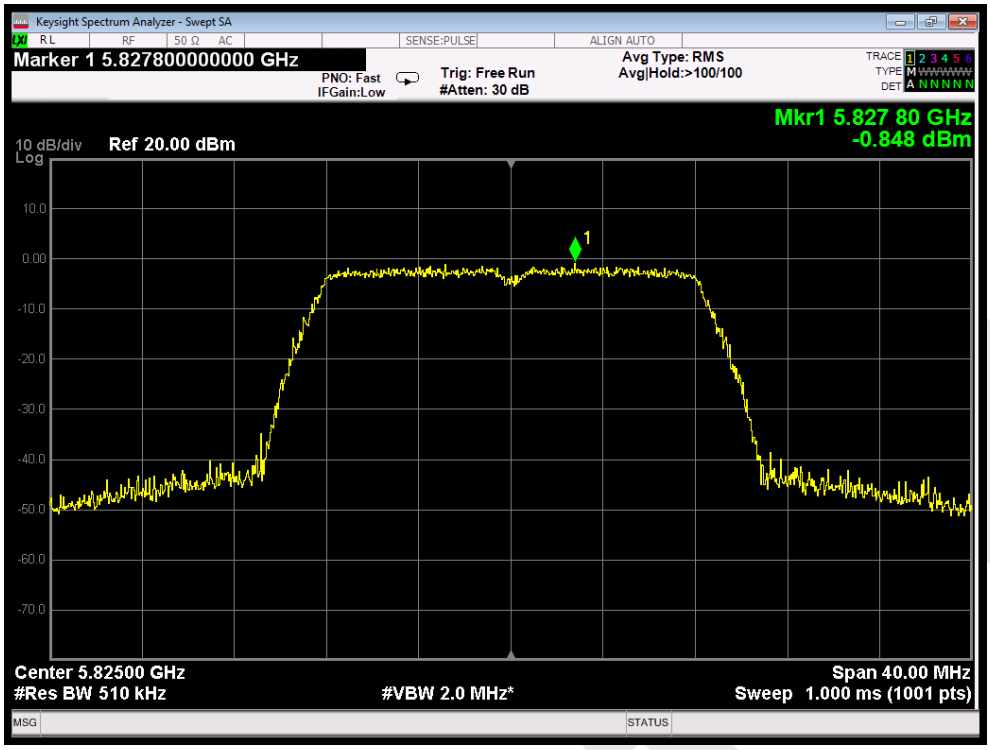
Antenna 2



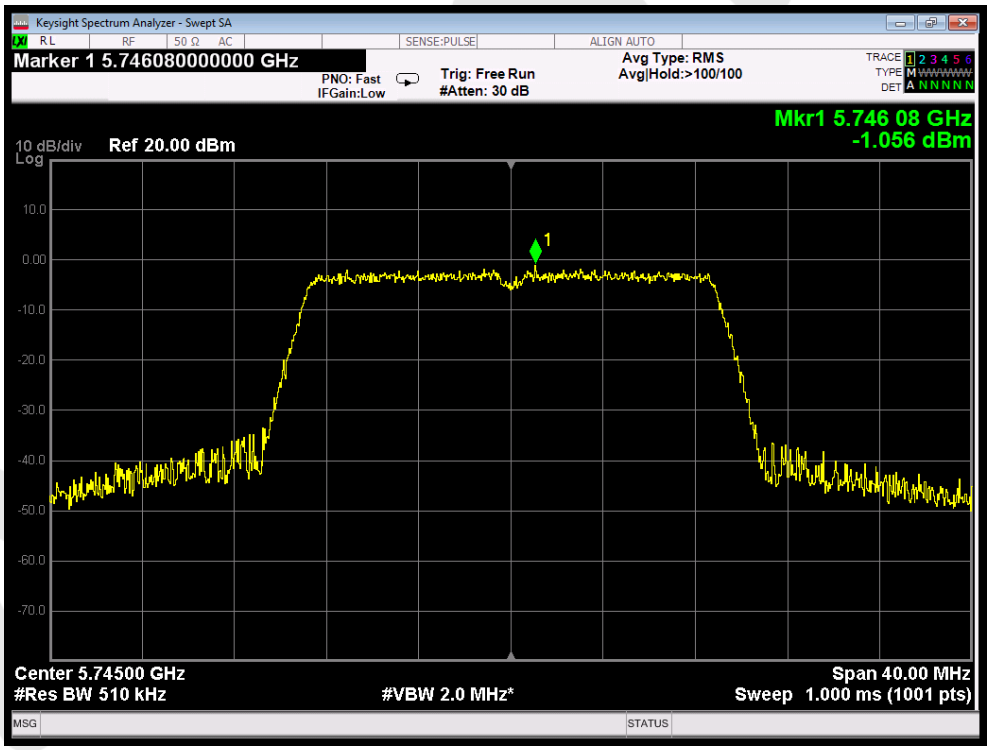
Test Mode: 802.11a--Low



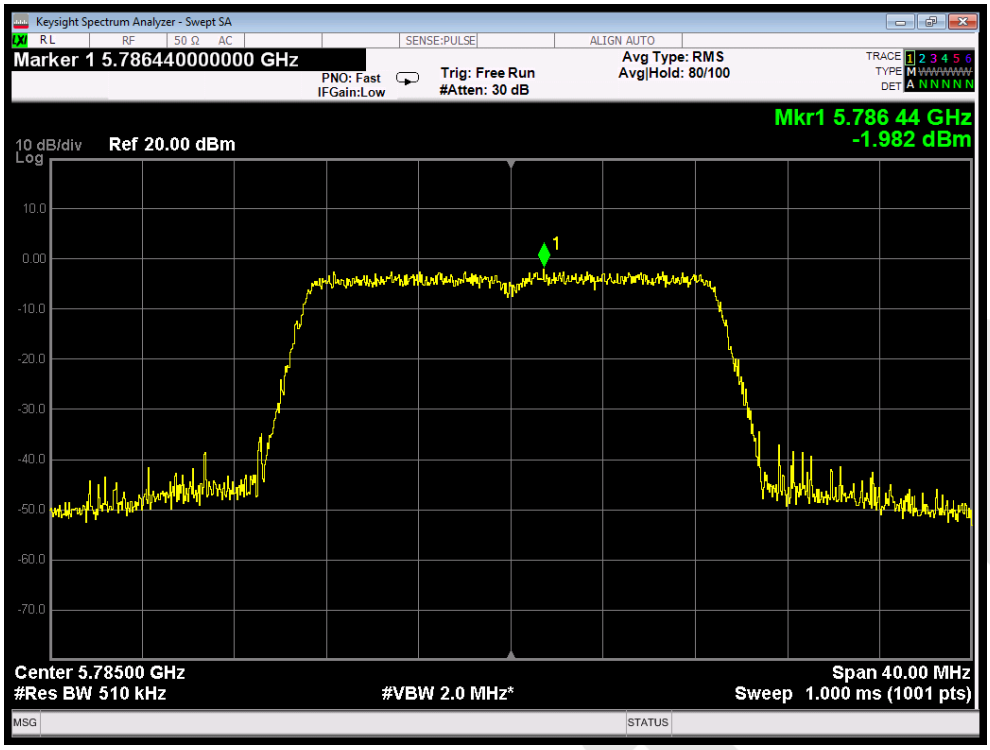
Test Mode: 802.11a---Middle



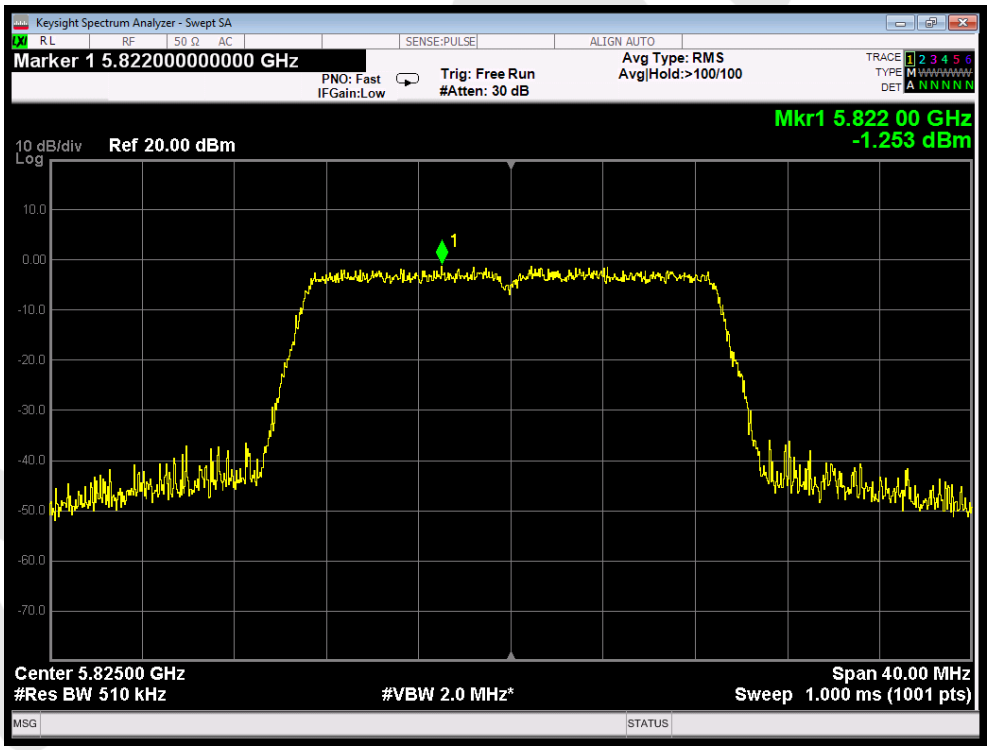
Test Mode: 802.11a---High



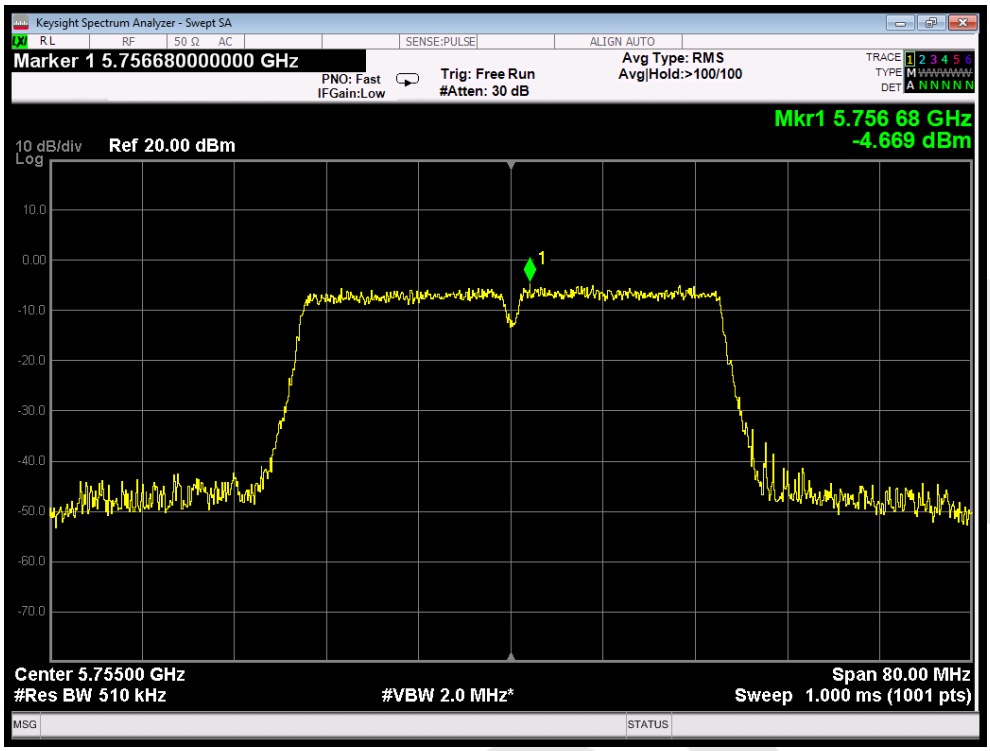
Test Mode: 802.11n20---Low



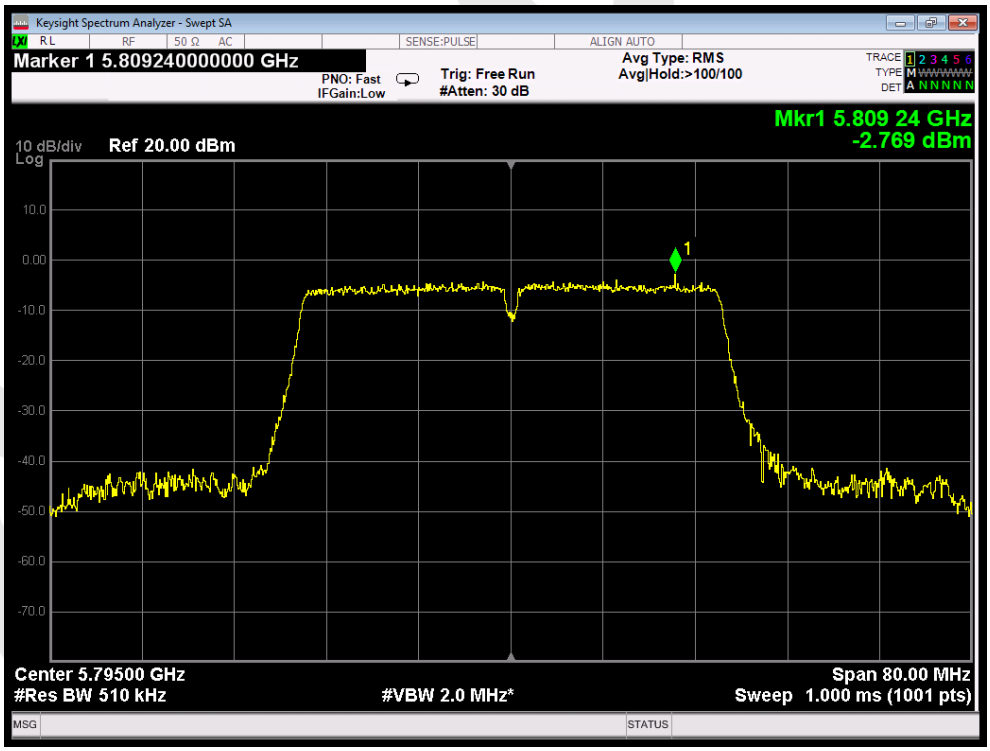
Test Mode: 802.11n20---Middle



Test Mode: 802.11n20---High



Test Mode: 802.11n40---Low



Test Mode: 802.11n40---High

8. Antenna Requirement

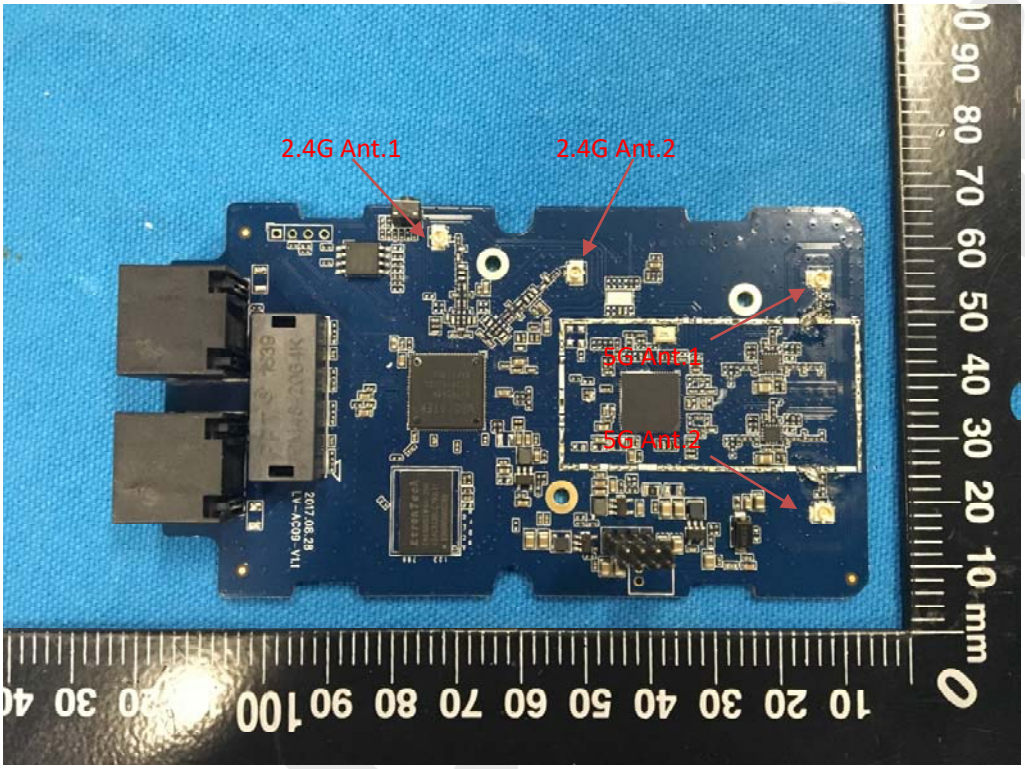
8.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /15.407
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.407 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

8.2. Antenna Connected Construction

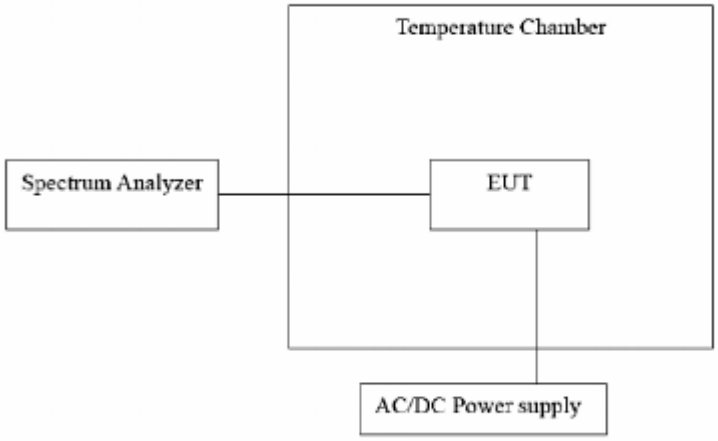
The WIFI antenna is a PIFA antenna which permanently attached, and the best case gain of the antenna is 2 dBi. It complies with the standard requirement.

WIFI Antenna



9.Frequency Stability Measurement

9.1 Test Specification

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

Test result as follows:

For antenna 1

Mode	Voltage (V)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	132 V	5744.986	14	5824.984	16
	120 V	5744.985	15	5824.984	16
	108 V	5744.983	17	5824.983	17

Mode	Temperature (℃)	FHL (5745MHz)	Deviation (KHz)	FHH (5825MHz)	Deviation (KHz)
5.8G Band	-30	5744.958	42	5824.966	34
	-20	5744.957	43	5824.956	44
	-10	5744.979	21	5824.978	22
	0	5744.975	25	5824.978	22
	10	5744.976	24	5824.975	25
	20	5744.988	12	5824.983	17
	30	5744.975	25	5824.977	23
	40	5744.974	26	5824.973	27
	50	5744.961	39	5824.969	31

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement

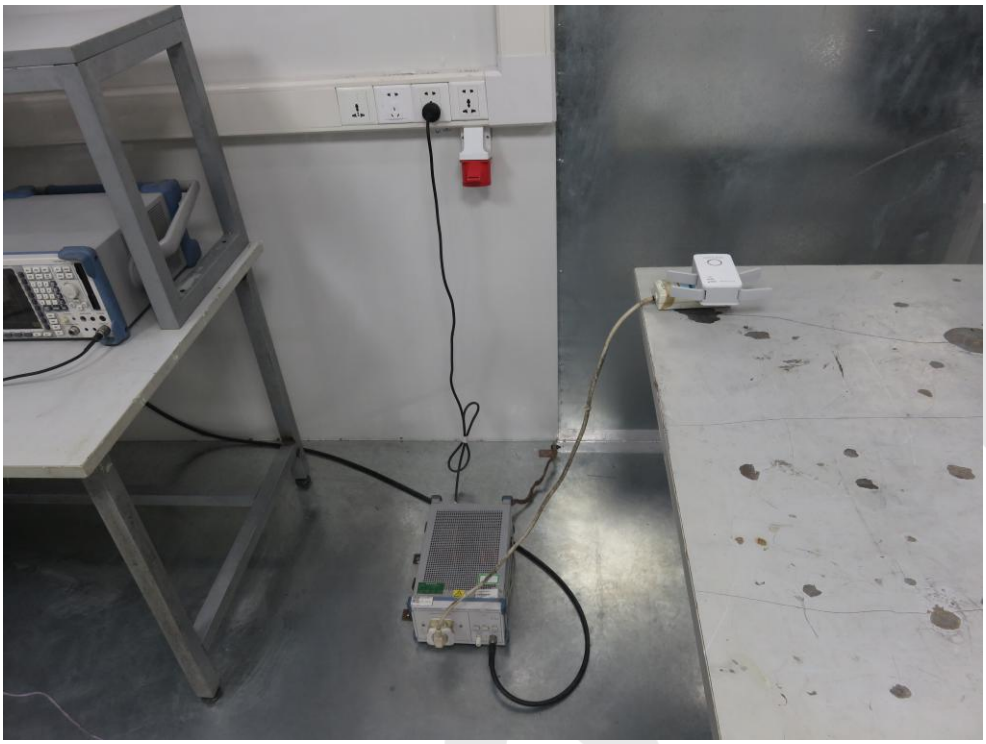
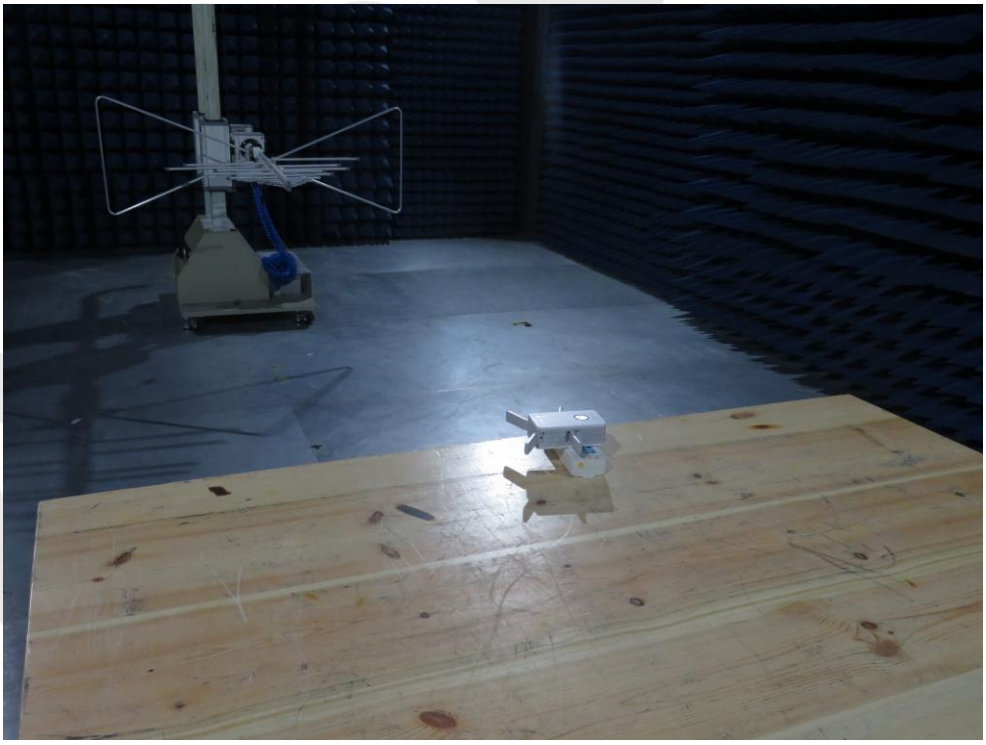
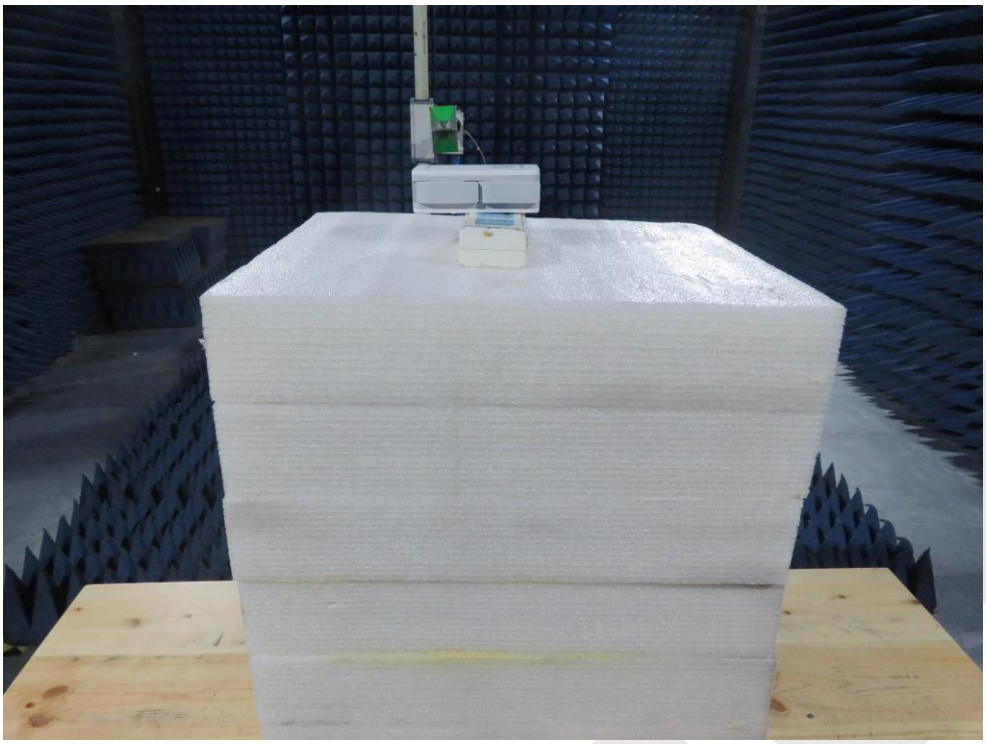


Photo of Radiation Emission Test





APPENDIX II -- EXTERNAL PHOTOGRAPH

Please see the test report of SZAWW171228001-01

APPENDIX III -- INTERNAL PHOTOGRAPH

Please see the test report of SZAWW171228001-01

End of Report